ISSUED

# United States Department of Energy
# Carlsbad Field Office

# Waste Isolation Pilot Plant
# Annual Site Environmental Report for 2024

## DOE/WIPP-25-3591
## Revision 0

**Effective: September 29, 2025**

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**Reader Survey – Annual Site Environmental Report for 2024**

To our readers:

This report presents summary environmental data to (1) characterize environmental management performance at the Waste Isolation Pilot Plant (WIPP) site; (2) summarize environmental occurrences and responses reported during the calendar year; (3) summarize compliance with environmental standards and requirements; and (4) highlight the WIPP Environmental Management System (EMS), significant environmental programs and accomplishments, including progress toward U.S. Department of Energy (DOE) Environmental Sustainability Goals.

It is important that the information we provide is valid, accurate, easily understood, of interest, and communicates the DOE's efforts and commitment to environmental protection, compliance, and sustainability. We would like to know from you whether we are successful in achieving these goals. Your comments are appreciated and will help us to improve our communications.

Is the writing: ☐ Too concise ☐ Too wordy ☐ Uneven ☐ Just right

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Is the text easy to understand ☐ Yes ☐ No
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How do you use the WIPP Annual Site Environmental Report (ASER) (check all that apply)?

| | | |
|---|---|---|
| To obtain general information about DOE activities at WIPP | ☐ | ☐ |
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Other (please specify):________________________________________
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Optional Information:

Name____________________________ Occupation____________________________

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# REVISION SUMMARY

| Revision Number | Description of Changes |
|---|---|
| 0 | Initial issue. This report was prepared to meet the annual reporting requirement prescribed in (DOE) Orders 231.1B and 458.1. |

# EXECUTIVE SUMMARY

## REPORT PURPOSE AND DEVELOPMENT

The purpose of the Waste Isolation Pilot Plant (WIPP) Annual Site Environmental Report (ASER) is to meet the requirements of U.S. Department of Energy (DOE) Order 231.1B, *Environmental, Safety, and Health Reporting*, and DOE Order 458.1, *Radiation Protection of the Public and the Environment,* to assure that the public is informed of any WIPP activities that could adversely affect the health and safety of the public, WIPP site personnel, or the environment.

For the calendar year (CY), the WIPP facility was managed and operated by Salado Isolation Mining Contractors, LLC (SIMCO) for the DOE (owner of the WIPP facility) under contract 89303322DEM000077. This report was developed by LATA, a subcontractor to SIMCO.

## WIPP MISSION AND WASTE EMPLACEMENT

The WIPP Project's mission is to provide underground disposal of transuranic (TRU) and TRU mixed wastes generated by the research and production of nuclear weapons and other activities related to the national defense of the United States. There were 470 shipments of TRU waste received in the CY, yielding a total emplaced volume of TRU mixed waste and LWA TRU waste volume totaling 3,498.93 cubic meters ($m^3$) and 2836.20 $m^3$ respectively. As of the end of 2024, the total TRU mixed emplaced waste inventory is 108,873.01 $m^3$ and the Land Withdrawal Act (LWA) total volume is 78,325.59 $m^3$. The LWA limit is 175,564 $m^3$, leaving 97,238.41 $m^3$ of volume remaining for waste emplacement.

### Monitoring for Environmental Impacts

Numerous samples and data are collected to detect and quantify potential impacts of WIPP facility operations on the surrounding environment. The *Waste Isolation Pilot Plant Environmental Monitoring Plan* (DOE/WIPP-99-2194) outlines major environmental monitoring and surveillance activities at the WIPP facility. It discusses the WIPP facility quality assurance/quality control (QA/QC) program as it relates to environmental monitoring.

In the CY, results of these programs, including observations and analytical data, demonstrated that (1) compliance with applicable environmental requirements was maintained at the WIPP facility, and (2) human health and the environment have not been adversely impacted by operations at the WIPP facility. In the CY, TRU radionuclides in environmental samples were detected only in effluent air samples by the National Emission Standards for Hazardous Air Pollutants (NESHAP) program. These detections were less than 1 percent of regulatory limits.

### Environmental Compliance

The owner and operator of the WIPP facility are required to comply with applicable federal and state laws, DOE orders, and active New Mexico Environment Department (NMED) administrative orders. All documents regarding the Permit, *WIPP Discharge Permit* (DP-831), U.S. Environmental Protection Agency (EPA), and Carlsbad Field Office (CBFO) were submitted as required. Other relevant correspondence, regulatory submittals, monitoring reports, and the results of the EPA Annual Inspection and other inspections are described in chapters 2 and 3 of this report.

### WIPP Environmental Management System and Sustainable Practices

The WIPP Environmental Management System (EMS) is one of the mechanisms to facilitate the protection of human health and the environment; to assist in maintaining compliance with applicable environmental laws and regulations; and to foster the implementation of sustainable practices for enhancing environmental management performance. The EMS is described in the *Waste Isolation Pilot Plant Environmental Management System* (WP 02-EC.14). Measuring and monitoring are key activities to ensure the project meets the objectives of the EMS.

The WIPP site—excluding waste generated from capital construction projects—generated 433.81 metric tons of municipal solid waste, wood waste, and recyclable materials in fiscal year (FY) 2024. Of that, 370.75 metric tons, or 85.46 percent was recycled and diverted from being landfilled.

## SUMMARY OF RELEASES AND RADIOLOGICAL DOSES TO THE PUBLIC

### Doses to the Public and the Environment

The calculated radiation dose to members of the public from WIPP facility operations is based on WIPP facility effluent monitoring results and demonstrated compliance with applicable federal regulations (40 CFR Part 191, Subpart A and 40 CFR Part 61, Subpart H).

### Total Dose from WIPP Facility Operations

The potential dose to an individual from the ingestion of WIPP facility managed radionuclides transported in water is estimated at zero. This is because drinking water for communities near the WIPP site comes from groundwater sources that are isolated from WIPP facility operations. Drinking water has an extremely low chance of being contaminated due to WIPP facility operations.

Similar to the trend in recent years, limited game animals were collected in the CY. Based on analytical results, it is improbable that any individual received dose from WIPP-related TRU radionuclides from the ingestion of edible portions of game animals. Furthermore, TRU-waste disposal has not impacted the surrounding area’s soil, surface water, sediment, and vegetation.

Based on the results of the Effluent Monitoring Program, concentrations of radionuclides in air emissions did not exceed environmental dose limits set by 40 Code of Federal Regulations (CFR) Part 191, Subpart A, "Environmental Standards for Management and Storage," for radiological dose to a member of the public from WIPP facility operations. For air emissions specifically, the standards of 40 CFR Part 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities," were also met. Chapter 4 of this report presents figures and tables that provide the effective dose equivalent (EDE) values from CY 2003 through this CY. These EDE values are below the EPA limits specified in 40 CFR Part 191, Subpart A, and 40 CFR Part 61, Subpart H.

### Dose to Nonhuman Biota

Screening results indicate radiation in the environment surrounding the WIPP site does not have a deleterious effect on populations of nonhuman biota (i.e., aquatic and terrestrial organisms). More details can be found in section 4.8.5 of this report.

### Release of Property Containing Residual Radioactive Material

There were no items released containing residual radioactive material in the CY.

### Unplanned Releases

There were no: (1) unplanned reportable releases of pollutants or hazardous substances; (2) unplanned releases of radionuclides; or (3) unplanned radiological airborne releases in the CY, on or off the WIPP site (i.e., during waste transportation).

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| | |
|---|---|
| AAQS | Ambient Air Quality Standards |
| ACO | Administrative Compliance Order |
| AMR | annual mitigation report |
| AMSL | above mean sea level |
| ANSI | American National Standards Institute |
| ANSI/HPS | American National Standards Institute Health Physics Society |
| AQB | Air Quality Bureau |
| ASER | Annual Site Environmental Report |
| AST | aboveground storage tank |
| ATWIR | Annual Transuranic Waste Inventory Report |
| AWMS | Advanced Waste Management Systems |
| | |
| BCG | biota concentration guides |
| BEV | battery electric vehicle |
| BLM | U.S. Department of the Interior Bureau of Land Management |
| Bq | becquerel |
| Bq/g | becquerel per gram |
| Bq/L | becquerel per liter |
| $Bq/m^3$ | becquerel per cubic meter |
| Bq/sample | becquerel per sample (composite air filter sample) |
| BRPE | Brine Retention Pond East |
| BRPW | Brine Retention Pond West |
| | |
| C&D | construction and demolition |
| CAA | *Clean Air Act* |
| CAR | Corrective Action Report |
| CBFO | Carlsbad Field Office (DOE) |
| CDX | Central Data Exchange |
| CFR | Code of Federal Regulations |
| cm | centimeter |
| CRA | Compliance Recertification Application |
| CWA | *Clean Water Act* |
| CY | calendar year (2024, unless specified otherwise) |
| | |
| DMP | Detection Monitoring Program |
| DOE | U.S. Department of Energy |
| DP | discharge permit |
| DQO | Data Quality Objective |
| DRVMP | Disposal Room VOC Monitoring Program |
| DTRKMF | Double precision particle TRacKing for MODFLOW 2000 (software) |
| | |
| EA | environmental assessment |
| ECHO | Enforcement and Compliance History Online |
| ECR | environmental compliance review |

| | |
|---|---|
| EDE | effective dose equivalent |
| EIS | environmental impact statement |
| EMS | Environmental Management System |
| EMSSC | Environmental Management System Steering Committee |
| EO | executive order |
| EOC | Emergency Operations Center |
| EPA | U.S. Environmental Protection Agency |
| EPCRA | *Emergency Planning and Community Right-to-Know Act* |
| EPEAT | Electronic Product Environmental Assessment Tool |
| ES&H | Environmental, Safety, and Health |
| EUA | Exclusive Use Area |
| | |
| FEMP | Federal Energy Management Program |
| ft | foot |
| $ft^2/d$ | square foot per day |
| $ft^3$ | cubic foot |
| $ft^3/min$ | cubic foot per minute |
| FWS | U.S. Fish and Wildlife Service |
| FY | fiscal year (2024: 10/1/2023 to 9/30/2024; 2025: 10/1/2024 to 9/30/2025) |
| | |
| GC/MS | gas chromatography/mass spectrometry |
| GHG | greenhouse gas |
| | |
| HEMSF | high-energy mission specific facility |
| HEPA | high-efficiency particulate air (filter) |
| HI | Hazard Index |
| HMAR | Hazardous Materials Area Representative |
| HWDU | Hazardous Waste Disposal Unit |
| HWFP | Hazardous Waste Facility Permit |
| | |
| ICE | Issue Collection and Evaluation |
| ICP | inductively coupled plasma |
| ID | identification (confidence) |
| IH&S | Industrial Health & Safety |
| in | inch |
| IR | Information Repository |
| ISMS | Integrated Safety Management System |
| ISO | International Organization for Standardization |
| | |
| J | estimated concentration/value |
| | |
| kgal | 1,000 gallons |
| km | kilometer |
| $km^2$ | square kilometer |
| | |
| L | liter |

| | |
|---|---|
| LCS | laboratory control sample |
| LCSD | laboratory control sample duplicate |
| LEPC | Local Emergency Planning Committee |
| LLW | low-level waste |
| LMP | *Waste Isolation Pilot Plant Land Management Plan* |
| LUR | land use request |
| LWA | *Waste Isolation Pilot Plant Land Withdrawal Act* (as amended) |
| LWB | Land Withdrawal Boundary |
| | |
| m | meter |
| $m^2$ | square meter |
| $m^2/d$ | square meter per day |
| $m^3$ | cubic meter |
| $m^3/min$ | cubic meter per minute |
| MAPEP | Mixed Analyte Performance Evaluation Program |
| MDC | minimum detectable concentration |
| MDL | method detection limit |
| MEI | maximally exposed individual |
| mg/L | milligrams per liter |
| mi | mile (statute) |
| MLLW | mixed low-level waste |
| mm | millimeter |
| MOC | management and operating contractor (also M&O) |
| MOU | Memorandum of Understanding |
| mrem | millirem |
| MRL | method reporting limit |
| MS/MSD | matrix spike/matrix spike duplicate |
| mSv | millisievert |
| | |
| N/A | not applicable |
| NATTS | National Air Toxics Trends Station |
| ND | not detected/non-detect |
| NELAP | National Environmental Laboratory Accreditation Program |
| NEPA | *National Environmental Policy Act* |
| NESHAP | National Emission Standards for Hazardous Air Pollutants |
| NM | New Mexico |
| NMAC | New Mexico Administrative Code |
| NMDA | New Mexico State Department of Agriculture |
| NMDHSEM | New Mexico Department of Homeland Security and Emergency Management |
| NMED | New Mexico Environment Department |
| NMIMT | New Mexico Institute of Mining and Technology |
| NMSA | New Mexico Statutes Annotated |
| NMTSO | New Mexico Tech Seismological Observatory |
| NPDES | National Pollutant Discharge Elimination System |
| NR | not reported |

| | |
|---|---|
| NS | not sampled |
| | |
| ODS | ozone depleting substance |
| Order | Settlement Agreement and Stipulated Final Order |
| | |
| P2 | Pollution Prevention |
| PA | Performance Assessment |
| PABC | Performance Assessment Baseline Calculation |
| PAS | portable air sampler |
| PAW | Perched Anthropogenic Water |
| PCB | polychlorinated biphenyl |
| Permit | WIPP Hazardous Waste Facility Permit |
| PEST | parameter estimation (software) |
| PFAS | per- and polyfluoroalkyl substance |
| PIC | Potential Impact Category |
| PIP | production-injection packer |
| PPA | Property Protection Area |
| ppbv | parts per billion by volume |
| ppmv | parts per million by volume |
| pptv | parts per trillion by volume |
| PQL | Practical Quantitation Level |
| PT | proficiency testing |
| PV | photovoltaic |
| | |
| Q | qualifier |
| QA | quality assurance |
| QA/QC | quality assurance/quality control |
| QAO | quality assurance objective |
| QC | quality control |
| | |
| RCRA | *Resource Conservation and Recovery Act* |
| REC | Renewable Energy Certificate |
| RER | relative error ratio |
| RMSE | root mean square error |
| ROD | Record of Decision |
| RPD | relative percent difference |
| RVMP | Repository VOC Monitoring Program |
| | |
| SA | supplemental analysis |
| SARA | *Superfund Amendments and Reauthorization Act of 1986* |
| SDS | safety data sheet |
| SEC | Site Environmental Compliance |
| SERC | State Emergency Response Commission |
| SGS | SGS North America Inc. |
| SHS | Salt Handling Shaft |
| SIMCO | Salado Isolation Mining Contractors LLC |

| | |
|---|---|
| SMP | Safety Management Program |
| SNAP | Significant New Alternatives Policy |
| SNL | Sandia National Laboratories |
| SOO | sample of opportunity |
| SOP | standard operating procedure |
| SOW | statement of work |
| SPDV | Site and Preliminary Design Validation |
| SSCVS | Safety Significant Confinement Ventilation System |
| SSP | Site Sustainability Plan |
| Sv | sievert |
| SVOC | semi-volatile organic compound |
| SVS | Supplemental Ventilation System |
| SWDA | *Safe Drinking Water Act* |
| TDS | total dissolved solids |
| TENORM | Technologically Enhanced Naturally Occurring Radioactive Material |
| TID | Technical Incompleteness Determination |
| TKN | total Kjeldahl nitrogen |
| TPQ | threshold planning quantities |
| TPU | total propagated uncertainty |
| TRI | toxic release inventory |
| TRU | transuranic |
| TSP | total suspended particulate |
| U | undetected (qualifier for radiological data) |
| U.S. | United States |
| U.S.C. | United States Code |
| USGS | United States Geological Survey |
| UST | underground storage tank |
| UTLV | upper tolerance limit value |
| VOC | volatile organic compound |
| WHB | Waste Handling Building |
| WIPP | Waste Isolation Pilot Plant |
| WLWA | WIPP Land Withdrawal Area |
| yr | year |

## SYMBOLS

| | |
|---|---|
| ˚C | degrees Celsius |
| ˚F | degrees Fahrenheit |
| > | greater than |
| ≥ | greater than or equal to |
| < | less than |
| ≤ | less than or equal to |
| µg | microgram |
| µmhos/cm | micromhos per centimeter |
| % | percent |
| + | detected (qualifier) |
| ± | plus or minus |
| [RN] | radionuclide concentration |
| σ | sigma |

## CHEMICAL SYMBOLS

*Note: A number preceding a chemical symbol denotes the mass number for the radionuclide/radioisotope (e.g., $^{238}$Pu), and two numbers (separated by a slash) preceding a chemical symbol indicate two radionuclides/radioisotopes that are not analytically separated (e.g., $^{239/240}$Pu). When the symbol is not used for the chemical element, the mass number follows the element and is separated by a hyphen (e.g., plutonium-239/240).*

| | |
|---|---|
| Am | americium |
| Cl | chlorine |
| Co | cobalt |
| Cs | cesium |
| K | potassium |
| Na | sodium |
| Pu | plutonium |
| Sr | strontium |
| U | uranium |

# 1.0 INTRODUCTION

This Annual Site Environmental Report (ASER) is published to provide an overview of the WIPP facility environmental monitoring processes and the calendar year (CY) environmental monitoring and surveillance results to members of the public, U.S. Department of Energy (DOE) headquarters, and other interested stakeholders. It meets the requirements of DOE Order 231.1B and was prepared in accordance with supplemental guidance (DOE, 2025). It is available to the public electronically at the following website: WIPP Home Page at https://www.wipp.energy.gov/.

Specifically, this ASER presents a summary of environmental data to:

- Characterize Waste Isolation Pilot Plant (WIPP) site environmental management performance.
- Summarize environmental occurrences and responses reported during the CY.
- Confirm compliance with environmental standards and requirements.
- Highlight significant environmental performance indicators and/or performance measures that reflect the size and extent of programs at the WIPP site, including progress toward the DOE Environmental Sustainability Goals made through implementation of the WIPP Environmental Management System (EMS).
- Summarize property clearance activities, including authorized limits, results of radiological monitoring and surveys of cleared property, types, and quantities of property cleared, and independent verification program results in accordance with DOE Order 458.1 “Radiation and Protection of the Public and the Environment.”

Located in southeastern New Mexico (NM), the WIPP facility is the nation’s first underground repository permitted to dispose of TRU radioactive and TRU mixed waste generated through U.S. defense activities and programs. Transuranic waste is defined in the *Waste Isolation Pilot Plant Land Withdrawal Act* (Public Law 102–579, as amended by Public Law 104–201) (LWA) as radioactive waste containing more than 100 nanocuries (3,700 becquerels [Bq]) of alpha-emitting TRU isotopes per gram of waste, with half-lives greater than 20 years except for: (a) high-level radioactive waste; (b) waste that the Secretary has determined, with the concurrence of the Administrator, does not need the degree of isolation required by the disposal regulations; or (c) waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61, “Licensing Requirements for Land Disposal of Radioactive Waste.” The waste must meet the applicable criteria in the *Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant* (DOE/WIPP-02-3122) in order to be eligible for disposal in the WIPP repository.

**Figure 1.0 – Shaft #5**

The TRU waste is disposed of approximately 655 m (2,150 ft) below the surface in excavated disposal rooms in the Salado Formation (Salado), which is a thick sequence of interbedded salt (halite) and anhydrite. The WIPP repository is currently serviced by four shafts extending to the surface. A fifth shaft, Shaft #5 (figure 1), when completed, will provide an additional connection between the underground facility and the surface to provide intake air for the underground. All shafts will be sealed after the WIPP disposal phase. One of the main attributes of salt at the depth of the WIPP repository, as a rock formation to isolate radioactive waste, is the characteristic of the salt to creep; that is, to deform continuously over time until emplaced waste is encapsulated. A detailed description of the WIPP geology and hydrology is in chapter 6.

## 1.1 WIPP MISSION

The WIPP mission is to provide for the safe and environmentally sound underground disposal of defense-generated TRU and TRU mixed waste left from research, development, and production of nuclear weapons and other activities related to the national defense of the United States.

## 1.2 WIPP HISTORY

Government officials and scientists initiated the WIPP site selection process in the 1950s. At that time, the National Academy of Sciences evaluated stable geological formations that could be used to contain radioactive waste for thousands of years. In 1957, salt deposits were recommended as a promising medium for the disposal of radioactive waste.

Salt deposits were selected as the host for nuclear waste disposal for several reasons. Most salt deposits are found in geologically stable areas with very little earthquake activity, ensuring the stability of a waste repository. Salt deposits also demonstrate the absence of circulating groundwater that could move waste to the surface. If water had been present in the past or current, it would have dissolved the salt beds. In addition, salt is relatively easy to mine. Finally, rock salt at the depth of the WIPP repository heals its fractures because it behaves plastically under lithostatic pressure. This means salt formations at depth will slowly and progressively fill mined areas and seal radioactive waste within the formation, safely away from the biosphere.

After a search for an appropriate site for the disposal of radioactive waste throughout the 1960s, the salt deposits in southeastern NM were tested in the early 1970s. Salt and other evaporite formations at the WIPP site were deposited in thick beds during the evaporation of the Permian Sea. These geologic formations consist mainly of halite (NaCl). The Salado that serves as the host rock for the WIPP repository is approximately 610 m (2,000 ft) thick, begins 259 m (850 ft) below the Earth's surface at the WIPP site, and constitutes a stable geologic environment.

Congress authorized the construction of the WIPP facility in 1979, and the DOE constructed it during the 1980s. In late 1993, the DOE created the Carlsbad Area Office, subsequently redesignated as the Carlsbad Field Office (CBFO), to lead the TRU waste disposal effort. The CBFO coordinates the National TRU Program throughout the DOE complex.

## 1.3 SITE DESCRIPTION

Located in Eddy County in the Chihuahuan Desert of southeastern NM (figure 1.1), the WIPP site encompasses 16 square miles. This part of NM is relatively flat and is sparsely inhabited, with little surface water. The center of the WIPP site is approximately 26 mi east of Carlsbad, NM, in an area known as Los Medaños.

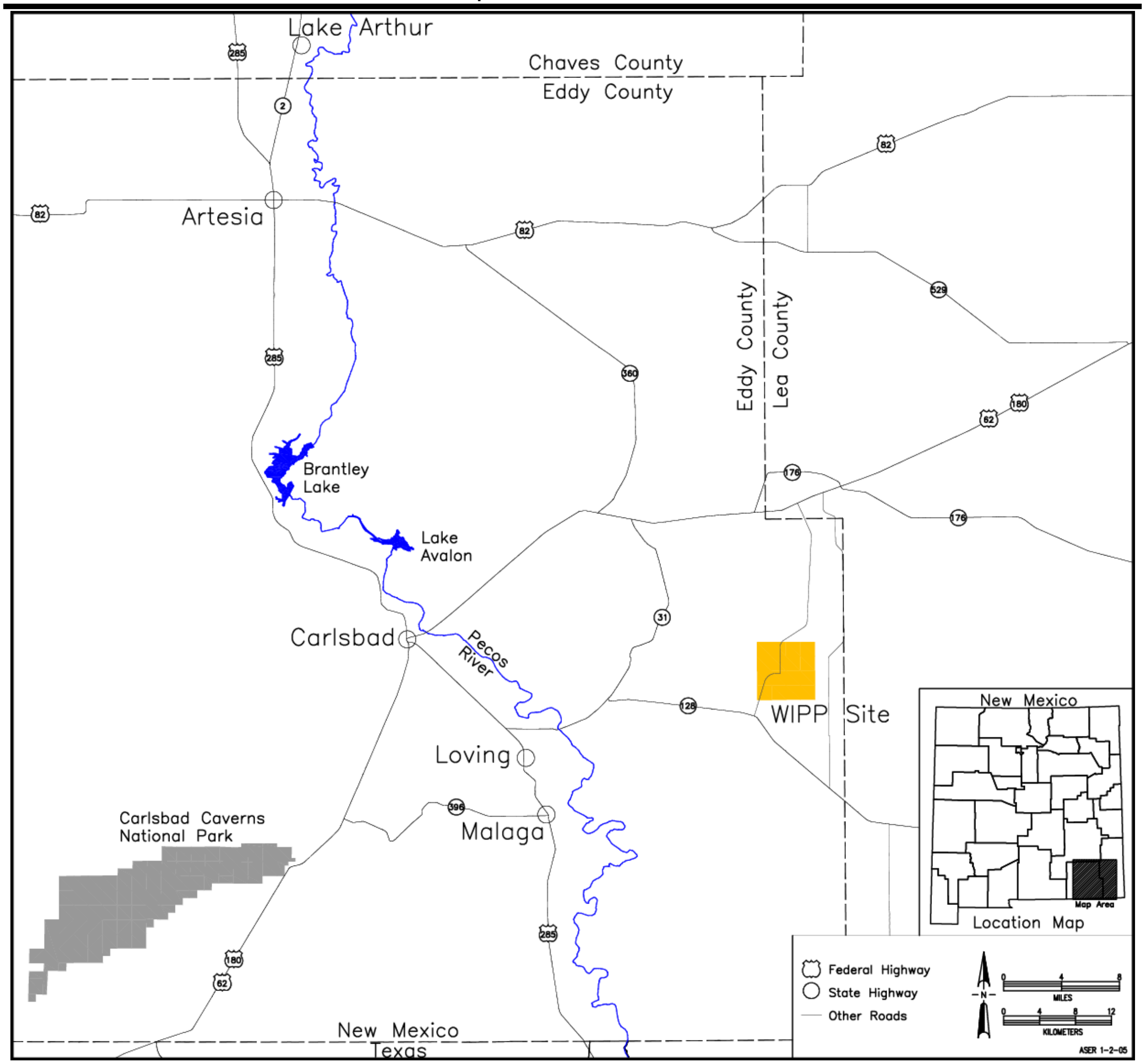


**Figure 1.1 – WIPP Site Location**

Most of the lands near the WIPP site are managed by the U.S. Department of the Interior Bureau of Land Management (BLM) and the New Mexico State Land Office. Land uses in the surrounding area includes livestock grazing, potash mining, oil and gas exploration and production, and recreational activities such as hunting, camping, hiking, and bird watching. The area is home to diverse populations of animals and plants.

### 1.3.1 WIPP Property Areas

The LWA established a withdrawal area reserved for the WIPP facility. The withdrawal area is generally described as sections 15 through 22 and 27 through 34, all-inclusive, of Township 22 south, Range 31 east, New Mexico Principal Meridian. Property or functional areas are designated within the WIPP site boundary (figure 1.2).

### Property Protection Area

The active portion of the facility, established as the Property Protection Area (PPA) in the Permit, is surrounded by a security barrier, which encompasses approximately 44 acres and provides security and protection for the major surface structures. A second PPA consisting of a nominal 22 acres surrounds Shaft #5.

### Exclusive Use Area

The Exclusive Use Area (EUA) comprises approximately 293 acres. It is surrounded by a barbed-wire fence and is restricted exclusively for the use of the DOE and its contractors and subcontractors to support the project. This area is marked by warning signs (e.g., “No Trespassing”) and is patrolled by WIPP facility security personnel to detect unauthorized activities or uses.

### Off-Limits Area

The Off-Limits Area boundary defines the exclusion zone. For a detailed description of the area included in the Off-Limits Area, refer to Federal Register Document Number 94-18917. In the Off-Limits Area, the unauthorized entry and introduction of weapons or dangerous materials is prohibited (as provided in 10 CFR § 860.3 and § 860.4). Pertinent prohibitions and penalties (10 CFR § 860.5) are posted as directed in 10 CFR § 860.6 along the perimeter of the Off-Limits Area, which encompasses approximately 1,454 acres. Livestock grazing and limited public thoroughfare will continue in this area unless these activities threaten the security, safety, or environmental quality of the WIPP site. This area is patrolled by WIPP facility security personnel to detect unauthorized activities or use.

### WIPP Land Withdrawal Area

The LWA was signed into law on October 30, 1992, transferring the administration of federal land from the U.S. Department of the Interior to the DOE. An amendment to this law was subsequently enacted on September 23, 1996. The WIPP site boundary or Land Withdrawal Boundary (LWB) delineates the perimeter of the WIPP Land Withdrawal Area (WLWA). This tract includes the PPA, the EUA, and the Off-Limits Area, as well as outlying areas open to public recreation within the LWB. Livestock grazing and public access for recreational use (e.g., hunting) will continue unless these activities threaten the security, safety, or environmental quality of the WIPP site. Additional details for the property areas and access restrictions may be found in the *Waste Isolation Pilot Plant Land Management Plan* (LMP) (DOE/WIPP-93-004), available on WIPP Home Page at https://www.wipp.energy.gov/.

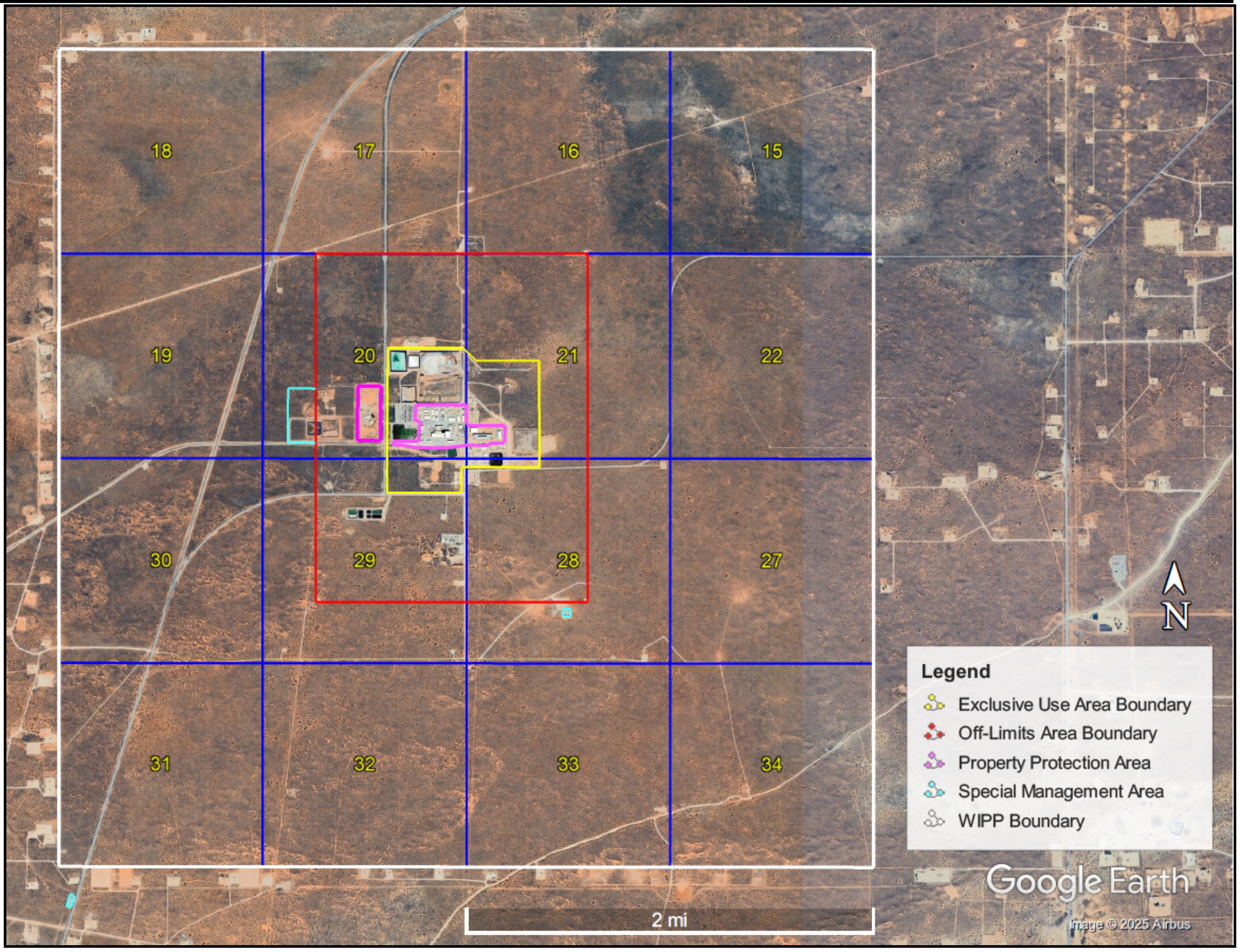


**Figure 1.2 – WIPP Property Areas**

### Special Management Areas

Certain properties used in the execution of the WIPP Project (e.g., reclamation sites, well pads, roads) are, or may be, identified as special management areas in accordance with the LMP, which is described further in chapter 5. A special management area designation is made when resources and/or other circumstances meet the criteria for protection and management under special management designations. Unique resources of value that are in danger of being lost or damaged, areas where ongoing construction is occurring, fragile plant and/or animal communities, sites of archaeological significance, locations containing safety hazards, or sectors that could receive an unanticipated elevated security status would be suitable for designation as special management areas.

Several areas are considered special management areas due to safety hazards or ongoing construction. Evaporation Pond H-19 (H19), located in section 28, is removed from public access with fencing and postings. The western portion of the Shaft #5 construction area in section 20 is removed from public access by a barbed-wire fence. The salt storage pond within the Shaft #5 area is fenced and posted to prevent unauthorized entry. The final special management area is an equipment storage area located southeast of section 31. This area, formerly used during WIPP road construction, is fenced and posted to prevent unauthorized entry.

### 1.3.2 Population

The number of permanent residents living within 10 mi (16 km) of the WIPP site is very small (less than 30). This permanent population is associated with ranching. The majority of the local population within 50 mi (80.5 km) of the WIPP site is concentrated in and around Carlsbad, Hobbs, Eunice, Loving, Jal, Lovington, and Artesia, NM. According to the 2020 census data, the population within this radius is 106,174. The nearest community is the village of Loving, 18 mi (29 km) west-southwest of the WIPP site, with a population of 1,390. The nearest major populated area is Carlsbad, 26 mi (42 km) west of the center of the WIPP site. The 2020 census reported the population of Carlsbad as 32,238. Since 2010, two periods of rapid growth have occurred due to oil field activity, reflected in the 2020 census.

## 1.4 ENVIRONMENTAL STEWARDSHIP AT THE WIPP FACILITY

The DOE policy is to conduct its operations in compliance with applicable environmental laws and regulations and to safeguard the integrity of the southeastern NM environment. Effluent monitoring, environmental surveillance, land management, and assessments are conducted to verify these objectives are met. Environmental monitoring includes collecting and analyzing environmental samples from various media and evaluating whether WIPP facility operations have caused any adverse environmental impacts.

### 1.4.1 Environmental Monitoring Plan

The *Waste Isolation Pilot Plant Environmental Monitoring Plan* (DOE/WIPP-99-2194), available on WIPP Home Page at https://www.wipp.energy.gov/, outlines the program for monitoring the environment at and around the WIPP site, including the major environmental monitoring and surveillance activities at the facility. The plan discusses the WIPP Project QA/QC program as it relates to environmental monitoring. The plan's purpose is to describe the implementation of an environmental monitoring program for determining any effects of WIPP facility operations on the local ecosystem. Effluent and environmental monitoring data are necessary to demonstrate compliance with applicable environmental protection regulations. A description of environmental sampling performed in the CY and the respective sampling frequency is provided in table 1.1.

**Table 1.1 – Environmental Monitoring Sampling**

*(Refer to the end of the table for notes)*

| Program | Type of Sample | Sampling Locations [1] | Sampling Frequency |
|---|---|---|---|
| Radiological | (1) Airborne effluent particulate | Primarily 2 (Station C and variable for Exhaust Shaft outflow, mine ventilation configuration dependent) | Periodic/confirmatory (batched as monthly or quarterly composites). |
| | (2) Airborne ambient particulate [2] | 11 | Weekly (batched as quarterly composites). |
| | (3) Liquid effluent | Waste Handling Shaft sump and other collection points | As needed. |
| | (4) Biotic (wild fauna): Quail species, Catfish species, Rabbits (Desert Cottontail), Javelina (Collared Peccary), Mule Deer | Per permit authorizing collection | As available. |
| | (5) Biotic (Beef) | WIPP vicinity | As available and as permitted by rancher. |
| | (6) Vegetation | 6 | Annual, as available. |
| | (7) Soil | 6 | Annual, as available. |
| | (8) Surface water | 15 (12 co-located with sediment and 3 on site) | Annual, as available. |
| | (9) Sediment | 12 | Annual, as available. |
| | (10) Groundwater [3] | 6 | Annual. |
| | (11) H19, PAW, and Dewey Lake wells (DP-831, conditions 41 and 57, respectively) | 20 (H19 and 19 wells) | Minimum one sample within the first year of DP-831 (requirement met in CY 2022). |
| Non-radiological | (12) Meteorology | 1 | Continuous |
| | (13) VOC Monitoring | See below | Per Permit Part 4 and Attachment N. |
| | • VOCs – Repository Monitoring (surface) | 2 | Two times per week. |
| | • VOCs – Disposal Room Monitoring | Varies based on number of rooms with emplaced waste in active panel | Routinely once every 2 weeks; increasing to weekly as needed per Permit conditions. |
| | (14) Groundwater [3] | 6 | Annual. |

| Program | Type of Sample | Sampling Locations [1] | Sampling Frequency |
|---|---|---|---|
| | (15) Perched anthropogenic water and Dewey Lake wells (DP-831, conditions 57, 58, and 59) | 19 | Minimum one sample within first year of DP-831 and semi-annual from PZ-1, PZ-5, PZ-6, PZ-7, PZ-9, PZ-10, PZ-11, PZ-12, PZ-13, PZ-14, PZ-15, PZ-16, PZ-17a, PZ-17b, PZ-18, PZ-19a, C-2507, C-2811, WQSP-6a (one sample requirement met in 2022). |
| | (16) H19 and Salt Storage Pond 4 [4] (DP-831, condition 40) | 2 | Semi-annual. |
| | (17) Effluent Lagoon A (DP-831, condition 34) | 1 | Semi-annual. |
| | (18) Effluent Lagoon B and C (DP-831, condition 35) | 2 | Only after industrial wastewater has been discharged into the impoundment(s). |
| | (19) Stormwater Ponds 1, 2, and 3 (DP-831, condition 39) | 3 | Annually after a significant storm event. [5] |
| | (20) Salt Storage Ponds 1, 2, 3, and 5 (DP-831, condition 47) | 4 | Annually after a significant storm event. [5] |
| | (21) H19 inorganics and organics (DP-831, conditions 41 and 42, respectively) | 1 | Minimum one sample within the first year of DP-831 (requirement met in 2022). |
| | (22) Brine Retention Pond East (BRPE) and Brine Retention Pond West (BRPW) [6] (DP-831, condition 44). | 2 | Quarterly rotation, minimum of four consecutive quarterly sampling events. |

1. Values presented are location counts. Actual sample numbers may be higher when including duplicates and blanks. The number of certain types of samples taken can be impacted by access restrictions or location conditions. For example, during dry periods there may be no surface water or infiltration control water to sample and some wells may be dry. Likewise, the number of samples for biota will also vary. For example, the number of rabbits available as samples of opportunity will vary as will fishing conditions that are affected by weather and algal blooms.
2. Seven legacy locations have two samplers running simultaneously generating a primary sample and an additional sample which is used for event evaluation or backup. Four locations are sampled only for use in an event evaluation. Each week this results in 18 samples, but routinely only seven samples are analyzed (one from each legacy location). Weekly legacy samples are then combined into quarterly composites.
3. Detection Monitoring Wells – sampling includes radiological and non-radiological program components.
4. Salt Storage Pond 4 has not been commissioned; therefore sampling did not occur in the CY.
5. A significant storm event is defined as the DP-831 threshold of 2 inches or greater in a 24-hour period (none for CY).
6. BRPE and BRPW have not been commissioned, therefore sampling did not occur in the CY.

The Environmental Monitoring Plan describes the monitoring of naturally occurring and specific anthropogenic radionuclides. The geographic scope of radiological sampling is based on projections of potential release pathways from the waste disposed of at the

WIPP facility. The plan also describes monitoring of volatile organic compounds (VOCs), groundwater chemistry, other non-radiological environmental parameters, and meteorological data collection.

### 1.4.2 WIPP Facility Environmental Monitoring Program and Surveillance Activities

The management and operating contractor (MOC) of the WIPP facility (i.e., Salado Isolation Mining Contractors [SIMCO]) monitors air, surface water, groundwater, sediments, soils, and biota (e.g., vegetation, selected mammals, quail, and fish). Environmental monitoring activities are performed in accordance with procedures that govern how samples are to be collected, preserved, and transferred. Procedures direct the verification and validation of environmental sampling data.

The atmospheric pathway, which can lead to the inhalation of radionuclides, has been determined to be the most likely release pathway to the public from the WIPP facility before the final facility closure. Therefore, airborne particulate sampling for alpha-emitting radionuclides is emphasized. Air sampling results are used to trend environmental radiological levels and determine if there has been a deviation from established baseline values. The geographic scope of radiological sampling is based on projections of potential release pathways and nearby populations for the types of radionuclides in TRU wastes managed at the WIPP facility and includes Carlsbad and ranches. Non-radiological environmental monitoring activities at the WIPP site consist of sampling and analyses designed to detect and quantify the impacts of operational activities and verify compliance with applicable requirements.

## 1.5 ENVIRONMENTAL PERFORMANCE

The DOE is committed to environmental protection and the implementation of sound stewardship practices that protect the air, water, land, and other natural and cultural resources. Provisions for protection are implemented via the WIPP Project environmental policy and the WIPP EMS. Sustainability goals, as directed by the DOE, are achieved through the *Site Sustainability Plan* (SSP) (DOE, 2024) and the WIPP EMS (see chapter 3).

Implementing the *Waste Isolation Pilot Plant Environmental Monitoring Plan* (DOE/WIPP-99-2194) fulfills the environmental monitoring requirements of DOE Order 458.1, DOE Order 436.1A *Departmental Sustainability*, and DOE's Sustainability goals, and Federal, State, and Local Regulations. The DOE expectation is to ensure continued protection of workers, the public, and the environment. The remaining chapters include detailed information on the WIPP Project's environmental programs.

# 2.0 COMPLIANCE SUMMARY

The DOE must comply with the applicable regulations promulgated pursuant to federal and state statutes, DOE orders, and executive orders (EOs) regarding the WIPP facility. Facility plans and implementing procedures ensure compliance with regulatory requirements. Methods used to maintain compliance with environmental requirements include engineered controls, written procedures, routine training of facility personnel, ongoing self-assessments, and personal accountability. The following sections list the environmental statutes and regulations applicable to the operation of the WIPP facility and describe significant accomplishments and ongoing compliance activities. A detailed breakdown of WIPP facility compliance with environmental laws is available in the *Waste Isolation Pilot Plant Biennial Environmental Compliance Report* (DOE/WIPP-22-3526). A list of major WIPP environmental permits is included in appendix B.

## 2.1 COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT

The *Comprehensive Environmental Response, Compensation, and Liability Act* (42 U.S.C. [United States Code] § 9601, et seq.), or Superfund Act, and the *Superfund Amendments and Reauthorization Act of 1986* (SARA) establish a comprehensive federal strategy for responding to and determining liability for releases of hazardous substances from a facility to the environment. Spills of hazardous substances that exceed a reportable quantity must be reported to the National Response Center under the provisions of *Comprehensive Environmental Response, Compensation, and Liability Act,* and 40 CFR Part 302, “Designation, Reportable Quantities, and Notification.” Hazardous substance cleanup procedures are specified in 40 CFR Part 300, “National Oil and Hazardous Substances Pollution Contingency Plan.”

### 2.1.1 Superfund Amendments and Reauthorization Act of 1986

The DOE is required by the *Superfund Amendments and Reauthorization Act of 1986 Title III* (SARA) (42 U.S.C. § 11001 et seq., also known as the *Emergency Planning and Community Right-to-Know Act* [EPCRA]), which is implemented pursuant to 40 CFR Parts 350 through 399, to submit (1) a list of hazardous chemicals present at the facility over the threshold planning quantities (TPQ) or 10,000 pounds for which Safety Data Sheets (SDSs) are required; (2) an Emergency and Hazardous Chemical Inventory Form (Tier II Form) that provides types, quantities and locations of hazardous chemicals stored each year at WIPP; and (3) notification to the State Emergency Response Commission (SERC), the Local Emergency Planning Committee (LEPC), and fire departments with jurisdiction over the facility in the case of an emergency event at the site. Submitting a list of hazardous chemicals or hazardous chemical SDSs meeting or exceeding the applicable thresholds is a one-time notification, provided no new hazardous chemicals are stored at or above applicable reporting threshold levels or existing hazardous chemical SDSs are significantly revised. Any new hazardous chemical subject to reporting requirements or a significantly revised SDS is reported within 3 months after discovery and within 30 days of any request made by the LEPC.

The SARA Tier II Report, due annually on March 1, provides State and local officials and the public with specific information on the amounts and locations of hazardous chemicals present at WIPP during the previous CY. Specifically, for WIPP, the SARA Tier II Report must be sent to the New Mexico Department of Homeland Security and Emergency Management (NMDHSEM), Eddy County LEPC, and cities of Carlsbad and Hobbs fire departments. As a courtesy, the report is also provided to volunteer fire departments in Otis and Joel. The CY 2024 Tier II Report for the WIPP facility was submitted electronically utilizing the U.S. Environmental Protection Agency's (EPA) online Tier2 Submit™ Software prior to March 1, 2025, as required by 40 CFR Part 370, "Hazardous Chemical Reporting: Community Right-To-Know" and in compliance with EPCRA, Section 312. This report included the revised physical and health hazard classifications associated with the WIPP facility onsite chemical inventory (see table 2.1).

Title 40 CFR Part 372, "Toxic Chemical Release Reporting: Community Right to Know," requires facilities to submit a toxic chemical release report to the EPA and the resident state, identifying the toxic chemicals disposed of or released at the facility more than established threshold amounts. The CY 2024 Toxic Release Inventory (TRI) Report was submitted electronically on the EPA Central Data Exchange (CDX) website utilizing the software TRIMEweb™ before July 1, 2025. The CDX website (cdx.epa.gov) submits the TRI report to EPA the report to the SERC, or NMDHSEM. Table 2.1 presents the CY 2024 EPCRA regulatory sections, reporting requirements, and corresponding submission status.

**Table 2.1 – Emergency Planning and Community Right-to-Know Act (EPCRA) Reporting Requirements**

| Emergency Planning and Community Right-to-Know Act Sections | Facility Reporting Requirements | Submission Status |
|---|---|---|
| EPCRA Section 302–303 (40 CFR Part 355 Subpart B) | Emergency Planning & Emergency Response Notification | Further notification not required at this time [1] |
| EPCRA Section 304 (40 CFR Part 355, Appendices A & B) | Notification of a Hazardous Substance Release or Extremely Hazardous Substance Release Above Reportable Quantities | Not required; facility did not have any hazardous substance released of reportable quantity. |
| EPCRA Section 311–312 (40 CFR Part 370) | Hazardous Chemical Reporting (Tier II Report) | Yes [2] |
| EPCRA Section 313 (40 CFR Part 372) | Toxic Chemical Release Reporting (TRI Report) | Yes [2] |

1. The facility is subject to emergency planning requirements; however, further notification is only required when significant changes are implemented to the existing plan.
2. Reporting notification requirements were satisfied and submitted by the applicable deadline.

### 2.1.2 Unplanned Releases of Reportable Quantities of Hazardous Substances

There were no unplanned releases of hazardous substances or extremely hazardous substances exceeding the reportable quantity thresholds during CY 2024.

## 2.2 RESOURCE CONSERVATION AND RECOVERY ACT

The *Resource Conservation and Recovery Act* (RCRA) (42 U.S.C. § 6901, et seq.) was enacted in 1976. Initial implementing regulations were promulgated in May 1980. This body of regulations ensures that hazardous waste is managed and disposed to protect human health and the environment. The *Hazardous and Solid Waste Amendments of 1984* (Public Law 98–616, Stat. 3221) prohibit land disposal of hazardous waste unless treatment standards are met, or specific exemptions apply. The amendments also emphasize waste minimization. Section 9(a) of the WIPP LWA exempts TRU mixed waste designated by the Secretary of Energy for disposal at the WIPP facility from the treatment standards. Such waste is not subject to the land disposal prohibitions of the *Solid Waste Disposal Act* (42 U.S.C. § 6901–6992k).

The NMED is authorized by the EPA to implement the hazardous waste program in NM pursuant to the *New Mexico Hazardous Waste Act* (New Mexico Statutes Annotated [NMSA] § 74-4-1, et seq., 1978). The technical standards for hazardous waste treatment, storage, and disposal facilities in NM are outlined in 20.4.1.500 New Mexico Administrative Code (NMAC), which adopts, by reference, 40 CFR Part 264, “Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.” The hazardous waste management permitting program is administered through 20.4.1.900 NMAC, which adopts 40 CFR Part 270, “EPA Administered Permit Programs: The Hazardous Waste Permit Program.”

### 2.2.1 Hazardous Waste Facility Permit

The WIPP Permit authorizes the DOE and the MOC (collectively known as the Permittees) to manage, store, and dispose of contact-handled and remote-handled TRU mixed waste at the WIPP facility. Two storage units (the Parking Area Unit and the Waste Handling Building [WHB] Unit) are permitted to store TRU mixed waste. Ten underground hazardous waste disposal units (HWDUs) or panels are currently permitted to dispose of contact-handled and remote-handled TRU mixed waste.

The NMED Hazardous Waste Bureau performed a RCRA WIPP facility inspection which was initiated on April 2, 2024. The inspection focused on the implementation of RCRA requirements applicable to both site-generated hazardous wastes and TRU mixed wastes authorized by the Permit for receipt, management, storage, and disposal at the WIPP facility. A comprehensive list of requested records (e.g., inspection records, training reports, status reports) and photographs were requested by the NMED to be provided for review.

The closeout meeting for this RCRA WIPP facility inspection was held on November 21, 2024.

On August 20, 2024, the NMED issued an Administrative Compliance Order (ACO) (No. HWB-25-01) to the CBFO and to SIMCO which addressed a WIPP facility compliance evaluation conducted on April 17, 2023, by the NMED. This routine compliance inspection at the WIPP facility also requested records required to be maintained at the WIPP facility in accordance with the WIPP Hazardous Waste Facility Permit. In the ACO, the NMED alleged that three (3) potential violations had been identified during the 2023 compliance evaluation. The alleged potential violations included 1) an excess accumulation of combustible materials in the WIPP underground, 2) an unlabeled box containing universal waste lamps in the WIPP underground, and 3) the same unlabeled box of universal waste lamps was not marked with an accumulation start date or associated with an accumulation log. During the inspection, NMED was provided with photographic documentation showing 1) the combustible materials had been removed from the underground areas of concern, and 2) the box of universal waste lamps had been labeled and an accumulation start date had been marked on the label.

On April 2, 2024, the NMED conducted a compliance evaluation at the WIPP facility. During the evaluation in the WIPP underground oil storage area, the NMED observed one 55-gallon drum of used oil that that was not labeled properly. This labeling issue was corrected immediately on the same date of the inspection.

The CBFO and SIMCO (Respondents) filed an Original Answer and Request for Hearing in response to the ACO. On September 19, 2024, a Request for Hearing was filed in the Office of Public Facilitation. In order to eliminate the necessity of a public hearing, during the remainder of the CY, all parties began drafting a Stipulated Final Order to resolve the alleged violations. The goal of the draft Stipulated Final Order is to reach a full and final settlement of all claims asserted in the ACO and claims related to the NMED compliance inspections conducted on April 17, 2023, and April 2, 2024, whether or not asserted in the ACO.

### 2.2.2 Modification Requests

In CY 2024, the Permittees submitted permit modification notifications and permit modification requests to NMED, as described in table 2.2. In accordance with Permit Part 1, Section 1.14, Information Repository (IR), Permit modification notifications and requests associated with the Permit, along with associated responses from the regulator, were posted to the IR on the Permittees' webpage (WIPP Home Page at https://www.wipp.energy.gov/) within 10 calendar days. Additionally, other information required by the Permit was provided in the IR.

**Table 2.2 – Permit Modification Notifications and Requests Submitted in CY 2024**

| Class | Description | Date Submitted |
|---|---|---|
| 1 | Revise text in Permit Part 1, Section 1.15.1 through 1.15.5, regarding Tribal Community notice and involvement.<br>Revise text in Permit Attachment A1, concerning the flood zone designation for the Waste Isolation Pilot Plant (WIPP) facility. | March 19, 2024 |
| 1 | Update Permit Attachments D and E with some upgrades to the New Fire Water Distribution System Description.<br>Update Permit Part 3 and Attachments A3, B, D, and M with the Current Facility Layout. | April 29, 2024 |
| 1 | Update references to the Waste Isolation Pilot Plant Fire Department in permit attachments D, E, and F.<br>Revise the Waste Data System User's Manual reference in permit attachments C and C3.<br>Update location of an Underground First Aid Station in permit attachment D.<br>Update permit attachment B, Appendix B. | August 15, 2024 |
| 1 | Update Permit Attachment D, Table D-1, Resource Conservation and Recovery Act Emergency Coordinators. | October 3, 2024 |
| 1 | Update Underground Escape and Evacuation Map in Permit Attachment D.<br>Update Program Manager's email address in Permit Attachment B.<br>Revise Acceptable Knowledge Summary Report Information in Permit Attachments C3 and C6.<br>Revise Footnote H in Table E-1 in Permit Attachment E. | December 23, 2024 |
| 2 | Addition of Four New Shielded Containers.<br>Revise Site Recertification Audit Scheduling from Annual to Graded Approach. | March 29, 2024 |

### 2.2.3 Underground Storage Tanks

Federal regulation 40 CFR Part 280, "Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (USTs)," addresses USTs containing petroleum products or hazardous chemicals. Requirements for UST management pertain to the design, construction, installation, and operation of USTs, as well as notification and corrective action requirements in the event of a release, and actions required for out-of-service USTs. The EPA has authorized the NMED to regulate USTs and implements the EPA program through 20.5 NMAC, "Petroleum Storage Tanks."

The WIPP facility used two petroleum USTs during the CY, one containing diesel and the other containing unleaded gasoline. Facility Operations personnel are Class A, B, and C Operator trained and certified to perform necessary functions according to their classification. Weekly and monthly inspections were performed for leak detection and proper operation of the storage tank systems. No leaks were detected in the leak detection systems. The NMED did not inspect the UST system during the CY.

### 2.2.4 Hazardous Waste Generator Compliance

Non-radioactive hazardous waste is currently generated through routine facility operations. Mixed low-level radioactive waste (i.e., low-level radioactive wastes known or suspected to contain hazardous constituents) is generated at the WIPP facility because of the cleanup from the February 2014 radiological release.

Hazardous wastes are managed in satellite accumulation areas. The WIPP site has a Central Accumulation Area (less-than-90-days storage area) on the surface, and a Central Accumulation Area (less-than-90-days storage area) underground. Mixed low-level (radioactive) waste is segregated from hazardous waste, and low-level waste (LLW) is managed as mixed low-level waste (MLLW).

Mixed low-level waste is managed to comply with DOE Order 435.1, Administrative Chg. 2, *Radioactive Waste Management*. Mixed low-level waste is shipped to offsite treatment, storage, or disposal facilities that are permitted and licensed to treat and dispose of these types of wastes. During the CY, hazardous waste and MLLW samples were analyzed by GEL Laboratories, LLC, Charleston, SC. Hazardous wastes were sent to offsite facilities for disposal via Veolia North America, LLC, Henderson, CO, while LLW and MLLW were disposed of via Waste Control Specialists, LLC, Andrews, TX. Transuranic mixed waste generated as the result of operations is characterized as derived waste in accordance with the Permit and is managed as contact-handled TRU mixed waste at the WIPP facility.

### 2.2.5 Program Deliverables and Schedule

The Permittees met the Permit requirements to demonstrate compliance with reporting, as described below:

> Permit Part 1, Section 1.7.14, Other Noncompliance, requires submission annually in October of other instances of noncompliance not otherwise required to be reported in Sections 1.7.10 through 1.7.13. The results of other noncompliance were reported as required in the annual October Noncompliance Report.
>
> Permit Part 2, Section 2.4, Waste Minimization Program, requires submission of a report annually by December 1 for the year ending the previous September 30 regarding progress made in the waste minimization program in the previous year. This report was submitted to the NMED in November 2024.
>
> Permit Part 2, Section 2.14.2, Biennial Report, requires the submittal of the biennial hazardous waste report, as required by 20.4.1.500 NMAC (incorporating 40 CFR § 264.75). The owner or operator must complete and submit the required data to the EPA management information system by March 1 of the following

even-numbered year and must cover activities during the previous year. This report was submitted to the NMED in February 2024.

Permit Part 2, Section 2.14.3, Repository Siting Annual Report, requires submission of an annual report summarizing its progress toward siting another repository for TRU waste in a state other than NM. This report was submitted to the NMED in December 2024.

Permit Part 3, Section 3.1.1.4, Notification of CH Bay Surge Storage Use, requires a report by October 27 of each year summarizing CH Bay Surge Storage usage. The Permittees did not utilize CH Bay surge storage in this CY; thus, notification or report was unnecessary in this CY.

Permit Part 3, Section 3.1.2.4, Notification of Parking Area Surge Storage Use, requires a report by October 27 of each year summarizing Parking Area Surge Storage usage. The Permittees did not utilize Parking Area surge storage in this CY; thus, notification or report was not necessary in this CY.

Permit Part 4, Section 4.2.1.4, Prioritization and Risk Reduction of New Mexico Waste, requires that within 15 days of DOE publishing the Annual Transuranic Waste Inventory Report (ATWIR), the Permittees shall certify to the NMED there is sufficient TRU Mixed Waste Volume capacity in permitted HWDUs to dispose of the NM generator/storage site waste detailed in the ATWIR. The certification was provided to NMED on December 18, 2024.

Permit Part 4, Section 4.6.1.2, Reporting Requirements, requires an annual report in October evaluating the geomechanical monitoring program. The Permittees submitted the annual Geotechnical Analysis Report in October 2024, representing results for July 1, 2022, to June 30, 2023.

Permit Part 4, Section 4.6.2.1, Implementation of Repository VOC Monitoring, requires the Permittees to implement repository VOC monitoring and proficiency testing. On February 10, 2017, the NMED approved the Laboratory Proficiency Testing Plan submitted on July 26, 2016. The Laboratory Proficiency Testing Plan (further described in Permit Attachment N, Section N-5e) focuses on results from an analytical laboratory that participates in low level VOC proficiency testing because the analytical laboratory is not accredited by accepted accreditation bodies. As described in Permit Attachment N, Section N-5e, the proficiency testing results will be reported in the Semi-Annual VOC Monitoring Report, however, the current contracted analytical laboratory, SGS North America Inc. (SGS), maintains accreditations required by the National Environmental Laboratory Accreditation Program, therefore, the requirement to report proficiency test results is no longer applicable.

Permit Part 4, Section 4.6.2.2, Reporting Requirements, requires semi-annual reports due in April and October describing the results (data and analysis) of the VOC Monitoring Plan for the previous semi-annual period. Due to a unique situation with the permittees analytical laboratory in CY 2023, the NMED granted a 120-day extension for the submittal of the October 2023 semi-annual report (reporting period January 1 to June 30, 2023); therefore, this report was submitted in February 2024. The Permittees followed in April 2024 submitting the report representing results for July 1 to December 31, 2023, and lastly, in October 2024, the report representing results for January 1 to June 30, 2024, was submitted.

Permit Part 4, Section 4.6.4.2, Reporting Requirements, requires a report annually in October presenting the data results and analysis of the mine ventilation rate monitoring program. The Permittees submitted the annual report in October 2024, representing results for July 1, 2023, to June 30, 2024.

Permit Part 5, Section 5.10.2.1, Data Evaluation Results, requires a report annually by November 30 of the analytical results for the annual Detection Monitoring Program (DMP) well samples and duplicates, as well as results of the statistical analysis of the samples showing whether statistically significant evidence of contamination is present. The Annual Culebra Groundwater Report for sampling round 46 was submitted to the NMED in November 2024. Sampling results are also summarized in appendices E and F of this ASER.

Permit Part 5, Section 5.10.2.2, Groundwater Surface Elevation Results, requires semi-annual reports by May 31 and November 30. These reports were submitted to the NMED in May and November 2024. The November report was combined with the Annual Culebra Groundwater Report.

Permit Part 5, Section 5.10.2.3, Groundwater Flow Results, requires that groundwater flow data be included in the Annual Culebra Groundwater Report by November 30. The groundwater flow data were submitted in November 2024.

Permit Part 6, Section 6.7, Certificate of Closure, requires the Permittees to certify in writing to the Secretary within 60 calendar days of completion of closure of each underground HWDU, and within 60 calendar days of completion of final closure, that the underground HWDUs and/or facility have been closed. No underground HWDUs were closed during this reporting period.

Permit Part 6, Section 6.8, Survey Plat, requires submission of a survey plat detailing the location and dimensions of each HWDU with respect to permanently surveyed benchmarks. No underground HWDUs were closed during this reporting period.

## 2.3 NATIONAL ENVIRONMENTAL POLICY ACT

The *National Environmental Policy Act* (NEPA) (42 U.S.C. § 4321, et seq.) requires the Federal Government to use all practical means to consider potential environmental and cultural impacts of proposed projects as part of the decision-making process. The NEPA also requires that the public be allowed to review and comment on proposed projects that have the potential to significantly affect the quality of the environment.

The DOE codified its requirements for implementing NEPA regulations in 10 CFR Part 1021, "National Environmental Policy Act Implementing Procedures." Operational compliance with the NEPA at the WIPP facility is achieved by implementing a NEPA Compliance Plan, and an environmental compliance review (ECR) and NEPA screening procedures. In the CY, 129 proposed projects were evaluated through the ECR process. Four of the projects also required land use request (LUR) evaluation, which is required for projects located beyond the PPA under the WIPP Land Management Plan. None of the projects undergoing ECR and LUR evaluations were determined to require the preparation of an environmental assessment (EA), supplemental analysis (SA), categorical exclusion, or environmental impact statement (EIS).

The CBFO is still tracking mitigation commitments made in Records of Decision (RODs) issued for the Final EIS (DOE/EIS, 1980) published in 1981 for the development of the WIPP site, and the Supplemental EIS (DOE/EIS, 1990) published in 1990 for the implementation of the WIPP test phase that has not been fully completed. Per 10 CFR § 1021.331, a mitigation action plan was developed in 1991 to track the development and implementation of mitigation action commitments from the two RODs. The CBFO requires that these ongoing mitigation commitments be tracked and documented in annual mitigation reports (AMRs). The last WIPP AMR was completed on July 10, 2024.

## 2.4 CLEAN AIR ACT

The *Clean Air Act* (42 U.S.C. § 7401, et seq.) provides for air quality preservation, protection, and enhancement. Both the State of NM and the EPA have the authority to regulate compliance with portions of the *Clean Air Act*. Radiological effluent monitoring in compliance with EPA standards is discussed in chapter 4.

In 1993, a *New Mexico Air Quality Control* (NMSA 1978 § 74-2) Regulation 702 Operating Permit (recodified in 2001 as 20.2.72 NMAC, "Construction Permits") was obtained for two backup diesel generators at the WIPP facility. No activities or modifications to the operating conditions of the diesel generators occurred in the CY requiring reporting under the conditions of the Operating Permit.

The *Clean Air Act* established National Ambient Air Quality Standards (AAQS) for six criteria pollutants: sulfur oxides, particulate matter, carbon monoxide, ozone, nitrogen dioxide, and lead. The initial 1993 WIPP air emissions inventory was developed as a baseline document to calculate maximum potential hourly and annual emissions of hazardous and criteria pollutants. Based on the current air emissions inventory, WIPP facility operations do not exceed the 10 tons per year emission limit for any individual hazardous air pollutant, the 25 tons per year limit for any combination of hazardous air pollutant emissions, or the 10 tons per year emission limit for criteria pollutants except for total suspended particulate (TSP) matter and particulate matter less than 10 microns in diameter. Particulate matter is produced from fugitive sources related to managing salt tailings extracted from the underground. Consultation with the NMED Air Quality Bureau (AQB) resulted in a March 2006 determination that a permit is not required for fugitive emissions of particulate matter that result from mined rock management at the WIPP facility. In 2018, the New Mexico Environmental Improvement Board repealed the New Mexico AAQS for TSP. Proposed facility modifications are reviewed to determine if they will create new air emission sources and require permit applications.

On February 9, 2024, an Exemption from Permitting by the NMED – Air Quality Bureau was granted for the operation of two 4,021 horsepower stand-by generators at the Safety Significant Continuous Ventilation System (SSCVS). These two generators cannot operate for more than 500 hours per year, and a log of run time is maintained.

## 2.5 CLEAN WATER ACT

The *Clean Water Act* (33 U.S.C. §1251, et seq.) establishes provisions for the issuance of permits for discharges into waters of the United States. The regulation defining the scope of the permitting process is contained in 40 CFR §122.1(b), "Scope of the NPDES Permit Requirement," which states: "The National Pollutant Discharge Elimination System program requires permits for the discharge of 'pollutants' from any 'point source' into 'waters' of the United States."

The WIPP facility does not discharge wastewater or stormwater runoff into the waters of the United States. It is not subject to regulation under the National Pollutant Discharge Elimination System program. Wastewaters generated at the WIPP facility are disposed of offsite or managed in onsite lined evaporation ponds. Stormwater runoff is also collected in lined retention ponds. The management of wastewater and stormwater runoff is regulated under the *New Mexico Water Quality Act* (NMSA 1978, §74-6-1, et seq.), as discussed in section 2.6.

## 2.6 NEW MEXICO WATER QUALITY ACT

The *New Mexico Water Quality Act* created the New Mexico Water Quality Control Commission, tasked with developing regulations to protect NM ground and surface water. New Mexico water quality regulations for ground and surface water protection are contained in 20.6.2 NMAC, "Ground and Surface Water Protection." The WIPP facility does not discharge to surface water but does have a discharge permit (DP) designed to prevent impacts to groundwater.

The NMED Groundwater Quality Bureau issued the DP-831 permit for the operation of the WIPP sewage treatment facility in January 1992 for 5 years. It was most recently renewed in January 2022 to include the SSCVS, a new shaft project, new stormwater ponds and a salt cell (figure 2). The modifications also included one-time radium and uranium analysis in the Perched Anthropogenic Water (PAW) wells.

**Figure 2.0 – New Salt Storage Cell for SSCVS**

In accordance with the DP in effect during the CY, monthly inspections are conducted at each of the stormwater ponds, salt storage ponds, and salt storage cells to ensure proper maintenance. When deficiencies are observed, such as liner tears or significant erosion, appropriate repairs are conducted. Regarding facility operation, the sewage lagoons and Evaporation Pond H19 are inspected weekly for signs of erosion or damage to the liners. The distance between normal water levels and the top (known as "freeboard") of the sewage lagoons, H19, stormwater ponds, and salt storage ponds are monitored regularly. The 2022 DP renewal added the requirement of inspecting the leak detection sumps in Salt Storage Ponds 2, 3, 4, and 5.

The DP requires the sewage lagoons, Evaporation Pond H19, and Salt Storage Pond 4 to be sampled semi-annually. The sewage lagoons are analyzed for nitrate, total Kjeldahl nitrogen (TKN), total dissolved solids (TDS), sulfate, and chloride, while Evaporation Pond H19 and Salt Storage Pond 4 are analyzed for only TDS, sulfate, and chloride. The stormwater ponds and salt storage ponds must be sampled annually after 2 inches of rain in 24 hours for TDS, sulfates, and chlorides. There were no 2-inch rainfall events at WIPP in 2024. The results of this monitoring are reported in section 5.6, Liquid Effluent Monitoring. In addition, the Permit requires annual PAW level contour mapping and semi-annual groundwater sampling for sulfate, chloride, and TDS. The PAW monitoring results are discussed in chapter 6.

The DP requires the sludge in the Facultative Lagoon System and the Salt Storage Ponds to be measured once during the first 3 years after the new DP is issued. The sludge in the DP-831 ponds and lagoons were not measured in 2024, since they were already measured in 2023 according to the DP requirements.

The DP requires semi-annual reports to be submitted to the NMED by the first of February and August. The reports included permit-required inspection results, water analyses, and sewage and stormwater discharge volumes. Both semi-annual reports were submitted, one in July 2024 for the reporting period of January 1 to June 30, 2024, and the other in February 2025, for the reporting period of July 1 to December 31, 2024. There were no inspections at the WIPP facility in 2024 by the NMED, Ground Water Quality Bureau.

The new salt pile and ponds at Shaft #5 and at the SSCVS are scheduled to be released from the contractor to the WIPP MOC for operation. The only DP-831 requirement not completed in the CY is the installation of fencing and signage around Brine Water Storage Pond 4. This will occur before the operation of the pond is turned over to the MOC.

## 2.7 SAFE DRINKING WATER ACT

The *Safe Drinking Water Act* (42 U.S.C. § 300f, et seq.) provides the regulatory strategy for protecting public water supply systems and underground drinking water sources. New Mexico's drinking water regulations are contained in 20.7.10 NMAC, "Drinking Water," which adopts, by reference, 40 CFR Part 141, "National Primary Drinking Water Regulations," and 40 CFR Part 143, Subpart A, "National Secondary Drinking Water Regulations." Water is supplied to the WIPP facility by the city of Carlsbad, NM. The WIPP facility's water system (NM3598008) is classified as a non-transient, non-community water system subject to NM drinking water regulations.

Bacterial samples are collected, and residual chlorine levels are tested monthly. Free chlorine levels are reported to the NMED twice each month. Bacteriological analytical results were below the *Safe Drinking Water Act* regulatory limits, and residual chlorine levels met safe drinking water requirements.

Facilities personnel conduct disinfectant byproducts testing per 40 CFR § 141.132, "Monitoring Requirements," annually. The results are reported in the Waste Isolation Pilot Plant Annual Disinfectant Byproducts Compliance Sampling for 2024 Report. In September 2024, samples were collected at two points in accordance with 40 CFR § 141.132, "Monitoring Requirements" for disinfection byproducts. Results in both samples were below regulatory limits for disinfection byproducts, trihalomethanes, and haloacetic acids.

The WIPP Water System must be sampled for lead and copper triennially within the distribution system in accordance with 40 CFR Part 141 Subpart I, "Control of Lead and Copper." Lead and copper sampling occurred in August 2023 at 10 locations throughout the drinking water system. All samples resulted in lead and copper as "non-detected" except for two locations at the Guard and Security Building, which were at or above action levels. The Drinking Water Bureau was notified of these exceedances of the action level along with a plan to remediate. Two valves containing lead were replaced. Action levels were exceeded for lead in these two samples, but the regulatory limit was not exceeded.

In July 2023, the Drinking Water Bureau presented training on the Federal Lead and Copper Rule Revisions, which required water systems to create a service line inventory of lead lines and fittings within their water system along with a plan to replace them within 5 years. This inventory and plan was submitted to the State on October 16, 2024.

## 2.8 NATIONAL HISTORIC PRESERVATION ACT

The *National Historic Preservation Act*, as amended (54 U.S.C. § 300101, et seq.; formerly 16 U.S.C. § 470, et seq.), was enacted to protect the nation's cultural resources in conjunction with the states, local governments, Indian tribes, and private organizations and individuals. The act also established the National Register of Historic Places. The actual regulations are found in 36 CFR Part 800. The State Historic Preservation Officer coordinates the State of New Mexico's participation in implementing the *National Historic Preservation Act*. Protection and management of cultural resources at and around the WIPP facility is implemented per DOE Policy 141.1 and through the WIPP LMP, the land use request (LUR), and the Environmental Compliance Review (see section 5.2). Planning/management policies pertaining to cultural resources within the WLWA are conducted in accordance with regulations and guidelines included in appendix F, *Implementing Regulations Regarding Cultural Resources*, of the LMP. The objectives of the policies are to protect and preserve the full array of cultural resources within the WLWA for the benefit of scientific and socio-cultural use by present and future generations.

To protect cultural resources, projects proposed on previously undisturbed areas require the submittal of an LUR. For WIPP-related projects, an Environmental Compliance Review form is also required. These documents are reviewed by personnel cognizant of regulatory requirements. They are used to determine if air, water, hazardous waste, or land use permits are required for the activity as well as documenting potential impacts to wildlife, vegetation, and cultural resources. Projects that could potentially impact cultural sites may require additional surveys to minimize any impacts, one cultural survey was completed during this CY. Four LURs were processed in the CY and reviewed to ensure protection of cultural resources.

## 2.9 TOXIC SUBSTANCES CONTROL ACT

The *Toxic Substances Control Act* (15 U.S.C. § 2601, et seq.) regulates the production, use, distribution, and disposal of new, potentially toxic chemical substances including asbestos and polychlorinated biphenyls (PCBs).

Because of the potential for serious health hazards associated with asbestos, Congress amended the TSCA in 1986 by adding Title II, the Asbestos Hazard Emergency

Response Act, to regulate asbestos-containing materials in schools. A survey of the buildings at the WIPP facility determined that there are no asbestos-containing materials in any of the structures.

The PCB storage and disposal regulations are listed in the applicable subparts of 40 CFR Part 761, “Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions.” On May 15, 2003, EPA Region VI approved the disposal of transuranic waste containing PCBs at the WIPP facility. The WIPP facility began receiving PCB-contaminated waste on February 5, 2005. The EPA renewed the disposal authority for 5 years on April 30, 2008, May 21, 2013, and March 19, 2018. On July 20, 2022, a letter requesting re-authorization was sent to the EPA Region IV. The EPA provided an extension through September 30, 2023. The EPA extended the previous approval through April 15, 2024. On April 11, 2024, the EPA issued Conditions of Approval granting reauthorization for the disposal of non-liquid PCBs contaminated with transuranic waste (PCB/TRU) and PCB/TRU waste mixed with hazardous waste. The reauthorization was effective on April 11, 2024, and is effective for 5 years. The required PCB annual report, containing information on PCB waste received and disposed of at the WIPP facility during 2024, was submitted to EPA Region VI in accordance with 40 CFR Part 761 prior to the July 15 due date.

## 2.10 FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT

The *Federal Insecticide, Fungicide, and Rodenticide Act* (7 U.S.C. § 136, et seq.) authorizes the EPA to regulate the registration, certification, use, storage, disposal, transportation, and recall of pesticides (40 CFR Parts 150 to 189, “Federal Insecticide, Fungicide, and Rodenticide Act Regulations”).

The Pesticide Control Act (NMSA 1978, §§ 76-4-1 through 76-4-39) is administered and enforced by the New Mexico State Department of Agriculture (NMDA). This act provides for the registration, labeling, distribution, storage, transportation, application, use, and disposal of pesticides and pesticide-related devices in order to protect the environment and the public health and welfare. It provides for the licensing of pesticide dealers, consultants, applicators, and operators of pesticide apparatus and allows for penalties for noncompliance with requirements. The New Mexico Pesticide Control Act is implemented through 21.17.50 NMAC “Agriculture and Ranching”. The regulations establish requirements for licensing and for applying pesticides in New Mexico.

Licensed, certified applicators are contracted to apply pesticides at the WIPP facilities and are required to produce proof of licensing as part of the procurement process. The MOC contractor reviews the pesticides to be applied by the subcontractor before their application to ensure that products proposed for use are registered with NMDA.

Applicators routinely spray herbicides to control mesquite and other plant species on the 16 sections of the WLWA, including within the PPA, around evaporation ponds, salt storage cells, and Site and Preliminary Design Validation (SPDV) salt tailings pile. General-use pesticides are stored according to label instructions.

## 2.11 ENDANGERED SPECIES ACT

The *Endangered Species Act of 1973*, as amended (16 U.S.C. §1531, et seq.), was enacted to prevent the extinction of imperiled species. This act provides strong measures to help alleviate the loss of species and their habitats. It places restrictions on activities that may affect endangered and threatened species to help ensure their continued survival. With limited exceptions, the act prohibits activities that could potentially impact protected species unless permitted by the U.S. Fish and Wildlife Service (FWS). A biological assessment and formal consultation, followed by the issuance of a biological opinion by the FWS, may be required for any species determined to be in potential jeopardy. The intent of the Congressional endangered species legislation is further advanced in the New Mexico *Wildlife Conservation Act* (NMSA 1978, §17-2-37, et seq.), enacted in 1978 to protect the state's threatened and endangered wildlife.

During the CY, no imperiled species protected by the *Endangered Species Act* or New Mexico *Wildlife Conservation Act* were identified as occurring within the WLWA. However, considerations pertaining to protected species are implemented in accordance with the LMP (see section 5.2) during the deliberation and administration of projects conducted on WIPP lands. In the CY, no permits, biological assessments, or formal consultations were required. Additional details on wildlife population monitoring are presented in section 5.2.2 and the LMP.

## 2.12 MIGRATORY BIRD TREATY ACT

The *Migratory Bird Treaty Act* (16 U.S.C. §703, et seq.) is intended to protect birds with common migratory flyways between the United States, Canada, Mexico, Japan, and Russia. The act makes it unlawful “at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, or attempt to take, capture, or kill any migratory bird, any part, nest, or eggs of any such bird” unless specifically authorized by the Secretary of the Interior by direction or through regulations permitting and governing actions (50 CFR Part 20, “Migratory Bird Hunting”). Hunting allowances within the WLWA continued except for the areas that are posted against trespass. Hunts for migratory bird species within unrestricted areas is per federal and state laws.

In a notice published in 78 Federal Register 219, the DOE informed the public of the availability of its Memorandum of Understanding (MOU) with the FWS regarding the implementation of Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. The Executive order was published in 66 Federal Register 3853. This MOU expired in 2018, but the DOE signed an addendum to extend the MOU past this date. The MOU and the Executive order commit DOE to take specific actions to implement the Migratory Bird Treaty Act.

The DOE has implemented management objectives to protect birds and their habitats in the WIPP LMP. During the bird-nesting season, routine inspections of equipment at the WIPP are performed to monitor for early signs of nest building in critical areas and on critical equipment. When established nests are discovered, subsequent mitigative actions depend on specific species, situations, state and federal regulations, and authorizations and conditions of the MOC relocation permit. All requests for the use of WIPP lands outside the WIPP PPA are contingent on environmental walk-downs and confirming that nesting birds (including ground-nesting species) do not occupy the requested land. When nests are found, projects may be delayed or paused, or measures (e.g., buffer zones) are implemented to minimize impact.

The MOC, under the purview of the DOE, was granted an FWS relocation permit which allows for conditional relocation of nests, eggs, and or fledglings of migratory birds if located in a critical area that will impact their safety. Relocation was not needed during the CY. Incidental take did occur when three eggs of a curve-billed thrasher were unintentionally transported to the WIPP underground within chain-link fencing. The eggs were determined as not viable due to the length of time in the underground. The required annual report form for the CY was submitted to FWS ePermits portal on January 7, 2025, and this incidental take was reported.

## 2.13 FEDERAL LAND POLICY AND MANAGEMENT ACT

The objective of the *Federal Land Policy and Management Act of 1976,* as amended (43 U.S.C. Chapter 35 § 1701, et seq.), is to ensure that,

> …public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use.

Title II under the act, *Land Use Planning; Land Acquisition and Disposition*, directs the Secretary of the Interior to prepare and maintain an inventory of public lands and to develop and maintain, with public involvement, land use plans regardless of whether subject public lands have been classified as withdrawn, set aside, or otherwise designated for one or more uses, which is described in further detail in section 5.2.

Under Title V, *Rights-of-Way*, the Secretary of the Interior is authorized to grant, issue, or renew rights-of-way over, upon, under, or through public lands. To date, numerous right-of-way reservations and land-use permits have been granted. Appendix B1 of Permit Attachment B includes a list of active right-of-way permits. Each facility (road, well pads, and rail spur) is maintained and operated in accordance with the stipulations provided in the respective right-of-way reservation. Areas that are the subject of a right-of-way reservation are reclaimed and revegetated in a manner consistent with the terms of the right-of-way when they are no longer needed.

For the CY, no reclamations were completed for rights-of-way granted as per this act.

## 2.14 ATOMIC ENERGY ACT

The *Atomic Energy Act of 1954*, as amended (42 U.S.C. § 2011, et seq.), initiated a national program with responsibility for the development and production of nuclear weapons and a civilian program for the development and the regulation of civilian uses of nuclear materials and facilities in the United States. Amendments to the act split these functions between the DOE, which is responsible for developing and producing nuclear weapons, promoting nuclear power, and other energy-related work, and the U.S. Nuclear Regulatory Commission, which regulates the use of nuclear energy for domestic civilian purposes.

The statutory authority for the EPA to establish and generate applicable environmental radiation protection standards for the management and disposal of spent nuclear fuel, high-level waste, and TRU radioactive waste is found in the *Atomic Energy Act of 1954*, Reorganization Plan Number 3 of 1970, and in the *Nuclear Waste Policy Act of 1982* (42 U.S.C. § 10101, et seq.). The EPA final rule, 40 CFR Part 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes," was promulgated on December 20, 1993 (effective January 19, 1994) and consists of three subparts: Subpart A, "Environmental Standards for Management and Storage," Subpart B, "Environmental Standards for Disposal," and Subpart C, "Environmental Standards for Ground-Water Protection."

The results of both environmental and effluent monitoring and dose calculations have indicated that there have been no releases of radionuclides from the WIPP facility that may adversely impact the public. Results of the monitoring program demonstrate compliance with the dose limits specified in 40 CFR Part 191, Subpart A, and 40 CFR § 61.92, which are discussed in further detail in chapter 4. Facility personnel have conducted confirmatory effluent monitoring since receipt of waste began in March 1999.

The LWA requires the EPA to conduct recertification of continued compliance with the standards in 40 CFR Part 191, Subpart B, "Environmental Standards for Disposal," and Subpart C, "Environmental Standards for Ground-Water Protection," every 5 years after the initial receipt of TRU waste for disposal until the end of the decommissioning phase. The EPA issued certification and recertification criteria in 40 CFR Part 194, "Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR Part 191 Disposal Regulations." The fourth Compliance Recertification Application (CRA) for the WIPP Project (DOE/WIPP-19-3609) was submitted to the EPA on March 19, 2019. On May 3, 2022, EPA recertified the WIPP facility, confirming that it continued to comply with the agency's radioactive waste disposal regulations at 40 CFR Part 191, Subparts B and C, as well as with the WIPP Compliance Criteria at 40 CFR Part 194. The final recertification decision was published in 87 Federal Register 26126.

## 2.15 EPA ECHO DATABASE, LIST OF FACILITIES FOR WIPP

The EPA Enforcement and Compliance History Online (ECHO) database, (echo.epa.gov) first launched in 2002, is a public website that provides compliance information (data, monitoring history, compliance status, etc.) about permitted, regulated facilities. The WIPP site has 10 listings for the CY with information as follows:

1. **USDOE Waste Isolation Pilot Plant** – *Clean Air Act* (CAA): Operating Minor (NM0000003501500194), *Resource Conservation and Recovery Act* (RCRA): Active LQG, Operating TSDF (NM4890139088), Toxic Release Inventory (TRI): 88220SDWST3MILE, Facility Register Service (FRS) ID: 110060818735, there is one Hazardous Waste violation type is 279.c – Standards for Used Oil: Generators, citation is 279.22(c)(1) Containers and Aboveground storage tanks must be clearly marked used oil.
2. **USDOE Waste Isolation Pilot Plant** – FRS ID: 110070753598
3. **USDOE Waste Isolation Pilot Plant** – *Clean Water Act* (CWA): Non-Major, (NMU001557), Non-Major, Permit Not Needed (NMR05A823), FRS ID: 110032592031
4. **USDOE Waste Isolation Pilot Plant** – Integrated Compliance Information System (ICIS): 600033624
5. **Waste Isolation Pilot Plant** – FRS ID: 110012516722
6. **Waste Isolation Pilot Plant** – FRS ID: 110022722035
7. **WIPP Safety Significant Confinement Ventilation System** – *Clean Water Act* (CWA): Non-Major, Permit Expired, (NMR1001Y9), FRS ID:110070528602, no violations identified.
8. **USI** – *Clean Water Act* (CWA): Non-Major, Permit Expired, (NMR100207), FRS ID:110070530291, no violations identified.
9. **WIPP North Access Road Bypass** – *Clean Water Act* (CWA): Non-Major, Permit Expired, (NMR1001WV), FRS ID:110070519468, no violations identified.
10. **WIPP Water Supply** – *Safe Drinking Water Act* (SWDA) WNER: Federal government, PRIMARY SERVICE AREA DESCRIPTION: Industrial/Agricultural, SOURCE: Ground water purchased, TYPE: Non-Transient non-community system Permit Active (NM3598008), FRS ID: 110050946134, no violations identified.

# 3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The CBFO and the MOC consider protection of workers, the public, and the environment to be their highest priority at the WIPP facility. This commitment is evident by continued participation and certification to the International Organization for Standardization (ISO) 14001 environmental management standard. Performance at the WIPP facility regarding program implementation of the ISO 14001 program is made public online through the WIPP Home Page in accordance with the expectations defined by the President's Council on Environmental Quality, EO 14057, *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability*, implemented by DOE Order 436.1A Department Sustainability.

The WIPP EMS is implemented as a function of the Integrated Safety Management System (ISMS). This allows WIPP EMS program elements to be presented as a business strategy constructed as best management practices. The best management practices approach facilitates the creation, implementation, and maintenance of internal plans, policies, and procedures in a manner that protects the worker, the public, and the environment by documenting conformance with the standard and regulatory compliance.

The defined scope of the WIPP EMS applies to environmental aspects of the WIPP Project. On May 28, 2024, Advanced Waste Management Systems (AWMS) confirmed the WIPP EMS program to be suitable, adequate, and effective, as confirmed by audit ER5 206E. Completion of audit ER5 206E successfully recertified WIPP's EMS to the ISO 14001:2015 standard. The WIPP registration certification (number 206E) dated May 28, 2024, remains in effect until May 28, 2027. Audit ER5 206E resulted in three minor nonconformances: the WIPP environmental objectives were not clearly defined and therefore pathways for communication of those objectives and their progress were also not clearly defined. This resulted in the creation of an issue notice (WIPP-ISSUE-23-1066) that was tracked through WIPP's Issues Management Program, which has been adequately addressed and corrected. Another minor non-conformance included top-leadership not being included in the EMS Management Review, which was corrected in 2024. The WIPP EMS remains suitable, adequate, and effective. The continual improvement of WIPP's EMS and environmental performance continues to be managed, monitored, and evaluated by the Environmental Management System Steering Committee (EMSSC) to document leadership commitment.

With the support of the EMSSC, the program maintains an Environmental Policy Statement, WIPP EMS Description procedure, Pollution Prevention Program Plan, Sustainable Procurement Plan, and an Electronic Management Policy Statement and has successfully recertified to the ISO 14001:2015 standard.

Operational TRU waste emplacement was a significant priority during the CY. The facility confirmation process denoted 470 shipments received in the CY, yielding a total emplaced volume of TRU mixed waste and LWA TRU waste volume totaling 3,498.93 and 2836.20 $m^3$, respectively. At the end of the CY, the TRU mixed waste volumes in the underground totaled 108,873.01 $m^3$. Emplacement of TRU waste remains the most significant (positive) environmental aspect of the WIPP Project.

Progress toward the DOE sustainability goals during CY 2024 were limited. Some sustainability-related EMS goals included the installation of building load meter monitoring (carried over from the previous year) which has been partially completed by CY 2024, increasing and developing WIPP-specific sustainable acquisition training among P-card holders (still underway), acquiring three battery electric vehicles (BEVs) and charging stations for use by site personnel, and planning a solar element for the WIPP site (NextEra Energy was selected for a utility scale project on up to 1,800 acres of land at WIPP).

## 3.1 ENVIRONMENTAL MANAGEMENT SYSTEM HIGHLIGHTS

This section highlights improvements that supported TRU waste emplacement and the facility's long-term operation at pre-event rates.

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| **Environmental Policy** | The WIPP Environmental Policy Statement was reviewed by SIMCO leadership, signed, and issued on June 14, 2023; this Environmental Policy Statement continues to be effective, relevant, and applicable as determined by review from the EMSSC. The policy continues to be communicated to WIPP Project staff through postings, the EMS internal website, and the mandatory online training course (ENV-100/EMS Awareness Training), completed at initial hire and every 24 months after that. Additionally, General Employee Training includes specific EMS awareness training. The policy is available to the public on the WIPP home page. Management uses the Environmental Policy Statement to communicate the commitment to protect the environment publicly and is on an as-needed revision cycle as determined by the EMSSC. The WIPP EMS procedure (WP 02-EC.14) was revised in November 2024. |
| **Environmental Aspects** | During the CY, controls continued to be reviewed and strengthened as necessary for the following environmental aspects:<br>Resource use – Energy (including renewables) and water efficiency<br>Sustainable procurement<br>Solid waste – pollution prevention (P2)<br>Hazardous waste – reduction<br>Sustainable building management/design<br>Fleet management – BEV acquisition and utilization |

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| **Legal and Other Requirements** | On April 11, 2024, the EPA issued Conditions of Approval granting reauthorization for the disposal of non-liquid PCB/TRU waste and PCB/TRU waste mixed with hazardous waste. The reauthorization was effective on April 11, 2024, and is effective for 5 years.<br><br>On August 20, 2024, NMED issued an ACO to the CBFO and SIMCO which address a WIPP facility compliance evaluation conducted on April 17, 2023, by the NMED. The CBFO and SIMCO filed an Original Answer and Request for hearing in response the ACO. One September 18, 2024, a Request for hearing was filed in the Office of Public Facilitation. |
| **Objectives, Targets, and Program(s)** | Significant impacts and aspects are documented in the WIPP EMS Planning Matrix, which drives the creation of the WIPP Project strategic level environmental objectives and project targets. This is documented and made public by the WIPP Environmental Policy Statement and the EMS Planning Matrix via the internal EMS website. The SSP contributes to establishing the environmental targets that support DOE sustainable operation goals. The following is a summary of the WIPP facility performance principles as stated in the Environmental Policy Statement:<br><br>**Environmental Protection:** Strive to prevent pollution, protect land, habitats, air and water quality, ecologically sensitive areas, and cultural resources, and act to correct conditions that endanger the environment.<br><br>**Compliance Obligations:** Meet or exceed applicable environmental laws, regulations, directives, plans, and procedures while conducting WIPP facility operations.<br><br>**Environmental Performance Objectives:** Review the work scope of WIPP operations on an annual basis for environmental impacts and develop meaningful objectives and targets to drive continual improvement of our environmental performance.<br><br>**Sustainable Environmental Management:** Strive to diminish the consumption of natural resources (energy, water, materials), use sustainable products, minimize waste generation, and recycle or reuse materials, when viable.<br><br>**Environmental Communication:** Promote environmental best practices throughout the organization and provide employees, stakeholders, and interested members of the public timely, accurate, and meaningful information related to our environmental performance.<br><br>Within the WIPP EMS program, nine environmental targets were pursued and reported in the SSP in FY 24. Of those nine targets, three were successfully completed during the CY and six more were close to completion. Progress toward DOE sustainability goals is gained by completion of EMS environmental targets. Targets are tracked and |

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| | reported in support of the WIPP Environmental Policy Statement in the EMS Planning Matrix and reported to senior management via the annual management review, which took place on December 12, 2024. |
| **Competence, Awareness, and Training** | A WIPP EMS awareness training module, ENV-100, was designed and implemented as an online course to allow tracking via the WIPP Technical Training Learning Management System. The WIPP EMS awareness training course includes EMS-specific information for new employees, including the requirement of taking the course, which is mandatory for WIPP Project personnel, MOC subcontractors, and embedded subcontractors every 24 months.<br><br>Every WIPP employee completes an in-depth initial General Employee Training and annual refresher as well as a one-time Conduct of Operations Training, which is fundamental to implementing the operational control elements as a function of the ISMS supporting the WIPP EMS program. General Employee Training includes EMS-specific information for new employees, including the requirement to take the ENV-100 course.<br><br>At the end of CY 2024, ENV-100 completion rates had increased to over 98 percent of WIPP personnel. |
| **Operational Control** | Operational controls are established, and changes are controlled, reviewed, and planned in accordance with the WIPP Conduct of Operations and Conduct of Engineering Programs. The Conduct of Operations Program ensures processes are designed and technology is used for control as appropriate and operations are planned and executed in a formal, disciplined manner that protects people and the environment. Changes to physical equipment and configuration are managed through the Conduct of Engineering Program. This program ensures that proposed changes are analyzed for potential impacts. Changes to administrative controls such as programs, plans, and procedures are addressed via the document control process.<br><br>Quality Assurance programs provide an integral function that supports operational controls. Comprehensive CBFO and WIPP QA programs have been implemented to ensure that work is performed in a manner that meets or exceeds quality and regulatory requirements. In CY 2024, The QA and CBFO organization conducted audits and surveillances including, but was not limited to: conduct of operations, VOC monitoring, Central Characterization Program reporting, contractor assurance system, quality management system, contact handled waste handling program, and worker safety. |
| **Emergency Preparedness and Response** | The effectiveness of the WIPP Emergency Preparedness Program is continuously assessed through drills, exercises, internal and external management assessments, and offsite interfaces. In CY 2024, 47 drills and exercises were conducted that provided training opportunities specific to underground and building evacuations, Central Monitoring |

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| | Room operations, emergency response and Emergency Operations Center (EOC) functionality, and the practice of surface protective actions at the WIPP site and the Skeen-Whitlock Building. This included a full-scale drill in October 2024 with a malevolent act that resulted in a filtered release.<br><br>The planning for drills and exercises is based on the data from the Emergency Planning Hazards Survey, which is used to identify the chemical and radiological hazards at the WIPP facility and their quantities, along with the Emergency Planning Hazard Assessment, which identifies the Emergency Planning Zones, Emergency Action Levels, and the Protective Action Criteria associated with possible emergency events.<br><br>The WIPP Emergency Preparedness personnel and Security Department Protective Force coordinate with Eddy and Lea County Sheriff's Offices and emergency management offices to prepare for drills and exercises. The purpose of these drills/exercises is to enhance coordination, allowing these agencies to work together better, and to address specific issues and communications. In addition, the Emergency Preparedness Section coordinated with both mutual aid hospitals (Carlsbad Medical Center and Covenant Health Hospitals of Hobbs) on developing and scheduling of emergency training for the hospitals in response to a contaminated injured victim from the WIPP facility. The purpose of the drills and exercises is to ensure that the WIPP facility and emergency response personnel are adequately trained in the event of an emergency at the WIPP site. The WIPP Emergency Management Annual Exercise is designed for testing or validating the effectiveness of the onsite response in accordance with WIPP emergency plans and procedures as well as the communication and coordination of offsite response agencies providing assistance and resources to a WIPP Operational Emergency. The Emergency Management Section updates applicable plans and procedures in conjunction with their Memoranda of Understanding with local, regional, state, and federal agencies.<br><br>Emergency Services firefighters are certified to Firefighter I/II levels. In addition, Emergency Services conducts numerous drills throughout the year. Emergency Services also responds to actual events (vehicle accidents) within a 15-mi radius of the WIPP site. The WIPP Emergency Services has also implemented a state-certified Emergency Medical Service Basic and Advance Life Support response capability. |
| **Monitoring and Measurement** | The WIPP Environmental Monitoring Program continued to be robust, with sampling conducted across the full range of media that could be affected by the operation of the WIPP facility. The media sampled included air, soil, surface water, sediment, biota, VOCs, and groundwater. Further details can be found in chapters 4, 5, and 6. |

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| **Evaluation of Compliance** | Compliance evaluations completed in the CY included:<br>• During CY 2024, audits and/or surveillances were performed in the following environmental areas: VOC Monitoring Program, WIPP Laboratories, Effluent and Hazardous Material Sampling Program, NESHAP Program, Drinking Water Sampling Program and Metrology Program. This included checks for compliance with environmental requirements related to various environmental parameters. These areas were selected because QA has an independent assessment schedule with the schedule of surveillances/audits determined by requirements and/or management recommendations.<br>• During the year, environmental staff conducted a management self-assessment on the WIPP Laboratories in accordance with procedures, orders, statements of work (SOWs), safety standards, and competency of trained personnel. Management Assessments are scheduled and tracked on the DevonWay software platform. In addition, a team of environmental staff consistently reviews documentation of Permit inspection requirements. If corrections are noted with the inspection reviews, attempts are made to perform corrective practices during the inspection time frame to both correct an inspection form and coach those performing inspections on the core value element for continuous improvement. There were three safety management program (SMP) health assessments completed during CY 2024 in place of a regularly scheduled Management. The three SMPs completed during CY 2024 within the Environmental Program department: (1) Chapter 18. Waste Stream Profile Form; (2) Chapter 18. TRU Waste Confirmation, and (3) Chapter 18. Waste Stream Profile and Approval Program. The chapters relate back to the Documented Safety Analysis. Safety management programs are programmatic administrative controls that are assessed on a yearly basis within DevonWay. These assessments have been initiated in 2023 but became closed in the DevonWay system during the CY.<br>• In addition, a team of environmental staff consistently reviews documentation of Permit inspection requirements. If corrections are noted with the inspection reviews, attempts are made to perform corrective practices during the inspection time frame to correct an inspection form and coach those performing inspections on the core value element for continuous improvement. |
| **Nonconformity, Corrective Action, and** | The CBFO continued to apply two programs related to corrective actions and preventive actions: |

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| **Preventive Action** | The Issue Collection and Evaluation (ICE) system is the CBFO management tool for documenting and tracking identified issues through management evaluation, approval, resolution, and closure. Through the ICE system, the CBFO implements applicable portions of DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*; DOE Order 414.1D, *Quality Assurance*, DOE Order 422.1, *Conduct of Operations*; DOE/CBFO-94-1012, *Quality Assurance Program Document*; and DOE/CBFO-04-3299, *Carlsbad Field Office Contractor Oversight Plan*. Thirty-four ICE forms were assigned to the MOC, and 52 were closed during CY 2024.<br><br>The Corrective Action Report (CAR) program identifies conditions that are averse to quality and provides corrective actions for timely resolution to prevent recurrence. The CAR program implements applicable portions of DOE Order 414.1D and DOE/CBFO-94-1012. There were 27 CARs issued during CY 2024 and 40 CARs were closed, none involving any groups within the Environmental Program Organization.<br><br>The WIPP issues management and CAR programs continue to be robust:<br><br>WIPP personnel use the Issue Notice process to identify issues and conditions adverse to quality and apply corrective actions for timely resolution to prevent recurrence. The WIPP Issue Notice process implements applicable portions of DOE Order 422.1, DOE Order 414.1D, DOE Order 226.1B, and WP 13-1, *Quality Assurance Program Description*. In May 2021, the MOC and CBFO transitioned to utilizing Hanford's DevonWay integrated Contractor Assurance System. DevonWay offers a variety of solutions and toolsets for asset management, quality management, environmental health and safety, workforce solutions, and benchmarking. Utilizing the DevonWay software now provides the MOC and CBFO options to further integrate and optimize other programs and processes at the WIPP site under a single enterprise software platform. There were 1,678 Issue Notices generated, and 1,731 Issue Notices closed during CY 2024. |

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| **Internal Audit** | The QA organization completed a full-scale internal audit of the EMS on September 11–21, 2023, in accordance with the Quality Assurance Independent Assessment Schedule on a triennial basis. The results of this audit indicate that the WIPP EMS program is adequate and effectively implemented. The audit resulted in three findings, no conditions corrected during the assessment, and five observations. The findings were as follows:<br>1. The EMSSC meeting held on August 29, 2023, did not meet the requirements for a quorum.<br>2. ENV-100 and/or GTFE-01 are not completed by all employees.<br>3. Sections of the EMS Planning Matrix at the time of the audit needed review.<br>All observations and findings were entered into the DevonWay Issues Management System and have been adequately addressed and corrected. |
| **Management Review** | The EMS Coordinator and the Environmental, Safety, and Health (ES&H) Senior Manager conducted a management review on the status of the WIPP EMS in December 2024, which was completed December 12, 2024. |

## 3.2 ENVIRONMENTAL PERFORMANCE MEASUREMENT

Extensive monitoring and measurement are conducted so that facility personnel can ensure that the WIPP mission is carried out in accordance with its environmental policy. This includes monitoring for: (1) impacts to the environment, (2) WIPP EMS effectiveness, and (3) sustainability progress. Each of these is discussed in the following sections.

### 3.2.1 Environmental Impacts

There were no significant adverse impacts on the environment from WIPP facility operations in the CY, as determined by extensive environmental monitoring for radiological and non-radiological monitoring results. Detailed analyses and summaries of environmental monitoring results are included in chapters 4, 5, and 6.

### 3.2.2 WIPP Environmental Management System Effectiveness

The effectiveness of the WIPP EMS is ultimately determined by how well the WIPP EMS program is integrated into daily operations. Its effectiveness is confirmed through internal audits and management self-assessments in conjunction with multiple independent third-party audits, which are subsequently evaluated by the EMSSC.

The EMS Coordinator provides WIPP EMS program updates to senior management via the management review process. The report includes details specific to the program’s current state, changes, needs and expectations, program aspects, risks and opportunities, current objective support, target progress, program performance, monitoring and measurement, fulfillment of compliance obligations, audit results, adequacy of resource funding, communications, continual improvement, proposed changes (if applicable), followed by denoting the challenges, changes, and accomplishments relative to the WIPP EMS program for sustainability and P2 programs.

At the end of CY 2024, internal assessments determined that the EMS continued to be suitable, adequate, and effective in implementing the strategic principles outlined in the WIPP Environmental Policy Statement.

### 3.2.3 Sustainability Progress (Continuous Improvement)

The annual WIPP EMS submittal is used to denote WIPP EMS performance directly to DOE headquarters, the Department of Environmental Management. For the CY, the WIPP EMS annual reporting submittal stated that the CBFO/MOC achieved “green” status. Overall, “green” status indicates that at least 80 percent of reporting EMS topics are rated as green (at least four As, the rest Bs).

The WIPP SSP details the environmental performance specific to supporting federal sustainability goals. Refer to the FY SSP for details regarding energy, water, fleet management, clean and renewable energy projects, sustainable acquisition and procurement, investments for improvement measures, workforce, and the community, fugitive emissions and refrigerants, and organizational adaptation and resilience.

For FY 2024, the DOE had eight overarching sustainability categories goals (taken from the DOE Sustainable Performance Office’s Sustainability Dashboard):

1. Scope 1 & 2 Greenhouse Gas Emissions: Reduce direct GHG emissions by 50 percent by FY 2025 relative to FY 2008 baseline.
2. Scope 3 Greenhouse Gas Emissions: Reduce indirect GHG emissions by 25 percent by FY 2025 relative to FY 2008 baseline.
3. Energy Intensity: Reduce energy intensity by 30 percent relative to 2015 baseline.
4. Renewable Energy: Use 30 percent renewable energy as a percentage of overall facility electricity use by FY 2025.
5. Potable Water Intensity: Reduce potable water intensity by 36 percent by FY 2025 relative to FY 2007 baseline.
6. Fleet Petroleum: Reduce fleet petroleum use by 20 percent by FY 2015 and thereafter relative to FY 2005 baseline.
7. High Performance Sustainable Buildings: Ensure 15 percent (18 percent by gross square feet) of buildings meet the Guiding Principles for Sustainable Buildings by FY 2025.

8. Fleet Greenhouse Gas Emissions/Mile: Reduce per-mile greenhouse gas emissions by 30 percent by FY 2025 relative to FY 2014 baseline.

Progress toward the following sustainability goals was accomplished during FY 2024 according to DOE's Comprehensive Scorecard:

*Greenhouse Gas Management*

- Scope 1 & 2 Greenhouse Gas Emissions: reduce direct GHG emissions by 50 percent by FY 2025 relative to FY 2008 baseline. The site's scope 1 and 2 GHG emissions have been reduced by 40.2 percent from the FY 2008 baseline.
- Scope 3 Greenhouse Gas Emissions: reduce indirect GHG emissions by 25 percent by FY 2025 relative to the FY 2008 baseline. The site's scope 3 GHG emissions have been reduced by 15.8 percent from the FY 2008 baseline.

*Waste Management*

- Municipal Solid Waste: divert at least 50 percent of non-hazardous solid waste (excluding construction and demolition [C&D] debris). The site diverted 84.1 percent of its non-hazardous solid waste from being landfilled in FY 2024.

*Electronics Stewardship*

- Electronics Acquisition: 100 percent of eligible electronics procurements must be environmentally sustainable (e.g., Electronic Product Environmental Assessment Tool [EPEAT]). During FY 2024, 96 percent of eligible electronics procurements were EPEAT-registered to the highest available level.
- Electronics Recycling: Dispose of 100 percent of electronics through government programs and certified recyclers. The WIPP site generated 38.81 metric tons of electronics to be disposed of in FY 2024, and 100 percent were either recycled through the Federal Prison Industries program (operating under the trade name UNICOR), a certified electronics recycler or donated to the local community.
- Power Management: Implement and actively use power management features on 100 percent of eligible computers (personal computers and laptops) and monitors. The WIPP site owns just under 4,347 computer monitors and central processing units as of 2024, all of which actively use power management features.
- Duplex Printing: Implement and actively use duplex printing features of 100 percent of eligible printers. The WIPP site actively uses duplex printing features on all eligible printers as a default printing setting.

### 3.2.4 Reduce Greenhouse Gas Emissions

The WIPP site used approximately 21,000 megawatt hours of electricity in FY 2024, a slight 1.2 percent decrease compared to FY 2023. The decrease comes as the number of shipments to the facility increased. WIPP attributes the decrease to more efficient operations, milder weather, and equipment retrofits. With the addition of new systems and equipment, and the expansion of the site footprint along with an increase in shipments, WIPP's energy usage will grow significantly. WIPP will be expanding the site's power capacity over the same time period to support the additional loads.

WIPP has begun to explore the installation of renewable energy and battery energy storage systems at the site. It has completed a power study and a 30 percent design for a solar photovoltaic (PV) array coupled with a battery energy storage system. In parallel with the effort, the DOE's Cleanup to Clean Energy program aims to repurpose parts of DOE-owned lands, portions of which were previously used in the nation's nuclear weapons program, into sites for clean energy generation; the WIPP site has been named as one of the five potential development sites. The WIPP site does not use natural gas in any of its systems. One of the subsidiary offices in Carlsbad, NM, uses natural gas for water heating.

WIPP is also installing advanced metering and monitoring equipment, starting at the substation level, and then working down to the building level. The meters are being permanently installed and are recording at 1-minute intervals. At the moment, they do not transmit data, but the planned data system will use a local area network to transmit information to a remote location, for further transfer to interested divisions. Metering will allow for site personnel to conduct both internal and external benchmarking.

**Figure 3.0 – Construction of the SSCVS**

WIPP is constructing two systems that will dramatically increase the site's energy usage: the SSCVS (figure 3) and the corresponding utility shaft (i.e., Shaft #5). The SSCVS will increase airflow to the underground area from 170,000 cubic feet per minute ($ft^3$/min) to 540,000 $ft^3$/min. The corresponding Shaft #5 will provide air to the SSCVS. Although the site does not have any high-energy mission specific facilities (HEMSFs), the installation of the SSCVS and the corresponding Shaft #5 may be considered an HEMSF and will substantially impact sustainability metrics, including GHGs. The SSCVS handover began in late CY 2024 to the MOC, and it is expected to come online in CY 2025.

Options to reduce GHGs include purchasing renewable energy; purchasing renewable energy certificates (REC); building onsite renewable energy generation; and continuing to install retrofit and replace equipment with energy-efficient equivalents. The first option is currently unavailable, the third option is costly and time consuming, and the last option cannot reduce emission to zero, leaving RECs as the remaining alternative.

Renewable energy certificates represent the energy generated by renewable energy sources, such as solar or wind power facilities. Buying RECs is not equivalent to buying electricity. Instead, RECs represent the clean energy attributes of renewable electricity that is generated elsewhere. RECs can be purchased to offset the GHGs attributed to site energy usage. The most economical way for WIPP to achieve Scope 1 and 2 GHG reduction goals is by purchasing RECs.

Given the facility's lack of access to alternative fuels, the facility will continue to use electricity or diesel to power mobile and light-duty equipment and vehicles. WIPP is currently working to reduce and electrify non-fleet vehicles and equipment at the site. Light-duty trucks using gasoline have been replaced with electric equivalents, and infrastructure to charge these vehicles is being added and planned.

### 3.2.5 Water Efficiency and Management

As it is in a remote location on the edge of the Chihuahuan Desert, water, consumption, and discharge are important to site operations. WIPP has instituted purchasing guidelines for water-using equipment for both current systems and equipment and new buildings and installations. It plans to install WaterSense-labeled and other high-efficiency restroom fixtures through retrofit and replacement strategies. Water lines are being tested, water leaks are being identified, and pipes are repaired, and water usage is tracked. WIPP is planning the installation of water meters at the building level to measure and monitor water consumption and to support benchmarking efforts. Water usage during CY 2024 increased compared to usage during 2023 (table 3.1) due to several factors including testing of an impaired fire protection system, limiting plastic water bottle use, and higher than average summer temperatures.

The WIPP facility is using a demand-side strategy to address the water efficiency of systems and equipment currently in place. Surveys of buildings, systems, and equipment at the site began at the end of CY 2023 and will continue through CY 2025 The surveys, once completed, will identify the water using systems at the site and detail strategies and measures to reduce water usage and discharge. Potential projects include adopting water conservation equipment and measures in the heating, ventilation and air-conditioning systems, bathrooms, showers, deep sinks, and kitchen equipment. On the supply side, the facility is ensuring that newly purchased water-using equipment and systems are efficient. The facility does not have significant water usage to support operations, with most of the water being consumed by personnel; therefore, strategies and subsequent measures will have to address a significant quantity of very small users to reduce usage.

Despite being in the Chihuahuan desert, the facility suffers from neither water shortages nor excessive water costs. Currently the site embraces Xeriscaping and has a robust stormwater runoff system. If future climate issues result in water shortages or increased water costs, WIPP may have to adjust its strategies to increase conservation efforts.

**Table 3.1 – WIPP Total Yearly Water Use** (Data provided by the City of Carlsbad Water Department)

| Year | Use (kgal) |
|---|---|
| 2024 | 8,020 |
| 2023 | 5,551 |
| 2022 | 6,104 |
| 2021 | 6,809 |
| 2020 | 4,409 |
| 2019 | 3,749 |
| 2018 | 6,738 |
| 2017 | 3,687 |
| 2016 | 5,182 |
| 2015 | 4,271 |
| 2014 | 3,258 |
| 2013 | 3,350 |
| 2012 | 4,596 |

Note: kgal = 1,000 gallons

### 3.2.6 Waste Diversion

An active P2 program is in place with recycling as a key component of the program. As a result, the WIPP Project has historically recycled site-generated waste that can be recycled within its regional infrastructure. This includes a narrow scope of municipal solid waste, C&D, hazardous, universal, and NM special waste streams. Non-hazardous site-generated waste recycled by the P2 program includes lead-acid batteries, alkaline batteries, aluminum, cardboard, ink and toner cartridges, paper, number 1 polyethylene terephthalate plastics, wood pallets, hard hats, and C&D waste, which includes asphalt, concrete, wood, and scrap metal. Other wastes recycled or recovered include antifreeze, circuit boards, motor oil, universal batteries (cadmium, lead-acid, lithium, silver-oxide, zinc), and universal lighting (fluorescent, light-emitting diode, incandescent). Site-generated electronic wastes (computers, printers, copiers, and miscellaneous electronics) are either donated for reuse or sent for recycling. The DOE requires language to be embedded in subcontracts to show that they will adhere to P2 program standards, which include recycling, to the best extent possible.

During FY 2024, a total of 554.55 metric tons of municipal solid waste, wood waste, and recyclable materials were generated at the WIPP site and associated construction & demolition-related activities. The WIPP site successfully diverted 80.33 percent, or 442.88 metric tons, of that waste from the local landfill (inclusive of waste generated from capital construction projects).

The WIPP site—excluding waste generated from capital construction projects—generated a total of 433.81 metric tons of municipal solid waste, wood waste, and recyclable materials in FY 2024. Of that, 370.75 metric tons, or 85.46, percent was recycled and diverted from being landfilled. Capital construction projects (Shaft #5 and

SSCVS construction) generated 120.74 metric tons of municipal solid waste and recyclable materials (metal), 72.13 metric tons or 59.74 percent of which was recycled (figure 3.1).

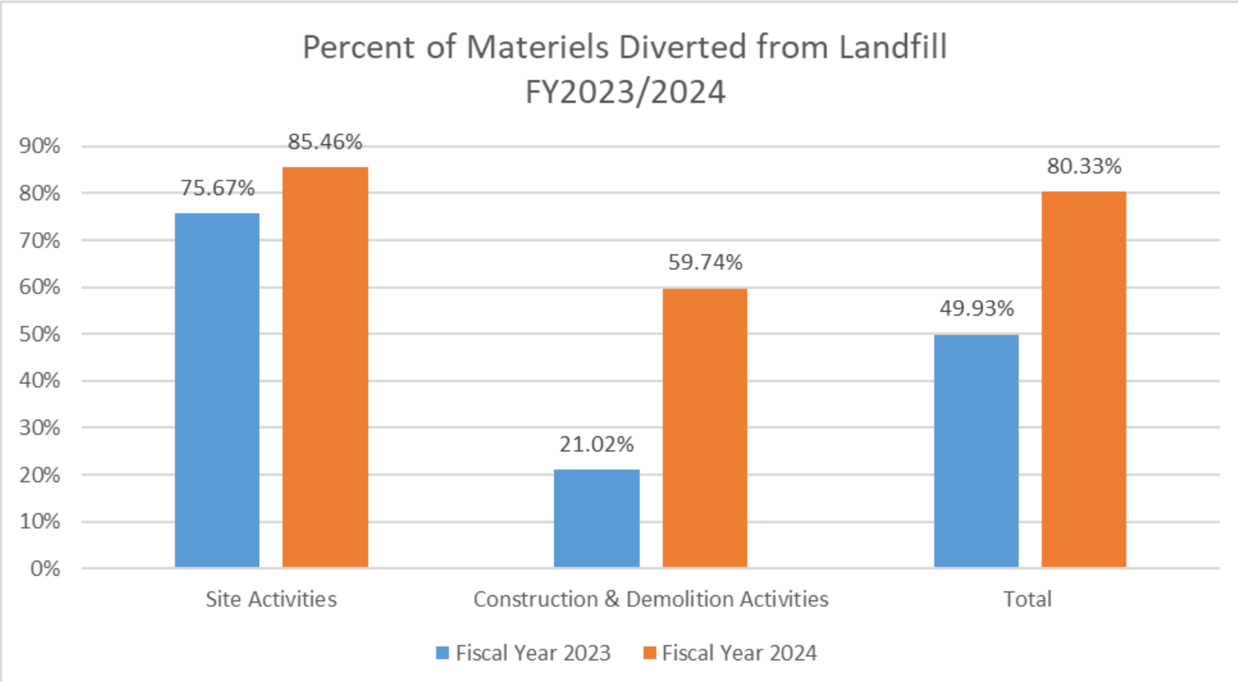



**Figure 3.1 – Percent of Materials Diverted from Landfill, FY 2023 / FY 2024**

#### 3.2.6.1 Plans and Projected Performance

Efforts toward making continual improvements to maintaining and ultimately improving the site's waste diversion rate are focused on employee awareness and training along with continued efforts to identify new recycling pathways.

For FY 2025, actions to improve waste diversion rates and source reduction include:

- Monitoring the placement areas and maintenance of the recycling bins around the site.
- Recycling wood pallets through pallet vendors.
- Finding new vendors for recycling waste that is yet to be recycled, such as wood shipping crates and recyclable office waste.
- Educating site personnel on the P2 and Waste Minimization Program. Site Environmental Compliance (SEC) personnel will continue distributing regular communications through WIPP Communications and Morning Summaries and will continue to develop resources for site personnel to educate and encourage recycling and source reduction participation.

### 3.2.7 Sustainable Acquisition

The DOE requires the inclusion of sustainability contract language and inclusive clauses in site-generated service and construction contracts. This requirement communicates the expectation specific to purchasing and using sustainable products, goods, and services.

The implementation to expand the EMS with emphasis on sustainability in procurement standards was started during FY 2017 and is still applicable. The increased emphasis is on procurement of recycled content, Energy Star, FEMP, EPEAT, SNAP and Safer Choice labeling, WaterSense, and BioBased/BioPreferred content while utilizing SmartWay logistic providers. SNAP and Safer Choice are the standards that mandate low to zero VOC products and zero tolerance for products containing ozone-depleting substances (ODSs).

In addition, the project expanded the inclusion of preferred sustainability contract language into scopes of work, purchase orders, service contracts, and construction projects from initial design to procurement. This process helps ensure that the majority of purchases contain requirements to implement sustainable procurement standards.

During CY 2024, efforts to improve the acquisition of sustainable products included increasing site personnel's awareness of sustainable acquisition and reporting requirements. This included efforts to create and maintain a new Sustainability SharePoint site. Trained SEC personnel review all credit card purchases at the site to ensure applicable purchasing requirements are being met when feasible and appropriate documentation is generated when it is not. To better track sustainable purchases for end-of-year reporting, SEC personnel are working with representatives from Procurement and the Information Resource Management departments to update the Integrated Financial Management System procurement database to create streamlined data reports of all applicable sustainable purchases.

#### 3.2.7.1 Plans and Projected Performance

The EMS will continue to focus on increasing the use of sustainable products to meet projected FY 2025 goals. Actions to help achieve this include:

- Continuing to review and update sustainable acquisition-related resources available to site personnel on the new Sustainability SharePoint site.
- Continuing to review and monitor the site's credit card purchases for opportunities to buy sustainable products when feasible.
- Working with the Procurement Initiative Team to better incorporate sustainable purchasing requirements into all procurement pathways at the site, including purchases made through all mechanisms outside of a credit card purchase.

### 3.2.8 Electronics Stewardship and Data Centers

The CBFO/MOC applies sustainable lifecycle management by requiring applicable products, goods, and services to meet management expectations as required, in part, by the WIPP Electronic Management Policy. In September 2020, the CBFO/MOC adopted and issued an update to the *Waste Isolation Pilot Plant Electronic Management Policy Statement* (DOE/WIPP 11-3474, available on WIPP Home Page) relative to ensuring sustainable operations that strengthen the overall sustainability and resilience of the facility. The policy update requires products denoted as having EPEAT requirements shall be EPEAT rated at the highest rating possible. The policy update expands expectations by revoking the allowance for exceptions to the application of site prescribed default power management settings and the default duplex print management settings. The policy update notes that the paper used to produce site generated printed material shall be printed on 30 percent recycled content copy paper.

The policy requirements continue to ensure that the disposition of surplus electronics is conducted in a manner that meets federal expectations. The CBFO/MOC documents that 100 percent of the electronics processed for distribution are completed either through donations, transfer for reuse, or by a certified electronic product recycler.

In FY 2024, the WIPP collected 85,564.50 pounds of surplus electronics and electronics needing disposal. This represented 173 computers, 69 monitors, 5 printers, and 303 miscellaneous supplies such as phones and switches. The collection of old/used electronics will continue through 2025 and will be delivered to UNICOR for refurbishment and reuse or will be donated to the local community.

#### 3.3.8.1 Plans and Projected Performance

The WIPP Electronic Management Policy notes that electronics managed under the policy will be held to a higher procurement standard including expanded accountability and documentation expectations.

# 4.0 ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM INFORMATION

The purpose of Department of Energy Order 458.1, Chg. 4 is to establish requirements to protect the public and the environment against undue risk from radiation associated with radiological activities conducted under the control of the Department of Energy (DOE) pursuant to the *Atomic Energy Act of 1954*, as amended. The objectives of this Order are:

- To conduct DOE radiological activities so that exposure to members of the public is maintained within the dose limits established in this Order.
- To control the radiological clearance of DOE real and personal property.
- To ensure that potential radiation exposures to members of the public are as low as is reasonably achievable.
- To ensure that DOE sites have the capabilities, consistent with the types of radiological activities conducted, to monitor routine and non-routine radiological releases and to assess the radiation dose to members of the public.
- To provide protection of the environment from the effects of radiation and radioactive material.

Radionuclides present in the environment, whether naturally occurring or human-made, may result in radiation doses to humans. Therefore, environmental monitoring around nuclear facilities is imperative to characterize radiological baseline conditions, identify any releases, and determine the effects of releases should they occur.

Personnel at the WIPP facility sample effluent and ambient air, groundwater, surface water, soils, sediments, and biota to monitor the radiological environment around the facility. This monitoring is carried out in accordance with the *Waste Isolation Pilot Plant Environmental Monitoring Plan*. The radiological effluent monitoring portion of this plan meets the requirements contained in DOE/HDBK-1216-2015, *Environmental Radiological Effluent Monitoring and Environmental Surveillance*.

The environmental standards for the WIPP facility are established in 40 CFR Part 191, Subpart A, “Environmental Standards for Management and Storage.” The DOE must comply with environmental radiation protection standards in 40 CFR § 191.03, Subpart A, which applies to the management and storage of radioactive waste. The limits in 40 CFR § 191.03(b) state that the combined annual dose equivalent to any member of the public in the general environment resulting from discharges of radioactive material and direct radiation from such management and storage shall not exceed 0.25 mSv (25 mrem) to the whole body and 0.75 mSv (75 mrem) to any critical organ. In a 1995 MOU, between the EPA and the DOE, the DOE agreed that the WIPP facility would comply with 40 CFR Part 61, NESHAP, Subpart H, “National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities.” The NESHAP limit (40 CFR § 61.92) states that the emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an EDE of 0.1 mSv (10 mrem).

The *Statistical Summary of the Radiological Baseline for the Waste Isolation Pilot Plant* (DOE/WIPP-92-037) summarizes the radiological baseline data obtained at and near the WIPP site. The baseline was established from 1985 through 1989, prior to the time that the WIPP facility became operational. Radioisotope concentrations in environmental media sampled under the current ongoing monitoring program are compared with this baseline to gain information regarding annual fluctuations.

The media sampled as part of the Environmental Monitoring Program included airborne particulates, soil, surface water, groundwater, sediments, and biota (vegetation and animals). These samples are analyzed for uranium ($^{233/234}$U, $^{235}$U, $^{238}$U), potassium ($^{40}$K), plutonium ($^{238}$Pu, $^{239/240}$Pu), americium ($^{241}$Am), cesium ($^{137}$Cs), cobalt ($^{60}$Co), and strontium ($^{90}$Sr) for a total of 10 individual or combined (not analytically separated) target radionuclides/radioisotopes monitored. Since the isotopes of uranium ($^{238}$U, $^{235}$U, and $^{234}$U) and potassium ($^{40}$K) are naturally occurring and not a result of WIPP operations, the data is presented in appendix G for completeness. The americium and plutonium isotopes make up the majority of radionuclides placed into storage at WIPP (> 99 percent based on the Annual Transuranic Waste Inventory Report of the TRU actinides expected to be present in the waste). Cesium and strontium radionuclides are major fission products, thus potentially a component of the waste. The cobalt radionuclide is an activation product of reactor structural materials. Environmental levels of these radionuclides could provide corroborating information on which to base conclusions regarding releases from WIPP facility operations. Of the 10 radionuclides, $^{40}$K, $^{137}$Cs, and $^{60}$Co are gamma emitters, $^{90}$Sr is a beta emitter, and the remainder are alpha emitters.

Radionuclides are considered detected in an environmental sample if the measured concentration or activity is greater than the total propagated uncertainty (TPU) at the 2 sigma (σ) level, and greater than the minimum detectable concentration (MDC). This methodology was patterned after "Hanford Decision Level for Alpha Spectrometry Bioassay Analyses Based on the Sample-Specific Total Propagated Uncertainty" (MacLellan, 1999). The MDC is determined based upon the natural background radiation, the analytical technique, and the inherent characteristics of the analytical equipment as determined by the analytical laboratory. The MDC represents the minimum radionuclide concentration detectable in a given environmental sample using the given equipment and techniques with a specific statistical confidence (usually 95 percent). The TPU is an estimate of the uncertainty in the measurement due to all sources, including counting error, measurement error, chemical recovery error, detector efficiency, randomness of radioactive decay, and any other sources.

Measurements of radioactivity in environmental samples are probabilities due to the random nature of the disintegration process. The radioisotope in the sample is decaying as it is being measured, so no finite value can be assigned. However, the actual amount of radioactivity can be reasonably assumed to be within the range of the TPU, that is, it is statistically highly improbable to fall outside of that range. Analytical results are also normalized with the instrument background and/or the method blank. If either of those measurements has greater activity ranges than the actual sample, it is possible to get negative values on one end of the reported range of activities. Results are often reported in scientific notation. Additional information on scientific notation and the equations used is provided in appendix D.

WIPP Laboratories analyzed the 10 target radionuclides in environmental radiological samples. Highly sensitive radiochemical analysis and detection techniques were used resulting in very low detection limits. This allowed the detection of radionuclides at concentration levels far below those of environmental and human health concerns. The MDCs attained by WIPP Laboratories were below the recommended MDCs specified in American National Standards Institute (ANSI) N13.30, *Performance Criteria for Radiobioassay*.

Comparisons of radionuclide concentrations in environmental samples were made to the radiological baseline data obtained at and near the WIPP site from 1985 through 1989, before the WIPP facility became operational. These values are useful for comparison only and are not regulatory requirements. The isotopes for time series plots presented in this ASER were picked based on likely detection in the matrix in accordance with historical results and chances of detecting them in the matrix.

The air monitoring for radionuclides is divided between two programs: the WIPP facility Effluent Monitoring Program and the Environmental Monitoring Program. The following sections describe these two programs.

**Effluent Monitoring Program**

During the CY, there were four airborne effluent monitoring stations in use at the WIPP facility for characterizing radioactive particulate effluent: Stations A, B, C, and H. Each station employs one or more air samplers, collecting particulates from the effluent air stream using an acrylic copolymer membrane filter. Fixed air samplers at Station A collect samples from the underground exhaust prior to high-efficiency particulate air (HEPA) filtration. Fixed air samplers at Station B collect samples from the underground exhaust air after HEPA filtration. Fixed air samplers at Station C collect samples from the exhaust air from the WHB after HEPA filtration. Portable air samplers at Station H collect samples from the unfiltered underground exhaust downstream of Station A, including from the ventilation ductwork between Station A and the 700-C fan exit. The samples from Station A and Station H are compared, and the larger activity value of the two locations is used in emissions calculations. For the CY, activity from Station H is reported since the activity associated with the radionuclide $^{241}$Am, which is the predominant radionuclide released from the underground exhaust, was greater in the Station H sample composites than in the Station A sample composites.

Stations A, B, C, and H are categorized as Potential Impact Category (PIC) 3 sources, requiring periodic confirmatory sampling and off-line analysis to confirm air emissions to be at or less than a 0.01 potential fraction of the allowable dose limit in accordance with American National Standards Institute Health Physics Society (ANSI/HPS) N13.1-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities*.

The supplemental ventilation system (SVS) was operated during this reporting period. The SVS consists of an auxiliary fan installed in the S-90 drift in the underground repository to provide additional ventilation air to the underground. Use of the SVS minimizes dust particulate loading on the underground ventilation system HEPA filtration units since the airflow directed to the construction (active mining) areas comes from the additional clean surface air. A portion of the salt-dust-laden air is exhausted up the Salt Handling Shaft (SHS). Ventilation air through the disposal area will continue to be routed through the Exhaust Shaft (i.e., Stations A, B, and H). The SHS exhaust point is classified as a PIC 4, requiring an annual administrative review of facility uses to confirm the absence of radioactive materials in forms and quantities not conforming to prescribed specifications and limits, confirming air emissions to be at or less than a 0.0001 potential fraction of the allowable dose limit, in accordance with ANSI/HPS N13.1-1999.

For each sampling event, chain-of-custody forms are initiated to track and maintain an accurate written record of filter sample handling and treatment from the time of sample collection through laboratory procedures to disposal. During the CY, filter samples from the effluent air monitoring stations were analyzed for $^{238}$Pu, $^{239/240}$Pu, $^{241}$Am, $^{90}$Sr, $^{137}$Cs, $^{233/234}$U, and $^{238}$U.

**Environmental Radiological Monitoring Program**

The purpose of the Environmental Radiological Monitoring Program is to measure radionuclides in the ambient environmental media. These data allow for a comparison of sample data to results from previous years and baseline data to determine what impact, if any, the WIPP facility is having on the surrounding environment. Radiological monitoring at and around the WIPP site includes sampling analyzing air, groundwater, surface water, sediment, soil, and biota. The radionuclides analyzed include $^{238}$Pu, $^{239/240}$Pu, $^{241}$Am, $^{233/234}$U, $^{235}$U, $^{238}$U, $^{137}$Cs, $^{60}$Co, $^{40}$K, and $^{90}$Sr. Plutonium and americium isotopes were analyzed because they are the most significant alpha-emitting radionuclides among the constituents of TRU wastes received at the WIPP facility. Uranium isotopes were analyzed largely because they represent prominent alpha-emitting radionuclides in the natural environment.

Strontium-90, $^{60}$Co, and $^{137}$Cs were analyzed to demonstrate the ability to quantify these beta- and gamma-emitting radionuclides, should they appear in the TRU waste stream. These radionuclides have been the subject of background studies at WIPP prior to 1999 and continue to be monitored. Potassium-40, a natural gamma-emitting radionuclide that is ubiquitous in the Earth's crust, was also monitored because of its possible enhancement in southeastern NM due to potash mining.

The radionuclide analysis results for the CY ASER samples are provided in appendix G.

## 4.1 AIRBORNE EFFLUENT PARTICULATES

### 4.1.1 Sample Collection

Radiological air sampling at Stations A, B, and C use skid-mounted fixed air samplers at each effluent air sampling station. Station H consists of portable air samplers (PASs) used to collect representative samples of airborne particulates. Each PAS has a vacuum pump. Backup PASs are available if a Station H PAS encounters operational problems. Each PAS is connected to permanent site power. Sampling at the SHS is conducted using a PAS. The air volume sampled at each location varied depending on the sampling location and configuration. Each system is designed to provide a representative sample using a 3.0-micrometer pore size, 47-millimeter (mm) diameter acrylic copolymer membrane filter.

Daily (24-hour) filter samples were collected from the underground exhaust air commensurate with the ventilation configuration (i.e., Station A and H for unfiltered ventilation and Station B for filtered ventilation). Approximately 19,889 cubic feet ($ft^3$) (563 $m^3$) of air was sampled each week through the acrylic copolymer membrane filters at Station B. There were brief periods when sampling associated with these sampling locations was interrupted during the CY, including planned outage periods when there was no underground ventilation flow; however, total air volume sampled was well within the specified recovery limits. Based on the specified sampling periods, these air volumes were within plus or minus (±) 10 percent of the volume derived using the flow rate set point of 0.057 cubic meters per minute ($m^3$/min) (2 cubic feet per minute [$ft^3$/min]) for Station B. Since 2014, Station B has been the primary emissions sample point of record. During this reporting period, operation of the 700-C fan (i.e., unfiltered exhaust fan) continued. The 700-C fan ran for approximately 1.4 percent of the year. The amount of air filtered through the Station B and H acrylic copolymer membrane filters during the CY was 1,034,236 $ft^3$ (29,286 $m^3$) and 14,450 $ft^3$ (409 $m^3$). The primary emission samples are collected daily or more often as ventilation configurations change between filtered and unfiltered ventilation at Stations A, B, and H. During the CY, the Exhaust Shaft ventilation system operated normally at a nominal flow rate of 114,000 $ft^3$/min for filtered ventilation and 280,000 $ft^3$/min for unfiltered ventilation.

Weekly filter samples were collected at Station C, which samples the air from the WHB after HEPA filtration. The amount of air filtered through the Station C acrylic copolymer membrane filters during the CY was 179,763 $ft^3$ (5,090 $m^3$). Even though there were brief periods where sampling associated with Station C was interrupted during the CY, the total air volume sampled was within the specified recovery limits. The calculated air volume for Station C was within ±10 percent of the average volume derived using the flow rate required for isokinetic sampling conditions. The sampling flow rate for Station C automatically tracks proportionately to the exhaust airflow in the WHB to maintain isokinetic sampling conditions.

The Station C effluent air sampling system was designed in accordance with ANSI Standard N13.1-1969, *Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities*. The isokinetic sampling configuration did not change, thus maintaining compliance with the 1969 standard. This is consistent with retaining pre-2000 "grandfathered" air emission sampling systems since ANSI/HPS N13.1-1999 does not address isokinetic sampling.

Stations B and H were the sampling points of record for emissions from the underground repository during the CY. These samples were collected once per day or more often depending on the ventilation configuration. The Station B samples were assembled into monthly composite samples and the Station H samples were assembled into a yearly composite sample since there were less than 10 filters.. The weekly filter samples for Station C were composited each quarter. Filter sample composites were radiochemically analyzed for $^{241}$Am, $^{238}$Pu, $^{239/240}$Pu, $^{90}$Sr, $^{233/234}$U, $^{238}$U, and $^{137}$Cs.

Salt Handling Shaft PAS filters were collected daily. An annual administrative review was conducted for this location.

### 4.1.2 Results and Discussion

Stations B, C, and H operated within specifications, and no calculated adjustments to sample data were necessary for the CY. The analytes of interest were $^{241}$Am, $^{238}$Pu, $^{239/240}$Pu, $^{90}$Sr, $^{233/234}$U, $^{238}$U, and $^{137}$Cs.

Radioanalytical results of air filter samples representing WIPP facility air emissions in the CY are shown in appendix G, tables G.1, G.2, and G.3. The CAP88-PC radioactivity input criterion was to compare the 2 σ TPU with the activity value. The higher result of the two was selected for the nuclide data input for the CAP88-PC dataset, ensuring a conservative bias to the dataset. The MDC, calculated before the analysis is performed, indicates the expected analytical sensitivity for that test.

For the SHS PAS, an administrative review was performed of the SVS, including trending of underground ventilation air sample radioactivity levels, to confirm the absence of radioactive materials in forms and quantities not conforming to prescribed specifications and limits during this reporting period. Radiochemical analyses were conducted to verify that detected radionuclides remained below an action level indicating potential contaminant detection at or near the PIC 4 constraining values.

Evaluation of the CY filter sample results using the latest EPA-approved CAP88-PC code in effect during the CY, CAP88-PC Version 4.1.1.0, indicated that there were no detectable releases from the WIPP facility that resulted in a dose that exceeded the 40 CFR §191.03(b) limits of 0.25 mSv (25 mrem) to the whole body and 0.75 mSv (75 mrem) to any critical organ. In addition, there were no detectable airborne releases from the WIPP facility that resulted in a dose that exceeded the 0.1 mSv/yr (10 mrem/yr) limit, as specified in 40 CFR §61.92, and the 0.001 mSv/yr (0.1 mrem/yr) limit for periodic confirmatory sampling required by 40 CFR §61.93(b)(4)(i).

## 4.2 AIRBORNE AMBIENT PARTICULATES

### 4.2.1 Sample Collection

Ambient air is the surrounding atmosphere, usually the outside air, as it exists around people, animals, plants, and structures. It does not include the air adjacent to emission sources (DOE-HDBK-1216-2015). Weekly airborne ambient particulate samples were collected from seven legacy locations at or near the WIPP site (figure 4.1) using low-volume air samplers. Sample head heights are representative of the typical breathing zone. Location codes are shown in appendix C.

Weekly samples are composited quarterly for analysis. Assuming no downtime and a stable flow rate, for each week approximately 20,160 $ft^3$ (571 $m^3$) of air is sampled through a 1.85-in (4.7-centimeter [cm]) diameter glass microfiber filter for the continuous low-volume air samplers set at a flow rate of 2 $ft^3$/min. For a quarterly composite (13 weeks), the volume of air for best-case scenario conditions is approximately 262,459 $ft^3$ (7,423 $m^3$).

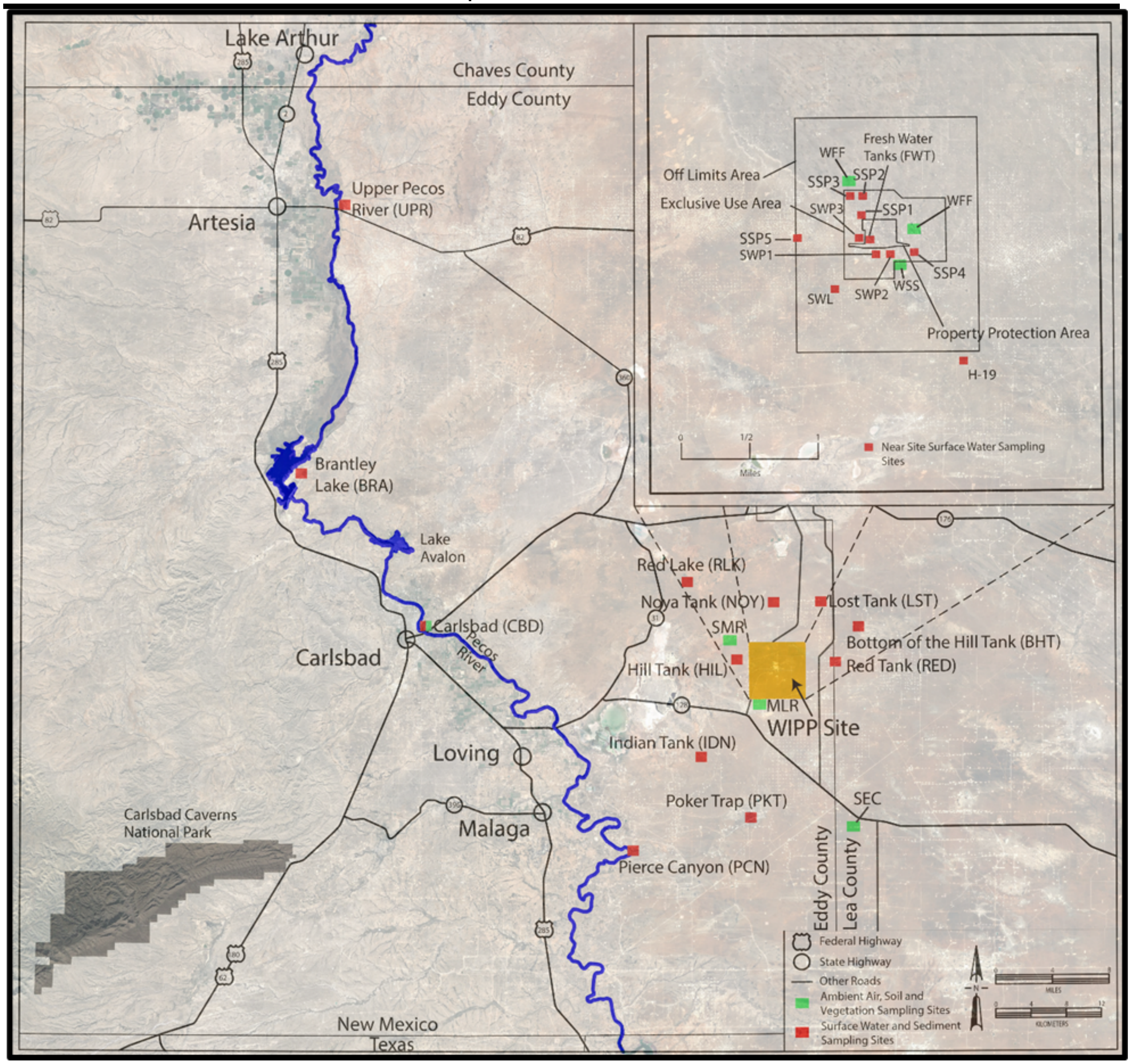



**Figure 4.1 – Ambient Air, Soil, Vegetation, Surface Water, and Sediment Sampling Locations on and Near the WIPP Site**

### 4.2.2 Results and Discussion

The quarterly composite sample data are reported in units of becquerel per composite air filter sample (Bq/sample) by the laboratory. Blank filter composite samples were prepared and analyzed, and results were reported separately for each quarter. The average concentrations of the quarterly composite samples are reported for those locations where quality control (QC) duplicate samples were collected using low-volume air samplers. Duplicate samples were collected at one sample location each quarter. Appendix G, table G.4, contains the results in Bq/sample for the quarterly air filter composite samples. A "Q" (qualifier) column is included in table G.4 of appendix G to show whether the radionuclide was detected (i.e., whether the activity of the radionuclide is greater than the 2 σ TPU and MDC). Table G.5 in appendix G shows the Bq/sample from table G.4 converted to $Bq/m^3$ by dividing the sample activity in Bq by the total quarterly air volumes sampled. Time series plots of the concentrations for $^{239/240}Pu$, $^{241}Am$, $^{137}Cs$, and $^{60}Co$ are shown in figures below and current levels are within the range of the normal background concentrations. In addition to the annual sampling site locations, a sample of opportunity (SOO) was taken for additional scrutiny and robustness (see appendix G, tables G.4 and G.5). This sample was taken from the southeast quadrant of the PPA of the WIPP site. The results of the SOO were within typical ranges, with $^{239/240}Pu$, $^{241}Am$, $^{137}Cs$, and $^{60}Co$ all undetected.

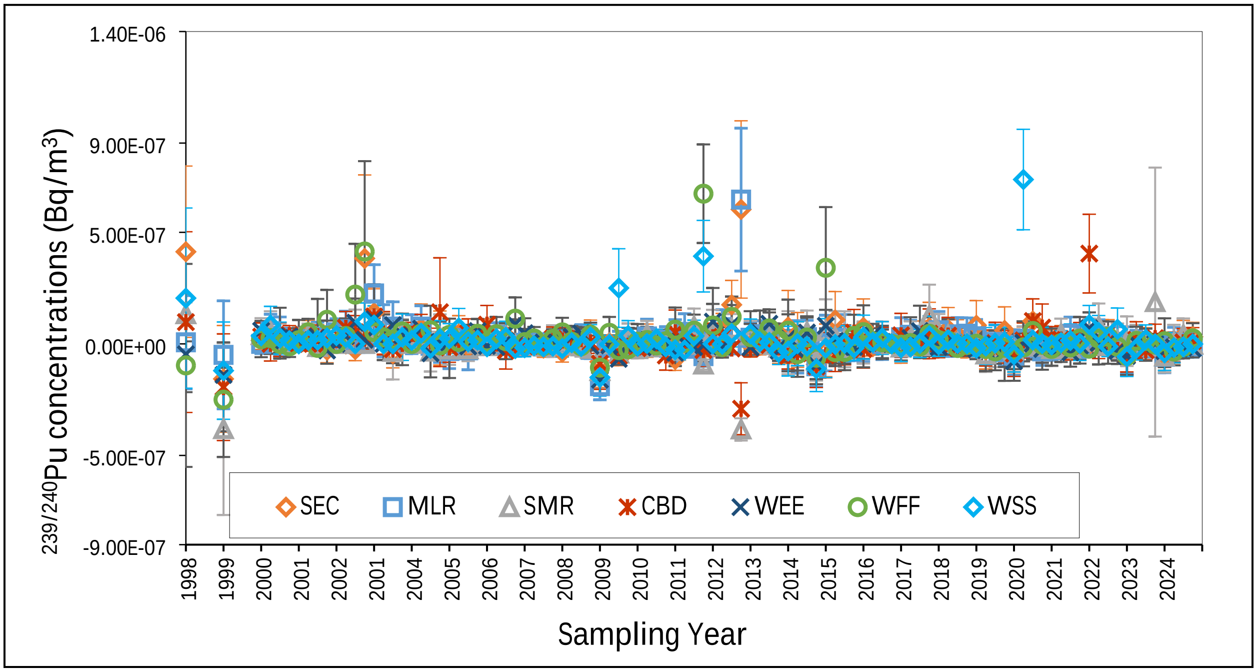



**Figure 4.2a – Historical Concentrations of $^{239/240}Pu$ at Seven Air Sampling Locations**

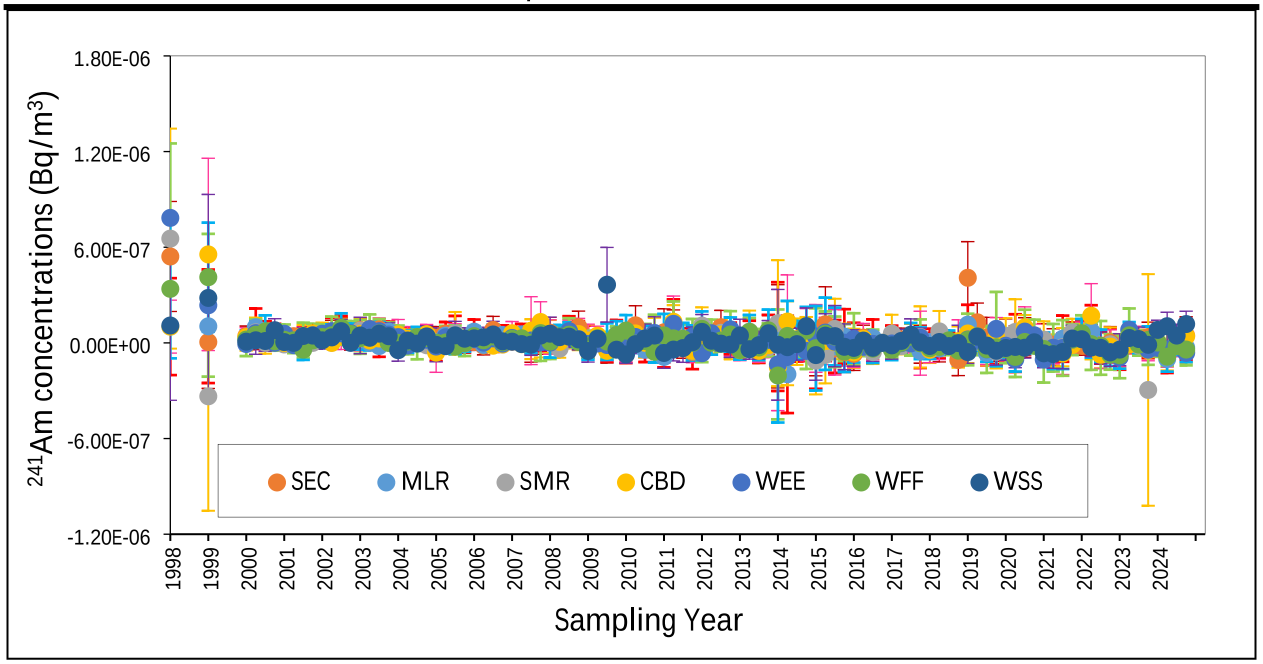



**Figure 4.2b – Historical Concentrations of $^{241}$Am at Seven Air Sampling Locations**

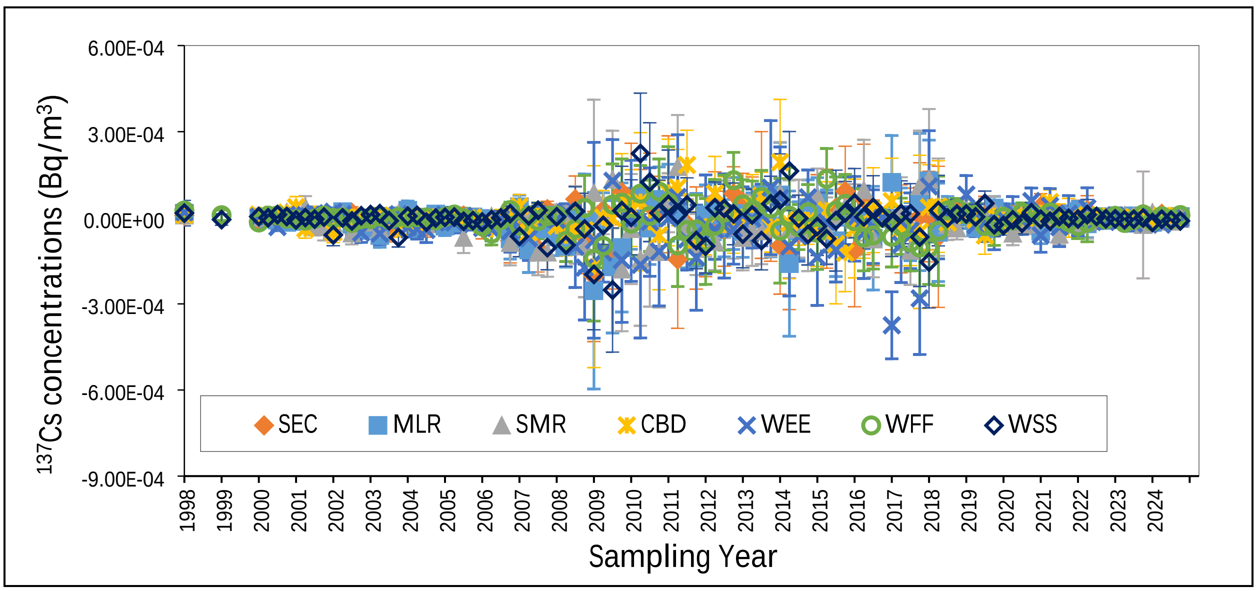



**Figure 4.3a – Historical Concentrations of $^{137}$Cs at Seven Air Sampling Locations**

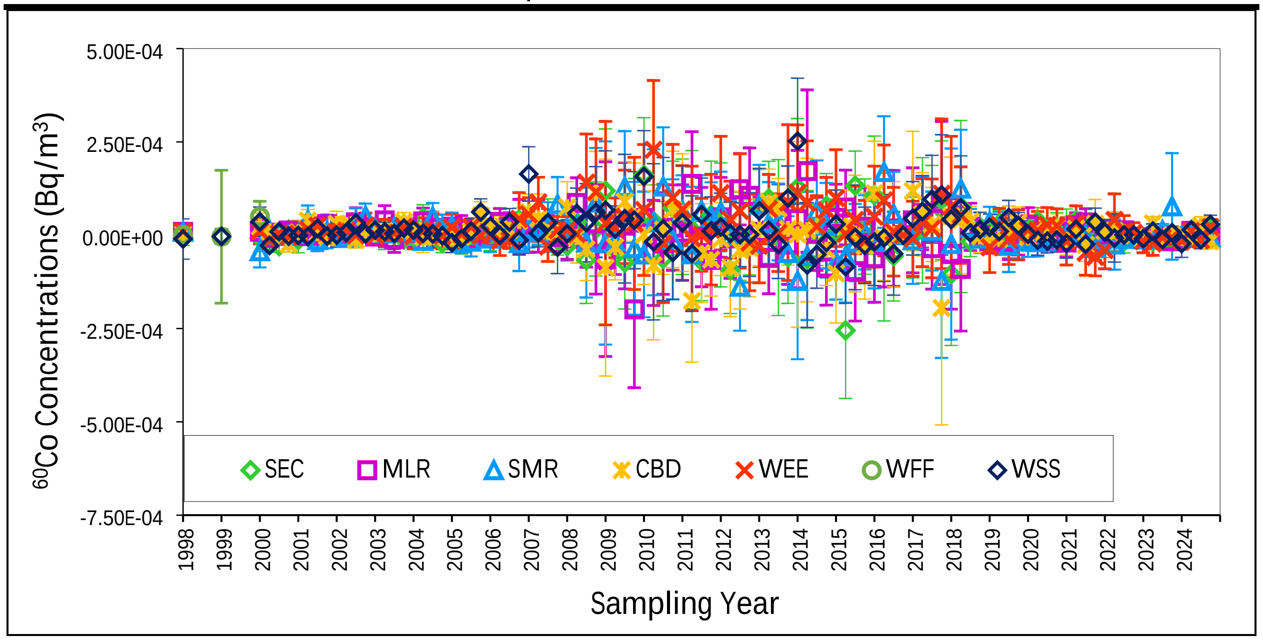



**Figure 4.3b – Historical Concentrations of $^{60}$Co at Seven Air Sampling Locations**

## 4.3 SURFACE WATER

### 4.3.1 Sample Collection

The *Waste Isolation Pilot Plant Environmental Monitoring Plan* (DOE/WIPP-99-2194) includes routine regional and local surface water and sediment sampling that extends as far north as Artesia, NM, on the upper Pecos River, to as far south as Pierce Canyon on the lower Pecos River. Figure 4.1 (see appendix C for sampling location codes) shows the locations where samples are collected annually and reported in the ASER. If a particular surface water collection location was dry, only a sediment sample was collected. Sediment sample analysis results are discussed in section 4.4.

Surface water and sediment sampling is normally performed in late summer of every year. At times, the cattle tanks (earthen ponds) are dry, and only sediment samples can be obtained. The sampling locations selected represent the major bodies of surface water and potential livestock uptake locations in the WIPP vicinity. There are four sampling locations on the Pecos River: the Upper Pecos River near Artesia (UPR), Brantley Lake (BRA), Carlsbad (CBD), and Pierce Canyon (PCN). Area ranches used eight dirt tanks (earthen catchment basins) to collect precipitation runoff water for livestock. These tanks are Red Lake (RLK), Noya (NOY), Red (RED), Indian (IDN), Lost (LST), Bottom of the Hill (BHT), Poker Trap (PKT), and Hill (HIL). One other type of surface water sample consisted of water from the WIPP sewage lagoons (SWL). Another sample collected is from the Fresh Water Tank (FWT), which is from the WIPP domestic water supply system (Double Eagle), piped in from a remote public water well source. It is categorized as surface water because it is altered due to onsite chlorination and sampled from a faucet in the WIPP site pump house. Each year a duplicate sample is taken from one location and identified by a secondary name Coyote (Coy) for the purpose of blind testing. The sample duplicate for the CY was collected from the FWT (COY). A sample collected from SWL routinely consists of a composite of Settling Lagoons 1 and 2, Effluent Lagoons A, B, and C, and Polishing Lagoons 1 and 2, but depends on water availability.

### 4.3.2 Results and Discussion

The surface water samples were analyzed for $^{238}$Pu, $^{239/240}$Pu, and $^{241}$Am, as shown in appendix G, table G.8. None of these radionuclides were detected in the surface water samples in 2024. A sample was not taken from PKT in 2024 due to drought conditions. The analysis data for the gamma isotopes and $^{90}$Sr are presented in appendix G, table G.9.

## 4.4 SEDIMENTS

### 4.4.1 Sample Collection

Sediment samples were collected from 11 locations around the WIPP site (figure 4.1), and a duplicate sample was collected from RED, for a total of 12 samples. See appendix C for location codes.

### 4.4.2 Results and Discussion

Sediment samples were also analyzed for $^{238}$Pu, $^{239/240}$Pu, and $^{241}$Am by alpha spectroscopy; the results are shown in appendix G, table G.11. As with surface water, a sample was not selected from PKT in 2024 due to drought conditions. None of these radionuclides were detected in sediment samples in this CY. Concentration plots presented in figures 4.4a and 4.4b show historical concentrations of $^{239/240}$Pu at the sampling locations.

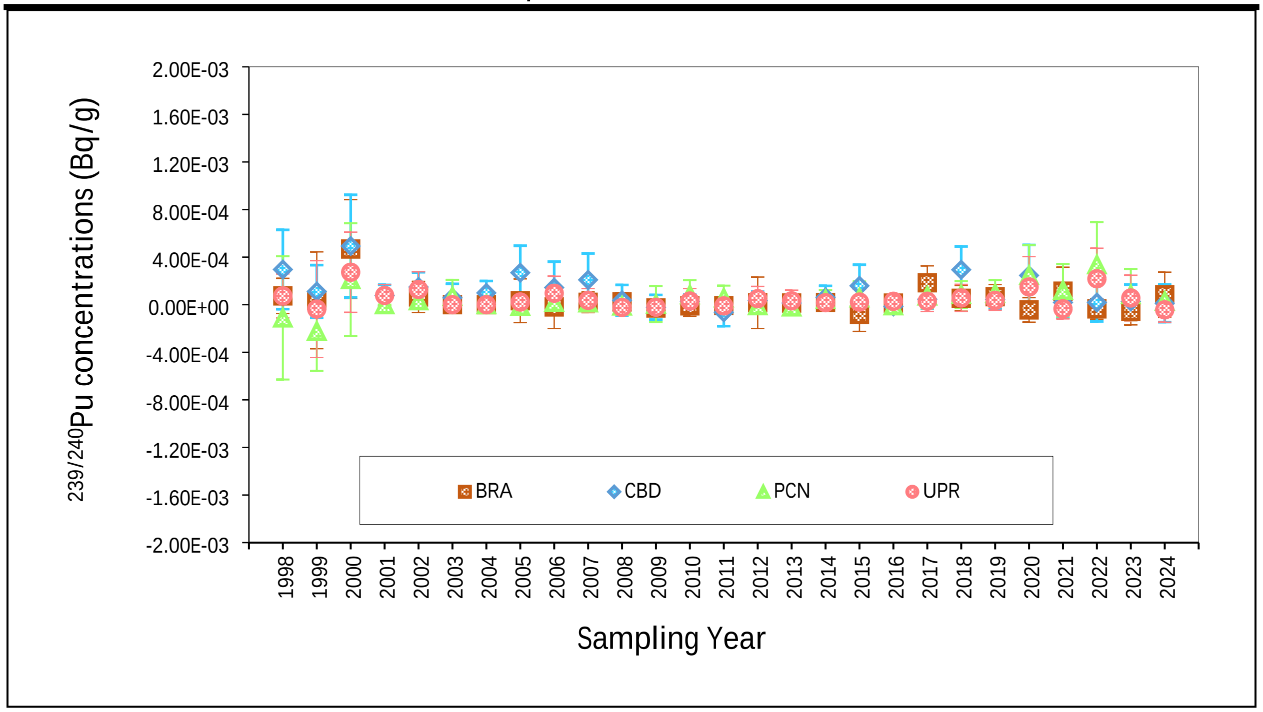



**Figure 4.4a – Historical Concentrations of $^{239/240}$Pu in Sediment Samples at Pecos River and Associated Bodies of Water**

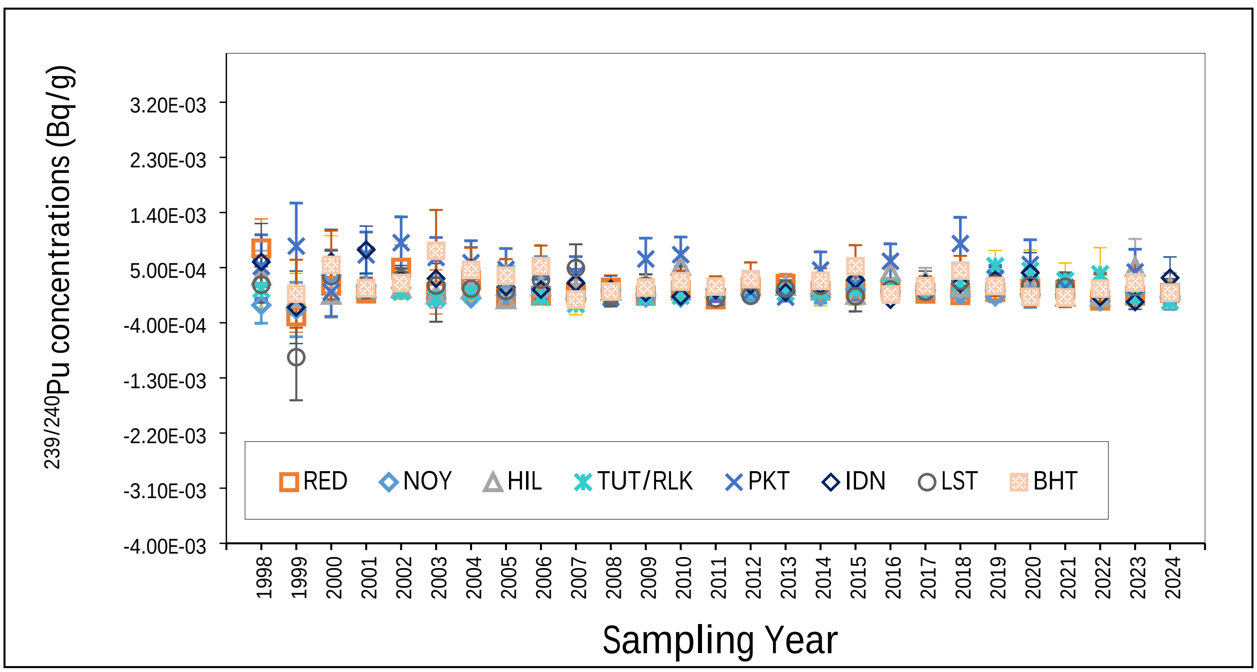



**Figure 4.4b – Historical Concentrations of $^{239/240}$Pu in Sediment Samples at Tanks and Tank-like Structures**

The sediment analysis results for the gamma radionuclides and $^{90}Sr$ are shown in appendix G, table G.12. Strontium-90 was not detected in any sample. Cesium-137 was detected slightly above the MDC in the RED duplicate sample but was undetected in the original RED sample, and $^{137}Cs$ was also detected in the HIL sample. The highest concentration of $^{137}Cs$ in tanks and tank-like structures was from HIL with a value of 3.80E-03 Bq/g (figure 4.5), which is below the baseline concentration of 3.50E-02 Bq/g for tanks and tank-like structures.

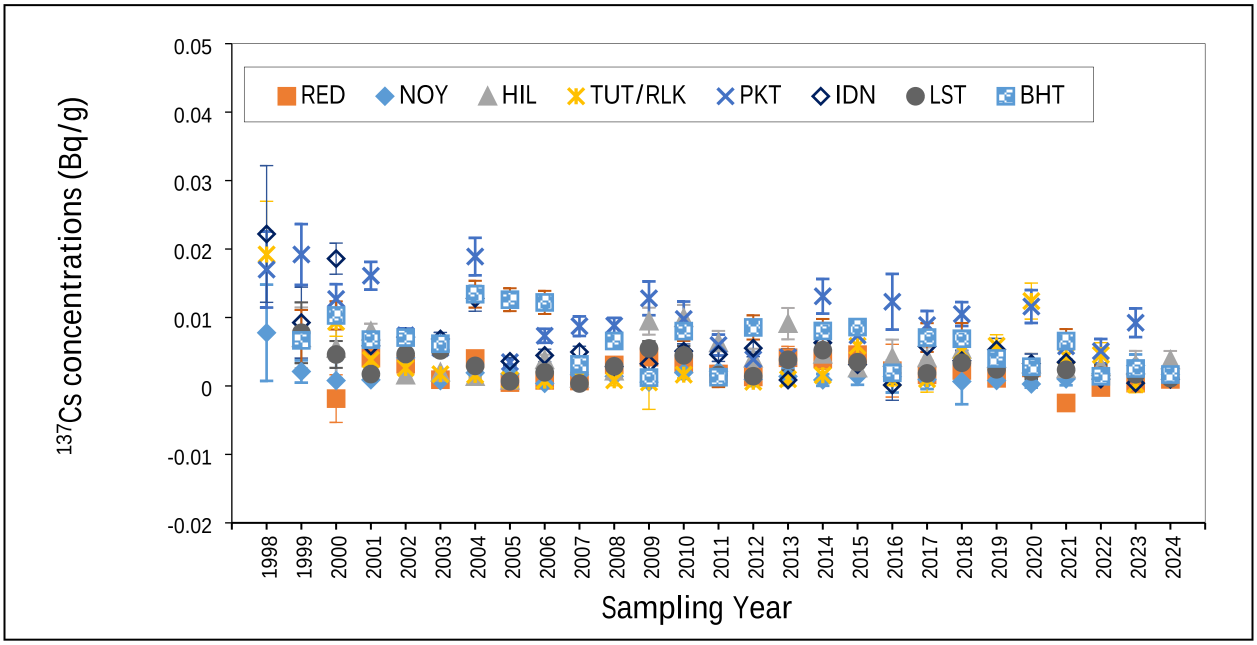



**Figure 4.5 – Historical Concentrations of $^{137}Cs$ in Sediment Samples at Tanks and Tank-like Structures**

## 4.5 SOIL SAMPLES

### 4.5.1 Sample Collection

Regular soil samples were collected from the same six locations where the low-volume air samplers are stationed around the WIPP site: WFF, WEE, WSS, MLR, SEC, and SMR (figure 4.1), with a duplicate sample collected from WFF. Samples were collected from each location in three incremental profiles: surface (shallow) soil (0–2 cm [0–0.8 in]), intermediate soil (2–5 cm [0.8–2 in]), and deep soil (5–10 cm [2–4 in]). Measurements of radionuclides in depth profiles may provide information about their vertical movements in the soil systems.

Soil sample locations are divided into three geographic groups.

- The WIPP site group covers the smallest area with locations within 1 km (0.62 mi) of the WHB and Exhaust Shaft and includes WFF, WEE, and WSS.
- The 5-mi ring group includes MLR and SMR.

- The outer sites group only includes sampling location SEC.

Soil samples were collected at WFF, WEE, and WSS on March 21, 2024. Locations MLR, SMR, and SEC were collected on March 11, 2024.

### 4.5.2 Results and Discussion

There were no detections of $^{241}$Am at any of the locations this CY. There was a single case of $^{239/240}$Pu detected at MLR at 0–2 cm. Appendix G, table G.14, presents the analysis data for $^{238}$Pu, $^{239/240}$Pu, and $^{241}$Am. Appendix G, table G.15, presents the CY soil sample analysis data for the gamma radionuclides and $^{90}$Sr. Table G.15 shows that $^{137}$Cs was detected in WFF at 2–5 cm and 5–10 cm, WFF Dup at 0–2 cm, MLR at all three depths, WEE at 0–2 cm and 2–5 cm, SMR at 2–5 cm and 5–10, and SEC at 0–2 cm. Cobalt-60 and $^{90}$Sr were not detected in any of the samples.

The $^{137}$Cs 99 percent confidence interval range of baseline concentrations was determined according to distance from the WIPP site. The values are 2.40E-02 Bq/g, both for the WIPP site group (WFF, WEE, and WSS) and 5-mi ring group (SMR and MLR), and 4.00E-02 Bq/g for the outer sites group (SEC). As shown in table G.15, none of the CY $^{137}$Cs concentrations were higher than the 99 percent confidence interval range of the baseline concentrations.

Overall, all radionuclides are within the trends of the previous years for all locations. Figures 4.6 (a, b, and c), 4.7 (a, b, and c), and 4.8 (a, b, and c) show historical concentrations of $^{239/240}$Pu, $^{241}$Am, and $^{137}$Cs in WIPP soils. The values all fell within the range of concentrations previously observed in WIPP soils.

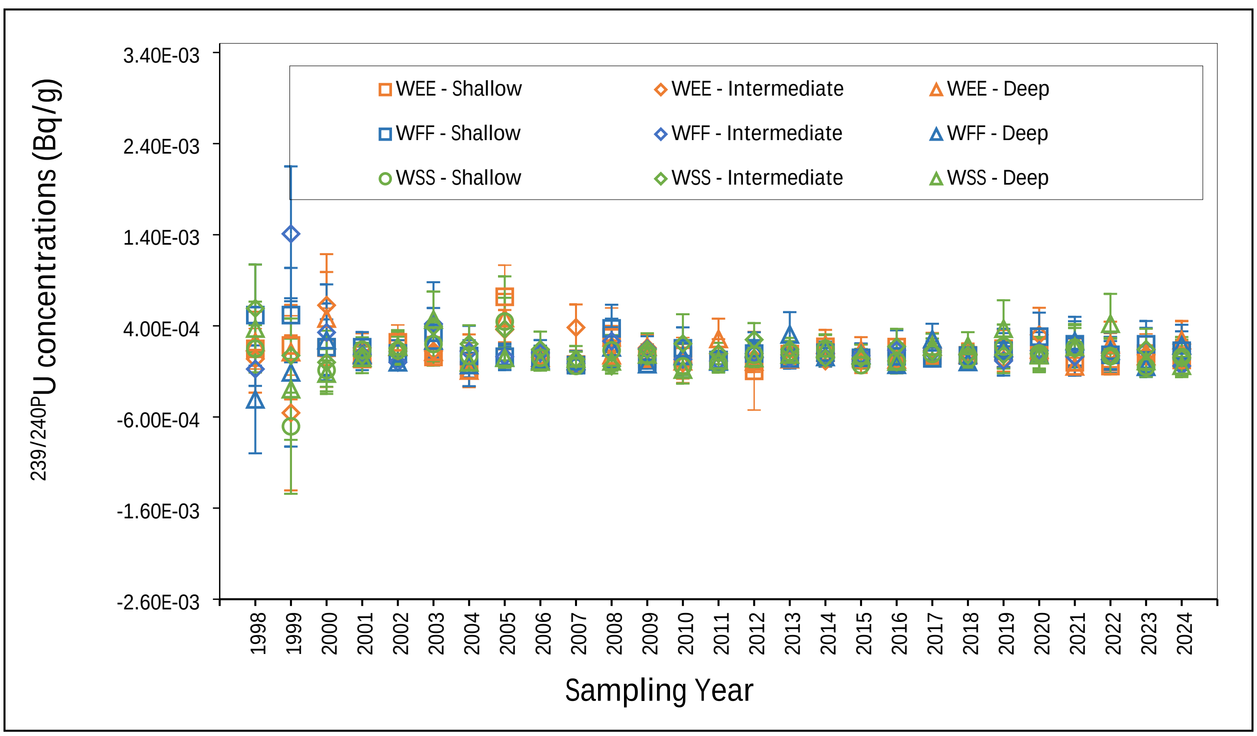



**Figure 4.6a – $^{239/240}$Pu Concentrations in Soil Samples Collected from WIPP Site**

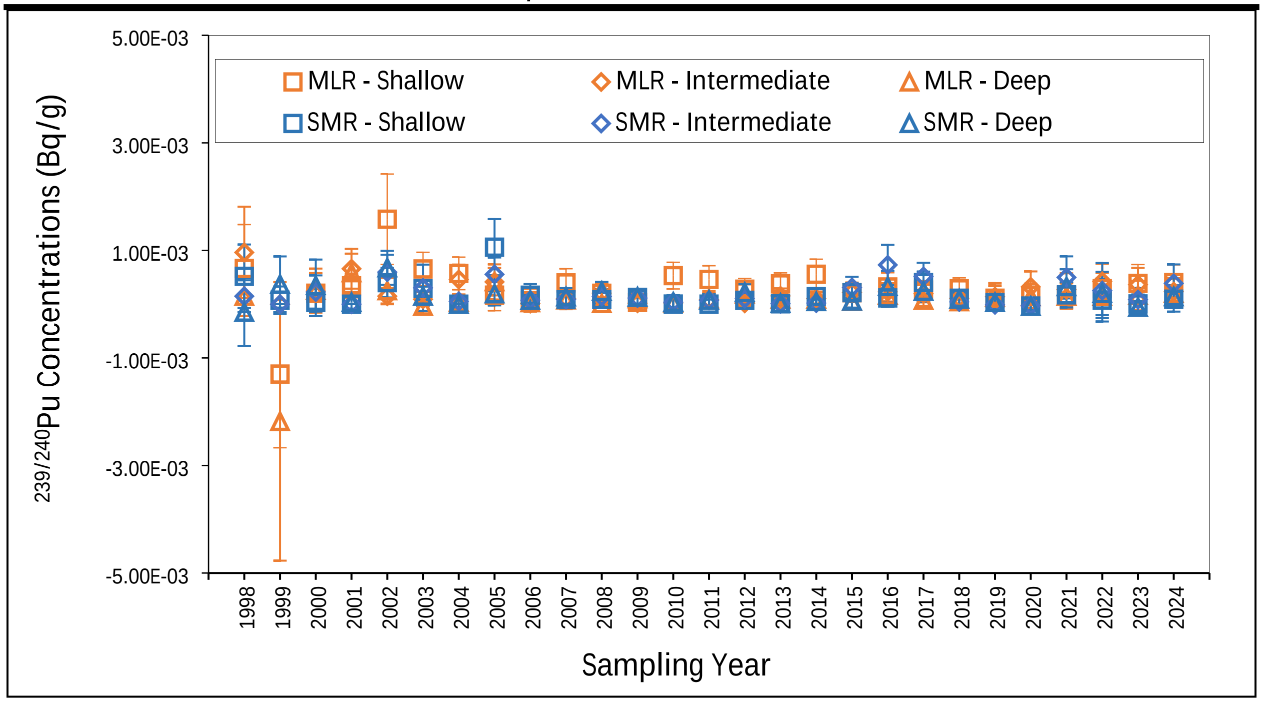



**Figure 4.6b – $^{239/240}$Pu Concentrations in Soil Samples Collected from 5-mi Ring**

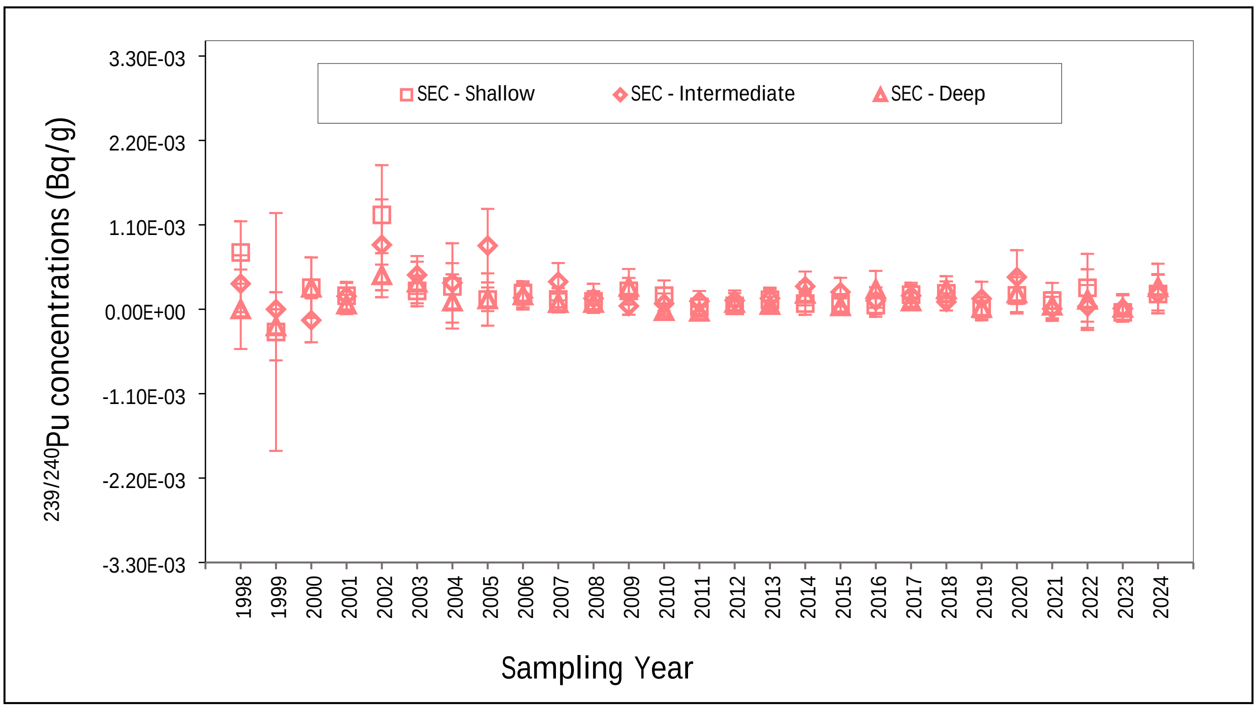



**Figure 4.6c – $^{239/240}$Pu Concentrations in Soil Samples Collected from Outer Sites**

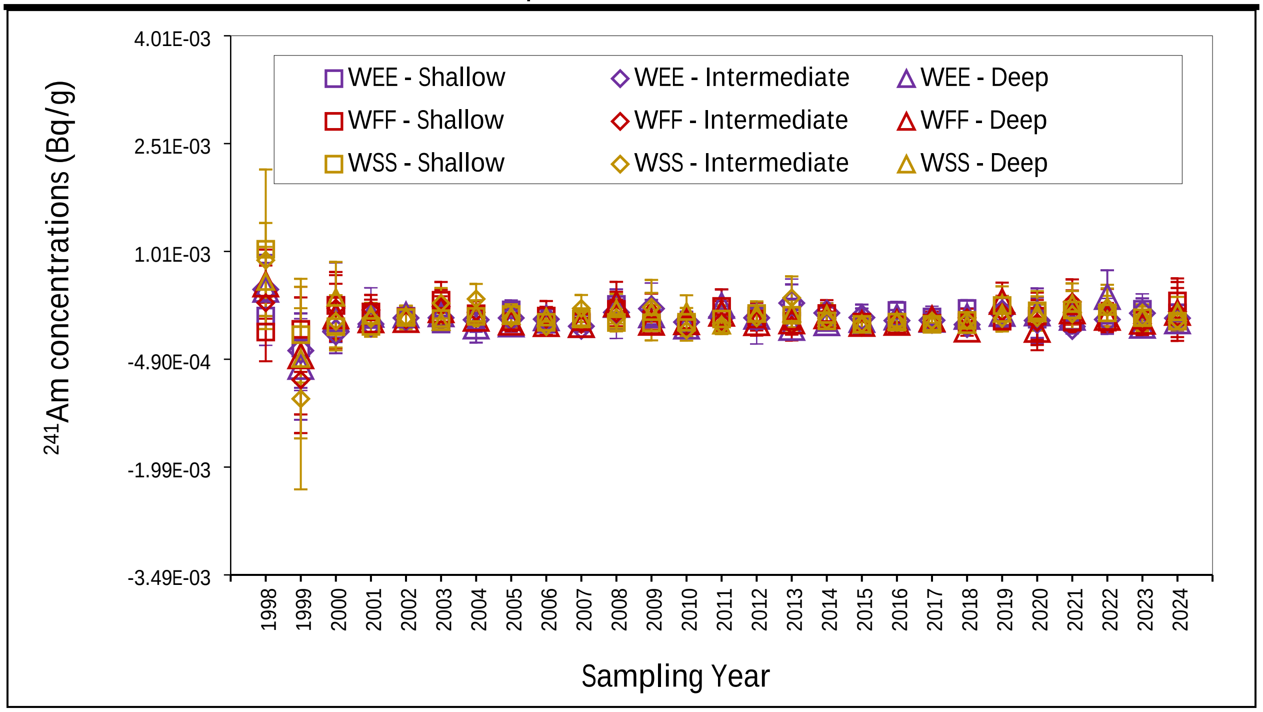



**Figure 4.7a – $^{241}$Am Concentrations in Soil Samples Collected from WIPP Site**

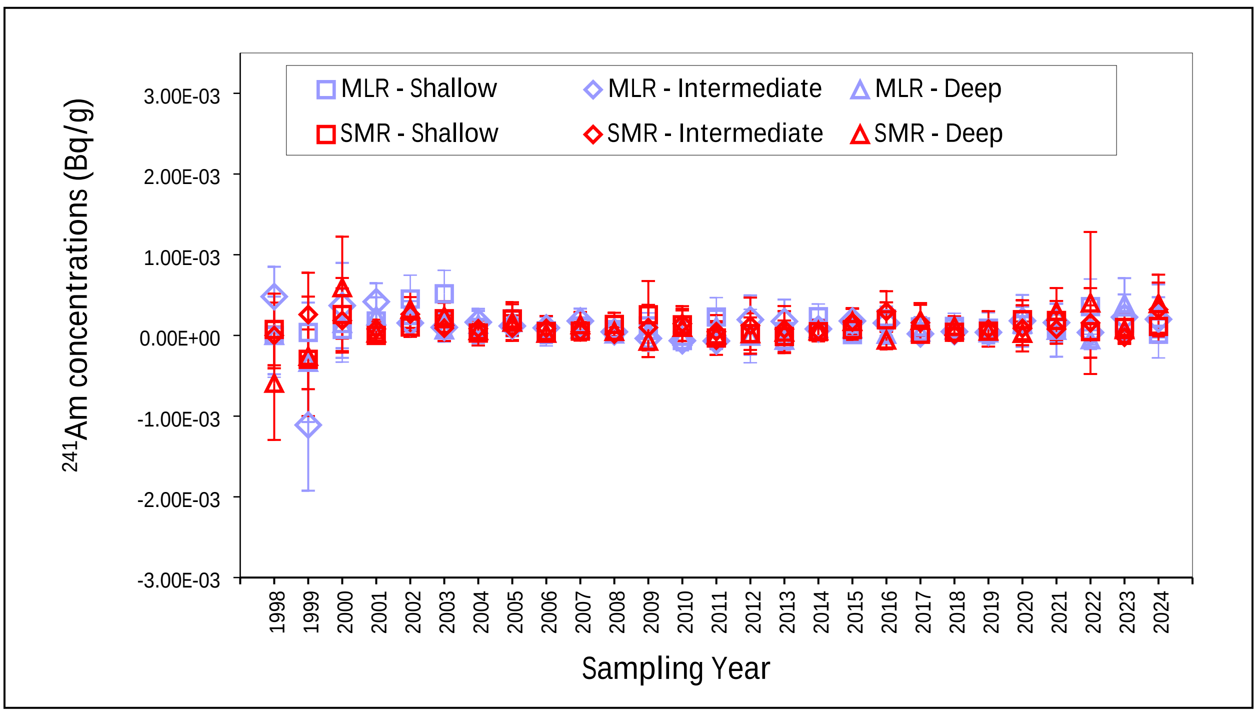



**Figure 4.7b – $^{241}$Am Concentrations in Soil Samples Collected from 5-mi Ring**

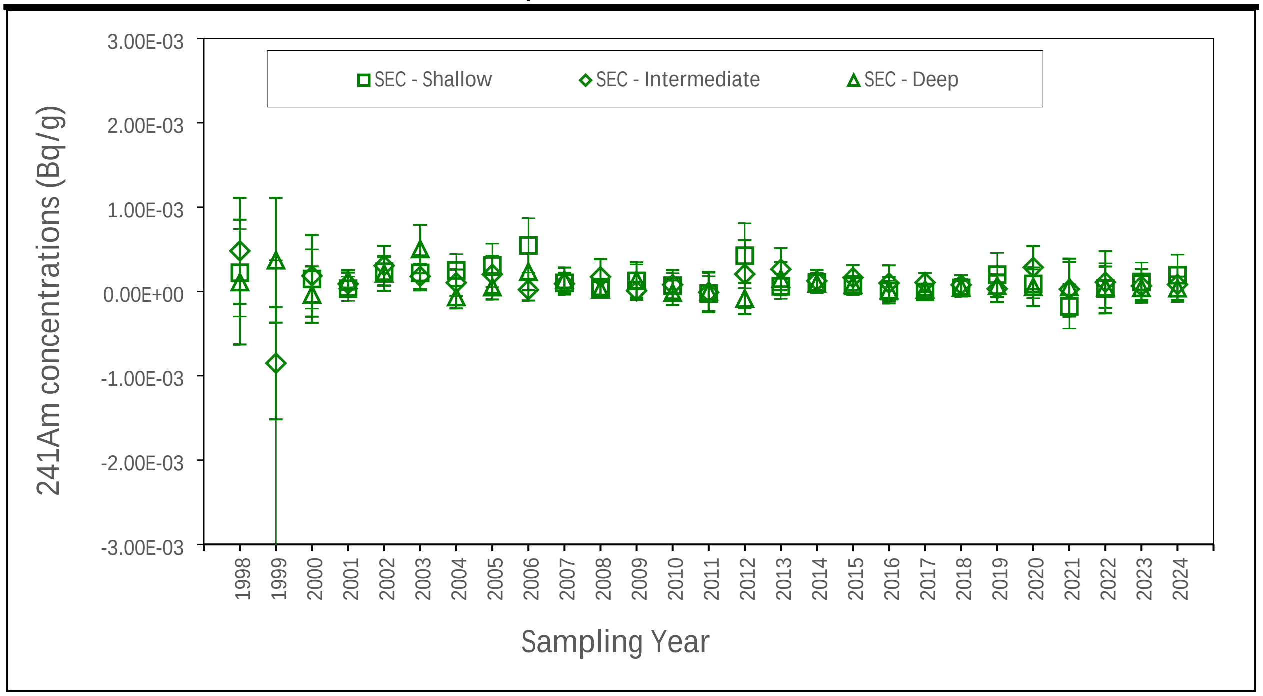



**Figure 4.7c – $^{241}$Am Concentrations in Soil Samples Collected from Outer Sites**

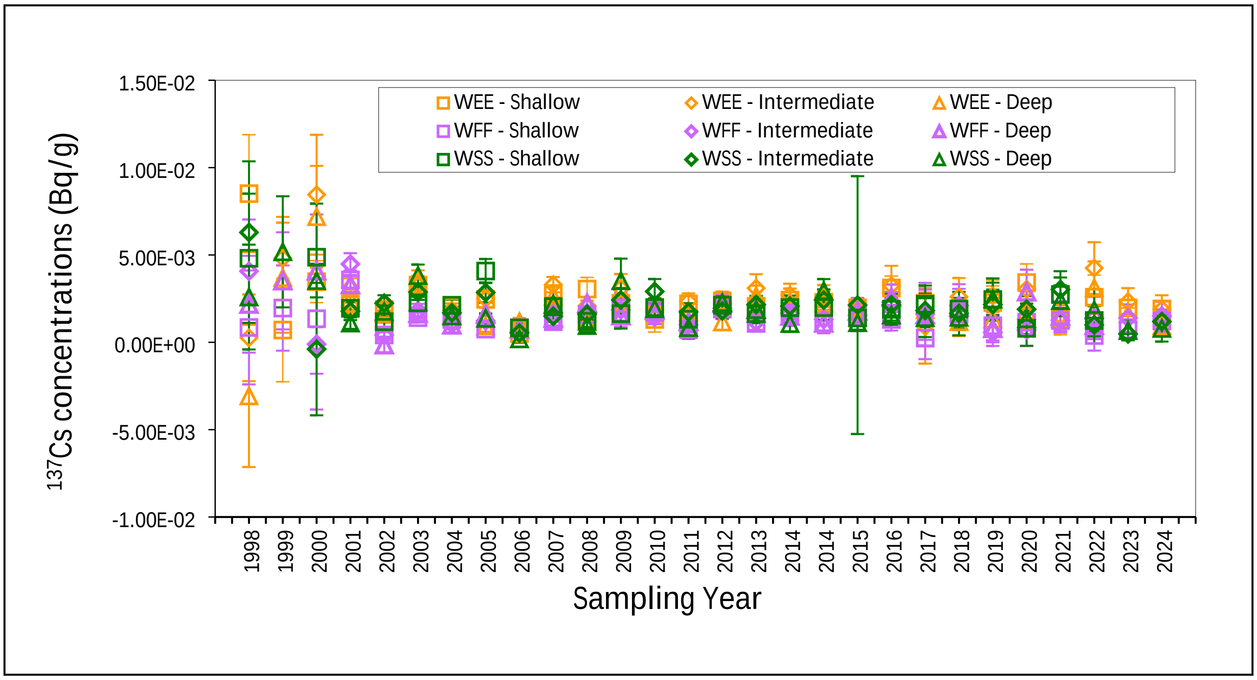



**Figure 4.8a – $^{137}$Cs Concentrations in Soil Samples Collected from WIPP Site**

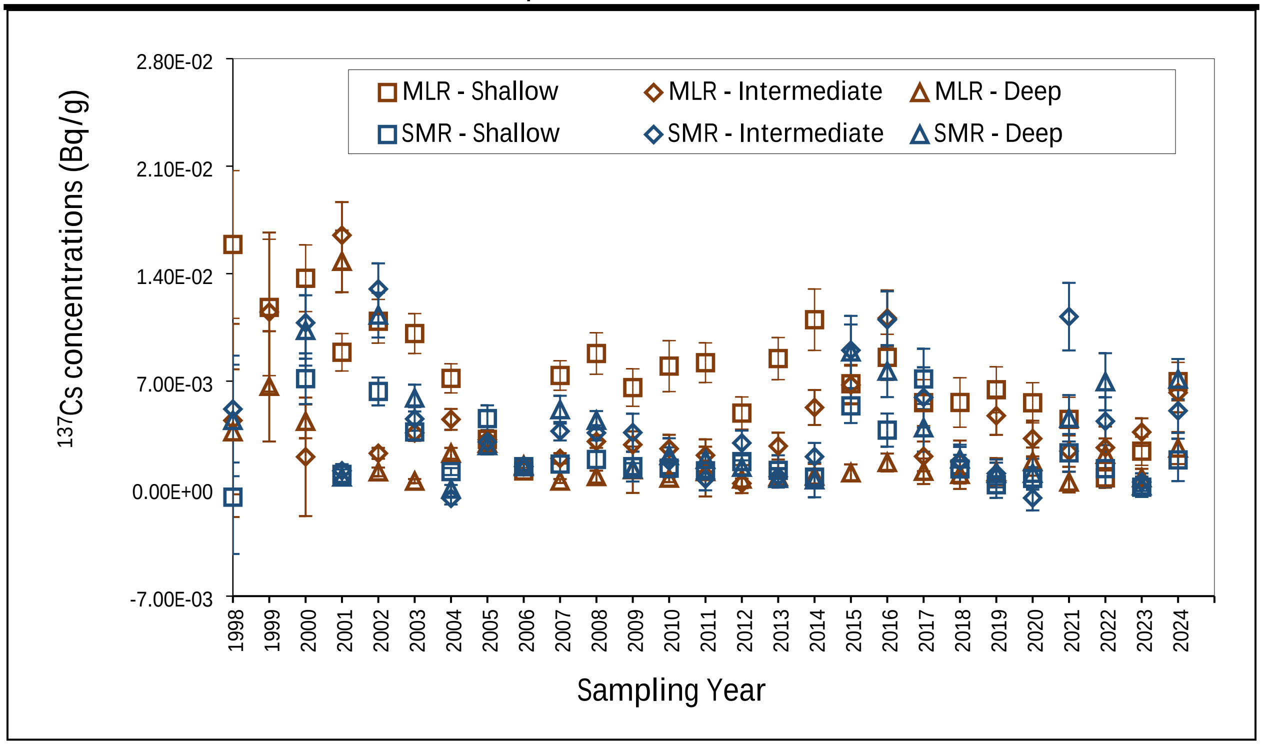



**Figure 4.8b – $^{137}$Cs Concentrations in Soil Samples Collected from 5-mi Ring**

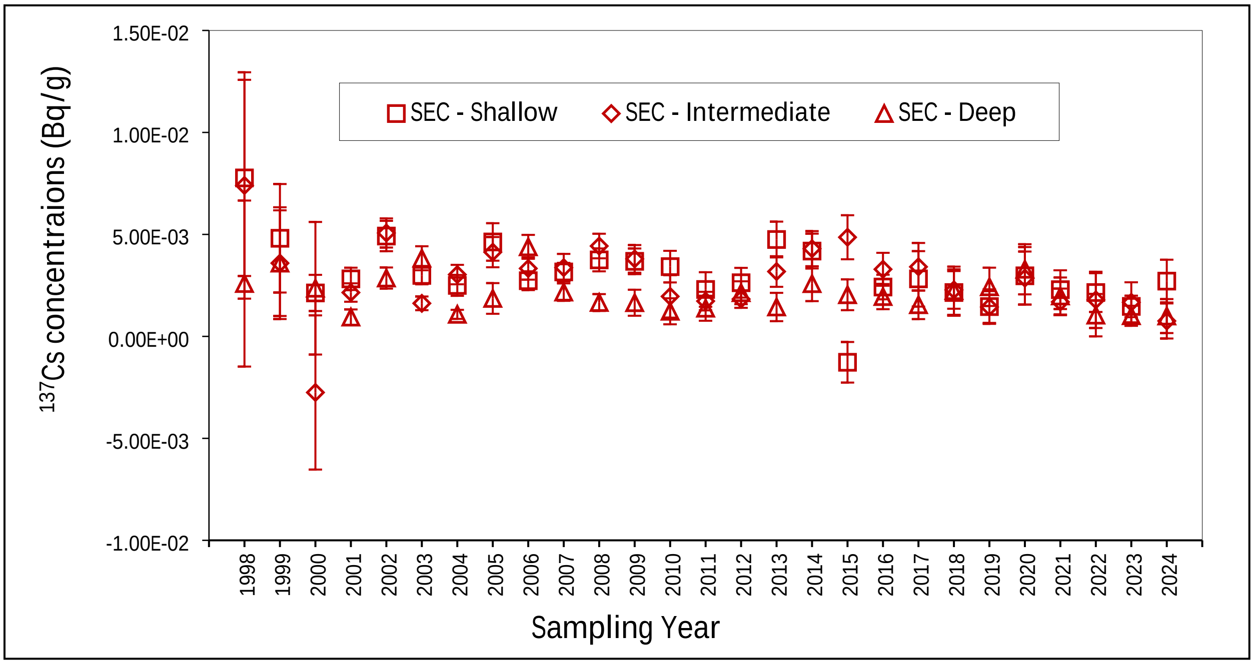



**Figure 4.8c – $^{137}$Cs Concentrations in Soil Samples Collected from Outer Sites**

# 4.6 BIOTA

## 4.6.1 Sample Collection

Rangeland vegetation samples were collected from five of the same six locations as the soil samples (figure 4.1), with a duplicated sample taken from WEE. Vegetation samples were not collected at SEC due to drought conditions. Fauna (animal) samples were also collected when available. Biota samples were analyzed for the 10 target radionuclides.

## 4.6.2 Results and Discussion

### 4.6.2.1 Vegetation Samples

There were no detections of plutonium isotopes and americium isotopes in any of the vegetation samples. Figures 4.9, 4.10, and 4.11 show historical concentrations of $^{239/240}$Pu, $^{241}$Am, and $^{137}$Cs in vegetation samples. Appendix G, table G.16, presents the analysis results for the uranium, plutonium, and americium target radionuclides in the vegetation samples from the five locations. Duplicate samples were collected at WEE during the vegetation sampling period in 2024. Appendix G, table G.17, presents the analysis results for the gamma radionuclides and $^{90}$Sr during the regular vegetation sampling in the CY.

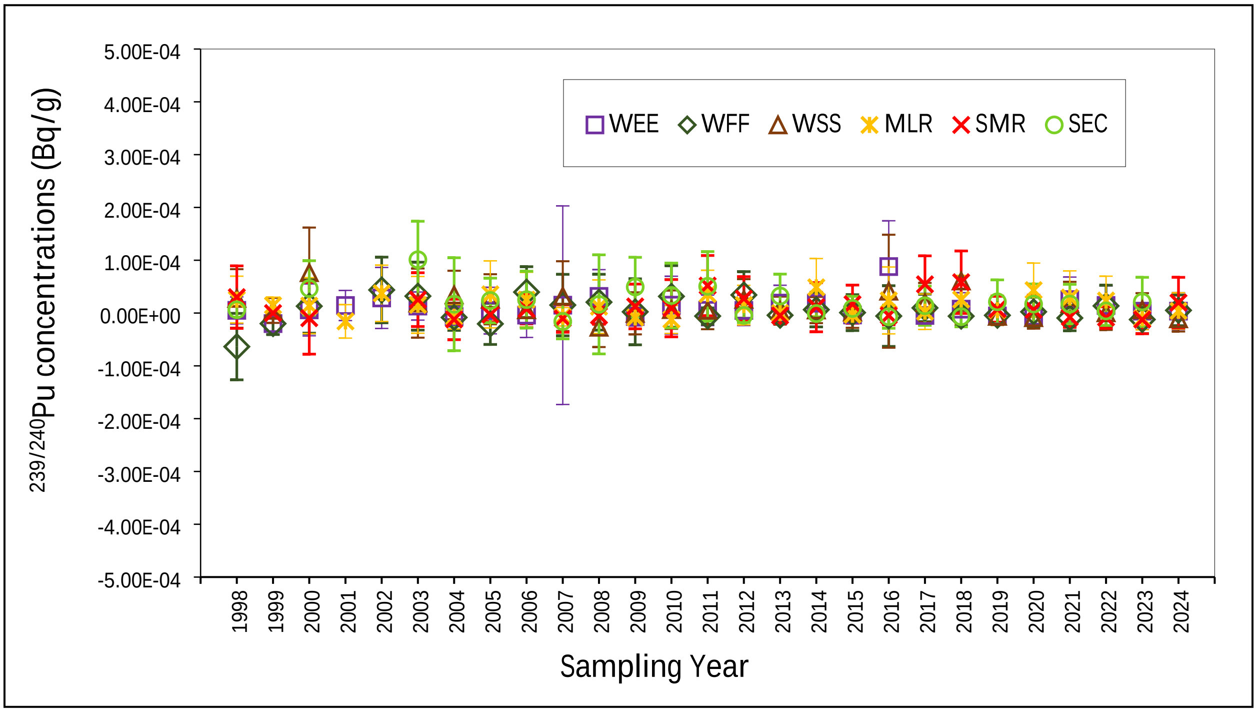



**Figure 4.9 – Historical Concentrations of $^{239/240}$Pu in Vegetation Samples Collected from Six Sampling Locations**

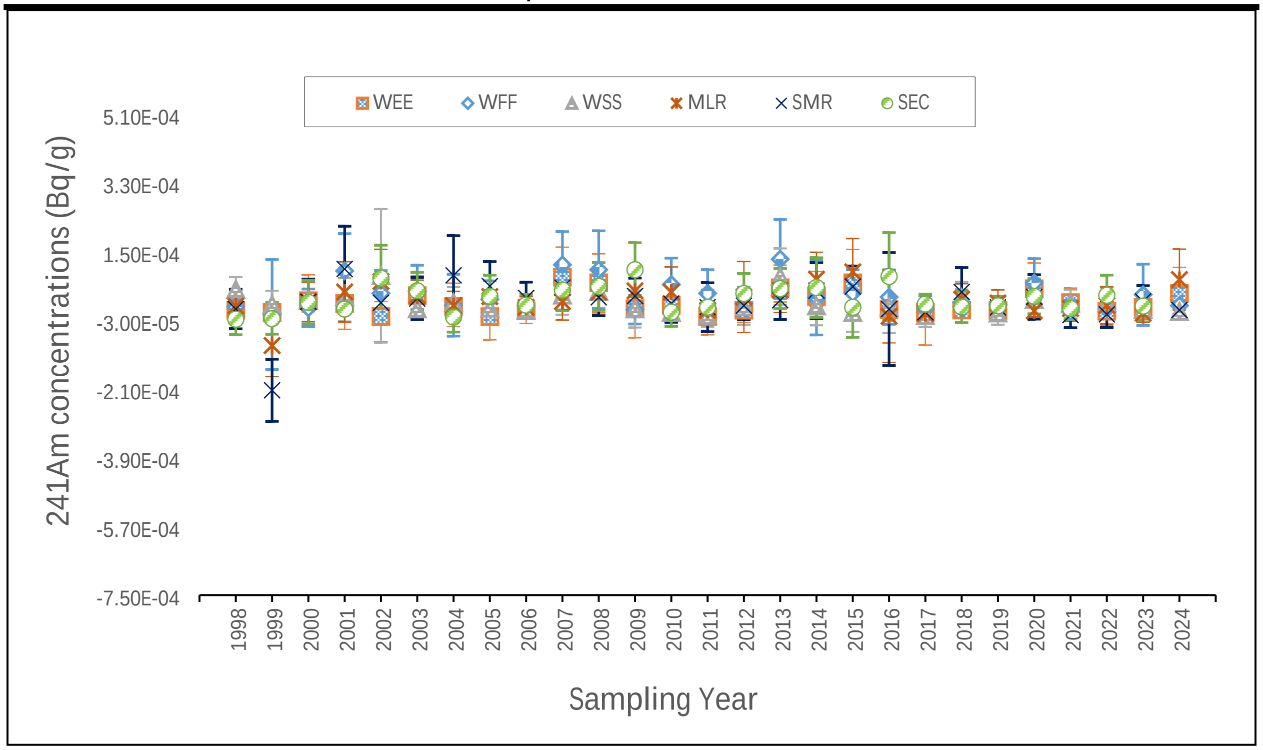



**Figure 4.10 – Historical Concentrations of $^{241}$Am in Vegetation Samples Collected from Six Sampling Locations**

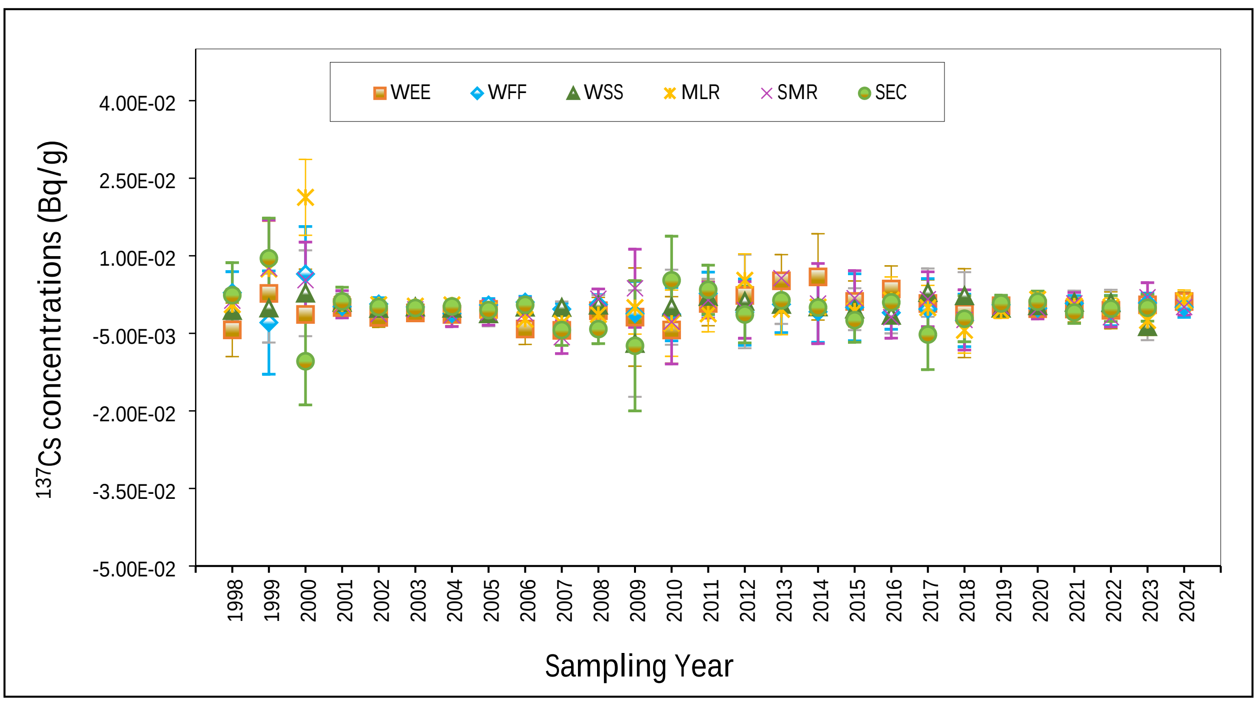



**Figure 4.11 – Historical Concentrations of $^{137}$Cs in Vegetation Samples Collected from Six Sampling Locations**

#### 4.6.2.2 Fauna (Animals)

The fauna samples analyzed included one composite fish sample from CBD. One SOO was collected (one deer sample). One composite quail sample was collected at WEE. All radionuclides detected in the fish and quail composite samples are within the trends of previous fish and quail composite samples. The fauna analysis results for radionuclides are presented in appendix G, table G.18, for the uranium isotopes, plutonium isotopes, and americium, and in appendix G, table G.19, for the gamma radionuclides and $^{90}$Sr. The deer SOO sample received a "UJ" qualifier used (nuclide was not detected above the reported MDC and 2 sigma counting uncertainty and a quality deficiency affected the data making the reported data more uncertain) for all three uranium isotopes. The fish composite sample received a "UJ" qualifier for $^{235}$U and $^{238}$U.

## 4.7 GROUNDWATER

### 4.7.1 Sample Collection

Groundwater samples were collected once in the CY (round 46) from each of six detection monitoring wells on the WIPP site (figure 4.12). The wells are completed in the Culebra Dolomite Member (Culebra), a water-bearing member of the Rustler Formation (Rustler). The groundwater from the detection monitoring wells was collected from depths ranging from 180 to 270 m (591 to 886 ft) from the six DMP wells (WQSP-1 to WQSP-6).

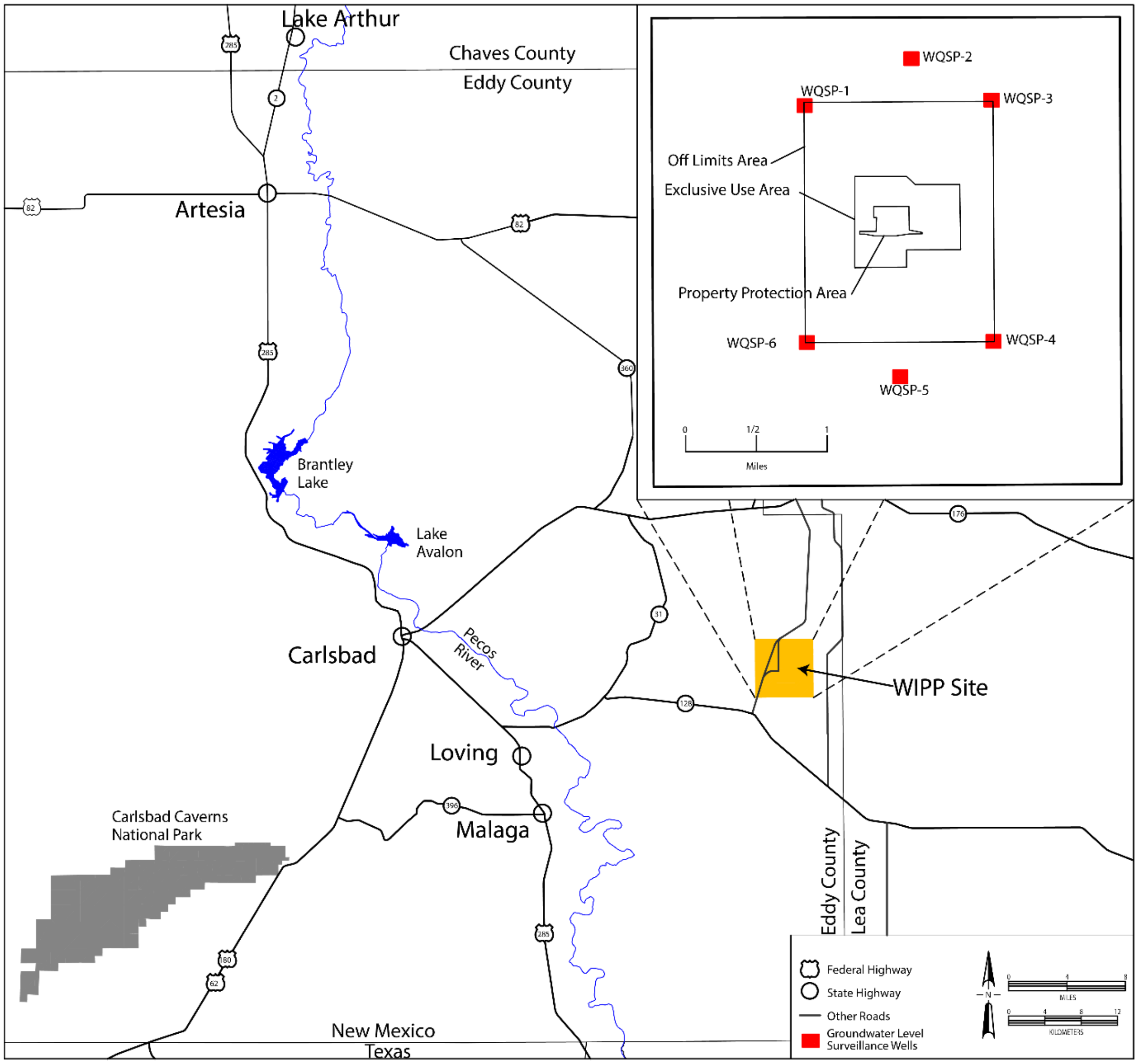



**Figure 4.12 – DMP Well Locations**

### 4.7.2 Results and Discussion

The data in appendix G, table G.6 show that isotopes of naturally occurring uranium ($^{234}U$, $^{235}U$, and $^{238}U$) were detected in the groundwater well samples in the CY. The concentrations reported in table G.6 are from the primary samples collected from each DMP well.

Concentrations of uranium isotopes in the groundwater samples were also compared with the 99 percent confidence interval range of the baseline concentrations measured between 1985 and 1989 (baseline values: $^{233/234}U$ = 1.30E+00 Bq/L, $^{235}U$ = 3.10E-02 Bq/L, and $^{238}U$ = 3.20E-01 Bq/L). The highest round 46 concentration of $^{233/234}U$ was 1.28E+00 Bq/L in WQSP-2, slightly lower than the 99 percent confidence interval range of the baseline concentration of 1.30E+00 Bq/L. The highest concentration of $^{235}U$ was 5.81E-02 Bq/L in WQSP-5, which was higher than the 99 percent confidence interval range of the baseline concentration of 3.10E-02 Bq/L. The highest concentration of $^{238}U$ was 2.16E-01 Bq/L in WQSP-1 which was lower than the 99 percent confidence interval range of the baseline concentration of 3.20E-01 Bq/L. For $^{233/234}U$ and $^{238}U$ for WQSP-1 and WQSP-2, the qualifier "NJ" was used (nuclide present at an estimated quantity). The other individual and average for $^{233/234}U$, $^{235}U$, and $^{238}U$ groundwater concentrations were within the 99 percent confidence interval ranges of the baseline concentrations (DOE/WIPP 92-037). The baseline concentrations were based on samples collected from 37 wells, including 23 wells in the Culebra.

The groundwater samples were also analyzed using alpha spectroscopy for the following radionuclides: $^{238}Pu$, $^{239/240}Pu$, and $^{241}Am$. These isotopes, which are related to WIPP waste disposal operations, were not detected in any of the groundwater samples as shown in table G.3. Historical concentrations of selected radionuclides are shown in figures 4.13a and 4.13b. The concentrations measured were consistent with those from previous years. The groundwater wells were sampled twice yearly until 2012 when modifications were made to the Permit that required them to be sampled only once a year. Table G.6 also shows the concentration of the other gamma radionuclides and $^{90}Sr$, which was not detected in the CY. Other radionuclides were measured and detected in the samples, such as $^{40}K$, however these are naturally occurring isotopes, and are within the expected range.

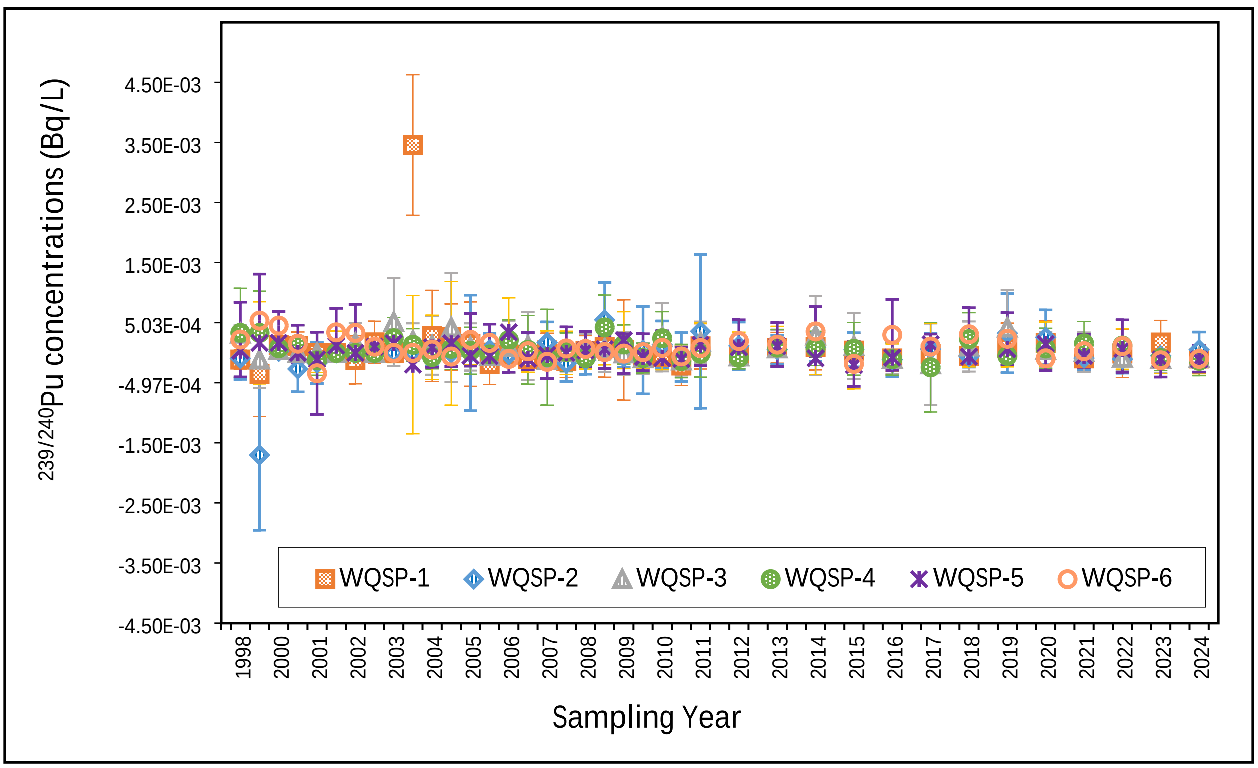



**Figure 4.13a – Historical Concentrations of $^{239/240}Pu$ at Six DMP Wells**

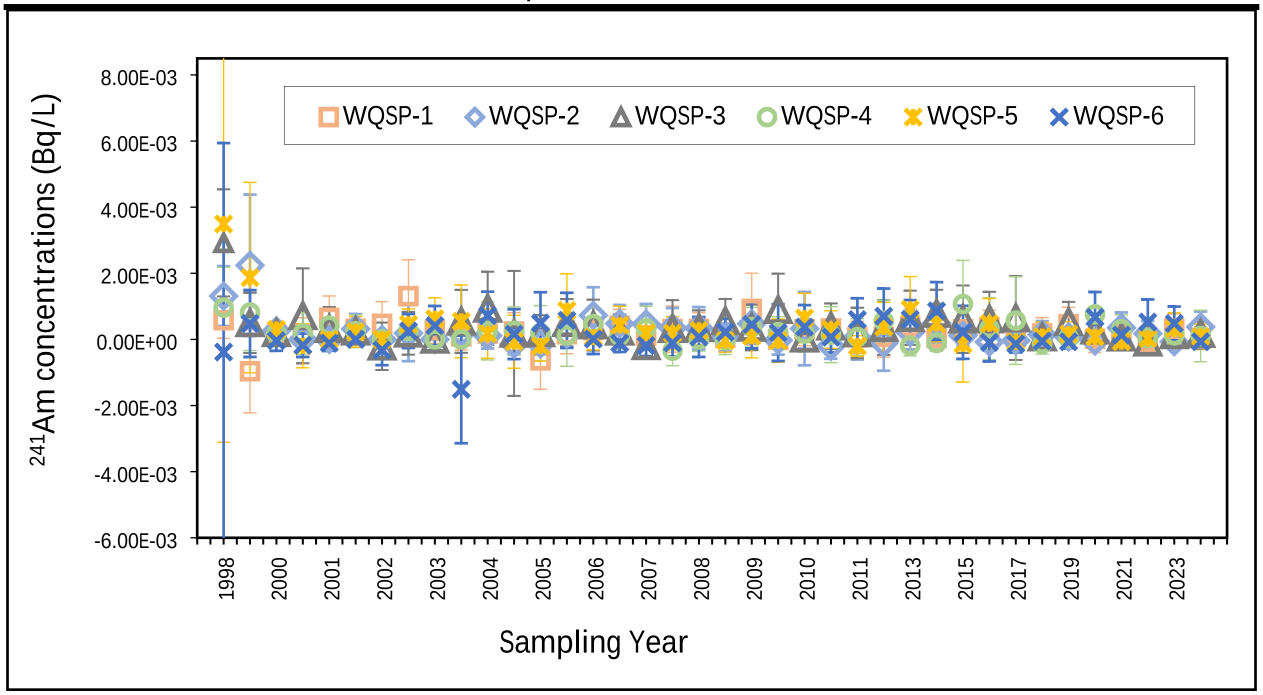



**Figure 4.13b – Historical Concentrations of $^{241}$Am at Six DMP Wells**

## 4.8 POTENTIAL DOSE FROM WIPP OPERATIONS

### 4.8.1 Dose Limits

Compliance with the environmental radiation dose limits is determined by comparing annual radiation doses to the dose limits discussed in the introduction to this chapter.

Compliance with the environmental radiation dose limits is determined by monitoring, extracting, and calculating the EDE. The EDE is the weighted sum of the doses to the individual organs of the body. The dose to each organ is weighted according to the risk that dose represents. These organ doses are then added together, and the total is the EDE. Calculating the EDE to members of the public requires the use of CAP88-PC or other EPA-approved computer models and procedures. The WIPP Effluent Monitoring Program personnel use the EPA emission monitoring and test procedure (40 CFR § 61.93, "Emission Monitoring and Test Procedure"), which requires the use of the EPA-approved Clean Air Assessment Package 1988 (CAP88-PC) (CAP88-PC, 2019) (computer code for calculating both dose and risk from radionuclide emissions) to calculate the EDE to members of the public. The CAP88-PC software uses a modified Gaussian plume dispersion model, which calculates deposition rates, concentrations in food, and intake rates for people. The CAP88-PC software estimates dose and risk to individuals and populations from multiple pathways. Dose and risk are calculated for ingestion, inhalation, ground-level air immersion, and ground-surface irradiation exposure pathways.

The *Safe Drinking Water Act* (40 CFR §141.66, "Maximum Contaminant Levels for Radionuclides") states that average annual concentrations for beta- and gamma-emitting human-made radionuclides in drinking water shall not result in an annual dose equivalent greater than 0.04 mSv (4 mrem). It is important to note that these dose equivalent limits are set for radionuclides released to the environment from DOE operations. These limits do not include but rather are exposures in addition to, doses from natural background radiation or medical procedures.

### 4.8.2 Background Radiation

There are several sources of natural radiation: cosmic and cosmogenic radiation (from outer space and the Earth's atmosphere), terrestrial radiation (from the Earth's crust), and internal radiation (naturally occurring radiation in our bodies, such as $^{40}$K). The most common sources of terrestrial radiation are uranium and thorium and their decay products. Radon gas, a decay product of uranium, is a widely known naturally occurring terrestrial radionuclide. In addition to natural radioactivity, small amounts of radioactivity are present in the environment from aboveground nuclear weapons tests, the 1986 Chernobyl nuclear accident, and Technologically Enhanced Naturally Occurring Radioactive Material (TENORM) from the Permian Basin. Together, these sources of radiation are called background radiation.

Naturally occurring radiation in the environment can deliver both internal and external doses. Internal dose is received as a result of the intake of radionuclides through ingestion (consuming food or drink containing radionuclides) and inhalation (breathing radioactive particulates). External dose can occur from immersion in contaminated air or deposition of contaminants on surfaces. The average annual dose received by a member of the public from natural background radiation is approximately 3 mSv (300 mrem).

### 4.8.3 Dose from Air Emissions

The standard 40 CFR Part 191, Subpart A, provides limits regarding radiation doses to members of the public and the general environment from all sources (i.e., air, soil, water).

Compliance with Subpart A, "Standards" (40 CFR § 191.03[b]) and the NESHAP limit (40 CFR § 61.92) is determined by comparing annual radiation doses calculated for the maximally exposed individual (MEI) to the regulatory limits. As recommended by the EPA, computer modeling is used to calculate radiation doses to comply with the Subpart A and NESHAP limits. Compliance procedures for DOE facilities (40 CFR § 61.93[a]) require the use of CAP88-PC or AIRDOS-PC computer programs, or an approved equivalent, to calculate dose to members of the public.

Source term input for CAP88-PC for the CY was determined by radiochemical analyses of particulate samples collected from fixed air sampling filters at Stations B and C. For periods of unfiltered underground exhaust ventilation, Station H PAS filters were analyzed. Air filter samples were analyzed for $^{241}$Am, $^{239/240}$Pu, $^{238}$Pu, $^{90}$Sr, $^{233/234}$U, $^{238}$U, and $^{137}$Cs because these radionuclides constitute over 98 percent of the dose potential from contact-handled and remote-handled TRU waste. A conservative dataset using the higher value of either the measured radionuclide concentration or 2 σ TPU was used as input to the CAP88-PC computer program to calculate the EDEs to members of the public. See section 4.1.2 for more information on the results and discussion of the effluent monitoring data.

CAP88-PC dose calculations assume that exposed persons remain at the same point of exposure during the entire year and that the vegetables, milk, and meat consumed are locally produced. Thus, this dose calculation is a maximum potential dose resulting from WIPP facility operations, which includes doses from inhalation, immersion, deposition, and ingestion of radionuclides emitted via the air pathway from the WIPP facility.

### 4.8.4 Total Potential Dose from WIPP Operations

The radiation dose limits specified in 40 CFR Part 191, Subpart A, state that the combined annual dose equivalent to any member of the public in the general environment resulting from the discharges of radioactive material and direct radiation from management and storage shall not exceed limits of 0.25 mSv (25 mrem) to the whole body, and 0.75 mSv (75 mrem) to any critical organ. The following sections discuss the potential dose equivalent through other pathways and the total potential dose equivalent a member of the public may have received from the WIPP facility during the CY. Section 4.8.4.3 discusses the potential dose equivalent received from radionuclides released to the air from the WIPP facility.

#### 4.8.4.1 Potential Dose from Water Ingestion Pathway

The potential dose to individuals from the ingestion of WIPP facility-related radionuclides transported in water is determined to be zero for several reasons. Drinking water for communities near the WIPP facility comes from groundwater sources that are too remote to be affected by WIPP facility contaminants, based on current radionuclide transport scenarios summarized in *Title 40 CFR Part 191 Subparts B & C Compliance Certification Application for the Waste Isolation Pilot Plant* (DOE/CAO-96-2184). Water from the Culebra in the vicinity of the WIPP facility is naturally not potable due to high levels of TDS.

#### 4.8.4.2 Potential Dose from Wild Game Ingestion

Game animals sampled during the CY were fish, deer, and quail. Potassium-40 was detected in all game samples. Uranium-233/234 was detected in one fish composite sample. Therefore, no measurable dose from WIPP facility-related radionuclides would have been received by any individual from this pathway during the CY.

#### 4.8.4.3 Total Potential Dose from All Pathways

The only credible pathway from the WIPP facility to humans from operations this CY is through air emissions; therefore, this is the only pathway for calculating a potential dose. Table 4.1 summarizes the total atmospheric release and potential radiological dose at the WIPP facility in the CY for the limits in both 40 CFR § 61.92 and 40 CFR § 191.03(b).

**Table 4.1 – WIPP Radiological Releases and Doses**

| $^{238}Pu$ | $^{239/240}Pu$ | $^{241}Am$ | $^{90}Sr$ | $^{233/234}U$ | $^{238}U$ | $^{137}Cs$ |
|---|---|---|---|---|---|---|
| 3.089E-08 Ci | 4.949E-08 Ci | 2.775E-07 Ci | 7.946E-07 Ci | 4.361E-08 Ci | 3.148E-08 Ci | 2.613E-06 Ci |
| 1.143E+03 Bq | 1.831E+03 Bq | 1.027E+04 Bq | 2.940E+04 Bq | 1.613E+03 Bq | 1.165E+03 Bq | 9.670E+04 Bq |

| WIPP Radiological Dose Reporting Table – MEI | | | |
|---|---|---|---|
| **Pathway** | EDE to Shaft #5 Office Worker MEI at 0.5 miles (812 m) WNW [4] | | Percent of EPA 10 mrem/yr limit to member of the public |
| | (mrem/year) | (mSv/year) | |
| Air | 4.51E-05 | 4.51E-07 | 4.51E-04 |
| Water | N/A [3] | N/A | N/A |
| Other Pathways | N/A | N/A | N/A |

| WIPP Radiological Dose Reporting Table – Offsite Maximally Exposed Individual | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Pathway** | EDE to the Resident MEI at 8,850 m WNW | | Percent of EPA 10 mrem/yr limit to member of the public | Estimated population dose within 80 km | | Population within 80 km [1] | Estimated natural radiation population dose [2] |
| | (mrem/year) | (mSv/year) | | (person-rem/year) | (person-Sv/year) | | (person-rem/year) |
| Air | 1.45E-06 | 1.45E-08 | 1.45E-05 | 6.51E-06 | 6.51E-08 | 115,770 | 34,731 |
| Water | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Other Pathways | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

| WIPP Radiological Dose Reporting Table – Fence Line | | | | | | |
|---|---|---|---|---|---|---|
| | Dose equivalent to the whole body of the receptor who resides year-round at WIPP fence line 652 m WNW | | Percent of EPA 25 mrem/yr whole body limit | Dose equivalent to the critical organ of the receptor who resides year-round at WIPP fence line 652 m WNW | | Percent of EPA 75-mrem/year critical organ limit |
| **Pathway** | (mrem/year) | (mSv/year) | | (mrem/year) | (mSv/year) | |
| Air | 5.89E-05 | 5.89E-07 | 2.36E-04 | 1.31E-03 | 1.31E-05 | 1.75E-03 |
| Water | N/A | N/A | N/A | N/A | N/A | N/A |
| Other Pathways | N/A | N/A | N/A | N/A | N/A | N/A |

Note. Total releases from combination of Stations B, C, and H. Values are calculated from sample activities plus 2 σ TPU or the central value, whichever is greater, and divided by the ratio of sample flow to stack flow volumes.

1. Source: United States Census Bureau (2020 Census Data).
2. Estimated natural radiation population dose = (population within 80 km) × (300 mrem/year).
3. Not applicable at the WIPP facility.
4. The previous MEI at the SSCVS construction office was included in dose assessments and based on primary wind direction, the Shaft #5 construction office resulted in a higher dose than the SSCVS construction office.

In accordance with 40 CFR Part 191, Subpart A, the receptor selected is assumed to reside year-round at the EUA fence line in the northwest sector. For the CY, the dose to this hypothetical receptor was calculated to be 5.89E-07 mSv/yr (5.89E-05 mrem/yr) for the whole body and 1.31E-05 mSv/yr (1.31E-03 mrem/yr) to the critical organs. These values are less than the limits in 40 CFR § 191.03(b).

For the NESHAP standard (40 CFR § 61.92), the EDE potentially received by the offsite resident MEI in the CY, assumed to be residing 8.9 km (5.5 mi) west-northwest of the WIPP facility, is calculated to be 1.45E-08 mSv/yr (1.45E-06 mrem/yr) for the whole body. This value is less than the 40 CFR § 61.92 limit.

For the NESHAP standard (40 CFR § 61.92), the EDE potentially received by the non-WIPP worker at the Shaft #5 construction office trailer MEI in the CY, assumed to be located 812 meters (0.5 mi) west-northwest of the WIPP facility, is calculated to be 4.51E-07 mSv/yr (4.51E-05 mrem/yr) for the whole body. This value is less than the 40 CFR § 61.92 limit. The non-WIPP worker at the SSCVS was included in the dose assessment evaluations for the CY; however, the resulting dose at this location was lower than the dose at the Shaft #5 construction office and, thus, was not identified as the MEI for this CY.

As required by DOE Order 458.1, Administrative Chg. 4, the collective dose to the public within 80 km (50 mi) of the WIPP facility has been evaluated and is 6.51E-08 person-Sv/yr (6.51E-06 person-rem/yr) in the CY.

#### 4.8.5 Dose to Nonhuman Biota

Dose standards for populations of aquatic and terrestrial organisms are discussed in National Council on Radiation Protection and Measurements Report No. 109, *Effects of Ionizing Radiation on Aquatic Organisms* (NCRP, 1991), and the International Atomic Energy Agency (1992) Technical Report Series No. 332, *Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards*.

Those dose standards are:

- Aquatic animals – 10 milligrays per day (1 radiation absorbed dose per day)
- Terrestrial plants – 10 milligrays per day (1 radiation absorbed dose per day)
- Terrestrial animals – 1 milligrays per day (0.1 radiation absorbed dose per day)

The DOE has considered establishing these dose standards as limits for aquatic and terrestrial biota in proposed rule 10 CFR Part 834, "Radiation Protection of the Public and the Environment," but has delayed finalizing this rule until guidance for demonstrating compliance is developed. *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE-STD-1153-2002) was developed to meet this need.

The radiation doses to nonhuman biota are reported in the ASER using DOE-STD-1153-2002, which requires an initial general screening using conservative assumptions. In the initial screen, biota concentration guides (BCG) are derived using conservative assumptions for various generic organisms. Maximum concentrations of radionuclides detected in soil, sediment, and water during environmental monitoring are divided by the BCG, and the results are summed for each organism. If the sum of these fractions is less than 1.0, the site is deemed to have passed the screen, and no further action is required. This screening evaluation is intended to provide a very conservative evaluation of the site about the recommended limits. This guidance was used to screen radionuclide concentrations observed around the WIPP during the CY using the maximum radionuclide concentrations listed in table 4.2, and the sum of fractions was less than 1.0 for all media. The element $^{40}K$ is not included in table 4.2 because it is a natural component of the Earth's crust and is not part of WIPP-related radionuclides.

**Table 4.2 – General Screening Results for Potential Radiation Dose to Nonhuman Biota from Radionuclide Concentrations in Surface Water (Bq/L), Sediment (Bq/g), and Soil (Bq/g)**

| Medium | Radionuclide | Maximum Detected Concentration | Location | BCG [1] | Concentration/ BCG |
|---|---|---|---|---|---|
| **Aquatic System Evaluation** | | | | | |
| Sediment (Bq/g) | $^{233/234}U$ | 2.49E-02 | UPR | 2.00E+02 | 1.25E-04 |
| | $^{235}U$ | 2.04E-03 | LST | 1.00E+02 | 2.04E-05 |
| | $^{238}U$ | 2.50E-02 | PCN | 9.00E+01 | 2.78E-04 |
| | $^{238}Pu$ | ND [2] | N/A [3] | 2.00E+02 | N/A [3] |
| | $^{239/240}Pu$ | ND [2] | N/A [3] | 2.00E+02 | N/A [3] |
| | $^{241}Am$ | ND [2] | N/A [3] | 2.00E+02 | N/A [3] |
| | $^{60}Co$ | ND [2] | N/A [3] | 5.00E+01 | N/A [3] |
| | $^{137}Cs$ | 3.80E-03 | HIL | 1.00E+02 | 3.80E-05 |
| | $^{90}Sr$ | ND [2] | N/A [3] | 2.00E+01 | N/A [3] |
| Surface Water [4] (Bq/L) | $^{233/234}U$ | 2.29E-01 | PCN | 7.00E+00 | 3.27E-02 |
| | $^{235}U$ | 8.80E-03 | UPR | 8.00E+00 | 1.10E-03 |
| | $^{238}U$ | 1.01E-01 | PCN | 8.00E+00 | 1.26E-02 |
| | $^{238}Pu$ | ND [2] | N/A [3] | 7.00E+00 | N/A [3] |
| | $^{239/240}Pu$ | ND [2] | N/A [3] | 7.00E+00 | N/A [3] |
| | $^{241}Am$ | ND [2] | N/A [3] | 2.00E+01 | N/A [3] |
| | $^{60}Co$ | ND [2] | N/A [3] | 1.00E+02 | N/A [3] |
| | $^{137}Cs$ | ND [2] | N/A [3] | 2.00E+00 | N/A [3] |
| | $^{90}Sr$ | ND [2] | N/A [3] | 1.00E+01 | N/A [3] |
| Sum of Fractions | | | | | 4.69E-02 |
| Terrestrial System Evaluation | | | | | |
| Soil (Bq/g) | $^{233/234}U$ | 2.14E-02 | SMR 2–5 cm | 2.00E+02 | 1.07E-04 |
| | $^{235}U$ | 1.47E-03 | SMR 0–2 cm | 1.00E+02 | 1.47E-05 |
| | $^{238}U$ | 2.31E-02 | SMR 2–5 cm | 6.00E+01 | 3.85E-04 |
| | $^{238}Pu$ | ND [2] | N/A [3] | 2.00E+02 | N/A [3] |
| | $^{239/240}Pu$ | 4.02E-04 | MLR 0–2 cm | 2.00E+02 | 2.01E-06 |
| | $^{241}Am$ | ND [2] | N/A [3] | 1.00E+02 | N/A [3] |
| | $^{60}Co$ | ND [2] | N/A [3] | 3.00E+01 | N/A [3] |
| | $^{137}Cs$ | 7.13E-03 | SMR 5–10 cm | 8.00E-01 | 8.91E-03 |
| | $^{90}Sr$ | ND [2] | N/A [3] | 8.00E-01 | N/A [3] |

| Medium | Radionuclide | Maximum Detected Concentration | Location | BCG [1] | Concentration/ BCG |
|---|---|---|---|---|---|
| **Terrestrial System Evaluation** | | | | | |
| Surface Water (Bq/L) | $^{233/234}U$ | 2.29E-01 | PCN | 7.00E+00 | 3.27E-02 |
| | $^{235}U$ | 8.80E-03 | UPR | 8.00E+00 | 1.10E-03 |
| | $^{238}U$ | 1.01E-01 | PCN | 8.00E+00 | 1.26E-02 |
| | $^{238}Pu$ | ND [2] | N/A [3] | 7.00E+00 | N/A [3] |
| | $^{239/240}Pu$ | ND [2] | N/A [3] | 7.00E+00 | N/A [3] |
| | $^{241}Am$ | ND [2] | N/A [3] | 2.00E+01 | N/A [3] |
| | $^{60}Co$ | ND [2] | N/A [3] | 1.00E+02 | N/A [3] |
| | $^{137}Cs$ | ND [2] | N/A [3] | 2.00E+04 | N/A [3] |
| | $^{90}Sr$ | ND [2] | N/A [3] | 2.00E+04 | N/A [3] |
| Sum of Fractions | | | | | 5.59E-02 |

Note. Maximum detected concentrations were compared with BCG values to assess potential dose to biota. As long as the sum of the ratios between detected maximum concentrations and the associated BCG is below 1.0, no adverse effects on plant or animal populations are expected (DOE-STD-1153-2002).

1. The radionuclide concentration in the medium that would produce a radiation dose in the organism equal to the dose standard under the conservative assumptions in the model.
2. Not detected in any of the sampling locations for a given sample matrix.
3. Not applicable.
4. Sediment and surface water samples were assumed to be co-located.

### 4.8.6 Release of Property Containing Residual Radioactive Material

WIPP uses procedures to govern unconditionally releasing items. WIPP can release the item after it has a radiological survey if it meets specific documented limits. For items meeting unconditional release criteria, WIPP generates a form and performs multiple verifications to ensure compliance. These measures ensure that radiological material releases from WIPP are consistent with DOE Order 458.1 requirements. Compliance with these limits which are dose-based and are such that if any member of the public received any exposure, it would be less than 1 mrem/yr. There was no release of TRU radiologically contaminated materials or property from the WIPP facility in the CY.

## 4.9 RADIOLOGICAL PROGRAM CONCLUSIONS

### 4.9.1 Effluent Monitoring

For the CY, the calculated EDE to the receptor (hypothetical MEI) who resides year-round at the EUA fence line is 5.89E-05 mrem/yr (5.89E-07 mSv/yr) for the whole body and 1.31E-03 mrem/yr (1.31E-05 mSv/yr) for the critical organs. For the WIPP Effluent Monitoring Program, figure 4.14 and table 4.3 show the dose to the whole body for the hypothetical MEI from CY 2002 to this CY. Figure 4.15 and table 4.4 show the dose to the critical organs for the hypothetical MEI from CY 2002 to this CY. These dose equivalent values are below 25 mrem (0.25 mSv) to the whole body and 75 mrem (0.75 mSv) to any critical organ, in accordance with the limits in 40 CFR § 191.03(b).

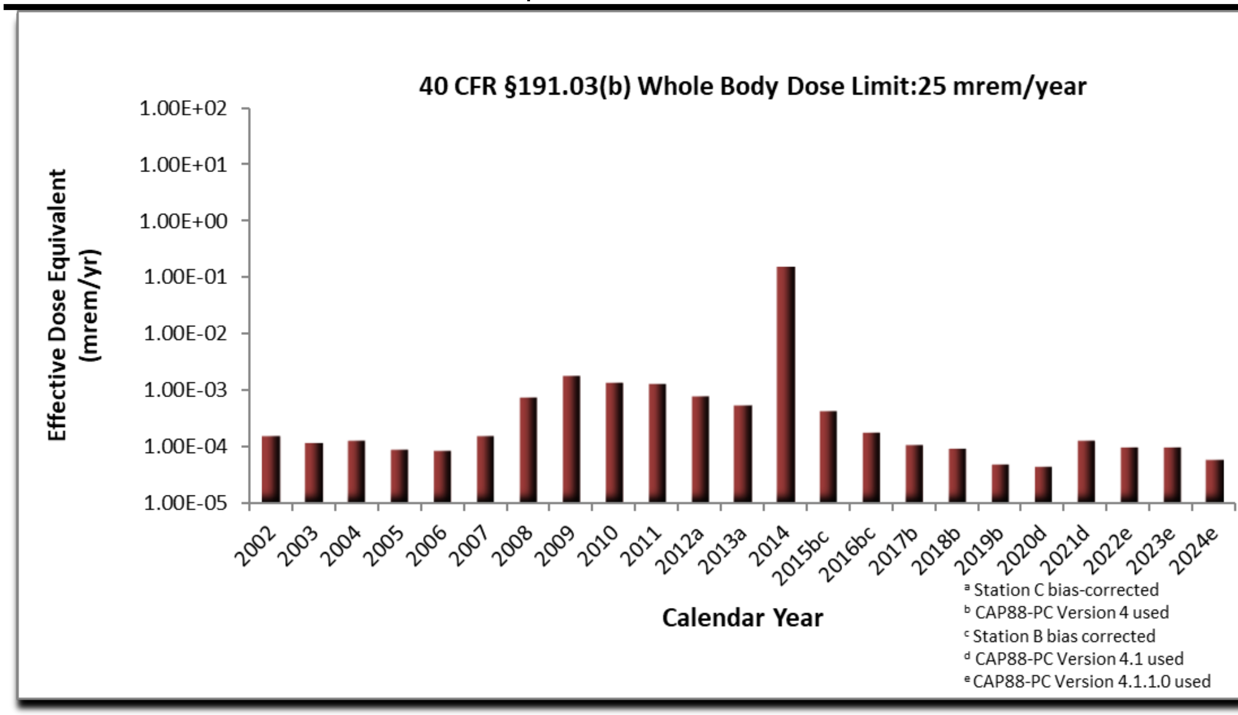



**Figure 4.14 – Dose to the Whole Body for the Hypothetical Maximally Exposed Individual at the WIPP Fence Line**

**Table 4.3 – Comparison of Dose to the Whole Body to EPA Limit of 25 mrem/year per 40 CFR § 191.03(b)**

| Year | Effective Dose Equivalent (mrem/yr) | Percentage of EPA Limit |
|---|---|---|
| 2002 | 1.51E-04 | 0.00060% |
| 2003 | 1.15E-04 | 0.00046% |
| 2004 | 1.27E-04 | 0.00051% |
| 2005 | 8.86E-05 | 0.00035% |
| 2006 | 8.16E-05 | 0.00033% |
| 2007 | 1.52E-04 | 0.00061% |
| 2008 | 7.14E-04 | 0.00286% |
| 2009 | 1.71E-03 | 0.00684% |
| 2010 | 1.31E-03 | 0.00524% |
| 2011 | 1.29E-03 | 0.00516% |
| 2012 [a] | 7.55E-04 | 0.00302% |
| 2013 [a] | 5.25E-04 | 0.00210% |
| 2014 | 1.49E-01 | 0.59600% |
| 2015 [b c] | 4.23E-04 | 0.00169% |

| Year | Effective Dose Equivalent (mrem/yr) | Percentage of EPA Limit |
|---|---|---|
| 2016 [bc] | 1.71E-04 | 0.00068% |
| 2017 [b] | 1.04E-04 | 0.00042% |
| 2018 [b] | 9.31E-05 | 0.00037% |
| 2019 [b] | 4.88E-05 | 0.00020% |
| 2020 [d] | 4.32E-05 | 0.00017% |
| 2021 [d] | 1.28E-04 | 0.00051% |
| 2022 [e] | 9.35E-05 | 0.00037% |
| 2023 [e] | 9.44E-05 | 0.00038% |
| 2024 [e] | 5.89E-05 | 0.00024% |
| **40 CFR §191.03(b) Whole Body Limit** | **25** | |

a. Station C bias-corrected.
b. CAPP88-PC Version 4 used.
c. Station B bias-corrected.
d. CAPP88-PC Version 4.1 used.
e. CAP88-PC Version 4.1.1.0 used.

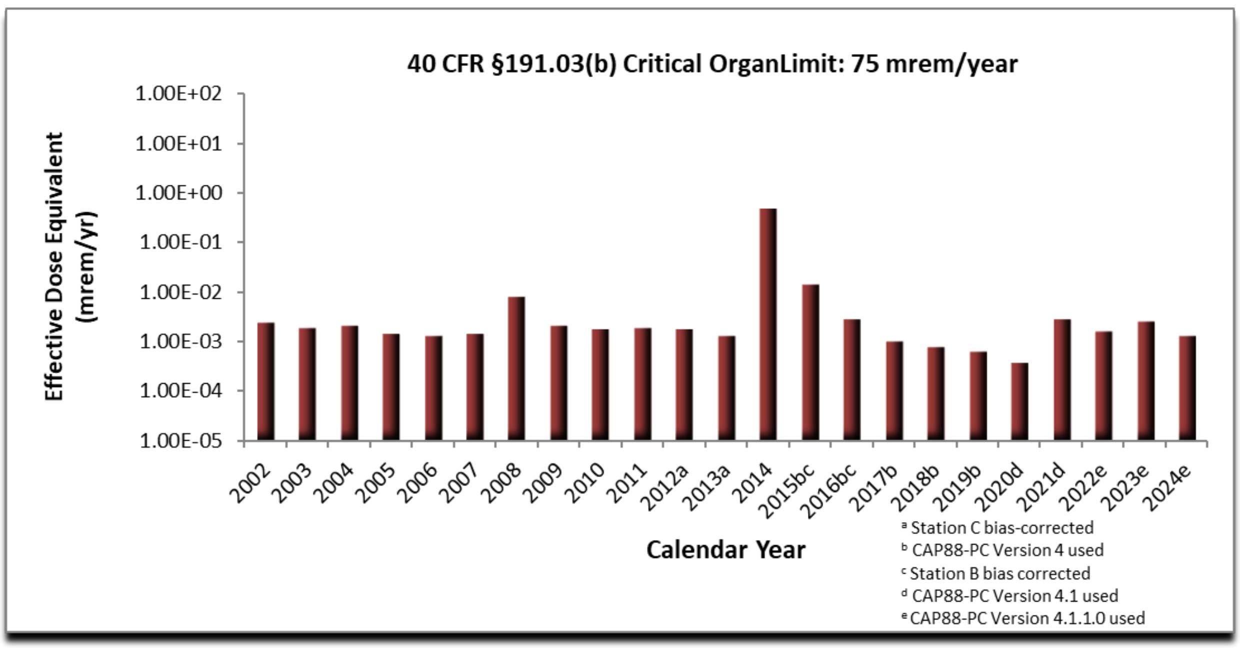



**Figure 4.15 – Dose to the Critical Organ for Hypothetical Maximally Exposed Individual at the WIPP Fence Line**

**Table 4.4 – Comparison of Dose to the Critical Organ to EPA Limit of 75 mrem/year per 40 CFR §191.03(b)**

| Year | Effective Dose Equivalent (mrem/yr) | Percentage of EPA Limit |
|---|---|---|
| 2002 | 2.46E-03 | 0.0033% |
| 2003 | 1.85E-03 | 0.0025% |
| 2004 | 2.11E-03 | 0.0028% |
| 2005 | 1.41E-03 | 0.0019% |
| 2006 | 1.30E-03 | 0.0017% |
| 2007 | 1.46E-03 | 0.0019% |
| 2008 | 7.81E-03 | 0.0104% |
| 2009 | 2.10E-03 | 0.0028% |
| 2010 | 1.73E-03 | 0.0023% |
| 2011 | 1.86E-03 | 0.0025% |
| 2012 [a] | 1.75E-03 | 0.0023% |
| 2013 [a] | 1.31E-03 | 0.0017% |
| 2014 | 4.80E-01 | 0.6400% |
| 2015 [b c] | 1.41E-02 | 0.0188% |
| 2016 [b c] | 2.79E-03 | 0.0037% |
| 2017 [b] | 9.87E-04 | 0.0013% |
| 2018 [b] | 7.82E-04 | 0.0010% |
| 2019 [b] | 6.18E-04 | 0.0008% |
| 2020 [d] | 3.74E-04 | 0.0005% |
| 2021 [d] | 2.78E-03 | 0.0037% |
| 2022 [e] | 1.56E-03 | 0.0021% |
| 2023 [e] | 2.61E-03 | 0.0035% |
| 2024 [e] | 1.31E-03 | 0.0017% |
| **40 CFR §191.03(b) Critical Organ Limit** | **75** | |

a. Station C bias-corrected.
b. CAPP88-PC Version 4 used.
c. Station B bias-corrected.
d. CAPP88-PC Version 4.1 used.
e. CAP88-PC Version 4.1.1.0 used.

The calculated annual EDE to the non-WIPP worker at the Shaft #5 construction office trailer for this CY is 4.51E-05 mrem (4.51E-07 mSv). The Shaft #5 construction office trailer is located 0.5 mi (812 m) west-northwest. For the WIPP Effluent Monitoring Program, figure 4.16 and table 4.5 show the EDE to the unbadged onsite worker MEI for the CY. These EDE values are more than four orders of magnitude below the EPA NESHAP limit of 10 mrem (0.1 mSv) per year, as specified in 40 CFR § 61.92.

The non-WIPP business workspace identified as a construction office trailer at the nearest occupied point of the SSCVS project was considered in dose calculations for the CY. However, based on the default parameters in the CAP88-PC model for agricultural activities and the prevailing wind direction, the Shaft #5 construction office was selected as the receptor location. The dose for the Shaft #5 workspace is included in Addendum A to the Periodic Confirmatory Measurement Compliance Report for CY 2024. The calculated dose for the SSCVS workspace was less than that for the Shaft #5 workspace, and thus, is not the maximum receptor. Figure 4.16 and table 4.5 include the historical dose to the MEI (either the SSCVS or the Shaft #5 workspace) for the respective CY.

For the CY, the calculated annual EDE to the offsite resident MEI from normal operations conducted at the WIPP facility is 1.45E-06 mrem (1.45E-08 mSv). For the WIPP Effluent Monitoring Program, figure 4.17 and table 4.6 show the EDE to the MEI from CY 2002 to this CY. These EDE values are more than five orders of magnitude below the EPA NESHAP limit of 10 mrem/yr (0.1 mSv/yr), as specified in 40 CFR § 61.92.

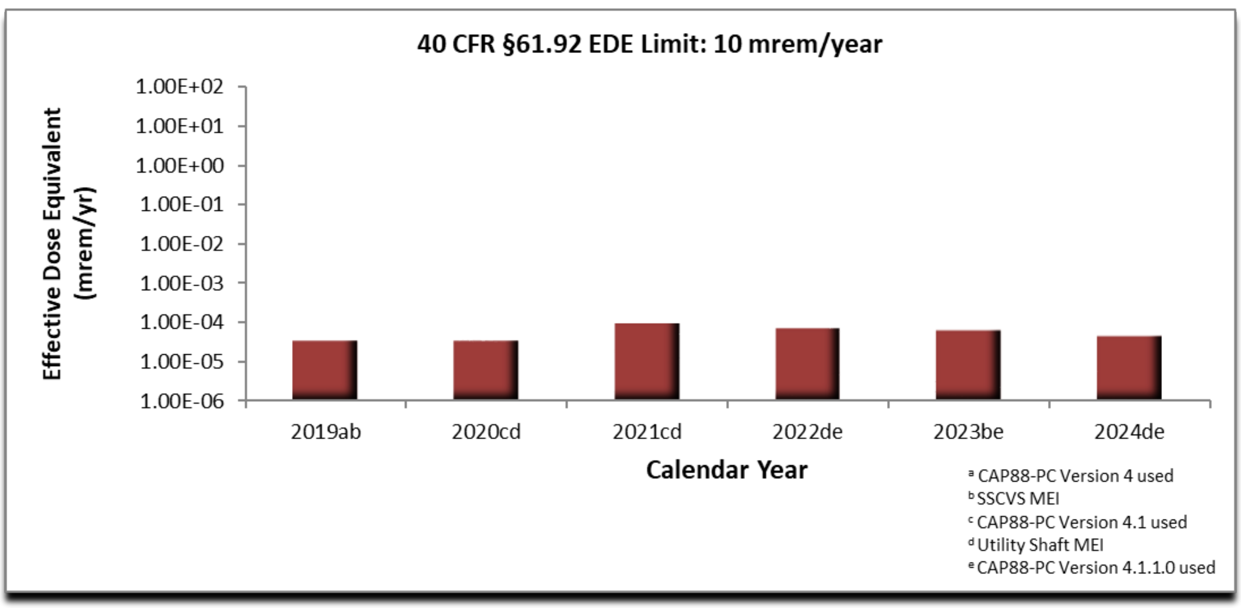



**Figure 4.16 – WIPP Effective Dose Equivalent to the Maximally Exposed Individual**

**Table 4.5 – Comparison of EDEs to EPA Limit of 10 mrem/year per 40 CFR § 61.92**

| Year | Effective Dose Equivalent (mrem/yr) | Percentage of EPA Limit |
|---|---|---|
| 2019 [a b] | 3.48E-05 | 0.000348% |
| 2020 [c d] | 3.43E-05 | 0.000342% |
| 2021 [c d] | 9.70E-05 | 0.000970% |
| 2022 [d e] | 7.20E-05 | 0.000720% |
| 2023 [b e] | 6.30E-05 | 0.000630% |
| 2024 [d e] | 4.51E-05 | 0.000451% |

a. CAP88-PC Version 4 used.
b. SSCVS MEI.
c. CAP88-PC Version 4.1 used.
d. Shaft #5 used.
e. CAP88-PC Version 4.1.1.0 used.

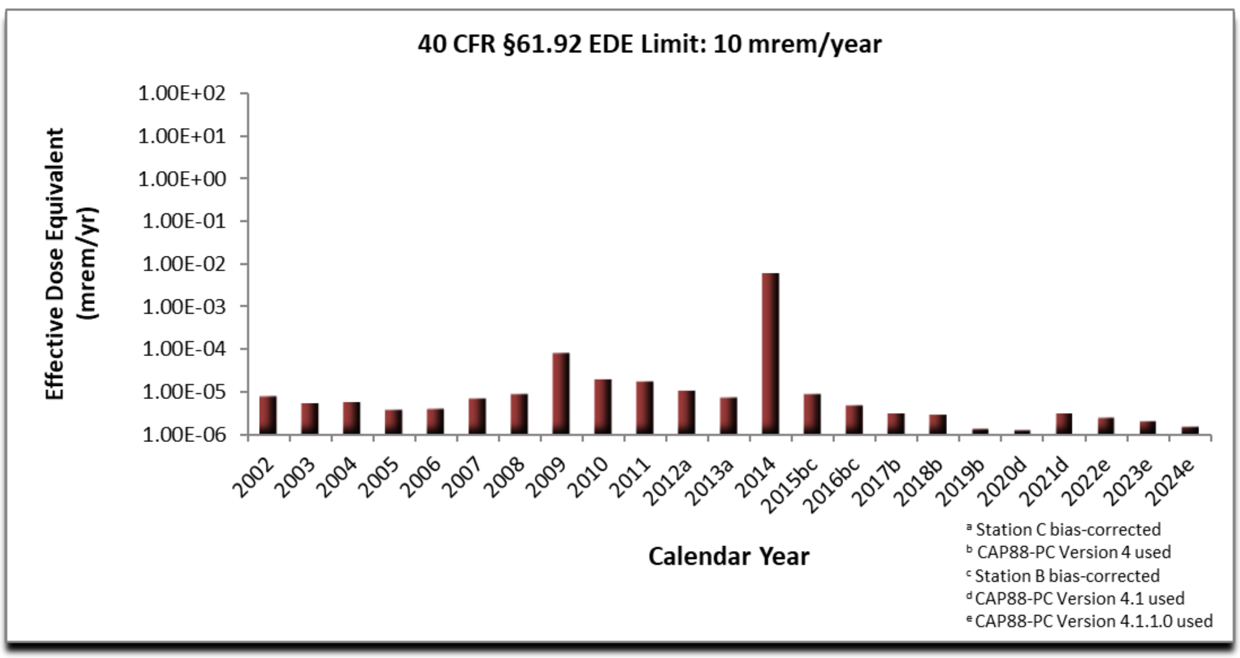



**Figure 4.17 – WIPP Effective Dose Equivalent to the Offsite Maximally Exposed Individual (i.e., individual resident member of the public)**

**Table 4.6 – Comparison of EDEs to EPA Limit of 10 mrem/year per 40 CFR § 61.92**

| Year | Effective Dose Equivalent (mrem/yr) | Percentage of EPA Limit |
|---|---|---|
| 2002 | 7.61E-06 | 0.000076% |
| 2003 | 5.43E-06 | 0.000054% |
| 2004 | 5.69E-06 | 0.000057% |
| 2005 | 3.85E-06 | 0.000039% |
| 2006 | 3.93E-06 | 0.000039% |
| 2007 | 7.01E-06 | 0.000070% |
| 2008 | 9.05E-06 | 0.000091% |
| 2009 | 7.80E-05 | 0.000780% |
| 2010 | 1.91E-05 | 0.000191% |
| 2011 | 1.75E-05 | 0.000175% |
| 2012 [a] | 1.06E-05 | 0.000110% |
| 2013 [a] | 7.39E-06 | 0.000081% |
| 2014 | 5.86E-03 | 0.058600% |
| 2015 [b c] | 8.98E-06 | 0.000090% |
| 2016 [b c] | 4.72E-06 | 0.000047% |
| 2017 [b] | 3.02E-06 | 0.000030% |
| 2018 [b] | 2.86E-06 | 0.000029% |
| 2019 [b] | 1.36E-06 | 0.000014% |
| 2020 [d] | 1.28E-06 | 0.000013% |
| 2021 [d] | 3.17E-06 | 0.000032% |
| 2022 [e] | 2.49E-06 | 0.000025% |
| 2023 [e] | 1.98E-06 | 0.000020% |
| 2024 [e] | 1.45E-06 | 0.000015% |
| NESHAP Limit | 10 | |

a. Station C bias-corrected.
b. CAPP88-PC Version 4 used.
c. Station B bias-corrected.
d. CAPP88-PC Version 4.1 used.
e. CAPP88-PC Version 4.1.1.0 used.

### 4.9.2 Environmental Monitoring

The radionuclide concentrations observed in environmental monitoring samples were extremely low and comparable to radiological baseline levels and to previous years' levels.

Environmental samples that contained the highest concentrations of radionuclides that were higher (or equal) to the baseline concentrations included the following:

Groundwater: For $^{235}U$, WQSP-5 at 5.81E-02 was above the $^{235}U$ baseline of 3.00E-02 Bq/L

Sediment: For Pecos River and associated bodies of water, the $^{40}K$ concentration baseline of 5.00E-01 Bq/g was exceeded at PCN with a concentration of 5.13E-01 Bq/g.

Soil: For $^{234}U$ above the baseline concentration of 8.60E-03 Bq/g was WFF Dup 5–10 cm with 9.04E-03 Bq/g. For $^{235}U$ above the baseline concentration of 9.50E-04 Bq/g were WEE 2–5 with 9.77E-04 Bq/g and WSS 5–10 cm with 1.37E-03 Bq/g. For $^{238}U$ above the baseline concentration of 1.30E-02 Bq/g were MLR 0–2 cm with 1.57E-02 Bq/g, MLR 2–5 cm with 1.48E-02 Bq/g, MLR 5–10 cm with 1.59E-02 Bq/g. For $^{40}K$ above the baseline concentration of 3.40E-01 Bq/g was MLR 0–2 cm with 3.92E-01 Bq/g and MLR 2–5 cm with 4.30E-01 Bq/g, and MLR 5–10 cm with 3.94E-01.

Vegetation: For $^{234}U$ above the baseline concentration of 6.00E-05 Bq/g was SMR with 1.49E-03 Bq/g. For $^{238}U$ above the baseline concentration of 6.90E-04 Bq/g was SMR with 1.77E-03 Bq/g, MLR with 7.29E-03 Bq/g, and WSS with 7.94E-04 Bq/g.

Air Filter Composites: For $^{40}K$ above the baseline concentration of 3.20E-04 Bq/m$^3$ were WEE Q2 at 7.25E-04 Bq/m$^3$, WEE Q3 at 5.41E-04 Bq/m$^3$, WEE Q4 at 5.86E-04 Bq/m$^3$, WSS Q4 at 6.69E-04 Bq/m$^3$ , SEC Q1 at 4.85E-04 Bq/m$^3$, SEC Q3 at 3.97E-04 Bq/m$^3$, CBD Q3 at 6.04E-04 Bq/m$^3$, and SOO Q1 at 6.18E-04 Bq/m$^3$.

No other groundwater, surface water, sediment, soil, vegetation, or fauna samples yielded concentrations higher than the baseline concentration. The concentrations higher than the baseline listed above are most likely due to natural spatial variability, and within the trends of previous years.

# 5.0 ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION

Non-radiological programs at the WIPP facility include land management, meteorological monitoring, VOC monitoring, seismic monitoring, certain aspects of liquid effluent, and surface water and groundwater monitoring. The monitoring is performed to comply with Permit requirements and provisions of the WIPP authorization documents. Radiological and non-radiological groundwater monitoring are discussed in chapters 4 and 6, respectively.

## 5.1 PRINCIPAL FUNCTIONS OF NON-RADIOLOGICAL SAMPLING

The principal functions of the non-radiological environmental surveillance program are to:

- Assess the impacts of the WIPP facility operations on human health.
- Assess the impacts of the WIPP facility operations on the surrounding ecosystem.
- Monitor ecological conditions in the Los Medaños region.
- Provide data that has not been or will not be acquired by other programs but is important to the WIPP mission.
- Comply with applicable commitments (e.g., DOE/BLM Memorandum of Understanding and interagency agreements).

## 5.2 LAND MANAGEMENT PLAN

The LMP, available to the public on the WIPP Home Page, was developed as required by the WIPP LWA to identify resource values, promote multiple-use management, and establish long-term goals for the management of WIPP lands. It was developed in consultation with the BLM and the State of NM.

The LMP sets forth cooperative arrangements and protocols for addressing WIPP-related land management actions. The LMP is reviewed biennially to assess the adequacy and effectiveness of the document or as may be necessary to address emerging issues affecting WIPP lands. The LMP will be updated in 2025.

### 5.2.1 Land Use Requests

Parties who wish to conduct activities that may impact lands under the jurisdiction of the DOE but outside the PPA (figure 1.2) are required by the LMP to prepare an LUR. An LUR consists of a narrative description of the project, a completed environmental compliance review, and a map depicting the location of the proposed activity. In the 2023 update to the LMP, the LUR abstract was revised to include an abbreviated environmental compliance review for non-WIPP related projects. WIPP-related projects will continue to provide separate environmental compliance review documentation with land use requests. Documentation is used to determine if applicable regulatory requirements have been met prior to approval of a proposed project. An LUR is submitted to the Land Use Coordinator by organizations wishing to perform construction on rights-of-way, pipeline easements, or similar actions within the WLWA or on lands used in the operation of the WIPP facility under the jurisdiction of the DOE. In the CY, four LURs were reviewed and approved.

### 5.2.2 Wildlife Population Monitoring

An updated list of threatened and endangered species for Eddy and Lea Counties, NM, was compiled from multiple sources in April 2023 and included in the updated LMP (see section 2.11 Endangered Species Act). This list includes federal and state-listed threatened and endangered species, and species under federal review.

Employees of the WIPP facility continue to consider resident species when planning activities that may impact wildlife or their habitat. The LMP details wildlife management objectives and provisions for hunting and trapping. Implementation of these objectives ensures that operations at the WIPP facility have little to no impact on wildlife.

Implementation of specific best management practices are also utilized to monitor and protect wildlife. For example, best management practices for mowing access road rights-of-way have been developed. They are utilized to support compliance with the DOE's Pollinator Protection Plan, which is part of a national strategy to protect pollinators and enhance their habitats. As previously mentioned in chapter 2, section 2.12, best management practices are utilized to protect migratory birds found nesting on an artificial nesting platform near a groundwater monitoring well.

### 5.2.3 Reclamation of Disturbed Lands

Reclamation mitigates the effects of WIPP-related activities on affected plant and animal communities and ensures that the effects are not permanent. The objective of the reclamation program is to restore lands used in the operation of the WIPP facility that are no longer needed for those activities by achieving short-term stability that sets a course for eventual ecosystem restoration through natural processes. Reclamation is intended to reduce soil erosion, increase the rate of natural plant colonization and succession, provide habitat for wildlife in disturbed areas, and comply with land use reclamation commitments.

Reclamation includes controlling invasive non-native plants and noxious weeds. Executive Order 13751, *Safeguarding the Nation from the Impacts of Invasive Species,* calls on federal agencies to prevent the introduction, establishment, and spread of invasive species, and eradicate and control populations of established invasive species. In addition, right-of-way grants typically require control of noxious weeds. The primary invasive plant at the WIPP site and on DOE rights-of-way is *Peganum harmala*, commonly known as African rue. Noxious weed management objectives have been established in the LMP to address control of this noxious weed at the WIPP site and on rights-of-ways.

The DOE follows a reclamation program and a long-range reclamation plan in accordance with the LMP and specified right-of-way permit conditions. As locations are identified for reclamation, WIPP personnel reclaim these areas by using the best acceptable reclamation practices. Seed mixes used reflect those species indigenous to the area, with priority given to those plant species that are conducive to soil stabilization, wildlife, and livestock needs. For the CY, no reclamations were completed for rights-of-way granted per this act.

### 5.2.4 Oil and Gas Surveillance

Oil and gas activities within 1.6 km (1 mi) of the LWB are routinely monitored in accordance with the LMP to identify new activities associated with oil and gas exploration and production, including the following:

- Survey staking
- Surface geophysical exploration
- Drilling
- Pipeline construction
- Work-overs
- Changes in well status
- Anomalous occurrences (e.g., leaks, spills, accidents, noxious weeds, litter, non-compliances)

During the CY, WIPP surveillance teams conducted monthly surveillance and field inspections. Oil and gas industry traffic remained high near the WLWA and rights-of-way. Consequently, land management measures were utilized to ensure objectives were met for minimal environmental impact on WIPP properties. These measures included monitoring for illegal dumping and off-road travel. High-risk areas were identified, and signs and barricades were maintained in several areas to control access. The oil and gas industry traffic resulted in many abandoned tires and debris on WIPP access roads. This material was removed by WIPP personnel and properly discarded or recycled if possible.

The New Mexico Department of Agriculture selects noxious weeds and targets them for control or eradication pursuant to the New Mexico Noxious Weed Management Act of 1998. In the CY, monitoring for noxious weeds was continued on WIPP lands. A probable mode of dispersal for noxious weeds is oil and gas industry traffic within the WLWA. Areas, where noxious weeds were discovered on WIPP lands, were treated and will be monitored and managed to ensure control is maintained. Noxious weed management objectives are detailed in the LMP.

Proposed new well locations staked within 1.6 km (1 mi) of the LWB are field verified. This ensures that the proposed location is sufficiently far from the LWB to protect the WLWA from potential surface and subsurface trespass. Data from a public database maintained by the State of NM indicated that no new oil wells were spudded during the CY within 1.6 km (1 mi) of the LWB. This was determined from data available on January 2, 2025, and is subject to change. The Delaware Basin Drilling Surveillance Program tracks new wells and updates in status of existing wells.

## 5.3 METEOROLOGICAL MONITORING

Meteorological monitoring data are collected through an array of instrumentation installed on and near a tower located at the WIPP site. Total precipitation for the CY was 48.51 mm (1.91 in) compared to 219.19 mm (8.63 in) for 2023. The average yearly rainfall recorded since August 1996 is 269.38 mm (10.61 in). Figure 5.1 and table 5.1 show the monthly precipitation at the WIPP site for 2024.

The maximum recorded temperature (10-m level) in the CY was 40.39 °C (104.72 °F) in June, whereas the lowest temperature recorded was -13.04 °C (8.53 °F) in January. Monthly temperatures are illustrated in figures and tables 5.2, 5.3, and 5.4. The average temperature in the CY was 19.57 °C (67.23 °F), which is 0.61 °C (1.1 °F) warmer than the 2023 average of 18.96 °C (66.13 °F). The average monthly temperatures ranged from 29.77 °C (85.59 °F) during August to 6.53 °C (43.75 °F) in January (figure 5.3).

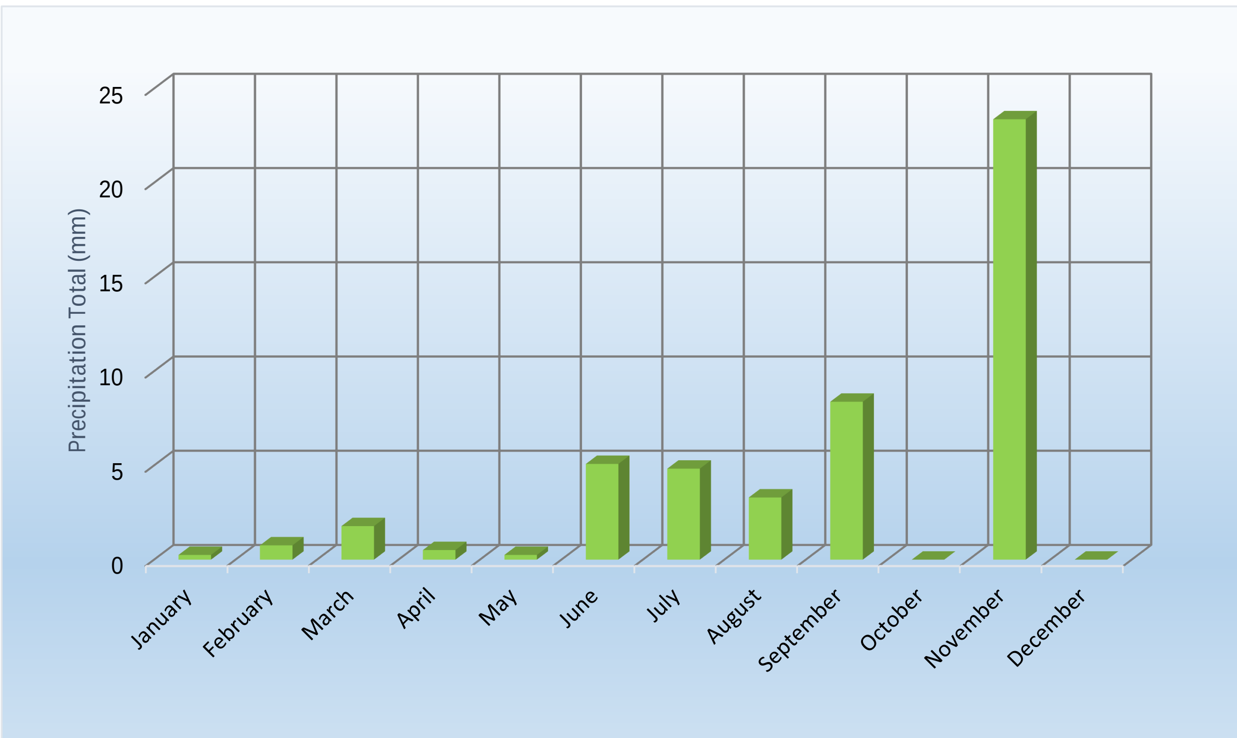



**Figure 5.1 – Precipitation Monthly Totals for 2024**

**Table 5.1 – Precipitation Monthly Totals for 2024**

| Month | Total (mm) | Total (inch) |
|---|---|---|
| January | 0.25 | 0.01 |
| February | 0.76 | 0.03 |
| March | 1.78 | 0.07 |
| April | 0.51 | 0.02 |
| May | 0.25 | 0.01 |
| June | 5.08 | 0.20 |
| July | 4.83 | 0.19 |
| August | 3.30 | 0.13 |
| September | 8.38 | 0.33 |
| October | 0.00 | 0.00 |
| November | 23.37 | 0.92 |
| December | 0.00 | 0.00 |

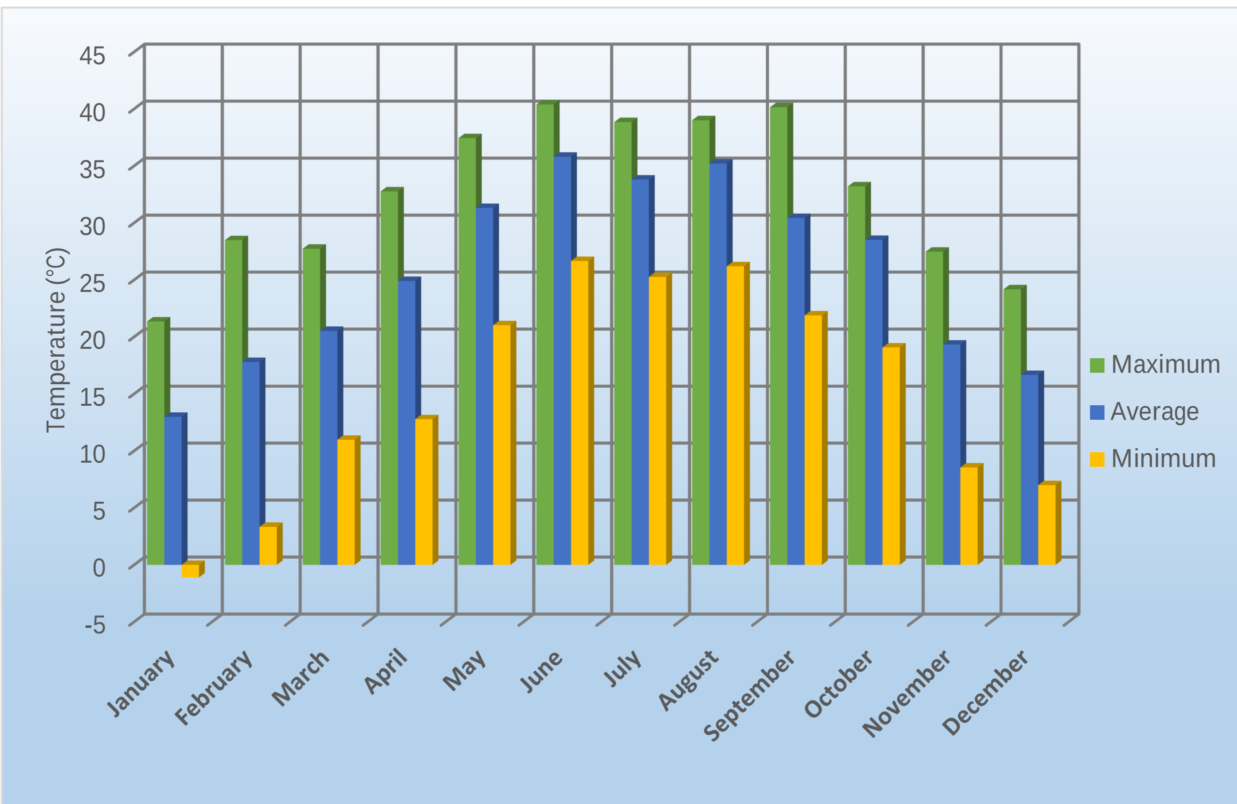



**Figure 5.2 – High Temperatures (°C) for 2024**

**Table 5.2 – High Temperatures (ºC) for 2024**

| Month | Maximum High | Average High | Minimum High |
|---|---|---|---|
| January | 21.36 | 12.99 | -1.10 |
| February | 28.49 | 17.80 | 3.34 |
| March | 27.74 | 20.53 | 10.98 |
| April | 32.77 | 24.91 | 12.78 |
| May | 37.44 | 31.32 | 21.03 |
| June | 40.39 | 35.81 | 26.66 |
| July | 38.85 | 33.81 | 25.26 |
| August | 39.01 | 35.21 | 26.20 |
| September | 40.15 | 30.44 | 21.89 |
| October | 33.21 | 28.51 | 19.08 |
| November | 27.48 | 19.33 | 8.55 |
| December | 24.18 | 16.67 | 7.00 |

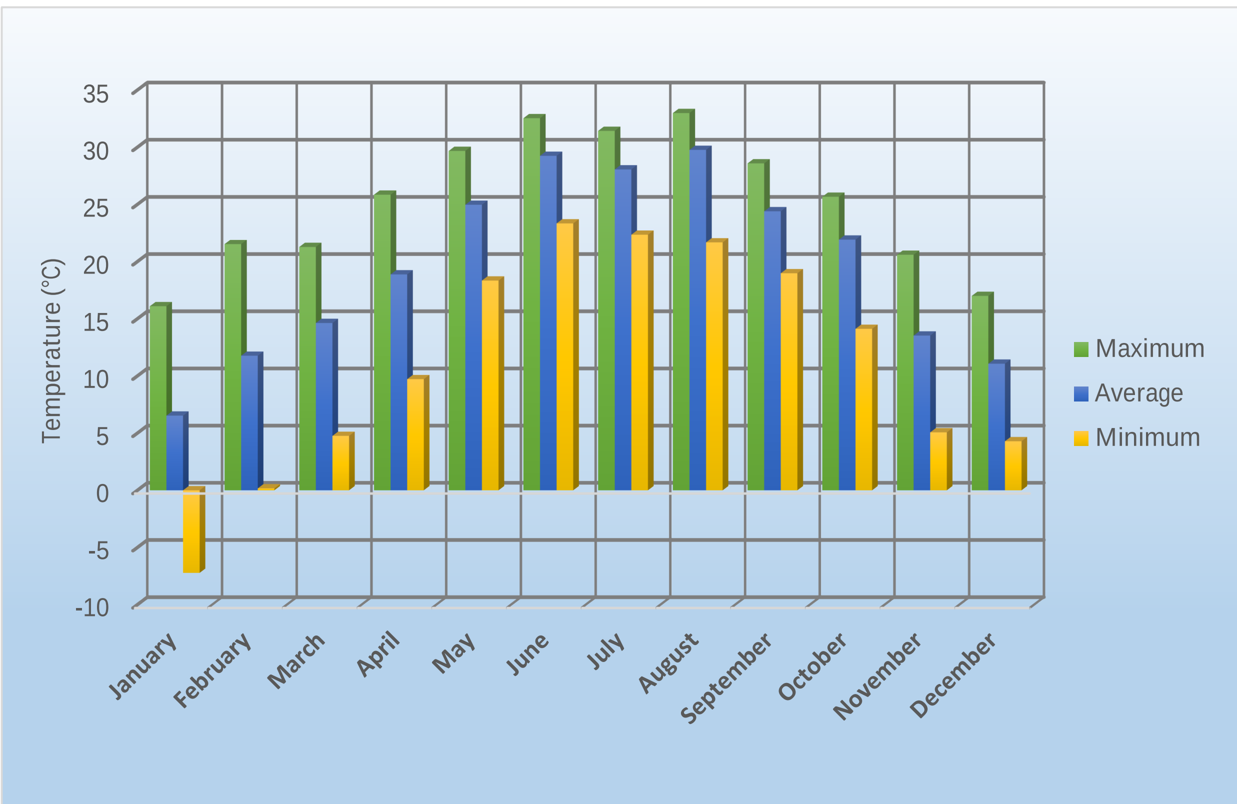



**Figure 5.3 – Average Temperatures (°C) for 2024**

**Table 5.3 – Average Temperatures (°C) for 2024**

| Month | Maximum Average | Average | Minimum Average |
|---|---|---|---|
| January | 16.10 | 6.53 | -7.22 |
| February | 21.53 | 11.77 | 0.17 |
| March | 21.28 | 14.63 | 4.76 |
| April | 25.85 | 18.88 | 9.72 |
| May | 29.68 | 24.97 | 18.34 |
| June | 32.54 | 29.25 | 23.34 |
| July | 31.43 | 28.06 | 22.35 |
| August | 32.99 | 29.77 | 21.68 |
| September | 28.59 | 24.40 | 18.98 |
| October | 25.67 | 21.92 | 14.12 |
| November | 20.60 | 13.53 | 5.07 |
| December | 17.00 | 11.07 | 4.29 |

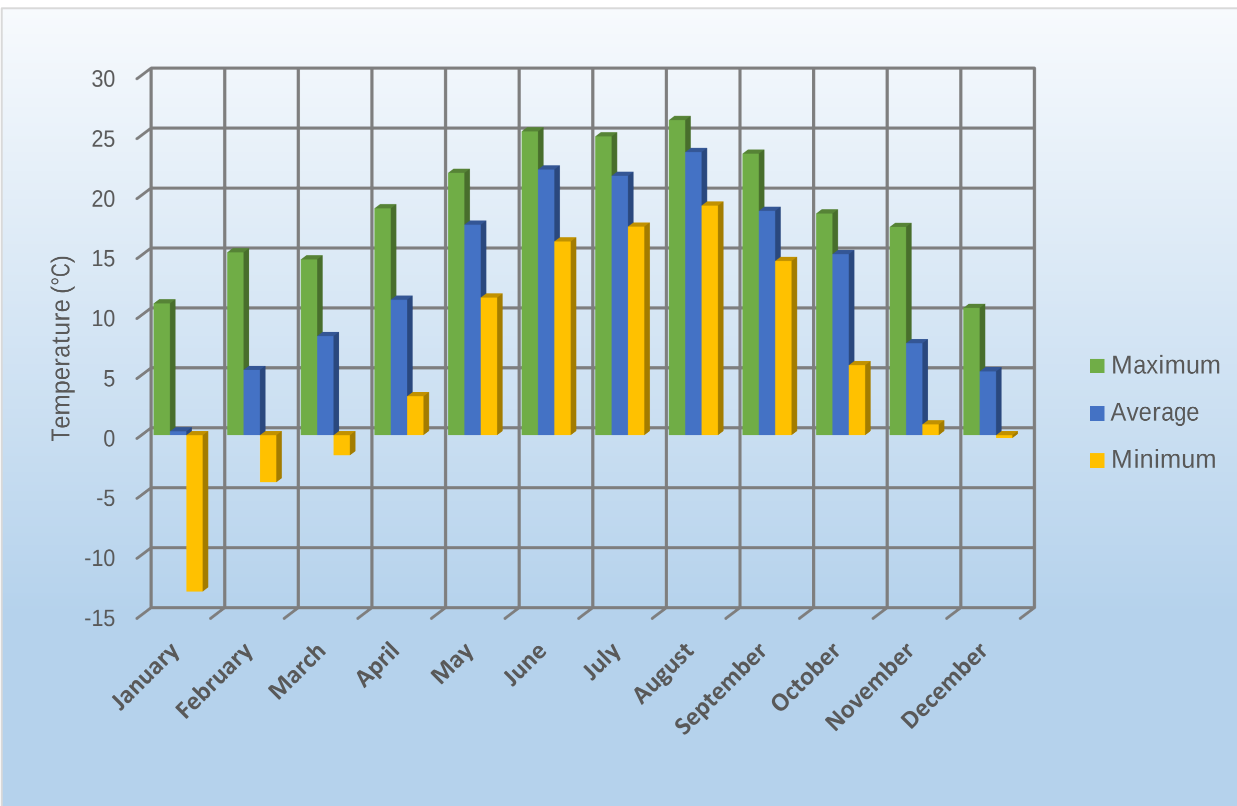


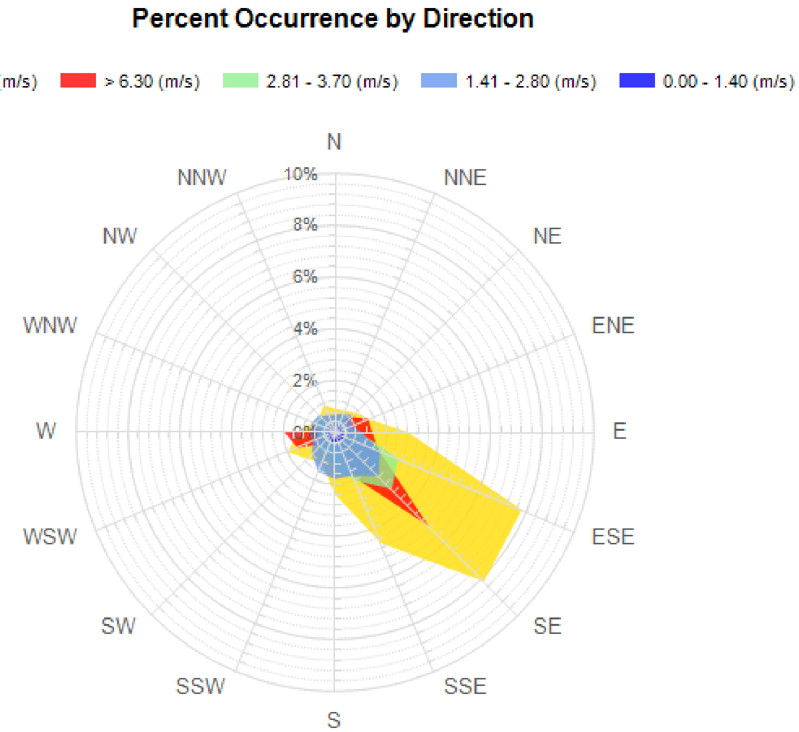

**Figure 5.4 – Low Temperatures (°C) for 2024**

**Table 5.4 – Low Temperatures (ºC) for 2024**

| Month | Maximum Low | Average Low | Minimum Low |
|---|---|---|---|
| January | 10.99 | 0.32 | -13.04 |
| February | 15.25 | 5.45 | -3.93 |
| March | 14.66 | 8.27 | -1.68 |
| April | 18.92 | 11.30 | 3.25 |
| May | 21.88 | 17.56 | 11.48 |
| June | 25.34 | 22.16 | 16.16 |
| July | 24.92 | 21.63 | 17.40 |
| August | 26.28 | 23.61 | 19.15 |
| September | 23.48 | 18.71 | 14.53 |
| October | 18.49 | 15.10 | 5.84 |
| November | 17.37 | 7.67 | 0.90 |
| December | 10.62 | 5.32 | -0.24 |

### 5.3.2 Wind Direction and Wind Speed

Winds in the WIPP area are predominantly from the southeast. Winds of 3.71 to 6.30 meters per second (m/s) (8.30 to 14.09 miles per hour) were the most prevalent in this reporting period, occurring approximately 39.16 percent of the time (measured at the 10-meter level). Figure 5.5 shows percent by wind direction and summarizes the annual wind data for the CY.



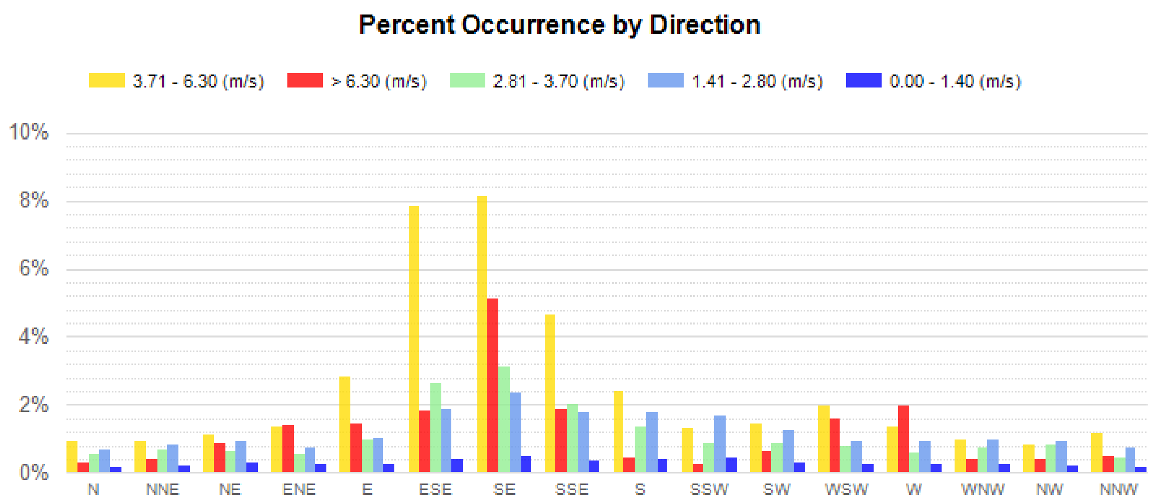




**Figure 5.5 – WIPP Site Wind Speed and Direction (at 10-Meter Level)**

The wind rose in figure 5.5 shows which direction the wind originated from and the length of the color represents how often (percent of the time) the wind blew from that direction. The data represented in the graph is based on 15-minute averages recorded from the 10-meter sensor. The colors represent the different wind speed groups in m/s. The longest color shows wind speeds from the SE at 3.71 to 6.30 m/s, 8.14 percent of the time. In table 5.5 the colors indicate distinct categories of wind speed, while the intensity or opacity of each color reflects the specific range within those categories.

**Table 5.5 – WIPP Site Wind Speed and Direction (at 10-Meter Level)**

| Wind Direction | 0.00–1.40 (m/s) | 1.41–2.80 (m/s) | 2.81–3.70 (m/s) | 3.71–6.30 (m/s) | > 6.30 (m/s) | Total Percent Occurrence by Direction |
|---|---|---|---|---|---|---|
| | | | | | | |
| **N** | 0.17 | 0.66 | 0.53 | 0.91 | 0.32 | 2.60 |
| **NNE** | 0.22 | 0.81 | 0.68 | 0.92 | 0.41 | 3.05 |
| **NE** | 0.28 | 0.93 | 0.63 | 1.09 | 0.85 | 3.78 |
| **ENE** | 0.26 | 0.71 | 0.54 | 1.36 | 1.39 | 4.25 |
| **E** | 0.25 | 1.02 | 0.95 | 2.82 | 1.43 | 6.47 |
| **ESE** | 0.40 | 1.87 | 2.65 | 7.82 | 1.82 | 14.56 |
| **SE** | 0.47 | 2.37 | 3.10 | 8.14 | 5.12 | 19.21 |
| **SSE** | 0.37 | 1.80 | 2.02 | 4.63 | 1.86 | 10.67 |
| **S** | 0.39 | 1.80 | 1.36 | 2.40 | 0.43 | 6.38 |
| **SSW** | 0.43 | 1.66 | 0.89 | 1.30 | 0.23 | 4.53 |
| **SW** | 0.28 | 1.26 | 0.88 | 1.45 | 0.63 | 4.50 |
| **WSW** | 0.27 | 0.92 | 0.80 | 1.99 | 1.57 | 5.56 |
| **W** | 0.25 | 0.91 | 0.60 | 1.37 | 1.95 | 5.09 |
| **WNW** | 0.24 | 0.98 | 0.72 | 0.95 | 0.38 | 3.27 |
| **NW** | 0.18 | 0.90 | 0.80 | 0.85 | 0.39 | 3.13 |
| **NNW** | 0.18 | 0.72 | 0.43 | 1.15 | 0.48 | 2.96 |
| **Totals:** | **4.66%** | **19.33%** | **17.58%** | **39.16%** | **19.28%** | **100.00%** |

## 5.4 VOLATILE ORGANIC COMPOUND MONITORING

Implementation of WP 12-VC.01, *Volatile Organic Compound Monitoring Plan*, ensures the Permittees closely monitor the VOC emissions associated with the TRU mixed waste disposed of in the WIPP repository. There are two Permit-required, concurrent VOC monitoring programs implemented for the WIPP facility. These are the Repository VOC Monitoring Program (RVMP) (surface-based VOC monitoring) and the Disposal Room VOC Monitoring Program (DRVMP) (underground-based VOC monitoring).

Requirements for both programs are in Permit Part 4, Geologic Repository Disposal, and in Permit Attachment N, Volatile Organic Compound Monitoring Plan. The 10 target analytes (target VOCs) required for monitoring and respective limits and risk-based action levels are in Permit Part 4, Section 4.4, Volatile Organic Compound Limits, and in Permit Part 4, Section 4.6.2, Repository Volatile Organic Compound Monitoring.

The RVMP is designed to measure airborne VOC concentrations to which non-waste-handling surface workers and members of the public living outside the WIPP site boundary could be exposed. The RVMP provides the Permittees with the data necessary to determine if VOCs exceed the action levels specified in the Permit. The target analytes are known components to the TRU mixed waste emplaced in the underground. As identified in Permit Attachment N, Section N-2, these target analytes were selected because together they represent approximately 99 percent of the carcinogenic risk due to air emissions of VOCs. The RVMP is also used to determine compliance with the panel closure standards in Permit Part 6, Section 6.10.1, and Permit Attachment G, Section G-1e(1). Post-closure monitoring is performed to demonstrate compliance with the environmental performance standards applicable to members of the public, including the nearest resident beyond the WIPP site boundary.

The Permit-required RVMP locations are Station VOC-C, located on the west side of Building 489—and a background location, Station VOC-D, as shown in figure M-78 of Permit Attachment M. Sampling frequency for repository VOC monitoring occurs twice per week for the two air-sampling locations, in accordance with Permit Attachment N, Section N-3d(1).

For this reporting period, 208 original samples were collected from Stations VOC-C and VOC-D, along with 24 field duplicate samples. Analytical results reported above the method reporting limit from Station VOC-D (background data) are subtracted from Station VOC-C providing the emission value concentration for each VOC target analyte originating from the hazardous waste disposal unit. Summary results for the target analyte maximum emission values are presented in table 5.6a.

**Table 5.6a – Target Analyte Maximum Emission Value**

| Target Analyte | Maximum Emission Value (pptv) | Collection Date |
|---|---|---|
| Carbon tetrachloride | 635 | 10/8/2024 |
| Chlorobenzene | 9.2 | 2/1/2024 |
| Chloroform | 32 | 10/8/2024 |
| 1,1-Dichloroethylene | 11 | 2/1/2024 |
| 1,2-Dichloroethane | 26 | 9/25/2024 & 10/17/2024 |
| Methylene chloride | 2,440 Q | 5/2/2024 |
| 1,1,2,2-Tetrachloroethane | 13 | 2/1/2024 |
| Toluene | 2,600 Q | 10/17/2024 |
| 1,1,1-Trichloroethane | 256 | 10/2/2024 |
| Trichloroethylene | 260 | 10/8/2024 |

Notes.

pptv – parts per trillion by volume

Q = Results are useable but were not associated with analyses that met the QA/QC requirements for precision, accuracy, or completeness.

The total non-carcinogenic risk in terms of Hazard Index (HI) and carcinogenic risk using the emission value in accordance with Permit Attachment N, Section N-3e(1) is also calculated for each target analyte and totaled after each sampling event. The Permittees determined that the risk has remained below action limits listed in Permit Part 4, Section 4.6.2.3, for the RVMP. Summary results for the maximum running annual averages for carcinogenic risk and HI are presented in table 5.6b.

**Table 5.6b – Maximum Individual Sample Results and Maximum Running Annual Averages for Carcinogenic Risk and Hazard Index (Non-Carcinogenic)**

| Maximums | Carcinogenic Risk (unitless) | Hazard Index (unitless) |
|---|---|---|
| **Action Levels** | **1E-05** | **1.0** |
| Maximum Individual Sample Results | 1.04E-06 (10/8/2024) | 1.63E-01 (10/8/2024) |
| Maximum Running Annual Average | 2.01E-07 (10/17/2024 & 10/22/2024) | 3.12E-02 (10/30/2024 & 11/5/2024) |

The DRVMP is designed to measure airborne VOC concentrations within disposal rooms of open/active panels and provides the Permittees with the data necessary to determine if airborne VOC concentrations exceed the limits identified in the Permit. The Permittees compare the measured concentrations of target analytes to the room-based limits and action levels listed in Permit Part 4, Sections 4.4.1 and 4.6.3.2, respectively. For this reporting period, 127 original samples were collected from Panel 8, along with 10 field duplicates and includes measurement results from Rooms 4 (exhaust only), 5, 6, and 7.

The DRVMP sampling in open panels occurs once every two weeks, unless the need to increase the frequency to weekly occurs in accordance with Permit Section 4.6.3.3. For this reporting period, the DRVMP sampling was performed once every two weeks.

Panel 8 disposal room VOC monitoring results conclude that the risk to the waste handling worker remains well below the 50 and 95 percent action levels for any VOC constituent of concern in any closed rooms or active open and immediately adjacent closed room. Summary results for the maximum reported values are presented in table 5.6c and location data is identified by room number, and intake (I) or exhaust (E) function.

**Table 5.6c – Panel 8 Disposal Room VOC Monitoring Program Maximum Results**

| Target Analyte | Maximum Detected Value | | | Action Level (ppmv) | | Room Based Limits (ppmv) |
|---|---|---|---|---|---|---|
| | Result (ppmv) | Location | Date | 50% | 95% | |
| Carbon tetrachloride | 0.805 | 6E | 12/16/2024 | 1,604 | 3,047 | 3,208 |
| Chlorobenzene | 0.00032 | 7E | 8/5/2024 | 6,500 | 12,350 | 13,000 |
| Chloroform | 0.137 | 7I | 12/30/2024 | 1,655 | 3,144 | 3,310 |
| 1,1-Dichloroethylene | 0.0094 | 7E | 12/30/2024 | 915 | 1,738 | 1,830 |
| 1,2-Dichloroethane | 0.0042 J | 7I | 12/30/2024 | 400 | 760 | 800 |
| Methylene chloride | 0.0947 | 7I | 12/30/2024 | 16,665 | 31,665 | 33,333 |
| 1,1,2,2-Tetrachloroethane | 0.00012 J | 6I | 7/23/2024 | 493 | 936 | 986 |
| Toluene | 0.0535 | 7E | 12/30/2024 | 4,011 | 7,621 | 8,023 |
| 1,1,1-Trichloroethane | 0.28 | 6E | 12/16/2024 | 5,616 | 10,671 | 11,233 |
| Trichloroethylene | 1.76 | 7I | 12/30/2024 | 8,000 | 15,200 | 16,000 |

Note. ppmv = parts per million by volume; J = estimated value; E = exhaust side of disposal room (sample location); I = intake side of disposal room (sample location).

The analytical data presented in this section is further detailed in the *Semi-Annual Volatile Organic Compound Data Summary Report for the Reporting Period January 1 to June 30, 2024* (DOE-WIPP-24-3611.0) and the *Semi-Annual Volatile Organic Compound Data Summary Report for the Reporting Period July 1 to December 31, 2024* (DOE-WIPP-25-3611.0). All samples were analyzed using gas chromatography/mass spectrometry (GC/MS) under an established QA/QC program and based on the guidance included in EPA Compendium Method TO-15, Determination of VOCs in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS) (EPA, 1999).

## 5.5 SEISMIC ACTIVITY

Currently, seismicity within 300 km (186 mi) of the WIPP site is being monitored using United States Geological Survey (USGS). This information was historically obtained by New Mexico Institute of Mining and Technology (NMIMT). Data generated by the NMIMT were used from January 1 to March 31, 2024. Data obtained from the USGS were used from April 1 to December 31, 2024. The USGS collects information from their own network of seismographs as well as seismographs from NMIMT (figure 5.6). A network of 25 seismograph stations continuously monitors the seismographic activity occurring in eastern New Mexico.

No additional stations were installed this year. From January 1 to December 31, 2024, locations for 4,672 total seismic events and for this same period, 477 seismic events larger than magnitude 2.5 recorded within 300 km (186 mi) of the WIPP site. Recorded data included origin times, epicenter coordinates, and magnitudes. This number of events cannot be directly compared to ASERs prior to 2022 because a new methodology was used that located events more accurately but excluded extremely small indeterminate events. Comparing similar datasets, this region's detected events remained approximately constant from 2022. The strongest recorded event (magnitude 5.1) occurred on September 17, 2024; this event was approximately 166.6 km (103.5 mi) southwest of the WIPP site. The seismic event closest to the site occurred approximately 32.2 km (20 mi) southwest and had a magnitude of 1.1.

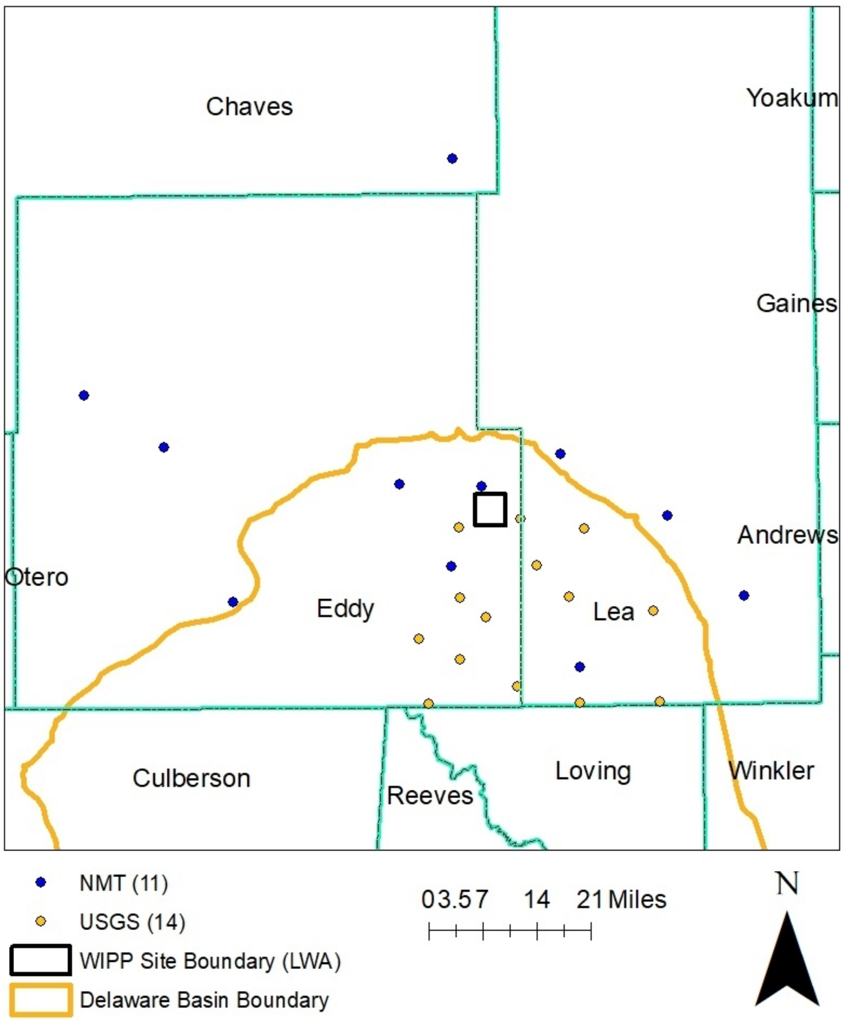



**Figure 5.6 – Seismograph Station Locations in the Vicinity of the WIPP Site**

## 5.6 LIQUID EFFLUENT MONITORING

The NMED Ground and Surface Water Protection regulations outlined 20.6.2 NMAC regulate discharges that could impact surface water or groundwater. The DOE's compliance with these regulations is discussed in chapter 2. The DP was modified and renewed on January 28, 2022. This DP renewal/modification was discussed in the 2022 ASER.

Effluent Lagoons B and C were not sampled during 2024 since there was no industrial wastewater discharge to either lagoon. Salt Storage Ponds 1–3 and 5, and Stormwater Ponds 1–3 were not sampled as there were no rain events of 2 inches or greater within a 24-hour period during 2024.

Brine Water Storage Pond 4 and Brine Retention Ponds East and West were not sampled because they were not completed during this reporting period. Analytical data from the discharge monitoring reports for Effluent Lagoon A and Evaporation Pond H-19 are summarized in table 5.7.

**Table 5.7 – Effluent Lagoon A and Evaporation Pond H-19 Analytical Results for 2024**

| Location and Sampling Period | Nitrate (mg/L) | TKN (mg/L) | TDS (mg/L) | Sulfate (mg/L) | Chloride (mg/L) |
|---|---|---|---|---|---|
| Effluent Lagoon A - Spring | ND | 46 | 3,700 | 220 | 1,100 |
| Evaporation Pond H-19 - Spring | NS | NS | NS | NS | NS |
| Effluent Lagoon A - Fall | ND | 49 | 2,730 | 186 | 867 |
| Evaporation Pond H-19 - Fall | NA | NA | 294,000 | 54.7 | 143,000 |

Note.

mg/L = milligrams per liter.
NA = not applicable; analysis not required by DP-831.
ND = non-detect.
NS = not sampled (due to pond/lagoon being dry or no rainfall event over 2 inches in 24 hours).

# 6.0 SITE HYDROLOGY, GROUNDWATER MONITORING, AND PUBLIC DRINKING WATER PROTECTION

Current groundwater monitoring activities near the WIPP facility are outlined in the *WIPP Groundwater Monitoring Program Plan* (WP 02-1). In addition, the MOC has detailed procedures for performing specific activities, such as pumping system installations, field monitoring analyses and documentation, and QA records management. Groundwater monitoring activities are also included in the *Waste Isolation Pilot Plant Environmental Monitoring Plan* (DOE/WIPP-99-2194).

## 6.1 SITE HYDROLOGY

The hydrology at and surrounding the WIPP site has been studied extensively over the past 40 years. The following sections summarize the hydrology in this area. Figure 6.1 shows a generalized schematic of the site's stratigraphy. Details for hydrology and stratigraphy can be found in Mercer (1983), Beauheim (1986, 1987), and Beauheim and Ruskauff (1998).

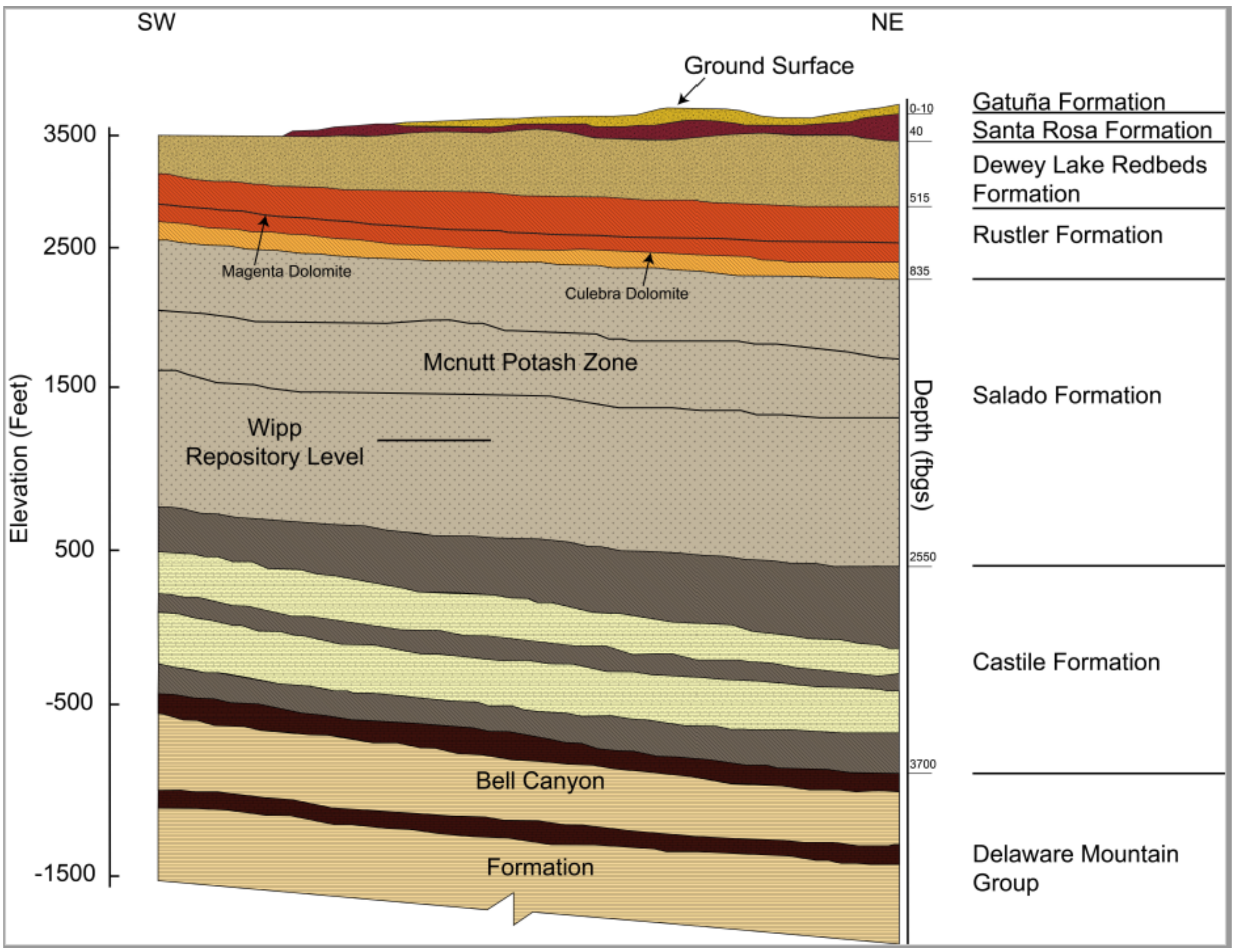



**Figure 6.1 – WIPP Stratigraphy**

### 6.1.1 Surface Hydrology

Surface water is absent at the WIPP site. The nearest significant surface water body, Laguna Grande de la Sal, is 13 km (8 mi) west-southwest of the center of the WIPP site in Nash Draw, where shallow brine ponds occur. Small, manmade livestock watering holes (tanks) occur several kilometers from the WIPP site but are not hydrologically connected to the formations overlying the WIPP repository.

### 6.1.2 Subsurface Hydrology

Several water-bearing zones have been identified and extensively studied at and near the WIPP site. Limited amounts of potable water are found in the middle of the Dewey Lake Redbeds Formation (Dewey Lake) and the overlying Triassic Dockum group in the southern part of the WLWA. Two saline water-bearing units, the Culebra and the Magenta Dolomite (Magenta), occur in the Rustler. Another very low transmissivity, saline water-bearing zone occurs at the Rustler-Salado contact.

#### 6.1.2.1 Hydrology of the Castile Formation

The Castile Formation (Castile) is composed of a sequence of three thick anhydrite beds separated by two thick halite beds. This formation acts as an aquitard, separating the Salado from the underlying water-bearing sandstones of the Bell Canyon Formation (Bell Canyon). In the halite zones, the occurrence of circulating groundwater is restricted because halite at these depths does not readily maintain secondary porosity, open fractures, or solution channels.

No regional groundwater flow system has been found in the Castile near the WIPP site. The only significant water present in the formation occurs in isolated brine reservoirs in fractured anhydrite. Wells have encountered pressurized brine reservoirs in the upper anhydrite unit (A-III) of the Castile in the vicinity of the WIPP site. Two such encounters were made by boreholes drilled for the WIPP Project: ERDA-6, northeast of the WIPP site, encountered a pressurized brine reservoir in 1975; and borehole WIPP-12, 1.61 km (1 mi) north of the center of the WIPP site, encountered a brine reservoir in 1981. Both encounters were hydrologically and chemically tested in 1981 and determined to be unconnected (Popielak et al., 1983).

#### 6.1.2.2 Hydrology of the Salado Formation

The massive halite beds within the Salado host the WIPP repository horizon. The Salado represents a regional aquiclude due to the hydraulic properties of the bedded halite that forms most of the formation. In the halites, the presence of circulating groundwater is restricted because halites do not readily maintain primary porosity, solution channels, or open fractures.

The results of permeability testing, both within the facility and from the surface, provide interpreted Darcy permeabilities that range from less than 1E-23 to 3E-16 $m^2$ (1.08E-22 to 3.23E-15 $ft^2$), with the more pure (less argillaceous) halites having the lower permeability. Anhydrite interbeds typically have permeabilities ranging from 2E-20 to 9E-18 $m^2$ (2.15E-19 to 9.67E-18 $ft^2$) (Beauheim and Roberts, 2002). The only significant variation to these extremely low permeabilities occurs in the immediate vicinity of the underground workings (Stormont et al., 1991). This increase is believed to be a result of near-field fracturing due to the excavation.

Small quantities of brine have been observed to collect in boreholes drilled into Marker Bed 139 a few feet below the floor of the WIPP underground repository rooms and have been observed to seep out of the excavated walls. The long-term performance assessment for the WIPP disposal system assumes that small quantities of brine will be present in the WIPP repository.

#### 6.1.2.3 Hydrology of the Rustler-Salado Contact

In Nash Draw and areas immediately west of the site, the Rustler-Salado contact exists as a dissolution residue capable of transmitting water. Eastward from Nash Draw toward the WIPP site, the amount of dissolution decreases and the transmissivity of this interval decreases (Mercer, 1983). Small quantities of brine were found in the test holes in this zone at the WIPP site (Mercer and Orr, 1977).

#### 6.1.2.4 Hydrology of the Culebra Member

The Culebra is the most transmissive hydrologic unit in the WIPP site area and is considered the most significant potential hydrologic pathway for a radiologic release to the accessible environment. Tests show that the Culebra is a fractured, heterogeneous system approximately 7.6 m (25 ft) thick, with varying local anisotropic characteristics (Mercer and Orr, 1977; Mercer, 1983; Beauheim, 1986, 1987; Beauheim and Ruskauff, 1998). Culebra transmissivities in the Nash Draw range up to 1,250 square ft ($ft^2$) per day ($ft^2$/d) ($1.3 \times 10^{-3}$ meters squared per second [$m^2$/s]); closer to the WIPP facility, they are as low as 0.007 to 74 $ft^2$/d ($7.5 \times 10^{-9}$ to $8.0 \times 10^{-5}$ $m^2$/s) (NMED, 2023; see HWFP Section L-1a(2)(iii)) the document is available here: wipp.energy.gov. Transmissivities generally decrease from west to east across the site area, with a higher transmissivity zone trending southeast from the center of the WIPP site to the LWB. The regional flow direction of groundwater in the Culebra is generally south.

#### 6.1.2.5 Hydrology of the Magenta Member

The Magenta is situated above the Culebra and, although it is not the water-bearing zone of interest for monitoring of a facility release, it is of interest in understanding water-level changes that occur in the Culebra. The Magenta has been tested in 18 cased and open holes at and around the WIPP site. Magenta transmissivities within the WIPP site range from 2.0E-04 to 3.5E-02 $m^2$/d (2.1E-03 to 3.8E-01 $ft^2$/d) (Beauheim et al., 1991; Beauheim and Ruskauff, 1998; Bowman and Roberts, 2009).

#### 6.1.2.6 Hydrology of the Dewey Lake Redbeds Formation

The Dewey Lake at the WIPP site is approximately 152 m (500 ft) thick and consists of alternating thin beds of siltstone and fine-grained sandstone. The upper Dewey Lake consists of a thick, generally unsaturated section. The middle Dewey Lake is the interval immediately above a cementation change, from carbonate (above) to sulfate (below), where saturated conditions and a natural water table have been identified in limited areas. An anthropogenic saturated zone has been observed in the overlying Santa Rosa Formation (Santa Rosa) and in the upper part of the Dewey Lake since 1995. This is described in section 6.4. The lower Dewey Lake is below the sulfate cementation change, with much lower permeabilities.

WIPP monitoring wells WQSP-6A and PZ-17b (figure 6.8, later in this chapter) intersect natural water in the Dewey Lake. At these locations, the saturated horizon is within the middle portion of the formation. The saturated zone is vertically and laterally distinct from the water at well C-2811 (see section 6.4 for a full discussion of PAW). Well C-2811 is located approximately 1.61 km (1 mi) northeast of WQSP-6A on the C-2737 well pad (figure 6.2). Approximately 1.61 km (1 mi) south of the WIPP site, domestic and stock supply wells produce water from the middle Dewey Lake.

#### 6.1.2.7 Hydrology of the Santa Rosa and Gatuña Formations

Within the LWB, the Santa Rosa is relatively thin to absent. At the Air Intake Shaft, 0.6 m (2 ft) of rock is classified as the Santa Rosa. The Santa Rosa is a maximum of 78 m (256 ft) thick in exploratory potash holes drilled for the WIPP Project east of the LWB. The Santa Rosa is thicker to the east. The geologic data from site characterization studies have been incorporated with data from drilling to investigate PAW to map Santa Rosa structure and thickness in the vicinity of the WIPP surface structures. These results are consistent with the broader regional distribution of the Santa Rosa (*WIPP Compliance Recertification Application*, DOE/WIPP-04-3231).

Water in the Santa Rosa was discovered in the center part of the WIPP site through characterizing several monitoring wells in 1995. This shallow water was not detected while mapping the shafts in the 1980s. It was determined that the shallow water was anthropogenic and derived from infiltration through unlined sources (Daniel B. Stephens & Associates, Inc., 2003).

To assess the nature and extent of this water, piezometers PZ-1 to PZ-12 were installed in the area between the WIPP shafts. Also, wells C-2505, C-2506, and C-2507 were drilled and tested in 1996 and 1997 (*Exhaust Shaft Hydraulic Assessment Data Report*, DOE/WIPP-97-2219). These wells are shown in figure 6.8 later in this chapter. During October 2007, three additional piezometers (PZ-13, PZ-14, and PZ-15) were installed around the SPDV tailings pile to evaluate the nature and extent of PAW around this area. For further investigation, wells PZ-16, PZ-17a, PZ-18, and PZ-19 were completed in the Santa Rosa in 2020.

The Gatuña Formation (Gatuña) unconformably overlies the Santa Rosa at the WIPP site, ranging in thickness from approximately 6 to 9 m (20 to 30 ft). The Gatuña consists of silt, sand, and clay, with deposits formed in localized depressions during the Pleistocene period.

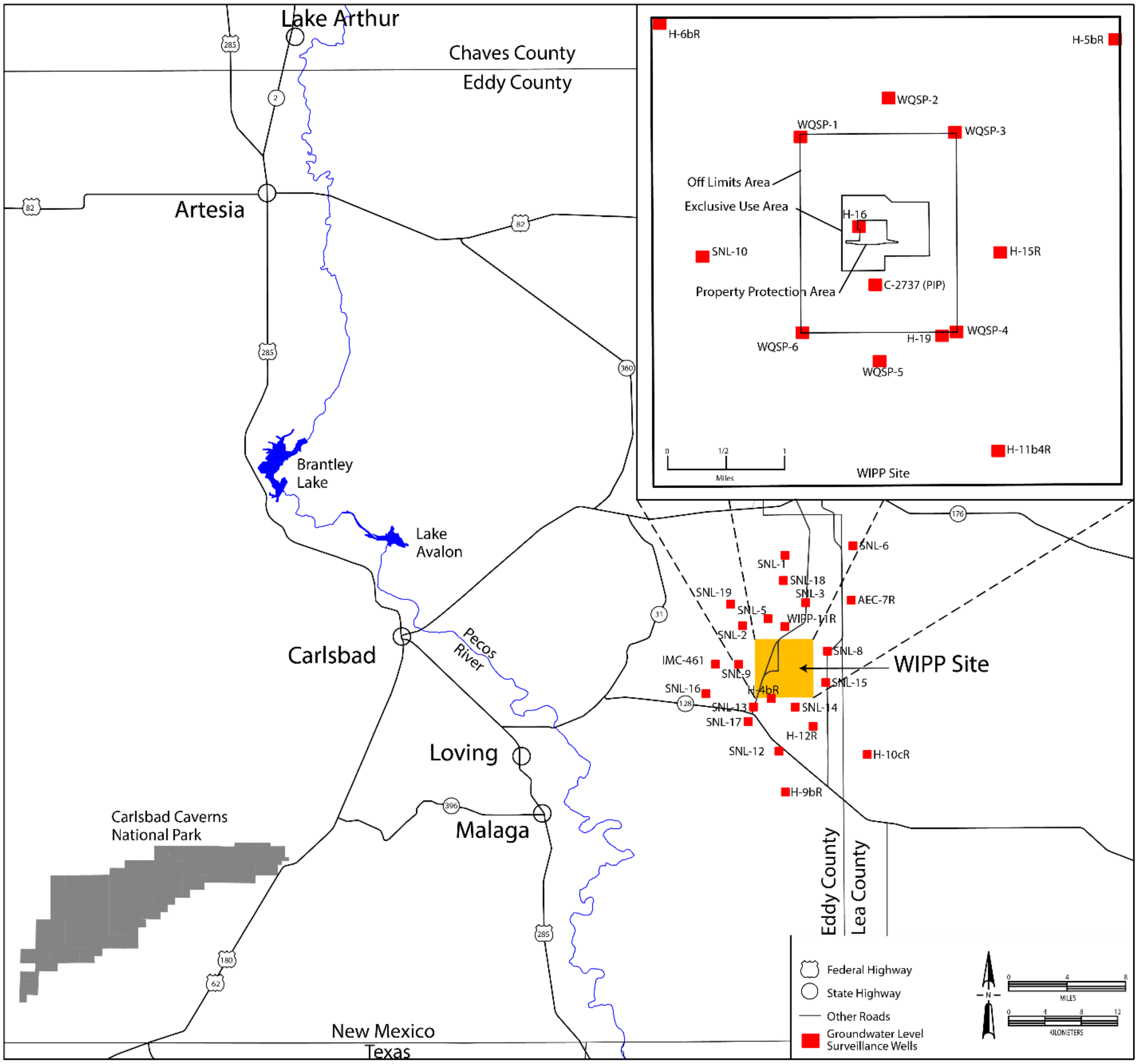



**Figure 6.2 – Culebra Groundwater Level Surveillance Wells** *(Inset Represents the Groundwater Surveillance Wells in the WIPP Land Withdrawal Area)*

The Gatuña is water-bearing in some areas, with saturation occurring in discontinuous perched zones. However, the Gatuña has no known continuous saturation zone because of its erratic distribution. Drilling at the WIPP site, including 30 exploration borings drilled between 1978 and 1979, did not identify saturated zones in the Gatuña (Daniel B. Stephens & Associates, Inc., 2003).

## 6.2 GROUNDWATER MONITORING

### 6.2.1 Program Objectives

The objectives of the groundwater monitoring program are to:

- Monitor the physical and chemical characteristics of groundwater.
- Maintain surveillance of groundwater levels surrounding the WIPP facility throughout the operational lifetime of the facility.
- Document and identify effects, if any, of WIPP operations on groundwater parameters throughout the operational lifetime (including closure) and post-closure of the facility.

Data obtained through the WIPP groundwater monitoring program support two major regulatory programs: (1) the RCRA*,* DMP supporting the Permit in compliance with 20.4.1.500 NMAC (incorporating 40 CFR Part 264, Subpart F, "Releases From Solid Waste Management Units," and 40 CFR Part 264, Subpart X, "Miscellaneous Units"), and (2) performance assessment supporting *Title 40 CFR Part 191 Subparts B & C Compliance Certification Application for the Waste Isolation Pilot Plant* (DOE/CAO-96-2184) and 5-year CRAs.

Baseline water chemistry data in the DMP wells were collected from 1995 through 1997 and reported in the *Waste Isolation Pilot Plant RCRA Background Groundwater Quality Baseline Report* (DOE/WIPP-98-2285). The baseline data were expanded in 2000 to include 10 rounds of sampling instead of 5 and the sample distribution type was based upon the 10 rounds. The 95th upper tolerance limit value (UTLV) is used in cases where the sample distribution type is either normal or lognormal. The 95th percentile value is used in cases where the sample distribution type is nonparametric or has greater than 15 percent non-detects. The data were published in Addendum 1, *Waste Isolation Pilot Plant RCRA Background Groundwater Quality Baseline Update Report* (IT Corporation, 2000). These baseline data are compared to water quality data collected annually.

### 6.2.2 Summary of Activities

Culebra's groundwater monitoring activities include groundwater quality sampling, groundwater level monitoring, and the fluid density survey, as described in this section. The Permit requires these programs. Table 6.1 presents a summary of WIPP groundwater monitoring activities in the CY.

Wells are classified as environmental surveillance wells. The WIPP facility does not have wells required for remediation, waste management, or other uses. Appendix F, table F.3, lists active groundwater monitoring wells used for the WIPP facility at the end of the CY. Radiological data for the CY from the DMP are summarized in chapter 4. The remaining data from the DMP are contained in this chapter.

**Table 6.1 – Summary of WIPP Groundwater Monitoring Program**

| | |
|---|---|
| Number of Active Wells during CY | 81 |
| Number of Samples | 244 [a] |
| Number of Water Level Measurements | 738 |
| Total Number of Analyte Measurements | 1,116 [b] |

a. Includes primary, duplicate, and blank samples collected from six wells.

b. Includes primary, duplicate, and QA (blanks) sample analyses.

Regular monthly groundwater level data were gathered from 52 wells across the WIPP region, one of which (i.e., C-2737) is equipped with a production-injection packer (PIP) to allow groundwater level surveillance of more than one hydrologic zone in the same well. The six redundant wells on the H-19 pad, the 21 shallow water wells for Santa Rosa/Dewey Lake contact, the one Gatuña well, and the Dewey Lake PZ well (listed in appendix F, table F.3), were measured quarterly. Table F.4 shows the water level data. A water level measurement was not collected where access was unavailable, or in certain wells when testing equipment was present.

### 6.2.3 Groundwater Quality Sampling

The Permit requires groundwater quality sampling once a year, from March through October (round 46 for this CY). Sampling for groundwater quality was performed at six well locations completed in the Culebra (WQSP-1 through WQSP-6), (figure 6.2). Field analyses for pH, specific gravity, specific conductance, and temperature were performed during the sampling to determine when the well had stabilized for final sampling. Primary and duplicate samples for groundwater quality were collected from each of the six wells, for 230 analyses completed per sampling round. Groundwater quality sampling results for the six WQSP wells are included in appendix F, table F.2.

Wells WQSP-1, WQSP-2, and WQSP-3 are upgradient of the WIPP shafts within the LWB. The locations of the wells were selected to be representative of the groundwater moving downgradient onto the WIPP site. Wells WQSP-4, WQSP-5, and WQSP-6 are downgradient of the WIPP shafts within the LWB. Well WQSP-4 was also specifically located to monitor a zone of higher transmissivity.

The difference between the depth of the WIPP repository and the depth of the detection monitoring wells completed in the Culebra varies from 1,270 ft to 1,926 ft (387 m to 587 m). WIPP-related contamination in the groundwater is not anticipated because a release from the repository to the Culebra is highly unlikely. For contaminated liquid to move from the repository to the Culebra, three conditions would have to be met. First, sufficient brine would have to accumulate in the waste disposal areas to leach contaminants from the disposed waste. Second, sufficient pressure would have to build up in the disposal area to overcome the hydrostatic head between the repository and the Culebra. Third, a pathway would have to exist and remain open for contaminated brine to flow from the repository to the Culebra. Since the times required for the brine accumulation and repository pressurization are on the order of thousands of years, and current plans call for the sealing of the shafts and boreholes that could potentially become such pathways upon closure of the facility, WIPP-related contamination of the groundwater is highly unlikely.

### 6.2.4 Evaluation of Culebra Groundwater Quality

The quality of the Culebra groundwater sampled at the WIPP site is naturally poor and not suitable for human consumption or agricultural purposes because the TDS concentrations are generally above 10,000 mg/L. In the CY, TDS concentrations in the

Culebra (as measured in detection monitoring wells) varied from a low of 15,400 mg/L (WQSP-6 primary) to a high of 280,000 mg/L (WQSP-3 duplicate). The groundwater of the Culebra is Class III water (non-potable) by EPA guidelines.

For comparison, water quality measurements performed in the Dewey Lake indicate the water is considerably better quality than in the Culebra. In the CY, the TDS concentrations in water from well WQSP-6A, obtained from the Dewey Lake, averaged 3,105 mg/L. This water is suitable for livestock consumption and is classified as Class II water by EPA guidelines. The saturation of Dewey Lake in the area of the WIPP facility is discontinuous. In addition to this naturally occurring groundwater, anthropogenic PAW has been encountered in the upper Dewey Lake at the Santa Rosa contact (see section 6.4).

Because of the highly variable TDS concentrations within the Culebra, baseline groundwater quality was defined for each well. The CY analytical results showing the concentrations of detectable constituents are displayed as time series plots compared to the baseline concentrations (appendix E). The tables in appendix F display either the 95th UTLV or the 95th percentile value (as calculated for the background sampling rounds) for each parameter, depending on the type of distribution exhibited by the parameter or constituent. Both values represent the concentrations below which 95 percent of the concentrations in a population are expected to occur. The UTLVs were calculated for data that exhibited a normal or a lognormal distribution. The 95th percentile was applied to data that were considered nonparametric (i.e., having neither a normal nor a lognormal distribution with 16–95 percent non-detects). Due to the large number of non-detectable concentrations of organic compounds, the limits for organic compounds were considered nonparametric and based on the contract-required method reporting limit (MRL) (table F.1, appendix F) for the contract laboratory. None of the constituents of interest (organics and trace metals) exceeded the baseline concentrations. Detailed analytical results for each parameter or constituent for the sampling in the CY (round 46) can be found in the *Annual Culebra Groundwater Report* (DOE, November 2024).

### 6.2.5 Groundwater Level Surveillance

Wells were used to perform surveillance of the groundwater surface elevation of five water-bearing zones in the vicinity of the WIPP facility:

- PAW (Santa Rosa/Dewey Lake contact)
- Dewey Lake
- Magenta
- Culebra
- Bell Canyon

During the CY, water levels in 42 Culebra wells were measured (including the Culebra zone of a dual completion well) and 13 wells in the Magenta (including the Magenta zone of a dual completion well). Two Dewey Lake wells and two Bell Canyon wells were measured. Twenty-one wells in the PAW zone of the Santa Rosa/Dewey Lake contact were measured, as well as one in the Gatuña. Groundwater level measurements were collected monthly at each well location for each available formation. Water levels in redundant well bores (well bores located on well pads with multiple wells completed in the same formation) were measured on a quarterly basis (appendix F, table F.4). Water levels at PAW wells and piezometers were also measured every quarter. A breakdown of the groundwater zones intercepted by each well measured at least once in the CY is given in appendix F, table F.3.

The observation of water elevation variation was performed for 42 Culebra wells and showed 20 naturally changing wells. The subset of wells analyzed had a sufficient period of record to analyze through the CY (appendix F, table F.3). Excluded from trend analysis were SNL-6 and SNL-15, which were both in long-term water level recovery. Because they were only measured quarterly, the redundant H-19 wells were also excluded. Of the 20 naturally changing wells 12 had an increase and 8 had a decrease in water levels over the CY. The average increase was 0.88 ft, and the average decrease was -0.70 ft. The CY rainfall was below average at 2.68 in (68.07 mm).

For the Culebra wells in the vicinity of the WIPP site, equivalent freshwater heads for November 2024 were used to calibrate a groundwater flow model, which was used by Sandia National Laboratories (SNL) to compute a potentiometric surface using SNL procedure SP 9-9 (Kuhlman, 2009). The water levels and specific gravity used in the model were obtained in the field by SNL. The month of December was judged to have the greatest number of Culebra water levels available that were unaffected by pumping events, and all wells in quasi-steady state. Table 6.2 shows the SNL water-level data set in ft above mean sea level (AMSL). Wells SNL-6 and SNL-15 were not included in the mapping because the elevations do not represent static conditions. These wells are located in the low transmissivity zone of the Culebra and, after drilling and testing, are still in recovery to reach equilibrium. Adjusted freshwater heads are typically accurate to ±1.5 ft, given the density measurement error. The density measurement error is less than 0.019 specific gravity units (WP 02-1).

**Table 6.2 – Water Level Elevations for the Potentiometric Surface Calibration, Culebra Hydraulic Unit**

| Well | Measurement Date | Freshwater Head (ft. AMSL) | Specific Gravity (Freshwater at 70˚F [21˚C]) | Notes |
|---|---|---|---|---|
| AEC-7R | 11/05/2024 | 3,062.54 | 1.072 | |
| C-2737 | 11/06/2024 | 2,972.72 | 1.029 | |
| H-4bR | 11/04/2024 | 2,995.97 | 1.023 | |
| H-5bR | 11/05/2024 | 3,062.99 | 1.092 | |
| H-6bR | 11/05/2024 | 3,061.54 | 1.039 | |
| H-9bR | 11/04/2024 | 2,973.27 | 1.004 | |
| H-10cR | 11/04/2024 | 3,046.27 | 1.094 | |
| H-11b4R | 11/06/2024 | 2,990.5 | 1.076 | |
| H-12R | 11/05/2024 | 3,000.85 | 1.106 | |

| Well | Measurement Date | Freshwater Head (ft. AMSL) | Specific Gravity (Freshwater at 70˚F [21˚C]) | Notes |
|---|---|---|---|---|
| H-15R | 11/06/2024 | 3,000.28 | 1.127 | |
| H-16 | 11/06/2024 | 2,932.45 | 1.035 | |
| H-19b0 | 11/06/2024 | 2,986.95 | 1.064 | |
| IMC-461 | 11/05/2024 | 3,033.78 | 1.012 | |
| SNL-1 | 11/05/2024 | 3,074.21 | 1.035 | |
| SNL-2 | 11/05/2024 | 3,064.3 | 1.013 | |
| SNL-3 | 11/05/2024 | 3,070.3 | 1.028 | |
| SNL-5 | 11/05/2024 | 3,062.79 | 1.007 | |
| SNL-6 | 11/05/2024 | 3,494.5 | 1.263 | Excluded from mapping, long-term recovery |
| SNL-8 | 11/05/2024 | 3,057.25 | 1.098 | |
| SNL-9 | 11/05/2024 | 3,045.63 | 1.018 | |
| SNL-10 | 11/05/2024 | 3,038.82 | 1.008 | |
| SNL-12 | 11/04/2024 | 2,990.61 | 1.013 | |
| SNL-13 | 11/04/2024 | 3,000.69 | 1.027 | |
| SNL-14 | 11/06/2024 | 2,990.35 | 1.048 | |
| SNL-15 | 11/05/2024 | 3,126.48 | 1.234 | Excluded from mapping, long-term recovery |
| SNL-16 | 11/04/2024 | 3,004.85 | 1.011 | |
| SNL-17 | 11/04/2024 | 3,001.21 | 1.004 | |
| SNL-18 | 11/05/2024 | 3,063.17 | 1.001 | |
| SNL-19 | 11/05/2024 | 3,063.36 | 1.006 | |
| WIPP-11R | 11/05/2024 | 3,067.43 | 1.028 | |
| WQSP-1 | 11/11/2024 | 3,062.17 | 1.042 | |
| WQSP-2 | 11/05/2024 | 3,065.5 | 1.034 | |
| WQSP-3 | 11/05/2024 | 3,055.69 | 1.142 | |
| WQSP-4 | 11/06/2024 | 2,987.02 | 1.069 | |
| WQSP-5 | 11/06/2024 | 2,985.32 | 1.028 | |
| WQSP-6 | 11/06/2024 | 2,991.35 | 1.005 | |

Modeled freshwater head contours for November 2024 for the model domain are shown in figure 6.3 (Akara, 2025). For this model, an ensemble of 100 calibrated parameters (transmissivity [T], horizontal anisotropy [A], and recharge [R]) fields were used. The calibrated parameter fields were taken from the data used in the CRA-2009 Performance Assessment Baseline Calculation (PABC) and subsequently used in CRA-2014 & 2019 Performance Assessments (PAs). For each parameter, the average of the

100 realizations was computed. These averaged parameter fields were then used with MODFLOW-2000 to simulate hydraulic head distribution within and near the WIPP Land Withdrawal Boundary (LWB). The parameter estimation software (PEST) was used to adjust the model boundary conditions to obtain a good fit between observed and simulated hydraulic heads. Hydraulic heads measured in December 2023 were used as optimization targets during PEST calibration. Based on the optimal boundary conditions, the simulated hydraulic heads were then contoured to produce the Culebra potentiometric surface map. In addition, the velocity field derived from the final set of simulated hydraulic heads was used to compute the advective particle pathway from the WIPP waste handling shaft to the WIPP LWB. The generation of the Culebra potentiometric map follows three main steps. First, the average of the 100 calibrated parameter fields is computed. The ensemble of 100 calibrated parameter fields includes those developed for the CRA-2009 PABC and subsequently used in CRA-2014 & 2019 PAs. These averaged parameter fields (T, A, R) were used as inputs for the MODFLOW-2000 groundwater model. The version of MODFLOW-2000 and boundary conditions of the groundwater model are identical to those used in CRA-2019 PA. Groundwater flow simulations are performed under steady-state conditions. The second step of the analysis consists of adjusting the model boundary conditions such that the mismatch between simulated and observed hydraulic heads is reduced. The parameter estimation software PEST is used during this calibration phase. This calibration process differs from that used in the CRA-2019 PA. Here, only a subset of boundary conditions (figure 6.3) is adjusted; the other parameters (T, A, R) are not changed during the calibration process. The optimal boundary conditions derived from the PEST calibration are used to simulate hydraulic head distribution within and near the WIPP LWB. The simulated hydraulic heads are then contoured to produce the potentiometric surface map. The hydraulic head contours span the entire active MODFLOW-2000 domain, as shown in figure 6.3. The direction of groundwater flow in the WIPP LWB is also presented. The last step of this analysis uses the flow field/budget file from MODFLOW-2000 to simulate the pathway of a single conservative particle from the WIPP waste handling shaft to the LWB. The Double-precision particle TRacKing for MODFLOW 2000 (DTRKMF) software is used for particle tracking.

Figure 6.4 shows the hydraulic head contours within and around the WIPP LWB. Hydraulic head contours in the central portion of the map are east-west trending and closely spaced, which suggests a low transmissivity zone. The general east-west trending head contours suggest a north-south groundwater flow direction, as shown with the black arrows in figures 6.3 and 6.4. Hydraulic head contours are not drawn for the eastern region of the model domain. This region corresponds to the portion of the Culebra bounded by the Anhydrite of the Tamarisk Member and the Mudstone/Halite of the Los Medaños Member. The eastern region is considered a no-flow boundary because of its low transmissivity. Figure 6.4 shows the simulated freshwater head contours with measured freshwater heads (in ft AMSL) listed at each well (5-foot contour interval). The black arrows indicate the groundwater flow direction inside the WIPP LWB (black square). The black dashed line with the arrow in figure 6.4 corresponds to the DTRKMF-simulated pathway that a particle would take from the WIPP waste handling shaft to the WIPP LWB (a path length of 3930 m). The blue dashed line in figure 6.4 corresponds to the 2023 DTRKMF-simulated pathway. From 2023 to 2024, the simulated pathway shifts slightly to the west. The 2023 and 2024 simulated pathways are based on the same porosity value and parameter fields (hydraulic conductivity, horizontal anisotropy, and recharge). Thus, the slight shift in simulated pathways results from change in hydraulic gradient caused by the salt shaft liner leak and shaft 5 drilling. The DTRKMF output assumes that the transmissive portion of the Culebra is 4 m thick (as opposed to the entire thickness of the aquifer at 7.75 m) and has a constant porosity of 16%. The Culebra thickness is reduced to 4 m to focus all flow through the lower and most permeable portion of the Culebra (Holt, 1997). The DTRKMF-simulated pathway indicates a travel time of 6646 years, which corresponds to an average velocity of 0.59 m/yr. The 2024 average velocity is similar to the 2023 value (0.60 m/yr).

The scatter plot in figure 6.5 presents the measured vs. simulated hydraulic heads for all wells used in the calibration process. These wells are divided into three groups, based on their proximity to the WIPP LWB. Wells inside the WIPP LWB are represented by circles, wells outside but within 3 km of the LWB are shown with the squares, and all other wells are indicated by the stars. Figure 6.5 also shows the 1:1 line and the ± 1 m misfit lines. Note that only wells with a misfit greater than 1.5 m are labeled in figure 6.5.

The simulated hydraulic heads are in good agreement with the observed heads; 60 percent of simulated heads are within ±1.5 m of observations. Some wells (H-19b0, WQSP-4, WQSP-5, and WQSP-6) inside in the WIPP LWB show relatively high residuals. These high residuals reflect changes in hydraulic heads likely caused by salt handling shaft leakage and/or Shaft #5 drilling. The $r^2$ values indicate a strong correlation between observed and simulated hydraulic heads. Similarly, the root mean square error (RMSE) and the normalized RMSE are 8.0 ft and 5.5 percent, respectively. The strongest correlation between simulated and observed heads corresponds to wells inside the WIPP LWB. This is particularly important, given that the WIPP LWB is the primary region of interest in this analysis.

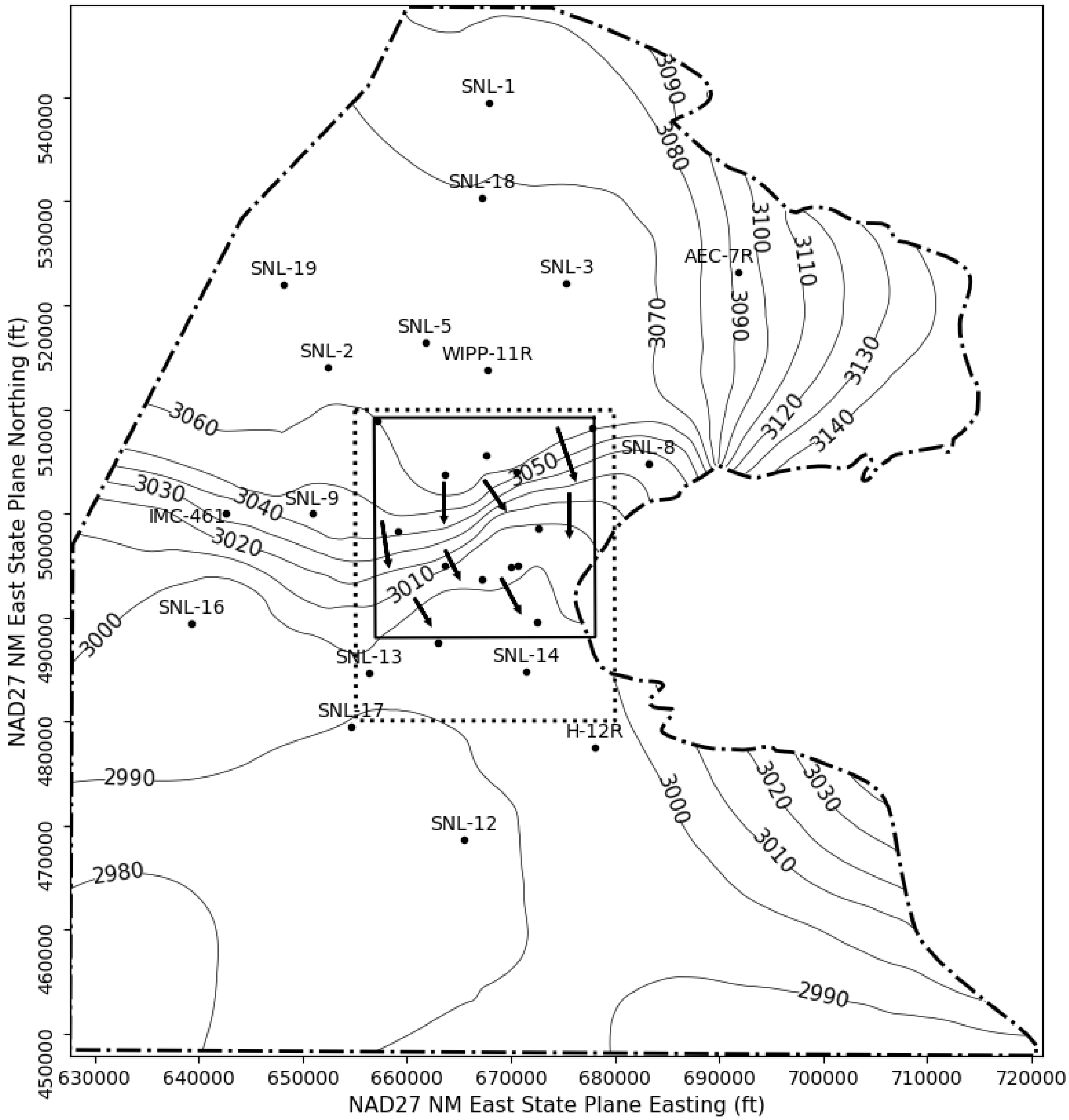



**Figure 6.3 – Model-Generated 2024 Culebra Freshwater Head Contours in the Model Domain** *(Contour interval 10 feet, contour in feet above mean sea level). The dotted rectangle corresponds to the region contoured in figure 6.4. The black square corresponds to the WIPP LWB. Wells inside the WIPP LWB are not labeled; refer to figure 6.5 for identification of these wells. The black arrows indicate the groundwater flow direction inside the WIPP LWB.*

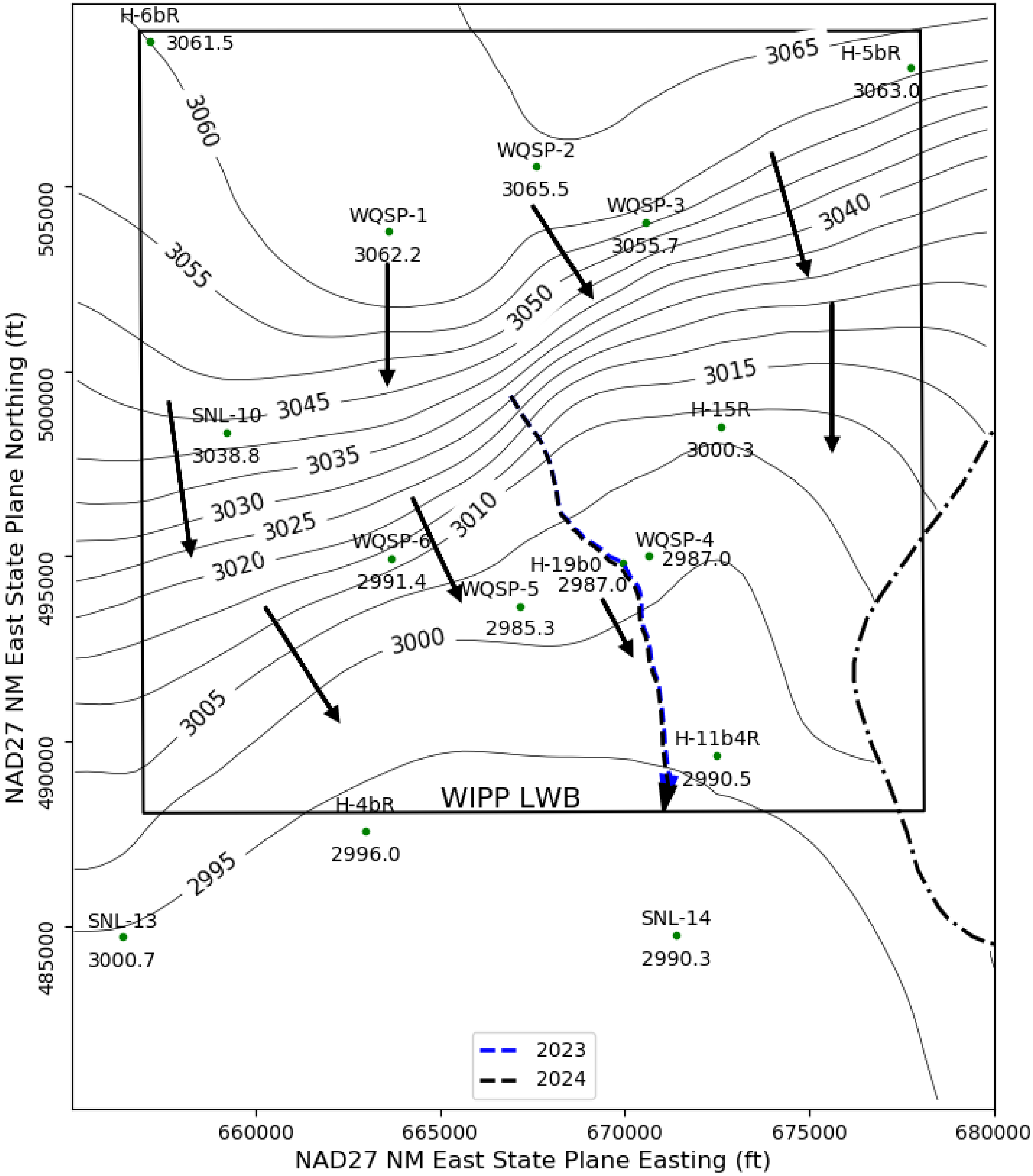



**Figure 6.4 – 2024 Simulated Freshwater Head Contours with Measured Freshwater Heads (ft. AMSL) Listed at Each Well (5-foot Contour Interval).**
*(Contour in feet above mean sea level, the dashed lines represent the DTRKMF simulated particle pathways from the waste handling shaft to the WIPP LWB, for 2023 and 2024. The slight shift in particle pathways from 2023 to 2024 results from changes in hydraulic gradient. The black arrows indicate the groundwater flow direction inside the WIPP LWB. The dash-dotted line indicates the active groundwater model boundary).*

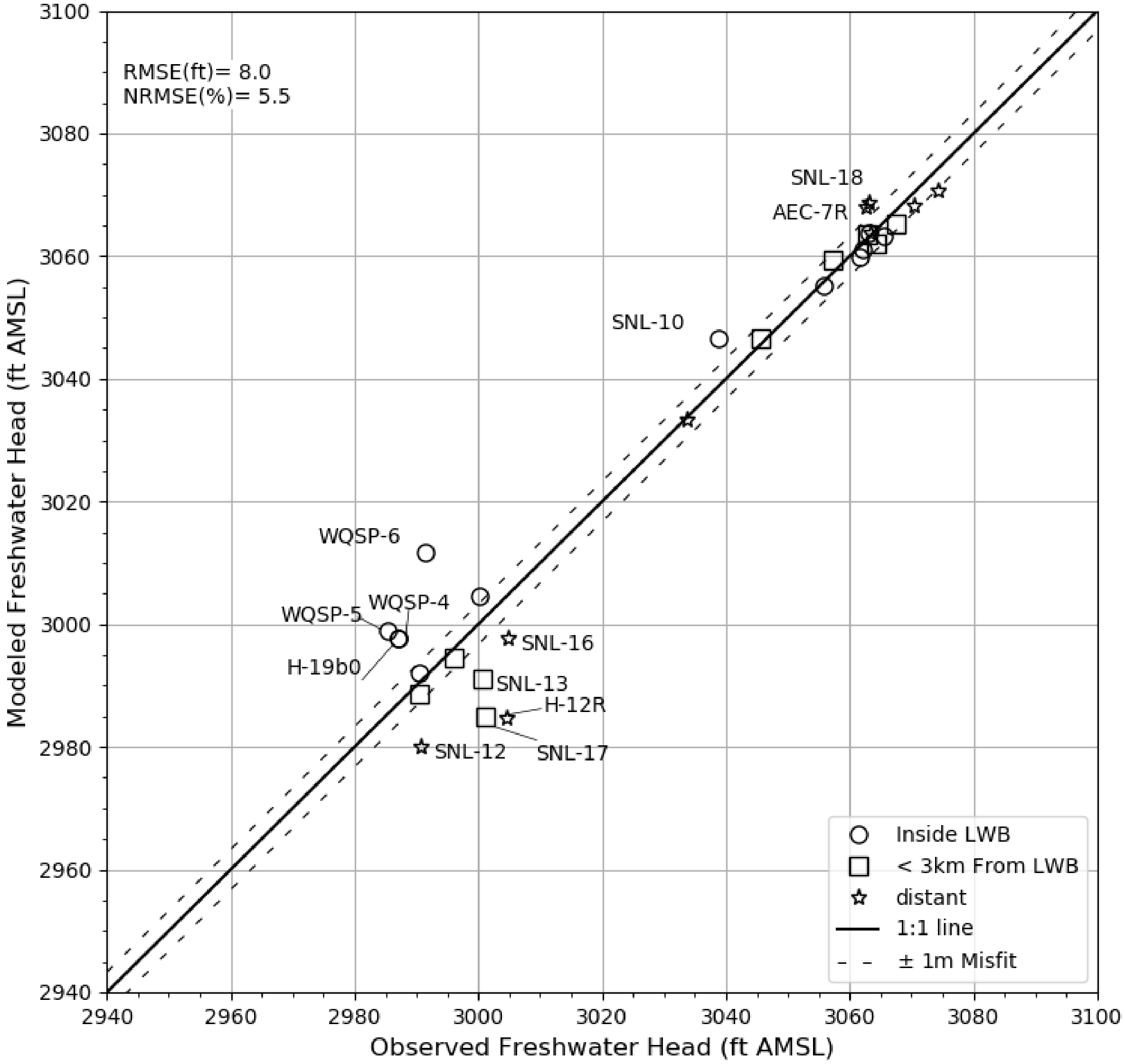



**Figure 6.5 – Modeled Versus Measured Scatter Plot for Parameter Estimation Tool-Calibrated MODFLOW 2000 Generated Heads and November 2024 Culebra Freshwater Heads**

### 6.2.6 Fluid Density Surveys

At the WIPP site, variable TDS concentrations result in variability in groundwater density (WP 02-1). WIPP personnel measure the density of well-bore fluids in water-level monitoring wells to adjust water levels to their equivalent freshwater head values. This allows a more accurate determination of relative heads between wells. In the CY, densities were derived from 36 wells containing pressure transducers installed by SNL (table 6.3). For comparison, 2022 and 2023 density data are shown. Year-to-year density differences are within the error described in WP 02-1.

**Table 6.3 – Fluid Density Survey**

| Well | 2022 Fluid Density Survey Result (g/cm³) | 2022 Conversion to Specific Gravity at 70°F | 2023 Fluid Density Survey Result (g/cm³) | 2023 Conversion to Specific Gravity at 70°F | 2024 Fluid Density Survey Result (g/cm³) | 2024 Conversion to Specific Gravity at 70°F | Notes for 2022–2024 Fluid Density Survey |
|---|---|---|---|---|---|---|---|
| AEC-7R | 1.070 | 1.072 | 1.070 | 1.072 | 1.071 | 1.073 | |
| C-2737 | 1.025 | 1.027 | 1.027 | 1.029 | 1.028 | 1.030 | |
| H-4bR | 1.019 | 1.021 | 1.021 | 1.023 | 1.020 | 1.022 | |
| H-5bR | 1.089 | 1.091 | 1.090 | 1.092 | 1.091 | 1.093 | |
| H-6bR | 1.038 | 1.040 | 1.037 | 1.039 | 1.037 | 1.039 | |
| H-9bR | 1.002 | 1.004 | 1.002 | 1.004 | 1.004 | 1.006 | |
| H-10cR | 1.090 | 1.092 | 1.092 | 1.094 | 1.092 | 1.094 | |
| H-11b4R | 1.078 | 1.080 | 1.074 | 1.076 | 1.074 | 1.076 | |
| H-12R | 1.103 | 1.105 | 1.094 | 1.096 | 1.104 | 1.106 | |
| H-15R | 1.125 | 1.127 | 1.125 | 1.127 | 1.123 | 1.125 | |
| H-16 | 1.031 | 1.033 | 1.033 | 1.035 | 1.033 | 1.035 | |
| H-19b0 | 1.065 | 1.067 | 1.062 | 1.064 | 1.057 | 1.059 | Fluid density used for all other H-19 wells |
| IMC-461 | 1.002 | 1.004 | 1.010 | 1.012 | 1.010 | 1.012 | |
| SNL-1 | 1.032 | 1.034 | 1.033 | 1.035 | 1.021 | 1.023 | |
| SNL-2 | 1.007 | 1.009 | 1.011 | 1.013 | 1.011 | 1.013 | |
| SNL-3 | 1.025 | 1.027 | 1.026 | 1.028 | 1.030 | 1.032 | |
| SNL-5 | 1.006 | 1.008 | 1.005 | 1.007 | 1.003 | 1.005 | |
| SNL-6 | 1.260 | 1.263 | 1.260 | 1.263 | 1.262 | 1.265 | |
| SNL-8 | 1.090 | 1.092 | 1.096 | 1.098 | 1.094 | 1.096 | |
| SNL-9 | 1.015 | 1.017 | 1.016 | 1.018 | 1.017 | 1.019 | |
| SNL-10 | 1.003 | 1.005 | 1.006 | 1.008 | 1.010 | 1.012 | |
| SNL-12 | 1.012 | 1.014 | 1.011 | 1.013 | 1.007 | 1.009 | |
| SNL-13 | 1.025 | 1.027 | 1.025 | 1.027 | 1.025 | 1.027 | |
| SNL-14 | 1.046 | 1.048 | 1.046 | 1.048 | 1.049 | 1.051 | |
| SNL-15 | 1.228 | 1.230 | 1.232 | 1.234 | 1.232 | 1.234 | |
| SNL-16 | 1.018 | 1.020 | 1.009 | 1.011 | 1.004 | 1.006 | |
| SNL-17 | 1.000 | 1.001 | 1.002 | 1.004 | 1.001 | 1.003 | |
| SNL-18 | 1.000 | 1.002 | 1.000 | 1.001 | 1.000 | 1.002 | |
| SNL-19 | 1.004 | 1.006 | 1.004 | 1.006 | 1.004 | 1.006 | |
| WIPP-11R | 1.023 | 1.025 | 1.026 | 1.028 | 1.026 | 1.028 | |
| WQSP-1 | 1.047 | 1.049 | 1.046 | 1.048 | 1.047 | 1.049 | Hydrometer measurements |
| WQSP-2 | 1.044 | 1.046 | 1.045 | 1.047 | 1.048 | 1.050 | Hydrometer measurements |
| WQSP-3 | 1.144 | 1.147 | 1.143 | 1.146 | 1.146 | 1.148 | Hydrometer measurements |

| Well | 2022 Fluid Density Survey Result (g/cm³) | 2022 Conversion to Specific Gravity at 70°F | 2023 Fluid Density Survey Result (g/cm³) | 2023 Conversion to Specific Gravity at 70°F | 2024 Fluid Density Survey Result (g/cm³) | 2024 Conversion to Specific Gravity at 70°F | Notes for 2022–2024 Fluid Density Survey |
|---|---|---|---|---|---|---|---|
| WQSP-4 | 1.076 | 1.078 | 1.073 | 1.075 | 1.076 | 1.078 | Hydrometer measurements |
| WQSP-5 | 1.027 | 1.029 | 1.027 | 1.029 | 1.027 | 1.029 | Hydrometer measurements |
| WQSP-6 | 1.015 | 1.017 | 1.018 | 1.020 | 1.018 | 1.020 | Hydrometer measurements |

## 6.3 DRILLING AND PLUGGING ACTIVITIES

No wells were drilled or plugged in the CY.

## 6.4 PERCHED ANTHROPOGENIC WATER MONITORING PROGRAM

Perched anthropogenic waters occur beneath the WIPP site at a depth of 12–21 m (39–69 ft) below ground level at the contact between the Santa Rosa and the Dewey Lake (figure 6.1). Water yields are generally less than 2.79 liters per minute (1 gallon per minute) in monitoring wells and piezometers, and the water contains varying historical concentrations of TDS (874 mg/L to 274,000 mg/L) and chloride (146 mg/L to 197,000 mg/L). To the south, yields are greater, and TDS and chloride concentrations are lower. The origin of the high TDS and chlorides in this water is believed to be primarily from anthropogenic sources, with some contribution from natural sources. The PAW occurs not only under the WIPP site surface facilities, but also to the south, as indicated by shallow water in drill hole C-2811, about 0.8 km (0.5 mi) south of the WIPP facility PPA fence. The PAW primarily resulting from surficial runoff and infiltration existed before the liners were installed. Infiltration controls in the form of liners were installed beginning in 2003 and completed in 2005 for the salt cells and ponds.

In order to investigate the PAW, 21 piezometers completed in the Santa Rosa/Dewey Lake contact (PZ-1 to PZ-7 and PZ-9 to PZ-14, PZ-16, PZ-17a, PZ-18 and PZ-19, C-2505, C-2506, C-2507, and C-2811) and one in the Gatuña (PZ-15) are used as part of a monitoring program to measure spatial and temporal changes in PAW levels and water quality. Monitoring activities during the CY included PAW level surveillance at these 22 locations (figure 6.7).

Drilling in 2007 around the SPDV salt pile tailings revealed shallow water in three piezometers (PZ-13, PZ-14, and PZ-15, shown in figure 6.8). Natural shallow groundwater occurs in the middle part of the Dewey Lake at the southern portion of the WIPP site (WQSP-6A and PZ-17b; figure 6.8) and to the south of the WIPP site (Mills Ranch). To date, based on water chemistry, there is no indication that the PAW has affected the naturally occurring groundwater in the Dewey Lake.

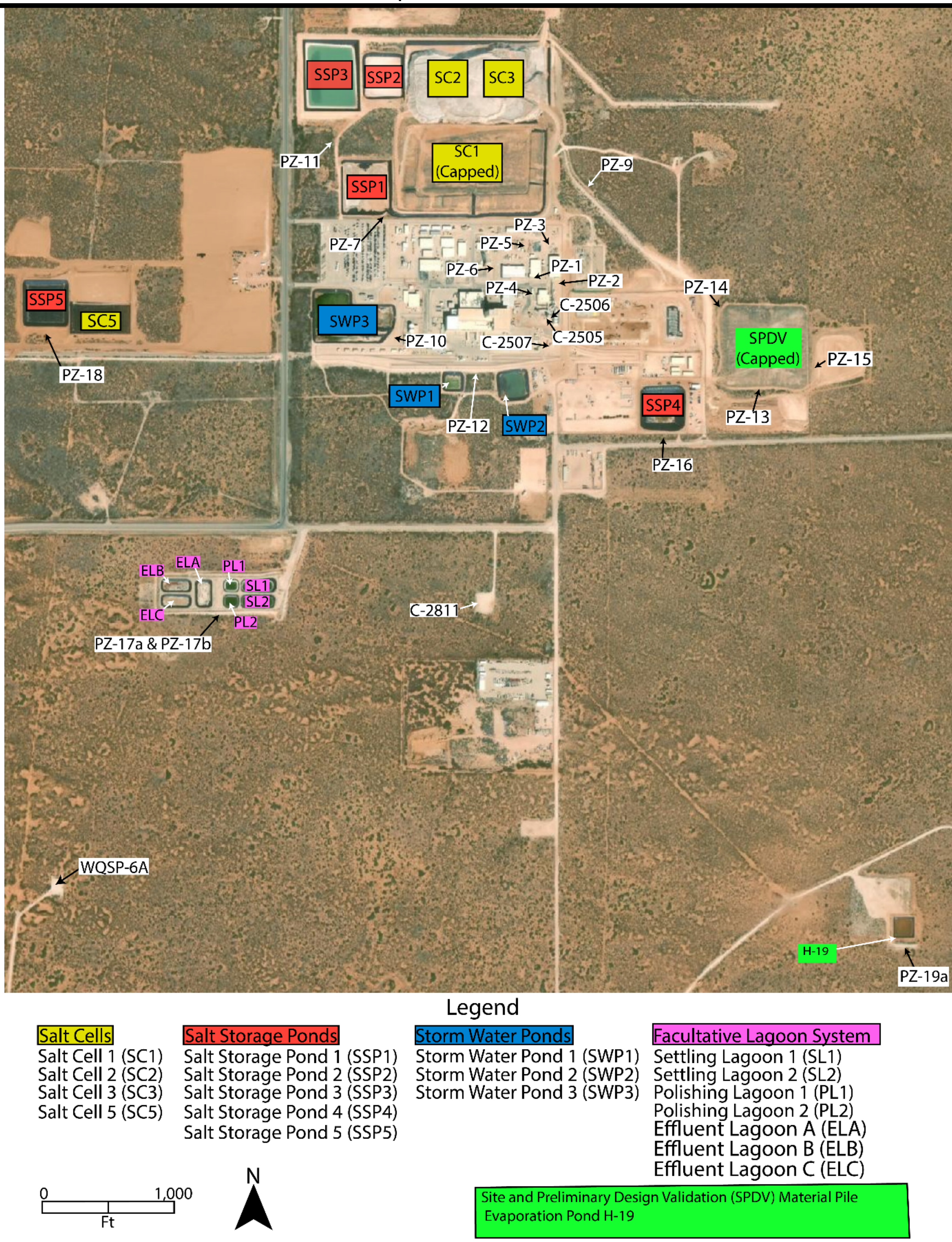



**Figure 6.6 – Location of Perched Anthropogenic Water Wells**

### 6.4.1 Perched Anthropogenic Water Quality Sampling

The DP-831, as issued in January 2022, requires 17 PAW wells (C-2507, C-2811, PZ-1, PZ-5, PZ-6, PZ-7, PZ-9, PZ-10, PZ-11, PZ-12, PZ-13, PZ-14, PZ-15, PZ-16, PZ-17a, PZ-18, PZ-19) and two middle DL wells (WQSP-6A, PZ-17b) to be sampled on a semi-annual basis. These wells were sampled in April–May (round 41) and October–December 2024 (round 42) and reported in the semi-annual DP-831 reports (DOE, July 2024 and January 2025, respectively). Field parameters were measured for pH, temperature and, Specific Conductivity in the 19 wells listed above except for PZ-9, PZ-13, PZ-14, and PZ-15, which were bailed, and PZ-16, PZ-17a, PZ-18 and, PZ-19, which were dry and not sampled. Laboratory analysis was performed for Sulfate, Chloride, and TDS in all wells sampled except for PZ-17b, which was also tested for TKN and Nitrate.

#### 6.4.1.1 Results and Discussion

In general, the concentrations of Sulfate, Chloride, and TDS have been decreasing since 2008 except for PZ-7, PZ-9, and C-2507. The PAW quality sampling during the CY (rounds 41 and 42) did not identify any new exceedances with respect to groundwater quality standards listed in 20.6.2.3103 NMAC for Human Health and Domestic Water Supply.

### 6.4.2 Perched Anthropogenic Water Level Surveillance

Twenty-one wells were used for surveillance of the PAW-bearing horizon in the Santa Rosa and the upper portion of the Dewey Lake. Water levels were measured quarterly. Since their highest water levels in 2006, the overall trend has decreased. However, water levels experienced an increase from 2014 to March 2017 due to higher-than-average precipitation levels from 2014 to 2016. During the reporting period, the groundwater levels showed an average decrease in elevation of -0.55 ft.

The potentiometric surface for the PAW using December 2024 data is presented in figure 6.8. The contours were generated using *SURFER*, Version 19, a surface mapping software by Golden Software. Fifteen data points were used in the contour development, whereas the contours around the SPDV salt pile were estimated by hand.

Groundwater elevation measurements in the PAW (formerly shallow subsurface water) indicate that flow is to the east and south, away from a potentiometric high located near PZ-7 near Salt Storage Pond 1 (figure 6.8). At this time, it appears that the water identified in PZ-13 and PZ-14 is separate and geochemically distinct from the PAW in the other wells at the WIPP facilities area (DOE/WIPP-08-3375, *Basic Data Report for Piezometers PZ-13, PZ-14, and PZ-15 and Shallow Subsurface Water)*. Wells PZ-13 and PZ-14 were completed at the contact of the Santa Rosa and Dewey Lake. Well PZ-15 was completed at a shallower level in the Gatuña, where rainwater has accumulated from a localized recharge source.

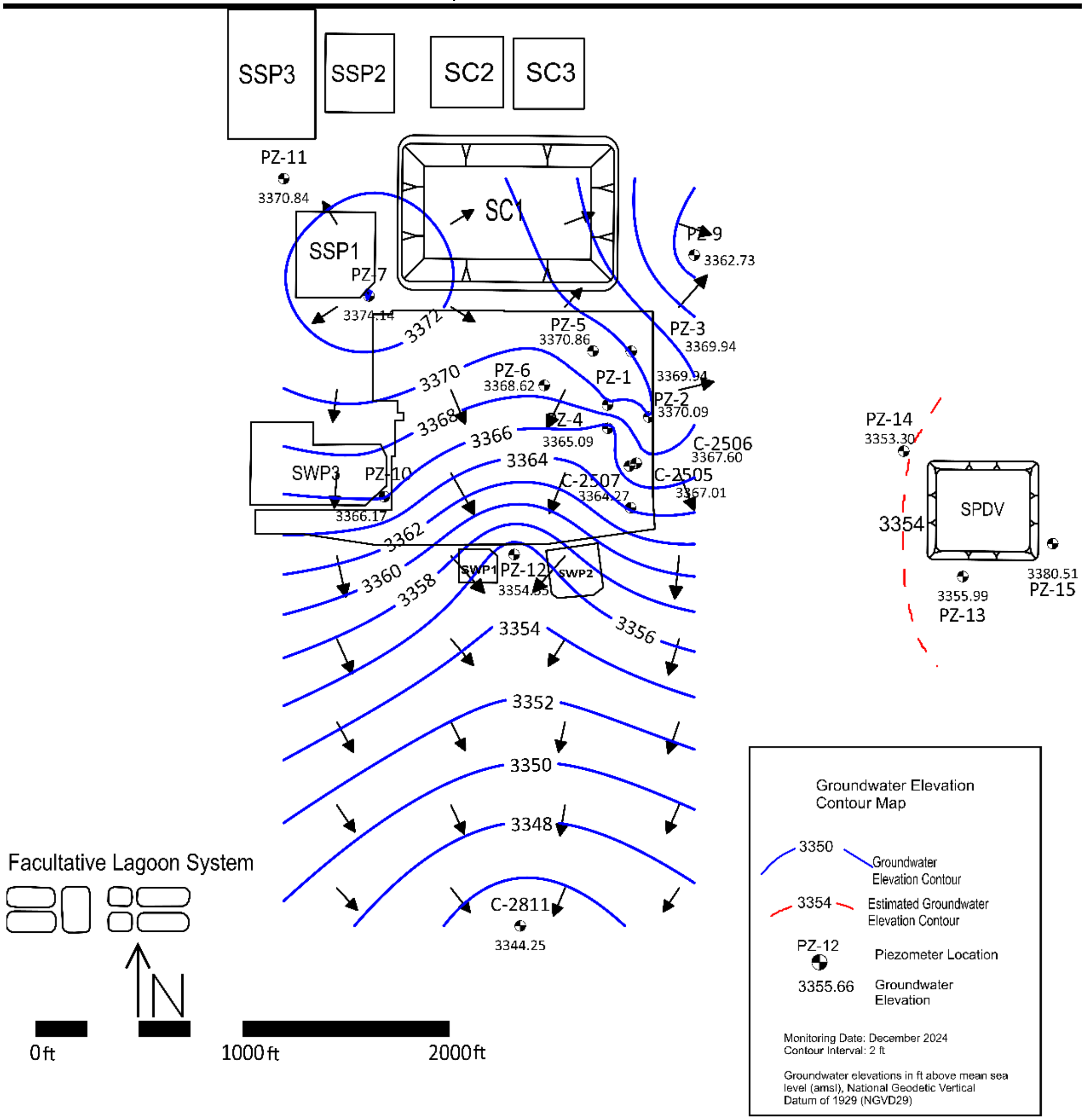



**Figure 6.7 – December 2024 Perched Anthropogenic Water Potentiometric Surface**

## 6.5 PUBLIC DRINKING WATER PROTECTION

The water wells nearest to the WIPP site that use the natural Dewey Lake groundwater for domestic use are the wells located on the Mills Ranch. These wells are located approximately 4.8 km (3 mi) south-southwest of the WIPP surface facilities and about 2.8 km (1.75 mi) south of WQSP-6A (figure 6.2). These wells are used for livestock and industrial purposes. Total dissolved solids in the Barn Well have ranged from 630 to 720 mg/L, and TDS concentrations in the Ranch Well have ranged from 2,800 to 3,300 mg/L (DOE/CAO-96-2184).

## 6.6 EMERGING CONTAMINANTS

In recent years, there has been increasing regulatory interest in emerging contaminants of concern which may be present in the environment and in drinking water supplies. A category of man-made chemicals known as per- and polyfluoroalkyl substances (PFAS) have been detected in surface waters and groundwater across the country, and their toxicity and persistence in the environment has led to designation of these substances as emerging contaminants of concern.

The WIPP facility has no records of ordering or using chemicals with PFAS but does have products that may have been manufactured using fluoropolymers (e.g., fire protective gear, UV-resistant materials). Given the lack of chemical use records and regulatory limits, monitoring of the WIPP facility drinking water supply for PFAS has not occurred. Water is supplied to the WIPP site by the City of Carlsbad from the Double Eagle Water System. The city obtained and analyzed water supply wells in the 2024–2025 time frame for PFAS.  The city reported that PFAS was not detected in any of the samples.

To measure PFAS in the environment, PFAS samples were obtained in 2024 at the direction of CBFO in respect to the DOE PFAS strategic roadmap (DOE, 2022) to sample nine groundwater monitoring wells completed in three water bearing zones (all six of the DMP wells, PZ-7, PZ-10, and WQSP-6a) and two lagoons of the Facultative Lagoon System (Settling Lagoons 1 and 2). Initial baseline sample was performed in 2024 and subsequent sampling may be performed as needed.. Results of the 2024 sampling are reported in Per- and Polyfluoroalkyl Substances (PFAS) Sampling Report for the Waste Isolation Pilot Plant (DOE, 2024).

# 7.0 QUALITY ASSURANCE

The fundamental objective of the environmental QA program is to facilitate the acquisition of accurate and precise analytical data that are technically and legally defensible. Quality data are generated through activities that plan, implement, review, assess, and correct as necessary. Field samples are collected and analyzed in sample delivery groups along with the requisite QC samples using industry-standard analytical methods. The sample analysis results and associated QC data are reviewed, verified, validated, and incorporated into concise and informative reports, which present the data and describe compliance with QA objectives.

During the CY, radiological analyses of environmental samples were performed by WIPP Laboratories in Carlsbad, NM (section 7.1). Analyses for VOC Monitoring Program samples were performed by SGS North America Inc. (SGS) in Dayton, New Jersey (section 7.2). Non-radiological groundwater sample analyses were performed by Eurofins Environment Testing South Central, LLC (Eurofins) in Albuquerque, NM (section 7.3).

The laboratories demonstrated the quality of their analytical data through participation in reputable, inter-laboratory comparison programs, such as the Mixed Analyte Performance Evaluation Program (MAPEP) and the National Environmental Laboratory Accreditation Program (NELAP). Laboratories used the applicable requirements of the CBFO *Quality Assurance Program Document* (DOE/CBFO-94-1012), as flowed down through the *Quality Assurance Program Description* (WP 13-1).

The sampling program and the subcontracted analytical laboratories operate in accordance with general QA plans and specific QA project plans that incorporate QA requirements from the *Quality Assurance Program Description*. These plans address the following elements:

- Management and organization.
- Quality system and description.
- Personnel qualification and training.
- Procurement of products and services, including supplier-related nonconformances.
- Documents and records.
- Computer hardware and software.
- Planning.
- Management of work processes (using SOPs).
- Assessment and response.
- Quality improvement, including the reporting of non-administrative nonconformances.

To ensure that the quality of systems, processes, and deliverables are maintained or improved, four layers of assessments and audits are performed:

- DOE/CBFO performs assessments and audits of the MOC QA program.
- The MOC performs internal assessments and audits of its own QA program.
- The MOC performs assessments and audits of subcontractor QA programs as applied to MOC contract work.
- DOE/CBFO and the MOC also perform routine assessments of the WIPP Laboratories.

Any significant findings discovered during assessments and audits of the contract laboratories will be discussed in the sections below specific to each laboratory.

The QA objectives for the sampling and analysis program are completeness, precision, accuracy, comparability, and representativeness. Each laboratory processes QA/QC data independently according to laboratory SOPs and statements of work (SOWs). Sections 7.1, 7.2, and 7.3 discuss the QC results for the WIPP Laboratories, SGS, and Eurofins, respectively, regarding how well they met the QA objectives. Quality control sample summaries are included in analytical reports prepared by contract laboratory personnel.

## 7.1 WIPP LABORATORIES

Samples for analysis of radionuclides were collected using approved WIPP facility procedures. The procedures are based on generally accepted methodologies for environmental sampling, ensuring that the samples were representative of the media sampled. The samples were analyzed for natural radioactivity, fallout radioactivity from nuclear weapons tests, and radionuclides contained in the TRU waste disposed of at the WIPP facility. The WIPP Laboratories organization is located in a leased space in Carlsbad, NM.

### 7.1.1 Completeness

The SOW for analyses performed by WIPP Laboratories states that “analytical completeness, as measured by the amount of valid data collected versus the amount of data expected or needed, shall be greater than 90 percent for the MOC sampling programs.”

Valid data were generated from all the samples analyzed in the CY. There were instances where data were qualified due to QC deficiencies, but the results were comparable to the previous year’s data. For example, in the process of uranium testing in groundwater samples, laboratory contamination led to reagent blank samples reporting above the acceptance criteria; however, results from actual samples were within expected values. Thus, 100 percent of the expected samples and measurements for the sampled environmental media (air particulate composites, groundwater, surface water, soil, sediment, plants, and animals) were reported.

### 7.1.2 Precision

The SOW states that analytical precision (as evaluated through replicate measurements) will meet control criteria or guidelines established in the industry-standard radiochemical methods used for sample analysis. To ensure the overall quality of analysis of environmental samples, precision was evaluated for sample collection and sample analysis procedures combined, as well as the sample analysis procedures alone. At least one pair of field duplicates was collected and analyzed for each sample matrix type when possible (field duplicates would not necessarily apply to all sample matrix types, such as small animals). The precision of laboratory-generated duplicates was reported by WIPP Laboratories and reviewed by the data validator. The precision of field duplicates was calculated and reported by the data validator based on the analysis results of the individual samples. The precision objective is a requirement of the laboratory. Batches of samples can be recounted or reprocessed to achieve the laboratory duplicate precision objective before the data is reported.

The relative error ratios (RERs) for field duplicate samples were calculated by the data reviewer as an indicator of the overall precision, reflecting the combination of both sample collection and laboratory analysis. Duplicate samples were collected at the same time, same place, and under similar conditions as the primary samples. Regarding vegetation samples, separate plants were collected to generate a duplicate sample.

For this report, precision data were evaluated using the guidance for a similar monitoring project as cited in the reference document *Rocky Flats Annual Report of Site Surveillance and Maintenance Activities-CY 2008* (Doc. No. S05247, U.S. Department of Energy, 2009). This source suggests that 85 percent of field duplicates should yield RERs less than 1.96. The value of 1.96 is based on the 95 percent confidence interval, but 15 percent of the precision values would be allowed to be greater than 1.96. The WIPP field duplicate analyses yielded zero RER values greater than 1.96, indicating whether the radionuclide was detected or not in the CY. A total of 111 field duplicate RERs were calculated with 100 percent of field duplicates yielding RERs less than 1.96.

### 7.1.3 Accuracy

The accuracy of the radiochemical analyses was checked by analyzing initial and continuing calibration standards, reagent blanks, matrix filter blanks in the case of air filter composite samples, some aqueous field blanks, and reagent laboratory control samples, which are spiked method blanks as specified in the published industry-standard analytical methods and in the corresponding lab SOPs. Samples for alpha spectrometry analysis were spiked with tracers and samples for $^{90}$Sr analysis were spiked with a carrier. The percent recovery of the tracers and carriers were reported as a measure of accuracy, and the analysis results were corrected for the percent recoveries to improve the accuracy of the analyses.

### 7.1.4 Comparability

The mission of WIPP Laboratories is to produce high-quality and defensible analytical data in support of the WIPP operations. The SOW requires WIPP Laboratories to ensure consistency using standard analytical methods coupled with specific procedures that govern the handling of samples and the reporting of analytical results. Proficiency was also ensured through the participation of WIPP Laboratories in DOE-administered proficiency testing. The blind testing of environmental samples prepared by MAPEP ensured results measured by WIPP Laboratories were accurate and comparable to those achieved by other comparable accredited laboratories.

WIPP Laboratories analyzed eight MAPEP environmental samples consisting of two each of soil, water, air filter, and vegetation samples, as well as a single urine sample and a single feces sample. The target radionuclides included the WIPP target radionuclides $^{233/234}$U, $^{238}$U, $^{238}$Pu, $^{239/240}$Pu, $^{241}$Am, $^{40}$K, $^{60}$Co, $^{137}$Cs, and $^{90}$Sr. Results for the other WIPP radionuclide, $^{235}$U, were not requested by MAPEP. The acceptable range for the MAPEP samples is a bias less than or equal to ±20 percent (i.e., within 80 to 120 percent of the MAPEP value). The acceptable range with a warning is a bias greater than ±20 percent, but less than ±30 percent (i.e., within 70 to 80 percent or 120 to 130 percent of the MAPEP value). The Not Acceptable (N) results are those with a bias greater than ±30 percent (i.e., less than 70 percent or greater than 130 percent of the MAPEP value). The MAPEP studies conducted in 2024 were MAPEP series 50 and 51. The first round of testing produced mostly acceptable results. The exceptions include N flags for $^{137}$Cs in a soil matrix, $^{238}$Pu in a urine matrix, and $^{241}$Am in an air filter matrix. The Series 51 round of testing produced acceptable results for all analytes.

### 7.1.5 Representativeness

Representativeness is the extent to which measurements represent the actual environmental condition or population at the time a sample was collected. The primary objective of the Environmental Monitoring Program is to generate environmental data to determine that the health and safety of the population surrounding the WIPP facility is being protected. Analytical representativeness is ensured through technically sound and accepted approaches for environmental investigations, including industry-standard analytical methods and WIPP procedures for sample collection and monitoring for potential sample cross-contamination through the analysis of field blank samples and laboratory method/reagent blank samples. These conditions were satisfied during the sample collection and analysis practices of the WIPP Environmental Monitoring Program in the CY.

## 7.2 SGS NORTH AMERICA, INC.

The permittees analytical laboratory, SGS, performed the analyses of the air VOC samples collected for the RVMP and DRVMP at the WIPP facility during the CY. The laboratory QA/QC analyses indicate that, during the reporting period, there were instances where SGS was not performing within specifications but was capable of quantifying detectable target analytes. For this CY, SGS performed analyses using an established QA/QC program. For instances where the QA/QC analyses were not performed within laboratory specifications, the reported data was evaluated for usability and flagged appropriately using the qualifiers (data flags). The QA/QC results for this reporting period are discussed below.

### 7.2.1 Completeness

Completeness is defined in WP 12-VC.02, *Quality Assurance Project Plan for Volatile Organic Compound Monitoring*, as the percentage of the ratio of the number of valid sample results received (i.e., those which meet data quality objectives [DQOs]) versus the total number of samples collected. Completeness may be affected, for example, by sample loss or destruction during shipping, by laboratory sample handling errors, inability to collect the required samples, or by rejection of analytical data during data validation. The expected completeness objective for this program is greater than or equal to 95 percent.

In the *Semi-Annual VOC Data Summary Report for Reporting Period January 1 to June 30, 2024* (DOE-WIPP-24-3611.0), the completeness percentage for the VOC Monitoring Program was reported at 82 percent. Therefore, the expected completeness of greater than or equal to 95 percent was not met. This was due to the program being deficient in 30 samples for one or more of the following criteria identified in table 7.1a.

**Table 7.1a – Summary of Data Quality Objective Deficiencies in the Semi-Annual VOC Data Summary Report for Reporting Period January 1 to June 30, 2024**

| Deficiency | Sample Count for Repository | Sample Count for Disposal Room |
|---|---|---|
| Laboratory sample duplicate results, for one or more target analyte(s), exceeds the precision objective (RPD) of 25. [a] | 18 | 0 |
| LCS/LCSD results outside 40 to 160 percent recovery range. | 6 | 0 |
| Field duplicate results, for one or more target analyte(s), exceeds the precision objective (RPD) of 35. [a] | 6 | 2 |

a. Precision degrades as the concentration approaches the detection limit, thereby affecting completeness.

In the *Semi-Annual VOC Data Summary Report for Reporting Period July 1 to December 31, 2024* (DOE-WIPP-25-3611.0), the method to determine completeness was adjusted from discrediting an entire sample (each sample contains 10 target analytes) as deficient because one target analyte *may* not have met the required QA/QC objectives. Further, because the RVMP sample collection methods and reporting limits are different than the DRVMP sample collection and reporting limits, the completeness for each program is reported independently of each other. Utilizing this concept to interpret completeness in the July 1 to December 31, 2024, reporting period, the analyses for each sample, the 10 target analytes are evaluated individually against the QA/QC objectives.

The RVMP was deficient in 121 target analytes for one or more of the criteria identified in table 7.1b. Table 7.1c summarizes the 10 target analytes and the analytes deficiency percentage implicated by the QA/QC DQOs. Thus, the overall completeness percentage for the RVMP is reported at 90 percent. Therefore, the expected completeness of greater than or equal to 95 percent was not met.

The DRVMP was deficient in 13 target analytes for one or more of the criteria identified in table 7.1b. Table 7.1d summarizes the 10 target analytes and the analytes deficiency percentage implicated by the QA/QC DQOs. Thus, the overall completeness percentage for the DRVMP is reported at 98 percent. Therefore, the expected completeness of greater than or equal to 95 percent was met.

**Table 7.1b – Summary of Data Quality Objective Deficiencies in the Semi-Annual VOC Data Summary Report for Reporting Period July 1 to December 31, 2024**

| Deficiency | Affected Number of Target Analytes | | Affected Number of Collected Samples | |
|---|---|---|---|---|
| | RVMP (SIM) | DRVMP (Scan) | RVMP (SIM) | DRVMP (Scan) |
| Laboratory samples unusable, rejected. | 10 | 0 | 1 | 0 |
| Laboratory sample duplicate results, for one or more target analyte(s), exceeds the precision objective (RPD) of 25.[a] | 44 | 9 | 42 | 9 |
| LCS/LCSD results outside 40 to 160 percent recovery range. | 14 | 0 | 14 | 0 |
| LCS/LCSD, for one or more target analyte(s), exceeds the precision objective (RPD) of 25.[a] | 45 | 0 | 32 | 0 |
| Field duplicate results, for one or more target analyte(s), exceeds the precision objective (RPD) of 35. [a] | 15 | 5 | 8 | 1 |

a. Precision degrades as the concentration approaches the detection limit, thereby affecting completeness.

**Table 7.1c – Summary of Repository Completeness by Target Analyte in the Semi-Annual VOC Data Summary Report for Reporting Period July 1 to December 31, 2024**

| Target Analyte | Total Number of Acceptable Analytes Meeting all DQOs | Total Number of Analytes Analyzed (n = 117) | Reporting Period Completeness (Percent) [1] | Expected Completeness (Percent) |
|---|---|---|---|---|
| Carbon Tetrachloride | 116 | 117 | 99 | 95 |
| Chlorobenzene | 115 | 117 | 98 | 95 |
| Chloroform | 112 | 117 | 96 | 95 |
| 1,1-Dichloroethylene | 94 | 117 | **80** | 95 |
| 1,2-Dichloroethane | 115 | 117 | 98 | 95 |
| Methylene Chloride | 77 | 117 | **66** | 95 |
| 1,1,2,2-Tetrachloroethane | 115 | 117 | 98 | 95 |
| Toluene | 74 | 117 | **63** | 95 |
| 1,1,1-Trichloroethane | 115 | 117 | 98 | 95 |
| Trichloroethylene | 116 | 117 | 99 | 95 |
| **Total** | 1049 | 1170 | **90** | 95 |

Note. n = total number of samples.

1. Technical acceptance criterion for expected completeness is greater than or equal to 95 percent. Values shown in **BOLD** are outside the technical acceptance criterion. Values are rounded to the nearest whole number.

**Table 7.1d – Summary of Disposal Room Completeness by Target Analyte in the Semi-Annual VOC Data Summary Report for Reporting Period July 1 to December 31, 2024**

| Target Analyte | Total Number of Acceptable Analytes Meeting all DQOs | Total Number of Analytes Analyzed (n = 84) | Reporting Period Completeness (Percent) [1] | Expected Completeness (Percent) |
|---|---|---|---|---|
| Carbon Tetrachloride | 83 | 84 | 99 | 95 |
| Chlorobenzene | 84 | 84 | 100 | 95 |
| Chloroform | 84 | 84 | 100 | 95 |
| 1,1-Dichloroethylene | 84 | 84 | 100 | 95 |
| 1,2-Dichloroethane | 84 | 84 | 100 | 95 |
| Methylene Chloride | 75 | 84 | **89** | 95 |
| 1,1,2,2-Tetrachloroethane | 84 | 84 | 100 | 95 |
| Toluene | 83 | 84 | 99 | 95 |
| 1,1,1-Trichloroethane | 83 | 84 | 99 | 95 |
| Trichloroethylene | 83 | 84 | 99 | 95 |
| **Total** | 827 | 840 | 98 | 95 |

Note. n = total number of samples.

1. Technical acceptance criterion for expected completeness is greater than or equal to 95 percent. Values shown in **BOLD** are outside the technical acceptance criterion. Values are rounded to the nearest whole number.

### 7.2.2 Precision

Precision is demonstrated in the VOC Monitoring Program by evaluating results from laboratory duplicate analysis and field duplicate samples. The laboratory duplicate samples consist of a laboratory control sample (LCS), laboratory control sample duplicate (LCSD), and laboratory sample duplicates (duplicate analytical runs of monitoring program samples). The field duplicate is a duplicate sample that is collected in parallel with the original sample and is intended to show consistency in the sample collection method. Duplicate samples are evaluated using the relative percent difference (RPD), as defined in WP 12-VC.02. The RPD is calculated using the following equation.

$$RPD = \frac{(|A - B|)}{(A + B)\ /\ 2} \times 100$$

Where:

$RPD$ = relative percent difference.

$A$ = original sample result.

$B$ = duplicate sample result.

Note: vertical lines in the formula above indicate absolute value of A minus B

Referring to tables 7.1a and 7.1b, the LCS/LCSD criteria for RPDs less than or equal to 25 had implications only in sample analyses from the RVMP, whereas all DRVMP samples met this technical acceptance criteria. The SGS laboratory sample duplicate results for the RVMP and DRVMP did not fully meet the technical acceptance criteria for precision of RPDs less than or equal to 25.

Field duplicate samples were also collected and compared for precision. The acceptable range for the RPD between measured concentrations is less than or equal to the acceptance limit of 35. Tables 7.1a and 7.1b conclude field duplicate samples from the RVMP and DRVMP were analyzed and when reported against the original sample, the technical acceptance criterion was not fully met.

### 7.2.3 Accuracy

The VOC monitoring program is used to evaluate both quantitative and qualitative accuracy and recovery of internal standards. Qualitative evaluation consists of the evaluation of standard ion abundance for the instrument tune, which is a mass calibration check with bromofluorobenzene performed prior to analyses of calibration curves and samples. All prescribed checks were performed and met all limits.

#### 7.2.3.1 Quantitative Accuracy

**Instrument Calibrations**

Instrument calibrations are required to have a relative standard deviation percentage of less than or equal to 30 percent for each analyte of the calibration. For VOCs, this is calculated by first calculating the relative response factor as indicated below.

$$\text{Relative Response Factor (RRF)} = \frac{(\text{Analyte Response})(\text{Internal Standard Concentration})}{(Internal\ Standard\ Response)(Analyte\ Concentration)}$$

$$\text{Relative Standard Deviation (RSD)} = \left(\frac{Standard\ Deviation\ of\ Relative\ Response\ Factor}{Average\ Relative\ Response\ Factor\ of\ Analyte}\right) x\ 100$$

During the CY, 100 percent of instrument calibrations met the ±30 percent criterion.

### Laboratory Control Sample Recoveries

Laboratory control sample recoveries are required to have an acceptance criterion of ±40 percent (60 to 140 percent recoveries). Laboratory control sample recoveries are calculated as:

$$Percent\ Recovery = \frac{X}{T} \times 100$$

Where:

$X$ = experimentally determined value of the analyte recovered from the standard.
T = true reference value of the analyte being measured.

Referring to tables 7.1a and 7.1b, LCS sample recoveries were not met for some RVMP samples, whereas all DRVMP samples met this QA/QC objective.

### Internal Standard Area

For VOC analyses, internal standard areas are compared to a calibrated standard area to evaluate accuracy. The acceptance criterion is ±40 percent.

During the CY, 100 percent of internal standards met the ±40 percent criterion.

### Sensitivity

To meet sensitivity requirements, method detection limit (MDL) for each of the 10 target compounds must be evaluated before sampling begins. The initial and annual MDL evaluation is performed in accordance with Appendix B of 40 CFR Part 136, “Guidelines Establishing Test Procedures for the Analysis of Pollutants,” and with Chapter 1, *Quality Control,* of EPA SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (1996). The analytical laboratory, SGS, met the MDL requirements for the CY.

### 7.2.3.2 Qualitative Accuracy

For VOC analyses, the standard ion abundance criterion for bromofluorobenzene is used to evaluate the performance of the analytical system in the ID of target analytes as well as unknown constituents (qualitative accuracy). This ensures that the instrumentation is functioning properly during the analysis of air samples.

During the CY, ion abundance criteria were within tolerance.

### 7.2.4 Comparability

As required by Permit Part 4, Section 4.6.2.1, the Permittees have implemented a proficiency testing (PT) plan for the analytical laboratory. The PT plan is described in Permit Attachment N, Section N-5e. This plan requires the analytical laboratory to participate in a low-concentration PT program, which is provided by an independent laboratory contracted directly with the EPA and is administered twice a year when the analytical laboratory is not accredited by accepted accreditation bodies. The contracted laboratory, SGS, participates in national proficiency test programs twice a year to maintain the accreditations required by the National Environmental Laboratory Accreditation Program and uses Phenova as its PT provider.

### 7.2.5 Representativeness

Representativeness is ensured using programmatic plans and procedures implementing EPA guidance designed to collect and analyze samples in a consistent manner.

## 7.3 EUROFINS ENVIRONMENT TESTING SOUTH CENTRAL, LLC

Eurofins performed the chemical analyses for the round 46 groundwater sampling in the CY. Eurofins followed laboratory SOPs based on standard analytical methods from the EPA and *Standard Methods for the Examination of Water and Wastewater,* 22nd and 23rd editions (Eaton et al., 2012, 2017). Eurofins performed analyses for the metals barium, beryllium, cadmium, nickel, silver, vanadium, calcium, magnesium, potassium and sodium by inductively-coupled plasma atomic emission spectroscopy (ICP-AES); antimony, arsenic, lead, selenium, and thallium by inductively-coupled plasma mass spectrometry (ICP-MS), and mercury by graphite furnace atomic absorption spectroscopy. These methods followed EPA 6010B, EPA 6020, and EPA 7470 respectively.

### 7.3.1 Completeness

Six DMP wells were sampled once in the CY from March through May. The completeness objective was met as analytical results were received for all the samples submitted (100 percent completeness).

### 7.3.2 Precision

Eurofins provided precision data for the analyses of LCS/LCSD pairs, matrix spike / matrix spike duplicate (MS/MSD) pairs, and single primary groundwater samples analyzed as laboratory duplicates for selected analytes where MS/MSD samples are not applicable. The quality assurance objective (QAO) for the precision of the LCS/LCSD, MS/MSD, and duplicate sample concentrations is ≤ 20 RPD for all constituents and general chemistry parameters.

Considering the hundreds of groundwater sample data points and QA/QC sample data points that were generated during round 46, the number of duplicate groundwater samples and QA samples that did not meet the precision objective was low. Values of the RPD are detailed in the laboratory’s QC summary reports located in appendices 3 through 8 of the *Annual Culebra Groundwater Report* (DOE, November 2024).

### 7.3.3 Accuracy

The accuracy of the analyses was checked by analyzing initial calibration verification standards, continuing calibration verification standards, method blanks, LCS and LCSD samples, and MS/MSD samples, as specified in the standard methods and the corresponding lab SOPs. The daily calibration standards were used to confirm that the response in the daily standard closely matched the corresponding response during the initial calibration. The method blanks were used to confirm that the accuracy of the groundwater sample analyses was not adversely affected by the presence of any of the target analytes as background contaminants that may have been introduced during sample preparation and analysis. Where applicable, the LCS and LCSD samples were analyzed to check that the analytical method was in control by measuring the percent recoveries of the target analytes spiked into clean water. The MS/MSD samples were prepared and analyzed to check the effect of the groundwater sample matrix on the accuracy of the analytical measurements as percent recovery. Although the laboratory experienced some difficulties with some low MS/MSD and surrogate recoveries, likely resulting from the effects of matrix interference on extraction combined with losses due to chromatographic absorption, they did not impact conclusions made with the data. The accuracy of the QC data was quite good, with nearly all LCS/LCSD and some MS/MSD recoveries meeting the QAO for accuracy. The accuracies of the QC data are detailed in the laboratory's QC summary reports located in appendices 3 through 8 of the *Annual Culebra Groundwater Report* (DOE, November 2024).

### 7.3.4 Comparability

The Permit requires that groundwater analytical results be comparable by reporting data in consistent units and collecting and analyzing samples using a consistent methodology (Permit Attachment L, Section L-7a(2)(vi)). These comparability requirements were met using consistent, approved SOPs for sample collection and analyses. The standard reporting unit for metals and general chemistry parameters was mg/L; and the standard reporting unit for organics was micrograms per liter (µg/L).

Eurofins is certified by NELAP and by several states, including Oregon, Texas, New Mexico, and Arizona. The lab participates in inter-laboratory evaluation programs, including onsite NELAP QA audits. The lab also regularly analyzes performance evaluation samples from a NELAP-accredited proficiency standard vendor. Eurofins obtained proficiency standards from vendor Phenova Certified Reference Materials (a Phenomenex company). Detailed results are in the *Annual Culebra Groundwater Report* (DOE, November 2024).

### 7.3.5 Representativeness

The groundwater DMP is designed so that representative groundwater samples are collected from specific monitoring well locations. Prior to collecting the final samples from each well, serial samples were collected and analyzed in an onsite mobile laboratory to help determine whether the water being pumped from the monitoring wells was stable and representative of the natural groundwater at each well. The parameters analyzed in the mobile laboratory included temperature, pH, specific gravity, and specific conductance. The final samples for analysis of VOCs, semi-volatile organic compounds (SVOCs), metals, and general chemistry parameters were collected only when it had been determined from the serial sampling analysis results that the water being pumped was representative of the natural groundwater at each location.

# APPENDIX A – REFERENCES

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10 CFR Part 834. "Radiation Protection of the Public and the Environment." Proposed Rule. *Code of Federal Regulations*. Office of the Federal Register, National Archives and Records Administration, Washington, D.C.

10 CFR Part 860. "Trespassing on Department of Energy Property." *Code of Federal Regulations*. Office of the Federal Register, National Archives and Records Administration, Washington, D.C.

10 CFR Part 1021. "National Environmental Policy Act Implementing Procedures." *Code of Federal Regulations*. Office of the Federal Register, National Archives and Records Administration, Washington, D.C.

40 CFR § 61.92. "National Emission Standards for Hazardous Air Pollutants Subpart H. Standard." *Code of Federal Regulations*. Office of the Federal Register, National Archives and Records Administration, Washington, D.C.

40 CFR § 61.93. "National Emission Standards for Hazardous Air Pollutants Subpart H Emission Monitoring and Test Procedures." *Code of Federal Regulations*. Office of the Federal Register, National Archives and Records Administration, Washington, D.C.

40 CFR Part 61, Subpart H. "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities." *Code of Federal Regulations*. Office of the Federal Register, National Archives and Records Administration, Washington, D.C.

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40 CFR §191.03, Subpart A. "Standards." *Code of Federal Regulations*. Office of the Federal Register, National Archives and Records Administration, Washington, D.C.

40 CFR Part 194. "Criteria for the Certification and Re-Certification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR Part 191 Disposal Regulations." *Code of Federal Regulations.* Office of the Federal Register, National Archives and Records Administration, Washington, D.C.

40 CFR Part 264. "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities." *Code of Federal Regulations*. Office of the Federal Register, National Archives and Records Administration, Washington, D.C.

40 CFR Part 264, Subpart F. "Releases from Solid Waste Management Units." *Code of Federal Regulations*. Office of the Federal Register, National Archives and Records Administration, Washington, D.C.

40 CFR Part 264, Subpart X. "Miscellaneous Units." *Code of Federal Regulations*. Office of the Federal Register, National Archives and Records Administration, Washington, D.C.

40 CFR Part 270. "EPA Administered Permit Programs: The Hazardous Waste Permit Program." *Code of Federal Regulations*. Office of the Federal Register, National Archives and Records Administration, Washington, D.C.

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42 U.S.C. § 7401, et seq. *Clean Air Act*. United States Code. U.S. Government Printing Office, Washington, D.C.

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42 U.S.C. § 10101, et seq. *Nuclear Waste Policy Act of 1982*. United States Code. U.S. Government Printing Office, Washington, D.C.

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# APPENDIX B – ENVIRONMENTAL PERMITS

**Major Environmental Permits for the Waste Isolation Pilot Plant During Reporting Period, with status as of March 11, 2025**

| Granting Agency | Type of Permit | Permit Number | Granted/ Submitted | Expiration | Permit Status |
|---|---|---|---|---|---|
| New Mexico Environment Department | Hazardous Waste Facility Permit | NM4890139088-TSDF | 10/04/2023 effective 11/03/2023 | 11/02/2033 | Active |
| New Mexico Environment Department Groundwater Quality Bureau | Discharge Permit | DP-831 | 01/28/2022 | 01/27/2027 | Active |
| New Mexico Environment Department Air Quality Bureau | Operating Permit for Two Backup Diesel Generators | 310-M-2 | 12/07/1993 | None | Active |
| New Mexico Environment Department Petroleum Storage Tank Bureau | Petroleum Storage Tank Registration Certificate | Registration Number 2008<br>Facility Number 31539 | 07/02/2023 | 06/30/2024 | Expired |
| New Mexico Environment Department Petroleum Storage Tank Bureau | Petroleum Storage Tank Registration Certificate | Registration Number 2032<br>Facility Number 31539 | 07/01/2024 | 03/30/2025 | Temporary closure submitted, Feb 2025 |
| U.S. Environmental Protection Agency Region 6 | Reauthorization and Conditions of Approval for Disposal of Non-Liquid PCB/TRU and PCB/TRU Mixed Waste at the U.S. Department of Energy (DOE) Waste Isolation Pilot Plant (WIPP) Carlsbad, NM | N/A | 03/19/2018 | 03/19/2023<br>Extension:<br>09/30/2023<br>04/15/2024 | Expired |
| U.S. Environmental Protection Agency Region 6 | Reauthorization and Conditions of Approval for Disposal of Non-Liquid PCB/TRU and PCB/TRU Mixed Waste at the U.S. Department of Energy (DOE) Waste Isolation Pilot Plant (WIPP) Carlsbad, NM | N/A | 04/11/2024 | 04/11/2029 | Active |
| U.S. Fish and Wildlife Service | Special Purpose – Relocate | MB155189-2 | 04/01/2023 | 03/31/2026 | Active |
| New Mexico Department of Game and Fish | Biotic Collection Permit | Authorization № 3293 | 12/16/2022 | 12/31/2025 | Active |

N/A = Not applicable

# APPENDIX C – LOCATION CODES

| | | | |
|---|---|---|---|
| BHT | Bottom of the Hill Tank | PCN | Pierce Canyon |
| BLK | Blank | PEC | Pecos River |
| BRA | Brantley Lake | PKT | Poker Trap |
| CBD | Carlsbad | RED | Red Tank |
| COW | Coyote Well (deionized water blank) | RLK | Red Lake |
| COY | Coyote (surface water duplicate) | SEC | Southeast Control |
| FWT | Fresh Water Tank | SMR | Smith Ranch |
| H19 | Evaporation Pond H-19 (DP-831) | SOO | Sample of Opportunity [1] |
| HIL | Hill Tank | SWL | Sewage Lagoon |
| IDN | Indian Tank | UPR | Upper Pecos River |
| LST | Lost Tank | WEE | WIPP East |
| MLR | Mills Ranch | WFF | WIPP Far Field |
| NOY | Noya Tank | WSS | WIPP South |

1. A SOO code is used for a location that may present itself aside from any other named location.

# APPENDIX D – RADIOCHEMICAL EQUATIONS

## Scientific Notation

Scientific notation is used to express large or small numbers. For example, 1 million can be written as 1,000,000 or, using E notation, written as 1.0E+06. Converting from scientific notation to a general number requires moving the decimal point either left or right from its current location. If the value given is 4.0E-03, the decimal point should be moved three places to the left, so the general number is 0.004. If the value given is 1.0E+03, the decimal point should be moved three places to the right, so the result would be 1,000.

## Minimum Detectable Concentration

The MDC is the smallest amount (activity or mass) of a radionuclide in a sample that will be detected with a maximum of a 5 percent probability of false positive, a maximum of a 5 percent probability of a false negative and a 95 percent probability for detection, assuming a Gaussian distribution. It is possible to achieve a very low detection level by analyzing a large sample size and counting for an extended time.

The WIPP Laboratories use the following general equation for calculating the MDCs for each radionuclide in various sample matrices:

$$MDC = \frac{4.66\sqrt{S}}{K\,T} + \frac{3.00}{K\,T}$$

Where:

*S* = net method blank counts. When the method blank counts = 0, the average of the last 30 blanks analyzed are substituted

*K* = a correction factor that includes items such as unit conversions, sample volume/weight, decay correction, detector efficiency, chemical recovery, abundance correction, and others.

*T* = counting time where the background and sample counting time are identical

For further evaluation of the MDC, refer to ANSI N13.30, *Performance Criteria for Radiobioassay*.

## Total Propagated Uncertainty

The TPU estimates the uncertainty in the measurement due to all sources, including counting error, measurement error, chemical recovery error, detector efficiency, randomness of radioactive decay, and any other sources of uncertainty.

The TPU for each data point must be reported at the 2-sigma level (2 σ TPU), where sigma (σ) is one standard deviation of the calculated result from the mean, taking into account the combined uncertainties of the measurements used to calculate the result. For further discussion of TPU, refer to ANSI N13.30.

**Relative Error Ratio**

The RER is a method, similar to a t-test, to compare duplicate sample analysis results (see chapters 4 and 7, and WP 02-EM3004, *Radiological Data Verification and Validation*). RER for laboratory duplicates has an objective of ≤ 2.

$$\text{RER} = \frac{|(Activity)pri - (Activity)dup)|}{\sqrt{(1\sigma TPU)^2 pri + (1\sigma TPU)^2 dup}}$$

Where:

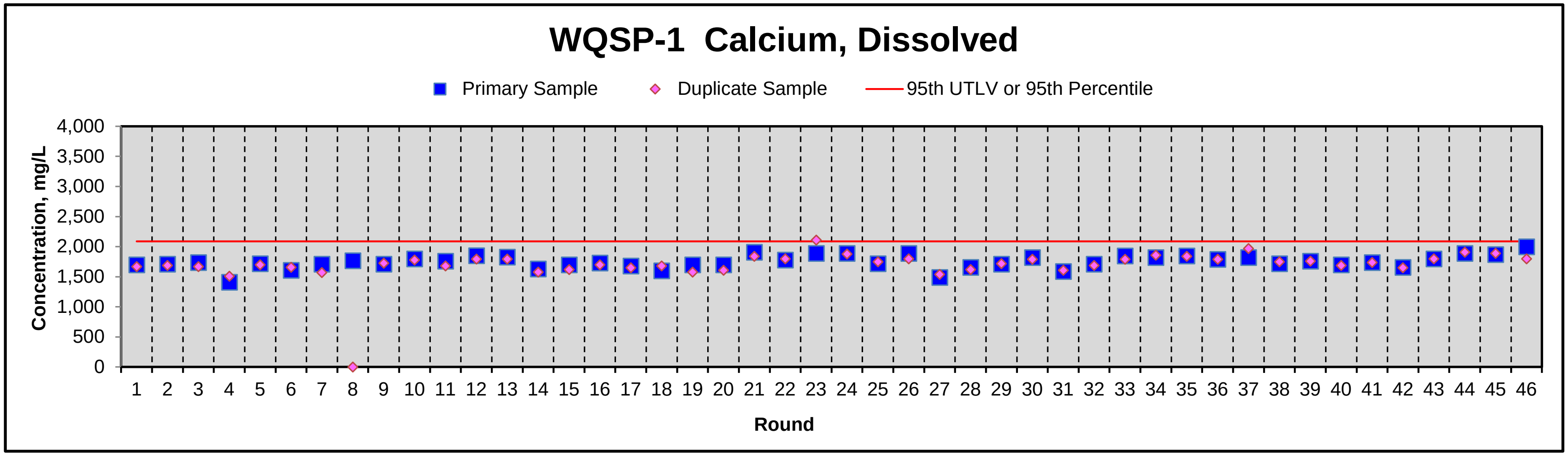
The vertical brackets (| |) indicate absolute value.

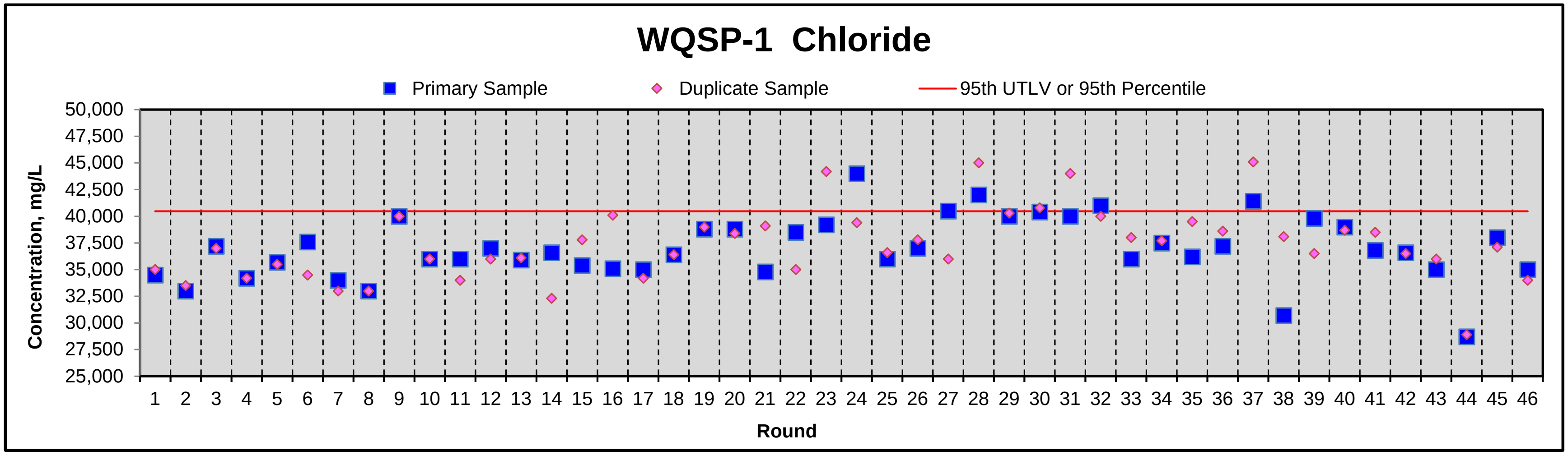
| | | |
|---|---|---|
| $(Activity)^{pri}$ | = | mean activity of the primary sample |
| $(Activity)^{dup}$ | = | mean activity of the duplicate sample |
| *1σTPU* | = | total propagated uncertainty at the 1 σ level |

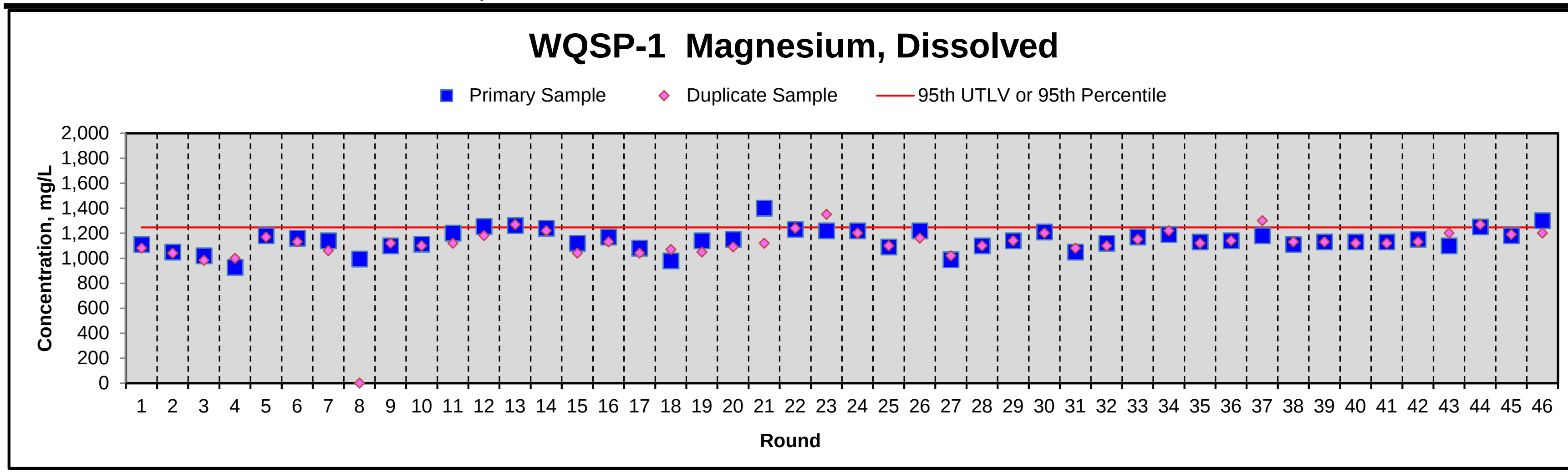
# APPENDIX E – TIME SERIES PLOTS FOR MAIN PARAMETERS IN GROUNDWATER

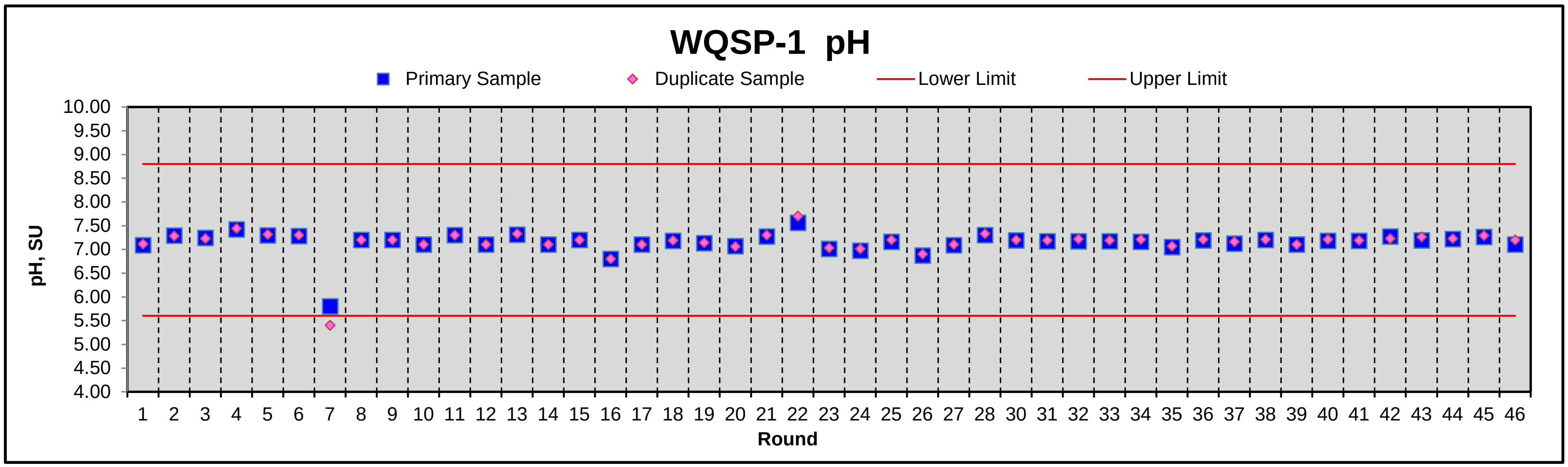
The first 10 sampling rounds were conducted from 1995 through 2000 (prior to receiving mixed waste at the WIPP) and were used to establish the original baseline for groundwater chemistry at each sampling location. The baseline sample sets are used to determine whether statistically significant changes have occurred at any well. Time series plots are provided below for the following general chemistry indicator parameters: dissolved calcium, chloride, dissolved magnesium, pH, dissolved potassium, and TDS. These plots show the concentrations in the primary sample and the duplicate sample for all sampling rounds.

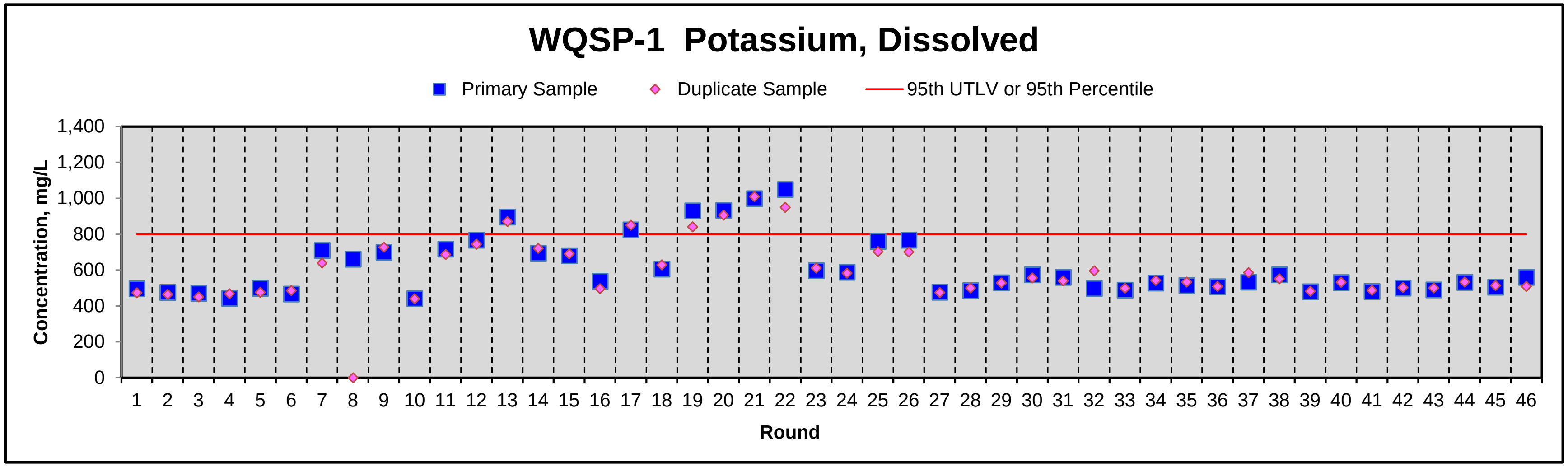
The CY laboratory analytical results were verified and validated in accordance with WIPP procedures and EPA technical guidance. Sampling round 46 samples were collected from March through May 2024. See appendix F for method reporting limits in table F.1 and the results of the target analytes in the DMP wells in table F.2.

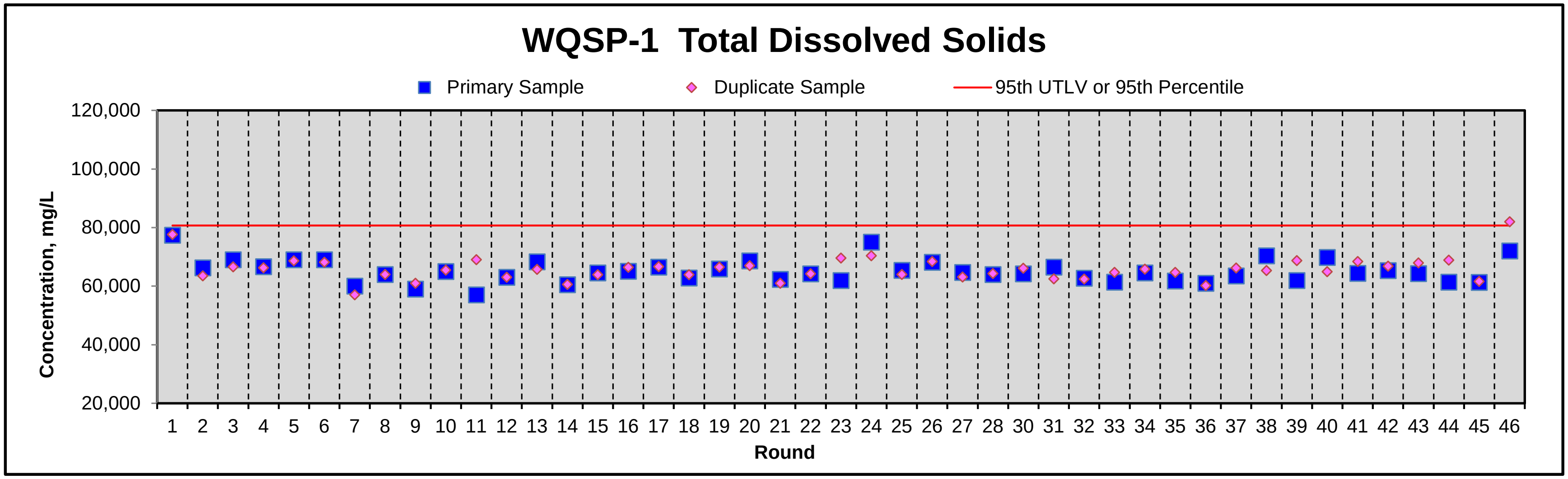

WQSP-1 Calcium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
Round
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46


WQSP-1 Chloride
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
25,000
27,500
30,000
32,500
35,000
37,500
40,000
42,500
45,000
47,500
50,000
Round
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46


WQSP-1 Magnesium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round


WQSP-1 pH
Primary Sample
Duplicate Sample
Lower Limit
Upper Limit
pH, SU
10.00
9.50
9.00
8.50
8.00
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round


WQSP-1 Potassium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
0
200
400
600
800
1,000
1,200
1,400
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round


WQSP-1 Total Dissolved Solids
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
20,000
40,000
60,000
80,000
100,000
120,000
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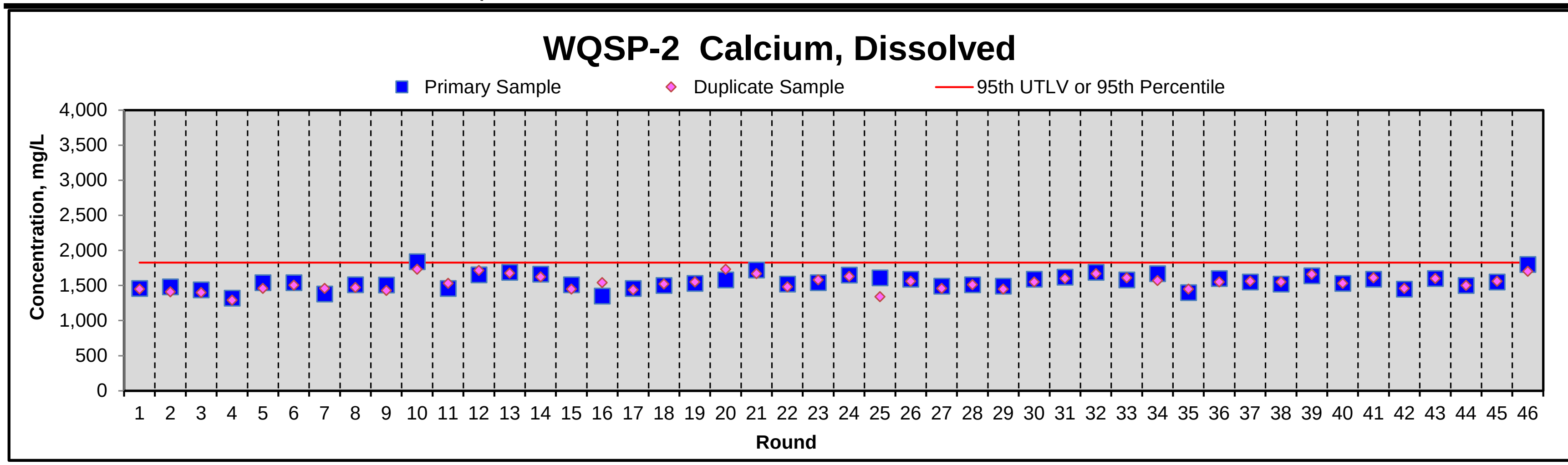
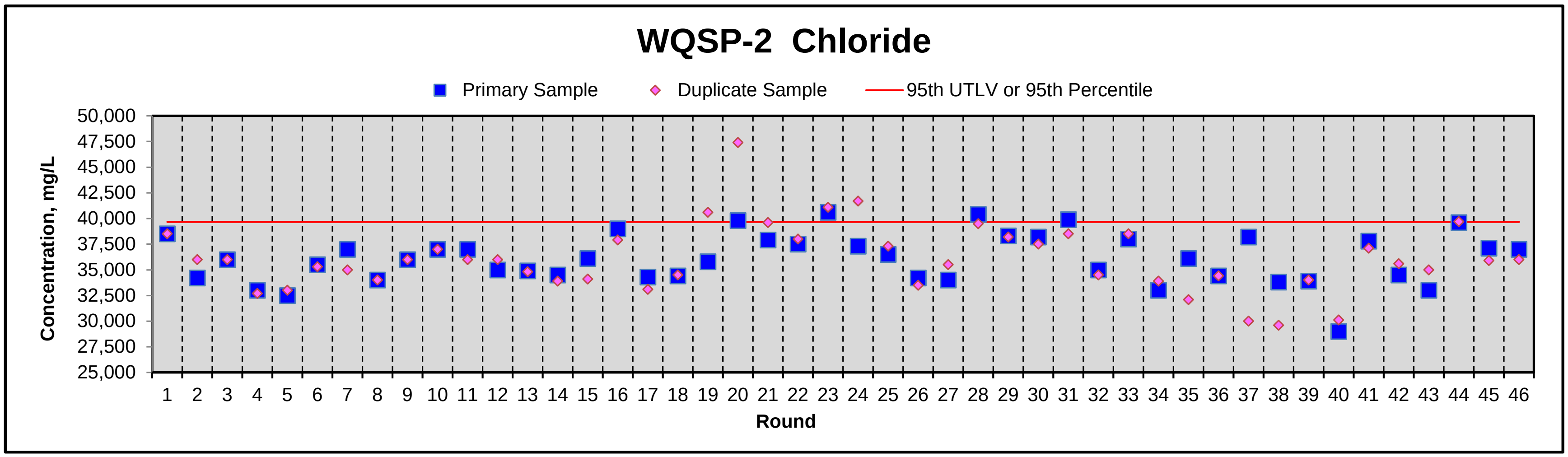
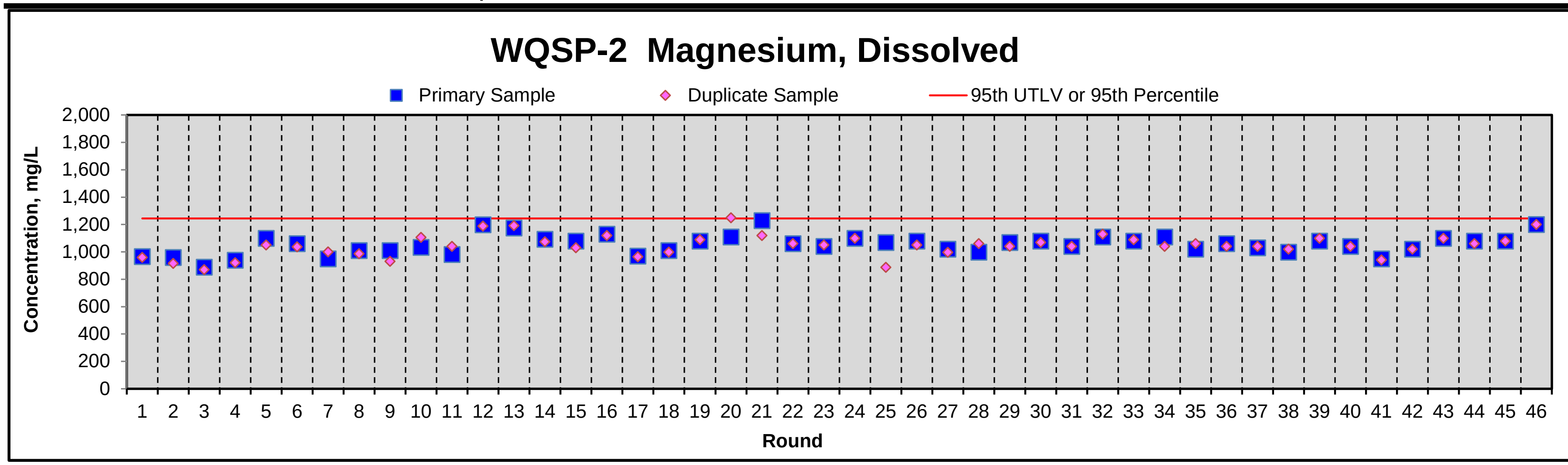
Round

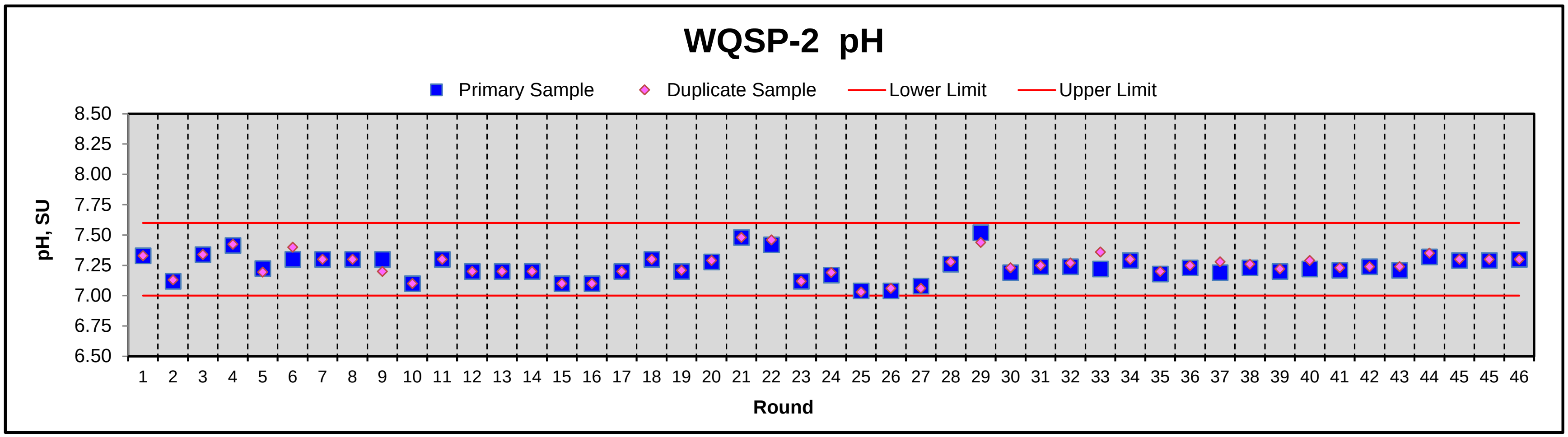

WQSP-2 Calcium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

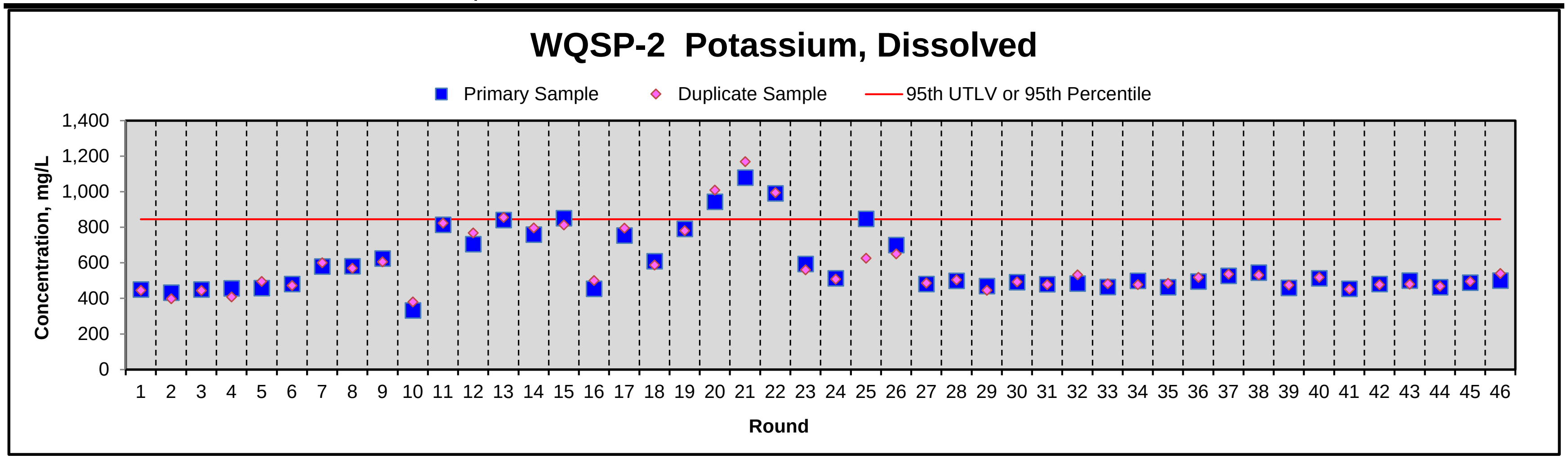

WQSP-2 Chloride
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
50,000
47,500
45,000
42,500
40,000
37,500
35,000
32,500
30,000
27,500
25,000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

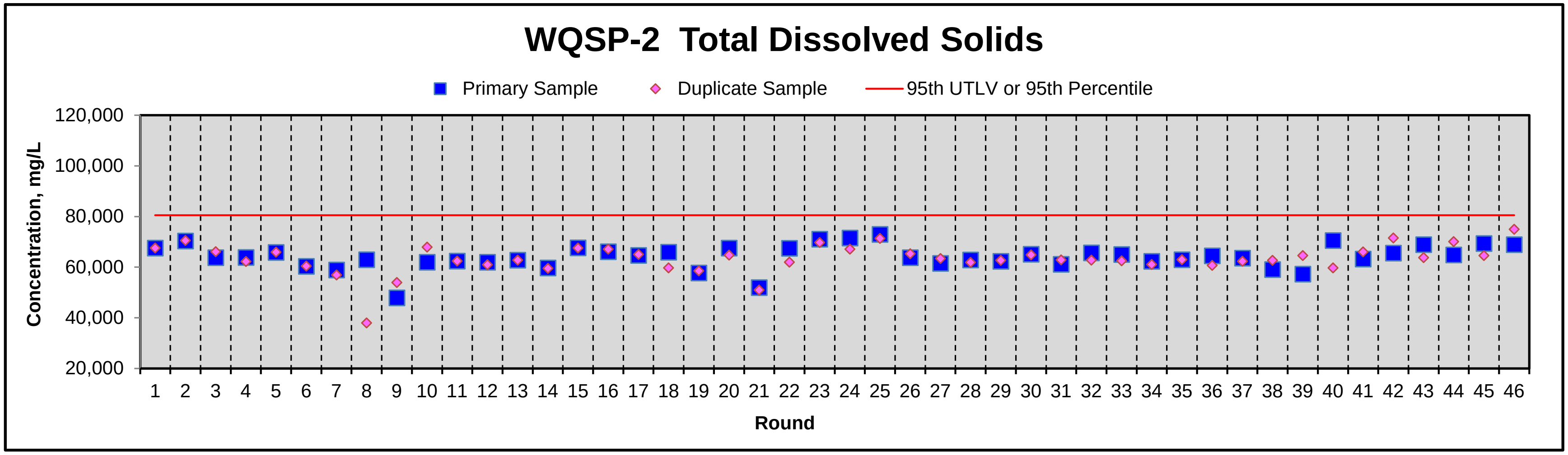
ISSUED

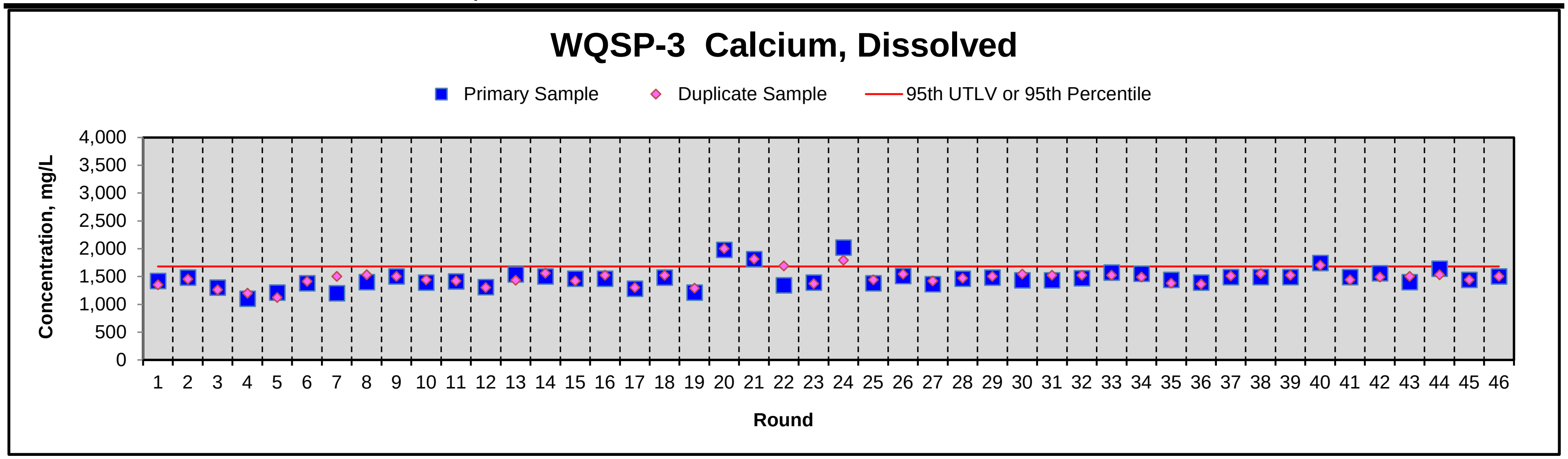


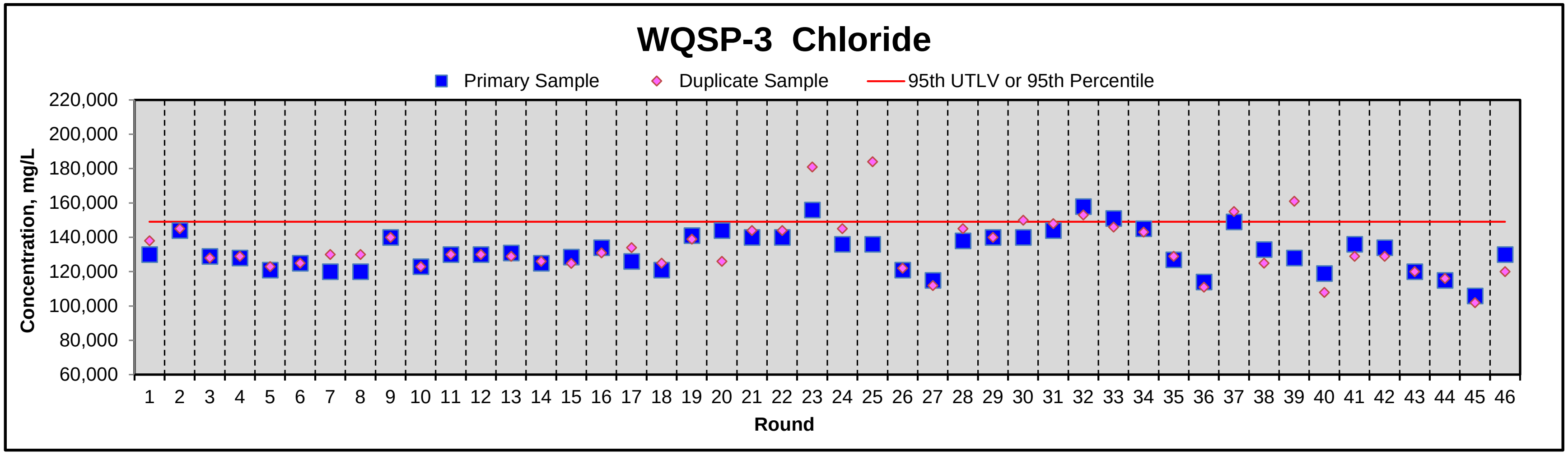

WQSP-2 Magnesium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

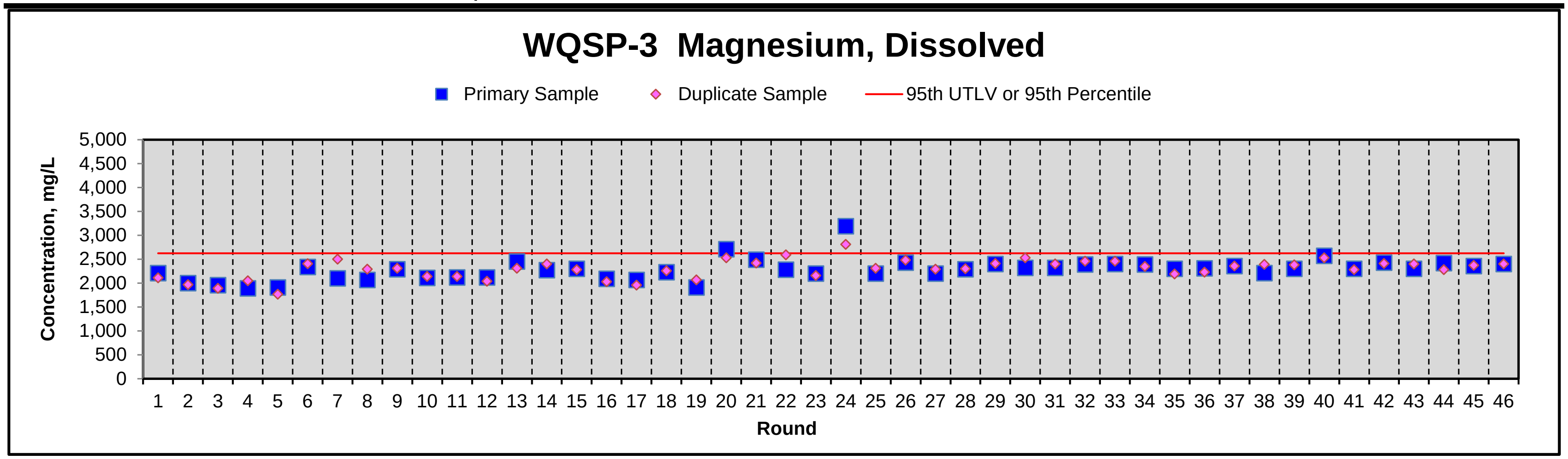

WQSP-2 pH
Primary Sample
Duplicate Sample
Lower Limit
Upper Limit
pH, SU
8.50
8.25
8.00
7.75
7.50
7.25
7.00
6.75
6.50
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 45 46
Round

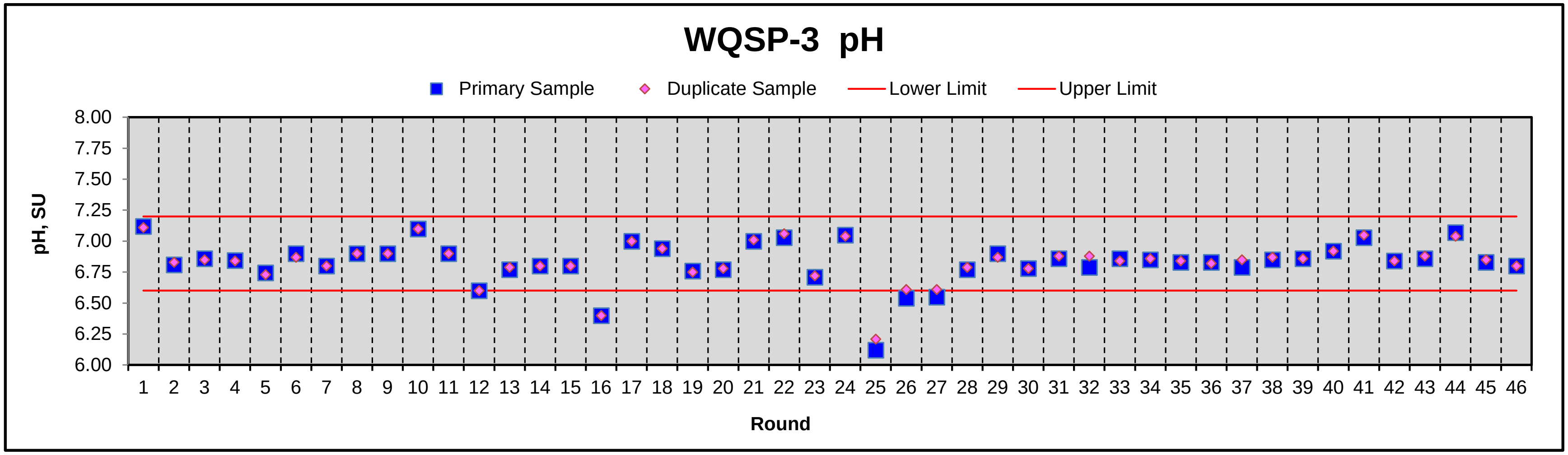

WQSP-2 Potassium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
1,400
1,200
1,000
800
600
400
200
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

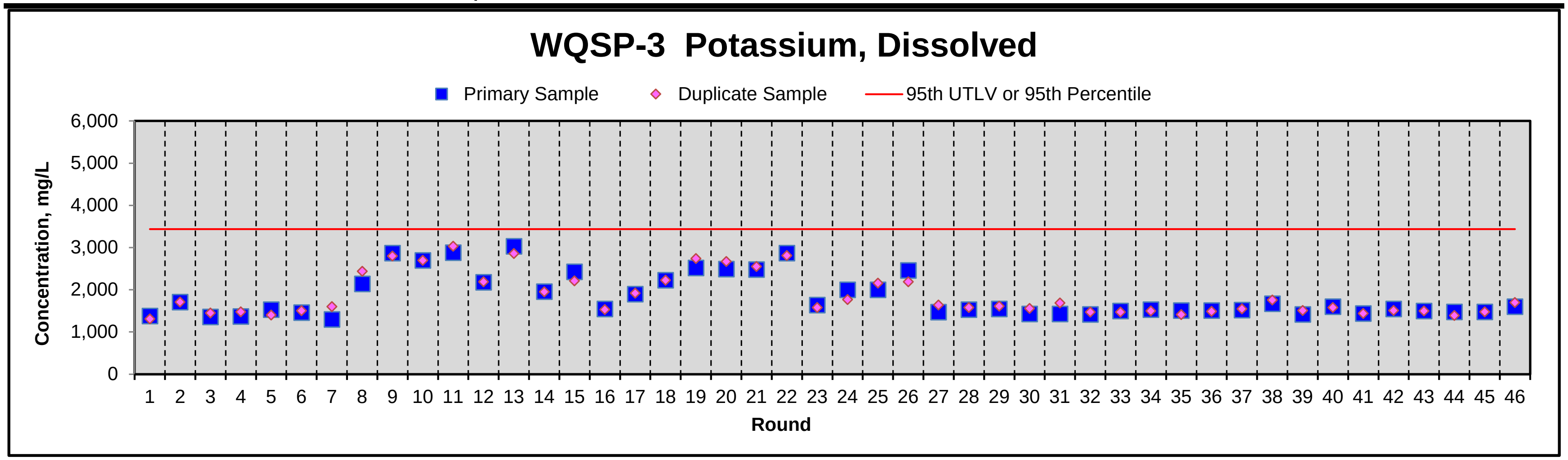

WQSP-2 Total Dissolved Solids
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
120,000
100,000
80,000
60,000
40,000
20,000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

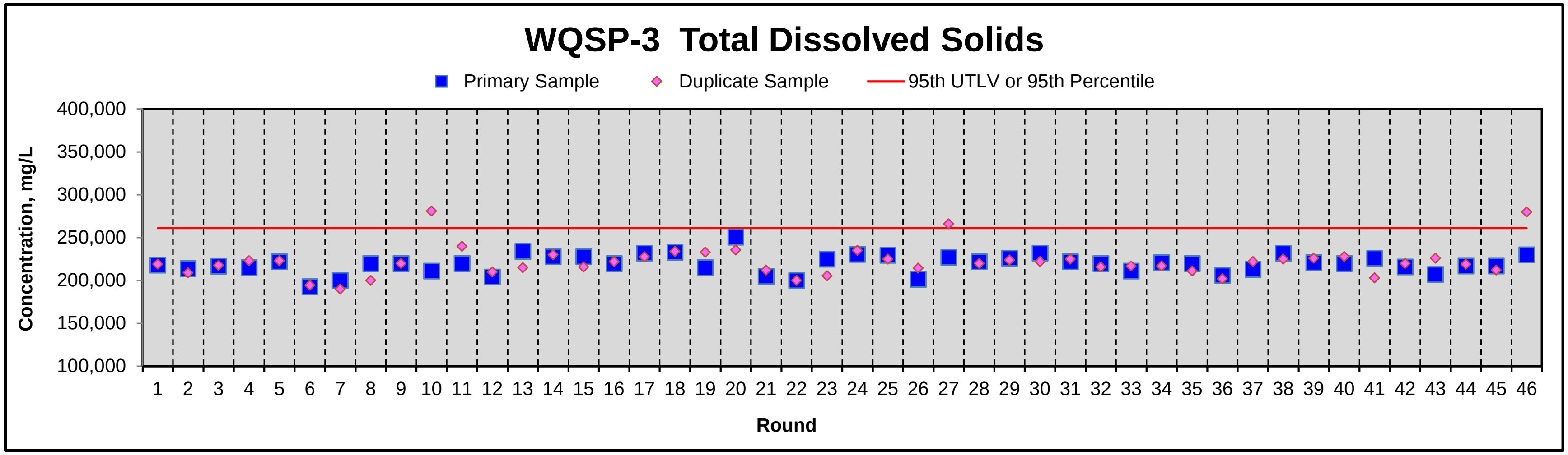

WQSP-3 Calcium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

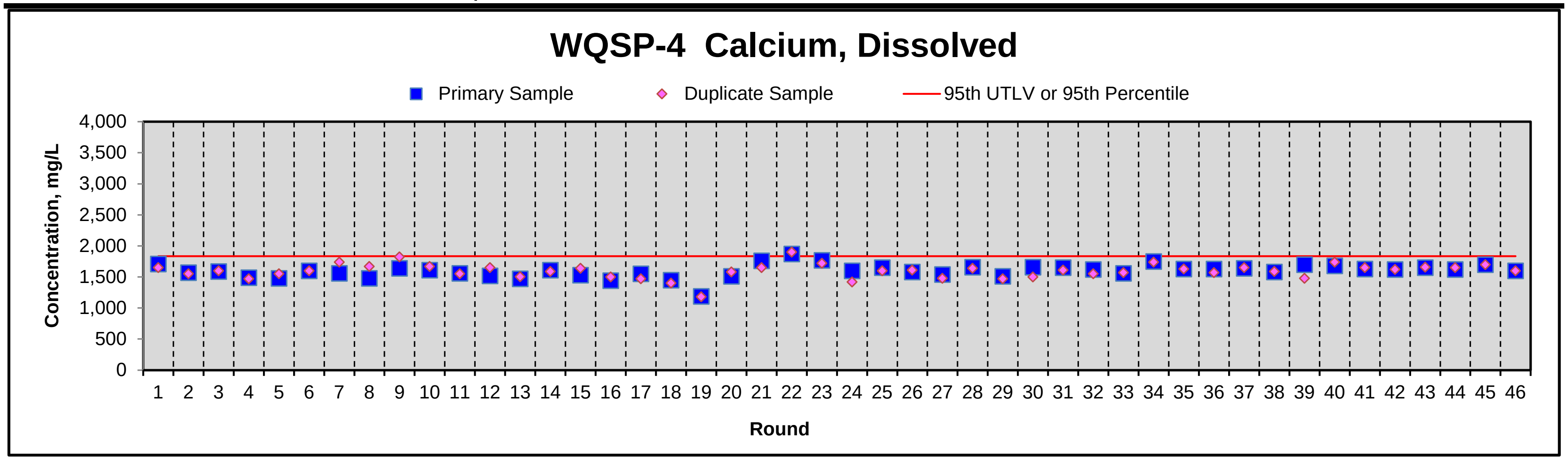

WQSP-3 Chloride
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

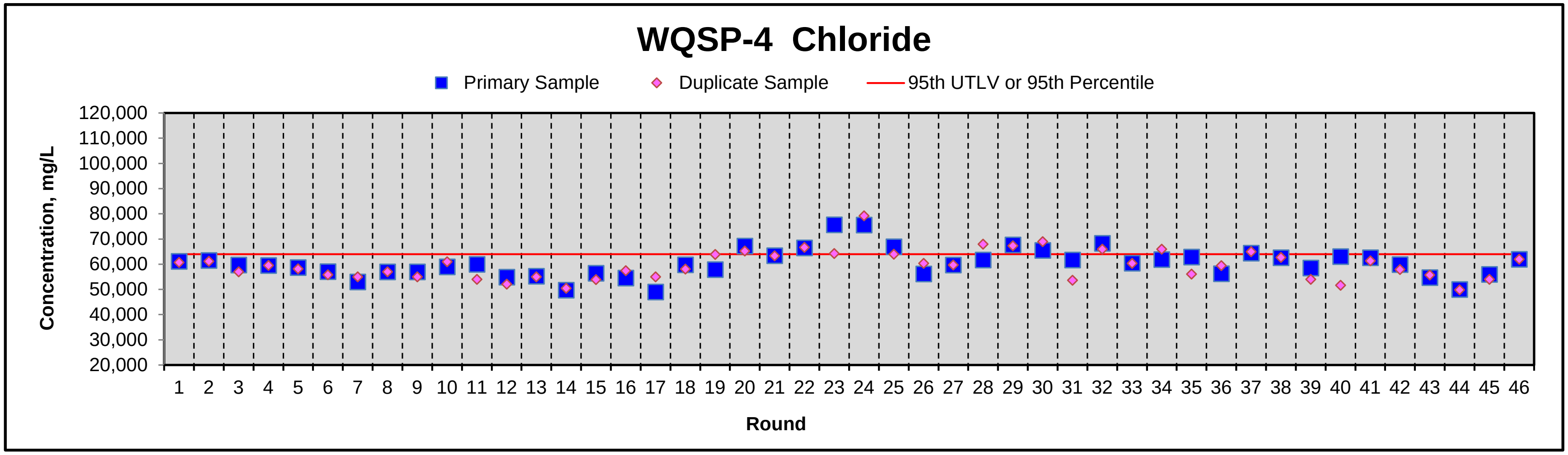

WQSP-3 Magnesium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

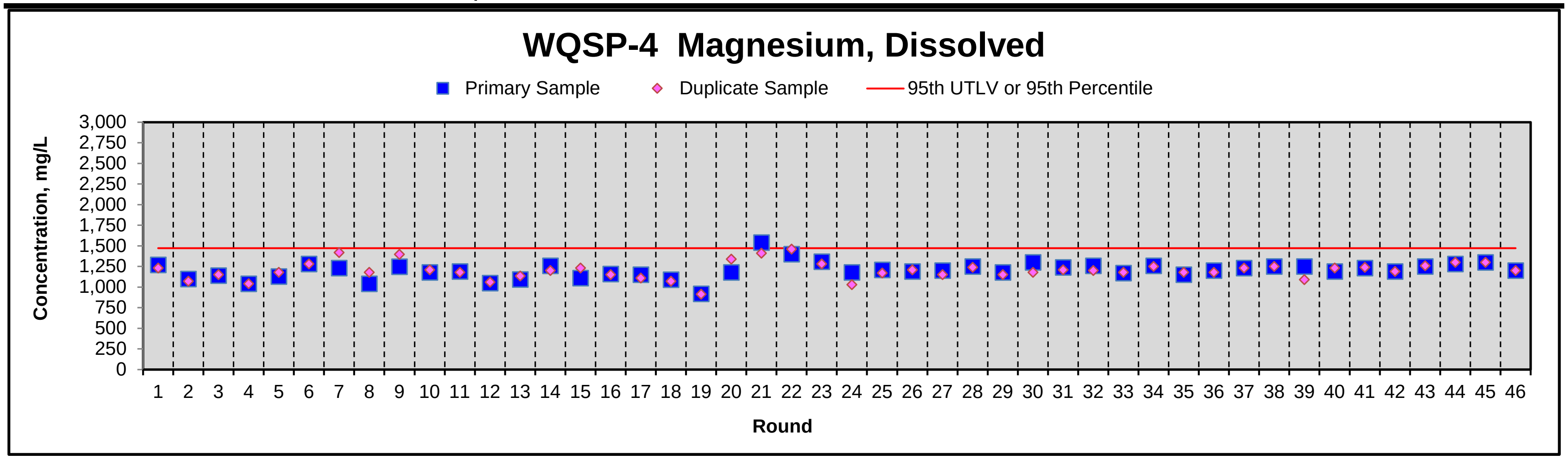

WQSP-3 pH
Primary Sample
Duplicate Sample
Lower Limit
Upper Limit
pH, SU
8.00
7.75
7.50
7.25
7.00
6.75
6.50
6.25
6.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

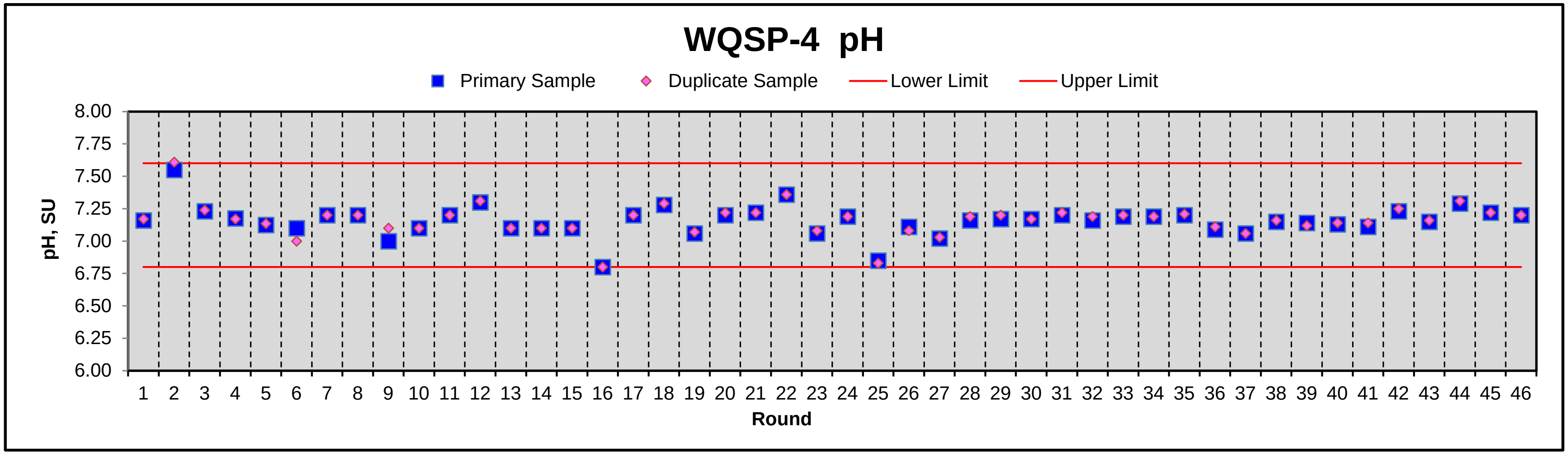

WQSP-3 Potassium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
6,000
5,000
4,000
3,000
2,000
1,000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

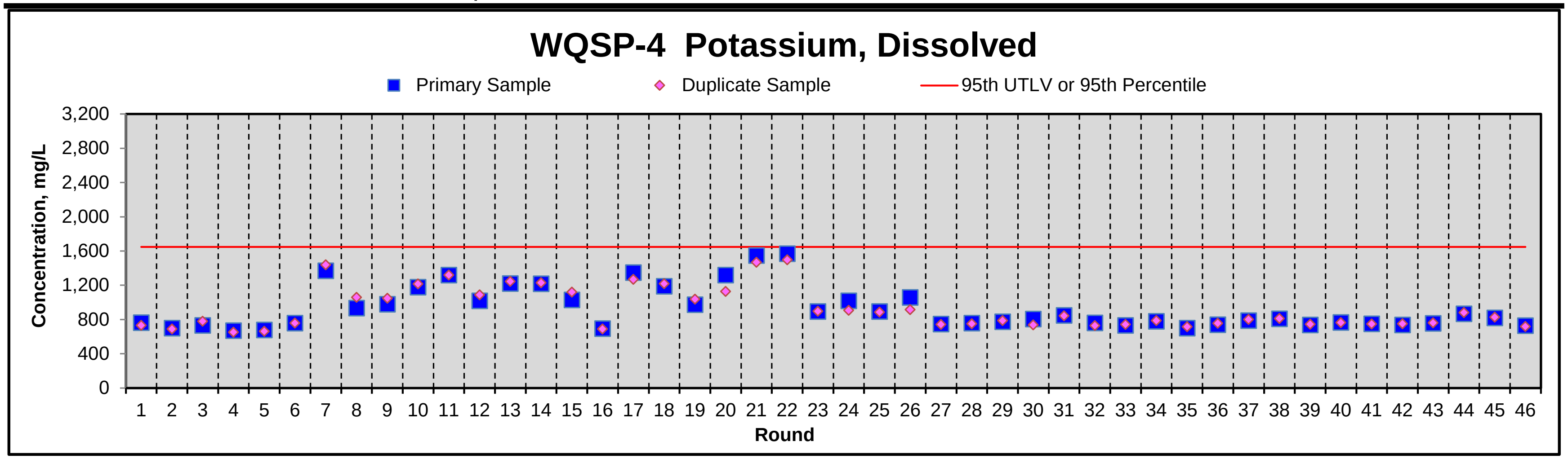

WQSP-3 Total Dissolved Solids
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
400,000
350,000
300,000
250,000
200,000
150,000
100,000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

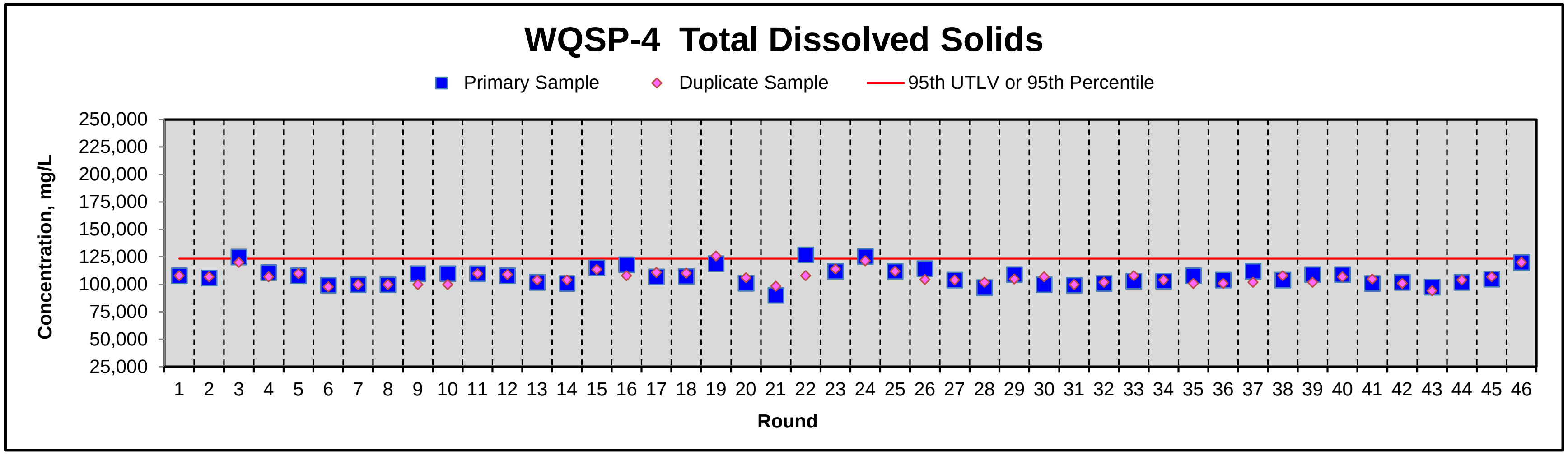

WQSP-4 Calcium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

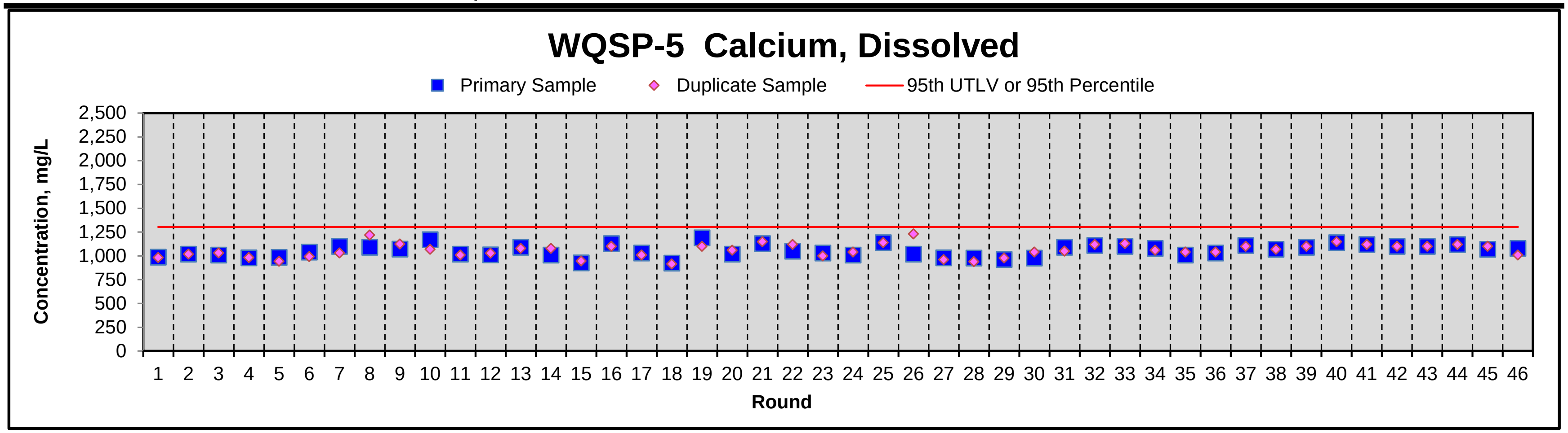

WQSP-4 Chloride
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

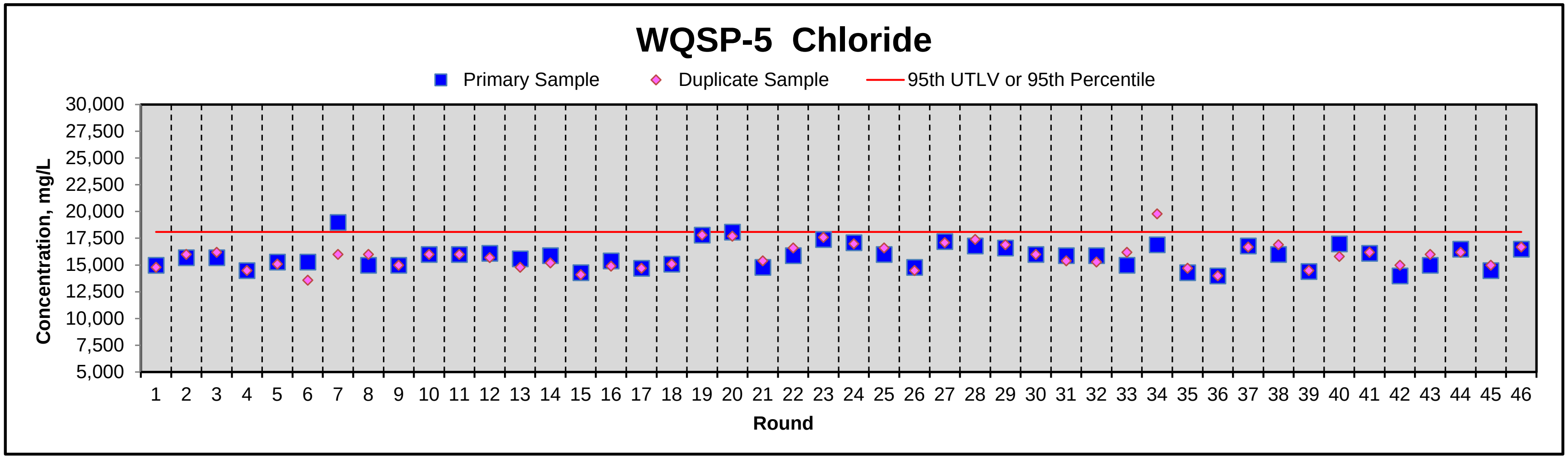

WQSP-4 Magnesium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
3,000
2,750
2,500
2,250
2,000
1,750
1,500
1,250
1,000
750
500
250
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

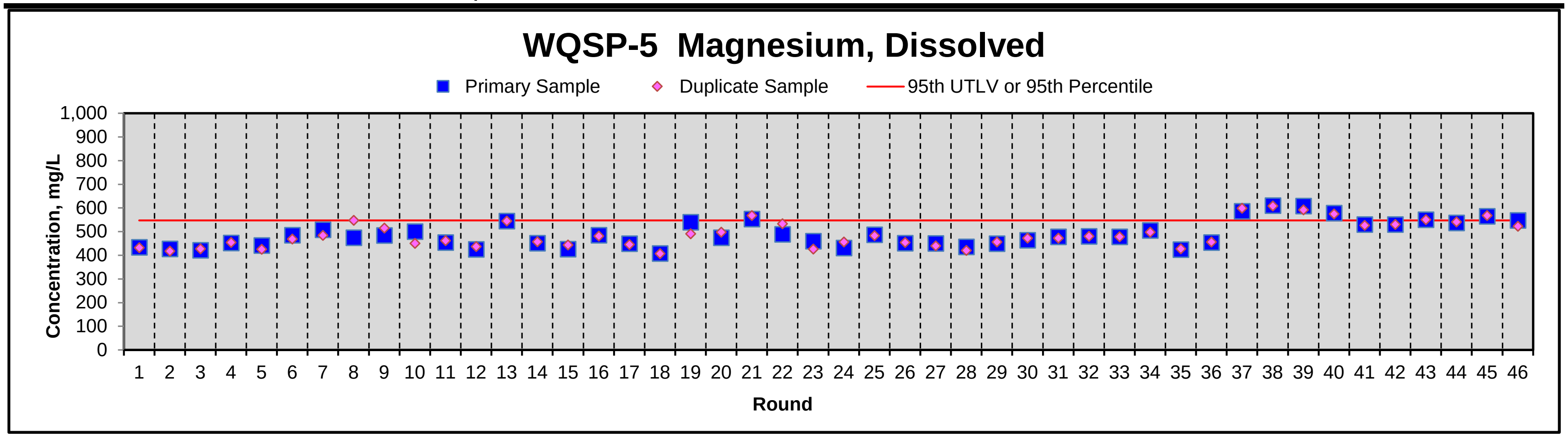

WQSP-4 pH
Primary Sample
Duplicate Sample
Lower Limit
Upper Limit
pH, SU
8.00
7.75
7.50
7.25
7.00
6.75
6.50
6.25
6.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

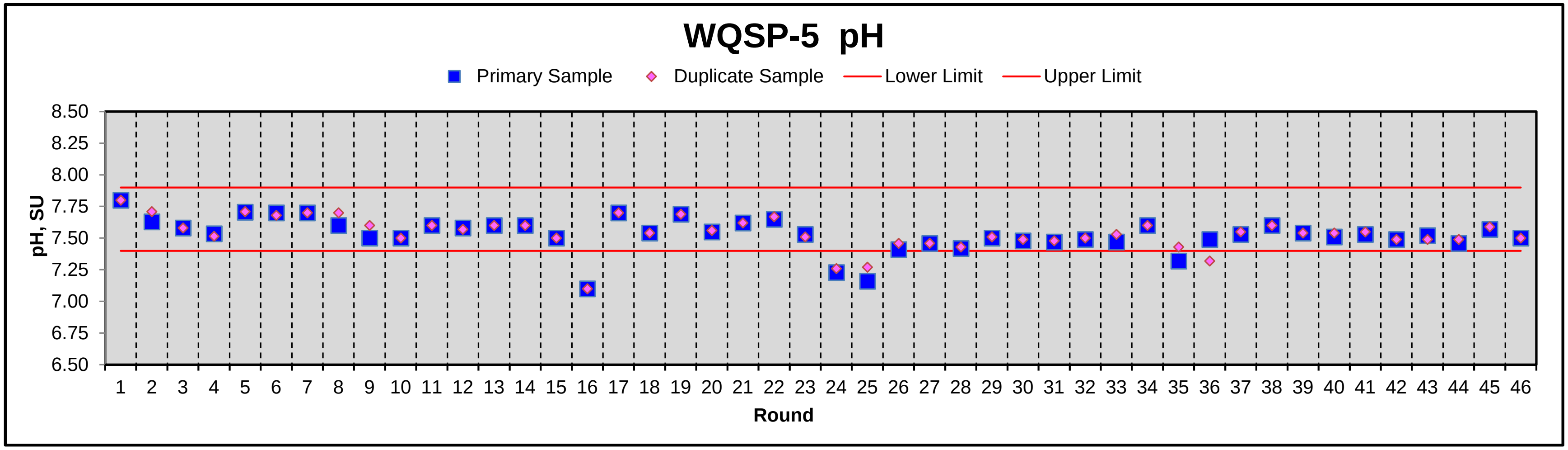

WQSP-4 Potassium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
3,200
2,800
2,400
2,000
1,600
1,200
800
400
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

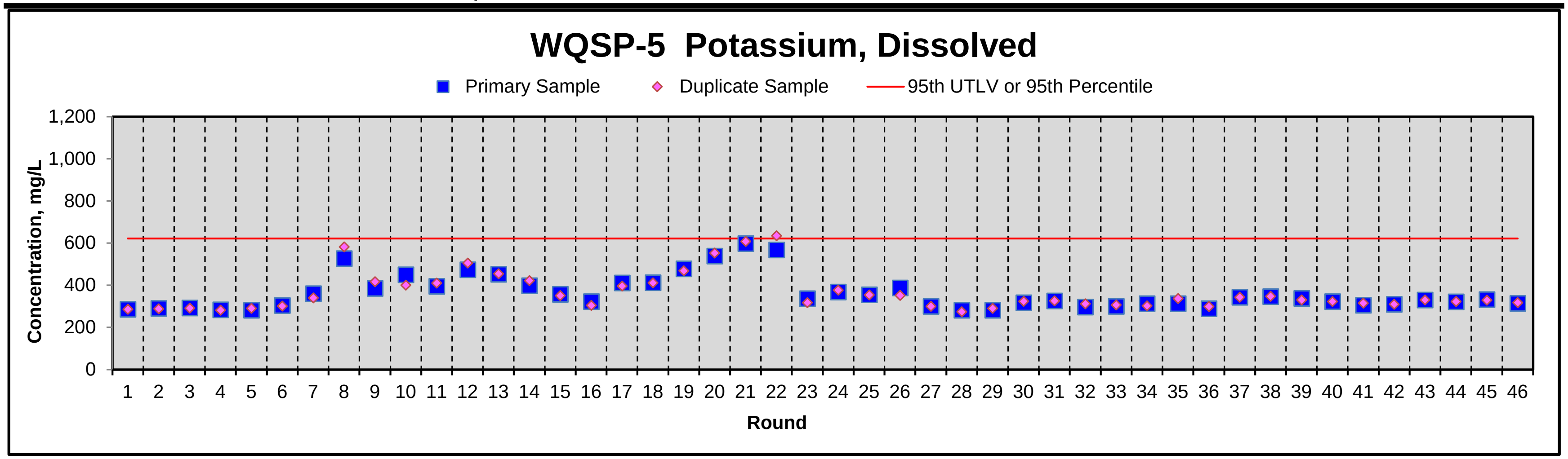

WQSP-4 Total Dissolved Solids
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
250,000
225,000
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

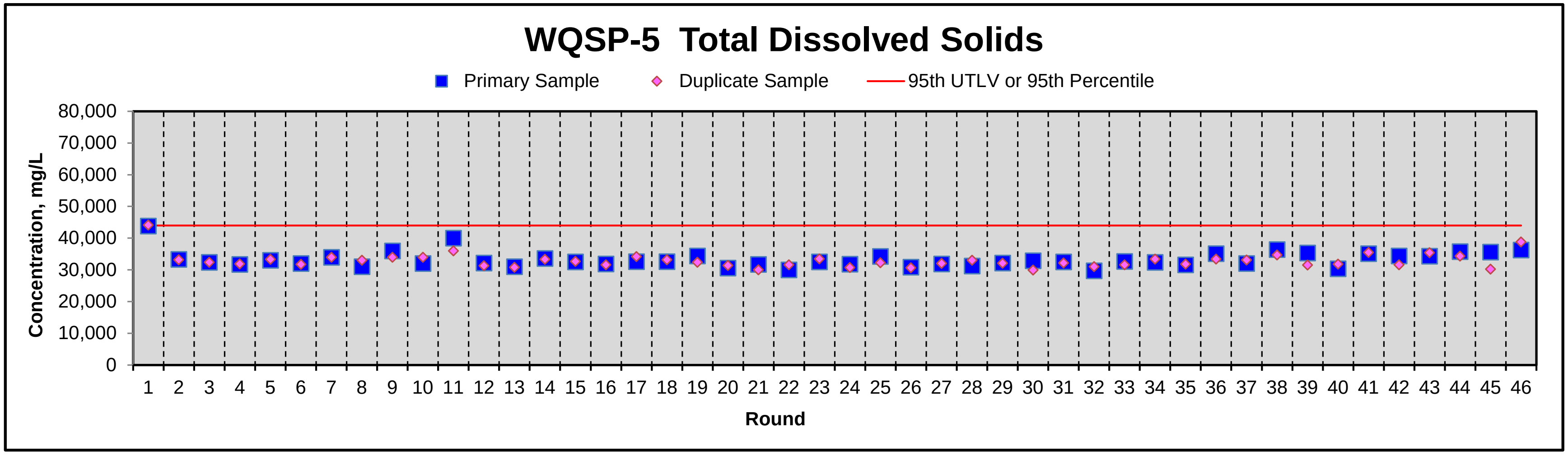

WQSP-5 Calcium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
2,500
2,250
2,000
1,750
1,500
1,250
1,000
750
500
250
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

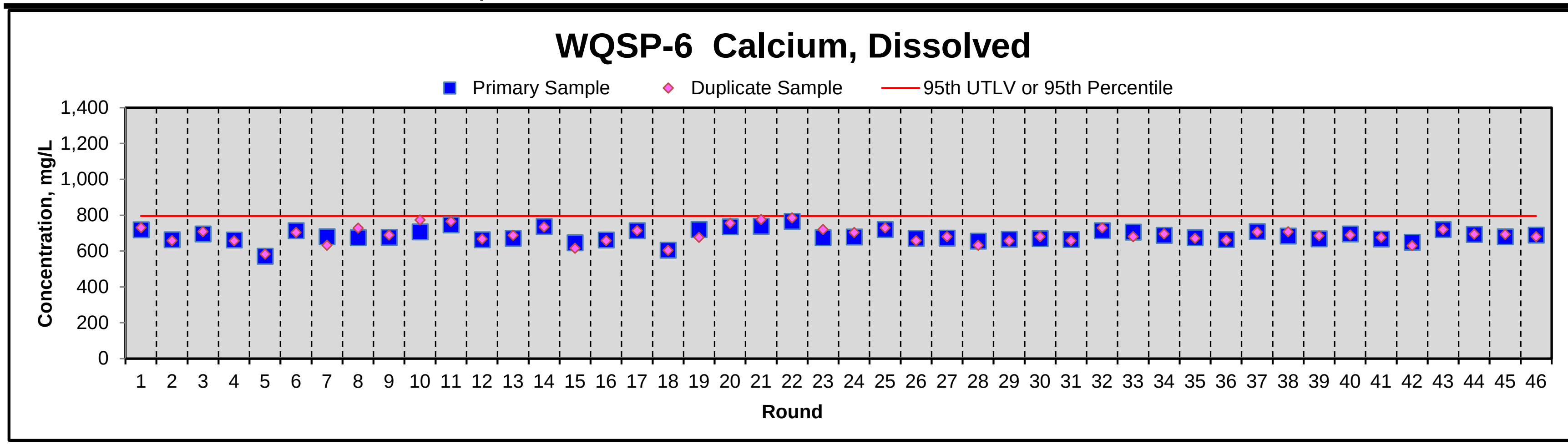

WQSP-5 Chloride
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
30,000
27,500
25,000
22,500
20,000
17,500
15,000
12,500
10,000
7,500
5,000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

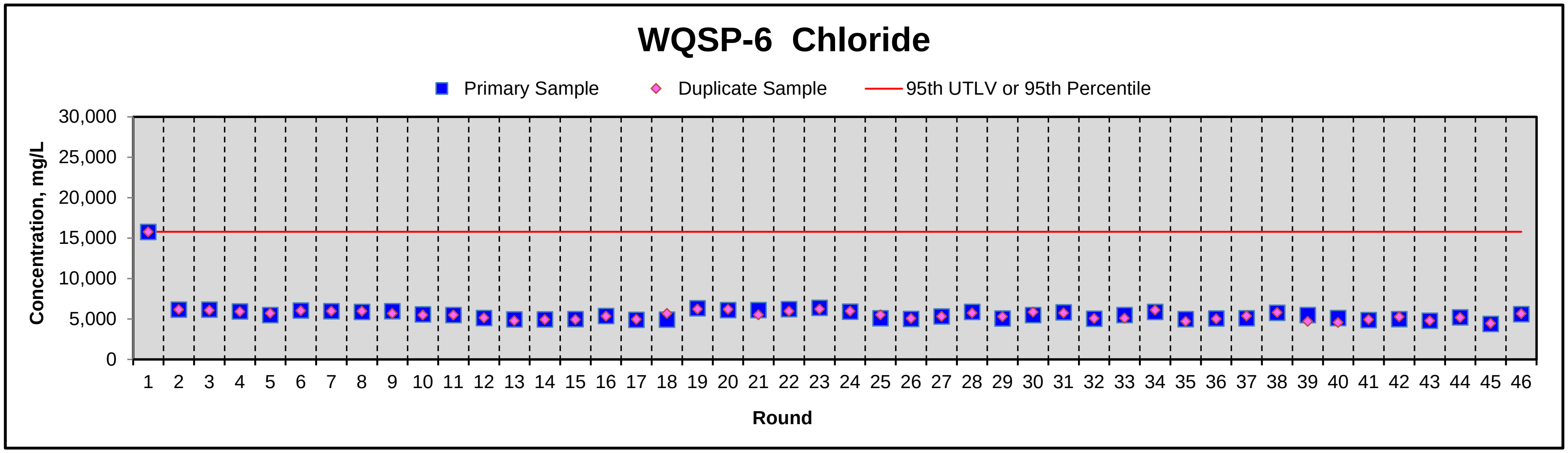

WQSP-5 Magnesium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
1,000
900
800
700
600
500
400
300
200
100
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

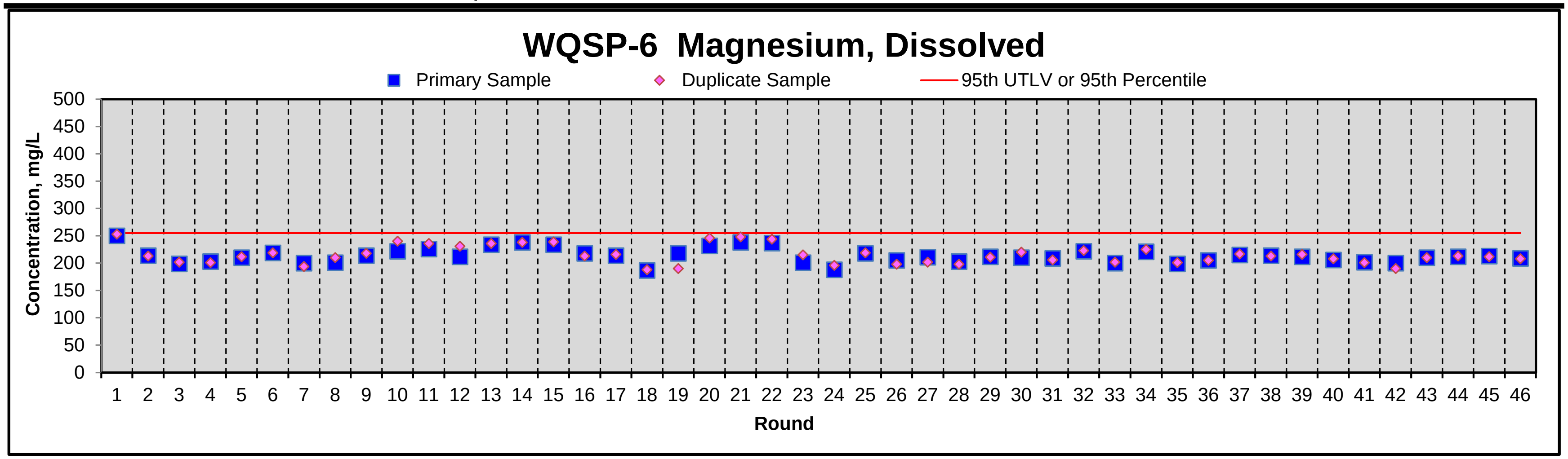

WQSP-5 pH
Primary Sample
Duplicate Sample
Lower Limit
Upper Limit
pH, SU
8.50
8.25
8.00
7.75
7.50
7.25
7.00
6.75
6.50
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

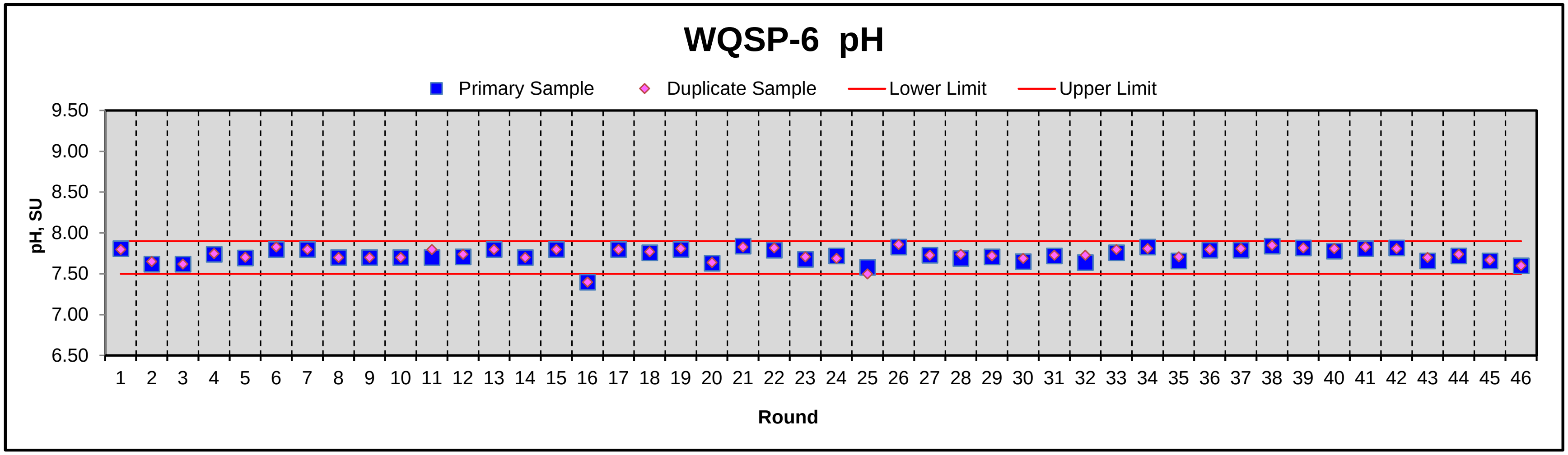

WQSP-5 Potassium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
0
200
400
600
800
1,000
1,200
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

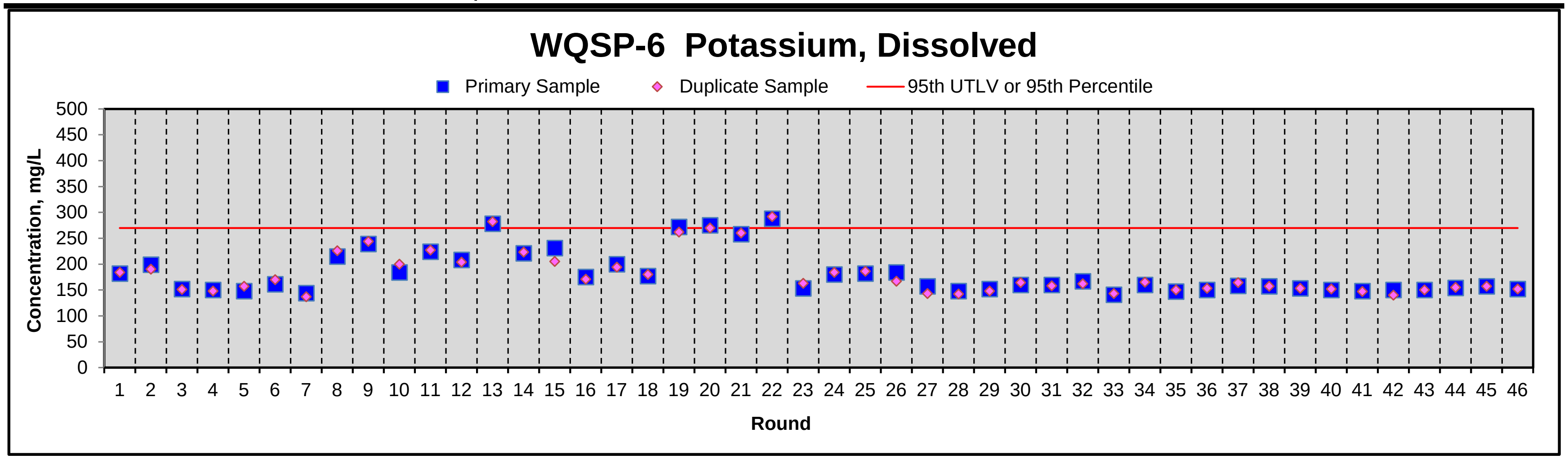

WQSP-5 Total Dissolved Solids
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

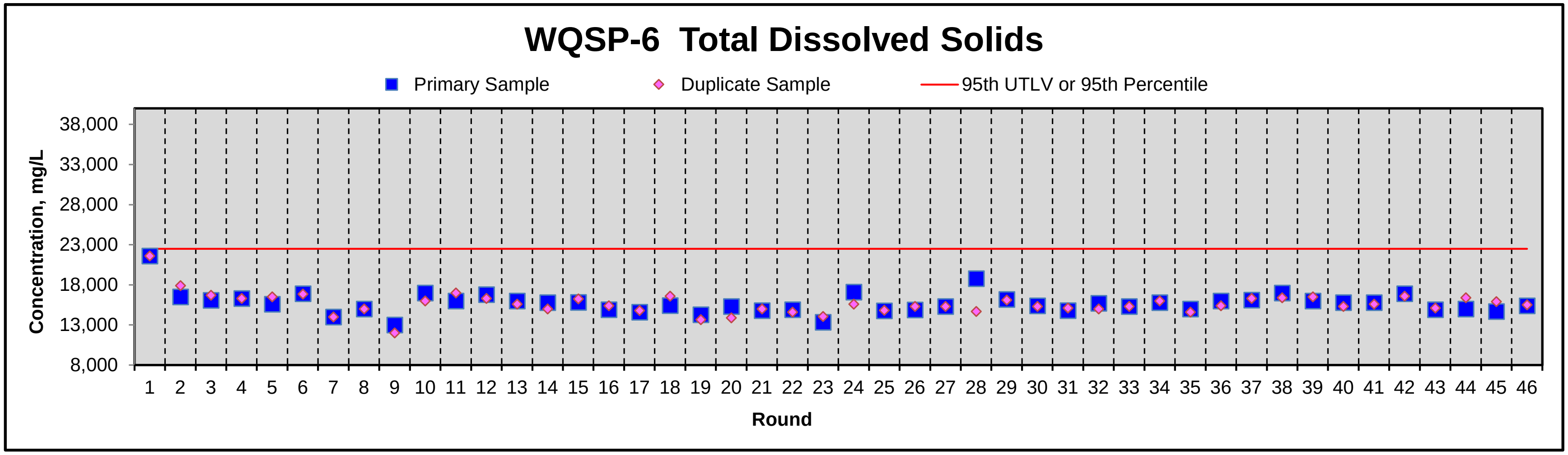

WQSP-6 Calcium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
1,400
1,200
1,000
800
600
400
200
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round


WQSP-6 Chloride
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
30,000
25,000
20,000
15,000
10,000
5,000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round


WQSP-6 Magnesium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
0
50
100
150
200
250
300
350
400
450
500
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round


WQSP-6 pH
Primary Sample
Duplicate Sample
Lower Limit
Upper Limit
pH, SU
6.50
7.00
7.50
8.00
8.50
9.00
9.50
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round


WQSP-6 Potassium, Dissolved
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
500
450
400
350
300
250
200
150
100
50
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round


WQSP-6 Total Dissolved Solids
Primary Sample
Duplicate Sample
95th UTLV or 95th Percentile
Concentration, mg/L
38,000
33,000
28,000
23,000
18,000
13,000
8,000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
Round

# APPENDIX F – GROUNDWATER DATA TABLES

## Table F.1 – Method Reporting Limits for Target Analytes

| Compound [a] | MRL, µg/L | Trace Metal | MRL, mg/L |
|---|---|---|---|
| **VOCs** | | | |
| Isobutanol (Isobutyl Alcohol) | 5.0 | Antimony | 0.025 |
| Carbon tetrachloride | 1.0 | Arsenic | 0.050 |
| Chlorobenzene | 1.0 | Barium | 0.020 |
| Chloroform | 1.0 | Beryllium | 0.010 |
| 1,1-Dichloroethane | 1.0 | Cadmium | 0.010 |
| 1,2-Dichloroethane | 1.0 | Chromium | 0.025 |
| 1,1-Dichloroethylene (1,1-Dichloroethene) | 1.0 | Lead | 0.020 |
| trans-1,2-Dichloroethylene (trans-1,2-DCE) | 1.0 | Mercury | 0.0002 |
| Methyl ethyl ketone (2-Butanone) | 5.0 | Nickel | 0.025 |
| Methylene chloride | 5.0 | Selenium | 0.025 |
| 1,1,2,2-Tetrachloroethane | 1.0 | Silver | 0.013 |
| Tetrachloroethylene (Tetrachloroethene) | 1.0 | Thallium | 0.025 |
| 1,1,1-Trichloroethane | 1.0 | Vanadium | 0.025 |
| 1,1,2-Trichloroethane | 1.0 | | |
| Toluene | 1.0 | | |
| Trichloroethylene (Trichloroethene) | 1.0 | | |
| Trichlorofluoromethane | 1.0 | | |
| Vinyl chloride | 1.0 | | |
| Xylenes (Xylenes, Total) | 1.0 | | |
| **SVOCs** | | | |
| 1,2-Dichlorobenzene | 5.0 | | |
| 1,4-Dichlorobenzene | 5.0 | | |
| 2,4-Dinitrophenol | 5.0 | | |

| Compound [a] | MRL, µg/L | Trace Metal | MRL, mg/L |
|---|---|---|---|
| 2,4-Dinitrotoluene | 5.0 | | |
| Hexachlorobenzene | 5.0 | | |
| Hexachloroethane | 5.0 | | |
| 2-Methylphenol [b] | 5.0 | | |
| 3-Methylphenol [b] | 5.0 | | |
| 4-Methylphenol [b] | 5.0 | | |
| Nitrobenzene | 5.0 | | |
| Pentachlorophenol | 5.0 | | |
| Pyridine | 5.0 | | |

Note. µg/L = microgram per liter; mg/L = milligram per liter.

a. Chemical synonyms used by the current analytical laboratory, Eurofins, are noted in parentheses.
b. 2-, 3-, and 4-methylphenol are listed collectively as cresols in the Hazardous Waste Facility Permit.

## Table F.2 – DMP Results

*(Refer to the end of the table for notes)*

| WQSP-1 Round 46, SDG 885-1315-1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **General Chemistry Parameter** | **Units** | **SOW MRL [a]** | **Lab MDL [b]** | **Lab MRL [a]** | **Primary Sample** | **Flag** | **Duplicate Sample** | **Flag** | **Avg** | **RPD** | **Applicable 95th UTLV or 95th percentile** |
| Chloride | mg/L | 0.5 | 2,500 | 5,000 | 35,000 | | 34,000 | | 34,500 | 2.90 | 40,472 |
| TOC | mg/L | 1.0 | 0.46 | 1.0 | 0.48 | J | 0.49 | J | 0.5 | 2.1 | <5.0 |
| Alkalinity (Bicarbonate) | mg/L | 4.0 | 20 | 20 | 50.0 | | 50.0 | | 50.0 | 0.00 | 55.8 |
| Specific Conductance | umhos/cm | NA | 1,000 | 1000 | 130,000 | | 130,000 | | 130,000 | 0.00 | 175,000 |
| pH | pH units | NA | 0.1 | 0.1 | 7.10 | | 7.20 | | 7.15 | 1.40 | 5.6 - 8.8 |
| Specific Gravity | NA | NA | NA | NA | 1.038 | | 1.040 | | 1.039 | 0.19 | 1.07 |
| TDS | mg/L | 10 | 2,500 | 5,000 | 72,000 | | 82,000 | | 77,000 | 12.99 | 80,700 |
| TSS | mg/L | 1.0 | 4.0 | 4.0 | **37.0** | | 8.0 | | 23 | **128.9** | 33.3 |
| **Dissolved Metals (ICP)** | | | | | | | | | | | |
| Ca (Diss) | mg/L | 0.5 | 8.90 | 100 | 2,000 | | 1,800 | | 1,900 | 10.53 | 2,087 |
| Mg (Diss) | mg/L | 0.5 | 9.80 | 100 | 1,300 | | 1,200 | | 1,250 | 8.00 | 1,247 |
| K (Diss) | mg/L | 0.5 | 13 | 100 | 560 | | 510 | | 535 | 9.35 | 799 |
| Na (Diss) | mg/L | 0.5 | 150 | 500 | 20,000 | | 20,000 | | 20,000 | 0.00 | 22,090 |
| **Total Metals (ICP)** | - | - | - | - | - | - | - | - | - | - | |
| Hg (CVAAS) | mg/L | 0.00020 | 0.000081 | 0.0002 | ND | | ND | | NA | NA | <0.002 |
| Ba | mg/L | 0.020 | 0.0044 | 0.020 | 0.0140 | J | 0.0120 | | 0.0130 | 15.4 | <1.0 |
| Be | mg/L | 0.010 | 0.0025 | 0.015 | 0.0041 | J | 0.0042 | J | ND | NA | <0.02 |
| Cd | mg/L | 0.010 | 0.0120 | 0.020 | ND | | 0.028 | | NA | NA | <0.2 |
| Ca | mg/L | 0.500 | 4.60 | 100 | 1,900 | | 1,800 | | 1,850 | 5.4 | NA |
| Cr | mg/L | 0.025 | 0.0058 | 0.030 | ND | | ND | | NA | NA | <0.5 |
| Mg | mg/L | 0.50 | 3.1 | 100 | 1,200 | | 1,200 | | 1,200 | 0.00 | NA |
| Ni | mg/L | 0.025 | 0.360 | 1.000 | ND | | ND | | NA | NA | 0.490 |
| K | mg/L | 0.50 | 0.97 | 10.0 | 540 | | 540 | | 540 | 0.00 | NA |
| Ag | mg/L | 0.013 | 0.0130 | 0.050 | 0.030 | J | 0.030 | J | 0.030 | 0.00 | <0.5 |
| Na | mg/L | 0.50 | 110 | 500 | 20,000 | | 21,000 | | 20,500 | 4.88 | NA |
| V | mg/L | 0.025 | 0.0240 | 0.50 | 0.0280 | J | 0.026 | J | NA | NA | <0.1 |

| **ICP/MS Metals** | **Units** | **SOW MRL** [a] | **Lab MDL** [b] | **Lab MRL** [a] | **Primary Sample** | **Flag** | **Duplicate Sample** | **Flag** | **Avg** | **RPD** | **Applicable 95th UTLV or 95th percentile** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pb | mg/L | 0.02 | 0.012 | 0.2 | ND | | ND | | NA | NA | 0.105 |
| Sb | mg/L | 0.025 | 0.04000 | 0.0500 | ND | | ND | | NA | NA | 0.33 |
| As | mg/L | 0.050 | 0.00500 | 0.0100 | 0.0074 | J | ND | | NA | NA | <0.1 |
| Se | mg/L | 0.025 | 0.08000 | 0.1000 | ND | | ND | | NA | NA | 0.15 |
| Tl | mg/L | 0.025 | 0.10000 | 0.2000 | ND | | ND | | NA | NA | 0.98 |
| **WQSP-2 Round 46, 885-1571-1** | | | | | | | | | | | |
| **General Chemistry Parameter** | **Units** | **SOW MRL**[(a)] | **Lab MDL**[(b)] | **Lab MRL**[(a)] | **Primary Sample** | **Flag** | **Duplicate Sample** | **Flag** | **Avg** | **RPD** | **Applicable 95th UTLV or 95th percentile** |
| Chloride | mg/L | 0.5 | 2,500 | 1,300 | 37,000 | | 36,000 | | 36,500 | 2.74 | 39,670 |
| TOC | mg/L | 1.0 | 0.460 | 1.00 | ND | | ND | | NA | NA | 7.97 |
| Alkalinity (Bicarbonate) | mg/L | 4.0 | 20.0 | 20.0 | 47.00 | | 47.00 | | 47.0 | 0.00 | 70.3 |
| Specific Conductance | umhos/cm | NA | 1,000 | 1,000 | **130,000** | | **130,000** | | 130,000 | 0.00 | 124,000 |
| pH | pH units | NA | 0.1 | 0.1 | 7.30 | | 7.30 | | 7.30 | 0.00 | 7.0 - 7.6 |
| Specific Gravity | NA | NA | NA | NA | 1.044 | | 1.039 | | 1.042 | 0.48 | 1.06 |
| TDS | mg/L | 10 | 2,500 | 5,000 | 69,000 | | 75,000 | | 72,000 | 8.33 | 80,500 |
| TSS | mg/L | 1.0 | 4.00 | 4.00 | 9.0 | | 8.0 | | NA | NA | 43.0 |
| **Dissolved Metals (ICP)** | | | | | | | | | | | |
| Ca (Diss) | mg/L | 0.50 | 8.90 | 100.0 | 1,800 | | 1,700 | | 1,750 | 5.71 | 1,827 |
| Mg (Diss) | mg/L | 0.50 | 9.8 | 100.0 | 1,200 | | 1,200 | | 1,200 | 0.00 | 1,244 |
| K (Diss) | mg/L | 0.50 | 0.67 | 5.0 | 500 | | 540 | | 520 | 7.69 | 845 |
| Na (Diss) | mg/L | 0.50 | 150 | 500 | 21,000 | | 20,000 | | 20,500 | 4.88 | 21,900 |
| **Total Metals (ICP)** | - | - | - | - | - | - | - | - | - | - | - |
| Hg (CVAAS) | mg/L | 0.00020 | 0.0012 | 0.0020 | ND | | ND | | NA | NA | <0.002 |
| Ba | mg/L | 0.020 | 0.048 | 0.010 | ND | | 0.018 | | NA | NA | <1.0 |
| Be | mg/L | 0.010 | 0.025 | 0.150 | ND | | 0.0078 | J | NA | NA | <1.0 |
| Cd | mg/L | 0.010 | 0.061 | 0.100 | ND | | ND | | NA | NA | <0.50 |
| Ca | mg/L | 0.500 | 2.30 | 50.0 | 1,500 | | 1,600 | | 1,550 | 6.45 | NA |
| Cr | mg/L | 0.025 | 0.058 | 0.300 | ND | | ND | | NA | NA | <0.50 |
| Mg | mg/L | 0.50 | 5.50 | 50.0 | 1,100 | | 1,100 | | 1,100 | 0.00 | NA |
| Ni | mg/L | 0.025 | 0.18 | 0.50 | ND | | ND | | NA | NA | 0.37 |
| K | mg/L | 0.50 | 8.00 | 50.00 | 490 | | 510 | | 500 | 4.00 | NA |

| **Total Metals (ICP)** | **Units** | **SOW MRL[(a)]** | **Lab MDL[(b)]** | **Lab MRL[(a)]** | **Primary Sample** | **Flag** | **Duplicate Sample** | **Flag** | **Avg** | **RPD** | **Applicable 95th UTLV or 95th percentile** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ag | mg/L | 0.013 | 0.065 | 0.250 | ND | | 0.053 | | NA | NA | <0.5 |
| Na | mg/L | 0.50 | 230.0 | 500 | 21,000 | | 19,000 | | 20,000 | 10.00 | NA |
| V | mg/L | 0.025 | 0.12 | 2.50 | ND | | 0.050 | J | NA | NA | <0.1 |
| **ICP/MS Metals** | | | | | | | | | | | |
| Sb | mg/L | 0.025 | 0.0160 | 0.0200 | ND | | ND | | NA | NA | <0.5 |
| As | mg/L | 0.050 | 0.0100 | 0.0200 | ND | | ND | | NA | NA | 0.062 |
| Se | mg/L | 0.025 | 0.0400 | 0.0500 | ND | | ND | | NA | NA | 0.150 |
| Tl | mg/L | 0.025 | 0.0500 | 0.1000 | ND | | ND | | NA | NA | 0.980 |
| Pb | mg/L | 0.02 | 0.0600 | 0.1000 | ND | | ND | | NA | NA | 0.163 |
| **WQSP-3 Round 46, SDG 885-2712-1** | | | | | | | | | | | |
| **General Chemistry Parameter** | **Units** | **SOW MRL[(a)]** | **Lab MDL[(b)]** | **Lab MRL[(a)]** | **Primary Sample** | **Flag** | **Duplicate Sample** | **Flag** | **Avg** | **RPD** | **Applicable 95th UTLV or 95th percentile** |
| Chloride | mg/L | 0.5 | 2,500 | 5,000 | 130,000 | | 120,000 | | 125,000 | 8.00 | 149,100 |
| TOC | mg/L | 1.0 | 0.046 | 1.00 | ND | | ND | | NA | NA | <5.0 |
| Alkalinity (Bicarbonate) | mg/L | 4.0 | 20.0 | 20.0 | 32.00 | | 34.00 | | 33.0 | 6.06 | 54.5 |
| Specific Conductance | umhos/cm | NA | 1,000 | 1,000 | 410,000 | | 420,000 | | 415,000 | 2.41 | 517,000 |
| pH | pH units | NA | 0.1 | 0.1 | 6.80 | | 6.80 | | 6.80 | 0.00 | 6.6 - 7.2 |
| Specific Gravity | NA | NA | NA | NA | 1.132 | | 1.133 | | 1.133 | 0.09 | 1.17 |
| TDS | mg/L | 10 | 5,000 | 10,000 | 230,000 | | 280,000 | | 255,000 | 19.6 | 261,000 |
| TSS | mg/L | 1.0 | 4.00 | 4.00 | **160.0** | | 100.0 | | 130.0 | **46.2** | **107** |
| **Dissolved Metals (ICP)** | | | | | | | | | | | |
| Ca (Diss) | mg/L | 0.5 | 8.90 | 100.0 | 1,500 | | 1,500 | | 1,500 | 0.00 | 1,680 |
| Mg (Diss) | mg/L | 0.5 | 9.80 | 100.0 | 2,400 | | 2,400 | | 2,400 | 0.00 | 2,625 |
| K (Diss) | mg/L | 0.5 | 13.0 | 100.0 | 1,600 | | 1,700 | | 1,650 | 6.06 | 3,438 |
| Na (Diss) | mg/L | 0.5 | 300 | 1,000 | 74,000 | | 74,000 | | 74,000 | 0.00 | 140,400 |
| **Total Metals (ICP)** | | | | | | | | | | | |
| Hg (CVAAS) | mg/L | 0.00020 | 0.00012 | 0.0002 | ND | | ND | | NA | NA | <0.002 |
| Ba | mg/L | 0.020 | 0.048 | 0.100 | ND | | 0.017 | J | NA | NA | <1.0 |
| Be | mg/L | 0.010 | 0.0250 | 0.150 | ND | | ND | | NA | NA | <0.1 |
| Cd | mg/L | 0.010 | 0.0610 | 0.100 | ND | | ND | | NA | NA | <0.5 |
| Ca | mg/L | 0.500 | 2.30 | 50.0 | 1,600 | | 930 | | 1,265 | 53.0 | NA |

| Total Metals (ICP) | Units | SOW MRL(a) | Lab MDL(b) | Lab MRL(a) | Primary Sample | Flag | Duplicate Sample | Flag | Avg | RPD | Applicable 95th UTLV or 95th percentile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cr | mg/L | 0.025 | 0.058 | 0.300 | ND | | ND | | NA | NA | <2.0 |
| Mg | mg/L | 0.50 | 5.50 | 50.0 | 2,500 | | 1,500 | | 2,000 | 50.00 | NA |
| Ni | mg/L | 0.025 | 0.1800 | 0.500 | ND | | ND | | NA | NA | <5.0 |
| K | mg/L | 0.50 | 8.00 | 50.0 | 1,600 | | 920 | | 1,260 | 53.97 | NA |
| Ag | mg/L | 0.013 | 0.06500 | 0.250 | ND | | 0.0300 | J | NA | NA | 0.31 |
| Na | mg/L | 0.50 | 460 | 1,000 | 79,000 | | 45,000 | | 62,000 | 54.84 | NA |
| V | mg/L | 0.025 | 0.1200 | 2.500 | ND | | 0.033 | J | NA | NA | <5.0 |
| **ICP/MS Metals** | | | | | | | | | | | |
| Sb | mg/L | 0.025 | 0.400 | 0.500 | ND | | ND | | NA | NA | <1.0 |
| As | mg/L | 0.050 | 0.250 | 0.500 | ND | | ND | | NA | NA | <1.0 |
| Se | mg/L | 0.025 | 0.400 | 0.500 | ND | | ND | | NA | NA | <2.0 |
| Tl | mg/L | 0.025 | 0.250 | 0.500 | ND | | ND | | NA | NA | 5.8 |
| Pb | mg/L | 0.02 | 0.300 | 0.500 | ND | | ND | | NA | NA | 0.8 |
| **VOC** | | | | | | | | | | | |
| Toluene | ug/L | 1.00 | 0.250 | 1.00 | 0.62 | J | 0.64 | J | 0.63 | 3.17 | <1.0 |

**WQSP-4 Round 46, SDG 885-5015-1**

| General Chemistry Parameter | Units | SOW MRL(a) | Lab MDL(b) | Lab MRL(a) | Primary Sample | Flag | Duplicate Sample | Flag | Avg | RPD | Applicable 95th UTLV or 95th percentile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | mg/L | 0.5 | 1,300 | 2,500 | 62,000 | | 62,000 | | 62,000 | 0.00 | 63,960 |
| TOC | mg/L | 1.0 | 0.46 | 1.00 | 0.091 | J | 0.59 | J | NA | NA | <5.0 |
| Alkalinity (Bicarbonate) | mg/L | 4.0 | 20.0 | 20.0 | 40.00 | | 40.00 | | 40.0 | 0.00 | 47.1 |
| Specific Conductance | umhos/cm | NA | 1,000 | 1,000 | 200,000 | | 200,000 | | 200,000 | 0.00 | 319,800 |
| pH | pH units | NA | NA | NA | 7.20 | | 7.20 | | 7.20 | 0.00 | 6.8 - 7.6 |
| Specific Gravity | NA | NA | NA | NA | 1.067 | | 1.073 | | 1.070 | 0.56 | 1.09 |
| TDS | mg/L | 10 | 2,500 | 5,000 | 120,000 | | 120,000 | | 120,000 | 0.00 | 123,500 |
| TSS | mg/L | 1.0 | 4.00 | 4.00 | 57.0 | | 59.0 | | 58.0 | 3.4 | 57.0 |
| **Dissolved Metals** | | | | | | | | | | | |
| Ca (Diss) | mg/L | 0.5 | 8.90 | 100.0 | 1,600 | | 1,600 | | 1,600 | 0.00 | 1,834 |
| Mg (Diss) | mg/L | 0.5 | 9.80 | 100.0 | 1,200 | | 1,200 | | 1,200 | 0.00 | 1,472 |
| K (Diss) | mg/L | 0.5 | 13.0 | 100.0 | 730 | | 720 | | 725 | 1.38 | 1,648 |
| Na (Diss) | mg/L | 0.5 | 150 | 500 | 36,000 | | 35,000 | | 35,500 | 2.82 | 38,790 |

| **Total Metals (ICP)** | **Units** | **SOW MRL(a)** | **Lab MDL(b)** | **Lab MRL(a)** | **Primary Sample** | **Flag** | **Duplicate Sample** | **Flag** | **Avg** | **RPD** | **Applicable 95th UTLV or 95th percentile** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hg (CVAAS) | mg/L | 0.0002 | 0.00120 | 0.0020 | ND | | ND | | NA | NA | <0.002 |
| Ba | mg/L | 0.020 | 0.0048 | 0.010 | 0.018 | | 0.022 | | 0.020 | 20.00 | 1.000 |
| Be | mg/L | 0.010 | 0.0025 | 0.015 | ND | | ND | | NA | NA | 0.250 |
| Cd | mg/L | 0.010 | 0.0061 | 0.010 | ND | | ND | | NA | NA | <0.5 |
| Ca | mg/L | 0.500 | 4.60 | 100.0 | 1,600 | | 1,700 | | 1,650 | 6.06 | NA |
| Cr | mg/L | 0.025 | 0.0058 | 0.030 | ND | | ND | | NA | NA | <2.0 |
| Mg | mg/L | 0.50 | 11.00 | 100.0 | 1,100 | | 1,200 | | 1,150 | 8.70 | NA |
| Ni | mg/L | 0.025 | 0.018 | 0.050 | ND | | ND | | NA | NA | <5.0 |
| K | mg/L | 0.50 | 16.00 | 100.0 | 690 | | 730 | | 710 | 5.63 | NA |
| Ag | mg/L | 0.013 | 0.0065 | 0.025 | 0.018 | J | 0.018 | J | 0.018 | 0.0 | 0.519 |
| Na | mg/L | 0.50 | 230 | 500 | 28,000 | | 31,000 | | 29,500 | 10.17 | NA |
| V | mg/L | 0.025 | 0.0120 | 0.25 | 0.018 | J | 0.017 | J | NA | NA | <5.0 |
| **ICP/MS Metals** | | | | | | | | | | | |
| Sb | mg/L | 0.025 | 0.1600 | 0.2000 | ND | | ND | | NA | NA | <10.0 |
| As | mg/L | 0.050 | 0.1000 | 0.2000 | ND | | ND | | NA | NA | <0.5 |
| Se | mg/L | 0.025 | 0.1600 | 0.2000 | ND | | ND | | NA | NA | 2.009 |
| Tl | mg/L | 0.025 | 0.1000 | 0.2000 | ND | | ND | | NA | NA | 1.000 |
| Pb | mg/L | 0.02 | 0.1200 | 0.2000 | ND | | ND | | NA | NA | 0.525 |
| **WQSP-5 Round 46, SDG 885-4698-1** | | | | | | | | | | | |
| **General Chemistry Parameter** | **Units** | **SOW MRL(a)** | **Lab MDL(b)** | **Lab MRL(a)** | **Primary Sample** | **Flag** | **Duplicate Sample** | **Flag** | **Avg** | **RPD** | **Applicable 95th UTLV or 95th percentile** |
| Chloride | mg/L | 0.5 | 500 | 1,000 | 16,500 | | 16,700 | | 16,600 | 1.20 | 18,100 |
| TOC | mg/L | 1.0 | 0.459 | 1.00 | 0.631 | J | 0.542 | J | NA | NA | <5.0 |
| Alkalinity (Bicarbonate) | mg/L | 4.0 | 20.0 | 20.0 | 48.2 | | 48.6 | | 48.4 | 0.83 | 56 |
| Specific Conductance | umhos/cm | NA | 100 | 100 | 58,600 | | 58,500 | | 58,550 | 0.17 | 67,700 |
| pH | pH units | NA | 0.1 | 0.1 | 7.50 | | 7.50 | | 7.50 | 0.00 | 7.4 - 7.9 |
| Specific Gravity | NA | NA | NA | NA | 1.016 | | 1.019 | | 1.018 | 0.29 | 1.04 |
| TDS | mg/L | 10 | 500 | 1,000 | 36,300 | | 38,800 | | 37,550 | 6.66 | 43,950 |
| TSS | mg/L | 1.0 | 4.00 | 4.00 | 6.00 | | **11.00** | | 8.5 | **58.8** | **<10.0** |
| **Dissolved Metals** | | | | | | | | | | | |
| Ca (Diss) | mg/L | 0.5 | 44.50 | 500.0 | 1,080 | | 1,010 | | 1,045 | 6.70 | 1,303 |

| Dissolved Metals | Units | SOW MRL(a) | Lab MDL(b) | Lab MRL(a) | Primary Sample | Flag | Duplicate Sample | Flag | Avg | RPD | Applicable 95th UTLV or 95th percentile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mg (Diss) | mg/L | 0.5 | 0.981 | 10.0 | 547 | | 522 | | 535 | 4.68 | 547 |
| K (Diss) | mg/L | 0.5 | 1.34 | 10.0 | 314 | | 317 | | 316 | 0.95 | 622 |
| Na (Diss) | mg/L | 0.5 | 149 | 500 | 9,880 | | 9,290 | | 9,585 | 6.16 | 11,190 |
| **Total Metals (ICP)** | | | | | | | | | | | |
| Hg (CVAAS) | mg/L | 0.0002 | 0.0012 | 0.0020 | ND | | ND | J | NA | NA | <0.002 |
| Ba | mg/L | 0.020 | 0.00475 | 0.0100 | 0.0136 | | 0.00849 | J | 0 | 46.3 | <1.0 |
| Be | mg/L | 0.010 | 0.00248 | 0.015 | ND | | ND | | NA | NA | <0.02 |
| Cd | mg/L | 0.010 | 0.1210 | 0.200 | ND | | ND | | NA | NA | <0.05 |
| Ca | mg/L | 0.500 | 4.61 | 100.0 | 1,100 | | 1,100 | | 1,100 | 0.0 | NA |
| Cr | mg/L | 0.025 | 0.00575 | 0.030 | ND | | ND | | NA | NA | <0.5 |
| Mg | mg/L | 0.50 | 11.00 | 100.0 | 565 | | 564 | | 565 | 0.2 | NA |
| Ni | mg/L | 0.025 | 0.0182 | 0.050 | ND | | ND | | NA | NA | <0.1 |
| K | mg/L | 0.50 | 0.80 | 5.00 | 354 | | 337 | | 346 | 4.92 | NA |
| Ag | mg/L | 0.013 | 0.00652 | 0.025 | 0.0163 | J | 0.0164 | J | 0.016 | **0.61** | <0.5 |
| Na | mg/L | 0.50 | 230 | 500 | 10,600 | | 10,000 | | 10,300 | 5.83 | NA |
| V | mg/L | 0.025 | 0.0118 | 0.250 | 0.0141 | J | 0.0183 | J | NA | NA | 2.7 |
| **ICP/MS Metals** | | | | | | | | | | | |
| Sb | mg/L | 0.025 | 0.080 | 0.100 | ND | | ND | | NA | NA | 0.073 |
| As | mg/L | 0.050 | 0.050 | 0.100 | ND | | ND | | NA | NA | <0.5 |
| Se | mg/L | 0.025 | 0.080 | 0.100 | ND | | ND | | NA | NA | <0.1 |
| Tl | mg/L | 0.025 | 0.100 | 0.200 | ND | | ND | | NA | NA | 0.209 |
| Pb | mg/L | 0.02 | 0.120 | 0.200 | ND | | ND | | NA | NA | <0.05 |

**WQSP-6 Round 46, SDG 885-3447-1**

| General Chemistry Parameter | Units | SOW MRL(a) | Lab MDL(b) | Lab MRL(a) | Primary Sample | Flag | Duplicate Sample | Flag | Avg | RPD | Applicable 95th UTLV or 95th percentile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | mg/L | 0.5 | 500 | 1,000 | 5,620 | | 5,670 | | 5,645 | 0.89 | 15,800 |
| TOC | mg/L | 1.0 | 0.459 | 1.0 | 7.90 | | 7.46 | | 7.68 | 5.73 | 10.14 |
| Alkalinity (Bicarbonate) | mg/L | 4.0 | 20.0 | 20.0 | 51.7 | | 51.8 | | 51.8 | 0.19 | 55.8 |
| Specific Conductance | umhos/cm | NA | 100 | 100 | 27,500 | | 25,000 | | 26,250 | 9.52 | 27,660 |
| pH | pH units | NA | 0.1 | 0.1 | 7.60 | | 7.60 | | 7.60 | 0.00 | 7.5 - 7.9 |
| Specific Gravity | NA | NA | NA | NA | 1.015 | | 1.013 | | 1.014 | 0.20 | 1.02 |

| General Chemistry Parameter | Units | SOW MRL[(a)] | Lab MDL[(b)] | Lab MRL[(a)] | Primary Sample | Flag | Duplicate Sample | Flag | Avg | RPD | Applicable 95th UTLV or 95th percentile |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TDS | mg/L | 10 | 250 | 500 | 15,400 | | 15,500 | | 15,450 | 0.65 | 22,500 |
| TSS | mg/L | 1.0 | 4.00 | 4.00 | ND | | ND | | NA | NA | 14.8 |
| **Dissolved Metals** | | | | | | | | | | | |
| Ca (Diss) | mg/L | 0.5 | 0.89 | 10.0 | 689 | | 680 | | 685 | 1.31 | 796 |
| Mg (Diss) | mg/L | 0.5 | 0.491 | 5.0 | 209 | | 208 | | 209 | 0.48 | 255 |
| K (Diss) | mg/L | 0.5 | 1.34 | 10.0 | 152 | | 152 | | 152 | 0.00 | 270 |
| Na (Diss) | mg/L | 0.5 | 29.7 | 100 | 4,190 | | 4,110 | | 4,150 | 1.93 | 6,290 |
| **Total Metals (ICP)** | - | - | - | - | - | - | - | - | - | - | |
| Hg (CVAAS) | mg/L | 0.0002 | 0.0012 | 0.0020 | ND | | ND | | NA | NA | <0.002 |
| Ba | mg/L | 0.020 | 0.00475 | 0.010 | 0.00768 | J | 0.00881 | J | 0.008245 | **13.7** | <1.0 |
| Be | mg/L | 0.010 | 0.00248 | 0.015 | ND | | ND | | NA | NA | <0.02 |
| Cd | mg/L | 0.010 | 0.0121 | 0.020 | ND | | ND | | NA | NA | <0.05 |
| Ca | mg/L | 0.500 | 4.61 | 100.0 | 654 | | 668 | | 661 | 2.12 | NA |
| Cr | mg/L | 0.025 | 0.00575 | 0.030 | ND | | ND | | NA | NA | <0.5 |
| Mg | mg/L | 0.50 | 0.55 | 5.00 | 214 | | 211 | | 213 | 1.41 | NA |
| Ni | mg/L | 0.025 | 0.0182 | 0.05 | ND | | ND | | NA | NA | <0.5 |
| K | mg/L | 0.50 | 0.800 | 5.00 | 157 | | 155 | | 156 | 1.28 | NA |
| Ag | mg/L | 0.013 | 0.0065 | 0.025 | 0.0190 | J | 0.0131 | J | 0.016 | 36.76 | <0.5 |
| Na | mg/L | 0.50 | 46.0 | 100.0 | 4,380 | | 4,360 | | 4,370 | 0.46 | NA |
| V | mg/L | 0.025 | 0.0118 | 0.25 | ND | | ND | | NA | NA | 0.070 |
| **ICP/MS Metals** | | | | | | | | | | | |
| Sb | mg/L | 0.025 | 0.040 | 0.050 | ND | | ND | | NA | NA | 0.140 |
| As | mg/L | 0.050 | 0.025 | 0.050 | ND | | 0.135 | | NA | NA | <0.5 |
| Se | mg/L | 0.025 | 0.040 | 0.050 | ND | | ND | | NA | NA | 0.10 |
| Tl | mg/L | 0.025 | 0.050 | 0.100 | ND | | ND | | NA | NA | 0.560 |
| Pb | mg/L | 0.02 | 0.030 | 0.050 | ND | | ND | | NA | NA | 0.150 |

Note. Method Reporting Limit (MRL) and lab's Practical Quantitation Level (PQL) generally equivalent for a given sample.
Lab's PQL corresponds to low calibration standard adjusted for the dilution factor as necessary for high-brine samples.

J Flag indicates concentration was below the lab's PQL but above the Method Detection Limit (MDL) for the analyte.
NA = not applicable; ND = not detected; CVAAS = cold vapor atomic absorption spectroscopy; ICP = inductively coupled plasma emission spectroscopy; ICP/MS = ICP combined with mass spectrometry;
(a) MRL = method reporting limit.
(b) MDL = method detection limit.

**Table F.3 – WIPP Well Inventory**

*(Refer to the end of the table for zone descriptions)*

| Sorted by Well Name | | | | Sorted by Zone | | | |
|---|---|---|---|---|---|---|---|
| Count | Well Name | Zone | Comments | Count | Well Name | Zone | Reason Not Assessed for Long-Term Water Level Trend in Culebra |
| 1 | AEC-7R | CUL | | 1 | CB-1 | B/C | |
| 2 | C-2505 | SR/DL | | 2 | DOE-2 | B/C | |
| 3 | C-2506 | SR/DL | | 3 | AEC-7R | CUL | |
| 4 | C-2507 | SR/DL | | 4 | C-2737 | CUL | |
| 5 | C-2737 | CUL | | 5 | H-4bR | CUL | |
| 6 | C-2737 | MAG | | 6 | H-5bR | CUL | |
| 7 | C-2811 | SR/DL | | 7 | H-6bR | CUL | |
| 8 | CB-1 | B/C | | 8 | H-9bR | CUL | |
| 9 | DOE-2 | B/C | | 9 | H-10cR | CUL | |
| 10 | H-2b1 | MAG | | 10 | H-11b4R | CUL | |
| 11 | H-3b1 | MAG | | 11 | H-12R | CUL | |
| 12 | H-4bR | CUL | | 12 | H-19b0 | CUL | |
| 13 | H-4c | MAG | | 13 | H-19b2 | CUL | Redundant to H19b0 |
| 14 | H-5bR | CUL | | 14 | H-19b3 | CUL | Redundant to H19b0 |
| 15 | H-6bR | CUL | | 15 | H-19b4 | CUL | Redundant to H19b0 |
| 16 | H-6c | MAG | | 16 | H-19b5 | CUL | Redundant to H19b0 |
| 17 | H-8a | MAG | | 17 | H-19b6 | CUL | Redundant to H19b0 |
| 18 | H-9c | MAG | | 18 | H-19b7 | CUL | Redundant to H19b0 |
| 19 | H-9bR | CUL | | 19 | IMC-461 | CUL | |
| 20 | H-10a | MAG | | 20 | SNL-1 | CUL | |

| Sorted by Well Name | | | | Sorted by Zone | | | |
|---|---|---|---|---|---|---|---|
| **Count** | **Well Name** | **Zone** | **Comments** | **Count** | **Well Name** | **Zone** | **Reason Not Assessed for Long-Term Water Level Trend in Culebra** |
| 21 | H-10cR | CUL | | 21 | SNL-2 | CUL | |
| 22 | H-11b2 | MAG | | 22 | SNL-3 | CUL | |
| 23 | H-11b4R | CUL | | 23 | SNL-5 | CUL | |
| 24 | H-12R | CUL | | 24 | SNL-6 | CUL | Long term recovery |
| 25 | H-14 | MAG | | 25 | SNL-8 | CUL | |
| 26 | H-15R | CUL | | 26 | SNL-9 | CUL | |
| 27 | H-15 | MAG | | 27 | H-15R | CUL | |
| 28 | H-16 | CUL | | 28 | SNL-10 | CUL | |
| 29 | H-18 | MAG | | 29 | H-16 | CUL | |
| 30 | H-19b0 | CUL | | 30 | SNL-12 | CUL | |
| 31 | H-19b2 | CUL | | 31 | SNL-13 | CUL | |
| 32 | H-19b3 | CUL | | 32 | SNL-14 | CUL | |
| 33 | H-19b4 | CUL | | 33 | SNL-15 | CUL | Long term recovery |
| 34 | H-19b5 | CUL | | 34 | SNL-16 | CUL | |
| 35 | H-19b6 | CUL | | 35 | SNL-17 | CUL | |
| 36 | H-19b7 | CUL | | 36 | SNL-18 | CUL | |
| 37 | IMC-461 | CUL | | 37 | SNL-19 | CUL | |
| 38 | SNL-1 | CUL | | 38 | WIPP-11R | CUL | |
| 39 | SNL-2 | CUL | | 39 | WQSP-1 | CUL | |
| 40 | SNL-3 | CUL | | 40 | WQSP-2 | CUL | |
| 41 | SNL-5 | CUL | | 41 | WQSP-3 | CUL | |
| 42 | SNL-6 | CUL | | 42 | WQSP-4 | CUL | |

| Sorted by Well Name | | | | Sorted by Zone | | | |
|---|---|---|---|---|---|---|---|
| Count | Well Name | Zone | Comments | Count | Well Name | Zone | Reason Not Assessed for Long-Term Water Level Trend in Culebra |
| 43 | SNL-8 | CUL | | 43 | WQSP-5 | CUL | |
| 44 | SNL-9 | CUL | | 44 | WQSP-6 | CUL | |
| 45 | SNL-10 | CUL | | 45 | WQSP-6A | DL | |
| 46 | SNL-12 | CUL | | 46 | PZ-17b | DL | |
| 47 | SNL-13 | CUL | | 47 | PZ-15 | GAT | |
| 48 | SNL-14 | CUL | | 48 | H-2b1 | MAG | |
| 49 | SNL-15 | CUL | | 49 | H-3b1 | MAG | |
| 50 | SNL-16 | CUL | | 50 | H-4c | MAG | |
| 51 | SNL-17 | CUL | | 51 | H-6c | MAG | |
| 52 | SNL-18 | CUL | | 52 | H-8a | MAG | |
| 53 | SNL-19 | CUL | | 53 | H-9c | MAG | |
| 54 | PZ-1 | SR/DL | | 54 | H-10a | MAG | |
| 55 | PZ-2 | SR/DL | | 55 | H-11b2 | MAG | |
| 56 | PZ-3 | SR/DL | | 56 | H-14 | MAG | |
| 57 | PZ-4 | SR/DL | | 57 | H-18 | MAG | |
| 58 | PZ-5 | SR/DL | | 58 | WIPP-18 | MAG | |
| 59 | PZ-6 | SR/DL | | 59 | H-15 | MAG | |
| 60 | PZ-7 | SR/DL | | 60 | C-2737 | MAG | |
| 61 | PZ-9 | SR/DL | | 61 | C-2505 | SR/DL | |
| 62 | PZ-10 | SR/DL | | 62 | C-2506 | SR/DL | |
| 63 | PZ-11 | SR/DL | | 63 | C-2507 | SR/DL | |
| 64 | PZ-12 | SR/DL | | 64 | C-2811 | SR/DL | |

| Sorted by Well Name | | | | Sorted by Zone | | | |
|---|---|---|---|---|---|---|---|
| Count | Well Name | Zone | Comments | Count | Well Name | Zone | Reason Not Assessed for Long-Term Water Level Trend in Culebra |
| 65 | PZ-13 | SR/DL | | 65 | PZ-1 | SR/DL | |
| 66 | PZ-14 | SR/DL | | 66 | PZ-2 | SR/DL | |
| 67 | PZ-15 | GAT | | 67 | PZ-3 | SR/DL | |
| 68 | PZ-16 | SR/DL | Drilled June 2020 | 68 | PZ-4 | SR/DL | |
| 69 | PZ-17a | SR/DL | Drilled July 2020 | 69 | PZ-5 | SR/DL | |
| 70 | PZ-17b | DL | Drilled July 2020 | 70 | PZ-6 | SR/DL | |
| 71 | PZ-18 | SR/DL | Drilled June 2020 | 71 | PZ-7 | SR/DL | |
| 72 | PZ-19a | SR/DL | Drilled July 2020 | 72 | PZ-9 | SR/DL | |
| 73 | WIPP-11R | CUL | Drilled in Sept 2019 | 73 | PZ-10 | SR/DL | |
| 74 | WIPP-18 | MAG | | 74 | PZ-11 | SR/DL | |
| 75 | WQSP-1 | CUL | | 75 | PZ-12 | SR/DL | |
| 76 | WQSP-2 | CUL | | 76 | PZ-13 | SR/DL | |
| 77 | WQSP-3 | CUL | | 77 | PZ-14 | SR/DL | |
| 78 | WQSP-4 | CUL | | 78 | PZ-16 | SR/DL | |
| 79 | WQSP-5 | CUL | | 79 | PZ-17a | SR/DL | |
| 80 | WQSP-6 | CUL | | 80 | PZ-18 | SR/DL | |
| 81 | WQSP-6A | DL | | 81 | PZ-19a | SR/DL | |

Zones:
B/C = Bell Canyon
CUL = Culebra
DL = Dewey Lake
GAT = Gatuña
MAG = Magenta
SR/DL = Santa Rosa/Dewey Lake

**Table F.4 – Water Levels**

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| AEC-7R | CUL | 01/10/24 | 615.31 | 3,043.04 | 3,061.65 |
| AEC-7R | CUL | 02/07/24 | 615.28 | 3,043.07 | 3,061.68 |
| AEC-7R | CUL | 03/05/24 | 615.49 | 3,042.86 | 3,061.46 |
| AEC-7R | CUL | 04/03/24 | 615.43 | 3,042.92 | 3,061.52 |
| AEC-7R | CUL | 05/08/24 | 614.91 | 3,043.44 | 3,062.08 |
| AEC-7R | CUL | 06/04/24 | 615.55 | 3,042.80 | 3,061.39 |
| AEC-7R | CUL | 07/02/24 | 615.97 | 3,042.38 | 3,060.94 |
| AEC-7R | CUL | 08/06/24 | 615.32 | 3,043.03 | 3,061.64 |
| AEC-7R | CUL | 09/10/24 | 614.98 | 3,043.37 | 3,062.00 |
| AEC-7R | CUL | 10/08/24 | 614.61 | 3,043.74 | 3,062.40 |
| AEC-7R | CUL | 11/05/24 | 614.48 | 3,043.87 | 3,062.54 |
| AEC-7R | CUL | 12/10/24 | 614.75 | 3,043.60 | 3,062.25 |
| C-2737 (PIP) | CUL | 01/11/24 | 431.99 | 2,968.77 | 2,976.28 |
| C-2737 (PIP) | CUL | 02/08/24 | 432.25 | 2,968.51 | 2,976.02 |
| C-2737 (PIP) | CUL | 03/05/24 | 432.04 | 2,968.72 | 2,976.23 |
| C-2737 (PIP) | CUL | 04/04/24 | 432.04 | 2,968.72 | 2,976.23 |
| C-2737 (PIP) | CUL | 05/16/24 | 432.58 | 2,968.18 | 2,975.68 |
| C-2737 (PIP) | CUL | 06/05/24 | 433.60 | 2,967.16 | 2,974.63 |
| C-2737 (PIP) | CUL | 07/03/24 | 434.42 | 2,966.34 | 2,973.78 |
| C-2737 (PIP) | CUL | 08/07/24 | 434.66 | 2,966.10 | 2,973.54 |
| C-2737 (PIP) | CUL | 09/11/24 | 435.10 | 2,965.66 | 2,973.08 |
| C-2737 (PIP) | CUL | 10/09/24 | 435.36 | 2,965.40 | 2,972.82 |
| C-2737 (PIP) | CUL | 11/06/24 | 435.45 | 2,965.31 | 2,972.72 |
| C-2737 (PIP) | CUL | 12/11/24 | 436.30 | 2,964.46 | 2,971.85 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| H-4bR | CUL | 01/09/24 | 344.98 | 2,989.66 | 2,993.41 |
| H-4bR | CUL | 02/06/24 | 344.06 | 2,990.58 | 2,994.35 |
| H-4bR | CUL | 03/04/24 | 343.24 | 2,991.40 | 2,995.19 |
| H-4bR | CUL | 04/02/24 | 342.92 | 2,991.72 | 2,995.51 |
| H-4bR | CUL | 05/16/24 | 351.05 | 2,983.59 | 2,987.20 |
| H-4bR | CUL | 06/03/24 | 348.07 | 2,986.57 | 2,990.25 |
| H-4bR | CUL | 07/01/24 | 345.18 | 2,989.46 | 2,993.20 |
| H-4bR | CUL | 08/05/24 | 342.98 | 2,991.66 | 2,995.45 |
| H-4bR | CUL | 09/09/24 | 342.32 | 2,992.32 | 2,996.13 |
| H-4bR | CUL | 10/07/24 | 342.19 | 2,992.45 | 2,996.26 |
| H-4bR | CUL | 11/04/24 | 342.47 | 2,992.17 | 2,995.97 |
| H-4bR | CUL | 12/09/24 | 343.40 | 2,991.24 | 2,995.02 |
| H-5bR | CUL | 01/10/24 | 484.00 | 3,024.95 | 3,064.37 |
| H-5bR | CUL | 02/07/24 | 484.07 | 3,024.88 | 3,064.29 |
| H-5bR | CUL | 03/05/24 | 484.05 | 3,024.90 | 3,064.31 |
| H-5bR | CUL | 04/03/24 | 484.08 | 3,024.87 | 3,064.28 |
| H-5bR | CUL | 05/08/24 | 484.12 | 3,024.83 | 3,064.24 |
| H-5bR | CUL | 06/04/24 | 484.23 | 3,024.72 | 3,064.12 |
| H-5bR | CUL | 07/02/24 | 485.12 | 3,023.83 | 3,063.14 |
| H-5bR | CUL | 08/06/24 | 485.14 | 3,023.81 | 3,063.12 |
| H-5bR | CUL | 09/10/24 | 485.53 | 3,023.42 | 3,062.70 |
| H-5bR | CUL | 10/08/24 | 485.44 | 3,023.51 | 3,062.79 |
| H-5bR | CUL | 11/05/24 | 485.26 | 3,023.69 | 3,062.99 |
| H-5bR | CUL | 12/10/24 | 485.15 | 3,023.80 | 3,063.11 |
| H-6bR | CUL | 01/11/24 | 300.56 | 3,048.66 | 3,061.01 |
| H-6bR | CUL | 02/08/24 | 300.80 | 3,048.42 | 3,060.76 |
| H-6bR | CUL | 03/05/24 | 300.75 | 3,048.47 | 3,060.82 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| H-6bR | CUL | 04/03/24 | 300.59 | 3,048.63 | 3,060.98 |
| H-6bR | CUL | 05/15/24 | 300.45 | 3,048.77 | 3,061.13 |
| H-6bR | CUL | 06/04/24 | 300.50 | 3,048.72 | 3,061.08 |
| H-6bR | CUL | 07/03/24 | 300.78 | 3,048.44 | 3,060.79 |
| H-6bR | CUL | 08/06/24 | 300.54 | 3,048.68 | 3,061.03 |
| H-6bR | CUL | 09/11/24 | 300.28 | 3,048.94 | 3,061.30 |
| H-6bR | CUL | 10/09/24 | 300.31 | 3,048.91 | 3,061.27 |
| H-6bR | CUL | 11/05/24 | 300.05 | 3,049.17 | 3,061.54 |
| H-6bR | CUL | 12/10/24 | 300.22 | 3,049.00 | 3,061.37 |
| H-9bR | CUL | 01/09/24 | 436.42 | 2,971.92 | 2,972.83 |
| H-9bR | CUL | 02/06/24 | 436.13 | 2,972.21 | 2,973.12 |
| H-9bR | CUL | 03/04/24 | 435.21 | 2,973.13 | 2,974.05 |
| H-9bR | CUL | 04/02/24 | 436.79 | 2,971.55 | 2,972.46 |
| H-9bR | CUL | 05/07/24 | 438.97 | 2,969.37 | 2,970.27 |
| H-9bR | CUL | 06/03/24 | 434.55 | 2,973.79 | 2,974.71 |
| H-9bR | CUL | 07/01/24 | 432.50 | 2,975.84 | 2,976.77 |
| H-9bR | CUL | 08/05/24 | 432.01 | 2,976.33 | 2,977.26 |
| H-9bR | CUL | 09/09/24 | 432.10 | 2,976.24 | 2,977.17 |
| H-9bR | CUL | 10/07/24 | 435.91 | 2,972.43 | 2,973.35 |
| H-9bR | CUL | 11/04/24 | 435.99 | 2,972.35 | 2,973.27 |
| H-9bR | CUL | 12/09/24 | 434.35 | 2,973.99 | 2,974.91 |
| H-10cR | CUL | 01/10/24 | 710.63 | 2,979.44 | 3,041.78 |
| H-10cR | CUL | 02/06/24 | 710.98 | 2,979.09 | 3,041.39 |
| H-10cR | CUL | 03/04/24 | 712.77 | 2,977.30 | 3,039.43 |
| H-10cR | CUL | 04/02/24 | 711.33 | 2,978.74 | 3,041.01 |
| H-10cR | CUL | 05/08/24 | 709.16 | 2,980.91 | 3,043.38 |
| H-10cR | CUL | 06/03/24 | 708.70 | 2,981.37 | 3,043.89 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| H-10cR | CUL | 07/01/24 | 708.42 | 2,981.65 | 3,044.19 |
| H-10cR | CUL | 08/05/24 | 708.08 | 2,981.99 | 3,044.56 |
| H-10cR | CUL | 09/09/24 | 707.13 | 2,982.94 | 3,045.60 |
| H-10cR | CUL | 10/07/24 | 707.11 | 2,982.96 | 3,045.63 |
| H-10cR | CUL | 11/04/24 | 706.52 | 2,983.55 | 3,046.27 |
| H-10cR | CUL | 12/09/24 | 707.79 | 2,982.28 | 3,044.88 |
| H-11b4R | CUL | 01/09/24 | 445.91 | 2,965.96 | 2,988.00 |
| H-11b4R | CUL | 02/06/24 | 444.78 | 2,967.09 | 2,989.21 |
| H-11b4R | CUL | 03/04/24 | 444.00 | 2,967.87 | 2,990.05 |
| H-11b4R | CUL | 04/02/24 | 443.60 | 2,968.27 | 2,990.48 |
| H-11b4R | CUL | 05/08/24 | 453.74 | 2,958.13 | 2,979.57 |
| H-11b4R | CUL | 06/03/24 | 449.31 | 2,962.56 | 2,984.34 |
| H-11b4R | CUL | 07/01/24 | 446.56 | 2,965.31 | 2,987.30 |
| H-11b4R | CUL | 08/05/24 | 444.54 | 2,967.33 | 2,989.47 |
| H-11b4R | CUL | 09/09/24 | 443.42 | 2,968.45 | 2,990.67 |
| H-11b4R | CUL | 10/07/24 | 443.05 | 2,968.82 | 2,991.07 |
| H-11b4R | CUL | 11/06/24 | 443.58 | 2,968.29 | 2,990.50 |
| H-11b4R | CUL | 12/09/24 | 443.45 | 2,968.42 | 2,990.64 |
| H-12R | CUL | 01/10/24 | 464.20 | 2,964.68 | 3,003.76 |
| H-12R | CUL | 02/06/24 | 464.30 | 2,964.58 | 3,003.65 |
| H-12R | CUL | 03/04/24 | 463.76 | 2,965.12 | 3,004.25 |
| H-12R | CUL | 04/02/24 | 463.70 | 2,965.18 | 3,004.31 |
| H-12R | CUL | 05/08/24 | 464.37 | 2,964.51 | 3,003.57 |
| H-12R | CUL | 06/03/24 | 465.49 | 2,963.39 | 3,002.34 |
| H-12R | CUL | 07/01/24 | 465.57 | 2,963.31 | 3,002.25 |
| H-12R | CUL | 08/05/24 | 464.92 | 2,963.96 | 3,002.97 |
| H-12R | CUL | 09/09/24 | N/A | N/A | N/A |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| H-12R | CUL | 10/07/24 | 464.62 | 2,964.26 | 3,003.30 |
| H-12R | CUL | 11/05/24 | 464.11 | 2,964.77 | 3,003.86 |
| H-12R | CUL | 12/09/24 | 464.27 | 2,964.61 | 3,003.68 |
| H-15R | CUL | 01/11/24 | 526.57 | 2,955.45 | 2,999.41 |
| H-15R | CUL | 02/08/24 | 526.24 | 2,955.78 | 2,999.78 |
| H-15R | CUL | 03/06/24 | 526.04 | 2,955.98 | 3,000.01 |
| H-15R | CUL | 04/04/24 | 525.71 | 2,956.31 | 3,000.38 |
| H-15R | CUL | 05/16/24 | 528.14 | 2,953.88 | 2,997.64 |
| H-15R | CUL | 06/05/24 | 528.70 | 2,953.32 | 2,997.01 |
| H-15R | CUL | 07/08/24 | 528.27 | 2,953.75 | 2,997.50 |
| H-15R | CUL | 08/07/24 | 527.58 | 2,954.44 | 2,998.27 |
| H-15R | CUL | 09/11/24 | 526.77 | 2,955.25 | 2,999.19 |
| H-15R | CUL | 10/09/24 | 526.48 | 2,955.54 | 2,999.51 |
| H-15R | CUL | 11/06/24 | 525.80 | 2,956.22 | 3,000.28 |
| H-15R | CUL | 12/11/24 | 525.32 | 2,956.70 | 3,000.82 |
| H-16 | CUL | 01/09/24 | 474.84 | 2,935.22 | 2,943.61 |
| H-16 | CUL | 02/08/24 | 472.65 | 2,937.41 | 2,945.87 |
| H-16 | CUL | 03/06/24 | 469.79 | 2,940.27 | 2,948.83 |
| H-16 | CUL | 04/04/24 | 474.39 | 2,935.67 | 2,944.07 |
| H-16 | CUL | 05/15/24 | 471.71 | 2,938.35 | 2,946.85 |
| H-16 | CUL | 06/05/24 | 471.27 | 2,938.79 | 2,947.30 |
| H-16 | CUL | 07/08/24 | 476.97 | 2,933.09 | 2,941.40 |
| H-16 | CUL | 08/07/24 | 478.90 | 2,931.16 | 2,939.40 |
| H-16 | CUL | 09/11/24 | 480.49 | 2,929.57 | 2,937.76 |
| H-16 | CUL | 10/09/24 | 483.37 | 2,926.69 | 2,934.78 |
| H-16 | CUL | 11/06/24 | 485.62 | 2,924.44 | 2,932.45 |
| H-16 | CUL | 12/11/24 | 487.45 | 2,922.61 | 2,930.55 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| H-19b0 | CUL | 01/09/24 | 451.07 | 2,967.26 | 2,986.64 |
| H-19b0 | CUL | 02/06/24 | 450.70 | 2,967.63 | 2,987.04 |
| H-19b0 | CUL | 03/07/24 | 450.31 | 2,968.02 | 2,987.45 |
| H-19b0 | CUL | 04/02/24 | 450.15 | 2,968.18 | 2,987.62 |
| H-19b0 | CUL | 05/08/24 | 452.40 | 2,965.93 | 2,985.23 |
| H-19b0 | CUL | 06/05/24 | 453.30 | 2,965.03 | 2,984.27 |
| H-19b0 | CUL | 07/03/24 | 452.87 | 2,965.46 | 2,984.73 |
| H-19b0 | CUL | 08/05/24 | 452.07 | 2,966.26 | 2,985.58 |
| H-19b0 | CUL | 09/09/24 | 451.43 | 2,966.90 | 2,986.26 |
| H-19b0 | CUL | 10/09/24 | 451.22 | 2,967.11 | 2,986.48 |
| H-19b0 | CUL | 11/06/24 | 450.78 | 2,967.55 | 2,986.95 |
| H-19b0 | CUL | 12/09/24 | 450.92 | 2,967.41 | 2,986.80 |
| H-19b2 | CUL | 03/07/24 | 451.67 | 2,967.26 | 2,986.74 |
| H-19b2 | CUL | 06/05/24 | 454.63 | 2,964.30 | 2,983.59 |
| H-19b2 | CUL | 09/09/24 | 452.78 | 2,966.15 | 2,985.56 |
| H-19b2 | CUL | 12/09/24 | 452.33 | 2,966.60 | 2,986.04 |
| H-19b3 | CUL | 03/07/24 | 451.86 | 2,967.16 | 2,986.54 |
| H-19b3 | CUL | 06/05/24 | 454.84 | 2,964.18 | 2,983.37 |
| H-19b3 | CUL | 09/09/24 | 453.02 | 2,966.00 | 2,985.30 |
| H-19b3 | CUL | 12/09/24 | 452.51 | 2,966.51 | 2,985.85 |
| H-19b4 | CUL | 03/07/24 | 451.29 | 2,967.69 | 2,987.10 |
| H-19b4 | CUL | 06/05/24 | 454.24 | 2,964.74 | 2,983.96 |
| H-19b4 | CUL | 09/09/24 | 452.42 | 2,966.56 | 2,985.90 |
| H-19b4 | CUL | 12/09/24 | 451.93 | 2,967.05 | 2,986.42 |
| H-19b5 | CUL | 03/07/24 | 451.11 | 2,967.47 | 2,986.87 |
| H-19b5 | CUL | 06/05/24 | 454.09 | 2,964.49 | 2,983.70 |
| H-19b5 | CUL | 09/09/24 | 452.30 | 2,966.28 | 2,985.60 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| H-19b5 | CUL | 12/09/24 | 451.81 | 2,966.77 | 2,986.12 |
| H-19b6 | CUL | 03/07/24 | 451.85 | 2,967.17 | 2,986.55 |
| H-19b6 | CUL | 06/05/24 | 454.79 | 2,964.23 | 2,983.42 |
| H-19b6 | CUL | 09/09/24 | 452.94 | 2,966.08 | 2,985.39 |
| H-19b6 | CUL | 12/09/24 | 452.45 | 2,966.57 | 2,985.91 |
| H-19b7 | CUL | 03/07/24 | 451.60 | 2,967.34 | 2,986.73 |
| H-19b7 | CUL | 06/05/24 | 454.44 | 2,964.50 | 2,983.71 |
| H-19b7 | CUL | 09/09/24 | 452.78 | 2,966.16 | 2,985.47 |
| H-19b7 | CUL | 12/09/24 | 452.29 | 2,966.65 | 2,985.99 |
| I-461 | CUL | 01/11/24 | 250.71 | 3,033.17 | 3,034.68 |
| I-461 | CUL | 02/08/24 | 251.10 | 3,032.78 | 3,034.29 |
| I-461 | CUL | 03/05/24 | 251.15 | 3,032.73 | 3,034.24 |
| I-461 | CUL | 04/03/24 | 251.27 | 3,032.61 | 3,034.12 |
| I-461 | CUL | 05/15/24 | 251.32 | 3,032.56 | 3,034.07 |
| I-461 | CUL | 06/04/24 | 251.34 | 3,032.54 | 3,034.05 |
| I-461 | CUL | 07/03/24 | 251.62 | 3,032.26 | 3,033.76 |
| I-461 | CUL | 08/06/24 | 251.38 | 3,032.50 | 3,034.00 |
| I-461 | CUL | 09/11/24 | 251.41 | 3,032.47 | 3,033.98 |
| I-461 | CUL | 10/09/24 | 251.59 | 3,032.29 | 3,033.79 |
| I-461 | CUL | 11/05/24 | 251.61 | 3,032.27 | 3,033.77 |
| I-461 | CUL | 12/10/24 | 251.75 | 3,032.13 | 3,033.63 |
| SNL-1 | CUL | 01/10/24 | 444.78 | 3,068.06 | 3,073.94 |
| SNL-1 | CUL | 02/07/24 | 444.93 | 3,067.91 | 3,073.79 |
| SNL-1 | CUL | 03/05/24 | 445.03 | 3,067.81 | 3,073.68 |
| SNL-1 | CUL | 04/03/24 | 444.93 | 3,067.91 | 3,073.79 |
| SNL-1 | CUL | 05/15/24 | 444.75 | 3,068.09 | 3,073.97 |
| SNL-1 | CUL | 06/04/24 | 444.78 | 3,068.06 | 3,073.94 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| SNL-1 | CUL | 07/02/24 | 445.07 | 3,067.77 | 3,073.64 |
| SNL-1 | CUL | 08/06/24 | 445.07 | 3,067.77 | 3,073.64 |
| SNL-1 | CUL | 09/10/24 | 444.86 | 3,067.98 | 3,073.86 |
| SNL-1 | CUL | 10/08/24 | 444.74 | 3,068.10 | 3,073.98 |
| SNL-1 | CUL | 11/05/24 | 444.52 | 3,068.32 | 3,074.21 |
| SNL-1 | CUL | 12/10/24 | 444.77 | 3,068.07 | 3,073.95 |
| SNL-2 | CUL | 01/10/24 | 263.49 | 3,059.57 | 3,062.26 |
| SNL-2 | CUL | 02/07/24 | 263.35 | 3,059.71 | 3,062.41 |
| SNL-2 | CUL | 03/05/24 | 263.44 | 3,059.62 | 3,062.32 |
| SNL-2 | CUL | 04/03/24 | 263.10 | 3,059.96 | 3,062.66 |
| SNL-2 | CUL | 05/15/24 | 262.91 | 3,060.15 | 3,062.85 |
| SNL-2 | CUL | 06/04/24 | 262.74 | 3,060.32 | 3,063.02 |
| SNL-2 | CUL | 07/02/24 | 262.50 | 3,060.56 | 3,063.27 |
| SNL-2 | CUL | 08/06/24 | 262.02 | 3,061.04 | 3,063.75 |
| SNL-2 | CUL | 09/10/24 | 261.70 | 3,061.36 | 3,064.08 |
| SNL-2 | CUL | 10/09/24 | 261.77 | 3,061.29 | 3,064.01 |
| SNL-2 | CUL | 11/05/24 | 261.48 | 3,061.58 | 3,064.30 |
| SNL-2 | CUL | 12/10/24 | 261.71 | 3,061.35 | 3,064.07 |
| SNL-3 | CUL | 01/10/24 | 429.91 | 3,060.44 | 3,069.87 |
| SNL-3 | CUL | 02/07/24 | 430.05 | 3,060.30 | 3,069.72 |
| SNL-3 | CUL | 03/05/24 | 430.14 | 3,060.21 | 3,069.63 |
| SNL-3 | CUL | 04/03/24 | 429.88 | 3,060.47 | 3,069.90 |
| SNL-3 | CUL | 05/15/24 | 429.89 | 3,060.46 | 3,069.89 |
| SNL-3 | CUL | 06/04/24 | 429.95 | 3,060.40 | 3,069.82 |
| SNL-3 | CUL | 07/02/24 | 430.16 | 3,060.19 | 3,069.61 |
| SNL-3 | CUL | 08/06/24 | 430.24 | 3,060.11 | 3,069.53 |
| SNL-3 | CUL | 09/10/24 | 429.76 | 3,060.59 | 3,070.02 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| SNL-3 | CUL | 10/08/24 | 429.79 | 3,060.56 | 3,069.99 |
| SNL-3 | CUL | 11/05/24 | 429.49 | 3,060.86 | 3,070.30 |
| SNL-3 | CUL | 12/10/24 | 429.61 | 3,060.74 | 3,070.17 |
| SNL-5 | CUL | 01/10/24 | 320.64 | 3,059.34 | 3,061.64 |
| SNL-5 | CUL | 02/07/24 | 320.72 | 3,059.26 | 3,061.56 |
| SNL-5 | CUL | 03/05/24 | 320.78 | 3,059.20 | 3,061.50 |
| SNL-5 | CUL | 04/03/24 | 320.16 | 3,059.82 | 3,062.12 |
| SNL-5 | CUL | 05/15/24 | 320.34 | 3,059.64 | 3,061.94 |
| SNL-5 | CUL | 06/04/24 | 320.44 | 3,059.54 | 3,061.84 |
| SNL-5 | CUL | 07/02/24 | 320.48 | 3,059.50 | 3,061.80 |
| SNL-5 | CUL | 08/06/24 | 320.56 | 3,059.42 | 3,061.72 |
| SNL-5 | CUL | 09/10/24 | 319.92 | 3,060.06 | 3,062.36 |
| SNL-5 | CUL | 10/09/24 | 319.79 | 3,060.19 | 3,062.49 |
| SNL-5 | CUL | 11/05/24 | 319.50 | 3,060.48 | 3,062.79 |
| SNL-5 | CUL | 12/10/24 | 319.15 | 3,060.83 | 3,063.14 |
| SNL-6 | CUL | 01/10/24 | 404.85 | 3,241.26 | 3,486.73 |
| SNL-6 | CUL | 02/07/24 | 404.31 | 3,241.80 | 3,487.42 |
| SNL-6 | CUL | 03/05/24 | 402.42 | 3,243.69 | 3,489.80 |
| SNL-6 | CUL | 04/03/24 | 402.19 | 3,243.92 | 3,490.09 |
| SNL-6 | CUL | 05/08/24 | 401.45 | 3,244.66 | 3,491.03 |
| SNL-6 | CUL | 06/04/24 | 400.99 | 3,245.12 | 3,491.61 |
| SNL-6 | CUL | 07/02/24 | 400.77 | 3,245.34 | 3,491.89 |
| SNL-6 | CUL | 08/06/24 | 400.25 | 3,245.86 | 3,492.54 |
| SNL-6 | CUL | 09/10/24 | 399.57 | 3,246.54 | 3,493.40 |
| SNL-6 | CUL | 10/08/24 | 399.89 | 3,246.22 | 3,493.00 |
| SNL-6 | CUL | 11/05/24 | 398.70 | 3,247.41 | 3,494.50 |
| SNL-6 | CUL | 12/10/24 | 398.21 | 3,247.90 | 3,495.12 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| SNL-8 | CUL | 01/10/24 | 539.89 | 3,015.84 | 3,057.96 |
| SNL-8 | CUL | 02/07/24 | 539.91 | 3,015.82 | 3,057.94 |
| SNL-8 | CUL | 03/05/24 | 540.08 | 3,015.65 | 3,057.76 |
| SNL-8 | CUL | 04/03/24 | 541.08 | 3,014.65 | 3,056.66 |
| SNL-8 | CUL | 05/08/24 | 541.06 | 3,014.67 | 3,056.68 |
| SNL-8 | CUL | 06/04/24 | 540.92 | 3,014.81 | 3,056.83 |
| SNL-8 | CUL | 07/02/24 | 542.09 | 3,013.64 | 3,055.55 |
| SNL-8 | CUL | 08/06/24 | 541.42 | 3,014.31 | 3,056.28 |
| SNL-8 | CUL | 09/10/24 | 541.11 | 3,014.62 | 3,056.62 |
| SNL-8 | CUL | 10/08/24 | 541.05 | 3,014.68 | 3,056.69 |
| SNL-8 | CUL | 11/05/24 | 540.54 | 3,015.19 | 3,057.25 |
| SNL-8 | CUL | 12/10/24 | 540.05 | 3,015.68 | 3,057.79 |
| SNL-9 | CUL | 01/11/24 | 319.95 | 3,041.01 | 3,045.46 |
| SNL-9 | CUL | 02/08/24 | 320.19 | 3,040.77 | 3,045.22 |
| SNL-9 | CUL | 03/05/24 | 320.14 | 3,040.82 | 3,045.27 |
| SNL-9 | CUL | 04/03/24 | 320.13 | 3,040.83 | 3,045.28 |
| SNL-9 | CUL | 05/15/24 | 320.02 | 3,040.94 | 3,045.39 |
| SNL-9 | CUL | 06/04/24 | 320.10 | 3,040.86 | 3,045.31 |
| SNL-9 | CUL | 07/03/24 | 320.30 | 3,040.66 | 3,045.10 |
| SNL-9 | CUL | 08/06/24 | 320.03 | 3,040.93 | 3,045.38 |
| SNL-9 | CUL | 09/11/24 | 319.87 | 3,041.09 | 3,045.54 |
| SNL-9 | CUL | 10/09/24 | 319.97 | 3,040.99 | 3,045.44 |
| SNL-9 | CUL | 11/05/24 | 319.78 | 3,041.18 | 3,045.63 |
| SNL-9 | CUL | 12/10/24 | 319.99 | 3,040.97 | 3,045.42 |
| SNL-10 | CUL | 01/11/24 | 340.68 | 3,036.91 | 3,039.09 |
| SNL-10 | CUL | 02/08/24 | 340.74 | 3,036.85 | 3,039.03 |
| SNL-10 | CUL | 03/05/24 | 340.77 | 3,036.82 | 3,039.00 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| SNL-10 | CUL | 04/03/24 | 340.80 | 3,036.79 | 3,038.97 |
| SNL-10 | CUL | 05/15/24 | 340.83 | 3,036.76 | 3,038.94 |
| SNL-10 | CUL | 06/04/24 | 340.88 | 3,036.71 | 3,038.89 |
| SNL-10 | CUL | 07/03/24 | 341.31 | 3,036.28 | 3,038.46 |
| SNL-10 | CUL | 08/06/24 | 341.20 | 3,036.39 | 3,038.57 |
| SNL-10 | CUL | 09/11/24 | 340.98 | 3,036.61 | 3,038.79 |
| SNL-10 | CUL | 10/09/24 | 341.03 | 3,036.56 | 3,038.74 |
| SNL-10 | CUL | 11/05/24 | 340.95 | 3,036.64 | 3,038.82 |
| SNL-10 | CUL | 12/10/24 | 341.19 | 3,036.40 | 3,038.58 |
| SNL-12 | CUL | 01/09/24 | 354.45 | 2,985.01 | 2,987.82 |
| SNL-12 | CUL | 02/06/24 | 353.33 | 2,986.13 | 2,988.96 |
| SNL-12 | CUL | 03/04/24 | 352.28 | 2,987.18 | 2,990.02 |
| SNL-12 | CUL | 04/02/24 | 352.10 | 2,987.36 | 2,990.20 |
| SNL-12 | CUL | 05/07/24 | 365.27 | 2,974.19 | 2,976.86 |
| SNL-12 | CUL | 06/03/24 | 357.75 | 2,981.71 | 2,984.48 |
| SNL-12 | CUL | 07/01/24 | 354.12 | 2,985.34 | 2,988.16 |
| SNL-12 | CUL | 08/05/24 | 351.72 | 2,987.74 | 2,990.59 |
| SNL-12 | CUL | 09/09/24 | 351.01 | 2,988.45 | 2,991.31 |
| SNL-12 | CUL | 10/07/24 | 351.26 | 2,988.20 | 2,991.05 |
| SNL-12 | CUL | 11/04/24 | 351.70 | 2,987.76 | 2,990.61 |
| SNL-12 | CUL | 12/09/24 | 351.94 | 2,987.52 | 2,990.37 |
| SNL-13 | CUL | 01/09/24 | 297.03 | 2,997.08 | 2,999.89 |
| SNL-13 | CUL | 02/06/24 | 296.85 | 2,997.26 | 3,000.07 |
| SNL-13 | CUL | 03/04/24 | 296.59 | 2,997.52 | 3,000.34 |
| SNL-13 | CUL | 04/02/24 | 296.27 | 2,997.84 | 3,000.67 |
| SNL-13 | CUL | 05/16/24 | 296.14 | 2,997.97 | 3,000.80 |
| SNL-13 | CUL | 06/03/24 | 296.58 | 2,997.53 | 3,000.35 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| SNL-13 | CUL | 07/01/24 | 296.70 | 2,997.41 | 3,000.23 |
| SNL-13 | CUL | 08/05/24 | 297.08 | 2,997.03 | 2,999.84 |
| SNL-13 | CUL | 09/09/24 | 296.45 | 2,997.66 | 3,000.48 |
| SNL-13 | CUL | 10/07/24 | 296.61 | 2,997.50 | 3,000.32 |
| SNL-13 | CUL | 11/04/24 | 296.25 | 2,997.86 | 3,000.69 |
| SNL-13 | CUL | 12/09/24 | 297.15 | 2,996.96 | 2,999.76 |
| SNL-14 | CUL | 01/09/24 | 393.88 | 2,974.53 | 2,987.76 |
| SNL-14 | CUL | 02/06/24 | 392.63 | 2,975.78 | 2,989.07 |
| SNL-14 | CUL | 03/04/24 | 391.98 | 2,976.43 | 2,989.75 |
| SNL-14 | CUL | 04/02/24 | 391.32 | 2,977.09 | 2,990.44 |
| SNL-14 | CUL | 05/08/24 | 404.27 | 2,964.14 | 2,976.87 |
| SNL-14 | CUL | 06/03/24 | 397.17 | 2,971.24 | 2,984.31 |
| SNL-14 | CUL | 07/01/24 | 393.77 | 2,974.64 | 2,987.88 |
| SNL-14 | CUL | 08/05/24 | 391.72 | 2,976.69 | 2,990.02 |
| SNL-14 | CUL | 09/09/24 | 390.67 | 2,977.74 | 2,991.12 |
| SNL-14 | CUL | 10/07/24 | 390.44 | 2,977.97 | 2,991.37 |
| SNL-14 | CUL | 11/06/24 | 391.41 | 2,977.00 | 2,990.35 |
| SNL-14 | CUL | 12/09/24 | 391.22 | 2,977.19 | 2,990.55 |
| SNL-15 | CUL | 01/10/24 | 464.17 | 3,015.76 | 3,123.09 |
| SNL-15 | CUL | 02/06/24 | 344.06 | 3,015.99 | 3,123.37 |
| SNL-15 | CUL | 03/04/24 | 463.70 | 3,016.23 | 3,123.67 |
| SNL-15 | CUL | 04/02/24 | 342.92 | 3,016.69 | 3,124.23 |
| SNL-15 | CUL | 05/08/24 | 462.84 | 3,017.09 | 3,124.73 |
| SNL-15 | CUL | 06/03/24 | 348.07 | 3,016.57 | 3,124.09 |
| SNL-15 | CUL | 07/01/24 | 463.32 | 3,016.61 | 3,124.14 |
| SNL-15 | CUL | 08/05/24 | 342.98 | 3,017.25 | 3,124.93 |
| SNL-15 | CUL | 09/09/24 | 462.31 | 3,017.62 | 3,125.38 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| SNL-15 | CUL | 10/07/24 | 342.19 | 3,018.14 | 3,126.02 |
| SNL-15 | CUL | 11/05/24 | 461.42 | 3,018.51 | 3,126.48 |
| SNL-15 | CUL | 12/09/24 | 343.40 | 3,018.17 | 3,126.06 |
| SNL-16 | CUL | 01/09/24 | 127.88 | 3,005.12 | 3,005.98 |
| SNL-16 | CUL | 02/06/24 | 128.04 | 3,004.96 | 3,005.82 |
| SNL-16 | CUL | 03/04/24 | 128.02 | 3,004.98 | 3,005.84 |
| SNL-16 | CUL | 04/02/24 | 128.38 | 3,004.62 | 3,005.48 |
| SNL-16 | CUL | 05/07/24 | 128.31 | 3,004.69 | 3,005.55 |
| SNL-16 | CUL | 06/03/24 | 128.54 | 3,004.46 | 3,005.32 |
| SNL-16 | CUL | 07/01/24 | 128.85 | 3,004.15 | 3,005.00 |
| SNL-16 | CUL | 08/05/24 | 128.93 | 3,004.07 | 3,004.92 |
| SNL-16 | CUL | 09/09/24 | 128.99 | 3,004.01 | 3,004.86 |
| SNL-16 | CUL | 10/07/24 | 129.12 | 3,003.88 | 3,004.73 |
| SNL-16 | CUL | 11/04/24 | 129.00 | 3,004.00 | 3,004.85 |
| SNL-16 | CUL | 12/09/24 | 128.85 | 3,004.15 | 3,005.00 |
| SNL-17 | CUL | 01/09/24 | 236.66 | 3,001.40 | 3,001.51 |
| SNL-17 | CUL | 02/06/24 | 236.79 | 3,001.27 | 3,001.72 |
| SNL-17 | CUL | 03/04/24 | 236.64 | 3,001.42 | 3,001.87 |
| SNL-17 | CUL | 04/02/24 | 236.75 | 3,001.31 | 3,001.76 |
| SNL-17 | CUL | 05/07/24 | 238.87 | 2,999.19 | 2,999.63 |
| SNL-17 | CUL | 06/03/24 | 238.15 | 2,999.91 | 3,000.36 |
| SNL-17 | CUL | 07/01/24 | 237.88 | 3,000.18 | 3,000.63 |
| SNL-17 | CUL | 08/05/24 | 237.48 | 3,000.58 | 3,001.03 |
| SNL-17 | CUL | 09/09/24 | 237.41 | 3,000.65 | 3,001.10 |
| SNL-17 | CUL | 10/07/24 | 237.39 | 3,000.67 | 3,001.12 |
| SNL-17 | CUL | 11/04/24 | 237.30 | 3,000.76 | 3,001.21 |
| SNL-17 | CUL | 12/09/24 | 237.51 | 3,000.55 | 3,001.00 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| SNL-18 | CUL | 01/10/24 | 313.84 | 3,061.60 | 3,061.84 |
| SNL-18 | CUL | 02/07/24 | 313.98 | 3,061.46 | 3,061.70 |
| SNL-18 | CUL | 03/05/24 | 313.91 | 3,061.53 | 3,061.77 |
| SNL-18 | CUL | 04/03/24 | 313.27 | 3,062.17 | 3,062.41 |
| SNL-18 | CUL | 05/15/24 | 313.82 | 3,061.62 | 3,061.86 |
| SNL-18 | CUL | 06/04/24 | 313.48 | 3,061.96 | 3,062.20 |
| SNL-18 | CUL | 07/02/24 | 313.55 | 3,061.89 | 3,062.13 |
| SNL-18 | CUL | 08/06/24 | 313.42 | 3,062.02 | 3,062.26 |
| SNL-18 | CUL | 09/10/24 | 313.00 | 3,062.44 | 3,062.68 |
| SNL-18 | CUL | 10/08/24 | 312.64 | 3,062.80 | 3,063.04 |
| SNL-18 | CUL | 11/05/24 | 312.51 | 3,062.93 | 3,063.17 |
| SNL-18 | CUL | 12/10/24 | 312.02 | 3,063.42 | 3,063.66 |
| SNL-19 | CUL | 01/10/24 | 161.96 | 3,060.69 | 3,061.85 |
| SNL-19 | CUL | 02/07/24 | 161.91 | 3,060.74 | 3,061.90 |
| SNL-19 | CUL | 03/05/24 | 161.96 | 3,060.69 | 3,061.85 |
| SNL-19 | CUL | 04/03/24 | 161.62 | 3,061.03 | 3,062.19 |
| SNL-19 | CUL | 05/15/24 | 161.43 | 3,061.22 | 3,062.38 |
| SNL-19 | CUL | 06/04/24 | 161.46 | 3,061.19 | 3,062.35 |
| SNL-19 | CUL | 07/02/24 | 161.28 | 3,061.37 | 3,062.53 |
| SNL-19 | CUL | 08/06/24 | 160.80 | 3,061.85 | 3,063.02 |
| SNL-19 | CUL | 09/10/24 | 160.58 | 3,062.07 | 3,063.24 |
| SNL-19 | CUL | 10/09/24 | 160.61 | 3,062.04 | 3,063.21 |
| SNL-19 | CUL | 11/05/24 | 160.46 | 3,062.19 | 3,063.36 |
| SNL-19 | CUL | 12/10/24 | 160.55 | 3,062.10 | 3,063.27 |
| WIPP-11R | CUL | 01/10/24 | 373.90 | 3,053.36 | 3,066.89 |
| WIPP-11R | CUL | 02/08/24 | 374.05 | 3,053.21 | 3,066.74 |
| WIPP-11R | CUL | 03/05/24 | 374.13 | 3,053.13 | 3,066.66 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| WIPP-11R | CUL | 04/03/24 | 373.77 | 3,053.49 | 3,067.03 |
| WIPP-11R | CUL | 05/15/24 | 373.48 | 3,053.78 | 3,067.33 |
| WIPP-11R | CUL | 06/04/24 | 373.89 | 3,053.37 | 3,066.90 |
| WIPP-11R | CUL | 07/03/24 | 374.12 | 3,053.14 | 3,066.67 |
| WIPP-11R | CUL | 08/06/24 | 374.31 | 3,052.95 | 3,066.47 |
| WIPP-11R | CUL | 09/10/24 | 373.40 | 3,053.86 | 3,067.41 |
| WIPP-11R | CUL | 10/08/24 | 373.65 | 3,053.61 | 3,067.15 |
| WIPP-11R | CUL | 11/05/24 | 373.38 | 3,053.88 | 3,067.43 |
| WIPP-11R | CUL | 12/10/24 | 373.35 | 3,053.91 | 3,067.46 |
| WQSP-1 | CUL | 01/10/24 | 371.67 | 3,047.58 | 3,061.94 |
| WQSP-1 | CUL | 02/08/24 | 371.87 | 3,047.38 | 3,061.73 |
| WQSP-1 | CUL | 03/05/24 | 371.86 | 3,047.39 | 3,061.75 |
| WQSP-1 | CUL | 04/02/24 | 371.78 | 3,047.47 | 3,061.83 |
| WQSP-1 | CUL | 05/15/24 | 371.63 | 3,047.62 | 3,061.98 |
| WQSP-1 | CUL | 06/04/24 | 371.67 | 3,047.58 | 3,061.94 |
| WQSP-1 | CUL | 07/03/24 | 371.96 | 3,047.29 | 3,061.64 |
| WQSP-1 | CUL | 08/06/24 | 371.94 | 3,047.31 | 3,061.66 |
| WQSP-1 | CUL | 09/11/24 | 371.62 | 3,047.63 | 3,062.00 |
| WQSP-1 | CUL | 10/09/24 | 371.52 | 3,047.73 | 3,062.10 |
| WQSP-1 | CUL | 11/11/24 | 371.27 | 3,047.98 | 3,062.36 |
| WQSP-1 | CUL | 12/10/24 | 371.18 | 3,048.07 | 3,062.45 |
| WQSP-2 | CUL | 01/10/24 | 412.74 | 3,051.13 | 3,065.15 |
| WQSP-2 | CUL | 02/07/24 | 412.78 | 3,051.09 | 3,065.11 |
| WQSP-2 | CUL | 03/05/24 | 412.98 | 3,050.89 | 3,064.90 |
| WQSP-2 | CUL | 04/03/24 | 412.70 | 3,051.17 | 3,065.19 |
| WQSP-2 | CUL | 05/15/24 | 412.60 | 3,051.27 | 3,065.29 |
| WQSP-2 | CUL | 06/04/24 | 412.69 | 3,051.18 | 3,065.20 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| WQSP-2 | CUL | 07/02/24 | 413.03 | 3,050.84 | 3,064.85 |
| WQSP-2 | CUL | 08/06/24 | 412.95 | 3,050.92 | 3,064.93 |
| WQSP-2 | CUL | 09/10/24 | 412.76 | 3,051.11 | 3,065.13 |
| WQSP-2 | CUL | 10/08/24 | 412.63 | 3,051.24 | 3,065.26 |
| WQSP-2 | CUL | 11/05/24 | 412.40 | 3,051.47 | 3,065.50 |
| WQSP-2 | CUL | 12/10/24 | 412.44 | 3,051.43 | 3,065.46 |
| WQSP-3 | CUL | 01/10/24 | 477.54 | 3,002.60 | 3,056.89 |
| WQSP-3 | CUL | 02/07/24 | 477.58 | 3,002.56 | 3,056.84 |
| WQSP-3 | CUL | 03/05/24 | 477.72 | 3,002.42 | 3,056.68 |
| WQSP-3 | CUL | 04/03/24 | 477.75 | 3,002.39 | 3,056.65 |
| WQSP-3 | CUL | 05/15/24 | 478.27 | 3,001.87 | 3,056.05 |
| WQSP-3 | CUL | 06/04/24 | 478.14 | 3,002.00 | 3,056.20 |
| WQSP-3 | CUL | 07/02/24 | 478.64 | 3,001.50 | 3,055.63 |
| WQSP-3 | CUL | 08/06/24 | 478.66 | 3,001.48 | 3,055.61 |
| WQSP-3 | CUL | 09/10/24 | 478.75 | 3,001.39 | 3,055.50 |
| WQSP-3 | CUL | 10/08/24 | 478.72 | 3,001.42 | 3,055.54 |
| WQSP-3 | CUL | 11/05/24 | 478.59 | 3,001.55 | 3,055.69 |
| WQSP-3 | CUL | 12/10/24 | 478.50 | 3,001.64 | 3,055.79 |
| WQSP-4 | CUL | 01/09/24 | 468.12 | 2,964.97 | 2,986.09 |
| WQSP-4 | CUL | 02/06/24 | 467.75 | 2,965.34 | 2,986.05 |
| WQSP-4 | CUL | 03/04/24 | 467.45 | 2,965.64 | 2,986.22 |
| WQSP-4 | CUL | 04/02/24 | 467.16 | 2,965.93 | 2,986.28 |
| WQSP-4 | CUL | 05/08/24 | 469.30 | 2,963.79 | 2,986.07 |
| WQSP-4 | CUL | 06/03/24 | 470.15 | 2,962.94 | 2,984.55 |
| WQSP-4 | CUL | 07/03/24 | 469.82 | 2,963.27 | 2,984.14 |
| WQSP-4 | CUL | 08/05/24 | 468.99 | 2,964.10 | 2,984.29 |
| WQSP-4 | CUL | 09/09/24 | 468.37 | 2,964.72 | 2,984.65 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| WQSP-4 | CUL | 10/09/24 | 468.13 | 2,964.96 | 2,985.04 |
| WQSP-4 | CUL | 11/06/24 | 467.68 | 2,965.41 | 2,985.32 |
| WQSP-4 | CUL | 12/09/24 | 467.86 | 2,965.23 | 2,984.82 |
| WQSP-5 | CUL | 01/09/24 | 405.38 | 2,979.00 | 2,986.09 |
| WQSP-5 | CUL | 02/06/24 | 405.42 | 2,978.96 | 2,986.05 |
| WQSP-5 | CUL | 03/04/24 | 405.26 | 2,979.12 | 2,986.22 |
| WQSP-5 | CUL | 04/02/24 | 405.20 | 2,979.18 | 2,986.28 |
| WQSP-5 | CUL | 05/08/24 | 405.40 | 2,978.98 | 2,986.07 |
| WQSP-5 | CUL | 06/03/24 | 406.88 | 2,977.50 | 2,984.55 |
| WQSP-5 | CUL | 07/01/24 | 407.28 | 2,977.10 | 2,984.14 |
| WQSP-5 | CUL | 08/05/24 | 407.13 | 2,977.25 | 2,984.29 |
| WQSP-5 | CUL | 09/11/24 | 406.78 | 2,977.60 | 2,984.65 |
| WQSP-5 | CUL | 10/09/24 | 406.40 | 2,977.98 | 2,985.04 |
| WQSP-5 | CUL | 11/06/24 | 406.13 | 2,978.25 | 2,985.32 |
| WQSP-5 | CUL | 12/11/24 | 406.62 | 2,977.76 | 2,984.82 |
| WQSP-6 | CUL | 01/09/24 | 372.41 | 2,992.31 | 2,993.43 |
| WQSP-6 | CUL | 02/06/24 | 372.69 | 2,992.03 | 2,993.15 |
| WQSP-6 | CUL | 03/04/24 | 372.76 | 2,991.960 | 2,993.08 |
| WQSP-6 | CUL | 04/02/24 | 373.04 | 2,991.68 | 2,992.80 |
| WQSP-6 | CUL | 05/08/24 | 373.78 | 2,990.94 | 2,992.06 |
| WQSP-6 | CUL | 06/03/24 | 373.58 | 2,991.14 | 2,992.26 |
| WQSP-6 | CUL | 07/01/24 | 374.28 | 2,990.44 | 2,991.55 |
| WQSP-6 | CUL | 08/05/24 | 374.63 | 2,990.09 | 2,991.20 |
| WQSP-6 | CUL | 09/11/24 | 374.65 | 2,990.07 | 2,991.18 |
| WQSP-6 | CUL | 10/09/24 | 374.72 | 2,990.00 | 2,991.11 |
| WQSP-6 | CUL | 11/06/24 | 374.48 | 2,990.24 | 2,991.35 |
| WQSP-6 | CUL | 12/11/24 | 375.65 | 2,989.07 | 2,990.18 |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| C-2737 (ANNULUS) | MAG | 01/11/24 | 264.34 | 3,136.42 | N/A |
| C-2737 (ANNULUS) | MAG | 02/08/24 | 265.30 | 3,135.46 | N/A |
| C-2737 (ANNULUS) | MAG | 03/05/24 | 265.98 | 3,134.78 | N/A |
| C-2737 (ANNULUS) | MAG | 04/04/24 | 266.88 | 3,133.88 | N/A |
| C-2737 (ANNULUS) | MAG | 05/16/24 | 267.80 | 3,132.96 | N/A |
| C-2737 (ANNULUS) | MAG | 06/05/24 | 268.33 | 3,132.43 | N/A |
| C-2737 (ANNULUS) | MAG | 07/03/24 | 269.21 | 3,131.55 | N/A |
| C-2737 (ANNULUS) | MAG | 08/07/24 | 269.17 | 3,131.59 | N/A |
| C-2737 (ANNULUS) | MAG | 09/11/24 | 271.07 | 3,129.69 | N/A |
| C-2737 (ANNULUS) | MAG | 10/09/24 | 271.81 | 3,128.95 | N/A |
| C-2737 (ANNULUS) | MAG | 11/06/24 | 272.18 | 3,128.58 | N/A |
| C-2737 (ANNULUS) | MAG | 12/11/24 | 272.31 | 3,128.45 | N/A |
| H-2b1 | MAG | 01/09/24 | 236.94 | 3,141.55 | N/A |
| H-2b1 | MAG | 02/06/24 | 237.92 | 3,140.57 | N/A |
| H-2b1 | MAG | 03/04/24 | 238.77 | 3,139.72 | N/A |
| H-2b1 | MAG | 04/02/24 | 239.62 | 3,138.87 | N/A |
| H-2b1 | MAG | 05/15/24 | 240.93 | 3,137.56 | N/A |
| H-2b1 | MAG | 06/03/24 | 241.59 | 3,136.90 | N/A |
| H-2b1 | MAG | 07/01/24 | 242.59 | 3,135.90 | N/A |
| H-2b1 | MAG | 08/05/24 | 243.72 | 3,134.77 | N/A |
| H-2b1 | MAG | 09/09/24 | 244.87 | 3,133.62 | N/A |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| H-2b1 | MAG | 10/07/24 | 245.85 | 3,132.64 | N/A |
| H-2b1 | MAG | 11/04/24 | 246.47 | 3,132.02 | N/A |
| H-2b1 | MAG | 12/09/24 | 248.05 | 3,130.44 | N/A |
| H-3b1 | MAG | 01/11/24 | 243.20 | 3,147.52 | N/A |
| H-3b1 | MAG | 02/06/24 | 243.79 | 3,146.93 | N/A |
| H-3b1 | MAG | 03/05/24 | 244.19 | 3,146.53 | N/A |
| H-3b1 | MAG | 04/02/24 | 244.65 | 3,146.07 | N/A |
| H-3b1 | MAG | 05/16/24 | 245.28 | 3,145.44 | N/A |
| H-3b1 | MAG | 06/05/24 | 245.72 | 3,145.00 | N/A |
| H-3b1 | MAG | 07/03/24 | 246.42 | 3,144.30 | N/A |
| H-3b1 | MAG | 08/06/24 | 246.98 | 3,143.74 | N/A |
| H-3b1 | MAG | 09/11/24 | 247.66 | 3,143.06 | N/A |
| H-3b1 | MAG | 10/09/24 | 248.35 | 3,142.37 | N/A |
| H-3b1 | MAG | 11/06/24 | 248.88 | 3,141.84 | N/A |
| H-3b1 | MAG | 12/11/24 | 249.50 | 3,141.22 | N/A |
| H-4c | MAG | 01/09/24 | 189.95 | 3,144.33 | N/A |
| H-4c | MAG | 02/06/24 | 190.09 | 3,144.19 | N/A |
| H-4c | MAG | 03/04/24 | 190.28 | 3,144.00 | N/A |
| H-4c | MAG | 04/02/24 | 189.98 | 3,144.30 | N/A |
| H-4c | MAG | 05/16/24 | 190.21 | 3,144.07 | N/A |
| H-4c | MAG | 06/03/24 | 190.35 | 3,143.93 | N/A |
| H-4c | MAG | 07/01/24 | 190.51 | 3,143.77 | N/A |
| H-4c | MAG | 08/05/24 | 190.66 | 3,143.62 | N/A |
| H-4c | MAG | 09/09/24 | 190.87 | 3,143.41 | N/A |
| H-4c | MAG | 10/07/24 | 190.99 | 3,143.29 | N/A |
| H-4c | MAG | 11/04/24 | 191.03 | 3,143.25 | N/A |
| H-4c | MAG | 12/09/24 | 192.55 | 3,141.73 | N/A |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| H-6c | MAG | 01/11/24 | 287.95 | 3,060.74 | N/A |
| H-6c | MAG | 02/08/24 | 288.49 | 3,060.20 | N/A |
| H-6c | MAG | 03/05/24 | 288.77 | 3,059.92 | N/A |
| H-6c | MAG | 04/03/24 | 289.03 | 3,059.66 | N/A |
| H-6c | MAG | 05/15/24 | 289.40 | 3,059.29 | N/A |
| H-6c | MAG | 06/04/24 | 289.72 | 3,058.97 | N/A |
| H-6c | MAG | 07/03/24 | 289.99 | 3,058.70 | N/A |
| H-6c | MAG | 08/06/24 | 290.41 | 3,058.28 | N/A |
| H-6c | MAG | 09/11/24 | 290.62 | 3,058.07 | N/A |
| H-6c | MAG | 10/09/24 | 290.93 | 3,057.76 | N/A |
| H-6c | MAG | 11/05/24 | 291.04 | 3,057.65 | N/A |
| H-6c | MAG | 12/10/24 | 291.43 | 3,057.26 | N/A |
| H-8a | MAG | 01/09/24 | 402.76 | 3,030.52 | N/A |
| H-8a | MAG | 02/06/24 | 402.03 | 3,031.25 | N/A |
| H-8a | MAG | 03/04/24 | 402.28 | 3,031.00 | N/A |
| H-8a | MAG | 04/02/24 | 401.77 | 3,031.51 | N/A |
| H-8a | MAG | 05/07/24 | 401.42 | 3,031.86 | N/A |
| H-8a | MAG | 06/03/24 | 401.35 | 3,031.93 | N/A |
| H-8a | MAG | 07/01/24 | 401.37 | 3,031.91 | N/A |
| H-8a | MAG | 08/05/24 | 402.06 | 3,031.22 | N/A |
| H-8a | MAG | 09/09/24 | 402.77 | 3,030.51 | N/A |
| H-8a | MAG | 10/07/24 | 403.46 | 3,029.82 | N/A |
| H-8a | MAG | 11/04/24 | 403.81 | 3,029.47 | N/A |
| H-8a | MAG | 12/09/24 | 403.85 | 3,029.43 | N/A |
| H-9c | MAG | 01/09/24 | 259.28 | 3,147.77 | N/A |
| H-9c | MAG | 02/06/24 | 259.61 | 3,147.44 | N/A |
| H-9c | MAG | 03/04/24 | 258.84 | 3,148.21 | N/A |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| H-9c | MAG | 04/02/24 | 258.24 | 3,148.81 | N/A |
| H-9c | MAG | 05/07/24 | 257.80 | 3,149.25 | N/A |
| H-9c | MAG | 06/03/24 | 257.70 | 3,149.35 | N/A |
| H-9c | MAG | 07/01/24 | 257.83 | 3,149.22 | N/A |
| H-9c | MAG | 08/05/24 | 256.86 | 3,150.19 | N/A |
| H-9c | MAG | 09/09/24 | 258.06 | 3,148.99 | N/A |
| H-9c | MAG | 10/07/24 | 258.17 | 3,148.88 | N/A |
| H-9c | MAG | 11/04/24 | 258.23 | 3,148.82 | N/A |
| H-9c | MAG | 12/09/24 | 259.12 | 3,147.93 | N/A |
| H-10a | MAG | 01/10/24 | 577.09 | 3,111.36 | N/A |
| H-10a | MAG | 02/06/24 | 577.08 | 3,111.37 | N/A |
| H-10a | MAG | 03/04/24 | 578.50 | 3,109.95 | N/A |
| H-10a | MAG | 04/02/24 | 578.69 | 3,109.76 | N/A |
| H-10a | MAG | 05/07/24 | 577.31 | 3,111.14 | N/A |
| H-10a | MAG | 06/03/24 | 576.84 | 3,111.61 | N/A |
| H-10a | MAG | 07/01/24 | 576.49 | 3,111.96 | N/A |
| H-10a | MAG | 08/05/24 | 576.25 | 3,112.20 | N/A |
| H-10a | MAG | 09/09/24 | 575.68 | 3,112.77 | N/A |
| H-10a | MAG | 10/07/24 | 576.36 | 3,112.09 | N/A |
| H-10a | MAG | 11/04/24 | 576.31 | 3,112.14 | N/A |
| H-10a | MAG | 12/09/24 | 575.81 | 3,112.64 | N/A |
| H-11b2 | MAG | 01/09/24 | 266.96 | 3,144.90 | N/A |
| H-11b2 | MAG | 02/06/24 | 267.10 | 3,144.76 | N/A |
| H-11b2 | MAG | 03/04/24 | 267.09 | 3,144.77 | N/A |
| H-11b2 | MAG | 04/02/24 | 267.38 | 3,144.48 | N/A |
| H-11b2 | MAG | 05/08/24 | 267.42 | 3,144.44 | N/A |
| H-11b2 | MAG | 06/03/24 | 267.54 | 3,144.32 | N/A |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| H-11b2 | MAG | 07/01/24 | 267.71 | 3,144.15 | N/A |
| H-11b2 | MAG | 08/05/24 | 267.87 | 3,143.99 | N/A |
| H-11b2 | MAG | 09/09/24 | 268.21 | 3,143.65 | N/A |
| H-11b2 | MAG | 10/07/24 | 268.57 | 3,143.29 | N/A |
| H-11b2 | MAG | 11/06/24 | 268.68 | 3,143.18 | N/A |
| H-11b2 | MAG | 12/09/24 | 268.73 | 3,143.13 | N/A |
| H-14 | MAG | 01/09/24 | 207.49 | 3,139.59 | N/A |
| H-14 | MAG | 02/06/24 | 207.58 | 3,139.50 | N/A |
| H-14 | MAG | 03/04/24 | 207.66 | 3,139.42 | N/A |
| H-14 | MAG | 04/02/24 | 207.66 | 3,139.42 | N/A |
| H-14 | MAG | 05/16/24 | 207.84 | 3,139.24 | N/A |
| H-14 | MAG | 06/03/24 | 208.00 | 3,139.08 | N/A |
| H-14 | MAG | 07/03/24 | 208.05 | 3,139.03 | N/A |
| H-14 | MAG | 08/05/24 | 208.23 | 3,138.85 | N/A |
| H-14 | MAG | 09/09/24 | 208.38 | 3,138.70 | N/A |
| H-14 | MAG | 10/07/24 | 208.54 | 3,138.54 | N/A |
| H-14 | MAG | 11/04/24 | 208.63 | 3,138.45 | N/A |
| H-14 | MAG | 12/09/24 | 208.97 | 3,138.11 | N/A |
| H-15 | MAG | 01/11/24 | 326.89 | 3,156.89 | N/A |
| H-15 | MAG | 02/08/24 | 327.28 | 3,156.50 | N/A |
| H-15 | MAG | 03/06/24 | 327.37 | 3,156.41 | N/A |
| H-15 | MAG | 04/04/24 | 327.78 | 3,156.00 | N/A |
| H-15 | MAG | 05/16/24 | 328.18 | 3,155.60 | N/A |
| H-15 | MAG | 06/05/24 | 328.46 | 3,155.32 | N/A |
| H-15 | MAG | 07/08/24 | 329.18 | 3,154.60 | N/A |
| H-15 | MAG | 08/07/24 | 329.38 | 3,154.40 | N/A |
| H-15 | MAG | 09/11/24 | 329.88 | 3,153.90 | N/A |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| H-15 | MAG | 10/09/24 | 330.65 | 3,153.13 | N/A |
| H-15 | MAG | 11/06/24 | 330.11 | 3,153.67 | N/A |
| H-15 | MAG | 12/11/24 | 330.61 | 3,153.17 | N/A |
| H-18 | MAG | 01/10/24 | 259.07 | 3,155.14 | N/A |
| H-18 | MAG | 02/14/24 | 259.88 | 3,154.33 | N/A |
| H-18 | MAG | 03/05/24 | 260.06 | 3,154.15 | N/A |
| H-18 | MAG | 04/02/24 | 260.53 | 3,153.68 | N/A |
| H-18 | MAG | 05/15/24 | 261.11 | 3,153.10 | N/A |
| H-18 | MAG | 06/04/24 | 261.53 | 3,152.68 | N/A |
| H-18 | MAG | 07/03/24 | 262.28 | 3,151.93 | N/A |
| H-18 | MAG | 08/06/24 | 263.00 | 3,151.21 | N/A |
| H-18 | MAG | 09/11/24 | 263.59 | 3,150.62 | N/A |
| H-18 | MAG | 10/09/24 | 264.19 | 3,150.02 | N/A |
| H-18 | MAG | 11/06/24 | 264.70 | 3,149.51 | N/A |
| H-18 | MAG | 12/10/24 | 265.21 | 3,149.00 | N/A |
| WIPP-18 | MAG | 01/10/24 | 302.11 | 3,155.46 | N/A |
| WIPP-18 | MAG | 02/07/24 | 302.42 | 3,155.15 | N/A |
| WIPP-18 | MAG | 03/05/24 | 302.68 | 3,154.89 | N/A |
| WIPP-18 | MAG | 04/03/24 | 302.85 | 3,154.72 | N/A |
| WIPP-18 | MAG | 05/15/24 | 303.41 | 3,154.16 | N/A |
| WIPP-18 | MAG | 06/04/24 | 303.66 | 3,153.91 | N/A |
| WIPP-18 | MAG | 07/02/24 | 304.21 | 3,153.36 | N/A |
| WIPP-18 | MAG | 08/06/24 | 304.77 | 3,152.80 | N/A |
| WIPP-18 | MAG | 09/10/24 | 305.41 | 3,152.16 | N/A |
| WIPP-18 | MAG | 10/08/24 | 305.82 | 3,151.75 | N/A |
| WIPP-18 | MAG | 11/05/24 | 305.97 | 3,151.60 | N/A |
| WIPP-18 | MAG | 12/10/24 | 306.45 | 3,151.12 | N/A |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| WQSP-6a | DL | 01/09/24 | 168.53 | 3,195.27 | N/A |
| WQSP-6a | DL | 02/06/24 | 168.59 | 3,195.21 | N/A |
| WQSP-6a | DL | 03/04/24 | 168.47 | 3,195.33 | N/A |
| WQSP-6a | DL | 04/02/24 | 168.79 | 3,195.01 | N/A |
| WQSP-6a | DL | 05/08/24 | 168.48 | 3,195.32 | N/A |
| WQSP-6a | DL | 06/03/24 | 168.52 | 3,195.28 | N/A |
| WQSP-6a | DL | 07/01/24 | 168.77 | 3,195.03 | N/A |
| WQSP-6a | DL | 08/05/24 | 168.78 | 3,195.02 | N/A |
| WQSP-6a | DL | 09/11/24 | 168.56 | 3,195.24 | N/A |
| WQSP-6a | DL | 10/09/24 | 168.75 | 3,195.05 | N/A |
| WQSP-6a | DL | 11/06/24 | 168.65 | 3,195.15 | N/A |
| WQSP-6a | DL | 12/11/24 | 168.99 | 3,194.81 | N/A |
| CB-1 | B/C | 01/09/24 | 265.04 | 3,064.08 | N/A |
| CB-1 | B/C | 02/06/24 | 264.77 | 3,064.35 | N/A |
| CB-1 | B/C | 03/04/24 | 264.46 | 3,064.66 | N/A |
| CB-1 | B/C | 04/02/24 | 264.00 | 3,065.12 | N/A |
| CB-1 | B/C | 05/08/24 | 263.48 | 3,065.64 | N/A |
| CB-1 | B/C | 06/03/24 | 263.04 | 3,066.08 | N/A |
| CB-1 | B/C | 07/01/24 | 262.75 | 3,066.37 | N/A |
| CB-1 | B/C | 08/05/24 | 262.35 | 3,066.77 | N/A |
| CB-1 | B/C | 09/09/24 | 261.88 | 3,067.24 | N/A |
| CB-1 | B/C | 10/07/24 | 261.51 | 3,067.61 | N/A |
| CB-1 | B/C | 11/06/24 | 260.99 | 3,068.13 | N/A |
| CB-1 | B/C | 12/09/24 | 260.61 | 3,068.51 | N/A |
| DOE-2 | B/C | 01/10/24 | 347.16 | 3,072.02 | N/A |
| DOE-2 | B/C | 02/08/24 | 347.24 | 3,071.94 | N/A |
| DOE-2 | B/C | 03/05/24 | 347.20 | 3,071.98 | N/A |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| DOE-2 | B/C | 04/03/24 | 346.98 | 3,072.20 | N/A |
| DOE-2 | B/C | 05/15/24 | 346.98 | 3,072.20 | N/A |
| DOE-2 | B/C | 06/04/24 | 347.05 | 3,072.13 | N/A |
| DOE-2 | B/C | 07/03/24 | 347.25 | 3,071.93 | N/A |
| DOE-2 | B/C | 08/06/24 | 347.40 | 3,071.78 | N/A |
| DOE-2 | B/C | 09/11/24 | 347.51 | 3,071.67 | N/A |
| DOE-2 | B/C | 10/08/24 | 347.45 | 3,071.73 | N/A |
| DOE-2 | B/C | 11/05/24 | 347.15 | 3,072.03 | N/A |
| DOE-2 | B/C | 12/10/24 | 347.31 | 3,071.87 | N/A |
| C-2505 | SR/DL | 03/07/24 | 42.77 | 3,368.00 | N/A |
| C-2505 | SR/DL | 06/05/24 | 42.96 | 3,367.81 | N/A |
| C-2505 | SR/DL | 09/11/24 | 43.18 | 3,367.59 | N/A |
| C-2505 | SR/DL | 12/16/24 | 43.76 | 3,367.01 | N/A |
| C-2506 | SR/DL | 03/07/24 | 41.97 | 3,368.56 | N/A |
| C-2506 | SR/DL | 06/05/24 | 42.24 | 3,368.29 | N/A |
| C-2506 | SR/DL | 09/12/24 | 42.50 | 3,368.03 | N/A |
| C-2506 | SR/DL | 12/16/24 | 42.93 | 3,367.60 | N/A |
| C-2507 | SR/DL | 03/06/24 | 44.66 | 3,365.25 | N/A |
| C-2507 | SR/DL | 06/05/24 | 44.53 | 3,365.38 | N/A |
| C-2507 | SR/DL | 09/12/24 | 45.17 | 3,364.74 | N/A |
| C-2507 | SR/DL | 12/11/24 | 45.64 | 3,364.27 | N/A |
| C-2811 | SR/DL | 03/05/24 | 53.45 | 3,345.39 | N/A |
| C-2811 | SR/DL | 06/05/24 | 53.69 | 3,345.15 | N/A |
| C-2811 | SR/DL | 09/11/24 | 54.06 | 3,344.78 | N/A |
| C-2811 | SR/DL | 12/05/24 | 54.59 | 3,344.25 | N/A |
| PZ-1 | SR/DL | 03/06/24 | 42.00 | 3,371.28 | N/A |
| PZ-1 | SR/DL | 06/05/24 | 42.24 | 3,371.04 | N/A |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| PZ-1 | SR/DL | 09/12/24 | 42.53 | 3,370.75 | N/A |
| PZ-1 | SR/DL | 12/11/24 | 43.34 | 3,369.94 | N/A |
| PZ-2 | SR/DL | 03/06/24 | 42.48 | 3,370.88 | N/A |
| PZ-2 | SR/DL | 06/05/24 | 42.66 | 3,370.70 | N/A |
| PZ-2 | SR/DL | 09/12/24 | 42.72 | 3,370.64 | N/A |
| PZ-2 | SR/DL | 12/11/24 | 43.27 | 3,370.09 | N/A |
| PZ-3 | SR/DL | 03/07/24 | 44.28 | 3,371.84 | N/A |
| PZ-3 | SR/DL | 06/05/24 | 44.83 | 3,371.29 | N/A |
| PZ-3 | SR/DL | 09/12/24 | 45.31 | 3,370.81 | N/A |
| PZ-3 | SR/DL | 12/11/24 | 46.18 | 3,369.94 | N/A |
| PZ-4 | SR/DL | 03/06/24 | 45.35 | 3,366.66 | N/A |
| PZ-4 | SR/DL | 06/05/24 | 45.69 | 3,366.32 | N/A |
| PZ-4 | SR/DL | 09/12/24 | 46.13 | 3,365.88 | N/A |
| PZ-4 | SR/DL | 12/11/24 | 46.92 | 3,365.09 | N/A |
| PZ-5 | SR/DL | 03/06/24 | 42.66 | 3,372.58 | N/A |
| PZ-5 | SR/DL | 06/05/24 | 42.89 | 3,372.35 | N/A |
| PZ-5 | SR/DL | 09/12/24 | 43.56 | 3,371.68 | N/A |
| PZ-5 | SR/DL | 12/11/24 | 44.38 | 3,370.86 | N/A |
| PZ-6 | SR/DL | 03/06/24 | 42.63 | 3,370.70 | N/A |
| PZ-6 | SR/DL | 06/05/24 | 43.45 | 3,369.88 | N/A |
| PZ-6 | SR/DL | 09/12/24 | 44.18 | 3,369.15 | N/A |
| PZ-6 | SR/DL | 12/11/24 | 44.71 | 3,368.62 | N/A |
| PZ-7 | SR/DL | 03/06/24 | 38.64 | 3,375.20 | N/A |
| PZ-7 | SR/DL | 06/05/24 | 38.98 | 3,374.86 | N/A |
| PZ-7 | SR/DL | 09/11/24 | 39.03 | 3,374.81 | N/A |
| PZ-7 | SR/DL | 12/05/24 | 39.70 | 3,374.14 | N/A |
| PZ-9 | SR/DL | 03/06/24 | 57.93 | 3,363.16 | N/A |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| PZ-9 | SR/DL | 06/05/24 | 57.98 | 3,363.11 | N/A |
| PZ-9 | SR/DL | 09/11/24 | 57.95 | 3,363.14 | N/A |
| PZ-9 | SR/DL | 12/05/24 | 58.36 | 3,362.73 | N/A |
| PZ-10 | SR/DL | 03/06/24 | 38.33 | 3,367.40 | N/A |
| PZ-10 | SR/DL | 06/05/24 | 38.54 | 3,367.19 | N/A |
| PZ-10 | SR/DL | 09/11/24 | 38.98 | 3,366.75 | N/A |
| PZ-10 | SR/DL | 12/05/24 | 39.56 | 3,366.17 | N/A |
| PZ-11 | SR/DL | 03/07/24 | 47.20 | 3,371.58 | N/A |
| PZ-11 | SR/DL | 06/05/24 | 47.44 | 3,371.34 | N/A |
| PZ-11 | SR/DL | 09/11/24 | 47.66 | 3,371.12 | N/A |
| PZ-11 | SR/DL | 12/05/24 | 47.94 | 3,370.84 | N/A |
| PZ-12 | SR/DL | 03/07/24 | 52.84 | 3,356.08 | N/A |
| PZ-12 | SR/DL | 06/05/24 | 53.26 | 3,355.66 | N/A |
| PZ-12 | SR/DL | 09/11/24 | 53.70 | 3,355.22 | N/A |
| PZ-12 | SR/DL | 12/05/24 | 54.37 | 3,354.55 | N/A |
| PZ-13 | SR/DL | 03/06/24 | 65.21 | 3,357.03 | N/A |
| PZ-13 | SR/DL | 06/05/24 | 65.49 | 3,356.75 | N/A |
| PZ-13 | SR/DL | 09/11/24 | 65.63 | 3,356.61 | N/A |
| PZ-13 | SR/DL | 12/05/24 | 66.25 | 3,355.99 | N/A |
| PZ-14 | SR/DL | 03/06/24 | 66.91 | 3,353.67 | N/A |
| PZ-14 | SR/DL | 06/05/24 | 67.07 | 3,353.51 | N/A |
| PZ-14 | SR/DL | 09/11/24 | 67.02 | 3,353.56 | N/A |
| PZ-14 | SR/DL | 12/05/24 | 67.28 | 3,353.30 | N/A |
| PZ-15 | GAT | 03/06/24 | 50.13 | 3,380.73 | N/A |
| PZ-15 | GAT | 06/05/24 | 50.42 | 3,380.44 | N/A |
| PZ-15 | GAT | 09/11/24 | 50.24 | 3,380.62 | N/A |
| PZ-15 | GAT | 12/05/24 | 50.35 | 3,380.51 | N/A |

| Well | Zone | Date | Adjusted Depth Top of Casing (ft) | Water Level Elevation (ft AMSL) | Adjusted Freshwater Head (ft AMSL) |
|---|---|---|---|---|---|
| PZ-16 | SR/DL | 03/06/24 | 65.50 | 3,267.59 | N/A |
| PZ-16 | SR/DL | 06/05/24 | 66.49 | 3,266.60 | N/A |
| PZ-16 | SR/DL | 09/11/24 | 66.15 | 3,266.94 | N/A |
| PZ-16 | SR/DL | 12/05/24 | 65.22 | 3,267.87 | N/A |
| PZ-17a | SR/DL | 03/06/24 | N/A | N/A | N/A |
| PZ-17a | SR/DL | 06/05/24 | N/A | N/A | N/A |
| PZ-17a | SR/DL | 09/11/24 | N/A | N/A | N/A |
| PZ-17a | SR/DL | 12/05/24 | N/A | N/A | N/A |
| PZ-17b | DL | 03/06/24 | 191.19 | 3,116.47 | N/A |
| PZ-17b | DL | 06/05/24 | 191.35 | 3,116.31 | N/A |
| PZ-17b | DL | 09/11/24 | 191.25 | 3,116.41 | N/A |
| PZ-17b | DL | 12/05/24 | 191.59 | 3,116.07 | N/A |
| PZ-18 | SR/DL | 03/06/24 | N/A | N/A | N/A |
| PZ-18 | SR/DL | 06/05/24 | N/A | N/A | N/A |
| PZ-18 | SR/DL | 09/11/24 | N/A | N/A | N/A |
| PZ-18 | SR/DL | 12/05/24 | N/A | N/A | N/A |
| PZ-19 | SR/DL | 03/07/24 | N/A | N/A | N/A |
| PZ-19 | SR/DL | 06/05/24 | N/A | N/A | N/A |
| PZ-19 | SR/DL | 09/09/24 | N/A | N/A | N/A |
| PZ-19 | SR/DL | 12/05/24 | N/A | N/A | N/A |

# APPENDIX G – SUMMARY OF RADIOLOGICAL EFFLUENT AND ENVIRONMENTAL MONITORING PROGRAM DATA

## Table G.1 – Station B Sample Results

*(Refer to the end of each table for notes)*

| Month | Nuclide | Activity (Bq/Sample) | 2 σ TPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan | $^{241}Am$ | 1.30E-03 | 8.73E-04 | 7.73E-04 |
| Feb | $^{241}Am$ | 7.44E-03 | 1.93E-03 | 6.55E-04 |
| Mar | $^{241}Am$ | 3.77E-03 | 1.31E-03 | 7.47E-04 |
| Apr | $^{241}Am$ | 3.60E-03 | 1.42E-03 | 7.70E-04 |
| May | $^{241}Am$ | 4.55E-03 | 1.48E-03 | 6.66E-04 |
| Jun | $^{241}Am$ | 1.55E-04 | 4.11E-04 | 7.99E-04 |
| Jul | $^{241}Am$ | 2.46E-02 | 4.18E-03 | 6.59E-04 |
| Aug | $^{241}Am$ | 9.73E-03 | 2.41E-03 | 7.92E-04 |
| Sep | $^{241}Am$ | 1.36E-02 | 2.82E-03 | 6.96E-04 |
| Oct | $^{241}Am$ | 5.88E-03 | 1.73E-03 | 7.03E-04 |
| Nov | $^{241}Am$ | 3.39E-03 | 1.38E-03 | 8.10E-04 |
| Dec | $^{241}Am$ | 1.97E-03 | 9.92E-04 | 7.88E-04 |

| Month | Nuclide | Activity (Bq/Sample) | 2 σ TPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan | $^{239/240}Pu$ | 5.37E-05 | 3.05E-04 | 7.44E-04 |
| Feb | $^{239/240}Pu$ | 4.07E-04 | 5.07E-04 | 6.73E-04 |
| Mar | $^{239/240}Pu$ | 7.44E-04 | 6.14E-04 | 5.81E-04 |
| Apr | $^{239/240}Pu$ | 2.48E-04 | 4.07E-04 | 6.25E-04 |
| May | $^{239/240}Pu$ | 6.18E-04 | 6.18E-04 | 6.85E-04 |
| Jun | $^{239/240}Pu$ | 1.12E-03 | 8.03E-04 | 6.36E-04 |
| Jul | $^{239/240}Pu$ | 2.50E-03 | 1.11E-03 | 6.55E-04 |
| Aug | $^{239/240}Pu$ | 1.40E-03 | 8.40E-04 | 6.22E-04 |
| Sep | $^{239/240}Pu$ | 2.78E-03 | 1.19E-03 | 6.59E-04 |
| Oct | $^{239/240}Pu$ | 6.85E-04 | 6.59E-04 | 8.18E-04 |
| Nov | $^{239/240}Pu$ | 4.07E-04 | 4.81E-04 | 5.96E-04 |
| Dec | $^{239/240}Pu$ | 4.74E-04 | 5.33E-04 | 7.18E-04 |

| Month | Nuclide | Activity (Bq/Sample) | 2 σ TPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan | $^{238}Pu$ | -6.22E-05 | 1.72E-04 | 6.33E-04 |
| Feb | $^{238}Pu$ | -5.59E-05 | 1.61E-04 | 6.07E-04 |
| Mar | $^{238}Pu$ | 6.03E-05 | 2.69E-04 | 6.29E-04 |
| Apr | $^{238}Pu$ | -6.48E-05 | 1.65E-04 | 6.07E-04 |
| May | $^{238}Pu$ | 1.40E-04 | 3.96E-04 | 7.44E-04 |
| Jun | $^{238}Pu$ | 1.87E-04 | 4.11E-04 | 7.62E-04 |
| Jul | $^{238}Pu$ | 8.92E-05 | 2.39E-04 | 5.37E-04 |
| Aug | $^{238}Pu$ | 7.18E-05 | 2.60E-04 | 5.66E-04 |
| Sep | $^{238}Pu$ | 9.10E-05 | 2.45E-04 | 5.48E-04 |
| Oct | $^{238}Pu$ | 5.59E-05 | 3.16E-04 | 7.59E-04 |
| Nov | $^{238}Pu$ | 4.63E-05 | 2.87E-04 | 6.40E-04 |
| Dec | $^{238}Pu$ | -7.10E-05 | 1.76E-04 | 6.92E-04 |

| Month | Nuclide | Activity (Bq/Sample) | 2 σ TPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan | $^{90}Sr$ | -1.29E-03 | 1.71E-02 | 1.54E-02 |
| Feb | $^{90}Sr$ | -4.22E-03 | 2.08E-02 | 1.72E-02 |
| Mar | $^{90}Sr$ | -5.29E-03 | 2.05E-02 | 1.72E-02 |
| Apr | $^{90}Sr$ | 7.81E-03 | 2.40E-02 | 1.74E-02 |
| May | $^{90}Sr$ | -1.14E-02 | 2.02E-02 | 1.69E-02 |
| Jun | $^{90}Sr$ | -9.77E-04 | 1.96E-02 | 1.65E-02 |
| Jul | $^{90}Sr$ | -5.22E-03 | 2.05E-02 | 1.48E-02 |
| Aug | $^{90}Sr$ | 5.00E-04 | 2.03E-02 | 1.32E-02 |
| Sep | $^{90}Sr$ | 1.38E-02 | 2.33E-02 | 1.35E-02 |
| Oct | $^{90}Sr$ | -1.39E-03 | 2.25E-02 | 1.21E-02 |
| Nov | $^{90}Sr$ | 6.14E-03 | 1.96E-02 | 1.25E-02 |
| Dec | $^{90}Sr$ | -6.62E-03 | 1.91E-02 | 1.25E-02 |

| Month | Nuclide | Activity (Bq/Sample) | 2 σ TPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan | $^{233/234}U$ | 1.64E-03 | 1.01E-03 | 1.11E-03 |
| Feb | $^{233/234}U$ | 8.18E-04 | 6.33E-04 | 1.04E-03 |
| Mar | $^{233/234}U$ | 1.26E-03 | 7.88E-04 | 1.06E-03 |
| Apr | $^{233/234}U$ | 9.69E-04 | 7.70E-04 | 1.12E-03 |
| May | $^{233/234}U$ | 1.27E-03 | 9.10E-04 | 1.14E-03 |
| Jun | $^{233/234}U$ | 1.79E-03 | 1.41E-03 | 1.40E-03 |
| Jul | $^{233/234}U$ | 9.44E-04 | 7.40E-04 | 1.22E-03 |
| Aug | $^{233/234}U$ | 8.10E-04 | 7.10E-04 | 1.30E-03 |
| Sep | $^{233/234}U$ | 8.99E-04 | 7.59E-04 | 1.29E-03 |
| Oct | $^{233/234}U$ | 9.47E-04 | 8.14E-04 | 1.35E-03 |
| Nov | $^{233/234}U$ | 1.39E-03 | 9.07E-04 | 1.23E-03 |
| Dec | $^{233/234}U$ | 6.66E-04 | 6.07E-04 | 1.22E-03 |

| Month | Nuclide | Activity (Bq/Sample) | 2 σ TPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan | $^{137}Cs$ | -3.56E-02 | 6.40E-02 | 1.12E-01 |
| Feb | $^{137}Cs$ | -3.70E-02 | 5.74E-02 | 9.95E-02 |
| Mar | $^{137}Cs$ | 1.78E-02 | 7.10E-02 | 1.22E-01 |
| Apr | $^{137}Cs$ | 2.97E-02 | 7.92E-02 | 1.39E-01 |
| May | $^{137}Cs$ | 4.22E-02 | 7.07E-02 | 1.34E-01 |
| Jun | $^{137}Cs$ | -2.54E-02 | 5.92E-02 | 9.77E-02 |
| Jul | $^{137}Cs$ | -3.77E-02 | 6.44E-02 | 1.14E-01 |
| Aug | $^{137}Cs$ | -4.55E-02 | 5.59E-02 | 9.32E-02 |
| Sep | $^{137}Cs$ | -5.25E-02 | 7.03E-02 | 1.21E-01 |
| Oct | $^{137}Cs$ | 6.81E-04 | 6.92E-02 | 1.18E-01 |
| Nov | $^{137}Cs$ | -2.41E-02 | 6.99E-02 | 1.22E-01 |
| Dec | $^{137}Cs$ | 3.81E-02 | 6.55E-02 | 1.15E-01 |

| Month | Nuclide | Activity (Bq/Sample) | 2 σ TPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan | $^{238}U$ | 9.32E-04 | 7.70E-04 | 1.21E-03 |
| Feb | $^{238}U$ | 7.88E-04 | 6.36E-04 | 1.16E-03 |
| Mar | $^{238}U$ | 1.24E-03 | 7.92E-04 | 1.17E-03 |
| Apr | $^{238}U$ | 7.14E-04 | 6.59E-04 | 9.51E-04 |
| May | $^{238}U$ | 7.55E-04 | 6.88E-04 | 9.73E-04 |
| Jun | $^{238}U$ | 1.37E-03 | 1.22E-03 | 1.24E-03 |
| Jul | $^{238}U$ | 1.02E-03 | 7.92E-04 | 1.07E-03 |
| Aug | $^{238}U$ | 7.59E-05 | 2.94E-04 | 1.06E-03 |
| Sep | $^{238}U$ | 6.51E-04 | 6.25E-04 | 1.05E-03 |
| Oct | $^{238}U$ | 1.10E-03 | 8.70E-04 | 1.08E-03 |
| Nov | $^{238}U$ | 4.81E-04 | 5.33E-04 | 1.04E-03 |
| Dec | $^{238}U$ | 6.55E-04 | 6.11E-04 | 1.05E-03 |

a. Total propagated uncertainty.

b. Minimum detectable concentration.

**Table G.2 – Station C Sample Results**

| Qtr. | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| 1st | $^{241}$Am | 2.86E-04 | 3.92E-04 | 6.70E-04 |
| 2nd | $^{241}$Am | 3.89E-04 | 5.62E-04 | 8.33E-04 |
| 3rd | $^{241}$Am | 1.21E-05 | 3.26E-04 | 8.36E-04 |
| 4th | $^{241}$Am | 4.48E-05 | 3.07E-04 | 8.03E-04 |

| Qtr. | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| 1st | $^{238}$Pu | 1.90E-04 | 3.52E-04 | 5.88E-04 |
| 2nd | $^{238}$Pu | -1.03E-04 | 2.77E-04 | 9.44E-04 |
| 3rd | $^{238}$Pu | -4.77E-05 | 1.42E-04 | 5.55E-04 |
| 4th | $^{238}$Pu | -8.88E-05 | 1.95E-04 | 6.62E-04 |

| Qtr. | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| 1st | $^{239/240}$Pu | 1.74E-04 | 3.60E-04 | 6.59E-04 |
| 2nd | $^{239/240}$Pu | 7.07E-05 | 4.81E-04 | 1.13E-03 |
| 3rd | $^{239/240}$Pu | -6.59E-05 | 1.67E-04 | 6.73E-04 |
| 4th | $^{239/240}$Pu | -7.36E-05 | 1.77E-04 | 6.73E-04 |

| Qtr. | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| 1st | $^{90}$Sr | -1.25E-02 | 1.99E-02 | 1.71E-02 |
| 2nd | $^{90}$Sr | -1.03E-02 | 1.85E-02 | 1.64E-02 |
| 3rd | $^{90}$Sr | 3.57E-03 | 2.08E-02 | 1.32E-02 |
| 4th | $^{90}$Sr | -6.96E-03 | 2.30E-02 | 1.34E-02 |

| Qtr. | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| 1st | $^{233/234}$U | 8.14E-04 | 6.88E-04 | 1.10E-03 |
| 2nd | $^{233/234}$U | 1.85E-03 | 1.45E-03 | 1.37E-03 |
| 3rd | $^{233/234}$U | 8.84E-04 | 6.77E-04 | 1.24E-03 |
| 4th | $^{233/234}$U | 6.62E-04 | 6.29E-04 | 1.34E-03 |

| Qtr. | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| 1st | $^{238}$U | 2.93E-04 | 4.66E-04 | 1.21E-03 |
| 2nd | $^{238}$U | 1.15E-03 | 1.15E-03 | 1.28E-03 |
| 3rd | $^{238}$U | 5.29E-04 | 5.37E-04 | 1.03E-03 |
| 4th | $^{238}$U | -7.70E-05 | 1.91E-04 | 1.04E-03 |

| Qtr. | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| 1st | $^{137}$Cs | -4.29E-02 | 6.73E-02 | 1.17E-01 |
| 2nd | $^{137}$Cs | 1.41E-02 | 7.22E-02 | 1.34E-01 |
| 3rd | $^{137}$Cs | -1.66E-02 | 6.44E-02 | 1.16E-01 |
| 4th | $^{137}$Cs | -7.70E-03 | 5.66E-02 | 1.02E-01 |

a. Total propagated uncertainty.

b. Minimum detectable concentration.

**Table G.3 – Station H Sample Results**

| Period | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan-Dec | $^{241}$Am | 3.85E-02 | 6.49E-03 | 1.14E-03 |

| Period | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan-Dec | $^{238}$Pu | 5.93E-03 | 2.18E-03 | 1.02E-03 |

| Period | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan-Dec | $^{239/240}$Pu | 6.90E-03 | 2.36E-03 | 1.00E-03 |

| Period | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan-Dec | $^{90}$Sr | -2.01E-03 | 2.67E-02 | 1.62E-02 |

| Period | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan-Dec | $^{233/234}$U | 1.84E-03 | 1.66E-03 | 2.27E-03 |

| Period | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan-Dec | $^{238}$U | 1.85E-03 | 1.65E-03 | 1.87E-03 |

| Period | Nuclide | Activity (Bq/Sample) | 2σTPU [a] | MDC [b] |
|---|---|---|---|---|
| Jan-Dec | $^{137}$Cs | -5.32E-02 | 1.05E-01 | 1.82E-01 |

a. Total propagated uncertainty.

b. Minimum detectable concentration.

## Table G.4 – Radionuclide Activity in Quarterly Ambient Air Filter Composite Samples Collected from Locations on and Near the WIPP Site

*(Refer to the end of the table for notes)*

| | | $^{233/234}U$ | | | | $^{235}U$ | | | | $^{238}U$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | **Quarter** | **[RN] [1]** | **2 σ TPU [2]** | **MDC [3]** | **Q [4]** | **[RN] [1]** | **2 σ TPU [2]** | **MDC [3]** | **Q [4]** | **[RN] [1]** | **2 σ TPU [2]** | **MDC [3]** | **Q [4]** |
| WFF | 1 | 6.12E-03 | 6.54E-03 | 6.56E-03 | UJ | -6.72E-06 | 1.03E-03 | 1.76E-03 | U | 2.75E-03 | 5.78E-03 | 6.39E-03 | U |
| | 2 | 6.47E-03 | 5.58E-03 | 5.83E-03 | = | -3.24E-04 | 6.78E-04 | 1.80E-03 | U | 9.70E-03 | 5.56E-03 | 6.04E-03 | = |
| | 3 | -5.25E-03 | 8.68E-03 | 5.45E-03 | U | 9.26E-05 | 1.13E-03 | 1.67E-03 | U | -6.40E-03 | 8.37E-03 | 5.95E-03 | U |
| | 4 | 3.03E-03 | 7.09E-03 | 5.51E-03 | U | -1.98E-05 | 1.24E-03 | 1.84E-03 | U | 4.00E-03 | 7.04E-03 | 5.50E-03 | U |
| WEE | 1 | 1.26E-02 | 7.49E-03 | 6.59E-03 | NJ | -1.63E-04 | 1.06E-03 | 1.85E-03 | U | 4.07E-03 | 6.10E-03 | 6.42E-03 | U |
| | 2 | 8.58E-03 | 5.85E-03 | 5.83E-03 | = | 5.91E-04 | 1.00E-03 | 1.76E-03 | U | 7.67E-03 | 5.37E-03 | 6.04E-03 | = |
| | 3 | -6.24E-03 | 8.99E-03 | 5.49E-03 | U | 6.64E-05 | 1.15E-03 | 1.72E-03 | U | -4.29E-03 | 8.66E-03 | 6.00E-03 | U |
| | 4 | 3.44E-03 | 7.16E-03 | 5.52E-03 | U | 3.78E-04 | 1.35E-03 | 1.82E-03 | U | 4.27E-03 | 7.10E-03 | 5.50E-03 | U |
| WSS | 1 | 5.90E-03 | 6.68E-03 | 6.57E-03 | UJ | -6.91E-05 | 1.05E-03 | 1.78E-03 | U | 6.94E-03 | 6.23E-03 | 6.38E-03 | = |
| | 2 | 7.13E-03 | 5.59E-03 | 5.82E-03 | = | 1.20E-03 | 1.15E-03 | 1.76E-03 | U | 1.03E-02 | 5.58E-03 | 6.03E-03 | = |
| | 3 | -1.55E-03 | 9.56E-03 | 5.54E-03 | U | 5.35E-04 | 1.36E-03 | 1.83E-03 | U | -2.14E-03 | 9.19E-03 | 6.04E-03 | U |
| | 4 | 6.84E-03 | 7.58E-03 | 5.55E-03 | U | 6.53E-04 | 1.47E-03 | 1.92E-03 | U | 7.21E-03 | 7.50E-03 | 5.54E-03 | U |
| MLR | 1 | 1.29E-02 | 7.66E-03 | 6.60E-03 | NJ | 6.03E-04 | 1.24E-03 | 1.82E-03 | U | 1.11E-02 | 6.92E-03 | 6.43E-03 | = |
| | 2 | 9.98E-03 | 5.92E-03 | 5.82E-03 | = | 8.64E-04 | 1.07E-03 | 1.79E-03 | U | 9.90E-03 | 5.55E-03 | 6.03E-03 | = |
| | 3 | 1.50E-03 | 9.23E-03 | 5.51E-03 | U | -7.70E-05 | 1.14E-03 | 1.75E-03 | U | -1.69E-03 | 8.81E-03 | 6.02E-03 | U |
| | 4 (Avg) | 1.07E-02 | 1.07E-02 | 5.88E-03 | = | 5.68E-04 | 1.67E-03 | 2.34E-03 | U | 9.83E-03 | 1.05E-02 | 5.84E-03 | U |
| SEC | 1 | 6.52E-03 | 6.72E-03 | 6.55E-03 | UJ | 9.27E-04 | 1.28E-03 | 1.75E-03 | U | 4.51E-03 | 6.02E-03 | 6.39E-03 | U |
| | 2 | 9.27E-03 | 5.96E-03 | 5.85E-03 | = | 4.95E-04 | 9.87E-04 | 1.82E-03 | U | 6.04E-03 | 5.22E-03 | 6.06E-03 | U |
| | 3 (Avg) | -4.06E-03 | 8.87E-03 | 5.46E-03 | U | -1.89E-04 | 1.08E-03 | 1.71E-03 | U | -4.90E-03 | 8.53E-03 | 5.96E-03 | U |
| | 4 | 7.77E-03 | 9.05E-03 | 5.74E-03 | U | -1.96E-04 | 1.30E-03 | 2.10E-03 | U | 7.53E-03 | 8.87E-03 | 5.72E-03 | U |
| CBD | 1 (Avg) | 6.13E-03 | 6.60E-03 | 6.56E-03 | U | -1.84E-04 | 9.82E-04 | 1.77E-03 | U | 3.37E-03 | 5.88E-03 | 6.39E-03 | U |
| | 2 | 1.04E-02 | 6.04E-03 | 5.85E-03 | = | 7.74E-04 | 1.06E-03 | 1.82E-03 | U | 1.09E-02 | 5.74E-03 | 6.04E-03 | = |
| | 3 | 6.23E-04 | 1.00E-02 | 5.58E-03 | U | -1.35E-04 | 1.16E-03 | 1.83E-03 | U | -2.39E-03 | 9.58E-03 | 6.07E-03 | U |
| | 4 | 7.63E-03 | 7.87E-03 | 5.57E-03 | U | 3.15E-04 | 1.36E-03 | 1.93E-03 | U | 7.19E-03 | 7.69E-03 | 5.55E-03 | U |
| SMR | 1 | 6.39E-03 | 6.93E-03 | 6.59E-03 | UJ | 2.00E-04 | 1.13E-03 | 1.82E-03 | U | 7.52E-03 | 6.49E-03 | 6.42E-03 | = |
| | 2 (Avg) | 8.87E-03 | 5.71E-03 | 5.83E-03 | = | 7.59E-04 | 1.03E-03 | 1.76E-03 | U | 9.82E-03 | 5.47E-03 | 6.03E-03 | = |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 | -3.74E-04 | 9.52E-03 | 5.52E-03 | U | 7.85E-04 | 1.37E-03 | 1.77E-03 | U | 7.50E-04 | 9.21E-03 | 6.02E-03 | U |
| | 4 | 4.64E-03 | 7.13E-03 | 5.50E-03 | U | 5.25E-04 | 1.35E-03 | 1.78E-03 | U | 6.41E-03 | 7.17E-03 | 5.48E-03 | U |
| SOO | 1 | 1.30E-02 | 7.40E-03 | 6.58E-03 | NJ | -1.74E-04 | 1.05E-03 | 1.80E-03 | U | 1.14E-02 | 6.72E-03 | 6.42E-03 | = |
| | 2 | 1.10E-02 | 6.15E-03 | 5.83E-03 | = | 1.09E-03 | 1.13E-03 | 1.76E-03 | U | 8.97E-03 | 5.54E-03 | 6.04E-03 | = |
| | 3 | -9.35E-05 | 9.33E-03 | 5.50E-03 | U | 8.59E-05 | 1.17E-03 | 1.74E-03 | U | -1.16E-03 | 8.96E-03 | 6.00E-03 | U |
| | 4 | 1.07E-02 | 6.10E-03 | 5.23E-03 | = | 2.29E-04 | 1.26E-03 | 1.77E-03 | U | 1.04E-02 | 5.96E-03 | 5.44E-03 | = |
| Mean [5] | | 5.64E-03 | 7.49E-03 | 5.87E-03 | N/A | 3.19E-04 | 1.17E-03 | 1.82E-03 | N/A | 4.99E-03 | 7.10E-03 | 6.01E-03 | N/A |
| Minimum | | -6.24E-03 | 8.99E-03 | 5.49E-03 | WEE (3) | -3.24E-04 | 6.78E-04 | 1.80E-03 | WFF (2) | -6.40E-03 | 8.37E-03 | 5.95E-03 | WFF (3) |
| Maximum | | 1.30E-02 | 7.40E-03 | 6.58E-03 | SOO (1) | 1.20E-03 | 1.15E-03 | 1.76E-03 | WSS (2) | 1.14E-02 | 6.72E-03 | 6.42E-03 | SOO (1) |
| | | | | | | | | | | | | | |
| WAB | 1 | 1.58E-02 | 4.51E-03 | 6.57E-03 | NJ | 7.59E-04 | 7.48E-04 | 1.79E-03 | U | 1.40E-02 | 4.11E-03 | 6.40E-03 | = |
| (Filter | 2 | 1.22E-02 | 3.66E-03 | 5.84E-03 | = | 4.17E-04 | 5.49E-04 | 1.77E-03 | U | 1.09E-02 | 3.36E-03 | 6.04E-03 | = |
| Blank) | 3 | 1.14E-02 | 3.43E-03 | 5.33E-03 | = | 4.26E-04 | 4.11E-04 | 1.51E-03 | U | 1.09E-02 | 3.30E-03 | 5.84E-03 | = |
| | 4 | 1.09E-02 | 3.47E-03 | 5.22E-03 | = | 9.44E-04 | 8.50E-04 | 1.77E-03 | U | 1.06E-02 | 3.39E-03 | 5.43E-03 | = |
| | | | | | | | | | | | | | |
| | | $^{238}$Pu | | | | $^{239/240}$PU | | | | $^{241}$Am | | | |
| **Location** | **Quarter** | **[RN] [1]** | **2 σ TPU [2]** | **MDC [3]** | **Q [4]** | **[RN] [1]** | **2 σ TPU [2]** | **MDC [3]** | **Q [4]** | **[RN] [1]** | **2 σ TPU [2]** | **MDC [3]** | **Q [4]** |
| WFF | 1 | -4.68E-05 | 3.70E-04 | 8.07E-04 | U | 8.41E-05 | 7.26E-04 | 9.77E-04 | U | 1.66E-05 | 5.19E-04 | 1.03E-03 | U |
| | 2 | -3.06E-04 | 4.51E-04 | 8.44E-04 | U | -2.55E-04 | 4.57E-04 | 8.98E-04 | U | -6.36E-04 | 6.95E-04 | 1.09E-03 | U |
| | 3 | -1.86E-04 | 2.78E-04 | 7.92E-04 | U | -1.01E-04 | 3.26E-04 | 8.74E-04 | U | -1.52E-04 | 4.24E-04 | 1.15E-03 | U |
| | 4 | -8.33E-07 | 3.09E-04 | 7.63E-04 | U | 1.79E-04 | 4.92E-04 | 9.05E-04 | U | -3.02E-04 | 5.74E-04 | 1.07E-03 | U |
| WEE | 1 | -2.11E-04 | 3.25E-04 | 8.13E-04 | U | -2.33E-04 | 5.11E-04 | 8.61E-04 | U | -2.26E-04 | 3.99E-04 | 1.03E-03 | U |
| | 2 | -2.67E-04 | 4.09E-04 | 8.14E-04 | U | -1.13E-04 | 5.04E-04 | 9.75E-04 | U | -3.03E-04 | 7.57E-04 | 1.10E-03 | U |
| | 3 | -1.30E-04 | 1.66E-04 | 7.36E-04 | U | -1.27E-04 | 3.59E-04 | 9.55E-04 | U | -6.83E-05 | 3.14E-04 | 1.03E-03 | U |
| | 4 | -1.04E-04 | 1.85E-04 | 7.44E-04 | U | -1.53E-04 | 2.80E-04 | 9.08E-04 | U | -4.50E-04 | 5.56E-04 | 1.26E-03 | U |
| WSS | 1 | -1.76E-04 | 2.70E-04 | 8.25E-04 | U | -2.82E-04 | 5.45E-04 | 9.16E-04 | U | 2.99E-05 | 5.68E-04 | 1.08E-03 | U |
| | 2 | -1.26E-04 | 4.44E-04 | 7.33E-04 | U | -1.24E-04 | 4.98E-04 | 8.90E-04 | U | -3.08E-04 | 7.65E-04 | 1.10E-03 | U |
| | 3 | -4.44E-05 | 3.30E-04 | 7.76E-04 | U | -9.69E-05 | 3.20E-04 | 9.00E-04 | U | -8.60E-05 | 3.40E-04 | 1.04E-03 | U |
| | 4 | -1.17E-04 | 2.15E-04 | 7.42E-04 | U | -4.02E-06 | 2.97E-04 | 8.23E-04 | U | 9.08E-05 | 7.14E-04 | 1.11E-03 | U |
| MLR | 1 | -1.81E-04 | 2.79E-04 | 8.25E-04 | U | -4.14E-04 | 5.12E-04 | 8.96E-04 | U | -7.35E-05 | 4.37E-04 | 1.03E-03 | U |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | -2.78E-04 | 4.20E-04 | 8.26E-04 | U | 3.07E-05 | 5.03E-04 | 8.41E-04 | U | -7.27E-04 | 6.37E-04 | 1.14E-03 | U |
| | 3 | -1.95E-04 | 2.92E-04 | 8.89E-04 | U | 4.38E-05 | 3.96E-04 | 8.92E-04 | U | -2.02E-06 | 4.88E-04 | 1.20E-03 | U |
| | 4 (Avg) | -1.61E-04 | 2.60E-04 | 8.03E-04 | U | -6.85E-05 | 3.64E-04 | 8.92E-04 | U | -2.08E-04 | 5.82E-04 | 1.09E-03 | U |
| SEC | 1 | -1.64E-04 | 2.50E-04 | 7.46E-04 | U | -3.79E-04 | 4.79E-04 | 8.83E-04 | U | -1.46E-04 | 4.91E-04 | 1.01E-03 | U |
| | 2 | -4.05E-05 | 5.29E-04 | 7.68E-04 | U | -1.55E-04 | 5.26E-04 | 1.00E-03 | U | -3.20E-04 | 7.36E-04 | 1.06E-03 | U |
| | 3 (Avg) | -7.86E-05 | 2.46E-04 | 7.49E-04 | U | 2.73E-04 | 5.08E-04 | 8.87E-04 | U | 4.65E-05 | 4.74E-04 | 1.09E-03 | U |
| | 4 | -1.29E-04 | 2.38E-04 | 7.74E-04 | U | 2.27E-04 | 4.60E-04 | 8.62E-04 | U | 3.27E-04 | 8.41E-04 | 1.16E-03 | U |
| CBD | 1 (Avg) | -1.27E-04 | 3.20E-04 | 8.09E-04 | U | -2.11E-04 | 5.49E-04 | 9.05E-04 | U | 2.79E-05 | 5.06E-04 | 1.01E-03 | U |
| | 2 | -1.48E-04 | 4.75E-04 | 8.20E-04 | U | -1.10E-04 | 4.93E-04 | 9.00E-04 | U | -3.37E-04 | 7.78E-04 | 1.12E-03 | U |
| | 3 | -3.50E-05 | 3.29E-04 | 7.30E-04 | U | 4.82E-05 | 4.22E-04 | 8.54E-04 | U | -4.08E-05 | 5.48E-04 | 1.26E-03 | U |
| | 4 | -1.19E-04 | 2.19E-04 | 7.67E-04 | U | 9.26E-05 | 4.37E-04 | 9.04E-04 | U | 2.98E-04 | 8.23E-04 | 1.15E-03 | U |
| SMR | 1 | -1.49E-04 | 2.20E-04 | 7.35E-04 | U | -3.63E-04 | 4.64E-04 | 8.28E-04 | U | 3.75E-05 | 4.85E-04 | 1.04E-03 | U |
| | 2 (Avg) | -2.80E-04 | 4.23E-04 | 7.86E-04 | U | 4.50E-05 | 5.79E-04 | 9.12E-04 | U | -5.96E-04 | 6.62E-04 | 1.10E-03 | U |
| | 3 | 8.98E-05 | 4.10E-04 | 8.45E-04 | U | 2.86E-04 | 5.17E-04 | 8.70E-04 | U | -1.05E-04 | 3.66E-04 | 1.05E-03 | U |
| | 4 | -3.67E-05 | 3.46E-04 | 7.57E-04 | U | -2.56E-05 | 3.30E-04 | 8.32E-04 | U | -3.95E-04 | 5.01E-04 | 1.10E-03 | U |
| SOO | 1 | -2.33E-04 | 3.54E-04 | 8.57E-04 | U | -2.85E-04 | 5.58E-04 | 9.24E-04 | U | 1.15E-04 | 5.92E-04 | 1.05E-03 | U |
| | 2 | -1.37E-04 | 4.72E-04 | 7.84E-04 | U | 1.68E-05 | 5.56E-04 | 9.74E-04 | U | -5.75E-04 | 6.49E-04 | 1.04E-03 | U |
| | 3 | -2.39E-04 | 3.56E-04 | 1.04E-03 | U | -5.65E-06 | 4.70E-04 | 1.05E-03 | U | 1.13E-04 | 4.98E-04 | 1.07E-03 | U |
| | 4 | -1.38E-04 | 2.54E-04 | 7.95E-04 | U | -1.53E-04 | 2.79E-04 | 9.12E-04 | U | -3.11E-04 | 6.03E-04 | 1.16E-03 | U |
| Mean [5] | | -1.40E-04 | 3.26E-04 | 7.97E-04 | N/A | -7.29E-05 | 4.60E-04 | 9.03E-04 | N/A | -1.65E-04 | 5.73E-04 | 1.09E-03 | N/A |
| Minimum | | -3.06E-04 | 4.51E-04 | 8.44E-04 | WFF (2) | -4.14E-04 | 5.12E-04 | 8.96E-04 | MLR (1) | -7.27E-04 | 6.37E-04 | 1.14E-03 | MLR (2) |
| Maximum | | 8.98E-05 | 4.10E-04 | 8.45E-04 | SMR (3) | 2.86E-04 | 5.17E-04 | 8.70E-04 | SMR (3) | 3.27E-04 | 8.41E-04 | 1.16E-03 | SEC (4) |
| | | | | | | | | | | | | | |
| WAB | 1 | -9.84E-05 | 2.12E-04 | 8.23E-04 | U | 3.09E-04 | 4.25E-04 | 8.60E-04 | U | 1.77E-04 | 3.76E-04 | 1.07E-03 | U |
| (Filter | 2 | 2.17E-04 | 3.61E-04 | 8.48E-04 | U | 1.59E-04 | 3.95E-04 | 8.74E-04 | U | 6.44E-04 | 5.85E-04 | 1.06E-03 | U |
| Blank) | 3 | -8.21E-05 | 2.03E-04 | 8.95E-04 | U | -8.18E-05 | 2.02E-04 | 9.52E-04 | U | 1.04E-04 | 2.95E-04 | 1.09E-03 | U |
| | 4 | -1.13E-04 | 2.38E-04 | 8.77E-04 | U | 4.32E-05 | 3.28E-04 | 9.17E-04 | U | 3.46E-04 | 4.67E-04 | 1.08E-03 | U |
| | | | | | | | | | | | | | |
| | | $^{40}K$ | | | | $^{60}Co$ | | | | $^{137}Cs$ | | | |
| **Location** | **Quarter** | **[RN] [1]** | **2 σ TPU [2]** | **MDC [3]** | **Q [4]** | **[RN] [1]** | **2 σ TPU [2]** | **MDC [3]** | **Q [4]** | **[RN] [1]** | **2 σ TPU [2]** | **MDC [3]** | **Q [4]** |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WFF | 1 | 1.49E+00 | 1.39E+00 | 3.00E+00 | U | -1.04E-01 | 1.61E-01 | 2.19E-01 | U | -8.83E-02 | 1.40E-01 | 2.37E-01 | U |
| | 2 | -8.51E-02 | 1.35E+00 | 2.56E+00 | U | 7.05E-02 | 1.41E-01 | 2.34E-01 | U | 4.03E-02 | 1.42E-01 | 2.58E-01 | U |
| | 3 | 1.98E+00 | 1.46E+00 | 3.13E+00 | U | 1.18E-01 | 1.43E-01 | 2.01E-01 | U | -3.88E-02 | 1.45E-01 | 2.41E-01 | U |
| | 4 | 7.18E-01 | 1.53E+00 | 3.01E+00 | U | 1.03E-02 | 1.59E-01 | 2.85E-01 | U | 6.85E-02 | 1.48E-01 | 2.71E-01 | U |
| WEE | 1 | 2.16E+00 | 1.51E+00 | 3.26E+00 | U | -1.07E-01 | 1.64E-01 | 2.25E-01 | U | 5.71E-02 | 1.30E-01 | 2.52E-01 | U |
| | 2 | 5.35E+00 | 1.73E+00 | 4.11E+00 | = | 8.23E-02 | 1.26E-01 | 2.70E-01 | U | -1.76E-01 | 1.09E-01 | 1.68E-01 | U |
| | 3 | 4.02E+00 | 1.72E+00 | 3.91E+00 | = | -1.02E-01 | 1.38E-01 | 2.41E-01 | U | 1.87E-02 | 1.12E-01 | 2.14E-01 | U |
| | 4 | 4.18E+00 | 1.75E+00 | 3.98E+00 | = | 1.55E-01 | 1.46E-01 | 2.69E-01 | U | -1.90E-02 | 1.09E-01 | 2.05E-01 | U |
| WSS | 1 | 3.25E+00 | 2.10E+00 | 4.84E+00 | U | -1.56E-01 | 2.57E-01 | 3.49E-01 | U | -1.14E-01 | 1.30E-01 | 2.19E-01 | U |
| | 2 | 2.30E+00 | 1.87E+00 | 2.98E+00 | U | 1.03E-01 | 1.38E-01 | 2.35E-01 | U | -3.75E-02 | 1.18E-01 | 2.01E-01 | U |
| | 3 | 2.14E+00 | 2.07E+00 | 4.48E+00 | U | -8.95E-02 | 1.79E-01 | 2.79E-01 | U | -6.18E-02 | 1.55E-01 | 2.62E-01 | U |
| | 4 | 4.04E+00 | 1.62E+00 | 3.77E+00 | = | 1.74E-01 | 1.49E-01 | 2.79E-01 | U | -6.59E-02 | 1.29E-01 | 2.15E-01 | U |
| MLR | 1 | 1.85E+00 | 1.57E+00 | 3.73E+00 | U | -2.65E-02 | 1.63E-01 | 3.24E-01 | U | -1.16E-01 | 1.56E-01 | 2.58E-01 | U |
| | 2 | 2.42E+00 | 1.51E+00 | 3.28E+00 | U | 8.24E-02 | 1.37E-01 | 2.35E-01 | U | 1.67E-02 | 1.22E-01 | 2.19E-01 | U |
| | 3 | 2.47E+00 | 1.43E+00 | 3.17E+00 | U | -5.10E-02 | 1.41E-01 | 2.29E-01 | U | -5.72E-02 | 1.17E-01 | 1.96E-01 | U |
| | 4 (Avg) | 1.15E+00 | 1.06E+00 | 3.52E+00 | U | -4.40E-02 | 1.43E-01 | 2.29E-01 | U | 3.23E-02 | 1.41E-01 | 2.60E-01 | U |
| SEC | 1 | 3.51E+00 | 1.36E+00 | 3.30E+00 | = | -2.67E-02 | 1.26E-01 | 2.38E-01 | U | 4.04E-02 | 1.16E-01 | 2.28E-01 | U |
| | 2 | 3.07E+00 | 2.07E+00 | 4.83E+00 | U | 1.59E-01 | 2.11E-01 | 3.54E-01 | U | 1.01E-01 | 1.63E-01 | 3.31E-01 | U |
| | 3 (Avg) | 2.94E+00 | 1.54E+00 | 2.92E+00 | = | 3.60E-02 | 1.25E-01 | 2.54E-01 | U | 1.93E-02 | 1.36E-01 | 2.56E-01 | U |
| | 4 | 2.90E+00 | 2.40E+00 | 3.87E+00 | U | 1.46E-01 | 1.32E-01 | 2.74E-01 | U | 6.16E-02 | 1.13E-01 | 2.27E-01 | U |
| CBD | 1 (Avg) | 2.12E+00 | 1.82E+00 | 3.95E+00 | U | -5.35E-02 | 1.88E-01 | 3.01E-01 | U | -5.07E-02 | 1.31E-01 | 2.39E-01 | U |
| | 2 | 3.35E+00 | 2.17E+00 | 4.92E+00 | U | -3.38E-02 | 1.50E-01 | 2.77E-01 | U | 4.62E-02 | 1.28E-01 | 2.63E-01 | U |
| | 3 | 4.12E+00 | 1.80E+00 | 2.40E+00 | = | 1.75E-01 | 1.62E-01 | 2.98E-01 | U | 5.41E-02 | 1.60E-01 | 2.99E-01 | U |
| | 4 | 3.76E+00 | 1.68E+00 | 3.77E+00 | U | -1.16E-01 | 1.49E-01 | 2.54E-01 | U | -8.97E-03 | 1.36E-01 | 2.48E-01 | U |
| SMR | 1 | 6.76E-01 | 1.42E+00 | 2.81E+00 | U | -1.83E-02 | 1.33E-01 | 2.48E-01 | U | 1.17E-01 | 1.44E-01 | 2.84E-01 | U |
| | 2 (Avg) | 3.27E+00 | 1.62E+00 | 3.62E+00 | U | 7.26E-02 | 1.51E-01 | 2.65E-01 | U | 8.40E-03 | 1.26E-01 | 2.30E-01 | U |
| | 3 | 1.73E+00 | 1.47E+00 | 3.13E+00 | U | -4.89E-02 | 1.29E-01 | 2.32E-01 | U | -9.51E-02 | 1.47E-01 | 2.43E-01 | U |
| | 4 | 1.80E+00 | 1.60E+00 | 3.32E+00 | U | -3.69E-02 | 1.41E-01 | 2.28E-01 | U | -2.57E-02 | 1.43E-01 | 2.48E-01 | U |
| SOO | 1 | 4.48E+00 | 1.53E+00 | 3.69E+00 | = | -1.32E-01 | 1.34E-01 | 1.55E-01 | U | -4.76E-02 | 1.20E-01 | 2.10E-01 | U |
| | 2 | 1.19E+00 | 2.08E+00 | 4.33E+00 | U | 1.75E-01 | 2.08E-01 | 3.90E-01 | U | 1.42E-02 | 1.22E-01 | 2.45E-01 | U |
| | 3 | 1.02E+00 | 1.79E+00 | 3.78E+00 | U | -4.69E-02 | 1.42E-01 | 2.79E-01 | U | -9.74E-02 | 1.32E-01 | 2.19E-01 | U |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4 | 3.14E+00 | 1.52E+00 | 3.41E+00 | U | 8.74E-02 | 1.41E-01 | 2.46E-01 | U | 4.52E-02 | 1.20E-01 | 2.17E-01 | U |
| Mean [5] | | 2.58E+00 | 1.67E+00 | 3.59E+00 | N/A | 1.42E-02 | 1.53E-01 | 2.62E-01 | N/A | -1.12E-02 | 1.32E-01 | 2.39E-01 | N/A |
| Minimum | | -8.51E-02 | 1.35E+00 | 2.56E+00 | WFF (2) | -1.56E-01 | 2.57E-01 | 3.49E-01 | WSS (1) | -1.76E-01 | 1.09E-01 | 1.68E-01 | WEE (2) |
| Maximum | | 5.35E+00 | 1.73E+00 | 4.11E+00 | WEE (2) | 1.75E-01 | 2.08E-01 | 3.90E-01 | SOO (2) | 1.17E-01 | 1.44E-01 | 2.84E-01 | SMR (1) |
| | | | | | | 1.75E-01 | 1.62E-01 | 2.98E-01 | CBD (3) | | | | |
| | | | | | | | | | | | | | |
| WAB | 1 | 2.45E+00 | 1.37E+00 | 3.10E+00 | U | 1.89E-02 | 1.43E-01 | 2.81E-01 | U | -7.61E-02 | 1.37E-01 | 2.36E-01 | U |
| (Filter | 2 | 3.70E+00 | 2.05E+00 | 2.96E+00 | = | -1.22E-01 | 1.97E-01 | 3.45E-01 | U | -4.64E-02 | 1.45E-01 | 2.58E-01 | U |
| Blank) | 3 | 2.22E+00 | 1.62E+00 | 3.43E+00 | U | 5.20E-02 | 1.35E-01 | 2.33E-01 | U | -6.89E-02 | 1.35E-01 | 2.26E-01 | U |
| | 4 | 2.50E+00 | 1.57E+00 | 3.37E+00 | U | -4.82E-02 | 1.28E-01 | 2.20E-01 | U | 4.26E-03 | 1.19E-01 | 2.09E-01 | U |

| | | $^{90}Sr$ | | | |
|---|---|---|---|---|---|
| **Location** | **Quarter** | **[RN] [1]** | **2 σ TPU [2]** | **MDC [3]** | **Q [4]** |
| WFF | 1 | -4.90E-04 | 1.88E-02 | 3.12E-02 | U |
| | 2 | -1.11E-02 | 1.95E-02 | 3.29E-02 | U |
| | 3 | 8.98E-03 | 1.97E-02 | 3.32E-02 | U |
| | 4 | -3.50E-03 | 1.82E-02 | 3.31E-02 | U |
| WEE | 1 | 2.75E-06 | 1.88E-02 | 3.12E-02 | U |
| | 2 | -1.15E-03 | 1.94E-02 | 3.28E-02 | U |
| | 3 | 5.43E-03 | 1.93E-02 | 3.31E-02 | U |
| | 4 | 1.11E-02 | 1.89E-02 | 3.31E-02 | U |
| WSS | 1 | -5.07E-03 | 1.89E-02 | 3.13E-02 | U |
| | 2 | 3.54E-03 | 1.89E-02 | 3.27E-02 | U |
| | 3 | 5.52E-03 | 1.95E-02 | 3.32E-02 | U |
| | 4 | -6.89E-04 | 1.99E-02 | 3.32E-02 | U |
| MLR | 1 | -6.22E-03 | 1.85E-02 | 3.12E-02 | U |
| | 2 | 1.89E-03 | 1.83E-02 | 3.26E-02 | U |
| | 3 | 9.47E-03 | 1.99E-02 | 3.32E-02 | U |
| | 4 (Avg) | 2.43E-03 | 1.83E-02 | 3.30E-02 | U |
| SEC | 1 | -1.04E-02 | 1.83E-02 | 3.12E-02 | U |

| | | | | | |
|---|---|---|---|---|---|
| | 2 | -8.77E-03 | 1.84E-02 | 3.28E-02 | U |
| | 3 (Avg) | 3.50E-03 | 1.88E-02 | 3.32E-02 | U |
| | 4 | 3.20E-03 | 1.90E-02 | 3.31E-02 | U |
| CBD | 1 (Avg) | -5.16E-04 | 1.95E-02 | 3.13E-02 | U |
| | 2 | 6.21E-03 | 2.01E-02 | 3.29E-02 | U |
| | 3 | -1.44E-02 | 1.69E-02 | 3.32E-02 | U |
| | 4 | 9.44E-04 | 1.82E-02 | 3.30E-02 | U |
| SMR | 1 | -5.66E-03 | 1.86E-02 | 3.12E-02 | U |
| | 2 (Avg) | 1.60E-04 | 1.90E-02 | 3.28E-02 | U |
| | 3 | 5.66E-03 | 1.90E-02 | 3.32E-02 | U |
| | 4 | 2.45E-03 | 1.81E-02 | 3.30E-02 | U |
| SOO | 1 | -5.09E-04 | 1.87E-02 | 3.12E-02 | U |
| | 2 | -6.58E-03 | 1.90E-02 | 3.28E-02 | U |
| | 3 | 1.06E-02 | 1.91E-02 | 3.31E-02 | U |
| | 4 | 1.67E-02 | 1.95E-02 | 3.30E-02 | U |
| Mean [5] | | 7.10E-04 | 1.89E-02 | 3.26E-02 | N/A |
| Minimum | | -1.44E-02 | 1.69E-02 | 3.32E-02 | CBD (3) |
| Maximum | | 1.67E-02 | 1.95E-02 | 3.30E-02 | SOO (4) |
| | | | | | |
| WAB | 1 | 7.25E-03 | 1.37E-02 | 3.12E-02 | U |
| (Filter | 2 | -8.24E-03 | 1.30E-02 | 3.28E-02 | U |
| Blank) | 3 | 1.93E-03 | 1.23E-02 | 3.32E-02 | U |
| | 4 | 8.19E-03 | 1.31E-02 | 3.30E-02 | U |

Note. Units are Bq/sample. See appendix C for sampling location codes.

1. Radionuclide activity. The average is used for duplicate samples. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration
4. Qualifier. Indicates whether a radionuclide was detected. Equal sign (=) denotes detected. U denotes undetected. UJ denotes a nuclide that was not detected above the reported MDC and 2 sigma counting uncertainty and a quality deficiency affected the data making the reported data more uncertain. NJ denotes nuclide present at an estimated quantity.
5. Non-relational values are presented for the mean. In all other cases, [RN], 2 σ TPU, and MDC are a data set.

## Table G.5 – Radionuclide Activity in Quarterly Air Filter Composite Samples Collected from Locations on and Near the WIPP Site

*(Refer to the end of the table for notes)*

| | | | $^{233/234}U$ | | $^{235}U$ | | $^{238}U$ | | $^{238}Pu$ | | $^{239/240}Pu$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | **Quarter** | **Volume ($m^3$)** | **Bq/sample** | **Bq/$m^3$** | **Bq/sample** | **Bq/$m^3$** | **Bq/sample** | **Bq/$m^3$** | **Bq/sample** | **Bq/$m^3$** | **Bq/sample** | **Bq/$m^3$** |
| WFF | 1 | 7073.58 | 6.12E-03 | 8.65E-07 | -6.72E-06 | -9.50E-10 | 2.75E-03 | 3.89E-07 | -4.68E-05 | -6.62E-09 | 8.41E-05 | 1.19E-08 |
| | 2 | 7372.29 | 6.47E-03 | 8.78E-07 | -3.24E-04 | -4.39E-08 | 9.70E-03 | 1.32E-06 | -3.06E-04 | -4.15E-08 | -2.55E-04 | -3.46E-08 |
| | 3 | 7485.55 | -5.25E-03 | -7.01E-07 | 9.26E-05 | 1.24E-08 | -6.40E-03 | -8.55E-07 | -1.86E-04 | -2.48E-08 | -1.01E-04 | -1.35E-08 |
| | 4 | 7241.80 | 3.03E-03 | 4.18E-07 | -1.98E-05 | -2.73E-09 | 4.00E-03 | 5.52E-07 | -8.33E-07 | -1.15E-10 | 1.79E-04 | 2.47E-08 |
| WEE | 1 | 7180.32 | 1.26E-02 | 1.75E-06 | -1.63E-04 | -2.27E-08 | 4.07E-03 | 5.67E-07 | -2.11E-04 | -2.94E-08 | -2.33E-04 | -3.24E-08 |
| | 2 | 7377.42 | 8.58E-03 | 1.16E-06 | 5.91E-04 | 8.01E-08 | 7.67E-03 | 1.04E-06 | -2.67E-04 | -3.62E-08 | -1.13E-04 | -1.53E-08 |
| | 3 | 7430.53 | -6.24E-03 | -8.40E-07 | 6.64E-05 | 8.94E-09 | -4.29E-03 | -5.77E-07 | -1.30E-04 | -1.75E-08 | -1.27E-04 | -1.71E-08 |
| | 4 | 7131.11 | 3.44E-03 | 4.82E-07 | 3.78E-04 | 5.30E-08 | 4.27E-03 | 5.99E-07 | -1.04E-04 | -1.46E-08 | -1.53E-04 | -2.15E-08 |
| WSS | 1 | 6965.78 | 5.90E-03 | 8.47E-07 | -6.91E-05 | -9.92E-09 | 6.94E-03 | 9.96E-07 | -1.76E-04 | -2.53E-08 | -2.82E-04 | -4.05E-08 |
| | 2 | 7318.26 | 7.13E-03 | 9.74E-07 | 1.20E-03 | 1.64E-07 | 1.03E-02 | 1.41E-06 | -1.26E-04 | -1.72E-08 | -1.24E-04 | -1.69E-08 |
| | 3 | 7411.92 | -1.55E-03 | -2.09E-07 | 5.35E-04 | 7.22E-08 | -2.14E-03 | -2.89E-07 | -4.44E-05 | -5.99E-09 | -9.69E-05 | -1.31E-08 |
| | 4 | 6041.07 | 6.84E-03 | 1.13E-06 | 6.53E-04 | 1.08E-07 | 7.21E-03 | 1.19E-06 | -1.17E-04 | -1.94E-08 | -4.02E-06 | -6.65E-10 |
| MLR | 1 | 7148.74 | 1.29E-02 | 1.80E-06 | 6.03E-04 | 8.44E-08 | 1.11E-02 | 1.55E-06 | -1.81E-04 | -2.53E-08 | -4.14E-04 | -5.79E-08 |
| | 2 | 7225.84 | 9.98E-03 | 1.38E-06 | 8.64E-04 | 1.20E-07 | 9.90E-03 | 1.37E-06 | -2.78E-04 | -3.85E-08 | 3.07E-05 | 4.25E-09 |
| | 3 | 6826.27 | 1.50E-03 | 2.20E-07 | -7.70E-05 | -1.13E-08 | -1.69E-03 | -2.48E-07 | -1.95E-04 | -2.86E-08 | 4.38E-05 | 6.42E-09 |
| | 4 (Avg) [1] | 7212.68 | 1.07E-02 | 1.48E-06 | 5.68E-04 | 7.88E-08 | 9.83E-03 | 1.36E-06 | -1.61E-04 | -2.23E-08 | -6.85E-05 | -9.50E-09 |
| SEC | 1 | 7238.02 | 6.52E-03 | 9.01E-07 | 9.27E-04 | 1.28E-07 | 4.51E-03 | 6.23E-07 | -1.64E-04 | -2.27E-08 | -3.79E-04 | -5.24E-08 |
| | 2 | 7273.57 | 9.27E-03 | 1.27E-06 | 4.95E-04 | 6.81E-08 | 6.04E-03 | 8.30E-07 | -4.05E-05 | -5.57E-09 | -1.55E-04 | -2.13E-08 |
| | 3 (Avg) | 7414.30 | -4.06E-03 | -5.48E-07 | -1.89E-04 | -2.55E-08 | -4.90E-03 | -6.61E-07 | -7.86E-05 | -1.06E-08 | 2.73E-04 | 3.68E-08 |
| | 4 | 7111.28 | 7.77E-03 | 1.09E-06 | -1.96E-04 | -2.76E-08 | 7.53E-03 | 1.06E-06 | -1.29E-04 | -1.81E-08 | 2.27E-04 | 3.19E-08 |
| CBD | 1 (Avg) | 7253.95 | 6.13E-03 | 8.45E-07 | -1.84E-04 | -2.54E-08 | 3.37E-03 | 4.65E-07 | -1.27E-04 | -1.75E-08 | -2.11E-04 | -2.91E-08 |
| | 2 | 7332.08 | 1.04E-02 | 1.42E-06 | 7.74E-04 | 1.06E-07 | 1.09E-02 | 1.49E-06 | -1.48E-04 | -2.02E-08 | -1.10E-04 | -1.50E-08 |
| | 3 | 6822.39 | 6.23E-04 | 9.13E-08 | -1.35E-04 | -1.98E-08 | -2.39E-03 | -3.50E-07 | -3.50E-05 | -5.13E-09 | 4.82E-05 | 7.06E-09 |
| | 4 | 7273.23 | 7.63E-03 | 1.05E-06 | 3.15E-04 | 4.33E-08 | 7.19E-03 | 9.89E-07 | -1.19E-04 | -1.64E-08 | 9.26E-05 | 1.27E-08 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SMR | 1 | 6447.08 | 6.39E-03 | 9.91E-07 | 2.00E-04 | 3.10E-08 | 7.52E-03 | 1.17E-06 | -1.49E-04 | -2.31E-08 | -3.63E-04 | -5.63E-08 |
| | 2 (Avg) | 7280.38 | 8.87E-03 | 1.22E-06 | 7.59E-04 | 1.04E-07 | 9.82E-03 | 1.35E-06 | -2.80E-04 | -3.85E-08 | 4.50E-05 | 6.18E-09 |
| | 3 | 7049.34 | -3.74E-04 | -5.31E-08 | 7.85E-04 | 1.11E-07 | 7.50E-04 | 1.06E-07 | 8.98E-05 | 1.27E-08 | 2.86E-04 | 4.06E-08 |
| | 4 | 7170.35 | 4.64E-03 | 6.47E-07 | 5.25E-04 | 7.32E-08 | 6.41E-03 | 8.94E-07 | -3.67E-05 | -5.12E-09 | -2.56E-05 | -3.57E-09 |
| SOO | 1 | 7253.09 | 1.30E-02 | 1.79E-06 | -1.74E-04 | -2.40E-08 | 1.14E-02 | 1.57E-06 | -2.33E-04 | -3.21E-08 | -2.85E-04 | -3.93E-08 |
| | 2 | 7293.20 | 1.10E-02 | 1.51E-06 | 1.09E-03 | 1.49E-07 | 8.97E-03 | 1.23E-06 | -1.37E-04 | -1.88E-08 | 1.68E-05 | 2.30E-09 |
| | 3 | 7065.83 | -9.35E-05 | -1.32E-08 | 8.59E-05 | 1.22E-08 | -1.16E-03 | -1.64E-07 | -2.39E-04 | -3.38E-08 | -5.65E-06 | -8.00E-10 |
| | 4 | 7246.74 | 1.07E-02 | 1.48E-06 | 2.29E-04 | 3.16E-08 | 1.04E-02 | 1.44E-06 | -1.38E-04 | -1.90E-08 | -1.53E-04 | -2.11E-08 |
| Mean | | 7155.25 | 5.64E-03 | 7.92E-07 | 3.19E-04 | 4.46E-08 | 4.99E-03 | 7.00E-07 | -1.40E-04 | -1.96E-08 | -7.29E-05 | -1.02E-08 |
| Minimum | | 6041.07 | -6.24E-03 | -8.40E-07 | -3.24E-04 | -4.39E-08 | -6.40E-03 | -8.55E-07 | -3.06E-04 | -4.15E-08 | -4.14E-04 | -5.79E-08 |
| Maximum | | 7485.55 | 1.30E-02 | 1.80E-06 | 1.20E-03 | 1.64E-07 | 1.14E-02 | 1.57E-06 | 8.98E-05 | 1.27E-08 | 2.86E-04 | 4.06E-08 |

| | | | $^{241}$Am | | $^{40}$K | | $^{60}$Co | | $^{137}$Cs | | $^{90}$Sr | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location** | **Quarter** | **Volume (m$^3$)** | **Bq/sample** | **Bq/m$^3$** | **Bq/sample** | **Bq/m$^3$** | **Bq/sample** | **Bq/m$^3$** | **Bq/sample** | **Bq/m$^3$** | **Bq/sample** | **Bq/m$^3$** |
| WFF | 1 | 7073.58 | 1.66E-05 | 2.35E-09 | 1.49E+00 | 2.11E-04 | -1.04E-01 | -1.47E-05 | -8.83E-02 | -1.25E-05 | -4.90E-04 | -6.93E-08 |
| | 2 | 7372.29 | -6.36E-04 | -8.63E-08 | -8.51E-02 | -1.15E-05 | 7.05E-02 | 9.56E-06 | 4.03E-02 | 5.47E-06 | -1.11E-02 | -1.51E-06 |
| | 3 | 7485.55 | -1.52E-04 | -2.03E-08 | 1.98E+00 | 2.65E-04 | 1.18E-01 | 1.58E-05 | -3.88E-02 | -5.18E-06 | 8.98E-03 | 1.20E-06 |
| | 4 | 7241.80 | -3.02E-04 | -4.17E-08 | 7.18E-01 | 9.91E-05 | 1.03E-02 | 1.42E-06 | 6.85E-02 | 9.46E-06 | -3.50E-03 | -4.83E-07 |
| WEE | 1 | 7180.32 | -2.26E-04 | -3.15E-08 | 2.16E+00 | 3.01E-04 | -1.07E-01 | -1.49E-05 | 5.71E-02 | 7.95E-06 | 2.75E-06 | 3.83E-10 |
| | 2 | 7377.42 | -3.03E-04 | -4.11E-08 | 5.35E+00 | 7.25E-04 | 8.23E-02 | 1.12E-05 | -1.76E-01 | -2.39E-05 | -1.15E-03 | -1.56E-07 |
| | 3 | 7430.53 | -6.83E-05 | -9.19E-09 | 4.02E+00 | 5.41E-04 | -1.02E-01 | -1.37E-05 | 1.87E-02 | 2.52E-06 | 5.43E-03 | 7.31E-07 |
| | 4 | 7131.11 | -4.50E-04 | -6.31E-08 | 4.18E+00 | 5.86E-04 | 1.55E-01 | 2.17E-05 | -1.90E-02 | -2.66E-06 | 1.11E-02 | 1.56E-06 |
| WSS | 1 | 6965.78 | 2.99E-05 | 4.29E-09 | 3.25E+00 | 4.67E-04 | -1.56E-01 | -2.24E-05 | -1.14E-01 | -1.64E-05 | -5.07E-03 | -7.28E-07 |
| | 2 | 7318.26 | -3.08E-04 | -4.21E-08 | 2.30E+00 | 3.14E-04 | 1.03E-01 | 1.41E-05 | -3.75E-02 | -5.12E-06 | 3.54E-03 | 4.84E-07 |
| | 3 | 7411.92 | -8.60E-05 | -1.16E-08 | 2.14E+00 | 2.89E-04 | -8.95E-02 | -1.21E-05 | -6.18E-02 | -8.34E-06 | 5.52E-03 | 7.45E-07 |
| | 4 | 6041.07 | 9.08E-05 | 1.50E-08 | 4.04E+00 | 6.69E-04 | 1.74E-01 | 2.88E-05 | -6.59E-02 | -1.09E-05 | -6.89E-04 | -1.14E-07 |
| MLR | 1 | 7148.74 | -7.35E-05 | -1.03E-08 | 1.85E+00 | 2.59E-04 | -2.65E-02 | -3.71E-06 | -1.16E-01 | -1.62E-05 | -6.22E-03 | -8.70E-07 |
| | 2 | 7225.84 | -7.27E-04 | -1.01E-07 | 2.42E+00 | 3.35E-04 | 8.24E-02 | 1.14E-05 | 1.67E-02 | 2.31E-06 | 1.89E-03 | 2.62E-07 |
| | 3 | 6826.27 | -2.02E-06 | -2.96E-10 | 2.47E+00 | 3.62E-04 | -5.10E-02 | -7.47E-06 | -5.72E-02 | -8.38E-06 | 9.47E-03 | 1.39E-06 |
| | 4 (Avg) | 7212.68 | -2.08E-04 | -2.88E-08 | 1.15E+00 | 1.59E-04 | -4.40E-02 | -6.10E-06 | 3.23E-02 | 4.48E-06 | 2.43E-03 | 3.37E-07 |
| SEC | 1 | 7238.02 | -1.46E-04 | -2.02E-08 | 3.51E+00 | 4.85E-04 | -2.67E-02 | -3.69E-06 | 4.04E-02 | 5.58E-06 | -1.04E-02 | -1.44E-06 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 7273.57 | -3.20E-04 | -4.40E-08 | 3.07E+00 | 4.22E-04 | 1.59E-01 | 2.19E-05 | 1.01E-01 | 1.39E-05 | -8.77E-03 | -1.21E-06 |
| | 3 (Avg) | 7414.30 | 4.65E-05 | 6.27E-09 | 2.94E+00 | 3.97E-04 | 3.60E-02 | 4.85E-06 | 1.93E-02 | 2.60E-06 | 3.50E-03 | 4.72E-07 |
| | 4 | 7111.28 | 3.27E-04 | 4.60E-08 | 2.90E+00 | 4.08E-04 | 1.46E-01 | 2.05E-05 | 6.16E-02 | 8.66E-06 | 3.20E-03 | 4.50E-07 |
| CBD | 1 (Avg) | 7253.95 | 2.79E-05 | 3.85E-09 | 2.12E+00 | 2.92E-04 | -5.35E-02 | -7.37E-06 | -5.07E-02 | -6.99E-06 | -5.16E-04 | -7.11E-08 |
| | 2 | 7332.08 | -3.37E-04 | -4.60E-08 | 3.35E+00 | 4.57E-04 | -3.38E-02 | -4.61E-06 | 4.62E-02 | 6.30E-06 | 6.21E-03 | 8.47E-07 |
| | 3 | 6822.39 | -4.08E-05 | -5.98E-09 | 4.12E+00 | 6.04E-04 | 1.75E-01 | 2.57E-05 | 5.41E-02 | 7.93E-06 | -1.44E-02 | -2.11E-06 |
| | 4 | 7273.23 | 2.98E-04 | 4.10E-08 | 3.76E+00 | 5.17E-04 | -1.16E-01 | -1.59E-05 | -8.97E-03 | -1.23E-06 | 9.44E-04 | 1.30E-07 |
| SMR | 1 | 6447.08 | 3.75E-05 | 5.82E-09 | 6.76E-01 | 1.05E-04 | -1.83E-02 | -2.84E-06 | 1.17E-01 | 1.81E-05 | -5.66E-03 | -8.78E-07 |
| | 2 (Avg) | 7280.38 | -5.96E-04 | -8.19E-08 | 3.27E+00 | 4.49E-04 | 7.26E-02 | 9.97E-06 | 8.40E-03 | 1.15E-06 | 1.60E-04 | 2.20E-08 |
| | 3 | 7049.34 | -1.05E-04 | -1.49E-08 | 1.73E+00 | 2.45E-04 | -4.89E-02 | -6.94E-06 | -9.51E-02 | -1.35E-05 | 5.66E-03 | 8.03E-07 |
| | 4 | 7170.35 | -3.95E-04 | -5.51E-08 | 1.80E+00 | 2.51E-04 | -3.69E-02 | -5.15E-06 | -2.57E-02 | -3.58E-06 | 2.45E-03 | 3.42E-07 |
| SOO | 1 | 7253.09 | 1.15E-04 | 1.59E-08 | 4.48E+00 | 6.18E-04 | -1.32E-01 | -1.82E-05 | -4.76E-02 | -6.56E-06 | -5.09E-04 | -7.02E-08 |
| | 2 | 7293.20 | -5.75E-04 | -7.88E-08 | 1.19E+00 | 1.63E-04 | 1.75E-01 | 2.40E-05 | 1.42E-02 | 1.95E-06 | -6.58E-03 | -9.02E-07 |
| | 3 | 7065.83 | 1.13E-04 | 1.60E-08 | 1.02E+00 | 1.44E-04 | -4.69E-02 | -6.64E-06 | -9.74E-02 | -1.38E-05 | 1.06E-02 | 1.50E-06 |
| | 4 | 7246.74 | -3.11E-04 | -4.29E-08 | 3.14E+00 | 4.33E-04 | 8.74E-02 | 1.21E-05 | 4.52E-02 | 6.24E-06 | 1.67E-02 | 2.30E-06 |
| Mean | | 7155.25 | -1.65E-04 | -2.25E-08 | 2.58E+00 | 3.61E-04 | 1.42E-02 | 2.07E-06 | -1.12E-02 | -1.58E-06 | 7.10E-04 | 9.28E-08 |
| Minimum | | 6041.07 | -7.27E-04 | -1.01E-07 | -8.51E-02 | -1.15E-05 | -1.56E-01 | -2.24E-05 | -1.76E-01 | -2.39E-05 | -1.44E-02 | -2.11E-06 |
| Maximum | | 7485.55 | 3.27E-04 | 4.60E-08 | 5.35E+00 | 7.25E-04 | 1.75E-01 | 2.88E-05 | 1.17E-01 | 1.81E-05 | 1.67E-02 | 2.30E-06 |

Note. See appendix C for sampling location codes.

1. The average is used for duplicate samples.

**Table G.6 – Round 46 Radionuclide Activity in Primary Groundwater from Detection Monitoring Program Wells on the WIPP Site**

*(Refer to the end of the table for notes)*

| Location | Round | Sample Date | $^{233/234}U$ | | | | $^{235}U$ | | | | $^{238}U$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| WQSP-1 | 46 | 3/12/2024 | 1.25E+00 | 2.66E-01 | 2.16E-03 | NJ | 2.03E-02 | 5.49E-03 | 7.37E-04 | = | 2.16E-01 | 4.69E-02 | 2.49E-03 | NJ |
| WQSP-2 | 46 | 3/19/2024 | 1.28E+00 | 3.21E-01 | 2.25E-03 | NJ | 1.97E-02 | 6.15E-03 | 9.98E-04 | = | 2.05E-01 | 5.22E-02 | 2.57E-03 | NJ |
| WQSP-3 | 46 | 4/9/2024 | 1.96E-01 | 4.49E-02 | 1.06E-03 | = | 4.48E-03 | 1.95E-03 | 8.08E-04 | = | 3.07E-02 | 7.88E-03 | 1.21E-03 | = |
| WQSP-4 | 46 | 5/21/2024 | 5.77E-01 | 1.80E-01 | 1.35E-03 | = | 2.55E-02 | 9.16E-03 | 1.11E-03 | = | 1.00E-01 | 3.20E-02 | 1.08E-03 | = |
| WQSP-5 | 46 | 5/21/2024 | 4.68E-01 | 1.82E-01 | 1.60E-03 | = | 5.81E-02 | 2.38E-02 | 1.38E-03 | = | 6.94E-02 | 2.80E-02 | 1.59E-03 | = |
| WQSP-6 | 46 | 4/23/2024 | 3.99E-01 | 9.41E-02 | 1.15E-03 | = | 8.55E-03 | 3.11E-03 | 1.01E-03 | = | 6.06E-02 | 1.52E-02 | 1.28E-03 | = |
| Location | Round | Sample Date | $^{238}Pu$ | | | | $^{239/240}Pu$ | | | | $^{241}Am$ | | | |
| | | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| WQSP-1 | 46 | 3/12/2024 | 9.30E-05 | 3.37E-04 | 6.97E-04 | U | -9.28E-05 | 2.29E-04 | 7.92E-04 | U | 3.53E-05 | 3.42E-04 | 8.12E-04 | U |
| WQSP-2 | 46 | 3/19/2024 | 4.02E-05 | 3.05E-04 | 6.70E-04 | U | 5.21E-05 | 2.95E-04 | 7.61E-04 | U | 3.77E-04 | 4.62E-04 | 7.22E-04 | U |
| WQSP-3 | 46 | 4/9/2024 | 3.09E-05 | 2.99E-04 | 6.67E-04 | U | -8.09E-05 | 1.90E-04 | 6.45E-04 | U | 1.76E-04 | 3.64E-04 | 8.07E-04 | U |
| WQSP-4 | 46 | 5/21/2024 | -7.59E-05 | 1.87E-04 | 6.52E-04 | U | -1.32E-04 | 2.47E-04 | 7.80E-04 | U | 1.03E-04 | 7.81E-04 | 1.66E-03 | U |
| WQSP-5 | 46 | 5/14/2024 | -9.04E-05 | 2.18E-04 | 6.67E-04 | U | -1.08E-04 | 2.38E-04 | 7.55E-04 | U | 8.54E-05 | 3.80E-04 | 9.15E-04 | U |
| WQSP-6 | 46 | 4/23/2024 | 5.41E-05 | 3.06E-04 | 6.79E-04 | U | -9.97E-05 | 2.19E-04 | 7.53E-04 | U | -6.95E-05 | 1.87E-04 | 8.33E-04 | U |
| Location | Round | Sample Date | $^{40}K$ | | | | $^{60}Co$ | | | | $^{137}Cs$ | | | |
| | | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| WQSP-1 | 46 | 3/12/2024 | 1.50E+01 | 3.60E+00 | 4.69E+00 | = | 1.68E-02 | 1.56E-01 | 2.65E-01 | U | -1.36E-01 | 1.56E-01 | 2.60E-01 | U |
| WQSP-2 | 46 | 3/19/2024 | 1.15E+01 | 3.06E+00 | 4.01E+00 | = | -4.01E-03 | 1.02E-01 | 2.01E-01 | U | -3.09E-02 | 1.14E-01 | 2.02E-01 | U |
| WQSP-3 | 46 | 4/9/2024 | 4.83E+01 | 1.09E+01 | 9.52E+00 | = | 6.87E-02 | 1.49E+00 | 1.50E+00 | U | -1.70E-01 | 1.05E+00 | 1.31E+00 | U |
| WQSP-4 | 46 | 5/21/2024 | 2.23E+01 | 3.90E+00 | 4.48E+00 | = | 4.41E-03 | 1.00E-01 | 2.00E-01 | U | 9.88E-02 | 1.19E-01 | 2.40E-01 | U |
| WQSP-5 | 46 | 5/14/2024 | 6.40E+00 | 1.45E+01 | 1.81E+01 | U | -7.72E-01 | 1.50E+00 | 1.34E+00 | U | 1.22E+00 | 9.68E-01 | 1.44E+00 | U |
| WQSP-6 | 46 | 4/23/2024 | 5.16E+00 | 2.62E+00 | 4.00E+00 | = | -1.57E-01 | 1.30E-01 | 1.92E-01 | U | 7.42E-02 | 1.47E-01 | 2.71E-01 | U |
| Location | Round | Sample Date | $^{90}Sr$ | | | | | | | | | | | |
| | | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | | | | | | | | |
| WQSP-1 | 46 | 3/12/2024 | -6.48E-03 | 1.87E-02 | 1.73E-02 | U | | | | | | | | |
| WQSP-2 | 46 | 3/19/2024 | 4.92E-03 | 1.86E-02 | 1.72E-02 | U | | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| WQSP-3 | 46 | 4/9/2024 | 4.75E-03 | 1.72E-02 | 1.72E-02 | U |
| WQSP-4 | 46 | 5/21/2024 | -1.79E-02 | 1.97E-02 | 1.65E-02 | U |
| WQSP-5 | 46 | 5/14/2024 | -1.20E-02 | 1.91E-02 | 1.63E-02 | U |
| WQSP-6 | 46 | 4/23/2024 | 4.70E-04 | 1.64E-02 | 1.71E-02 | U |

Notes: Units are Bq/L.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier. Indicates whether radionuclide was detected. Equal sign (=) denotes detected. U denotes undetected. NJ denotes nuclide present at an estimated quantity.

**Table G.7 – Uranium Isotopes Activity in Surface Water Samples Collected on and Near the WIPP Site**

| Location | Sampling Date | $^{233/234}U$ | | | | $^{235}U$ | | | | $^{238}U$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| HIL | 4/24/2024 | 1.36E-02 | 4.37E-03 | 1.22E-03 | = | 9.77E-04 | 8.46E-04 | 7.84E-04 | = | 1.16E-02 | 3.86E-03 | 1.11E-03 | = |
| NOY | 4/24/2024 | 1.93E-02 | 5.86E-03 | 1.21E-03 | = | 6.65E-04 | 7.41E-04 | 9.47E-04 | U | 1.13E-02 | 3.79E-03 | 1.18E-03 | = |
| IDN | 8/1/2024 | 4.90E-03 | 2.36E-03 | 1.25E-03 | = | 1.39E-04 | 5.03E-04 | 1.08E-03 | U | 3.96E-03 | 2.06E-03 | 1.14E-03 | = |
| RLK | 8/1/2024 | 4.14E-03 | 1.97E-03 | 1.19E-03 | = | 1.54E-04 | 4.16E-04 | 8.98E-04 | U | 5.82E-03 | 2.48E-03 | 1.06E-03 | = |
| LST | 11/7/2024 | 1.02E-02 | 3.34E-03 | 1.32E-03 | = | 6.57E-04 | 6.86E-04 | 8.08E-04 | U | 1.19E-02 | 3.77E-03 | 1.07E-03 | = |
| PCN | 4/24/2024 | 2.29E-01 | 5.64E-02 | 1.18E-03 | = | 6.85E-03 | 2.70E-03 | 8.53E-04 | = | 1.01E-01 | 2.54E-02 | 1.11E-03 | = |
| RED | 9/5/2024 | 1.11E-02 | 3.23E-03 | 1.26E-03 | = | 2.56E-04 | 4.51E-04 | 8.55E-04 | U | 8.47E-03 | 2.66E-03 | 9.99E-04 | = |
| CBD | 4/18/2024 | 1.05E-01 | 2.63E-02 | 1.21E-03 | = | 3.98E-03 | 1.92E-03 | 8.70E-04 | = | 4.69E-02 | 1.24E-02 | 1.13E-03 | = |
| BRA | 4/18/2024 | 1.18E-01 | 2.78E-02 | 1.16E-03 | = | 6.17E-03 | 2.43E-03 | 8.65E-04 | = | 6.84E-02 | 1.65E-02 | 1.08E-03 | = |
| COY [6] | 5/9/2024 | 5.93E-02 | 1.40E-02 | 1.17E-03 | = | 1.84E-03 | 1.15E-03 | 7.82E-04 | = | 2.27E-02 | 5.95E-03 | 1.09E-03 | = |
| UPR | 4/18/2024 | 2.06E-01 | 5.22E-02 | 1.20E-03 | = | 8.80E-03 | 3.27E-03 | 8.28E-04 | = | 9.79E-02 | 2.53E-02 | 1.11E-03 | = |
| FWT | 5/9/2024 | 6.00E-02 | 1.60E-02 | 1.20E-03 | = | 1.72E-03 | 1.16E-03 | 7.95E-04 | = | 2.11E-02 | 6.24E-03 | 1.15E-03 | = |
| SWL [5] | 5/9/2024 | 5.23E-03 | 2.13E-03 | 1.22E-03 | = | 1.04E-04 | 4.01E-04 | 8.89E-04 | U | 1.74E-03 | 1.09E-03 | 1.13E-03 | = |
| BHT | 11/7/2024 | 1.01E-02 | 2.94E-03 | 1.23E-03 | = | 8.00E-04 | 6.93E-04 | 7.53E-04 | = | 1.03E-02 | 2.98E-03 | 9.86E-04 | = |

Note. See appendix C for sampling location codes. Units are Bq/L.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier. Indicates whether radionuclide was detected. Equal sign (=) denotes detected. U denotes undetected.
5. Surface water composite consisting of Settling Lagoons 1 and 2, Effluent Lagoons A, B, and C, and Polishing Lagoons 1 and 2, as available.
6. Semi-blind field duplicate.

**Table G.8 – Plutonium and Americium Activity in Surface Water Samples Collected on and Near the WIPP Site**

| Location | Sample Date | $^{238}Pu$ | | | | $^{239/240}Pu$ | | | | $^{241}Am$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| HIL | 4/24/2024 | -1.07E-04 | 2.30E-04 | 7.95E-04 | U | 2.81E-04 | 4.91E-04 | 7.33E-04 | U | -1.26E-04 | 2.56E-04 | 8.53E-04 | U |
| NOY | 4/24/2024 | 2.05E-04 | 3.80E-04 | 6.02E-04 | U | 4.18E-05 | 3.18E-04 | 7.19E-04 | U | 2.95E-04 | 4.76E-04 | 8.55E-04 | U |
| IDN | 8/1/2024 | -4.99E-05 | 1.55E-04 | 6.09E-04 | U | -9.14E-05 | 2.10E-04 | 6.95E-04 | U | 2.90E-04 | 4.26E-04 | 7.77E-04 | U |
| RLK | 8/1/2024 | -9.50E-05 | 2.18E-04 | 6.97E-04 | U | -8.63E-05 | 2.08E-04 | 6.90E-04 | U | 1.83E-04 | 3.68E-04 | 7.21E-04 | U |
| LST | 11/7/2024 | -6.53E-05 | 1.75E-04 | 6.28E-04 | U | 5.30E-05 | 3.00E-04 | 6.85E-04 | U | 1.43E-04 | 4.04E-04 | 8.07E-04 | U |
| PCN | 4/24/2024 | 3.19E-05 | 3.56E-04 | 7.76E-04 | U | 4.55E-05 | 3.45E-04 | 7.41E-04 | U | 4.20E-04 | 5.29E-04 | 8.13E-04 | U |
| RED | 9/5/2024 | -5.27E-05 | 1.51E-04 | 6.03E-04 | U | -6.02E-05 | 1.62E-04 | 6.09E-04 | U | -7.83E-05 | 1.93E-04 | 8.75E-04 | U |
| CBD | 4/18/2024 | -7.06E-05 | 1.70E-04 | 5.32E-04 | U | -8.45E-05 | 1.85E-04 | 6.03E-04 | U | 6.23E-04 | 6.11E-04 | 7.65E-04 | U |
| BRA | 4/18/2024 | -1.12E-04 | 2.27E-04 | 7.15E-04 | U | 1.51E-04 | 3.87E-04 | 7.09E-04 | U | 5.99E-04 | 6.14E-04 | 7.87E-04 | U |
| COY [6] | 5/9/2024 | -6.24E-05 | 1.73E-04 | 6.04E-04 | U | -5.40E-05 | 1.61E-04 | 7.19E-04 | U | 2.63E-04 | 4.85E-04 | 8.82E-04 | U |
| UPR | 4/18/2024 | -1.05E-04 | 2.21E-04 | 7.60E-04 | U | -8.85E-05 | 2.03E-04 | 6.87E-04 | U | 4.96E-04 | 5.26E-04 | 7.13E-04 | U |
| FWT | 5/9/2024 | -7.90E-05 | 1.95E-04 | 6.75E-04 | U | -1.37E-04 | 2.57E-04 | 8.09E-04 | U | 2.04E-04 | 3.77E-04 | 7.48E-04 | U |
| SWL [5] | 5/9/2024 | -4.65E-05 | 1.44E-04 | 5.83E-04 | U | 3.48E-05 | 2.97E-04 | 6.21E-04 | U | 1.60E-04 | 3.98E-04 | 7.77E-04 | U |
| BHT | 11/7/2024 | 7.29E-05 | 2.82E-04 | 6.40E-04 | U | 4.21E-04 | 5.11E-04 | 6.66E-04 | U | 7.34E-05 | 3.04E-04 | 7.70E-04 | U |

Note. See appendix C for sampling location codes. Units are Bq/L.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier. Indicates whether radionuclide was detected. U denotes undetected.
5. Surface water composite consisting of Settling Lagoons 1 and 2, Effluent Lagoons A, B, and C, and Polishing Lagoons 1 and 2.
6. Semi-blind field duplicate.

## Table G.9 – Gamma Radionuclides and $^{90}Sr$ Activity in Surface Water Samples Collected on and Near the WIPP Site

*(Refer to the end of the table for notes)*

| Location | Sample Date | $^{40}K$ | | | | $^{60}Co$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| HIL | 4/24/2024 | 2.51E+00 | 1.61E+00 | 3.37E+00 | U | 5.00E-03 | 1.04E-01 | 1.96E-01 | U |
| NOY | 4/24/2024 | 1.99E+00 | 1.43E+00 | 3.05E+00 | U | -1.38E-01 | 1.16E-01 | 1.82E-01 | U |
| RLK | 8/1/2024 | 9.90E-01 | 1.62E+00 | 3.19E+00 | U | -1.27E-02 | 1.21E-01 | 2.07E-01 | U |
| IDN | 8/1/2024 | 4.16E+00 | 1.57E+00 | 3.60E+00 | = | -4.37E-03 | 1.11E-01 | 2.03E-01 | U |
| LST | 11/7/2024 | 2.01E+00 | 1.56E+00 | 3.28E+00 | U | -4.23E-02 | 1.35E-01 | 1.91E-01 | U |
| PCN | 4/24/2024 | 1.22E+01 | 2.52E+00 | 5.89E+00 | = | 3.40E-02 | 1.46E-01 | 2.61E-01 | U |
| RED | 9/5/2024 | 1.60E+01 | 1.16E+01 | 1.78E+01 | U | -3.04E-01 | 1.57E+00 | 1.66E+00 | U |
| CBD | 4/18/2024 | 2.19E+00 | 1.39E+00 | 3.06E+00 | U | 7.45E-02 | 1.15E-01 | 2.17E-01 | U |
| BRA | 4/18/2024 | 1.41E+00 | 1.39E-01 | 1.60E+00 | U | -4.99E-01 | 1.32E+00 | 1.33E+00 | U |
| COY [6] | 5/9/2024 | 1.94E+00 | 1.40E+00 | 3.02E+00 | U | -1.35E-01 | 1.25E-01 | 1.88E-01 | U |
| UPR | 4/18/2024 | 2.88E-01 | 1.25E+00 | 2.47E+00 | U | 6.01E-02 | 1.32E-01 | 2.11E-01 | U |
| FWT | 5/9/2024 | 5.22E-01 | 1.04E+00 | 2.20E+00 | U | 6.56E-03 | 1.23E-01 | 2.15E-01 | U |
| SWL [5] | 5/9/2024 | 6.99E+00 | 2.54E+00 | 3.54E+00 | = | 1.37E-01 | 1.07E-01 | 2.33E-01 | U |
| BHT | 11/7/2024 | 1.02E+00 | 1.43E+00 | 2.87E+00 | U | 4.99E-04 | 1.32E-01 | 2.05E-01 | U |

| Location | Sample Date | $^{137}Cs$ | | | | $^{90}Sr$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| HIL | 4/24/2024 | 9.96E-03 | 1.37E-01 | 2.31E-01 | U | 3.62E-03 | 1.75E-02 | 1.67E-02 | U |
| NOY | 4/24/2024 | 1.00E-02 | 1.31E-01 | 2.44E-01 | U | -8.44E-03 | 2.43E-02 | 1.78E-02 | U |
| RLK | 8/1/2024 | 5.95E-02 | 1.21E-01 | 2.26E-01 | U | 1.00E-02 | 2.75E-02 | 1.68E-02 | U |
| IDN | 8/1/2024 | -7.79E-02 | 1.18E-01 | 1.93E-01 | U | 1.12E-03 | 2.70E-02 | 1.67E-02 | U |
| LST | 11/7/2024 | 3.44E-03 | 1.23E-01 | 2.18E-01 | U | 1.60E-02 | 2.46E-02 | 1.40E-02 | U |
| PCN | 4/24/2024 | 8.28E-02 | 1.57E-01 | 2.88E-01 | U | 6.53E-03 | 2.37E-02 | 1.75E-02 | U |
| RED | 9/5/2024 | -2.25E-01 | 1.08E+00 | 1.29E+00 | U | -5.04E-03 | 2.04E-02 | 1.36E-02 | U |
| CBD | 4/18/2024 | 2.19E-02 | 1.10E-01 | 2.13E-01 | U | 1.59E-03 | 2.01E-02 | 1.71E-02 | U |
| BRA | 4/18/2024 | -1.86E-01 | 9.98E-01 | 1.23E+00 | U | -8.03E-03 | 2.05E-02 | 1.73E-02 | U |
| COY [6] | 5/9/2024 | -7.19E-02 | 1.30E-01 | 2.25E-01 | U | 1.11E-03 | 1.78E-02 | 1.67E-02 | U |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| UPR | 4/18/2024 | -3.51E-02 | 1.28E-01 | 2.31E-01 | U | -6.86E-04 | 1.83E-02 | 1.69E-02 | U |
| FWT | 5/9/2024 | -2.72E-02 | 1.32E-01 | 2.41E-01 | U | 3.56E-03 | 1.73E-02 | 1.67E-02 | U |
| SWL [5] | 5/9/2024 | 8.40E-03 | 1.10E-01 | 2.10E-01 | U | 4.95E-03 | 1.74E-02 | 1.67E-02 | U |
| BHT | 11/7/2024 | 3.69E-02 | 1.22E-01 | 2.23E-01 | U | -5.48E-03 | 2.05E-02 | 1.35E-02 | U |

Note. See appendix C for sampling location codes. Units are Bq/L.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier. Indicates whether radionuclide was detected. Equal sign (=) denotes detected. U denotes undetected.
5. Surface water composite consisting of Settling Lagoons 1 and 2, Effluent Lagoons A, B, and C, and Polishing Lagoons 1 and 2.
6. Semi-blind field duplicate.

# Table G.10 – Uranium Activity in Sediment Samples Collected Near the WIPP Site

| Location | Sample Date | $^{233/234}U$ | | | | $^{235}U$ | | | | $^{238}U$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| HIL | 4/24/2024 | 1.74E-02 | 5.20E-03 | 9.86E-04 | = | 6.38E-04 | 5.36E-04 | 5.80E-04 | = | 1.67E-02 | 5.02E-03 | 7.57E-04 | = |
| NOY | 4/24/2024 | 2.39E-02 | 1.16E-02 | 1.16E-03 | = | 9.48E-04 | 9.16E-04 | 8.30E-04 | = | 2.36E-02 | 1.14E-02 | 9.48E-04 | = |
| RLK | 8/1/2024 | 1.45E-02 | 3.62E-03 | 9.25E-04 | = | 9.43E-04 | 5.74E-04 | 5.36E-04 | = | 1.60E-02 | 3.94E-03 | 7.91E-04 | = |
| IDN | 8/1/2024 | 1.60E-02 | 4.39E-03 | 9.63E-04 | = | 8.57E-04 | 5.98E-04 | 5.93E-04 | = | 1.58E-02 | 4.35E-03 | 8.36E-04 | = |
| LST | 11/7/2024 | 1.33E-02 | 7.16E-03 | 1.48E-03 | = | 2.04E-03 | 1.62E-03 | 9.96E-04 | = | 1.16E-02 | 6.30E-03 | 1.22E-03 | = |
| PCN | 4/24/2024 | 2.30E-02 | 7.12E-03 | 9.99E-04 | = | 1.40E-03 | 8.50E-04 | 5.94E-04 | = | 2.50E-02 | 7.69E-03 | 7.70E-04 | = |
| RED | 9/5/2024 | 1.61E-02 | 5.36E-03 | 1.27E-03 | = | 8.90E-04 | 6.94E-04 | 6.62E-04 | = | 1.65E-02 | 5.51E-03 | 9.32E-04 | = |
| RED Dup | 9/5/2024 | 1.22E-02 | 6.16E-03 | 1.43E-03 | = | 7.86E-04 | 8.57E-04 | 9.35E-04 | U | 1.60E-02 | 7.85E-03 | 1.06E-03 | = |
| BHT | 9/5/2024 | 1.28E-02 | 8.22E-03 | 1.52E-03 | = | 8.16E-04 | 9.74E-04 | 9.70E-04 | U | 9.43E-03 | 6.21E-03 | 1.23E-03 | = |
| CBD | 4/18/2024 | 1.14E-02 | 3.43E-03 | 9.81E-04 | = | 1.46E-04 | 3.03E-04 | 5.67E-04 | U | 1.23E-02 | 3.64E-03 | 7.74E-04 | = |
| BRA | 4/18/2024 | 2.24E-02 | 8.67E-03 | 1.13E-03 | = | 1.19E-03 | 9.07E-04 | 7.15E-04 | = | 2.24E-02 | 8.68E-03 | 8.29E-04 | = |
| UPR | 4/18/2024 | 2.49E-02 | 7.74E-03 | 1.01E-03 | = | 1.52E-03 | 9.07E-04 | 6.07E-04 | = | 2.42E-02 | 7.52E-03 | 7.67E-04 | = |

Note. See appendix C for sampling location codes. Units are in becquerels per gram (Bq/g), dry weight.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier. Indicates whether radionuclide was detected. Equal sign (=) denotes detected. U denotes undetected.

## Table G.11 – Plutonium and Americium Activity in Sediment Samples Collected Near the WIPP Site

| Location | Sample Date | $^{238}$Pu | | | | $^{239/240}$Pu | | | | $^{241}$Am | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| HIL | 4/24/2024 | 1.28E-05 | 1.43E-04 | 3.50E-04 | U | 1.83E-04 | 2.33E-04 | 3.51E-04 | U | 1.85E-04 | 3.63E-04 | 6.90E-04 | U |
| NOY | 4/24/2024 | 1.47E-04 | 2.33E-04 | 3.70E-04 | U | -6.18E-06 | 1.76E-04 | 4.36E-04 | U | -1.16E-04 | 2.68E-04 | 1.09E-03 | U |
| RLK | 8/1/2024 | 1.21E-04 | 2.49E-04 | 4.17E-04 | U | -4.81E-05 | 1.08E-04 | 4.06E-04 | U | 4.02E-05 | 1.93E-04 | 5.81E-04 | U |
| IDN | 8/1/2024 | -3.93E-05 | 9.97E-05 | 3.80E-04 | U | 3.34E-04 | 3.41E-04 | 4.36E-04 | U | 2.39E-05 | 1.89E-04 | 6.14E-04 | U |
| LST | 11/7/2024 | -3.16E-05 | 9.09E-05 | 4.31E-04 | U | 1.15E-04 | 2.02E-04 | 3.98E-04 | U | -3.49E-05 | 9.68E-05 | 5.81E-04 | U |
| PCN | 4/24/2024 | 2.62E-05 | 1.26E-04 | 3.04E-04 | U | 2.96E-05 | 1.23E-04 | 3.51E-04 | U | -1.25E-04 | 2.61E-04 | 8.83E-04 | U |
| RED | 9/5/2024 | -2.69E-05 | 8.03E-05 | 4.03E-04 | U | 8.68E-05 | 1.96E-04 | 4.28E-04 | U | 2.09E-04 | 2.74E-04 | 5.82E-04 | U |
| RED Dup | 9/5/2024 | 1.55E-05 | 1.50E-04 | 4.05E-04 | U | 2.51E-05 | 1.42E-04 | 3.93E-04 | U | 1.92E-05 | 1.45E-04 | 5.42E-04 | U |
| BHT | 9/5/2024 | 5.33E-05 | 1.36E-04 | 3.92E-04 | U | 8.94E-05 | 2.02E-04 | 4.19E-04 | U | 9.18E-05 | 1.96E-04 | 5.37E-04 | U |
| CBD | 4/18/2024 | -5.02E-05 | 1.08E-04 | 4.03E-04 | U | 1.20E-05 | 1.58E-04 | 3.87E-04 | U | 7.62E-05 | 3.97E-04 | 8.81E-04 | U |
| BRA | 4/18/2024 | -2.00E-06 | 1.68E-04 | 3.93E-04 | U | 8.39E-05 | 1.90E-04 | 3.75E-04 | U | 6.69E-05 | 4.58E-04 | 1.01E-03 | U |
| UPR | 4/18/2024 | 4.11E-05 | 1.49E-04 | 3.51E-04 | U | -4.32E-05 | 1.04E-04 | 4.09E-04 | U | -1.02E-04 | 2.67E-04 | 1.10E-03 | U |

Note. See appendix C for sampling location codes. Units are in Bq/g, dry weight.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier. Indicates whether radionuclide was detected. U denotes undetected.

## Table G.12 – Gamma Radionuclides and $^{90}$Sr Activity in Sediment Samples Collected Near the WIPP Site

*(Refer to the end of the table for notes)*

| Location | Sample Date | $^{40}$K | | | | $^{60}$Co | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| HIL | 4/24/2024 | 7.35E-01 | 4.44E-02 | 2.56E-02 | = | -2.72E-04 | 7.96E-04 | 1.44E-03 | U |
| NOY | 4/24/2024 | 9.00E-01 | 6.55E-02 | 2.41E-02 | = | 2.95E-04 | 1.52E-03 | 2.96E-03 | U |
| RLK | 8/1/2024 | 6.42E-01 | 3.95E-02 | 2.48E-02 | = | 1.90E-04 | 7.00E-04 | 1.35E-03 | U |
| IDN | 8/1/2024 | 4.07E-01 | 2.97E-02 | 1.89E-02 | = | 1.50E-04 | 7.25E-04 | 1.37E-03 | U |
| LST | 11/7/2024 | 4.23E-01 | 3.06E-02 | 1.85E-02 | = | 5.50E-04 | 6.02E-04 | 1.27E-03 | U |
| PCN | 4/24/2024 | 5.13E-01 | 3.63E-02 | 2.25E-02 | = | 2.43E-04 | 7.62E-04 | 1.42E-03 | U |
| RED | 9/5/2024 | 3.87E-01 | 2.87E-02 | 1.76E-02 | = | 5.44E-04 | 6.57E-04 | 1.35E-03 | U |
| RED Dup | 9/5/2024 | 3.41E-01 | 2.63E-02 | 1.64E-02 | = | -4.53E-05 | 6.71E-04 | 1.10E-03 | U |
| BHT | 9/5/2024 | 5.25E-01 | 3.51E-02 | 2.23E-02 | = | -9.28E-05 | 7.83E-04 | 1.44E-03 | U |
| CBD | 4/18/2024 | 2.25E-01 | 2.53E-02 | 1.99E-02 | = | 5.40E-04 | 5.93E-04 | 1.34E-03 | U |
| BRA | 4/18/2024 | 4.30E-01 | 2.70E-02 | 1.49E-02 | = | -1.50E-04 | 4.74E-04 | 8.59E-04 | U |
| UPR | 4/18/2024 | 4.21E-01 | 4.17E-02 | 1.91E-02 | = | 6.68E-04 | 7.43E-04 | 1.47E-03 | U |
| **Location** | **Sample Date** | **137Cs** | | | | **$^{90}$Sr** | | | |
| | | **[RN] [1]** | **2 σ TPU [2]** | **MDC [3]** | **Q [4]** | **[RN] [1]** | **2 σ TPU [2]** | **MDC [3]** | **Q [4]** |
| HIL | 4/24/2024 | 3.80E-03 | 1.31E-03 | 2.00E-03 | = | -1.12E-03 | 9.54E-03 | 1.57E-02 | U |
| NOY | 4/24/2024 | 1.65E-03 | 1.21E-03 | 2.48E-03 | U | 2.81E-03 | 9.82E-03 | 1.57E-02 | U |
| RLK | 8/1/2024 | 1.13E-04 | 7.96E-04 | 1.39E-03 | U | -1.94E-03 | 9.60E-03 | 1.57E-02 | U |
| IDN | 8/1/2024 | 9.75E-04 | 8.89E-04 | 1.68E-03 | U | -4.75E-03 | 9.84E-03 | 1.57E-02 | U |
| LST | 11/7/2024 | 1.13E-03 | 9.44E-04 | 1.55E-03 | U | 1.96E-03 | 7.93E-03 | 1.19E-02 | U |
| PCN | 4/24/2024 | 2.81E-04 | 7.43E-04 | 1.39E-03 | U | 5.91E-03 | 9.73E-03 | 1.57E-02 | U |
| RED | 9/5/2024 | 9.56E-04 | 9.09E-04 | 1.50E-03 | U | 1.25E-03 | 7.85E-03 | 1.19E-02 | U |
| RED Dup | 9/5/2024 | 1.53E-03 | 7.41E-04 | 1.46E-03 | = | -1.55E-03 | 7.63E-03 | 1.19E-02 | U |
| BHT | 9/5/2024 | 1.67E-03 | 9.30E-04 | 1.77E-03 | U | -3.79E-03 | 7.68E-03 | 1.19E-02 | U |
| CBD | 4/18/2024 | 1.71E-05 | 5.45E-04 | 1.02E-03 | U | -8.62E-04 | 9.51E-03 | 1.56E-02 | U |
| BRA | 4/18/2024 | 5.50E-04 | 6.20E-04 | 1.13E-03 | U | 5.97E-04 | 9.65E-03 | 1.57E-02 | U |
| UPR | 4/18/2024 | -3.11E-04 | 7.20E-04 | 1.26E-03 | U | -6.53E-03 | 9.26E-03 | 1.57E-02 | U |

Note. See appendix C for sampling location codes. Units are in Bq/g, dry weight.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier. Indicates whether radionuclide was detected. Equal sign (=) denotes detected. U denotes undetected.

## Table G.13 – Uranium Activity in Soil Samples Collected on and Near the WIPP Site

| Location | Depth (cm) | Sample Date | $^{233/234}U$ | | | | $^{235}U$ | | | | $^{238}U$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| WFF | 0–2 | 3/21/2024 | 6.31E-03 | 2.36E-03 | 1.04E-03 | = | 7.65E-04 | 6.13E-04 | 6.14E-04 | = | 6.11E-03 | 2.30E-03 | 1.03E-03 | = |
| WFF | 2–5 | 3/21/2024 | 5.10E-03 | 1.53E-03 | 9.72E-04 | = | 2.76E-04 | 2.98E-04 | 4.86E-04 | U | 5.48E-03 | 1.62E-03 | 9.61E-04 | = |
| WFF | 5–10 | 3/21/2024 | 4.49E-03 | 1.47E-03 | 9.81E-04 | = | 1.42E-04 | 2.26E-04 | 4.98E-04 | U | 5.59E-03 | 1.74E-03 | 9.68E-04 | = |
| WFF Dup | 0–2 | 3/21/2024 | 7.75E-03 | 2.67E-03 | 1.04E-03 | = | 6.59E-04 | 5.42E-04 | 5.64E-04 | = | 6.44E-03 | 2.30E-03 | 1.03E-03 | = |
| WFF Dup | 2–5 | 3/21/2024 | 5.66E-03 | 1.90E-03 | 1.01E-03 | = | 6.37E-05 | 1.92E-04 | 5.45E-04 | U | 6.63E-03 | 2.15E-03 | 9.93E-04 | = |
| WFF Dup | 5–10 | 3/21/2024 | 9.04E-03 | 3.01E-03 | 1.03E-03 | = | 6.59E-04 | 5.63E-04 | 6.21E-04 | = | 1.02E-02 | 3.33E-03 | 1.03E-03 | = |
| MLR | 0–2 | 4/11/2024 | 1.41E-02 | 3.70E-03 | 9.91E-04 | = | 8.56E-04 | 5.73E-04 | 5.32E-04 | = | 1.57E-02 | 4.04E-03 | 9.82E-04 | = |
| MLR | 2–5 | 4/11/2024 | 1.36E-02 | 3.35E-03 | 9.79E-04 | = | 5.53E-04 | 4.32E-04 | 5.02E-04 | = | 1.48E-02 | 3.61E-03 | 9.68E-04 | = |
| MLR | 5–10 | 4/11/2024 | 1.32E-02 | 3.38E-03 | 9.00E-04 | = | 6.68E-04 | 4.86E-04 | 5.15E-04 | = | 1.59E-02 | 3.97E-03 | 9.99E-04 | = |
| WEE | 0–2 | 3/21/2024 | 6.39E-03 | 2.57E-03 | 1.06E-03 | = | 8.53E-04 | 6.95E-04 | 7.24E-04 | = | 5.94E-03 | 2.41E-03 | 1.06E-03 | = |
| WEE | 2–5 | 3/21/2024 | 6.66E-03 | 2.49E-03 | 1.03E-03 | = | 9.77E-04 | 7.09E-04 | 5.99E-04 | = | 6.37E-03 | 2.40E-03 | 1.04E-03 | = |
| WEE | 5–10 | 3/21/2024 | 7.98E-03 | 3.00E-03 | 1.06E-03 | = | 5.32E-04 | 5.18E-04 | 6.21E-04 | U | 7.85E-03 | 2.96E-03 | 1.05E-03 | = |
| SMR | 0–2 | 4/11/2024 | 2.12E-02 | 5.39E-03 | 9.08E-04 | = | 1.47E-03 | 7.55E-04 | 5.05E-04 | = | 2.16E-02 | 5.48E-03 | 9.94E-04 | = |
| SMR | 2–5 | 4/11/2024 | 2.14E-02 | 5.74E-03 | 9.12E-04 | = | 1.08E-03 | 6.57E-04 | 5.34E-04 | = | 2.31E-02 | 6.16E-03 | 1.01E-03 | = |
| SMR | 5–10 | 4/11/2024 | 1.94E-02 | 5.34E-03 | 9.25E-04 | = | 1.21E-03 | 7.15E-04 | 5.45E-04 | = | 1.99E-02 | 5.46E-03 | 1.02E-03 | = |
| SEC | 0–2 | 4/11/2024 | 1.23E-02 | 3.44E-03 | 9.22E-04 | = | 2.90E-04 | 3.61E-04 | 5.67E-04 | U | 1.18E-02 | 3.32E-03 | 1.01E-03 | = |
| SEC | 2–5 | 4/11/2024 | 9.28E-03 | 2.69E-03 | 9.00E-04 | = | 5.65E-04 | 4.48E-04 | 5.05E-04 | = | 1.17E-02 | 3.26E-03 | 1.00E-03 | = |
| SEC | 5–10 | 4/11/2024 | 1.12E-02 | 2.83E-03 | 8.91E-04 | = | 4.93E-04 | 4.06E-04 | 5.02E-04 | U | 1.28E-02 | 3.16E-03 | 9.88E-04 | = |
| WSS | 0–2 | 3/21/2024 | 7.45E-03 | 2.64E-03 | 1.03E-03 | = | 5.82E-04 | 5.18E-04 | 6.14E-04 | U | 6.45E-03 | 2.34E-03 | 1.02E-03 | = |
| WSS | 2–5 | 3/21/2024 | 7.15E-03 | 2.83E-03 | 1.08E-03 | = | 5.33E-04 | 5.35E-04 | 6.42E-04 | U | 7.39E-03 | 2.91E-03 | 1.07E-03 | = |
| WSS | 5–10 | 3/21/2024 | 7.57E-03 | 2.53E-03 | 1.03E-03 | = | 1.37E-03 | 8.02E-04 | 5.91E-04 | = | 8.96E-03 | 2.90E-03 | 1.01E-03 | = |

Note. See appendix C for sampling location codes. Units are in Bq/g, dry weight.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier indicates whether radionuclide was detected. Equal sign (=) denotes detected; U denotes undetected.

## Table G.14 – Plutonium and Americium Activity in Soil Samples Collected on and Near the WIPP Site

| Location | Depth (cm) | Sample Date | $^{238}$Pu | | | | $^{239/240}$Pu | | | | $^{241}$Am | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| WFF | 0–2 | 3/21/2024 | 2.06E-05 | 1.41E-04 | 3.46E-04 | U | 1.27E-04 | 2.13E-04 | 3.77E-04 | U | 3.22E-04 | 3.13E-04 | 6.04E-04 | U |
| WFF | 2–5 | 3/21/2024 | -3.38E-05 | 9.09E-05 | 3.50E-04 | U | -4.00E-05 | 9.88E-05 | 4.08E-04 | U | 1.75E-04 | 4.10E-04 | 8.65E-04 | U |
| WFF | 5–10 | 3/21/2024 | -4.15E-05 | 9.30E-05 | 3.36E-04 | U | 1.85E-04 | 2.27E-04 | 3.67E-04 | U | 1.60E-04 | 3.41E-04 | 7.63E-04 | U |
| WFF Dup | 0–2 | 3/21/2024 | 3.01E-05 | 1.44E-04 | 3.52E-04 | U | 7.99E-05 | 1.92E-04 | 3.86E-04 | U | 2.33E-04 | 3.92E-04 | 8.06E-04 | U |
| WFF Dup | 2–5 | 3/21/2024 | -3.24E-05 | 8.70E-05 | 3.39E-04 | U | 2.22E-05 | 1.52E-04 | 4.13E-04 | U | 1.20E-04 | 2.90E-04 | 7.40E-04 | U |
| WFF Dup | 5–10 | 3/21/2024 | -3.58E-05 | 8.82E-05 | 3.33E-04 | U | 2.98E-04 | 2.89E-04 | 3.74E-04 | U | 1.15E-05 | 2.31E-04 | 7.26E-04 | U |
| MLR | 0–2 | 4/11/2024 | -3.44E-05 | 8.98E-05 | 3.81E-04 | U | 4.02E-04 | 3.29E-04 | 3.64E-04 | = | 1.46E-05 | 2.93E-04 | 8.61E-04 | U |
| MLR | 2–5 | 4/11/2024 | -2.10E-05 | 7.13E-05 | 3.45E-04 | U | 2.32E-04 | 2.58E-04 | 3.84E-04 | U | 2.00E-04 | 2.74E-04 | 6.42E-04 | U |
| MLR | 5–10 | 4/11/2024 | -3.32E-05 | 8.91E-05 | 3.56E-04 | U | 2.03E-04 | 2.66E-04 | 4.07E-04 | U | 3.03E-04 | 3.29E-04 | 6.62E-04 | U |
| WEE | 0–2 | 3/21/2024 | -6.46E-05 | 1.25E-04 | 4.03E-04 | U | 2.50E-05 | 1.55E-04 | 3.98E-04 | U | 1.54E-04 | 2.27E-04 | 6.02E-04 | U |
| WEE | 2–5 | 3/21/2024 | -4.60E-05 | 1.03E-04 | 3.73E-04 | U | 2.00E-04 | 2.55E-04 | 3.85E-04 | U | 8.16E-05 | 1.90E-04 | 6.16E-04 | U |
| WEE | 5–10 | 3/21/2024 | -3.25E-05 | 1.01E-04 | 4.27E-04 | U | 2.43E-05 | 2.07E-04 | 4.70E-04 | U | 4.21E-05 | 1.63E-04 | 6.34E-04 | U |
| SMR | 0–2 | 4/11/2024 | -2.39E-05 | 8.14E-05 | 3.85E-04 | U | 9.32E-05 | 2.31E-04 | 4.62E-04 | U | 1.12E-04 | 2.01E-04 | 6.17E-04 | U |
| SMR | 2–5 | 4/11/2024 | -4.22E-05 | 1.02E-04 | 4.01E-04 | U | 3.88E-04 | 3.52E-04 | 4.41E-04 | U | 3.21E-04 | 3.34E-04 | 6.43E-04 | U |
| SMR | 5–10 | 4/11/2024 | 8.98E-05 | 1.76E-04 | 3.27E-04 | U | 1.39E-04 | 2.13E-04 | 3.73E-04 | U | 3.94E-04 | 3.59E-04 | 6.45E-04 | U |
| SEC | 0–2 | 4/11/2024 | -3.15E-05 | 8.48E-05 | 3.35E-04 | U | 1.99E-04 | 2.51E-04 | 3.91E-04 | U | 1.93E-04 | 2.43E-04 | 6.03E-04 | U |
| SEC | 2–5 | 4/11/2024 | -2.61E-05 | 7.78E-05 | 3.47E-04 | U | 2.02E-04 | 2.55E-04 | 3.90E-04 | U | 8.25E-05 | 2.05E-04 | 6.18E-04 | U |
| SEC | 5–10 | 4/11/2024 | 2.91E-05 | 1.40E-04 | 3.59E-04 | U | 2.89E-04 | 3.05E-04 | 4.13E-04 | U | 3.81E-05 | 1.38E-04 | 5.98E-04 | U |
| WSS | 0–2 | 3/21/2024 | 2.34E-05 | 1.60E-04 | 3.76E-04 | U | 5.74E-05 | 2.20E-04 | 4.56E-04 | U | 4.00E-05 | 1.55E-04 | 6.15E-04 | U |
| WSS | 2–5 | 3/21/2024 | -4.28E-05 | 1.19E-04 | 4.35E-04 | U | 4.83E-05 | 2.00E-04 | 5.24E-04 | U | 5.10E-05 | 1.30E-04 | 5.89E-04 | U |
| WSS | 5–10 | 3/21/2024 | -4.72E-05 | 1.11E-04 | 4.28E-04 | U | -3.81E-05 | 9.95E-05 | 4.28E-04 | U | 1.69E-04 | 2.09E-04 | 6.07E-04 | U |

Note. See appendix C for sampling location codes. Units are in Bq/g, dry weight.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier indicates whether radionuclide was detected. Equal sign (=) denotes detected; U denotes undetected.

**Table G.15 – Gamma Radionuclides and $^{90}Sr$ Activity in Soil Samples Collected on and Near the WIPP Site**

| Location | Depth (cm) | Sample Date | $^{40}K$ | | | | $^{60}Co$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| WFF | 0–2 | 3/21/2024 | 1.82E-01 | 1.93E-02 | 1.59E-02 | = | 1.39E-04 | 5.62E-04 | 9.97E-04 | U |
| WFF | 2–5 | 3/21/2024 | 1.86E-01 | 1.87E-02 | 1.44E-02 | = | -8.01E-05 | 4.47E-04 | 8.54E-04 | U |
| WFF | 5–10 | 3/21/2024 | 1.64E-01 | 2.16E-02 | 1.45E-02 | = | 2.38E-04 | 6.97E-04 | 1.45E-03 | U |
| WFF Dup | 0–2 | 3/21/2024 | 1.81E-01 | 1.85E-02 | 1.52E-02 | = | -2.33E-05 | 4.94E-04 | 8.73E-04 | U |
| WFF Dup | 2–5 | 3/21/2024 | 1.96E-01 | 2.04E-02 | 1.77E-02 | = | 3.52E-04 | 5.75E-04 | 1.08E-03 | U |
| WFF Dup | 5–10 | 3/21/2024 | 1.52E-01 | 2.15E-02 | 1.61E-02 | = | -4.36E-04 | 7.47E-04 | 1.27E-03 | U |
| MLR | 0–2 | 4/11/2024 | 3.92E-01 | 2.80E-02 | 1.78E-02 | = | 2.60E-04 | 6.14E-04 | 1.18E-03 | U |
| MLR | 2–5 | 4/11/2024 | 4.30E-01 | 4.38E-02 | 2.13E-02 | = | 3.04E-05 | 8.10E-04 | 1.50E-03 | U |
| MLR | 5–10 | 4/11/2024 | 3.94E-01 | 2.92E-02 | 1.93E-02 | = | 2.45E-04 | 6.07E-04 | 1.22E-03 | U |
| WEE | 0–2 | 3/21/2024 | 2.27E-01 | 2.22E-02 | 1.87E-02 | = | 3.82E-04 | 5.58E-04 | 1.15E-03 | U |
| WEE | 2–5 | 3/21/2024 | 2.03E-01 | 1.94E-02 | 1.56E-02 | = | -4.16E-04 | 4.50E-04 | 7.54E-04 | U |
| WEE | 5–10 | 3/21/2024 | 1.78E-01 | 2.33E-02 | 1.52E-02 | = | -3.18E-04 | 9.10E-04 | 1.58E-03 | U |
| SMR | 0–2 | 4/11/2024 | 7.62E-01 | 5.46E-02 | 2.59E-02 | = | 1.05E-03 | 1.15E-03 | 2.26E-03 | U |
| SMR | 2–5 | 4/11/2024 | 6.34E-01 | 3.92E-02 | 1.64E-02 | = | -4.89E-04 | 8.60E-04 | 1.42E-03 | U |
| SMR | 5–10 | 4/11/2024 | 6.51E-01 | 3.83E-02 | 2.02E-02 | = | 8.73E-05 | 6.44E-04 | 1.14E-03 | U |
| SEC | 0–2 | 4/11/2024 | 2.08E-01 | 2.53E-02 | 1.76E-02 | = | 2.47E-04 | 6.99E-04 | 1.43E-03 | U |
| SEC | 2–5 | 4/11/2024 | 1.69E-01 | 1.77E-03 | 1.55E-02 | = | -1.86E-04 | 5.84E-04 | 9.60E-04 | U |
| SEC | 5–10 | 4/11/2024 | 2.34E-01 | 2.22E-02 | 1.67E-02 | = | 3.87E-04 | 6.07E-04 | 1.19E-03 | U |
| WSS | 0–2 | 3/21/2024 | 2.34E-01 | 2.19E-02 | 1.70E-02 | = | 3.66E-04 | 4.86E-04 | 1.04E-03 | U |
| WSS | 2–5 | 3/21/2024 | 2.25E-01 | 2.73E-02 | 1.81E-02 | = | -1.86E-04 | 6.21E-04 | 1.11E-03 | U |
| WSS | 5–10 | 3/21/2024 | 1.78E-01 | 1.93E-02 | 1.62E-02 | = | 3.85E-04 | 5.78E-04 | 1.14E-03 | U |
| **Location** | **Depth (cm)** | **Sample Date** | $^{137}Cs$ | | | | $^{90}Sr$ | | | |
| | | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| WFF | 0–2 | 3/21/2024 | 1.22E-03 | 6.22E-04 | 1.28E-03 | U | -3.12E-03 | 1.20E-02 | 1.68E-02 | U |
| WFF | 2–5 | 3/21/2024 | 1.51E-03 | 8.23E-04 | 1.29E-03 | = | 1.85E-03 | 1.25E-02 | 1.69E-02 | U |
| WFF | 5–10 | 3/21/2024 | 1.99E-03 | 1.02E-03 | 1.56E-03 | = | 4.46E-03 | 1.35E-02 | 1.70E-02 | U |
| WFF Dup | 0–2 | 3/21/2024 | 1.78E-03 | 7.48E-04 | 1.12E-03 | = | 8.59E-04 | 1.26E-02 | 1.69E-02 | U |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| WFF Dup | 2–5 | 3/21/2024 | 8.16E-04 | 7.50E-04 | 1.23E-03 | U | 2.60E-03 | 1.29E-02 | 1.69E-02 | U |
| WFF Dup | 5–10 | 3/21/2024 | 1.33E-03 | 7.61E-04 | 1.59E-03 | U | 6.08E-04 | 1.28E-02 | 1.69E-02 | U |
| MLR | 0–2 | 4/11/2024 | 6.97E-03 | 1.25E-03 | 1.64E-03 | = | -2.24E-03 | 1.16E-02 | 1.67E-02 | U |
| MLR | 2–5 | 4/11/2024 | 6.25E-03 | 1.28E-03 | 1.67E-03 | = | -1.25E-04 | 1.17E-02 | 1.67E-02 | U |
| MLR | 5–10 | 4/11/2024 | 2.64E-03 | 1.04E-03 | 1.58E-03 | = | -1.49E-03 | 8.52E-03 | 1.55E-02 | U |
| WEE | 0–2 | 3/21/2024 | 1.91E-03 | 8.89E-04 | 1.36E-03 | = | -8.84E-04 | 1.13E-02 | 1.67E-02 | U |
| WEE | 2–5 | 3/21/2024 | 1.89E-03 | 8.04E-04 | 1.22E-03 | = | -2.09E-04 | 1.11E-02 | 1.67E-02 | U |
| WEE | 5–10 | 3/21/2024 | 9.38E-04 | 7.57E-04 | 1.54E-03 | U | -6.39E-04 | 1.17E-02 | 1.67E-02 | U |
| SMR | 0–2 | 4/11/2024 | 1.87E-03 | 1.38E-03 | 2.23E-03 | U | 4.60E-04 | 8.77E-03 | 1.55E-02 | U |
| SMR | 2–5 | 4/11/2024 | 5.07E-03 | 1.44E-03 | 2.11E-03 | = | -3.59E-03 | 8.61E-03 | 1.55E-02 | U |
| SMR | 5–10 | 4/11/2024 | 7.13E-03 | 1.31E-03 | 1.72E-03 | = | 2.16E-04 | 8.73E-03 | 1.55E-02 | U |
| SEC | 0–2 | 4/11/2024 | 2.71E-03 | 1.05E-03 | 1.50E-03 | = | 1.21E-03 | 8.75E-03 | 1.55E-02 | U |
| SEC | 2–5 | 4/11/2024 | 7.56E-04 | 8.60E-04 | 1.44E-03 | U | -2.63E-04 | 8.74E-03 | 1.55E-02 | U |
| SEC | 5–10 | 4/11/2024 | 9.96E-04 | 8.33E-04 | 1.36E-03 | U | 3.31E-03 | 8.78E-03 | 1.55E-02 | U |
| WSS | 0–2 | 3/21/2024 | 7.38E-04 | 7.16E-04 | 1.30E-03 | U | -4.72E-03 | 1.15E-02 | 1.67E-02 | U |
| WSS | 2–5 | 3/21/2024 | 1.19E-03 | 7.02E-04 | 1.41E-03 | U | 2.01E-03 | 1.17E-02 | 1.67E-02 | U |
| WSS | 5–10 | 3/21/2024 | 7.93E-04 | 7.50E-04 | 1.24E-03 | U | 1.20E-03 | 1.18E-02 | 1.67E-02 | U |

Note. See appendix C for sampling location codes. Units are in Bq/g, dry weight.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier. Indicates whether radionuclide was detected. Equal sign (=) denotes detected. U denotes undetected.

**Table G.16 – Uranium, Plutonium, and Americium Activity in Vegetation Samples Collected on and Near the WIPP Site**

| Location | Sample Date | $^{233/234}U$ | | | | $^{235}U$ | | | | $^{238}U$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| SMR | 10/24/2024 | 1.49E-03 | 5.11E-04 | 1.02E-03 | = | 1.61E-05 | 4.33E-05 | 3.63E-04 | U | 1.77E-03 | 5.90E-04 | 6.38E-04 | = |
| MLR | 10/24/2024 | 9.10E-04 | 3.25E-04 | 1.01E-03 | U | 8.73E-05 | 8.27E-05 | 3.56E-04 | U | 7.29E-04 | 2.76E-04 | 6.33E-04 | = |
| WFF | 10/24/2024 | 5.72E-04 | 2.30E-04 | 1.01E-03 | U | 1.37E-05 | 3.90E-05 | 3.57E-04 | U | 5.55E-04 | 2.25E-04 | 6.32E-04 | U |
| WSS | 10/24/2024 | 6.44E-04 | 2.57E-04 | 1.02E-03 | U | 1.25E-05 | 4.25E-05 | 3.59E-04 | U | 7.94E-04 | 2.98E-04 | 6.34E-04 | = |
| WEE | 10/24/2024 | 8.91E-04 | 3.41E-04 | 1.02E-03 | U | 7.26E-05 | 8.32E-05 | 3.63E-04 | U | 6.63E-04 | 2.74E-04 | 6.38E-04 | = |
| WEE Dup | 10/24/2024 | 6.23E-04 | 2.35E-04 | 1.01E-03 | U | 2.91E-05 | 4.88E-05 | 3.52E-04 | U | 5.92E-04 | 2.27E-04 | 6.29E-04 | U |
| **Location** | **Sample Date** | $^{238}Pu$ | | | | $^{239/240}Pu$ | | | | $^{241}Am$ | | | |
| | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| SMR | 10/24/2024 | 3.48E-06 | 3.88E-05 | 2.42E-04 | U | 1.99E-05 | 4.78E-05 | 2.24E-04 | U | -2.62E-06 | 1.26E-05 | 3.91E-04 | U |
| MLR | 10/24/2024 | -4.05E-06 | 1.45E-05 | 2.35E-04 | U | 4.04E-06 | 3.44E-05 | 2.20E-04 | U | 7.72E-05 | 7.99E-05 | 3.96E-04 | U |
| WFF | 10/24/2024 | 1.22E-05 | 4.00E-05 | 2.33E-04 | U | 5.12E-06 | 2.90E-05 | 2.14E-04 | U | 9.16E-06 | 3.32E-05 | 3.88E-04 | U |
| WSS | 10/24/2024 | -1.11E-05 | 2.39E-05 | 2.37E-04 | U | 1.82E-05 | 4.24E-05 | 2.20E-04 | U | -6.48E-06 | 1.86E-05 | 3.86E-04 | U |
| WEE | 10/24/2024 | -1.22E-05 | 2.53E-05 | 2.40E-04 | U | 3.61E-06 | 3.49E-05 | 2.21E-04 | U | 4.13E-05 | 6.80E-05 | 3.99E-04 | U |
| WEE Dup | 10/24/2024 | -8.81E-06 | 2.07E-05 | 2.35E-04 | U | 2.93E-06 | 3.27E-05 | 2.16E-04 | U | 3.72E-05 | 5.39E-05 | 3.89E-04 | U |

Note. See appendix C for sampling location codes. Units are in Bq/g, dry weight.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier. Indicates whether radionuclide was detected. Equal sign (=) denotes detected. U denotes undetected.

**Table G.17 – Gamma and $^{90}Sr$ Radionuclide Activity in Vegetation Samples Collected on and Near the WIPP Site**

| Location | Sample Date | $^{40}K$ | | | | $^{60}Co$ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| SMR | 10/24/2024 | 8.65E-01 | 7.93E-02 | 6.01E-02 | = | 2.08E-03 | 1.83E-03 | 4.02E-03 | U |
| MLR | 10/24/2024 | 8.32E-01 | 7.93E-02 | 6.47E-02 | = | -2.18E-04 | 2.21E-03 | 4.07E-03 | U |
| WFF | 10/24/2024 | 4.87E-01 | 6.09E-02 | 5.51E-02 | = | -9.66E-04 | 1.75E-03 | 2.93E-03 | U |
| WSS | 10/24/2024 | 4.96E-01 | 6.19E-02 | 5.85E-02 | = | -2.77E-05 | 1.66E-03 | 3.15E-03 | U |
| WEE | 10/24/2024 | 3.79E-01 | 6.16E-02 | 6.56E-02 | = | 1.44E-03 | 2.29E-03 | 4.23E-03 | U |
| WEE Dup | 10/24/2024 | 3.03E-01 | 5.35E-02 | 5.97E-02 | = | -2.21E-03 | 2.29E-03 | 3.79E-03 | U |
| Location | Sample Date | $^{137}Cs$ | | | | $^{90}Sr$ | | | |
| | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| SMR | 10/24/2024 | 7.65E-05 | 1.53E-03 | 2.92E-03 | U | 3.33E-04 | 1.90E-03 | 1.06E-02 | U |
| MLR | 10/24/2024 | 1.28E-03 | 2.08E-03 | 3.85E-03 | U | 2.86E-04 | 1.89E-03 | 1.06E-02 | U |
| WFF | 10/24/2024 | 5.75E-05 | 1.97E-03 | 3.41E-03 | U | 1.79E-03 | 2.01E-03 | 1.06E-02 | U |
| WSS | 10/24/2024 | -8.07E-04 | 2.12E-03 | 3.56E-03 | U | 1.35E-03 | 2.08E-03 | 1.06E-02 | U |
| WEE | 10/24/2024 | 1.15E-03 | 1.85E-03 | 3.65E-03 | U | 2.07E-03 | 2.07E-03 | 1.06E-02 | U |
| WEE Dup | 10/24/2024 | 8.51E-04 | 2.16E-03 | 4.10E-03 | U | 2.60E-03 | 2.04E-03 | 1.06E-02 | U |

Note. See appendix C for sampling location codes. Units are in Bq/g, dry weight.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier. Indicates whether radionuclide was detected. Equal sign (=) denotes detected. U denotes undetected.

## Table G.18 – Uranium, Plutonium, and Americium Radionuclide Activity in Fauna Samples

| Type | Location | Sample Date | $^{233/234}U$ | | | | $^{235}U$ | | | | $^{238}U$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| Deer | SOO [5] | 8/8/2024 | 2.37E-05 | 1.43E-05 | 8.72E-04 | UJ | -1.90E-07 | 1.02E-06 | 3.28E-04 | UJ | 1.19E-05 | 9.12E-06 | 6.61E-04 | UJ |
| Fish | CBD | 10/21/2024 | 9.53E-04 | 3.17E-04 | 8.73E-04 | = | 2.20E-05 | 1.38E-05 | 3.29E-04 | UJ | 4.52E-04 | 1.54E-04 | 6.62E-04 | UJ |
| Quail | WEE | 12/19/2024 | 1.52E-04 | 4.39E-05 | 8.61E-04 | U | 1.24E-05 | 5.02E-06 | 3.24E-04 | U | 1.50E-04 | 4.33E-05 | 6.60E-04 | U |
| Type | Location | Sample Date | $^{238}Pu$ | | | | $^{239/240}Pu$ | | | | $^{241}Am$ | | | |
| | | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| Deer | SOO [5] | 8/8/2024 | 1.34E-06 | 3.63E-06 | 2.01E-04 | U | 7.76E-07 | 4.05E-06 | 1.81E-04 | U | 3.92E-07 | 1.88E-06 | 3.42E-04 | U |
| Fish | CBD | 10/21/2024 | -8.82E-07 | 2.24E-06 | 2.25E-04 | U | -7.82E-07 | 2.11E-06 | 1.82E-04 | U | -7.18E-07 | 1.73E-06 | 3.43E-04 | U |
| Quail | WEE | 12/19/2024 | -9.56E-08 | 3.10E-07 | 2.21E-04 | U | 2.20E-06 | 1.67E-06 | 1.81E-04 | U | 1.13E-07 | 1.27E-06 | 3.71E-04 | U |

Note. See appendix C for sampling location codes. Units are in Bq/g, dry weight.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier. Indicates whether radionuclide was detected. Equal sign (=) denotes detected. U denotes undetected. UJ denotes a nuclide that was not detected above the reported MDC and 2 sigma counting uncertainty and a quality deficiency affected the data making the reported data more uncertain.
5. Sample of opportunity.

## Table G.19 – Gamma Radionuclides and $^{90}Sr$ Radionuclide Activity in Fauna Samples

| Type | Location | Sample Date | $^{40}K$ | | | | $^{60}Co$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| Deer | SOO [5] | 8/8/2024 | 2.88E-01 | 2.75E-02 | 2.02E-02 | = | 8.04E-04 | 7.06E-04 | 1.36E-03 | U |
| Fish | CBD | 10/21/2024 | 3.33E-01 | 3.30E-02 | 2.51E-02 | = | -1.80E-04 | 8.67E-04 | 1.61E-03 | U |
| Quail | WEE | 12/19/2024 | 7.43E-02 | 6.94E-03 | 5.02E-03 | = | 3.31E-05 | 1.81E-04 | 3.48E-04 | U |
| Type | Location | Sample Date | $^{137}Cs$ | | | | $^{90}Sr$ | | | |
| | | | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] | [RN] [1] | 2 σ TPU [2] | MDC [3] | Q [4] |
| Deer | SOO [5] | 8/8/2024 | -4.97E-05 | 5.38E-04 | 9.80E-04 | U | 6.47E-05 | 1.04E-04 | 1.07E-02 | U |
| Fish | CBD | 10/21/2024 | -2.33E-04 | 8.45E-04 | 1.45E-03 | U | 2.36E-04 | 1.87E-04 | 1.07E-02 | U |
| Quail | WEE | 12/19/2024 | -1.11E-04 | 1.85E-04 | 3.06E-04 | U | 1.29E-04 | 3.45E-05 | 1.05E-02 | U |

Note. See appendix C for sampling location codes. Units are in Bq/g, dry weight.

1. Radionuclide activity. Only radionuclides with activities greater than 2 σ TPU and the MDC are considered detections. Samples may have a negative value when background radioactivity is subtracted.
2. Total propagated uncertainty.
3. Minimum detectable concentration.
4. Qualifier. Indicates whether radionuclide was detected. Equal sign (=) denotes detected. U denotes undetected.
5. Sample of opportunity.