BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 142
Department of Energy, *Energy Reliability and Resilience*

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Energy reliability is the ability of a power system to consistently deliver power to homes, buildings, and devices—even in the face of instability, uncontrolled

events, cascading failures, or unanticipated loss of system components. Energy resilience is the ability of the grid, buildings, and communities to withstand and rapidly recover from power outages and continue operating with electricity, heating, cooling, ventilation, and other energy-dependent services. Energy resilience increases energy reliability and renewable energy sources can help support a resilient, reliable energy system.

Resilient, reliable energy is critical to the well-being of every American. It keeps life-saving hospital equipment and communications systems operating, buildings at safe temperatures with good ventilation, and American workers to go about their business without interruption. Energy infrastructure—facilities or equipment used to generate, deliver, process, or produce energy—that can withstand and quickly recover from disruptions is resilient and reliable infrastructure.

A resilient and reliable power system reduces the likelihood of long-duration outages over large service areas, limits the scope and impact of outages when they do occur, and rapidly restores power after an outage.

What Makes Energy Resilient?

Power outages can be caused by extreme weather, breaches in cybersecurity, high energy demand that overloads the electric grid, failure of aging equipment, and physical interference with equipment. Grid disturbances are changes in electrical voltage and frequency on the grid that can lead to power outages.

A resilient electric grid distribution system uses local resources, such as solar panels and battery storage in homes and buildings, to quickly reconfigure power flows and recover electricity services during a disturbance. The approach to modernize the grid and

increase resilience focuses on integrating distributed energy resources, advanced controls, grid architecture, and emerging grid technologies at a regional scale.

Strong resilience measures in building energy codes can also ensure that new construction and major renovation projects minimize energy use, maximize comfort, and enhance potentially life-saving resilience benefits. Building owners and operators, communities, and local and state governments can strategically plan to increase resilience using these resources.

What Makes Energy Reliable?

When we diversify our energy mix by adding more types of energy to the grid, we increase our energy reliability. The rise of renewable power, which comes from unlimited energy resources, like wind, sunlight, water, and the Earth's natural heat, has the potential to vastly improve the reliability of the American energy system. Currently, renewable energy generates about 21% of all U.S. electricity, and that percentage is rising quickly.

A reliable electric grid distribution system can continue to deliver electricity to homes and buildings regardless of any disruptions or disturbances. The approach to modernizing the grid to increase resilience and reliability focuses on integrating distributed energy resources, advanced controls, grid architecture, and emerging grid technologies at a regional scale. DOE efforts, like the Energy Storage Grand Challenge Roadmap, will increase resilience.

DOE's Grid Modernization Initiative works with public and private partners to develop concepts, tools, and technologies needed to measure, analyze, predict, protect, and control the grid of the future.

Improving Reliability Through Energy Storage

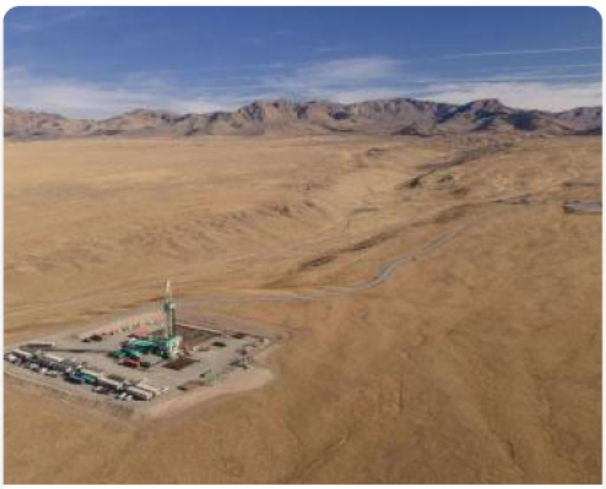
Energy storage technologies can improve energy reliability by making surplus energy available whenever it is needed, such as during a power outage.

Pumped storage hydropower is responsible for most U.S. commercial energy storage capacity and has been used for more than 100 years. Wind energy and solar energy can be captured and stored for later use with batteries, and researchers are investigating geothermal energy storage.

Energy storage is also essential to efficient transportation. EERE invests in research and development of hydrogen storage and batteries to ensure on- and off-road vehicles can reliably move people and goods from one place to another.

The U.S. Department of Energy's Energy Storage Grand Challenge is a comprehensive program to accelerate the development, commercialization, and use of next-generation energy storage technologies. As part of this program, the Long Duration Storage Shot™ aims to, within the decade, reduce the cost of grid-scale energy storage by 90% for systems that can provide energy for at least 10 hours in duration.

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Exhibit 143
NERC 2025–2026 Winter Reliability Assessment

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

2025–2026 Winter Reliability Assessment

November 2025



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Preface

Electricity is a key component of the fabric of modern society, and the Electric Reliability Organization (ERO) Enterprise serves to strengthen that fabric. The vision for the ERO Enterprise, which is comprised of NERC and the six Regional Entities, is a highly reliable, resilient, and secure North American bulk power system (BPS). Our mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid.

Reliability | Resilience | Security

Because nearly 400 million citizens in North America are counting on us

The North American BPS is made up of six Regional Entities as shown in the map and corresponding table below. The multicolored area denotes overlap as some load-serving entities participate in one Regional Entity while associated Transmission Owners/Operators participate in another.



MRO	Midwest Reliability Organization
NPCC	Northeast Power Coordinating Council
RF	ReliabilityFirst
SERC	SERC Reliability Corporation
Texas RE	Texas Reliability Entity
WECC	Western Electricity Coordinating Council

About this Assessment

NERC's *2025–2026 Winter Reliability Assessment* (WRA) identifies, assesses, and reports on areas of concern regarding the reliability of the North American BPS for the upcoming winter season. In addition, the WRA presents peak electricity demand and supply changes and highlights any unique regional challenges or expected conditions that might affect the reliability of the BPS.

The reliability assessment process is a coordinated evaluation between the Reliability Assessment Subcommittee, the Regional Entities, and NERC staff with demand and resource projections obtained from the assessment areas.

This report reflects an independent assessment by the ERO Enterprise (i.e., NERC and the six Regional Entities) and is intended to inform industry leaders, planners, operators, and regulatory bodies so that they are better prepared to ensure BPS reliability. This report also provides an opportunity for industry to discuss plans and preparations to ensure reliability for the upcoming winter period.

Key Findings

This WRA covers the upcoming three-month (December–February) winter period, providing an evaluation of the generation resource and transmission system adequacy necessary to meet projected winter peak demands and operating reserves. This assessment identifies potential reliability issues of interest and regional risks. The following findings are the ERO Enterprise's independent evaluation of electricity generation and transmission capacity as well as the potential operational concerns that may need to be addressed for the upcoming winter.

Two trends affecting resource adequacy across the BPS for the upcoming winter are rising electricity demand forecasts and a continued shift in the resource mix characterized by the retirement of thermal generators and growth in battery resources. After years of flat or low (~1%) peak demand growth, the aggregate peak demand for all NERC assessment areas has risen by 20 GW (2.5%) since the previous winter. Nearly all assessment areas are reporting year-on-year demand growth; some are forecasting increases near 10%. Total BPS resources have also increased since last winter, but by a smaller amount of 9.4 GW. This number includes the net change in generating capacity as well as additional demand response. These demand and resource changes are described in **Escalating Winter Demand** and **Resource Trends** sections.

The following findings are derived from NERC and the ERO Enterprise's independent evaluation of electricity generation and transmission capacity as well as potential operating concerns that should receive attention for Winter 2025–2026:

1. **All areas are assessed as having adequate resources for normal winter peak-load conditions (i.e., the area's 50-50 peak forecast). However, more extreme winter conditions extending over a wide area could result in electricity supply shortfalls.** Prolonged, wide-area cold snaps can drive sharp increases in electricity demand and threaten reliable BPS generation and the availability of fuel supplies for natural-gas-fired generation. Four severe arctic storms have descended to cover much of North America since 2021, causing regional demand for electricity and heating fuel to soar and exposing generation and fuel infrastructure in temperate areas to freezing conditions.[1] The following areas face risks of electricity supply shortfalls during periods of more extreme conditions this winter (see **Figure 1**):

    - **NPCC-Maritimes**: The peak demand forecast has fallen slightly (-1.6%) in the NPCC-Maritimes assessment area, contributing to higher reserves compared to the 2024–2025 winter. Maritimes is projected to have an Anticipated Reserve Margin (ARM) of 16.9%, which is 270 MW below the area's Reference Margin Level of 20% . New Brunswick has long-term energy contracts that can be used to mitigate resource adequacy challenges through the purchase of energy on a day-ahead basis. NPCC's all-hours probabilistic assessment for the NPCC Region included the simulation of both a base case (i.e., normal 50/50 demand) and highest peak load scenario (having an approximate 7% chance of occurring), for both an expected and a low-likelihood, reduced-resource condition. The preliminary results of this assessment indicate that operators in Maritimes are likely to require emergency operating mitigations and/or energy emergency alerts (EEA) during above-normal demand or low-resource output conditions.
    - **NPCC-New England**: A lower peak demand forecast and additional resources from demand response and firm imports offset recent generator retirements, resulting in little change to the NPCC-New England ARM for this winter. New England continues to closely monitor regional energy adequacy, particularly during extended cold snaps where constrained natural gas pipelines contribute to rapid depletion of stored fuel supplies. ISO-NE's deterministic winter scenario analysis shows limited exposure to energy shortfalls this winter. In New England, winter energy concerns are highest in scenarios when stored fuels are rapidly depleted; during these periods, timely replenishment is critical to minimizing the potential for energy shortfalls.
    - **SERC-East**: The winter peak demand forecast has increased by 700 MW (1.6%) since last winter, while winter firm capacity has declined, resulting in lower reserves. SERC-East has changed from a summer-peaking area to potentially peaking during both summer and winter. This is due to the continued addition of solar photovoltaic (PV) generation that shaves off summer peak demand and a trend toward electrification of heating that drives up winter peak demand. All-hours probabilistic analysis from SERC found some load-loss hours (<0.1 hrs) and small amounts of expected unserved energy, with the highest risk occurring during above-normal peak demand and early morning hours when solar output is absent.
    - **SERC-Central:** Additional demand response and flat load growth since last winter is offsetting declining resource capacity (down 1,120 MW), resulting in little change to the ARM at 30.5%. There are adequate resources for normal winter peak demand; however, higher levels of demand that can occur during extreme cold temperatures can result in insufficient reserves that operators would need to manage with non-firm imports and potential energy emergencies.
    - **Texas RE-ERCOT:** Strong load growth from new data centers and other large industrial end users is driving higher winter electricity demand forecasts and contributing to continued risk of supply shortfalls. For the upcoming winter season, Texas RE-ERCOT is expected to continue facing reserve shortage risks during the peak load hour and high-

[1] See detailed reports on the January 2024 and January 2025 Arctic Storms, Winter Storm Elliott, and Winter Storm Uri.

net-load hours, particularly under extreme load conditions that accompany freezing temperatures. Elevated forced outage of thermal resources and reduced output from intermittent resources during these conditions exacerbates the risk of supply shortfalls. In winter, peak demands typically occur before sunrise and after sunset coinciding with the unavailability of solar generation making the system dependent on wind generation and dispatchable resources. Data centers are altering the daily load shape due to their round-the-clock operating pattern, lengthening peak demand periods. Additional battery storage and demand-response resources since last winter help mitigate shortfall risks. However, with the continued flattening of the load curve, maintaining sufficient battery state of charge will become increasingly challenging for extended periods of high loads, such as a severe multi-day storm like Winter Storm Uri.

- **WECC-Basin**: There is sufficient capacity in the area for expected peak conditions; however, Balancing Authorities (BA) are likely to require external assistance during extreme winter weather that causes thermal plant outages, adverse wind turbine conditions, and natural gas fuel supply issues for area internal resources. External assistance may not be available during region-wide extreme winter conditions. With an expected winter peak demand of 11.1 GW, under an extreme combination of generator derates and outages, the region could be short 1.6 GW before imports. Forecasted net internal demand has increased 1% since last year, with little change in winter capacity. Note that the WECC-Basin assessment area includes Utah, southern Idaho, and a portion of western Wyoming. In prior WRA reports, this part of the BPS was included as part of the WECC-NW assessment area. The *2025–2026 WRA* includes a new assessment area map for the Western Interconnection. The new assessment area boundaries provide reliability risk information in more geographic detail for the United States and Mexico.
- **WECC-NW**: Like WECC-Basin, there is sufficient capacity in the area for expected peak conditions; however, BAs are likely to require external assistance during extreme winter weather that causes thermal plant outages and adverse wind turbine conditions for area internal resources. External assistance may not be available during region-wide extreme winter conditions. Winter peak demand for the area is forecast to be 2.9 GW higher (9.3%) compared to last year. Over 3 GW of new resources have been in development for the assessment area this year, primarily battery storage, solar PV, and wind resources. Delays that threaten timely completion of these resource additions will make the area more reliant on imports to meet peak demand.

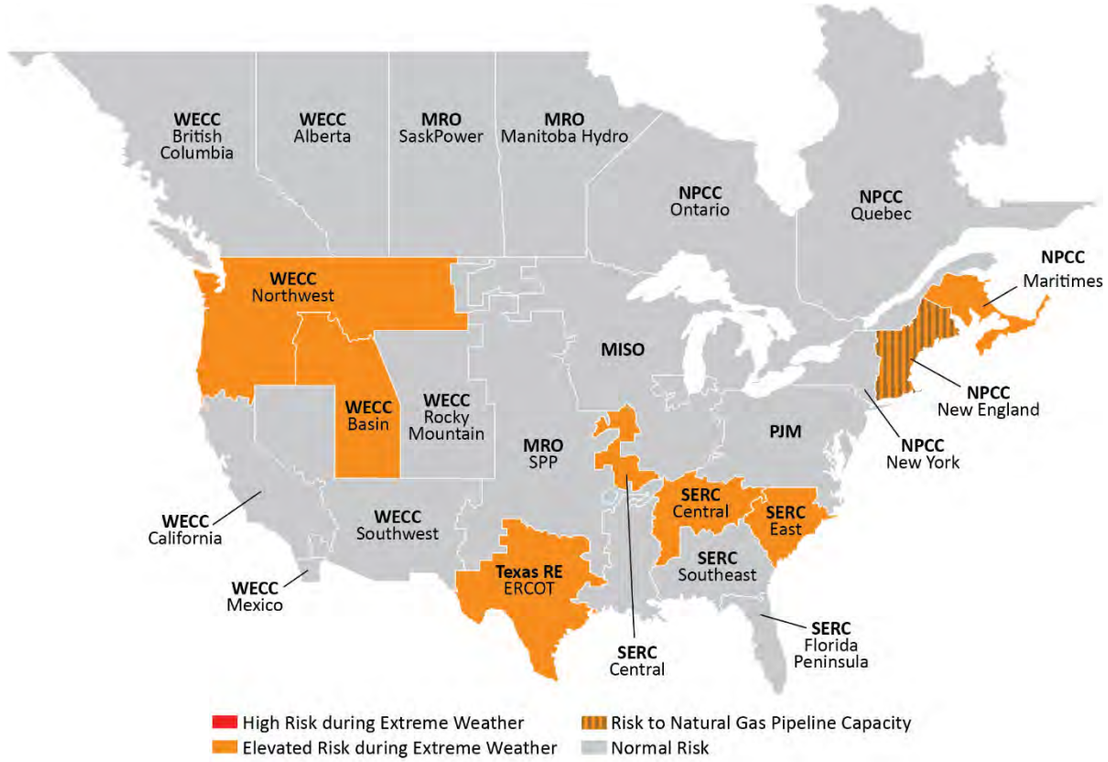


Figure 1: Winter Reliability Risk Area Summary

2. **The performance of natural gas production and supply infrastructure during peak winter conditions will again have a significant effect on BPS reliability.** Natural gas is an essential fuel for electricity generation in winter. Winter fuel supplies for thermal generators must be readily available during the periods of high electricity and natural gas demand that accompany extreme cold weather. Yet these periods are the most challenging for natural-gas-fired Generator Operators to obtain sufficient fuel and delivery. Natural gas production often falls off in extreme winter temperatures as supply infrastructure is affected by freezing issues, and Generator Operators that fail to secure firm fuel delivery are frequently unable to access fully subscribed pipelines. Evidence from the past two winters indicates notable improvement in the delivery of natural gas to BPS generators since winter storms Elliott and Uri with overall less natural gas production decline during cold weather and fewer natural gas infrastructure

force majeures.[2] Still, natural gas infrastructure freeze protection mitigations are voluntary for the natural gas industry in most of North America, resulting in uneven application of protections and continued supply risks during extreme conditions. Furthermore, timing misalignments between the natural gas and electric markets continue to challenge generator fuel procurement in advance of severe winter conditions that occur over winter holiday weekends. As winter approaches, NERC encourages all entities across the gas-electric value chain—from production to the burner tip—to take all necessary preparations for extreme cold and keep natural gas flowing and the lights on.

3. **Cold weather Reliability Standards first introduced in 2023 have been improved prior to the upcoming winter and address recommendations from winter storms Elliott and Uri.** In September 2025, the Federal Energy Regulatory Commission (FERC) approved EOP-012-3 with an effective date of October 1, 2025, concluding the development of Reliability Standards for generator cold weather preparedness.[3] The EOP-012 Reliability Standard contains requirements for generator freeze protection measures, cold weather preparedness plans, and operator training. Among the improvements in the new version are enhanced and expanded requirements to ensure that Generator Owners (GO) are implementing corrective actions to address known issues affecting their ability to operate in cold weather in a timely manner. NERC collects data on the winterization of generating units, which, in conjunction with NERC's monitoring of BPS performance and analysis of cold weather events, helps determine the effectiveness of Reliability Standards. NERC submitted to FERC its first annual *Cold Weather Data and Analysis* informational filing in October 2025.[4] Based on the data reported this year, 96% of the total net winter capacity reported extreme cold weather temperatures (ECWT) at or below 32 degrees Fahrenheit, triggering winter preparedness measures under the Cold Weather Preparedness Standard, and 99% of total net winter capacity in the continental US reporting the ability to operate at the calculated ECWT. As the first such report, this *Cold Weather Data and Analysis* filing provides a benchmark for future analysis.

Recommendations

To reduce the risks of energy shortfalls on the BPS this winter, NERC recommends the following:

- Reliability Coordinators (RC), BAs, and Transmission Operators (TOP) in the elevated risk areas identified in the key findings should review seasonal operating plans and the protocols for communicating and resolving potential supply shortfalls in anticipation of potentially high generator outages and extreme demand levels. Operators should review NERC's Resources on Cold Weather Preparations.
- GOs should complete winter readiness plans and checklists prior to December, deploy weatherization packages well in advance of approaching winter storms, and frequently check and maintain cold weather mitigations while conditions persist.
- BAs should be cognizant of the potential for short-term load forecasts to underestimate load in extreme cold weather events and be prepared to take early action to implement protocols and procedures for managing potential reserve deficiencies. Proactive issuance of winter advisories and other steps directed at generator availability contributed to improved reliability during cold weather events of the past two winters.
- RCs and BAs should implement generator fuel surveys to monitor the adequacy of fuel supplies. They should prepare their operating plans to manage potential supply shortfalls and take proactive steps for generator readiness, fuel availability, load curtailment, and sustained operations in extreme conditions.
- Generator Owners/Operators of natural-gas-fired units should maintain awareness of potential extreme cold weather developing over holiday weekends and the implications for fuel planning and procurement that may result given the natural gas purchase close dates that precede long holiday weekends.
- State and provincial regulators can assist grid owners and operators in advance of and during extreme cold weather by maintaining awareness of BA, natural gas pipeline, and gas local distribution company (LDC) operational public announcements and notices, amplifying public appeals for electricity and natural gas conservation, and supporting requested environmental and transportation waivers.

[2] See *January 2025 Arctic Events | A System Performance Review*, April 2025
[3] See NERC's Statement on FERC September Open Meeting for summary and link to FERC's order.
[4] See 2025 Cold Weather Data Collection and Analysis Informational Filing

Risk Highlights

Escalating Winter Demand

Winter electricity demand is rising at the fastest rate in recent years, particularly in areas where data center development is occurring. After several years of low (~1%) growth, total internal demand for the BPS is forecast to increase by 20.2 GW (2.5%) over last winter's forecast. The changes in forecasted net internal demand for each assessment area are shown in Figure 2 below.[5] Assessment areas develop these forecasts based on historical load and weather information as well as future projections. Most assessment areas are projecting an increase in peak demand. SaskPower, PJM, the U.S. Southeast, and parts of the U.S. West have the largest increase in peak demand forecasts.

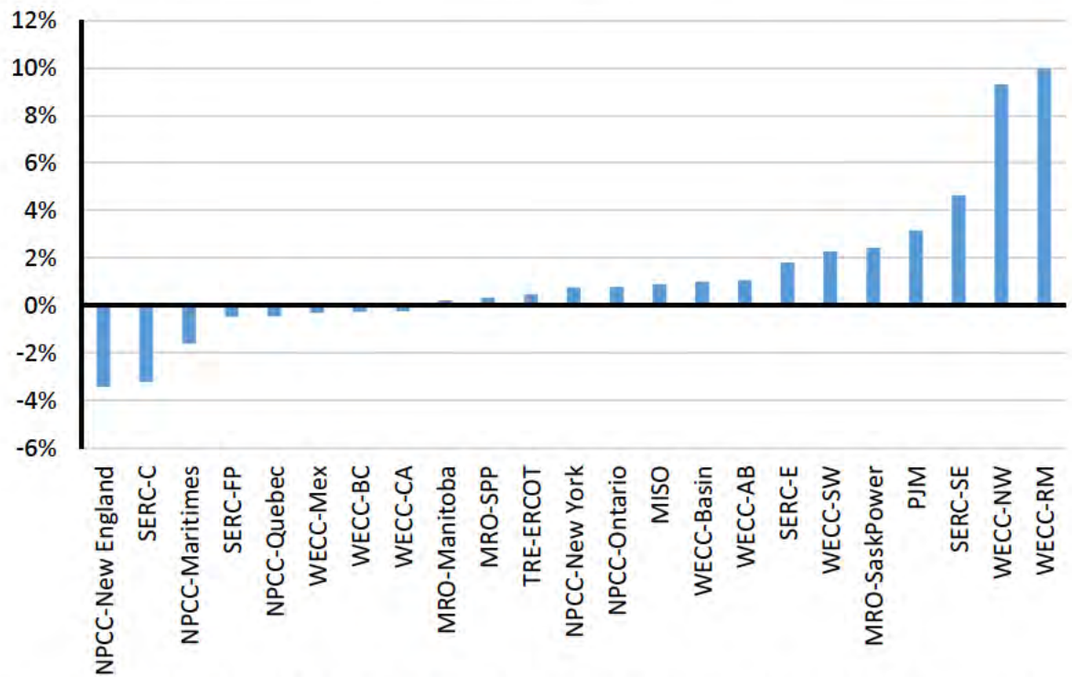


Figure 2: Change in Net Internal Demand—Winter 2025–2026 Forecast Compared to Winter 2024–2025 Forecast

[5] See Data Concepts and Assumptions section for demand definitions.

Resource Trends

BPS resources are growing, but at a slower rate than demand is rising. Battery and solar facilities were the leading resource types added to the BPS since last winter. Solar resources, however, often do not supply output during hours of peak winter demand. Growth in demand response is also contributing to BPS resources for the upcoming winter. Table 1 shows the total change in BPS resources since last winter. For battery, solar, and wind resources, the table includes change in both nameplate (installed) capacity as well as the change in on-peak demand capacity, which is the capacity that resources are expected to provide in their area during the time of peak demand. For assessment-area specific information see Variable Energy Resource Contributions section.

Table 1: BPS Resource Change from Winter 2024–2025 to Winter 2025–2026

Resource	Net Change Nameplate Capacity (MW)	Net Change Peak Demand Capacity (MW)
Total Generator Capacity		1,335
Battery	19,659	11,121
Solar	11,097	1,176
Wind	-562	-14,238
Thermal and Hydro		3,276
Demand Response		8,112
Total Resources		9,447

Total BPS resources for serving winter peak demand, including generating capacity and demand response, have increased since last winter by 9,447 MW. Sizeable additions in battery resources and some new natural gas-fired generators contribute to the increase in resource capacity. However, the increase is offset by lower on-peak capacity values for wind resources, which are the result of revised valuations of wind resource capability at peak demand hours in some areas.[6] As a result, BPS generator capacity for winter peak demand makes up only a small portion of the total BPS increase. Generation accounts for 1,335 MW of the total 9,445 MW increase, while the larger share comes from demand response programs. Area specific information on demand response is provided in the Demand and Resource Tables.

The recent trend in resource additions is contributing to higher risk of electricity supply shortfalls in winter. BA operators are likely to face higher winter demand without a comparable increase in supply resources. Furthermore, the types of resources that are growing the most-- battery resources and

[6] Since last winter, ERCOT and MISO have implemented new methods for determining capacity contributions that result in lower wind and solar resources contributions at peak demand. See ERCOT's Resource Adequacy page and MISO's *Planning Year 2025-2026 Wind and Solar Capacity Credit Report*.

demand response—have unique characteristics that operators will need to account for and could limit the use of these resources in extreme winter conditions. Battery energy is reliable when it can be dispatched and has sufficient charge for the period it is needed, yet little time to recharge can be expected during extreme winter weather. System operators will need good visibility on battery state of charge and should anticipate that some extreme winter events will cause these resources to become depleted when needed. Demand response is limited by contract terms, which typically specify how often and for how long the resource may be used. Other resource types are also challenged in winter (see **Thermal Generator Fuel Adequacy and Security**). As BAs grapple with higher demand in most parts of the BPS, they will do so with resources that are becoming increasingly complex to dispatch especially in winter.

Thermal Generator Fuel Adequacy and Security

The performance of the thermal generator fleet remains critical to winter BPS operations. Winter fuel supplies for thermal generators must be readily available during periods of high demand and extreme cold weather. Generally, fuel adequacy for the thermal generating fleet is bolstered through strategic infrastructure investments and fuel stockpiling that increases the certainty of having fuel on hand that can be converted to electricity when needed. Because of this, winter performance of thermal generators is inextricably linked to extraction, processing, storage, and delivery infrastructure for a variety of fuels. Fuel supply risks have been noted in recent years' WRAs related to coal and natural gas availability and illustrate the interconnected nature of these critical energy infrastructure systems.

BPS stakeholders across North America note multiple fuel-related issues that are being monitored entering the winter season. For example, while coal represents a waning share of the overall resource mix, it continues to play an important role in meeting demand during extreme winter weather events, and oil inventories at dual-fuel gas-oil generators lessen risks related to natural gas deliverability in infrastructure-constrained regions, especially during the winter. Notably, it is infeasible or prohibitively costly to stockpile natural gas locally at power plants, and this exposes the BPS to the risk profile of the constituent systems that comprise the supply and delivery of this just-in-time fuel.

Natural Gas Generator Fuel Supplies

Natural gas generators remain a crucial part of on-peak resources meant to meet winter electricity demand across much of North America. While many Generator Owners and Operators secure backup fuel supplies at critical gas-fired generators, particularly in the northeastern United States and Florida, large contributions to the on-peak winter resource mix by single-fuel natural-gas-fired generators remain across North America (see **Figure 3**).

Natural gas generator performance can be threatened when natural gas supplies are insufficient or when natural gas infrastructure is unable to maintain the flow of fuel to critical generators. Grid operators continue to acknowledge and enhance their winter planning processes to firm up their fuel supplies and guard against natural gas disruptions, but winter storms Uri and Elliott demonstrated that combinations of natural gas flow restrictions and supply insufficiency can occur regardless of whether cold temperatures are common or uncommon in the region and can affect more than one BA area concurrently.

Many BPS areas that regularly experience cold weather events, like New England, have adopted mitigating technologies to lessen the impact of natural gas shortages through generator dual-fuel capability and stored backup fuel. In those areas, prolonged cold weather events present a risk of rapid depletion of stored backup fuel. Robust regional and distributed storage investments and winter planning for timely fuel replenishment are critical to minimizing potential energy shortfalls in the operational time frame in these areas.

Natural gas and electricity infrastructures have the added complexity of interdependence. Electricity is used to power some facilities, such as compressor stations and processing plants that make up natural gas infrastructure. These interdependencies mean that reliability events that originate on one system have the potential to affect the other and worsen the overall event magnitude or duration.

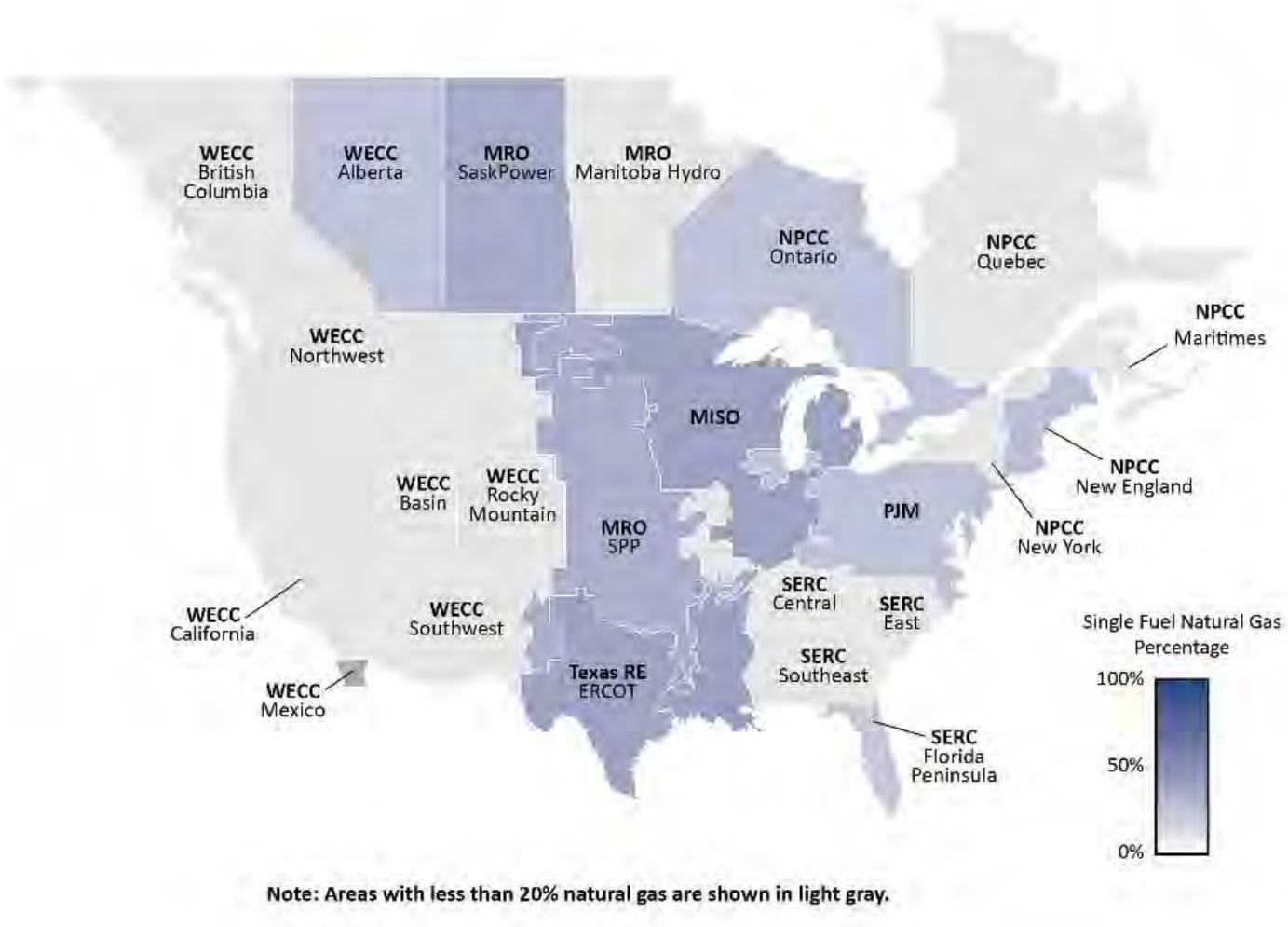
Natural gas infrastructure freeze protection mitigations are voluntary for the natural gas industry in most of North America. Texas is an exception, where the Railroad Commission of Texas adopted rules to require critical natural gas facilities to implement weather-related emergency preparation measures.[7] Lack of consistent standards for natural gas infrastructure protections will result in uneven application of freeze protections and continued supply risks during extreme conditions in many areas.

These considerations have driven higher levels of coordination to ensure sustained reliable operation of the natural gas and electricity systems. While a FERC and ERO staff review of system performance during the January 2025 arctic events[8] details improvements in electric and natural gas coordination since winter storms Uri and Elliott, the review also identifies continuing gaps between the electricity and natural gas industries that remain entering the 2025–2026 Winter season. These include natural gas scheduling challenges during winter holiday weekends, market time frame and process incompatibility, and electric power entities' lack of visibility into operational impact data from natural gas producers and suppliers.

[7] See Railroad Commission of Texas weatherization rule.

[8] FERC, NERC Issue Report on System Performance During the January 2025 Arctic Weather | Federal Energy Regulatory Commission

The U.S. Energy Information Administration (EIA)[9] anticipates a slightly milder winter than last year across much of the United States, especially in the Northeast, leading to a projection that households will consume approximately 2% less natural gas than last winter. Working natural gas storage inventories are about 5% above the previous five-year average in the United States heading into the winter season. The EIA attributes this relative surplus in part to robust production this summer and lower-than-expected natural gas consumption by power generators.



Single-Fuel Natural-Gas-Fired Generation

	Winter Capacity (GW)	Contribution to Total Winter Resource Mix
MISO	63.9	38%
TRE-ERCOT	53.0	38%
WECC-MX	2.2	34%
MRO-SaskPower	2.5	34%
SPP	33.4	32%
NPCC-New England	12.1	24%
PJM	60.9	23%
WECC-AB	13.9	23%
NPCC-Ontario	8.0	23%
SERC-FP	45.6	21%
WECC-CA	35.9	18%
WECC-SW	21.5	17%
WECC-Basin	4.9	16%
WECC-RM	6.2	14%
SERC-C	17.0	13%
SERC-SE	21.5	13%
WECC-NW	8.7	12%
SERC-E	11.3	9%
NPCC-New York	5.0	8%
NPCC-Maritimes	0.5	7%
MRO-Manitoba	0.3	4%
WECC-BC	0.1	1%
NPCC-Quebec	0.0	0%

Figure 3: Single-Fuel Natural-Gas-Fired Generation Capacity Contribution to the 2025–2026 Winter Generation Mix

[9] See the U.S. Energy Information Administration's Winter Fuels Outlook 2025–26

Risk Assessment Discussion

NERC assesses the risk of electricity supply shortfall in each assessment area for the upcoming season by considering Planning Reserve Margins, seasonal risk scenarios, probability-based risk assessments, and other available risk information. NERC provides an independent assessment of the potential for each assessment area to have sufficient operating reserves under normal conditions as well as above-normal demand and low-resource output conditions selected for the assessment. A summary of the assessment approach is provided in Table 2.

Table 2: Seasonal Risk Assessment Summary

Category	Criteria[1]
High Potential for insufficient operating reserves in normal peak conditions	• Planning Reserve Margins do not meet Reference Margin Levels (RML); or • Probabilistic indices exceed benchmarks, e.g., loss of load hours (LOLH) of 2.4 hours over the season; or • Analysis of the risk hour(s) indicates resources will not be sufficient to meet operating reserves under **normal peak-day demand and outage scenarios**[2]
Elevated Potential for insufficient operating reserves in above-normal conditions	• Probabilistic indices are low but not negligible (e.g., LOLH above 0.1 hours over the season); or • Analysis of the risk hour(s) indicates resources will not be sufficient to meet operating reserves under **extreme peak-day demand with normal resource scenarios** (i.e., typical or expected outage and derate scenarios for conditions);[2] or • Analysis of the risk hour(s) indicates resources will not be sufficient to meet operating reserves under **normal peak-day demand with reduced resources** (i.e., extreme outage and derate scenarios)[3]
Normal Sufficient operating reserves expected	• Probabilistic indices are negligible • Analysis of the risk hour(s) indicates resources will be sufficient to meet operating reserves under normal and extreme peak-day demand and outage scenarios[4]

Table Notes:
[1]The table provides general criteria. Other factors may influence a higher or lower risk assessment.
[2]**Normal resource scenarios** include planned and typical forced outages as well as outages and derates that are closely correlated to the extreme peak demand.
[3]**Reduced resource scenarios** include planned and typical forced outages and low-likelihood resource scenarios, such as extreme low-wind scenarios, low-hydro scenarios during drought years, or high thermal outages when such a scenario is warranted.
[4]Even in normal risk assessment areas, extreme demand and extreme outage scenarios that are not closely linked may indicate risk of operating reserve shortfall.

Assessment of Planning Reserve Margins and Operational Risk Analysis

Anticipated Reserve Margins (ARM), which provide the Planning Reserve Margins for normal peak conditions, as well as reserve margins with typical forced outage levels and for the most extreme seasonal risk scenarios are provided in Table 3.

Table 3: Seasonal Risk Scenario On-Peak Reserve Margins

Assessment Area	Anticipated Reserve Margin	Reserve Margin with Typical Outages	Reserve Margin with Higher Demand, Outages, Derates in Extreme Conditions
MISO	49.5%	22.3%	3.7%
MRO-Manitoba	13.7%	11.4%	6.1%
MRO-SaskPower	35.1%	29.0%	16.1%
MRO-SPP	56.5%	29.4%	16.9%
NPCC-Maritimes	16.9%	12.5%	-4.7%
NPCC-New England	58.9%	45.4%	8.7%
NPCC-New York	78.2%	52.4%	16.2%
NPCC-Ontario	28.6%	21.8%	13.2%
NPCC-Québec	15.2%	15.1%	5.0%
PJM	35.6%	24.8%	15.6%
SERC-C	30.5%	22.4%	-0.9%
SERC-E	21.9%	17.5%	3.0%
SERC-FP	41.7%	28.3%	25.6%
SERC-SE	39.7%	24.7%	17.7%
TRE-ERCOT	36.0%	25.2%	-20.0%
WECC-AB	35.2%	32.4%	10.0%
WECC-Basin	29.6%	19.7%	-21.1%
WECC-BC	25.9%	25.8%	15.4%
WECC-CA	82.3%	73.7%	57.9%
WECC-Mex	83.1%	79.4%	52.9%
WECC-NW	30.9%	29.5%	-8.5%
WECC-RM	61.7%	53.2%	10.0%
WECC-SW	104.4%	90.1%	50.1%

Seasonal risk scenarios for each assessment area are presented in the Regional Assessments Dashboards section. The on-peak reserve margin and seasonal risk scenario charts in each dashboard provide potential winter peak demand and resource condition information. The reserve margins on the right side of the dashboard pages provide a comparison to the previous year's assessment. The seasonal risk scenario charts present deterministic scenarios for further analysis of different demand and resource levels with adjustments for normal and extreme conditions. The assessment areas determined the adjustments to capacity and peak demand based on methods or assumptions that are summarized in the seasonal risk scenario charts; more information about these dashboard charts is provided in the Data Concepts and Assumptions section.

The seasonal risk scenario charts can be expressed in terms of reserve margins: In Table 3, each assessment area's ARMs are shown alongside the reserve margins for a typical generation outage scenario (where applicable) and the extreme demand and resource conditions in their seasonal risk scenario.

Areas highlighted in orange in Figure 1 above have been identified as having resource adequacy or energy risks for the winter and are included in the Key Findings section's discussion that follows. The typical outage reserve margin includes anticipated resources minus the capacity that is likely to be in maintenance or forced outage at peak demand. If the typical maintenance or forced-outage margin is the same as the ARM, it is because an assessment area has already factored typical outages into the anticipated resources. The extreme conditions margin includes all components of the scenario and represents the most severe operating conditions of an area's scenario. Note that any reserve margin below zero indicates that the resources fall below demand in the scenario.

In addition to the peak demand and seasonal risk hour scenario charts, the assessment areas provided a resource adequacy risk assessment that was probability-based for the winter season. Results are summarized in Table 5. The risk assessments account for the hour(s) of greatest risk of resource shortfall. For most areas, the hour(s) of risk coincides with the time of forecasted peak demand; however, some areas incur the greatest risk at other times based on the varying demand and resource profiles. Various risk metrics are provided and include loss of load expectation (LOLE), loss of load hours (LOLH), expected unserved energy (EUE), and the probabilities of energy emergency alert (EEA) declarations (see Table 4 for a description of EEA levels).

Table 4: Energy Emergency Alert Levels

EEA Level	Description	Circumstances
EEA 1	All available generation resources in use	• The BA is experiencing conditions in which all available generation resources are committed to meet firm load, firm transactions, and reserve commitments and is concerned about sustaining its required operating reserves. • Non-firm wholesale energy sales (other than those that are recallable to meet reserve requirements) have been curtailed.
EEA 2	Load management procedures in effect	• The BA is no longer able to provide its expected energy requirements and is an energy-deficient BA. • An energy-deficient BA has implemented its operating plan(s) to mitigate emergencies. • An energy-deficient BA is still able to maintain minimum operating reserve requirements.
EEA 3	Firm load interruption is imminent or in progress	• The energy-deficient BA is unable to meet minimum operating reserve requirements.

Energy Emergency Alerts

The combination of above-normal generation outages, low resource output, and peak loads as occurred during the extreme cold weather events of Winter Storm Uri in 2021 and Winter Storm Elliott in 2022 are ongoing winter reliability risks. When supply resources in an area fall below expected demand and operating reserve requirements, BAs may need to employ EEAs to maintain balance between available capacity and energy and real-time demand. A description of each EEA level is provided above.

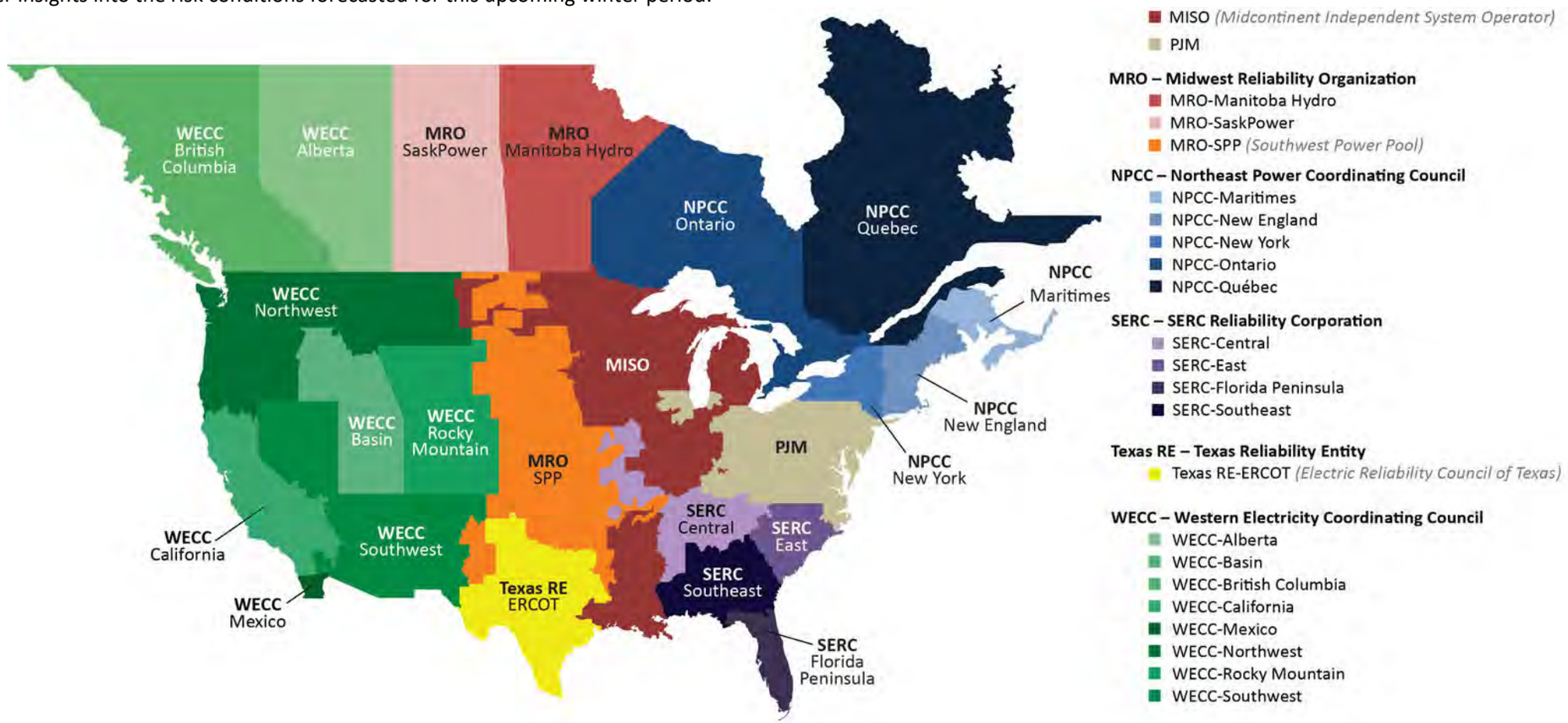
Table 5: Probability-Based Risk Assessment		
Area	**Type of Assessment**	**Results and Insight from Assessment**
MISO	Deterministic	MISO does not provide a probabilistic assessment for the WRA. MISO applies a deterministic look at expected system conditions, looking at generation availability under typical and extreme outages and looking at a typical 50/50 load forecast and an extreme 90/10 load forecast. For the upcoming winter season, under an extreme outage and extreme 90/10 load forecast, this is the riskiest scenario for the MISO footprint. This scenario produces the shortest actual reserve margin for January.
MRO-Manitoba	Probabilistic study for the NERC Probabilistic Assessment (ProbA)	Probabilistic analysis for the 2024 ProbA summarized in NERC's 2024 *Long-Term Reliability Assessment* (LTRA) found no load-loss or unserved energy hours for 2026.
MRO-SaskPower	Probability-based capacity adequacy assessment	SaskPower's probabilistic assessment for the 2025–2026 Winter indicates that risk of shortfalls is lower than the previous winter. LOLH for an elevated risk scenario for the 2025–2026 Winter season is 0.08 hours. The month with the highest LOLH is December (0.05 hours).
MRO-SPP	NERC 2024 ProbA	Probabilistic analysis for the 2024 ProbA summarized in NERC's 2024 LTRA found no load-loss or unserved energy hours for 2026.
NPCC	NPCC conducted an all-hour probabilistic reliability assessment that included detailed neighbor modeling and consisted of a base case and severe case examining low resources, reduced imports, and higher loads. The assessment evaluates the probabilistic indices of LOLE, LOLH, and EUE. The highest peak load scenario has an approximately 7% probability of occurring.	
NPCC-Maritimes	The Maritimes Area low-likelihood resource case assumed: wind derated by 50% for every hour in December through February and a 50% natural gas capacity curtailment for December through February (dual-fuel units assumed reverting to oil) and reduced transfer capabilities.	The preliminary assessment indicates that established operating procedures are not sufficient to maintain a balance between electricity supply and demand. Under highest peak load levels, the Maritimes Area shows a notable likelihood of utilizing its operating procedures such as reducing 30-minute reserves, initiating interruptible loads, and reducing 10-minute reserves to maintain system reliability during the upcoming winter period.
NPCC-New England	The New England Area low-likelihood resource case assumed: 500 MW of additional maintenance outages, ~4,513 MW of gas-fired generation unavailable due to fuel supply constraints, and 50% reduced import capabilities of external ties.	The preliminary results of this assessment indicate that operating procedures were not needed to maintain a balance between electricity supply and demand
NPCC-New York	The New York Area low-likelihood resource case assumed: ~500 MW of extended maintenance in southeastern New York, 600 MW of cable transmission reduction across HVdc facilities, and ~5,000 MW of generation unavailable due to fuel delivery issues.	The preliminary results of this assessment indicate that operating procedures were not needed to maintain a balance between electricity supply and demand. No cumulative LOLE, LOLH or EUE risks were indicated over the December–February winter period, for all the scenarios modeled.
NPCC-Ontario	An energy assessment for the Ontario Assessment Area was conducted for two scenarios: firm resources and firm demand with expected weather, and planned resources with planned demand with expected weather.	No cumulative LOLH or EUE risks were identified over the entire November-to-April winter season for both scenarios modeled.

Table 5: Probability-Based Risk Assessment		
Area	**Type of Assessment**	**Results and Insight from Assessment**
NPCC-Québec	The Québec Area low-likelihood resource case assumed 1,000 MW of generation reductions.	The preliminary results of this assessment indicate that established operating procedures are sufficient to maintain a balance between electricity supply and demand if needed. No cumulative LOLE, LOLH or EUE risks were indicated over the December–February winter period for all the scenarios modeled
PJM	Probabilistic study for the NERC Probabilistic Assessment (ProbA)	Probabilistic study for 2025–2026 Winter is not provided for the WRA. PJM performed probabilistic analysis for 2026-2027 winter as part of the 2024 ProbA summarized in NERC's 2024 LTRA. The results of this study indicate risk of load loss (<0.1 hours) and unserved energy during winter months. For the upcoming winter, load-loss hours are expected to be less than this value because forecasted load is lower and anticipated resource capacity is higher than the case studied for the 2024 ProbA.
SERC	Based on the 2024 NERC Probabilistic Assessment (ProbA) base-case result. SERC's assessment used 38 years of historical load shapes to assess the resource adequacy of years 2026 and 2028, primarily based on data from the 2024 Long Term Reliability Assessment (LTRA).	
SERC-Central		Probabilistic analysis for the 2024 ProbA summarized in NERC's 2024 LTRA found no load-loss or unserved energy hours for 2026.
SERC-East		Probabilistic analysis for the 2024 ProbA summarized in NERC's 2024 LTRA found a small number of load-loss hours (<0.1) and EUE (61 MWh / 1 ppm) for 2026.
SERC-Florida Peninsula		Probabilistic analysis for the 2024 ProbA summarized in NERC's 2024 LTRA found negligible load-loss hours and EUE.
SERC-Southeast		Probabilistic analysis for the 2024 ProbA summarized in NERC's 2024 LTRA found no load-loss or unserved energy hours for 2026.
Texas RE-ERCOT	ERCOT Probabilistic Reserve Risk Model	ERCOT's probabilistic risk assessment indicates a 2% probability of having to declare EEAs during the January forecasted winter peak day (which coincides with the highest reserve shortage risk) and a controlled load shed probability of 1.8%. ERCOT defines low-risk hours as when the probability of an EEA is less than 10%.
WECC	The resource adequacy work performed at WECC used the Multi-Area Variable Resource Integration Convolution (MAVRIC) model for the 2025 LTRA. The MAVRIC model is a convolution-based probabilistic model and is WECC's chosen method for developing probability metrics used for assessing demand and variable resource availability in every hour. In the resource adequacy environment, the reports produced support NERC's seasonal assessments, LTRA, and ProbA.	
WECC-AB		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.
WECC-Basin		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.
WECC-BC		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.

Table 5: Probability-Based Risk Assessment		
Area	**Type of Assessment**	**Results and Insight from Assessment**
WECC-CA		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.
WECC-Mexico		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.
WECC-Rocky Mountain		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.
WECC-NW		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026. Results for a case where new resource additions are not completed for the upcoming winter found some EUE and LOLH.
WECC-SW		The results of the probabilistic assessment reveal no EUE or LOLH for Winter 2025–2026.

Regional Assessments Dashboards

The following assessment area dashboards and summaries were developed based on data and narrative information collected by NERC from the six Regional Entities on an assessment area basis. Guidelines and definitions are in the **Data Concepts and Assumptions** table. On-Peak Reserve Margin bar charts show the ARM compared to a reference margin level (RML) that is established for each area to meet resource adequacy criteria. Prospective Reserve Margins can give an indication of additional on-peak capacity but are not used for assessing adequacy. The operational risk analysis shown in the following regional assessments dashboard pages provides a deterministic scenario for understanding how various factors that affect resources and demand can combine to impact overall resource adequacy. For each assessment area, there is a risk-period scenario graphic; the left blue column shows anticipated resources (from the **Demand and Resource Tables**), and the two orange columns at the right show the two demand scenarios of the normal peak net internal demand (from the **Demand and Resource Tables**) and the extreme winter peak demand determined by the assessment area. The middle red or green bars show adjustments that are applied cumulatively to the anticipated resources. Adjustments may include reductions for typical generation outages (maintenance and forced not already accounted for in anticipated resources) and additions that represent the quantified capacity from operational tools (if any) that are available during scarcity conditions but have not been accounted for in the WRA reserve margins. Resources throughout the scenario are compared against expected operating reserve requirements that are based on peak load and normal weather. The cumulative effects from extreme events are also factored in through additional resource derates or low-output scenarios. In addition, results from a probability-based resource adequacy assessment are shown in the Highlights section of each dashboard. Methods vary by assessment area and provide further insights into the risk conditions forecasted for this upcoming winter period.



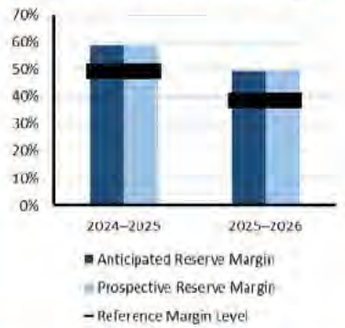


MISO

The Midcontinent Independent System Operator, Inc. (MISO) is an independent, not-for-profit organization responsible for operating the bulk electric power system and administering wholesale electricity markets across 15 U.S. states and the Canadian province of Manitoba. MISO ensures the reliable delivery of electricity to approximately 45 million people by managing regional transmission operations as well as energy and ancillary services markets and advising on long-term resource planning. The MISO footprint includes 39 Local BAs and more than 550 market participants. MISO operates one of the world's largest organized electricity markets, with its members operating a system that consists of over 77,000 miles of transmission lines and approximately 1,888 generating units. The peak electricity demand on the MISO system currently occurs during the summer season. MISO's footprint lies across three regional entities (MRO, RF, and SERC), but MRO is responsible for coordinating data and information submitted for NERC's reliability assessments.

- MISO expects limited risk in the 2025–26 Winter season as MISO was able to procure 6.1% more resources through the annual planning reserve auction than required by its minimum resource adequacy target. A further 3.3 GW of resources were available but not chosen to be committed for the winter season.
- Some risk has been identified for this upcoming winter season. In a high generation outage and high winter load scenario reliability is expected to be maintained by reliance upon operational mitigations that include non-firm energy transfers into the system, energy-only resources not subject to a must-offer requirement that may still offer into the energy markets, load-modifying resources, and internal transfers that exceed the Sub-Regional Import/Export Constraint (SRIC/SREC) between the MISO North/Central and South areas.
- MISO continues to coordinate with neighboring RCs and BAs to improve situational awareness and vet any needs for energy transfers to address extreme system conditions.
- MISO continues to survey and coordinate with its members on winter preparedness and fuel sufficiency.
- MISO has implemented a seasonal resource adequacy construct and seasonal unit accreditation to better affirm adequate supply in all seasons.

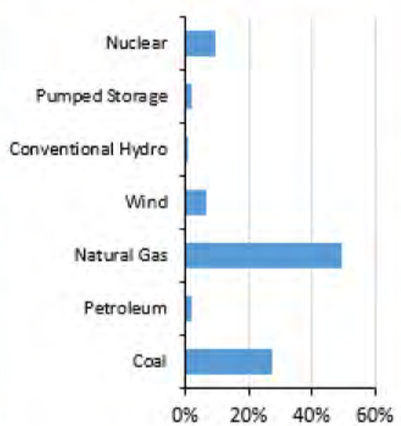
On-Peak Reserve Margin[10]



Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed demand scenarios. Above-normal winter peak load combined with generator outages from freezing or fuel supply issues and low wind output result in the need to employ operating mitigations (i.e., demand response and transfers).

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: 50/50 net internal demand and additional demand during extreme weather conditions (e.g., Winter Storm Enzo) using member submitted data and historical load data

Typical Maintenance Outages: Rolling three-year winter average of peak-day maintenance and planned outages

Typical Forced Outages: Three-year average of all peak-day outages that were not planned

Resource Derates for Extreme Conditions: Represents derates aligning with the most extreme hour of each of the past 3 years,

Operational Mitigations: Non-firm energy transfers into the system, energy-only resources that do not have a must-offer requirement, or internal transfers that exceed the SRIC/SREC between the MISO North/Central and South regions

[10] The MISO Risk Scenario Assessment for the 2025-26 Winter Season is not directly comparable to that for the 2024-25 Winter Season as methodology improvements have been implemented.



MRO-Manitoba Hydro

Manitoba Hydro is a provincial Crown corporation and one of the largest integrated electricity and natural gas distribution utilities in Canada. Manitoba Hydro is a leader in providing renewable energy and clean-burning natural gas. Manitoba Hydro provides electricity to approximately 608,500 electric customers in Manitoba and natural gas to approximately 293,000 customers in southern Manitoba. Its service area is the province of Manitoba, which is 251,000 square miles. Manitoba Hydro is winter-peaking. Manitoba Hydro is its own Planning Coordinator (PC) and Balancing Authority (BA). Manitoba Hydro is a coordinating member of MISO, which is the RC for Manitoba Hydro.

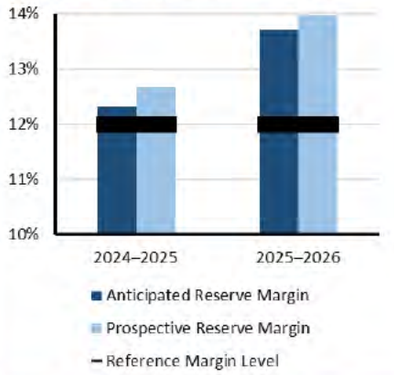
Highlights

- Manitoba Hydro is not anticipating any operational challenges and/or emerging reliability issues in its assessment area for Winter 2025–2026.
- Manitoba Hydro expects to reliably supply its internal demand and export obligations even under continued drought conditions.
- Manitoba Hydro is experiencing well below-average water supply conditions; however, the Manitoba Hydro system is designed and operated such that reliable operations can be maintained under extreme drought.
- The ARM for Winter 2025–26 exceeds the 12% RML.

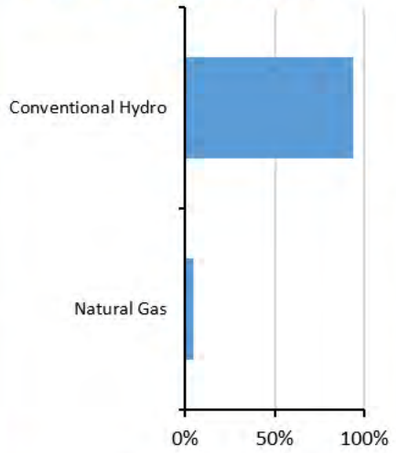
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

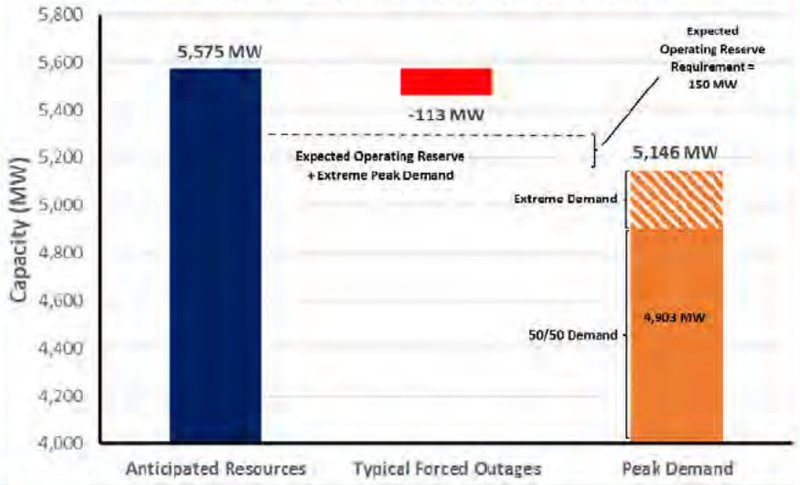
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast using 30 years of weather data

Typical Forced Outages: Accounts for average forced outages



MRO-SaskPower

MRO-SaskPower is an assessment area that covers the Canadian province of Saskatchewan. The province has a geographic area of 651,900 square kilometers (251,700 square miles) and a population of just over 1.1 million people. The Saskatchewan Power Corporation (SaskPower) is the PC and RC for the province of Saskatchewan and is the principal supplier of electricity in the province. SaskPower is a provincial Crown corporation and, under provincial legislation, is responsible for the reliability oversight of the Saskatchewan Bulk Electric System (BES) and its interconnections. Overall, SaskPower operates nearly 14,816 circuit-km of transmission lines, 65 high-voltage switching stations, and 191 distribution substations. Peak electricity demand on the SaskPower system currently occurs during the winter season.

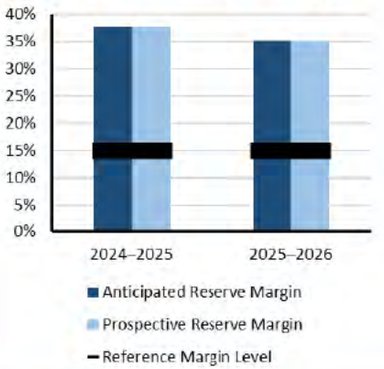
Highlights

- Saskatchewan experiences its peak load during the winter months due to extreme cold weather.
- Based on the planned maintenance, typical forced outages from historical data, and expected renewable generation under the normal and extreme demand conditions, SaskPower does not anticipate any reliability issues during the 2025–2026 Winter.
- During extreme winter conditions, SaskPower would utilize available demand-response programs, short-term power transfers from neighboring utilities, maintenance rescheduling, and/or short-term load interruptions to manage the situation.

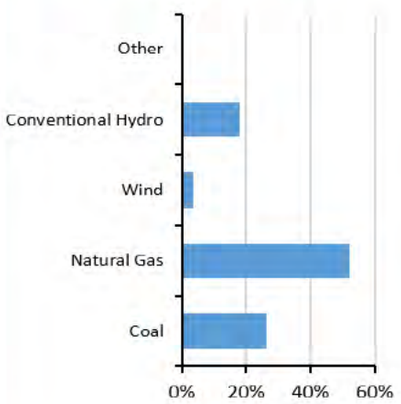
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

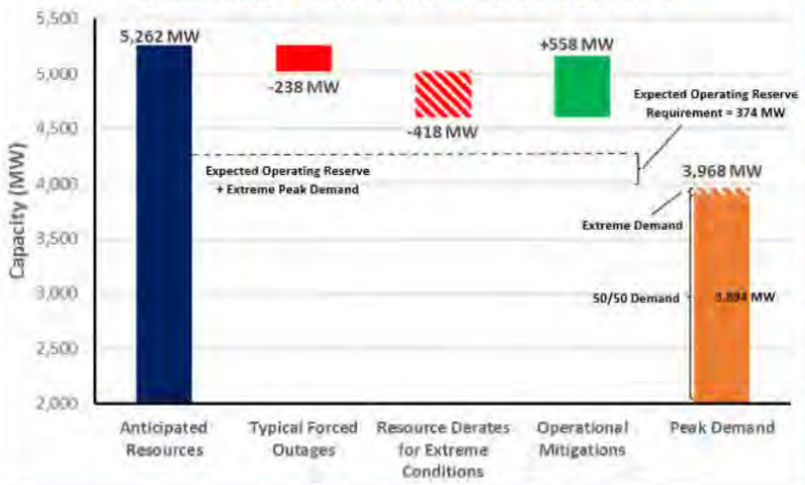
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Based on the historical load variability, SaskPower calculates a probability density function for load to simulate various scenarios that include extreme conditions.

Typical Forced Outages: Estimated using SaskPower forced outage model

Resource Derates for Extreme Conditions: Wind capacity is derated by 96% due to the cut-out of most wind farms below -30°C. Solar generation is expected to be fully unavailable under extreme conditions.

Operational Mitigations: Includes the non-firm import capability (360 MW) and generators in layup status (167 MW) that can be brought online with one to five days' notice; additional demand-side resources are estimated based on other demand response programs and non-firm loads that require 15 minutes to 2 hours of notification



MRO-SPP

SPP's footprint covers 546,000 square miles and encompasses all or parts of Arkansas, Iowa, Kansas, Louisiana, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming. The SPP long-term assessment is reported based on the PC footprint, which touches parts of the MRO Regional Entity and the WECC Regional Entity. The SPP assessment area footprint has approximately 61,000 miles of transmission lines, 756 generating plants, and 4,811 transmission-class substations, and it serves a population of more than 18 million.

Highlights

- SPP anticipates that planning reserves are adequate for the upcoming winter season even as SPP continues to set new winter season load records.
- SPP does not anticipate any emerging reliability issues impacting the area for the 2025–2026 Winter season but realizes that interruptions to fuel supply combined with higher penetration of variable energy resources could create unique operation challenges.
- SPP continues to work at enhancing communications and operator preparedness with neighboring regions to address potential electric deliverability issues associated with extreme weather events.
- To minimize conservative operations, EEAs, and mid-range forecast error uncertainty response in wind forecasts, SPP implemented several new operational mitigation processes and procedures to deal with high-impact real-time areas of reliability concern.
- SPP has proposed numerous resource adequacy initiatives, including addressing EUE standards, fuel assurance, winter planning reserve margins, outage policies, demand response, and accreditation; all were recently approved by FERC.

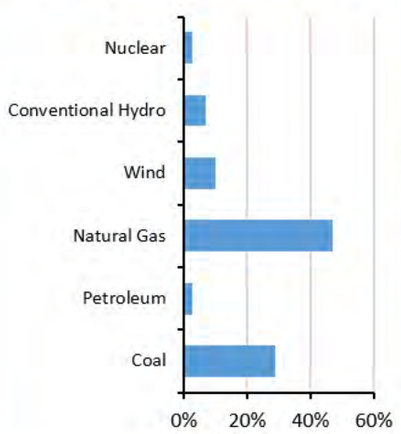
On-Peak Reserve Margin



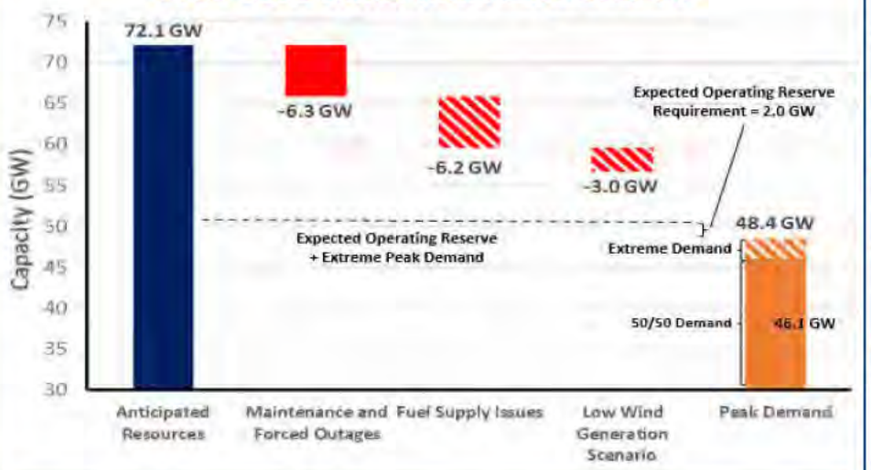
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and extreme demand forecast using historical data

Maintenance and Forced Outages: A capacity derate of 6.3 GW for maintenance outages, forced outages, and performance in extreme weather based on historical data

Fuel Supply Issues: BA derate of 6.2 GW based on MW capacity of gas-fired generators experiencing fuel supply issues in winter storm Elliott.

Low Wind Generation Scenario: 3 GW of wind potentially off-line when temperatures fall below their cold weather performance packages



NPCC-Maritimes

NPCC-Maritimes is an assessment area that covers the Canadian Maritime provinces—New Brunswick, Nova Scotia, and Prince Edward Island—and the northernmost portion of the U.S. state of Maine. The area covers approximately 150,000 square kilometers (58,000 square miles) and has a total population of nearly 1.9 million people. The New Brunswick Power Corporation (NB Power) is the balancing authority for New Brunswick, Prince Edward Island, and the northern portion of Maine. Nova Scotia Power Inc. (NSPI) is the balancing authority for Nova Scotia. NB Power's system is electrically interconnected with NPCC-Québec and NPCC-New England, and the electric systems in the provinces of Nova Scotia and Prince Edward Island have ties with New Brunswick but no direct ties with other assessment areas. Peak electricity demand in NPCC-Maritimes occurs during the winter season.

Highlights

- The Maritimes has a diversified mix of capacity resources fueled by oil, coal, hydro, nuclear, natural gas, wind, dual-fuel oil/gas, tie benefits, and biomass with no one type making up more than about 27% of the total capacity in the area.
- The Maritimes has long-term energy contracts in place for its winter supply and can purchase additional energy in the day-ahead and in real time as required.
- As part of the winter planning and preparation process, dual-fueled units will have sufficient supplies of heavy fuel oil stored on site to enable sustained operation in the event of natural gas supply interruptions.

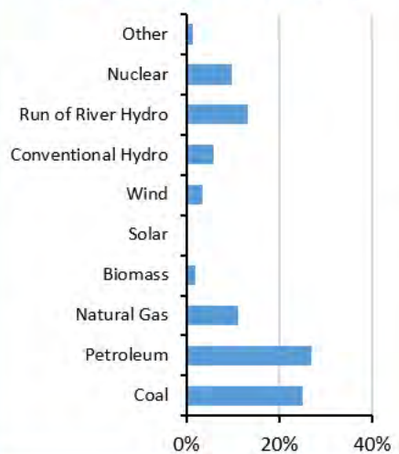
Risk Scenario Summary

Expected resources do not meet operating reserve requirements under normal peak-demand scenarios. Normal winter peak load and outage conditions could result in the need for operating mitigations (i.e., demand response, transfers, appeals) and EEAs. NPCC probabilistic analysis indicates some risk of unserved energy and LOLH under high demand or low resource scenarios.

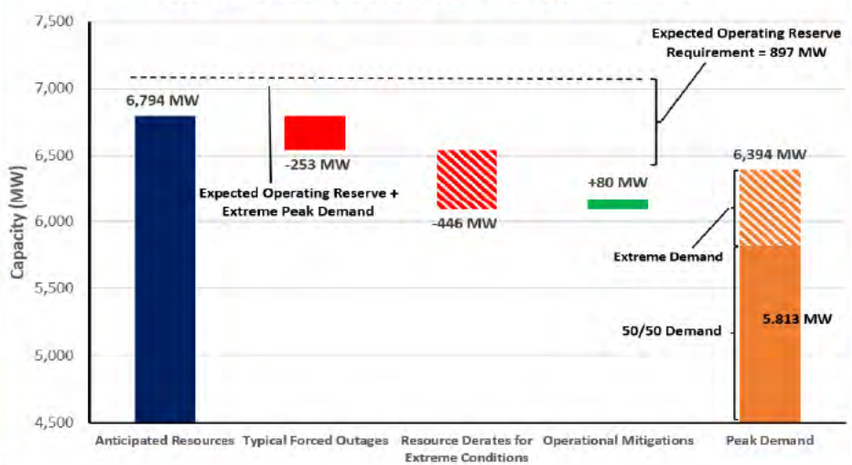
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Scenario peak load with adjustment calculated by adding a 10% margin of error to the peak internal demand forecast taken from the *Long-Term Reliability Assessment* (LTRA) for the 2025–2026 Winter period (aligns with the all-time winter peak, which occurred on February 4, 2024)

Typical Forced Outages: Based on historical operating experience

Resource Derates for Extreme Conditions: Based on ambient temperature thermal derates, wind derated to zero, as well as natural gas capacity derated by 50% due to supply issues

Operational Mitigations: Based on emergency operations and planning procedures in place including fuel switching



NPCC-New England

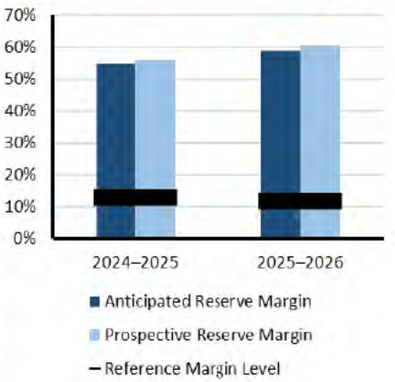
NPCC-New England is an assessment area consisting of the states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont that is served by ISO New England (ISO-NE) Inc. ISO-NE is a regional transmission organization that is responsible for the reliable day-to-day operation of New England's bulk power generation and transmission system, administration of the area's wholesale electricity markets, and management of the comprehensive planning of the regional BPS.

The New England BPS serves approximately 14.5 million customers over 68,000 square miles.

Highlights

- ISO-NE expects to meet its regional resource adequacy requirements this 2025–2026 Winter operating period without calling upon operating procedures to maintain a balance between electricity supply and demand.
- A standing concern is whether there will be sufficient energy available to satisfy electricity demand during an extended cold spell given the existing resource mix, fuel delivery infrastructure, and expected fuel arrangements without considerable effort to replenish stored fuels (i.e., fuel oil and liquefied natural gas (LNG)).
- ISO-NE expects to have sufficient capacity resources to meet the 2025–2026 50/50 and 90/10 winter peak demand forecast of 19,616 MW and 21,125 MW, respectively, for the weeks beginning January 10, January 17, and January 24.
- ISO-NE has recently developed the Regional Energy Shortfall Threshold (REST) as an effort to quantify the tolerable risk of energy shortfall during extreme events. Within the 0.25% highest-risk scenarios, the REST thresholds are 3.0% normalized EUE over 72-hour periods and 18.0 hours over 21-day periods.
  - ISO-NE does not anticipate exceeding the REST criteria for Winter 2025–2026.

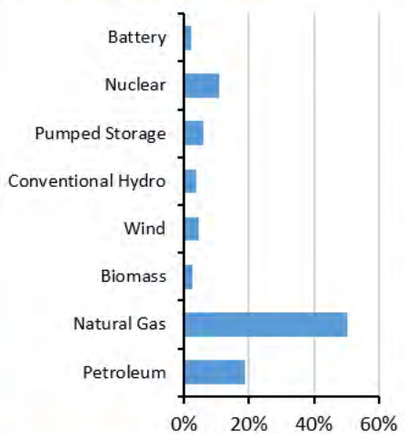
On-Peak Reserve Margin



Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed demand scenarios. Above-normal winter peak load combined with high generator outages could result in the need for operating mitigations (i.e., demand response and transfers). Prolonged extreme cold weather events that result in depletion of stored fuels can lead to resource shortfalls.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

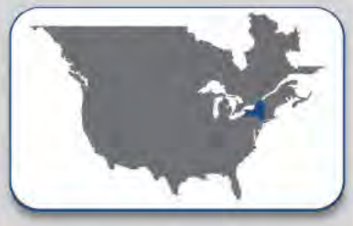
Demand Scenarios: Peak net internal demand (50/50) and (90/10) extreme demand forecast capturing the region's coldest day in the last 30 years using current and future load models

Typical Maintenance Outages: Based on historical weekly averages

Typical Forced Outages: Based on seasonal capacity of each resource as determined by ISO-NE

Resource Derates for Extreme Conditions: Represent a case that is beyond the (90/10) conditions based on historical observation of force outages and additional reductions for generation at risk due to natural gas supply and cold weather-related outages

Operational Mitigations: Based on load and capacity relief assumed available from invocation of ISO-NE operating procedures



NPCC-New York

NPCC-New York is an assessment area consisting of the New York ISO (NYISO) service territory. NYISO is responsible for operating New York's BPS, administering wholesale electricity markets, and conducting system planning. NYISO is the only BA within the state of New York. The BPS in New York encompasses over 11,000 miles of transmission lines and 760 power generation units and serves 20.2 million customers. For this WRA, the established RML is 15%. Wind, grid-connected solar PV, and run-of-river totals were derated for this calculation. However, New York requires load-serving entities to procure capacity for their loads equal to their peak demand plus an Installed Reserve Margin (IRM). The IRM requirement represents a percentage of capacity above peak load forecast and is approved annually by the New York State Reliability Council. The council approved the 2025–2026 IRM at 24.4%.

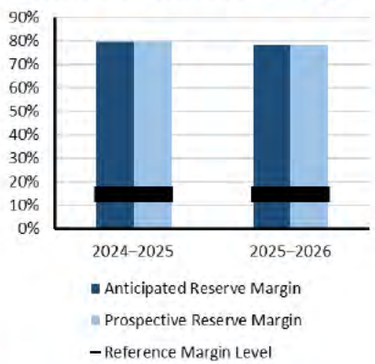
Highlights

- New York is presently a summer-peaking area, and no emerging reliability issues are anticipated during the 2025–26 Winter assessment period.
- Expected resources meet operating reserve requirements under the assessed demand and resource scenarios. A scenario involving an extended cold snap that causes above-normal demand and diminished natural gas supplies would result in low but sufficient reserves.
- The preliminary results of the NPPCC winter probabilistic assessment indicate that operating procedures are not needed to maintain a balance between electricity supply and demand. No cumulative LOLE, LOL,H or EUE risks were indicated over the December–February winter period for all the scenarios modeled.

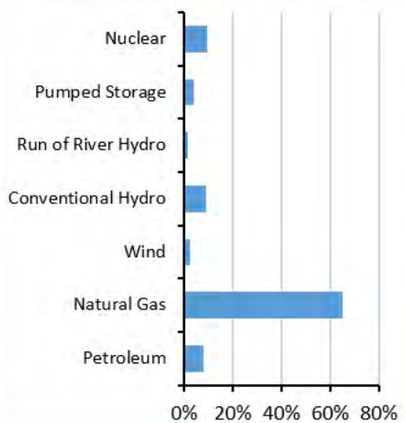
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed demand and resource scenarios.

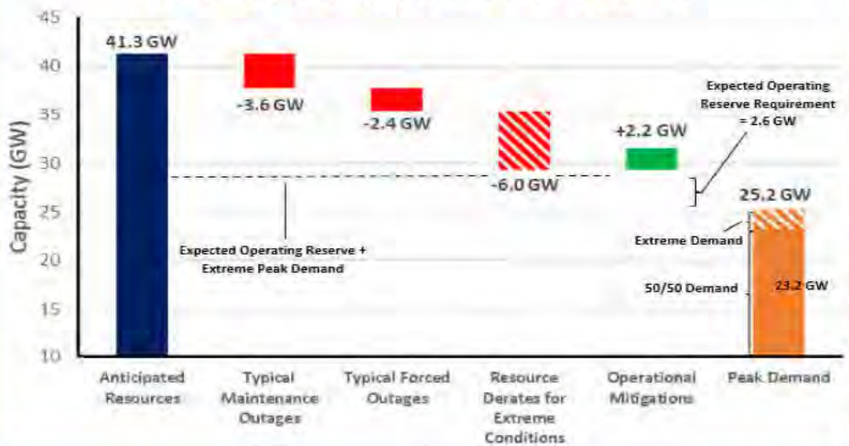
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast

Typical Maintenance Outages: Based on planned scheduled maintenance

Typical Forced Outages: Based on 5–year averages from GADS data.

Resource Derates for Extreme Conditions: Potential natural gas generation at risk if non-firm supply is unavailable in a period of extended cold weather. Based on a 2025 analysis, approximately 6,307 MW of gas generation with non-firm fuel supplies could be unavailable.

Operational Mitigations: Based on NYISO operating procedures



NPCC-Ontario

NPCC-Ontario is an assessment area that covers the Canadian province of Ontario. The province of Ontario covers more than 1 million square kilometers (415,000 square miles) and has a population of almost 16 million people. The Independent Electricity System Operator (IESO) is the balancing authority for the province of Ontario. NPCC-Ontario is electrically interconnected with NPCC-Québec, MRO-Manitoba, MISO, and NPCC-New York. Peak electricity demand in NPCC-Ontario occurs during the summer season.

Highlights

- As Ontario is a summer-peaking province, there is typically a lower risk of reliability issues during the winter than the summer. However, Ontario regularly experiences extreme cold weather in the winter.
- NPCC-Ontario is well prepared for Winter 2025–2026, and IESO expects that the electric system will remain reliable with reserve margins well above required levels.
- Operators and forecasters in Ontario work closely with neighboring jurisdictions to manage extreme weather events.
- Natural-gas-fired generators in Ontario are supplied by pipelines with access to the Enbridge Gas Dawn Hub and its associated storage facilities, which significantly reduces natural gas deliverability and reliability concerns by connecting those systems to several major gas transportation corridors, enabling access to multiple supply basins.

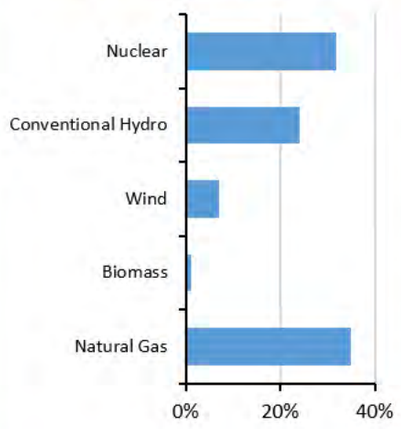
On-Peak Reserve Margin



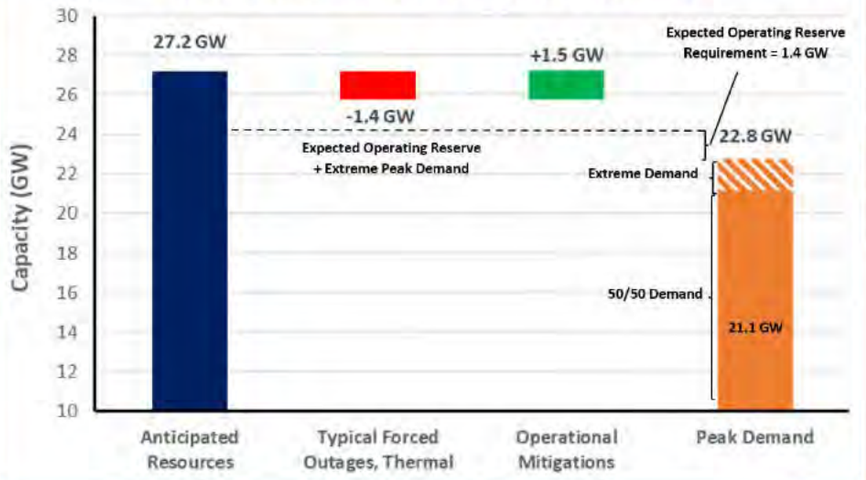
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50 forecast) and highest weather-adjusted daily demand from 31 years of winter demand history

Typical Forced Outages, Thermal: Based on analysis of a rolling five-year history of actual forced outage data.

Operational Mitigations: Imports anticipated from **neighbors** during emergencies



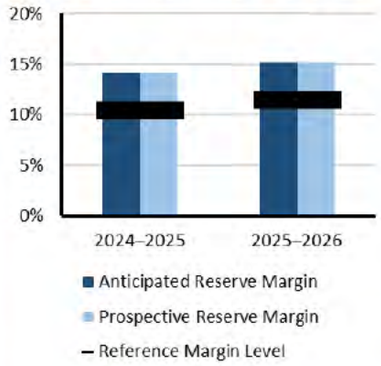
NPCC-Québec

NPCC-Québec is an assessment area that covers the Canadian province of Québec. The province of Québec covers over 1.5 million square kilometers (nearly 600,000 square miles) and has a population of 9 million people. Hydro-Québec is the BA for the province of Québec. The Québec BPS is one of the four electric Interconnections in North America. It is a predominately hydroelectric-generation-based system that is electrically interconnected with NPCC-Ontario, NPCC-New York, NPCC-New England, and NPCC-Maritimes. Peak electricity demand in NPCC-Québec occurs during the winter season.

Highlights

- NPCC-Québec projects adequate capacity margins above its reference reserve requirements and that system resource adequacy will be maintained for the province for the 2025–26 Winter assessment period.
- No hydropower performance issues are expected during extreme cold because of design criteria for cold weather.
- No fuel supply or transportation issues are anticipated for the upcoming winter season.
- While a slight decrease in net firm transfers has occurred since last winter (-89 MW), significant increases in demand-side management programs (+450 MW year-over-year) have been realized over the same period and are expected to compensate for this winter's modest expected load growth.

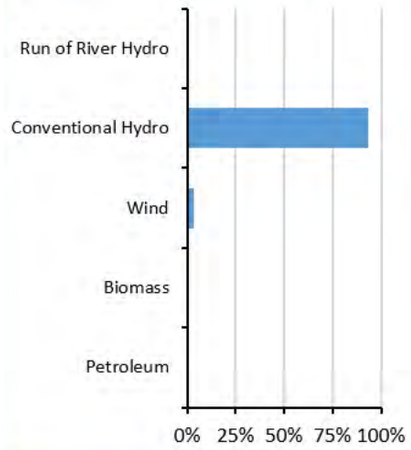
On-Peak Reserve Margin



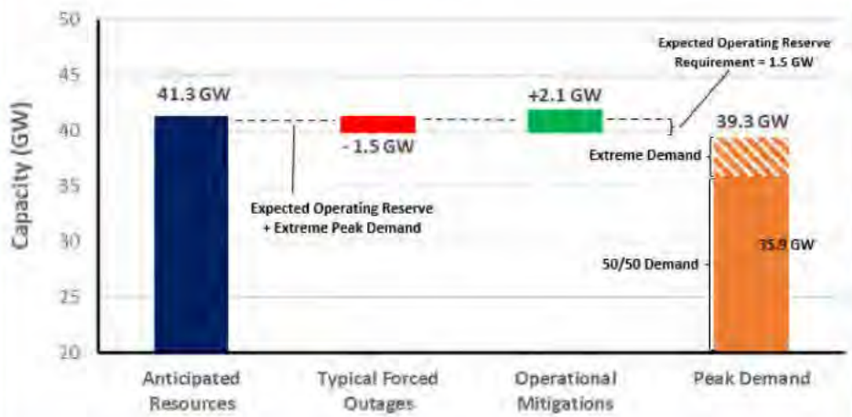
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

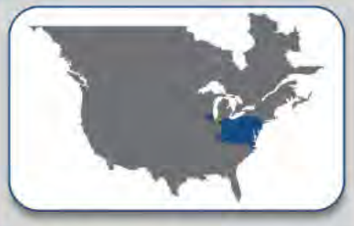
Risk Period: Highest risk for unserved energy at hour ending 8:00 a.m.

Demand Scenarios: Demand forecasts include demand-side resources. The demand side resources are the same for the 50/50 and extreme demand scenarios. The extreme load forecast is determined at two standard deviations higher than the mean, which has a 6.06% probability of occurrence.

Extreme Derates: Maintenance outages and other deratings are already included in existing-certain capacity calculation. Wind capacity is 64% derated

Typical Forced Outages: Unplanned outages are 1,500 MW.

Operational Mitigations: Operational mitigations include imports from neighboring areas and reduction of reserves



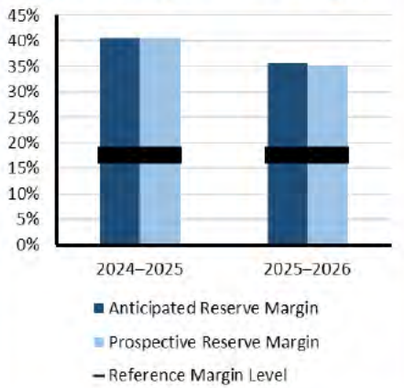
PJM

PJM Interconnection is a regional transmission organization that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia. PJM's footprint covers approximately 369,054 square miles and with an approximate population of 67 million people. PJM is the area's BA, Transmission and Resource Planner, interchange authority, TOP, transmission service provider, and RC. PJM is electrically interconnected with MISO, NPCC-New York, SERC-Central, and SERC-East. Peak electricity demand in PJM occurs during the summer season.

Highlights

- Due to the low penetration of limited and variable resources in PJM relative to PJM's peak load, the hour with highest loss-of-load risk remains the hour with highest forecasted demand.
- PJM is expecting little capacity adequacy risk during Winter 2025–2026 and expects around 35% installed reserves, which is above the target IRM of 17.7% necessary to meet the 1-day-in-10-years LOLE criterion.
- Last winter, PJM hit a new all-time winter peak, but generator preparations anticipating congestion and tight capacity projections led to sufficient reserves throughout the demand event and PJM's transmission system performed well.
- The decrease in reserves from Winter 2024–2025 is due to load increases and retirement of generation without like (non-solar dispatchable) replacement generation.

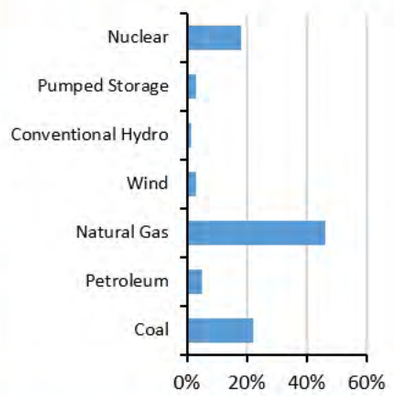
On-Peak Reserve Margin



Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast

Typical Forced Outages: Based on historical data and trending

Resource Derates for Extreme Conditions: Reduced thermal capacity contributions due to performance in extreme conditions

Operational Mitigations: accounts for an estimated value based on operational / emergency procedures



SERC-Central

SERC-Central is an assessment area within the SERC Regional Entity. SERC-Central includes all of Tennessee and portions of Georgia, Alabama, Mississippi, Missouri, and Kentucky. Historically a summer-peaking area, SERC-Central is beginning to have higher peak demand forecasts in winter. SERC is one of the six companies across North America that are responsible for the work under FERC-approved delegation agreements with NERC. SERC-Central is specifically responsible for the reliability and security of the electric grid across the Southeastern and Central areas of the United States. This area covers approximately 630,000 square miles and serves a population of more than 91 million. The SERC Regional Entity includes 36 BAs, 28 planning entities, and 6 RCs.

Highlights

- SERC-Central is transitioning from a summer-peaking area to a dual-peaking system.
- For the 2025–2026 Winter, SERC-Central projects a sufficient level of resources to serve the expected load under median weather and typical system operating conditions, based on the 2024 NERC ProbA base-case results.
- Most entities across SERC-Central report that fuel security is strong since it is supported by firm natural gas contracts, storage resources, and reliable pipeline capacity. Coal inventories are projected to remain within operational ranges necessary to meet winter demand.
- Following lessons from Winter Storm Elliott, one SERC-Central entity raised its winter Planning Reserve Margin target to 26% and updated preparedness programs with improved heat trace capabilities.

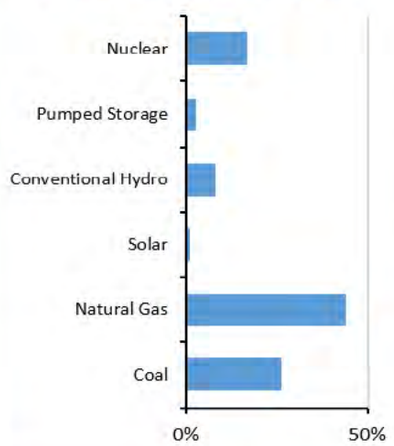
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal peak demand. A severe cold weather event that extends to the south could lead to energy emergencies as operators face sharp increases in generator forced outages and electricity demand. Above-normal winter peak load and outage conditions could result in the need for operating mitigations (i.e., demand response and transfers) and EEAs. Load shedding is unlikely but may be needed under wide-area cold weather events.

On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

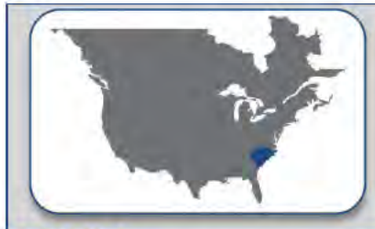
Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast using 30 years of historical data

Typical Maintenance Outages: Data collected through a survey of members for expected outages during December through February

Typical Forced Outages and Solar Derate: Includes any weighted average forced-outage rates on-peak that are not factored into the anticipated resources calculation . Also, solar resources are derated to account for peak demand occurrence during darkness.

Resource Derates for Extreme Conditions: Entity-provided values for low likelihood extreme conditions

Operational Mitigations: A total of over 1.6 GW based on operational/emergency procedures



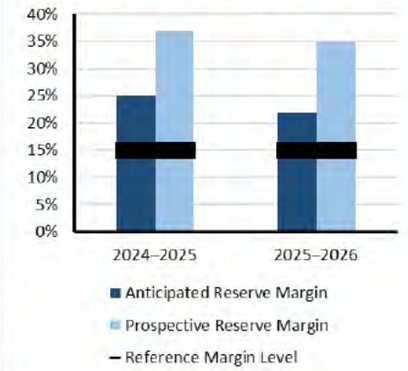
SERC-East

SERC-East is an assessment area within the SERC Regional Entity. SERC-East includes North Carolina and South Carolina. Historically a summer-peaking area, SERC-East is beginning to have higher peak demand forecasts in winter. SERC is one of the six Regional Entities across North America that are responsible for the work under FERC-approved delegation agreements with NERC. SERC is specifically responsible for the reliability and security of the electric grid across the Southeastern and Central United States. The SERC Regional Entity covers approximately 630,000 square miles with a population of more than 91 million. The SERC Regional Entity includes 36 BAs, 28 Planning Authorities (PA), and 6 RCs.

Highlights

- SERC-East is transitioning from a summer-peaking area to potentially peaking during both summer and winter. This shift is attributed to the continued addition of solar PV generation, which reduces summer peak demand, and a trend toward electrification of heating, which drives up winter peak demand.
- For the 2025–2026 Winter, the SERC-East region projects a sufficient level of resources to serve the expected load under median weather and typical system operating conditions, based on the 2024 NERC ProbA base-case results.
- Fuel supplies and transportation remain stable, and entities anticipate maintaining adequate coal and oil inventories with no reported changes to fuel procurement or operator plans for the upcoming winter.
- Probabilistic Base Case Results (Median Weather): EUE is 61.95 MWh and LOLH is 0.06 hours/year. EUE values are likely due to higher winter peaks and/or lower supply of capacity that can meet early winter morning demand.
- Mitigation measures for extreme conditions include voltage reduction (25–50 MW) and load-shedding programs that cover up to 30% of system load.

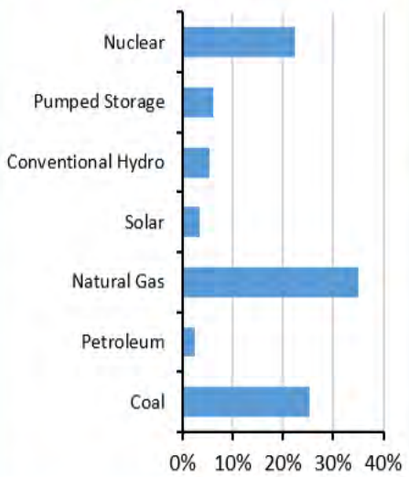
On-Peak Reserve Margin



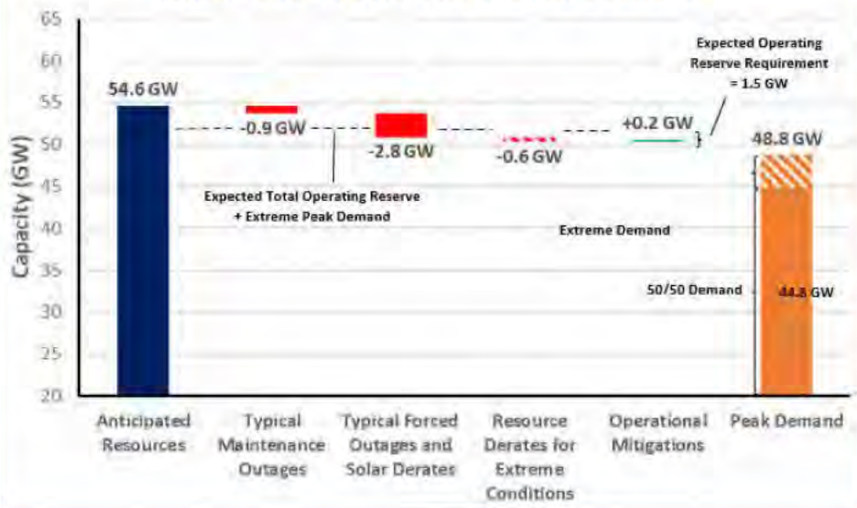
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal demand scenarios. A severe cold weather event extending to the south could lead to energy emergencies as operators face sharp increases in generator forced outages and electricity demand. Above-normal winter peak load and outage conditions could result in the need for operating mitigations (i.e., demand response and transfers) and EEAs. Load shedding is unlikely but may be needed under wide-area cold weather events.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast

Typical Maintenance Outages: Data collected through a survey of members for outages during December through February

Typical Forced Outages and Solar Derate: Weighted average forced-outage rates on-peak are factored into the anticipated resources calculation. Also, solar resources are derated to account for peak demand occurrence during darkness.

Resource Derates for Extreme Conditions: Maximum historical generation outages (excluding 2022–2025)

Operational Mitigations: A total of 0.2 GW based on operational/emergency procedures



SERC-Florida Peninsula

SERC-Florida Peninsula is a summer-peaking assessment area within SERC. SERC is one of the six Regional Entities across North America that is responsible for the work under FERC-approved delegation agreements with NERC. SERC is specifically responsible for the reliability and security of the electric grid across the Southeastern and Central United States. The SERC Regional Entity area covers approximately 630,000 square miles with a population of more than 91 million. The SERC Regional Entity includes 36 BAs, 28 PAs, and 6 RCs.

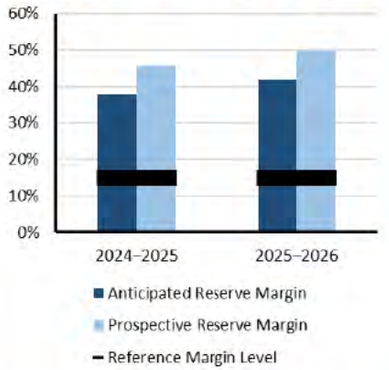
Highlights

- SERC-Florida Peninsula is a summer-peaking assessment area.
- Florida Peninsula entities have not identified any emerging reliability issues for the upcoming 2025–26 Winter season with an ARM projected at 39%, well above the RML, while the 2024 NERC ProbA base-case results project a sufficient level of resources to serve the expected load under median weather and typical system operating conditions (EUE is 1.09 MWh and LOLH is 0.00 hours/year).
- Many entities report strong fuel security, supported by firm natural gas contracts, storage resources, reliable pipeline capacity, and actively managed coal and oil inventories, which are projected to remain within operational ranges to meet winter demand.
- Florida Peninsula entities do not assume non-firm external assistance from neighboring areas during extreme conditions.

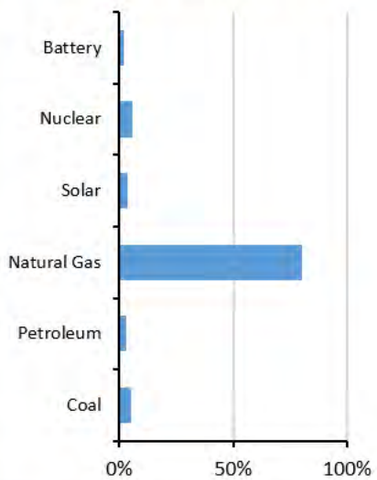
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

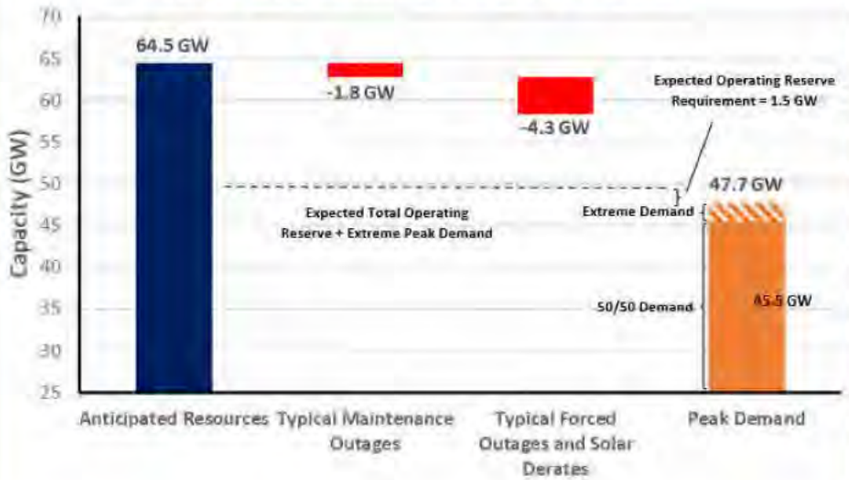
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

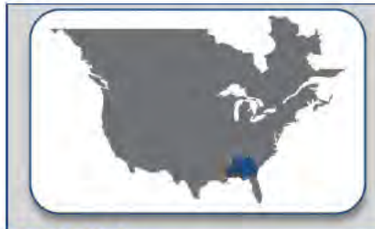
Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast using 30 years of historical data

Typical Maintenance Outages: Data collected through a survey of members for outages during December through February

Typical Forced Outages and Solar Derate: Weighted average forced-outage rates on-peak are factored into the anticipated resources calculation. Also, solar resources are derated to account for peak demand occurrence during darkness.

Resource Derates for Extreme Conditions: Entity-provided values for low likelihood extreme conditions



SERC-Southeast

SERC-Southeast is a summer-peaking assessment area within the SERC Regional Entity. SERC-Southeast includes all or portions of Georgia, Alabama, and Mississippi. SERC is one of the six Regional Entities across North America that is responsible for the work under FERC-approved delegation agreements with NERC. SERC is specifically responsible for the reliability and security of the electric grid across the Southeastern and Central United States. The SERC Regional Entity covers approximately 630,000 square miles with a population of more than 91 million. The SERC Regional Entity includes 36 BAs, 28 PAs, and 6 RCs.

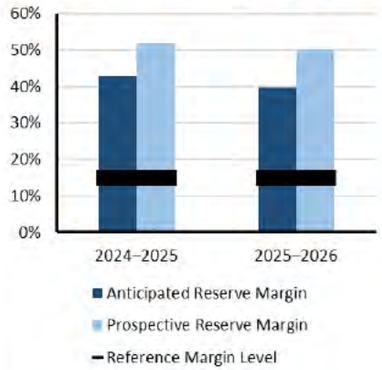
Highlights

- SERC-Southeast is trending towards becoming slightly winter-peaking.
- For the 2025–2026 Winter, SERC-Southeast entities report no emerging reliability concerns and expect to have adequate resources, supported by firm natural gas transportation contracts, diverse fuel portfolios, and sufficient on-site coal inventories to serve the expected load under typical system operating conditions. The 2024 NERC ProbA base-case results in EUE and LOLH are both 0.00.
- While most SERC-Southeast BAs expect to have adequate resources, supported by firm natural gas transportation contracts, diverse fuel portfolios, and sufficient on-site coal inventories, one BA highlights potential risks related to natural gas transportation capacity, citing high pipeline utilization, competition for delivered gas, and ratable flow requirements. Mitigation strategies include securing third-party gas supply, adding dual-fuel capability, and implementing coal inventory management.
- Entities have made refinements such as replacing specific 230 kV circuit breakers and increasing monitoring frequencies for critical plant systems after January 2025 winter events.

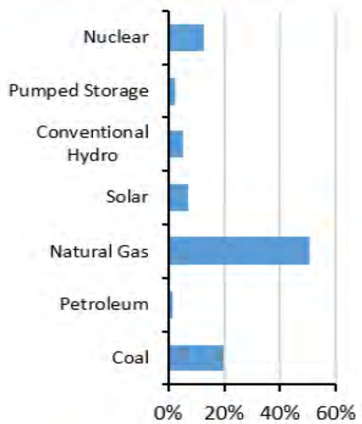
Risk Scenario Summary

Expected resources meet operating reserve requirements under the assessed scenarios.

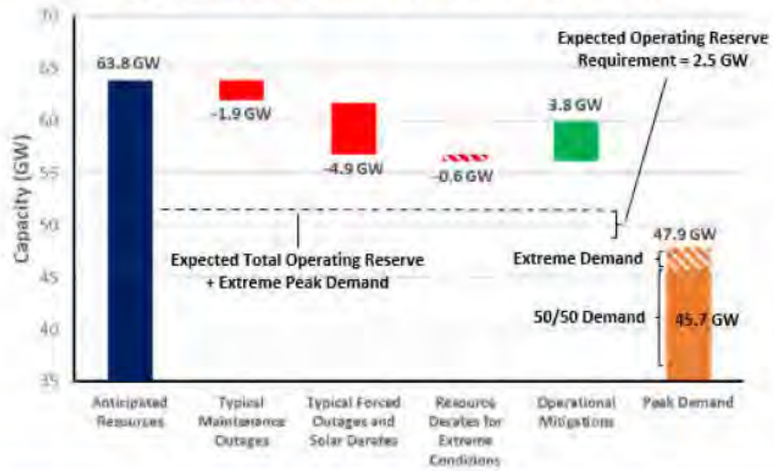
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Net internal demand (50/50) and (90/10) demand forecast using 30 years of historical data

Typical Maintenance Outages: Data collected through a survey of members for outages during December through February

Typical Forced Outages and Solar Derate: Weighted average forced-outage rates on-peak are factored into the anticipated resources calculation. Also, solar resources are derated to account for peak demand occurrence during darkness.

Resource Derates for Extreme Conditions: Maximum historical generation outages

Operational Mitigations: A total of 3.8 GW based on operational/emergency procedures



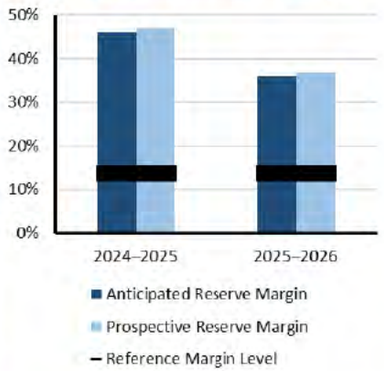
Texas RE-ERCOT

ERCOT is the ISO for the ERCOT Interconnection and is located entirely in the state of Texas; it operates as a single BA. It also performs financial settlement for the competitive wholesale bulk-power market and administers retail switching for nearly 8 million premises in competitive choice areas. ERCOT is governed by a board of directors and subject to oversight by the Public Utility Commission of Texas and the Texas Legislature. ERCOT is summer-peaking and covers approximately 200,000 square miles, connects over 54,100 miles of transmission lines, has over 1,250 generation units, and serves more than 27 million customers. Texas RE is responsible for the Regional Entity functions described in the Energy Policy Act of 2005 for ERCOT. On November 3, 2022, the Public Utility Commission of Texas issued an order directing ERCOT to assume the duties and responsibilities of the reliability monitor for the Texas power grid.

Highlights

- Given expected system conditions, an ARM of 36% and RML of 13.75%, ERCOT expects to have sufficient operating reserves for the peak hour ending 8:00 a.m.
- ERCOT does not expect any significant fuel supply issues for the winter.
- ERCOT has conducted 2,028 generation resource and transmission service provider (TSP) winter weatherization inspections since Winter 2021–2022.
- Winter peak demands typically occur before sunrise and after sunset when solar generation is not available. Significant battery storage mitigates these risks.
- ERCOT's probabilistic risk assessment indicates a 2% probability of having to declare EEAs during the January forecasted winter peak day (which coincides with the highest reserve shortage risk) and a controlled load shed probability of 1.8%. ERCOT defines low-risk hours as when the probability of an EEA is less than 10%.
- Increased load growth in west Texas combined with "no solar" and low wind conditions can cause transmission lines into this area to become heavily loaded. ERCOT has introduced improved dynamic line ratings that allow for greater transfers at colder temperatures and periods of low irradiance.

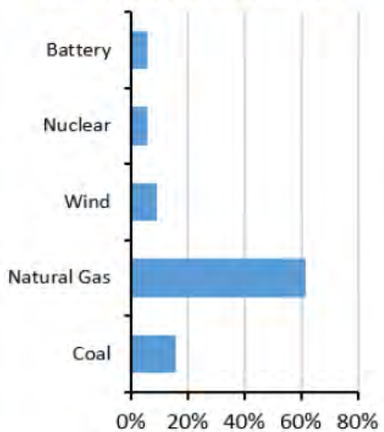
On-Peak Reserve Margin



Risk Scenario Summary

Expected resources meet operating reserve requirements under normal peak-demand scenarios. Above-normal winter peak load and outage conditions could result in the need for operating mitigations (i.e., demand response and transfers) and EEAs. Load shedding is unlikely but may be needed under wide-area cold weather events.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy at peak demand hour

Demand Scenarios: Presumes weather conditions comparable to Winter Storm Uri. The adjustment is calculated as the difference between the 100th percentile and 50th percentile values from ERCOT's Probabilistic Reserve Risk Model (PRRM) simulated load outcome distribution for hour ending 8:00 a.m.

Typical Maintenance Outages: Based on historical winter data and consideration of ERCOT's allowed maximum system daily planned outage capacity

Typical Forced Outages: Based on a probability distribution created using historical ERCOT Outage Scheduler data for the last three Januarys.

Resource Derates for Extreme Conditions: Weather-related thermal and wind outages based on Winter Storm Uri levels, adjusted for reductions due to weatherization standards. Also includes high non-weather-related outages.

Operational Mitigations: Additional potential capacity from switchable generation and imports



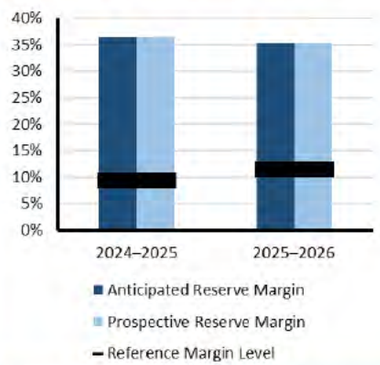
WECC-Alberta

WECC-Alberta is an assessment area that covers the Canadian province of Alberta. The province has a geographic area of 661,848 square kilometers (255,541 square miles) and a population of almost 5 million people. The Alberta Electric System Operator (AESO) is the province's Planning Entity and RC responsible for safe, reliable, and economic operation of the Alberta Interconnected Electric System. AESO is a non-profit corporation that operates a system that includes approximately 26,000 kilometers of transmission lines and connects approximately 426 qualified generating units and nearly 250 market participants through a wholesale market. Alberta's transmission system has three interties with neighboring areas: Saskatchewan (see MRO-SaskPower), British Columbia (see WECC-British Columbia), and Montana (see WECC-Northwest). Peak electricity demand on the AESO system currently occurs during the winter season.

Highlights

- At an extreme winter peak of 12,982 MW, with extreme forced outages at 530 MW and derates for extreme conditions bringing wind energy availability down by 1,800 MW and hydroelectricity by 88 MW, the required reserves are 759 MW and are sufficiently met, even with low availability.
- Demand is expected to increase 1.1% from last winter with the existing-certain installed capacity having increased 23%.
- Solar availability is down because 1,000 MW of PV moved from originally expecting to come on-line in 2024 as Tier 1 resources to Tier 2s mostly anticipated to come on-line in 2025, but with less certainty.

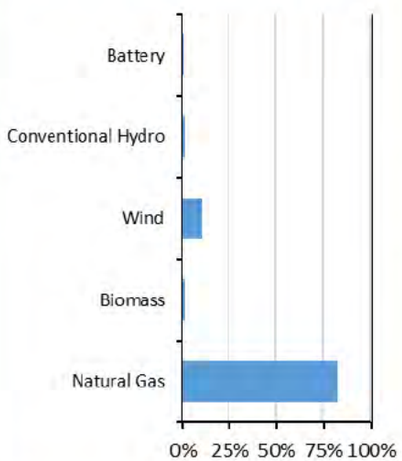
On-Peak Reserve Margin



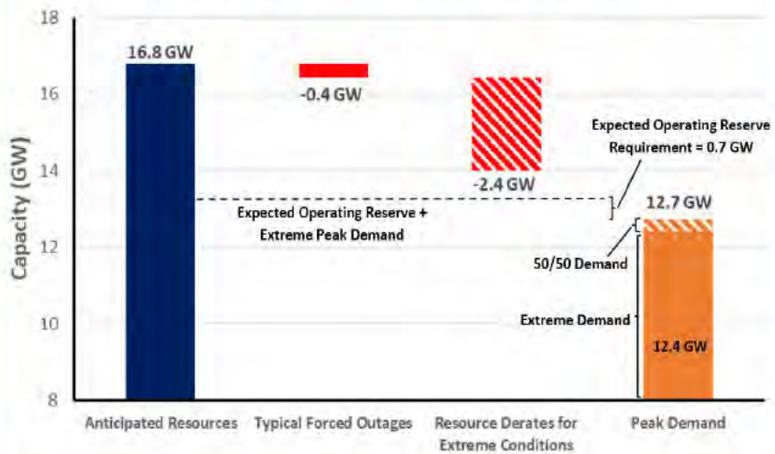
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed scenarios.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS data

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period



WECC-Basin

WECC-Basin is a summer-peaking assessment area in the WECC Regional Entity that includes Utah, southern Idaho, and a portion of western Wyoming, covering Idaho Power and PacifiCorp's eastern BA area. The population of this area is approximately 5.4 million. It has 15,910 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025-26 WRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Basin is a new assessment area in 2025 that was part of WECC-NW in the 2024–25 WRA.*

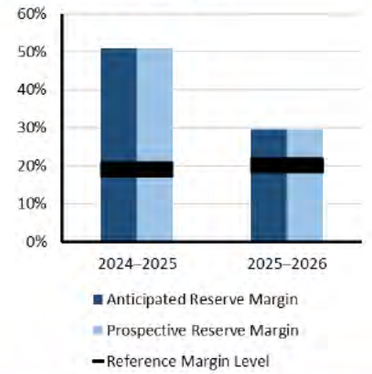
Highlights

- At an extreme winter peak of 11.1 GW under an extreme combination of derates and outages, the region could be short 1.0 GW before imports and is expected to need to rely on transfers.
- Net internal demand is expected to increase 1% since last year, with total internal demand up 1.8% being offset by a doubling of controllable and dispatchable demand response.
- Tier 1 resources have declined and do not appear to be offset by increases in existing-certain generation resource capacity. Nameplate wind has increased by almost 18% and solar by almost 30%. Hydro is also up over 7% in total installed capacity.
- Reliance on imports is expected to be required to maintain resource adequacy during extreme peak demand and extreme derate conditions.

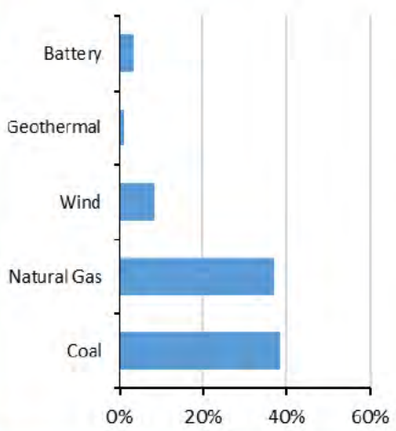
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal peak demand scenarios. Above-normal peak demand combined with high generator outages in extreme conditions results in the need for external assistance to maintain reserves.

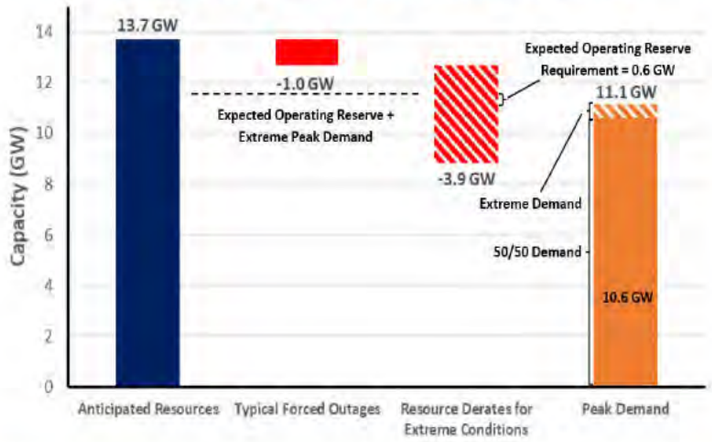
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Extreme Derates: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period



WECC-British Columbia

WECC-British Columbia is an assessment area that covers the Canadian province of British Columbia. The province has a geographic area of 944,735 square kilometers (364,764 square miles) and a population of just over 5 million people. BC Hydro is the Planning Entity and RC for the province of British Columbia and is the principal supplier of electricity for the province. BC Hydro is a provincial Crown corporation and, under provincial legislation, is responsible for the oversight of the British Columbia BES and its interconnections. BC Hydro operates an integrated system supported by 30 hydroelectric plants, approximately 80,000 kilometers of transmission and distribution lines, and 125 contracts with independent power producers. BC Hydro's transmission system has two interties with neighboring areas: the U.S. state of Washington (see WECC-Northwest) and Alberta (see WECC-Alberta). Peak electricity demand on the BC Hydro system currently occurs during winter.

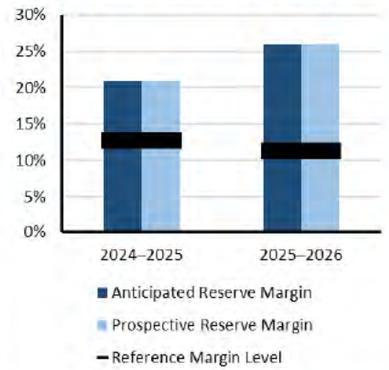
Highlights

- Peak demand is expected to remain about the same as last winter.
- There are about 200 MW more (47%) planned Tier 1 resources for this winter than last.
- Solar nameplate capacity has increased from 2 MW to 17 MW since last winter and hydroelectric nameplate capacity is up more than 5%, or 1,366 MW.

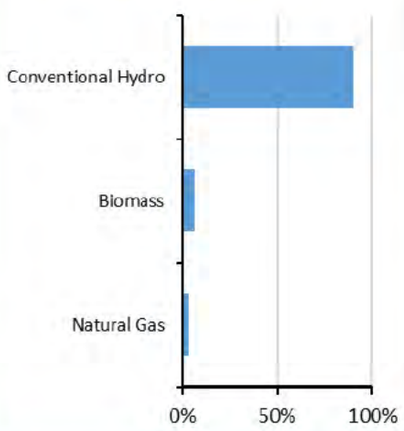
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal and extreme demand scenarios.

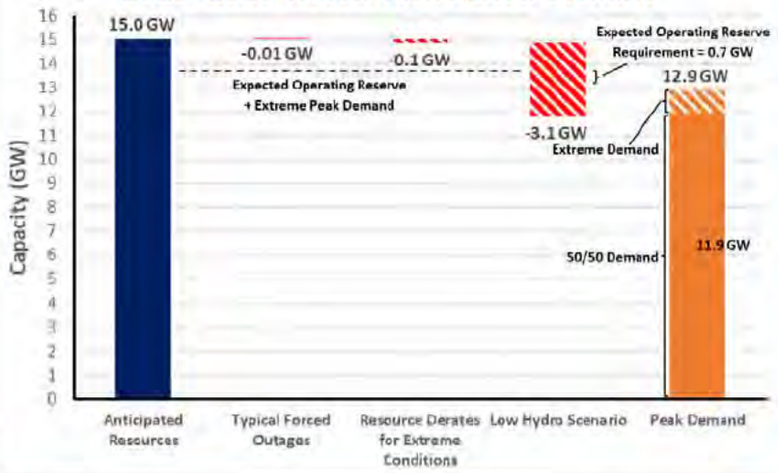
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period

Low Hydro Scenario: Estimated derate for lower hydro output



WECC-California

WECC-California is a summer-peaking assessment area in the Western Interconnection that includes most of California and a small section of Nevada. The assessment area has a population of over 42.5 million people. The area includes the California ISO, the Los Angeles Department of Water and Power, the Turlock Irrigation District, and the Balancing Area of Northern California. It has 32,712 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025–26 WRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Basin is a new assessment area in 2025 that was part of WECC-NW in the 2024–25 WRA.*

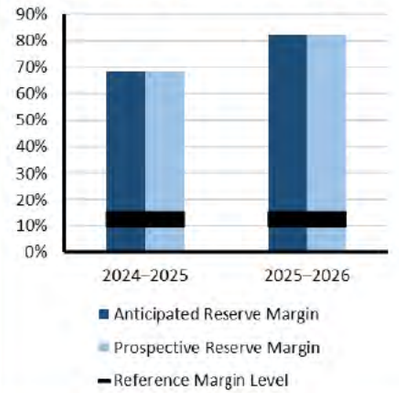
Highlights

- Operating reserve margins are met before imports in all winter resource availability scenarios.
- On-peak demand is expected to remain about the same as last winter. Demand-side management is down about 10%.
- Existing-certain capacity is up almost 5%, while planned Tier 1 resources are up more than 2 GW. The total wind nameplate capacity is up almost 27% and solar almost 13%. Hydro is down 4%.
- No reliance on imports is expected to be required to maintain resource adequacy for Winter 2025–2026.

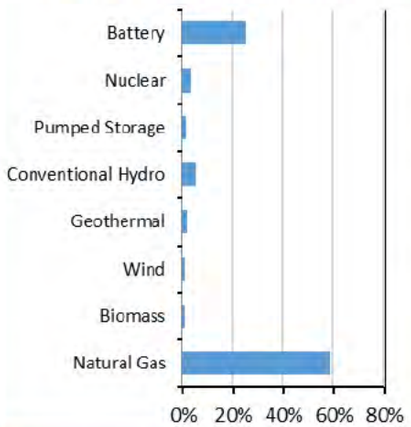
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed scenarios.

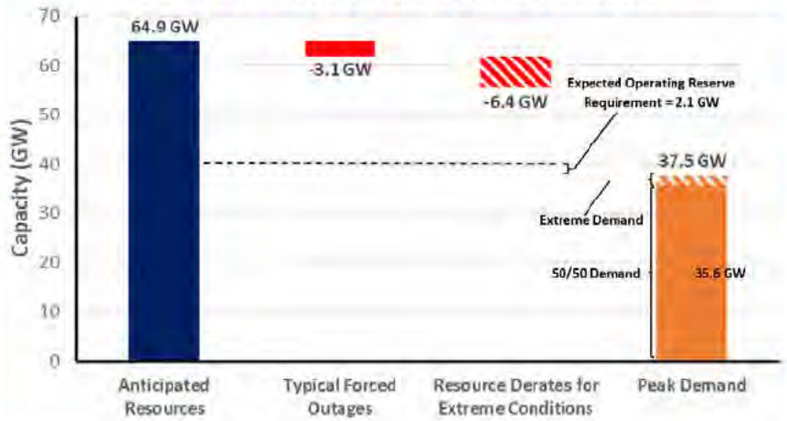
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period



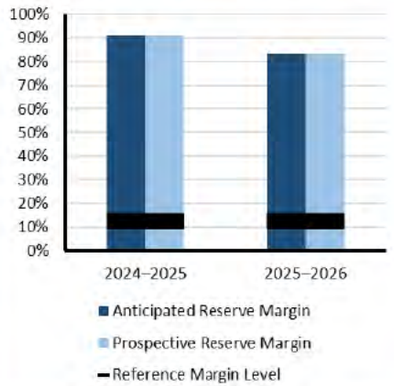
WECC-Mexico

WECC-Mexico is a summer-peaking assessment area in the Western Interconnection that includes the northern portion of the Mexican state of Baja California, which has a population of 3.8 million people and includes CENACE. It has 1,568 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025–26 WRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Basin is a new assessment area in 2025 that was part of WECC-NW in the 2024–25 WRA.*

Highlights

- As a summer-peaking region, operating reserve margins are met before imports in all scenarios.
- Planned Tier 1 resources are down 100% to zero as expected resources have either been brought on-line to move into existing or, in the case of some natural gas, have been delayed until 2026 and moved into Tier 2.
- The existing-certain on peak reserve margin is down by 5.2%, and the anticipated and prospective reserve margins are down by 7.8%; however, since Mexico is heavily summer-peaking, the 83% reserve margin still exceeds the RML of 12.5%, which remains unchanged.

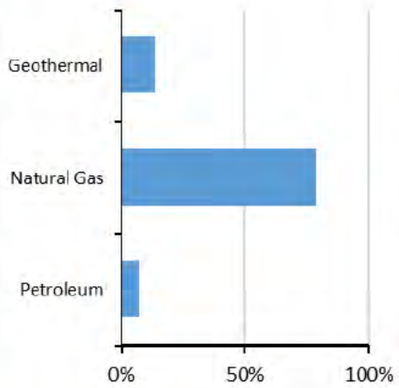
On-Peak Reserve Margin



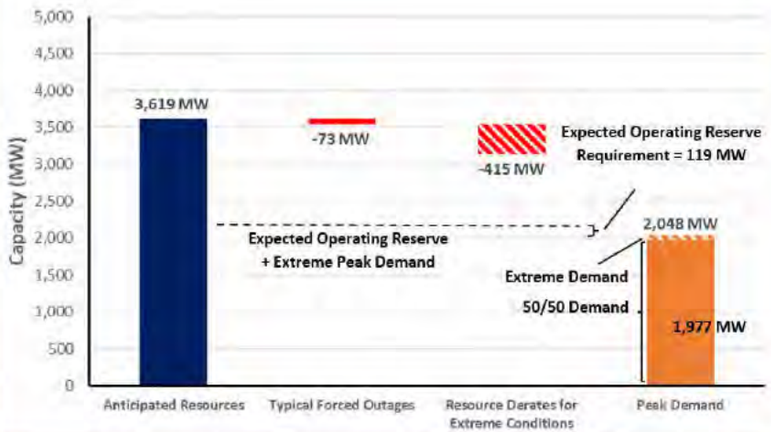
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed scenarios.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period



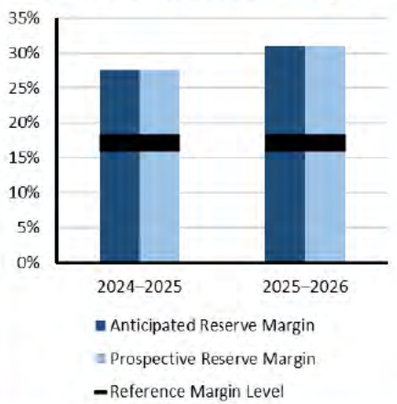
WECC-Northwest

WECC-Northwest is a winter-peaking assessment area in the WECC Regional Entity. The area includes Montana, Oregon, and Washington and parts of northern California and northern Idaho. The population of the area is approximately 13.6 million. It has 32,751 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note: The 2025–26 WRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Basin is a new assessment area in 2025 that was part of WECC-NW in the 2024–25 WRA.*

Highlights

- The Northwest has historically been a mixed season-peaking region.
- Operating reserve margins are expected to be met after imports in all winter scenarios.
- Total and net internal demand are up 9.3% with the primary drivers being data centers, residential electrification, transportation electrification, and semiconductor manufacturing.
- Large coal unit retirements and conventional hydro unit retirements are attributable to the reduction in existing certain capacity of 10.5%; however, planned Tier 1 resources have soared over 580%, from 463 MW to over 3 GW.
- Nameplate wind capacity is up over 3 GW (26%) and solar nameplate capacity is up nearly 2,690 MW (134%), which has also increased the solar availability on the peak hour.
- An increase in firm imports is seen in the model, 6.1 GW, absorbing the reduction in existing certain capacity of 4 GW.

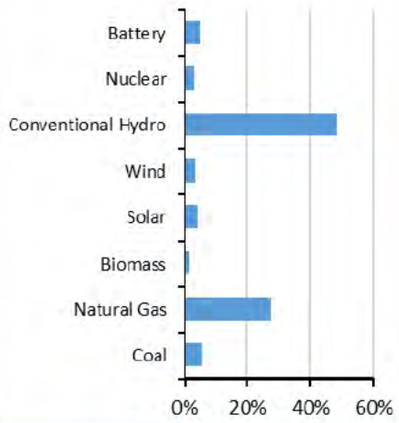
On-Peak Reserve Margin



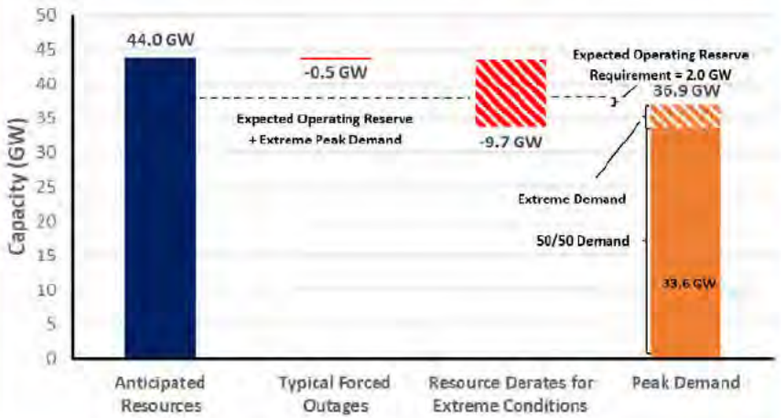
Risk Scenario Summary

Expected resources meet operating reserve requirements under normal peak demand scenarios. Above-normal peak demand combined with high generator outages in extreme conditions results in the need for external assistance to maintain reserves.

On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period. This value includes 6.8 GW of hydro derates.



WECC-Rocky Mountain

WECC-Rocky Mountain is a summer-peaking assessment area in the Western Interconnection that includes Colorado, most of Wyoming, and parts of Nebraska and South Dakota. The population of the area is approximately 6.7 million. It covers the balancing areas of the Public Service Company of Colorado and the Western Area Power Administration's Rocky Mountain Region. It has 18,797 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note The 2025–26 WRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Basin is a new assessment area in 2025 that was part of WECC-NW in the 2024–25 WRA.*

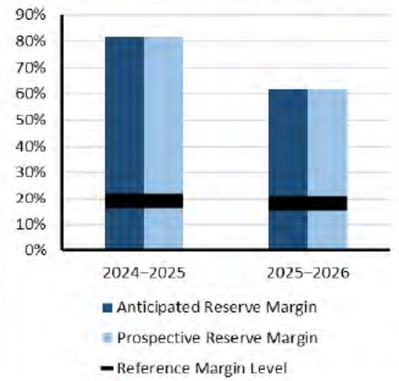
Highlights

- In Rocky Mountain, operating reserve margins are expected to be met before imports in all winter scenarios.
- Total and net internal demand are up almost 1%. The primary drivers are data centers and commercial and industrial customer growth.
- Planned Tier 1 resources are up over 84%, from almost 200 MW to over 365 MW. Solar nameplate capacity is up 27%; however, on-peak solar energy availability is down 100% due to the shift to after sunset. Expected hydro on peak energy availability is also down by around a quarter on the peak hour. Existing-Certain, Anticipated, and Prospective Reserve Margins are all down by over 20% on the peak hour; however, the region still maintains resource adequacy with margins hovering around 60% compared to the RML of 18%.
- No reliance on imports is expected to be required to maintain resource adequacy under combined extreme peak and extreme derated conditions.

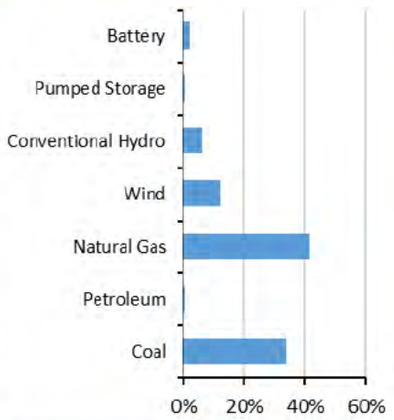
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed scenarios.

On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period



WECC-Southwest

WECC-Southwest is a summer-peaking assessment area in the Western Interconnection that includes all of Arizona and New Mexico, most of Nevada, and small parts of California and Texas. The area has a population of approximately 13.6 million. It has 23,084 miles of transmission. WECC is responsible for coordinating and promoting BES reliability in the Western Interconnection. WECC's 329 members include 40 BAs, representing a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and more than 84.5 million customers, it is geographically the largest and most diverse Regional Entity. *Note The 2025–26 WRA includes a new assessment area map for the U.S. Western Interconnection. The new assessment area boundaries provide more geographic detail of reliability risk information. WECC-Basin is a new assessment area in 2025 that was part of WECC-NW in the 2024–25 WRA.*

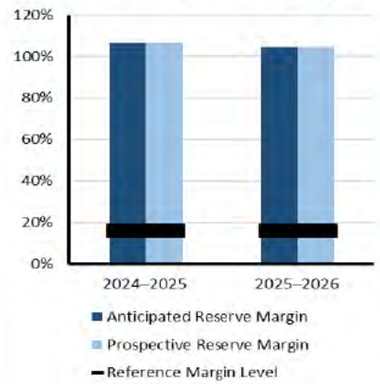
Highlights

- The Southwest is anticipated to be resource adequate under all winter expected and extreme energy availability and demand scenarios before imports.
- Total internal demand is expected to be up 1.5% and net internal demand up 2.3% since last winter. The primary drivers for load growth are data centers and industrial and residential electrification. Controllable and dispatchable demand response is down nearly half, by 163 MW.
- Planned Tier 1 resources are down over 19% as some have moved into existing certain, which is up almost 3%, over 1 GW, and other projects have experienced delays.
- Wind nameplate is up 12%, 470 MW, correlating to on-peak energy availability from wind increasing almost 11%, by 114 MW, while solar nameplate is up 27% or over 2.5 GW.

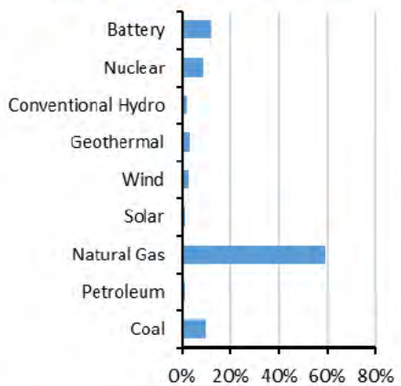
Risk Scenario Summary

Expected resources meet operating reserve requirements under assessed scenarios.

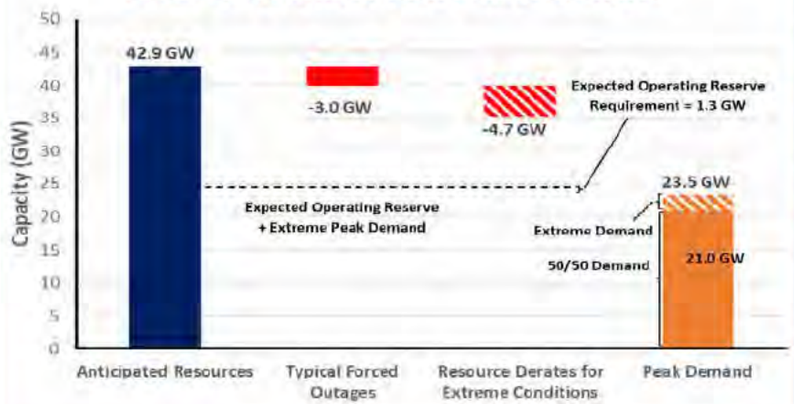
On-Peak Reserve Margin



On-Peak Resource Mix



2025–2026 Winter Risk Period Scenario



Scenario Description (See Data Concepts and Assumptions)

Risk Period: Highest risk for unserved energy is on the peak demand hour

Demand Scenarios: Net internal demand is the expected (50th percentile) peak and the 90th percentile of peak demand is the extreme forecast

Typical Forced Outages: Calculated using historical GADS

Resource Derates for Extreme Conditions: Thermal, wind, and solar are based on the hourly energy availability curves' probability distributions' 10th percentiles for the risk period

Data Concepts and Assumptions

The table below explains data concepts and important assumptions used throughout this assessment.

General Assumptions
• Reliability of the interconnected BPS is comprised of both adequacy and operating reliability:
▪ Adequacy is the ability of the electric system to supply the aggregate electric power and energy requirements of the electricity consumers at all times while taking into account scheduled and reasonably expected unscheduled outages of system components.
▪ Operating reliability is the ability of the electric system to withstand sudden disturbances, such as electric short-circuits or unanticipated loss of system components.
• The reserve margin calculation is an important industry planning metric used to examine future resource adequacy.
• All data in this assessment is based on existing federal, state, and provincial laws and regulations.
• Differences in data collection periods for each assessment area should be considered when comparing demand and capacity data between year-to-year seasonal assessments.
• A positive net transfer capability would indicate a net importing assessment area; a negative value would indicate a net exporter.
Demand Assumptions
• Electricity demand projections, or load forecasts, are provided by each assessment area.
• Load forecasts include peak hourly load[11] or total internal demand for the summer and winter of each year.[12]
• Total internal demand projections are based on normal weather (50/50 distribution)[13] and are provided on a coincident[14] basis for most assessment areas.
• Net internal demand is used in all reserve margin calculations, and it is equal to total internal demand then reduced by the amount of controllable and dispatchable demand response projected to be available during the peak hour.
Resource Assumptions
Resource planning methods vary throughout the North American BPS. NERC uses the categories below to provide a consistent approach for collecting and presenting resource adequacy. Because the electrical output of variable energy resources (VER) (e.g., wind, solar PV) depends on weather conditions, their contribution to reserve margins and other on-peak resource adequacy analysis is less than their nameplate capacity.
Anticipated Resources: • **Existing-Certain Capacity**: Included in this category are commercially operable generating units or portions of generating units that meet at least one of the following requirements when examining the period of peak demand for the summer season: unit must have a firm capability and have a power purchase agreement with firm transmission that must be in effect for the unit; unit must be classified as a designated network resource; and/or, where energy-only markets exist, unit must be a designated market resource eligible to bid into the market. • **Tier 1 Capacity Additions**: This category includes capacity that either is under construction or has received approved planning requirements. • **Net Firm Capacity Transfers (Imports minus Exports)**: This category includes transfers with firm contracts.
Prospective Resources: Includes all anticipated resources plus the following: **Existing-Other Capacity**: Included in this category are commercially operable generating units or portions of generating units that could be available to serve load for the period of peak demand for the season but do not meet the requirements of existing-certain.

[11] https://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf used in NERC Reliability Standards

[12] The summer season represents June–September and the winter season represents December–February.

[13] Essentially, this means that there is a 50% probability that actual demand will be higher and a 50% probability that actual demand will be lower than the value provided for a given season/year.

[14] Coincident: This is the sum of two or more peak loads that occur in the same hour. Noncoincident: This is the sum of two or more peak loads on individual systems that do not occur in the same time interval; this is meaningful only when considering loads within a limited period of time, such as a day, a week, a month, a heating or cooling season, and usually for not more than one year. SERC calculates total internal demand on a noncoincidental basis.

Reserve Margin Descriptions

Planning Reserve Margin: This is the primary metric used to measure resource adequacy; it is defined as the difference in resources (anticipated or prospective) and net internal demand then divided by net internal demand and shown as a percentage.

Reference Margin Level: The assumptions and naming convention of this metric vary by assessment area. The RML can be determined using both deterministic and probabilistic (based on a 0.1/year loss-of-load study) approaches. In both cases, this metric is used by system planners to quantify the amount of reserve capacity in the system above the forecasted peak demand that is needed to ensure sufficient supply to meet peak loads. Establishing an RML is necessary to account for long-term factors of uncertainty involved in system planning, such as unexpected generator outages and extreme weather impacts that could lead to increase demand beyond what was projected in the 50/50 load forecasted. In many assessment areas, an RML is established by a state, provincial authority, ISO/Regional Transmission Organization (RTO), or other regulatory body. In some cases, the RML is a requirement. RMLs may be different for the summer and winter seasons. If an RML is not provided by an assessment area, NERC applies 15% for predominantly thermal systems and 10% for predominantly hydro systems.

Seasonal Risk Scenario Chart Description

Each assessment area performed an operational risk analysis that was used to produce the seasonal risk scenario charts in the **Regional Assessments Dashboards**. The chart presents deterministic scenarios for further analysis of different resource and demand levels: The left blue column shows anticipated resources, and the two orange columns at the right show the two demand scenarios of the normal peak net internal demand and the extreme summer peak demand—both determined by the assessment area. The middle red or green bars show adjustments that are applied cumulatively to the anticipated resources, such as the following:

- Reductions for typical generation outages (i.e., maintenance and forced outages that are not already accounted for in anticipated resources)
- Reductions that represent additional outage or performance derating by resource type for extreme, low-probability conditions (e.g., drought condition impacts on hydroelectric generation, low-wind scenario affecting wind generation, fuel supply limitations, or extreme temperature conditions that result in reduced thermal generation output)
- Additional capacity resources that represent quantified capacity from operational procedures, if any, that are made available during scarcity conditions

Not all assessment areas have the same categories of adjustments to anticipated resources. Furthermore, each assessment area determined the adjustments to capacity based on methods or assumptions that are summarized below the chart. Methods and assumptions differ by assessment area and may not be comparable.

The chart enables evaluation of resource levels against levels of expected operating reserve requirement and the forecasted demand. Furthermore, the effects from extreme events can also be examined by comparing resource levels after applying extreme scenario derates and/or extreme summer peak demand.

Resource Adequacy

The ARM, which is based on available resource capacity, is a metric used to evaluate resource adequacy by comparing the projected capability of anticipated resources to serve forecast peak demand.[15] Large year-to-year changes in anticipated resources or forecast peak demand (net internal demand) can greatly impact Planning Reserve Margin calculations. NPCC-Maritimes marginally does not meet its RML for the upcoming winter. Other than NPCC-Maritimes, all assessment areas have sufficient ARMs to meet or exceed their RML for the 2025 winter as shown in Figure 4.

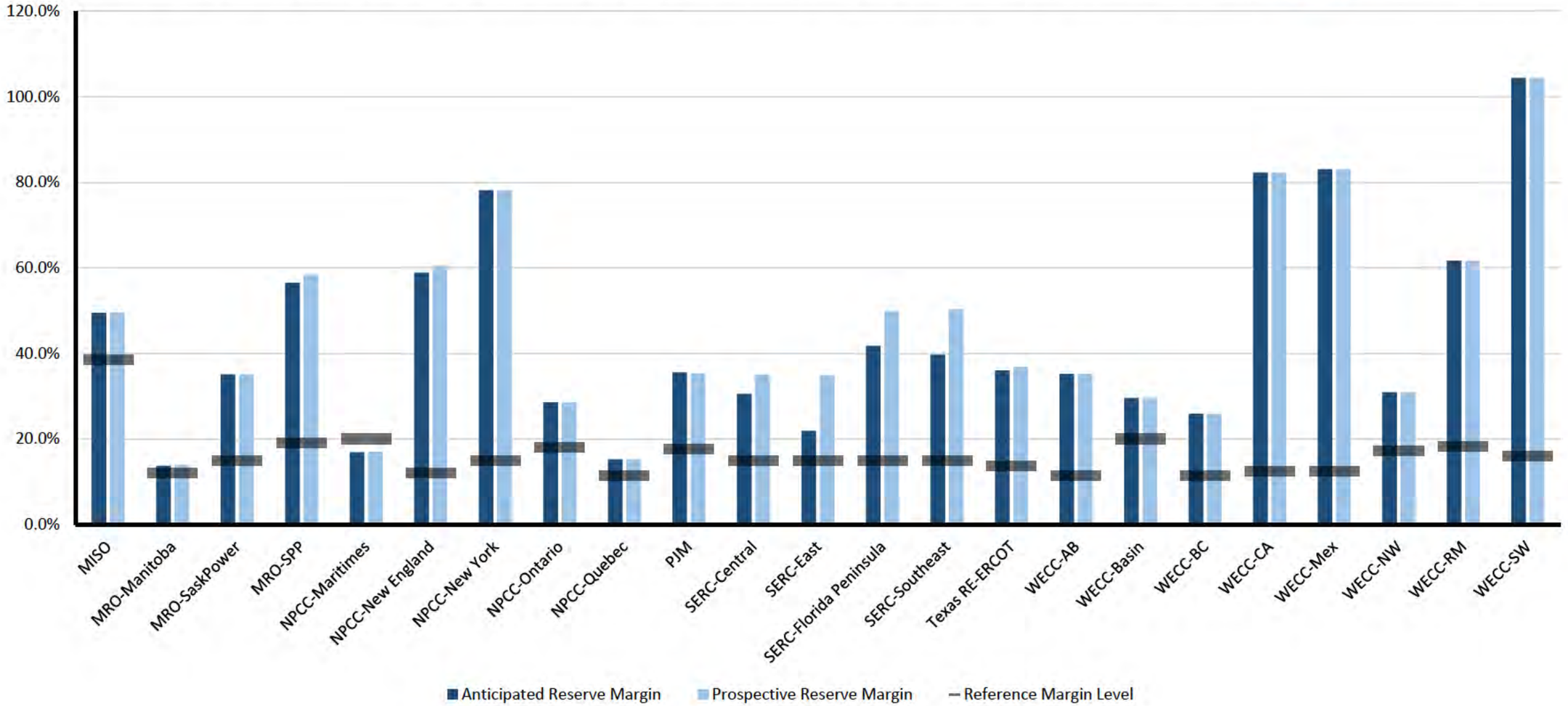


Figure 4: Winter 2025–2026 Anticipated/Prospective Reserve Margins Compared to Reference Margin Level

[15] Generally, anticipated resources include generators and firm capacity transfers that are expected to be available to serve load during electrical peak loads for the season. Prospective resources are those that could be available but do not meet criteria to be counted as anticipated resources. Refer to the Data Concepts and Assumptions section for additional information on Anticipated/Prospective Reserve Margins, anticipated/prospective resources, and RMLs.

Changes from Year-to-Year

Figure 5 provides the relative change in the forecast ARMs from the 2024–2025 Winter to the 2025–2026 Winter. All areas except NPCC-Maritimes remain above their RMLs for 2025–2026 Winter. The Canadian winter-peaking systems, which include MRO-Manitoba, MRO-SaskPower, NPCC-Maritimes, NPCC-Québec, WECC-Alberta, and WECC-British Columbia, may have reserve margins that are near RMLs but are unlikely to experience high outage rates from their winterized generators. Additional details are provided in the Data Concepts and Assumptions section.

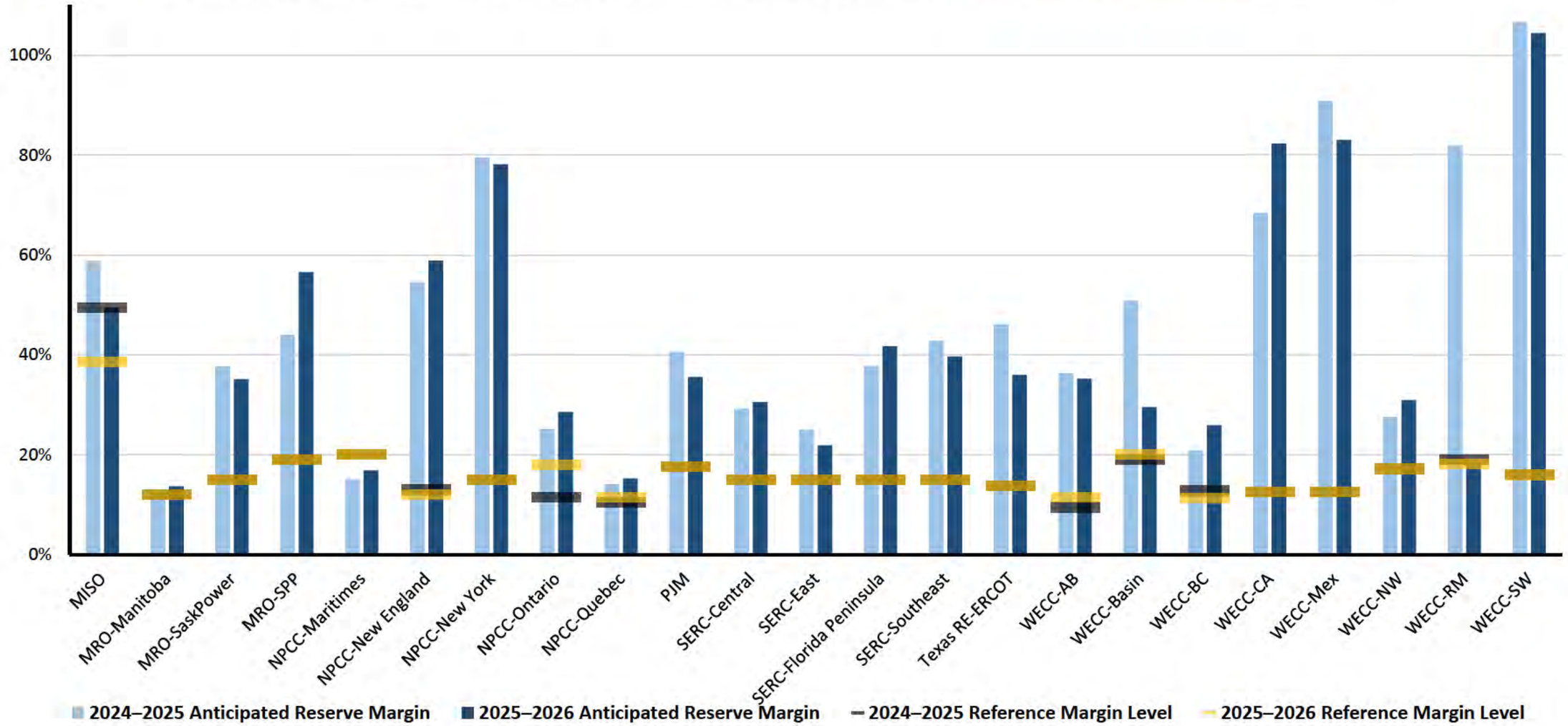


Figure 5: Winter 2024–2025 and Winter 2025–2026 Anticipated Reserve Margins Year-to-Year Change

Demand and Resource Tables

Peak demand and supply capacity data (i.e., resource adequacy data) for each assessment area are as follows in each table.

MISO			
Demand, Resource, and Reserve Margins	**2024–2025 WRA[16]**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	102,353	105,249	2.8%
Demand Response: Available	6,219	8,250	32.7%
Net Internal Demand	96,134	96,999	0.9%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	150,407	142,880	-5.0%
Tier 1 Planned Capacity	122	0	0.0%
Net Firm Capacity Transfers	2,310	2,113	-8.5%
Anticipated Resources	152,717	144,993	-5.1%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	152,839	144,993	-5.1%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	58.9%	49.5%	-9.4
Prospective Reserve Margin	59.0%	49.5%	-9.5
Reference Margin Level	49.4%	38.6%	-10.8

MRO-SPP			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	45,788	47,168	3.0%
Demand Response: Available	1,128	1,091	-3.3%
Net Internal Demand	45,926	46,077	0.3%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	67,252	71,074	5.7%
Tier 1 Planned Capacity	0	1087	0.0%
Net Firm Capacity Transfers	-1,116	-32	-97.1%
Anticipated Resources	66,136	72,129	9.1%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	66,090	73,029	10.5%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	44.0%	56.5%	12.5
Prospective Reserve Margin	43.9%	58.5%	14.6
Reference Margin Level	19.0%	19.0%	0.0

MRO-SaskPower			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	3,852	3,944	2.4%
Demand Response: Available	50	50	0.0%
Net Internal Demand	3,802	3,894	2.4%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	4,946	4,972	0.5%
Tier 1 Planned Capacity	0	0	0.0%
Net Firm Capacity Transfers	290	290	0.0%
Anticipated Resources	5,236	5,262	0.5%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	5,236	5,262	0.5%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	37.7%	35.1%	-2.6
Prospective Reserve Margin	37.7%	35.1%	-2.6
Reference Margin Level	15.0%	15.0%	0.0

MRO-Manitoba Hydro			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	4,814	4,903	1.8%
Demand Response: Available	0	0	0.0%
Net Internal Demand	4,814	4,903	1.8%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	5,924	5,688	-4.0%
Tier 1 Planned Capacity	10	0	-100.0%
Net Firm Capacity Transfers	-527	-113	-78.5%
Anticipated Resources	5,407	5,575	3.1%
Existing-Other Capacity	18	13	-26.8%
Prospective Resources	5,425	5,588	3.0%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	12.3%	13.7%	1.4
Prospective Reserve Margin	12.7%	14.0%	1.3
Reference Margin Level	12.0%	12.0%	0.0

[16] MISO-provided updated data post 2024-25 WRA publication.

NPCC-Maritimes			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	6,167	6,061	-1.7%
Demand Response: Available	259	248	-4.4%
Net Internal Demand	5,907	5,813	-1.6%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	6,647	6,704	0.9%
Tier 1 Planned Capacity	6	88	0.0%
Net Firm Capacity Transfers	145	1	-99.0%
Anticipated Resources	6,798	6,794	-0.1%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	6,798	6,800	0.0%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	15.1%	16.9%	1.8
Prospective Reserve Margin	15.1%	17.0%	1.9
Reference Margin Level	20.0%	20.0%	0.0

NPCC-New England			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	20,651	20,056	-2.9%
Demand Response: Available	343	440	28.2%
Net Internal Demand	20,308	19,616	-3.4%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	30,030	29,935	-0.3%
Tier 1 Planned Capacity	194	0	-100.0%
Net Firm Capacity Transfers	1,161	1,235	6.4%
Anticipated Resources	31,385	31,170	-0.7%
Existing-Other Capacity	306	322	5.2%
Prospective Resources	31,691	31,492	-0.6%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	54.5%	58.9%	4.4
Prospective Reserve Margin	56.1%	60.5%	4.5
Reference Margin Level	13.0%	12.0%	-1.0

NPCC-New York			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	23,800	24,200	1.7%
Demand Response: Available	802	1,027	28.1%
Net Internal Demand	22,998	23,173	0.8%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	40,522	40,080	-1.1%
Tier 1 Planned Capacity	0	0	0.0%
Net Firm Capacity Transfers	759	1,203	58.5%
Anticipated Resources	41,281	41,283	0.0%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	41,281	41,283	0.0%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	79.5%	78.2%	-1.3
Prospective Reserve Margin	79.5%	78.2%	-1.3
Reference Margin Level	15.0%	15.0%	0.0

NPCC-Ontario			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	21,898	22,013	0.7%
Demand Response: Available	915	868	-5.2%
Net Internal Demand	20,982	21,146	0.9%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	26,652	27,319	2.5%
Tier 1 Planned Capacity	0	294	#DIV/0!
Net Firm Capacity Transfers	-450	-420	-6.7%
Anticipated Resources	26,202	27,193	3.8%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	26,202	27,193	3.8%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	25.1%	28.6%	3.5
Prospective Reserve Margin	25.1%	28.6%	3.5
Reference Margin Level	11.5%	18.0%	6.5

NPCC-Québec			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	40,512	40,799	0.8%
Demand Response: Available	4,451	4,902	10.9%
Net Internal Demand	36,061	35,897	-0.4%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	41,560	41,698	0.3%
Tier 1 Planned Capacity	73	61	0.0%
Net Firm Capacity Transfers	-479	-390	-18.6%
Anticipated Resources	41,154	41,368	0.5%
Existing-Other Capacity	-479	0	0.0%
Prospective Resources	41,154	41,368	0.5%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	14.1%	15.2%	1.1
Prospective Reserve Margin	14.1%	15.2%	1.1
Reference Margin Level	10.5%	11.5%	1.0

PJM			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	136,328	140,827	3.3%
Demand Response: Available	5,616	5,998	6.8%
Net Internal Demand	130,712	134,829	3.1%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	179,216	178,335	-0.5%
Tier 1 Planned Capacity	0	0	0.0%
Net Firm Capacity Transfers	4,502	4,448	-1.2%
Anticipated Resources	183,718	182,783	-0.5%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	183,718	182,452	-0.7%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	40.6%	35.6%	-5.0
Prospective Reserve Margin	40.6%	35.3%	-5.2
Reference Margin Level	17.7%	17.7%	-12.3

SERC-Central			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	42,895	42,875	0.0%
Demand Response: Available	1,497	2,809	87.6%
Net Internal Demand	41,397	40,067	-3.2%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	51,578	50,454	-2.2%
Tier 1 Planned Capacity	0	0	0%
Net Firm Capacity Transfers	1,922	1,847	-3.9%
Anticipated Resources	53,500	52,301	-2.2%
Existing-Other Capacity	1,498	1,810	20.8%
Prospective Resources	54,998	54,111	-1.6%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	29.2%	30.5%	1.3
Prospective Reserve Margin	32.9%	35.1%	2.2
Reference Margin Level	15.0%	15.0%	0.0

SERC-East			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	45,005	45,703	1.6%
Demand Response: Available	982	888	-9.6%
Net Internal Demand	44,023	44,815	1.8%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	54,379	54,460	0.1%
Tier 1 Planned Capacity	72	11	-84.3%
Net Firm Capacity Transfers	593	150	-74.7%
Anticipated Resources	55,045	54,622	-0.8%
Existing-Other Capacity	5,209	5,832	12.0%
Prospective Resources	60,254	60,453	0.3%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	25.0%	21.9%	-3.2
Prospective Reserve Margin	36.9%	34.9%	-2.0
Reference Margin Level	15.0%	15.0%	0.0

SERC-Florida Peninsula			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	48,494	48,628	0.3%
Demand Response: Available	2,780	3,127	12.5%
Net Internal Demand	45,714	45,501	-0.5%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	62,579	63,502	1.5%
Tier 1 Planned Capacity	15	692	4510.0%
Net Firm Capacity Transfers	400	300	-25.0%
Anticipated Resources	62,994	64,494	2.4%
Existing-Other Capacity	3,673	3,671	0.0%
Prospective Resources	66,667	68,165	2.2%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	37.8%	41.7%	3.9
Prospective Reserve Margin	45.8%	49.8%	4.0
Reference Margin Level	15.0%	15.0%	0.0

SERC-Southeast			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	45,308	47,056	3.9%
Demand Response: Available	1,638	1,365	-16.7%
Net Internal Demand	43,670	45,691	4.6%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	62,805	63,339	0.9%
Tier 1 Planned Capacity	765	0	-100.0%
Net Firm Capacity Transfers	-1,192	489	-141.0%
Anticipated Resources	62,378	63,828	2.3%
Existing-Other Capacity	3,920	4,847	23.7%
Prospective Resources	66,298	68,675	3.6%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	42.8%	39.7%	-3.1
Prospective Reserve Margin	51.8%	50.3%	-1.5
Reference Margin Level	15.0%	15.0%	0.0

Texas RE-ERCOT			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	73,193	77,387	5.7%
Demand Response: Available	5,447	9,330	71.3%
Net Internal Demand	67,746	68,057	0.5%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	98,712	89,977	-8.8%
Tier 1 Planned Capacity	239	1351	464.9%
Net Firm Capacity Transfers	20	1,235	6075.0%
Anticipated Resources	98,971	92,562	-6.5%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	99,691	93,137	-6.6%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	46.1%	36.0%	-10.1
Prospective Reserve Margin	47.2%	36.9%	-10.3
Reference Margin Level	13.75%	13.8%	0.0

WECC-AB			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	12,280	12,411	1.1%
Demand Response: Available	0	0	0.0%
Net Internal Demand	12,280	12,411	1.1%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	13,535	16,658	23.1%
Tier 1 Planned Capacity	3206	124	-96.1%
Net Firm Capacity Transfers	0	0	0.0%
Anticipated Resources	16,740	16,782	0.3%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	16,740	16,782	0.3%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	36.3%	35.2%	-1.1
Prospective Reserve Margin	36.3%	35.2%	-1.1
Reference Margin Level	9.5%	11.5%	2.0

WECC-Basin			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	10,568	10,758	1.8%
Demand Response: Available	85	170	100.0%
Net Internal Demand	10,483	10,588	1.0%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	13,213	13,183	-0.2%
Tier 1 Planned Capacity	2,605	533	-79.5%
Net Firm Capacity Transfers	0	0	0%
Anticipated Resources	15,817	13,717	-13.3%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	15,817	13,717	-13.3%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	50.9%	29.6%	-21.3
Prospective Reserve Margin	50.9%	29.6%	-21.3
Reference Margin Level	19.0%	20.0%	1.0

WECC-CA			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	36,441	36,281	-0.4%
Demand Response: Available	743	666	-10.4%
Net Internal Demand	35,698	35,615	-0.2%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	55,380	57,923	4.6%
Tier 1 Planned Capacity	4,757	6,997	47.1%
Net Firm Capacity Transfers	0	0	0.0%
Anticipated Resources	60,138	64,920	8.0%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	60,138	65,920	8.0%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	68.5%	82.3%	13.8
Prospective Reserve Margin	68.5%	82.3%	13.8
Reference Margin Level	12.5%	12.5%	0.0

WECC-BC			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	11,966	11,936	-0.3%
Demand Response: Available	0	0	0.0%
Net Internal Demand	11,966	11,936	-0.3%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	13,870	14,389	3.7%
Tier 1 Planned Capacity	433	637	47.0%
Net Firm Capacity Transfers	164	0	-100.0%
Anticipated Resources	14,467	15,026	3.9%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	14,467	15,026	3.9%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	20.9%	25.9%	5.0
Prospective Reserve Margin	20.9%	25.9%	5.0
Reference Margin Level	12.8%	11.4%	-1.5

WECC-Mexico			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–2025 vs. 2025–2026**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	1,983	1,977	-0.3%
Demand Response: Available	0	0	0%
Net Internal Demand	1,983	1,977	-0.3%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	3,733	3,619	-3.0%
Tier 1 Planned Capacity	52	0	-100.0%
Net Firm Capacity Transfers	0	0	0%!
Anticipated Resources	3,784	3,619	-4.4%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	3,784	3,619	-4.4%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	90.8%	83.1%	-7.8
Prospective Reserve Margin	90.8%	83.1%	-7.8
Reference Margin Level	12.5%	12.5%	0

WECC-Northwest			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–25 vs. 2025–26**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	30,748	33,604	9.3%
Demand Response: Available	30	30	0.0%
Net Internal Demand	30,718	33,574	9.3%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	38,729	34,671	-10.5%
Tier 1 Planned Capacity	463	3,152	581.5%
Net Firm Capacity Transfers	0	6,136	100%!
Anticipated Resources	39,192	43,959	12.2%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	39,192	43,959	12.2%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	27.6%	30.9%	3.3
Prospective Reserve Margin	27.6%	30.9%	3.3
Reference Margin Level	17.2%	17.2%	0.0

WECC-Rocky Mountain			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–25 vs. 2025–26**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	10,481	11,501	9.7%
Demand Response: Available	282	285	1.1%
Net Internal Demand	10,199	11,216	10.0%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	18,356	17,768	-3.2%
Tier 1 Planned Capacity	199	366	84.3%
Net Firm Capacity Transfers	0	0	0%
Anticipated Resources	18,555	18,134	-2.3%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	18,555	18,134	-2.3%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	81.9%	61.7%	-20.3
Prospective Reserve Margin	81.9%	61.7%	-20.3
Reference Margin Level	19.0%	18.2%	-0.8

WECC-Southwest			
Demand, Resource, and Reserve Margins	**2024–2025 WRA**	**2025–2026 WRA**	**2024–25 vs. 2025–26**
Demand Projections	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	20,844	21,147	1.5%
Demand Response: Available	340	177	-47.9%
Net Internal Demand	20,504	20,970	2.3%
Resource Projections	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	38,991	40,135	2.9%
Tier 1 Planned Capacity	3,381	2,733	-19.2%
Net Firm Capacity Transfers	0	0	0.0%
Anticipated Resources	42,372	42,868	1.2%
Existing-Other Capacity	0	0	0.0%
Prospective Resources	42,372	42,868	1.2%
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	106.6%	104.4%	-2.2
Prospective Reserve Margin	106.6%	104.4%	-2.2
Reference Margin Level	16.0%	16.0%	0.0

Variable Energy Resource Contributions

Because the electrical output of VERs (e.g., wind, solar PV) depends on weather conditions, on-peak capacity contributions are less than nameplate capacity and may vary widely year to year based on the identified risk hour. In many areas, winter demand peaks in the early morning hours or early evening resulting in little or no electrical resource output from solar PV resources and wide variability in wind availability. The following table shows the capacity contribution of existing wind and solar PV resources at the identified risk hour for each assessment area. Resource contributions are also aggregated by Interconnection and across the entire BPS.

BPS Variable Energy Resources On-Peak Capacity Contributions by Assessment Area									
	Wind			Solar			Hydro		
Assessment Area/Interconnection	Nameplate Wind (MW)	Expected Wind (MW)	Expected Share of Nameplate (%)	Nameplate Solar PV (MW)	Expected Solar (MW)	Expected Share of Nameplate (%)	Nameplate Hydro (MW)	Expected Hydro (MW)	Expected Share of Nameplate (%)
MISO	30,247	8,772	29%	13,726	686	5%	9,103	5,354	59%
MRO-Manitoba Hydro	259	52	20%	0	0	0%	6,288	5,676	90%
MRO-SaskPower	816	433	53%	30	0	13%	884	703	80%
MRO-SPP	35,714	7,198	20%	1,197	457	38%	5,602	5,521	99%
NPCC-Maritimes	1,635	241	15%	155	10	6%	1,357	1,283	0%
NPCC-New England	2,675	455	17%	3,620	0	0%	3,742	1,453	39%
NPCC-New York	2,586	737	29%	627	0	0%	6,357	5,283	83%
NPCC-Ontario	4,943	1,971	40%	478	0	0%	8,763	6,824	78%
NPCC-Québec	4,024	1,426	35%	10	0	0%	41,014	39,501	96%
PJM	13,318	5,463	41%	15,732	1	0%	8,134	7,900	97%
SERC-Central	1,324	370	28%	1,576	455	29%	4,991	4,027	81%
SERC-East	0	0	0%	7,068	1,792	25%	3,010	2,951	98%
SERC-Florida Peninsula	0	0	0%	12,058	2,151	18%	0	0	0%
SERC-Southeast	0	0	0%	8,670	4,461	51%	3,258	3,258	100%
Texas RE-ERCOT	40,629	7,833	19%	35,609	660	2%	579	566	98%
WECC-AB	5,712	1,919	34%	2,206	0	0%	1,788	570	32%
WECC-Basin	5,932	1,148	19%	3,853	62	2%	5,334	2,946	55%
WECC-BC	747	85	11%	17	0	0%	35,504	27,119	76%
WECC-CA	9,382	682	7%	28,328	0	0%	31,479	9,143	29%
WECC-Mex	40	4	11%	350	0	0%	0	0	0%
WECC-NW	14,744	1,319	9%	4,695	1,556	33%	65,830	37,005	56%
WECC-RM	5,681	2,265	40%	3,521	0	0%	6,502	2,654	41%
WECC-SW	4,303	1,182	27%	12,139	391	3%	6,234	1,896	30%
EASTERN INTERCONNECTION	93,517	25,692	27%	64,937	10,013	15%	61,489	50,233	82%
QUÉBEC INTERCONNECTION	4,024	1,426	35%	10	0	0%	41,014	39,501	96%
TEXAS INTERCONNECTION	40,629	7,833	19%	35,609	660	0%	579	566	98%
WECC INTERCONNECTION	46,541	8,605	19%	55,108	2,008	4%	152,671	81,333	53%
INTERCONNECTION TOTAL:	**184,711**	**43,556**	**23%**	**155,664**	**12,685**	**8%**	**255,753**	**171,633**	**67%**

Review of Winter 2024–2025 Capacity and Energy Performance

The meteorological winter across the contiguous United States had an average temperature of 34.1 degrees F—1.9 degrees above average—ranking in the warmest third of NOAA's historical record. Total winter precipitation in the US was 5.87 inches, 0.92 of an inch below average, ranking in the driest third of the December–February climate record.[17] Most of Canada experienced temperatures at least 2°C above the baseline average with the Maritime provinces, southern Ontario, and the Canadian west coast recording temperature departures nearer the baseline average while a small region in southern Saskatchewan recorded temperatures just slightly below the baseline average.[18]

In February 2025, FERC and NERC and its Regional Entities launched a joint review of the BPS' performance during the January 2025 arctic events, which comprised Winter Storms Blair, Cora, Demi, and Enzo.[19] The week of January 19–25, 2025 was the third coldest winter week (spanning Sunday through Saturday) across the United States since 2000. Between January 21 and 22, 2025, natural gas demand peaked at 150 Bcf/day, electric demand peaked at 683 GW, and unplanned outages peaked at 71,022 MW. Nevertheless, during the January 2025 arctic events, manual load shed was not required. The January 2025 arctic events had lower observed hourly wind chill temperatures in pockets of the Northeast, the Louisiana Gulf, California, and the Southwest compared to Winter Storms Uri, Elliott, Gerri, and Heather. During the January 2025 arctic events, the most extreme storm relative to typical weather was Winter Storm Enzo—a Gulf and Southern storm. On January 20, 2025, a burst of snow, sleet, and freezing rain developed across Texas and Louisiana late in the day. A mixture of sleet and freezing rain fell from Austin to San Antonio and to the southernmost point of Texas. By the early morning hours of January 21, 2025, for the first time in history, a blizzard warning was issued for southwest Louisiana and the southeastern-most point of Texas. Snow fell in Gulf cities in Texas, southern Mississippi, southern Alabama, and western Florida. On January 21, 2025, Baton Rouge recorded 7.6 inches of snowfall, making it the city's snowiest day since recordkeeping began in 1892, while New Orleans saw its snowiest day on record, with a total of 8.0 inches. Temperatures plunged to single digits in Louisiana. Temperatures in some parts of the state fell to levels not seen in more than 125 years.

The review team engaged with 10 electric entities across the Eastern and Texas Interconnections to gather the information necessary to provide a high-level overview of the BPS' performance during the cold weather events. Based on the data and interviews that the team reviewed, electric generators appear to have performed better during the January 2025 arctic events because of additional generator commitments, improved preparedness, increased situational awareness, and the implementation of lessons learned from previous extreme cold weather events and prior report recommendations. The natural gas system also performed better overall, serving record levels of natural gas demand and experiencing only minor production declines and short-duration force majeure events.

On October 1, 2025, NERC submitted to the Federal Energy Regulatory Commission its first *Cold Weather Data Annual Report*. This report includes a review of forced outage data from GADS for the winter 2024–2025 period indicating performance consistent with historical performance as reported in NERC's annual *State of Reliability* report. This is within the normal range of capacity that occurs across the fleet. During the Winter 2024–2025 period, the highest amount of capacity in a forced outage state for all reasons occurred on January 20, 2025, with 68,519 MW across all regions. The outages occurring over January 20, 2025, were analyzed as part of the joint FERC, NERC, and Regional Entity *2025 System Performance Review*. The joint FERC, NERC, and Regional Entity *2025 System Performance Review* found a reduction in peak coincident unplanned generator outages for the four 2025 winter storms reviewed compared to past winter storms; however, this review also noted that it was not an exact comparison due to prior winter storms having different characteristics.

Eastern Interconnection–Canada and Québec Interconnection

No EEAs were needed during the previous winter season. One entity plans to make a slight increase to the demand-response program based on last winter's operations.

[17] Despite Arctic air outbreaks, U.S. had warm, dry winter on average | National Oceanic and Atmospheric Administration
[18] Climate Trends and Variations Bulletin – Winter 2024/2025 - Canada.ca
[19] https://www.ferc.gov/media/report-january-2025-arctic-events-system-performance-review-ferc-nerc-and-its-regional

Eastern Interconnection–United States

Several entities indicated that generators performed better during the January 2025 arctic events than in previous winter storms. For example, TVA stated that generator performance within its footprint was stable, with minimal natural gas delivery issues. Southeastern RC detailed that no major fuel-related outages occurred. FRCC noted that generator performance was strong during this period. The significant characteristics of Winter Storm Enzo in the Southern and Gulf states were freezing precipitation and snow accumulation, especially in regions where those conditions rarely occur. In FRCC, only the northern portion of Florida experienced severe arctic weather including freezing precipitation and snowfall (record-setting, in some cities) that were abnormal for the region even though certain northern cities have faced cold temperatures in the past. In Florida, entities experienced energy emergencies caused by extended generation outages from hurricanes Milton and Helene, compounded by unusually high loads from cold weather. Entities were able to serve native load and firm delivery obligations, though non-firm sales were curtailed during certain events. ISO-NE, NYISO, and PJM all generally described the January 2025 arctic events as having cold temperatures but overall weather conditions that were similar to a winter without a major storm.

MISO emerged from Winter 2024–2025 without turning to emergency procedures despite the wide-ranging winter storms from January 6 to 9 and again from January 20 to 22. Generators continue to prioritize scheduling planned or maintenance outages to the shoulder seasons of fall and spring to maximize unit availability for the winter season. Also, extreme cold weather outage adders were added to the LOLE model to make sure that winter storm risks are included in planning. In PJM, demand reached a new all-time winter peak on January 22, 2025, of 143,714 MW with sufficient reserves. PJM did call an EEA1 on January 22, 2025, however reserves remained adequate. PJM had less than 3% load forecast error over the peak days of the January cold weather events. Reliability cases were conducted, and units with extended start times were evaluated and started early to ensure units were on-line before extreme cold weather settled in. PJM had a 9.24% forced outage rate on the peak day, a relatively low forced outage rate for the weather experienced. There were also very few gas production problems; however, market issues prevented proper scheduling because of the four-day holiday weekend.

In SERC-Central, entities reported only limited impacts from Winter 2024–2025 coldest weather and made minor adjustments. One entity declared conservative operations ahead of peak conditions but experienced no emergencies. One entity raised its winter Planning Reserve Margin target to 26% following lessons learned from Winter Storm Elliott. Corrective actions were implemented due to isolated equipment issues, including improved heat trace capabilities and adding heat trace equipment to the cold weather critical component list. During the previous winter season, some SERC-Florida Peninsula entities experienced energy emergencies caused by extended generation outages from hurricanes Milton and Helene, compounded by unusually high loads from cold weather. Despite these challenges, entities were able to serve native load and firm delivery obligations, though non-firm sales were curtailed during certain events.

Texas Interconnection–ERCOT

There were no energy emergencies for the Texas RE-ERCOT region last winter and no conditions that prompted changes in operating procedures. Winter Storm Kingston, which occurred in February 2025, was the only storm where ERCOT utilized firm fuel supply service resources (FFSS), a firm-fuel product that provides additional grid reliability and resiliency during extreme cold weather and compensates generation resources that meet a higher resiliency standard. A maximum FFSS deployment of 470 MW occurred on February 19 between the hours 13:10 and 17:02. Two other storms, Enzo and Cora, impacted ERCOT in January 2025, but these storms did not cause any system reliability issues.

Western Interconnection

Between January 11 and 17, 2024, a prolonged Arctic outbreak impacted British Columbia, Alberta, and the U.S. Pacific Northwest, driving record electricity demand and widespread reliability challenges. Four U.S. Northwest BAs and one Canadian BA declared energy emergencies, underscoring two core vulnerabilities: Inadequate capacity during evening peak hours (4 to 8 p.m.) and Insufficient fuel supply (limited hydro availability) across multiple days.

Although temperatures were comparable to the December 2022 cold snap, WECC-Northwest peak demand rose two percentage points to 6% over then, with BC Hydro and AESO both setting new all-time records. The U.S. Northwest relied heavily on imports—averaging 4,745 MW during peaks and 5,241 MW across all hours, mostly from the Southwest and Rockies. California remained a net importer, providing little relief. Market prices in the Northwest reached or neared caps across most hours, indicating persistent scarcity rather than short-term peaks. Overall, the January 2024 event illustrated capacity alone does not ensure resilience. Sustained energy availability with interregional flexibility (both physical and market-based) will be key to maintaining reliability through the 2025–2026 and future winter seasons.

2024–2025 Winter Demand and Generation Summary at Peak Demand											
Assessment Area	**Peak Demand Date**	**Peak Demand Hour**	**Demand[1] (MW)**	**WRA Peak Demand Scenarios[2] (MW)**	**Generation[1] (MWh)**	**Transfers[1] (MW)**	**Wind – Actual[1] (MWh)**	**Wind – Expected[3] (MW)**	**Solar – Actual[1] (MWh)**	**Solar – Expected[3] (MW)**	**Forced Outages Summary[4] (MW)**
MISO	Jan. 21	18:00	108,888*	96,134 100,395	101,655	-977	18,468	16,761	0	519	17,010
MRO-Manitoba Hydro	Jan. 20	08:00	5,132	4,814 5,060	5,292	-277	142	52	N/A	0	146
MRO-SaskPower	Dec. 18	18:00	3,785	3,802 3,897	3,641	-231	664	368	0	3	0
MRO-SPP	Feb. 20	08:00	47,981	45,926 47,054	40,898	-1,424	4,886	4,783	255	36	9,272
NPCC-Maritimes	Jan. 22	07:00	5,810	5,907 6,498	4,266	-1,174	368	261	3	5	*
NPCC-New England	Jan. 21	18:00	19,607	20,308 21,814	17,686	-1,896	285	329	4	23	624
NPCC-New York	Jan. 22	19:00	23,521	22,998 24,023	18,932	-4,589	654	728	0	0	4,835

2024–2025 Winter Demand and Generation Summary at Peak Demand											
Assessment Area	Peak Demand Date	Peak Demand Hour	Demand[1] (MW)	WRA Peak Demand Scenarios[2] (MW)	Generation[1] (MWh)	Transfers[1] (MW)	Wind – Actual[1] (MWh)	Wind – Expected[3] (MW)	Solar – Actual[1] (MWh)	Solar – Expected[3] (MW)	Forced Outages Summary[4] (MW)
NPCC-Ontario	Jan. 22	18:00	21,940	20,951 22,179	24,250	2,990	3,693	1,914	0	0	*
NPCC-Québec	Jan. 22	08:00	37,178	36,061 39,545	39,514	-766	1,463	1,449	0	0	*
PJM	Jan. 22	09:00	144,420	130,712 144,939	152,142	7,731	3,704	3,620	3,076	1	8,663
SERC-C	Jan. 22	08:00	47,815	41,397 47,062	40,898	-6,921	563	176	214	455	1,538
SERC-E	Jan. 23	08:00	47,130	44,023 47,662	41,810	-5,323	0	0	145	2,526	1,830
SERC-FP	Jan. 25	08:00	43,974	45,714 54,239	41,702	-557	0	0	362	1,684	2,824
SERC-SE	Jan. 22	08:00	46,490	43,670 45,116	48,227	1,741	0	0	592	3,861	2,210

2024–2025 Winter Demand and Generation Summary at Peak Demand											
Assessment Area	**Peak Demand Date**	**Peak Demand Hour**	**Demand[1] (MW)**	**WRA Peak Demand Scenarios[2] (MW)**	**Generation[1] (MWh)**	**Transfers[1] (MW)**	**Wind – Actual[1] (MWh)**	**Wind – Expected[3] (MW)**	**Solar – Actual[1] (MWh)**	**Solar – Expected[3] (MW)**	**Forced Outages Summary[4] (MW)**
TRE-ERCOT	Feb. 20	08:00	80,560	73,193[5] 90,405[5]	79,960	-191	9,397	15,697	1,586	15	5,742
WECC-AB	Dec. 18	17:00	12,241	12,280 12,635	12,711	-470	3,175	1,867	4	0	*
WECC-BC	Feb 3	18:00	11,359	11,996 12,749	11,415	44	70	279	0	0	839
WECC-CA/MX	Dec. 12	15:00	35,555	35,359 36,823	31,925	-4,669	4,021	569	11,547	0	1,627
WECC-NW	Feb. 12	08:00	54,278	58,001 62,230	48,437	-920	2,607	7,876	1,494	2,198	3,281
WECC-SW	Feb. 13	16:00	22,969	16,177 17,777	25,087	2,117	2,741	1,065	1,599	182	1,496
Highlighting Notes:			Actual peak demand in the highlighted areas met or exceeded extreme scenario levels				Actual wind output in highlighted areas was significantly below seasonal forecast.		Actual solar output in highlighted areas was significantly below seasonal forecast.		Actual forced outages above or below forecast by factor of two

2024–2025 Winter Demand and Generation Summary at Peak Demand											
Assessment Area	**Peak Demand Date**	**Peak Demand Hour**	**Demand[1] (MW)**	**WRA Peak Demand Scenarios[2] (MW)**	**Generation[1] (MWh)**	**Transfers[1] (MW)**	**Wind – Actual[1] (MWh)**	**Wind – Expected[3] (MW)**	**Solar – Actual[1] (MWh)**	**Solar – Expected[3] (MW)**	**Forced Outages Summary[4] (MW)**
Table Notes: [1] Actual demand, wind, and solar values for the hour of peak demand in U.S. areas were obtained from EIA From 930 data. For areas in Canada, this data was provided to NERC by system operators and utilities. [2] See NERC *2024–2025* WRA demand scenarios for each assessment area. Values are the normal winter peak demand forecast and an extreme peak demand forecast that represents a 90/10, or once-per-decade, peak demand. Some areas use other basis for extreme peak demand. [3] Expected values of wind and solar resources from the *2024–2025 WRA*. [4] Values from NERC Generator Availability Data System for the 2024–2025 winter hour of peak demand in each assessment area. Highlighted areas had actual forced outages that were more than twice the value for typical forced outage rates used in the 2024–2025 winter risk period scenarios in the *2024–2025 WRA*. [5] Texas RE-ERCOT peak demand scenarios are obtained by adding expected demand response (5.4 GW for winter 2024-2025) to the demand scenarios found on p. 29 of the 2024-2025 WRA. *Canadian assessment areas report to the NERC Generator Availability Data System on a voluntary basis, which can contribute to the absence of some values in certain assessment areas.										

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 147
Schahfer 2024 Groundwater Monitoring Report

2024 Annual Groundwater Monitoring and Corrective Action Report - Waste Disposal Area

NIPSCO LLC R. M. Schahfer Generating Station

Prepared Pursuant to 40 CFR §257.90(e) and Corresponding Regulations under 329 Indiana Administrative Code 10-9-1

Submitted to:

Northern Indiana Public Service Company LLC
R.M. Schahfer Generating Station
Wheatfield, Indiana

Submitted by:

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January 31, 2025

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1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), WSP USA Inc. (WSP) prepared this 2024 Annual Groundwater Monitoring and Corrective Action Report (2024 Annual Report) for the Rollin M. Schahfer Generating Station (RMSGS, Schahfer) coal combustion residuals (CCR) surface impoundment known as the Waste Disposal Area (WDA, the CCR Unit). WSP prepared the 2024 Annual Report in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, “Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule” (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

In conformance with the applicable requirements of 40 CFR §257.90(e)(1) through (5) and corresponding State of Indiana requirements, the 2024 Annual Report:

- Documents the status of the groundwater monitoring and corrective action program
- Provides figures showing the CCR Unit, monitoring well locations, and groundwater flow direction(s)
- Summarizes key CCR Rule groundwater activities completed during calendar year 2024
- Includes CCR Rule groundwater monitoring data obtained in calendar year 2024
- Describes any problems encountered during the monitoring activities
- Discusses actions taken to resolve the problems, if applicable
- Projects key activities for the upcoming year.

2.0 SUBJECT CCR UNIT

RMSGS is located at 2723 E 1500 N, Wheatfield, Jasper County, Indiana (Latitude 41° 12' 36" and Longitude 87° 01' 48", see Figure 1). As shown in Figure 2, the WDA is an approximately 80-acre impoundment located in the southwest portion of the RMSGS facility.

The CCR Unit is currently in Assessment Monitoring pursuant to 40 CFR §257.95. Routine monitoring activities performed during the reporting period include inspection of wells for integrity and security, measurement of groundwater levels prior to sample collection to assess groundwater flow direction, and collection of groundwater samples for laboratory analysis.

3.0 GROUNDWATER MONITORING AND CORRECTIVE ACTION PROGRAM - OVERVIEW OF CURRENT STATUS

In 2016, NIPSCO/WSP installed a 40 CFR §257.91-compliant groundwater monitoring system (Table 1). Beginning in 2016 and continuing throughout calendar year 2017, WSP collected background groundwater samples and performed Detection Monitoring at the CCR Unit pursuant to the requirements of 40 CFR §257.93-94.

Following Detection Monitoring and the determination of statistically significant increases (SSIs) over background levels of one or more Appendix III constituents, NIPSCO established an Assessment Monitoring program in January 2018 pursuant to the requirements of 40 CFR §257.95 to assess the nature and extent and overall groundwater quality farther downgradient of the WDA.

In 2018, WSP performed the first and second Assessment Monitoring events. Following the first Assessment Monitoring event, including verification sampling, NIPSCO posted a notification to the publicly accessible website of detections of Appendix IV constituents at concentrations above applicable groundwater protection standards (GWPSs) downgradient of the WDA.

In November 2018, WSP prepared an alternative source demonstration (ASD) indicating that the detections of Appendix IV parameters downgradient of the WDA are not due to a release from the WDA.

Subsequent to the ASD, WSP performed the following additional Assessment Monitoring events:

- Third and fourth Assessment Monitoring events in 2019
- Fifth and sixth Assessment Monitoring events in 2020
- Seventh and eighth Assessment Monitoring events in 2021
- Ninth and tenth Assessment Monitoring events in 2022
- Eleventh and twelfth Assessment Monitoring events in 2023
- Thirteenth and fourteenth Assessment Monitoring events in 2024

The thirteenth and fourteenth Assessment Monitoring events were completed in April and September 2024.

For April and September 2024 Assessment Monitoring event, WSP calculated the groundwater elevations from static water level measurements and prepared groundwater elevation contour maps. The static water level measurements and calculated groundwater elevations for the April (water levels measured in March) and September 2024 events are presented in Table 2, and the groundwater elevation contours from those events are presented in Figures 3 and 4, respectively.

For the April and September 2024 Assessment Monitoring events, WSP summarized the sampling activities associated with the events in Table 3. Table 3 includes the sampling dates, number of groundwater samples collected from each background and downgradient well, and the purpose of sampling associated with each event. WSP summarized the analytical results from these events in Table 4.

The WDA began and ended the current annual reporting period in Assessment Monitoring pursuant to 40 CFR §257.95. WSP identified Appendix IV constituents at statistically significant levels (SSLs) in 2024 that included molybdenum and lithium in groundwater samples collected from well GAMW-51B and GAMW-60B, and arsenic in well GAMW-44.

Pursuant to 40 CFR §257.94, in May and November 2024, a qualified Indiana-licensed professional engineer recertified the ASD indicating that the SSLs for molybdenum, lithium, and arsenic were not due to a release from the WDA, therefore, the CCR Unit remained in Assessment Monitoring. Based upon groundwater monitoring results collected pursuant to the CCR Rule to date, no corrective action program requirements as outlined in 40 CFR §257.96-98 have either been triggered or implemented at this CCR Unit.

3.1 Key Actions Completed - 2024

NIPSCO completed the following key actions relative to CCR Rule groundwater monitoring at the WDA during calendar year 2024:

- Preparation of the of 2023 Groundwater Monitoring and Corrective Action Annual Report in January 2024 (2023 Annual Report, WSP 2024a) (40 CFR §257.90(e))
- Evaluation of the results of the twelfth Assessment Monitoring event in February 2024 (40 CFR §257.95)
- Notification that Appendix IV constituents exceeded the GWPS in March 2024 (40 CFR §257.95(g))
- Performance of the thirteenth Assessment Monitoring event in April 2024 (40 CFR §257.95)
- Recertification of the ASD in May 2024 (WSP 2024c) (40 CFR §257.95(g))
- Evaluation of the results of the thirteenth Assessment Monitoring event in August 2024 (40 CFR §257.95)
- Notification that Appendix IV constituents exceeded the GWPS in September 2024 (40 CFR §257.95(g))
- Performance of the fourteenth Assessment Monitoring event in September 2024 (40 CFR §257.95)
- Recertification of the ASD in November 2024 (WSP 2024d) (40 CFR §257.95(g))

3.2 Monitoring System Modifications

In 2024, the WDA remained in Assessment Monitoring. Attached Table 1 provides a summary of the well rationale/purpose and date of installation. Figure 2 shows the well network for the WDA. Table 5 below provides an overview of the modified groundwater monitoring network.

Table 5: Overview of Groundwater Monitoring Network

Background Monitoring Wells	Downgradient Monitoring Wells	Assessment Monitoring Wells
GAMW-03, GAMW-03B, GAMW-68, and GAMW-68B	GAMW-01, GAMW-01B, GAMW-12, GAMW-12B, GAMW-13, GAMW-13B, GAMW-14, and GAMW-14B	GAMW-42, GAMW-42B, GAMW-42C, GAMW-43, GAMW-43B, GAMW-44, GAMW-44B, GAMW-51, GAMW-51B, GAMW-57, GAMW-57B, GAMW-58, GAMW-58B, GAMW-59, GAMW-59B, GAMW-60, GAMW-60B, and GAMW-77

WSP decommissioned, installed, developed, and surveyed the wells in accordance with the CCR Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017)

3.3 Groundwater Flow

As noted above, WSP tabulated the March and September 2024 static water measurements and calculated groundwater elevations in Table 2 and prepared the groundwater elevation contour maps for March and September (See Figures 3 and 4) using calculated groundwater elevations. Based on these elevations and contour maps and consistent with the requirements of the CCR Rule, WSP determined the rate and direction of groundwater flow within the uppermost aquifer after each sampling event.

Overall site groundwater flow direction is northeast towards the Kankakee River. In March and September 2024, groundwater flowed toward the northwest in the vicinity of the WDA (Figure 3 and Figure 4). The groundwater elevation, in the vicinity of the WDA, varies between approximately 655 to 665 feet North American Vertical Datum of 1988 (NAVD88) with a depth to groundwater less than 10 feet below ground surface.

WSP calculated the hydraulic gradient in the vicinity of the CCR units at 1.17E-03 feet per foot. Using an assumed porosity value of 30 percent, the average hydraulic conductivity from slug tests for the shallow unconfined aquifer of 93.5 feet per day, and the calculated gradient, WSP calculated the average rate of groundwater flow to be approximately 133 feet per year (Groundwater Monitoring System Design Manual [GMSDM], WSP 2024b).

3.4 Background Monitoring (2016 to 2017)

Per the requirements of 40 CFR §257.94, WSP collected eight independent background groundwater samples from each background and downgradient well between July 2016 and August 2017. WSP used the results of the background monitoring phase to develop appropriate, statistically valid background values for each constituent/monitoring well. WSP submitted the samples to a contract laboratory, in accordance with chain of custody and quality assurance/quality control procedures, for analysis of Appendix III and Appendix IV constituents. In addition, WSP personnel measured field water quality parameters including specific conductance, temperature, dissolved oxygen, turbidity, oxidation-reduction potential, and pH. The background data set was included in the 2017 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2018 (2017 Annual Report, Golder 2018a).

WSP performed a periodic update of background datasets, which includes incorporation of additional background data, to improve statistical power and accuracy by providing a more conservative estimate of the true background populations. The CCR Rule Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017) allows for the statistical limits to be updated after four to eight new measurements are available (i.e., every two to four years of semi-annual monitoring). WSP incorporated the new data into the background dataset and updated the GWPS in both March 2020 and September 2022.

3.5 Detection Monitoring

WSP performed the first Detection Monitoring event in October 2017, followed by the statistical evaluation and data analysis in January 2018. WSP collected groundwater samples from the CCR Unit background and downgradient monitoring wells for analysis of Appendix III constituents per 40 CFR §257.94 and included the results in the 2017 Annual Report (Golder 2018a). Following receipt and validation of laboratory results, WSP evaluated the results of the first Detection Monitoring sampling event to compare the concentrations of Appendix III constituents to facility background concentrations.

Using Sanitas™ software, WSP pooled the background data to calculate prediction limits and compared the October 2017 results to the calculated prediction limits to identify SSIs. Based on that comparison, WSP established an Assessment Monitoring program in April 2018.

3.6 Assessment Monitoring

WSP performed the first Assessment Monitoring event (i.e., Assessment and Verification sampling) in March and April 2018, followed by a statistical evaluation and data analysis in August 2018. In March 2018, WSP collected groundwater samples from each background and downgradient monitoring well for analysis of Appendix IV constituents per 40 CFR §257.95. In April 2018, WSP collected groundwater samples from the downgradient monitoring well locations for analysis of Appendix III and detected Appendix IV constituents per 40 CFR §257.95.

In August 2018, WSP developed CCR Unit-specific GWPS for comparisons with the Assessment Monitoring results. At the time of the GWPS development, the GWPS was the higher value of either the Maximum Contaminant Level (MCL) or the CCR Unit-specific background concentration for each analyte calculated using a tolerance/prediction limit procedure in accordance with 40 CFR §257.95(h)(2).

Following receipt and validation of laboratory results, WSP evaluated the Appendix IV constituent results relative to CCR Unit-specific GWPSs (Table 6). Results from the downgradient monitoring wells were evaluated by comparing the lower confidence limit (LCL) to the CCR Unit-specific GWPS for each Appendix IV analyte at each well. If the LCL exceeded the GWPS, there is statistical evidence of an SSL. WSP determined that SSLs existed for the WDA in 2018, specifically molybdenum at GAMW-01, GAMW-13B, and GAMW-14B, but identified an alternative natural source for the elevated levels of molybdenum detected in downgradient monitoring wells and prepared an ASD. A qualified Indiana-licensed professional engineer certified the ASD in November 2018 (Appendix A of the 2018 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2019 (2018 Annual Report, Golder 2019a)).

Following the initial Assessment Monitoring event, WSP performed thirteen additional Assessment Monitoring events at the WDA by collecting groundwater samples from each background and downgradient monitoring well per 40 CFR §257.95. In addition, WSP performed boundary well sampling in 2018 and 2019. Those sample events and their results are summarized below:

- Second Assessment Monitoring Event – WSP performed the second Assessment Monitoring event in October 2018 by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents and performed the statistical evaluation of the analytical results in February 2019. WSP identified SSLs for arsenic (GAMW-01) and cobalt (GAMW-14). In May 2019, WSP prepared, and a qualified Indiana-licensed professional engineer certified an ASD demonstrating that the arsenic and cobalt concentrations observed in the downgradient monitoring wells were due to natural variation and not a release from the WDA (Appendix A of the 2019 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2020 (2019 Annual Report, Golder 2020a))). The results from the first and second Assessment Monitoring events are included in the 2018 Annual Report (Golder 2019a).
- Third Assessment Monitoring Event – WSP performed the third Assessment Monitoring event in April 2019 by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents and performed the statistical evaluation of the analytical results in August 2019. The results confirmed the SSLs for arsenic (GAMW-01) and cobalt (GAMW-14). A qualified-licensed professional engineer recertified the ASD in November 2019 (Appendix B of the 2019 Annual Report, Golder 2020a)).

WSP collected groundwater samples from the following property boundary Assessment Monitoring wells (see Figure 2):

- GAMW-42/42B, GAMW-43/43B, and GAMW-44/44B installed in July 2018 were sampled in March, April, June, July, August, October, and November 2019
- GAMW-42C, GAMW-57/57B, and GAMW-58/58B installed in June 2019 were sampled in July, August, October, and November 2019.

SSLs were not identified in groundwater samples collected from these property boundary wells. The boundary wells have been included in the routine semi-annual sampling since 2020.

- Fourth Assessment Monitoring Event – WSP performed the fourth Assessment Monitoring event in November 2019 by collecting groundwater samples for analysis of Appendix III and detected Appendix IV constituents and performed the statistical evaluation of the analytical results in March 2020. WSP identified an SSL for molybdenum in well GAMW-51B. In June 2020, WSP prepared, and a qualified Indiana-licensed professional engineer certified, an ASD demonstrating that the SSL for molybdenum and observed lithium

levels above the GWPS in GAMW-51B were not due to a release from the WDA (Appendix A of the 2020 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2021 (2020 Annual Report, Golder 2021a)). The results from the third and fourth Assessment Monitoring events and the 2019 boundary sampling are included in the 2019 Annual Report (Golder 2020a).

- Fifth Assessment Monitoring Event – WSP performed the fifth Assessment Monitoring event in April/May 2020 by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents and performed the statistical evaluation of the analytical results in September 2020. WSP identified SSLs for molybdenum and lithium in well GAMW-51B. As these results were consistent with the previous Assessment Monitoring event, a qualified Indiana-licensed professional engineer recertified the ASD in December 2020 (Appendix B of the 2020 Annual Report, Golder 2021a).
- Sixth Assessment Monitoring Event – WSP performed the sixth Assessment Monitoring event in October 2020 by collecting groundwater samples for analysis of Appendix III and detected Appendix IV constituents and performed the statistical evaluation of the analytical results in February 2021. WSP identified SSLs for molybdenum and lithium in well GAMW-51B and molybdenum in GAMW-60B. As described in the 2019 Annual Report (Golder 2020a), GAMW-60B was installed downgradient of GAMW-51/51B in 2019 to further assess the nature and extent of groundwater quality further downgradient of the WDA. The October 2020 Assessment Monitoring event was the fourth round of sampling at this location, and therefore, was the first event for which SSLs were calculated. As these results are consistent with the primary lines of evidence presented in the June 2020 ASD, a qualified Indiana-licensed professional engineer recertified the ASD in May 2021 (Appendix A of the 2021 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2022 (2021 Annual Report, Golder 2022a)). The results from the fifth and sixth Assessment Monitoring events are included in the 2020 Annual Report (Golder 2021a).
- Seventh Assessment Monitoring Event – WSP performed the seventh Assessment Monitoring event in April 2021 by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents and performed the statistical evaluation of the analytical results in August 2021. WSP identified SSLs for molybdenum and lithium in well GAMW-51B and molybdenum in GAMW-60B. As these results were consistent with the previous Assessment Monitoring event, a qualified Indiana-licensed professional engineer recertified the ASD in November 2021 (Appendix B of the 2021 Annual Report, Golder 2022a).
- Eighth Assessment Monitoring Event – WSP performed the eighth Assessment Monitoring event in September 2021 by collecting groundwater samples for analysis of Appendix III and detected Appendix IV constituents and performed the statistical evaluation of the analytical results in January 2022. The results confirmed the SSLs for molybdenum and lithium in well GAMW-51B and molybdenum in GAMW-60B. A qualified Indiana-licensed professional engineer recertified the ASD in April 2022 (Appendix A of the 2022 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2023 (2022 Annual Report, WSP 2023a)). The results from the seventh and eighth Assessment Monitoring events are included in the 2021 Annual Report (Golder 2022a).
- Ninth Assessment Monitoring Event – WSP performed the ninth Assessment Monitoring event in May/June 2022 by collecting groundwater for analysis of Appendix III and Appendix IV constituents and performed the statistical evaluation of the analytical results in September 2022. The results confirmed the SSLs for molybdenum and lithium in well GAMW-51B and molybdenum in GAMW-60B. A qualified Indiana-licensed professional engineer recertified the ASD in December 2022 (Appendix B of the 2022 Annual Report, WSP 2023a).

- Tenth Assessment Monitoring Event – WSP performed the tenth Assessment Monitoring event in October/November 2022 by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents and performed the statistical evaluation of the analytical results in February 2023. The results confirmed the SSLs for molybdenum and lithium in well GAMW-51B and molybdenum in GAMW-60B. A qualified Indiana-licensed professional engineer recertified the ASD in May 2023 (Appendix A of the 2023 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2024 (2023 Annual Report, WSP 2024a)). The results from the ninth and tenth Assessment Monitoring events are included in the 2022 Annual Report (WSP 2023a).
- Eleventh Assessment Monitoring Event – WSP performed the eleventh Assessment Monitoring event in April/May 2023 by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents and performed the statistical evaluation of the analytical results in August 2023. The results confirmed the SSLs for molybdenum and lithium in well GAMW-51B and molybdenum in GAMW-60B. The results also indicated a new SSL for arsenic at GAMW-44. WSP prepared, and a qualified Indiana-licensed professional engineer certified, an ASD demonstrating that the SSL for arsenic observed at levels above the GWPS in GAMW-44 were not due to a release from the WDA (Appendix B of the 2023 Annual Report, WSP 2024a). Furthermore, NIPSCO installed an additional monitoring well GAMW-77 downgradient of and closer to the property boundary than GAMW-44 to further evaluate downgradient groundwater quality.
- Twelfth Assessment Monitoring Event – WSP performed the twelfth Assessment Monitoring event in September/October 2023 by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents and performed the statistical evaluation of the analytical results in February 2024. The results confirmed the SSLs for molybdenum and lithium in well GAMW-51B, molybdenum in GAMW-60B, and arsenic in well GAMW-44. The results also indicated a new SSL for lithium in well GAMW-60B. As these results are consistent with the primary lines of evidence presented in the June 2020 ASD, a qualified Indiana-licensed professional engineer recertified the ASD in May 2024 (Appendix A). The results from the ninth and tenth Assessment Monitoring events are included in the 2023 Annual Report (WSP 2024a).
- Thirteenth Assessment Monitoring Event – WSP performed the thirteenth Assessment Monitoring event in April 2024 by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents and performed the statistical evaluation of the analytical results in August 2024. The results confirmed the SSLs for lithium and molybdenum in wells GAMW-51B and GAMW-60B and for arsenic in well GAMW-44. A qualified Indiana-licensed professional engineer recertified the ASD in November 2024 (Appendix B).
- Fourteenth Assessment Monitoring Event – WSP performed the fourteenth Assessment Monitoring event in September 2024 by collecting groundwater samples for analyses of Appendix III and Appendix IV constituents and will perform the statistical evaluation of the analytical results in January 2025.

The analytical laboratory reports for April and September 2024 are provided in Appendix C and Appendix D, respectively. The data usability assessment report for the analytical data is provided in Appendix E. The February and August 2024 statistical evaluation results are provided in Appendix F.

3.7 Statistical Evaluation

In accordance with 40 CFR §257.95, WSP performed the statistical evaluation of the groundwater analytical results following each monitoring event. For this evaluation, WSP utilized the Sanitas™ statistical analysis software package. The methods used during this statistical evaluation are described in the GMPIM (Golder 2017),

were certified by a qualified engineer in October 2017. WSP has summarized the statistical evaluations in the subsections below.

3.7.1 Data Evaluation

After each event, WSP assessed the analytical data for outliers, anomalies, and trends that might be an indication of a sampling or analytical error. Outliers and anomalies are generally defined as inconsistently large or small values that can occur because of sampling, laboratory, transportation, or transcription errors, or even by chance alone. Significant trends may indicate natural geochemical variability, a source of systematic error, influence of an upgradient/off-site source, or an actual occurrence of CCR Unit influence upon groundwater quality. Prior to the calculation of statistical limits, WSP used appropriate statistical methods to remove outliers from the database and manage trends with detrending routines.

To assess the data for outliers, anomalies, and trends, WSP assessed the data using time vs. concentration graphs, and statistical routines included in the Sanitas™ statistical analysis software package.

Outliers and Anomalies

Based on these evaluations, WSP identified outliers in 2024 in addition to those identified in the 2023 Annual Report:

- The April 2023 pH results collected from monitoring wells GAMW-68, GAMW-68B, GAMW-43, and GAMW-43B.

These results were identified as outliers and removed from the dataset for the following reasons:

- Generally, statistical testing, including the Dixon outlier test (see Appendix F), identified the results as outliers
- Trend charts indicate that these results were inconsistent with other concentrations detected in these wells and the high results were not confirmed by the October 2023 data
- A malfunction in field equipment is the suspected cause of the anomalous data.

Trends

WSP evaluated the background data set for trends using Sanitas™ software (Appendix F). WSP will continue to monitor all trends and apply detrending routines, if applicable, before using these data to calculate GWPS. WSP identified the following Appendix IV parameter trends in background monitoring wells:

- Arsenic concentrations detected in groundwater samples collected from GAMW-03B show a decreasing trend. Arsenic has never been detected above the MCL in this well. No detrending routines are required.
- Arsenic concentrations detected in groundwater samples collected from GAMW-68 and GAMW-68B show an increasing trend. Arsenic has never been detected above the MCL in these wells. No detrending routines are required.
- Beryllium concentrations detected in groundwater samples collected from GAMW-03 and GAMW-03B show a decreasing trend. Beryllium has never been detected above the MCL in these wells. No detrending routines are required.

- Cadmium concentrations detected in groundwater samples collected from GAMW-03 and GAMW-03B show a decreasing trend. Cadmium has never been detected above the MCL in these wells. No detrending routines are required.
- Chromium concentrations detected in groundwater samples collected from GAMW-03 show a decreasing trend. Chromium has never been detected above the MCL in this well. No detrending routines are required.
- Lead concentrations detected in groundwater samples collected from GAMW-03 and GAMW-03B show a decreasing trend. Lead has never been detected above the health-based standard in these wells. No detrending routines are required.
- Molybdenum concentrations detected in groundwater samples collected from GAMW-03B show a decreasing trend. Molybdenum has never been detected above the health-based standard in this well. No detrending routines are required.
- Selenium concentrations detected in groundwater samples collected from GAMW-03B show a decreasing trend. Selenium has never been detected above the MCL in this well. No detrending routines are required.
- Thallium concentrations detected in groundwater samples collected from GAMW-03 and GAMW-03B show a decreasing trend. Thallium has never been detected above the MCL in these wells. No detrending routines are required.

3.7.2 Development of Groundwater Protection Standard

Pursuant to CFR §257.95(h), WSP developed GWPS for each of the Appendix IV analytes. The GWPSs are set equal to the MCL or health-based standard or a limit based on background data, whichever is greater, as described in 40 CFR §257.95(h)(2).

The CCR Rule and *Unified Guidance* provide two acceptable approaches for establishing a background-based GWPS; a tolerance interval approach or a prediction interval approach. Either of these approaches can be used in all cases except if all values are non-detect, in which case the background-based GWPS is set equal to the laboratory reporting limit (RL).

If the background dataset is normally or transformed normally distributed, the GMPIM (Golder 2017) states that the tolerance interval approach is used. The background-based GWPS will be based on a 95 percent coverage/95 percent confidence tolerance interval. If the background data are non-normal (even after transformation) than a non-parametric prediction interval approach is used.

As described in Section 3.4, WSP performed a periodic update of background datasets. This update included incorporation of additional background data, to improve statistical power and accuracy by providing a more conservative estimate of the true background populations. The GMPIM (Golder 2017) allows for the statistical limits to be updated after four to eight new measurements are available (i.e., every two to four years of semi-annual monitoring). WSP incorporated the new data into the background dataset and updated the GWPS in both March 2020 and September 2022 (see Table 6). The September 2022 GWPS include the first four data points collected from GAMW-68 and GAMW-68B. A summary of the GWPSs is provided in Table 6. The corresponding tolerance limits and/or prediction limits are provided in Appendix F.

3.7.3 Results of Appendix IV Downgradient Statistical Comparisons

For Assessment Monitoring results, WSP used an interwell statistical evaluation to identify SSLs. An interwell evaluation compares the most recent values from downgradient compliance wells to a background dataset composed of upgradient well data. Because the CCR Unit is in Assessment Monitoring, no statistical evaluations were conducted on Appendix III (Detection Monitoring) constituents.

For Appendix IV constituents, WSP used the confidence interval method to evaluate for potential exceedances or SSLs based on procedures described in the Unified Guidance, and the GMPIM (Golder 2017). Using confidence intervals, SSLs are identified by comparing the calculated confidence interval against the GWPS. A confidence interval statistically defines the upper and lower bounds of a specified population within a stipulated level of confidence. If the lower confidence limit exceeds the GWPS, there is statistical evidence that an SSL has been triggered.

Based on the comparisons discussed above, WSP determined that the results of the statistical analyses completed in February 2024 and August 2024 identified SSLs for lithium in well GAMW-51B and molybdenum in wells GAMW-51B and GAMW-60B. Additionally, trend analysis indicated that there are statistically significant increasing trends for arsenic in well GAMW-44 and lithium in well GAMW-60B and in both cases the lower confidence band is above the GWPS, resulting in SSLs for these locations. The calculated confidence intervals and confidence band for arsenic at GAMW-44 and lithium at GAMW-60B are provided in Appendix F.

3.8 Problems Encountered and Follow-Up Corrective Actions

In the Thirteenth Assessment Monitoring event (April 2024); WSP collected the following groundwater samples with higher than expected turbidity levels:

- GAMW-03; 7.10 nephelometric turbidity units (NTUs)
- GAMW-12B; 5.30 NTUs
- GAMW-42C; 11.60 NTUs
- GAMW-43; 5.11 NTUs
- GAMW-44; 18.80 NTUs
- GAMW-51; 41.80 NTUs.

In the Fourteenth Assessment Monitoring event (September 2024); WSP collected the following groundwater samples with higher than expected turbidity levels:

- GAMW-42B; 9.74 NTUs
- GAMW-42C; 99.79 NTUs

According to the GMPIM (Golder 2017), groundwater samples are to be collected once groundwater has achieved a turbidity level below 5 NTUs. If the 5 NTU objective cannot be achieved due to time constraints in the field, groundwater is then purged for a minimum of two hours and sampled when turbidity appears to stabilize (e.g., no downward or upward trend over three consecutive readings five minutes apart).

WSP's evaluation of the analytical results from these wells suggests that the slightly elevated turbidity levels had no significant effect on the representativeness of groundwater quality.

During future monitoring events, WSP will purge groundwater for a minimum of two hours or five well volumes and then use professional judgement to assess when the purge water is representative of groundwater to be sampled. If an acceptable turbidity level cannot be achieved within a reasonable timeframe (e.g., three hours maximum), WSP will redevelop the affected monitoring well(s) prior to the next sampling event.

4.0 KEY ACTIVITIES PROJECTED FOR 2025

During calendar year 2025, NIPSCO anticipates conducting the following key CCR Rule groundwater monitoring activities for the WDA:

- Prepare and submit the appropriate notifications according to the CCR Rule
- Continue semi-annual Assessment Monitoring groundwater sampling per CCR Rule requirements
- Inspect and maintain the monitoring system including wells, pumps, and equipment.

5.0 REFERENCES

Golder 2017, “CCR Groundwater Monitoring Program Implementation Manual,” Golder Associates Inc., October 2017.

Golder 2018a, “2017 Annual Groundwater Monitoring and Corrective Action Report - Waste Disposal Area, NIPSCO R. M. Schafer Generating Station”, Golder Associates Inc., January 31, 2018.

Golder 2018b, “Waste Disposal Area Alternative Source Demonstration,” Golder Associates Inc., November 19, 2018.

Golder 2019a, “2018 Annual Groundwater Monitoring and Corrective Action Report - Waste Disposal Area, NIPSCO R. M. Schafer Generating Station”, Golder Associates Inc., January 31, 2019.

Golder 2019b, “Alternative Source Demonstration - Waste Disposal Area,” Golder Associates Inc., May 17, 2019.

Golder 2019c, “Recertification of R. M. Schahfer Waste Disposal Area Alternative Source Demonstration,” Golder Associates Inc., November 26, 2019.

Golder 2020a, “2019 Annual Groundwater Monitoring and Corrective Action Report - Waste Disposal Area, NIPSCO R. M. Schafer Generating Station”, Golder Associates Inc., January 31, 2020.

Golder 2020b, “Alternative Source Demonstration – Waste Disposal Area,” Golder Associates Inc., June 9, 2020.

Golder 2020c, “Recertification of R. M. Schahfer Waste Disposal Area Alternative Source Demonstration,” Golder Associates Inc., December 4, 2020.

Golder 2021a, “2020 Annual Groundwater Monitoring and Corrective Action Report – Waste Disposal Area, NIPSCO R. M. Schahfer Generating Station”, Golder Associates Inc., January 31, 2021.

Golder 2021b, “Recertification of R. M. Schahfer Waste Disposal Area Alternative Source Demonstration,” Golder Associates Inc., May 18, 2021.

Golder 2021c, “Recertification of R. M. Schahfer Waste Disposal Area Alternative Source Demonstration,” Golder Associates Inc., November 12, 2021.

Golder 2022a, 2021, “2021 Annual Groundwater Monitoring and Corrective Action Report – Waste Disposal Area, NIPSCO R. M. Schahfer Generating Station”, Golder Associates Inc., January 31, 2022.

Golder 2022b, “Recertification of R. M. Schahfer Waste Disposal Area Alternative Source Demonstration,” Golder Associates Inc., April 15, 2022.

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WSP 2023a, “2022 Annual Groundwater Monitoring and Corrective Action Report – Waste Disposal Area, NIPSCO R. M. Schahfer Generating Station”, WSP USA Inc., January 31, 2023.

WSP 2023b, “Recertification of R. M. Schahfer Waste Disposal Area Alternative Source Demonstration,” WSP USA Inc., May 8, 2023.

WSP 2023c, “Recertification of R. M. Schahfer Waste Disposal Area Alternative Source Demonstration,” WSP USA Inc., November 17, 2023.

WSP 2024a, “2023 Annual Groundwater Monitoring and Corrective Action Report – Waste Disposal Area, NIPSCO R. M. Schahfer Generating Station”, WSP USA Inc., January 31, 2024.

WSP 2024b. “CCR Groundwater Monitoring System Design Manual,” WSP USA Inc., July 2024.

WSP 2024c, “Recertification of R. M. Schahfer Waste Disposal Area Alternative Source Demonstration,” WSP USA Inc., March 25, 2024.

WSP 2024d, “Recertification of R. M. Schahfer Waste Disposal Area Alternative Source Demonstration,” WSP USA Inc., October 15, 2024.

Tables

Table 1: Monitoring Well Network
CCR Unit Schahfer Waste Disposal Area
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

CCR Unit	Well Purpose	Monitoring Well ID	Installation Date	Decommission Date (If Applicable)	Basis For Action
Waste Disposal Area	Background Monitoring Well	GAMW-03	6/27/2015	-	Installed for groundwater quality monitoring(1)
		GAMW-03B	5/24/2016	-	
		GAMW-68	8/27/2020	-	
		GAMW-68B	8/27/2020	-	
	Downgradient Monitoring Well	GAMW-01	6/26/2015	-	Installed for groundwater quality monitoring(1)
		GAMW-12	5/23/2016	-	
		GAMW-13	5/24/2016	-	
		GAMW-13B	5/23/2016	-	
		GAMW-14	5/23/2016	-	
		GAMW-14B	5/23/2016	-	
		GAMW-01B	7/31/2018	-	Installed to characterize the nature and extent of a potential release(2)
		GAMW-12B	7/31/2018	-	
		GAMW-51	7/25/2018	-	
		GAMW-51B	7/25/2018	-	
		GAMW-42	7/24/2018	-	Installed to monitor groundwater quality at the property boundary(3)
		GAMW-42B	7/24/2018	-	
		GAMW-42C	6/8/2019	-	
		GAMW-43	5/16/2018	-	
		GAMW-43B	5/16/2018	-	
		GAMW-44	5/16/2018	-	
		GAMW-44B	5/16/2018	-	
		GAMW-57	6/7/2019	-	
		GAMW-57B	6/7/2019	-	
		GAMW-58	6/6/2019	-	
		GAMW-58B	6/6/2019	-	
		GAMW-59	6/8/2019	-	Installed to characterize the nature and extent of a potential release(2)
		GAMW-59B	6/6/2019	-	
		GAMW-60	6/8/2019	-	
		GAMW-60B	6/4/2019	-	
		GAMW-77	11/10/2023	-	Installed to monitor groundwater quality at the property boundary(3)

1) Per 40 CFR §257.93, WSP collected eight rounds of background data prior to October 17, 2017, excluding wells GAMW-68 and GAMW-68B.
2) Per 40 CFR §257.95(g)(1)(i) Rule requirements, WSP collected additional data to further characterize the nature and extent of potential groundwater impacts.
3) Per 40 CFR §257.95(g)(1)(iii), WSP collected data to monitor groundwater quality in the direction of flow at the property boundary.

Prepared by: MJS 11/20/2024
Checked by: DFSC
Reviewed by: JBG

Table 2: 2024 Groundwater Elevations
CCR Unit Schahfer Waste Disposal Unit
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Monitoring Well Location	Northing (ft)	Easting (ft)	Top of Casing Elevation (ft-NAVD88)	Measurement Date		Well Diameter (in)	Stickup (ft)	2024-03-13		2024-09-03	
				Screen Interval Top (ft-bgs)	Screen Interval Bottom (ft-bgs)			Depth to Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)	Depth to Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)
Davis Ditch South Culvert	2168387.49	2971366.64	662.83	-	-	-	-	2.95	659.88	3.45	659.38
GAMW01	2169108.22	2968518.99	668.23	5	15	2	3.29	9.24	658.99	9.90	658.33
GAMW01B	2169107.37	2968525.20	667.87	26	36	2	2.67	8.77	659.10	9.42	658.45
GAMW02	2168720.88	2970548.50	669.57	5	15	2	3.49	9.56	660.01	10.23	659.34
GAMW03	2169821.53	2971646.34	668.20	5	15	2	3.06	5.41	662.79	8.65	659.55
GAMW03B	2169813.71	2971647.06	668.16	25	35	2	2.87	5.41	662.75	8.70	659.46
GAMW04	2170947.82	2971503.36	669.24	5	15	2	3.43	6.92	662.32	9.50	659.74
GAMW05	2170870.00	2968721.92	669.75	7	17	2	3.06	10.76	658.99	11.91	657.84
GAMW06	2172320.06	2969128.60	670.81	5	15	2	3.31	11.44	659.37	11.93	658.88
GAMW07	2172327.53	2970256.34	669.94	5	15	2	3.39	10.23	659.71	10.66	659.28
GAMW08	2173335.20	2970799.89	669.76	5	15	2	3.81	10.08	659.68	10.64	659.12
GAMW08B	2173334.70	2970790.59	668.47	26	36	2	2.55	8.83	659.64	9.41	659.06
GAMW09	2172509.36	2971291.29	668.56	5	15	2	3.46	7.98	660.58	9.07	659.49
GAMW09B	2172502.57	2971291.67	668.29	25	35	2	2.94	7.62	660.67	8.73	659.56
GAMW10	2173531.42	2973046.25	667.83	5	15	2	3.84	9.20	658.63	9.79	658.04
GAMW11	2174218.62	2972678.78	667.17	5	15	2	3.57	8.74	658.43	9.24	657.93
GAMW12	2169576.84	2968314.48	667.29	5	15	2	2.94	8.68	658.61	9.30	657.99
GAMW12B	2169580.32	2968309.54	666.81	25	35	2	2.58	8.05	658.76	8.66	658.15
GAMW13	2170059.98	2968285.46	667.24	5	15	2	2.93	8.77	658.47	9.30	657.94
GAMW13B	2170055.88	2968285.69	667.12	25	35	2	2.89	8.65	658.47	9.37	657.75
GAMW14	2170532.49	2968467.96	667.96	5	15	2	3.20	9.10	658.86	9.10	658.86
GAMW14B	2170534.66	2968471.60	667.94	25	35	2	3.32	9.14	658.80	10.17	657.77
GAMW15	2172753.76	2970258.35	668.25	5	15	2	3.24	8.70	659.55	9.16	659.09
GAMW15B	2172749.68	2970258.92	668.05	25	35	2	2.91	8.50	659.55	8.96	659.09
GAMW16BR	2173189.53	2970399.45	664.39	30	40	2	2.93	7.87	656.52	8.28	656.11
GAMW16R	2173189.51	2970396.68	667.17	10	20	2	2.82	7.72	659.45	8.15	659.02
GAMW17	2173164.44	2970944.07	671.93	5	15	2	3.12	12.17	659.76	12.80	659.13
GAMW17B	2173164.84	2970947.44	670.60	25	35	2	1.74	10.83	659.77	12.57	658.03
GAMW18	2171919.78	2971272.41	669.07	5	15	2	3.03	7.87	661.20	9.32	659.75
GAMW18B	2171910.00	2971272.53	668.47	25	35	2	2.53	7.04	661.43	8.50	659.97
GAMW20	2171579.62	2974761.60	667.21	6	16	2	2.60	8.67	658.54	8.60	658.61
GAMW20B	2171579.95	2974757.37	667.40	22.5	32.5	2	2.92	8.73	658.67	8.77	658.63
GAMW24	2171048.72	2974868.68	665.39	6	16	2	3.30	5.84	659.55	6.75	658.64
GAMW24B	2171050.67	2974866.89	665.33	21	31	2	3.20	5.65	659.68	6.55	658.78
GAMW25	2171586.03	2973730.34	668.05	6	16	2	2.79	8.53	659.52	9.01	659.04
GAMW25B	2171588.49	2973730.66	667.95	25	35	2	2.69	8.47	659.48	8.90	659.05
GAMW26	2172243.83	2973744.80	667.71	6	16	2	2.82	8.84	658.87	9.03	658.68
GAMW26B	2172245.87	2973744.66	667.75	23	33	2	2.84	8.86	658.89	9.03	658.72

Table 2: 2024 Groundwater Elevations
CCR Unit Schahfer Waste Disposal Unit
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Monitoring Well Location	Northing (ft)	Easting (ft)	Top of Casing Elevation (ft-NAVD88)	Measurement Date		Well Diameter (in)	Stickup (ft)	2024-03-13		2024-09-03	
				Screen Interval Top (ft-bgs)	Screen Interval Bottom (ft-bgs)			Depth to Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)	Depth to Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)
GAMW27	2172624.68	2973958.32	665.51	6	16	2	2.83	7.17	658.34	7.41	658.10
GAMW27B	2172624.95	2973960.21	665.44	21	31	2	2.79	7.18	658.26	7.27	658.17
GAMW31	2174043.93	2974076.43	665.40	6	16	2	2.72	7.07	658.33	7.79	657.61
GAMW31B	2174041.68	2974075.83	665.41	20	30	2	2.72	7.03	658.38	7.75	657.66
GAMW32	2174364.59	2974353.14	668.08	8	18	2	2.64	9.63	658.45	10.35	657.73
GAMW32B	2174364.70	2974350.09	668.28	24	34	2	2.75	9.83	658.45	10.52	657.76
GAMW33	2174015.71	2976811.15	665.29	6	16	2	2.66	6.41	658.88	7.65	657.64
GAMW33B	2174015.85	2976814.01	665.29	21	31	2	2.86	6.50	658.79	7.60	657.69
GAMW34	2173123.80	2976637.58	664.82	4	16	2	3.04	5.85	658.97	6.86	657.96
GAMW34B	2173126.75	2976637.84	664.84	19	29	2	3.19	5.75	659.09	6.86	657.98
GAMW35B	2172046.64	2976576.97	664.62	14	24	2	2.84	5.31	659.31	6.39	658.23
GAMW36	2174145.14	2977866.72	665.00	6	16	2	2.76	5.60	659.40	7.60	657.40
GAMW36B	2174142.51	2977866.95	665.07	24.5	34.5	2	2.72	5.61	659.46	7.60	657.47
GAMW37B	2173307.54	2977852.54	665.32	15	25	2	2.64	5.70	659.62	7.33	657.99
GAMW42	2170186.91	2967937.39	665.80	5	15	2	2.68	6.97	658.83	7.97	657.83
GAMW42B	2170182.55	2967943.17	665.66	26	36	2	2.51	6.85	658.81	7.82	657.84
GAMW42C	2170207.09	2967974.69	666.30	40	50	2	3.09	7.53	658.77	8.49	657.81
GAMW43	2170878.63	2967926.92	665.59	5	15	2	2.45	6.80	658.79	8.02	657.57
GAMW43B	2170876.91	2967926.66	665.53	26	36	2	2.41	6.73	658.80	7.51	658.02
GAMW44	2171240.72	2967833.09	666.31	5	15	2	2.20	7.54	658.77	8.84	657.47
GAMW44B	2171239.72	2967834.35	666.25	26	36	2	2.14	7.52	658.73	8.80	657.45
GAMW45	2178836.29	2971287.41	664.50	5	15	2	2.29	8.00	656.50	9.60	654.90
GAMW45B	2178836.27	2971289.23	664.32	28	38	2	2.09	7.80	656.52	9.40	654.92
GAMW46	2178839.03	2973531.39	664.80	5	15	2	2.81	6.95	657.85	8.87	655.93
GAMW46B	2178838.97	2973532.88	664.79	22	32	2	2.81	6.92	657.87	8.84	655.95
GAMW48	2178605.72	2975279.25	663.38	5	15	2	2.57	6.30	657.08	8.15	655.23
GAMW48B	2178606.46	2975283.24	663.33	20	30	2	2.89	6.25	657.08	8.12	655.21
GAMW49	2176111.21	2976600.94	664.64	5	15	2	2.64	5.53	659.11	7.50	657.14
GAMW49B	2176115.76	2976600.61	664.52	23	33	2	2.40	5.53	658.99	7.30	657.22
GAMW50	2174957.14	2977953.35	665.15	5	15	2	2.65	5.98	659.17	7.92	657.23
GAMW50B	2174961.01	2977953.31	664.88	21	31	2	2.62	5.68	659.20	7.65	657.23
GAMW51	2171145.47	2968512.12	668.77	5	15	2	2.62	10.05	658.72	11.06	657.71
GAMW51B	2171147.99	2968515.78	668.79	27	37	2	2.76	9.87	658.92	10.92	657.87
GAMW52	2175030.90	2970079.13	666.79	5	15	2	2.72	8.22	658.57	8.95	657.84
GAMW52B	2175032.00	2970073.23	666.90	27	37	2	2.40	8.29	658.61	9.07	657.83
GAMW53	2174535.34	2971036.47	667.24	5	15	2	2.56	8.60	658.64	9.20	658.04
GAMW53B	2174536.54	2971032.60	667.29	26	36	2	2.67	8.63	658.66	9.17	658.12
GAMW54	2174080.28	2971911.36	666.37	5	15	2	2.50	6.91	659.46	7.87	658.50
GAMW54B	2174081.64	2971906.90	666.47	22	32	2	2.49	7.17	659.30	7.96	658.51

Table 2: 2024 Groundwater Elevations
CCR Unit Schahfer Waste Disposal Unit
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Monitoring Well Location	Northing (ft)	Easting (ft)	Top of Casing Elevation (ft-NAVD88)	Measurement Date		Well Diameter (in)	Stickup (ft)	2024-03-13		2024-09-03	
				Screen Interval Top (ft-bgs)	Screen Interval Bottom (ft-bgs)			Depth to Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)	Depth to Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)
GAMW55B	2173632.34	2972222.72	667.53	25	35	2	2.35	8.00	659.53	8.98	658.55
GAMW55R	2173631.97	2972230.54	667.73	5	15	2	2.37	8.19	659.54	9.14	658.59
GAMW56	2173343.43	2972428.30	667.91	5	15	2	2.48	8.24	659.67	9.30	658.61
GAMW56B	2173343.23	2972423.77	667.82	25	35	2	2.49	8.16	659.66	9.22	658.60
GAMW57	2171592.09	2967729.66	672.99	5	15	2	2.52	14.22	658.77	15.60	657.39
GAMW57B	2171592.28	2967726.72	672.90	35	45	2	2.44	14.08	658.82	15.49	657.41
GAMW58	2171902.75	2967863.88	667.56	5	15	2	2.52	9.29	658.27	10.30	657.26
GAMW58B	2171900.81	2967867.00	667.61	25	35	2	2.73	9.32	658.29	10.35	657.26
GAMW59	2171317.51	2968668.03	668.51	5	15	2	2.58	9.71	658.80	10.73	657.78
GAMW59B	2171313.72	2968668.36	668.57	30	40	2	2.61	9.76	658.81	10.83	657.74
GAMW60	2171552.61	2968698.92	667.52	5	15	2	2.43	9.00	658.52	9.96	657.56
GAMW60B	2171549.04	2968699.96	667.52	30	40	2	2.46	8.75	658.77	9.72	657.80
GAMW63B	2171969.16	2971860.97	668.76	23	33	2	2.45	7.34	661.42	8.90	659.86
GAMW64B	2171789.81	2972174.66	666.85	21	31	2	2.43	5.52	661.33	7.05	659.80
GAMW65B	2173229.48	2968253.82	668.67	25	35	2	3.22	10.52	658.15	11.13	657.54
GAMW66B	2173363.62	2967853.20	672.99	34	44	2	3.79	15.24	657.75	15.88	657.11
GAMW67B	2174213.30	2967604.35	667.97	30.5	40.5	2	3.32	10.29	657.68	10.98	656.99
GAMW68	2970328.36	2168555.54	665.53	7	17	2	0.42	5.43	660.10	6.34	659.19
GAMW68B	2970325.08	2168557.42	665.72	24.5	34.5	2	0.25	5.61	660.11	6.54	659.18
GAMW72	2173514.76	2973920.43	666.93	5	15	2	2.82	8.22	658.71	8.62	658.31
GAMW72B	2173511.12	2973920.44	666.88	21	31	2	2.68	8.19	658.69	8.60	658.28
GAMW73	2173737.29	2974225.62	664.26	5	15	2	2.62	5.39	658.87	6.06	658.20
GAMW73B	2173740.94	2974228.37	664.31	18	18	2	2.65	5.45	658.86	6.10	658.21
GAMW74	2173737.57	2974539.26	664.44	5	15	2	2.82	5.51	658.93	6.21	658.23
GAMW74B	2173737.58	2974542.01	664.21	18	18	2	2.59	5.27	658.94	6.00	658.21
GAMW77	2171387.05	2967443.04	668.25	9.5	19.5	2	2.27	8.81	659.44	10.73	657.52
GAMW78	2171030.91	2967481.46	674.71	10	20	2	2.38	15.29	659.42	17.13	657.58
GAPIEZ07	2174443.92	2973071.62	668.77	5	15	2	3.62	10.68	658.09	11.04	657.73
MW-10D	2171037.13	2974845.36	663.18	NA	NA	2	0.98	3.44	659.74	4.38	658.80
MW-10S	2171039.40	2974843.76	662.53	NA	NA	2	0.58	2.85	659.68	3.75	658.78

Table 2: 2024 Groundwater Elevations
CCR Unit Schahfer Waste Disposal Unit
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Monitoring Well Location	Northing (ft)	Easting (ft)	Top of Casing Elevation (ft-NAVD88)	Measurement Date		Well Diameter (in)	Stickup (ft)	2024-03-13		2024-09-03	
				Screen Interval Top (ft-bgs)	Screen Interval Bottom (ft-bgs)			Depth to Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)	Depth to Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)
MW-11D	2175123.58	2976338.85	663.57	NA	NA	2	2.06	4.79	658.78	6.05	657.52
MW-11S	2175119.58	2976338.76	663.25	NA	NA	2	1.79	4.49	658.76	5.72	657.53
MW-12D	2175120.55	2975384.31	663.60	NA	NA	2	2.02	4.75	658.85	5.90	657.70
MW-12S	2175120.73	2975379.24	663.48	NA	NA	2	1.94	4.65	658.83	5.83	657.65
MW-13D	2173960.00	2976837.35	664.80	NA	NA	2	2.77	5.90	658.90	7.08	657.72
MW-13S	2173953.77	2976836.91	664.67	NA	NA	2	2.45	5.77	658.90	6.94	657.73
MW-14D	2174539.41	2977869.89	665.41	NA	NA	2	2.77	6.06	659.35	8.05	657.36
MW-14S	2174539.25	2977863.57	665.24	NA	NA	2	2.67	5.91	659.33	7.86	657.38
MW-1D	2170444.49	2973803.64	668.86	NA	NA	2	2.50	7.23	661.63	9.11	659.75
MW-1S	2170448.20	2973803.98	668.81	NA	NA	2	2.38	7.21	661.60	9.08	659.73
MW-2D	2172923.26	2976537.67	663.73	NA	NA	2	1.56	4.55	659.18	5.62	658.11
MW-2S	2172927.38	2976537.39	664.10	NA	NA	2	2.00	4.95	659.15	6.00	658.10
MW-3D	2174870.27	2976027.63	667.58	NA	NA	2	2.74	9.02	658.56	9.97	657.61
MW-3S	2174870.86	2976031.85	667.58	NA	NA	2	2.76	9.05	658.53	9.91	657.67
MW-4D	2174850.77	2974079.15	666.56	NA	NA	2	2.43	8.44	658.12	8.84	657.72
MW-4S	2174855.51	2974079.60	666.90	NA	NA	2	2.64	8.79	658.11	9.17	657.73
MW-5D	2172943.46	2973945.66	664.37	NA	NA	2	1.62	6.10	658.27	6.34	658.03
MW-5S	2172947.30	2973945.82	664.29	NA	NA	2	1.57	6.00	658.29	6.28	658.01
MW-6D	2176184.07	2979231.73	664.64	NA	NA	2	2.85	7.51	657.13	9.64	655.00
MW-6S	2176187.92	2979232.21	664.61	NA	NA	2	2.60	7.52	657.09	9.64	654.97
MW-7D	2176191.44	2976686.21	664.72	NA	NA	2	2.71	5.99	658.73	7.72	657.00
MW-7S	2176190.47	2976682.35	664.80	NA	NA	2	2.81	5.70	659.10	7.78	657.02
MW-8D	2178623.03	2975045.81	663.52	NA	NA	2	2.18	6.26	657.26	8.11	655.41
MW-8S	2178621.44	2975049.79	663.75	NA	NA	2	2.33	6.48	657.27	8.35	655.40
MW-9D	2178811.96	2972838.00	662.68	NA	NA	2	0.84	5.30	657.38	6.85	655.83
MW-9S	2178809.97	2972839.80	662.42	NA	NA	2	0.59	5.08	657.34	6.60	655.82
SW-10	2170976.65	2975340.69	660.45	-	-	-	-	0.40	660.05	1.18	659.27
SW-4	2174898.62	2973926.86	662.48	-	-	-	-	0.75	661.73	0.75	661.73
Davis Ditch West Gate	2173623.30	2967604.35	668.17	-	-	-	-	10.96	657.21	11.54	656.63

Notes:
Locations surveyed in US State Plane Indiana West Zone North American Datum of 1983 and North American Vertical Datum of 1988 (ft)
CCR = coal combustion residual
ft-bgs = feet below ground surface
ft-btoc = feet below top of casing
ft-NAVD88 = feet relative to NAVD88
in = inch
NA = not available

Prepared by: MJS
Checked by: DFSC
Reviewed by: JBG

Table 3: Summary of Sampling Events
CCR Unit Schahfer Waste Disposal Area
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Well Purpose	Monitoring Well ID	Sample Event #22	Sample Event #23	Total Number of Samples
Purpose of Sample		Annual Assessment Monitoring	Semi-Annual Assessment Monitoring	
Sample Parameters		Appendix III and Appendix IV	Appendix III and detected Appendix IV	
Background Monitoring Well	GAMW03	4/3/2024	9/12/2024	2
	GAMW03B	4/3/2024	9/12/2024	2
	GAMW68	4/12/2024	9/12/2024	2
	GAMW68B	4/12/2024	9/12/2024	2
Downgradient Monitoring Well	GAMW01	4/2/2024	9/11/2024	2
	GAMW01B	4/2/2024	9/11/2024	2
	GAMW12	4/2/2024	9/17/2024	2
	GAMW12B	4/3/2024	9/24/2024	2
	GAMW13	4/1/2024	9/17/2024	2
	GAMW13B	4/2/2024	9/17/2024	2
	GAMW14	4/1/2024	9/16/2024	2
	GAMW14B	4/1/2024	9/16/2024	2
	GAMW42	4/16/2024	9/25/2024	2
	GAMW42B	4/16/2024	9/25/2024	2
	GAMW42C	4/16/2024	9/26/2024	2
	GAMW43	4/17/2024	9/26/2024	2
	GAMW43B	4/17/2024	9/27/2024	2
	GAMW44	4/16/2024	9/25/2024	2
	GAMW44B	4/16/2024	9/25/2024	2
	GAMW51	4/4/2024	9/13/2024	2
	GAMW51B	4/4/2024	9/13/2024	2
	GAMW57	4/17/2024	9/26/2024	2
	GAMW57B	4/17/2024	9/26/2024	2
	GAMW58	4/19/2024	9/26/2024	2
	GAMW58B	4/19/2024	9/26/2024	2
	GAMW59	4/3/2024	9/13/2024	2
	GAMW59B	4/11/2024	9/13/2024	2
	GAMW60	4/3/2024	9/16/2024	2
	GAMW60B	4/3/2024	9/16/2024	2
	GAMW77	4/16/2024	9/27/2024	2
Total Number of Samples		30	30	60

Notes:

Sample counts do not include QC/QA samples.

(1) Sample events #1-19 were completed prior to 2023. The purpose, sample parameters, and sample dates are included in the 2017, 2018, 2019, 2020, 2021, 2022, and 2023 Annual Reports.

(2) Sample events #20 and 21 correspond to the eleventh and twelfth Assessment Monitoring events, respectively.

Prepared by: AJS 1/7/2025
Checked by: DBSC 1/8/2025
Reviewed by: JRG 1/10/25

Table 4: 2024 Analytical Data
CCR Unit Schahfer Waste Disposal Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW01		GAMW01B			GAMW03		GAMW03B		GAMW12			GAMW12B	
	Sample Date	2024-04-02	2024-09-11	2024-04-02		2024-09-11	2024-04-03	2024-09-12	2024-04-03	2024-09-12	2024-04-02	2024-09-17		2024-04-03	2024-09-24
	Sample Type	N	N	FD	N	N	N	N	N	N	N	FD	N	N	N
Chemical	Unit														
CCR Appendix III															
Boron	mg/L	0.86	1.6	0.34	0.34	0.37	0.22	0.17	0.39	0.43	0.053 J	0.069 J	0.072 J	0.36	0.43
Calcium	mg/L	88.1	97.6	110	111	112	85.8	82.1	104	110	75.5	79	83.6	111	103
Chloride	mg/L	4.5	8.7	22.6	22.6	24.5	14.1	4.4	24.6	23.2	4.5	3.2	3.2	23.7	23.6
Fluoride	mg/L	0.3	0.39	0.15	0.15	0.16	0.23	0.13	0.21	0.21	0.22	0.25	0.25	0.11	0.099 J
pH	SU	7.36	6.99		7.18	6.96	7.22	6.81	7.31	7.12	7.03		7.00	7.26	7.62
Sulfate	mg/L	108	123	77.7	75.7	84.7	76.7	48.5	115	129	28.7	9.1	9	107	124 J-
Total Dissolved Solids	mg/L	341	422	451	429	426	319	332	449	475	271	300	302	469	485
CCR Appendix IV															
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00042 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.0033	0.0075	0.00026 J	0.00032 J	0.00032 J	0.004	0.013	0.00042 J	0.00046 J	0.0051	0.014	0.014	0.00034 J	0.00042 J
Barium	mg/L	0.045	0.062	0.17	0.17	0.18	0.087	0.093	0.11	0.11	0.072	0.087	0.086	0.15	0.15
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	2E-05 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	5.7E-05 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.002 U	0.00047 J	0.002 U	0.002 U	0.00051 J	0.00032 J	0.00043 J	0.0004 J	0.00048 J	0.002 U	0.002 U	0.002 U	0.00037 J	0.002 U
Cobalt	mg/L	0.0012	0.0018	0.00026 J	0.00026 J	0.00026 J	0.0053	0.00091 J	0.00051 J	0.00022 J	0.00056 J	0.0012	0.0012	0.00022 J	0.00019 J
Fluoride	mg/L	0.3	0.39	0.15	0.15	0.16	0.23	0.13	0.21	0.21	0.22	0.25	0.25	0.11	0.099 J
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00013 J	0.001 U	8.8E-05 J	0.001 U	7.3E-05 J	0.001 U	0.001 U	0.001 U	6.5E-05 J
Lithium	mg/L	0.02 U	0.005 J	0.0059 J	0.0095 J	0.0062 J	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0064 J	0.0041 J	0.02 U	0.0052 J
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.015	0.017	0.001	0.001	0.00088 J	0.01	0.011	0.006	0.0056	0.011	0.0052	0.0052	0.0016	0.0025
Radium, Total	pCi/L	1.58 U	1.86 U	2.21 U	1.74	2.15 U	1.25 U	2.34 U	1.76	1.8 U	1.86 U	2.19 U	2.38 U	1.6 U	1.69 U
Selenium	mg/L	0.0095	0.0031	0.001 U	0.001 U	0.001 U	0.00039 J	0.001 U	0.001 U	0.001 U	0.00042 J	0.00027 J	0.00028 J	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.00014 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters															
Dissolved Oxygen	mg/L	0.08	0.08		-0.42	-0.13	2.01	0.05	-0.35	-0.13	0.84		-0.10	0.20	-0.03
Oxidation-Reduction Potential	millivolts	3.6	-52.7		-85.1	-107.1	98.3	-97.1	-65.8	-121.7	-63.9		-130.1	-103.6	-119.7
pH	SU	7.36	6.99		7.18	6.96	7.22	6.81	7.31	7.12	7.03		7.00	7.26	7.62
Specific Conductance	mS/cm	0.473	0.617		0.606	0.628	0.383	0.488	0.552	0.597	0.502		0.488	0.559	0.624
Temperature	deg c	9.6	18.6		12.3	15.2	8.8	17.6	10.7	14.5	9.4		18.2	11.5	15.1
Turbidity	ntu	4.59	1.85		4.02	1.16	7.10	3.29	3.73	3.94	4.84		3.95	5.30	3.60

Notes:
"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result was estimated
"J-" = Indicates the result was estimated, bias low
"J+" = Indicates the result was estimated, bias high
"UJ" = Indicates the result is estimated and non-detect.

Abbreviations:
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
mg/L = milligrams per liter
mS/cm = milli Siemens per centimeter
pCi/L = picocuries per liter
SU = Standard Units
N = normal sample
FD = field duplicate

Table 4: 2024 Analytical Data
CCR Unit Schahfer Waste Disposal Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW13		GAMW13B		GAMW14		GAMW14B		GAMW42		GAMW42B		GAMW42C	
	Sample Date	2024-04-01	2024-09-17	2024-04-02	2024-09-17	2024-04-01	2024-09-16	2024-04-01	2024-09-16	2024-04-16	2024-09-25	2024-04-16	2024-09-25	2024-04-16	2024-09-26
	Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical	Unit														
CCR Appendix III															
Boron	mg/L	0.15	0.32	0.61	0.69	0.091 J	0.1 U	3.7	4.8	0.025 J	0.041 J	0.032 J	0.037 J	0.56	0.59
Calcium	mg/L	76.1	71.4	78.5	77.6	58.2	49.8	155	149	56.8	57.1	63.5	57.8	56.1	52.1
Chloride	mg/L	12.7	15.1	26.8	27.3	1.1	0.99	125	153	10.9	9.3	12.3	8.5	11.1	8.2
Fluoride	mg/L	0.21	0.28	0.29	0.24	0.21	0.2	0.32	0.28	0.13	0.13	0.13	0.13	0.2	0.18
pH	SU	6.79	6.84	7.60	7.56	6.96	6.82	7.78	7.62	7.67	7.82	7.75	8.02	7.54	7.66
Sulfate	mg/L	30.7	45.7	115	133	34.4	32.7	1240	1520	64.7	42	44.2	34.4	4.9	4
Total Dissolved Solids	mg/L	303	312	373	373	220	203	2220	2550	217	221	243	217	213	212
CCR Appendix IV															
Antimony	mg/L	0.00032 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.0043	0.0059	0.0014	0.0013	0.011	0.013	0.0008 J	0.00093 J	0.0021	0.0013	0.00027 J	0.00028 J	0.00041 J	0.0011
Barium	mg/L	0.081	0.12	0.081	0.079	0.037	0.025	0.083	0.1	0.022	0.021	0.022	0.02	0.0092	0.0083
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	7.5E-05 J	7.9E-05 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	2.8E-05 J	3.6E-05 J
Cadmium	mg/L	0.00014 J	7.7E-05 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Chromium	mg/L	0.00089 J	0.002 U	0.002 U	0.002 U	0.00082 J	0.0011 J	0.0019 J	0.0024	0.002 U	0.00092 J	0.002 U	0.0007 J	0.002 U	0.0028
Cobalt	mg/L	0.00082 J	0.00063 J	0.001 U	0.00011 J	0.0079	0.0065	0.00036 J	0.00039 J	0.00014 J	0.0001 J	0.00018 J	0.00011 J	0.00046 J	0.0013
Fluoride	mg/L	0.21	0.28	0.29	0.24	0.21	0.2	0.32	0.28	0.13	0.13	0.13	0.13	0.2	0.18
Lead	mg/L	0.001 U	0.001 U	4.6E-05 J	0.001 U	0.001 U	7.1E-05 J	7.5E-05 J	9.5E-05 J	0.001 U	9.2E-05 J	0.001 U	0.0001 J	0.001 U	0.0018
Lithium	mg/L	0.02 U	0.02 U	0.02 U	0.0053 J	0.02 U	0.02 U	0.011 J	0.004 J	0.02 U	0.02 U	0.02 U	0.02 U	0.029	0.03
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0039	0.0082	0.015	0.016	0.0042	0.0073	0.027	0.029	0.0037	0.0028	0.0028	0.0024	0.0026	0.0036
Radium, Total	pCi/L	1.54 U	1.59 U	1.65 U	2.61 U	1.26 U	1.8 U	1.61 U	2.55	2.11 U	1.84 UJ	1.56 U	1.69 UJ	2.02	1.41 UJ
Selenium	mg/L	0.00076 J	0.00057 J	0.001 U	0.001 U	0.001 U	0.00043 J	0.00047 J	0.00054 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00044 J
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	4.3E-05 J	0.00014 J
Sample Parameters															
Dissolved Oxygen	mg/L	0.41	0.07	0.25	-0.05	-0.40	0.07	-0.33	-0.06	-0.39	0.11	-0.24	-0.05	-0.33	-0.04
Oxidation-Reduction Potential	millivolts	-76.8	-116.6	-128.0	-158.3	-89.6	-92.7	-106.7	-129.1	-107.2	-136.5	-119.7	-163.7	-120.4	-146.2
pH	SU	6.79	6.84	7.60	7.56	6.96	6.82	7.78	7.62	7.67	7.82	7.75	8.02	7.54	7.66
Specific Conductance	mS/cm	0.408	0.527	0.461	0.512	0.227	0.302	2.476	2.817	0.305	0.317	0.336	0.298	0.373	0.351
Temperature	deg c	9.6	18.6	11.9	16.2	9.8	17.4	12.3	14.8	11.7	15.3	12.6	13.3	12.5	12.8
Turbidity	ntu	4.55	0.72	4.12	0.49	0.96	4.21	3.18	1.65	4.31	3.97	4.28	9.74	11.60	99.79

Notes:
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NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW43		GAMW43B		GAMW44		GAMW44B			GAMW51		GAMW51B			GAMW57	
	Sample Date	2024-04-17	2024-09-26	2024-04-17	2024-09-27	2024-04-16	2024-09-25	2024-04-16	2024-09-25		2024-04-04	2024-09-13	2024-04-04	2024-09-13		2024-04-17	2024-09-26
	Sample Type	N	N	N	N	N	N	N	FD	N	N	N	N	FD	N	N	N
Chemical	Unit																
CCR Appendix III																	
Boron	mg/L	0.012 J	0.006 J	0.028 J	0.025 J	0.022 J	0.036 J	0.022 J	0.026 J	0.027 J	0.29	0.82	7.7	8.4	8	0.028 J	0.023 J
Calcium	mg/L	21.9	30.3	37.7	36	15.4	21.7	31.7	38.8	39.7	129	175	208	211	196	19.2	23.7
Chloride	mg/L	0.61	0.57	1.6	1.2	2.4	1.5	1.5	22.2	21.9	0.93	5.2	46.4	47.9	47.7	2.2	0.92
Fluoride	mg/L	0.12	0.14	0.18	0.17	0.23	0.075 J	0.11	0.1	0.1	0.14	0.46	1.1	1.2	1.1	0.05 U	0.05 U
pH	SU	7.33	7.38	7.96	8.24	6.18	6.28	7.93		7.93	6.99	6.88	7.99		7.80	6.30	8.07
Sulfate	mg/L	21.8	20	21	18.3	46.2	51.4	12.4	7.8	7.9	99.3	312	1210	1200	1190	48	28.8
Total Dissolved Solids	mg/L	84	94	116	145	140	107	104	146	149	468	752	1910	1890	1780	96	70
CCR Appendix IV																	
Antimony	mg/L	0.00021 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.0023	0.0033	0.00044 J	0.00045 J	0.03	0.021	0.0002 J	0.00026 J	0.00026 J	0.0017	0.00065 J	0.0044	0.0042	0.0044	0.00028 J	0.00069 J
Barium	mg/L	0.014	0.018	0.011	0.011	0.029	0.019	0.0083	0.011	0.011	0.096	0.1	0.052	0.055	0.055	0.012	0.0038
Beryllium	mg/L	3.4E-05 J	0.0002 U	2.6E-05 J	2.7E-05 J	0.00029	9.6E-05 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	2.8E-05 J	0.0002 U
Cadmium	mg/L	2.1E-05 J	2.5E-05 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	1.7E-05 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	4.5E-05 J	0.0002 U
Chromium	mg/L	0.0013 J	0.002 U	0.00064 J	0.00065 J	0.0064	0.0019 J	0.002 U	0.00061 J	0.00055 J	0.00039 J	0.002 U	0.00052 J	0.002 U	0.002 U	0.0009 J	0.002 U
Cobalt	mg/L	0.0011	0.00091 J	9.5E-05 J	8.3E-05 J	0.0012	0.00098 J	7.8E-05 J	6.6E-05 J	6.3E-05 J	0.0017	0.0022	0.00031 J	0.00032 J	0.00033 J	0.0018	0.00014 J
Fluoride	mg/L	0.12	0.14	0.18	0.17	0.23	0.075 J	0.11	0.1	0.1	0.14	0.46	1.1	1.2	1.1	0.05 U	0.05 U
Lead	mg/L	0.00053 J	8.2E-05 J	0.001 U	0.00014 J	0.0017	0.00013 J	0.001 U	0.00026 J	0.00027 J	0.00012 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00047 J
Lithium	mg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.056	0.051	0.055	0.02 U	0.02 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0018	0.0033	0.0022	0.0023	0.0021	0.0026	0.002	0.0015	0.0015	0.0018	0.016	0.14	0.12	0.13	0.002	0.001
Radium, Total	pCi/L	1.57 U	1.81 UJ	1.24 U	1.71 U	1.9 U	1.6 UJ	1.23 U	1.74 J-	1.49 UJ	2.25 U	1.77 U	2.68 J+	3.32	4.1	1.57 U	1.63 UJ
Selenium	mg/L	0.00039 J	0.00033 J	0.001 U	0.001 U	0.0012	0.001 U	0.001 U	0.001 U	0.001 U	0.0004 J	0.001 U	0.00037 J	0.00036 J	0.00033 J	0.00026 J	0.00041 J
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters																	
Dissolved Oxygen	mg/L	-0.17	0.18	-0.34	0.04	0.51	0.94	0.27		-0.11	-0.18	-0.05	-0.39		-0.12	4.75	4.21
Oxidation-Reduction Potential	millivolts	105.5	18.5	-95.6	-183.5	-51.0	-14.1	-135.3		-167.4	56.7	-107.9	-138.6		-167.8	167.3	75.2
pH	SU	7.33	7.38	7.96	8.24	6.18	6.28	7.93		7.93	6.99	6.88	7.99		7.80	6.30	8.07
Specific Conductance	mS/cm	0.127	0.204	0.184	0.184	0.142	0.179	0.148		0.185	0.519	0.941	2.028		2.021	0.131	0.135
Temperature	deg c	9.9	17.1	11.0	12.9	10.3	15.6	11.9		12.6	10.1	17.2	12.0		14.6	10.2	13.0
Turbidity	ntu	5.11	3.39	0.82	3.09	18.80	2.51	2.00		0.19	41.80	1.01	1.24		0.88	4.14	3.99

Notes:
"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result was estimated
"J-" = Indicates the result was estimated, bias low
"J+" = Indicates the result was estimated, bias high
"UJ" = Indicates the result is estimated and non-detect.

Abbreviations:
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
mg/L = milligrams per liter
mS/cm = milli Siemens per centimeter
pCi/L = picocuries per liter
SU = Standard Units
N = normal sample
FD = field duplicate

Table 4: 2024 Analytical Data
CCR Unit Schahfer Waste Disposal Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW57B			GAMW58		GAMW58B		GAMW59		GAMW59B		GAMW60		GAMW60B	
	Sample Date	2024-04-17		2024-09-26	2024-04-19	2024-09-26	2024-04-19	2024-09-26	2024-04-03	2024-09-13	2024-04-11	2024-09-13	2024-04-03	2024-09-16	2024-04-03	2024-09-16
	Sample Type	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chemical	Unit															
CCR Appendix III																
Boron	mg/L	0.061 J	0.061 J	0.15	0.035 J	0.031 J	0.037 J	0.036 J	4.5	1.4	4.9	4.2	2.8	1.5	3.7	4.2
Calcium	mg/L	46	46.2	52.6	9.2	10.8	37.5	37.9	247	194	124	188	262	337	363	300
Chloride	mg/L	14.3	14.4	15	0.78	0.84	3.7	4.1	105	23.4	59	35.6	39.5	21.5	13.2	21.3
Fluoride	mg/L	0.13	0.13	0.12	0.44	0.6	0.13	0.15	0.8	0.91	0.46	0.55	0.59	0.44	0.54	0.51
pH	SU		7.67	7.57	5.59	5.91	7.80	7.81	7.30	7.14	7.71	7.50	6.99	6.80	7.47	7.49
Sulfate	mg/L	15.6	15.7	19.3	46.3	46.2	23.7	20.7	380	219	843	800	492	673	1050	873
Total Dissolved Solids	mg/L	167	163	182	50	57	122	132	884	686	1570	1480	1040	1320	1590	1420
CCR Appendix IV																
Antimony	mg/L	0.001 U	0.001 U	0.001 U	8.9E-05 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00024 J	0.001 U	0.001 U
Arsenic	mg/L	0.00057 J	0.00054 J	0.00064 J	0.0038	0.0044	0.0007 J	0.00074 J	0.00094 J	0.00099 J	0.0011	0.0008 J	0.00028 J	0.00035 J	0.00024 J	0.00015 J
Barium	mg/L	0.021	0.021	0.024	0.051	0.045	0.015	0.014	0.063	0.049	0.028 J+	0.029	0.036	0.046	0.057	0.053
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0011	0.00086	0.0002 U	0.0002 U	0.0002 U	0.0002 U	2.8E-05 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.00034	0.0002	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	3.5E-05 J	3.8E-05 J	1.7E-05 J	0.0002 U
Chromium	mg/L	0.00082 J	0.00039 J	0.002 U	0.0014 J	0.002 U	0.00047 J	0.002 U	0.00032 J	0.002 U	0.00088 J	0.002 U	0.00072 J	0.00032 J	0.0005 J	0.00051 J
Cobalt	mg/L	8.7E-05 J	8.2E-05 J	9.1E-05 J	0.015	0.014	9.1E-05 J	9.5E-05 J	0.00084 J	0.00074 J	0.0003 J	0.0003 J	0.00082 J	0.00096 J	0.0004 J	0.00035 J
Fluoride	mg/L	0.13	0.13	0.12	0.44	0.6	0.13	0.15	0.8	0.91	0.46	0.55	0.59	0.44	0.54	0.51
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.00067 J	0.00058 J	6.5E-05 J	5.2E-05 J	0.001 U	0.001 U	3.8E-05 J	0.001 U	9.7E-05 J	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0092 J	0.0054 J	0.011 J	0.0047 J	0.012 J	0.0059 J	0.064	0.066
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0024	0.0024	0.006	0.0011	0.00084 J	0.0025	0.0041	0.02	0.015	0.072	0.055	0.027	0.011	0.15	0.17
Radium, Total	pCi/L	1.81 U	1.54 U	1.28 UJ	1.32 U	2.22 UJ	1.37 U	1.62 UJ	1.27	1.88	1.85 U	3.05	1.71 U	2.25 U	3.58	1.97 U
Selenium	mg/L	0.001 U	0.001 U	0.001 U	0.0023	0.0034	0.001 U	0.001 U	0.001 U	0.001 U	0.00034 J	0.001 U	0.0012	0.0035	0.001 U	0.001 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters																
Dissolved Oxygen	mg/L		0.25	-0.11	1.01	0.16	0.36	-0.15	-0.41	-0.04	0.19	-0.10	0.31	0.05	0.23	-0.11
Oxidation-Reduction Potential	millivolts		-122.3	-138.1	168.9	47.8	-98.9	-147.8	-57.1	-119.4	-128.2	-150.9	82.4	27.4	-102.0	-138.1
pH	SU		7.67	7.57	5.59	5.91	7.80	7.81	7.30	7.14	7.71	7.50	6.99	6.80	7.47	7.49
Specific Conductance	mS/cm		0.239	0.283	0.085	0.098	0.188	0.201	1.041	0.892	1.833	1.661	1.016	1.501	1.47	1.481
Temperature	deg c		11.3	12.4	9.3	14.6	10.6	12.7	12.4	19.6	13.5	16.3	12.6	19.7	12.6	15.6
Turbidity	ntu		2.35	0.01	2.05	2.87	2.97	0.73	3.88	3.75	0.88	0.85	1.90	1.08	2.86	1.29

Notes:
"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
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"UJ" = Indicates the result is estimated and non-detect.

Abbreviations:
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
mg/L = milligrams per liter
mS/cm = milli Siemens per centimeter
pCi/L = picocuries per liter
SU = Standard Units
N = normal sample
FD = field duplicate

Table 4: 2024 Analytical Data
CCR Unit Schahfer Waste Disposal Area
NIPSCO LLC R. M. Schahfer Generating Station
Wheatfield, Indiana

	Location	GAMW68			GAMW68B		GAMW77	
	Sample Date	2024-04-12	2024-09-12		2024-04-12	2024-09-12	2024-04-16	2024-09-27
	Sample Type	N	FD	N	N	N	N	N
Chemical	Unit							
CCR Appendix III								
Boron	mg/L	0.021 J	0.1 U	0.1 U	0.029 J	0.1 U	0.017 J	0.019 J
Calcium	mg/L	61.9	62.8	62.4	38.6	35.2	17.7	17.9
Chloride	mg/L	24.6	24.2	23.9	12.2	12.9	1.4	1.8
Fluoride	mg/L	0.2	0.19	0.19	0.13	0.13	0.13	0.066 J
pH	SU	7.75		7.54	8.05	7.93	6.81	7.53
Sulfate	mg/L	65.5	70.9	64.6	44.8	44.1	24.6	14.1
Total Dissolved Solids	mg/L	293	292	280	225	169	67	86
CCR Appendix IV								
Antimony	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic	mg/L	0.0012	0.0011	0.0011	0.00038 J	0.00025 J	0.00024 J	0.0005 J
Barium	mg/L	0.096	0.099	0.099	0.1	0.076	0.036	0.019
Beryllium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0008	0.00054
Cadmium	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00013 J	6.7E-05 J
Chromium	mg/L	0.002 U	0.00063 J	0.00024 J	0.002 U	0.00037 J	0.002 U	0.00071 J
Cobalt	mg/L	0.0004 J	0.00034 J	0.00036 J	8E-05 J	8.1E-05 J	0.0017	0.00066 J
Fluoride	mg/L	0.2	0.19	0.19	0.13	0.13	0.13	0.066 J
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.00019 J	0.00017 J	0.001 U	0.0002 J
Lithium	mg/L	0.02 U	0.02 U	0.0044 J	0.0057 J	0.02 U	0.02 U	0.02 U
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.0032	0.0035	0.0036	0.002	0.0017	0.00047 J	0.0007 J
Radium, Total	pCi/L	1.78 U	1.74 U	2.08 U	1.81 U	1.71 U	1.66 U	1.7 U
Selenium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0019	0.0015
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters								
Dissolved Oxygen	mg/L	-0.39		0.07	-0.40	-0.05	3.55	2.88
Oxidation-Reduction Potential	millivolts	-117.9		-106.8	-148.1	-162.1	122.3	45.7
pH	SU	7.75		7.54	8.05	7.93	6.81	7.53
Specific Conductance	mS/cm	0.364		0.407	0.259	0.249	0.107	0.123
Temperature	deg c	9.9		15.8	11.5	14.2	11.4	13.7
Turbidity	ntu	3.89		4.08	4.08	2.33	4.21	3.82

Notes:
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Prepared by: MJS 11/20/24
Checked by: DFSC
Reviewed by: JBG

Abbreviations:
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
mg/L = milligrams per liter
mS/cm = milli Siemens per centimeter
pCi/L = picocuries per liter
SU = Standard Units
N = normal sample
FD = field duplicate

Table 6: Groundwater Protection Standards
CCR Unit Schahfer Waste Disposal Area
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	MCL (mg/L)	GWPS (mg/L)[2]	GWPS (mg/L)[3]	GWPS (mg/L)[4]
Antimony	0.006	0.006	0.006	0.006
Arsenic	0.01	0.015	0.018	0.019
Barium	2	2	2	2
Beryllium	0.004	0.004	0.004	0.004
Cadmium	0.005	0.005	0.005	0.005
Chromium	0.1	0.1	0.1	0.1
Cobalt[1]	0.006	0.015	0.015	0.015
Fluoride	4	4	4	4
Lead[1]	0.015	0.015	0.015	0.015
Lithium[1]	0.04	0.04	0.04	0.04
Mercury	0.002	0.002	0.002	0.002
Molybdenum[1]	0.1	0.1	0.1	0.1
Radium 226+228	5	5	5	5
Selenium	0.05	0.05	0.05	0.05
Thallium	0.002	0.002	0.002	0.002

Notes:
MCL= Environmental Protection Agency Maximum Contaminant Level
GWPS= Groundwater Protection Standard
mg/L= milligrams per liter
1) As of August 29, 2016, these four constituents have health-based standards that can be used when calculating the GWPS. These health-based standards are not MCLs but are provided in the MCL column.
2) GWPS calculated in August 2018.
3) GWPS calculated in March 2020.
4) GWPS calculated in September 2022.

Prepared by: GRD
Checked by: DFSC
Reviewed by: MAH

Figures



LEGEND

Approximate Property Line

0 0.75 1.5

1 " = 0.75 miles Miles

REFERENCE(S)

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

SITE LOCATION MAP

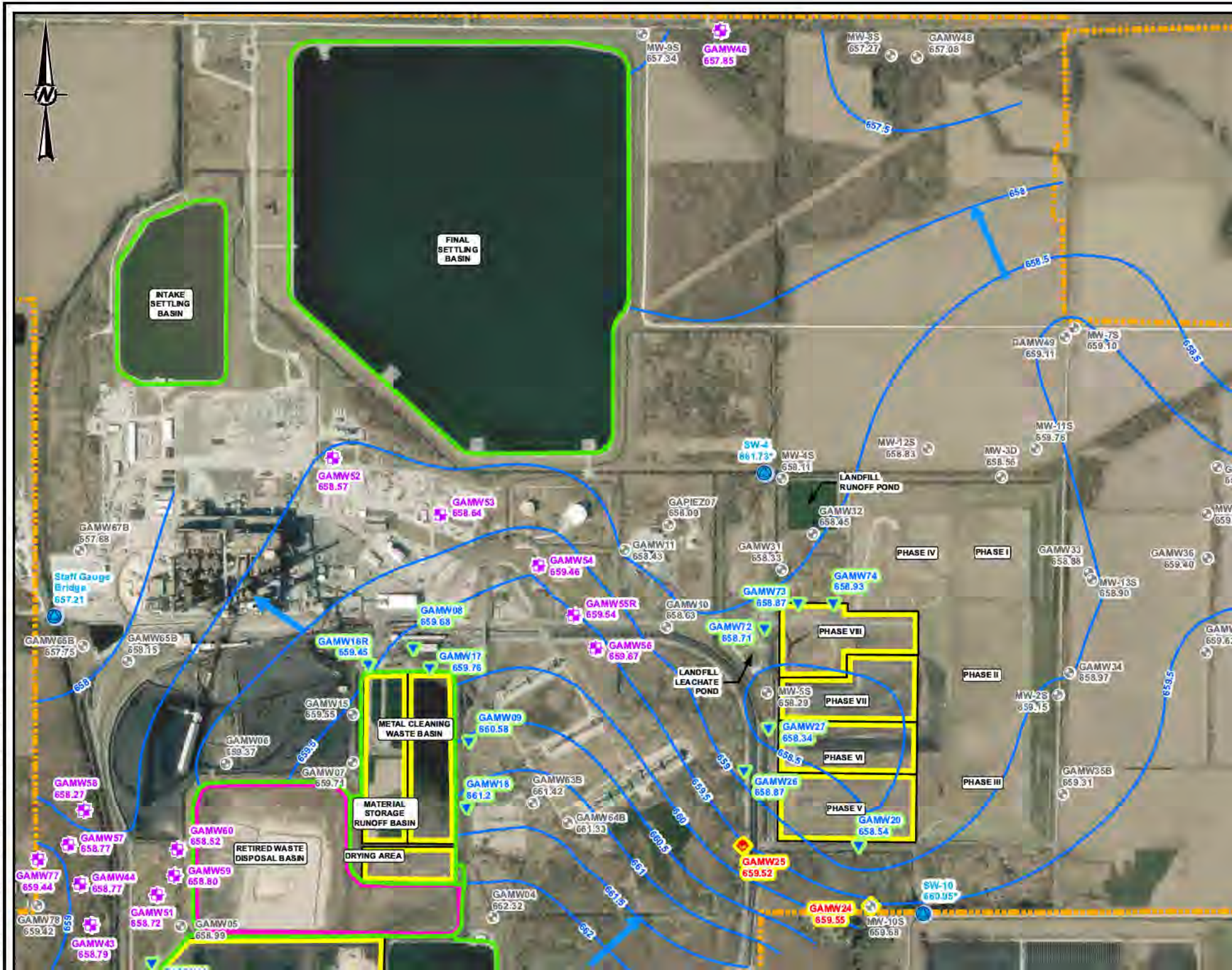
CONSULTANT

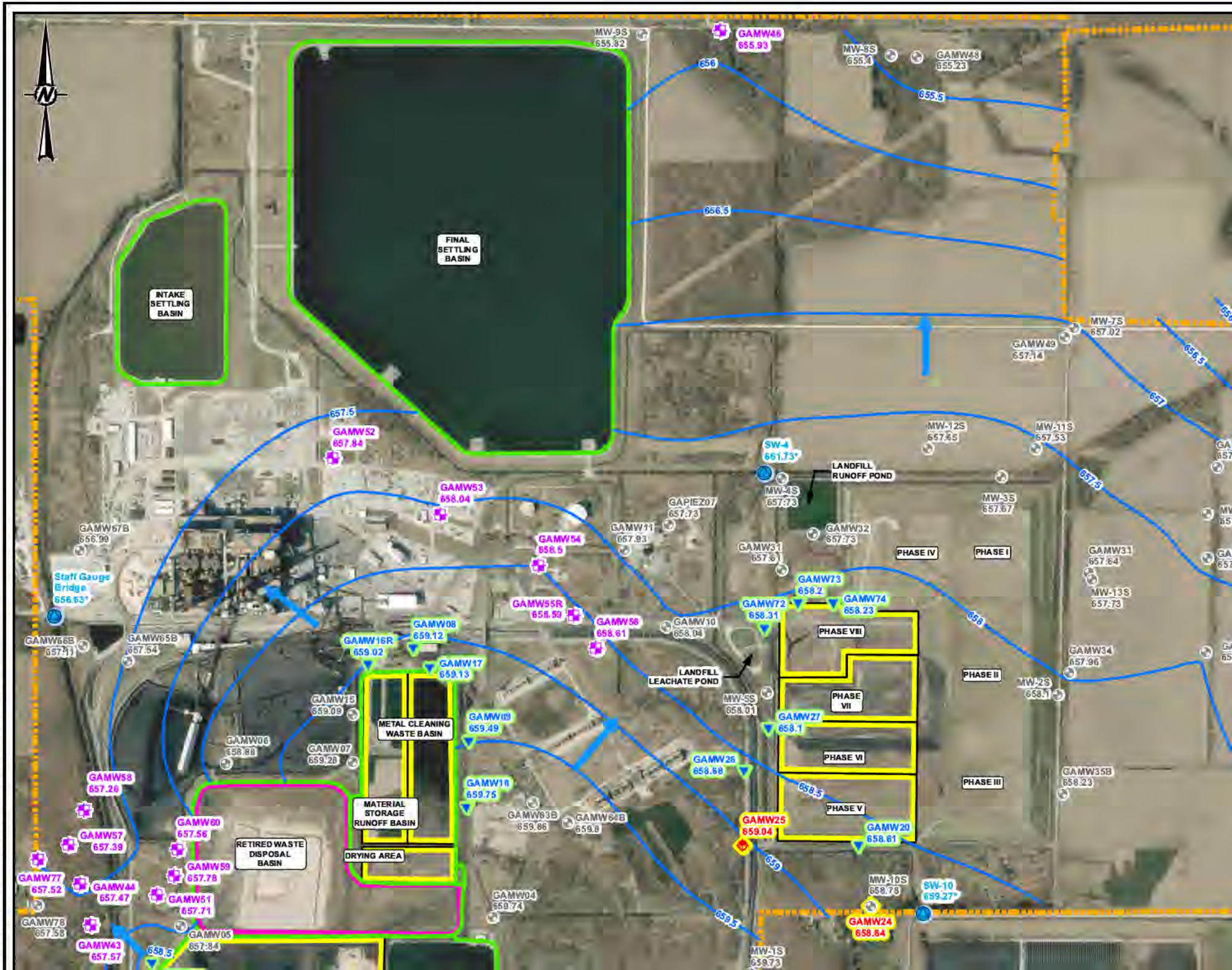
wsp

(YYYY-MM-DD)	1/04/2021
DESIGNED	DFSC
PREPARED	SHL
REVIEWED	DFSC
APPROVED	MAH

PROJECT NO.	CONTROL	REV	FIGURE
31406779	A	0	1


GAMW58/58B
GAMW57/57B
GAMW60/60B
GAMW77
GAMW59/59B
GAMW44/44B
GAMW51/51B
GAMW43/43B
GAMW14/14B
GAMW42C
GAMW42/42B
GAMW13/13B
WASTE
DISPOSAL AREA
GAMW12/12B
GAMW01/01B


FINAL SETTLING BASIN
INTAKE SETTLING BASIN
METAL CLEANING WASTE BASIN
MATERIAL STORAGE RUNOFF BASIN
DRYING AREA
RETIRED WASTE DISPOSAL BASIN
LANDFILL RUNOFF POND
LANDFILL LEACHATE POND
PHASE I
PHASE II
PHASE III
PHASE IV
PHASE V
PHASE VI
PHASE VII
PHASE VIII
MW-9S 657.34
GAMW46 657.85
MW-8S 657.27
GAMW48 657.08
GAMW49 659.11
MW-7S 659.10
MW-11S 659.75
MW-12S 658.83
MW-3D 658.56
SW-4 661.73*
MW-4S 658.11
GAMW52 658.57
GAMW53 658.64
GAPIEZ07 658.09
GAMW32 658.45
GAMW67B 657.68
GAMW11 658.43
GAMW31 658.33
GAMW33 658.88
GAMW36 659.40
MW-13S 658.90
Staff Gauge Bridge 657.21
GAMW54 659.46
GAMW74 658.93
GAMW73 658.87
GAMW55R 659.54
GAMW10 658.63
GAMW08 659.68
GAMW72 658.71
GAMW66B 657.75
GAMW65B 658.15
GAMW16R 659.45
GAMW17 659.76
GAMW56 659.67
GAMW34 658.97
MW-5S 658.29
GAMW15 659.55
GAMW09 660.58
GAMW27 658.34
MW-2S 659.15
GAMW06 659.37
GAMW07 659.71
GAMW35B 659.31
GAMW58 658.27
GAMW18 661.2
GAMW63B 661.42
GAMW26 658.87
GAMW57 658.77
GAMW60 658.52
GAMW64B 661.33
GAMW20 658.54
GAMW77 659.44
GAMW59 658.80
GAMW44 658.77
GAMW25 659.52
GAMW51 658.72
GAMW04 662.32
SW-10 660.95*
GAMW24 659.55
GAMW78 659.42
GAMW05 658.99
MW-10S 659.68
GAMW43 658.79
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FINAL SETTLING BASIN
INTAKE SETTLING BASIN
METAL CLEANING WASTE BASIN
MATERIAL STORAGE RUNOFF BASIN
RETIRED WASTE DISPOSAL BASIN
DRYING AREA
LANDFILL RUNOFF POND
LANDFILL LEACHATE POND
PHASE I
PHASE II
PHASE III
PHASE IV
PHASE V
PHASE VI
PHASE VII
PHASE VIII
MW-9S 655.82
GAMW46 655.93
MW-8S 655.4
GAMW43 655.23
MW-7S 657.02
GAMW49 657.14
MW-12S 657.35
MW-11S 657.53
MW-3S 657.67
MW-4S 657.73
SW-4 661.73*
GAMW52 657.84
GAMW53 658.04
GAMW54 658.5
GAMW55R 658.59
GAMW56 658.61
GAMW57 657.39
GAMW58 657.26
GAMW59 657.78
GAMW60 657.56
GAMW61 659.49
GAMW62 659.75
GAMW63B 659.66
GAMW64B 659.8
GAMW65B 657.54
GAMW66B 657.11
GAMW67B 656.99
GAMW68 658.88
GAMW69 659.28
GAMW70 659.09
GAMW71 659.02
GAMW72 658.31
GAMW73 658.2
GAMW74 658.23
GAMW75 659.12
GAMW76 659.13
GAMW77 657.52
GAMW78 657.58
GAMW04 659.74
GAMW05 657.84
GAMW10 658.04
GAMW11 657.93
GAMW20 658.61
GAMW24 658.64
GAMW25 659.04
GAMW26 658.68
GAMW27 658.1
GAMW31 657.64
GAMW32 657.73
GAMW34 657.96
GAMW35B 658.23
GAMW43 657.57
GAMW44 657.47
GAMW51 657.71
MW-1S 659.73
MW-2S 658.1
MW-5S 658.01
MW-10S 658.78
MW-13S 657.73
GAPIEZ07 657.73
SW-10 659.27*
Staff Gauge Bridge 656.63*
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BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 148
Culley 2024 Groundwater Monitoring Report

HALEY ALDRICH

www.haleyaldrich.com

ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
EAST ASH POND
F.B. CULLEY GENERATING STATION
WARRICK COUNTY, INDIANA

by
Haley & Aldrich, Inc.
Greenville, South Carolina

for
Southern Indiana Gas and Electric Company
Evansville, Indiana

File No. 129420
January 2025

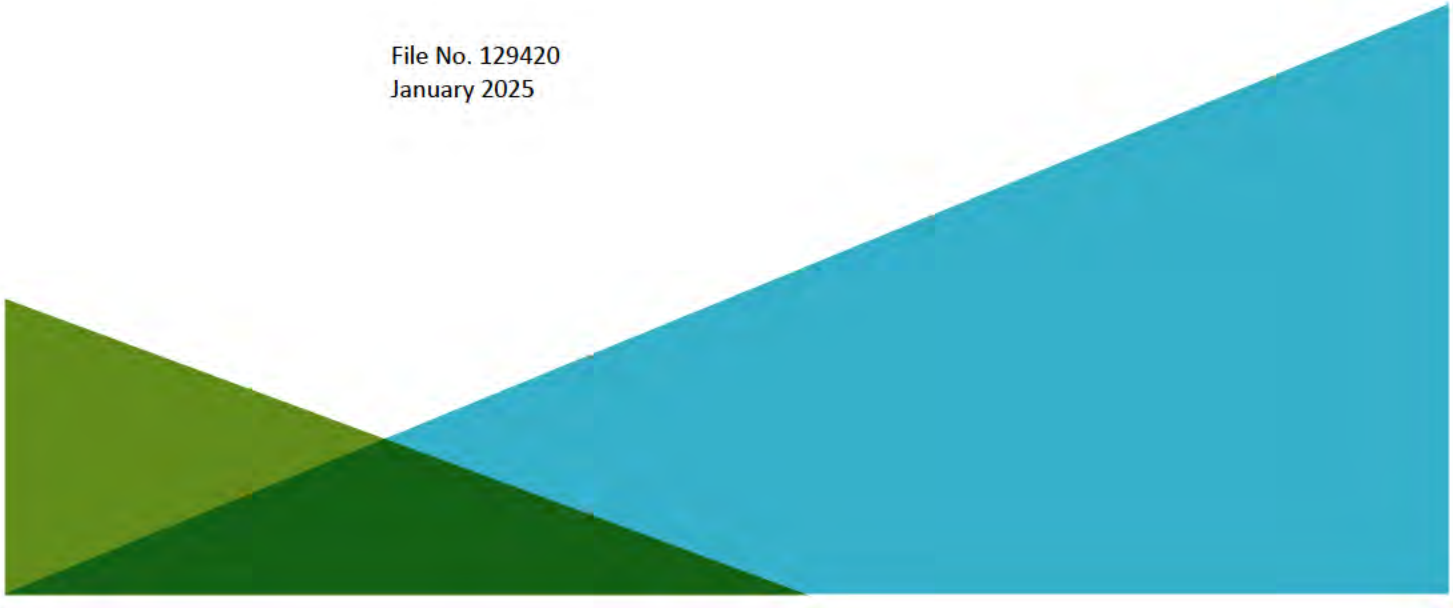


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1. Annual Groundwater Monitoring Report Summary

1.1 CODE OF FEDERAL REGULATIONS TITLE 40 (40 CFR) § 257.90(e)(6) SUMMARY

A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the [coal combustion residual] CCR unit. At a minimum, the summary must specify all of the following.

1.1.1 40 CFR § 257.90(e)(6)(i) – Status of Monitoring Program at Start of Reporting Period

At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95.

At the start of the current annual reporting period (1 January 2024), the East Ash Pond (EAP) at F.B. Culley Generating Station was operating under an assessment monitoring program in compliance with 40 CFR § 257.95.

1.1.2 40 CFR § 257.90(e)(6)(ii) – Status of Monitoring Program at End of Reporting Period

At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in § 257.95.

At the end of the current annual reporting period (31 December 2024), the EAP was operating under an assessment monitoring program in compliance with 40 CFR § 257.95.

1.1.3 40 CFR § 257.90(e)(6)(iii) – Statistically Significant Increases

If it was determined that there was a statistically significant increase over background for one or more constituents listed in appendix III to this part pursuant to § 257.94(e).

1.1.3.1 40 CFR § 257.90(e)(6)(iii)(A)

Identify those constituents listed in appendix III to this part and the names of the monitoring wells associated with such an increase.

The EAP was operating under an assessment monitoring program throughout 2024; therefore, no statistical evaluations were conducted on Appendix III constituents in 2024.

1.1.3.2 40 CFR § 257.90(e)(6)(iii)(B)

Provide the date when the assessment monitoring program was initiated for the CCR unit.

An assessment monitoring program was established on 15 August 2018 for the EAP to meet the requirements of 40 CFR § 257.95. The EAP has remained in assessment monitoring since that time.

1.1.4 40 CFR § 257.90(e)(6)(iv) – Statistically Significant Levels

If it was determined that there was a statistically significant level above the groundwater protection standard for one or more constituents listed in appendix IV to this part pursuant to § 257.95(g) include all of the following.

1.1.4.1 40 CFR § 257.90(e)(6)(iv)(A) – Statistically Significant Level Constituents

Identify those constituents listed in appendix IV to this part and the names of the monitoring wells associated with such an increase.

Statistical analyses of Appendix IV constituents were completed in 2024 following the November 2023 and May 2024 semiannual assessment monitoring events as described in 40 CFR § 257.93(h)(2) and statistically significant levels (SSLs) of molybdenum were identified downgradient of the EAP at monitoring well CCR-AP-5. A summary of statistical analysis is provided in Appendix A.

1.1.4.2 40 CFR § 257.90(e)(6)(iv)(B) – Initiation of the Assessment of Corrective Measures

Provide the date when the assessment of corrective measures was initiated for the CCR unit.

Assessment of corrective measures was initiated on 15 May 2019 for the EAP.

1.1.4.3 40 CFR § 257.90(e)(6)(iv)(C) – Assessment of Corrective Measures Public Meeting

Provide the date when the public meeting was held for the assessment of corrective measures for the CCR unit.

The public was given the opportunity to comment on the assessment of corrective measures prepared for the EAP during a public meeting held on 18 October 2021.

1.1.4.4 40 CFR § 257.90(e)(6)(iv)(D) – Completion of the Assessment of Corrective Measures

Provide the date when the assessment of corrective measures was completed for the CCR unit.

The assessment of corrective measures was completed on 13 September 2019 and placed into the facility's Operating Record, posted to the publicly available website, and the notification was sent to the state agency.

1.1.5 40 CFR § 257.90(e)(6)(v) – Selection of Remedy

Whether a remedy was selected pursuant to § 257.97 during the current annual reporting period, and if so, the date of remedy selection.

The selection of remedy required under 40 CFR § 257.97 was ongoing in 2024 for molybdenum at the EAP. A summary of actions completed associated with selection of remedy are provided in the March 2024 and September 2024 Semi-Annual Remedy Selection Progress Reports.

Information collected through prior field investigations is being used to evaluate and design an alternative remedy, as well as update the groundwater conceptual model for the EAP.

1.1.6 40 CFR § 257.90(e)(6)(vi) – Remedial Activities

Whether remedial activities were initiated or are ongoing pursuant to § 257.98 during the current annual reporting period.

Closure of the EAP by source removal was initiated in November 2023 and is anticipated to be part of the remedy; however, the selection of remedy has not yet been completed due to ongoing work to analyze remedial activities for site suitability. Remedial activities were not initiated in 2024; therefore, no demonstration or certification is applicable for this unit.

1.2 40 CFR § 257.90(a)

Except as provided for in § 257.100 for inactive CCR surface impoundments, all CCR landfills, CCR surface impoundments, and lateral expansions of CCR units are subject to the groundwater monitoring and corrective action requirements under § 257.90 through § 257.98.

The EAP is subject to the groundwater monitoring and corrective action requirements described under 40 CFR § 257.90 through 40 CFR § 257.98 (the Rule). The remainder of this document addresses the specific requirements for the Owner/Operator to prepare an Annual Groundwater Monitoring and Corrective Action Report per 40 CFR § 257.90(e).

1.3 40 CFR § 257.90(e) – SUMMARY

Annual groundwater monitoring and corrective action report. For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by § 257.105(h)(1).

This *2024 Annual Groundwater Monitoring and Corrective Action Report* documents the activities completed in 2024 for the EAP as required by the Rule. Semiannual groundwater sampling and analysis was conducted per the requirements described in 40 CFR § 257.93, and the status of the groundwater monitoring program described in 40 CFR § 257.95 is provided in this report. Field forms for the groundwater sampling events are provided in Appendix B. Laboratory analytical reports are provided in Appendix C.

1.3.1 Status of the Groundwater Monitoring Program

Following completion of the Assessment of Corrective Measures in September 2019, a semiannual groundwater sampling plan was implemented to satisfy requirements of 40 CFR § 257.95(b) and § 257.95(d)(1). During the 2024 reporting period, groundwater samples were collected from the monitoring wells at the EAP from 7 to 13 May 2024 and again from 13 to 15 November 2024. Groundwater monitoring well location and construction details for the existing monitoring well network are summarized in Table 1.

Statistical analysis of Appendix IV constituents collected during the November 2023 sampling event was completed on 25 April 2024, within 90-days following the receipt of laboratory analytical results on 26 January 2024, per the requirements of 40 CFR § 257.93(h)(2). Statistical analysis of Appendix IV constituents collected during the May 2024 sampling event was completed on 17 September 2024, within 90-days following the receipt of laboratory analytical results on 19 June 2024, per the requirements of 40 CFR § 257.93(h)(2). Statistical analysis of Appendix IV constituents collected during the November 2024 sampling event will be completed within the 2025 reporting period and will be included in the 2025 annual report.

Statistical analysis of Appendix IV constituents during the 2024 reporting period determined that SSLs of molybdenum continue to be observed downgradient of the EAP, which is consistent with previous findings. The selection of remedy process required under 40 CFR § 257.97 was still on-going, as discussed in Section 1.1.5, during the 2024 reporting period.

1.3.2 Key Actions Completed

The following key actions were completed in 2024:

- 3 January 2024 – Removed pressure transducers at the EAP after encountering technical difficulties with data collection. Groundwater level data collected over deployment period are presented in Appendix D.
- 30 January 2024 – Prepared *2023 Annual Groundwater Monitoring and Corrective Action Report* (2023 Annual Report) including:
  - Pursuant to 40 CFR § 257.105(h)(1), the 2023 Annual Report was placed in the facility's operating record on 30 January 2024;
  - Pursuant to 40 CFR § 257.106(h)(1), the notification was sent to the relevant State Director and/or Tribal authority within 30 days of the 2023 Annual Report being placed in the facility's operating record [40 CFR § 257.106(d)];
  - Pursuant to 40 CFR § 257.107(h)(1), the 2023 Annual Report was posted to the CCR Website within 30 days of the 2023 Annual Report being placed in the facility's operating record [40 CFR § 257.107(d) and § 257.107(h)(1)];
- 25 April 2024 – Completed statistical analysis of November 2023 assessment monitoring laboratory analytical results received on 26 January 2024.
- 15 March 2024 – Prepared semiannual selection of remedy progress report in accordance with 40 CFR § 257.97(a) to document progress. The semiannual progress report was placed in the operating record as required by 40 CFR § 257.105(h)(12) and posted on the facility's publicly available website as required by 40 CFR § 257.107(h)(9).
- 2 to 4 May 2024 – Completed routine maintenance of monitoring well network including re-development of select wells to address observations of elevated turbidity.

- 6 May 2024 – Static water level measurements were collected in a synoptic gaging at the beginning of the May 2024 sampling event and again immediately prior to collecting each sample to evaluate groundwater flow direction and rate per the requirements of 40 CFR § 257.93(c).
- 23 to 25 May 2023 – Collected groundwater samples from monitoring wells at the EAP for laboratory analysis in accordance with 40 CFR § 257.95.
- 11 June 2024 – Installed pressure transducers in select monitoring wells around the EAP to temporarily monitor groundwater fluctuations related to construction dewatering. Groundwater level data is included in Appendix D.
- 11 September 2024 – Prepared semiannual selection of remedy progress report in accordance with 40 CFR § 257.97(a) to document progress. The semiannual progress report was placed in the operating record as required by 40 CFR § 257.105(h)(12) and posted on the facility's publicly available website as required by 40 CFR § 257.107(h)(9).
- 17 September 2024 – Completed statistical analysis of May 2024 assessment monitoring laboratory analytical results received on 19 June 2024.
- 11 November 2024 – Static water level measurements were collected in a synoptic gaging at the beginning of the November 2024 sampling event and again immediately prior to collecting each sample to evaluate groundwater flow direction and rate per the requirements of 40 CFR § 257.93(c).
- 13 November 2024 – Removed pressure transducers from monitoring wells at the EAP. Groundwater level data collected over deployment period are presented in Appendix D.
- 13 to 15 November 2024 – Collected groundwater samples from monitoring wells at the EAP for laboratory analysis in accordance with 40 CFR § 257.95.

1.3.3 Problems Encountered

Problems encountered during the November 2024 sampling events include:

- Prior to the November 2024 sampling event, monitoring well CCR-AP-5I was damaged during construction activities on site. The monitoring well was inaccessible for the November 2024 synoptic water level gauging.
- Monitoring well CCR-AP-6 was determined to be dry during the November 2024 sampling event and a sample could not be collected.
- Monitoring wells CCR-AP-3, CCR-AP-8 and CCR-AP-8I were temporarily inaccessible during the November 2024 sampling event due to on-site construction activities and health and safety concerns related to pond closure.

1.3.4 Actions to Resolve Problems

Confirmation samples were collected on 22 December 2023 at CCR-AP-1R for radium analysis following the November 2023 sampling event to verify initial results obtained. Confirmation sample results remained elevated, and results were included in the November 2023 statistical analysis and are provided in Table 2. Radium results remained slightly elevated at CCR-AP-1R during the May 2024 sampling event and have returned to normal baseline as of the November 2024 sampling event. Radium will continue to be monitored closely at monitoring well CCR-AP-1R.

Monitoring well CCR-AP-6 was observed to be dry as a result of construction dewatering efforts associated with the ongoing EAP closure-by-removal. Water levels are expected to recover following the termination of dewatering activities, and therefore, no action is required at this time.

Monitoring well CCR-AP-5I was assessed for damage by downhole camera and verified to be intact below the ground surface, with damage being limited to the surface finishing. The monitoring well was re-developed and sampled on 19 December 2024, and surface finishing was repaired by a licensed driller on 23 December 2024.

Monitoring wells CCR-AP-8, CCR-AP-8I, and CCR-AP-3 locations were inaccessible during the November 2024 sampling event due to obstructions related to EAP closure activities coupled with health and safety concerns. Location CCR-AP-8I was able to be accessed and sampled on 19 December 2024. Efforts to complete sampling at monitoring well locations CCR-AP-3 and CCR-AP-8 are still ongoing at the close of the 2024 reporting period, and results will be included in the 2025 annual report.

1.3.5 Project Key Activities for Upcoming Year

Key activities to be completed in 2025 include the following:

- Continue semiannual groundwater monitoring in accordance with 40 CFR § 257.95.
- Complete statistical analyses of the semiannual groundwater sampling results within 90-days of sampling and analysis as required by 40 CFR § 257.93(h)(2).
- Select a remedy that, at a minimum, meets the standards outlined in 40 CFR § 257.97(b) and considers the evaluation factors in 40 CFR § 257.97(c).
- As part of the selected remedy the Southern Indiana Gas and Electric Company will develop a schedule for implementing and completing remedial activities as defined in 40 CFR § 257.97(d).
- Prepare semiannual and annual progress reports, as necessary, describing the progress in selecting and designing the remedy as outlined in 40 CFR § 257.97(a).
- Following remedy selection initiate remedial activities and implement the corrective action groundwater monitoring program as outlined in 40 CFR § 257.98.

1.4 40 CFR § 257.90(e) – INFORMATION

At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available.

1.4.1 40 CFR § 257.90(e)(1)

A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit.

As required by 40 CFR § 257.90(e)(1), a map showing the location of the EAP and associated upgradient, downgradient and nature and extent monitoring wells is presented on Figure 1. Groundwater elevation contours for the May 2024 sampling event are presented on Figure 2. Groundwater elevation contours for the November 2024 sampling event are presented on Figure 3.

1.4.2 40 CFR § 257.90(e)(2)

Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken.

No monitoring wells were installed or decommissioned during the 2024 reporting period.

1.4.3 40 CFR § 257.90(e)(3)

In addition to all the monitoring data obtained under § 257.90 through § 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs.

In accordance with 40 CFR § 257.95(b) and § 257.95(d)(1), two independent samples from each background and downgradient monitoring well were collected and analyzed. A summary table including the sample names, dates of sample collection, reason for sample collection (detection or assessment), and monitoring data obtained for the groundwater monitoring program for the EAP is presented in Table 2.

1.4.4 40 CFR § 257.90(e)(4)

A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels).

Statistical analysis of Appendix IV constituents was completed for the November 2023 and May 2024 sampling events as described in 40 CFR § 257.93(h)(2) and demonstrate that molybdenum remains the only constituent at a SSL to be observed downgradient of the EAP, which is consistent with previous results. As a result, the monitoring program did not change, and the EAP remained in assessment monitoring throughout 2024. Statistical analysis for the November 2024 sampling event is ongoing and will be completed within 90 days after sampling and analysis to determine if a statistically significant increase over background has occurred.

1.4.5 40 CFR § 257.90(e)(5)

Other information required to be included in the annual report as specified in § 257.90 through § 257.98.

Other information including development of groundwater protection standards, recording of groundwater monitoring results in the operating record, and an evaluation of alternate sources was discussed in prior annual reports.

TABLES

TABLE 1
GROUNDWATER MONITORING WELL LOCATION AND CONSTRUCTION DETAILS
EAST ASH POND
F.B. CULLEY GENERATING STATION
WARRICK COUNTY, INDIANA

Well ID	Date Installed	Easting	Northing	Top of Pad Elevation (ft NAVD88)	Top of Riser Elevation (ft NAVD88)	Surface Grout (ft bgs)	Bentonite (ft bgs)	Sand Pack (ft bgs)	Screen Zone (ft bgs)	Top of Screen (ft NAVD88)	Bottom of Screen (ft NAVD88)	Screen Length (ft)	Well Radius (in)	Status
Background Wells														
CCR-AP-1R	March 2016	2883429.87	969939.89	438.20	441.64	1.0 - 51.0	51.0 - 53.0	53.0 - 65.0	55.0 - 65.0	383.5	373.5	10	2	Active
CCR-AP-7	March 2016	2883090.62	970774.82	429.50	432.41	1.0 - 16.0	16.0 - 18.0	18.0 - 30.0	20.0 - 30.0	409.5	399.5	10	2	Active
CCR-AP-9	February 2017	2883998.88	969768.96	445.58	448.53	1.0 - 56.0	56.0 - 58.0	58.0 - 70.0	60.0 - 70.0	385.6	375.6	10	2	Active
East Ash Pond Wells														
CCR-AP-2	December 2015	2884168.88	969117.46	394.40	394.02	1.0 - 30.5	30.5 - 32.5	32.5 - 45.0	36.0 - 46.0	358.4	348.4	10	2	Active
CCR-AP-3	December 2015	2883542.17	969007.88	395.00	394.55	1.0 - 31.0	31.0 - 32.8	32.8 - 45.0	35.0 - 45.0	360.0	350.0	10	2	Active
CCR-AP-4	December 2015	2883281.67	969641.72	395.40	394.98	1.0 - 19.7	19.7 - 22.5	23.0 - 35.5	25.5 - 35.5	369.9	359.9	10	2	Active
CCR-AP-5	December 2015	2884016.86	969379.74	394.90	394.38	1.0 - 28.6	28.6 - 30.6	30.6 - 44.0	34.0 - 44.0	360.9	350.9	10	2	Active
CCR-AP-5I	January 2019	2884022.43	969377.35	394.90	394.59	1.0 - 71.2	71.2 - 73.0	73.0 - 86.0	75.3 - 85.3	319.6	309.3	10	2	Active
CCR-AP-6	March 2016	2883285.02	969122.07	397.10	396.75	1.0 - 31.5	31.5 - 33.0	33.5 - 45.5	35.5 - 45.5	361.6	351.6	10	2	Active
CCR-AP-6I	November 2018	2883289.37	969119.68	397.20	396.88	1.0 - 60.7	60.7 - 62.7	62.7 - 64.7	64.7 - 74.7	332.5	322.2	10	2	Active
CCR-AP-8	February 2017	2883846.86	969045.93	394.00	393.68	1.0 - 31.5	31.5 - 33.0	33.5 - 45.5	35.5 - 45.5	358.5	348.5	10	2	Active
CCR-AP-8I	November 2018	2883853.30	969046.82	393.80	393.46	1.0 - 53.7	53.7 - 56.7	56.7 - 69.0	58.7 - 68.7	334.8	324.8	10	2	Active
CCR-AP-10	January 2019	2883772.84	969536.11	--	402.40	1.0 - 36.5	36.5 - 38.0	38.0 - 50.5	40.2 - 50.2	362.2	352.2	10	2	Abandoned[1]
CCR-AP-11	January 2019	2884485.51	969352.71	--	385.10	1.0 - 40.0	40.0 - 41.8	41.8 - 54.7	44.4 - 54.4	340.7	330.7	10	2	Active
2022 Aquifer Performance Test Wells														
CCR-PW-1	July 2022	2883797.21	969046.55	394.80	394.40	0.0 - 37.0	37.0 - 43.0	43.0 - 70.0	50.0 - 70.0	344.8	324.8	20	16	N/A
CCR-OW-1	June 2022	2883701.02	969027.17	395.00	394.62	0.0 - 1.5	1.5 - 4.4	34.0 - 48.0	36.0 - 46.0	359.0	349.0	10	2	N/A
CCR-OW-1I	June 2022	2883704.95	969027.17	394.90	394.44	0.0 - 1.5	1.5 - 58.0	58.0 - 70.4	60.0 - 70.0	334.9	324.9	10	2	N/A
CCR-OW-2	June 2022	2883773.63	969041.30	394.40	393.97	0.0 - 1.5	1.5 - 33.0	33.0 - 46.0	34.0 - 44.0	360.4	350.4	10	2	N/A
CCR-OW-2I	July 2022	2883777.40	969042.58	394.20	394.08	0.0 - 1.5	1.5 - 54.0	54.0 - 68.0	56.0 - 66.0	338.2	328.2	10	2	N/A
CCR-OW-3	June 2022	2883807.86	969047.93	393.90	393.69	0.0 - 1.5	1.5 - 34.0	34.0 - 47.0	35.0 - 45.0	358.9	348.9	10	2	N/A
CCR-OW-3I	June 2022	2883811.66	969048.75	394.00	393.61	0.0 - 1.5	1.5 - 57.0	57.0 - 70.0	58.0 - 68.0	336.0	326.0	10	2	N/A
CCR-OW-4	June 2022	2883872.53	969059.36	394.10	393.77	0.0 - 1.5	1.5 - 34.0	34.0 - 47.0	36.0 - 46.0	358.1	348.1	10	2	N/A
CCR-OW-4I	June 2022	2883876.12	969059.67	394.10	393.86	0.0 - 1.5	1.5 - 55.0	55.0 - 69.0	58.0 - 68.0	336.1	326.1	10	2	N/A
CCR-OW-5I	July 2022	2883799.69	969110.80	392.00	391.65	0.0 - 1.5	1.5 - 51.0	51.0 - 63.0	58.0 - 63.0	334.0	329.0	5	2	N/A

Notes and Abbreviations:

-- = was not surveyed
bgs = below ground surface
ft = feet
in = inches
N/A = not available
NAVD88 = North American Vertical Datum of 1988
[1] *Monitoring well CCR-AP-10 abandoned January 2022*

TABLE 2
SUMMARY OF GROUNDWATER QUALITY DATA - DECEMBER 2023, MAY AND NOVEMBER 2024
EAST ASH POND
F.B. CULLEY GENERATING STATION
WARRICK COUNTY, INDIANA

Location Group	Action Level	Background						
Location Name	GWPS	CCR-AP-1R	CCR-AP-1R	CCR-AP-1R	CCR-AP-7	CCR-AP-7	CCR-AP-9	CCR-AP-9
Sample Name		CCR-AP-1R-20231222	CCR-AP-1R-20240508	CCR-AP-1R-20241114	CCR-AP-7-20240510	CCR-AP-7-20241115	CCR-AP-9-20240508	CCR-AP-9-20241114
Sample Date		12/22/2023	05/08/2024	11/14/2024	05/10/2024	11/15/2024	05/08/2024	11/14/2024
Lab Sample ID		180-167383-1	180-173844-1	180-182961-1	180-173881-1	180-182934-5	180-173844-8	180-182961-6
Detection Monitoring - EPA Appendix III Constituents (mg/L)								
Boron, Total	4	-	**0.75**	**0.79**	0.1 U	0.1 U	**0.39**	**0.41**
Calcium, Total	NA	-	**61**	**55**	**120**	**120**	**130**	**120**
Chloride	NA	-	**32**	**28**	**43**	**43**	**9.6**	**2.5**
Fluoride	4	-	**0.25 J**	**0.4**	**0.31**	**0.41**	**0.3**	**0.15 J**
pH (lab) (pH units)	NA	-	**7.4 J**	**7.4 J**	**7.2 J**	**7.1 J**	**7.2 J**	**7.2 J**
Sulfate	NA	-	**100**	**160**	**110**	**86**	**130**	2.5 U
Total Dissolved Solids (TDS)	NA	-	**480 J**	**700**	**630**	**600**	**2400 J**	**710**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)								
Antimony, Total	0.02	-	**0.00073 J**	**0.001 J**	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic, Total	0.038	-	**0.0059**	**0.011**	**0.0009 J**	**0.0042 J**	**0.0039 J**	**0.0022 J**
Barium, Total	2	-	**0.35**	**0.2**	**0.1**	**0.12**	**0.17**	**0.16**
Beryllium, Total	0.01	-	**0.00095 J**	**0.0015**	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium, Total	0.01	-	0.001 U	**0.00034 J**	0.001 U	**0.000097 J**	0.001 U	**0.000077 J**
Chromium, Total	0.16	-	**0.021**	**0.034**	0.005 U	0.005 U	**0.01**	**0.0065**
Cobalt, Total	0.081	-	**0.013**	**0.018**	**0.0003 J**	**0.00036 J**	**0.0061**	**0.0025**
Fluoride	4	-	**0.25 J**	**0.4**	**0.31**	**0.41**	**0.3**	**0.15 J**
Lead, Total	0.094	-	**0.013**	**0.018**	0.001 U	0.001 U	**0.0047**	**0.0024**
Lithium, Total	0.23	-	**0.036**	**0.067**	**0.011**	**0.0098**	**0.038**	**0.035**
Mercury, Total	0.002	-	0.0002 U	0.0002 U	0.0002 U	**0.00032 J-**	0.0002 U	0.0002 U
Molybdenum, Total	0.1	-	**0.0053**	**0.0056**	**0.0013 J**	**0.0011 J**	**0.0017 J**	**0.0017 J**
Selenium, Total	0.05	-	0.005 U	**0.0013 J**	0.005 U	0.005 U	0.005 U	0.005 U
Thallium, Total	0.01	-	0.001 U	**0.00092 J+**	0.001 U	0.001 U	0.001 U	0.001 U
Radiological (pCi/L)								
Radium-226	NA	**5.36 ± 0.809**	**2.32 ± 0.528**	**1.1 J ± 0.397**	**0.337 ± 0.148**	**0.496 ± 0.169**	**3.35 ± 0.626**	**2.63 ± 0.635**
Radium-228	NA	**9.08 ± 2.49**	**4.98 ± 1.34**	2.28 U ± 1.75	0.529 U ± 0.367	0.358 U ± 0.507	**2.98 J ± 0.969**	3.7 U ± 1.55
Radium-226 & 228	12.6	**14.4 ± 2.62**	**7.3 ± 1.44**	3.38 UJ ± 1.79	**0.866 J ± 0.396**	**0.854 J ± 0.534**	**6.33 J ± 1.15**	**6.33 ± 1.68**
Field Parameters								
Temperature (Deg C)	NA	**12.89**	**19.29**	**15.67**	**17.68**	**15.91**	**18.21**	**17.17**
Dissolved Oxygen, Field (mg/L)	NA	**11.72**	**5.36**	**9.7**	**0.05**	**0.22**	**4.44**	**5.01**
Conductivity, Field (mS/cm)	NA	**1.59**	**0.64758**	**0.15311**	**0.6171**	**1.0125**	**1.165**	**0.74**
Oxidation Reduction Potential (ORP), Field (mv)	NA	**-45**	**103**	**9.7**	**-111.4**	**-101.6**	**65.6**	**313.6**
Turbidity, Field (NTU)	NA	**208**	**351**	**1792**	**28.94**	**5.57**	**464**	**764.02**
pH, Field (pH units)	NA	**6.76**	**7.5**	**5.26**	**7.26**	**7.16**	**6.98**	**8.15**

Notes and Abbreviations:

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Deg C: Degrees Celsius
mS/cm: milliSiemen per centimeter
mv: millivolts
NTU: Nephelometric Turbidity Units
NA: not available
U: not detected, value is the laboratory reporting limit
U: activity level below the Minimum Detectable Concentration (Radiological)
J: value is estimated
J+: value is estimated with a potential high bias
USEPA: United States Environmental Protection Agency
GWPS: Ground Water Protection Standard

*Results in **bold** are detected*
Shaded values indicate a GWPS exceedance

USEPA. 2020. Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities. December 14. 40 CFR Part 257.
https://www.epa.gov/coalash/coal-ash-rule

TABLE 2
SUMMARY OF GROUNDWATER QUALITY DATA - DECEMBER 2023, MAY AND NOVEM
EAST ASH POND
F.B. CULLEY GENERATING STATION
WARRICK COUNTY, INDIANA

Location Group	Action Level	Downgradient									
Location Name	GWPS	CCR-AP-2	CCR-AP-2	CCR-AP-3	CCR-AP-4	CCR-AP-4	CCR-AP-5	CCR-AP-5	CCR-AP-5	CCR-AP-5	CCR-AP-5I
Sample Name		CCR-AP-2-20240508	CCR-AP-2-20241114	CCR-AP-3-20240507	CCR-AP-4-20240508	CCR-AP-4R-20241114	CCR-AP-5-20240513	DUP 1-20240513	CCR-AP-5-20241114	DUP 1-20241114	CCR-AP-5I-20240513
Sample Date		05/08/2024	11/14/2024	05/07/2024	05/08/2024	11/14/2024	05/13/2024	05/13/2024	11/14/2024	11/14/2024	05/13/2024
Lab Sample ID		180-173844-2	180-182961-2	180-173844-3	180-173844-4	180-182961-3	180-174082-1	180-174082-3	180-182961-4	180-182961-8	180-174082-2
Detection Monitoring - EPA Appendix III Constituents (mg/L)											
Boron, Total	4	**8.1**	**9.2**	**0.28**	**1.1**	**0.58**	**17**	**17**	**11**	**12**	**12**
Calcium, Total	NA	**230**	**230**	**150**	**130**	**140**	**260**	**260**	**200**	**200**	**270**
Chloride	NA	**250**	**190**	**27**	**32**	**26**	**150**	**160**	**51**	**54**	**280**
Fluoride	4	**0.27**	**0.24**	**0.35**	**0.61**	**0.89**	**0.84**	**0.83**	**1.7**	**1.8**	**0.32**
pH (lab) (pH units)	NA	**6.7 J**	**6.8 J**	**7.1 J**	**7 J**	**6.9 J**	**7.1 J**	**7.1 J**	**7.7 J**	**7.6 J**	**6.9 J**
Sulfate	NA	**340**	**420**	**32**	**73**	**12**	**620**	**640**	**450**	**450**	**640**
Total Dissolved Solids (TDS)	NA	**1500 J**	**1500**	**730 J**	**690 J**	**740**	**1600 J**	**1700**	**1200**	**1200**	**1800 J**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)											
Antimony, Total	0.02	**0.0011 J**	0.002 U	0.002 U	0.002 U	**0.00096 J**	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic, Total	0.038	**0.025**	**0.0021 J**	**0.051**	**0.027**	**0.089**	**0.00085 J**	0.005 U	**0.0013 J**	**0.0015 J**	0.005 U
Barium, Total	2	**0.83**	**0.045**	**0.38**	**0.53**	**0.52**	**0.046**	**0.045**	**0.053**	**0.051**	**0.027**
Beryllium, Total	0.01	**0.0037**	0.001 U	0.001 U	0.001 U	**0.00099 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium, Total	0.01	**0.003**	**0.00011 J**	0.001 U	0.001 U	**0.00045 J**	0.001 U	0.001 U	**0.0001 J**	**0.000088 J**	0.001 U
Chromium, Total	0.16	**0.11**	**0.0024 J**	**0.0031 J**	0.005 U	**0.027**	**0.002 J**	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Total	0.081	**0.048**	**0.008**	**0.0061**	**0.0028**	**0.014**	**0.0025**	**0.0022**	**0.0023**	**0.0023**	**0.00051 J**
Fluoride	4	**0.27**	**0.24**	**0.35**	**0.61**	**0.89**	**0.84**	**0.83**	**1.7**	**1.8**	**0.32**
Lead, Total	0.094	**0.056**	**0.0013**	**0.00097 J**	0.001 U	**0.019**	**0.00068 J**	0.001 U	0.001 U	0.001 U	0.001 U
Lithium, Total	0.23	**0.085**	**0.0038 J**	**0.0028 J**	**0.0045 J**	**0.02**	**0.056**	**0.058**	**0.08**	**0.083**	**0.035**
Mercury, Total	0.002	**0.00016 J**	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum, Total	0.1	**0.0065**	0.005 U	**0.0093**	**0.017**	**0.0073**	**0.15**	**0.15**	**0.34**	**0.34**	**0.0026 J**
Selenium, Total	0.05	**0.0027 J**	0.005 U	**0.0016 J**	0.005 U	**0.0018 J**	**0.00095 J**	0.005 U	0.005 U	0.005 U	0.005 U
Thallium, Total	0.01	**0.001**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Radiological (pCi/L)											
Radium-226	NA	**1.65 ± 0.442**	0.401 U ± 0.306	**0.4 ± 0.18**	**0.337 ± 0.17**	0.852 U ± 0.379	**0.424 ± 0.286**	0.182 U ± 0.181	0.158 U ± 0.103	0.212 U ± 0.125	**0.249 ± 0.18**
Radium-228	NA	1.57 U ± 0.852	1.42 U ± 1.51	0.495 U ± 0.461	0.869 U ± 0.646	0.598 U ± 1.24	0.452 U ± 0.509	**0.983 ± 0.583**	-0.153 U ± 0.355	0.46 U ± 0.453	**1.08 ± 0.435**
Radium-226 & 228	12.6	**3.22 J+ ± 0.96**	1.82 U ± 1.54	**0.896 J ± 0.495**	**1.21 J ± 0.668**	1.45 UJ ± 1.3	**0.877 J ± 0.584**	**1.17 J ± 0.61**	0.158 UJ ± 0.37	0.673 UJ ± 0.47	**1.33 ± 0.471**
Field Parameters											
Temperature (Deg C)	NA	**18.11**	**14.14**	**20.93**	**18.22**	**14.31**	**18.31**	**18.31**	**14.45**	**14.45**	**18.21**
Dissolved Oxygen, Field (mg/L)	NA	**4.54**	**9.99**	**5.07**	**4.85**	**3.36**	**4.5**	**4.5**	**1.02**	**1.02**	**2.83**
Conductivity, Field (mS/cm)	NA	**2.201**	**0.07**	**1.582**	**1.261**	**0.07**	**2.281**	**2.281**	**1.233**	**1.233**	**2.641**
Oxidation Reduction Potential (ORP), Field (mv)	NA	**71.6**	**60.6**	**-125.2**	**-120.2**	**209.4**	**300.5**	**300.5**	**-59.6**	**-59.6**	**51.8**
Turbidity, Field (NTU)	NA	**9.503**	**0**	**138**	**30**	**0**	**72**	**72**	**11.21**	**11.21**	**120**
pH, Field (pH units)	NA	**8.97**	**7.32**	**6.84**	**6.83**	**7.95**	**7.11**	**7.11**	**7.08**	**7.08**	**6.72**

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mv: millivolts
NTU: Nephelometric Turbidity Units
NA: not available
U: not detected, value is the laboratory reporting limit
U: activity level below the Minimum Detectable Concentration (Radiological)
J: value is estimated
J+: value is estimated with a potential high bias
USEPA: United States Environmental Protection Agency
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Results in ***bold*** *are detected*
Shaded values indicate a GWPS exceedance

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EAST ASH POND
F.B. CULLEY GENERATING STATION
WARRICK COUNTY, INDIANA

Location Group	Action Level	Down-Gradient						
Location Name	GWPS	CCR-AP-6	CCR-AP-6I	CCR-AP-6I	CCR-AP-8	CCR-AP-8I	CCR-AP-11	CCR-AP-11
Sample Name		CCR-AP-6-20240507	CCR-AP-6I-20240507	CCR-AP-6I-20241113	CCR-AP-8-20240510	CCR-AP-8I-20240508	CCR-AP-11-20240510	CCR-AP-11-20241115
Sample Date		05/07/2024	05/07/2024	11/13/2024	05/10/2024	05/08/2024	05/10/2024	11/15/2024
Lab Sample ID		180-173844-5	180-173844-6	180-182961-5	180-173881-2	180-173844-7	180-173881-3	180-182961-7
Detection Monitoring - EPA Appendix III Constituents (mg/L)								
Boron, Total	4	**0.66**	**15**	**0.14**	**0.13**	**33**	**0.3**	**0.45**
Calcium, Total	NA	**110**	**250**	**46**	**140**	**490**	**120**	**140**
Chloride	NA	**36**	**87**	**31**	**25**	**180**	**26**	**29**
Fluoride	4	**0.37**	**0.13**	**0.2**	**0.22**	**0.12 J**	**0.3**	**0.34**
pH (lab) (pH units)	NA	**7.2 J**	**7.4 J**	**7.6 J**	**7.1 J**	**7.3 J**	**6.5 J**	**6.2 J**
Sulfate	NA	**46**	**430**	**140**	**2.7**	**1100**	**450**	**610**
Total Dissolved Solids (TDS)	NA	**530**	**1200 J**	**350**	**770**	**2400 J**	**900**	**1200**
Assessment Monitoring - EPA Appendix IV Constituents (mg/L)								
Antimony, Total	0.02	**0.00082 J**	0.002 U	0.002 U	**0.00064 J**	0.002 U	0.002 U	0.002 U
Arsenic, Total	0.038	**0.057**	**0.0057**	0.005 U	**0.013**	**0.0013 J**	**0.0056**	**0.051**
Barium, Total	2	**0.43**	**0.041**	**0.21**	**0.27**	**0.34**	**0.15**	**0.23**
Beryllium, Total	0.01	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Cadmium, Total	0.01	0.001 U	**0.00028 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chromium, Total	0.16	**0.0027 J**	0.005 U	0.005 U	**0.0039 J**	0.005 U	**0.0016 J**	**0.0021 J**
Cobalt, Total	0.081	**0.0034**	**0.00062 J**	**0.00085 J**	**0.0044**	**0.00065 J**	**0.036**	**0.065**
Fluoride	4	**0.37**	**0.13**	**0.2**	**0.22**	**0.12 J**	**0.3**	**0.34**
Lead, Total	0.094	**0.0012**	0.001 U	0.001 U	**0.003**	0.001 U	**0.00059 J**	**0.00051 J**
Lithium, Total	0.23	**0.0057 J**	**0.083**	**0.0049 J**	**0.0039 J**	**0.17**	**0.0048 J**	**0.0043 J**
Mercury, Total	0.002	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum, Total	0.1	**0.043**	**0.86**	**0.02**	**0.012**	**0.29**	0.005 U	0.005 U
Selenium, Total	0.05	0.005 U	0.005 U	0.005 U	**0.0021 J**	0.005 U	0.005 U	0.005 U
Thallium, Total	0.01	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Radiological (pCi/L)								
Radium-226	NA	**0.541 ± 0.233**	0.159 U ± 0.115	0.0927 U ± 0.106	**0.489 ± 0.21**	**0.804 ± 0.228**	**0.292 ± 0.148**	0.243 U ± 0.163
Radium-228	NA	0.169 U ± 0.446	0.536 U ± 0.37	0.844 U ± 0.465	0.589 U ± 0.508	1.15 U ± 0.572	0.562 U ± 0.348	0.965 U ± 0.656
Radium-226 & 228	12.6	0.71 UJ ± 0.503	0.695 UJ ± 0.387	0.937 UJ ± 0.477	**1.08 J ± 0.55**	**1.95 J+ ± 0.616**	**0.854 J+ ± 0.378**	1.21 UJ ± 0.676
Field Parameters								
Temperature (Deg C)	NA	**19.79**	**18.2**	**19.25**	**18.56**	**19.72**	**21.43**	**12.05**
Dissolved Oxygen, Field (mg/L)	NA	**3.65**	**0.15**	**0.2**	**0.25**	**6.7**	**0.36**	**1.63**
Conductivity, Field (mS/cm)	NA	**1.105**	**1.6373**	**0.46525**	**1.429**	**3.0125**	**1.3368**	**1.1029**
Oxidation Reduction Potential (ORP), Field (mv)	NA	**-146.7**	**-78.3**	**-28.6**	**-76.3**	**-140.1**	**-24.8**	**-57.5**
Turbidity, Field (NTU)	NA	**93**	**1.18**	**0**	**140**	**91.67**	**88.4**	**93.11**
pH, Field (pH units)	NA	**7.19**	**7.37**	**7.38**	**6.9**	**5.68**	**6.26**	**6.33**

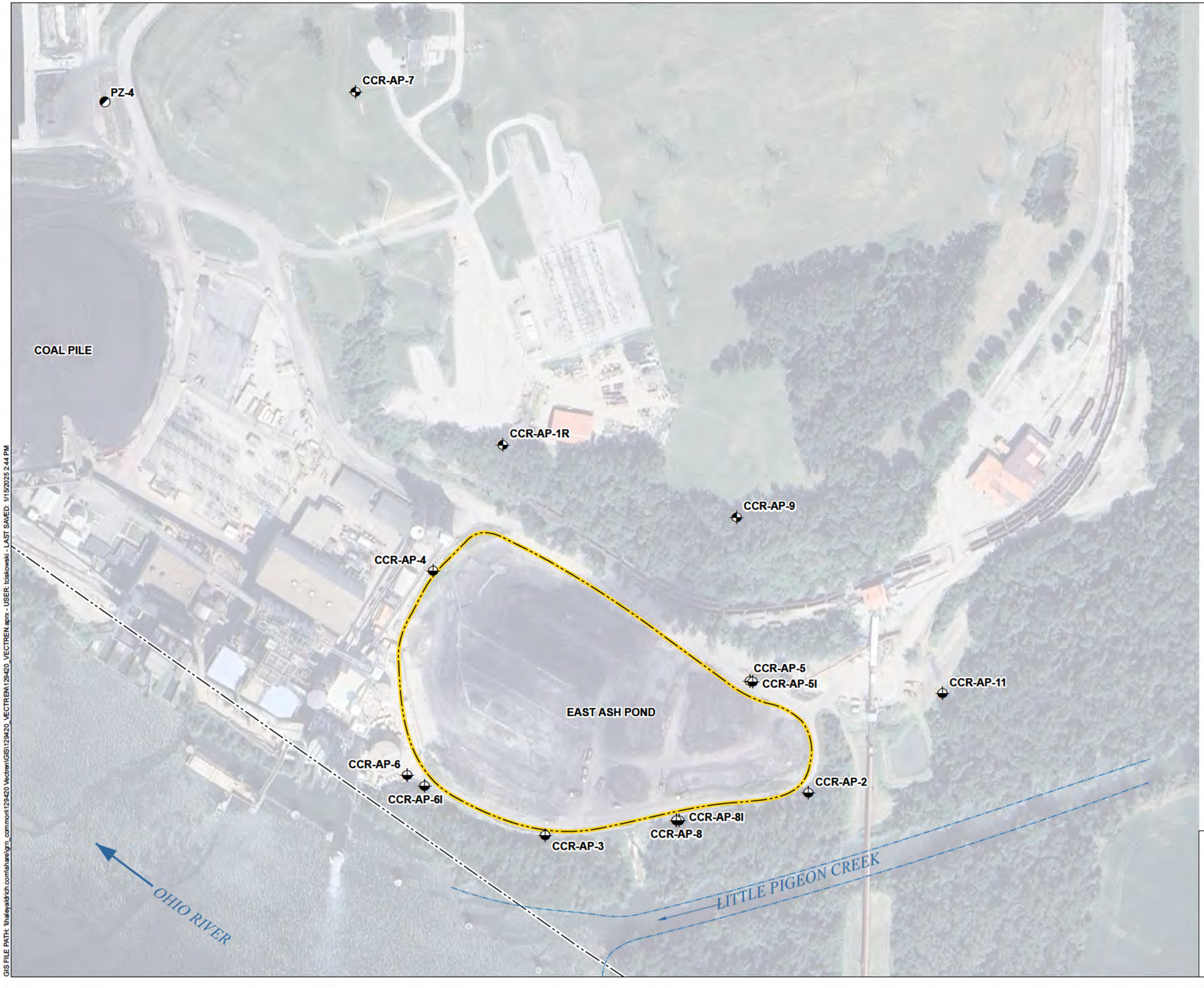
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https://www.epa.gov/coalash/coal-ash-rule

FIGURES



LEGEND

- UPGRADIENT MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- PIEZOMETER
- CREEK BOUNDARY
- UNIT BOUNDARY
- APPROXIMATE PROPERTY BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. CCR = COAL COMBUSTION RESIDUALS
3. AERIAL IMAGERY SOURCE: GOOGLE, 10 AUGUST 2024

N

0 230 460
SCALE IN FEET

HALEY ALDRICH

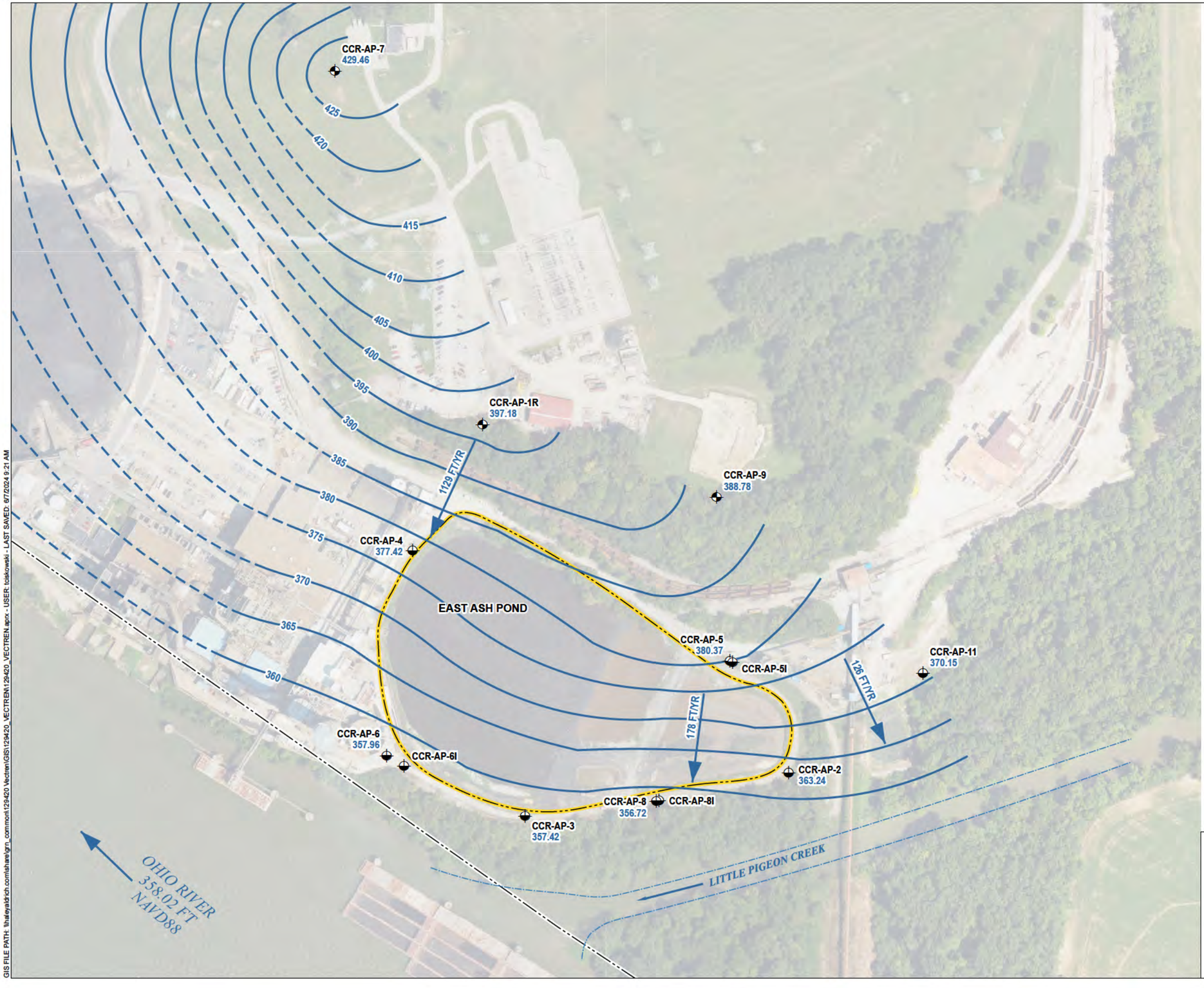
EAST ASH POND
F.B. CULLEY GENERATING STATION
WARRICK COUNTY, INDIANA

GROUNDWATER MONITORING WELL LOCATIONS - EAST ASH POND

JANUARY 2025

FIGURE 1

GIS FILE PATH: \\haleyaldrich.com\share\grn_common\129420 Vectren\GIS\129420_VECTREN\129420_VECTREN.aprx - USER: tolskowski - LAST SAVED: 1/15/2025 2:44 PM



LEGEND

- UPGRADIENT GROUNDWATER MONITORING WELL
- DOWNGRADIENT GROUNDWATER MONITORING WELL
- GROUNDWATER FLOW DIRECTION
- CREEK BOUNDARY
- GROUNDWATER ELEVATION CONTOUR, 5-FT INTERVAL, DASHED WHERE INFERRED
- APPROXIMATE UNIT BOUNDARY
- APPROXIMATE PROPERTY BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

2. DEFINITIONS:
CCR = COAL COMBUSTION RESIDUALS
ND = NO DATA
NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988

3. WATER LEVELS GAGED ON 6 MAY 2024

4. OHIO RIVER LEVEL COLLECTED BY USGS OWENSBORO GAGE #03303502 ON 6 MAY 2024 AT 12:00 PM

5. GROUNDWATER VELOCITY SHOWN IN FEET PER YEAR

6. $V = \frac{K(i)}{n_e}$

V = GROUNDWATER VELOCITY (FT/YR)
K = HYDRAULIC CONDUCTIVITY (FT/YR)
i = GROUNDWATER GRADIENT
n_e = EFFECTIVE POROSITY

7. AERIAL IMAGERY SOURCE: HEXAGON, 25 JULY 2023

N

0 230 460
SCALE IN FEET

HALEY ALDRICH

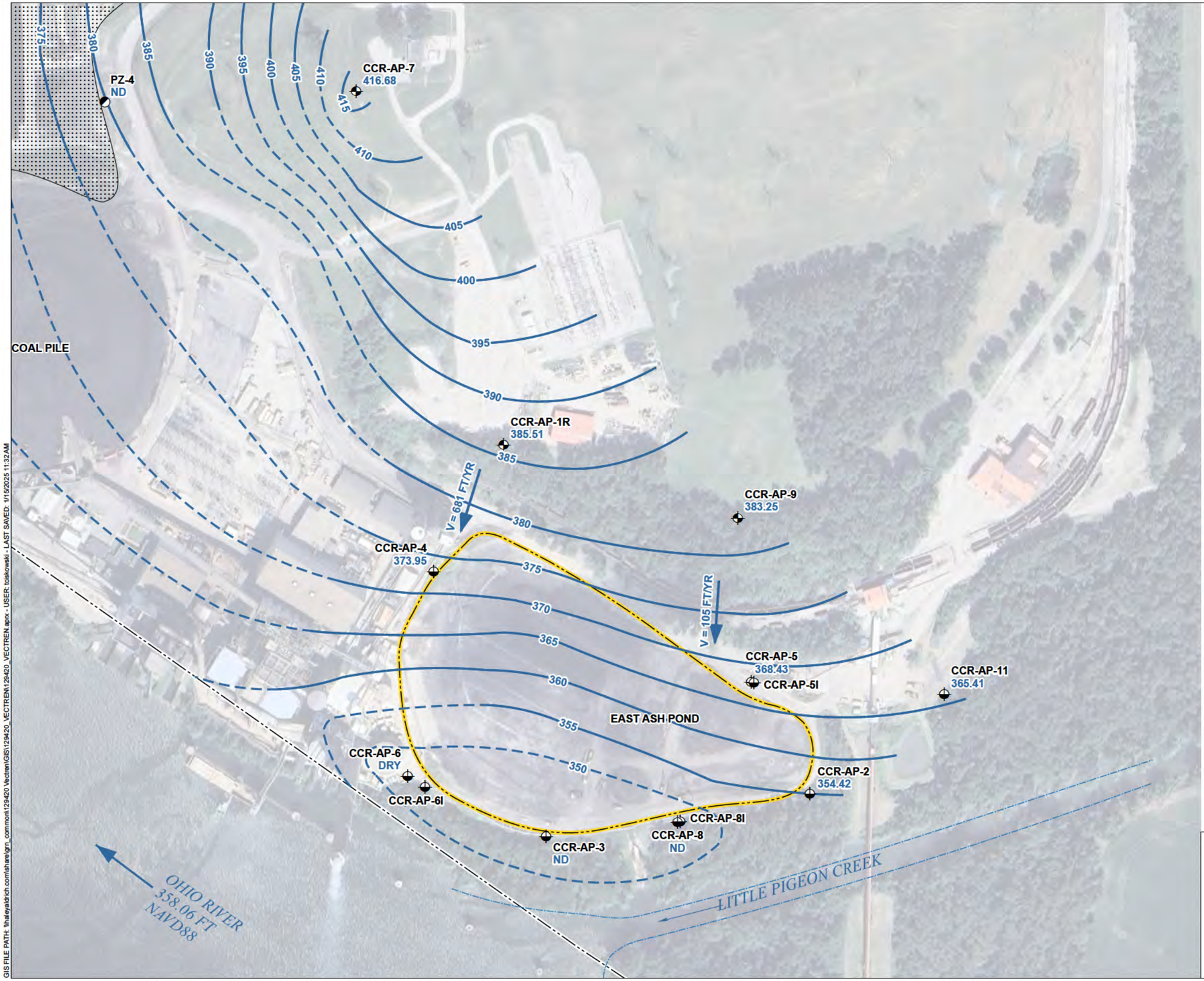
EAST ASH POND
F.B. CULLEY GENERATING STATION
WARRICK COUNTY, INDIANA

SHALLOW GROUNDWATER CONFIGURATION - EAST ASH POND - MAY 2024

JANUARY 2025

FIGURE 2

GIS FILE PATH: \\haleyaldrich.com\share\grn_common\129420 Vectren\GIS\129420_VECTREN129420_VECTREN.aprx - USER: tciakowski - LAST SAVED: 6/7/2024 9:21 AM



GIS FILE PATH: \\haleyaldrich.com\share\grn_common\129420 Vectren\GIS\129420_VECTREN129420_VECTREN.aprx - USER: tcakowski - LAST SAVED: 1/15/2025 11:32 AM

LEGEND

- UPGRADIENT MONITORING WELL
- DOWNGRADIENT MONITORING WELL
- PIEZOMETER
- GROUNDWATER FLOW DIRECTION
- GROUNDWATER ELEVATION CONTOUR, 5-FT INTERVAL, DASHED WHERE INFERRED
- CREEK BOUNDARY
- APPROXIMATE LIMITS OF WEST ASH POND CCR REMOVAL
- UNIT BOUNDARY
- APPROXIMATE PROPERTY BOUNDARY

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

2. DEFINITIONS:
CCR = COAL COMBUSTION RESIDUALS
ND = NO DATA
NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988

3. WATER LEVELS GAGED ON 11 NOVEMBER 2024.

4. OHIO RIVER LEVEL COLLECTED BY USGS OWENSBORO GAGE #03303502 ON 11 NOVEMBER 2024 AT 12:00 PM.

5. GROUNDWATER VELOCITY SHOWN IN FEET PER YEAR.

6. $V = \frac{k(i)}{n_e}$

V = GROUNDWATER VELOCITY (FT/YR)
K = HYDRAULIC CONDUCTIVITY (FT/YR)
i = GROUNDWATER GRADIENT
n_e = EFFECTIVE POROSITY

7. AERIAL IMAGERY SOURCE: GOOGLE, 10 AUGUST 2024

N

0 230 460
SCALE IN FEET

HALEY ALDRICH

EAST ASH POND
F.B. CULLEY GENERATING STATION
WARRICK COUNTY, INDIANA

SHALLOW GROUNDWATER CONFIGURATION - EAST ASH POND NOVEMBER 2024

JANUARY 2025

FIGURE 3

APPENDIX A
Summary of Statistical Analysis

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TECHNICAL MEMORANDUM

25 April 2024
File No. 0129420-032

TO: Southern Indiana Gas and Electric Company

FROM: Haley & Aldrich, Inc.
Todd Plating, Senior Project Manager
Steven F. Putrich, P.E., Project Principal

SUBJECT: Statistical Evaluation of the November 2023 Semi-annual Groundwater Assessment Monitoring Data
Southern Indiana Gas and Electric Company
East Ash Pond
F.B. Culley Generating Station; Warrick County, Indiana

Pursuant to Title 40 Code of Federal Regulations (40 CFR) § 257.93 and § 257.95 (Rule), this memorandum summarizes the statistical evaluation of the analytical results for the November 2023 semi-annual assessment monitoring event for the F.B. Culley Generating Station (FBC) East Ash Pond (EAP). Haley & Aldrich, Inc. (Haley & Aldrich) completed this statistical evaluation to determine if Appendix IV groundwater monitoring constituents have been detected in downgradient wells at statistically significant levels (SSL) greater than Groundwater Protection Standards (GWPS), consistent with the requirements in 40 CFR § 257.95.

Methods used during this statistical analysis are described in Haley & Aldrich's 2017 *Statistical Data Analysis Plan for the F.B. Culley Generating Station*. A summary of how applicable performance standards described in 40 CFR § 257.93 (g) were achieved include:

- 40 CFR § 257.93 (g) (1) - Data set distribution was evaluated using basic summary statistics, graphical methods, and the Shapiro-Wilks Test of Normality. Parametric methods were used where normal distributions were identified. Those data sets were evaluated for outliers using box plots, Dixon's test and Rosner's test. Outlier identification and data set distribution groups are summarized in Attachment A.
- 40 CFR § 257.93 (g) (2) – Not applicable
- 40 CFR § 257.93 (g) (3) – Not applicable

- 40 CFR § 257.93 (g) (4) – Levels of confidence and additional supporting information for the use of tolerance intervals and prediction limits are included in Attachment A.
- 40 CFR § 257.93 (g) (5) – Non-detect values were accounted for by simple substitution, where the detection limit replaced the non-detect result. Non-detect values are identified and summarized in Attachment A.
- 40 CFR § 257.93 (g) (6) – Time series plots for groundwater monitoring wells included in this evaluation were reviewed to identify potential seasonal variability. No additional statistics to account for seasonality of spatial variability were necessary.

Data from the groundwater sampling event for the downgradient monitoring wells (CCR-AP-2 through CCR-AP-6 and CCR-AP-8) were compared to the GWPS established from the background dataset for the upgradient monitoring wells (CCR-AP-1R, CCR-AP-7, and CCR-AP-9) for detected Appendix IV constituents. GWPS for each of the Appendix IV constituents have been set equal to the highest value of the maximum contaminant level (MCL), regional screening level (RSL), or background concentration. The results of the assessment monitoring statistical evaluation are discussed below and provided in Attachment A.

Development of Groundwater Protection Standard

The Rule provides four specific options for statistical evaluation of groundwater quality data collected at a coal combustion residual (CCR) unit (40 CFR §257.93(f) (1-4)). Haley & Aldrich certified the tolerance limit (TL) as the statistical method used for developing background concentration for the GWPS on 14 January 2019. As noted above, the GWPS for each of the Appendix IV constituents have been set equal to the highest value of the MCL, RSL, or background concentration. The most recent groundwater sampling result from each compliance well was compared to the GWPS to determine if additional statistical testing is warranted.

STATISTICAL EVALUATION

An interwell statistical evaluation was used to identify SSLs (Table 1). An interwell evaluation compares the most recent values from downgradient compliance wells to a background dataset composed of upgradient well data. Because the CCR unit is in assessment monitoring, no statistical evaluations were conducted on Appendix III (detection monitoring) constituents.

The parametric TL method was used to complete statistical evaluations of the referenced dataset. The TL procedure is one in which a concentration limit for each constituent is established from the distribution of the background data, with a minimum 95 percent confidence level. The upper endpoint of a tolerance interval is called the UTL. Depending on the data distribution, parametric or non-parametric TL procedures are used to evaluate groundwater monitoring data. Parametric TLs utilize normally distributed data or data normalized via a transformation of the sample background data used to construct the limit. If the data are non-normal and a transformation is not indicated, non-parametric procedures (order statistics or bootstrap methods) are used to calculate the TL. If all the background data are non-detect, a maximum reporting limit may serve as an appropriate UTL.

These statistical evaluations were conducted using the background dataset for all detected Appendix IV constituents using parametric TL. If an Appendix IV constituent concentration from the November 2023 sampling event was greater than the GWPS, the lower confidence limit (LCL) for the downgradient well constituent was used to evaluate if an SSL was indicated. The LCL is the lower end of the confidence interval range, which is an estimated concentration range intended to contain the true mean or median of the population from which the sample is drawn. The confidence interval range is designed to locate the true population mean or median with a high degree of statistical confidence, or conversely, with a low probability of error.

The UTLs were calculated from the background well dataset using the EnvStats (version 2.8.1) R programming package after testing for outlier sample results that would warrant removal from the dataset based on likely error in sampling or measurement. Statistical outlier tests for the background data were performed using the outliers (version 0.15) R programming package, and a visual inspection of the data was performed using box plots and distribution plots for the downgradient sample data. No sample data were identified as outliers that warranted removal from the dataset.

BACKGROUND DISTRIBUTIONS

The groundwater analytical results for each sampling event from the background sample locations were combined to calculate the UTL for each detected Appendix IV constituent. The variability and distribution of the pooled dataset was evaluated to determine the method for UTL calculation. The background concentrations were periodically updated per the document *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, March 2009* (Unified Guidance).

TREND SUMMARY

Mann Kendall trend analyses were performed on data sets from downgradient wells of sufficient sample size. Results of the trend analysis are included as Table 2. Trends indicated for constituents identified as SSLs are summarized below:

- Molybdenum was determined to be increasing at monitoring well locations CCR-AP-2 and CCR-AP-4R. Analytical results at those locations are below the GWPS.
- Molybdenum was determined to be stable at upgradient location CCR-AP-1R and downgradient locations CCR-AP-6 and CCR-AP-8.
- Molybdenum was determined to be decreasing at upgradient locations CCR-AP-7 and CCR-AP-9, along with downgradient locations CCR-AP-3 and CCR-AP-5.

RESULTS OF APPENDIX IV DOWNGRADIENT STATISTICAL COMPARISONS

The sample concentrations from the downgradient wells for each of the detected Appendix IV constituents from the November 2023 assessment monitoring event were compared to their respective GWPS (Attachment A). LCLs were calculated where constituents were detected at concentrations greater than the GWPS. An SSL is indicated when the LCL is greater than the GWPS. SSLs are summarized in the table below. Based on previous compliance sampling events and statistical evaluations, interwell comparisons were used to evaluate constituents not subject to an Alternative

Source Demonstration (ASD) in downgradient monitoring wells. Because a successful ASD was completed for arsenic, an intrawell statistical analysis was used to evaluate that constituent.

The results of the statistical analyses conducted for detected Appendix IV constituents confirm that molybdenum remains the only SSL downgradient of the EAP. As a result, the EAP will remain in Assessment Monitoring.

Table 1. Statistically Significant Level Summary – Appendix IV Constituents

Location ID	Trend	Constituent	Newly Identified SSL	Concentration (mg/L)
CCR-AP-5	Decrease	Molybdenum	No	0.14

Notes:
mg/L= milligrams per liter

Enclosure:

Table 2 – Trend Summary
Attachment A - Assessment Monitoring Statistical Analysis Summary – November 2023

G:\129420 Vectren\Deliverables\FB_Culley\East Ash Pond\SSL Notification\2023-11 Nov Sampling SSL Memo\2024-0425 FBC EAP Statistical Evaluation Summary_F.docx

Table 2. Trend Summary

Location	Chemical	Units	Identified Trends		Trend Analysis on All Available Data					Trend Analysis on Recent Data				
			Trend (All Data)	Trend (Recent Data)	Results, n	Detected Results, n	Max Concentration	Sen Slope (magnitude per year)	p-value	*Results, n	*Detected Results, n	*Max Concentration	*Sen Slope (magnitude per year)	*p-value
CCR-AP-1R	Antimony, Total	mg/L	No Trend	Stable	22	16	0.01	1.92e-05	0.41	8	8	0.0041	-8.8e-05	0.618
CCR-AP-2	Antimony, Total	mg/L	No Trend	No Trend	22	13	0.01	2e-05	0.138	8	8	0.0079	0.000105	0.319
CCR-AP-3	Antimony, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	21	5	0.005	NA	NA	8	3	0.005	NA	NA
CCR-AP-4R	Antimony, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	21	7	0.028	NA	NA	8	5	0.028	0.000188	0.61
CCR-AP-5	Antimony, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Probably Increasing	21	6	0.01	NA	NA	8	5	0.0047	0.000172	0.0746
CCR-AP-6	Antimony, Total	mg/L	No Trend	No Trend	21	12	0.018	0	0.636	8	6	0.018	0.000134	0.308
CCR-AP-7	Antimony, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Only one detected result	23	3	0.0025	NA	NA	8	1	0.0025	NA	NA
CCR-AP-8	Antimony, Total	mg/L	Stable	No Trend	21	15	0.0046	-1.77e-05	0.195	8	7	0.0046	2.11e-05	0.902
CCR-AP-9	Antimony, Total	mg/L	No Trend	No Trend	20	15	0.01	0	1	8	6	0.01	-0.000162	0.536
CCR-AP-1R	Arsenic, Total	mg/L	Increasing	Stable	22	22	0.038	0.000708	0.00675	8	8	0.034	-0.001	0.711
CCR-AP-2	Arsenic, Total	mg/L	Increasing	Probably Increasing	22	22	0.048	0.00145	7.69e-05	8	8	0.048	0.005	0.0635
CCR-AP-3	Arsenic, Total	mg/L	Increasing	Stable	21	21	0.095	0.000818	0.0136	8	8	0.095	0	1
CCR-AP-4R	Arsenic, Total	mg/L	Increasing	No Trend	21	21	0.33	0.00618	0.000782	8	8	0.33	0.00325	0.902
CCR-AP-5	Arsenic, Total	mg/L	Increasing	Increasing	20	18	0.024	0.000226	0.00181	8	8	0.024	0.00204	0.00277
CCR-AP-6	Arsenic, Total	mg/L	Increasing	Stable	21	21	0.12	0.00206	0.0117	8	8	0.12	0	0.694
CCR-AP-7	Arsenic, Total	mg/L	Decreasing	Stable	23	23	0.018	-0.000232	0.0173	8	8	0.015	-0.000733	0.135
CCR-AP-8	Arsenic, Total	mg/L	Increasing	Stable	21	21	0.12	0.00294	0.000422	8	8	0.12	-0.00333	0.12
CCR-AP-9	Arsenic, Total	mg/L	No Trend	Stable	20	20	0.032	0.000226	0.153	8	8	0.02	-0.000633	0.454
CCR-AP-1R	Barium, Total	mg/L	Increasing	Stable	22	22	0.59	0.00842	0.0452	8	8	0.32	-0.00667	0.902
CCR-AP-2	Barium, Total	mg/L	Increasing	Increasing	22	22	0.64	0.015	0.00519	8	8	0.64	0.08	0.0187
CCR-AP-3	Barium, Total	mg/L	No Trend	No Trend	21	21	0.49	0.002	0.114	8	8	0.49	0.00167	1
CCR-AP-4R	Barium, Total	mg/L	No Trend	No Trend	21	21	1.4	0.00333	0.628	8	8	1.4	0.0317	0.618
CCR-AP-5	Barium, Total	mg/L	Increasing	Probably Increasing	21	21	0.2	0.00358	0.000124	8	8	0.2	0.0161	0.0635
CCR-AP-6	Barium, Total	mg/L	Stable	Decreasing	21	21	0.69	-0.00258	0.332	8	8	0.69	-0.015	0.0461
CCR-AP-7	Barium, Total	mg/L	Decreasing	Stable	23	23	0.19	-0.00222	0.019	8	8	0.19	-0.00625	0.212
CCR-AP-8	Barium, Total	mg/L	Decreasing	Decreasing	21	21	0.68	-0.01	0.00202	8	8	0.57	-0.0317	0.0461
CCR-AP-9	Barium, Total	mg/L	Increasing	Stable	20	20	0.72	0.00812	0.04	8	8	0.39	-0.00167	1
CCR-AP-1R	Beryllium, Total	mg/L	Increasing	Stable	22	22	0.0066	0.00018	0.00679	8	8	0.0061	-0.000292	0.711
CCR-AP-2	Beryllium, Total	mg/L	Increasing	No Trend	22	22	0.0077	0.00016	0.000244	8	8	0.0077	0.000707	0.386
CCR-AP-3	Beryllium, Total	mg/L	Not Evaluated - Only one detected result	Not Evaluated - Only one detected result	21	1	0.00056	NA	NA	8	1	0.00056	NA	NA
CCR-AP-4R	Beryllium, Total	mg/L	Increasing	Stable	21	15	0.0017	2.13e-05	0.0071	8	4	0.0017	-2.14e-06	0.507
CCR-AP-5	Beryllium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Only one detected result	21	6	0.005	NA	NA	8	1	0.0016	NA	NA
CCR-AP-6	Beryllium, Total	mg/L	No Trend	Not Evaluated - Majority of data (>50%) non-detect	21	13	0.0025	8.82e-06	0.188	8	3	0.00096	NA	NA
CCR-AP-7	Beryllium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Only one detected result	23	7	0.00075	NA	NA	8	1	0.0005	NA	NA
CCR-AP-8	Beryllium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	21	6	0.0005	NA	NA	8	2	0.0005	NA	NA
CCR-AP-9	Beryllium, Total	mg/L	Increasing	Stable	20	19	0.005	4.6e-05	0.021	8	7	0.005	-3.25e-05	0.902
CCR-AP-1R	Cadmium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Decreasing	22	10	0.005	NA	NA	8	6	0.0025	-4.87e-05	0.0354
CCR-AP-2	Cadmium, Total	mg/L	Increasing	No Trend	22	19	0.0066	5.47e-05	0.014	8	8	0.0066	0.000164	0.454
CCR-AP-3	Cadmium, Total	mg/L	Not Evaluated - Only one detected result	Not Evaluated - Only one detected result	21	1	0.0005	NA	NA	8	1	0.0005	NA	NA
CCR-AP-4R	Cadmium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Stable	21	10	0.0025	NA	NA	8	4	0.00079	0	1
CCR-AP-5	Cadmium, Total	mg/L	No Trend	No Trend	21	16	0.005	7.35e-06	0.564	8	5	0.0014	5.88e-05	0.445
CCR-AP-6	Cadmium, Total	mg/L	No Trend	Not Evaluated - Majority of data (>50%) non-detect	21	13	0.0011	0	0.298	8	2	0.0011	NA	NA
CCR-AP-7	Cadmium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - No detected results	23	2	0.0005	NA	NA	8	0	0.0005	NA	NA
CCR-AP-8	Cadmium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	21	6	0.00064	NA	NA	8	4	0.00064	0	0.592
CCR-AP-9	Cadmium, Total	mg/L	Increasing	Not Evaluated - Majority of data (>50%) non-detect	20	11	0.005	2.36e-05	0.00351	8	2	0.005	NA	NA
CCR-AP-1R	Chromium, Total	mg/L	Increasing	No Trend	22	22	0.16	0.00312	0.0152	8	8	0.11	0.0028	0.902
CCR-AP-2	Chromium, Total	mg/L	Increasing	Increasing	22	22	0.14	0.004	0.000307	8	8	0.14	0.0163	0.0187
CCR-AP-3	Chromium, Total	mg/L	No Trend	No Trend	21	17	0.014	3.61e-05	0.15	8	7	0.014	0.000138	0.618
CCR-AP-4R	Chromium, Total	mg/L	No Trend	No Trend	20	18	0.0493	0.000386	0.144	8	7	0.0493	0.000317	0.902
CCR-AP-5	Chromium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Probably Increasing	21	5	0.056	NA	NA	8	4	0.056	0.00236	0.0842

Abbreviations: CF = confidence facotr; CV = coefficient of variation; mg/L = milligrams per liter; pCi/L = picocuries per liter.

Notes: *Recent data defined as the 8 most recent data points. MK = Mann Kendall Trend Test. Secular Trend Classification based on Aziz (2003) guidance and MK Results. Thiel-Sen slope and p-value evaluated at 95% confidence level to confirm MK trends.

Additional information about trend analysis provided in Attachment A.

			Identified Trends		Trend Analysis on All Available Data					Trend Analysis on Recent Data				
Location	Chemical	Units	Trend (All Data)	Trend (Recent Data)	Results, n	Detected Results, n	Max Concentration	Sen Slope (magnitude per year)	p-value	*Results, n	*Detected Results, n	*Max Concentration	*Sen Slope (magnitude per year)	*p-value
CCR-AP-6	Chromium, Total	mg/L	Stable	No Trend	21	20	0.043	-0.000148	0.545	8	7	0.043	-0.00035	0.536
CCR-AP-7	Chromium, Total	mg/L	No Trend	Not Evaluated - Only one detected result	23	12	0.019	0	0.808	8	1	0.0062	NA	NA
CCR-AP-8	Chromium, Total	mg/L	No Trend	No Trend	20	18	0.014	9.72e-06	0.922	8	7	0.014	-0.000287	0.618
CCR-AP-9	Chromium, Total	mg/L	Increasing	No Trend	20	20	0.15	0.00129	0.0052	8	8	0.045	0.00108	0.803
CCR-AP-1R	Cobalt, Total	mg/L	Increasing	Stable	22	22	0.081	0.00192	0.00523	8	8	0.08	-0.000633	0.902
CCR-AP-2	Cobalt, Total	mg/L	Increasing	Probably Increasing	22	22	0.091	0.00164	5.41e-05	8	8	0.091	0.00774	0.0635
CCR-AP-3	Cobalt, Total	mg/L	Decreasing	No Trend	21	21	0.0094	-0.000195	0.000258	8	8	0.0092	0.0001	0.902
CCR-AP-4R	Cobalt, Total	mg/L	No Trend	Stable	21	21	0.0175	1.44e-05	0.856	8	8	0.0175	-0.000179	0.902
CCR-AP-5	Cobalt, Total	mg/L	Decreasing	Increasing	21	21	0.01	-0.000355	0.00225	8	8	0.01	0.000712	0.0461
CCR-AP-6	Cobalt, Total	mg/L	Stable	Stable	21	21	0.019	-0.000168	0.264	8	8	0.019	-0.000147	0.711
CCR-AP-7	Cobalt, Total	mg/L	Decreasing	No Trend	23	21	0.015	-9e-05	0.013	8	6	0.0049	2.47e-05	0.902
CCR-AP-8	Cobalt, Total	mg/L	Decreasing	Stable	21	21	0.017	-0.000475	0.000275	8	8	0.012	-0.000545	0.536
CCR-AP-9	Cobalt, Total	mg/L	Increasing	Stable	20	20	0.047	0.000341	0.0286	8	8	0.023	0	1
CCR-AP-1R	Fluoride	mg/L	Decreasing	Decreasing	22	22	0.81	-0.00692	0.00594	8	8	0.63	-0.02	0.00609
CCR-AP-2	Fluoride	mg/L	Increasing	No Trend	22	22	0.69	0.0167	0.000171	8	8	0.69	0.03	0.618
CCR-AP-3	Fluoride	mg/L	Stable	Stable	21	20	0.93	-0.0105	0.183	8	8	0.57	-0.0179	0.266
CCR-AP-4R	Fluoride	mg/L	No Trend	No Trend	21	20	0.64	0.005	0.333	8	8	0.64	0.0117	0.902
CCR-AP-5	Fluoride	mg/L	Increasing	No Trend	21	21	2.3	0.05	0.000765	8	8	2.3	0.139	0.258
CCR-AP-6	Fluoride	mg/L	Stable	No Trend	21	21	0.69	-0.00375	0.694	8	8	0.69	0.009	0.902
CCR-AP-7	Fluoride	mg/L	Increasing	No Trend	22	22	0.72	0.00875	0.019	8	8	0.72	0.0267	0.618
CCR-AP-8	Fluoride	mg/L	No Trend	No Trend	21	20	1.1	0.00764	0.238	8	8	1.1	0.0333	0.319
CCR-AP-9	Fluoride	mg/L	No Trend	No Trend	20	20	0.42	0.00172	0.415	8	8	0.39	0.0045	0.618
CCR-AP-1R	Lead, Total	mg/L	Increasing	Stable	22	22	0.094	0.00194	0.00572	8	8	0.078	0.00025	1
CCR-AP-2	Lead, Total	mg/L	Increasing	Increasing	22	22	0.1	0.0025	0.000271	8	8	0.1	0.0101	0.0354
CCR-AP-3	Lead, Total	mg/L	Increasing	No Trend	21	17	0.01	2.23e-05	0.0314	8	7	0.01	0.000132	0.536
CCR-AP-4R	Lead, Total	mg/L	No Trend	Stable	21	21	0.039	0.000167	0.29	8	8	0.039	-0.00045	0.902
CCR-AP-5	Lead, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	21	8	0.02	NA	NA	8	6	0.02	0.000821	0.212
CCR-AP-6	Lead, Total	mg/L	Stable	No Trend	21	21	0.041	-8.22e-05	0.763	8	8	0.041	-4e-05	1
CCR-AP-7	Lead, Total	mg/L	Probably Decreasing	Not Evaluated - Majority of data (>50%) non-detect	23	14	0.02	-3.36e-05	0.0935	8	3	0.006	NA	NA
CCR-AP-8	Lead, Total	mg/L	No Trend	Stable	21	20	0.0076	3.33e-05	0.38	8	7	0.0061	-0.000133	0.711
CCR-AP-9	Lead, Total	mg/L	Increasing	Stable	20	20	0.041	0.000571	0.0193	8	8	0.025	-0.000425	0.803
CCR-AP-1R	Lithium, Total	mg/L	Increasing	No Trend	22	22	0.23	0.004	0.0139	8	8	0.15	0.0049	0.618
CCR-AP-2	Lithium, Total	mg/L	Probably Increasing	Increasing	22	17	0.125	0.0016	0.0508	8	8	0.11	0.0132	0.0187
CCR-AP-3	Lithium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	21	3	0.025	NA	NA	8	3	0.0043	NA	NA
CCR-AP-4R	Lithium, Total	mg/L	Stable	No Trend	21	15	0.047	-0.000219	0.375	8	7	0.025	0.000538	0.536
CCR-AP-5	Lithium, Total	mg/L	Decreasing	No Trend	21	21	0.15	-0.00563	1.3e-05	8	8	0.072	0.00214	0.536
CCR-AP-6	Lithium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	21	10	0.125	NA	NA	8	5	0.018	-0.000182	0.454
CCR-AP-7	Lithium, Total	mg/L	Decreasing	Stable	23	23	0.039	-0.000211	0.006	8	8	0.018	-0.00045	0.711
CCR-AP-8	Lithium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Only one detected result	21	5	0.025	NA	NA	8	1	0.0067	NA	NA
CCR-AP-9	Lithium, Total	mg/L	Increasing	Stable	20	20	0.12	0.000858	0.0345	8	8	0.072	-0.00217	0.711
CCR-AP-1R	Mercury, Total	mg/L	Not Evaluated - No detected results	Not Evaluated - No detected results	21	0	0.001	NA	NA	8	0	0.001	NA	NA
CCR-AP-2	Mercury, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Increasing	21	8	0.00071	NA	NA	8	6	0.00071	4.8e-05	0.0327
CCR-AP-3	Mercury, Total	mg/L	Not Evaluated - No detected results	Not Evaluated - No detected results	20	0	0.00025	NA	NA	8	0	0.00025	NA	NA
CCR-AP-4R	Mercury, Total	mg/L	Not Evaluated - No detected results	Not Evaluated - No detected results	20	0	0.00025	NA	NA	8	0	0.00025	NA	NA
CCR-AP-5	Mercury, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	20	3	0.0016	NA	NA	8	3	0.0016	NA	NA
CCR-AP-6	Mercury, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	20	2	0.00041	NA	NA	8	2	0.00041	NA	NA
CCR-AP-7	Mercury, Total	mg/L	Not Evaluated - No detected results	Not Evaluated - No detected results	20	0	0.00025	NA	NA	8	0	0.00025	NA	NA
CCR-AP-8	Mercury, Total	mg/L	Not Evaluated - Only one detected result	Not Evaluated - Only one detected result	20	1	0.00026	NA	NA	8	1	0.00026	NA	NA
CCR-AP-9	Mercury, Total	mg/L	Not Evaluated - No detected results	Not Evaluated - No detected results	19	0	0.0001	NA	NA	8	0	0.0001	NA	NA
CCR-AP-1R	Molybdenum, Total	mg/L	Stable	Stable	22	22	0.023	-2.5e-05	0.755	8	8	0.023	-0.000264	0.212
CCR-AP-2	Molybdenum, Total	mg/L	Increasing	No Trend	22	22	0.01	0.000358	2.01e-05	8	8	0.01	0.000533	0.108
CCR-AP-3	Molybdenum, Total	mg/L	Decreasing	No Trend	21	21	0.025	-0.0003	0.0074	8	8	0.025	0.000213	0.803
CCR-AP-4R	Molybdenum, Total	mg/L	Increasing	No Trend	21	18	0.01	0.000113	0.0312	8	5	0.01	0.00025	0.61
CCR-AP-5	Molybdenum, Total	mg/L	Decreasing	Stable	21	21	0.53	-0.0121	0.00266	8	8	0.34	-0.015	0.53
CCR-AP-6	Molybdenum, Total	mg/L	Stable	Stable	21	21	0.037	-7.74e-05	0.738	8	8	0.037	-0.0005	0.454
CCR-AP-7	Molybdenum, Total	mg/L	Decreasing	No Trend	23	22	0.013	-0.00025	1.8e-05	8	7	0.0025	7.32e-05	0.803
CCR-AP-8	Molybdenum, Total	mg/L	Stable	Stable	21	21	0.029	0	0.903	8	8	0.029	-8.33e-05	1
CCR-AP-9	Molybdenum, Total	mg/L	Decreasing	No Trend	20	18	0.025	-0.000292	0.00428	8	6	0.025	-0.00025	0.386
CCR-AP-1R	Radium-226 & 228	pCi/L	No Trend	No Trend	20	20	14.4	0.0993	0.23	8	8	14.4	1.6	0.266
CCR-AP-2	Radium-226 & 228	pCi/L	No Trend	No Trend	20	19	5.53	0.00427	0.974	8	7	5.53	0.252	0.711
CCR-AP-3	Radium-226 & 228	pCi/L	No Trend	No Trend	19	18	4.87	0.0048	1	8	7	4.87	0.189	0.386

Abbreviations: CF = confidence facotr; CV = coefficient of variation; mg/L = milligrams per liter; pCi/L = picocuries per liter.

Notes: *Recent data defined as the 8 most recent data points. MK = Mann Kendall Trend Test. Secular Trend Classification based on Aziz (2003) guidance and MK Results. Thiel-Sen slope and p-value evaluated at 95% confidence level to confirm MK trends.

Additional information about trend analysis provided in Attachment A.

			Identified Trends		Trend Analysis on All Available Data					Trend Analysis on Recent Data				
Location	Chemical	Units	Trend (All Data)	Trend (Recent Data)	Results, n	Detected Results, n	Max Concentration	Sen Slope (magnitude per year)	p-value	*Results, n	*Detected Results, n	*Max Concentration	*Sen Slope (magnitude per year)	*p-value
CCR-AP-4R	Radium-226 & 228	pCi/L	No Trend	No Trend	19	19	30	0.03	0.675	8	8	30	0.324	0.174
CCR-AP-5	Radium-226 & 228	pCi/L	No Trend	Increasing	19	19	5.54	0.0501	0.363	8	8	5.54	0.683	0.00937
CCR-AP-6	Radium-226 & 228	pCi/L	No Trend	No Trend	19	19	10.2	0.0118	0.576	8	8	3.21	0.2	0.266
CCR-AP-7	Radium-226 & 228	pCi/L	Stable	Increasing	20	20	1.72	-0.0163	0.417	8	8	1.44	0.161	0.0187
CCR-AP-8	Radium-226 & 228	pCi/L	Stable	No Trend	18	18	2.88	-0.0145	0.544	8	8	2.88	0.0846	0.711
CCR-AP-9	Radium-226 & 228	pCi/L	Probably Increasing	No Trend	18	18	12.6	0.154	0.0956	8	8	12.6	0.583	0.386
CCR-AP-1R	Selenium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	22	10	0.025	NA	NA	8	5	0.0125	-0.0002	0.135
CCR-AP-2	Selenium, Total	mg/L	Increasing	No Trend	22	15	0.026	0.000171	0.0115	8	7	0.013	0.00035	0.386
CCR-AP-3	Selenium, Total	mg/L	Probably Increasing	No Trend	21	20	0.0068	1.79e-05	0.0752	8	8	0.003	1.25e-05	0.421
CCR-AP-4R	Selenium, Total	mg/L	Probably Increasing	No Trend	21	11	0.031	2.84e-05	0.0717	8	4	0.0036	0.000108	0.18
CCR-AP-5	Selenium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Increasing	21	7	0.025	NA	NA	8	6	0.02	0.0004	0.00609
CCR-AP-6	Selenium, Total	mg/L	No Trend	Stable	21	17	0.0125	9.55e-06	0.563	8	7	0.003	-0.000123	0.386
CCR-AP-7	Selenium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Only one detected result	21	3	0.0028	NA	NA	8	1	0.0028	NA	NA
CCR-AP-8	Selenium, Total	mg/L	No Trend	Stable	21	18	0.007	6.11e-06	0.693	8	8	0.0051	-0.00015	0.266
CCR-AP-9	Selenium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	20	6	0.025	NA	NA	8	2	0.025	NA	NA
CCR-AP-1R	Thallium, Total	mg/L	Increasing	No Trend	22	16	0.0027	3.13e-05	0.0187	8	5	0.0027	1.5e-05	0.618
CCR-AP-2	Thallium, Total	mg/L	Increasing	No Trend	22	19	0.0076	5.6e-05	6.75e-05	8	7	0.0076	0.000117	0.379
CCR-AP-3	Thallium, Total	mg/L	Not Evaluated - Only one detected result	Not Evaluated - No detected results	21	1	0.001	NA	NA	8	0	0.001	NA	NA
CCR-AP-4R	Thallium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	21	10	0.0025	NA	NA	8	2	0.001	NA	NA
CCR-AP-5	Thallium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	21	7	0.005	NA	NA	8	4	0.00096	1.5e-05	0.507
CCR-AP-6	Thallium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - No detected results	21	8	0.0025	NA	NA	8	0	0.001	NA	NA
CCR-AP-7	Thallium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - No detected results	23	4	0.001	NA	NA	8	0	0.001	NA	NA
CCR-AP-8	Thallium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - No detected results	21	5	0.001	NA	NA	8	0	0.001	NA	NA
CCR-AP-9	Thallium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - No detected results	20	9	0.005	NA	NA	8	0	0.005	NA	NA

Abbreviations: CF = confidence facotr; CV = coefficient of variation; mg/L = milligrams per liter; pCi/L = picocuries per liter.

Notes: *Recent data defined as the 8 most recent data points. MK = Mann Kendall Trend Test. Secular Trend Classification based on Aziz (2003) guidance and MK Results. Thiel-Sen slope and p-value evaluated at 95% confidence level to confirm MK trends.

Additional information about trend analysis provided in Attachment A.

ATTACHMENT A
Assessment Monitoring Statistical Analysis Summary – November 2023

Table A-1. Descriptive Statistics

Location	Constituent	Units	n	n, non-detects	percent of non-detects	max	min	mean	median	standard deviation	variance	reporting limit range	date range
CCR-AP-1R	Antimony, Total	mg/L	22	6	27	0.02000	0.00053	0.0036	0.0017	0.0057	3.2e-05	0.002 - 0.02	2016-06-10 to 2023-11-02
CCR-AP-2	Antimony, Total	mg/L	22	9	41	0.02000	0.00024	0.00357	0.002	0.0046	2.1e-05	0.002 - 0.02	2016-06-10 to 2023-11-02
CCR-AP-3	Antimony, Total	mg/L	21	16	76	0.00500	0.00031	0.00195	0.002	0.00087	7.6e-07	0.002 - 0.002	2016-06-10 to 2023-11-02
CCR-AP-4R	Antimony, Total	mg/L	21	14	67	0.02800	0.0004	0.00343	0.002	0.0059	3.5e-05	0.002 - 0.01	2016-06-10 to 2023-11-02
CCR-AP-5	Antimony, Total	mg/L	21	15	71	0.02000	5.8e-05	0.00273	0.002	0.0041	1.6e-05	0.002 - 0.02	2016-06-10 to 2023-11-02
CCR-AP-6	Antimony, Total	mg/L	21	9	43	0.01800	0.00042	0.00254	0.0017	0.0041	1.7e-05	0.002 - 0.01	2016-06-10 to 2023-11-02
CCR-AP-7	Antimony, Total	mg/L	23	20	87	0.00500	0.00016	0.00194	0.002	0.00084	7.1e-07	0.002 - 0.005	2016-06-10 to 2023-11-06
CCR-AP-8	Antimony, Total	mg/L	21	6	29	0.00460	0.0004	0.00135	0.0011	0.00097	9.5e-07	0.002 - 0.002	2017-03-09 to 2023-11-02
CCR-AP-9	Antimony, Total	mg/L	20	5	25	0.02000	0.00061	0.00437	0.0014	0.006	3.6e-05	0.002 - 0.02	2017-03-09 to 2023-05-23
CCR-AP-1R	Arsenic, Total	mg/L	22	0	0	0.03800	0.0024	0.0166	0.0135	0.011	0.00013	NA	2016-06-10 to 2023-11-02
CCR-AP-2	Arsenic, Total	mg/L	22	0	0	0.04800	0.0016	0.0155	0.013	0.013	0.00016	NA	2016-06-10 to 2023-11-02
CCR-AP-3	Arsenic, Total	mg/L	21	0	0	0.09500	0.058	0.0765	0.077	0.0087	7.6e-05	NA	2016-06-10 to 2023-11-02
CCR-AP-4R	Arsenic, Total	mg/L	21	0	0	0.33000	0.027	0.115	0.086	0.081	0.0065	NA	2016-06-10 to 2023-11-02
CCR-AP-5	Arsenic, Total	mg/L	20	2	10	0.02400	0.00039	0.00458	0.00105	0.0073	5.3e-05	0.001 - 0.01	2016-06-10 to 2023-11-02
CCR-AP-6	Arsenic, Total	mg/L	21	0	0	0.12000	0.04	0.0943	0.1	0.022	0.00046	NA	2016-06-10 to 2023-11-02
CCR-AP-7	Arsenic, Total	mg/L	23	0	0	0.01800	0.00066	0.00588	0.0055	0.0041	1.7e-05	NA	2016-06-10 to 2023-11-06
CCR-AP-8	Arsenic, Total	mg/L	21	0	0	0.12000	0.044	0.0898	0.095	0.022	0.00048	NA	2017-03-09 to 2023-11-02
CCR-AP-9	Arsenic, Total	mg/L	20	0	0	0.03200	0.0031	0.0104	0.00875	0.0063	4e-05	NA	2017-03-09 to 2023-05-23
CCR-AP-1R	Barium, Total	mg/L	22	0	0	0.59000	0.05	0.228	0.18	0.16	0.024	NA	2016-06-10 to 2023-11-02
CCR-AP-2	Barium, Total	mg/L	22	0	0	0.64000	0.038	0.25	0.235	0.17	0.029	NA	2016-06-10 to 2023-11-02
CCR-AP-3	Barium, Total	mg/L	21	0	0	0.49000	0.38	0.431	0.43	0.032	0.001	NA	2016-06-10 to 2023-11-02
CCR-AP-4R	Barium, Total	mg/L	21	0	0	1.40000	0.45	0.703	0.63	0.25	0.061	NA	2016-06-10 to 2023-11-02
CCR-AP-5	Barium, Total	mg/L	21	0	0	0.20000	0.029	0.062	0.041	0.045	0.002	NA	2016-06-10 to 2023-11-02
CCR-AP-6	Barium, Total	mg/L	21	0	0	0.69000	0.48	0.582	0.58	0.066	0.0044	NA	2016-06-10 to 2023-11-02
CCR-AP-7	Barium, Total	mg/L	23	0	0	0.19000	0.076	0.128	0.12	0.029	0.00083	NA	2016-06-10 to 2023-11-06
CCR-AP-8	Barium, Total	mg/L	21	0	0	0.68000	0.31	0.543	0.57	0.096	0.0091	NA	2017-03-09 to 2023-11-02
CCR-AP-9	Barium, Total	mg/L	20	0	0	0.72000	0.13	0.293	0.27	0.12	0.015	NA	2017-03-09 to 2023-05-23
CCR-AP-1R	Beryllium, Total	mg/L	22	0	0	0.00660	0.00011	0.0027	0.0021	0.0022	4.7e-06	NA	2016-06-10 to 2023-11-02
CCR-AP-2	Beryllium, Total	mg/L	22	0	0	0.00770	0.00014	0.0021	0.0018	0.0021	4.2e-06	NA	2016-06-10 to 2023-11-02
CCR-AP-3	Beryllium, Total	mg/L	21	20	95	0.00100	0.00056	0.000979	0.001	9.6e-05	9.2e-09	0.001 - 0.001	2016-06-10 to 2023-11-02
CCR-AP-4R	Beryllium, Total	mg/L	21	6	29	0.00170	0.00014	0.000693	0.00061	0.00044	1.9e-07	0.001 - 0.001	2016-06-10 to 2023-11-02
CCR-AP-5	Beryllium, Total	mg/L	21	15	71	0.01000	0.00017	0.00133	0.001	0.002	4e-06	0.001 - 0.01	2016-06-10 to 2023-11-02
CCR-AP-6	Beryllium, Total	mg/L	21	8	38	0.00500	0.00011	0.000796	0.0005	0.001	1e-06	0.0005 - 0.005	2016-06-10 to 2023-11-02
CCR-AP-7	Beryllium, Total	mg/L	23	16	70	0.00100	6.7e-05	0.00075	0.001	0.00037	1.4e-07	0.0005 - 0.001	2016-06-10 to 2023-11-06
CCR-AP-8	Beryllium, Total	mg/L	21	15	71	0.00100	0.00016	0.000763	0.001	0.00035	1.2e-07	0.0005 - 0.001	2017-03-09 to 2023-11-02
CCR-AP-9	Beryllium, Total	mg/L	20	1	5	0.01000	0.00017	0.00146	0.00091	0.0022	4.7e-06	0.01 - 0.01	2017-03-09 to 2023-05-23
CCR-AP-1R	Cadmium, Total	mg/L	22	12	55	0.01000	8.1e-05	0.00207	0.001	0.003	9e-06	0.001 - 0.01	2016-06-10 to 2023-11-02
CCR-AP-2	Cadmium, Total	mg/L	22	3	14	0.01000	0.00011	0.00197	0.000875	0.0025	6.2e-06	0.005 - 0.01	2016-06-10 to 2023-11-02
CCR-AP-3	Cadmium, Total	mg/L	21	20	95	0.00100	0.00038	0.00097	0.001	0.00014	1.8e-08	0.001 - 0.001	2016-06-10 to 2023-11-02
CCR-AP-4R	Cadmium, Total	mg/L	21	11	52	0.00500	0.00014	0.000883	0.001	0.001	1e-06	0.001 - 0.005	2016-06-10 to 2023-11-02
CCR-AP-5	Cadmium, Total	mg/L	21	5	24	0.01000	0.00015	0.00106	0.00057	0.0021	4.3e-06	0.001 - 0.01	2016-06-10 to 2023-11-02
CCR-AP-6	Cadmium, Total	mg/L	21	8	38	0.00110	9.4e-05	0.000621	0.00052	0.00037	1.4e-07	0.001 - 0.001	2016-06-10 to 2023-11-02
CCR-AP-7	Cadmium, Total	mg/L	23	21	91	0.00100	0.00014	0.000911	0.001	0.00024	5.8e-08	0.0005 - 0.001	2016-06-10 to 2023-11-06
CCR-AP-8	Cadmium, Total	mg/L	21	15	71	0.00100	0.00016	0.000796	0.001	0.00034	1.2e-07	0.001 - 0.001	2017-03-09 to 2023-11-02
CCR-AP-9	Cadmium, Total	mg/L	20	9	45	0.01000	7.9e-05	0.00184	0.00031	0.0031	9.9e-06	0.001 - 0.01	2017-03-09 to 2023-05-23
CCR-AP-1R	Chromium, Total	mg/L	22	0	0	0.16000	0.0019	0.0573	0.0455	0.047	0.0022	NA	2016-06-10 to 2023-11-02
CCR-AP-2	Chromium, Total	mg/L	22	0	0	0.14000	0.003	0.0414	0.034	0.035	0.0012	NA	2016-06-10 to 2023-11-02
CCR-AP-3	Chromium, Total	mg/L	21	4	19	0.01400	0.0018	0.00297	0.0021	0.0026	6.8e-06	0.002 - 0.002	2016-06-10 to 2023-11-02
CCR-AP-4R	Chromium, Total	mg/L	20	2	10	0.05800	0.0015	0.013	0.00785	0.015	0.00022	0.002 - 0.0034	2016-06-10 to 2023-11-02
CCR-AP-5	Chromium, Total	mg/L	21	16	76	0.05600	0.0014	0.00694	0.002	0.013	0.00017	0.002 - 0.02	2016-06-10 to 2023-11-02
CCR-AP-6	Chromium, Total	mg/L	21	1	5	0.04300	0.0019	0.0133	0.0098	0.011	0.00012	0.002 - 0.002	2016-06-10 to 2023-11-02
CCR-AP-7	Chromium, Total	mg/L	23	11	48	0.01900	0.00047	0.00385	0.002	0.004	1.6e-05	0.002 - 0.01	2016-06-10 to 2023-11-06
CCR-AP-8	Chromium, Total	mg/L	20	2	10	0.01400	0.0012	0.00432	0.0029	0.0035	1.2e-05	0.002 - 0.0034	2017-03-09 to 2023-11-02
CCR-AP-9	Chromium, Total	mg/L	20	0	0	0.15000	0.0042	0.0262	0.017	0.032	0.00099	NA	2017-03-09 to 2023-05-23
CCR-AP-1R	Cobalt, Total	mg/L	22	0	0	0.08100	0.0015	0.0318	0.027	0.026	0.00067	NA	2016-06-10 to 2023-11-02
CCR-AP-2	Cobalt, Total	mg/L	22	0	0	0.09100	0.0073	0.0277	0.022	0.02	0.00039	NA	2016-06-10 to 2023-11-02
CCR-AP-3	Cobalt, Total	mg/L	21	0	0	0.00940	0.004	0.00602	0.0056	0.0016	2.5e-06	NA	2016-06-10 to 2023-11-02
CCR-AP-4R	Cobalt, Total	mg/L	21	0	0	0.02100	0.00071	0.00701	0.0055	0.0056	3.1e-05	NA	2016-06-10 to 2023-11-02
CCR-AP-5	Cobalt, Total	mg/L	21	0	0	0.01000	0.00036	0.00407	0.0041	0.0026	6.8e-06	NA	2016-06-10 to 2023-11-02
CCR-AP-6	Cobalt, Total	mg/L	21	0	0	0.01900	0.0034	0.00879	0.0075	0.0044	1.9e-05	NA	2016-06-10 to 2023-11-02
CCR-AP-7	Cobalt, Total	mg/L	23	2	9	0.01500	0.00021	0.00226	0.001	0.0032	1e-05	0.0005 - 0.002	2016-06-10 to 2023-11-06
CCR-AP-8	Cobalt, Total	mg/L	21	0	0	0.01700	0.0026	0.00876	0.0082	0.0038	1.5e-05	NA	2017-03-09 to 2023-11-02
CCR-AP-9	Cobalt, Total	mg/L	20	0	0	0.04700	0.0062	0.0152	0.014	0.0085	7.2e-05	NA	2017-03-09 to 2023-05-23
CCR-AP-1R	Fluoride	mg/L	22	0	0	0.81000	0.34	0.506	0.485	0.096	0.0091	NA	2016-06-10 to 2023-11-02
CCR-AP-2	Fluoride	mg/L	22	0	0	0.69000	0.11	0.366	0.31	0.15	0.023	NA	2016-06-10 to 2023-11-02
CCR-AP-3	Fluoride	mg/L	21	1	5	0.93000	0.1	0.404	0.39	0.19	0.036	0.1 - 0.1	2016-06-10 to 2023-11-02
CCR-AP-4R	Fluoride	mg/L	21	1	5	0.64000	0.1	0.379	0.37	0.11	0.012	0.1 - 0.1	2016-06-10 to 2023-11-02
CCR-AP-5	Fluoride	mg/L	21	0	0	2.30000	0.58	1.29	1.2	0.45	0.2	NA	2016-06-10 to 2023-11-02
CCR-AP-6	Fluoride	mg/L	21	0	0	0.69000	0.24	0.496	0.48	0.13	0.017	NA	2016-06-10 to 2023-11-02
CCR-AP-7	Fluoride	mg/L	22	0	0	0.72000	0.14	0.334	0.295	0.13	0.018	NA	2016-08-12 to 2023-11-06
CCR-AP-8	Fluoride	mg/L	21	1	5	1.10000	0.1	0.326	0.28	0.21	0.043	0.1 - 0.1	2017-03-09 to 2023-11-02
CCR-AP-9	Fluoride	mg/L	20	0	0	0.42000	0.14	0.33	0.345	0.065	0.0043	NA	2017-03-09 to 2023-05-23
CCR-AP-1R	Lead, Total	mg/L	22	0	0	0.09400	0.0011	0.0348	0.028	0.028	0.0008	NA	2016-06-10 to 2023-11-02
CCR-AP-2	Lead, Total	mg/L	22	0	0	0.10000	0.0023	0.028	0.0225	0.025	0.00061	NA	2016-06-10 to 2023-11-02

Note:

Units: mg/L = milligrams per liter, pCi/L = picocuries per liter

Location	Constituent	Units	n	n, non-detects	percent of non-detects	max	min	mean	median	standard deviation	variance	reporting limit range	date range
CCR-AP-3	Lead, Total	mg/L	21	4	19	0.01000	0.00021	0.00122	0.00078	0.002	4.2e-06	0.001 - 0.001	2016-06-10 to 2023-11-02
CCR-AP-4R	Lead, Total	mg/L	21	0	0	0.04700	0.00052	0.0105	0.0048	0.013	0.00016	NA	2016-06-10 to 2023-11-02
CCR-AP-5	Lead, Total	mg/L	21	13	62	0.02000	9.9e-05	0.00262	0.001	0.0047	2.2e-05	0.001 - 0.01	2016-06-10 to 2023-11-02
CCR-AP-6	Lead, Total	mg/L	21	0	0	0.04100	0.00039	0.00993	0.0071	0.0096	9.2e-05	NA	2016-06-10 to 2023-11-02
CCR-AP-7	Lead, Total	mg/L	23	9	39	0.02000	0.00013	0.00299	0.001	0.0044	1.9e-05	0.001 - 0.003	2016-06-10 to 2023-11-06
CCR-AP-8	Lead, Total	mg/L	21	1	5	0.00760	0.00027	0.00218	0.0017	0.0018	3.3e-06	0.003 - 0.003	2017-03-09 to 2023-11-02
CCR-AP-9	Lead, Total	mg/L	20	0	0	0.04100	0.0025	0.0128	0.0105	0.0089	7.9e-05	NA	2017-03-09 to 2023-05-23
CCR-AP-1R	Lithium, Total	mg/L	22	0	0	0.23000	0.035	0.094	0.0805	0.054	0.0029	NA	2016-06-10 to 2023-11-02
CCR-AP-2	Lithium, Total	mg/L	22	5	23	0.25000	0.01	0.0514	0.0395	0.051	0.0026	0.05 - 0.25	2016-06-10 to 2023-11-02
CCR-AP-3	Lithium, Total	mg/L	21	18	86	0.05000	0.0021	0.0241	0.005	0.023	0.00053	0.005 - 0.05	2016-06-10 to 2023-11-02
CCR-AP-4R	Lithium, Total	mg/L	21	6	29	0.05000	0.0028	0.0212	0.011	0.019	0.00037	0.005 - 0.05	2016-06-10 to 2023-11-02
CCR-AP-5	Lithium, Total	mg/L	21	0	0	0.15000	0.009	0.093	0.095	0.042	0.0018	NA	2016-06-10 to 2023-11-02
CCR-AP-6	Lithium, Total	mg/L	21	11	52	0.25000	0.0014	0.034	0.014	0.053	0.0029	0.005 - 0.25	2016-06-10 to 2023-11-02
CCR-AP-7	Lithium, Total	mg/L	23	0	0	0.03900	0.007	0.0135	0.011	0.0068	4.7e-05	NA	2016-06-10 to 2023-11-06
CCR-AP-8	Lithium, Total	mg/L	21	16	76	0.05000	0.0031	0.023	0.008	0.022	0.00048	0.005 - 0.05	2017-03-09 to 2023-11-02
CCR-AP-9	Lithium, Total	mg/L	20	0	0	0.12000	0.029	0.0478	0.0405	0.02	0.00042	NA	2017-03-09 to 2023-05-23
CCR-AP-1R	Mercury, Total	mg/L	21	21	100	0.00200	0.0002	0.000314	0.0002	0.0004	1.6e-07	0.0002 - 0.002	2016-06-10 to 2023-11-02
CCR-AP-2	Mercury, Total	mg/L	21	13	62	0.00071	0.00015	0.000243	0.0002	0.00013	1.6e-08	0.0002 - 0.0002	2016-06-10 to 2023-11-02
CCR-AP-3	Mercury, Total	mg/L	20	20	100	0.00050	0.0002	0.000215	0.0002	6.7e-05	4.5e-09	0.0002 - 0.0005	2016-06-10 to 2023-11-02
CCR-AP-4R	Mercury, Total	mg/L	20	20	100	0.00050	0.0002	0.000225	0.0002	7.9e-05	6.2e-09	0.0002 - 0.0005	2016-06-10 to 2023-11-02
CCR-AP-5	Mercury, Total	mg/L	20	17	85	0.00160	0.0002	0.000311	0.0002	0.00034	1.2e-07	0.0002 - 0.0002	2016-06-10 to 2023-11-02
CCR-AP-6	Mercury, Total	mg/L	20	18	90	0.00050	0.00017	0.000224	0.0002	8.1e-05	6.5e-09	0.0002 - 0.0005	2016-06-10 to 2023-11-02
CCR-AP-7	Mercury, Total	mg/L	20	20	100	0.00050	0.0002	0.000215	0.0002	6.7e-05	4.5e-09	0.0002 - 0.0005	2016-06-10 to 2023-11-06
CCR-AP-8	Mercury, Total	mg/L	20	19	95	0.00050	0.0002	0.000218	0.0002	6.8e-05	4.6e-09	0.0002 - 0.0005	2017-03-09 to 2023-11-02
CCR-AP-9	Mercury, Total	mg/L	19	19	100	0.00020	0.0002	0.0002	0.0002	0	0	0.0002 - 0.0002	2017-03-09 to 2023-05-23
CCR-AP-1R	Molybdenum, Total	mg/L	22	0	0	0.02300	0.0047	0.00945	0.0086	0.004	1.6e-05	NA	2016-06-10 to 2023-11-02
CCR-AP-2	Molybdenum, Total	mg/L	22	0	0	0.01000	0.00094	0.0047	0.0047	0.0027	7.5e-06	NA	2016-06-10 to 2023-11-02
CCR-AP-3	Molybdenum, Total	mg/L	21	0	0	0.02500	0.0065	0.0112	0.01	0.0039	1.5e-05	NA	2016-06-10 to 2023-11-02
CCR-AP-4R	Molybdenum, Total	mg/L	21	3	14	0.01000	0.00071	0.00318	0.0022	0.0026	6.9e-06	0.005 - 0.005	2016-06-10 to 2023-11-02
CCR-AP-5	Molybdenum, Total	mg/L	21	0	0	0.53000	0.046	0.294	0.33	0.12	0.014	NA	2016-06-10 to 2023-11-02
CCR-AP-6	Molybdenum, Total	mg/L	21	0	0	0.03700	0.015	0.0248	0.024	0.0056	3.2e-05	NA	2016-06-10 to 2023-11-02
CCR-AP-7	Molybdenum, Total	mg/L	23	1	4	0.01300	0.0011	0.00377	0.0025	0.0031	9.3e-06	0.005 - 0.005	2016-06-10 to 2023-11-06
CCR-AP-8	Molybdenum, Total	mg/L	21	0	0	0.02900	0.0029	0.0145	0.014	0.0055	3e-05	NA	2017-03-09 to 2023-11-02
CCR-AP-9	Molybdenum, Total	mg/L	20	2	10	0.05000	0.0018	0.00779	0.00495	0.01	0.00011	0.005 - 0.05	2017-03-09 to 2023-05-23
CCR-AP-1R	Radium-226 & 228	pCi/L	20	0	0	14.40000	0.862	4.75	4.58	3.3	11	NA	2016-06-10 to 2023-12-22
CCR-AP-2	Radium-226 & 228	pCi/L	20	1	5	5.53000	0.444	2.07	1.79	1.4	2.1	0.444 - 0.444	2016-06-10 to 2023-11-02
CCR-AP-3	Radium-226 & 228	pCi/L	19	1	5	4.87000	0.593	1.79	1.7	1.2	1.3	2.98 - 2.98	2016-06-10 to 2023-11-02
CCR-AP-4R	Radium-226 & 228	pCi/L	19	0	0	30.00000	1.07	3.9	2.4	6.4	41	NA	2016-06-10 to 2023-11-02
CCR-AP-5	Radium-226 & 228	pCi/L	19	0	0	5.54000	0.292	1.25	0.64	1.4	1.9	NA	2016-06-10 to 2023-11-02
CCR-AP-6	Radium-226 & 228	pCi/L	19	0	0	10.20000	0.351	2.47	1.68	2.2	4.9	NA	2016-06-10 to 2023-11-02
CCR-AP-7	Radium-226 & 228	pCi/L	20	0	0	1.72000	0.126	0.847	0.716	0.46	0.21	NA	2016-06-10 to 2023-11-06
CCR-AP-8	Radium-226 & 228	pCi/L	18	0	0	2.88000	0.449	1.46	1.48	0.66	0.43	NA	2017-03-09 to 2023-11-02
CCR-AP-9	Radium-226 & 228	pCi/L	18	0	0	12.60000	0.934	3.56	2.87	2.9	8.5	NA	2017-03-09 to 2023-05-23
CCR-AP-1R	Selenium, Total	mg/L	22	12	55	0.05000	0.00045	0.0114	0.005	0.015	0.00023	0.005 - 0.05	2016-06-10 to 2023-11-02
CCR-AP-2	Selenium, Total	mg/L	22	7	32	0.05000	0.00044	0.00882	0.005	0.012	0.00013	0.005 - 0.05	2016-06-10 to 2023-11-02
CCR-AP-3	Selenium, Total	mg/L	21	1	5	0.00680	0.00062	0.00223	0.0019	0.0013	1.7e-06	0.005 - 0.005	2016-06-10 to 2023-11-02
CCR-AP-4R	Selenium, Total	mg/L	21	10	48	0.03100	0.0009	0.00468	0.005	0.0063	3.9e-05	0.005 - 0.005	2016-06-10 to 2023-11-02
CCR-AP-5	Selenium, Total	mg/L	21	14	67	0.05000	0.0018	0.0076	0.005	0.01	0.00011	0.005 - 0.05	2016-06-10 to 2023-11-02
CCR-AP-6	Selenium, Total	mg/L	21	4	19	0.02500	0.001	0.00345	0.0019	0.0051	2.6e-05	0.005 - 0.025	2016-06-10 to 2023-11-02
CCR-AP-7	Selenium, Total	mg/L	21	18	86	0.00500	0.00035	0.00447	0.005	0.0014	1.9e-06	0.005 - 0.005	2016-06-10 to 2023-11-06
CCR-AP-8	Selenium, Total	mg/L	21	3	14	0.00700	0.0014	0.00271	0.0019	0.0016	2.7e-06	0.005 - 0.005	2017-03-09 to 2023-11-02
CCR-AP-9	Selenium, Total	mg/L	20	14	70	0.05000	0.001	0.0089	0.005	0.012	0.00014	0.005 - 0.05	2017-03-09 to 2023-05-23
CCR-AP-1R	Thallium, Total	mg/L	22	6	27	0.00500	7.9e-05	0.00102	0.0009	0.0011	1.2e-06	0.001 - 0.005	2016-06-10 to 2023-11-02
CCR-AP-2	Thallium, Total	mg/L	22	3	14	0.00760	4.8e-05	0.00117	0.000825	0.0018	3.1e-06	0.001 - 0.005	2016-06-10 to 2023-11-02
CCR-AP-3	Thallium, Total	mg/L	21	20	95	0.00200	0.0001	0.001	0.001	0.0003	9e-08	0.001 - 0.002	2016-06-10 to 2023-11-02
CCR-AP-4R	Thallium, Total	mg/L	21	11	52	0.00500	6.1e-05	0.000847	0.001	0.0011	1.2e-06	0.001 - 0.005	2016-06-10 to 2023-11-02
CCR-AP-5	Thallium, Total	mg/L	21	14	67	0.01000	6.5e-05	0.00119	0.001	0.0021	4.2e-06	0.001 - 0.01	2016-06-10 to 2023-11-02
CCR-AP-6	Thallium, Total	mg/L	21	13	62	0.00500	4.7e-05	0.000906	0.001	0.0011	1.1e-06	0.001 - 0.005	2016-06-10 to 2023-11-02
CCR-AP-7	Thallium, Total	mg/L	23	19	83	0.00200	6.6e-05	0.000906	0.001	0.0004	1.6e-07	0.001 - 0.002	2016-06-10 to 2023-11-06
CCR-AP-8	Thallium, Total	mg/L	21	16	76	0.00200	5.8e-05	0.00084	0.001	0.00046	2.1e-07	0.001 - 0.002	2017-03-09 to 2023-11-02
CCR-AP-9	Thallium, Total	mg/L	20	11	55	0.01000	9.8e-05	0.00133	0.001	0.0023	5.3e-06	0.001 - 0.01	2017-03-09 to 2023-05-23

Note:

Units: mg/L = milligrams per liter, pCi/L = picocuries per liter

Table A-2. Results of Shapiro-Wilk Test for Normality

				Shapiro-Wilk Test for Normality (R programming, package = stats, version 4.3.3, function = shapiro.test, non-detects substituted by 0.5*reporting limit)				Shapiro-Wilk Test for Lognormality on select datasets (R programming, package = stats, version 4.3.3, function = shapiro.test, non-detects substituted by 0.5*reporting limit, datasets log transformed)			
Location	**Constituent**	**n**	**n, non-detects**	**W statistic**	**p-value**	**Data Normality (significance level = 0.05)**	**Data Normality (significance level = 0.01)**	**W statistic**	**p-value**	**Data Normality (significance level = 0.05)**	**Data Normality (significance level = 0.01)**
CCR-AP-1R	Antimony, Total	22	6	0.6372	3.43e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-2	Antimony, Total	22	9	0.7025	2.11e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-3	Antimony, Total	21	16	0.4273	4.64e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-4R	Antimony, Total	21	14	0.3258	7.13e-09	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-5	Antimony, Total	21	15	0.4615	9.16e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-6	Antimony, Total	21	9	0.368	1.52e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-7	Antimony, Total	23	20	0.4792	5.46e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-8	Antimony, Total	21	6	0.5705	9.75e-07	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-9	Antimony, Total	20	5	0.7053	4.53e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Arsenic, Total	22	0	0.9073	0.0417	Not normal	Normal	NA	NA	NA	NA
CCR-AP-2	Arsenic, Total	22	0	0.8965	0.02527	Not normal	Normal	NA	NA	NA	NA
CCR-AP-3	Arsenic, Total	21	0	0.983	0.9612	Normal	Normal	NA	NA	NA	NA
CCR-AP-4R	Arsenic, Total	21	0	0.7996	0.0006464	Not normal	Not normal	0.9723	0.7831	Lognormal	Lognormal
CCR-AP-5	Arsenic, Total	20	2	0.5848	2.06e-06	Not normal	Not normal	0.8687	0.01113	Not normal	Lognormal
CCR-AP-6	Arsenic, Total	21	0	0.8715	0.01018	Not normal	Normal	NA	NA	NA	NA
CCR-AP-7	Arsenic, Total	23	0	0.8686	0.006032	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-8	Arsenic, Total	21	0	0.9448	0.2712	Normal	Normal	NA	NA	NA	NA
CCR-AP-9	Arsenic, Total	20	0	0.7489	0.000164	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Barium, Total	22	0	0.8819	0.01312	Not normal	Normal	NA	NA	NA	NA
CCR-AP-2	Barium, Total	22	0	0.9119	0.05174	Normal	Normal	NA	NA	NA	NA
CCR-AP-3	Barium, Total	21	0	0.9521	0.3731	Normal	Normal	NA	NA	NA	NA
CCR-AP-4R	Barium, Total	21	0	0.7672	0.0002157	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-5	Barium, Total	21	0	0.7223	5.29e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-6	Barium, Total	21	0	0.9457	0.282	Normal	Normal	NA	NA	NA	NA
CCR-AP-7	Barium, Total	23	0	0.9567	0.3997	Normal	Normal	NA	NA	NA	NA
CCR-AP-8	Barium, Total	21	0	0.9349	0.1722	Normal	Normal	NA	NA	NA	NA
CCR-AP-9	Barium, Total	20	0	0.7778	0.00041	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Beryllium, Total	22	0	0.89	0.01882	Not normal	Normal	NA	NA	NA	NA
CCR-AP-2	Beryllium, Total	22	0	0.786	0.0003046	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-3	Beryllium, Total	21	20	0.2284	1.4e-09	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-4R	Beryllium, Total	21	6	0.8028	0.0007251	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-5	Beryllium, Total	21	15	0.3958	2.54e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-6	Beryllium, Total	21	8	0.5847	1.36e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-7	Beryllium, Total	23	16	0.7676	0.0001213	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-8	Beryllium, Total	21	15	0.6685	1.14e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-9	Beryllium, Total	20	1	0.667	1.59e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Cadmium, Total	22	12	0.6371	3.42e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-2	Cadmium, Total	22	3	0.7407	6.75e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-3	Cadmium, Total	21	20	0.2284	1.4e-09	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-4R	Cadmium, Total	21	11	0.5419	5.07e-07	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-5	Cadmium, Total	21	5	0.4804	1.35e-07	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-6	Cadmium, Total	21	8	0.8228	0.001493	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-7	Cadmium, Total	23	21	0.4204	1.62e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-8	Cadmium, Total	21	15	0.6751	1.37e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-9	Cadmium, Total	20	9	0.5945	2.58e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Chromium, Total	22	0	0.8994	0.02887	Not normal	Normal	NA	NA	NA	NA
CCR-AP-2	Chromium, Total	22	0	0.8946	0.0232	Not normal	Normal	NA	NA	NA	NA
CCR-AP-3	Chromium, Total	21	4	0.5135	2.71e-07	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-4R	Chromium, Total	20	2	0.7581	0.0002188	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-5	Chromium, Total	21	16	0.4313	5.02e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-6	Chromium, Total	21	1	0.8563	0.005455	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-7	Chromium, Total	23	11	0.5967	8.3e-07	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-8	Chromium, Total	20	2	0.7875	0.0005657	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-9	Chromium, Total	20	0	0.5688	1.42e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Cobalt, Total	22	0	0.8809	0.01255	Not normal	Normal	NA	NA	NA	NA
CCR-AP-2	Cobalt, Total	22	0	0.7759	0.000215	Not normal	Not normal	0.9796	0.909	Lognormal	Lognormal
CCR-AP-3	Cobalt, Total	21	0	0.9188	0.08221	Normal	Normal	NA	NA	NA	NA
CCR-AP-4R	Cobalt, Total	21	0	0.8624	0.007	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-5	Cobalt, Total	21	0	0.9529	0.3867	Normal	Normal	NA	NA	NA	NA

				Shapiro-Wilk Test for Normality (R programming, package = stats, version 4.3.3, function = shapiro.test, non-detects substituted by 0.5*reporting limit)				Shapiro-Wilk Test for Lognormality on select datasets (R programming, package = stats, version 4.3.3, function = shapiro.test, non-detects substituted by 0.5*reporting limit, datasets log transformed)			
Location	**Constituent**	**n**	**n, non-detects**	**W statistic**	**p-value**	**Data Normality (significance level = 0.05)**	**Data Normality (significance level = 0.01)**	**W statistic**	**p-value**	**Data Normality (significance level = 0.05)**	**Data Normality (significance level = 0.01)**
CCR-AP-6	Cobalt, Total	21	0	0.912	0.06001	Normal	Normal	NA	NA	NA	NA
CCR-AP-7	Cobalt, Total	23	2	0.6111	1.2e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-8	Cobalt, Total	21	0	0.9659	0.6413	Normal	Normal	NA	NA	NA	NA
CCR-AP-9	Cobalt, Total	20	0	0.6873	2.74e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Fluoride	44	0	0.8774	0.0002353	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-2	Fluoride	44	0	0.9309	0.01121	Not normal	Normal	NA	NA	NA	NA
CCR-AP-3	Fluoride	42	2	0.9362	0.02117	Not normal	Normal	NA	NA	NA	NA
CCR-AP-4R	Fluoride	42	2	0.9349	0.0191	Not normal	Normal	NA	NA	NA	NA
CCR-AP-5	Fluoride	42	0	0.8864	0.0005783	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-6	Fluoride	42	0	0.9448	0.04207	Not normal	Normal	NA	NA	NA	NA
CCR-AP-7	Fluoride	44	0	0.8676	0.0001266	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-8	Fluoride	42	2	0.7346	2.33e-07	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-9	Fluoride	40	0	0.8556	0.0001233	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Lead, Total	22	0	0.8984	0.02756	Not normal	Normal	NA	NA	NA	NA
CCR-AP-2	Lead, Total	22	0	0.8718	0.008464	Not normal	Not normal	0.944	0.2388	Lognormal	Lognormal
CCR-AP-3	Lead, Total	21	4	0.3724	1.65e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-4R	Lead, Total	21	0	0.7147	4.23e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-5	Lead, Total	21	13	0.4576	8.46e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-6	Lead, Total	21	0	0.8002	0.0006598	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-7	Lead, Total	23	9	0.5867	6.47e-07	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-8	Lead, Total	21	1	0.7841	0.0003785	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-9	Lead, Total	20	0	0.8278	0.002312	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Lithium, Total	22	0	0.9014	0.03172	Not normal	Normal	NA	NA	NA	NA
CCR-AP-2	Lithium, Total	22	5	0.7974	0.0004551	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-3	Lithium, Total	21	18	0.6543	7.82e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-4R	Lithium, Total	21	6	0.8691	0.009226	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-5	Lithium, Total	21	0	0.9559	0.4379	Normal	Normal	NA	NA	NA	NA
CCR-AP-6	Lithium, Total	21	11	0.5462	5.58e-07	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-7	Lithium, Total	23	0	0.6987	1.35e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-8	Lithium, Total	21	16	0.7165	4.45e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-9	Lithium, Total	20	0	0.7294	9.11e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Mercury, Total	21	21	NA	NA	Not Evaluated - All Non-Detect Results	Not Evaluated - All Non-Detect Results	NA	NA	NA	NA
CCR-AP-2	Mercury, Total	21	13	0.603	2.12e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-3	Mercury, Total	20	20	NA	NA	Not Evaluated - All Non-Detect Results	Not Evaluated - All Non-Detect Results	NA	NA	NA	NA
CCR-AP-4R	Mercury, Total	20	20	NA	NA	Not Evaluated - All Non-Detect Results	Not Evaluated - All Non-Detect Results	NA	NA	NA	NA
CCR-AP-5	Mercury, Total	20	17	0.3998	4.45e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-6	Mercury, Total	20	18	0.4141	5.81e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-7	Mercury, Total	20	20	NA	NA	Not Evaluated - All Non-Detect Results	Not Evaluated - All Non-Detect Results	NA	NA	NA	NA
CCR-AP-8	Mercury, Total	20	19	0.3551	1.98e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-9	Mercury, Total	19	19	NA	NA	Not Evaluated - All Non-Detect Results	Not Evaluated - All Non-Detect Results	NA	NA	NA	NA
CCR-AP-1R	Molybdenum, Total	22	0	0.8283	0.001438	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-2	Molybdenum, Total	22	0	0.9395	0.1932	Normal	Normal	NA	NA	NA	NA
CCR-AP-3	Molybdenum, Total	21	0	0.7939	0.0005304	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-4R	Molybdenum, Total	21	3	0.6974	2.56e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-5	Molybdenum, Total	21	0	0.9467	0.2945	Normal	Normal	0.8362	0 002481	Not normal	Not normal
CCR-AP-6	Molybdenum, Total	21	0	0.9694	0.7203	Normal	Normal	NA	NA	NA	NA
CCR-AP-7	Molybdenum, Total	23	1	0.773	0.0001462	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-8	Molybdenum, Total	21	0	0.9174	0.0771	Normal	Normal	NA	NA	NA	NA
CCR-AP-9	Molybdenum, Total	20	2	0.7168	6.3e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Radium-226 & 228	38	0	0.9063	0.003864	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Radium-226 & 228	2	0	NA	NA	Not Evaluated - All Non-Detect Results	Not Evaluated - All Non-Detect Results	NA	NA	NA	NA
CCR-AP-2	Radium-226 & 228	40	2	0.8682	0.0002567	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-3	Radium-226 & 228	38	2	0.81	1.68e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-4R	Radium-226 & 228	38	0	0.3859	1.94e-11	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-5	Radium-226 & 228	38	0	0.6799	7.95e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-6	Radium-226 & 228	38	0	0.6464	2.51e-08	Not normal	Not normal	NA	NA	NA	NA

Location	Constituent	n	n, non-detects	Shapiro-Wilk Test for Normality (R programming, package = stats, version 4.3.3, function = shapiro.test, non-detects substituted by 0.5*reporting limit) W statistic	p-value	Data Normality (significance level = 0.05)	Data Normality (significance level = 0.01)	Shapiro-Wilk Test for Lognormality on select datasets (R programming, package = stats, version 4.3.3, function = shapiro.test, non-detects substituted by 0.5*reporting limit, datasets log transformed) W statistic	p-value	Data Normality (significance level = 0.05)	Data Normality (significance level = 0.01)
CCR-AP-7	Radium-226 & 228	40	0	0.9303	0.01645	Not normal	Normal	NA	NA	NA	NA
CCR-AP-8	Radium-226 & 228	36	0	0.9631	0.2682	Normal	Normal	NA	NA	NA	NA
CCR-AP-9	Radium-226 & 228	36	0	0.7516	2.03e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Selenium, Total	22	12	0.6681	7.89e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-2	Selenium, Total	22	7	0.7224	3.82e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-3	Selenium, Total	21	1	0.5491	5.96e-07	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-4R	Selenium, Total	21	10	0.3121	5.63e-09	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-5	Selenium, Total	21	14	0.4836	1.44e-07	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-6	Selenium, Total	21	4	0.5151	2.81e-07	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-7	Selenium, Total	21	18	0.4041	2.97e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-8	Selenium, Total	21	3	0.631	4.26e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-9	Selenium, Total	20	14	0.6214	4.95e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-1R	Thallium, Total	22	6	0.8126	0.0007934	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-2	Thallium, Total	22	3	0.5215	2.11e-07	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-3	Thallium, Total	21	20	0.4303	4.92e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-4R	Thallium, Total	21	11	0.6065	2.31e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-5	Thallium, Total	21	14	0.3788	1.85e-08	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-6	Thallium, Total	21	13	0.6003	1.99e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-7	Thallium, Total	23	19	0.6225	1.61e-06	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-8	Thallium, Total	21	16	0.7117	3.87e-05	Not normal	Not normal	NA	NA	NA	NA
CCR-AP-9	Thallium, Total	20	11	0.5154	4.39e-07	Not normal	Not normal	NA	NA	NA	NA

Table A-3. Results of Rosner/Dixon Test for Outliers

				Rosner or Dixon Test for Outliers (R programming, package = outliers, version 0.15, function = dixon.test or rosnerTest, non-detects substituted by 0.5*reporting limit)					
Location	Chemical	n	n_nd	Outlier Test	Statistic.Out	P.value.Out	Alternative	Statistical.Outlier	Outlier Removed
CCR-AP-1R	Antimony, Total	22	6	Dixon	0.5302	0.01366	highest value 0.01 is an outlier	Yes	No
CCR-AP-2	Antimony, Total	22	9	Dixon	0.5476	0.007539	highest value 0.01 is an outlier	Yes	No
CCR-AP-3	Antimony, Total	21	16	Dixon	0.9662	0	highest value 0.005 is an outlier	Yes	No
CCR-AP-4R	Antimony, Total	21	14	Dixon	0.9134	0	highest value 0.028 is an outlier	Yes	No
CCR-AP-5	Antimony, Total	21	15	Dixon	0.8111	0	highest value 0.01 is an outlier	Yes	No
CCR-AP-6	Antimony, Total	21	9	Dixon	0.9304	0	highest value 0.018 is an outlier	Yes	No
CCR-AP-7	Antimony, Total	23	20	Dixon	0.8982	0	highest value 0.0025 is an outlier	Yes	No
CCR-AP-8	Antimony, Total	21	6	Dixon	0.7729	0	highest value 0.0046 is an outlier	Yes	No
CCR-AP-9	Antimony, Total	20	5	Dixon	0.2278	0.9895	highest value 0.01 is an outlier	No	NA
CCR-AP-1R	Arsenic, Total	22	0	Dixon	0.1194	0.4192	highest value 0.038 is an outlier	No	NA
CCR-AP-2	Arsenic, Total	22	0	Dixon	0.3463	0.3107	highest value 0.048 is an outlier	No	NA
CCR-AP-3	Arsenic, Total	21	0	Dixon	0.3214	0.4391	lowest value 0.058 is an outlier	No	NA
CCR-AP-4R	Arsenic, Total	21	0	Dixon	0.4912	0.03981	highest value 0.33 is an outlier	Yes	No
CCR-AP-5	Arsenic, Total	20	2	Dixon	0.6319	0	highest value 0.024 is an outlier	Yes	No
CCR-AP-6	Arsenic, Total	21	0	Dixon	0.2857	0.6068	lowest value 0.04 is an outlier	No	NA
CCR-AP-7	Arsenic, Total	23	0	Dixon	0.5926	0	highest value 0.018 is an outlier	Yes	No
CCR-AP-8	Arsenic, Total	21	0	Dixon	0.2424	0.8592	lowest value 0.044 is an outlier	No	NA
CCR-AP-9	Arsenic, Total	20	0	Dixon	0.6489	0	highest value 0.032 is an outlier	Yes	No
CCR-AP-1R	Barium, Total	22	0	Dixon	0.2358	0.8565	highest value 0.59 is an outlier	No	NA
CCR-AP-2	Barium, Total	22	0	Dixon	0.2051	0.9493	highest value 0.64 is an outlier	No	NA
CCR-AP-3	Barium, Total	21	0	Dixon	0.1111	0.3494	highest value 0.49 is an outlier	No	NA
CCR-AP-4R	Barium, Total	21	0	Dixon	0.5455	0.01186	highest value 1.4 is an outlier	Yes	No
CCR-AP-5	Barium, Total	21	0	Dixon	0.4762	0.05385	highest value 0.2 is an outlier	No	NA
CCR-AP-6	Barium, Total	21	0	Dixon	0	0	highest value 0.69 is an outlier	Yes	No
CCR-AP-7	Barium, Total	23	0	Dixon	0.3333	0.3311	highest value 0.19 is an outlier	No	NA
CCR-AP-8	Barium, Total	21	0	Dixon	0.3529	0.3171	lowest value 0.31 is an outlier	No	NA
CCR-AP-9	Barium, Total	20	0	Dixon	0.6471	0	highest value 0.72 is an outlier	Yes	No
CCR-AP-1R	Beryllium, Total	22	0	Dixon	0.1637	0.6843	highest value 0.0066 is an outlier	No	NA
CCR-AP-2	Beryllium, Total	22	0	Dixon	0.3794	0.2069	highest value 0.0077 is an outlier	No	NA
CCR-AP-3	Beryllium, Total	21	20	Dixon	1	0	highest value 0 00056 is an outlier	Yes	No
CCR-AP-4R	Beryllium, Total	21	6	Dixon	0.3922	0.1971	highest value 0.0017 is an outlier	No	NA
CCR-AP-5	Beryllium, Total	21	15	Dixon	0.8918	0	highest value 0.005 is an outlier	Yes	No
CCR-AP-6	Beryllium, Total	21	8	Dixon	0.7974	0	highest value 0.0025 is an outlier	Yes	No
CCR-AP-7	Beryllium, Total	23	16	Dixon	0.1917	0.8982	lowest value 0.000067 is an outlier	No	NA
CCR-AP-8	Beryllium, Total	21	15	Dixon	0.1765	0.7338	lowest value 0 00016 is an outlier	No	NA
CCR-AP-9	Beryllium, Total	20	1	Dixon	0.7064	0	highest value 0.005 is an outlier	Yes	No
CCR-AP-1R	Cadmium, Total	22	12	Dixon	0.523	0.01631	highest value 0.005 is an outlier	Yes	No
CCR-AP-2	Cadmium, Total	22	3	Dixon	0.6592	0	highest value 0.0066 is an outlier	Yes	No
CCR-AP-3	Cadmium, Total	21	20	Dixon	1	0	lowest value 0.00038 is an outlier	Yes	No
CCR-AP-4R	Cadmium, Total	21	11	Dixon	0.7716	0	highest value 0.0025 is an outlier	Yes	No
CCR-AP-5	Cadmium, Total	21	5	Dixon	0.7851	0	highest value 0.005 is an outlier	Yes	No
CCR-AP-6	Cadmium, Total	21	8	Dixon	0.6304	0	highest value 0.0011 is an outlier	Yes	No
CCR-AP-7	Cadmium, Total	23	21	Dixon	0.5	0.02229	lowest value 0.00014 is an outlier	Yes	No
CCR-AP-8	Cadmium, Total	21	15	Dixon	0.08824	0 229	lowest value 0.00016 is an outlier	No	NA
CCR-AP-9	Cadmium, Total	20	9	Dixon	0.5112	0.03283	highest value 0.005 is an outlier	Yes	No
CCR-AP-1R	Chromium, Total	22	0	Dixon	0.2667	0.6731	highest value 0.16 is an outlier	No	NA
CCR-AP-2	Chromium, Total	22	0	Dixon	0.4255	0.1073	highest value 0.14 is an outlier	No	NA
CCR-AP-3	Chromium, Total	21	4	Dixon	0.7615	0	highest value 0.014 is an outlier	Yes	No
CCR-AP-4R	Chromium, Total	20	2	Dixon	0.5329	0.02096	highest value 0.058 is an outlier	Yes	No
CCR-AP-5	Chromium, Total	21	16	Dixon	0.8364	0	highest value 0.056 is an outlier	Yes	No
CCR-AP-6	Chromium, Total	21	1	Dixon	0.3509	0.3244	highest value 0.043 is an outlier	No	NA
CCR-AP-7	Chromium, Total	23	11	Dixon	0.7167	0	highest value 0.019 is an outlier	Yes	No
CCR-AP-8	Chromium, Total	20	2	Dixon	0.5635	0.009447	highest value 0.014 is an outlier	Yes	No
CCR-AP-9	Chromium, Total	20	0	Dixon	0.7436	0	highest value 0.15 is an outlier	Yes	No
CCR-AP-1R	Cobalt, Total	22	0	Dixon	0.07989	0.2086	highest value 0.081 is an outlier	No	NA
CCR-AP-2	Cobalt, Total	22	0	Dixon	0.6375	0	highest value 0.091 is an outlier	Yes	No
CCR-AP-3	Cobalt, Total	21	0	Dixon	0.28	0.6377	highest value 0.0094 is an outlier	No	NA
CCR-AP-4R	Cobalt, Total	21	0	Dixon	0.4145	0.1459	highest value 0.021 is an outlier	No	NA
CCR-AP-5	Cobalt, Total	21	0	Dixon	0.327	0.4161	highest value 0.01 is an outlier	No	NA
CCR-AP-6	Cobalt, Total	21	0	Dixon	0.3378	0.3734	highest value 0.019 is an outlier	No	NA
CCR-AP-7	Cobalt, Total	23	2	Dixon	0.6594	0	highest value 0.015 is an outlier	Yes	No
CCR-AP-8	Cobalt, Total	21	0	Dixon	0.3623	0 285	highest value 0.017 is an outlier	No	NA
CCR-AP-9	Cobalt, Total	20	0	Dixon	0.7179	0	highest value 0.047 is an outlier	Yes	No
CCR-AP-1R	Fluoride	22	0	Dixon	0.561	0.002602	highest value 0.81 is an outlier	Yes	No

Rosner or Dixon Test for Outliers (R programming, package = outliers, version 0.15, function = dixon.test or rosnerTest, non-detects substituted by 0.5*reporting limit)

Location	Chemical	n	n_nd	Outlier Test	Statistic.Out	P.value.Out	Alternative	Statistical.Outlier	Outlier Removed
CCR-AP-2	Fluoride	22	0	Dixon	0.3043	0.4808	highest value 0.69 is an outlier	No	NA
CCR-AP-3	Fluoride	21	1	Dixon	0.5	0.03305	highest value 0.93 is an outlier	Yes	No
CCR-AP-4R	Fluoride	21	1	Dixon	0.5455	0.01186	lowest value 0.05 is an outlier	Yes	No
CCR-AP-5	Fluoride	21	0	Dixon	0.2158	0.9746	highest value 2.3 is an outlier	No	NA
CCR-AP-6	Fluoride	21	0	Dixon	0.2791	0.6428	lowest value 0.24 is an outlier	No	NA
CCR-AP-7	Fluoride	22	0	Dixon	0.46	0.06051	highest value 0.72 is an outlier	No	NA
CCR-AP-8	Fluoride	21	1	Dixon	0.7473	0	highest value 1.1 is an outlier	Yes	No
CCR-AP-9	Fluoride	20	0	Dixon	0.48	0.06152	lowest value 0.14 is an outlier	No	NA
CCR-AP-1R	Lead, Total	22	0	Dixon	0.2064	0.9577	highest value 0.094 is an outlier	No	NA
CCR-AP-2	Lead, Total	22	0	Dixon	0.5041	0.02474	highest value 0.1 is an outlier	Yes	No
CCR-AP-3	Lead, Total	21	4	Dixon	0.8912	0	highest value 0.01 is an outlier	Yes	No
CCR-AP-4R	Lead, Total	21	0	Dixon	0.5752	0.001029	highest value 0.047 is an outlier	Yes	No
CCR-AP-5	Lead, Total	21	13	Dixon	0.7572	0	highest value 0.02 is an outlier	Yes	No
CCR-AP-6	Lead, Total	21	0	Dixon	0.5398	0.0138	highest value 0.041 is an outlier	Yes	No
CCR-AP-7	Lead, Total	23	9	Dixon	0.6051	0	highest value 0.02 is an outlier	Yes	No
CCR-AP-8	Lead, Total	21	1	Dixon	0.6125	0	highest value 0.0076 is an outlier	Yes	No
CCR-AP-9	Lead, Total	20	0	Dixon	0.4802	0.06127	highest value 0.041 is an outlier	No	NA
CCR-AP-1R	Lithium, Total	22	0	Dixon	0.3608	0.2619	highest value 0.23 is an outlier	No	NA
CCR-AP-2	Lithium, Total	22	5	Dixon	0.3889	0.1825	highest value 0.125 is an outlier	No	NA
CCR-AP-3	Lithium, Total	21	18	Dixon	0	0	highest value 0.025 is an outlier	Yes	No
CCR-AP-4R	Lithium, Total	21	6	Dixon	0.4989	0.03386	highest value 0.047 is an outlier	Yes	No
CCR-AP-5	Lithium, Total	21	0	Dixon	0.1844	0.7837	lowest value 0.009 is an outlier	No	NA
CCR-AP-6	Lithium, Total	21	11	Dixon	0.8163	0	highest value 0.125 is an outlier	Yes	No
CCR-AP-7	Lithium, Total	23	0	Dixon	0.6355	0	highest value 0.039 is an outlier	Yes	No
CCR-AP-8	Lithium, Total	21	16	Dixon	0	0	highest value 0.025 is an outlier	Yes	No
CCR-AP-9	Lithium, Total	20	0	Dixon	0.6437	0	highest value 0.12 is an outlier	Yes	No
CCR-AP-1R	Mercury, Total	21	21	Dixon	NA	NA	Not Evlauated - All results are non-detect	NA	NA
CCR-AP-2	Mercury, Total	21	13	Dixon	0.541	0.0134	highest value 0 00071 is an outlier	Yes	No
CCR-AP-3	Mercury, Total	20	20	Dixon	NA	NA	Not Evlauated - All results are non-detect	NA	NA
CCR-AP-4R	Mercury, Total	20	20	Dixon	NA	NA	Not Evlauated - All results are non-detect	NA	NA
CCR-AP-5	Mercury, Total	20	17	Dixon	0.8533	0	highest value 0.0016 is an outlier	Yes	No
CCR-AP-6	Mercury, Total	20	18	Dixon	0.7742	0	highest value 0 00041 is an outlier	Yes	No
CCR-AP-7	Mercury, Total	20	20	Dixon	NA	NA	Not Evlauated - All results are non-detect	NA	NA
CCR-AP-8	Mercury, Total	20	19	Dixon	1	0	highest value 0 00026 is an outlier	Yes	No
CCR-AP-9	Mercury, Total	19	19	Dixon	NA	NA	Not Evlauated - All results are non-detect	NA	NA
CCR-AP-1R	Molybdenum, Total	22	0	Dixon	0.5882	0	highest value 0.023 is an outlier	Yes	No
CCR-AP-2	Molybdenum, Total	22	0	Dixon	0.2558	0.7355	highest value 0.01 is an outlier	No	NA
CCR-AP-3	Molybdenum, Total	21	0	Dixon	0.6145	0	highest value 0.025 is an outlier	Yes	No
CCR-AP-4R	Molybdenum, Total	21	3	Dixon	0.5954	0	highest value 0.01 is an outlier	Yes	No
CCR-AP-5	Molybdenum, Total	21	0	Dixon	0.2733	0.6752	lowest value 0.046 is an outlier	No	NA
CCR-AP-6	Molybdenum, Total	21	0	Dixon	0.2105	0.9425	highest value 0.037 is an outlier	No	NA
CCR-AP-7	Molybdenum, Total	23	1	Dixon	0.4138	0.1122	highest value 0.013 is an outlier	No	NA
CCR-AP-8	Molybdenum, Total	21	0	Dixon	0.4712	0.05917	highest value 0.029 is an outlier	No	NA
CCR-AP-9	Molybdenum, Total	20	2	Dixon	0.6278	0	highest value 0.025 is an outlier	Yes	No
CCR-AP-1R	Radium-226 & 228	20	0	Dixon	0.5301	0.02225	highest value 14.4 is an outlier	Yes	No
CCR-AP-2	Radium-226 & 228	20	1	Dixon	0.47	0.07269	highest value 5.53 is an outlier	No	NA
CCR-AP-3	Radium-226 & 228	19	1	Dixon	0.5436	0.02151	highest value 4.87 is an outlier	Yes	No
CCR-AP-4R	Radium-226 & 228	19	0	Dixon	0.8959	0	highest value 30 is an outlier	Yes	No
CCR-AP-5	Radium-226 & 228	19	0	Dixon	0.5277	0.03011	highest value 5.54 is an outlier	Yes	No
CCR-AP-6	Radium-226 & 228	19	0	Dixon	0.7767	0	highest value 10.2 is an outlier	Yes	No
CCR-AP-7	Radium-226 & 228	20	0	Dixon	0.2152	0 935	highest value 1.72 is an outlier	No	NA
CCR-AP-8	Radium-226 & 228	18	0	Dixon	0.3621	0.3958	highest value 2.88 is an outlier	No	NA
CCR-AP-9	Radium-226 & 228	18	0	Dixon	0.58	0.01299	highest value 12.6 is an outlier	Yes	No
CCR-AP-1R	Selenium, Total	22	12	Dixon	0	0	highest value 0.025 is an outlier	Yes	No
CCR-AP-2	Selenium, Total	22	7	Dixon	0.4049	0.1462	highest value 0.026 is an outlier	No	NA
CCR-AP-3	Selenium, Total	21	1	Dixon	0.8269	0	highest value 0.0068 is an outlier	Yes	No
CCR-AP-4R	Selenium, Total	21	10	Dixon	0.9532	0	highest value 0.031 is an outlier	Yes	No
CCR-AP-5	Selenium, Total	21	14	Dixon	0.7867	0	highest value 0.025 is an outlier	Yes	No
CCR-AP-6	Selenium, Total	21	4	Dixon	0.8407	0	highest value 0.0125 is an outlier	Yes	No
CCR-AP-7	Selenium, Total	21	18	Dixon	1	0	lowest value 0 00035 is an outlier	Yes	No
CCR-AP-8	Selenium, Total	21	3	Dixon	0.6909	0	highest value 0.007 is an outlier	Yes	No
CCR-AP-9	Selenium, Total	20	14	Dixon	0.5297	0.02246	highest value 0.025 is an outlier	Yes	No
CCR-AP-1R	Thallium, Total	22	6	Dixon	0.4977	0.02832	highest value 0.0027 is an outlier	Yes	No
CCR-AP-2	Thallium, Total	22	3	Dixon	0.8445	0	highest value 0.0076 is an outlier	Yes	No
CCR-AP-3	Thallium, Total	21	20	Dixon	1	0	highest value 0.001 is an outlier	Yes	No
CCR-AP-4R	Thallium, Total	21	11	Dixon	0.8207	0	highest value 0.0025 is an outlier	Yes	No

Rosner or Dixon Test for Outliers (R programming, package = outliers, version 0.15, function = dixon.test or rosnerTest, non-detects substituted by 0.5*reporting limit)

Location	Chemical	n	n_nd	Outlier Test	Statistic.Out	P.value.Out	Alternative	Statistical.Outlier	Outlier Removed
CCR-AP-5	Thallium, Total	21	14	Dixon	0.9298	0	highest value 0.005 is an outlier	Yes	No
CCR-AP-6	Thallium, Total	21	13	Dixon	0.8299	0	highest value 0.0025 is an outlier	Yes	No
CCR-AP-7	Thallium, Total	23	19	Dixon	0.5482	0.003983	highest value 0.001 is an outlier	Yes	No
CCR-AP-8	Thallium, Total	21	16	Dixon	0.5453	0.01192	highest value 0.001 is an outlier	Yes	No
CCR-AP-9	Thallium, Total	20	11	Dixon	0.8221	0	highest value 0.005 is an outlier	Yes	No

Table A-4. Results of Mann Kendall and Thiel Sen Trend Tests

		Mann Kendall Trends			Secular Trend Evaluation for All Data									Secular Trend Evaluation for Recent Data (subset of 8 most recent data points)								
					Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)		Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)	
Location	Constituent	Trends, All Data	Trends, Recent Data	Seasonal Mann Kendall Used	n	n, detected results	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value	n	n, detected results	recent data date range	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value
CCR-AP-1R	Antimony, Total	No Trend	Stable	No	22	16	1.18	0.133	0.41	59	30	0.0000192	0.41	8	8	2020-11-13 to 2023-11-02	0.658	-0.182	0.618	38.2	-5	-0.000088	0.618
CCR-AP-2	Antimony, Total	No Trend	No Trend	No	22	13	1.05	0.239	0.138	86.2	53	0.00002	0.138	8	8	2020-11-12 to 2023-11-02	1.01	0.327	0.319	68.1	9	0.000105	0.319
CCR-AP-3	Antimony, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	21	5	0.783	NA	NA	NA	NA	NA	NA	8	3	2020-05-20 to 2023-11-02	0.878	NA	NA	NA	NA	NA	NA
CCR-AP-4R	Antimony, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	21	7	2.3	NA	NA	NA	NA	NA	NA	8	5	2020-05-20 to 2023-11-02	1.99	0.189	0.61	39	5	0.000188	0.61
CCR-AP-5	Antimony, Total	Not Evaluated - Majority of data (>50%) non-detect.	Probably Increasing	No	21	6	1.34	NA	NA	NA	NA	NA	NA	8	5	2020-05-19 to 2023-11-02	0.916	0.567	0.0746	92.5	15	0.000172	0.0746
CCR-AP-6	Antimony, Total	No Trend	No Trend	No	21	12	1.99	0.0837	0.636	36.4	16	0	0.636	8	6	2020-05-20 to 2023-11-02	2	0.34	0.308	69.2	9	0.000134	0.308
CCR-AP-7	Antimony, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Only one detected result.	No	23	3	0.375	NA	NA	NA	NA	NA	NA	8	1	2020-05-18 to 2023-11-06	0.465	NA	NA	NA	NA	NA	NA
CCR-AP-8	Antimony, Total	Stable	No Trend	No	21	15	0.826	-0.217	0.195	80.5	-43	-0.0000177	0.195	8	7	2020-05-20 to 2023-11-02	1.15	0.0714	0.902	9 8	2	0.0000211	0.902
CCR-AP-9	Antimony, Total	No Trend	No Trend	No	20	15	1.07	0	1	0	0	0	1	8	6	2019-10-22 to 2023-05-23	1	-0.214	0.536	46.4	-6	-0.000162	0.536
CCR-AP-1R	Arsenic, Total	Increasing	Stable	No	22	22	0.69	0.422	0.00675	99.3	97	0.000708	0.00675	8	8	2020-11-13 to 2023-11-02	0.45	-0.143	0.711	28.9	-4	-0 001	0.711
CCR-AP-2	Arsenic, Total	Increasing	Probably Increasing	No	22	22	0.828	0.616	0.0000769	100	141	0.00145	0.0000769	8	8	2020-11-12 to 2023-11-02	0.604	0.571	0.0635	93.7	16	0.005	0.0635
CCR-AP-3	Arsenic, Total	Increasing	Stable	No	21	21	0.114	0.402	0.0136	98.6	82	0.000818	0.0136	8	8	2020-05-20 to 2023-11-02	0.0802	-0.0378	1	0	-1	0	1
CCR-AP-4R	Arsenic, Total	Increasing	No Trend	No	21	21	0.7	0.538	0.000782	99.9	112	0.00618	0.000782	8	8	2020-05-20 to 2023-11-02	0.521	0.0714	0.902	9 8	2	0 00325	0.902
CCR-AP-5	Arsenic, Total	Increasing	Increasing	No	20	18	1.67	0.515	0.00181	99.8	97	0.000226	0.00181	8	8	2020-05-19 to 2023-11-02	1.05	0.909	0.00277	99.7	25	0 00204	0 00277
CCR-AP-6	Arsenic, Total	Increasing	Stable	No	21	21	0.228	0.419	0.0117	98.8	83	0.00206	0.0117	8	8	2020-05-20 to 2023-11-02	0.0759	-0.161	0.694	30.6	-4	0	0.694
CCR-AP-7	Arsenic, Total	Decreasing	Stable	No	23	23	0.701	-0.363	0.0173	98.3	-91	-0.000232	0.0173	8	8	2020-05-18 to 2023-11-06	0.972	-0.473	0.135	86.5	-13	-0.000733	0.135
CCR-AP-8	Arsenic, Total	Increasing	Stable	No	21	21	0.243	0.572	0.000422	100	117	0.00294	0.000422	8	8	2020-05-20 to 2023-11-02	0.169	-0.512	0.12	88	-13	-0.00333	0.12
CCR-AP-9	Arsenic, Total	No Trend	Stable	No	20	20	0.604	0.239	0.153	84.7	45	0.000226	0.153	8	8	2019-10-22 to 2023-05-23	0.415	-0.255	0.454	54.6	-7	-0.000633	0.454
CCR-AP-1R	Barium, Total	Increasing	Stable	No	22	22	0.684	0.312	0.0452	95.5	72	0.00842	0.0452	8	8	2020-11-13 to 2023-11-02	0.343	-0.0714	0.902	9 8	-2	-0.00667	0.902
CCR-AP-2	Barium, Total	Increasing	Increasing	No	22	22	0.678	0.436	0.00519	99.5	100	0.015	0.00519	8	8	2020-11-12 to 2023-11-02	0.617	0.714	0.0187	98.1	20	0.08	0.0187
CCR-AP-3	Barium, Total	No Trend	No Trend	No	21	21	0.0734	0.261	0.114	88.6	53	0.002	0.114	8	8	2020-05-20 to 2023-11-02	0.0765	0.0364	1	0	1	0 00167	1
CCR-AP-4R	Barium, Total	No Trend	No Trend	No	21	21	0.351	0.0823	0.628	37.2	17	0.00333	0.628	8	8	2020-05-20 to 2023-11-02	0.416	0.182	0.618	38.2	5	0.0317	0.618
CCR-AP-5	Barium, Total	Increasing	Probably Increasing	No	21	21	0.723	0.612	0.000124	100	128	0.00358	0.000124	8	8	2020-05-19 to 2023-11-02	0.558	0.571	0.0635	93.7	16	0.0161	0.0635
CCR-AP-6	Barium, Total	Stable	Decreasing	No	21	21	0.114	-0.161	0.332	66.8	-33	-0.00258	0.332	8	8	2020-05-20 to 2023-11-02	0.126	-0.618	0.0461	95.4	-17	-0 015	0.0461
CCR-AP-7	Barium, Total	Decreasing	Stable	No	23	23	0.224	-0.367	0.019	98.1	-89	-0.00222	0.019	8	8	2020-05-18 to 2023-11-06	0.302	-0.4	0.212	78.8	-11	-0.00625	0.212
CCR-AP-8	Barium, Total	Decreasing	Decreasing	No	21	21	0.176	-0.496	0.00202	99.8	-103	-0.01	0.00202	8	8	2020-05-20 to 2023-11-02	0.197	-0.618	0.0461	95.4	-17	-0 0317	0.0461
CCR-AP-9	Barium, Total	Increasing	Stable	No	20	20	0.416	0.344	0.04	96	64	0.00812	0.04	8	8	2019-10-22 to 2023-05-23	0.267	-0.0364	1	0	-1	-0.00167	1
CCR-AP-1R	Beryllium, Total	Increasing	Stable	No	22	22	0.804	0.42	0.00679	99.3	97	0.00018	0.00679	8	8	2020-11-13 to 2023-11-02	0.518	-0.143	0.711	28.9	-4	-0.000292	0.711
CCR-AP-2	Beryllium, Total	Increasing	No Trend	No	22	22	0.981	0.57	0.000244	100	131	0.00016	0.000244	8	8	2020-11-12 to 2023-11-02	0.736	0.286	0.386	61.4	8	0.000707	0.386
CCR-AP-3	Beryllium, Total	Not Evaluated - Only one detected result.	Not Evaluated - Only one detected result.	No	21	1	0.026	NA	NA	NA	NA	NA	NA	8	1	2020-05-20 to 2023-11-02	0.0418	NA	NA	NA	NA	NA	NA
CCR-AP-4R	Beryllium, Total	Increasing	Stable	No	21	15	0.713	0.44	0.0071	99.3	89	0.0000213	0.0071	8	4	2020-05-20 to 2023-11-02	0.62	-0.242	0.507	49.3	-6	-0.00000214	0.507
CCR-AP-5	Beryllium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Only one detected result.	No	21	6	1.33	NA	NA	NA	NA	NA	NA	8	1	2020-05-19 to 2023-11-02	0.61	NA	NA	NA	NA	NA	NA
CCR-AP-6	Beryllium, Total	No Trend	Not Evaluated - Majority of data (>50%) non-detect.	No	21	13	0.946	0.218	0.188	81.2	44	0.00000882	0.188	8	3	2020-05-20 to 2023-11-02	0.544	NA	NA	NA	NA	NA	NA
CCR-AP-7	Beryllium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Only one detected result.	No	23	7	0.415	NA	NA	NA	NA	NA	NA	8	1	2020-05-18 to 2023-11-06	0.253	NA	NA	NA	NA	NA	NA
CCR-AP-8	Beryllium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	21	6	0.302	NA	NA	NA	NA	NA	NA	8	2	2020-05-20 to 2023-11-02	0.295	NA	NA	NA	NA	NA	NA
CCR-AP-9	Beryllium, Total	Increasing	Stable	No	20	19	1.01	0.383	0.021	97.9	72	0.000046	0.021	8	7	2019-10-22 to 2023-05-23	0.898	-0.0714	0.902	9 8	-2	-0.0000325	0.902
CCR-AP-1R	Cadmium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Decreasing	No	22	10	1.31	NA	NA	NA	NA	NA	NA	8	6	2020-11-13 to 2023-11-02	1.27	-0.643	0.0354	96.5	-18	-0.0000487	0.0354

Note:
Mann Kendall Trends are classified based on Aziz (2003) guidance.

		Mann Kendall Trends			Secular Trend Evaluation for All Data									Secular Trend Evaluation for Recent Data (subset of 8 most recent data points)								
					Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)		Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)	
Location	Constituent	Trends, All Data	Trends, Recent Data	Seasonal Mann Kendall Used	n	n, detected results	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value	n	n, detected results	recent data date range	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value
CCR-AP-2	Cadmium, Total	Increasing	No Trend	No	22	19	1.04	0.383	0.014	98.6	88	0.0000547	0.014	8	8	2020-11-12 to 2023-11-02	1.07	0.255	0.454	54.6	7	0.000164	0.454
CCR-AP-3	Cadmium, Total	Not Evaluated - Only one detected result.	Not Evaluated - Only one detected result.	No	21	1	0.053	NA	NA	NA	NA	NA	NA	8	1	2020-05-20 to 2023-11-02	0.0875	NA	NA	NA	NA	NA	NA
CCR-AP-4R	Cadmium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Stable	No	21	10	0.922	NA	NA	NA	NA	NA	NA	8	4	2020-05-20 to 2023-11-02	0.309	0	1	0	0	0	1
CCR-AP-5	Cadmium, Total	No Trend	No Trend	No	21	16	1.41	0.0971	0.564	43.6	20	0.00000735	0.564	8	5	2020-05-19 to 2023-11-02	0.559	0.265	0.445	55.5	7	0.0000588	0.445
CCR-AP-6	Cadmium, Total	No Trend	Not Evaluated - Majority of data (>50%) non-detect.	No	21	13	0.499	0.178	0.298	70.2	34	0	0.298	8	2	2020-05-20 to 2023-11-02	0.52	NA	NA	NA	NA	NA	NA
CCR-AP-7	Cadmium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - No detected results.	No	23	2	0.203	NA	NA	NA	NA	NA	NA	8	0	2020-05-18 to 2023-11-06	0.189	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-8	Cadmium, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	21	6	0.308	NA	NA	NA	NA	NA	NA	8	4	2020-05-20 to 2023-11-02	0.383	0.206	0.592	40.8	5	0	0.592
CCR-AP-9	Cadmium, Total	Increasing	Not Evaluated - Majority of data (>50%) non-detect.	No	20	11	1.6	0.492	0.00351	99.6	90	0.0000236	0.00351	8	2	2019-10-22 to 2023-05-23	1.33	NA	NA	NA	NA	NA	NA
CCR-AP-1R	Chromium, Total	Increasing	No Trend	No	22	22	0.826	0.378	0.0152	98.5	87	0.00312	0.0152	8	8	2020-11-13 to 2023-11-02	0.448	0.0714	0.902	9 8	2	0.0028	0.902
CCR-AP-2	Chromium, Total	Increasing	Increasing	No	22	22	0.85	0.558	0.000307	100	129	0.004	0.000307	8	8	2020-11-12 to 2023-11-02	0.709	0.714	0.0187	98.1	20	0.0163	0.0187
CCR-AP-3	Chromium, Total	No Trend	No Trend	No	21	17	0.979	0.24	0.15	85	48	0.0000361	0.15	8	7	2020-05-20 to 2023-11-02	1.11	0.182	0.618	38.2	5	0.000138	0.618
CCR-AP-4R	Chromium, Total	No Trend	No Trend	No	20	18	0.885	0.243	0.144	85.6	46	0.000386	0.144	8	7	2020-05-20 to 2023-11-02	0.858	0.0714	0.902	9 8	2	0.000317	0.902
CCR-AP-5	Chromium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Probably Increasing	No	21	5	2.27	NA	NA	NA	NA	NA	NA	8	4	2020-05-19 to 2023-11-02	1.63	0.564	0.0842	91.6	14	0 00236	0.0842
CCR-AP-6	Chromium, Total	Stable	No Trend	No	21	20	0.833	-0.101	0.545	45.5	-21	-0.000148	0.545	8	7	2020-05-20 to 2023-11-02	1.33	-0.214	0.536	46.4	-6	-0.00035	0.536
CCR-AP-7	Chromium, Total	No Trend	Not Evaluated - Only one detected result.	No	23	12	1.27	0.0422	0.808	19.2	10	0	0.808	8	1	2020-05-18 to 2023-11-06	0.805	NA	NA	NA	NA	NA	NA
CCR-AP-8	Chromium, Total	No Trend	No Trend	No	20	18	0.851	0.0212	0.922	7.8	4	0.00000972	0.922	8	7	2020-05-20 to 2023-11-02	1.01	-0.182	0.618	38.2	-5	-0.000287	0.618
CCR-AP-9	Chromium, Total	Increasing	No Trend	No	20	20	1.2	0.462	0.0052	99.5	87	0.00129	0.0052	8	8	2019-10-22 to 2023-05-23	0.491	0.109	0.803	19.7	3	0 00108	0.803
CCR-AP-1R	Cobalt, Total	Increasing	Stable	No	22	22	0.816	0.434	0.00523	99.5	100	0.00192	0.00523	8	8	2020-11-13 to 2023-11-02	0.561	-0.0714	0.902	9 8	-2	-0.000633	0.902
CCR-AP-2	Cobalt, Total	Increasing	Probably Increasing	No	22	22	0.717	0.627	0.0000541	100	144	0.00164	0.0000541	8	8	2020-11-12 to 2023-11-02	0.654	0.571	0.0635	93.7	16	0 00774	0.0635
CCR-AP-3	Cobalt, Total	Decreasing	No Trend	No	21	21	0.261	-0.581	0.000258	100	-122	-0.000195	0.000258	8	8	2020-05-20 to 2023-11-02	0.324	0.0714	0.902	9 8	2	0.0001	0.902
CCR-AP-4R	Cobalt, Total	No Trend	Stable	Yes	21	21	0.623	0.0334	0.856	14.4	7	0.0000144	0.856	8	8	2020-05-20 to 2023-11-02	0.671	-0.0714	0.902	9 8	-2	-0.000179	0.902
CCR-AP-5	Cobalt, Total	Decreasing	Increasing	No	21	21	0.639	-0.49	0.00225	99.8	-102	-0.000355	0.00225	8	8	2020-05-19 to 2023-11-02	1.22	0.618	0.0461	95.4	17	0.000712	0.0461
CCR-AP-6	Cobalt, Total	Stable	Stable	No	21	21	0.502	-0.181	0.264	73.6	-38	-0.000168	0.264	8	8	2020-05-20 to 2023-11-02	0.738	-0.143	0.711	28.9	-4	-0.000147	0.711
CCR-AP-7	Cobalt, Total	Decreasing	No Trend	No	23	21	1.47	-0.377	0.013	98.7	-95	-0.00009	0.013	8	6	2020-05-18 to 2023-11-06	1.4	0.0714	0.902	9 8	2	0.0000247	0.902
CCR-AP-8	Cobalt, Total	Decreasing	Stable	No	21	21	0.439	-0.586	0.000275	100	-121	-0.000475	0.000275	8	8	2020-05-20 to 2023-11-02	0.509	-0.214	0.536	46.4	-6	-0.000545	0.536
CCR-AP-9	Cobalt, Total	Increasing	Stable	No	20	20	0.556	0.368	0.0286	97.1	68	0.000341	0.0286	8	8	2019-10-22 to 2023-05-23	0.281	-0.0378	1	0	-1	0	1
CCR-AP-1R	Fluoride	Decreasing	Decreasing	No	22	22	0.189	-0.435	0.00594	99.4	-98	-0.00692	0.00594	8	8	2020-11-13 to 2023-11-02	0.163	-0.837	0.00609	99.4	-23	-0.02	0 00609
CCR-AP-2	Fluoride	Increasing	No Trend	No	22	22	0.415	0.586	0.000171	100	134	0.0167	0.000171	8	8	2020-11-12 to 2023-11-02	0.255	0.182	0.618	38.2	5	0.03	0.618
CCR-AP-3	Fluoride	Stable	Stable	No	21	20	0.482	-0.216	0.183	81.7	-45	-0.0105	0.183	8	8	2020-05-20 to 2023-11-02	0.402	-0.357	0.266	73.4	-10	-0 0179	0.266
CCR-AP-4R	Fluoride	No Trend	No Trend	No	21	20	0.314	0.158	0.333	66.7	33	0.005	0.333	8	8	2020-05-20 to 2023-11-02	0.279	0.0714	0.902	9 8	2	0.0117	0.902
CCR-AP-5	Fluoride	Increasing	No Trend	No	21	21	0.349	0.544	0.000765	99.9	112	0.05	0.000765	8	8	2020-05-19 to 2023-11-02	0.312	0.371	0.258	74.2	10	0.139	0.258
CCR-AP-6	Fluoride	Stable	No Trend	No	21	21	0.263	-0.067	0.694	30.6	-14	-0.00375	0.694	8	8	2020-05-20 to 2023-11-02	0.303	0.0714	0.902	9 8	2	0.009	0.902
CCR-AP-7	Fluoride	Increasing	No Trend	No	22	22	0.397	0.368	0.019	98.1	84	0.00875	0.019	8	8	2020-05-18 to 2023-11-06	0.333	0.182	0.618	38.2	5	0.0267	0.618
CCR-AP-8	Fluoride	No Trend	No Trend	No	21	20	0.648	0.192	0.238	76.2	40	0.00764	0.238	8	8	2020-05-20 to 2023-11-02	0.757	0.327	0.319	68.1	9	0.0333	0.319
CCR-AP-9	Fluoride	No Trend	No Trend	No	20	20	0.198	0.14	0.415	58.5	26	0.00172	0.415	8	8	2019-10-22 to 2023-05-23	0.199	0.182	0.618	38.2	5	0.0045	0.618
CCR-AP-1R	Lead, Total	Increasing	Stable	No	22	22	0.815	0.429	0.00572	99.4	99	0.00194	0.00572	8	8	2020-11-13 to 2023-11-02	0.541	0	1	0	0	0 00025	1
CCR-AP-2	Lead, Total	Increasing	Increasing	No	22	22	0.883	0.566	0.000271	100	130	0.0025	0.000271	8	8	2020-11-12 to 2023-11-02	0.736	0.643	0.0354	96.5	18	0.0101	0.0354
CCR-AP-3	Lead, Total	Increasing	No Trend	No	21	17	1.85	0.348	0.0314	96.9	72	0.0000223	0.0314	8	7	2020-05-20 to 2023-11-02	1.61	0.214	0.536	46.4	6	0.000132	0.536
CCR-AP-4R	Lead, Total	No Trend	Stable	Yes	21	21	0.908	0.173	0.29	71	36	0.000167	0.29	8	8	2020-05-20 to 2023-11-02	0.856	-0.0714	0.902	9 8	-2	-0.00045	0.902

Note:
Mann Kendall Trends are classified based on Aziz (2003) guidance.

		Mann Kendall Trends			Secular Trend Evaluation for All Data									Secular Trend Evaluation for Recent Data (subset of 8 most recent data points)								
					Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)		Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)	
Location	Constituent	Trends, All Data	Trends, Recent Data	Seasonal Mann Kendall Used	n	n, detected results	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value	n	n, detected results	recent data date range	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value
CCR-AP-5	Lead, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	21	8	2.17	NA	NA	NA	NA	NA	NA	8	6	2020-05-19 to 2023-11-02	1.7	0.4	0.212	78.8	11	0.000821	0.212
CCR-AP-6	Lead, Total	Stable	No Trend	No	21	21	0.966	-0.0525	0.763	23.7	-11	-0.0000822	0.763	8	8	2020-05-20 to 2023-11-02	1.6	0	1	0	0	-0.00004	1
CCR-AP-7	Lead, Total	Probably Decreasing	Not Evaluated - Majority of data (>50%) non-detect.	No	23	14	1.64	-0.265	0.0935	90.6	-63	-0.0000336	0.0935	8	3	2020-05-18 to 2023-11-06	1.48	NA	NA	NA	NA	NA	NA
CCR-AP-8	Lead, Total	No Trend	Stable	No	21	20	0.855	0.144	0.38	62	30	0.0000333	0.38	8	7	2020-05-20 to 2023-11-02	0.876	-0.143	0.711	28.9	-4	-0.000133	0.711
CCR-AP-9	Lead, Total	Increasing	Stable	No	20	20	0.695	0.387	0.0193	98.1	73	0.000571	0.0193	8	8	2019-10-22 to 2023-05-23	0.412	-0.109	0.803	19.7	-3	-0.000425	0.803
CCR-AP-1R	Lithium, Total	Increasing	No Trend	No	22	22	0.571	0.385	0.0139	98.6	88	0.004	0.0139	8	8	2020-11-13 to 2023-11-02	0.31	0.182	0.618	38.2	5	0.0049	0.618
CCR-AP-2	Lithium, Total	Probably Increasing	Increasing	No	22	17	0.757	0.308	0.0508	94.9	70	0.0016	0.0508	8	8	2020-11-12 to 2023-11-02	0.733	0.714	0.0187	98.1	20	0.0132	0.0187
CCR-AP-3	Lithium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	21	3	0.923	NA	NA	NA	NA	NA	NA	8	3	2020-05-20 to 2023-11-02	0.262	NA	NA	NA	NA	NA	NA
CCR-AP-4R	Lithium, Total	Stable	No Trend	No	21	15	0.75	-0.149	0.375	62.5	-30	-0.000219	0.375	8	7	2020-05-20 to 2023-11-02	0.852	0.214	0.536	46.4	6	0.000538	0.536
CCR-AP-5	Lithium, Total	Decreasing	No Trend	No	21	21	0.452	-0.699	0.000013	100	-145	-0.00563	0.000013	8	8	2020-05-19 to 2023-11-02	0.466	0.214	0.536	46.4	6	0 00214	0.536
CCR-AP-6	Lithium, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	21	10	1.35	NA	NA	NA	NA	NA	NA	8	5	2020-05-20 to 2023-11-02	1.09	-0.255	0.454	54.6	-7	-0.000182	0.454
CCR-AP-7	Lithium, Total	Decreasing	Stable	No	23	23	0.508	-0.427	0.006	99.4	-104	-0.000211	0.006	8	8	2020-05-18 to 2023-11-06	0.336	-0.143	0.711	28.9	-4	-0.00045	0.711
CCR-AP-8	Lithium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Only one detected result.	No	21	5	0.854	NA	NA	NA	NA	NA	NA	8	1	2020-05-20 to 2023-11-02	0.468	NA	NA	NA	NA	NA	NA
CCR-AP-9	Lithium, Total	Increasing	Stable	No	20	20	0.427	0.351	0.0345	96.5	66	0.000858	0.0345	8	8	2019-10-22 to 2023-05-23	0.262	-0.143	0.711	28.9	-4	-0.00217	0.711
CCR-AP-1R	Mercury, Total	Not Evaluated - No detected results.	Not Evaluated - No detected results.	No	21	0	1.26	NA	No detected results.	NA	NA	NA	No detected results.	8	0	2020-11-13 to 2023-11-02	1.24	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-2	Mercury, Total	Not Evaluated - Majority of data (>50%) non-detect.	Increasing	No	21	8	0.862	NA	NA	NA	NA	NA	NA	8	6	2020-11-12 to 2023-11-02	0.798	0.667	0.0327	96.7	18	0.000048	0.0327
CCR-AP-3	Mercury, Total	Not Evaluated - No detected results.	Not Evaluated - No detected results.	No	20	0	0.312	NA	No detected results.	NA	NA	NA	No detected results.	8	0	2020-05-20 to 2023-11-02	0.447	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-4R	Mercury, Total	Not Evaluated - No detected results.	Not Evaluated - No detected results.	No	20	0	0.35	NA	No detected results.	NA	NA	NA	No detected results.	8	0	2020-05-20 to 2023-11-02	0.447	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-5	Mercury, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	20	3	1.64	NA	NA	NA	NA	NA	NA	8	3	2020-05-19 to 2023-11-02	1.33	NA	NA	NA	NA	NA	NA
CCR-AP-6	Mercury, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	20	2	0.6	NA	NA	NA	NA	NA	NA	8	2	2020-05-20 to 2023-11-02	0.676	NA	NA	NA	NA	NA	NA
CCR-AP-7	Mercury, Total	Not Evaluated - No detected results.	Not Evaluated - No detected results.	No	20	0	0.312	NA	No detected results.	NA	NA	NA	No detected results.	8	0	2020-05-18 to 2023-11-06	0.447	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-8	Mercury, Total	Not Evaluated - Only one detected result.	Not Evaluated - Only one detected result.	No	20	1	0.413	NA	NA	NA	NA	NA	NA	8	1	2020-05-20 to 2023-11-02	0.517	NA	NA	NA	NA	NA	NA
CCR-AP-9	Mercury, Total	Not Evaluated - No detected results.	Not Evaluated - No detected results.	No	19	0	0	NA	No detected results.	NA	NA	NA	No detected results.	8	0	2019-10-22 to 2023-05-23	0	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-1R	Molybdenum, Total	Stable	Stable	No	22	22	0.426	-0.053	0.755	24.5	-12	-0.000025	0.755	8	8	2020-11-13 to 2023-11-02	0.577	-0.4	0.212	78.8	-11	-0.000264	0.212
CCR-AP-2	Molybdenum, Total	Increasing	No Trend	No	22	22	0.584	0.662	0.00002	100	152	0.000358	0.0000201	8	8	2020-11-12 to 2023-11-02	0.307	0.5	0.108	89.2	14	0.000533	0.108
CCR-AP-3	Molybdenum, Total	Decreasing	No Trend	No	21	21	0.349	-0.438	0.0074	99.3	-89	-0.0003	0.0074	8	8	2020-05-20 to 2023-11-02	0.563	0.109	0.803	19.7	3	0.000213	0.803
CCR-AP-4R	Molybdenum, Total	Increasing	No Trend	No	21	18	0.892	0.35	0.0312	96.9	72	0.000113	0.0312	8	5	2020-05-20 to 2023-11-02	0.794	0.189	0.61	39	5	0 00025	0.61
CCR-AP-5	Molybdenum, Total	Decreasing	Stable	No	21	21	0.405	-0.488	0.00266	99.7	-100	-0.0121	0.00266	8	8	2020-05-19 to 2023-11-02	0.471	-0.222	0 53	47	-6	-0 015	0.53
CCR-AP-6	Molybdenum, Total	Stable	Stable	No	21	21	0.226	-0.0586	0.738	26.2	-12	-0.0000774	0.738	8	8	2020-05-20 to 2023-11-02	0.285	-0.255	0.454	54.6	-7	-0.0005	0.454
CCR-AP-7	Molybdenum, Total	Decreasing	No Trend	No	23	22	0.833	-0.652	0.000018	100	-163	-0.00025	0.000018	8	7	2020-05-18 to 2023-11-06	0.259	0.109	0.803	19.7	3	0.0000732	0.803
CCR-AP-8	Molybdenum, Total	Stable	Stable	No	21	21	0.377	-0.0248	0.903	9.7	-5	0	0.903	8	8	2020-05-20 to 2023-11-02	0.503	-0.0364	1	0	-1	-0.0000833	1

Note:
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		Mann Kendall Trends			Secular Trend Evaluation for All Data									Secular Trend Evaluation for Recent Data (subset of 8 most recent data points)								
					Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)		Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)	
Location	Constituent	Trends, All Data	Trends, Recent Data	Seasonal Mann Kendall Used	n	n, detected results	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value	n	n, detected results	recent data date range	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value
CCR-AP-9	Molybdenum, Total	Decreasing	No Trend	No	20	18	0.812	-0.47	0.00428	99.6	-89	-0.000292	0.00428	8	6	2019-10-22 to 2023-05-23	1.3	-0.286	0.386	61.4	-8	-0.00025	0.386
CCR-AP-1R	Radium-226 & 228	No Trend	No Trend	No	20	20	0.7	0.2	0.23	77	38	0.0993	0.23	8	8	2020-05-19 to 2023-12-22	0.766	0.357	0.266	73.4	10	1.6	0.266
CCR-AP-2	Radium-226 & 228	No Trend	No Trend	No	20	19	0.71	0.0105	0.974	2.6	2	0.00427	0.974	8	7	2020-05-20 to 2023-11-02	0.821	0.143	0.711	28.9	4	0.252	0.711
CCR-AP-3	Radium-226 & 228	No Trend	No Trend	No	19	18	0.652	0.00585	1	0	1	0.0048	1	8	7	2020-05-20 to 2023-11-02	0.781	0.286	0.386	61.4	8	0.189	0.386
CCR-AP-4R	Radium-226 & 228	No Trend	No Trend	No	19	19	1.65	0.076	0.675	32.5	13	0.03	0.675	8	8	2020-05-20 to 2023-11-02	1.66	0.429	0.174	82.6	12	0.324	0.174
CCR-AP-5	Radium-226 & 228	No Trend	Increasing	No	19	19	1.1	0.158	0.363	63.7	27	0.0501	0.363	8	8	2020-05-19 to 2023-11-02	0.9	0.786	0.00937	99.1	22	0.683	0 00937
CCR-AP-6	Radium-226 & 228	No Trend	No Trend	No	19	19	0.893	0.0994	0.576	42.4	17	0.0118	0.576	8	8	2020-05-20 to 2023-11-02	0.509	0.357	0.266	73.4	10	0.2	0.266
CCR-AP-7	Radium-226 & 228	Stable	Increasing	No	20	20	0.547	-0.137	0.417	58.3	-26	-0.0163	0.417	8	8	2020-05-18 to 2023-11-06	0.676	0.714	0.0187	98.1	20	0.161	0.0187
CCR-AP-8	Radium-226 & 228	Stable	No Trend	No	18	18	0.451	-0.111	0.544	45.6	-17	-0.0145	0.544	8	8	2020-05-20 to 2023-11-02	0.477	0.143	0.711	28.9	4	0 0846	0.711
CCR-AP-9	Radium-226 & 228	Probably Increasing	No Trend	No	18	18	0.821	0.294	0.0956	90.4	45	0.154	0.0956	8	8	2019-10-22 to 2023-05-23	0.779	0.286	0.386	61.4	8	0.583	0.386
CCR-AP-1R	Selenium, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	22	10	1.26	NA	NA	NA	NA	NA	NA	8	5	2020-11-13 to 2023-11-02	1.01	-0.473	0.135	86.5	-13	-0.0002	0.135
CCR-AP-2	Selenium, Total	Increasing	No Trend	No	22	15	1.13	0.399	0.0115	98.9	90	0.000171	0.0115	8	7	2020-11-12 to 2023-11-02	0.772	0.286	0.386	61.4	8	0 00035	0.386
CCR-AP-3	Selenium, Total	Probably Increasing	No Trend	No	21	20	0.549	0.296	0.0752	92.5	59	0.0000179	0.0752	8	8	2020-05-20 to 2023-11-02	0.209	0.289	0.421	57.9	7	0.0000125	0.421
CCR-AP-4R	Selenium, Total	Probably Increasing	No Trend	No	21	11	1.82	0.31	0.0717	92.8	57	0.0000284	0.0717	8	4	2020-05-20 to 2023-11-02	0.242	0.454	0.18	82	11	0.000108	0.18
CCR-AP-5	Selenium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Increasing	No	21	7	1.25	NA	NA	NA	NA	NA	NA	8	6	2020-05-19 to 2023-11-02	1.16	0.837	0.00609	99.4	23	0.0004	0 00609
CCR-AP-6	Selenium, Total	No Trend	Stable	No	21	17	0.989	0.0981	0.563	43.7	20	0.00000955	0.563	8	7	2020-05-20 to 2023-11-02	0.363	-0.286	0.386	61.4	-8	-0.000123	0.386
CCR-AP-7	Selenium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Only one detected result.	No	21	3	0.258	NA	NA	NA	NA	NA	NA	8	1	2020-05-18 to 2023-11-06	0.0418	NA	NA	NA	NA	NA	NA
CCR-AP-8	Selenium, Total	No Trend	Stable	No	21	18	0.566	0.0687	0.693	30.7	14	0.00000611	0.693	8	8	2020-05-20 to 2023-11-02	0.527	-0.357	0.266	73.4	-10	-0.00015	0.266
CCR-AP-9	Selenium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	20	6	1.17	NA	NA	NA	NA	NA	NA	8	2	2019-10-22 to 2023-05-23	1.27	NA	NA	NA	NA	NA	NA
CCR-AP-1R	Thallium, Total	Increasing	No Trend	No	22	16	0.924	0.371	0.0187	98.1	84	0.0000313	0.0187	8	5	2020-11-13 to 2023-11-02	0.85	0.182	0.618	38.2	5	0.000015	0.618
CCR-AP-2	Thallium, Total	Increasing	No Trend	No	22	19	1.56	0.621	0.0000675	100	142	0.000056	0.0000675	8	7	2020-11-12 to 2023-11-02	1.41	0.296	0.379	62.1	8	0.000117	0.379
CCR-AP-3	Thallium, Total	Not Evaluated - Only one detected result.	Not Evaluated - No detected results.	No	21	1	0.283	NA	NA	NA	NA	NA	NA	8	0	2020-05-20 to 2023-11-02	0.314	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-4R	Thallium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	21	10	1.12	NA	NA	NA	NA	NA	NA	8	2	2020-05-20 to 2023-11-02	0.342	NA	NA	NA	NA	NA	NA
CCR-AP-5	Thallium, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	21	7	1.59	NA	NA	NA	NA	NA	NA	8	4	2020-05-19 to 2023-11-02	0.579	0.242	0.507	49.3	6	0.000015	0.507
CCR-AP-6	Thallium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - No detected results.	No	21	8	1.09	NA	NA	NA	NA	NA	NA	8	0	2020-05-20 to 2023-11-02	0.314	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-7	Thallium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - No detected results.	No	23	4	0.399	NA	NA	NA	NA	NA	NA	8	0	2020-05-18 to 2023-11-06	0.314	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-8	Thallium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - No detected results.	No	21	5	0.483	NA	NA	NA	NA	NA	NA	8	0	2020-05-20 to 2023-11-02	0.314	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-9	Thallium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - No detected results.	No	20	9	1.55	NA	NA	NA	NA	NA	NA	8	0	2019-10-22 to 2023-05-23	1.25	NA	No detected results.	NA	NA	NA	No detected results.

Note:
Mann Kendall test run on seasonally adjusted data if seasonal trend identified. Seasonal trends identified based on Kruskall Wallis test and time series plots, where n seasons = 4 and (Dec-Feb, Mar-May, Jun-Aug, Sept-Nov).

Note:
Mann Kendall Trends are classified based on Aziz (2003) guidance.

Table A-5. Intrawell Arsenic Prediction Limit Calculations

			Baseline Data Characterization [a]												Prediction Limits		Parametric UPL Calculation Statistics			Non-Parametric UPL Calculation Statistics	
Location	Constituent	Units	Baseline Distribution [a]	Prediction Interval Calculation	min baseline sample date	max baseline sample sample	n	n, non-detects	max	mean	standard deviation	Trend (Baseline Data)	degrees of freedom	future samples (M)	Prediction Limit Calculation Method	UPL	confidence level (%)	t (percentile of student's t-test)	t quantile	actual confidence level (%)	false positive rate (%)
CCR-AP-2	Arsenic, Total	mg/L	Normal (Baseline, 95% Confidence)	Parametric	2016-06-10	2023-07-28	21	0	0.048	0.0143	0.0119	Increasing	20	4	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)	0.0526	99	0.9975	3.153	NA	NA
CCR-AP-3	Arsenic, Total	mg/L	Normal (Baseline, 95% Confidence)	Parametric	2016-06-10	2023-05-23	20	0	0.095	0.0759	0.00848	Increasing	19	4	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)	0.103	99	0.9975	3.174	NA	NA
CCR-AP-4R	Arsenic, Total	mg/L	Normal (Baseline, ln Trans, 95% Confidence)	Parametric (ln Transformed Data)	2016-06-10	2023-05-23	20	0	0.33	0.112	0.081	Increasing	19	4	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)	0.707	99	0.9975	3.174	NA	NA
CCR-AP-5	Arsenic, Total	mg/L	Not normal (Baseline, ln Trans, 95% Confidence)	Non-Parametric	2016-06-10	2023-05-25	19	2	0.024	0.00355	0.00584	Increasing	18	4	Non-Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.3.1)	0.024	NA	NA	NA	82.6	17.4
CCR-AP-6	Arsenic, Total	mg/L	Normal (Baseline, 95% Confidence)	Parametric	2016-06-10	2023-05-23	20	0	0.12	0.0942	0.0221	Increasing	19	4	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)	0.166	99	0.9975	3.174	NA	NA
CCR-AP-8	Arsenic, Total	mg/L	Normal (Baseline, 95% Confidence)	Parametric	2017-03-09	2023-05-25	20	0	0.12	0.091	0.0216	Increasing	19	4	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)	0.161	99	0.9975	3.174	NA	NA

Note:

[a] Baseline data refer to the entire statistical dataset, except the 4 most recent data points. The 4 most recent data points are considered 'compliance' or 'recent' samples. Baseline datasets were re-tested for outliers, secular trends, and data normality. No outliers were removed.
Prediction limits calculated using simple replacement with the reporting limit for non-detect results.

Table A-6. Confidence Intervals

			Confidence Interval (CI) Dataset						CI Calculation [a]			SSL Confirmation		Non-Parametric CI Statistics (if applicable)	
Location	Constituent	Units	n	max (Rank n)	min (Rank 1)	median	mean	standard deviation	CI calculation method	degrees of freedom	95% Confidence LCL	GWPS	LCL > GWPS?	bootstrap iterations	bootstrap median
CCR-AP-2	Cobalt, Total	mg/L	22	0.091	0.0073	0.022	0.0277	0.02	Calculation of the Confidence Interval Around the Lognormal Mean (Parametric)	21	0.0175	0.081	No	NA	NA
CCR-AP-2	Lead, Total	mg/L	22	0.100	0.0023	0.0225	0.028	0.025	Calculation of the Confidence Interval Around the Lognormal Mean (Parametric)	21	0.0111	0.094	No	NA	NA
CCR-AP-5	Molybdenum, Total	mg/L	21	0.530	0.046	0.33	0.294	0.12	Calculation of the Confidence Interval Around the Normal Mean (Parametric)	20	0.239	0.100	Yes	NA	NA

Note:

Confidence intervals are calculated for analyte/well pairs with GWPS exceedances in the November 2023 dataset.

[a] The 95% lower confience level (LCL) is compared to the Groundwater Protection Standard (GWPS) to confirm a statistically significant level (SSL). The 99% confidence interval is also shown for purposes of comparison. UCL = upper confidence level.

Table A-7. Groundwater Protection Standard (GWPS) Summary

Background Location	Constituent	Units	Background Threshold Value (BTV)	BTV Type	MCL/RSL	GWPS	GWPS Source	BTV Calculation Method
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Antimony, Total	mg/L	0.02	Interwell UTL	0.006	0.02	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-2	Arsenic, Total	mg/L	0.0526	Intrawell UPL	0.01	0.0526	BTV	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)
CCR-AP-3	Arsenic, Total	mg/L	0.103	Intrawell UPL	0.01	0.103	BTV	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)
CCR-AP-4R	Arsenic, Total	mg/L	0.707	Intrawell UPL	0.01	0.707	BTV	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)
CCR-AP-5	Arsenic, Total	mg/L	0.024	Intrawell UPL	0.01	0.024	BTV	Non-Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.3.1)
CCR-AP-6	Arsenic, Total	mg/L	0.166	Intrawell UPL	0.01	0.166	BTV	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)
CCR-AP-8	Arsenic, Total	mg/L	0.161	Intrawell UPL	0.01	0.161	BTV	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Barium, Total	mg/L	0.72	Interwell UTL	2	2	MCL/RSL	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Beryllium, Total	mg/L	0.01	Interwell UTL	0.004	0.01	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Cadmium, Total	mg/L	0.01	Interwell UTL	0.005	0.01	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Chromium, Total	mg/L	0.16	Interwell UTL	0.1	0.16	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Cobalt, Total	mg/L	0.081	Interwell UTL	0.006	0.081	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Fluoride	mg/L	0.681	Interwell UTL	4	4	MCL/RSL	Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.1)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Lead, Total	mg/L	0.094	Interwell UTL	0.015	0.094	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Lithium, Total	mg/L	0 23	Interwell UTL	0.04	0 23	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Mercury, Total	mg/L	0.002	Interwell UTL	0.002	0.002	BTV = MCL/RSL	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Molybdenum, Total	mg/L	0.05	Interwell UTL	0.1	0.1	MCL/RSL	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Radium-226 & 228	pCi/L	12.6	Interwell UTL	5	12.6	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Selenium, Total	mg/L	0.05	Interwell UTL	0.05	0.05	BTV = MCL/RSL	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Thallium, Total	mg/L	0.01	Interwell UTL	0.002	0.01	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)

Background Threshold Values (BTVs) include Upper Threshold Limits (UTLs) calculated from pooled/interwell background data and Upper Prediction Limits (UPLs) for Arsenic calculated from intrawell data. Groundwater Protection Standard (GWPS) is the maximum value between the BTV and the Maximum Contaminant Level/Regional Screening Level (MCL/RSL).

Table A-8. Groundwater Protection Standard (GWPS) Comparison Table

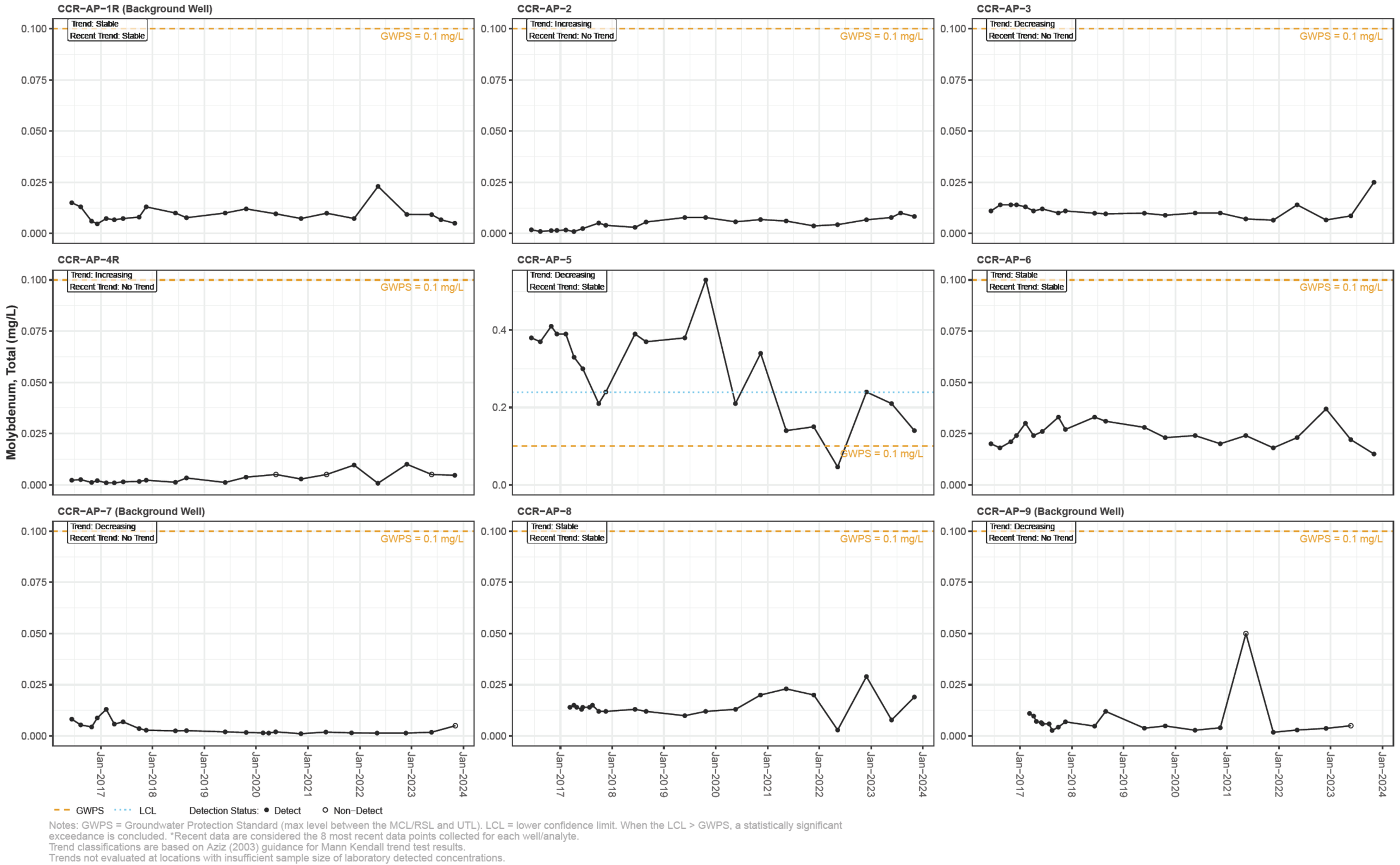
Location	Constituent	Units	Sample Date	Sample Result	Background Threshold Value (BTV)	BTV Type	GWPS	GWPS Exceedance	LCL	SSL Confirmed
CCR-AP-2	Antimony, Total	mg/L	2023-11-02	0.0013 J	0.02	Interwell UTL	0.02	No	NA	No
CCR-AP-3	Antimony, Total	mg/L	2023-11-02	0.005	0.02	Interwell UTL	0.02	No	NA	No
CCR-AP-4R	Antimony, Total	mg/L	2023-11-02	0.0031 J	0.02	Interwell UTL	0.02	No	NA	No
CCR-AP-5	Antimony, Total	mg/L	2023-11-02	0.0024 J	0.02	Interwell UTL	0.02	No	NA	No
CCR-AP-6	Antimony, Total	mg/L	2023-11-02	0.00066 J	0.02	Interwell UTL	0.02	No	NA	No
CCR-AP-8	Antimony, Total	mg/L	2023-11-02	0.00057 J	0.02	Interwell UTL	0.02	No	NA	No
CCR-AP-2	Arsenic, Total	mg/L	2023-11-02	0.04	0.0526	Intrawell UPL	0.0526	No	NA	No
CCR-AP-3	Arsenic, Total	mg/L	2023-11-02	0.089	0.103	Intrawell UPL	0.103	No	NA	No
CCR-AP-4R	Arsenic, Total	mg/L	2023-11-02	0.19	0.707	Intrawell UPL	0.707	No	NA	No
CCR-AP-5	Arsenic, Total	mg/L	2023-11-02	0.024	0.024	Intrawell UPL	0.024	No	NA	No
CCR-AP-6	Arsenic, Total	mg/L	2023-11-02	0.096	0.166	Intrawell UPL	0.166	No	NA	No
CCR-AP-8	Arsenic, Total	mg/L	2023-11-02	0.065	0.161	Intrawell UPL	0.161	No	NA	No
CCR-AP-2	Barium, Total	mg/L	2023-11-02	0.64	0.72	Interwell UTL	2	No	NA	No
CCR-AP-3	Barium, Total	mg/L	2023-11-02	0.48	0.72	Interwell UTL	2	No	NA	No
CCR-AP-4R	Barium, Total	mg/L	2023-11-02	0.92	0.72	Interwell UTL	2	No	NA	No
CCR-AP-5	Barium, Total	mg/L	2023-11-02	0.2	0.72	Interwell UTL	2	No	NA	No
CCR-AP-6	Barium, Total	mg/L	2023-11-02	0.48	0.72	Interwell UTL	2	No	NA	No
CCR-AP-8	Barium, Total	mg/L	2023-11-02	0.31	0.72	Interwell UTL	2	No	NA	No
CCR-AP-2	Beryllium, Total	mg/L	2023-11-02	0.0072	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-3	Beryllium, Total	mg/L	2023-11-02	0.00056	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-4R	Beryllium, Total	mg/L	2023-11-02	0.00047 J	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-5	Beryllium, Total	mg/L	2023-11-02	0.0016	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-6	Beryllium, Total	mg/L	2023-11-02	0.0005 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-8	Beryllium, Total	mg/L	2023-11-02	0.0005 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-2	Cadmium, Total	mg/L	2023-11-02	0.0023	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-3	Cadmium, Total	mg/L	2023-11-02	0.00038 J	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-4R	Cadmium, Total	mg/L	2023-11-02	0.0003 J	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-5	Cadmium, Total	mg/L	2023-11-02	0.0014	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-6	Cadmium, Total	mg/L	2023-11-02	0.000094 J	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-8	Cadmium, Total	mg/L	2023-11-02	0.00016 J	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-2	Chromium, Total	mg/L	2023-11-02	0.14	0.16	Interwell UTL	0.16	No	NA	No
CCR-AP-3	Chromium, Total	mg/L	2023-11-02	0.014	0.16	Interwell UTL	0.16	No	NA	No
CCR-AP-4R	Chromium, Total	mg/L	2023-11-02	0.012	0.16	Interwell UTL	0.16	No	NA	No
CCR-AP-5	Chromium, Total	mg/L	2023-11-02	0.056	0.16	Interwell UTL	0.16	No	NA	No
CCR-AP-6	Chromium, Total	mg/L	2023-11-02	0.0047 J	0.16	Interwell UTL	0.16	No	NA	No
CCR-AP-8	Chromium, Total	mg/L	2023-11-02	0.0016 J	0.16	Interwell UTL	0.16	No	NA	No
CCR-AP-2	Cobalt, Total	mg/L	2023-11-02	0.091	0.081	Interwell UTL	0.081	Yes	0.0175	No
CCR-AP-3	Cobalt, Total	mg/L	2023-11-02	0.0092	0.081	Interwell UTL	0.081	No	NA	No
CCR-AP-4R	Cobalt, Total	mg/L	2023-11-02	0.0049	0.081	Interwell UTL	0.081	No	NA	No
CCR-AP-5	Cobalt, Total	mg/L	2023-11-02	0.01	0.081	Interwell UTL	0.081	No	NA	No
CCR-AP-6	Cobalt, Total	mg/L	2023-11-02	0.0047	0.081	Interwell UTL	0.081	No	NA	No
CCR-AP-8	Cobalt, Total	mg/L	2023-11-02	0.0032	0.081	Interwell UTL	0.081	No	NA	No
CCR-AP-2	Fluoride	mg/L	2023-11-02	0.55	0.681	Interwell UTL	4	No	NA	No
CCR-AP-3	Fluoride	mg/L	2023-11-02	0.23	0.681	Interwell UTL	4	No	NA	No
CCR-AP-4R	Fluoride	mg/L	2023-11-02	0.48	0.681	Interwell UTL	4	No	NA	No
CCR-AP-5	Fluoride	mg/L	2023-11-02	2.3	0.681	Interwell UTL	4	No	NA	No
CCR-AP-6	Fluoride	mg/L	2023-11-02	0.51	0.681	Interwell UTL	4	No	NA	No
CCR-AP-8	Fluoride	mg/L	2023-11-02	1.1	0.681	Interwell UTL	4	No	NA	No
CCR-AP-2	Lead, Total	mg/L	2023-11-02	0.1	0.094	Interwell UTL	0.094	Yes	0.0111	No
CCR-AP-3	Lead, Total	mg/L	2023-11-02	0.01	0.094	Interwell UTL	0.094	No	NA	No
CCR-AP-4R	Lead, Total	mg/L	2023-11-02	0.011	0.094	Interwell UTL	0.094	No	NA	No
CCR-AP-5	Lead, Total	mg/L	2023-11-02	0.02	0.094	Interwell UTL	0.094	No	NA	No
CCR-AP-6	Lead, Total	mg/L	2023-11-02	0.0027 J	0.094	Interwell UTL	0.094	No	NA	No
CCR-AP-8	Lead, Total	mg/L	2023-11-02	0.003 U	0.094	Interwell UTL	0.094	No	NA	No
CCR-AP-2	Lithium, Total	mg/L	2023-11-02	0.11	0.23	Interwell UTL	0.23	No	NA	No
CCR-AP-3	Lithium, Total	mg/L	2023-11-02	0.0043 J	0.23	Interwell UTL	0.23	No	NA	No
CCR-AP-4R	Lithium, Total	mg/L	2023-11-02	0.0067	0.23	Interwell UTL	0.23	No	NA	No
CCR-AP-5	Lithium, Total	mg/L	2023-11-02	0.059	0.23	Interwell UTL	0.23	No	NA	No
CCR-AP-6	Lithium, Total	mg/L	2023-11-02	0.002 J	0.23	Interwell UTL	0.23	No	NA	No
CCR-AP-8	Lithium, Total	mg/L	2023-11-02	0.005 U	0.23	Interwell UTL	0.23	No	NA	No
CCR-AP-2	Mercury, Total	mg/L	2023-11-02	0.00042 J	0.002	Interwell UTL	0.002	No	NA	No

Background Threshold Values (BTVs) include Upper Threshold Limits (UTLs) calculated from pooled/interwell background data and Upper Prediction Limits (UPLs) for Arsenic calculated from intrawell data. Groundwater Protection Standard (GWPS) is the maximum value between the BTV and the Maximum Contaminant Level/Regional Screening Level (MCL/RSL). Lower Confidence Limit (LCL) calculated if the event sample result exceeds the GWPS. If the LCL is greater than the GWPS, a Statistically Significant Level (SSL) is confirmed.

Location	Constituent	Units	Sample Date	Sample Result	Background Threshold Value (BTV)	BTV Type	GWPS	GWPS Exceedance	LCL	SSL Confirmed
CCR-AP-3	Mercury, Total	mg/L	2023-11-02	0.0005 U	0.002	Interwell UTL	0.002	No	NA	No
CCR-AP-4R	Mercury, Total	mg/L	2023-11-02	0.0005 U	0.002	Interwell UTL	0.002	No	NA	No
CCR-AP-5	Mercury, Total	mg/L	2023-11-02	0.0016	0.002	Interwell UTL	0.002	No	NA	No
CCR-AP-6	Mercury, Total	mg/L	2023-11-02	0.0005 U	0.002	Interwell UTL	0.002	No	NA	No
CCR-AP-8	Mercury, Total	mg/L	2023-11-02	0.0005 U	0.002	Interwell UTL	0.002	No	NA	No
CCR-AP-2	Molybdenum, Total	mg/L	2023-11-02	0.0083	0.05	Interwell UTL	0.1	No	NA	No
CCR-AP-3	Molybdenum, Total	mg/L	2023-11-02	0.025	0.05	Interwell UTL	0.1	No	NA	No
CCR-AP-4R	Molybdenum, Total	mg/L	2023-11-02	0.0046 J	0.05	Interwell UTL	0.1	No	NA	No
CCR-AP-5	Molybdenum, Total	mg/L	2023-11-02	0.14	0.05	Interwell UTL	0.1	Yes	0.239	Yes
CCR-AP-6	Molybdenum, Total	mg/L	2023-11-02	0.015	0.05	Interwell UTL	0.1	No	NA	No
CCR-AP-8	Molybdenum, Total	mg/L	2023-11-02	0.019	0.05	Interwell UTL	0.1	No	NA	No
CCR-AP-2	Radium-226 & 228	pCi/L	2023-11-02	3.23 J+	12.6	Interwell UTL	12.6	No	NA	No
CCR-AP-3	Radium-226 & 228	pCi/L	2023-11-02	2 64 U	12.6	Interwell UTL	12.6	No	NA	No
CCR-AP-4R	Radium-226 & 228	pCi/L	2023-11-02	5 26 U	12.6	Interwell UTL	12.6	No	NA	No
CCR-AP-5	Radium-226 & 228	pCi/L	2023-11-02	5.54 J+	12.6	Interwell UTL	12.6	No	NA	No
CCR-AP-6	Radium-226 & 228	pCi/L	2023-11-02	2.72 U	12.6	Interwell UTL	12.6	No	NA	No
CCR-AP-8	Radium-226 & 228	pCi/L	2023-11-02	2.1 U	12.6	Interwell UTL	12.6	No	NA	No
CCR-AP-2	Selenium, Total	mg/L	2023-11-02	0.013	0.05	Interwell UTL	0.05	No	NA	No
CCR-AP-3	Selenium, Total	mg/L	2023-11-02	0.003 J	0.05	Interwell UTL	0.05	No	NA	No
CCR-AP-4R	Selenium, Total	mg/L	2023-11-02	0.0036 J	0.05	Interwell UTL	0.05	No	NA	No
CCR-AP-5	Selenium, Total	mg/L	2023-11-02	0.02	0.05	Interwell UTL	0.05	No	NA	No
CCR-AP-6	Selenium, Total	mg/L	2023-11-02	0.0012 J	0.05	Interwell UTL	0.05	No	NA	No
CCR-AP-8	Selenium, Total	mg/L	2023-11-02	0.0016 J	0.05	Interwell UTL	0.05	No	NA	No
CCR-AP-2	Thallium, Total	mg/L	2023-11-02	0.0012 J	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-3	Thallium, Total	mg/L	2023-11-02	0.002 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-4R	Thallium, Total	mg/L	2023-11-02	0.002 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-5	Thallium, Total	mg/L	2023-11-02	0.00096 J	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-6	Thallium, Total	mg/L	2023-11-02	0.002 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-8	Thallium, Total	mg/L	2023-11-02	0.002 U	0.01	Interwell UTL	0.01	No	NA	No

Background Threshold Values (BTVs) include Upper Threshold Limits (UTLs) calculated from pooled/interwell background data and Upper Prediction Limits (UPLs) for Arsenic calculated from intrawell data. Groundwater Protection Standard (GWPS) is the maximum value between the BTV and the Maximum Contaminant Level/Regional Screening Level (MCL/RSL). Lower Confidence Limit (LCL) calculated if the event sample result exceeds the GWPS. If the LCL is greater than the GWPS, a Statistically Significant Level (SSL) is confirmed.

Assessment Monitoring Trend Analysis for Molybdenum, Total



Notes: GWPS = Groundwater Protection Standard (max level between the MCL/RSL and UTL). LCL = lower confidence limit. When the LCL > GWPS, a statistically significant exceedance is concluded. *Recent data are considered the 8 most recent data points collected for each well/analyte.
Trend classifications are based on Aziz (2003) guidance for Mann Kendall trend test results.
Trends not evaluated at locations with insufficient sample size of laboratory detected concentrations.

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TECHNICAL MEMORANDUM

17 September 2024
File No. 0129420-032

TO: Southern Indiana Gas and Electric Company

FROM: Haley & Aldrich, Inc.
Todd Plating, Senior Project Manager
Steven F. Putrich, P.E., Project Principal

SUBJECT: Statistical Evaluation of the May 2024 Semi-annual Groundwater Assessment Monitoring Data
Southern Indiana Gas and Electric Company
East Ash Pond
F.B. Culley Generating Station; Warrick County, Indiana

Pursuant to Title 40 Code of Federal Regulations (40 CFR) § 257.93 and § 257.95 (Rule), this memorandum summarizes the statistical evaluation of the analytical results for the May 2024 semi-annual assessment monitoring event for the F.B. Culley Generating Station (FBC) East Ash Pond (EAP). Haley & Aldrich, Inc. (Haley & Aldrich) completed this statistical evaluation to determine if Appendix IV groundwater monitoring constituents have been detected in downgradient wells at statistically significant levels (SSL) greater than Groundwater Protection Standards (GWPS), consistent with the requirements in 40 CFR § 257.95.

Methods used during this statistical analysis are described in Haley & Aldrich's 2017 *Statistical Data Analysis Plan for the F.B. Culley Generating Station*. A summary of how applicable performance standards described in 40 CFR § 257.93 (g) were achieved include:

- 40 CFR § 257.93 (g) (1) - Data set distributions were evaluated using basic summary statistics, graphical methods including probability plots, and the Shapiro-Wilk Test for Normality. Data sets were also evaluated for statistical outliers using box plots and either Dixon's Q Test for Outliers or Rosner's Outlier Test depending on sample size. Outlier identification and data set distribution groups are summarized in Attachment A. For background limit calculations, parametric methods were used for normally distributed data sets and non-parametric methods were used for non-normally distributed data sets.
- 40 CFR § 257.93 (g) (2) – Not applicable
- 40 CFR § 257.93 (g) (3) – Not applicable

- 40 CFR § 257.93 (g) (4) – Levels of confidence and additional supporting information for the use of tolerance intervals and prediction limits are included in Attachment A.
- 40 CFR § 257.93 (g) (5) – Non-detect values were accounted for by simple substitution, where the reporting limit replaced the non-detect result. Non-detect values are identified and summarized in Attachment A.
- 40 CFR § 257.93 (g) (6) – Time series plots for groundwater monitoring wells included in this evaluation were reviewed to identify potential seasonal variability. Temporal trends were evaluated using the non-parametric Mann-Kendall Trend Test and Theil-Sen Estimator.

Data from the groundwater sampling event for the downgradient monitoring wells (CCR-AP-2 through CCR-AP-6 and CCR-AP-8) were compared to the GWPS established from the background dataset for the upgradient monitoring wells (CCR-AP-1R, CCR-AP-7, and CCR-AP-9) for detected Appendix IV constituents. The GWPS for each of the Appendix IV constituents has been set equal to the highest value among the maximum contaminant level (MCL), regional screening level (RSL), and background threshold value (BTV). The results of the assessment monitoring statistical evaluation are discussed below and provided in Attachment A.

Development of Groundwater Protection Standard

The Rule provides four specific options for statistical evaluation of groundwater quality data collected at a coal combustion residual (CCR) unit (40 CFR §257.93(f) (1-4)). Haley & Aldrich certified the tolerance limit (TL) as the statistical method used for developing BTVs on 14 January 2019. An alternate source demonstration was performed for arsenic on 13 September 2019, certifying the prediction limit (PL) as the statistical method for developing arsenic BTVs. As noted above, the GWPS for each of the Appendix IV constituents has been set equal to the highest value of the MCL, RSL, or BTV (either the TL or PL). The most recent groundwater sampling result from each compliance well was compared to the GWPS to determine if additional statistical testing is warranted.

STATISTICAL EVALUATION

BTVs are periodically updated per the document *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, March 2009* (Unified Guidance). Prior to calculating BTVs, data were evaluated for outlier results, data distribution, and spatial and temporal variability. Potential outlier sample results that would warrant removal from the data set based on likely error in sampling or measurement were identified through statistical outlier using the outliers (version 0.15) R programming package and either the Dixon's or Rosner's Test for Outliers. Potential outliers were further evaluated by visual inspection of box plots and probability plots, and field forms and analytical laboratory reports were reviewed as necessary. No sample data were identified as outliers that warranted removal from the dataset.

Background data distributions were assessed using the stats (version 4.3.3) R programming package and either the Shapiro-Wilk or Shapiro-Francia Test for Normality. Data distributions were further evaluated by visual inspection of probability and distribution plots. Data distributions inform appropriate BTV calculation methods.

Background and downgradient data sets were evaluated for spatial and temporal variability by visual inspection of box plots and time series plots and using the Mann-Kendall Trend Tests (Kendall R programming package, version 2.2.1) and Theil-Sen Estimator (trend R programming package, version 1.1.6). Spatial and temporal variability in background data sets inform appropriate BTV calculation methods.

Note that the CCR unit is in assessment monitoring, so Appendix III (detection monitoring) constituents were not evaluated.

Interwell Background Evaluation

An interwell statistical evaluation was used to determine the TL and identify potential SSLs for detected Appendix IV constituents, except arsenic (Table 1). The interwell evaluation compares the most recent value from downgradient compliance wells to a background dataset composed of pooled upgradient well data. TLs were calculated from the pooled background well dataset utilizing R programming language and the EnvStats (version 2.8.1) and tolerance (version 2.0.0) packages. The TL procedure is one in which a concentration limit for each constituent is established from the distribution of the background data, with a minimum 95 percent confidence level. The upper endpoint of a tolerance interval is called the UTL. Depending on the data distribution, parametric or non-parametric TL procedures are used. Parametric TLs utilize normally distributed data or data normalized via a transformation of the background data used to construct the limit. If the data are non-normal and a transformation is not indicated, non-parametric procedures (order statistics or bootstrap methods) are used to calculate the TL. If all the background data are non-detect, a maximum reporting limit may serve as an appropriate UTL.

Intrawell Background Evaluation for Arsenic

For arsenic, an intrawell statistical evaluation was used to determine the PL and identify potential SSLs. The intrawell evaluation compares the most recent data point from each downgradient compliance well to its well-specific background dataset, composed of data collected from the same well prior to the most recent sampling event. PLs were calculated from the well-specific background dataset utilizing R programming language and the stats (version 4.3.3) package. The PL procedure is one in which a concentration limit for each constituent at each downgradient well is established from the distribution of the background data, with a minimum 95 percent confidence level. The upper endpoint of a prediction interval is called the UPL. Depending on the data distribution, parametric or non-parametric PL procedures are used. Parametric PLs utilize normally distributed data or data normalized via a transformation of the background data used to construct the limit. If the data are non-normal and a transformation is not indicated, non-parametric procedures (order statistics or bootstrap methods) are used to calculate the PL. Note that the PL accounts for future variability based on existing data, so it is possible for the PL to be greater than the maximum measured background concentration.

GWPS Comparison and LCL Calculations

The lower confidence limits (LCL) were calculated for any Appendix IV constituent measured in a downgradient well during the May 2024 sampling event at a concentration greater than the GWPS. The LCL is the lower end of the confidence interval range, which is an estimated concentration range

intended to contain the true mean or median of the population from which the sample is drawn. The confidence interval range is designed to locate the true population mean or median with a high degree of statistical confidence, or conversely, with a low probability of error. An SSL is indicated when the downgradient well/constituent-specific LCL is greater than the GWPS.

TREND SUMMARY

Mann Kendall trend analyses were performed on data sets from downgradient wells of sufficient sample size as described above. Results of the trend analysis are summarized in Table 2. Trends indicated for constituents identified as SSLs are summarized below:

- Molybdenum was determined to be increasing at monitoring well locations CCR-AP-2 and CCR-AP-4R. Analytical results at those locations are below the GWPS.
- Molybdenum was determined to be stable at upgradient location CCR-AP-1R and downgradient location CCR-AP-8. No trend established at CCR-AP-6.
- Molybdenum was determined to be decreasing at upgradient locations CCR-AP-7 and CCR-AP-9, along with downgradient locations CCR-AP-3 and CCR-AP-5.

RESULTS OF APPENDIX IV DOWNGRADIENT STATISTICAL COMPARISONS

The sample concentrations from the downgradient wells for each of the detected Appendix IV constituents from the May 2024 assessment monitoring event were compared to their respective GWPS (Attachment A). LCLs were calculated where constituents were detected at concentrations greater than the GWPS. An SSL is indicated when the LCL is greater than the GWPS. SSLs are summarized in the table below. Based on previous compliance sampling events and statistical evaluations, interwell comparisons were used to evaluate constituents not subject to an Alternative Source Demonstration (ASD) in downgradient monitoring wells. Because a successful ASD was completed for arsenic, an intrawell statistical analysis was used to evaluate that constituent.

The results of the statistical analyses conducted for detected Appendix IV constituents confirm that molybdenum remains the only SSL downgradient of the EAP. As a result, the EAP will remain in Assessment Monitoring.

Table 1. Statistically Significant Level Summary – Appendix IV Constituents

Location ID	Trend	Constituent	Newly Identified SSL	Concentration (mg/L)
CCR-AP-5	Decrease	Molybdenum	No	0.15

Notes:
mg/L= milligrams per liter

Enclosure:

Table 2 – Trend Summary
Attachment A - Assessment Monitoring Statistical Analysis Summary – May 2024

TABLES

Table 2. Trend Summary

Location	Chemical	Units	Identified Trends		Trend Analysis on All Available Data					Trend Analysis on Recent Data				
			Trend (All Data)	Trend (Recent Data)	Results, n	Detected Results, n	Max Concentration	Sen Slope (magnitude per year)	p-value	*Results, n	*Detected Results, n	*Max Concentration	*Sen Slope (magnitude per year)	*p-value
CCR-AP-1R	Antimony, Total	mg/L	No Trend	Probably Decreasing	23	17	0.01	5e-06	0.69	8	8	0.0041	-0.000243	0.0635
CCR-AP-2	Antimony, Total	mg/L	No Trend	No Trend	23	14	0.01	1.58e-05	0.191	8	8	0.0079	4.85e-05	0.803
CCR-AP-3	Antimony, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	22	5	0.005	NA	NA	8	3	0.005	NA	NA
CCR-AP-4R	Antimony, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	22	7	0.028	NA	NA	8	5	0.028	0	1
CCR-AP-5	Antimony, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	22	6	0.01	NA	NA	8	5	0.0047	0.000114	0.126
CCR-AP-6	Antimony, Total	mg/L	No Trend	No Trend	22	13	0.018	0	0.861	8	6	0.018	0	1
CCR-AP-7	Antimony, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - No detected results	24	3	0.0025	NA	NA	8	0	0.0025	NA	NA
CCR-AP-8	Antimony, Total	mg/L	Stable	No Trend	22	16	0.0046	-1.92e-05	0.128	8	7	0.0046	-6.89e-05	0.386
CCR-AP-9	Antimony, Total	mg/L	No Trend	No Trend	21	15	0.01	-2.94e-06	0.785	8	6	0.01	-0.000108	0.536
CCR-AP-1R	Arsenic, Total	mg/L	Increasing	Decreasing	23	23	0.038	0.000577	0.0302	8	8	0.034	-0.00287	0.0354
CCR-AP-2	Arsenic, Total	mg/L	Increasing	Increasing	23	23	0.048	0.00133	4.64e-05	8	8	0.048	0.005	0.0354
CCR-AP-3	Arsenic, Total	mg/L	Probably Increasing	Stable	22	22	0.095	0.000625	0.0883	8	8	0.095	-0.00213	0.445
CCR-AP-4R	Arsenic, Total	mg/L	Increasing	Stable	22	22	0.33	0.00529	0.0101	8	8	0.33	-0.00778	0.711
CCR-AP-5	Arsenic, Total	mg/L	Increasing	No Trend	21	19	0.024	0.00014	0.0037	8	8	0.024	0.00165	0.212
CCR-AP-6	Arsenic, Total	mg/L	Probably Increasing	Stable	22	22	0.12	0.00171	0.0711	8	8	0.12	-0.00117	0.369
CCR-AP-7	Arsenic, Total	mg/L	Decreasing	Stable	24	24	0.018	-0.000242	0.00678	8	8	0.0062	-0.000525	0.319
CCR-AP-8	Arsenic, Total	mg/L	Increasing	Decreasing	22	22	0.12	0.0023	0.00706	8	8	0.12	-0.00958	0.0226
CCR-AP-9	Arsenic, Total	mg/L	No Trend	Stable	21	21	0.032	0.000129	0.432	8	8	0.02	-0.00142	0.174
CCR-AP-1R	Barium, Total	mg/L	Increasing	Stable	23	23	0.59	0.00909	0.0247	8	8	0.35	-0.00667	0.902
CCR-AP-2	Barium, Total	mg/L	Increasing	Increasing	23	23	0.83	0.0186	0.00138	8	8	0.83	0.105	0.000837
CCR-AP-3	Barium, Total	mg/L	No Trend	Stable	22	22	0.49	0.00125	0.364	8	8	0.49	-0.00633	0.386
CCR-AP-4R	Barium, Total	mg/L	No Trend	Stable	22	22	1.4	0	0.955	8	8	1.4	-0.005	1
CCR-AP-5	Barium, Total	mg/L	Increasing	No Trend	22	22	0.2	0.00312	0.000217	8	8	0.2	0.00945	0.536
CCR-AP-6	Barium, Total	mg/L	Stable	Decreasing	22	22	0.69	-0.004	0.133	8	8	0.69	-0.0167	0.0248
CCR-AP-7	Barium, Total	mg/L	Decreasing	Stable	24	24	0.19	-0.00226	0.00921	8	8	0.13	-0.00367	0.61
CCR-AP-8	Barium, Total	mg/L	Decreasing	Decreasing	22	22	0.68	-0.0114	0.00051	8	8	0.57	-0.0367	0.0126
CCR-AP-9	Barium, Total	mg/L	No Trend	Stable	21	21	0.72	0.00481	0.172	8	8	0.39	-0.0138	0.454
CCR-AP-1R	Beryllium, Total	mg/L	Increasing	Decreasing	23	23	0.0066	0.000138	0.0175	8	8	0.0061	-0.000662	0.0354
CCR-AP-2	Beryllium, Total	mg/L	Increasing	No Trend	23	23	0.0077	0.000162	0.000114	8	8	0.0077	0.000532	0.386
CCR-AP-3	Beryllium, Total	mg/L	Not Evaluated - Only one detected result	Not Evaluated - Only one detected result	22	1	0.00056	NA	NA	8	1	0.00056	NA	NA
CCR-AP-4R	Beryllium, Total	mg/L	Increasing	Stable	22	15	0.0017	1.69e-05	0.00759	8	4	0.0017	-1.29e-05	0.232
CCR-AP-5	Beryllium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Only one detected result	22	6	0.005	NA	NA	8	1	0.0016	NA	NA
CCR-AP-6	Beryllium, Total	mg/L	No Trend	Not Evaluated - Majority of data (>50%) non-detect	22	13	0.0025	8e-06	0.151	8	2	0.00096	NA	NA
CCR-AP-7	Beryllium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - No detected results	24	7	0.00075	NA	NA	8	0	0.0005	NA	NA
CCR-AP-8	Beryllium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Only one detected result	22	6	0.0005	NA	NA	8	1	0.0005	NA	NA
CCR-AP-9	Beryllium, Total	mg/L	Probably Increasing	Stable	21	19	0.005	3.14e-05	0.0846	8	6	0.005	-0.000113	0.386
CCR-AP-1R	Cadmium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	23	10	0.005	NA	NA	8	6	0.0025	-4.25e-05	0.386
CCR-AP-2	Cadmium, Total	mg/L	Increasing	No Trend	23	20	0.0066	6.25e-05	0.0055	8	8	0.0066	0.000237	0.174
CCR-AP-3	Cadmium, Total	mg/L	Not Evaluated - Only one detected result	Not Evaluated - Only one detected result	22	1	0.0005	NA	NA	8	1	0.0005	NA	NA
CCR-AP-4R	Cadmium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Stable	22	10	0.0025	NA	NA	8	4	0.00079	0	1
CCR-AP-5	Cadmium, Total	mg/L	No Trend	No Trend	22	16	0.005	4.55e-06	0.57	8	5	0.0014	2.46e-05	0.61
CCR-AP-6	Cadmium, Total	mg/L	No Trend	Not Evaluated - Majority of data (>50%) non-detect	22	13	0.0011	0	0.272	8	2	0.0011	NA	NA
CCR-AP-7	Cadmium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - No detected results	24	2	0.0005	NA	NA	8	0	0.0005	NA	NA
CCR-AP-8	Cadmium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	22	6	0.00064	NA	NA	8	3	0.00064	NA	NA
CCR-AP-9	Cadmium, Total	mg/L	Increasing	Not Evaluated - Majority of data (>50%) non-detect	21	11	0.005	2.26e-05	0.00325	8	2	0.005	NA	NA
CCR-AP-1R	Chromium, Total	mg/L	Increasing	Stable	23	23	0.16	0.00236	0.0322	8	8	0.11	-0.00746	0.174
CCR-AP-2	Chromium, Total	mg/L	Increasing	Increasing	23	23	0.14	0.00423	9.28e-05	8	8	0.14	0.0176	0.00198
CCR-AP-3	Chromium, Total	mg/L	Probably Increasing	No Trend	22	18	0.014	5e-05	0.0868	8	7	0.014	0.000225	0.212
CCR-AP-4R	Chromium, Total	mg/L	No Trend	Stable	21	18	0.0488	0.000267	0.123	8	7	0.0488	-0.000137	0.902
CCR-AP-5	Chromium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	22	6	0.056	NA	NA	8	5	0.056	0.000875	0.203

Abbreviations: mg/L = milligrams per liter; n = sample count; pCi/L = picocuries per liter.

Notes: *Recent data defined as the 8 most recent data points. MK = Mann Kendall Trend Test. Secular Trend Classification based on Aziz (2003) guidance and MK Results. Thiel-Sen slope and p-value evaluated at 95% confidence level to confirm MK trends.

Additional information about trend analysis provided in Attachment A.

Location	Chemical	Units	Identified Trends		Trend Analysis on All Available Data					Trend Analysis on Recent Data				
			Trend (All Data)	Trend (Recent Data)	Results, n	Detected Results, n	Max Concentration	Sen Slope (magnitude per year)	p-value	*Results, n	*Detected Results, n	*Max Concentration	*Sen Slope (magnitude per year)	*p-value
CCR-AP-6	Chromium, Total	mg/L	Stable	No Trend	22	21	0.043	-0.000237	0.296	8	7	0.043	-0.00066	0.536
CCR-AP-7	Chromium, Total	mg/L	No Trend	Not Evaluated - No detected results	24	12	0.019	0	0.723	8	0	0.005	NA	NA
CCR-AP-8	Chromium, Total	mg/L	No Trend	Stable	21	19	0.014	1.61e-05	0.832	8	7	0.014	-0.000237	0.711
CCR-AP-9	Chromium, Total	mg/L	Increasing	Stable	21	21	0.15	0.000926	0.0252	8	8	0.045	-0.000571	0.803
CCR-AP-1R	Cobalt, Total	mg/L	Increasing	Probably Decreasing	23	23	0.081	0.00169	0.015	8	8	0.08	-0.0058	0.0635
CCR-AP-2	Cobalt, Total	mg/L	Increasing	Increasing	23	23	0.091	0.0017	2.08e-05	8	8	0.091	0.00704	0.0187
CCR-AP-3	Cobalt, Total	mg/L	Decreasing	No Trend	22	22	0.0094	-0.000175	0.000877	8	8	0.0092	0.000236	0.386
CCR-AP-4R	Cobalt, Total	mg/L	No Trend	Stable	22	22	0.0173	2.43e-05	0.714	8	8	0.0173	-0.000189	0.902
CCR-AP-5	Cobalt, Total	mg/L	Decreasing	No Trend	22	22	0.01	-0.00032	0.00189	8	8	0.01	0.000558	0.212
CCR-AP-6	Cobalt, Total	mg/L	Stable	Stable	22	22	0.019	-0.00022	0.108	8	8	0.019	-0.000417	0.212
CCR-AP-7	Cobalt, Total	mg/L	Decreasing	No Trend	24	22	0.015	-8.48e-05	0.00631	8	6	0.001	2.47e-05	0.536
CCR-AP-8	Cobalt, Total	mg/L	Decreasing	Stable	22	22	0.017	-0.000467	0.000149	8	8	0.012	-0.000658	0.386
CCR-AP-9	Cobalt, Total	mg/L	No Trend	Stable	21	21	0.047	0.00025	0.153	8	8	0.023	-0.001	0.445
CCR-AP-1R	Fluoride	mg/L	Decreasing	Decreasing	23	23	0.81	-0.00818	0.00158	8	8	0.63	-0.0314	0.00277
CCR-AP-2	Fluoride	mg/L	Increasing	Stable	23	23	0.69	0.0143	0.00136	8	8	0.69	-0.0357	0.319
CCR-AP-3	Fluoride	mg/L	Stable	Stable	22	21	0.93	-0.00933	0.185	8	8	0.57	-0.0104	0.711
CCR-AP-4R	Fluoride	mg/L	No Trend	Probably Increasing	22	21	0.64	0.00667	0.15	8	8	0.61	0.0383	0.0635
CCR-AP-5	Fluoride	mg/L	Increasing	Stable	22	22	2.3	0.0429	0.00782	8	8	2.3	0	1
CCR-AP-6	Fluoride	mg/L	Stable	Stable	22	22	0.69	-0.00467	0.446	8	8	0.69	-0.005	1
CCR-AP-7	Fluoride	mg/L	Increasing	Stable	23	23	0.72	0.00667	0.0212	8	8	0.72	-0.021	0.536
CCR-AP-8	Fluoride	mg/L	No Trend	No Trend	22	21	1.1	0.00438	0.366	8	8	1.1	0.01	0.454
CCR-AP-9	Fluoride	mg/L	No Trend	Stable	21	21	0.42	0.00118	0.693	8	8	0.39	-0.0065	0.454
CCR-AP-1R	Lead, Total	mg/L	Increasing	Stable	23	23	0.094	0.00173	0.0162	8	8	0.078	-0.00715	0.108
CCR-AP-2	Lead, Total	mg/L	Increasing	Increasing	23	23	0.1	0.0025	0.000102	8	8	0.1	0.0101	0.00937
CCR-AP-3	Lead, Total	mg/L	Increasing	No Trend	22	18	0.01	2.67e-05	0.0203	8	7	0.01	0.000151	0.266
CCR-AP-4R	Lead, Total	mg/L	No Trend	Stable	22	21	0.0386	0.000142	0.397	8	7	0.0386	-0.000692	0.386
CCR-AP-5	Lead, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	22	9	0.02	NA	NA	8	7	0.02	0.0003	0.174
CCR-AP-6	Lead, Total	mg/L	No Trend	No Trend	22	22	0.041	-0.000167	0.446	8	8	0.041	-0.000437	0.902
CCR-AP-7	Lead, Total	mg/L	Probably Decreasing	Not Evaluated - Majority of data (>50%) non-detect	24	14	0.02	-3.32e-05	0.0621	8	2	0.0015	NA	NA
CCR-AP-8	Lead, Total	mg/L	No Trend	No Trend	22	21	0.0076	3.83e-05	0.224	8	7	0.0061	3.75e-05	0.902
CCR-AP-9	Lead, Total	mg/L	Probably Increasing	Stable	21	21	0.041	0.000426	0.0904	8	8	0.025	-0.00173	0.386
CCR-AP-1R	Lithium, Total	mg/L	Probably Increasing	Stable	23	23	0.23	0.00307	0.0639	8	8	0.15	-0.00804	0.319
CCR-AP-2	Lithium, Total	mg/L	Increasing	Increasing	23	18	0.125	0.002	0.0211	8	8	0.11	0.014	0.00198
CCR-AP-3	Lithium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	22	4	0.025	NA	NA	8	4	0.0043	0	0.894
CCR-AP-4R	Lithium, Total	mg/L	Stable	Stable	22	16	0.047	-0.000262	0.231	8	7	0.025	-0.0002	1
CCR-AP-5	Lithium, Total	mg/L	Decreasing	No Trend	22	22	0.15	-0.00514	9.12e-06	8	8	0.072	0.002	0.711
CCR-AP-6	Lithium, Total	mg/L	Decreasing	No Trend	22	11	0.125	-0.00127	6.5e-05	8	5	0.018	3.57e-05	1
CCR-AP-7	Lithium, Total	mg/L	Decreasing	No Trend	24	24	0.039	-0.0002	0.00968	8	8	0.011	0.000204	0.319
CCR-AP-8	Lithium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	22	6	0.025	NA	NA	8	2	0.0067	NA	NA
CCR-AP-9	Lithium, Total	mg/L	Probably Increasing	Stable	21	21	0.12	0.000554	0.0845	8	8	0.064	-0.000625	0.902
CCR-AP-1R	Mercury, Total	mg/L	Not Evaluated - No detected results	Not Evaluated - No detected results	22	0	0.001	NA	NA	8	0	0.001	NA	NA
CCR-AP-2	Mercury, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Probably Increasing	22	9	0.00071	NA	NA	8	6	0.00071	4.05e-05	0.0809
CCR-AP-3	Mercury, Total	mg/L	Not Evaluated - No detected results	Not Evaluated - No detected results	21	0	0.00025	NA	NA	8	0	0.00025	NA	NA
CCR-AP-4R	Mercury, Total	mg/L	Not Evaluated - No detected results	Not Evaluated - No detected results	21	0	0.00025	NA	NA	8	0	0.00025	NA	NA
CCR-AP-5	Mercury, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	21	3	0.0016	NA	NA	8	3	0.0016	NA	NA
CCR-AP-6	Mercury, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	21	2	0.00041	NA	NA	8	2	0.00041	NA	NA
CCR-AP-7	Mercury, Total	mg/L	Not Evaluated - No detected results	Not Evaluated - No detected results	21	0	0.00025	NA	NA	8	0	0.00025	NA	NA
CCR-AP-8	Mercury, Total	mg/L	Not Evaluated - Only one detected result	Not Evaluated - Only one detected result	21	1	0.00026	NA	NA	8	1	0.00026	NA	NA
CCR-AP-9	Mercury, Total	mg/L	Not Evaluated - No detected results	Not Evaluated - No detected results	20	0	0.0001	NA	NA	8	0	0.0001	NA	NA
CCR-AP-1R	Molybdenum, Total	mg/L	Stable	Decreasing	23	23	0.023	-7.78e-05	0.442	8	8	0.023	-0.000758	0.0354
CCR-AP-2	Molybdenum, Total	mg/L	Increasing	No Trend	23	23	0.01	0.000331	2.61e-05	8	8	0.01	0.0005	0.108
CCR-AP-3	Molybdenum, Total	mg/L	Decreasing	No Trend	22	22	0.025	-0.000262	0.00494	8	8	0.025	0.000371	0.536
CCR-AP-4R	Molybdenum, Total	mg/L	Increasing	No Trend	22	19	0.017	0.000153	0.00918	8	6	0.017	0.0011	0.319
CCR-AP-5	Molybdenum, Total	mg/L	Decreasing	Stable	22	22	0.53	-0.012	0.00136	8	8	0.34	-0.0138	0.706
CCR-AP-6	Molybdenum, Total	mg/L	No Trend	No Trend	22	22	0.043	0	0.821	8	8	0.043	0.00117	0.711
CCR-AP-7	Molybdenum, Total	mg/L	Decreasing	No Trend	24	23	0.013	-0.000227	5.4e-06	8	7	0.0025	5.18e-05	0.803
CCR-AP-8	Molybdenum, Total	mg/L	Stable	Stable	22	22	0.029	0	0.668	8	8	0.029	-0.000971	0.454
CCR-AP-9	Molybdenum, Total	mg/L	Decreasing	No Trend	21	19	0.025	-0.0003	0.0011	8	6	0.025	-0.00025	0.266
CCR-AP-1R	Radium-226 & 228	pCi/L	No Trend	No Trend	21	21	14.4	0.124	0.124	8	8	14.4	1.24	0.266
CCR-AP-2	Radium-226 & 228	pCi/L	No Trend	No Trend	21	21	5.53	0.0183	0.695	8	8	5.53	0.222	0.711
CCR-AP-3	Radium-226 & 228	pCi/L	No Trend	No Trend	20	20	4.87	0.00597	0.922	8	8	4.87	0.0326	0.902
CCR-AP-4R	Radium-226 & 228	pCi/L	No Trend	No Trend	20	20	30	-0.0041	0.974	8	8	30	0.117	0.711
CCR-AP-5	Radium-226 & 228	pCi/L	No Trend	No Trend	20	20	5.54	0.0379	0.315	8	8	5.54	0.506	0.108

Abbreviations: mg/L = milligrams per liter; n = sample count; pCi/L = picocuries per liter.

Notes: *Recent data defined as the 8 most recent data points. MK = Mann Kendall Trend Test. Secular Trend Classification based on Aziz (2003) guidance and MK Results. Thiel-Sen slope and p-value evaluated at 95% confidence level to confirm MK trends.

Additional information about trend analysis provided in Attachment A.

Location	Chemical	Units	Identified Trends		Trend Analysis on All Available Data					Trend Analysis on Recent Data				
			Trend (All Data)	Trend (Recent Data)	Results, n	Detected Results, n	Max Concentration	Sen Slope (magnitude per year)	p-value	*Results, n	*Detected Results, n	*Max Concentration	*Sen Slope (magnitude per year)	*p-value
CCR-AP-6	Radium-226 & 228	pCi/L	Stable	Stable	20	19	10.2	-0.000548	1	8	7	3.21	-0.00971	1
CCR-AP-7	Radium-226 & 228	pCi/L	Stable	Increasing	21	21	1.72	-0.0149	0.487	8	8	1.44	0.117	0.0354
CCR-AP-8	Radium-226 & 228	pCi/L	Stable	Stable	19	19	2.88	-0.0164	0.441	8	8	2.88	-0.0715	0.902
CCR-AP-9	Radium-226 & 228	pCi/L	Increasing	No Trend	19	19	12.6	0.182	0.0424	8	8	12.6	0.644	0.266
CCR-AP-1R	Selenium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	23	10	0.025	NA	NA	8	5	0.0125	-0.0003	0.319
CCR-AP-2	Selenium, Total	mg/L	Increasing	No Trend	23	16	0.026	0.00012	0.018	8	7	0.013	0.000105	0.536
CCR-AP-3	Selenium, Total	mg/L	No Trend	No Trend	22	21	0.0068	1.11e-05	0.23	8	8	0.003	0	0.898
CCR-AP-4R	Selenium, Total	mg/L	Probably Increasing	Not Evaluated - Majority of data (>50%) non-detect	22	11	0.031	1.67e-05	0.0561	8	3	0.0036	NA	NA
CCR-AP-5	Selenium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	22	8	0.025	NA	NA	8	6	0.02	0.000312	0.319
CCR-AP-6	Selenium, Total	mg/L	No Trend	Stable	22	17	0.0125	2e-05	0.378	8	6	0.003	-1e-05	1
CCR-AP-7	Selenium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - No detected results	22	3	0.0028	NA	NA	8	0	0.0025	NA	NA
CCR-AP-8	Selenium, Total	mg/L	No Trend	Stable	22	19	0.007	7.14e-06	0.609	8	8	0.0051	-1.25e-05	1
CCR-AP-9	Selenium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	21	6	0.025	NA	NA	8	2	0.025	NA	NA
CCR-AP-1R	Thallium, Total	mg/L	Increasing	Stable	23	16	0.0027	2.6e-05	0.0357	8	5	0.0027	-1.1e-05	0.803
CCR-AP-2	Thallium, Total	mg/L	Increasing	No Trend	23	20	0.0076	5e-05	5.15e-05	8	8	0.0076	6.75e-05	0.803
CCR-AP-3	Thallium, Total	mg/L	Not Evaluated - Only one detected result	Not Evaluated - No detected results	22	1	0.001	NA	NA	8	0	0.001	NA	NA
CCR-AP-4R	Thallium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - Majority of data (>50%) non-detect	22	10	0.0025	NA	NA	8	2	0.001	NA	NA
CCR-AP-5	Thallium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	No Trend	22	7	0.005	NA	NA	8	4	0.00096	5.67e-05	0.232
CCR-AP-6	Thallium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - No detected results	22	8	0.0025	NA	NA	8	0	0.001	NA	NA
CCR-AP-7	Thallium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - No detected results	24	4	0.001	NA	NA	8	0	0.001	NA	NA
CCR-AP-8	Thallium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - No detected results	22	5	0.001	NA	NA	8	0	0.001	NA	NA
CCR-AP-9	Thallium, Total	mg/L	Not Evaluated - Majority of data (>50%) non-detect	Not Evaluated - No detected results	21	9	0.005	NA	NA	8	0	0.005	NA	NA

Abbreviations: mg/L = milligrams per liter; n = sample count; pCi/L = picocuries per liter.

Notes: *Recent data defined as the 8 most recent data points. MK = Mann Kendall Trend Test. Secular Trend Classification based on Aziz (2003) guidance and MK Results. Thiel-Sen slope and p-value evaluated at 95% confidence level to confirm MK trends.

Additional information about trend analysis provided in Attachment A.

ATTACHMENT A
Assessment Monitoring Statistical Analysis Summary – May 2024

Table A-1. Descriptive Statistics

Location	Constituent	Units	n	n, non-detects	percent of non-detects	max	min	mean	median	standard deviation	variance	reporting limit range	date range
CCR-AP-1R	Antimony, Total	mg/L	23	6	26	0.02000	0.00053	0.00347	0.0015	0.0056	3.1e-05	0.002 - 0.02	2016-06-10 to 2024-05-08
CCR-AP-2	Antimony, Total	mg/L	23	9	39	0.02000	0.00024	0.00347	0.002	0.0045	2.1e-05	0.002 - 0.02	2016-06-10 to 2024-05-08
CCR-AP-3	Antimony, Total	mg/L	22	17	77	0.00500	0.00031	0.00195	0.002	0.00085	7.2e-07	0.002 - 0.002	2016-06-10 to 2024-05-07
CCR-AP-4R	Antimony, Total	mg/L	22	15	68	0.02800	0.0004	0.00336	0.002	0.0058	3.4e-05	0.002 - 0.01	2016-06-10 to 2024-05-08
CCR-AP-5	Antimony, Total	mg/L	22	16	73	0.02000	5.8e-05	0.0027	0.002	0.004	1.6e-05	0.002 - 0.02	2016-06-10 to 2024-05-13
CCR-AP-6	Antimony, Total	mg/L	22	9	41	0.01800	0.00042	0.00246	0.00155	0.004	1.6e-05	0.002 - 0.01	2016-06-10 to 2024-05-07
CCR-AP-7	Antimony, Total	mg/L	24	21	88	0.00500	0.00016	0.00194	0.002	0.00082	6.8e-07	0.002 - 0.005	2016-06-10 to 2024-05-10
CCR-AP-8	Antimony, Total	mg/L	22	6	27	0.00460	0.0004	0.00132	0.00105	0.00096	9.2e-07	0.002 - 0.002	2017-03-09 to 2024-05-10
CCR-AP-9	Antimony, Total	mg/L	21	6	29	0.02000	0.00061	0.00425	0.0014	0.0059	3.4e-05	0.002 - 0.02	2017-03-09 to 2024-05-08
CCR-AP-1R	Arsenic, Total	mg/L	23	0	0	0.03800	0.0024	0.0162	0.012	0.011	0.00013	NA	2016-06-10 to 2024-05-08
CCR-AP-2	Arsenic, Total	mg/L	23	0	0	0.04800	0.0016	0.0159	0.013	0.013	0.00016	NA	2016-06-10 to 2024-05-08
CCR-AP-3	Arsenic, Total	mg/L	22	0	0	0.09500	0.051	0.0754	0.077	0.01	0.0001	NA	2016-06-10 to 2024-05-07
CCR-AP-4R	Arsenic, Total	mg/L	22	0	0	0.33000	0.027	0.111	0.086	0.081	0.0066	NA	2016-06-10 to 2024-05-08
CCR-AP-5	Arsenic, Total	mg/L	21	2	10	0.02400	0.00039	0.0044	0.001	0.0072	5.1e-05	0.001 - 0.01	2016-06-10 to 2024-05-13
CCR-AP-6	Arsenic, Total	mg/L	22	0	0	0.12000	0.04	0.0926	0.1	0.022	0.0005	NA	2016-06-10 to 2024-05-07
CCR-AP-7	Arsenic, Total	mg/L	24	0	0	0.01800	0.00066	0.00567	0.00515	0.0042	1.7e-05	NA	2016-06-10 to 2024-05-10
CCR-AP-8	Arsenic, Total	mg/L	22	0	0	0.12000	0.013	0.0863	0.0925	0.027	0.00072	NA	2017-03-09 to 2024-05-10
CCR-AP-9	Arsenic, Total	mg/L	21	0	0	0.03200	0.0031	0.0101	0.0087	0.0063	4e-05	NA	2017-03-09 to 2024-05-08
CCR-AP-1R	Barium, Total	mg/L	23	0	0	0.59000	0.05	0.233	0.2	0.15	0.024	NA	2016-06-10 to 2024-05-08
CCR-AP-2	Barium, Total	mg/L	23	0	0	0.83000	0.038	0.275	0.24	0.2	0.042	NA	2016-06-10 to 2024-05-08
CCR-AP-3	Barium, Total	mg/L	22	0	0	0.49000	0.38	0.429	0.425	0.033	0.0011	NA	2016-06-10 to 2024-05-07
CCR-AP-4R	Barium, Total	mg/L	22	0	0	1.40000	0.45	0.695	0.63	0.24	0.059	NA	2016-06-10 to 2024-05-08
CCR-AP-5	Barium, Total	mg/L	22	0	0	0.20000	0.029	0.0613	0.0415	0.044	0.0019	NA	2016-06-10 to 2024-05-13
CCR-AP-6	Barium, Total	mg/L	22	0	0	0.69000	0.43	0.575	0.575	0.072	0.0052	NA	2016-06-10 to 2024-05-07
CCR-AP-7	Barium, Total	mg/L	24	0	0	0.19000	0.076	0.127	0.12	0.029	0.00082	NA	2016-06-10 to 2024-05-10
CCR-AP-8	Barium, Total	mg/L	22	0	0	0.68000	0.27	0.531	0.565	0.11	0.012	NA	2017-03-09 to 2024-05-10
CCR-AP-9	Barium, Total	mg/L	21	0	0	0.72000	0.13	0.287	0.27	0.12	0.015	NA	2017-03-09 to 2024-05-08
CCR-AP-1R	Beryllium, Total	mg/L	23	0	0	0.00660	0.00011	0.00262	0.002	0.0021	4.6e-06	NA	2016-06-10 to 2024-05-08
CCR-AP-2	Beryllium, Total	mg/L	23	0	0	0.00770	0.00014	0.00217	0.0019	0.002	4.2e-06	NA	2016-06-10 to 2024-05-08
CCR-AP-3	Beryllium, Total	mg/L	22	21	95	0.00100	0.00056	0.00098	0.001	9.4e-05	8.8e-09	0.001 - 0.001	2016-06-10 to 2024-05-07
CCR-AP-4R	Beryllium, Total	mg/L	22	7	32	0.00170	0.00014	0.000707	0.000725	0.00043	1.9e-07	0.001 - 0.001	2016-06-10 to 2024-05-08
CCR-AP-5	Beryllium, Total	mg/L	22	16	73	0.01000	0.00017	0.00132	0.001	0.002	3.9e-06	0.001 - 0.01	2016-06-10 to 2024-05-13
CCR-AP-6	Beryllium, Total	mg/L	22	9	41	0.00500	0.00011	0.000805	0.000575	0.00099	9.9e-07	0.0005 - 0.005	2016-06-10 to 2024-05-07
CCR-AP-7	Beryllium, Total	mg/L	24	17	71	0.00100	6.7e-05	0.00076	0.001	0.00037	1.4e-07	0.0005 - 0.001	2016-06-10 to 2024-05-10
CCR-AP-8	Beryllium, Total	mg/L	22	16	73	0.00100	0.00016	0.000774	0.001	0.00035	1.2e-07	0.0005 - 0.001	2017-03-09 to 2024-05-10
CCR-AP-9	Beryllium, Total	mg/L	21	2	10	0.01000	0.00017	0.00144	0.00092	0.0021	4.5e-06	0.001 - 0.01	2017-03-09 to 2024-05-08
CCR-AP-1R	Cadmium, Total	mg/L	23	13	57	0.01000	8.1e-05	0.00202	0.001	0.0029	8.7e-06	0.001 - 0.01	2016-06-10 to 2024-05-08
CCR-AP-2	Cadmium, Total	mg/L	23	3	13	0.01000	0.00011	0.00202	0.00089	0.0024	6e-06	0.005 - 0.01	2016-06-10 to 2024-05-08
CCR-AP-3	Cadmium, Total	mg/L	22	21	95	0.00100	0.00038	0.000972	0.001	0.00013	1.7e-08	0.001 - 0.001	2016-06-10 to 2024-05-07
CCR-AP-4R	Cadmium, Total	mg/L	22	12	55	0.00500	0.00014	0.000888	0.001	0.00099	9.7e-07	0.001 - 0.005	2016-06-10 to 2024-05-08
CCR-AP-5	Cadmium, Total	mg/L	22	6	27	0.01000	0.00015	0.00106	0.00057	0.002	4.1e-06	0.001 - 0.01	2016-06-10 to 2024-05-13
CCR-AP-6	Cadmium, Total	mg/L	22	9	41	0.00110	9.4e-05	0.000638	0.00056	0.00037	1.4e-07	0.001 - 0.001	2016-06-10 to 2024-05-07
CCR-AP-7	Cadmium, Total	mg/L	24	22	92	0.00100	0.00014	0.000915	0.001	0.00024	5.6e-08	0.0005 - 0.001	2016-06-10 to 2024-05-10
CCR-AP-8	Cadmium, Total	mg/L	22	16	73	0.00100	0.00016	0.000805	0.001	0.00034	1.1e-07	0.001 - 0.001	2017-03-09 to 2024-05-10
CCR-AP-9	Cadmium, Total	mg/L	21	10	48	0.01000	7.9e-05	0.0018	0.0004	0.0031	9.4e-06	0.001 - 0.01	2017-03-09 to 2024-05-08
CCR-AP-1R	Chromium, Total	mg/L	23	0	0	0.16000	0.0019	0.0557	0.036	0.047	0.0022	NA	2016-06-10 to 2024-05-08
CCR-AP-2	Chromium, Total	mg/L	23	0	0	0.14000	0.003	0.0444	0.035	0.037	0.0014	NA	2016-06-10 to 2024-05-08
CCR-AP-3	Chromium, Total	mg/L	22	4	18	0.01400	0.0018	0.00297	0.0021	0.0026	6.5e-06	0.002 - 0.002	2016-06-10 to 2024-05-07
CCR-AP-4R	Chromium, Total	mg/L	21	3	14	0.05800	0.0015	0.0126	0.0076	0.014	0.00021	0.002 - 0.005	2016-06-10 to 2024-05-08
CCR-AP-5	Chromium, Total	mg/L	22	16	73	0.05600	0.0014	0.00672	0.002	0.013	0.00016	0.002 - 0.02	2016-06-10 to 2024-05-13
CCR-AP-6	Chromium, Total	mg/L	22	1	5	0.04300	0.0019	0.0128	0.0095	0.011	0.00012	0.002 - 0.002	2016-06-10 to 2024-05-07
CCR-AP-7	Chromium, Total	mg/L	24	12	50	0.01900	0.00047	0.00389	0.002	0.0039	1.5e-05	0.002 - 0.01	2016-06-10 to 2024-05-10
CCR-AP-8	Chromium, Total	mg/L	21	2	10	0.01400	0.0012	0.0043	0.0029	0.0034	1.2e-05	0.002 - 0.0034	2017-03-09 to 2024-05-10
CCR-AP-9	Chromium, Total	mg/L	21	0	0	0.15000	0.0042	0.0254	0.016	0.031	0.00096	NA	2017-03-09 to 2024-05-08
CCR-AP-1R	Cobalt, Total	mg/L	23	0	0	0.08100	0.0015	0.031	0.019	0.026	0.00066	NA	2016-06-10 to 2024-05-08
CCR-AP-2	Cobalt, Total	mg/L	23	0	0	0.09100	0.0073	0.0286	0.023	0.02	0.00039	NA	2016-06-10 to 2024-05-08
CCR-AP-3	Cobalt, Total	mg/L	22	0	0	0.00940	0.004	0.00603	0.00565	0.0015	2.4e-06	NA	2016-06-10 to 2024-05-07
CCR-AP-4R	Cobalt, Total	mg/L	22	0	0	0.02100	0.00071	0.00682	0.0052	0.0055	3.1e-05	NA	2016-06-10 to 2024-05-08
CCR-AP-5	Cobalt, Total	mg/L	22	0	0	0.01000	0.00036	0.004	0.00365	0.0026	6.6e-06	NA	2016-06-10 to 2024-05-13
CCR-AP-6	Cobalt, Total	mg/L	22	0	0	0.01900	0.0034	0.00855	0.0074	0.0045	2e-05	NA	2016-06-10 to 2024-05-07
CCR-AP-7	Cobalt, Total	mg/L	24	2	8	0.01500	0.00021	0.00218	0.000935	0.0032	1e-05	0.0005 - 0.002	2016-06-10 to 2024-05-10
CCR-AP-8	Cobalt, Total	mg/L	22	0	0	0.01700	0.0026	0.00856	0.0081	0.0039	1.5e-05	NA	2017-03-09 to 2024-05-10
CCR-AP-9	Cobalt, Total	mg/L	21	0	0	0.04700	0.0061	0.0148	0.014	0.0085	7.2e-05	NA	2017-03-09 to 2024-05-08
CCR-AP-1R	Fluoride	mg/L	23	0	0	0.81000	0.25	0.495	0.48	0.11	0.012	NA	2016-06-10 to 2024-05-08
CCR-AP-2	Fluoride	mg/L	23	0	0	0.69000	0.11	0.362	0.3	0.15	0.022	NA	2016-06-10 to 2024-05-08
CCR-AP-3	Fluoride	mg/L	22	1	5	0.93000	0.1	0.401	0.375	0.19	0.034	0.1 - 0.1	2016-06-10 to 2024-05-07
CCR-AP-4R	Fluoride	mg/L	22	1	5	0.64000	0.1	0.389	0.38	0.12	0.014	0.1 - 0.1	2016-06-10 to 2024-05-08
CCR-AP-5	Fluoride	mg/L	22	0	0	2.30000	0.58	1.27	1.2	0.45	0.2	NA	2016-06-10 to 2024-05-13
CCR-AP-6	Fluoride	mg/L	22	0	0	0.69000	0.24	0.49	0.47	0.13	0.017	NA	2016-06-10 to 2024-05-07
CCR-AP-7	Fluoride	mg/L	23	0	0	0.72000	0.14	0.333	0.3	0.13	0.017	NA	2016-08-12 to 2024-05-10
CCR-AP-8	Fluoride	mg/L	22	1	5	1.10000	0.1	0.321	0.27	0.2	0.041	0.1 - 0.1	2017-03-09 to 2024-05-10
CCR-AP-9	Fluoride	mg/L	21	0	0	0.42000	0.14	0.329	0.34	0.064	0.0041	NA	2017-03-09 to 2024-05-08
CCR-AP-1R	Lead, Total	mg/L	23	0	0	0.09400	0.0011	0.0339	0.02	0.028	0.00079	NA	2016-06-10 to 2024-05-08
CCR-AP-2	Lead, Total	mg/L	23	0	0	0.10000	0.0023	0.0292	0.026	0.025	0.00062	NA	2016-06-10 to 2024-05-08

Note:
Units: mg/L = milligrams per liter, pCi/L = picocuries per liter

Location	Constituent	Units	n	n, non-detects	percent of non-detects	max	min	mean	median	standard deviation	variance	reporting limit range	date range
CCR-AP-3	Lead, Total	mg/L	22	4	18	0.01000	0.00021	0.0012	0.00085	0.002	4e-06	0.001 - 0.001	2016-06-10 to 2024-05-07
CCR-AP-4R	Lead, Total	mg/L	22	1	5	0.04700	0.00052	0.0101	0.0047	0.012	0.00015	0.001 - 0.001	2016-06-10 to 2024-05-08
CCR-AP-5	Lead, Total	mg/L	22	13	59	0.02000	9.9e-05	0.00253	0.001	0.0046	2.1e-05	0.001 - 0.01	2016-06-10 to 2024-05-13
CCR-AP-6	Lead, Total	mg/L	22	0	0	0.04100	0.00039	0.00953	0.00685	0.0095	9.1e-05	NA	2016-06-10 to 2024-05-07
CCR-AP-7	Lead, Total	mg/L	24	10	42	0.02000	0.00013	0.00291	0.001	0.0043	1.9e-05	0.001 - 0.003	2016-06-10 to 2024-05-10
CCR-AP-8	Lead, Total	mg/L	22	1	5	0.00760	0.00027	0.00222	0.0019	0.0018	3.1e-06	0.003 - 0.003	2017-03-09 to 2024-05-10
CCR-AP-9	Lead, Total	mg/L	21	0	0	0.04100	0.0025	0.0124	0.01	0.0088	7.8e-05	NA	2017-03-09 to 2024-05-08
CCR-AP-1R	Lithium, Total	mg/L	23	0	0	0.23000	0.035	0.0914	0.076	0.054	0.0029	NA	2016-06-10 to 2024-05-08
CCR-AP-2	Lithium, Total	mg/L	23	5	22	0.25000	0.01	0.0528	0.043	0.05	0.0025	0.05 - 0.25	2016-06-10 to 2024-05-08
CCR-AP-3	Lithium, Total	mg/L	22	18	82	0.05000	0.0021	0.0231	0.005	0.023	0.00052	0.005 - 0.05	2016-06-10 to 2024-05-07
CCR-AP-4R	Lithium, Total	mg/L	22	6	27	0.05000	0.0028	0.0205	0.0105	0.019	0.00036	0.005 - 0.05	2016-06-10 to 2024-05-08
CCR-AP-5	Lithium, Total	mg/L	22	0	0	0.15000	0.009	0.0914	0.0945	0.042	0.0017	NA	2016-06-10 to 2024-05-13
CCR-AP-6	Lithium, Total	mg/L	22	11	50	0.25000	0.0014	0.0327	0.014	0.052	0.0028	0.005 - 0.25	2016-06-10 to 2024-05-07
CCR-AP-7	Lithium, Total	mg/L	24	0	0	0.03900	0.007	0.0134	0.011	0.0067	4.5e-05	NA	2016-06-10 to 2024-05-10
CCR-AP-8	Lithium, Total	mg/L	22	16	73	0.05000	0.0031	0.0221	0.00735	0.022	0.00047	0.005 - 0.05	2017-03-09 to 2024-05-10
CCR-AP-9	Lithium, Total	mg/L	21	0	0	0.12000	0.029	0.0473	0.04	0.02	0.0004	NA	2017-03-09 to 2024-05-08
CCR-AP-1R	Mercury, Total	mg/L	22	22	100	0.00200	0.0002	0.000309	0.0002	0.00039	1.5e-07	0.0002 - 0.002	2016-06-10 to 2024-05-08
CCR-AP-2	Mercury, Total	mg/L	22	13	59	0.00071	0.00015	0.000239	0.0002	0.00013	1.6e-08	0.0002 - 0.0002	2016-06-10 to 2024-05-08
CCR-AP-3	Mercury, Total	mg/L	21	21	100	0.00050	0.0002	0.000214	0.0002	6.5e-05	4.3e-09	0.0002 - 0.0005	2016-06-10 to 2024-05-07
CCR-AP-4R	Mercury, Total	mg/L	21	21	100	0.00050	0.0002	0.000224	0.0002	7.7e-05	5.9e-09	0.0002 - 0.0005	2016-06-10 to 2024-05-08
CCR-AP-5	Mercury, Total	mg/L	21	18	86	0.00160	0.0002	0.000306	0.0002	0.00033	1.1e-07	0.0002 - 0.0002	2016-06-10 to 2024-05-13
CCR-AP-6	Mercury, Total	mg/L	21	19	90	0.00050	0.00017	0.000223	0.0002	7.9e-05	6.2e-09	0.0002 - 0.0005	2016-06-10 to 2024-05-07
CCR-AP-7	Mercury, Total	mg/L	21	21	100	0.00050	0.0002	0.000214	0.0002	6.5e-05	4.3e-09	0.0002 - 0.0005	2016-06-10 to 2024-05-10
CCR-AP-8	Mercury, Total	mg/L	21	20	95	0.00050	0.0002	0.000217	0.0002	6.6e-05	4.4e-09	0.0002 - 0.0005	2017-03-09 to 2024-05- 0
CCR-AP-9	Mercury, Total	mg/L	20	20	100	0.00020	0.0002	0.0002	0.0002	0	0	0.0002 - 0.0002	2017-03-09 to 2024-05-08
CCR-AP-1R	Molybdenum, Total	mg/L	23	0	0	0.02300	0.0047	0.00927	0.008	0.004	1.6e-05	NA	2016-06-10 to 2024-05-08
CCR-AP-2	Molybdenum, Total	mg/L	23	0	0	0.01000	0.00094	0.00478	0.0051	0.0027	7.3e-06	NA	2016-06-10 to 2024-05-08
CCR-AP-3	Molybdenum, Total	mg/L	22	0	0	0.02500	0.0065	0.0112	0.01	0.0039	1.5e-05	NA	2016-06-10 to 2024-05-07
CCR-AP-4R	Molybdenum, Total	mg/L	22	3	14	0.01700	0.00071	0.00381	0.00235	0.0039	1.5e-05	0.005 - 0.005	2016-06-10 to 2024-05-08
CCR-AP-5	Molybdenum, Total	mg/L	22	0	0	0.53000	0.046	0.287	0.315	0.12	0.014	NA	2016-06-10 to 2024-05-13
CCR-AP-6	Molybdenum, Total	mg/L	22	0	0	0.04300	0.015	0.0256	0.024	0.0067	4.5e-05	NA	2016-06-10 to 2024-05-07
CCR-AP-7	Molybdenum, Total	mg/L	24	1	4	0.01300	0.0011	0.00367	0.00225	0.003	9.2e-06	0.005 - 0.005	2016-06-10 to 2024-05-10
CCR-AP-8	Molybdenum, Total	mg/L	22	0	0	0.02900	0.0029	0.0144	0.0135	0.0054	2.9e-05	NA	2017-03-09 to 2024-05-10
CCR-AP-9	Molybdenum, Total	mg/L	21	2	10	0.05000	0.0017	0.0075	0.0049	0.01	0.0001	0.005 - 0.05	2017-03-09 to 2024-05-08
CCR-AP-1R	Radium-226 & 228	pCi/L	21	0	0	14.40000	0.862	4.87	5	3.3	11	NA	2016-06-10 to 2024-05-08
CCR-AP-2	Radium-226 & 228	pCi/L	21	0	0	5.53000	0.444	2.12	1.91	1.4	2	NA	2016-06-10 to 2024-05-08
CCR-AP-3	Radium-226 & 228	pCi/L	20	0	0	4.87000	0.593	1.75	1.67	1.1	1.3	NA	2016-06-10 to 2024-05-07
CCR-AP-4R	Radium-226 & 228	pCi/L	20	0	0	30.00000	1.07	3.76	2.39	6.3	39	NA	2016-06-10 to 2024-05-08
CCR-AP-5	Radium-226 & 228	pCi/L	20	0	0	5.54000	0.292	1.24	0.686	1.3	1.8	NA	2016-06-10 to 2024-05-13
CCR-AP-6	Radium-226 & 228	pCi/L	20	1	5	10.20000	0.351	2.38	1.64	2.2	4.8	0.71 - 0.71	2016-06-10 to 2024-05-07
CCR-AP-7	Radium-226 & 228	pCi/L	21	0	0	1.72000	0.126	0.847	0.764	0.45	0.2	NA	2016-06-10 to 2024-05-10
CCR-AP-8	Radium-226 & 228	pCi/L	19	0	0	2.88000	0.449	1.44	1.43	0.65	0.42	NA	2017-03-09 to 2024-05-10
CCR-AP-9	Radium-226 & 228	pCi/L	19	0	0	12.60000	0.934	3.7	3.13	2.9	8.5	NA	2017-03-09 to 2024-05-08
CCR-AP-1R	Selenium, Total	mg/L	23	13	57	0.05000	0.00045	0.0111	0.005	0.015	0.00022	0.005 - 0.05	2016-06-10 to 2024-05-08
CCR-AP-2	Selenium, Total	mg/L	23	7	30	0.05000	0.00044	0.00856	0.005	0.011	0.00013	0.005 - 0.05	2016-06-10 to 2024-05-08
CCR-AP-3	Selenium, Total	mg/L	22	1	5	0.00680	0.00062	0.0022	0.00185	0.0013	1.7e-06	0.005 - 0.005	2016-06-10 to 2024-05-07
CCR-AP-4R	Selenium, Total	mg/L	22	11	50	0.03100	0.0009	0.00469	0.005	0.0061	3.7e-05	0.005 - 0.005	2016-06-10 to 2024-05-08
CCR-AP-5	Selenium, Total	mg/L	22	14	64	0.05000	0.00095	0.00729	0.005	0.01	0.0001	0.005 - 0.05	2016-06-10 to 2024-05-13
CCR-AP-6	Selenium, Total	mg/L	22	5	23	0.02500	0.001	0.00352	0.0019	0.005	2.5e-05	0.005 - 0.025	2016-06-10 to 2024-05-07
CCR-AP-7	Selenium, Total	mg/L	22	19	86	0.00500	0.00035	0.00449	0.005	0.0014	1.9e-06	0.005 - 0.005	2016-06-10 to 2024-05-10
CCR-AP-8	Selenium, Total	mg/L	22	3	14	0.00700	0.0014	0.00269	0.00195	0.0016	2.6e-06	0.005 - 0.005	2017-03-09 to 2024-05-10
CCR-AP-9	Selenium, Total	mg/L	21	15	71	0.05000	0.001	0.00871	0.005	0.011	0.00013	0.005 - 0.05	2017-03-09 to 2024-05-08
CCR-AP-1R	Thallium, Total	mg/L	23	7	30	0.00500	7.9e-05	0.00102	0.00094	0.0011	1.2e-06	0.001 - 0.005	2016-06-10 to 2024-05-08
CCR-AP-2	Thallium, Total	mg/L	23	3	13	0.00760	4.8e-05	0.00116	0.00086	0.0017	2.9e-06	0.001 - 0.005	2016-06-10 to 2024-05-08
CCR-AP-3	Thallium, Total	mg/L	22	21	95	0.00200	0.0001	0.001	0.001	0.00029	8.6e-08	0.001 - 0.002	2016-06-10 to 2024-05-07
CCR-AP-4R	Thallium, Total	mg/L	22	12	55	0.00500	6.1e-05	0.000854	0.001	0.0011	1.1e-06	0.001 - 0.005	2016-06-10 to 2024-05-08
CCR-AP-5	Thallium, Total	mg/L	22	15	68	0.01000	6.5e-05	0.00118	0.001	0.002	4e-06	0.001 - 0.01	2016-06-10 to 2024-05-13
CCR-AP-6	Thallium, Total	mg/L	22	14	64	0.00500	4.7e-05	0.00091	0.001	0.001	1.1e-06	0.001 - 0.005	2016-06-10 to 2024-05-07
CCR-AP-7	Thallium, Total	mg/L	24	20	83	0.00200	6.6e-05	0.00091	0.001	0.00039	1.5e-07	0.001 - 0.002	2016-06-10 to 2024-05-10
CCR-AP-8	Thallium, Total	mg/L	22	17	77	0.00200	5.8e-05	0.000848	0.001	0.00045	2.1e-07	0.001 - 0.002	2017-03-09 to 2024-05-10
CCR-AP-9	Thallium, Total	mg/L	21	12	57	0.01000	9.8e-05	0.00132	0.001	0.0022	5e-06	0.001 - 0.01	2017-03-09 to 2024-05-08

Note:

Units: mg/L = milligrams per liter, pCi/L = picocuries per liter

Table A-2. Results of Shapiro-Wilk Test for Normality

				Shapiro-Wilk Test for Normality (R programming, package = stats, version 4.3.3, function = shapiro.test, non-detects substituted by 0.5*reporting limit)			
Location	**Constituent**	**n**	**n, non-detects**	**W statistic**	**p-value**	**Data Normality (significance level = 0.05)**	**Data Normality (significance level = 0.01)**
CCR-AP-1R	Antimony, Total	23	6	0.6265	1.784e-06	Not normal	Not normal
CCR-AP-2	Antimony, Total	23	9	0.6888	1.006e-05	Not normal	Not normal
CCR-AP-3	Antimony, Total	22	17	0.4157	2.326e-08	Not normal	Not normal
CCR-AP-4R	Antimony, Total	22	15	0.3165	3.688e-09	Not normal	Not normal
CCR-AP-5	Antimony, Total	22	16	0.4493	4.54e-08	Not normal	Not normal
CCR-AP-6	Antimony, Total	22	9	0.3591	7.95e-09	Not normal	Not normal
CCR-AP-7	Antimony, Total	24	21	0.4676	2.773e-08	Not normal	Not normal
CCR-AP-8	Antimony, Total	22	6	0.5652	5.718e-07	Not normal	Not normal
CCR-AP-9	Antimony, Total	21	6	0.691	2.129e-05	Not normal	Not normal
CCR-AP-1R	Arsenic, Total	23	0	0.8961	0.021	Not normal	Normal
CCR-AP-2	Arsenic, Total	23	0	0.9125	0.0462	Not normal	Normal
CCR-AP-3	Arsenic, Total	22	0	0.9744	0.8093	Normal	Normal
CCR-AP-4R	Arsenic, Total	22	0	0.8037	0.0005726	Not normal	Not normal
CCR-AP-5	Arsenic, Total	21	2	0.5714	9.967e-07	Not normal	Not normal
CCR-AP-6	Arsenic, Total	22	0	0.8796	0.01186	Not normal	Normal
CCR-AP-7	Arsenic, Total	24	0	0.8692	0.005084	Not normal	Not normal
CCR-AP-8	Arsenic, Total	22	0	0.9174	0.06726	Normal	Normal
CCR-AP-9	Arsenic, Total	21	0	0.7604	0.000173	Not normal	Not normal
CCR-AP-1R	Barium, Total	23	0	0.8989	0.02394	Not normal	Normal
CCR-AP-2	Barium, Total	23	0	0.8889	0.01501	Not normal	Normal
CCR-AP-3	Barium, Total	22	0	0.9503	0.3198	Normal	Normal
CCR-AP-4R	Barium, Total	22	0	0.7588	0.0001211	Not normal	Not normal
CCR-AP-5	Barium, Total	22	0	0.7146	3.019e-05	Not normal	Not normal
CCR-AP-6	Barium, Total	22	0	0.9674	0.6512	Normal	Normal
CCR-AP-7	Barium, Total	24	0	0.9503	0.2751	Normal	Normal
CCR-AP-8	Barium, Total	22	0	0.9151	0.0602	Normal	Normal
CCR-AP-9	Barium, Total	21	0	0.7867	0.0004142	Not normal	Not normal
CCR-AP-1R	Beryllium, Total	23	0	0.8822	0.01104	Not normal	Normal
CCR-AP-2	Beryllium, Total	23	0	0.8159	0.0006964	Not normal	Not normal
CCR-AP-3	Beryllium, Total	22	21	0.2215	7.417e-10	Not normal	Not normal
CCR-AP-4R	Beryllium, Total	22	7	0.794	0.0004033	Not normal	Not normal
CCR-AP-5	Beryllium, Total	22	16	0.3849	1.285e-08	Not normal	Not normal
CCR-AP-6	Beryllium, Total	22	9	0.5777	7.704e-07	Not normal	Not normal
CCR-AP-7	Beryllium, Total	24	17	0.7544	5.779e-05	Not normal	Not normal
CCR-AP-8	Beryllium, Total	22	16	0.6549	5.496e-06	Not normal	Not normal
CCR-AP-9	Beryllium, Total	21	2	0.6582	8.678e-06	Not normal	Not normal
CCR-AP-1R	Cadmium, Total	23	13	0.625	1.719e-06	Not normal	Not normal
CCR-AP-2	Cadmium, Total	23	3	0.7746	0.0001545	Not normal	Not normal
CCR-AP-3	Cadmium, Total	22	21	0.2215	7.417e-10	Not normal	Not normal
CCR-AP-4R	Cadmium, Total	22	12	0.5325	2.694e-07	Not normal	Not normal
CCR-AP-5	Cadmium, Total	22	6	0.4708	7.068e-08	Not normal	Not normal
CCR-AP-6	Cadmium, Total	22	9	0.8129	0.0008008	Not normal	Not normal
CCR-AP-7	Cadmium, Total	24	22	0.41	8.382e-09	Not normal	Not normal
CCR-AP-8	Cadmium, Total	22	16	0.6608	6.456e-06	Not normal	Not normal
CCR-AP-9	Cadmium, Total	21	10	0.5865	1.424e-06	Not normal	Not normal
CCR-AP-1R	Chromium, Total	23	0	0.8898	0.01567	Not normal	Normal
CCR-AP-2	Chromium, Total	23	0	0.9044	0.0312	Not normal	Normal
CCR-AP-3	Chromium, Total	22	4	0.5175	1.927e-07	Not normal	Not normal
CCR-AP-4R	Chromium, Total	21	3	0.7448	0.0001054	Not normal	Not normal
CCR-AP-5	Chromium, Total	22	16	0.4236	2.715e-08	Not normal	Not normal
CCR-AP-6	Chromium, Total	22	1	0.8493	0.003296	Not normal	Not normal
CCR-AP-7	Chromium, Total	24	12	0.5935	5.231e-07	Not normal	Not normal
CCR-AP-8	Chromium, Total	21	2	0.7905	0.0004714	Not normal	Not normal
CCR-AP-9	Chromium, Total	21	0	0.5599	7.632e-07	Not normal	Not normal
CCR-AP-1R	Cobalt, Total	23	0	0.8723	0.007094	Not normal	Not normal
CCR-AP-2	Cobalt, Total	23	0	0.8126	0.0006138	Not normal	Not normal
CCR-AP-3	Cobalt, Total	22	0	0.9257	0.09982	Normal	Normal
CCR-AP-4R	Cobalt, Total	22	0	0.8527	0.003791	Not normal	Not normal
CCR-AP-5	Cobalt, Total	22	0	0.952	0.3465	Normal	Normal
CCR-AP-6	Cobalt, Total	22	0	0.9072	0.04147	Not normal	Normal
CCR-AP-7	Cobalt, Total	24	2	0.6018	6.475e-07	Not normal	Not normal
CCR-AP-8	Cobalt, Total	22	0	0.9632	0.5559	Normal	Normal
CCR-AP-9	Cobalt, Total	21	0	0.7025	2.961e-05	Not normal	Not normal

Location	Constituent	n	n, non-detects	Shapiro-Wilk Test for Normality (R programming, package = stats, version 4.3.3, function = shapiro.test, non-detects substituted by 0.5*reporting limit) W statistic	p-value	Data Normality (significance level = 0.05)	Data Normality (significance level = 0.01)
CCR-AP-1R	Fluoride	23	0	0.9213	0.07115	Normal	Normal
CCR-AP-2	Fluoride	23	0	0.9305	0.1119	Normal	Normal
CCR-AP-3	Fluoride	22	1	0.9465	0.2689	Normal	Normal
CCR-AP-4R	Fluoride	22	1	0.9542	0.3822	Normal	Normal
CCR-AP-5	Fluoride	22	0	0.8948	0.0234	Not normal	Normal
CCR-AP-6	Fluoride	22	0	0.9547	0.3907	Normal	Normal
CCR-AP-7	Fluoride	23	0	0.8706	0.006579	Not normal	Not normal
CCR-AP-8	Fluoride	22	1	0.7377	6.14e-05	Not normal	Not normal
CCR-AP-9	Fluoride	21	0	0.8795	0.01428	Not normal	Normal
CCR-AP-1R	Lead, Total	23	0	0.8885	0.01477	Not normal	Normal
CCR-AP-2	Lead, Total	23	0	0.8932	0.01834	Not normal	Normal
CCR-AP-3	Lead, Total	22	4	0.3698	9.685e-09	Not normal	Not normal
CCR-AP-4R	Lead, Total	22	1	0.7108	2.696e-05	Not normal	Not normal
CCR-AP-5	Lead, Total	22	13	0.4478	4.403e-08	Not normal	Not normal
CCR-AP-6	Lead, Total	22	0	0.7959	0.0004312	Not normal	Not normal
CCR-AP-7	Lead, Total	24	10	0.5745	3.247e-07	Not normal	Not normal
CCR-AP-8	Lead, Total	22	1	0.7999	0.0004983	Not normal	Not normal
CCR-AP-9	Lead, Total	21	0	0.8248	0.00161	Not normal	Not normal
CCR-AP-1R	Lithium, Total	23	0	0.8904	0.01611	Not normal	Normal
CCR-AP-2	Lithium, Total	23	5	0.8238	0.0009454	Not normal	Not normal
CCR-AP-3	Lithium, Total	22	18	0.6503	4.862e-06	Not normal	Not normal
CCR-AP-4R	Lithium, Total	22	6	0.8597	0.005068	Not normal	Not normal
CCR-AP-5	Lithium, Total	22	0	0.959	0.4688	Normal	Normal
CCR-AP-6	Lithium, Total	22	11	0.5415	3.306e-07	Not normal	Not normal
CCR-AP-7	Lithium, Total	24	0	0.6882	7.068e-06	Not normal	Not normal
CCR-AP-8	Lithium, Total	22	16	0.7121	2.802e-05	Not normal	Not normal
CCR-AP-9	Lithium, Total	21	0	0.7177	4.613e-05	Not normal	Not normal
CCR-AP-1R	Mercury, Total	22	22	NA	NA	Not Evaluated - All Non-Detect Results	Not Evaluated - All Non-Detect Results
CCR-AP-2	Mercury, Total	22	13	0.605	1.504e-06	Not normal	Not normal
CCR-AP-3	Mercury, Total	21	21	NA	NA	Not Evaluated - All Non-Detect Results	Not Evaluated - All Non-Detect Results
CCR-AP-4R	Mercury, Total	21	21	NA	NA	Not Evaluated - All Non-Detect Results	Not Evaluated - All Non-Detect Results
CCR-AP-5	Mercury, Total	21	18	0.3882	2.203e-08	Not normal	Not normal
CCR-AP-6	Mercury, Total	21	19	0.4021	2.861e-08	Not normal	Not normal
CCR-AP-7	Mercury, Total	21	21	NA	NA	Not Evaluated - All Non-Detect Results	Not Evaluated - All Non-Detect Results
CCR-AP-8	Mercury, Total	21	20	0.3451	1.004e-08	Not normal	Not normal
CCR-AP-9	Mercury, Total	20	20	NA	NA	Not Evaluated - All Non-Detect Results	Not Evaluated - All Non-Detect Results
CCR-AP-1R	Molybdenum, Total	23	0	0.8294	0.001176	Not normal	Not normal
CCR-AP-2	Molybdenum, Total	23	0	0.9418	0.1959	Normal	Normal
CCR-AP-3	Molybdenum, Total	22	0	0.7873	0.0003192	Not normal	Not normal
CCR-AP-4R	Molybdenum, Total	22	3	0.6477	4.534e-06	Not normal	Not normal
CCR-AP-5	Molybdenum, Total	22	0	0.9452	0.2524	Normal	Normal
CCR-AP-6	Molybdenum, Total	22	0	0.9466	0.2706	Normal	Normal
CCR-AP-7	Molybdenum, Total	24	1	0.763	7.748e-05	Not normal	Not normal
CCR-AP-8	Molybdenum, Total	22	0	0.9074	0.04182	Not normal	Normal
CCR-AP-9	Molybdenum, Total	21	2	0.7209	5.078e-05	Not normal	Not normal
CCR-AP-1R	Selenium, Total	23	13	0.656	3.959e-06	Not normal	Not normal
CCR-AP-2	Selenium, Total	23	7	0.709	1.835e-05	Not normal	Not normal
CCR-AP-3	Selenium, Total	22	1	0.5438	3.48e-07	Not normal	Not normal
CCR-AP-4R	Selenium, Total	22	11	0.3046	2.992e-09	Not normal	Not normal
CCR-AP-5	Selenium, Total	22	14	0.4949	1.178e-07	Not normal	Not normal
CCR-AP-6	Selenium, Total	22	5	0.5132	1.751e-07	Not normal	Not normal
CCR-AP-7	Selenium, Total	22	19	0.3932	1.504e-08	Not normal	Not normal
CCR-AP-8	Selenium, Total	22	3	0.6241	2.443e-06	Not normal	Not normal
CCR-AP-9	Selenium, Total	21	15	0.6062	2.291e-06	Not normal	Not normal
CCR-AP-1R	Thallium, Total	23	7	0.8031	0.0004302	Not normal	Not normal
CCR-AP-2	Thallium, Total	23	3	0.5188	1.303e-07	Not normal	Not normal
CCR-AP-3	Thallium, Total	22	21	0.4181	2.437e-08	Not normal	Not normal
CCR-AP-4R	Thallium, Total	22	12	0.6002	1.334e-06	Not normal	Not normal
CCR-AP-5	Thallium, Total	22	15	0.3699	9.697e-09	Not normal	Not normal
CCR-AP-6	Thallium, Total	22	14	0.5929	1.115e-06	Not normal	Not normal
CCR-AP-7	Thallium, Total	24	20	0.6096	7.913e-07	Not normal	Not normal

Location	Constituent	n	n, non-detects	Shapiro-Wilk Test for Normality (R programming, package = stats, version 4.3.3, function = shapiro.test, non-detects substituted by 0.5*reporting limit) W statistic	p-value	Data Normality (significance level = 0.05)	Data Normality (significance level = 0.01)
CCR-AP-8	Thallium, Total	22	17	0.698	1.845e-05	Not normal	Not normal
CCR-AP-9	Thallium, Total	21	12	0.5047	2.249e-07	Not normal	Not normal

Table A-3. Results of Rosner/Dixon Test for Outliers

				Rosner or Dixon Test for Outliers (R programming, package = outliers, version 0.15, function = dixon.test or rosnerTest, non-detects substituted by 0.5*reporting limit)					
Location	Constituent	n	n, non-detects	Outlier Test	statistic	p-value	Alternative Hypothesis	Statistical Outlier (significance level = 0.05)	Outlier Removed
CCR-AP-1R	Antimony, Total	23	6	Dixon	0.5302	0.01059	highest value 0.01 is an outlier	Yes	No
CCR-AP-2	Antimony, Total	23	9	Dixon	0.5476	0.004206	highest value 0.01 is an outlier	Yes	No
CCR-AP-3	Antimony, Total	22	17	Dixon	0.9662	0	highest value 0.005 is an outlier	Yes	No
CCR-AP-4R	Antimony, Total	22	15	Dixon	0.9134	0	highest value 0.028 is an outlier	Yes	No
CCR-AP-5	Antimony, Total	22	16	Dixon	0.8111	0	highest value 0.01 is an outlier	Yes	No
CCR-AP-6	Antimony, Total	22	9	Dixon	0.9304	0	highest value 0.018 is an outlier	Yes	No
CCR-AP-7	Antimony, Total	24	21	Dixon	0.8982	0	highest value 0.0025 is an outlier	Yes	No
CCR-AP-8	Antimony, Total	22	6	Dixon	0.7729	0	highest value 0.0046 is an outlier	Yes	No
CCR-AP-9	Antimony, Total	21	6	Dixon	0.2278	0.9512	highest value 0.01 is an outlier	No	NA
CCR-AP-1R	Arsenic, Total	23	0	Dixon	0.1194	0.4373	highest value 0.038 is an outlier	No	NA
CCR-AP-2	Arsenic, Total	23	0	Dixon	0.3463	0.2847	highest value 0.048 is an outlier	No	NA
CCR-AP-3	Arsenic, Total	22	0	Dixon	0.4286	0.1023	lowest value 0.051 is an outlier	No	NA
CCR-AP-4R	Arsenic, Total	22	0	Dixon	0.4762	0.04417	highest value 0.33 is an outlier	Yes	No
CCR-AP-5	Arsenic, Total	21	2	Dixon	0.6319	0	highest value 0.024 is an outlier	Yes	No
CCR-AP-6	Arsenic, Total	22	0	Dixon	0.2714	0.6465	lowest value 0.04 is an outlier	No	NA
CCR-AP-7	Arsenic, Total	24	0	Dixon	0.5614	0	highest value 0.018 is an outlier	Yes	No
CCR-AP-8	Arsenic, Total	22	0	Dixon	0.4021	0.1522	lowest value 0.013 is an outlier	No	NA
CCR-AP-9	Arsenic, Total	21	0	Dixon	0.6415	0	highest value 0.032 is an outlier	Yes	No
CCR-AP-1R	Barium, Total	23	0	Dixon	0.2358	0.8196	highest value 0.59 is an outlier	No	NA
CCR-AP-2	Barium, Total	23	0	Dixon	0.3484	0.2777	highest value 0.83 is an outlier	No	NA
CCR-AP-3	Barium, Total	22	0	Dixon	0.1	0.31	highest value 0.49 is an outlier	No	NA
CCR-AP-4R	Barium, Total	22	0	Dixon	0.5455	0.00835	highest value 1.4 is an outlier	Yes	No
CCR-AP-5	Barium, Total	22	0	Dixon	0.4762	0.04417	highest value 0.2 is an outlier	Yes	No
CCR-AP-6	Barium, Total	22	0	Dixon	0.2308	0.8875	lowest value 0.43 is an outlier	No	NA
CCR-AP-7	Barium, Total	24	0	Dixon	0.3333	0.3081	highest value 0.19 is an outlier	No	NA
CCR-AP-8	Barium, Total	22	0	Dixon	0.2632	0.693	lowest value 0.27 is an outlier	No	NA
CCR-AP-9	Barium, Total	21	0	Dixon	0.6226	0	highest value 0.72 is an outlier	Yes	No
CCR-AP-1R	Beryllium, Total	23	0	Dixon	0.1637	0.7129	highest value 0.0066 is an outlier	No	NA
CCR-AP-2	Beryllium, Total	23	0	Dixon	0.3794	0.1859	highest value 0.0077 is an outlier	No	NA
CCR-AP-3	Beryllium, Total	22	21	Dixon	1	0	highest value 0.00056 is an outlier	Yes	No
CCR-AP-4R	Beryllium, Total	22	7	Dixon	0.3922	0.1746	highest value 0.0017 is an outlier	No	NA
CCR-AP-5	Beryllium, Total	22	16	Dixon	0.8918	0	highest value 0.005 is an outlier	Yes	No
CCR-AP-6	Beryllium, Total	22	9	Dixon	0.7974	0	highest value 0.0025 is an outlier	Yes	No
CCR-AP-7	Beryllium, Total	24	17	Dixon	0.1917	0.9362	lowest value 0.000067 is an outlier	No	NA
CCR-AP-8	Beryllium, Total	22	16	Dixon	0.1765	0.7648	lowest value 0.00016 is an outlier	No	NA
CCR-AP-9	Beryllium, Total	21	2	Dixon	0.7064	0	highest value 0.005 is an outlier	Yes	No
CCR-AP-1R	Cadmium, Total	23	13	Dixon	0.523	0.01304	highest value 0.005 is an outlier	Yes	No
CCR-AP-2	Cadmium, Total	23	3	Dixon	0.5788	0	highest value 0.0066 is an outlier	Yes	No
CCR-AP-3	Cadmium, Total	22	21	Dixon	1	0	lowest value 0.00038 is an outlier	Yes	No
CCR-AP-4R	Cadmium, Total	22	12	Dixon	0.7716	0	highest value 0.0025 is an outlier	Yes	No
CCR-AP-5	Cadmium, Total	22	6	Dixon	0.7851	0	highest value 0.005 is an outlier	Yes	No
CCR-AP-6	Cadmium, Total	22	9	Dixon	0.6304	0	highest value 0.0011 is an outlier	Yes	No
CCR-AP-7	Cadmium, Total	24	22	Dixon	0.5	0.01865	lowest value 0.00014 is an outlier	Yes	No
CCR-AP-8	Cadmium, Total	22	16	Dixon	0.08824	0.2487	lowest value 0.00016 is an outlier	No	NA
CCR-AP-9	Cadmium, Total	21	10	Dixon	0.5112	0.02629	highest value 0.005 is an outlier	Yes	No
CCR-AP-1R	Chromium, Total	23	0	Dixon	0.2667	0.6398	highest value 0.16 is an outlier	No	NA
CCR-AP-2	Chromium, Total	23	0	Dixon	0.2935	0.5017	highest value 0.14 is an outlier	No	NA
CCR-AP-3	Chromium, Total	22	4	Dixon	0.7615	0	highest value 0.014 is an outlier	Yes	No
CCR-AP-4R	Chromium, Total	21	3	Dixon	0.5329	0.01637	highest value 0.058 is an outlier	Yes	No
CCR-AP-5	Chromium, Total	22	16	Dixon	0.8364	0	highest value 0.056 is an outlier	Yes	No
CCR-AP-6	Chromium, Total	22	1	Dixon	0.3474	0.3069	highest value 0.043 is an outlier	No	NA
CCR-AP-7	Chromium, Total	24	12	Dixon	0.7167	0	highest value 0.019 is an outlier	Yes	No
CCR-AP-8	Chromium, Total	21	2	Dixon	0.5635	0.005373	highest value 0.014 is an outlier	Yes	No
CCR-AP-9	Chromium, Total	21	0	Dixon	0.7436	0	highest value 0.15 is an outlier	Yes	No
CCR-AP-1R	Cobalt, Total	23	0	Dixon	0.07989	0.2227	highest value 0.081 is an outlier	No	NA
CCR-AP-2	Cobalt, Total	23	0	Dixon	0.5375	0.007963	highest value 0.091 is an outlier	Yes	No
CCR-AP-3	Cobalt, Total	22	0	Dixon	0 28	0.6	highest value 0.0094 is an outlier	No	NA
CCR-AP-4R	Cobalt, Total	22	0	Dixon	0.4145	0.127	highest value 0.021 is an outlier	No	NA
CCR-AP-5	Cobalt, Total	22	0	Dixon	0.327	0.3838	highest value 0.01 is an outlier	No	NA
CCR-AP-6	Cobalt, Total	22	0	Dixon	0.3311	0.3674	highest value 0.019 is an outlier	No	NA
CCR-AP-7	Cobalt, Total	24	2	Dixon	0.6594	0	highest value 0.015 is an outlier	Yes	No

Rosner or Dixon Test for Outliers (R programming, package = outliers, version 0.15, function = dixon.test or rosnerTest, non-detects substituted by 0.5*reporting limit)

Location	Constituent	n	n, non-detects	Outlier Test	statistic	p-value	Alternative Hypothesis	Statistical Outlier (significance level = 0.05)	Outlier Removed
CCR-AP-8	Cobalt, Total	22	0	Dixon	0.3623	0.2572	highest value 0.017 is an outlier	No	NA
CCR-AP-9	Cobalt, Total	21	0	Dixon	0.7035	0	highest value 0.047 is an outlier	Yes	No
CCR-AP-1R	Fluoride	23	0	Dixon	0.5349	0.008932	highest value 0.81 is an outlier	Yes	No
CCR-AP-2	Fluoride	23	0	Dixon	0.3043	0.451	highest value 0.69 is an outlier	No	NA
CCR-AP-3	Fluoride	22	1	Dixon	0.5	0.02699	highest value 0.93 is an outlier	Yes	No
CCR-AP-4R	Fluoride	22	1	Dixon	0.5106	0.02152	lowest value 0.05 is an outlier	Yes	No
CCR-AP-5	Fluoride	22	0	Dixon	0.2055	0.9516	highest value 2.3 is an outlier	No	NA
CCR-AP-6	Fluoride	22	0	Dixon	0.2791	0.605	lowest value 0.24 is an outlier	No	NA
CCR-AP-7	Fluoride	23	0	Dixon	0.46	0.05099	highest value 0.72 is an outlier	No	NA
CCR-AP-8	Fluoride	22	1	Dixon	0.7473	0	highest value 1.1 is an outlier	Yes	No
CCR-AP-9	Fluoride	21	0	Dixon	0.48	0.05	lowest value 0.14 is an outlier	No	NA
CCR-AP-1R	Lead, Total	23	0	Dixon	0.2064	0.9962	highest value 0.094 is an outlier	No	NA
CCR-AP-2	Lead, Total	23	0	Dixon	0.4527	0.05866	highest value 0.1 is an outlier	No	NA
CCR-AP-3	Lead, Total	22	4	Dixon	0.8912	0	highest value 0.01 is an outlier	Yes	No
CCR-AP-4R	Lead, Total	22	1	Dixon	0.5714	0	highest value 0.047 is an outlier	Yes	No
CCR-AP-5	Lead, Total	22	13	Dixon	0.7572	0	highest value 0.02 is an outlier	Yes	No
CCR-AP-6	Lead, Total	22	0	Dixon	0.5276	0.01459	highest value 0.041 is an outlier	Yes	No
CCR-AP-7	Lead, Total	24	10	Dixon	0.6051	0	highest value 0.02 is an outlier	Yes	No
CCR-AP-8	Lead, Total	22	1	Dixon	0.6125	0	highest value 0.0076 is an outlier	Yes	No
CCR-AP-9	Lead, Total	21	0	Dixon	0.4683	0.06241	highest value 0.041 is an outlier	No	NA
CCR-AP-1R	Lithium, Total	23	0	Dixon	0.3608	0.2379	highest value 0.23 is an outlier	No	NA
CCR-AP-2	Lithium, Total	23	5	Dixon	0.3704	0.2099	highest value 0.125 is an outlier	No	NA
CCR-AP-3	Lithium, Total	22	18	Dixon	0	0	highest value 0.025 is an outlier	Yes	No
CCR-AP-4R	Lithium, Total	22	6	Dixon	0.4989	0.02764	highest value 0.047 is an outlier	Yes	No
CCR-AP-5	Lithium, Total	22	0	Dixon	0.1844	0.8154	lowest value 0.009 is an outlier	No	NA
CCR-AP-6	Lithium, Total	22	11	Dixon	0.8163	0	highest value 0.125 is an outlier	Yes	No
CCR-AP-7	Lithium, Total	24	0	Dixon	0.6355	0	highest value 0.039 is an outlier	Yes	No
CCR-AP-8	Lithium, Total	22	16	Dixon	0	0	highest value 0.025 is an outlier	Yes	No
CCR-AP-9	Lithium, Total	21	0	Dixon	0.6437	0	highest value 0.12 is an outlier	Yes	No
CCR-AP-1R	Mercury, Total	22	22	Dixon	NA	NA	Not Evlauated - All results are non-detect	NA	NA
CCR-AP-2	Mercury, Total	22	13	Dixon	0.541	0.01001	highest value 0.00071 is an outlier	Yes	No
CCR-AP-3	Mercury, Total	21	21	Dixon	NA	NA	Not Evlauated - All results are non-detect	NA	NA
CCR-AP-4R	Mercury, Total	21	21	Dixon	NA	NA	Not Evlauated - All results are non-detect	NA	NA
CCR-AP-5	Mercury, Total	21	18	Dixon	0.8533	0	highest value 0.0016 is an outlier	Yes	No
CCR-AP-6	Mercury, Total	21	19	Dixon	0.7742	0	highest value 0.00041 is an outlier	Yes	No
CCR-AP-7	Mercury, Total	21	21	Dixon	NA	NA	Not Evlauated - All results are non-detect	NA	NA
CCR-AP-8	Mercury, Total	21	20	Dixon	1	0	highest value 0.00026 is an outlier	Yes	No
CCR-AP-9	Mercury, Total	20	20	Dixon	NA	NA	Not Evlauated - All results are non-detect	NA	NA
CCR-AP-1R	Molybdenum, Total	23	0	Dixon	0.565	0	highest value 0.023 is an outlier	Yes	No
CCR-AP-2	Molybdenum, Total	23	0	Dixon	0.2558	0.7009	highest value 0.01 is an outlier	No	NA
CCR-AP-3	Molybdenum, Total	22	0	Dixon	0.6145	0	highest value 0.025 is an outlier	Yes	No
CCR-AP-4R	Molybdenum, Total	22	3	Dixon	0.4605	0.05997	highest value 0.017 is an outlier	No	NA
CCR-AP-5	Molybdenum, Total	22	0	Dixon	0.359	0.2679	highest value 0.53 is an outlier	No	NA
CCR-AP-6	Molybdenum, Total	22	0	Dixon	0.4	0.1567	highest value 0.043 is an outlier	No	NA
CCR-AP-7	Molybdenum, Total	24	1	Dixon	0.4138	0.09869	highest value 0.013 is an outlier	No	NA
CCR-AP-8	Molybdenum, Total	22	0	Dixon	0.4712	0.04883	highest value 0.029 is an outlier	Yes	No
CCR-AP-9	Molybdenum, Total	21	2	Dixon	0.6222	0	highest value 0.025 is an outlier	Yes	No
CCR-AP-1R	Radium-226 & 228	21	0	Dixon	0.5301	0.01745	highest value 14.4 is an outlier	Yes	No
CCR-AP-2	Radium-226 & 228	21	0	Dixon	0.47	0.06051	highest value 5.53 is an outlier	No	NA
CCR-AP-3	Radium-226 & 228	20	0	Dixon	0.4608	0.08453	highest value 4.87 is an outlier	No	NA
CCR-AP-4R	Radium-226 & 228	20	0	Dixon	0.8934	0	highest value 30 is an outlier	Yes	No
CCR-AP-5	Radium-226 & 228	20	0	Dixon	0.5277	0.0234	highest value 5.54 is an outlier	Yes	No
CCR-AP-6	Radium-226 & 228	20	1	Dixon	0.7758	0	highest value 10.2 is an outlier	Yes	No
CCR-AP-7	Radium-226 & 228	21	0	Dixon	0.2152	0.9709	highest value 1.72 is an outlier	No	NA
CCR-AP-8	Radium-226 & 228	19	0	Dixon	0.3621	0.3545	highest value 2.88 is an outlier	No	NA
CCR-AP-9	Radium-226 & 228	19	0	Dixon	0.5544	0.01698	highest value 12.6 is an outlier	Yes	No
CCR-AP-1R	Selenium, Total	23	13	Dixon	0	0	highest value 0.025 is an outlier	Yes	No
CCR-AP-2	Selenium, Total	23	7	Dixon	0.4049	0.1288	highest value 0.026 is an outlier	No	NA
CCR-AP-3	Selenium, Total	22	1	Dixon	0.8269	0	highest value 0.0068 is an outlier	Yes	No
CCR-AP-4R	Selenium, Total	22	11	Dixon	0.9532	0	highest value 0.031 is an outlier	Yes	No
CCR-AP-5	Selenium, Total	22	14	Dixon	0.7729	0	highest value 0.025 is an outlier	Yes	No
CCR-AP-6	Selenium, Total	22	5	Dixon	0.8407	0	highest value 0.0125 is an outlier	Yes	No
CCR-AP-7	Selenium, Total	22	19	Dixon	1	0	lowest value 0.00035 is an outlier	Yes	No
CCR-AP-8	Selenium, Total	22	3	Dixon	0.6909	0	highest value 0.007 is an outlier	Yes	No

Rosner or Dixon Test for Outliers (R programming, package = outliers, version 0.15, function = dixon.test or rosnerTest, non-detects substituted by 0.5*reporting limit)

Location	Constituent	n	n, non-detects	Outlier Test	statistic	p-value	Alternative Hypothesis	Statistical Outlier (significance level = 0.05)	Outlier Removed
CCR-AP-9	Selenium, Total	21	15	Dixon	0.5297	0.01762	highest value 0.025 is an outlier	Yes	No
CCR-AP-1R	Thallium, Total	23	7	Dixon	0.4977	0.02342	highest value 0.0027 is an outlier	Yes	No
CCR-AP-2	Thallium, Total	23	3	Dixon	0.8445	0	highest value 0.0076 is an outlier	Yes	No
CCR-AP-3	Thallium, Total	22	21	Dixon	1	0	highest value 0.001 is an outlier	Yes	No
CCR-AP-4R	Thallium, Total	22	12	Dixon	0.8207	0	highest value 0.0025 is an outlier	Yes	No
CCR-AP-5	Thallium, Total	22	15	Dixon	0.9298	0	highest value 0.005 is an outlier	Yes	No
CCR-AP-6	Thallium, Total	22	14	Dixon	0.8299	0	highest value 0.0025 is an outlier	Yes	No
CCR-AP-7	Thallium, Total	24	20	Dixon	0.5482	0.00102	highest value 0.001 is an outlier	Yes	No
CCR-AP-8	Thallium, Total	22	17	Dixon	0.5453	0.008424	highest value 0.001 is an outlier	Yes	No
CCR-AP-9	Thallium, Total	21	12	Dixon	0.8221	0	highest value 0.005 is an outlier	Yes	No

Table A-4. Results of Mann Kendall and Thiel Sen Trend Tests

		Mann Kendall Trends			Secular Trend Evaluation for All Data									Secular Trend Evaluation for Recent Data (subset of 8 most recent data points)								
					Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)		Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)								Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)	
Location	Constituent	Trends, All Data	Trends, Recent Data	Seasonal Mann Kendall Used	n	n, detected results	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value	n	n, detected results	recent data date range	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value
CCR-AP-1R	Antimony, Total	No Trend	Probably Decreasing	No	23	17	1.19	0.0647	0.69	31	16	0.000005	0.69	8	8	2021-05-13 to 2024-05-08	0.688	-0.571	0.0635	93.7	-16	-0.000243	0.0635
CCR-AP-2	Antimony, Total	No Trend	No Trend	No	23	14	1.06	0.205	0.191	80.9	50	0.0000158	0.191	8	8	2021-05-12 to 2024-05-08	1.02	0.109	0.803	19.7	3	0.0000485	0.803
CCR-AP-3	Antimony, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	22	5	0.77	NA	NA	NA	NA	NA	NA	8	3	2020-11-13 to 2024-05-07	0.878	NA	NA	NA	NA	NA	NA
CCR-AP-4R	Antimony, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	22	7	2.31	NA	NA	NA	NA	NA	NA	8	5	2020-11-13 to 2024-05-08	1.99	-0.0378	1	0	-1	0	1
CCR-AP-5	Antimony, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	22	6	1.33	NA	NA	NA	NA	NA	NA	8	5	2020-11-13 to 2024-05-13	0.916	0.491	0.126	87.4	13	0.000114	0.126
CCR-AP-6	Antimony, Total	No Trend	No Trend	No	22	13	1.99	0.033	0.861	13.9	7	0	0.861	8	6	2020-11-13 to 2024-05-07	1.96	0.0378	1	0	1	0	1
CCR-AP-7	Antimony, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - No detected results.	No	24	3	0.367	NA	NA	NA	NA	NA	NA	8	0	2020-11-12 to 2024-05-10	0.447	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-8	Antimony, Total	Stable	No Trend	No	22	16	0.825	-0.246	0.128	87.2	-54	-0.0000192	0.128	8	7	2020-11-12 to 2024-05-10	1.11	-0.286	0.386	61.4	-8	-0.0000689	0.386
CCR-AP-9	Antimony, Total	No Trend	No Trend	No	21	15	1.09	-0.0488	0.785	21.5	-10	-0.00000294	0.785	8	6	2020-05-19 to 2024-05-08	1.18	-0.214	0.536	46.4	-6	-0.000108	0.536
Pooled Background	Antimony, Total	No Trend	Stable	No	68	35	1.22	0.12	0.173	82.7	249	0	0.173	8	5	2023-05-23 to 2024-05-10	0.485	-0.109	0.803	19.7	-3	-0.0000225	0.803
CCR-AP-1R	Arsenic, Total	Increasing	Decreasing	No	23	23	0.708	0.329	0.0302	97	83	0.000577	0.0302	8	8	2021-05-13 to 2024-05-08	0.485	-0.643	0.0354	96.5	-18	-0.00287	0.0354
CCR-AP-2	Arsenic, Total	Increasing	Increasing	No	23	23	0.798	0.618	0.0000465	100	155	0.00133	0.0000464	8	8	2021-05-12 to 2024-05-08	0.59	0.643	0.0354	96.5	18	0.005	0.0354
CCR-AP-3	Arsenic, Total	Probably Increasing	Stable	No	22	22	0.134	0.271	0.0883	91.2	61	0.000625	0.0883	8	8	2020-11-13 to 2024-05-07	0.166	-0.265	0.445	55.5	-7	-0.00213	0.445
CCR-AP-4R	Arsenic, Total	Increasing	Stable	No	22	22	0.728	0.403	0.0101	99	92	0.00529	0.0101	8	8	2020-11-13 to 2024-05-08	0.664	-0.143	0.711	28.9	-4	-0.00778	0.711
CCR-AP-5	Arsenic, Total	Increasing	No Trend	No	21	19	1.71	0.465	0.0037	99.6	97	0.00014	0.0037	8	8	2020-11-13 to 2024-05-13	1.05	0.4	0.212	78.8	11	0.00165	0.212
CCR-AP-6	Arsenic, Total	Probably Increasing	Stable	No	22	22	0.243	0.292	0.0711	92.9	64	0.00171	0.0711	8	8	2020-11-13 to 2024-05-07	0.189	-0.309	0.369	63.1	-8	-0.00117	0.369
CCR-AP-7	Arsenic, Total	Decreasing	Stable	No	24	24	0.733	-0.401	0.00678	99.3	-110	-0.000242	0.00678	8	8	2020-11-12 to 2024-05-10	0.743	-0.327	0.319	68.1	-9	-0.000525	0.319
CCR-AP-8	Arsenic, Total	Increasing	Decreasing	No	22	22	0.311	0.426	0.00706	99.3	96	0.0023	0.00706	8	8	2020-11-12 to 2024-05-10	0.395	-0.718	0.0226	97.7	-19	-0.00958	0.0226
CCR-AP-9	Arsenic, Total	No Trend	Stable	No	21	21	0.623	0.129	0.432	56.8	27	0.000129	0.432	8	8	2020-05-19 to 2024-05-08	0.521	-0.429	0.174	82.6	-12	-0.00142	0.174
Pooled Background	Arsenic, Total	No Trend	Probably Decreasing	No	68	68	0.845	0.0776	0.354	64.6	176	0.0000305	0.354	8	8	2023-05-23 to 2024-05-10	0.742	-0.571	0.0635	93.7	-16	-0.00169	0.0635
CCR-AP-1R	Barium, Total	Increasing	Stable	No	23	23	0.662	0.341	0.0247	97.5	86	0.00909	0.0247	8	8	2021-05-13 to 2024-05-08	0.268	-0.0714	0.902	9.8	-2	-0.00667	0.902
CCR-AP-2	Barium, Total	Increasing	Increasing	No	23	23	0.746	0.485	0.00138	99.9	122	0.0186	0.00138	8	8	2021-05-12 to 2024-05-08	0.678	1	0.000837	99.9	28	0.105	0.000837
CCR-AP-3	Barium, Total	No Trend	Stable	No	22	22	0.0764	0.147	0.364	63.6	33	0.00125	0.364	8	8	2020-11-13 to 2024-05-07	0 0905	-0.286	0.386	61.4	-8	-0.00633	0.386
CCR-AP-4R	Barium, Total	No Trend	Stable	No	22	22	0.35	0.0132	0.955	4.5	3	0	0.955	8	8	2020-11-13 to 2024-05-08	0.424	-0.0364	1	0	-1	-0.005	1
CCR-AP-5	Barium, Total	Increasing	No Trend	No	22	22	0.716	0.575	0.000217	100	132	0.00312	0.000217	8	8	2020-11-13 to 2024-05-13	0.583	0.214	0.536	46.4	6	0.00945	0.536
CCR-AP-6	Barium, Total	Stable	Decreasing	No	22	22	0.126	-0.238	0.133	86.7	-54	-0.004	0.133	8	8	2020-11-13 to 2024-05-07	0.143	-0.691	0.0248	97.5	-19	-0.0167	0.0248
CCR-AP-7	Barium, Total	Decreasing	Stable	No	24	24	0.226	-0.397	0.00921	99.1	-105	-0.00226	0.00921	8	8	2020-11-12 to 2024-05-10	0.161	-0.189	0.61	39	-5	-0.00367	0.61
CCR-AP-8	Barium, Total	Decreasing	Decreasing	No	22	22	0.207	-0.543	0.00051	99.9	-124	-0.0114	0.00051	8	8	2020-11-12 to 2024-05-10	0.25	-0.764	0.0126	98.7	-21	-0.0367	0.0126
CCR-AP-9	Barium, Total	No Trend	Stable	No	21	21	0.424	0.223	0.172	82.8	46	0.00481	0.172	8	8	2020-05-19 to 2024-05-08	0.324	-0.255	0.454	54.6	-7	-0.0138	0.454
Pooled Background	Barium, Total	Probably Increasing	Stable	No	68	68	0.615	0.148	0.0785	92.2	333	0.00102	0.0785	8	8	2023-05-23 to 2024-05-10	0.436	-0.182	0.618	38.2	-5	-0.00875	0.618
CCR-AP-1R	Beryllium, Total	Increasing	Decreasing	No	23	23	0.82	0.36	0.0175	98.2	91	0.000138	0.0175	8	8	2021-05-13 to 2024-05-08	0.504	-0.643	0.0354	96.5	-18	-0.000662	0.0354
CCR-AP-2	Beryllium, Total	Increasing	No Trend	No	23	23	0.94	0.583	0.000114	100	147	0.000162	0.000114	8	8	2021-05-12 to 2024-05-08	0.683	0.286	0.386	61.4	8	0.000532	0.386
CCR-AP-3	Beryllium, Total	Not Evaluated - Only one detected result.	Not Evaluated - Only one detected result.	No	22	1	0.0254	NA	NA	NA	NA	NA	NA	8	1	2020-11-13 to 2024-05-07	0 0418	NA	NA	NA	NA	NA	NA
CCR-AP-4R	Beryllium, Total	Increasing	Stable	No	22	15	0.699	0.427	0.00759	99.2	94	0.0000169	0.00759	8	4	2020-11-13 to 2024-05-08	0.62	-0.403	0.232	76.8	-10	-0.0000129	0.232
CCR-AP-5	Beryllium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Only one detected result.	No	22	6	1.32	NA	NA	NA	NA	NA	NA	8	1	2020-11-13 to 2024-05-13	0.61	NA	NA	NA	NA	NA	NA
CCR-AP-6	Beryllium, Total	No Trend	Not Evaluated - Majority of data (>50%) non-detect.	No	22	13	0.925	0.232	0.151	84.9	51	0.000008	0.151	8	2	2020-11-13 to 2024-05-07	0.452	NA	NA	NA	NA	NA	NA

Note:
Mann Kendall Trends are classified based on Aziz (2003) guidance.

		Mann Kendall Trends			Secular Trend Evaluation for All Data									Secular Trend Evaluation for Recent Data (subset of 8 most recent data points)								
					Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)		Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)								Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)	
Location	Constituent	Trends, All Data	Trends, Recent Data	Seasonal Mann Kendall Used	n	n, detected results	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value	n	n, detected results	recent data date range	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value
CCR-AP-7	Beryllium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - No detected results.	No	24	7	0.404	NA	NA	NA	NA	NA	NA	8	0	2020-11-12 to 2024-05-10	0.189	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-8	Beryllium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Only one detected result.	No	22	6	0.295	NA	NA	NA	NA	NA	NA	8	1	2020-11-12 to 2024-05-10	0.237	NA	NA	NA	NA	NA	NA
CCR-AP-9	Beryllium, Total	Probably Increasing	Stable	No	21	19	1.02	0.279	0.0846	91.5	58	0.0000314	0.0846	8	6	2020-05-19 to 2024-05-08	0.971	-0.286	0.386	61.4	-8	-0.000113	0.386
Pooled Background	Beryllium, Total	Increasing	Stable	No	68	49	1.2	0.232	0.00658	99.3	510	0.00000879	0.00658	8	5	2023-05-23 to 2024-05-10	0.801	-0.327	0.319	68.1	-9	-0.000212	0.319
CCR-AP-1R	Cadmium, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	23	10	1.32	NA	NA	NA	NA	NA	NA	8	6	2021-05-13 to 2024-05-08	1.27	-0.286	0.386	61.4	-8	-0.0000425	0.386
CCR-AP-2	Cadmium, Total	Increasing	No Trend	No	23	20	0.997	0.421	0.0055	99.5	106	0.0000625	0.0055	8	8	2021-05-12 to 2024-05-08	0.964	0.429	0.174	82.6	12	0.000237	0.174
CCR-AP-3	Cadmium, Total	Not Evaluated - Only one detected result.	Not Evaluated - Only one detected result.	No	22	1	0.0517	NA	NA	NA	NA	NA	NA	8	1	2020-11-13 to 2024-05-07	0 0875	NA	NA	NA	NA	NA	NA
CCR-AP-4R	Cadmium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Stable	No	22	10	0.901	NA	NA	NA	NA	NA	NA	8	4	2020-11-13 to 2024-05-08	0.309	0	1	0	0	0	1
CCR-AP-5	Cadmium, Total	No Trend	No Trend	No	22	16	1.4	0.0934	0.57	43	21	0.00000455	0.57	8	5	2020-11-13 to 2024-05-13	0.559	0.189	0.61	39	5	0.0000246	0.61
CCR-AP-6	Cadmium, Total	No Trend	Not Evaluated - Majority of data (>50%) non-detect.	No	22	13	0.485	0.183	0.272	72.8	38	0	0.272	8	2	2020-11-13 to 2024-05-07	0.52	NA	NA	NA	NA	NA	NA
CCR-AP-7	Cadmium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - No detected results.	No	24	2	0.199	NA	NA	NA	NA	NA	NA	8	0	2020-11-12 to 2024-05-10	0.189	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-8	Cadmium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	22	6	0.3	NA	NA	NA	NA	NA	NA	8	3	2020-11-12 to 2024-05-10	0.339	NA	NA	NA	NA	NA	NA
CCR-AP-9	Cadmium, Total	Increasing	Not Evaluated - Majority of data (>50%) non-detect.	No	21	11	1.6	0.484	0.00325	99.7	97	0.0000226	0.00325	8	2	2020-05-19 to 2024-05-08	1.59	NA	NA	NA	NA	NA	NA
Pooled Background	Cadmium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	68	23	1.45	NA	NA	NA	NA	NA	NA	8	3	2023-05-23 to 2024-05-10	0.353	NA	NA	NA	NA	NA	NA
CCR-AP-1R	Chromium, Total	Increasing	Stable	No	23	23	0.841	0.326	0.0322	96.8	82	0.00236	0.0322	8	8	2021-05-13 to 2024-05-08	0.436	-0.429	0.174	82.6	-12	-0.00746	0.174
CCR-AP-2	Chromium, Total	Increasing	Increasing	No	23	23	0.839	0.589	0.0000927	100	149	0.00423	0.0000928	8	8	2021-05-12 to 2024-05-08	0.691	0.929	0.00198	99.8	26	0.0176	0 00198
CCR-AP-3	Chromium, Total	Probably Increasing	No Trend	No	22	18	0.951	0.276	0.0868	91.3	61	0.00005	0.0868	8	7	2020-11-13 to 2024-05-07	1.1	0.4	0.212	78.8	11	0.000225	0.212
CCR-AP-4R	Chromium, Total	No Trend	Stable	Yes	21	18	0.89	0.249	0.123	87.7	52	0.000267	0.123	8	7	2020-11-13 to 2024-05-08	0.87	-0.0714	0.902	9.8	-2	-0.000137	0.902
CCR-AP-5	Chromium, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	22	6	2.28	NA	NA	NA	NA	NA	NA	8	5	2020-11-13 to 2024-05-13	1.6	0.416	0.203	79.7	11	0.000875	0.203
CCR-AP-6	Chromium, Total	Stable	No Trend	No	22	21	0.862	-0.166	0.296	70.4	-38	-0.000237	0.296	8	7	2020-11-13 to 2024-05-07	1.44	-0.214	0.536	46.4	-6	-0.00066	0.536
CCR-AP-7	Chromium, Total	No Trend	Not Evaluated - No detected results.	No	24	12	1.26	0.0579	0.723	27.7	15	0	0.723	8	0	2020-11-12 to 2024-05-10	0.679	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-8	Chromium, Total	No Trend	Stable	No	21	19	0.832	0.0383	0.832	16.8	8	0.0000161	0.832	8	7	2020-11-12 to 2024-05-10	0.979	-0.143	0.711	28.9	-4	-0.000237	0.711
CCR-AP-9	Chromium, Total	Increasing	Stable	No	21	21	1.22	0.36	0.0252	97.5	75	0.000926	0.0252	8	8	2020-05-19 to 2024-05-08	0.594	-0.109	0.803	19.7	-3	-0.000571	0.803
Pooled Background	Chromium, Total	Probably Increasing	Stable	No	68	56	1.39	0.164	0.0511	94.9	369	0.000156	0.0511	8	6	2023-05-23 to 2024-05-10	0.877	-0.429	0.174	82.6	-12	-0.00456	0.174
CCR-AP-1R	Cobalt, Total	Increasing	Probably Decreasing	No	23	23	0.828	0.369	0.015	98.5	93	0.00169	0.015	8	8	2021-05-13 to 2024-05-08	0.542	-0.571	0.0635	93.7	-16	-0.0058	0.0635
CCR-AP-2	Cobalt, Total	Increasing	Increasing	No	23	23	0.695	0.644	0.0000207	100	162	0.0017	0.0000208	8	8	2021-05-12 to 2024-05-08	0.626	0.714	0.0187	98.1	20	0.00704	0.0187
CCR-AP-3	Cobalt, Total	Decreasing	No Trend	No	22	22	0.255	-0.515	0.000877	99.9	-119	-0.000175	0.000877	8	8	2020-11-13 to 2024-05-07	0.318	0.286	0.386	61.4	8	0.000236	0.386
CCR-AP-4R	Cobalt, Total	No Trend	Stable	Yes	22	22	0.626	0.0607	0.714	28.6	14	0.0000243	0.714	8	8	2020-11-13 to 2024-05-08	0.67	-0.0714	0.902	9.8	-2	-0.000189	0.902
CCR-AP-5	Cobalt, Total	Decreasing	No Trend	No	22	22	0.64	-0.485	0.00189	99.8	-111	-0.00032	0.00189	8	8	2020-11-13 to 2024-05-13	1.06	0.4	0.212	78.8	11	0.000558	0.212
CCR-AP-6	Cobalt, Total	Stable	Stable	No	22	22	0.522	-0.252	0.108	89.2	-58	-0.00022	0.108	8	8	2020-11-13 to 2024-05-07	0.781	-0.4	0.212	78.8	-11	-0.000417	0.212
CCR-AP-7	Cobalt, Total	Decreasing	No Trend	No	24	22	1.51	-0.404	0.00631	99.4	-111	-0.0000848	0.00631	8	6	2020-11-12 to 2024-05-10	0.561	0.214	0.536	46.4	6	0.0000247	0.536
CCR-AP-8	Cobalt, Total	Decreasing	Stable	No	22	22	0.451	-0.595	0.000149	100	-135	-0.000467	0.000149	8	8	2020-11-12 to 2024-05-10	0.542	-0.286	0.386	61.4	-8	-0.000658	0.386
CCR-AP-9	Cobalt, Total	No Trend	Stable	No	21	21	0.574	0.234	0.153	84.7	48	0.00025	0.153	8	8	2020-05-19 to 2024-05-08	0.385	-0.265	0.445	55.5	-7	-0.001	0.445

Note:
Mann Kendall Trends are classified based on Aziz (2003) guidance.

		Mann Kendall Trends			Secular Trend Evaluation for All Data										Secular Trend Evaluation for Recent Data (subset of 8 most recent data points)								
					Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)		Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)								Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)	
Location	Constituent	Trends, All Data	Trends, Recent Data	Seasonal Mann Kendall Used	n	n, detected results	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value	n	n, detected results	recent data date range	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value
Pooled Background	Cobalt, Total	No Trend	Probably Decreasing	No	68	66	1.25	0.0915	0.275	72.5	207	0.0000667	0.275	8	7	2023-05-23 to 2024-05-10	0.893	-0.571	0.0635	93.7	-16	-0.0035	0.0635
CCR-AP-1R	Fluoride	Decreasing	Decreasing	No	23	23	0.217	-0.485	0.00158	99.8	-120	-0.00818	0.00158	8	8	2021-05-13 to 2024-05-08	0.245	-0.909	0.00277	99.7	-25	-0.0314	0 00277
CCR-AP-2	Fluoride	Increasing	Stable	No	23	23	0.414	0.487	0.00136	99.9	122	0.0143	0.00136	8	8	2021-05-12 to 2024-05-08	0.28	-0.327	0.319	68.1	-9	-0.0357	0.319
CCR-AP-3	Fluoride	Stable	Stable	No	22	21	0.474	-0.209	0.185	81.5	-48	-0.00933	0.185	8	8	2020-11-13 to 2024-05-07	0.403	-0.143	0.711	28.9	-4	-0.0104	0.711
CCR-AP-4R	Fluoride	No Trend	Probably Increasing	No	22	21	0.324	0.227	0.15	85	52	0.00667	0.15	8	8	2020-11-13 to 2024-05-08	0.265	0.571	0.0635	93.7	16	0.0383	0.0635
CCR-AP-5	Fluoride	Increasing	Stable	No	22	22	0.354	0.419	0.00782	99.2	95	0.0429	0.00782	8	8	2020-11-13 to 2024-05-13	0.371	0	1	0	0	0	1
CCR-AP-6	Fluoride	Stable	Stable	No	22	22	0.265	-0.122	0.446	55.4	-28	-0.00467	0.446	8	8	2020-11-13 to 2024-05-07	0.318	-0.0364	1	0	-1	-0.005	1
CCR-AP-7	Fluoride	Increasing	Stable	No	23	23	0.389	0.353	0.0212	97.9	88	0.00667	0.0212	8	8	2020-11-12 to 2024-05-10	0.325	-0.214	0.536	46.4	-6	-0.021	0.536
CCR-AP-8	Fluoride	No Trend	No Trend	No	22	21	0.645	0.144	0.366	63.4	33	0.00438	0.366	8	8	2020-11-12 to 2024-05-10	0.79	0.255	0.454	54.6	7	0 01	0.454
CCR-AP-9	Fluoride	No Trend	Stable	No	21	21	0.195	0.0683	0.693	30.7	14	0.00118	0.693	8	8	2020-05-19 to 2024-05-08	0.138	-0.255	0.454	54.6	-7	-0.0065	0.454
Pooled Background	Fluoride	No Trend	Stable	No	67	67	0.335	0.00915	0.918	8.2	20	0	0.918	8	8	2023-05-23 to 2024-05-10	0.182	-0.5	0.108	89.2	-14	-0.019	0.108
CCR-AP-1R	Lead, Total	Increasing	Stable	No	23	23	0.83	0.364	0.0162	98.4	92	0.00173	0.0162	8	8	2021-05-13 to 2024-05-08	0.529	-0.5	0.108	89.2	-14	-0.00715	0.108
CCR-AP-2	Lead, Total	Increasing	Increasing	No	23	23	0.85	0.588	0.000102	100	148	0.0025	0.000102	8	8	2021-05-12 to 2024-05-08	0.697	0.786	0.00937	99.1	22	0.0101	0 00937
CCR-AP-3	Lead, Total	Increasing	No Trend	No	22	18	1.81	0.364	0.0203	98	83	0.0000267	0.0203	8	7	2020-11-13 to 2024-05-07	1.66	0.357	0.266	73.4	10	0.000151	0.266
CCR-AP-4R	Lead, Total	No Trend	Stable	Yes	22	21	0.916	0.135	0.397	60.3	31	0.000142	0.397	8	7	2020-11-13 to 2024-05-08	0.879	-0.286	0.386	61.4	-8	-0.000692	0.386
CCR-AP-5	Lead, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	22	9	2.19	NA	NA	NA	NA	NA	NA	8	7	2020-11-13 to 2024-05-13	1.69	0.429	0.174	82.6	12	0.0003	0.174
CCR-AP-6	Lead, Total	No Trend	No Trend	No	22	22	1	-0.121	0.446	55.4	-28	-0.000167	0.446	8	8	2020-11-13 to 2024-05-07	1.71	-0.0714	0.902	9.8	-2	-0.000437	0.902
CCR-AP-7	Lead, Total	Probably Decreasing	Not Evaluated - Majority of data (>50%) non-detect.	No	24	14	1.67	-0.289	0.0621	93.8	-74	-0.0000332	0.0621	8	2	2020-11-12 to 2024-05-10	0.648	NA	NA	NA	NA	NA	NA
CCR-AP-8	Lead, Total	No Trend	No Trend	No	22	21	0.824	0.193	0.224	77.6	44	0.0000383	0.224	8	7	2020-11-12 to 2024-05-10	0.821	0.0714	0.902	9.8	2	0.0000375	0.902
CCR-AP-9	Lead, Total	Probably Increasing	Stable	No	21	21	0.713	0.273	0.0904	91	57	0.000426	0.0904	8	8	2020-05-19 to 2024-05-08	0.529	-0.286	0.386	61.4	-8	-0.00173	0.386
Pooled Background	Lead, Total	No Trend	Stable	No	68	58	1.33	0.0976	0.246	75.4	220	0.0000713	0.246	8	6	2023-05-23 to 2024-05-10	0.961	-0.429	0.174	82.6	-12	-0.0026	0.174
CCR-AP-1R	Lithium, Total	Probably Increasing	Stable	No	23	23	0.588	0.284	0.0639	93.6	71	0.00307	0.0639	8	8	2021-05-13 to 2024-05-08	0.355	-0.327	0.319	68.1	-9	-0.00804	0.319
CCR-AP-2	Lithium, Total	Increasing	Increasing	No	23	18	0.738	0.353	0.0211	97.9	88	0.002	0.0211	8	8	2021-05-12 to 2024-05-08	0.704	0.929	0.00198	99.8	26	0.014	0 00198
CCR-AP-3	Lithium, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	22	4	0.949	NA	NA	NA	NA	NA	NA	8	4	2020-11-13 to 2024-05-07	0.258	0.0806	0.894	10.6	2	0	0.894
CCR-AP-4R	Lithium, Total	Stable	Stable	No	22	16	0.772	-0.193	0.231	76.9	-43	-0.000262	0.231	8	7	2020-11-13 to 2024-05-08	0.854	0	1	0	0	-0.0002	1
CCR-AP-5	Lithium, Total	Decreasing	No Trend	No	22	22	0.458	-0.692	0.00000912	100	-158	-0.00514	0.00000912	8	8	2020-11-13 to 2024-05-13	0.462	0.143	0.711	28.9	4	0.002	0.711
CCR-AP-6	Lithium, Total	Decreasing	No Trend	No	22	11	1.37	-0.639	0.000065	100	-140	-0.00127	0.000065	8	5	2020-11-13 to 2024-05-07	1.05	0.0364	1	0	1	0.0000357	1
CCR-AP-7	Lithium, Total	Decreasing	No Trend	No	24	24	0.502	-0.394	0.00968	99	-104	-0.0002	0.00968	8	8	2020-11-12 to 2024-05-10	0.164	0.327	0.319	68.1	9	0.000204	0.319
CCR-AP-8	Lithium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	22	6	0.873	NA	NA	NA	NA	NA	NA	8	2	2020-11-12 to 2024-05-10	0.44	NA	NA	NA	NA	NA	NA
CCR-AP-9	Lithium, Total	Probably Increasing	Stable	No	21	21	0.423	0.279	0.0845	91.5	58	0.000554	0.0845	8	8	2020-05-19 to 2024-05-08	0.23	-0.0714	0.902	9.8	-2	-0.000625	0.902
Pooled Background	Lithium, Total	No Trend	Stable	No	68	68	0.924	0.062	0.461	53.9	140	0.0000833	0.461	8	8	2023-05-23 to 2024-05-10	0.734	-0.4	0.212	78.8	-11	-0.00864	0.212
CCR-AP-1R	Mercury, Total	Not Evaluated - No detected results.	Not Evaluated - No detected results.	No	22	0	1.25	NA	No detected results.	NA	NA	NA	No detected results.	8	0	2021-05-13 to 2024-05-08	1.24	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-2	Mercury, Total	Not Evaluated - Majority of data (>50%) non-detect.	Probably Increasing	No	22	9	0.846	NA	NA	NA	NA	NA	NA	8	6	2021-05-12 to 2024-05-08	0.792	0.546	0.0809	91.9	15	0.0000405	0.0809
CCR-AP-3	Mercury, Total	Not Evaluated - No detected results.	Not Evaluated - No detected results.	No	21	0	0.306	NA	No detected results.	NA	NA	NA	No detected results.	8	0	2020-11-13 to 2024-05-07	0.447	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-4R	Mercury, Total	Not Evaluated - No detected results.	Not Evaluated - No detected results.	No	21	0	0.343	NA	No detected results.	NA	NA	NA	No detected results.	8	0	2020-11-13 to 2024-05-08	0.447	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-5	Mercury, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	21	3	1.65	NA	NA	NA	NA	NA	NA	8	3	2020-11-13 to 2024-05-13	1.33	NA	NA	NA	NA	NA	NA
CCR-AP-6	Mercury, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	21	2	0.593	NA	NA	NA	NA	NA	NA	8	2	2020-11-13 to 2024-05-07	0.676	NA	NA	NA	NA	NA	NA
CCR-AP-7	Mercury, Total	Not Evaluated - No detected results.	Not Evaluated - No detected results.	No	21	0	0.306	NA	No detected results.	NA	NA	NA	No detected results.	8	0	2020-11-12 to 2024-05-10	0.447	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-8	Mercury, Total	Not Evaluated - Only one detected result.	Not Evaluated - Only one detected result.	No	21	1	0.406	NA	NA	NA	NA	NA	NA	8	1	2020-11-12 to 2024-05-10	0.517	NA	NA	NA	NA	NA	NA

Note:
Mann Kendall Trends are classified based on Aziz (2003) guidance.

		Mann Kendall Trends			Secular Trend Evaluation for All Data									Secular Trend Evaluation for Recent Data (subset of 8 most recent data points)								
					Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)		Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)	
Location	Constituent	Trends, All Data	Trends, Recent Data	Seasonal Mann Kendall Used	n	n, detected results	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value	n	n, detected results	recent data date range	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value
CCR-AP-9	Mercury, Total	Not Evaluated - No detected results.	Not Evaluated - No detected results.	No	20	0	0	NA	No detected results.	NA	NA	NA	No detected results.	8	0	2020-05-19 to 2024-05-08	0	NA	No detected results.	NA	NA	NA	No detected results.
Pooled Background	Mercury, Total	Not Evaluated - No detected results.	Not Evaluated - No detected results.	No	63	0	0.963	NA	No detected results.	NA	NA	NA	No detected results.	8	0	2023-05-23 to 2024-05-10	0.505	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-1R	Molybdenum, Total	Stable	Decreasing	No	23	23	0.434	-0.121	0.442	55.8	-30	-0.0000778	0.442	8	8	2021-05-13 to 2024-05-08	0.61	-0.643	0.0354	96.5	-18	-0.000758	0.0354
CCR-AP-2	Molybdenum, Total	Increasing	No Trend	No	23	23	0.567	0.636	0.0000261	100	160	0.000331	0.0000261	8	8	2021-05-12 to 2024-05-08	0.309	0.5	0.108	89.2	14	0.0005	0.108
CCR-AP-3	Molybdenum, Total	Decreasing	No Trend	No	22	22	0.345	-0.446	0.00494	99.5	-100	-0.000262	0.00494	8	8	2020-11-13 to 2024-05-07	0.57	0.214	0.536	46.4	6	0.000371	0.536
CCR-AP-4R	Molybdenum, Total	Increasing	No Trend	No	22	19	1.12	0.41	0.00918	99.1	93	0.000153	0.00918	8	6	2020-11-13 to 2024-05-08	0.89	0.327	0.319	68.1	9	0.0011	0.319
CCR-AP-5	Molybdenum, Total	Decreasing	Stable	No	22	22	0.418	-0.506	0.00136	99.9	-114	-0.012	0.00136	8	8	2020-11-13 to 2024-05-13	0.492	-0.148	0.706	29.4	-4	-0.0138	0.706
CCR-AP-6	Molybdenum, Total	No Trend	No Trend	No	22	22	0.262	0.0398	0.821	17.9	9	0	0.821	8	8	2020-11-13 to 2024-05-07	0.383	0.143	0.711	28.9	4	0.00117	0.711
CCR-AP-7	Molybdenum, Total	Decreasing	No Trend	No	24	23	0.848	-0.674	0.0000054	100	-184	-0.000227	0.0000054	8	7	2020-11-12 to 2024-05-10	0.274	0.109	0.803	19.7	3	0.0000518	0.803
CCR-AP-8	Molybdenum, Total	Stable	Stable	No	22	22	0.372	-0.0726	0.668	33.2	-16	0	0.668	8	8	2020-11-12 to 2024-05-10	0.511	-0.255	0.454	54.6	-7	-0.000971	0.454
CCR-AP-9	Molybdenum, Total	Decreasing	No Trend	No	21	19	0.837	-0.52	0.0011	99.9	-109	-0.0003	0.0011	8	6	2020-05-19 to 2024-05-08	1.42	-0.357	0.266	73.4	-10	-0.00025	0.266
Pooled Background	Molybdenum, Total	Decreasing	Decreasing	No	68	65	0.747	-0.286	0.0006	99.9	-649	-0.0000761	0.0006	8	6	2023-05-23 to 2024-05-10	0.647	-0.618	0.0461	95.4	-17	-0.001	0.0461
CCR-AP-1R	Radium-226 & 228	No Trend	No Trend	No	21	21	0.675	0.248	0.124	87.6	52	0.124	0.124	8	8	2020-11-13 to 2024-05-08	0.675	0.357	0.266	73.4	10	1.24	0.266
CCR-AP-2	Radium-226 & 228	No Trend	No Trend	No	21	21	0.675	0.0667	0.695	30.5	14	0.0183	0.695	8	8	2020-11-12 to 2024-05-08	0.685	0.143	0.711	28.9	4	0.222	0.711
CCR-AP-3	Radium-226 & 228	No Trend	No Trend	No	20	20	0.652	0.0211	0.922	7.8	4	0.00597	0.922	8	8	2020-11-13 to 2024-05-07	0.733	0.0714	0.902	9.8	2	0.0326	0.902
CCR-AP-4R	Radium-226 & 228	No Trend	No Trend	No	20	20	1.67	-0.0105	0.974	2.6	-2	-0.0041	0.974	8	8	2020-11-13 to 2024-05-08	1.67	0.143	0.711	28.9	4	0.117	0.711
CCR-AP-5	Radium-226 & 228	No Trend	No Trend	No	20	20	1.09	0.168	0.315	68.5	32	0.0379	0.315	8	8	2020-11-13 to 2024-05-13	0.846	0.5	0.108	89.2	14	0.506	0.108
CCR-AP-6	Radium-226 & 228	Stable	Stable	No	20	19	0.929	0	1	0	0	-0.000548	1	8	7	2020-11-13 to 2024-05-07	0.621	0	1	0	0	-0.00971	1
CCR-AP-7	Radium-226 & 228	Stable	Increasing	No	21	21	0.533	-0.114	0.487	51.3	-24	-0.0149	0.487	8	8	2020-11-12 to 2024-05-10	0.58	0.643	0.0354	96.5	18	0.117	0.0354
CCR-AP-8	Radium-226 & 228	Stable	Stable	No	19	19	0.448	-0.135	0.441	55.9	-23	-0.0164	0.441	8	8	2020-11-12 to 2024-05-10	0.478	-0.0714	0.902	9.8	-2	-0.0715	0.902
CCR-AP-9	Radium-226 & 228	Increasing	No Trend	No	19	19	0.786	0.345	0.0424	95.8	59	0.182	0.0424	8	8	2020-05-19 to 2024-05-08	0.712	0.357	0.266	73.4	10	0.644	0.266
Pooled Background	Radium-226 & 228	No Trend	No Trend	No	61	61	0.971	0.108	0.22	78	198	0.0163	0.22	8	8	2023-05-22 to 2024-05-10	0.981	0.182	0.618	38.2	5	0.142	0.618
CCR-AP-1R	Selenium, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	23	10	1.27	NA	NA	NA	NA	NA	NA	8	5	2021-05-13 to 2024-05-08	1.01	-0.327	0.319	68.1	-9	-0.0003	0.319
CCR-AP-2	Selenium, Total	Increasing	No Trend	No	23	16	1.14	0.364	0.018	98.2	90	0.00012	0.018	8	7	2021-05-12 to 2024-05-08	0.796	0.214	0.536	46.4	6	0.000105	0.536
CCR-AP-3	Selenium, Total	No Trend	No Trend	No	22	21	0.545	0.196	0.23	77	43	0.0000111	0.23	8	8	2020-11-13 to 2024-05-07	0.224	0.0772	0.898	10.2	2	0	0.898
CCR-AP-4R	Selenium, Total	Probably Increasing	Not Evaluated - Majority of data (>50%) non-detect.	No	22	11	1.8	0.321	0.0561	94.4	64	0.0000167	0.0561	8	3	2020-11-13 to 2024-05-08	0.212	NA	NA	NA	NA	NA	NA
CCR-AP-5	Selenium, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	22	8	1.28	NA	NA	NA	NA	NA	NA	8	6	2020-11-13 to 2024-05-13	1.2	0.327	0.319	68.1	9	0.000312	0.319
CCR-AP-6	Selenium, Total	No Trend	Stable	No	22	17	0.965	0.143	0.378	62.2	32	0.00002	0.378	8	6	2020-11-13 to 2024-05-07	0.373	-0.0364	1	0	-1	-0.00001	1
CCR-AP-7	Selenium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - No detected results.	No	22	3	0.252	NA	NA	NA	NA	NA	NA	8	0	2020-11-12 to 2024-05-10	0	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-8	Selenium, Total	No Trend	Stable	No	22	19	0.556	0.0849	0.609	39.1	19	0.00000714	0.609	8	8	2020-11-12 to 2024-05-10	0.538	-0.0364	1	0	-1	-0.0000125	1

Note:
Mann Kendall Trends are classified based on Aziz (2003) guidance.

		Mann Kendall Trends			Secular Trend Evaluation for All Data									Secular Trend Evaluation for Recent Data (subset of 8 most recent data points)							
					Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)		Mann-Kendall Test (R programming, package = Kendall, version = 2.2.1, function = MannKendall, non-detects substituted by 0.5*reporting limit)							Thiel-Sen Test (R programming, package = trend, version = 1.1.6, function = sens.slope, non-detects substituted by 0.5*reporting limit)	
Location	Constituent	Trends, All Data	Trends, Recent Data	Seasonal Mann Kendall Used	n	n, detected results	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value	n	n, detected results	recent data date range	Coefficient of Variance	Kendall's Tau	p-value	Confidence Factor	Kendall Score (S)	Sen Slope (mg/L per year)	p-value
CCR-AP-9	Selenium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	21	6	1.17	NA	NA	NA	NA	NA	NA	8	2	2020-05-19 to 2024-05-08	1.52	NA	NA	NA	NA	NA	NA
Pooled Background	Selenium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	66	19	1.31	NA	NA	NA	NA	NA	NA	8	3	2023-05-23 to 2024-05-10	0.398	NA	NA	NA	NA	NA	NA
CCR-AP-1R	Thallium, Total	Increasing	Stable	No	23	16	0.919	0.325	0.0357	96.4	80	0.000026	0.0357	8	5	2021-05-13 to 2024-05-08	0.85	-0.109	0.803	19.7	-3	-0.000011	0.803
CCR-AP-2	Thallium, Total	Increasing	No Trend	No	23	20	1.52	0.615	0.0000515	100	154	0.00005	0.0000515	8	8	2021-05-12 to 2024-05-08	1.35	0.109	0.803	19.7	3	0.0000675	0.803
CCR-AP-3	Thallium, Total	Not Evaluated - Only one detected result.	Not Evaluated - No detected results.	No	22	1	0.277	NA	NA	NA	NA	NA	NA	8	0	2020-11-13 to 2024-05-07	0.314	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-4R	Thallium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Majority of data (>50%) non-detect.	No	22	10	1.09	NA	NA	NA	NA	NA	NA	8	2	2020-11-13 to 2024-05-08	0.342	NA	NA	NA	NA	NA	NA
CCR-AP-5	Thallium, Total	Not Evaluated - Majority of data (>50%) non-detect.	No Trend	No	22	7	1.57	NA	NA	NA	NA	NA	NA	8	4	2020-11-13 to 2024-05-13	0.579	0.403	0.232	76.8	10	0.0000567	0.232
CCR-AP-6	Thallium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - No detected results.	No	22	8	1.06	NA	NA	NA	NA	NA	NA	8	0	2020-11-13 to 2024-05-07	0.314	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-7	Thallium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - No detected results.	No	24	4	0.389	NA	NA	NA	NA	NA	NA	8	0	2020-11-12 to 2024-05-10	0.314	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-8	Thallium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - No detected results.	No	22	5	0.469	NA	NA	NA	NA	NA	NA	8	0	2020-11-12 to 2024-05-10	0.314	NA	No detected results.	NA	NA	NA	No detected results.
CCR-AP-9	Thallium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - No detected results.	No	21	9	1.53	NA	NA	NA	NA	NA	NA	8	0	2020-05-19 to 2024-05-08	1.5	NA	No detected results.	NA	NA	NA	No detected results.
Pooled Background	Thallium, Total	Not Evaluated - Majority of data (>50%) non-detect.	Not Evaluated - Only one detected result.	No	68	29	1.15	NA	NA	NA	NA	NA	NA	8	1	2023-05-23 to 2024-05-10	0.356	NA	NA	NA	NA	NA	NA

Note:
Mann Kendall test run on seasonally adjusted data if seasonal trend identified. Seasonal trends identified based on Kruskall Wallis test and time series plots, where n seasons = 4 and (Dec-Feb, Mar-May, Jun-Aug, Sept-Nov).

Note:
Mann Kendall Trends are classified based on Aziz (2003) guidance.

Table A-5. Upper Tolerance Limits (UTLs) & Updated Groundwater Protection Standards (GWPS)

		Interwell Background Data Characterization [a]												Groundwater Protection Standard (GWPS) Determination				UTL Calculation Details		
Constituent	Units	n	n, non-detects	max reporting limit	max detected value	mean	median	min sample date	max sample date	standard deviation	coefficient of variation	Mann Kendall trend	normalizing data transformation (if any)	UTL	UTL Result Detection Status [b]	MCL/RSL	GWPS	GWPS Source	UTL calculation method	UTL calculation details	Minimum Coverage (%)
Antimony, Total	mg/L	68	33	0.02	0.0079	0.00317	0.002	2016-06-10	2024-05-10	0.00465	1.47	No Trend	NA - Original Data	0.02	No	0.006	0.02	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)	Maximum Value (ND = RL, Non-discriminatory of detection status)	95.7
Barium, Total	mg/L	68	0	NA	0.72	0.212	0.165	2016-06-10	2024-05-10	0.13	0.615	Probably Increasing	NA - Original Data	0.72	Yes	2	2	MCL/RSL	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)	Maximum Value (ND = RL, Non-discriminatory of detection status)	95.7
Beryllium, Total	mg/L	68	19	0.01	0.0066	0.0016	0.001	2016-06-10	2024-05-10	0.00188	1.17	Increasing	NA - Original Data	0.01	No	0.004	0.01	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)	Maximum Value (ND = RL, Non-discriminatory of detection status)	95.7
Cadmium, Total	mg/L	68	45	0.01	0.00087	0.00156	0.001	2016-06-10	2024-05-10	0.00243	1.56	No Trend	NA - Original Data	0.01	No	0.005	0.01	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)	Maximum Value (ND = RL, Non-discriminatory of detection status)	95.7
Chromium, Total	mg/L	68	12	0.01	0.16	0.0281	0.012	2016-06-10	2024-05-10	0.0385	1.37	Increasing	NA - Original Data	0.16	Yes	0.1	0.16	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)	Maximum Value (ND = RL, Non-discriminatory of detection status)	95.7
Cobalt, Total	mg/L	68	2	0.002	0.081	0.0158	0.0098	2016-06-10	2024-05-10	0.0197	1.24	No Trend	NA - Original Data	0.081	Yes	0.006	0.081	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)	Maximum Value (ND = RL, Non-discriminatory of detection status)	95.7
Fluoride	mg/L	67	0	NA	0.81	0.387	0.36	2016-06-10	2024-05-10	0.13	0.335	No Trend	NA - Original Data	0.646	NA	4	4	MCL/RSL	Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.1)	Background mean + K * Background Standard Deviation	NA
Lead, Total	mg/L	68	10	0.003	0.094	0.0163	0.0085	2016-06-10	2024-05-10	0.0215	1.32	No Trend	NA - Original Data	0.094	Yes	0.015	0.094	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)	Maximum Value (ND = RL, Non-discriminatory of detection status)	95.7
Lithium, Total	mg/L	68	0	NA	0.23	0.0502	0.0385	2016-06-10	2024-05-10	0.0464	0.924	No Trend	NA - Original Data	0.23	Yes	0.04	0.23	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)	Maximum Value (ND = RL, Non-discriminatory of detection status)	95.7
Mercury, Total	mg/L	63	63	0.002	NA	0.000243	0.0002	2016-06-10	2024-05-10	0.000234	0.963	All non-detect results.	NA - Original Data	0.002	No	0.002	0.002	BTV = MCL/RSL	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)	Maximum Value (ND = RL, Non-discriminatory of detection status)	95.4
Molybdenum, Total	mg/L	68	3	0.05	0.023	0.00675	0.0056	2016-06-10	2024-05-10	0.0067	0.993	Decreasing	NA - Original Data	0.05	No	0.1	0.1	MCL/RSL	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)	Maximum Value (ND = RL, Non-discriminatory of detection status)	95.7
Radium-226 & 228	pCi/L	61	0	NA	14.4	3.12	1.93	2016-06-10	2024-05-10	3.03	0.971	No Trend	NA - Original Data	14.4	Yes	5	14.4	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)	Maximum Value (ND = RL, Non-discriminatory of detection status)	95.2
Selenium, Total	mg/L	66	47	0.05	0.025	0.00815	0.005	2016-06-10	2024-05-10	0.0111	1.37	No Trend	NA - Original Data	0.05	No	0.05	0.05	BTV = MCL/RSL	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)	Maximum Value (ND = RL, Non-discriminatory of detection status)	95.6
Thallium, Total	mg/L	68	39	0.01	0.0027	0.00107	0.001	2016-06-10	2024-05-10	0.0014	1.31	Increasing	NA - Original Data	0.01	No	0.002	0.01	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)	Maximum Value (ND = RL, Non-discriminatory of detection status)	95.7

Note:

[a] Interwell background datasets are analyte specific and include data collected from background wells (CCR-AP-1R, CCR-AP-7, and CCR-AP-9). Interwell background datasets were re-tested for outliers, secular trends, and data normality. No outliers were removed.

[b] In some cases, the maximum value selected as the UTL is a non-detect result with an elevated reporting limit.

Units = mg/L, milligrams per liter. pCi/L = picocuries per liter.

Table A-5. Intrawell Arsenic Prediction Limit Calculations

			Baseline Data Characterization [a]												Prediction Limits		Parametric UPL Calculation Statistics			Non-Parametric UPL Calculation Statistics	
Location	Constituent	Units	Baseline Distribution [a]	Prediction Interval Calculation	min baseline sample date	compliance sample sample	n	n, non-detects	max	mean	standard deviation	Trend (Baseline Data)	degrees of freedom	future samples (M)	Prediction Limit Calculation Method	UPL	confidence level (%)	t (percentile of student's t-test)	t quantile	actual confidence level (%)	false positive rate (%)
CCR-AP-2	Arsenic, Total	mg/L	Normal (Baseline, 95% Confidence)	Parametric	2016-06-10	2023-07-28	21	0	0.048	0.0143	0.0119	Increasing	20	4	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)	0.0526	99	0.9975	3.153	NA	NA
CCR-AP-3	Arsenic, Total	mg/L	Normal (Baseline, 95% Confidence)	Parametric	2016-06-10	2023-05-23	20	0	0.095	0.0759	0.00848	Increasing	19	4	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)	0.103	99	0.9975	3.174	NA	NA
CCR-AP-4R	Arsenic, Total	mg/L	Normal (Baseline, ln Trans, 95% Confidence)	Parametric (ln Transformed Data)	2016-06-10	2023-05-23	20	0	0.33	0.112	0.081	Increasing	19	4	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)	0.707	99	0.9975	3.174	NA	NA
CCR-AP-5	Arsenic, Total	mg/L	Not normal (Baseline, ln Trans, 95% Confidence)	Non-Parametric	2016-06-10	2023-05-25	19	2	0.024	0.00355	0.00584	Increasing	18	4	Non-Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.3.1)	0.024	NA	NA	NA	82.6	17.4
CCR-AP-6	Arsenic, Total	mg/L	Normal (Baseline, 95% Confidence)	Parametric	2016-06-10	2023-05-23	20	0	0.12	0.0942	0.0221	Increasing	19	4	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)	0.166	99	0.9975	3.174	NA	NA
CCR-AP-8	Arsenic, Total	mg/L	Normal (Baseline, 95% Confidence)	Parametric	2017-03-09	2023-05-25	20	0	0.12	0.091	0.0216	Increasing	19	4	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)	0.161	99	0.9975	3.174	NA	NA

Note:

[a] Baseline data refer to the entire statistical dataset, except the most recent data point (May 2023). The most recent data points is considered a 'compliance' or 'recent' sample. Baseline datasets were re-tested for outliers, secular trends, and data normality. No outliers were removed. Prediction limits calculated using simple replacement with the reporting limit for non-detect results.

Table A-6. Confidence Intervals

			Confidence Interval (CI) Dataset						CI Calculation [a]			SSL Confirmation		Non-Parametric CI Statistics (if applicable)	
Location	Constituent	Units	n	max (Rank n)	min (Rank 1)	median	mean	standard deviation	CI calculation method	degrees of freedom	95% Confidence LCL	GWPS	LCL > GWPS?	bootstrap iterations	bootstrap median
CCR-AP-5	Molybdenum, Total	mg/L	22	0.53	0.046	0.315	0.287	0.12	Calculation of the Confidence Interval Around the Normal Mean (Parametric)	21	0.234	0.1	Yes	NA	NA

Note:

Confidence intervals are calculated for analyte/well pairs with GWPS exceedances in the sampling event dataset.

[a] The 95% lower confience level (LCL) is compared to the Groundwater Protection Standard (GWPS) to confirm a statistically significant level (SSL). The 99% confidence interval is also shown for purposes of comparison. UCL = upper confidence level.

Table A-7. Groundwater Protection Standard (GWPS) Summary

Background Location	Constituent	Units	Background Threshold Value (BTV)	BTV Type	MCL/RSL	GWPS	GWPS Source	BTV Calculation Method
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Antimony, Total	mg/L	0.02	Interwell UTL	0.006	0.02	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-2	Arsenic, Total	mg/L	0.0526	Intrawell UPL	0.01	0.0526	BTV	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)
CCR-AP-3	Arsenic, Total	mg/L	0.103	Intrawell UPL	0.01	0.103	BTV	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)
CCR-AP-4R	Arsenic, Total	mg/L	0.707	Intrawell UPL	0.01	0.707	BTV	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)
CCR-AP-5	Arsenic, Total	mg/L	0.024	Intrawell UPL	0.01	0.024	BTV	Non-Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.3.1)
CCR-AP-6	Arsenic, Total	mg/L	0.166	Intrawell UPL	0.01	0.166	BTV	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)
CCR-AP-8	Arsenic, Total	mg/L	0.161	Intrawell UPL	0.01	0.161	BTV	Parametric Prediction Limit for M Future Values (USEPA, 2009 - Chapter 18.2.1)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Barium, Total	mg/L	0.72	Interwell UTL	2	2	MCL/RSL	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Beryllium, Total	mg/L	0.01	Interwell UTL	0.004	0.01	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Cadmium, Total	mg/L	0.01	Interwell UTL	0.005	0.01	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Chromium, Total	mg/L	0.16	Interwell UTL	0.1	0.16	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Cobalt, Total	mg/L	0.081	Interwell UTL	0.006	0.081	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Fluoride	mg/L	0.646	Interwell UTL	4	4	MCL/RSL	Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.1)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Lead, Total	mg/L	0.094	Interwell UTL	0.015	0.094	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Lithium, Total	mg/L	0.23	Interwell UTL	0.04	0.23	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Mercury, Total	mg/L	0.002	Interwell UTL	0.002	0.002	BTV = MCL/RSL	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Molybdenum, Total	mg/L	0.05	Interwell UTL	0.1	0.1	MCL/RSL	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Radium-226 & 228	pCi/L	14.4	Interwell UTL	5	14.4	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Selenium, Total	mg/L	0.05	Interwell UTL	0.05	0.05	BTV = MCL/RSL	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)
CCR-AP-1R, CCR-AP-7, CCR-AP-9	Thallium, Total	mg/L	0.01	Interwell UTL	0.002	0.01	BTV	Non-Parametric Tolerance Limits (USEPA, 2009 - Chapter 17.2.2)

Background Threshold Values (BTVs) include Upper Threshold Limits (UTLs) calculated from pooled/interwell background data and Upper Prediction Limits (UPLs) for Arsenic calculated from intrawell data. Groundwater Protection Standard (GWPS) is the maximum value between the BTV and the Maximum Contaminant Level/Regional Screening Level (MCL/RSL).

Table A-8. Groundwater Protection Standard (GWPS) Comparison Table

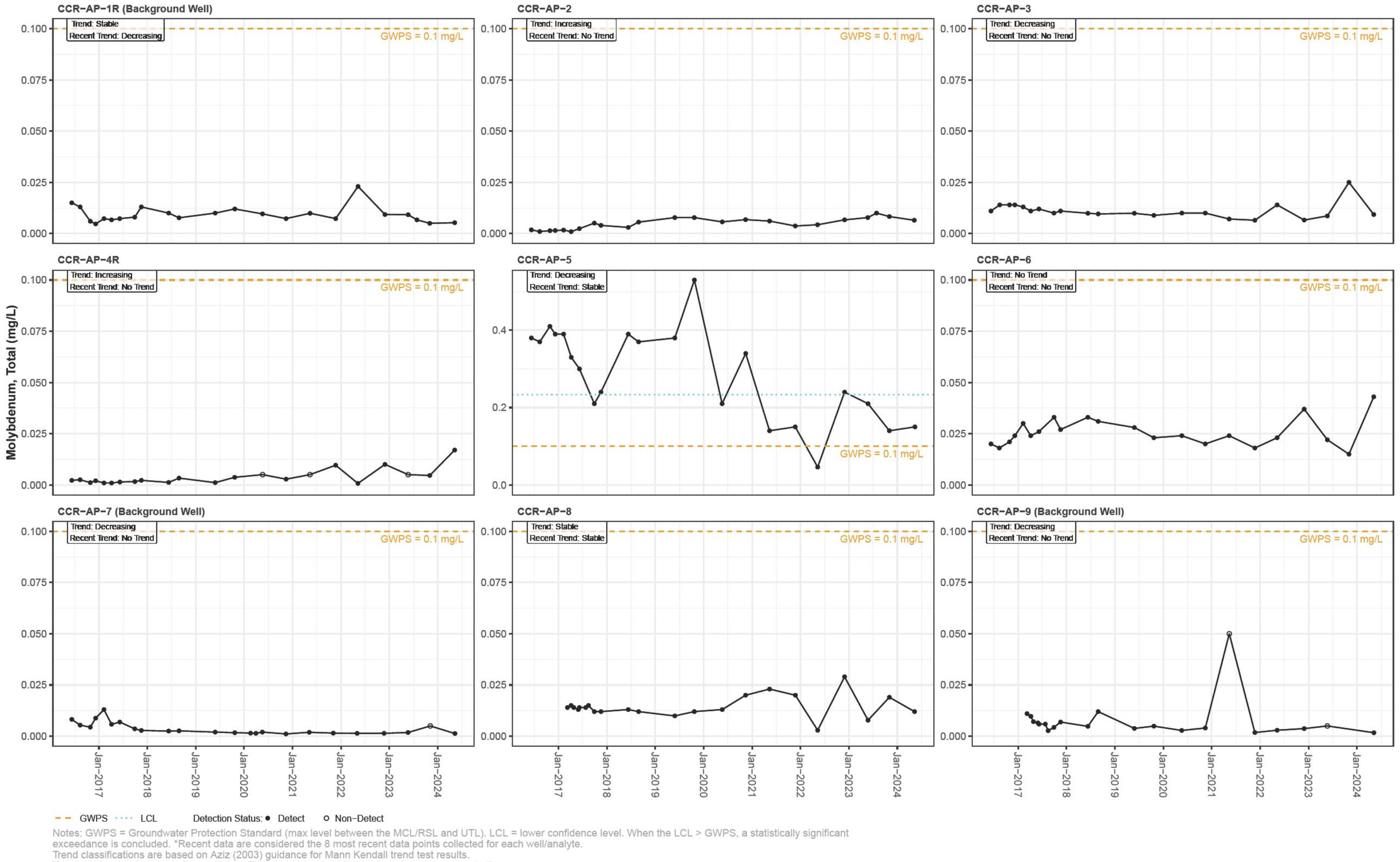
Location	Constituent	Units	Sample Date	Sample Result	Background Threshold Value (BTV)	BTV Type	GWPS	GWPS Exceedance	LCL	SSL Confirmed
CCR-AP-5	Molybdenum, Total	mg/L	2024-05-13	0.15	0.05	Interwell UTL	0.1	Yes	0.234	Yes
CCR-AP-2	Antimony, Total	mg/L	2024-05-08	0.0011 J	0.02	Interwell UTL	0.02	No	NA	No
CCR-AP-3	Antimony, Total	mg/L	2024-05-07	0.002 U	0.02	Interwell UTL	0.02	No	NA	No
CCR-AP-4R	Antimony, Total	mg/L	2024-05-08	0.002 U	0.02	Interwell UTL	0.02	No	NA	No
CCR-AP-5	Antimony, Total	mg/L	2024-05-13	0.002 U	0.02	Interwell UTL	0.02	No	NA	No
CCR-AP-6	Antimony, Total	mg/L	2024-05-07	0.00082 J	0.02	Interwell UTL	0.02	No	NA	No
CCR-AP-8	Antimony, Total	mg/L	2024-05-10	0.00064 J	0.02	Interwell UTL	0.02	No	NA	No
CCR-AP-2	Arsenic, Total	mg/L	2024-05-08	0.025	0.0526	Intrawell UPL	0.0526	No	NA	No
CCR-AP-3	Arsenic, Total	mg/L	2024-05-07	0.051	0.103	Intrawell UPL	0.103	No	NA	No
CCR-AP-4R	Arsenic, Total	mg/L	2024-05-08	0.027	0.707	Intrawell UPL	0.707	No	NA	No
CCR-AP-5	Arsenic, Total	mg/L	2024-05-13	0.00085 J	0.024	Intrawell UPL	0.024	No	NA	No
CCR-AP-6	Arsenic, Total	mg/L	2024-05-07	0.057	0.166	Intrawell UPL	0.166	No	NA	No
CCR-AP-8	Arsenic, Total	mg/L	2024-05-10	0.013	0.161	Intrawell UPL	0.161	No	NA	No
CCR-AP-2	Barium, Total	mg/L	2024-05-08	0.83	0.72	Interwell UTL	2	No	NA	No
CCR-AP-3	Barium, Total	mg/L	2024-05-07	0.38	0.72	Interwell UTL	2	No	NA	No
CCR-AP-4R	Barium, Total	mg/L	2024-05-08	0.53	0.72	Interwell UTL	2	No	NA	No
CCR-AP-5	Barium, Total	mg/L	2024-05-13	0.046	0.72	Interwell UTL	2	No	NA	No
CCR-AP-6	Barium, Total	mg/L	2024-05-07	0.43	0.72	Interwell UTL	2	No	NA	No
CCR-AP-8	Barium, Total	mg/L	2024-05-10	0.27	0.72	Interwell UTL	2	No	NA	No
CCR-AP-2	Beryllium, Total	mg/L	2024-05-08	0.0037	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-3	Beryllium, Total	mg/L	2024-05-07	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-4R	Beryllium, Total	mg/L	2024-05-08	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-5	Beryllium, Total	mg/L	2024-05-13	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-6	Beryllium, Total	mg/L	2024-05-07	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-8	Beryllium, Total	mg/L	2024-05-10	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-2	Cadmium, Total	mg/L	2024-05-08	0.003	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-3	Cadmium, Total	mg/L	2024-05-07	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-4R	Cadmium, Total	mg/L	2024-05-08	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-5	Cadmium, Total	mg/L	2024-05-13	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-6	Cadmium, Total	mg/L	2024-05-07	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-8	Cadmium, Total	mg/L	2024-05-10	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-2	Chromium, Total	mg/L	2024-05-08	0.11	0.16	Interwell UTL	0.16	No	NA	No
CCR-AP-3	Chromium, Total	mg/L	2024-05-07	0.0031 J	0.16	Interwell UTL	0.16	No	NA	No
CCR-AP-4R	Chromium, Total	mg/L	2024-05-08	0.005 U	0.16	Interwell UTL	0.16	No	NA	No
CCR-AP-5	Chromium, Total	mg/L	2024-05-13	0.002 J	0.16	Interwell UTL	0.16	No	NA	No
CCR-AP-6	Chromium, Total	mg/L	2024-05-07	0.0027 J	0.16	Interwell UTL	0.16	No	NA	No
CCR-AP-8	Chromium, Total	mg/L	2024-05-10	0.0039 J	0.16	Interwell UTL	0.16	No	NA	No
CCR-AP-2	Cobalt, Total	mg/L	2024-05-08	0.048	0.081	Interwell UTL	0.081	No	NA	No
CCR-AP-3	Cobalt, Total	mg/L	2024-05-07	0.0061	0.081	Interwell UTL	0.081	No	NA	No
CCR-AP-4R	Cobalt, Total	mg/L	2024-05-08	0.0028	0.081	Interwell UTL	0.081	No	NA	No
CCR-AP-5	Cobalt, Total	mg/L	2024-05-13	0.0025	0.081	Interwell UTL	0.081	No	NA	No
CCR-AP-6	Cobalt, Total	mg/L	2024-05-07	0.0034	0.081	Interwell UTL	0.081	No	NA	No
CCR-AP-8	Cobalt, Total	mg/L	2024-05-10	0.0044	0.081	Interwell UTL	0.081	No	NA	No
CCR-AP-2	Fluoride	mg/L	2024-05-08	0.27	0.646	Interwell UTL	4	No	NA	No
CCR-AP-3	Fluoride	mg/L	2024-05-07	0.35	0.646	Interwell UTL	4	No	NA	No
CCR-AP-4R	Fluoride	mg/L	2024-05-08	0.61	0.646	Interwell UTL	4	No	NA	No
CCR-AP-5	Fluoride	mg/L	2024-05-13	0.84	0.646	Interwell UTL	4	No	NA	No
CCR-AP-6	Fluoride	mg/L	2024-05-07	0.37	0.646	Interwell UTL	4	No	NA	No
CCR-AP-8	Fluoride	mg/L	2024-05-10	0.22	0.646	Interwell UTL	4	No	NA	No
CCR-AP-2	Lead, Total	mg/L	2024-05-08	0.056	0.094	Interwell UTL	0.094	No	NA	No
CCR-AP-3	Lead, Total	mg/L	2024-05-07	0.00097 J	0.094	Interwell UTL	0.094	No	NA	No
CCR-AP-4R	Lead, Total	mg/L	2024-05-08	0.001 U	0.094	Interwell UTL	0.094	No	NA	No
CCR-AP-5	Lead, Total	mg/L	2024-05-13	0.00068 J	0.094	Interwell UTL	0.094	No	NA	No
CCR-AP-6	Lead, Total	mg/L	2024-05-07	0.0012	0.094	Interwell UTL	0.094	No	NA	No
CCR-AP-8	Lead, Total	mg/L	2024-05-10	0.003	0.094	Interwell UTL	0.094	No	NA	No
CCR-AP-2	Lithium, Total	mg/L	2024-05-08	0.085	0 23	Interwell UTL	0.23	No	NA	No
CCR-AP-3	Lithium, Total	mg/L	2024-05-07	0.0028 J	0 23	Interwell UTL	0.23	No	NA	No
CCR-AP-4R	Lithium, Total	mg/L	2024-05-08	0.0045 J	0 23	Interwell UTL	0.23	No	NA	No
CCR-AP-5	Lithium, Total	mg/L	2024-05-13	0.056	0 23	Interwell UTL	0.23	No	NA	No
CCR-AP-6	Lithium, Total	mg/L	2024-05-07	0.0057 J	0 23	Interwell UTL	0.23	No	NA	No
CCR-AP-8	Lithium, Total	mg/L	2024-05-10	0.0039 J	0 23	Interwell UTL	0.23	No	NA	No

Background Threshold Values (BTVs) include Upper Threshold Limits (UTLs) calculated from pooled/interwell background data and Upper Prediction Limits (UPLs) for Arsenic calculated from intrawell data. Groundwater Protection Standard (GWPS) is the maximum value between the BTV and the Maximum Contaminant Level/Regional Screening Level (MCL/RSL). Lower Confidence Limit (LCL) calculated if the event sample result exceeds the GWPS. If the LCL is greater than the GWPS, a Statistically Significant Level (SSL) is confirmed.

Location	Constituent	Units	Sample Date	Sample Result	Background Threshold Value (BTV)	BTV Type	GWPS	GWPS Exceedance	LCL	SSL Confirmed
CCR-AP-2	Mercury, Total	mg/L	2024-05-08	0.00016 J	0.002	Interwell UTL	0.002	No	NA	No
CCR-AP-3	Mercury, Total	mg/L	2024-05-07	0.0002 U	0.002	Interwell UTL	0.002	No	NA	No
CCR-AP-4R	Mercury, Total	mg/L	2024-05-08	0.0002 U	0.002	Interwell UTL	0.002	No	NA	No
CCR-AP-5	Mercury, Total	mg/L	2024-05-13	0.0002 U	0.002	Interwell UTL	0.002	No	NA	No
CCR-AP-6	Mercury, Total	mg/L	2024-05-07	0.0002 U	0.002	Interwell UTL	0.002	No	NA	No
CCR-AP-8	Mercury, Total	mg/L	2024-05-10	0.0002 U	0.002	Interwell UTL	0.002	No	NA	No
CCR-AP-2	Molybdenum, Total	mg/L	2024-05-08	0.0065	0.05	Interwell UTL	0.1	No	NA	No
CCR-AP-3	Molybdenum, Total	mg/L	2024-05-07	0.0093	0.05	Interwell UTL	0.1	No	NA	No
CCR-AP-4R	Molybdenum, Total	mg/L	2024-05-08	0.017	0.05	Interwell UTL	0.1	No	NA	No
CCR-AP-6	Molybdenum, Total	mg/L	2024-05-07	0.043	0.05	Interwell UTL	0.1	No	NA	No
CCR-AP-8	Molybdenum, Total	mg/L	2024-05-10	0.012	0.05	Interwell UTL	0.1	No	NA	No
CCR-AP-2	Radium-226 & 228	pCi/L	2024-05-08	3.22 J+	14.4	Interwell UTL	14.4	No	NA	No
CCR-AP-3	Radium-226 & 228	pCi/L	2024-05-07	0.896 J	14.4	Interwell UTL	14.4	No	NA	No
CCR-AP-4R	Radium-226 & 228	pCi/L	2024-05-08	1.21 J	14.4	Interwell UTL	14.4	No	NA	No
CCR-AP-5	Radium-226 & 228	pCi/L	2024-05-13	0.877 J	14.4	Interwell UTL	14.4	No	NA	No
CCR-AP-6	Radium-226 & 228	pCi/L	2024-05-07	0.71 UJ	14.4	Interwell UTL	14.4	No	NA	No
CCR-AP-8	Radium-226 & 228	pCi/L	2024-05-10	1.08 J	14.4	Interwell UTL	14.4	No	NA	No
CCR-AP-2	Selenium, Total	mg/L	2024-05-08	0.0027 J	0.05	Interwell UTL	0.05	No	NA	No
CCR-AP-3	Selenium, Total	mg/L	2024-05-07	0.0016 J	0.05	Interwell UTL	0.05	No	NA	No
CCR-AP-4R	Selenium, Total	mg/L	2024-05-08	0.005 U	0.05	Interwell UTL	0.05	No	NA	No
CCR-AP-5	Selenium, Total	mg/L	2024-05-13	0.00095 J	0.05	Interwell UTL	0.05	No	NA	No
CCR-AP-6	Selenium, Total	mg/L	2024-05-07	0.005 U	0.05	Interwell UTL	0.05	No	NA	No
CCR-AP-8	Selenium, Total	mg/L	2024-05-10	0.0021 J	0.05	Interwell UTL	0.05	No	NA	No
CCR-AP-2	Thallium, Total	mg/L	2024-05-08	0.001	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-3	Thallium, Total	mg/L	2024-05-07	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-4R	Thallium, Total	mg/L	2024-05-08	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-5	Thallium, Total	mg/L	2024-05-13	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-6	Thallium, Total	mg/L	2024-05-07	0.001 U	0.01	Interwell UTL	0.01	No	NA	No
CCR-AP-8	Thallium, Total	mg/L	2024-05-10	0.001 U	0.01	Interwell UTL	0.01	No	NA	No

Background Threshold Values (BTVs) include Upper Threshold Limits (UTLs) calculated from pooled/interwell background data and Upper Prediction Limits (UPLs) for Arsenic calculated from intrawell data. Groundwater Protection Standard (GWPS) is the maximum value between the BTV and the Maximum Contaminant Level/Regional Screening Level (MCL/RSL). Lower Confidence Limit (LCL) calculated if the event sample result exceeds the GWPS. If the LCL is greater than the GWPS, a Statistically Significant Level (SSL) is confirmed.

Assessment Monitoring Trend Analysis for Molybdenum, Total



Notes: GWPS = Groundwater Protection Standard (max level between the MCL/RSL and UTL). LCL = lower confidence level. When the LCL > GWPS, a statistically significant exceedance is concluded. *Recent data are considered the 8 most recent data points collected for each well/analyte.
Trend classifications are based on Aziz (2003) guidance for Mann Kendall trend test results.
Trends not evaluated at locations with insufficient sample size of laboratory detection concentrations.

APPENDIX B
Field Forms

HALEY & ALDRICH

GROUNDWATER SAMPLING RECORD

Page 1 of 1

PROJECT	Vectren Culley	H&A FILE NO.	
LOCATION	Newburgh IN	PROJECT MGR.	
CLIENT	Vectren	FIELD REP	Hayley Tarin
CONTRACTOR	ATLAS	DATE	12-22-23

GROUNDWATER SAMPLING INFORMATION

Well No.		CCR-AP-1R					
Water Depth (ft)		53.83					
Time							
Product							
Depth Of Well (ft)							
Inside Diameter (in)		2					
Standing Water Depth (ft) [1]							
Volume Of Water In Well (gal)							
Purging Device		sleeve					
Volume of Bailer/Pump Capacity							
Cleaning Procedure							
Bails Removed/ Volume Removed							
Time Purging Started							
Time Purging Stopped							
Sampling Device							
Cleaning Procedure							
TIME SAMPLES TAKEN	VOA						
	ABN						
	Metals						
		Sample	12:25				
PARAMETERS	Time	12:25					
	DTW	53.83					
	pH	6.76					
	Conductivity	1.59 mS/cm					
	Turbidity	208					
	Dissolved Oxygen	11.72					
	Temp, ^{0}C	12.89					
	ORP	-45					

Remarks: (ie: field filtrations, persons communicated with at site, etc.)

1. Standing Water Depth = Depth of Well - Water Depth

Form 3005

CENTERPOINT ENERGY - FB CULLEY STATION
EAST ASH POND
CCR Groundwater Sampling Event
Gauging Date: May 6, 2024
Atlas Project No. 170LF01647

WELL ID	DATE	TIME	DTW FROM TOC
East Ash Pond Wells			
CCR-AP-2	5/6/2024	10:35	30.73
CCR-AP-3R	5/6/2024	13:30	37.12
CCR-AP-4R	5/6/2024	10:40	17.49
CCR-AP-5	5/6/2024	10:25	13.95
CCR-AP-5I	5/6/2024	10:26	12.29
CCR-AP-6	5/6/2024	13:40	38.75
CCR-AP-6I	5/6/2024	13:40	39.25
CCR-AP-8	5/6/2024	14:00	37.11
CCR-AP-8I	5/6/2024	14:00	28.82
CCR-AP-11	5/6/2024	10:30	14.95
Background Wells			
CCR-AP-1R	5/6/2024	10:10	44.46
CCR-AP-7	5/6/2024	10:00	4.65
CCR-AP-9	5/6/2024	10:15	59.91

NOTES
DTW= Depth to Water
TOC= Top of Casing

Low-Flow Test Report:

Test Date / Time: 5/7/2024 1:24:14 PM
Project: Culley East
Operator Name: Hayley Torres

Location Name: CCR-AP-6I **Well Diameter: 2 in** **Casing Type: Pvc** **Screen Length: 10 ft** **Top of Screen: 64.7 ft** **Total Depth: 74.7 ft** **Initial Depth to Water: 39.02 ft**	**Pump Type: Mp-50** **Pump Intake From TOC: 69.7 m** **Estimated Total Volume Pumped: 10260 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 380 ml/min** **Final Draw Down: 0 ft**	**Instrument Used: Aqua TROLL 600** **Serial Number: 651925**

Test Notes:

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth to Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 5	
5/7/2024 1:24 PM	00:00	7.48 pH	18.54 °C	3,396.7 µS/cm	6.75 mg/L	1.86 NTU	241.1 mV	39.02 ft	380.00 ml/min
5/7/2024 1:27 PM	03:00	7.32 pH	18.19 °C	1,691.0 µS/cm	0.47 mg/L	6.64 NTU	-39.5 mV	39.02 ft	380.00 ml/min
5/7/2024 1:30 PM	06:00	7.30 pH	18.13 °C	1,587.9 µS/cm	0.27 mg/L	6.12 NTU	-54.7 mV	39.02 ft	380.00 ml/min
5/7/2024 1:33 PM	09:00	7.31 pH	18.16 °C	1,559.1 µS/cm	0.21 mg/L	8.17 NTU	-63.0 mV	39.02 ft	380.00 ml/min
5/7/2024 1:36 PM	12:00	7.33 pH	18.18 °C	1,563.2 µS/cm	0.18 mg/L	5.30 NTU	-69.0 mV	39.02 ft	380.00 ml/min
5/7/2024 1:39 PM	15:00	7.34 pH	18.17 °C	1,570.0 µS/cm	0.17 mg/L	4.14 NTU	-73.7 mV	39.02 ft	380.00 ml/min
5/7/2024 1:42 PM	18:00	7.35 pH	18.14 °C	1,581.9 µS/cm	0.16 mg/L	1.52 NTU	-76.8 mV	39.02 ft	380.00 ml/min
5/7/2024 1:45 PM	21:00	7.36 pH	18.15 °C	1,621.2 µS/cm	0.15 mg/L	1.55 NTU	-78.1 mV	39.02 ft	380.00 ml/min
5/7/2024 1:48 PM	24:00	7.36 pH	18.23 °C	1,631.3 µS/cm	0.15 mg/L	1.44 NTU	-78.2 mV	39.02 ft	380.00 ml/min
5/7/2024 1:51 PM	27:00	7.37 pH	18.20 °C	1,637.3 µS/cm	0.15 mg/L	1.18 NTU	-78.3 mV	39.02 ft	380.00 ml/min

Samples

Sample ID:	Description:

Low-Flow Test Report:

Test Date / Time: 5/10/2024 11:20:07 AM
Project: Culley East (2)
Operator Name: Hayley Torres

Location Name: CCR-AP-7 **Well Diameter: 2 in** **Casing Type: Pvc** **Screen Length: 10 ft** **Top of Screen: 20 ft** **Total Depth: 30 ft** **Initial Depth to Water: 4.30 ft**	**Pump Type: Mp-50** **Pump Intake From TOC: 25 ft** **Estimated Total Volume Pumped: 1221.25 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 25 ml/min** **Final Draw Down: 1.05 ft**	**Instrument Used: Aqua TROLL 600** **Serial Number: 651925**

Test Notes:

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth to Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 5	
5/10/2024 11:20 AM	00:00	7.00 pH	19.18 °C	1,056.6 µS/cm	4.74 mg/L	66.84 NTU	157.9 mV	4.30 ft	25.00 ml/min
5/10/2024 11:23 AM	03:00	6.99 pH	18.83 °C	1,063.3 µS/cm	3.87 mg/L	44.60 NTU	153.3 mV		25.00 ml/min
5/10/2024 11:26 AM	06:00	6.98 pH	18.81 °C	1,076.7 µS/cm	3.46 mg/L	43.47 NTU	149.2 mV		25.00 ml/min
5/10/2024 11:26 AM	06:51	6.97 pH	18.88 °C	1,078.4 µS/cm	3.36 mg/L	35.10 NTU	148.3 mV		25.00 ml/min
5/10/2024 11:29 AM	09:51	6.97 pH	18.48 °C	1,077.8 µS/cm	3.15 mg/L	52.53 NTU	144.6 mV	4.53 ft	25.00 ml/min
5/10/2024 11:32 AM	12:51	6.97 pH	18.25 °C	1,073.9 µS/cm	3.01 mg/L	65.32 NTU	141.0 mV		25.00 ml/min
5/10/2024 11:35 AM	15:51	6.96 pH	18.69 °C	1,087.4 µS/cm	2.91 mg/L	84.98 NTU	136.2 mV		25.00 ml/min
5/10/2024 11:38 AM	18:51	6.96 pH	19.14 °C	1,092.0 µS/cm	2.81 mg/L	110.98 NTU	132.2 mV		25.00 ml/min
5/10/2024 11:41 AM	21:51	6.96 pH	18.86 °C	1,072.3 µS/cm	3.01 mg/L	27.95 NTU	127.0 mV		25.00 ml/min
5/10/2024 11:44 AM	24:51	6.96 pH	18.75 °C	1,070.2 µS/cm	2.81 mg/L	22.61 NTU	122.0 mV		25.00 ml/min
5/10/2024 11:47 AM	27:51	6.95 pH	19.24 °C	1,067.7 µS/cm	2.69 mg/L	30.75 NTU	118.3 mV	4.81 ft	25.00 ml/min
5/10/2024 11:50 AM	30:51	6.94 pH	18.61 °C	1,084.2 µS/cm	2.71 mg/L	52.52 NTU	113.7 mV		25.00 ml/min
5/10/2024 11:53 AM	33:51	6.95 pH	17.87 °C	1,075.5 µS/cm	3.34 mg/L	19.81 NTU	111.5 mV		25.00 ml/min
5/10/2024 11:56 AM	36:51	6.95 pH	18.03 °C	1,079.4 µS/cm	2.89 mg/L	23.27 NTU	99.1 mV		25.00 ml/min
5/10/2024 11:59 AM	39:51	6.95 pH	17.69 °C	1,071.0 µS/cm	2.81 mg/L	22.64 NTU	78.2 mV		25.00 ml/min
5/10/2024 12:02 PM	42:51	6.96 pH	18.24 °C	1,081.4 µS/cm	2.79 mg/L	26.44 NTU	62.7 mV		25.00 ml/min

5/10/2024 12:05 PM	45:51	6.96 pH	18.17 °C	1,071.6 µS/cm	2.72 mg/L	28.84 NTU	60.0 mV		25.00 ml/min
5/10/2024 12:08 PM	48:51	6.96 pH	18.49 °C	1,075.0 µS/cm	2.72 mg/L	39.15 NTU	58.3 mV	5.35 ft	25.00 ml/min

Samples

Sample ID:	Description:

Created using VuSitu from In-Situ, Inc.

Low-Flow Test Report:

Test Date / Time: 5/8/2024 11:39:13 AM
Project: Culley - East AP-8I 5-8-24
Operator Name: Mykah Bertram

Location Name: CCR-AP-8I **Latitude: 37.90845038** **Longitude: -87.322731** **Well Diameter: 2 in** **Casing Type: Pvc** **Screen Length: 10 ft** **Top of Screen: 58.7 ft** **Total Depth: 68.7 ft** **Initial Depth to Water: 37.09 ft**	**Pump Type: Bladder** **Pump Intake From TOC: 63.7 ft** **Estimated Total Volume Pumped: 10200 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 200 ml/min** **Final Draw Down: 0.01 ft**	**Instrument Used: Aqua TROLL 600** **Serial Number: 651965**

Test Notes:

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth to Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 5	
5/8/2024 11:39 AM	00:00	5.63 pH	19.40 °C	2,740.3 µS/cm	6.51 mg/L	74.55 NTU	-144.0 mV	37.09 ft	200.00 ml/min
5/8/2024 11:42 AM	03:00	5.65 pH	19.26 °C	2,766.1 µS/cm	6.82 mg/L	76.23 NTU	-143.6 mV	37.10 ft	200.00 ml/min
5/8/2024 11:45 AM	06:00	5.66 pH	19.51 °C	2,796.3 µS/cm	6.77 mg/L	76.90 NTU	-143.6 mV	37.11 ft	200.00 ml/min
5/8/2024 11:48 AM	09:00	5.66 pH	19.32 °C	2,820.1 µS/cm	6.84 mg/L	79.30 NTU	-142.9 mV	37.10 ft	200.00 ml/min
5/8/2024 11:51 AM	12:00	5.65 pH	19.59 °C	2,844.0 µS/cm	6.55 mg/L	76.47 NTU	-142.5 mV	37.09 ft	200.00 ml/min
5/8/2024 11:54 AM	15:00	5.65 pH	19.36 °C	2,884.2 µS/cm	6.71 mg/L	76.87 NTU	-141.9 mV	37.08 ft	200.00 ml/min
5/8/2024 11:57 AM	18:00	5.65 pH	19.66 °C	2,897.0 µS/cm	6.77 mg/L	80.21 NTU	-141.4 mV	37.08 ft	200.00 ml/min
5/8/2024 12:00 PM	21:00	5.66 pH	19.43 °C	2,917.8 µS/cm	6.68 mg/L	75.99 NTU	-141.3 mV	37.08 ft	200.00 ml/min
5/8/2024 12:03 PM	24:00	5.65 pH	19.56 °C	2,936.2 µS/cm	6.45 mg/L	81.82 NTU	-140.8 mV	37.09 ft	200.00 ml/min
5/8/2024 12:06 PM	27:00	5.66 pH	19.34 °C	2,946.7 µS/cm	6.75 mg/L	84.13 NTU	-140.4 mV	37.09 ft	200.00 ml/min
5/8/2024 12:09 PM	30:00	5.65 pH	19.54 °C	2,962.3 µS/cm	6.59 mg/L	93.12 NTU	-139.7 mV	37.09 ft	200.00 ml/min
5/8/2024 12:12 PM	33:00	5.67 pH	19.49 °C	2,971.8 µS/cm	6.63 mg/L	91.81 NTU	-139.1 mV	37.10 ft	200.00 ml/min
5/8/2024 12:15 PM	36:00	5.66 pH	19.50 °C	2,982.5 µS/cm	6.52 mg/L	86.54 NTU	-138.8 mV	37.10 ft	200.00 ml/min
5/8/2024 12:18 PM	39:00	5.67 pH	19.55 °C	2,988.7 µS/cm	6.47 mg/L	94.23 NTU	-138.7 mV	37.11 ft	200.00 ml/min
5/8/2024 12:21 PM	42:00	5.67 pH	19.48 °C	2,997.1 µS/cm	6.61 mg/L	87.89 NTU	-138.0 mV	37.11 ft	200.00 ml/min

5/8/2024 12:24 PM	45:00	5.67 pH	19.57 °C	3,004.9 µS/cm	6.40 mg/L	82.25 NTU	-137.4 mV	37.13 ft	200.00 ml/min
5/8/2024 12:27 PM	48:00	5.67 pH	19.46 °C	3,007.6 µS/cm	6.53 mg/L	82.50 NTU	-137.2 mV	37.13 ft	200.00 ml/min
5/8/2024 12:30 PM	51:00	5.68 pH	19.72 °C	3,012.5 µS/cm	6.70 mg/L	91.67 NTU	-140.1 mV	37.10 ft	200.00 ml/min

Samples

Sample ID:	Description:

Created using VuSitu from In-Situ, Inc.

Low-Flow Test Report:

Test Date / Time: 5/10/2024 2:27:37 PM
Project: Culley East (3)
Operator Name: Hayley Torres

Location Name: CCR-AP-11 **Well Diameter: 2 in** **Casing Type: Pvc** **Screen Length: 10 ft** **Top of Screen: 44.4 ft** **Total Depth: 54.4 ft** **Initial Depth to Water: 15.22 ft**	**Pump Type: Mp-50** **Pump Intake From TOC: 49.4 ft** **Estimated Total Volume Pumped: 1050 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 25 ml/min** **Final Draw Down: 0.36 ft**	**Instrument Used: Aqua TROLL 600** **Serial Number: 651925**

Test Notes:

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth to Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 5	
5/10/2024 2:27 PM	00:00	6.34 pH	19.24 °C	1,360.1 µS/cm	1.37 mg/L	336.45 NTU	-29.6 mV	15.22 ft	25.00 ml/min
5/10/2024 2:30 PM	03:00	6.33 pH	19.29 °C	1,359.2 µS/cm	1.04 mg/L	290.56 NTU	-27.8 mV		25.00 ml/min
5/10/2024 2:33 PM	06:00	6.33 pH	19.30 °C	1,348.3 µS/cm	0.92 mg/L	265.67 NTU	-27.3 mV		25.00 ml/min
5/10/2024 2:36 PM	09:00	6.32 pH	19.33 °C	1,360.6 µS/cm	0.89 mg/L	215.56 NTU	-26.9 mV		25.00 ml/min
5/10/2024 2:39 PM	12:00	6.31 pH	20.59 °C	1,338.6 µS/cm	0.83 mg/L	213.22 NTU	-28.8 mV	15.58 ft	25.00 ml/min
5/10/2024 2:42 PM	15:00	6.30 pH	21.82 °C	1,345.6 µS/cm	0.73 mg/L	199.96 NTU	-29.5 mV		25.00 ml/min
5/10/2024 2:45 PM	18:00	6.29 pH	22.24 °C	1,354.6 µS/cm	0.64 mg/L	161.26 NTU	-29.2 mV		25.00 ml/min
5/10/2024 2:48 PM	21:00	6.29 pH	21.67 °C	1,339.1 µS/cm	0.59 mg/L	117.67 NTU	-27.9 mV		25.00 ml/min
5/10/2024 2:51 PM	24:00	6.28 pH	22.22 °C	1,352.2 µS/cm	0.55 mg/L	101.81 NTU	-28.0 mV		25.00 ml/min
5/10/2024 2:54 PM	27:00	6.28 pH	22.25 °C	1,358.1 µS/cm	0.50 mg/L	96.22 NTU	-28.1 mV		25.00 ml/min
5/10/2024 2:57 PM	30:00	6.27 pH	22.39 °C	1,353.3 µS/cm	0.46 mg/L	89.89 NTU	-27.8 mV		25.00 ml/min
5/10/2024 3:00 PM	33:00	6.27 pH	22.57 °C	1,347.1 µS/cm	0.43 mg/L	91.46 NTU	-27.8 mV		25.00 ml/min
5/10/2024 3:03 PM	36:00	6.27 pH	22.95 °C	1,367.1 µS/cm	0.41 mg/L	72.80 NTU	-27.9 mV		25.00 ml/min
5/10/2024 3:06 PM	39:00	6.26 pH	21.58 °C	1,361.7 µS/cm	0.39 mg/L	75.78 NTU	-26.0 mV		25.00 ml/min
5/10/2024 3:09 PM	42:00	6.26 pH	21.43 °C	1,336.8 µS/cm	0.36 mg/L	88.40 NTU	-24.8 mV		25.00 ml/min

Samples

Sample ID:	Description:

HALEY ALDRICH

LOW FLOW SAMPLING FORM

Page 1 of 1

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Haylay T
CONTRACTOR	Atlas	SAMPLING DATE	5-8-24

Sampling Data:

Well ID:	CCR-AP-1R	Well Depth as Built:	65.0 ft	Well Diameter:	2.0 in	Sampling Device:	Hydrasleeve
		Well Depth Measured:	ft	Initial Depth To Water:	44.46 ft	Field Parameter Device:	
Start time:		Depth To Top Of Screen:	55.0 ft	Depth Of Pump Intake:	ft	Tubing Present In Well:	☐ Yes ☒ No
Finish Time:	11:20	Depth To Bottom Of Scree	65.0 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temperature (°F) or (°C)	pH	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
0	44.46				19.29	7.50	647.58	5.36	351	103.0	

Sample ID: CCR-AP-1R Date: 5-8-24 Time: 11:20 QAQC Samples:

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

LOW FLOW SAMPLING FORM

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Hayley T
CONTRACTOR	Atlas	SAMPLING DATE	5-8-24

Sampling Data:		Well Depth as Built:	46.0 ft	Well Diameter:	2.0 in	Sampling Device:	Hydrasleeve
Well ID:	CCR-AP-2	Well Depth Measured:	ft	Initial Depth To Water:	30.73 ft	Field Parameter Device:	
Start time:		Depth To Top Of Screen:	36.0 ft	Depth Of Pump Intake:	ft	Tubing Present In Well:	☐ Yes ☒ No
Finish Time:	10:20	Depth To Bottom Of Scree	46.0 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH mV pH	Conduct-ivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
0	30.73				18.11	8.98	2201	4.54	9503	71.6	actual pH cut off
Sample ID:	CCR-AP-2			Date:	5-8-24	Time:	10:20	QAQC Samples:			

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

LOW FLOW SAMPLING FORM

HALEY ALDRICH

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PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Hayley T
CONTRACTOR	Atlas	SAMPLING DATE	5-7-24

Sampling Data:

Well ID: CCR-AP-3	Well Depth as Built: 45.0 ft	Well Diameter: 2.0 in	Sampling Device: Hydrasleeve
	Well Depth Measured: ft	Initial Depth To Water: 37.12 ft	Field Parameter Device:
Start time:	Depth To Top Of Screen: 35.0 ft	Depth Of Pump Intake: ft	Tubing Present In Well: ☐ Yes ☒ No
Finish Time: 1400	Depth To Bottom Of Scree 45.0 ft	Measuring Point: Top of Casing (TOC)	Tubing Type: Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
0	37.12				20.93	6.84	~~[illegible]~~ 1582	5.07	138	-125.2	

Sample ID:	CCR-AP-3	Date:	5-7-24	Time:	1400	QAQC Samples:	

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

HALEY ALDRICH

LOW FLOW SAMPLING FORM

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Haylan Tolles
CONTRACTOR	Atlas	SAMPLING DATE	5-8-24

Sampling Data:

Well ID: CCR-AP-4	Well Depth as Built: 35.5 ft	Well Diameter: 2.0 in	Sampling Device: Hydrasleeve
Start time:	Well Depth Measured: ft	Initial Depth To Water: 17.49 ft	Field Parameter Device:
Finish Time: 9:45	Depth To Top Of Screen: 25.5 ft	Depth Of Pump Intake: ft	Tubing Present In Well: ☐ Yes ☒ No
	Depth To Bottom Of Scree 35.5 ft	Measuring Point: Top of Casing (TOC)	Tubing Type: Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temperature (°F) or (°C)	pH	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
0	17.49				18.22	6.83	1261	4.85	30	-120.2	Only 1 1-L collected

Sample ID: CCR-AP-4 Date: 5-8-24 Time: 9:45 QAQC Samples:

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

LOW FLOW SAMPLING FORM

HALEY ALDRICH

Page 1 of 1

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Hayley T
CONTRACTOR	Atlas	SAMPLING DATE	5-14-24

Sampling Data:

Well ID:	CCR-AP-5	Well Depth as Built:	44.0 ft	Well Diameter:	2.0 in	Sampling Device:	Bladder Pump
Start time:	14:24	Well Depth Measured:	ft	Initial Depth To Water:	11.99 ft	Field Parameter Device:	
Finish Time:		Depth To Top Of Screen:	34.0 ft	Depth Of Pump Intake:	39 ft	Tubing Present In Well:	☐ Yes ☒ No
		Depth To Bottom Of Scree	44.0 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
0	11.99		160		18.31	7.11	2281	4.5	72	300.5	5-13 Purged 1 WV = 3.42 gal purged 12:15 - 13:15 5gal/3min 100gal purged then sampled Dup 1 Taken
3											
6											
9											
12											
15											
18											

Sample ID:	CCR-AP-5	Date:	5-13-24	Time:	13:17	QAQC Samples:	DUP-1

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

LOW FLOW SAMPLING FORM

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Hayley Tolley
CONTRACTOR	Atlas	SAMPLING DATE	5-11-2024

Sampling Data:		Well Depth as Built:	85.3 ft	Well Diameter:	2.0 in	Sampling Device:	Bladder Pump
Well ID:	CCR-AP-5I	Well Depth Measured:	ft	Initial Depth To Water:	13.78 ft	Field Parameter Device:	
Start time:	12:00	Depth To Top Of Screen:	75.3 ft	Depth Of Pump Intake:	80.5 ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:	13:36	Depth To Bottom Of Scree	85.3 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
0	13.78		60	5760mL	20.26	6.74	2671	0.77	265	306.2	5/11 ~~Dup 1 Taken~~ Sampling ruined by nearby construction equipment shaking ground
3					20.88	6.72	~~2683~~	0.59	1728	45.2	
6					21.45	6.72	2691	0.57	1077	21.0	
9	13.71				19.66	6.76	2688	1.90	669	48.0	
12					19.29	6.73	2698	1.55	325	62.7	Purging 5-13
15					19.17	6.73	2700	1.53	170	69.5	1 wv = 11.65
18	13.84				19.49	6.72	2710	1.48	133	66.4	13:20 - 14:00
21					19.55	6.72	2711	1.38	124	55.7	5gal/3min
24					19.57	6.72	2714	1.33	115	47.5	purged 67 gal then sampled
27					19.59	6.72	2716	1.25	101	40.5	
30					19.61	6.71	2721	1.21	91	33.8	final data on page 3
33	13.85				19.61	6.71	2721	1.13	98	23.6	
36					19.54	6.71	2727	1.08	93	15.0	
39					19.56	6.71	2738	1.03	86	10.0	
42					19.47	6.71	2743	0.96	105	5.8	
45	13.89				19.48	6.71	2743	0.90	92	3.3	
48					19.51	6.71	2757	0.86	77	0.3	
51					19.45	6.71	2741	0.81	88	-2.5	
Sample ID:	CCR-AP-5I		Date:	5-11-24	Time:	14:30	QAQC Samples:				

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

Field Parameters

Well Number CCRAP-5I

	1	2	3	4	5	6	7
Time	54	57	60	63	66	69	72
PH (su)	6.71	6.71	6.71	6.71	6.71	6.71	6.71
Temp (C)	19.46	19.45	19.48	19.41	19.43	19.42	19.40
Conductivity	2731	2738	2720	2721	2711	2702	2679
D.O. (mg/L)	0.78	0.75	0.68	0.64	0.62	0.58	0.55
Turbidity (NTU)	90	80	88	95	95	92	88
ORP (mV)	-6.2	-9.7	-12.3	-16.0	-18.8	-22.0	-27.4
Water Lvl (DTW)	13.89			13.89			

Well Number

	1	2	3	4	5	6	7
Time	75	78	81	84	87	90	93
PH (su)	6.71	6.71	6.72	6.72	6.72	6.72	6.72
Temp (C)	19.45	19.33	19.33	19.50	19.39	19.39	19.37
Conductivity	2696	2693	2691	2722	2720	2726	2735
D.O. (mg/L)	0.51	0.51	0.48	0.57	0.49	0.42	0.40
Turbidity (NTU)	82	93	101	232	94	110	119
ORP (mV)	-27.9	-30.4	-32.4	-34.4	-35.8	-37.2	-38.3
Water Lvl (DTW)	13.89			13.89			13.89

Well Number

	1	2	3	4	5	6	7
Time	96						
PH (su)	6.72						
Temp (C)	19.36						
Conductivity	2741						
D.O. (mg/L)	0.39						
Turbidity (NTU)	95						
ORP (mV)	-38.6						
Water Lvl (DTW)							

Well Number

	1	2	3	4	5	6	7
Time							
PH (su)							
Temp (C)							
Conductivity							
D.O. (mg/L)							
Turbidity (NTU)							
ORP (mV)							
Water Lvl (DTW)							

LOW FLOW SAMPLING FORM

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Hayley T
CONTRACTOR	Atlas	SAMPLING DATE	5-13-24

Sampling Data:		Well Depth as Built:	85.3 ft	Well Diameter:	2.0 in	Sampling Device:	Bladder Pump
Well ID:	CCR-AP-5I	Well Depth Measured:	ft	Initial Depth To Water:	13.78 ft	Field Parameter Device:	
Start time:		Depth To Top Of Screen:	75.3 ft	Depth Of Pump Intake:	ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:	14:02	Depth To Bottom Of Scree	85.3 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
0					18.21	6.72	2641	2.83	120	51.8	Final data purged for 40mins @ 5gal/3min 67 gal total
Sample ID:	CCR-AP-5I			Date:	5-13	Time:	~~14:02~~ 14:02	QAQC Samples:			

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

LOW FLOW SAMPLING FORM

HALEY ALDRICH

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Hayley T
CONTRACTOR	Atlas	SAMPLING DATE	5-7-24

Sampling Data:		Well Depth as Built:	45.5 ft	Well Diameter:	2.0 in	Sampling Device:	Hydrasleeve
Well ID:	CCR-AP-6	Well Depth Measured:	ft	Initial Depth To Water:	38.75 ft	Field Parameter Device:	
Start time:		Depth To Top Of Screen:	35.5 ft	Depth Of Pump Intake:	ft	Tubing Present In Well:	☐ Yes ☒ No
Finish Time:	13:30	Depth To Bottom Of Scree	45.5 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity µS/cm	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
0	38.75				14.79	7.19	1105	3.65	93	-146.7	
Sample ID:	CCR-AP-6		Date:	5-7-24	Time:	13:30	QAQC Samples:				

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

LOW FLOW SAMPLING FORM

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Mayling T
CONTRACTOR	Atlas	SAMPLING DATE	5-7-24

Sampling Data:		Well Depth as Built:	74.7 ft	Well Diameter:	2.0 in	Sampling Device:	Bladder Pump
Well ID:	CCR-AP-6I	Well Depth Measured:	ft	Initial Depth To Water:	39.02 ft	Field Parameter Device:	
Start time:	12:24	Depth To Top Of Screen:	64.7 ft	Depth Of Pump Intake:	69.7 ft	Tubing Present In Well:	☒ Yes ☐ No
Finish Time:	12:51	Depth To Bottom Of Scree	74.7 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity µS (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
12:24	39.02	[illegible]	380		18.54	7.48	3396	6.75	1.86	241.1	
12:27	39.02				18.49	7.32	1694	0.47	6.64	-39.5	
12:30	39.02				18.13	7.30	1587	0.27	6.1	-54.7	
12:33	39.02				18.16	7.31	1559	0.21	8.1	-63.0	
12:36	39.02				18.18	7.33	1563	0.18	5.3	-69.0	
12:39	39.02				18.17	7.34	1570	0.17	4.1	-73.7	
12:42	39.02				18.14	7.35	1581	0.16	1.5	-76.8	
12:45	39.02				18.15	7.36	1621	0.15	1.5	-78.1	
12:48	39.02				18.23	7.36	1631	0.15	1.4	-78.2	
12:51	39.02			10260	18.20	7.367	1637	0.15	1.1	-78.3	
Sample ID:	CCR-AP-6I			Date:	5-7-24	Time:	13:15	QAQC Samples:			

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

LOW FLOW SAMPLING FORM

HALEY ALDRICH

Page 1 of 1

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Hayley Boller
CONTRACTOR	Atlas	SAMPLING DATE	5-10-2024

Sampling Data:		Well Depth as Built:	30.0 ft	Well Diameter:	2.0 in	Sampling Device:	Bladder Pump
Well ID:	CCR-AP-7	Well Depth Measured:	ft	Initial Depth To Water:	4.30 ft	Field Parameter Device:	
Start time:	10:20	Depth To Top Of Screen:	20.0 ft	Depth Of Pump Intake:	25 ft	Tubing Present In Well:	☐ Yes ☒ No
Finish Time:	11:08	Depth To Bottom Of Scree	30.0 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (µS/cm or mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
0	4.30		25mL	1221mL	19.18	7.0	1056	4.74	66	157.9	
3					18.83	6.99	1063	3.87	44	153.3	
6					18.81	6.98	1076	3.46	43	149.2	
7					18.88	6.97	1078	3.36	44	148.3	← Ipad froze?
10	4.53				18.48	6.97	1077	3.15	52	144.6	
13					18.25	6.97	1073	3.01	65	141.0	
16					18.69	6.96	1087	2.91	84	136.2	
19					19.14	6.96	1092	2.81	110	132.2	
22					18.86	6.96	1072	3.01	27	127.0	
25					18.75	6.96	1070	2.81	22	122.0	
28	4.81				19.24	6.95	1067	2.69	30	118.7	
31					18.61	6.94	1084	2.71	52	113.7	
34					17.87	6.95	1075	3.34	19	111.5	
37					18.03	6.95	1079	2.89	23	99.1	
40					17.69	6.95	1071	2.81	22	78.2	
43					18.24	6.96	1081	2.79	26	62.7	
46	5.35				18.49	6.96	1075	2.72	34	58.3	
Sample ID:	CCR-AP-7			Date:	5-10-24	Time:	12:00	QAQC Samples:			

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

LOW FLOW SAMPLING FORM

Page | of

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Hayley D
CONTRACTOR	Atlas	SAMPLING DATE	5-10-24

Sampling Data:

Well ID:	CCR-AP-8	Well Depth as Built:	45.5 ft	Well Diameter:	2.0 in	Sampling Device:	Bladder Pump
Start time:		Well Depth Measured:	ft	Initial Depth To Water:	36.42 ft	Field Parameter Device:	
Finish Time:	15:30	Depth To Top Of Screen:	35.5 ft	Depth Of Pump Intake:	40.5 ft	Tubing Present In Well:	☐ Yes ☒ No
		Depth To Bottom Of Scree	45.5 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity µS (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
0	36.42				18.56	6.90	1429	0.25	140	-76.3	

Sample ID:	CCR-AP-8	Date:	5-10-24	Time:	15:31	QAQC Samples:

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 l, 1L = 0.264 gal, 0.5l/min = 0.132 gal/min

LOW FLOW SAMPLING FORM

HALEY ALDRICH

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Mikah B
CONTRACTOR	Atlas	SAMPLING DATE	5-8-24

Sampling Data:		Well Depth as Built:	68.7 ft	Well Diameter:	2.0 in	Sampling Device:	Bladder Pump
Well ID:	CCR-AP-8I	Well Depth Measured:	ft	Initial Depth To Water:	37.09 ft	Field Parameter Device:	
Start time:	1039	Depth To Top Of Screen:	58.7 ft	Depth Of Pump Intake:	63.7 ft	Tubing Present In Well:	☐ Yes ☐ No
Finish Time:	1130	Depth To Bottom Of Scree	68.7 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting ~~(ml/min)~~ or ~~(ml/min)~~ or (gal/min)	Purge Rate ~~(ml/min)~~ or ~~(ml/min)~~ or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or ~~(°C)~~	pH	Conduct-ivity µS (ms/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
1039	37.09	200mL	200mL	10200mL	19.40	5.63	2740.3	6.51	74.55	-144.0	
1042	37.10				19.26	5.65	2766.1	6.82	76.23	-143.6	
1045	37.11				19.61	5.66	2796.3	6.77	76.90	-143.6	
1048	37.10				19.32	5.66	2820.1	6.64	79.30	-142.9	
1051	37.09				19.59	5.65	2844.0	6.55	76.47	-142.5	
1054	37.08				19.36	5.65	2864.2	6.71	76.87	-141.9	
1057	37.08				19.66	5.65	2897.0	6.77	80.21	-141.4	
1100	37.08				19.43	5.66	2917.8	6.68	75.99	-141.3	
1103	37.09				19.56	5.65	2936.2	6.45	81.80	-140.8	
1106	37.09				19.34	5.66	2946.7	6.75	84.13	-140.4	
1109	37.09				19.54	5.65	2962.3	6.59	93.12	-139.7	
1112	37.10				19.49	5.67	2971.8	6.63	91.81	-139.1	
1115	37.10				19.50	5.66	2982.5	6.52	86.54	-138.8	
1118	37.11				19.55	5.67	2988.7	6.47	94.23	-138.7	
1121	37.11				19.48	5.67	2997.1	6.61	87.89	-138.0	
1124	37.13				19.59	5.67	3004.9	6.40	82.25	-137.4	
1127	37.13				19.46	5.67	3007.6	6.53	82.50	-137.2	
1130	37.10				19.72	5.68	3012.5	6.70	91.67	-140.1	
Sample ID:	CCR-AP-8I			Date:	5-8-24	Time:	11:40	QAQC Samples:			

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

LOW FLOW SAMPLING FORM

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Hayley Tolles
CONTRACTOR	Atlas	SAMPLING DATE	5-8-24

Sampling Data:		Well Depth as Built:	70.0 ft	Well Diameter:	2.0 in	Sampling Device:	Bladder Pump
Well ID:	CCR-AP-9	Well Depth Measured:	ft	Initial Depth To Water:	59.91 ft	Field Parameter Device:	
Start time:		Depth To Top Of Screen:	60.0 ft	Depth Of Pump Intake:	ft	Tubing Present In Well:	☐ Yes ☒ No
Finish Time:	12:00	Depth To Bottom Of Scree	70.0 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
0	59.91				18.21	6.98	1165	4.44	464	65.6	ONLY 1 1-L taken

Sample ID:	CCR-AP-9	Date:	5-8-24	Time:	12:00	QAQC Samples:	

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

LOW FLOW SAMPLING FORM

HALEY ALDRICH

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	Hayley T
CONTRACTOR	Atlas	SAMPLING DATE	

Sampling Data:		Well Depth as Built:	54.4 ft	Well Diameter:	2.0 in	Sampling Device:	Bladder Pump
Well ID:	CCR-AP-11	Well Depth Measured:	ft	Initial Depth To Water:	15.22 ft	Field Parameter Device:	
Start time:	13:27	Depth To Top Of Screen:	44.4 ft	Depth Of Pump Intake:	49.4 ft	Tubing Present In Well:	☐ Yes ☒ No
Finish Time:	14:09	Depth To Bottom Of Scree	54.4 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
0	15.22		25	1050mL	19.24	6.34	1360	1.37	336	-29.6	
3					19.29	6.33	1359	1.04	290	-27.8	
6					19.30	6.33	1348	0.92	265	-27.3	
9					19.33	6.32	1360	0.89	215	-26.9	
12	15.58				20.59	6.31	1338	0.83	213	-28.8	
15					21.82	6.30	1345	0.73	199	-29.5	
18					22.24	6.29	1354	0.64	161	-29.2	
21					21.67	6.29	1339	0.59	117	-27.9	
24					22.22	6.28	1352	0.55	101	-28.0	
27					22.25	6.28	1358	0.50	96	-28.1	
30					22.39	6.27	1353	0.46	89	-27.8	
33					22.57	6.27	1347	0.43	91	-27.8	
36					22.95	6.27	1367	0.41	72	-27.9	
39					21.58	6.26	1361	0.39	75	-26.8	
42					21.43	6.26	1336	0.36	88	-27.8	

Sample ID:	CCR-AP-11	Date:	5-10-24	Time:	14:45	QAQC Samples:

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

CENTERPOINT ENERGY - FB CULLEY STATION
EAST ASH POND
CCR Groundwater Sampling Event
Gauging Date: November 11, 2024
Atlas Project No. 170LF01647

WELL ID	DATE	TIME	TOP OF CASING ELEVATION (FT-MSL)	DTW FROM TOC	STATIC WATER ELEVATION (FT-MSL)
East Ash Pond Wells					
CCR-AP-2	11/11/2024	16:31	394.02	39.60	354.42
CCR-AP-3R	Couldn't Locate/Not Gauged		394.55	-	-
CCR-AP-4R	11/11/2024	15:10	394.98	21.03	373.95
CCR-AP-5	11/11/2024	16:34	394.38	25.95	368.43
CCR-AP-5I	Damaged Pad, Cant Gauge		394.59	-	-
CCR-AP-6	11/11/2024	15:40	396.75	DRY TO SLEEVE (45.15)	<351.60
CCR-AP-6I	11/11/2024	15:35	396.88	58.45	338.43
CCR-AP-8	Couldn't Locate/Not Gauged		393.68	-	-
CCR-AP-8I	Couldn't Locate/Not Gauged		393.46	-	-
CCR-AP-11	11/11/2024	14:58	385.10	19.69	365.41
Background Wells					
CCR-AP-1R	11/11/2024	13:51	441.64	56.13	385.51
CCR-AP-7	11/11/2024	13:37	434.11	15.73	418.38
CCR-AP-9	11/11/2024	14:42	448.69	65.28	383.41

NOTES

DTW= Depth to Water

TOC= Top of Casing

What was originally thought to be the CCR-AP-8/8I nest during gauging on November 11, 2024 was actually an observation well nest.

CCR-AP-3 is believed to be covered under the excavation water management piping system. CCR-AP-8 and CCR-AP-8I were located by H&A and Atlas personnel under this equipment on November 14, 2024.

Low-Flow Test Report:

Test Date / Time: 11/14/2024 7:01:07 AM
Project: CULLEY EAST POND NOV 2024 GWM
Operator Name: M. BRETING

Location Name: CCR-AP-1R **Latitude:** **Longitude:** **Well Diameter: 2 in** **Casing Type: PVC** **Screen Length: 10 ft** **Top of Screen: 55 ft** **Total Depth: 65 ft** **Initial Depth to Water: 55.85 ft**	**Pump Type: Hydrasleeve** **Tubing Type: HDPE** **Flow Cell Volume: 130 ml** **Final Draw Down: 0 ft**	**Instrument Used: Aqua TROLL 500** **Serial Number: 625772**

Test Notes:

Weather Conditions:
Cloudy 52 degrees

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth to Water
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.3
11/14/2024 7:01 AM	00:00	5.13 pH	15.75 °C	132.12 µS/cm	9.71 mg/L	3,464.2 NTU	-8.8 mV	55.85 ft
11/14/2024 7:04 AM	03:00	5.19 pH	15.71 °C	150.15 µS/cm	9.69 mg/L	2,625.1 NTU	1.3 mV	55.85 ft
11/14/2024 7:07 AM	06:00	5.26 pH	15.67 °C	153.11 µS/cm	9.70 mg/L	1,792.4 NTU	9.7 mV	55.85 ft

Samples

Sample ID:	Description:
CCR-AP-1R	

Created using VuSitu from In-Situ, Inc.

Low-Flow Test Report:

Test Date / Time: 11/14/2024 8:34:15 AM
Project: CULLEY EAST POND NOV 2024 GWM (2)
Operator Name: M. BRETING

Location Name: CCR-AP-2 **Latitude:** **Longitude:** **Well Diameter: 2 in** **Screen Length: 10 ft** **Top of Screen: 36 ft** **Total Depth: 46 ft**	**Pump Type: Hydrasleeve** **Tubing Type: HDPE** **Flow Cell Volume: 130 ml**	**Instrument Used: Aqua TROLL 500** **Serial Number: 625772**

Test Notes:

Weather Conditions:
Cloudy 55 degrees rain approaching

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth to Water
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.3
11/14/2024 8:34 AM	00:00	7.37 pH	14.20 °C	0.07 µS/cm	9.98 mg/L	0.00 NTU	50.5 mV	
11/14/2024 8:37 AM	03:00	7.35 pH	14.16 °C	0.07 µS/cm	9.98 mg/L	0.00 NTU	56.0 mV	
11/14/2024 8:40 AM	06:00	7.32 pH	14.14 °C	0.07 µS/cm	9.99 mg/L	0.00 NTU	60.6 mV	

Samples

Sample ID:	Description:
CCR-AP-2	

Low-Flow Test Report:

Test Date / Time: 11/14/2024 1:28:03 PM
Project: CULLEY EAST POND NOV 2024 GWM (7)
Operator Name: M. BRETING

Location Name: CCR-AP-4R **Latitude:** **Longitude:** **Well Diameter: 2 in** **Casing Type: PVC** **Screen Length: 10 ft** **Top of Screen: 25.5 ft** **Total Depth: 35.5 ft** **Initial Depth to Water: 20.56 ft**	**Pump Type: Hydrasleeve** **Tubing Type: HDPE** **Flow Cell Volume: 130 ml** **Final Draw Down: 0 ft**	**Instrument Used: Aqua TROLL 500** **Serial Number: 625772**

Test Notes:

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth to Water
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.3
11/14/2024 1:28 PM	00:00	8.26 pH	14.24 °C	0.07 µS/cm	7.98 mg/L	0.01 NTU	136.9 mV	20.56 ft
11/14/2024 1:31 PM	03:00	8.27 pH	14.34 °C	0.07 µS/cm	4.93 mg/L	0.00 NTU	171.8 mV	20.56 ft
11/14/2024 1:34 PM	06:00	8.16 pH	14.39 °C	0.07 µS/cm	3.86 mg/L	0.00 NTU	188.5 mV	20.56 ft
11/14/2024 1:37 PM	09:00	8.09 pH	14.39 °C	0.07 µS/cm	3.53 mg/L	0.00 NTU	197.8 mV	20.56 ft
11/14/2024 1:40 PM	12:00	8.01 pH	14.36 °C	0.07 µS/cm	3.41 mg/L	0.00 NTU	204.4 mV	20.56 ft
11/14/2024 1:43 PM	15:00	7.95 pH	14.31 °C	0.07 µS/cm	3.36 mg/L	0.00 NTU	209.4 mV	20.56 ft

Samples

Sample ID:	Description:
CCR-AP-4R	

Created using VuSitu from In-Situ, Inc.

Low-Flow Test Report:

Test Date / Time: 11/14/2024 2:46:26 PM
Project: CULLEY EAST POND NOV 2024 GWM (3)
Operator Name: M. BRETING

Location Name: CCR-AP-5 **Latitude:** **Longitude:** **Well Diameter: 2 in** **Casing Type: PVC** **Screen Length: 10 ft** **Top of Screen: 34.0 ft** **Total Depth: 44.0 ft** **Initial Depth to Water: 24.96 ft**	**Pump Type: SAMPLE PRO PORTABLE BLADDER PUMP** **Tubing Type: HDPE** **Pump Intake From TOC: 39.0 ft** **Estimated Total Volume Pumped: 11190 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 200 ml/min** **Final Draw Down: 0.07 ft**	**Instrument Used: Aqua TROLL 500** **Serial Number: 625772**

Test Notes:

Weather Conditions:
Cloudy 55 degrees

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth to Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.3	
11/14/2024 2:46 PM	00:00	7.06 pH	15.36 °C	1,282.5 µS/cm	4.63 mg/L	468.05 NTU	-11.0 mV	25.01 ft	200.00 ml/min
11/14/2024 2:49 PM	03:00	7.07 pH	15.29 °C	1,276.1 µS/cm	4.17 mg/L	422.11 NTU	-18.5 mV	25.05 ft	200.00 ml/min
11/14/2024 2:52 PM	06:00	7.07 pH	15.26 °C	1,271.0 µS/cm	3.75 mg/L	394.92 NTU	-25.5 mV	25.05 ft	200.00 ml/min
11/14/2024 2:55 PM	09:00	7.07 pH	15.04 °C	1,264.9 µS/cm	3.42 mg/L	372.93 NTU	-30.6 mV		200.00 ml/min
11/14/2024 2:58 PM	12:00	7.07 pH	14.86 °C	1,260.1 µS/cm	3.12 mg/L	316.26 NTU	-36.3 mV		200.00 ml/min
11/14/2024 3:01 PM	15:00	7.07 pH	14.98 °C	1,258.2 µS/cm	2.82 mg/L	228.73 NTU	-41.1 mV	25.03 ft	200.00 ml/min
11/14/2024 3:04 PM	18:00	7.07 pH	14.96 °C	1,258.1 µS/cm	2.55 mg/L	167.47 NTU	-47.5 mV		200.00 ml/min
11/14/2024 3:07 PM	21:00	7.08 pH	14.93 °C	1,255.0 µS/cm	2.33 mg/L	157.91 NTU	-51.7 mV		200.00 ml/min
11/14/2024 3:10 PM	24:00	7.08 pH	15.00 °C	1,254.6 µS/cm	2.12 mg/L	96.64 NTU	-54.9 mV	25.03 ft	200.00 ml/min
11/14/2024 3:13 PM	27:00	7.08 pH	15.06 °C	1,253.1 µS/cm	1.91 mg/L	76.15 NTU	-56.3 mV		200.00 ml/min
11/14/2024 3:16 PM	30:00	7.08 pH	14.95 °C	1,250.5 µS/cm	1.75 mg/L	63.23 NTU	-57.7 mV		200.00 ml/min
11/14/2024 3:19 PM	33:00	7.08 pH	15.18 °C	1,249.9 µS/cm	1.57 mg/L	49.53 NTU	-59.7 mV	25.03 ft	200.00 ml/min
11/14/2024 3:22 PM	36:00	7.08 pH	15.17 °C	1,246.8 µS/cm	1.44 mg/L	33.96 NTU	-63.1 mV		200.00 ml/min

11/14/2024 3:25 PM	39:00	7.08 pH	15.11 °C	1,244.7 µS/cm	1.32 mg/L	36.93 NTU	-64.6 mV	25.03 ft	200.00 ml/min
11/14/2024 3:28 PM	42:00	7.08 pH	15.08 °C	1,242.4 µS/cm	1.20 mg/L	28.55 NTU	-66.5 mV		200.00 ml/min
11/14/2024 3:31 PM	45:00	7.08 pH	14.91 °C	1,240.3 µS/cm	1.09 mg/L	21.28 NTU	-67.1 mV		200.00 ml/min
11/14/2024 3:34 PM	48:00	7.08 pH	14.77 °C	1,238.6 µS/cm	1.00 mg/L	23.20 NTU	-68.6 mV	25.03 ft	200.00 ml/min
11/14/2024 3:37 PM	51:00	7.08 pH	14.69 °C	1,237.3 µS/cm	0.94 mg/L	10.18 NTU	-63.2 mV		200.00 ml/min
11/14/2024 3:40 PM	54:00	7.08 pH	14.55 °C	1,234.7 µS/cm	0.98 mg/L	12.24 NTU	-60.5 mV		200.00 ml/min
11/14/2024 3:42 PM	55:57	7.08 pH	14.45 °C	1,233.0 µS/cm	1.02 mg/L	11.21 NTU	-59.6 mV	25.03 ft	200.00 ml/min

Samples

Sample ID:	Description:
CCR-AP-5; DUP-1	

Created using VuSitu from In-Situ, Inc.

Low-Flow Test Report:

Test Date / Time: 11/13/2024 9:20:06 AM
Project: CULLEY EAST POND NOV 2024 GWM
Operator Name: M. BRETING

Location Name: CCR-AP-6I **Latitude:** **Longitude:** **Well Diameter: 2 in** **Casing Type: PVC** **Screen Length: 10 ft** **Top of Screen: 64.7 ft** **Total Depth: 74.7 ft** **Initial Depth to Water: 58.53 ft**	**Pump Type: Dedicated** **Tubing Type: HDPE** **Pump Intake From TOC: 69.7 ft** **Estimated Total Volume Pumped: 6300 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 350 ml/min** **Final Draw Down: 0.00 ft**	**Instrument Used: Aqua TROLL 500** **Serial Number: 625772**

Test Notes:

Weather Conditions:
Cloudy 50 degrees chance rain later today

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth to Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.3	
11/13/2024 9:20 AM	00:00	7.29 pH	19.35 °C	570.20 µS/cm	1.47 mg/L	0.04 NTU	-78.4 mV	58.53 ft	350.00 ml/min
11/13/2024 9:23 AM	03:00	7.34 pH	19.14 °C	483.29 µS/cm	0.46 mg/L	0.00 NTU	-50.3 mV		350.00 ml/min
11/13/2024 9:26 AM	06:00	7.34 pH	18.87 °C	475.73 µS/cm	0.56 mg/L	0.00 NTU	-37.8 mV	58.53 ft	350.00 ml/min
11/13/2024 9:29 AM	09:00	7.35 pH	19.24 °C	467.33 µS/cm	0.27 mg/L	0.12 NTU	-33.7 mV		350.00 ml/min
11/13/2024 9:32 AM	12:00	7.36 pH	19.18 °C	466.21 µS/cm	0.22 mg/L	0.00 NTU	-31.1 mV		350.00 ml/min
11/13/2024 9:35 AM	15:00	7.37 pH	19.23 °C	465.81 µS/cm	0.21 mg/L	0.00 NTU	-29.4 mV	58.53 ft	350.00 ml/min
11/13/2024 9:38 AM	18:00	7.38 pH	19.25 °C	465.25 µS/cm	0.20 mg/L	0.00 NTU	-28.6 mV	58.53 ft	350.00 ml/min

Samples

Sample ID:	Description:
CCR-AP-6I	

Low-Flow Test Report:

Test Date / Time: 11/14/2024 11:01:46 AM
Project: CULLEY EAST POND NOV 2024 GWM (6)
Operator Name: M. BRETING

Location Name: CCR-AP-9 **Latitude:** **Longitude:** **Casing Type: PVC** **Screen Length: 10 ft** **Top of Screen: 60 ft** **Total Depth: 70 ft**	**Pump Type: Hydrasleeve** **Tubing Type: HDPE** **Flow Cell Volume: 130 ml**	**Instrument Used: Aqua TROLL 500** **Serial Number: 625772**

Test Notes:

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth to Water
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.3
11/14/2024 11:01 AM	00:00	8.43 pH	17.10 °C	1.67 µS/cm	6.26 mg/L	1,200.2 NTU	320.4 mV	
11/14/2024 11:04 AM	03:00	8.23 pH	17.08 °C	1.06 µS/cm	5.17 mg/L	940.50 NTU	313.9 mV	
11/14/2024 11:07 AM	06:00	8.15 pH	17.17 °C	0.74 µS/cm	5.01 mg/L	764.02 NTU	313.6 mV	

Samples

Sample ID:	Description:
CCR-AP-9	

Created using VuSitu from In-Situ, Inc.

Low-Flow Test Report:

Test Date / Time: 11/15/2024 7:03:17 AM
Project: CULLEY EAST POND NOV 2024 GWM (8)
Operator Name: M. BRETING

Location Name: CCR-AP-11 **Latitude:** **Longitude:** **Well Diameter: 2 in** **Casing Type: PVC** **Screen Length: 10 ft** **Top of Screen: 44.4 ft** **Total Depth: 54.4 ft** **Initial Depth to Water: 18.77 ft**	**Pump Type: SAMPLE PRO PORTABLE BLADDER PUMP** **Tubing Type: HDPE** **Pump Intake From TOC: 49.4 ft** **Estimated Total Volume Pumped: 5080.667 ml** **Flow Cell Volume: 130 ml** **Final Flow Rate: 50 ml/min** **Final Draw Down: 1.38 ft**	**Instrument Used: Aqua TROLL 500** **Serial Number: 625772**

Test Notes:
Drawdown stabilized

Weather Conditions:
Cloudy 45 degrees

Low-Flow Readings:

Date Time	Elapsed Time	pH	Temperature	Specific Conductivity	RDO Concentration	Turbidity	ORP	Depth to Water	Flow
		+/- 0.1	+/- 3 %	+/- 3 %	+/- 10 %	+/- 10 %	+/- 10	+/- 0.3	
11/15/2024 7:03 AM	00:00	6.10 pH	13.42 °C	1,209.0 µS/cm	1.03 mg/L	188.20 NTU	-59.5 mV	19.30 ft	40.00 ml/min
11/15/2024 7:06 AM	03:00	6.10 pH	13.49 °C	1,204.7 µS/cm	1.05 mg/L	171.32 NTU	-58.0 mV		40.00 ml/min
11/15/2024 7:09 AM	06:00	6.10 pH	13.43 °C	1,200.1 µS/cm	1.06 mg/L	152.37 NTU	-56.1 mV	19.28 ft	40.00 ml/min
11/15/2024 7:12 AM	09:00	6.11 pH	13.35 °C	1,196.1 µS/cm	1.11 mg/L	130.31 NTU	-55.4 mV		40.00 ml/min
11/15/2024 7:13 AM	10:01	6.11 pH	13.31 °C	1,194.3 µS/cm	1.13 mg/L	124.84 NTU	-55.1 mV		40.00 ml/min
11/15/2024 7:16 AM	13:01	6.12 pH	13.17 °C	1,189.7 µS/cm	1.17 mg/L	123.15 NTU	-54.5 mV	19.26 ft	40.00 ml/min
11/15/2024 7:19 AM	16:01	6.12 pH	12.97 °C	1,185.1 µS/cm	1.23 mg/L	115.69 NTU	-53.7 mV		40.00 ml/min
11/15/2024 7:22 AM	19:01	6.12 pH	12.73 °C	1,179.7 µS/cm	1.29 mg/L	107.77 NTU	-51.0 mV	19.25 ft	40.00 ml/min
11/15/2024 7:25 AM	22:01	6.13 pH	12.47 °C	1,175.0 µS/cm	1.33 mg/L	102.99 NTU	-49.0 mV		40.00 ml/min
11/15/2024 7:28 AM	25:01	6.13 pH	12.19 °C	1,170.8 µS/cm	1.38 mg/L	107.52 NTU	-48.0 mV	19.20 ft	40.00 ml/min
11/15/2024 7:31 AM	28:01	6.11 pH	13.55 °C	1,175.2 µS/cm	1.32 mg/L	156.52 NTU	-49.6 mV		40.00 ml/min
11/15/2024 7:34 AM	31:01	6.12 pH	13.86 °C	1,178.7 µS/cm	1.27 mg/L	151.71 NTU	-54.4 mV		40.00 ml/min
11/15/2024 7:37 AM	34:01	6.14 pH	13.69 °C	1,174.6 µS/cm	1.33 mg/L	128.86 NTU	-54.4 mV		

11/15/2024 7:40 AM	37:01	6.26 pH	13.84 °C	1,173.5 µS/cm	3.87 mg/L	198.25 NTU	-51.3 mV		
11/15/2024 7:43 AM	40:01	6.21 pH	14.20 °C	791.51 µS/cm	3.65 mg/L	135.91 NTU	-52.7 mV		
11/15/2024 7:46 AM	43:01	6.24 pH	13.50 °C	1,163.4 µS/cm	3.78 mg/L	126.97 NTU	-49.5 mV	19.85 ft	40.00 ml/min
11/15/2024 7:49 AM	46:01	6.23 pH	13.25 °C	1,154.0 µS/cm	3.39 mg/L	117.30 NTU	-50.5 mV	19.78 ft	40.00 ml/min
11/15/2024 7:52 AM	49:01	6.22 pH	12.56 °C	1,145.4 µS/cm	2.82 mg/L	110.95 NTU	-51.6 mV	19.79 ft	40.00 ml/min
11/15/2024 7:55 AM	52:01	6.21 pH	12.11 °C	1,146.8 µS/cm	2.47 mg/L	115.74 NTU	-52.2 mV		50.00 ml/min
11/15/2024 7:58 AM	55:01	6.21 pH	12.03 °C	1,145.1 µS/cm	2.34 mg/L	115.28 NTU	-51.9 mV	19.95 ft	50.00 ml/min
11/15/2024 8:01 AM	58:01	6.21 pH	11.98 °C	1,141.8 µS/cm	2.35 mg/L	109.84 NTU	-51.0 mV	19.95 ft	50.00 ml/min
11/15/2024 8:04 AM	01:01:01	6.21 pH	12.59 °C	1,143.9 µS/cm	2.15 mg/L	92.72 NTU	-52.5 mV	19.87 ft	50.00 ml/min
11/15/2024 8:07 AM	01:04:01	6.22 pH	12.80 °C	1,140.0 µS/cm	2.08 mg/L	121.87 NTU	-51.7 mV		50.00 ml/min
11/15/2024 8:10 AM	01:07:01	6.23 pH	13.12 °C	1,139.9 µS/cm	1.77 mg/L	94.41 NTU	-55.8 mV		50.00 ml/min
11/15/2024 8:13 AM	01:10:01	6.25 pH	12.83 °C	1,134.5 µS/cm	1.61 mg/L	107.82 NTU	-56.9 mV	20.12 ft	50.00 ml/min
11/15/2024 8:16 AM	01:13:01	6.29 pH	12.40 °C	1,129.4 µS/cm	2.87 mg/L	121.12 NTU	-51.8 mV		50.00 ml/min
11/15/2024 8:19 AM	01:16:01	6.28 pH	12.35 °C	1,127.4 µS/cm	3.69 mg/L	132.89 NTU	-48.2 mV	20.13 ft	50.00 ml/min
11/15/2024 8:22 AM	01:19:01	6.28 pH	12.27 °C	1,123.5 µS/cm	3.57 mg/L	136.25 NTU	-48.1 mV		50.00 ml/min
11/15/2024 8:25 AM	01:22:01	6.28 pH	12.29 °C	1,122.6 µS/cm	3.19 mg/L	134.04 NTU	-49.4 mV	20.15 ft	50.00 ml/min
11/15/2024 8:28 AM	01:25:01	6.29 pH	12.30 °C	1,119.4 µS/cm	2.90 mg/L	112.55 NTU	-50.8 mV		50.00 ml/min
11/15/2024 8:31 AM	01:28:01	6.30 pH	12.19 °C	1,115.8 µS/cm	2.63 mg/L	98.48 NTU	-51.9 mV	20.15 ft	50.00 ml/min
11/15/2024 8:34 AM	01:31:01	6.30 pH	12.09 °C	1,112.6 µS/cm	2.34 mg/L	91.42 NTU	-53.0 mV		50.00 ml/min
11/15/2024 8:37 AM	01:34:01	6.31 pH	12.03 °C	1,110.8 µS/cm	2.13 mg/L	87.40 NTU	-54.0 mV		50.00 ml/min
11/15/2024 8:40 AM	01:37:01	6.31 pH	11.95 °C	1,108.6 µS/cm	1.99 mg/L	87.49 NTU	-54.5 mV	20.15 ft	50.00 ml/min
11/15/2024 8:43 AM	01:40:01	6.32 pH	11.90 °C	1,107.3 µS/cm	1.88 mg/L	95.71 NTU	-55.3 mV		50.00 ml/min
11/15/2024 8:46 AM	01:43:01	6.32 pH	11.91 °C	1,105.3 µS/cm	1.81 mg/L	99.77 NTU	-56.0 mV		50.00 ml/min
11/15/2024 8:49 AM	01:46:01	6.33 pH	11.89 °C	1,103.5 µS/cm	1.74 mg/L	86.53 NTU	-56.4 mV	20.15 ft	50.00 ml/min
11/15/2024 8:52 AM	01:49:01	6.33 pH	11.93 °C	1,103.0 µS/cm	1.69 mg/L	94.57 NTU	-56.9 mV		50.00 ml/min
11/15/2024 8:55 AM	01:52:01	6.33 pH	12.05 °C	1,102.9 µS/cm	1.63 mg/L	93.51 NTU	-57.5 mV	20.15 ft	50.00 ml/min

Samples

Sample ID:	Description:

CCR-AP-11	

Created using VuSitu from In-Situ, Inc.

HALEY ALDRICH

LOW FLOW SAMPLING FORM

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	M. Gracey
CONTRACTOR	Atlas	SAMPLING DATE	11/14/24

Sampling Data:		Well Depth as Built:	65.0 ft	Well Diameter:	2.0 in	Sampling Device:	Hydrasleeve
Well ID:	CCR-AP-1R	Well Depth Measured:	ft	Initial Depth To Water:	55.85 ft	Field Parameter Device:	Aquatroll 500
Start time:	0645	Depth To Top Of Screen:	55.0 ft	Depth Of Pump Intake:	ft	Tubing Present In Well:	☐ Yes ☐ No
Finish Time:	0650	Depth To Bottom Of Scree	65.0 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (ms/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
0701					15.75	5.13	132.12	9.71	3464.2	-8.8	
0704					15.71	5.19	150.15	9.69	2625.1	1.3	
0707					15.67	5.26	153.11	9.70	1792.4	9.7	
Sample ID:	CCR-AP-1R			Date:	11/14/24	Time:	0645	QAQC Samples:	—		

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

HALEY ALDRICH

LOW FLOW SAMPLING FORM

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	M. Bratton
CONTRACTOR	Atlas	SAMPLING DATE	11/14/24

Sampling Data:		Well Depth as Built:	46.0 ft	Well Diameter:	2.0 in	Sampling Device:	Hydrasleeve
Well ID:	CCR-AP-2	Well Depth Measured:	ft	Initial Depth To Water:	38.14 ft	Field Parameter Device:	Aquatroll 500
Start time:	08:05	Depth To Top Of Screen:	36.0 ft	Depth Of Pump Intake:	ft	Tubing Present In Well:	☐ Yes ☑ No
Finish Time:	08:20	Depth To Bottom Of Scree	46.0 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	~~Polyethylene~~ Hydrasleeve

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (ms/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
8:34					14.20	7.37	0.07	9.98	0.06	50.5	
8:37					14.16	7.35	0.07	9.88	0.00	56.0	
8:40					14.14	7.32	0.07	9.89	0.00	60.6	

Sample ID:	CCR-AP-2	Date:	11/14/24	Time:	0805	QAQC Samples:	—

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

HALEY ALDRICH

LOW FLOW SAMPLING FORM

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	M. Bacon
CONTRACTOR	Atlas	SAMPLING DATE	11/14/24

Sampling Data:		Well Depth as Built:	35.5 ft	Well Diameter:	2.0 in	Sampling Device:	Hydrasleeve
Well ID:	CCR-AP-4	Well Depth Measured:	ft	Initial Depth To Water:	20.56 ft	Field Parameter Device:	Aqua TROLL 500
Start time:	13:20	Depth To Top Of Screen:	25.5 ft	Depth Of Pump Intake:	ft	Tubing Present In Well:	☐ Yes ☐ No
Finish Time:	13:30	Depth To Bottom Of Scree	35.5 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (ms/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
13:28					14.24	8.26	0.07	2.98	0.01	136.9	
13:31					14.34	8.27	0.07	4.93	0.00	171.8	
13:34					14.39	8.16	0.07	3.86	0.00	188.5	
13:37					14.39	8.09	0.07	3.53	0.00	197.8	
13:40					14.36	8.01	0.07	3.41	0.00	204.4	
13:43					14.31	7.95	0.07	3.36	0.00	209.4	
Sample ID:	CCR-AP-4R			Date:	11/14/24	Time:	1320	QAQC Samples:	—		

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L. 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

HALEY ALDRICH

LOW FLOW SAMPLING FORM

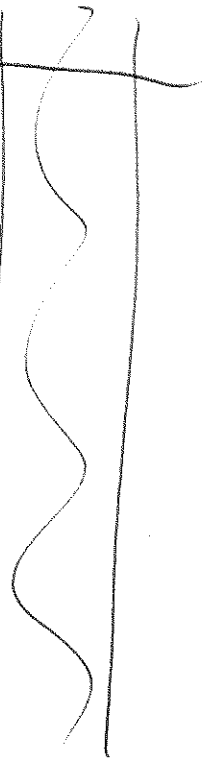
PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	M. Greving
CONTRACTOR	Atlas	SAMPLING DATE	11/14/24

Sampling Data:		Well Depth as Built:	44.0 ft	Well Diameter:	2.0 in	Sampling Device:	Bladder Pump
Well ID:	CCR-AP-5	Well Depth Measured:	ft	Initial Depth To Water:	24.96 ft	Field Parameter Device:	Aquatroll 500
Start time:	1545	Depth To Top Of Screen:	34.0 ft	Depth Of Pump Intake:	ft	Tubing Present In Well:	☐ Yes ☒ No
Finish Time:	1625	Depth To Bottom Of Scree	44.0 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (ms/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
1446	25.01		200		15.36	7.06	1252.5	4.63	468.05	-11.0	
1449	25.05		200		15.29	7.07	1276.1	4.17	422.11	-18.5	
1452	25.05		200		15.26	7.07	1271.0	3.75	394.92	-25.5	
1455			200		15.04	7.07	1264.9	3.42	372.93	-30.6	
1458			200		14.86	7.07	1260.1	3.12	346.26	-36.3	
1501	25.03		200		14.98	7.07	1258.2	2.82	228.73	-41.1	
1504			200		14.96	7.07	1258.1	2.55	167.47	-47.5	
1507			200		14.93	7.08	1255.0	2.33	157.91	-51.7	
1510	25.03		200		15.00	7.08	1254.6	2.12	96.64	-54.9	
1513			200		15.06	7.08	1253.1	1.91	76.15	-56.3	
1516			200		14.95	7.08	1250.5	1.75	63.23	-57.7	
1519	25.03		200		15.18	7.08	1249.9	1.57	49.53	-59.2	DUP-1 collected at this well
1522			200		15.17	7.08	1246.8	1.44	33.96	-63.1	
1525	25.03		200		15.11	7.08	1244.7	1.32	36.93	-64.6	
1528			200		15.08	7.08	1242.4	1.20	28.55	-66.5	
1531			200		14.91	7.08	1240.3	1.09	21.28	-67.1	
1534	25.03		200		14.77	7.08	1238.6	1.00	23.20	-68.6	
1537			200		14.69	7.08	1237.3	0.94	10.18	-63.2	
Sample ID:	CCR-AP-5			Date:	11/14/24	Time:	1545	QAQC Samples:		DUP-1	

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

Time	DTW	Purge Rate	Cumul. Purge	T	pH	SpC	DO	Turb	ORP
						1234.7			
1540				14.55	7.08	~~1233.0~~	0.98	12.24	-60.5
1542	25.03		11190 ml	14.45	7.08	1233.0	1.02	11.21	-59.6



HALEY ALDRICH

LOW FLOW SAMPLING FORM

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	M. BRETING
CONTRACTOR	Atlas	SAMPLING DATE	11/13/24

Sampling Data:		Well Depth as Built:	45.5 ft	Well Diameter:	2.0 in	Sampling Device:	Hydrasleeve
Well ID:	CCR-AP-6	Well Depth Measured:	ft	Initial Depth To Water:	Orq to 44.7 ft	Field Parameter Device:	—
Start time:		Depth To Top Of Screen:	35.5 ft	Depth Of Pump Intake:	(Top sleeve) ft	Tubing Present In Well:	☐ Yes ☐ No
Finish Time:		Depth To Bottom Of Scree	45.5 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (ms/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
	Orq TO	44.7 ft									Orq TO TOTAL Depth
											ASSE by Hydrasleeve
											Packer by Hydrasleeve,
											confirmed no
											water present.

Sample ID:		Date:	11/13/24	Time:	0910	QAQC Samples:	—

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

HALEY ALDRICH

LOW FLOW SAMPLING FORM

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	M. Bratina
CONTRACTOR	Atlas	SAMPLING DATE	11/13/24

Sampling Data:		Well Depth as Built:	74.7 ft	Well Diameter:	2.0 in	Sampling Device:	Bladder Pump
Well ID:	CCR-AP-6I	Well Depth Measured:	ft	Initial Depth To Water:	58.53 ft	Field Parameter Device:	Aquatroll 500
Start time:	8:41	Depth To Top Of Screen:	64.7 ft	Depth Of Pump Intake:	ft	Tubing Present In Well:	☑ Yes ☐ No
Finish Time:	8:52	Depth To Bottom Of Scree	74.7 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (ms/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
8 Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
8 920	58.53	350	350		19.35	7.29	570.20	1.47	0.54	-78.4	
8 923			350		19.14	7.34	453.29	0.46	0.00	-50.3	
8 926	58.53		350		18.87	7.34	475.73	0.56	0.00	-37.8	
8 929			350		19.24	7.35	467.33	0.27	0.12	-33.7	
8 932			350		19.18	7.36	466.21	0.22	0.00	-31.1	
8 935	58.53		350		19.23	7.37	465.81	0.21	0.00	-29.4	
X 8 938	58.53		350		19.25	7.38	465.25	0.20	0.00	-28.6	

Sample ID:	CCR-AP-6I	Date:	11/13/24	Time:	941	QAQC Samples:	—

well volume = 3.14 (PI) x radius² x height of water column, 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

(941 cotton)

HALEY ALDRICH

LOW FLOW SAMPLING FORM

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	M. Bielitz
CONTRACTOR	Atlas	SAMPLING DATE	11/14/24

Sampling Data:		Well Depth as Built:	70.0 ft	Well Diameter:	2.0 in	Sampling Device:	Bladder Pump
Well ID:	CCR-AP-9	Well Depth Measured:	ft	Initial Depth To Water:	65.06 ft	Field Parameter Device:	
Start time:	10:50	Depth To Top Of Screen:	60.0 ft	Depth Of Pump Intake:	ft	Tubing Present In Well:	☐ Yes ☐ No
Finish Time:	11:00	Depth To Bottom Of Scree	70.0 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (ms/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
11:01					17.10	8.43	1.67	6.26	1200.2	320.4	
11:04					17.28	8.23	1.06	5.17	940.50	313.9	
11:07					17.17	8.15	0.74	5.01	764.02	312.6	
Sample ID:	CCR-AP-9			Date:	11/14/24	Time:	1050	QAQC Samples:	—		

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

LOW FLOW SAMPLING FORM

HALEY ALDRICH

PROJECT	F.B. Culley Generating Station - East Ash Pond	H&A FILE NO.	0129420
LOCATION	Newburgh, Indiana	PROJECT MGR.	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	FIELD REP.	M. Gretling
CONTRACTOR	Atlas	SAMPLING DATE	11/15/24

Sampling Data:		Well Depth as Built:	54.4 ft	Well Diameter:	2.0 in	Sampling Device:	Bladder Pump
Well ID:	CCR-AP-11	Well Depth Measured:	ft	Initial Depth To Water:	18.77 ft	Field Parameter Device:	
Start time:	0858	Depth To Top Of Screen:	44.4 ft	Depth Of Pump Intake:	ft	Tubing Present In Well:	☐ Yes ☐ No
Finish Time:	11:10	Depth To Bottom Of Scree	54.4 ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Elapsed Time (24 hour)	Depth To Water From Casing (ft)	Pump Setting (ml/min) or (gal/min)	Purge Rate (ml/min) or (gal/min)	Cumulative Purge Vol. (liters) or (gal)	Temp-erature (°F) or (°C)	pH	Conduct-ivity (ms/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP/eH (mv)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		-	NA	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
703	19.30		40		13.42	6.10	1209.0	1.03	188.20	-59.5	Initially set flow
706			40		13.49	6.10	1209.7	1.05	171.32	-58.0	To ~75 ml/min
709	19.28		40		13.43	6.10	1200.1	1.06	154.37	-56.1	Ch. G starting up Then
712			40		13.35	6.11	1196.1	1.11	130.31	-55.4	bleed down to ~40 ml/
Lost Communication at 10 minutes in, Reestablished											min.
7:16	19.26		40		13.17	6.12	1189.7	1.17	123.15	-54.5	
7:19			40		12.97	6.12	1185.1	1.23	115.69	-53.7	
7:22	19.25		40		12.73	6.12	1179.7	1.29	107.77	-51.0	
7:25			40		12.47	6.13	1175.0	1.33	102.99	-49.0	
7:28	19.20		40		12.19	6.13	1170.8	1.38	107.52	-48.0	
7:31			40		13.55	6.11	1175.2	1.32	156.52	-49.6	
7:34			40		13.86	6.12	1178.7	1.27	151.71	-54.4	
Compressor 5503 135 PSI - Reading between 734-744 should be ignored, no flow											
7:46	19.85		40		13.50	6.26	1163.4	3.78	126.97	-49.5	
7:49	19.78		40		13.25	6.23	1154.0	3.39	117.30	-50.5	
7:52	19.79		40		12.56	6.22	1145.4	2.82	110.95	-51.6	Field Blank 1
7:55			~~40~~ 50		12.11	6.21	1146.8	2.47	115.74	-52.2	Collected 1155 1155
7:58	~~19.84~~		50		12.03	6.21	1145.1	2.34	115.28	-51.9	near AP-11

Sample ID:	CCR-AP-11	Date:	11/15/24	Time:	08:58	QAQC Samples:	—

well volume = 3.14 (PI) x radius² x height of water column. 2 in well = 0.163 gal/ft, 3 in = ~~0.367 gal/ft~~ 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

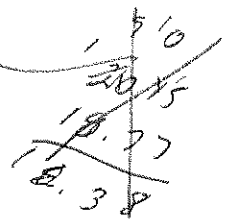
cdj cycle

19.95

CCR-AP-11

Time	OTW	Pump Setting	Purge Rate	Cumul Purge	T	pH	SpC	DO	Turb	ORP
8:01	19.95		50		11.98	6.21	1141.8	2.35	109.84	-51.0
8:04	19.87		50		12.59	6.21	1143.9	2.15	92.72	-52.5
8:07			50		12.50	6.22	1140.0	2.08	121.87	-51.7
8:10			50		13.12	6.23	1139.9	1.77	94.41	-55.8
8:13	20.12		50		12.83	6.25	1134.5	1.61	132.82	-56.9
8:16			50		12.40	6.29	1129.4	2.87	121.82	-51.8
8:19	20.13		50		12.35	6.28	1127.4	3.69	132.89	-48.2
8:22			50		12.27	6.28	1123.5	3.57	136.25	-48.1
825	20.15		50		12.29	6.28	1122.6	3.19	134.04	-49.4
828			50		12.30	6.29	1119.4	2.90	112.55	-50.8
831	20.15		50		12.15	6.30	1115.8	2.63	98.48	-51.9

Compressor stuck ignore 8:10 Reading



CCR
AP-11

	DTW	Purge Rate	Cumul Purge	T	pH	SpC	DO	Turb	ORP
834		50		12.09	6.30	1112.6	2.34	91.42	-53.0
837		50		12.03	6.31	1110.8	2.13	87.40	-54.0
840	20.15	50		11.95	6.31	1108.6	1.99	87.19	-54.5
843		50		11.90	6.32	1107.3	1.88	95.71	-55.3
846		50		11.91	6.32	1105.3	1.81	99.77	-56.0
849	20.15	50		11.89	6.33	1103.5	1.74	86.53	-56.4
852		50		11.93	6.33	1103.0	1.69	94.57	-56.9
855	20.15	50	5081 ml	12.05	6.33	1102.9	1.63	93.51	-57.5

HALEY ALDRICH

LOW FLOW SAMPLING FORM

Page 1 of 1

PROJECT	A.B. Brown Generating Station	**H&A FILE NO.**	0129420
LOCATION	Evansville, Indiana	**PROJECT MGR.**	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	**FIELD REP**	F. Reed
CONTRACTOR	N/A	**DATE**	12/19/24

Sampling Data:

Well ID:	CCR-AP-1R	Well Depth as Built:		ft	Well Diameter:	2	in	Purging Device:	Hydrasleeve
Start time:	11:00	Well Depth Measured:	65.76	ft	Initial Depth To Water:	59.62	ft	Field Parameter Device:	Horiba U-52
Finish Time:	12:20	Depth To Top Of Screen:		ft	Depth Of Pump Intake:	-	ft	Tubing Present In Well:	☐ Yes ☒ No
		Depth To Bottom Of Screen:		ft	Measuring Point:	Top of Casing (TOC)		Tubing Type:	N/A

Time (24 hour)	Depth to Water (ft TOC)	Pump Setting (mL/min)	Purge Rate (mL/min)	Cumulative Purge Volume (Liters)	Temperature (°F)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		--	N/A	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
* Grab sampled with a Hydrasleeve *											
12:00	-	-	-	-	17.08	6.89	1.03	1.75	>800	132	
											CCR-AP-1R-121924
											Sample Time: 11:40

well volume = 3.14 (PI) x radius^2 x height of water column 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

Form 3010

HALEY ALDRICH

LOW FLOW SAMPLING FORM

PROJECT	A.B. Brown Generating Station	**H&A FILE NO.**	0129420
LOCATION	Evansville, Indiana	**PROJECT MGR.**	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	**FIELD REP**	F. Reed
CONTRACTOR	N/A	**DATE**	12/19/24

Sampling Data:

Well ID	CCR-AP-2	Well Depth as Built	ft	Well Diameter	2	in	Purging Device	Hydrasleeve	
Start time	13:35	Well Depth Measured	45.40 ft	Initial Depth To Water	35.78	ft	Field Parameter Device	Horiba U-52	
Finish Time	19:10	Depth To Top Of Screen	ft	Depth Of Pump Intake	–	ft	Tubing Present In Well	☐ Yes ☒ No	
		Depth To Bottom Of Screen	ft	Measuring Point	Top of Casing (TOC)		Tubing Type	N/A	

Time (24 hour)	Depth to Water (ft TOC)	Pump Setting (mL/min)	Purge Rate (mL/min)	Cumulative Purge Volume (Liters)	Temperature (°F)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		--	N/A	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
		* Grab sampled with a Hydrasleeve *									
19:05	–	–	–	–	15.88	6.28	2.01	1.80	341	27	
											CCR-AP-2-121924
											Sample Time: 13:50

well volume = 3.14 (PI) x radius^2 x height of water column 2 in well = 0.163 gal/ft. 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft. 6 in = 1.469 gal/ft. 1 cu. ft. = 7.48 gal. 1 gal = 3.785 L. 1L = 0.264 gal. 0.5L/min = 0.132 gal/min

Form 3010

HALEY ALDRICH

LOW FLOW SAMPLING FORM

PROJECT	A.B. Brown Generating Station	**H&A FILE NO.**	0129420
LOCATION	Evansville, Indiana	**PROJECT MGR.**	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	**FIELD REP**	F. Reed
CONTRACTOR	N/A	**DATE**	12/19/24

Sampling Data:

Well ID:	CCR-AP-4	Well Depth as Built:	ft	Well Diameter:	2 in	Purging Device:	Hydra sleeve
Start time:	12:30	Well Depth Measured:	35.03 ft	Initial Depth To Water:	21.65 ft	Field Parameter Device:	Horiba U-52
Finish Time:		Depth To Top Of Screen:	ft	Depth Of Pump Intake:	– ft	Tubing Present In Well:	☐ Yes ☒ No
		Depth To Bottom Of Screen:	ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	N/A

Time (24 hour)	Depth to Water (ft TOC)	Pump Setting (mL/min)	Purge Rate (mL/min)	Cumulative Purge Volume (Liters)	Temperature (°F)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Comments
Stabilized within →		[100 mL/min] to	[500 mL/min]	--	N/A	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
	*	Grab Sampled	with	a	Hydra sleeve	*					
13:15	–	–	–	–	18.43	6.29	1.01	2.15	83.1	2.11	
											CCR-AP-4-121924
											Sample Time: 12:50

well volume = 3.14 (PI) x radius^2 x height of water column 2 in well = 0.163 gal/ft. 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft. 6 in = 1.469 gal/ft. 1 cu ft = 7.48 gal. 1 gal = 3.785 L. 1L = 0.264 gal. 0.5L/min = 0.132 gal/min

LOW FLOW SAMPLING FORM

HALEY ALDRICH

PROJECT	A.B. Brown Generating Station	**H&A FILE NO.**	0129420
LOCATION	Evansville, Indiana	**PROJECT MGR.**	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	**FIELD REP**	F. Reed
CONTRACTOR	N/A	**DATE**	12/19/24

Sampling Data:

Well ID:	CCR-AP-5I	Well Depth as Built:	ft	Well Diameter:	2 in	Purging Device:	Tornado / Bladder
Start time:	16:12	Well Depth Measured:	85.40 ft	Initial Depth To Water:	25.93 ft	Field Parameter Device:	Horiba U-52
Finish Time:	19:00	Depth To Top Of Screen:	ft	Depth Of Pump Intake:	ft	Tubing Present In Well:	☐ Yes ☑ No
		Depth To Bottom Of Screen:	ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Time (24 hour)	Depth to Water (ft TOC)	Pump Setting (mL/min)	Purge Rate (mL/min)	Cumulative Purge Volume (Liters)	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Comments
Stabilized within →		[100 mL/min] to [500 mL/min]		--	N/A	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
* Pumped 32 gallons out prior to taking parameters and sampling. 3 well volumes = 29.10 gallons *											
17:50	30.94	Set up dedicated pump									
17:58	31.05	-	200	1.0	16.50	6.68	2.32	1.13	394	20	
18:03	29.03	-	200	2.0	16.64	6.68	2.33	0.82	147	11	
18:08	28.52	-	200	3.0	16.70	6.67	2.34	0.43	134	2	
18:13	28.18	-	200	4.0	16.76	6.67	2.35	0.32	137	-1	
											CCR-AP-5I-121924
											Sample Time: 18:15

well volume = 3.14 (PI) x radius^2 x height of water column 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu ft = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

Form 3010

HALEY ALDRICH

LOW FLOW SAMPLING FORM

PROJECT	A.B. Brown Generating Station	**H&A FILE NO.**	0129420
LOCATION	Evansville, Indiana	**PROJECT MGR.**	Neal Kochis
CLIENT	Southern Indiana Gas and Electric Company	**FIELD REP**	F. Reed
CONTRACTOR	N/A	**DATE**	12/19/24

Sampling Data:

Well ID:	CCR-AP-8I	Well Depth as Built:	ft	Well Diameter:	2 in	Purging Device:	Bladder
Start time:	14:45	Well Depth Measured:	ft	Initial Depth To Water:	53.64 ft	Field Parameter Device:	Horiba U-52
Finish Time:	16:10	Depth To Top Of Screen:	ft	Depth Of Pump ~~Intake~~ Top:	60.90 ft	Tubing Present In Well:	☒ Yes ☐ No
		Depth To Bottom Of Screen:	ft	Measuring Point:	Top of Casing (TOC)	Tubing Type:	Polyethylene

Time (24 hour)	Depth to Water (ft TOC)	Pump Setting (mL/min)	Purge Rate (mL/min)	Cumulative Purge Volume (Liters)	Temperature (~~°F~~) (°C)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Comments
Stabilized within →		[100 mL/min] to	[500 mL/min]	--	N/A	[+/- 0.1]	[+/- 3%]	[+/- 10%]	[+/- 10%]	[+/- 10]	
15:13	53.64	—	400	~2.0	16.51	6.58	1.02	0.00	4.5	-137	
15:18	53.64	—	400	~4.0	16.76	6.60	0.769	0.00	0.7	-162	
15:23	53.64	—	400	6.0	16.77	6.59	0.756	0.00	0.0	-175	
15:28	53.64	—	400	8.0	16.74	6.57	0.754	0.00	0.0	-186	
15:33	53.64	—	400	10.0	16.70	6.57	0.752	0.00	0.0	-195	
15:38	53.64	—	400	12.0	16.73	6.58	0.752	0.00	0.0	-200	
15:43	53.64	—	400	14.00	16.79	6.58	0.751	0.00	0.0	-204	
											CCR-AP-8I - 121924
											Sample Time: 15:45
											~15 L Purged

well volume = 3.14 (PI) x radius^2 x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft, 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min

APPENDIX C
Laboratory Analytical Reports

eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Todd Plating
Haley & Aldrich, Inc.
400 Augusta Street
Suite 100
Greenville, South Carolina 29601

Generated 1/26/2024 7:58:08 AM

JOB DESCRIPTION

CCR Groundwater Monitoring FB Culley East
FB Culley East

JOB NUMBER

180-167383-1

Eurofins Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh PA 15238

See page two for job notes and contact information.

my EOL

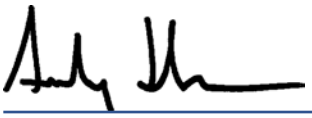
Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

PA Lab ID: 02-00416

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Pittsburgh Project Manager.

Authorization



Generated
1/26/2024 7:58:08 AM

Authorized for release by
Andy Johnson, Senior Project Manager
Andy.Johnson@et.eurofinsus.com
(615)818-9567

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Job ID: 180-167383-1 Eurofins Pittsburgh

Job Narrative
180-167383-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The sample was received on 12/23/2023 10:10 AM. Unless otherwise noted below, the sample arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 3.8°C

Receipt Exceptions
The container label for the following sample did not match the information listed on the Chain-of-Custody (COC): CCR-AP-1R (180-167383-1). The container labels list CCR-AP-1, while the COC lists CCR-AP-1R.

Gas Flow Proportional Counter
Method 9320_Ra228: Radium-228 batch 642707
The detection goal was not met for the following sample(s). Sample was prepped at a reduced volume due to the presence of matrix interferences: CCR-AP-1R (180-167383-1). Analytical results are reported with the detection limit achieved.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Rad
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Definitions/Glossary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-167383-1
SDG: FB Culley East

Qualifiers

Rad

Qualifier	Qualifier Description
G	The Sample MDC is greater than the requested RL.
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-167383-1
SDG: FB Culley East

Laboratory: Eurofins St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-25
ANAB	Dept. of Defense ELAP	L2305	04-06-25
ANAB	Dept. of Energy	L2305.01	04-06-25
ANAB	ISO/IEC 17025	L2305	04-06-25
Arizona	State	AZ0813	12-08-24
California	Los Angeles County Sanitation Districts	10259	06-30-22 *
California	State	2886	06-30-24
Connecticut	State	PH-0241	03-31-25
Florida	NELAP	E87689	06-30-24
HI - RadChem Recognition	State	n/a	06-30-24
Illinois	NELAP	200023	11-30-24
Iowa	State	373	12-01-24
Kansas	NELAP	E-10236	10-31-24
Kentucky (DW)	State	KY90125	12-31-24
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-24
Louisiana	NELAP	04080	06-30-22 *
Louisiana (All)	NELAP	04080	06-30-24
Louisiana (DW)	State	LA011	12-31-24
Maryland	State	310	09-30-24
Massachusetts	State	M-MO054	06-30-24
MI - RadChem Recognition	State	9005	06-30-24
Missouri	State	780	06-30-25
Nevada	State	MO000542020-1	07-31-24
New Jersey	NELAP	MO002	06-30-24
New Mexico	State	MO00054	06-30-24
New York	NELAP	11616	03-31-24
North Carolina (DW)	State	29700	07-31-24
North Dakota	State	R-207	06-30-24
Oklahoma	NELAP	9997	08-31-24
Oregon	NELAP	4157	09-01-24
Pennsylvania	NELAP	68-00540	02-28-24
South Carolina	State	85002001	06-30-24
Texas	NELAP	T104704193	07-31-24
US Fish & Wildlife	US Federal Programs	058448	07-31-24
USDA	US Federal Programs	P330-17-00028	05-18-26
Utah	NELAP	MO000542021-14	07-31-24
Virginia	NELAP	10310	06-15-25
Washington	State	C592	08-30-24
West Virginia DEP	State	381	01-31-24

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Sample Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-167383-1
SDG: FB Culley East

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
180-167383-1	CCR-AP-1R	Water	12/22/23 12:25	12/23/23 10:10

Method Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-167383-1
SDG: FB Culley East

Method	Method Description	Protocol	Laboratory
9315	Radium-226 (GFPC)	SW846	EET SL
9320	Radium-228 (GFPC)	SW846	EET SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	EET SL
PrecSep_0	Preparation, Precipitate Separation	None	EET SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	EET SL

Protocol References:

None = None

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-167383-1
SDG: FB Culley East

Client Sample ID: CCR-AP-1R

Date Collected: 12/22/23 12:25
Date Received: 12/23/23 10:10

Lab Sample ID: 180-167383-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			492.86 mL	1.0 g	642705	01/02/24 11:10	KAC	EET SL
Total/NA	Analysis	9315		1			645314	01/24/24 14:17	FLC	EET SL
	Instrument ID: GFPCRED									
Total/NA	Prep	PrecSep_0			492.86 mL	1.0 g	642707	01/02/24 11:14	KAC	EET SL
Total/NA	Analysis	9320		1			644701	01/18/24 11:42	FLC	EET SL
	Instrument ID: GFPCRED									
Total/NA	Analysis	Ra226_Ra228		1			645161	01/24/24 15:58	SCB	EET SL
	Instrument ID: NOEQUIP									

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Analyst References:

Lab: EET SL

Batch Type: Prep

KAC = Kevin Cox

Batch Type: Analysis

FLC = Fernando Cruz

SCB = Sarah Bernsen

Client Sample ID: CCR-AP-1R
Date Collected: 12/22/23 12:25
Date Received: 12/23/23 10:10

Lab Sample ID: 180-167383-1
Matrix: Water

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	5.36		0.649	0.809	1.00	0.285	pCi/L	01/02/24 11:10	01/24/24 14:17	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.8*		*30 - 110*	*01/02/24 11:10*	*01/24/24 14:17*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	9.08	G	2.35	2.49	1.00	2.44	pCi/L	01/02/24 11:14	01/18/24 11:42	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.8*		*30 - 110*	*01/02/24 11:14*	*01/18/24 11:42*	*1*
Y Carrier	*37.4*		*30 - 110*	*01/02/24 11:14*	*01/18/24 11:42*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	14.4		2.44	2.62	5.00	2.44	pCi/L		01/24/24 15:58	1

Method: 9315 - Radium-226 (GFPC)

Lab Sample ID: MB 160-642705/1-A
Matrix: Water
Analysis Batch: 645440

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 642705

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.03135	U	0.0829	0.0829	1.00	0.176	pCi/L	01/02/24 11:10	01/24/24 11:53	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.1*		*30 - 110*	*01/02/24 11:10*	*01/24/24 11:53*	*1*

Lab Sample ID: LCS 160-642705/2-A
Matrix: Water
Analysis Batch: 645441

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 642705

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	11.30		1.19	1.00	0.155	pCi/L	100	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*87.6*		*30 - 110*

Method: 9320 - Radium-228 (GFPC)

Lab Sample ID: MB 160-642707/1-A
Matrix: Water
Analysis Batch: 644701

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 642707

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.05854	U	0.310	0.310	1.00	0.565	pCi/L	01/02/24 11:14	01/18/24 11:38	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.1*		*30 - 110*	*01/02/24 11:14*	*01/18/24 11:38*	*1*
Y Carrier	*78.9*		*30 - 110*	*01/02/24 11:14*	*01/18/24 11:38*	*1*

Lab Sample ID: LCS 160-642707/2-A
Matrix: Water
Analysis Batch: 644701

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 642707

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			9.29	10.58		1.41	1.00	0.505	pCi/L	114	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*87.6*		*30 - 110*
Y Carrier	*79.6*		*30 - 110*

QC Association Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-167383-1
SDG: FB Culley East

Rad

Prep Batch: 642705

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-167383-1	CCR-AP-1R	Total/NA	Water	PrecSep-21	
MB 160-642705/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-642705/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 642707

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-167383-1	CCR-AP-1R	Total/NA	Water	PrecSep_0	
MB 160-642707/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-642707/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Eurofins Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone: 412-963-7058 Fax 412-963-2468

Chain of Custody Record

370472 eurofins Environment Testing

HARRISBURG PA

Client Information	Sampler: Hayley Torres	Lab PM: Johnson, Andy	Carrier Tracking No(s):	COC No: 180-97701-17191.1
Client Contact: Mark Breting	Phone:	E-Mail: Andy.Johnson@et.eurofinsus.com	State of Origin: IN	Page: Page 1 of 1
Company: Atlas Technical Consultants LLC	PWSID:			Job #:
Address: 7988 Centerpoint Drive Suite 100	Due Date Requested:			
City: Indianapolis	TAT Requested (days):			
State, Zip: IN, 46256	Compliance Project: Δ Yes Δ No			
Phone:	PO #: 0129420-032-001-01			
Email: mark.breting@atcassociates.com	WO #: See Chain			
Project Name: CCR Groundwater Monitoring FB Culley	Project #: 18016014			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	9040C, 9056A_ORGFM_28D		6020A, 7470A	2540C_Calcd - TDS by 2540C	9315_Ra226, 9320_Ra228		Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	D	N		D			
CCR-AP-1R	12-22-23	12:25	G	W	N	N					✓			

180-167383 Chain of Custody

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements.

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by	Date/Time	Company	Received by	Date/Time	Company
1	Hayley Torres	12-22-23 / 13:30	ATLAS	Fedex	12-22-23 / 13:30	
2					12-23-23 1010	ED.TMG
3		Date/Time:			Date/Time.	

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021


434 MTW EXP 08/24
ORIGIN ID:GTYA (317) 313-8306
MARK BRETING
CENTER POINT ENERGY CULLEY
3711 DARLINGTON ROAD
NEWBURGH, IN 47630
UNITED STATES US
SHIP DATE: 19DEC23
ACTWGT: 33.00 LB MAN
CAD: 0128689/CAFE3511
TO SAMPLE RECEIVING
EUROFINS ENVIRONMENT TESTING NE
301 ALPHA DRIVE
RIDC PARK
PITTSBURGH PA 152382907
(412) 963-7058
INV:
PO:
REF:
DEPT:
RMA:
Uncorrected temp °C
Thermometer ID 4.4 21
CF -0.1 Initials DB
PT-WI-SR-001 effective 11/8/18
RT 634 1 13:30 A
7717 12.23
FZ
FedEx
TRK# 0221 6772 2900 7717
SATURDAY 1:30P
PRIORITY OVERNIGHT
XO AGCA
15238
PA-US
PIT
EXP 04/24


180-167383 Waybill

Eurofins Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone: 412-963-7058 Fax: 412-963-2468

Chain of Custody Record

eurofins | Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Johnson, Andy	Carrier Tracking No(s):	COC No: 180-502839.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Andy.Johnson@et.eurofinsus.com	State of Origin: Indiana	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 180-167383-1
Address: 13715 Rider Trail North, ,	Due Date Requested: 1/30/2024			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: CCR Groundwater Monitoring FB Culley East	Project #: 18016014			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	9315_Ra226/PrecSep_21 Standard Target List	9320_Ra228/PrecSep_0 Standard Target List	Ra226Ra228_GFPC	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
CCR-AP-1R (180-167383-1)	12/22/23	12:25 Eastern		Water			X	X	X	2	

Note: Since laboratory accreditations are subject to change, Eurofins Pittsburgh places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Pittsburgh laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Pittsburgh attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Pittsburgh.

Possible Hazard Identification: Unconfirmed	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month): ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by: FEDEX	Date/Time:	Company	Received by: Sierra Woodington FEDEX	Date/Time: DEC 28 2023 0910	Company: ENSR
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

1/26/2024

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 180-167383-1
SDG Number: FB Culley East

Login Number: 167383
List Number: 1
Creator: Watson, Debbie

List Source: Eurofins Pittsburgh

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 180-167383-1
SDG Number: FB Culley East

Login Number: 167383
List Number: 2
Creator: Worthington, Sierra M

List Source: Eurofins St. Louis
List Creation: 12/28/23 11:06 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

PREPARED FOR

Attn: Todd Plating
Haley & Aldrich, Inc.
400 Augusta Street
Suite 100
Greenville, South Carolina 29601

Generated 6/14/2024 2:50:14 PM

JOB DESCRIPTION

CCR Groundwater Monitoring FB Culley East
FB Culley East

JOB NUMBER

180-173844-1

Eurofins Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh PA 15238

See page two for job notes and contact information.

my EOL

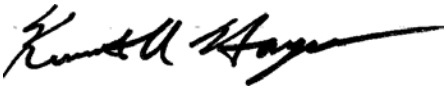
Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

PA Lab ID: 02-00416

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Pittsburgh Project Manager.

Authorization



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6/14/2024 2:50:14 PM

Authorized for release by
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Ken.Hayes@et.eurofinsus.com
Designee for
Andy Johnson, Senior Project Manager
Andy.Johnson@et.eurofinsus.com
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Table of Contents

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Job ID: 180-173844-1 Eurofins Pittsburgh

Job Narrative
180-173844-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 5/10/2024 9:30 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperatures of the 3 coolers at receipt time were 3.0°C, 4.0°C and 4.2°C.

Receipt Exceptions
The reference method requires samples to have a pH of less than 2. The following sample was received with a pH of 7: CCR-AP-2 (180-173844-2). The sample was adjusted to the appropriate pH in the laboratory.

Affected container:
A-2

This container was not received. CCR-AP-8I (180-173844-7)

A second 500mL unpreserved container was received for this sample.
CCR-AP-9 (180-173844-8)

The sample in this container is a different color than the sample material in the other containers.

CCR-AP-9 (180-173844-8)

The container label for the following sample container was collected on 5/8/2024 at 1200 but the COC says this sample was collected on 5/8/2024 at 1140. CCR-AP-9 (180-173844-8).

Sample containers are not completely filled. CCR-AP-4 (180-173844-4) and CCR-AP-9 (180-173844-8)

Gas Flow Proportional Counter
Method 9320_Ra228: Radium-228 prep batch 160-661792:

The detection goal was not met for the following samples due to the reduced sample volume attributed to the presence of matrix interferences: CCR-AP-1R (180-173844-1), CCR-AP-2 (180-173844-2) and CCR-AP-9 (180-173844-8) . Analytical results are reported with the detection limit achieved.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Rad
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Job ID: 180-173844-2 Eurofins Pittsburgh

Job Narrative
180-173844-2

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 5/10/2024 9:30 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperatures of the 3 coolers at receipt time were 3.0°C, 4.0°C and 4.2°C.

Receipt Exceptions
The reference method requires samples to have a pH of less than 2. The container for radiological testing for the following sample was received with a pH of 7: CCR-AP-2 (180-173844-2). This container was adjusted to the appropriate pH in the laboratory.

A second 500mL unpreserved container was received for this sample. CCR-AP-9 (180-173844-8)

The sample in one of the 500ml unpreserved containers is a different color than the sample material in the other containers. CCR-AP-9 (180-173844-8)

The container label for the following sample container shows that it was collected on 5/8/2024 at 1200 but the COC says this sample was collected on 5/8/2024 at 1140. CCR-AP-9 (180-173844-8).

Sample containers are not completely filled. CCR-AP-4 (180-173844-4) and CCR-AP-9 (180-173844-8)

Per client instruction, the ID for sample -7 was changed to CCR-AP-8I.

HPLC/IC
Method 9056A_ORGFM_28D: The following sample was diluted to bring the concentration of target analytes within the calibration range: CCR-AP-6I (180-173844-6). Elevated reporting limits (RLs) are provided.

Method 9056A_ORGFM_28D: The following samples were diluted due to the nature of the sample matrix: CCR-AP-1R (180-173844-1), CCR-AP-2 (180-173844-2), CCR-AP-8I (180-173844-7), (180-173881-D-1), (180-173881-D-1 MS) and (180-173881-D-1 MSD). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Metals
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry
Method 2540C_Calcd: Use of a larger volume of sample resulted in overload of the filter; therefore, a sample volume less than 100mL was utilized for this procedure and produced less than the 200mg dried residue specified by the SM 2540C Total Dissolved Solids reference method. The following samples were impacted: CCR-AP-1R (180-173844-1) and CCR-AP-2 (180-173844-2).

Method 2540C_Calcd: The sample did not reach a stable weight following 3 cycles of heating, cooling, and desiccation. The cycle 3 weight was used to calculate the Total Dissolved Solids for the sample result. CCR-AP-3 (180-173844-3) and CCR-AP-6I (180-173844-6)

Method 2540C_Calcd: The sample did not reach a stable weight following 3 cycles of heating, cooling, and desiccation. The cycle 3 weight was used to calculate the Total Dissolved Solids for the sample result. CCR-AP-2 (180-173844-2), CCR-AP-4

Job ID: 180-173844-2 (Continued) Eurofins Pittsburgh

(180-173844-4), CCR-AP-8I (180-173844-7) and CCR-AP-9 (180-173844-8)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Definitions/Glossary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173844-1
SDG: FB Culley East

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
HF	Parameter with a holding time of 15 minutes. Test performed by laboratory at client's request. Sample was analyzed outside of hold time.

Rad

Qualifier	Qualifier Description
G	The Sample MDC is greater than the requested RL.
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173844-1
SDG: FB Culley East

Laboratory: Eurofins Pittsburgh

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Arkansas DEQ	State	19-033-0	06-27-24
California	State	2891	04-30-24 *
Connecticut	State	PH-0688	09-30-24
Florida	NELAP	E871008	06-30-24
Georgia	State	PA 02-00416	04-30-25
Illinois	NELAP	004375	07-31-25
Kansas	NELAP	E-10350	01-31-25
Kentucky (UST)	State	162013	04-30-23 *
Kentucky (WW)	State	KY98043	12-31-24
Louisiana	NELAP	04041	06-30-22 *
Louisiana (All)	NELAP	04041	06-30-24
Maine	State	PA00164	03-06-26
Minnesota	NELAP	042-999-482	12-31-24
New Hampshire	NELAP	2030	04-04-24 *
New Jersey	NELAP	PA005	06-30-24
New York	NELAP	11182	04-01-25
North Carolina (WW/SW)	State	434	12-31-24
North Dakota	State	R-227	04-30-24 *
Oregon	NELAP	PA-2151	02-06-25
Pennsylvania	NELAP	02-00416	04-30-25
Rhode Island	State	LAO00362	01-01-25
South Carolina	State	89014	04-30-25
Texas	NELAP	T104704528	03-31-25
US Fish & Wildlife	US Federal Programs	058448	03-31-24 *
USDA	US Federal Programs	P330-16-00211	04-11-26
Utah	NELAP	PA001462019-8	05-31-24
Virginia	NELAP	10043	07-14-24
West Virginia DEP	State	142	01-31-25
Wisconsin	State	998027800	08-31-24

Laboratory: Eurofins Cleveland

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	2927	02-28-25
Georgia	State	4062	02-27-25
Illinois	NELAP	200004	07-31-24
Iowa	State	421	06-01-25
Kentucky (UST)	State	112225	02-27-25
Kentucky (WW)	State	KY98016	12-30-24
Minnesota	NELAP	039-999-348	12-31-24
New Jersey	NELAP	OH001	06-30-24
New York	NELAP	10975	04-02-25
Ohio VAP	State	ORELAP 4062	02-27-25
Oregon	NELAP	4062	02-27-25
Pennsylvania	NELAP	68-00340	08-31-24
Texas	NELAP	T104704517-22-19	08-31-24
USDA	US Federal Programs	P330-18-00281	01-05-27
Virginia	NELAP	460175	09-14-24
West Virginia DEP	State	210	12-31-24

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173844-1
SDG: FB Culley East

Laboratory: Eurofins St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-25
ANAB	Dept. of Defense ELAP	L2305	04-06-25
ANAB	Dept. of Energy	L2305.01	04-08-25
ANAB	ISO/IEC 17025	L2305	04-06-25
Arizona	State	AZ0813	12-08-24
California	Los Angeles County Sanitation Districts	10259	06-30-22 *
California	State	2886	06-30-24
Connecticut	State	PH-0241	03-31-25
Florida	NELAP	E87689	06-30-24
HI - RadChem Recognition	State	n/a	06-30-24
Illinois	NELAP	200023	11-30-24
Iowa	State	373	12-01-24
Kansas	NELAP	E-10236	10-31-24
Kentucky (DW)	State	KY90125	12-31-24
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-24
Louisiana	NELAP	04080	06-30-22 *
Louisiana (All)	NELAP	04080	06-30-24
Louisiana (DW)	State	LA011	12-31-24
Maryland	State	310	09-30-24
Massachusetts	State	M-MO054	06-30-24
MI - RadChem Recognition	State	9005	06-30-24
Missouri	State	780	06-30-25
Nevada	State	MO00054	07-31-24
New Jersey	NELAP	MO002	06-30-24
New Mexico	State	MO00054	06-30-24
New York	NELAP	11616	03-31-25
North Carolina (DW)	State	29700	07-31-24
North Dakota	State	R-207	06-30-24
Oklahoma	NELAP	9997	08-31-24
Oregon	NELAP	4157	09-01-24
Pennsylvania	NELAP	68-00540	02-28-25
South Carolina	State	85002001	06-30-24
Texas	NELAP	T104704193	07-31-24
US Fish & Wildlife	US Federal Programs	058448	07-31-24
USDA	US Federal Programs	P330-17-00028	05-18-26
Utah	NELAP	MO00054	07-31-24
Virginia	NELAP	460230	06-15-25
Washington	State	C592	08-30-24
West Virginia DEP	State	381	10-31-24

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Sample Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173844-1
SDG: FB Culley East

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
180-173844-1	CCR-AP-1R	Water	05/08/24 11:20	05/10/24 09:30
180-173844-2	CCR-AP-2	Water	05/08/24 10:20	05/10/24 09:30
180-173844-3	CCR-AP-3	Water	05/07/24 14:00	05/10/24 09:30
180-173844-4	CCR-AP-4	Water	05/08/24 09:45	05/10/24 09:30
180-173844-5	CCR-AP-6	Water	05/07/24 13:30	05/10/24 09:30
180-173844-6	CCR-AP-6I	Water	05/07/24 13:15	05/10/24 09:30
180-173844-7	CCR-AP-8I	Water	05/08/24 11:40	05/10/24 09:30
180-173844-8	CCR-AP-9	Water	05/08/24 12:00	05/10/24 09:30

Method Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173844-1
SDG: FB Culley East

Method	Method Description	Protocol	Laboratory
9315	Radium-226 (GFPC)	SW846	EET SL
9320	Radium-228 (GFPC)	SW846	EET SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	EET SL
PrecSep_0	Preparation, Precipitate Separation	None	EET SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	EET SL

Protocol References:

None = None

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173844-1
SDG: FB Culley East

Client Sample ID: CCR-AP-1R

Lab Sample ID: 180-173844-1

Date Collected: 05/08/24 11:20
Matrix: Water
Date Received: 05/10/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		5	1 mL	1 mL	468668	05/15/24 17:58	AM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			613436	05/17/24 04:12	KLC	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			613785	05/20/24 13:36	RKT	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	468856	05/16/24 13:30	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 11:29	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468497	05/13/24 16:30	SNR	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	468592	05/14/24 14:01	LWM	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			503.71 mL	1.0 g	661791	05/15/24 09:14	MLT	EET SL
Total/NA	Analysis	9315		1			665614	06/10/24 16:48	SCB	EET SL
	Instrument ID: GFPCBLUE									
Total/NA	Prep	PrecSep_0			503.71 mL	1.0 g	661792	05/15/24 09:17	MLT	EET SL
Total/NA	Analysis	9320		1			665182	06/07/24 11:52	SCB	EET SL
	Instrument ID: GFPCPURPLE									
Total/NA	Analysis	Ra226_Ra228		1			665833	06/12/24 08:25	FLC	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: CCR-AP-2

Lab Sample ID: 180-173844-2

Date Collected: 05/08/24 10:20
Matrix: Water
Date Received: 05/10/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	468668	05/15/24 22:53	AM	EET PIT
	Instrument ID: CHICS2100B									
Total/NA	Analysis	EPA 9056A		10	1 mL	1 mL	468668	05/15/24 23:08	AM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			613436	05/17/24 04:17	KLC	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			613785	05/20/24 13:38	RKT	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	468856	05/16/24 13:30	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 11:30	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468497	05/13/24 16:25	SNR	EET PIT
	Instrument ID: OZ									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173844-1
SDG: FB Culley East

Client Sample ID: CCR-AP-2

Date Collected: 05/08/24 10:20
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	468592	05/14/24 14:01	LWM	EET PIT
Total/NA	Prep	PrecSep-21			508.03 mL	1.0 g	661791	05/15/24 09:14	MLT	EET SL
Total/NA	Analysis	9315		1			665590	06/10/24 16:39	SCB	EET SL
	Instrument ID: GFPCPURPLE									
Total/NA	Prep	PrecSep_0			508.03 mL	1.0 g	661792	05/15/24 09:17	MLT	EET SL
Total/NA	Analysis	9320		1			665182	06/07/24 11:52	SCB	EET SL
	Instrument ID: GFPCPURPLE									
Total/NA	Analysis	Ra226_Ra228		1			665833	06/12/24 08:25	FLC	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: CCR-AP-3

Date Collected: 05/07/24 14:00
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	468504	05/15/24 05:12	M1D	EET PIT
	Instrument ID: INTEGRION									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			613436	05/17/24 04:21	KLC	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			613785	05/20/24 13:41	RKT	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	468856	05/16/24 13:30	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 11:31	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468497	05/13/24 17:37	SNR	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	468587	05/14/24 13:45	LWM	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			751.56 mL	1.0 g	661791	05/15/24 09:14	MLT	EET SL
Total/NA	Analysis	9315		1			665297	06/10/24 19:02	SCB	EET SL
	Instrument ID: GFPCRED									
Total/NA	Prep	PrecSep_0			751.56 mL	1.0 g	661792	05/15/24 09:17	MLT	EET SL
Total/NA	Analysis	9320		1			665182	06/07/24 11:52	SCB	EET SL
	Instrument ID: GFPCPURPLE									
Total/NA	Analysis	Ra226_Ra228		1			665833	06/12/24 08:25	FLC	EET SL
	Instrument ID: NOEQUIP									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173844-1
SDG: FB Culley East

Client Sample ID: CCR-AP-4

Date Collected: 05/08/24 09:45
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	468668	05/15/24 21:54	AM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			613436	05/17/24 04:25	KLC	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			613785	05/20/24 13:43	RKT	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	468856	05/16/24 13:30	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 11:36	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468497	05/13/24 17:33	SNR	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	468592	05/14/24 14:01	LWM	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			750.32 mL	1.0 g	661791	05/15/24 09:14	MLT	EET SL
Total/NA	Analysis	9315		1			665297	06/10/24 19:03	SCB	EET SL
	Instrument ID: GFPCRED									
Total/NA	Prep	PrecSep_0			750.32 mL	1.0 g	661792	05/15/24 09:17	MLT	EET SL
Total/NA	Analysis	9320		1			665182	06/07/24 11:52	SCB	EET SL
	Instrument ID: GFPCPURPLE									
Total/NA	Analysis	Ra226_Ra228		1			665833	06/12/24 08:25	FLC	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: CCR-AP-6

Date Collected: 05/07/24 13:30
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-5

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	468504	05/15/24 01:30	M1D	EET PIT
	Instrument ID: INTEGRION									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			613436	05/17/24 04:38	KLC	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			613785	05/20/24 13:46	RKT	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	468856	05/16/24 13:30	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 11:37	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468497	05/13/24 17:28	SNR	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	468587	05/14/24 13:45	LWM	EET PIT
	Instrument ID: NOEQUIP									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173844-1
SDG: FB Culley East

Client Sample ID: CCR-AP-6

Date Collected: 05/07/24 13:30
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-5

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			751.17 mL	1.0 g	661791	05/15/24 09:14	MLT	EET SL
Total/NA	Analysis	9315		1			665297	06/10/24 19:03	SCB	EET SL
	Instrument ID: GFPCRED									
Total/NA	Prep	PrecSep_0			751.17 mL	1.0 g	661792	05/15/24 09:17	MLT	EET SL
Total/NA	Analysis	9320		1			665181	06/07/24 11:39	SCB	EET SL
	Instrument ID: GFPCORANGE									
Total/NA	Analysis	Ra226_Ra228		1			665833	06/12/24 08:25	FLC	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: CCR-AP-6I

Date Collected: 05/07/24 13:15
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-6

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	468504	05/14/24 23:21	M1D	EET PIT
	Instrument ID: INTEGRION									
Total/NA	Analysis	EPA 9056A		10	1 mL	1 mL	468504	05/14/24 23:39	M1D	EET PIT
	Instrument ID: INTEGRION									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6010D		5			613436	05/17/24 08:23	KLC	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			613785	05/20/24 13:49	RKT	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	468856	05/16/24 13:30	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 11:38	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468300	05/11/24 10:21	BAB	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	468587	05/14/24 13:45	LWM	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			998.97 mL	1.0 g	661791	05/15/24 09:14	MLT	EET SL
Total/NA	Analysis	9315		1			665297	06/10/24 19:03	SCB	EET SL
	Instrument ID: GFPCRED									
Total/NA	Prep	PrecSep_0			998.97 mL	1.0 g	661792	05/15/24 09:17	MLT	EET SL
Total/NA	Analysis	9320		1			665181	06/07/24 13:04	SCB	EET SL
	Instrument ID: GFPCORANGE									
Total/NA	Analysis	Ra226_Ra228		1			665833	06/12/24 08:25	FLC	EET SL
	Instrument ID: NOEQUIP									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173844-1
SDG: FB Culley East

Client Sample ID: CCR-AP-8I
Date Collected: 05/08/24 11:40
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		2	1 mL	1 mL	468668	05/15/24 19:41	AM	EET PIT
	Instrument ID: CHICS2100B									
Total/NA	Analysis	EPA 9056A		20	1 mL	1 mL	468668	05/15/24 19:56	AM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6010D		5			613436	05/17/24 08:27	KLC	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			613785	05/20/24 13:51	RKT	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	468856	05/16/24 13:30	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 11:39	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468497	05/13/24 17:23	SNR	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	468592	05/14/24 14:01	LWM	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			750.38 mL	1.0 g	661791	05/15/24 09:14	MLT	EET SL
Total/NA	Analysis	9315		1			665297	06/10/24 19:04	SCB	EET SL
	Instrument ID: GFPCRED									
Total/NA	Prep	PrecSep_0			750.38 mL	1.0 g	661792	05/15/24 09:17	MLT	EET SL
Total/NA	Analysis	9320		1			665181	06/07/24 11:39	SCB	EET SL
	Instrument ID: GFPCORANGE									
Total/NA	Analysis	Ra226_Ra228		1			665833	06/12/24 08:25	FLC	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: CCR-AP-9
Date Collected: 05/08/24 12:00
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-8
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	468668	05/15/24 22:24	AM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			613436	05/17/24 04:56	KLC	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			613785	05/20/24 13:54	RKT	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	468860	05/16/24 13:30	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 11:03	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468300	05/11/24 11:29	BAB	EET PIT
	Instrument ID: OZ									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173844-1
SDG: FB Culley East

Client Sample ID: CCR-AP-9

Date Collected: 05/08/24 12:00
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-8

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	468592	05/14/24 14:01	LWM	EET PIT
Total/NA	Prep	PrecSep-21			505.77 mL	1.0 g	661791	05/15/24 09:14	MLT	EET SL
Total/NA	Analysis	9315		1	1.0 mL	1.0 mL	665297	06/10/24 19:05	SCB	EET SL
	Instrument ID: GFPCRED									
Total/NA	Prep	PrecSep_0			505.77 mL	1.0 g	661792	05/15/24 09:17	MLT	EET SL
Total/NA	Analysis	9320		1			665181	06/07/24 11:40	SCB	EET SL
	Instrument ID: GFPCORANGE									
Total/NA	Analysis	Ra226_Ra228		1			665833	06/12/24 08:25	FLC	EET SL
	Instrument ID: NOEQUIP									

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Analyst References:

Lab: EET CLE
- Batch Type: Prep
  - GK = Grace Kessler
- Batch Type: Analysis
  - KLC = Karen Counts
  - RKT = Roger Toth

Lab: EET PIT
- Batch Type: Prep
  - SJM = Shannon Mueller
- Batch Type: Analysis
  - AM = Adzuira Musule
  - BAB = Brooke Batyi
  - LWM = Leslie McIntire
  - M1D = Maureen Donlin
  - MTW = Michael Wesoloski
  - SNR = Sabra Richart

Lab: EET SL
- Batch Type: Prep
  - MLT = Michaela Tiemeyer
- Batch Type: Analysis
  - FLC = Fernando Cruz
  - SCB = Sarah Bernsen

Client Sample ID: CCR-AP-1R
Date Collected: 05/08/24 11:20
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-1
Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	32		5.0	3.6	mg/L			05/15/24 17:58	5
Fluoride	0.25	J	0.50	0.13	mg/L			05/15/24 17:58	5
Sulfate	100		5.0	3.8	mg/L			05/15/24 17:58	5

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	0.75		0.10	0.057	mg/L		05/15/24 14:00	05/17/24 04:12	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00073	J	0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 13:36	1
Arsenic	0.0059		0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 13:36	1
Barium	0.35		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 13:36	1
Beryllium	0.00095	J	0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 13:36	1
Cadmium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:36	1
Calcium	61		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 13:36	1
Chromium	0.021		0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 13:36	1
Cobalt	0.013		0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 13:36	1
Lead	0.013		0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 13:36	1
Lithium	0.036		0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 13:36	1
Molybdenum	0.0053		0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 13:36	1
Selenium	ND		0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 13:36	1
Thallium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:36	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/16/24 13:30	05/20/24 11:29	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	480		20	20	mg/L			05/14/24 14:01	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	7.4	HF	0.1	0.1	SU			05/13/24 16:30	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	2.32		0.485	0.528	1.00	0.289	pCi/L	05/15/24 09:14	06/10/24 16:48	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.1*		*30 - 110*	*05/15/24 09:14*	*06/10/24 16:48*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	4.98	G	1.26	1.34	1.00	1.35	pCi/L	05/15/24 09:17	06/07/24 11:52	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.1*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:52*	*1*

Client Sample ID: CCR-AP-1R
Lab Sample ID: 180-173844-1

Date Collected: 05/08/24 11:20
Matrix: Water
Date Received: 05/10/24 09:30

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*75.9*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:52*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**7.30**		1.35	1.44	5.00	1.35	pCi/L		06/12/24 08:25	1

Client Sample ID: CCR-AP-2

Date Collected: 05/08/24 10:20
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-2

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	250		10	7.1	mg/L			05/15/24 23:08	10
Fluoride	0.27		0.10	0.026	mg/L			05/15/24 22:53	1
Sulfate	340		10	7.6	mg/L			05/15/24 23:08	10

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	8.1		0.10	0.057	mg/L		05/15/24 14:00	05/17/24 04:17	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0011	J	0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 13:38	1
Arsenic	0.025		0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 13:38	1
Barium	0.83		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 13:38	1
Beryllium	0.0037		0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 13:38	1
Cadmium	0.0030		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:38	1
Calcium	230		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 13:38	1
Chromium	0.11		0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 13:38	1
Cobalt	0.048		0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 13:38	1
Lead	0.056		0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 13:38	1
Lithium	0.085		0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 13:38	1
Molybdenum	0.0065		0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 13:38	1
Selenium	0.0027	J	0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 13:38	1
Thallium	0.0010		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:38	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00016	J	0.00020	0.00013	mg/L		05/16/24 13:30	05/20/24 11:30	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	1500		20	20	mg/L			05/14/24 14:01	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	6.7	HF	0.1	0.1	SU			05/13/24 16:25	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.65		0.417	0.442	1.00	0.351	pCi/L	05/15/24 09:14	06/10/24 16:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.1*		*30 - 110*	*05/15/24 09:14*	*06/10/24 16:39*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.57	G	0.840	0.852	1.00	1.16	pCi/L	05/15/24 09:17	06/07/24 11:52	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.1*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:52*	*1*

Client Sample ID: CCR-AP-2
Date Collected: 05/08/24 10:20
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-2
Matrix: Water

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*72.1*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:52*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**3.22**		0.938	0.960	5.00	1.16	pCi/L		06/12/24 08:25	1

Client Sample ID: CCR-AP-3
Lab Sample ID: 180-173844-3

Date Collected: 05/07/24 14:00
Matrix: Water
Date Received: 05/10/24 09:30

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	27		1.0	0.71	mg/L			05/15/24 05:12	1
Fluoride	0.35		0.10	0.026	mg/L			05/15/24 05:12	1
Sulfate	32		1.0	0.76	mg/L			05/15/24 05:12	1

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	0.28		0.10	0.057	mg/L		05/15/24 14:00	05/17/24 04:21	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 13:41	1
Arsenic	0.051		0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 13:41	1
Barium	0.38		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 13:41	1
Beryllium	ND		0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 13:41	1
Cadmium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:41	1
Calcium	150		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 13:41	1
Chromium	0.0031	J	0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 13:41	1
Cobalt	0.0061		0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 13:41	1
Lead	0.00097	J	0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 13:41	1
Lithium	0.0028	J	0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 13:41	1
Molybdenum	0.0093		0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 13:41	1
Selenium	0.0016	J	0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 13:41	1
Thallium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:41	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/16/24 13:30	05/20/24 11:31	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	730		10	10	mg/L			05/14/24 13:45	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	7.1	HF	0.1	0.1	SU			05/13/24 17:37	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.400		0.176	0.180	1.00	0.183	pCi/L	05/15/24 09:14	06/10/24 19:02	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.1*		*30 - 110*	*05/15/24 09:14*	*06/10/24 19:02*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.495	U	0.459	0.461	1.00	0.722	pCi/L	05/15/24 09:17	06/07/24 11:52	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.1*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:52*	*1*

Client Sample ID: CCR-AP-3
Date Collected: 05/07/24 14:00
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-3
Matrix: Water

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*74.4*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:52*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**0.896**		0.492	0.495	5.00	0.722	pCi/L		06/12/24 08:25	1

Client Sample ID: CCR-AP-4
Date Collected: 05/08/24 09:45
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-4
Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**32**		1.0	0.71	mg/L			05/15/24 21:54	1
Fluoride	**0.61**		0.10	0.026	mg/L			05/15/24 21:54	1
Sulfate	**73**		1.0	0.76	mg/L			05/15/24 21:54	1

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**1.1**		0.10	0.057	mg/L		05/15/24 14:00	05/17/24 04:25	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 13:43	1
Arsenic	**0.027**		0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 13:43	1
Barium	**0.53**		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 13:43	1
Beryllium	ND		0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 13:43	1
Cadmium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:43	1
Calcium	**130**		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 13:43	1
Chromium	ND		0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 13:43	1
Cobalt	**0.0028**		0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 13:43	1
Lead	ND		0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 13:43	1
Lithium	**0.0045**	**J**	0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 13:43	1
Molybdenum	**0.017**		0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 13:43	1
Selenium	ND		0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 13:43	1
Thallium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:43	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/16/24 13:30	05/20/24 11:36	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	**690**		10	10	mg/L			05/14/24 14:01	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**7.0**	**HF**	0.1	0.1	SU			05/13/24 17:33	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.337**		0.167	0.170	1.00	0.186	pCi/L	05/15/24 09:14	06/10/24 19:03	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.6*		*30 - 110*	*05/15/24 09:14*	*06/10/24 19:03*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.869	U	0.641	0.646	1.00	0.985	pCi/L	05/15/24 09:17	06/07/24 11:52	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.6*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:52*	*1*

Client Sample ID: CCR-AP-4
Date Collected: 05/08/24 09:45
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-4
Matrix: Water

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Y Carrier	75.5		30 - 110	05/15/24 09:17	06/07/24 11:52	1

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.21		0.662	0.668	5.00	0.985	pCi/L		06/12/24 08:25	1

Client Sample ID: CCR-AP-6

Date Collected: 05/07/24 13:30
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-5

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	36		1.0	0.71	mg/L			05/15/24 01:30	1
Fluoride	0.37		0.10	0.026	mg/L			05/15/24 01:30	1
Sulfate	46		1.0	0.76	mg/L			05/15/24 01:30	1

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	0.66		0.10	0.057	mg/L		05/15/24 14:00	05/17/24 04:38	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00082	J	0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 13:46	1
Arsenic	0.057		0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 13:46	1
Barium	0.43		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 13:46	1
Beryllium	ND		0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 13:46	1
Cadmium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:46	1
Calcium	110		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 13:46	1
Chromium	0.0027	J	0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 13:46	1
Cobalt	0.0034		0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 13:46	1
Lead	0.0012		0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 13:46	1
Lithium	0.0057	J	0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 13:46	1
Molybdenum	0.043		0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 13:46	1
Selenium	ND		0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 13:46	1
Thallium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:46	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/16/24 13:30	05/20/24 11:37	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	530		10	10	mg/L			05/14/24 13:45	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	7.2	HF	0.1	0.1	SU			05/13/24 17:28	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.541		0.228	0.233	1.00	0.274	pCi/L	05/15/24 09:14	06/10/24 19:03	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.6*		*30 - 110*	*05/15/24 09:14*	*06/10/24 19:03*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.169	U	0.446	0.446	1.00	0.789	pCi/L	05/15/24 09:17	06/07/24 11:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*85.6*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:39*	*1*

Client Sample ID: CCR-AP-6
Lab Sample ID: 180-173844-5

Date Collected: 05/07/24 13:30
Matrix: Water
Date Received: 05/10/24 09:30

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*78.9*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:39*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.710	U	0.501	0.503	5.00	0.789	pCi/L		06/12/24 08:25	1

Client Sample ID: CCR-AP-6I

Date Collected: 05/07/24 13:15
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-6

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**87**		1.0	0.71	mg/L			05/14/24 23:21	1
Fluoride	**0.13**		0.10	0.026	mg/L			05/14/24 23:21	1
Sulfate	**430**		10	7.6	mg/L			05/14/24 23:39	10

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**15**		0.50	0.29	mg/L		05/15/24 14:00	05/17/24 08:23	5

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 13:49	1
Arsenic	**0.0057**		0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 13:49	1
Barium	**0.041**		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 13:49	1
Beryllium	ND		0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 13:49	1
Cadmium	**0.00028**	**J**	0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:49	1
Calcium	**250**		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 13:49	1
Chromium	ND		0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 13:49	1
Cobalt	**0.00062**	**J**	0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 13:49	1
Lead	ND		0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 13:49	1
Lithium	**0.083**		0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 13:49	1
Molybdenum	**0.86**		0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 13:49	1
Selenium	ND		0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 13:49	1
Thallium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:49	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/16/24 13:30	05/20/24 11:38	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	**1200**		10	10	mg/L			05/14/24 13:45	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**7.4**	**HF**	0.1	0.1	SU			05/11/24 10:21	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.159	U	0.114	0.115	1.00	0.161	pCi/L	05/15/24 09:14	06/10/24 19:03	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.0*		*30 - 110*	*05/15/24 09:14*	*06/10/24 19:03*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.536**		0.366	0.370	1.00	0.535	pCi/L	05/15/24 09:17	06/07/24 13:04	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.0*		*30 - 110*	*05/15/24 09:17*	*06/07/24 13:04*	*1*

Client Sample ID: CCR-AP-6I
Date Collected: 05/07/24 13:15
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-6
Matrix: Water

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*78.9*		*30 - 110*	*05/15/24 09:17*	*06/07/24 13:04*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**0.695**		0.383	0.387	5.00	0.535	pCi/L		06/12/24 08:25	1

Client Sample ID: CCR-AP-8I

Date Collected: 05/08/24 11:40
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-7

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**180**		2.0	1.4	mg/L			05/15/24 19:41	2
Fluoride	**0.12**	**J**	0.20	0.052	mg/L			05/15/24 19:41	2
Sulfate	**1100**		20	15	mg/L			05/15/24 19:56	20

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**33**		0.50	0.29	mg/L		05/15/24 14:00	05/17/24 08:27	5

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 13:51	1
Arsenic	**0.0013**	**J**	0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 13:51	1
Barium	**0.34**		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 13:51	1
Beryllium	ND		0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 13:51	1
Cadmium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:51	1
Calcium	**490**		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 13:51	1
Chromium	ND		0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 13:51	1
Cobalt	**0.00065**	**J**	0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 13:51	1
Lead	ND		0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 13:51	1
Lithium	**0.17**		0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 13:51	1
Molybdenum	**0.29**		0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 13:51	1
Selenium	ND		0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 13:51	1
Thallium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:51	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/16/24 13:30	05/20/24 11:39	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	**2400**		20	20	mg/L			05/14/24 14:01	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**7.3**	**HF**	0.1	0.1	SU			05/13/24 17:23	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.804**		0.216	0.228	1.00	0.153	pCi/L	05/15/24 09:14	06/10/24 19:04	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*99.0*		*30 - 110*	*05/15/24 09:14*	*06/10/24 19:04*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.15**		0.562	0.572	1.00	0.787	pCi/L	05/15/24 09:17	06/07/24 11:39	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*99.0*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:39*	*1*

Client Sample ID: CCR-AP-8I
Date Collected: 05/08/24 11:40
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-7
Matrix: Water

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*74.0*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:39*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**1.95**		0.602	0.616	5.00	0.787	pCi/L		06/12/24 08:25	1

Client Sample ID: CCR-AP-9

Date Collected: 05/08/24 12:00
Date Received: 05/10/24 09:30

Lab Sample ID: 180-173844-8

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	9.6		1.0	0.71	mg/L			05/15/24 22:24	1
Fluoride	0.30		0.10	0.026	mg/L			05/15/24 22:24	1
Sulfate	130		1.0	0.76	mg/L			05/15/24 22:24	1

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	0.39		0.10	0.057	mg/L		05/15/24 14:00	05/17/24 04:56	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 13:54	1
Arsenic	0.0039	J	0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 13:54	1
Barium	0.17		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 13:54	1
Beryllium	ND		0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 13:54	1
Cadmium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:54	1
Calcium	130		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 13:54	1
Chromium	0.010		0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 13:54	1
Cobalt	0.0061		0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 13:54	1
Lead	0.0047		0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 13:54	1
Lithium	0.038		0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 13:54	1
Molybdenum	0.0017	J	0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 13:54	1
Selenium	ND		0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 13:54	1
Thallium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:54	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/16/24 13:30	05/20/24 11:03	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	2400		20	20	mg/L			05/14/24 14:01	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	7.2	HF	0.1	0.1	SU			05/11/24 11:29	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	3.35		0.549	0.626	1.00	0.272	pCi/L	05/15/24 09:14	06/10/24 19:05	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.5*		*30 - 110*	*05/15/24 09:14*	*06/10/24 19:05*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	2.98	G	0.929	0.969	1.00	1.07	pCi/L	05/15/24 09:17	06/07/24 11:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.5*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:40*	*1*

Client Sample ID: CCR-AP-9
Lab Sample ID: 180-173844-8

Date Collected: 05/08/24 12:00
Matrix: Water
Date Received: 05/10/24 09:30

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*78.9*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:40*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**6.33**		1.08	1.15	5.00	1.07	pCi/L		06/12/24 08:25	1

Method: EPA 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 180-468504/45
Matrix: Water
Analysis Batch: 468504

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		1.0	0.71	mg/L			05/14/24 23:58	1
Fluoride	ND		0.10	0.026	mg/L			05/14/24 23:58	1
Sulfate	ND		1.0	0.76	mg/L			05/14/24 23:58	1

Lab Sample ID: MB 180-468504/6
Matrix: Water
Analysis Batch: 468504

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		1.0	0.71	mg/L			05/14/24 11:05	1
Fluoride	ND		0.10	0.026	mg/L			05/14/24 11:05	1
Sulfate	ND		1.0	0.76	mg/L			05/14/24 11:05	1

Lab Sample ID: LCS 180-468504/46
Matrix: Water
Analysis Batch: 468504

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	50.0	50.3		mg/L		101	80 - 120
Fluoride	2.50	2.52		mg/L		101	80 - 120
Sulfate	50.0	49.9		mg/L		100	80 - 120

Lab Sample ID: LCS 180-468504/7
Matrix: Water
Analysis Batch: 468504

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	50.0	50.0		mg/L		100	80 - 120
Fluoride	2.50	2.53		mg/L		101	80 - 120
Sulfate	50.0	49.7		mg/L		99	80 - 120

Lab Sample ID: MB 180-468668/6
Matrix: Water
Analysis Batch: 468668

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		1.0	0.71	mg/L			05/15/24 10:48	1
Fluoride	ND		0.10	0.026	mg/L			05/15/24 10:48	1
Sulfate	ND		1.0	0.76	mg/L			05/15/24 10:48	1

Lab Sample ID: LCS 180-468668/7
Matrix: Water
Analysis Batch: 468668

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	50.0	50.2		mg/L		100	80 - 120
Fluoride	2.50	2.49		mg/L		99	80 - 120
Sulfate	50.0	49.9		mg/L		100	80 - 120

Method: EPA 6010D - Metals (ICP)

Lab Sample ID: MB 240-613145/1-A
Matrix: Water
Analysis Batch: 613436

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 613145

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	ND		0.10	0.057	mg/L		05/15/24 14:00	05/17/24 03:00	1

Lab Sample ID: LCS 240-613145/2-A
Matrix: Water
Analysis Batch: 613436

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 613145

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Boron	1.00	1.04		mg/L		104	80 - 120

Method: EPA 6020B - Metals (ICP/MS)

Lab Sample ID: MB 240-613145/1-A
Matrix: Water
Analysis Batch: 613785

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 613145

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 12:45	1
Arsenic	ND		0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 12:45	1
Barium	ND		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 12:45	1
Beryllium	ND		0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 12:45	1
Cadmium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 12:45	1
Calcium	ND		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 12:45	1
Chromium	ND		0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 12:45	1
Cobalt	ND		0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 12:45	1
Lead	ND		0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 12:45	1
Lithium	ND		0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 12:45	1
Molybdenum	ND		0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 12:45	1
Selenium	ND		0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 12:45	1
Thallium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 12:45	1

Lab Sample ID: LCS 240-613145/3-A
Matrix: Water
Analysis Batch: 613785

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 613145

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Antimony	0.100	0.0942		mg/L		94	80 - 120
Arsenic	1.00	0.944		mg/L		94	80 - 120
Barium	1.00	0.933		mg/L		93	80 - 120
Beryllium	0.500	0.468		mg/L		94	80 - 120
Cadmium	0.500	0.479		mg/L		96	80 - 120
Calcium	25.0	24.5		mg/L		98	80 - 120
Chromium	0.500	0.481		mg/L		96	80 - 120
Cobalt	0.500	0.482		mg/L		96	80 - 120
Lead	0.500	0.488		mg/L		98	80 - 120
Lithium	0.500	0.518		mg/L		104	80 - 120
Molybdenum	0.500	0.469		mg/L		94	80 - 120
Selenium	1.00	0.951		mg/L		95	80 - 120
Thallium	1.00	0.970		mg/L		97	80 - 120

Method: EPA 7470A - Mercury (CVAA)

Lab Sample ID: MB 180-468856/1-A
Matrix: Water
Analysis Batch: 469200

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 468856

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/16/24 13:30	05/20/24 11:08	1

Lab Sample ID: LCS 180-468856/2-A
Matrix: Water
Analysis Batch: 469200

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 468856

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Mercury			0.00250	0.00260		mg/L		104	80 - 120		

Lab Sample ID: MB 180-468860/1-A
Matrix: Water
Analysis Batch: 469200

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 468860

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/16/24 13:30	05/20/24 10:35	1

Lab Sample ID: LCS 180-468860/2-A
Matrix: Water
Analysis Batch: 469200

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 468860

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Mercury			0.00250	0.00254		mg/L		101	80 - 120		

Method: EPA 9040C - pH

Lab Sample ID: LCS 180-468300/1
Matrix: Water
Analysis Batch: 468300

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
pH			7.00	7.0		SU		100	99 - 101		

Lab Sample ID: 180-173844-6 DU
Matrix: Water
Analysis Batch: 468300

Client Sample ID: CCR-AP-6I
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	7.4	HF		7.4		SU				0.1	2

Lab Sample ID: LCS 180-468497/1
Matrix: Water
Analysis Batch: 468497

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
pH			7.00	7.0		SU		100	99 - 101		

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 180-468587/1
Matrix: Water
Analysis Batch: 468587

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	10	mg/L			05/14/24 13:45	1

Lab Sample ID: LCS 180-468587/2
Matrix: Water
Analysis Batch: 468587

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Dissolved Solids	417	426		mg/L		102	85 - 115

Lab Sample ID: MB 180-468592/1
Matrix: Water
Analysis Batch: 468592

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	10	mg/L			05/14/24 14:01	1

Lab Sample ID: LCS 180-468592/2
Matrix: Water
Analysis Batch: 468592

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Dissolved Solids	417	424		mg/L		102	85 - 115

Method: 9315 - Radium-226 (GFPC)

Lab Sample ID: MB 160-661791/1-A
Matrix: Water
Analysis Batch: 665297

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 661791

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.01654	U	0.0608	0.0608	1.00	0.121	pCi/L	05/15/24 09:14	06/10/24 16:32	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.0*		*30 - 110*	*05/15/24 09:14*	*06/10/24 16:32*	*1*

Lab Sample ID: LCS 160-661791/2-A
Matrix: Water
Analysis Batch: 665297

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 661791

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits
Radium-226	11.3	10.47		1.18	1.00	0.156	pCi/L	92	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*78.9*		*30 - 110*

Method: 9320 - Radium-228 (GFPC)

Lab Sample ID: MB 160-661792/1-A
Matrix: Water
Analysis Batch: 665182

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 661792

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.5941		0.362	0.367	1.00	0.526	pCi/L	05/15/24 09:17	06/07/24 11:51	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.0*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:51*	*1*
Y Carrier	*77.4*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:51*	*1*

Lab Sample ID: LCS 160-661792/2-A
Matrix: Water
Analysis Batch: 665182

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 661792

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.87	10.19		1.45	1.00	0.679	pCi/L	115	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*78.9*		*30 - 110*
Y Carrier	*78.5*		*30 - 110*

HPLC/IC

Analysis Batch: 468504

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-3	CCR-AP-3	Total/NA	Water	EPA 9056A	
180-173844-5	CCR-AP-6	Total/NA	Water	EPA 9056A	
180-173844-6	CCR-AP-6I	Total/NA	Water	EPA 9056A	
180-173844-6	CCR-AP-6I	Total/NA	Water	EPA 9056A	
MB 180-468504/45	Method Blank	Total/NA	Water	EPA 9056A	
MB 180-468504/6	Method Blank	Total/NA	Water	EPA 9056A	
LCS 180-468504/46	Lab Control Sample	Total/NA	Water	EPA 9056A	
LCS 180-468504/7	Lab Control Sample	Total/NA	Water	EPA 9056A	

Analysis Batch: 468668

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-1	CCR-AP-1R	Total/NA	Water	EPA 9056A	
180-173844-2	CCR-AP-2	Total/NA	Water	EPA 9056A	
180-173844-2	CCR-AP-2	Total/NA	Water	EPA 9056A	
180-173844-4	CCR-AP-4	Total/NA	Water	EPA 9056A	
180-173844-7	CCR-AP-8I	Total/NA	Water	EPA 9056A	
180-173844-7	CCR-AP-8I	Total/NA	Water	EPA 9056A	
180-173844-8	CCR-AP-9	Total/NA	Water	EPA 9056A	
MB 180-468668/6	Method Blank	Total/NA	Water	EPA 9056A	
LCS 180-468668/7	Lab Control Sample	Total/NA	Water	EPA 9056A	

Metals

Prep Batch: 468856

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-1	CCR-AP-1R	Total/NA	Water	7470A	
180-173844-2	CCR-AP-2	Total/NA	Water	7470A	
180-173844-3	CCR-AP-3	Total/NA	Water	7470A	
180-173844-4	CCR-AP-4	Total/NA	Water	7470A	
180-173844-5	CCR-AP-6	Total/NA	Water	7470A	
180-173844-6	CCR-AP-6I	Total/NA	Water	7470A	
180-173844-7	CCR-AP-8I	Total/NA	Water	7470A	
MB 180-468856/1-A	Method Blank	Total/NA	Water	7470A	
LCS 180-468856/2-A	Lab Control Sample	Total/NA	Water	7470A	

Prep Batch: 468860

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-8	CCR-AP-9	Total/NA	Water	7470A	
MB 180-468860/1-A	Method Blank	Total/NA	Water	7470A	
LCS 180-468860/2-A	Lab Control Sample	Total/NA	Water	7470A	

Analysis Batch: 469200

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-1	CCR-AP-1R	Total/NA	Water	EPA 7470A	468856
180-173844-2	CCR-AP-2	Total/NA	Water	EPA 7470A	468856
180-173844-3	CCR-AP-3	Total/NA	Water	EPA 7470A	468856
180-173844-4	CCR-AP-4	Total/NA	Water	EPA 7470A	468856
180-173844-5	CCR-AP-6	Total/NA	Water	EPA 7470A	468856
180-173844-6	CCR-AP-6I	Total/NA	Water	EPA 7470A	468856
180-173844-7	CCR-AP-8I	Total/NA	Water	EPA 7470A	468856
180-173844-8	CCR-AP-9	Total/NA	Water	EPA 7470A	468860

Metals (Continued)

Analysis Batch: 469200 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 180-468856/1-A	Method Blank	Total/NA	Water	EPA 7470A	468856
MB 180-468860/1-A	Method Blank	Total/NA	Water	EPA 7470A	468860
LCS 180-468856/2-A	Lab Control Sample	Total/NA	Water	EPA 7470A	468856
LCS 180-468860/2-A	Lab Control Sample	Total/NA	Water	EPA 7470A	468860

Prep Batch: 613145

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-1	CCR-AP-1R	Total Recoverable	Water	3005A	
180-173844-2	CCR-AP-2	Total Recoverable	Water	3005A	
180-173844-3	CCR-AP-3	Total Recoverable	Water	3005A	
180-173844-4	CCR-AP-4	Total Recoverable	Water	3005A	
180-173844-5	CCR-AP-6	Total Recoverable	Water	3005A	
180-173844-6	CCR-AP-6I	Total Recoverable	Water	3005A	
180-173844-7	CCR-AP-8I	Total Recoverable	Water	3005A	
180-173844-8	CCR-AP-9	Total Recoverable	Water	3005A	
MB 240-613145/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-613145/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-613145/3-A	Lab Control Sample	Total Recoverable	Water	3005A	

Analysis Batch: 613436

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-1	CCR-AP-1R	Total Recoverable	Water	EPA 6010D	613145
180-173844-2	CCR-AP-2	Total Recoverable	Water	EPA 6010D	613145
180-173844-3	CCR-AP-3	Total Recoverable	Water	EPA 6010D	613145
180-173844-4	CCR-AP-4	Total Recoverable	Water	EPA 6010D	613145
180-173844-5	CCR-AP-6	Total Recoverable	Water	EPA 6010D	613145
180-173844-6	CCR-AP-6I	Total Recoverable	Water	EPA 6010D	613145
180-173844-7	CCR-AP-8I	Total Recoverable	Water	EPA 6010D	613145
180-173844-8	CCR-AP-9	Total Recoverable	Water	EPA 6010D	613145
MB 240-613145/1-A	Method Blank	Total Recoverable	Water	EPA 6010D	613145
LCS 240-613145/2-A	Lab Control Sample	Total Recoverable	Water	EPA 6010D	613145

Analysis Batch: 613785

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-1	CCR-AP-1R	Total Recoverable	Water	EPA 6020B	613145
180-173844-2	CCR-AP-2	Total Recoverable	Water	EPA 6020B	613145
180-173844-3	CCR-AP-3	Total Recoverable	Water	EPA 6020B	613145
180-173844-4	CCR-AP-4	Total Recoverable	Water	EPA 6020B	613145
180-173844-5	CCR-AP-6	Total Recoverable	Water	EPA 6020B	613145
180-173844-6	CCR-AP-6I	Total Recoverable	Water	EPA 6020B	613145
180-173844-7	CCR-AP-8I	Total Recoverable	Water	EPA 6020B	613145
180-173844-8	CCR-AP-9	Total Recoverable	Water	EPA 6020B	613145
MB 240-613145/1-A	Method Blank	Total Recoverable	Water	EPA 6020B	613145
LCS 240-613145/3-A	Lab Control Sample	Total Recoverable	Water	EPA 6020B	613145

General Chemistry

Analysis Batch: 468300

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-6	CCR-AP-6I	Total/NA	Water	EPA 9040C	
180-173844-8	CCR-AP-9	Total/NA	Water	EPA 9040C	

General Chemistry (Continued)

Analysis Batch: 468300 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 180-468300/1	Lab Control Sample	Total/NA	Water	EPA 9040C	
180-173844-6 DU	CCR-AP-6I	Total/NA	Water	EPA 9040C	

Analysis Batch: 468497

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-1	CCR-AP-1R	Total/NA	Water	EPA 9040C	
180-173844-2	CCR-AP-2	Total/NA	Water	EPA 9040C	
180-173844-3	CCR-AP-3	Total/NA	Water	EPA 9040C	
180-173844-4	CCR-AP-4	Total/NA	Water	EPA 9040C	
180-173844-5	CCR-AP-6	Total/NA	Water	EPA 9040C	
180-173844-7	CCR-AP-8I	Total/NA	Water	EPA 9040C	
LCS 180-468497/1	Lab Control Sample	Total/NA	Water	EPA 9040C	

Analysis Batch: 468587

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-3	CCR-AP-3	Total/NA	Water	SM 2540C	
180-173844-5	CCR-AP-6	Total/NA	Water	SM 2540C	
180-173844-6	CCR-AP-6I	Total/NA	Water	SM 2540C	
MB 180-468587/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 180-468587/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Analysis Batch: 468592

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-1	CCR-AP-1R	Total/NA	Water	SM 2540C	
180-173844-2	CCR-AP-2	Total/NA	Water	SM 2540C	
180-173844-4	CCR-AP-4	Total/NA	Water	SM 2540C	
180-173844-7	CCR-AP-8I	Total/NA	Water	SM 2540C	
180-173844-8	CCR-AP-9	Total/NA	Water	SM 2540C	
MB 180-468592/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 180-468592/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Rad

Prep Batch: 661791

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-1	CCR-AP-1R	Total/NA	Water	PrecSep-21	
180-173844-2	CCR-AP-2	Total/NA	Water	PrecSep-21	
180-173844-3	CCR-AP-3	Total/NA	Water	PrecSep-21	
180-173844-4	CCR-AP-4	Total/NA	Water	PrecSep-21	
180-173844-5	CCR-AP-6	Total/NA	Water	PrecSep-21	
180-173844-6	CCR-AP-6I	Total/NA	Water	PrecSep-21	
180-173844-7	CCR-AP-8I	Total/NA	Water	PrecSep-21	
180-173844-8	CCR-AP-9	Total/NA	Water	PrecSep-21	
MB 160-661791/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-661791/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 661792

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-1	CCR-AP-1R	Total/NA	Water	PrecSep_0	
180-173844-2	CCR-AP-2	Total/NA	Water	PrecSep_0	
180-173844-3	CCR-AP-3	Total/NA	Water	PrecSep_0	

Rad (Continued)

Prep Batch: 661792 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173844-4	CCR-AP-4	Total/NA	Water	PrecSep_0	
180-173844-5	CCR-AP-6	Total/NA	Water	PrecSep_0	
180-173844-6	CCR-AP-6I	Total/NA	Water	PrecSep_0	
180-173844-7	CCR-AP-8I	Total/NA	Water	PrecSep_0	
180-173844-8	CCR-AP-9	Total/NA	Water	PrecSep_0	
MB 160-661792/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-661792/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Eurofins Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone: 412-963-7058 Fax: 412-963-2468

Chain of Custody Record

Virginia Beach Service Center

eurofins | Environment Testing

Client Information	Sampler: Hayley Torres	Lab PM: Johnson, Andy	Carrier Tracking No(s):	COC No: 180-101847-14505.2
Client Contact: Mark Breting	Phone:	E-Mail: Andy.Johnson@et.eurofinsus.com	State of Origin:	Page: Page 2 of 2
Company: Atlas Technical Consultants LLC	PWSID:	Analysis Requested		Job #:
Address: 7988 Centerpoint Drive Suite 100	Due Date Requested:			Preservation Codes: N - None, D - HNO3
City: Indianapolis	TAT Requested (days):			
State, Zip: IN, 46256	Compliance Project: Δ Yes Δ No			
Phone:	PO #: 0129420-032-001-01			Other:
Email: mark.breting@atcassociates.com	WO #: See Chain			
Project Name: CCR GW Monitoring FB Culley East	Project #: 18016014			
Site: Culley East	SSOW#:			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	9040C, 9056A_ORGFM_28D	2540C_Calcd - TDS by 2540C	9315_Ra226, 9320_Ra228	6020B - Metals by 6020B	7470A - Hg by 7470A	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	N	D	D	D		
CCR-AP-1R	5-8-24	11:20	G	W	N		X	X	X	X	X	6	
CCR-AP-2	5-8-24	10:20	G	W	N		X	X	X	X	X	6	
CCR-AP-3	5-7-24	14:00	G	W	N		X	X	X	X	X	6	
CCR-AP-4	5-8-24	9:45	G	W	N		X	X	X	X	X	5	1 1-L Bottle
CCR-AP-6	5-7-24	13:30	G	W	N		X	X	X	X	X	5	1 1-L Bottle
CCR-AP-6T	5-7-24	13:15	G	W	N		X	X	X	X	X	6	
CCR-AP-8	5-8-24	11:40	G	W	N		X	X	X	X	X	6	
CCR-AP-9	5-8-24	12:00	G	W	N		X	X	X	X	X	5	1 1-L Bottle

180-173844 Chain of Custody

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time	Company	Received by:	Date/Time	Company
Hayley Torres	5-9-24 / 13:30	ATLAS	Fedex	5-9-24 / 13:30	
Relinquished by:	Date/Time	Company	Received by:	Date/Time	Company
Relinquished by:	Date/Time	Company	Received by:	Date/Time	Company

Custody Seals Intact. Δ Yes Δ No	Custody Seal No :	Cooler Temperature(s) °C and Other Remarks.



180-173844 Waybill



CRAIG KAISER
FB CULLEY VECTREN CORPORATION
3711 DARLINGTON ROAD

NEWBURGH , IN 47630
UNITED STATES US

ACTWGT: 25.00 LB MAN
CAD: 0415933/CAFE3755

Part # 159469-434 MTW EXP 10/24

TO SAMPLE RECEIVING
EUROFINS
301 ALPHA DR

PITTSBURGH PA 15238
(412) 963-7058

INV:
PO:
REF:
DEPT:

RMA:

FedEx Express

FedEx
TRK# 0221 7236 3961 3941

FRI - 10 MAY 10:30A
PRIORITY OVERNIGHT

NX AGCA

15238
PA-US PIT

Part # 156297-435 RRDW2 EXP 01/25

Uncorrected temp 4.0 °C
Thermometer ID 27
CF -0.0 Initials TJ
PT-WI-SR-001 effective 11/8/[illegible]

#3923924 05/09 583J3/C137/9AE3

EUR

PITT

(412) 963-

RE:

RMA:

Uncorrected temp 44 °C

Thermometer ID 20

CF 0.2 Initials RD

PT-WI-SR-001 effective 11/8/18

FedEx

TRK# 0221 7236 3961 3930

FRI – 10 MAY 10:3

PRIORITY OVERNIGI

NX AGCA

1523

PA – US

#3923924 05/09 583J3/C137/9AE3

RT 198

FZ 197

10:30 A

3930

05:10

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6/14/2024

Eurofins Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone: 412-963-7058 Fax: 412-963-2468

Chain of Custody Record

eurofins Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Johnson, Andy	Carrier Tracking No(s):	COC No: 180-514536.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Andy.Johnson@et.eurofinsus.com	State of Origin: Indiana	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 180-173844-1
Address: 13715 Rider Trail North,	Due Date Requested: 6/13/2024			Preservation Codes: -
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: CCR Groundwater Monitoring FB Culley East	Project #: 18016014			
Site:	SSOW#:			Other:

Analysis Requested

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	9315_Ra226/PrecSep_21 Radium-226 (GFPC) by 9315 (21-day decay)	9320_Ra228/PrecSep_0 Radium-228 (GFPC) by 9320	Ra226Ra228_GFPC/ Combined Radium-226 and Radium-228	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
CCR-AP-1R (180-173844-1)	5/8/24	11:20 Eastern		Water			X	X	X	2	
CCR-AP-2 (180-173844-2)	5/8/24	10:20 Eastern		Water			X	X	X	2	
CCR-AP-3 (180-173844-3)	5/7/24	14:00 Eastern		Water			X	X	X	2	
CCR-AP-4 (180-173844-4)	5/8/24	09:45 Eastern		Water			X	X	X	1	
CCR-AP-6 (180-173844-5)	5/7/24	13:30 Eastern		Water			X	X	X	1	
CCR-AP-6I (180-173844-6)	5/7/24	13:15 Eastern		Water			X	X	X	2	
CCR-AP-8 (180-173844-7)	5/8/24	11:40 Eastern		Water			X	X	X	2	
CCR-AP-9 (180-173844-8)	5/8/24	12:00 Eastern		Water			X	X	X	1	

Note: Since laboratory accreditations are subject to change, Eurofins Pittsburgh places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Pittsburgh laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Pittsburgh attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Pittsburgh.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by:	Date/Time:	Company	Received by:	Date/Time	Company
		5-13-24 17:20		M. Pinette		
	Relinquished by:	Date/Time:	Company	Received by:	Date/Time: MAY 14 2024 0950	Company
	Relinquished by:	Date/Time:	Company	Received by	Date/Time	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 180-173844-1
SDG Number: FB Culley East

Login Number: 173844
List Number: 1
Creator: Abernathy, Eric L

List Source: Eurofins Pittsburgh

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 180-173844-1
SDG Number: FB Culley East

Login Number: 173844
List Number: 2
Creator: Worthington, Sierra M

List Source: Eurofins St. Louis
List Creation: 05/14/24 01:52 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Todd Plating
Haley & Aldrich, Inc.
400 Augusta Street
Suite 100
Greenville, South Carolina 29601

Generated 6/19/2024 1:51:24 PM

JOB DESCRIPTION

CCR Groundwater Monitoring FB Culley East
FB Culley East

JOB NUMBER

180-174082-1

Eurofins Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh PA 15238

See page two for job notes and contact information.

my EOL

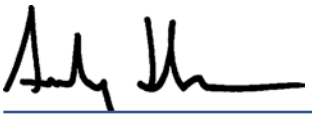
Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

PA Lab ID: 02-00416

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Pittsburgh Project Manager.

Authorization



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Authorized for release by
Andy Johnson, Senior Project Manager
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(615)818-9567

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Job Narrative
180-174082-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 5/15/2024 9:35 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 4.3°C.

Gas Flow Proportional Counter
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Rad
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Job ID: 180-174082-2 Eurofins Pittsburgh

Job Narrative
180-174082-2

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 5/15/2024 9:35 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 4.3°C.

HPLC/IC
Method 9056A_ORGFM_28D: The following samples were diluted due to the nature of the sample matrix: CCR-AP-5 (180-174082-1), CCR-AP-5I (180-174082-2), DUP 1 (180-174082-3), (180-174064-D-1), (180-174064-D-1 MS) and (180-174064-D-1 MSD). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Metals
Method 6020B - Total Recoverable: The continuing calibration verification (CCV) associated with batch 240-614112 recovered above the upper control limit for Beryllium and Antimony. The samples associated with this CCV were below the reporting limit for the affected analytes; therefore, the data have been reported. The associated samples are impacted: CCR-AP-5 (180-174082-1), CCR-AP-5I (180-174082-2) and DUP 1 (180-174082-3).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry
Method 2540C_Calcd: The sample did not reach a stable weight following 3 cycles of heating, cooling, and desiccation. The cycle 3 weight was used to calculate the Total Dissolved Solids for the sample result. CCR-AP-5 (180-174082-1) and CCR-AP-5I (180-174082-2)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Definitions/Glossary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-174082-1
SDG: FB Culley East

Qualifiers

Metals

Qualifier	Qualifier Description
^+	Continuing Calibration Verification (CCV) is outside acceptance limits, high biased.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
HF	Parameter with a holding time of 15 minutes. Test performed by laboratory at client's request. Sample was analyzed outside of hold time.

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-174082-1
SDG: FB Culley East

Laboratory: Eurofins Pittsburgh

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Arkansas DEQ	State	19-033-0	06-27-24
California	State	2891	04-30-24 *
Connecticut	State	PH-0688	09-30-24
Florida	NELAP	E871008	06-30-24
Georgia	State	PA 02-00416	04-30-25
Illinois	NELAP	004375	07-31-25
Kansas	NELAP	E-10350	01-31-25
Kentucky (UST)	State	162013	04-30-23 *
Kentucky (WW)	State	KY98043	12-31-24
Louisiana	NELAP	04041	06-30-22 *
Louisiana (All)	NELAP	04041	06-30-24
Maine	State	PA00164	03-06-26
Minnesota	NELAP	042-999-482	12-31-24
New Hampshire	NELAP	2030	04-04-24 *
New Jersey	NELAP	PA005	06-30-24
New York	NELAP	11182	04-01-25
North Carolina (WW/SW)	State	434	12-31-24
North Dakota	State	R-227	04-30-24 *
Oregon	NELAP	PA-2151	02-06-25
Pennsylvania	NELAP	02-00416	04-30-25
Rhode Island	State	LAO00362	01-01-25
South Carolina	State	89014	04-30-25
Texas	NELAP	T104704528	03-31-25
US Fish & Wildlife	US Federal Programs	058448	03-31-24 *
USDA	US Federal Programs	P330-16-00211	04-11-26
Utah	NELAP	PA001462019-8	05-31-24
Virginia	NELAP	10043	07-14-24
West Virginia DEP	State	142	01-31-25
Wisconsin	State	998027800	08-31-24

Laboratory: Eurofins Cleveland

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	2927	02-28-25
Georgia	State	4062	02-27-25
Illinois	NELAP	200004	07-31-24
Iowa	State	421	06-01-25
Kentucky (UST)	State	112225	02-27-25
Kentucky (WW)	State	KY98016	12-30-24
Minnesota	NELAP	039-999-348	12-31-24
New Jersey	NELAP	OH001	06-30-24
New York	NELAP	10975	04-02-25
Ohio VAP	State	ORELAP 4062	02-27-25
Oregon	NELAP	4062	02-27-25
Pennsylvania	NELAP	68-00340	08-31-24
Texas	NELAP	T104704517-22-19	08-31-24
USDA	US Federal Programs	P330-18-00281	01-05-27
Virginia	NELAP	460175	09-14-24
West Virginia DEP	State	210	12-31-24

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Job ID: 180-174082-1
Project/Site: CCR Groundwater Monitoring FB Culley East
SDG: FB Culley East

Laboratory: Eurofins St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-25
ANAB	Dept. of Defense ELAP	L2305	04-06-25
ANAB	Dept. of Energy	L2305.01	04-08-25
ANAB	ISO/IEC 17025	L2305	04-06-25
Arizona	State	AZ0813	12-08-24
California	Los Angeles County Sanitation Districts	10259	06-30-22 *
California	State	2886	06-30-24
Connecticut	State	PH-0241	03-31-25
Florida	NELAP	E87689	06-30-24
HI - RadChem Recognition	State	n/a	06-30-24
Illinois	NELAP	200023	11-30-24
Iowa	State	373	12-01-24
Kansas	NELAP	E-10236	10-31-24
Kentucky (DW)	State	KY90125	12-31-24
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-24
Louisiana	NELAP	04080	06-30-22 *
Louisiana (All)	NELAP	04080	06-30-24
Louisiana (DW)	State	LA011	12-31-24
Maryland	State	310	09-30-24
Massachusetts	State	M-MO054	06-30-24
MI - RadChem Recognition	State	9005	06-30-24
Missouri	State	780	06-30-25
Nevada	State	MO00054	07-31-24
New Jersey	NELAP	MO002	06-30-24
New Mexico	State	MO00054	06-30-24
New York	NELAP	11616	03-31-25
North Carolina (DW)	State	29700	07-31-24
North Dakota	State	R-207	06-30-24
Oklahoma	NELAP	9997	08-31-24
Oregon	NELAP	4157	09-01-24
Pennsylvania	NELAP	68-00540	02-28-25
South Carolina	State	85002001	06-30-24
Texas	NELAP	T104704193	07-31-24
US Fish & Wildlife	US Federal Programs	058448	07-31-24
USDA	US Federal Programs	P330-17-00028	05-18-26
Utah	NELAP	MO00054	07-31-24
Virginia	NELAP	460230	06-14-25
Washington	State	C592	08-30-24
West Virginia DEP	State	381	10-31-24

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Sample Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-174082-1
SDG: FB Culley East

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
180-174082-1	CCR-AP-5	Water	05/13/24 13:17	05/15/24 09:35
180-174082-2	CCR-AP-5I	Water	05/13/24 14:02	05/15/24 09:35
180-174082-3	DUP 1	Water	05/13/24 00:01	05/15/24 09:35

Method Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-174082-1
SDG: FB Culley East

Method	Method Description	Protocol	Laboratory
9315	Radium-226 (GFPC)	SW846	EET SL
9320	Radium-228 (GFPC)	SW846	EET SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	EET SL
PrecSep_0	Preparation, Precipitate Separation	None	EET SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	EET SL

Protocol References:

None = None

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-174082-1
SDG: FB Culley East

Client Sample ID: CCR-AP-5

Date Collected: 05/13/24 13:17
Date Received: 05/15/24 09:35

Lab Sample ID: 180-174082-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	468830	05/16/24 15:08	AM	EET PIT
	Instrument ID: CHICS2100B									
Total/NA	Analysis	EPA 9056A		10	1 mL	1 mL	468830	05/16/24 15:22	AM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	613656	05/21/24 05:00	TQ6W	EET CLE
Total Recoverable	Analysis	EPA 6010D		5			615032	05/30/24 10:20	KLC	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	613656	05/21/24 05:00	TQ6W	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			614112	05/22/24 20:26	AJC	EET CLE
	Instrument ID: I10									
Total Recoverable	Prep	3005A			50 mL	50 mL	613656	05/21/24 05:00	TQ6W	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			614474	05/24/24 17:17	AJC	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	469069	05/18/24 10:45	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 14:17	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468847	05/16/24 10:09	BAB	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	468906	05/16/24 16:46	LWM	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			750.57 mL	1.0 g	662403	05/20/24 08:11	MLT	EET SL
Total/NA	Analysis	9315		1			666559	06/17/24 22:59	SWS	EET SL
	Instrument ID: GFPCRED									
Total/NA	Prep	PrecSep_0			750.57 mL	1.0 g	662405	05/20/24 08:15	MLT	EET SL
Total/NA	Analysis	9320		1			666560	06/17/24 12:34	SWS	EET SL
	Instrument ID: GFPCBLUE									
Total/NA	Analysis	Ra226_Ra228		1			666939	06/19/24 00:31	SCB	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: CCR-AP-5I

Date Collected: 05/13/24 14:02
Date Received: 05/15/24 09:35

Lab Sample ID: 180-174082-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	468830	05/16/24 15:37	AM	EET PIT
	Instrument ID: CHICS2100B									
Total/NA	Analysis	EPA 9056A		10	1 mL	1 mL	468830	05/16/24 15:52	AM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	613656	05/21/24 05:00	TQ6W	EET CLE
Total Recoverable	Analysis	EPA 6010D		5			614072	05/22/24 17:44	KLC	EET CLE
	Instrument ID: I12									
Total Recoverable	Prep	3005A			50 mL	50 mL	613656	05/21/24 05:00	TQ6W	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			614112	05/22/24 20:31	AJC	EET CLE
	Instrument ID: I10									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-174082-1
SDG: FB Culley East

Client Sample ID: CCR-AP-5I

Date Collected: 05/13/24 14:02
Date Received: 05/15/24 09:35

Lab Sample ID: 180-174082-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			50 mL	50 mL	613656	05/21/24 05:00	TQ6W	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			614474	05/24/24 17:19	AJC	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	469069	05/18/24 10:45	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 14:18	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468847	05/16/24 10:14	BAB	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	468906	05/16/24 16:46	LWM	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			997.40 mL	1.0 g	662403	05/20/24 08:11	MLT	EET SL
Total/NA	Analysis	9315		1			666559	06/17/24 22:59	SWS	EET SL
	Instrument ID: GFPCRED									
Total/NA	Prep	PrecSep_0			997.40 mL	1.0 g	662405	05/20/24 08:15	MLT	EET SL
Total/NA	Analysis	9320		1			666560	06/17/24 12:34	SWS	EET SL
	Instrument ID: GFPCBLUE									
Total/NA	Analysis	Ra226_Ra228		1			666939	06/19/24 00:31	SCB	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: DUP 1

Date Collected: 05/13/24 00:01
Date Received: 05/15/24 09:35

Lab Sample ID: 180-174082-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	468830	05/16/24 16:07	AM	EET PIT
	Instrument ID: CHICS2100B									
Total/NA	Analysis	EPA 9056A		10	1 mL	1 mL	468830	05/16/24 16:21	AM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	613656	05/21/24 05:00	TQ6W	EET CLE
Total Recoverable	Analysis	EPA 6010D		5			614072	05/22/24 17:48	KLC	EET CLE
	Instrument ID: I12									
Total Recoverable	Prep	3005A			50 mL	50 mL	613656	05/21/24 05:00	TQ6W	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			614112	05/22/24 20:35	AJC	EET CLE
	Instrument ID: I10									
Total Recoverable	Prep	3005A			50 mL	50 mL	613656	05/21/24 05:00	TQ6W	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			614474	05/24/24 17:22	AJC	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	469069	05/18/24 10:45	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 14:19	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468847	05/16/24 10:20	BAB	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	468906	05/16/24 16:46	LWM	EET PIT
	Instrument ID: NOEQUIP									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-174082-1
SDG: FB Culley East

Client Sample ID: DUP 1

Date Collected: 05/13/24 00:01
Date Received: 05/15/24 09:35

Lab Sample ID: 180-174082-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			752.80 mL	1.0 g	662403	05/20/24 08:11	MLT	EET SL
Total/NA	Analysis	9315		1			666740	06/18/24 07:43	SWS	EET SL
	Instrument ID: GFPCRED									
Total/NA	Prep	PrecSep_0			752.80 mL	1.0 g	662405	05/20/24 08:15	MLT	EET SL
Total/NA	Analysis	9320		1	1.0 mL	1.0 mL	666560	06/17/24 12:34	SWS	EET SL
	Instrument ID: GFPCBLUE									
Total/NA	Analysis	Ra226_Ra228		1			666939	06/19/24 00:31	SCB	EET SL
	Instrument ID: NOEQUIP									

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Analyst References:

Lab: EET CLE
- Batch Type: Prep
  - TQ6W = Bryan Pere ka
- Batch Type: Analysis
  - AJC = Alexander Colosi
  - KLC = Karen Counts

Lab: EET PIT
- Batch Type: Prep
  - SJM = Shannon Mueller
- Batch Type: Analysis
  - AM = Adzuira Musule
  - BAB = Brooke Batyi
  - LWM = Leslie McIntire
  - MTW = Michael Wesoloski

Lab: EET SL
- Batch Type: Prep
  - MLT = Michaela Tiemeyer
- Batch Type: Analysis
  - SCB = Sarah Bernsen
  - SWS = Seth Stubblefield

Client Sample ID: CCR-AP-5

Date Collected: 05/13/24 13:17
Date Received: 05/15/24 09:35

Lab Sample ID: 180-174082-1

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**150**		1.0	0.71	mg/L			05/16/24 15:08	1
Fluoride	**0.84**		0.10	0.026	mg/L			05/16/24 15:08	1
Sulfate	**620**		10	7.6	mg/L			05/16/24 15:22	10

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**17**		0.50	0.29	mg/L		05/21/24 05:00	05/30/24 10:20	5

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND	^+	0.0020	0.00057	mg/L		05/21/24 05:00	05/22/24 20:26	1
Arsenic	**0.00085**	**J**	0.0050	0.00075	mg/L		05/21/24 05:00	05/22/24 20:26	1
Barium	**0.046**		0.0050	0.0022	mg/L		05/21/24 05:00	05/22/24 20:26	1
Beryllium	ND	^+	0.0010	0.00062	mg/L		05/21/24 05:00	05/22/24 20:26	1
Cadmium	ND		0.0010	0.00020	mg/L		05/21/24 05:00	05/22/24 20:26	1
Calcium	**260**		1.0	0.25	mg/L		05/21/24 05:00	05/22/24 20:26	1
Chromium	**0.0020**	**J**	0.0050	0.0012	mg/L		05/21/24 05:00	05/22/24 20:26	1
Cobalt	**0.0025**		0.0010	0.00019	mg/L		05/21/24 05:00	05/22/24 20:26	1
Lead	**0.00068**	**J**	0.0010	0.00045	mg/L		05/21/24 05:00	05/22/24 20:26	1
Lithium	**0.056**		0.0080	0.0017	mg/L		05/21/24 05:00	05/24/24 17:17	1
Molybdenum	**0.15**		0.0050	0.0011	mg/L		05/21/24 05:00	05/22/24 20:26	1
Selenium	**0.00095**	**J**	0.0050	0.00089	mg/L		05/21/24 05:00	05/22/24 20:26	1
Thallium	ND		0.0010	0.00020	mg/L		05/21/24 05:00	05/22/24 20:26	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/18/24 10:45	05/20/24 14:17	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	**1600**		10	10	mg/L			05/16/24 16:46	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**7.1**	**HF**	0.1	0.1	SU			05/16/24 10:09	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.424**		0.283	0.286	1.00	0.366	pCi/L	05/20/24 08:11	06/17/24 22:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*77.4*		*30 - 110*	*05/20/24 08:11*	*06/17/24 22:59*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.452	U	0.507	0.509	1.00	0.830	pCi/L	05/20/24 08:15	06/17/24 12:34	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*77.4*		*30 - 110*	*05/20/24 08:15*	*06/17/24 12:34*	*1*

Client Sample ID: CCR-AP-5
Lab Sample ID: 180-174082-1

Date Collected: 05/13/24 13:17
Matrix: Water
Date Received: 05/15/24 09:35

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*86.4*		*30 - 110*	*05/20/24 08:15*	*06/17/24 12:34*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**0.877**		0.581	0.584	5.00	0.830	pCi/L		06/19/24 00:31	1

Client Sample ID: CCR-AP-5I

Date Collected: 05/13/24 14:02
Date Received: 05/15/24 09:35

Lab Sample ID: 180-174082-2

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**280**		10	7.1	mg/L			05/16/24 15:52	10
Fluoride	**0.32**		0.10	0.026	mg/L			05/16/24 15:37	1
Sulfate	**640**		10	7.6	mg/L			05/16/24 15:52	10

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**12**		0.50	0.29	mg/L		05/21/24 05:00	05/22/24 17:44	5

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND	^+	0.0020	0.00057	mg/L		05/21/24 05:00	05/22/24 20:31	1
Arsenic	ND		0.0050	0.00075	mg/L		05/21/24 05:00	05/22/24 20:31	1
Barium	**0.027**		0.0050	0.0022	mg/L		05/21/24 05:00	05/22/24 20:31	1
Beryllium	ND	^+	0.0010	0.00062	mg/L		05/21/24 05:00	05/22/24 20:31	1
Cadmium	ND		0.0010	0.00020	mg/L		05/21/24 05:00	05/22/24 20:31	1
Calcium	**270**		1.0	0.25	mg/L		05/21/24 05:00	05/22/24 20:31	1
Chromium	ND		0.0050	0.0012	mg/L		05/21/24 05:00	05/22/24 20:31	1
Cobalt	**0.00051**	**J**	0.0010	0.00019	mg/L		05/21/24 05:00	05/22/24 20:31	1
Lead	ND		0.0010	0.00045	mg/L		05/21/24 05:00	05/22/24 20:31	1
Lithium	**0.035**		0.0080	0.0017	mg/L		05/21/24 05:00	05/24/24 17:19	1
Molybdenum	**0.0026**	**J**	0.0050	0.0011	mg/L		05/21/24 05:00	05/22/24 20:31	1
Selenium	ND		0.0050	0.00089	mg/L		05/21/24 05:00	05/22/24 20:31	1
Thallium	ND		0.0010	0.00020	mg/L		05/21/24 05:00	05/22/24 20:31	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/18/24 10:45	05/20/24 14:18	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	**1800**		20	20	mg/L			05/16/24 16:46	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**6.9**	**HF**	0.1	0.1	SU			05/16/24 10:14	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.249**		0.178	0.180	1.00	0.233	pCi/L	05/20/24 08:11	06/17/24 22:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.6*		*30 - 110*	*05/20/24 08:11*	*06/17/24 22:59*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.08**		0.424	0.435	1.00	0.549	pCi/L	05/20/24 08:15	06/17/24 12:34	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.6*		*30 - 110*	*05/20/24 08:15*	*06/17/24 12:34*	*1*

Client Sample ID: CCR-AP-5I
Date Collected: 05/13/24 14:02
Date Received: 05/15/24 09:35

Lab Sample ID: 180-174082-2
Matrix: Water

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Y Carrier	92.3		30 - 110	05/20/24 08:15	06/17/24 12:34	1

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.33		0.460	0.471	5.00	0.549	pCi/L		06/19/24 00:31	1

Client Sample ID: DUP 1

Date Collected: 05/13/24 00:01
Date Received: 05/15/24 09:35

Lab Sample ID: 180-174082-3

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**160**		1.0	0.71	mg/L			05/16/24 16:07	1
Fluoride	**0.83**		0.10	0.026	mg/L			05/16/24 16:07	1
Sulfate	**640**		10	7.6	mg/L			05/16/24 16:21	10

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**17**		0.50	0.29	mg/L		05/21/24 05:00	05/22/24 17:48	5

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND	^+	0.0020	0.00057	mg/L		05/21/24 05:00	05/22/24 20:35	1
Arsenic	ND		0.0050	0.00075	mg/L		05/21/24 05:00	05/22/24 20:35	1
Barium	**0.045**		0.0050	0.0022	mg/L		05/21/24 05:00	05/22/24 20:35	1
Beryllium	ND	^+	0.0010	0.00062	mg/L		05/21/24 05:00	05/22/24 20:35	1
Cadmium	ND		0.0010	0.00020	mg/L		05/21/24 05:00	05/22/24 20:35	1
Calcium	**260**		1.0	0.25	mg/L		05/21/24 05:00	05/22/24 20:35	1
Chromium	ND		0.0050	0.0012	mg/L		05/21/24 05:00	05/22/24 20:35	1
Cobalt	**0.0022**		0.0010	0.00019	mg/L		05/21/24 05:00	05/22/24 20:35	1
Lead	ND		0.0010	0.00045	mg/L		05/21/24 05:00	05/22/24 20:35	1
Lithium	**0.058**		0.0080	0.0017	mg/L		05/21/24 05:00	05/24/24 17:22	1
Molybdenum	**0.15**		0.0050	0.0011	mg/L		05/21/24 05:00	05/22/24 20:35	1
Selenium	ND		0.0050	0.00089	mg/L		05/21/24 05:00	05/22/24 20:35	1
Thallium	ND		0.0010	0.00020	mg/L		05/21/24 05:00	05/22/24 20:35	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/18/24 10:45	05/20/24 14:19	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	**1700**		10	10	mg/L			05/16/24 16:46	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**7.1**	**HF**	0.1	0.1	SU			05/16/24 10:20	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.182	U	0.181	0.181	1.00	0.269	pCi/L	05/20/24 08:11	06/18/24 07:43	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.3*		*30 - 110*	*05/20/24 08:11*	*06/18/24 07:43*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.983**		0.575	0.583	1.00	0.834	pCi/L	05/20/24 08:15	06/17/24 12:34	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.3*		*30 - 110*	*05/20/24 08:15*	*06/17/24 12:34*	*1*

Client Sample ID: DUP 1
Date Collected: 05/13/24 00:01
Date Received: 05/15/24 09:35

Lab Sample ID: 180-174082-3
Matrix: Water

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*82.2*		*30 - 110*	*05/20/24 08:15*	*06/17/24 12:34*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**1.17**		0.603	0.610	5.00	0.834	pCi/L		06/19/24 00:31	1

Method: EPA 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 180-468830/6
Matrix: Water
Analysis Batch: 468830

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		1.0	0.71	mg/L			05/16/24 11:07	1
Fluoride	ND		0.10	0.026	mg/L			05/16/24 11:07	1
Sulfate	ND		1.0	0.76	mg/L			05/16/24 11:07	1

Lab Sample ID: LCS 180-468830/7
Matrix: Water
Analysis Batch: 468830

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	50.0	49.7		mg/L		99	80 - 120
Fluoride	2.50	2.47		mg/L		99	80 - 120
Sulfate	50.0	49.4		mg/L		99	80 - 120

Method: EPA 6010D - Metals (ICP)

Lab Sample ID: MB 240-613656/1-A
Matrix: Water
Analysis Batch: 614072

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 613656

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	ND		0.10	0.057	mg/L		05/21/24 05:00	05/22/24 15:34	1

Lab Sample ID: LCS 240-613656/2-A
Matrix: Water
Analysis Batch: 614072

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 613656

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Boron	1.00	1.03		mg/L		103	80 - 120

Method: EPA 6020B - Metals (ICP/MS)

Lab Sample ID: MB 240-613656/1-A
Matrix: Water
Analysis Batch: 614112

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 613656

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		05/21/24 05:00	05/22/24 19:13	1
Arsenic	ND		0.0050	0.00075	mg/L		05/21/24 05:00	05/22/24 19:13	1
Barium	ND		0.0050	0.0022	mg/L		05/21/24 05:00	05/22/24 19:13	1
Beryllium	ND		0.0010	0.00062	mg/L		05/21/24 05:00	05/22/24 19:13	1
Cadmium	ND		0.0010	0.00020	mg/L		05/21/24 05:00	05/22/24 19:13	1
Calcium	ND		1.0	0.25	mg/L		05/21/24 05:00	05/22/24 19:13	1
Chromium	ND		0.0050	0.0012	mg/L		05/21/24 05:00	05/22/24 19:13	1
Cobalt	ND		0.0010	0.00019	mg/L		05/21/24 05:00	05/22/24 19:13	1
Lead	ND		0.0010	0.00045	mg/L		05/21/24 05:00	05/22/24 19:13	1
Lithium	ND		0.0080	0.0017	mg/L		05/21/24 05:00	05/22/24 19:13	1
Molybdenum	ND		0.0050	0.0011	mg/L		05/21/24 05:00	05/22/24 19:13	1
Selenium	ND		0.0050	0.00089	mg/L		05/21/24 05:00	05/22/24 19:13	1
Thallium	ND		0.0010	0.00020	mg/L		05/21/24 05:00	05/22/24 19:13	1

Method: EPA 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 240-613656/3-A
Matrix: Water
Analysis Batch: 614112

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 613656

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Antimony	0.100	0.0932		mg/L		93	80 - 120
Arsenic	1.00	0.895		mg/L		89	80 - 120
Barium	1.00	0.875		mg/L		87	80 - 120
Beryllium	0.500	0.505		mg/L		101	80 - 120
Cadmium	0.500	0.443		mg/L		89	80 - 120
Calcium	25.0	22.2		mg/L		89	80 - 120
Chromium	0.500	0.461		mg/L		92	80 - 120
Cobalt	0.500	0.470		mg/L		94	80 - 120
Lead	0.500	0.484		mg/L		97	80 - 120
Lithium	0.500	0.499		mg/L		100	80 - 120
Molybdenum	0.500	0.455		mg/L		91	80 - 120
Selenium	1.00	0.904		mg/L		90	80 - 120
Thallium	1.00	0.907		mg/L		91	80 - 120

Method: EPA 7470A - Mercury (CVAA)

Lab Sample ID: MB 180-469069/1-A
Matrix: Water
Analysis Batch: 469200

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 469069

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/18/24 10:45	05/20/24 14:02	1

Lab Sample ID: LCS 180-469069/2-A
Matrix: Water
Analysis Batch: 469200

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 469069

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Mercury	0.00250	0.00239		mg/L		96	80 - 120

Method: EPA 9040C - pH

Lab Sample ID: LCS 180-468847/24
Matrix: Water
Analysis Batch: 468847

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
pH	7.00	7.0		SU		100	99 - 101

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 180-468906/1
Matrix: Water
Analysis Batch: 468906

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	10	mg/L			05/16/24 16:46	1

Method: SM 2540C - Solids, Total Dissolved (TDS) (Continued)

Lab Sample ID: LCS 180-468906/2
Matrix: Water
Analysis Batch: 468906

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Dissolved Solids	417	404		mg/L		97	85 - 115

Method: 9315 - Radium-226 (GFPC)

Lab Sample ID: MB 160-662403/1-A
Matrix: Water
Analysis Batch: 666560

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 662403

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.07648	U	0.142	0.142	1.00	0.255	pCi/L	05/20/24 08:11	06/17/24 23:06	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.0*		*30 - 110*	*05/20/24 08:11*	*06/17/24 23:06*	*1*

Lab Sample ID: LCS 160-662403/2-A
Matrix: Water
Analysis Batch: 666560

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 662403

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits
Radium-226	11.3	9.160		1.23	1.00	0.412	pCi/L	81	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*88.8*		*30 - 110*

Method: 9320 - Radium-228 (GFPC)

Lab Sample ID: MB 160-662405/1-A
Matrix: Water
Analysis Batch: 666722

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 662405

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.1836	U	0.259	0.259	1.00	0.437	pCi/L	05/20/24 08:15	06/17/24 12:15	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.0*		*30 - 110*	*05/20/24 08:15*	*06/17/24 12:15*	*1*
Y Carrier	*86.0*		*30 - 110*	*05/20/24 08:15*	*06/17/24 12:15*	*1*

Lab Sample ID: LCS 160-662405/2-A
Matrix: Water
Analysis Batch: 666722

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 662405

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits
Radium-228	8.84	9.439		1.29	1.00	0.535	pCi/L	107	75 - 125

Method: 9320 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-662405/2-A
Matrix: Water
Analysis Batch: 666722

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 662405

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	88.8		30 - 110
Y Carrier	85.2		30 - 110

HPLC/IC

Analysis Batch: 468830

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-174082-1	CCR-AP-5	Total/NA	Water	EPA 9056A	
180-174082-1	CCR-AP-5	Total/NA	Water	EPA 9056A	
180-174082-2	CCR-AP-5I	Total/NA	Water	EPA 9056A	
180-174082-2	CCR-AP-5I	Total/NA	Water	EPA 9056A	
180-174082-3	DUP 1	Total/NA	Water	EPA 9056A	
180-174082-3	DUP 1	Total/NA	Water	EPA 9056A	
MB 180-468830/6	Method Blank	Total/NA	Water	EPA 9056A	
LCS 180-468830/7	Lab Control Sample	Total/NA	Water	EPA 9056A	

Metals

Prep Batch: 469069

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-174082-1	CCR-AP-5	Total/NA	Water	7470A	
180-174082-2	CCR-AP-5I	Total/NA	Water	7470A	
180-174082-3	DUP 1	Total/NA	Water	7470A	
MB 180-469069/1-A	Method Blank	Total/NA	Water	7470A	
LCS 180-469069/2-A	Lab Control Sample	Total/NA	Water	7470A	

Analysis Batch: 469200

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-174082-1	CCR-AP-5	Total/NA	Water	EPA 7470A	469069
180-174082-2	CCR-AP-5I	Total/NA	Water	EPA 7470A	469069
180-174082-3	DUP 1	Total/NA	Water	EPA 7470A	469069
MB 180-469069/1-A	Method Blank	Total/NA	Water	EPA 7470A	469069
LCS 180-469069/2-A	Lab Control Sample	Total/NA	Water	EPA 7470A	469069

Prep Batch: 613656

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-174082-1	CCR-AP-5	Total Recoverable	Water	3005A	
180-174082-2	CCR-AP-5I	Total Recoverable	Water	3005A	
180-174082-3	DUP 1	Total Recoverable	Water	3005A	
MB 240-613656/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-613656/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-613656/3-A	Lab Control Sample	Total Recoverable	Water	3005A	

Analysis Batch: 614072

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-174082-2	CCR-AP-5I	Total Recoverable	Water	EPA 6010D	613656
180-174082-3	DUP 1	Total Recoverable	Water	EPA 6010D	613656
MB 240-613656/1-A	Method Blank	Total Recoverable	Water	EPA 6010D	613656
LCS 240-613656/2-A	Lab Control Sample	Total Recoverable	Water	EPA 6010D	613656

Analysis Batch: 614112

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-174082-1	CCR-AP-5	Total Recoverable	Water	EPA 6020B	613656
180-174082-2	CCR-AP-5I	Total Recoverable	Water	EPA 6020B	613656
180-174082-3	DUP 1	Total Recoverable	Water	EPA 6020B	613656
MB 240-613656/1-A	Method Blank	Total Recoverable	Water	EPA 6020B	613656
LCS 240-613656/3-A	Lab Control Sample	Total Recoverable	Water	EPA 6020B	613656

QC Association Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-174082-1
SDG: FB Culley East

Metals

Analysis Batch: 614474

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-174082-1	CCR-AP-5	Total Recoverable	Water	EPA 6020B	613656
180-174082-2	CCR-AP-5I	Total Recoverable	Water	EPA 6020B	613656
180-174082-3	DUP 1	Total Recoverable	Water	EPA 6020B	613656

Analysis Batch: 615032

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-174082-1	CCR-AP-5	Total Recoverable	Water	EPA 6010D	613656

General Chemistry

Analysis Batch: 468847

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-174082-1	CCR-AP-5	Total/NA	Water	EPA 9040C	
180-174082-2	CCR-AP-5I	Total/NA	Water	EPA 9040C	
180-174082-3	DUP 1	Total/NA	Water	EPA 9040C	
LCS 180-468847/24	Lab Control Sample	Total/NA	Water	EPA 9040C	

Analysis Batch: 468906

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-174082-1	CCR-AP-5	Total/NA	Water	SM 2540C	
180-174082-2	CCR-AP-5I	Total/NA	Water	SM 2540C	
180-174082-3	DUP 1	Total/NA	Water	SM 2540C	
MB 180-468906/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 180-468906/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Rad

Prep Batch: 662403

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-174082-1	CCR-AP-5	Total/NA	Water	PrecSep-21	
180-174082-2	CCR-AP-5I	Total/NA	Water	PrecSep-21	
180-174082-3	DUP 1	Total/NA	Water	PrecSep-21	
MB 160-662403/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-662403/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 662405

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-174082-1	CCR-AP-5	Total/NA	Water	PrecSep_0	
180-174082-2	CCR-AP-5I	Total/NA	Water	PrecSep_0	
180-174082-3	DUP 1	Total/NA	Water	PrecSep_0	
MB 160-662405/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-662405/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Eurofins Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone. 412-963-7058 Fax. 412-963-2468

Chain of Custody Record

Virginia Beach Service Center

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Client Information	Sampler: Hayley Tolles	Lab PM: Johnson, Andy	Carrier Tracking No(s):	COC No: 180-101847-14505 2
Client Contact: Mark Breting	Phone:	E-Mail: Andy Johnson@et.eurofinsus com	State of Origin:	Page: Page 2 of 2
Company: Atlas Technical Consultants LLC	PWSID:	Analysis Requested		Job #:
Address: 7988 Centerpoint Drive Suite 100	Due Date Requested:			Preservation Codes: N - None D - HNO3
City: Indianapolis	TAT Requested (days):			
State, Zip: IN, 46256	Compliance Project: Δ Yes Δ No			
Phone	PO #: 0129420-032-001-01			
Email: mark.breting@atcassociates.com	WO #: See Chain			Other:
Project Name: CCR GW Monitoring FB Culley East	Project #: 18016014			
Site: Culley East	SSOW#:			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	9040C, 9056A_ORGFM_28D	2540C_Calcd - TDS by 2540C	9315_Ra226, 9320_Ra228	6020B - Metals by 6020B	7470A - Hg by 7470A	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	N	D	D	D		
CCR-AP-5	5-13-24	13:17	G	W	N		X	X	X	X	X		
CCR-AP-5E	5-13-24	14:02	G	W	N		X	X	X	X	X		
DUP 1	5-13-24		G	W	N		X	X	X	X	X		

180-174082 Chain of Custody

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested I, II, III, IV, Other (specify)

Special Instructions/QC Requirements

Empty Kit Relinquished by	Date:	Time	Method of Shipment:

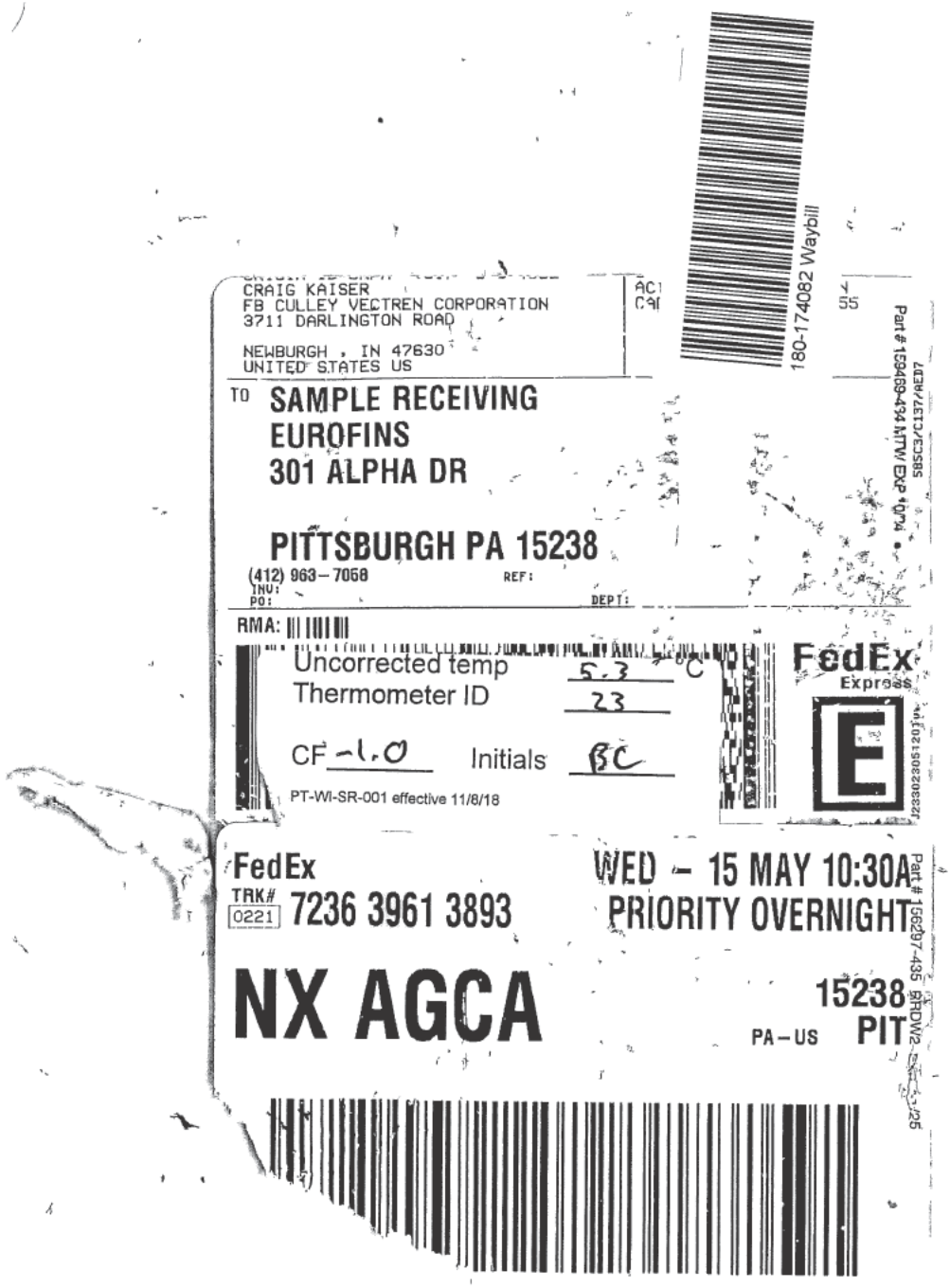
Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Hayley Tolles	5-14-24 / 1200	ATLAS	Fedex	5-14-24 / 1200	
Relinquished by	Date/Time	Company	Received by	Date/Time	Company
				05/15/24 0935	EHINE
Relinquished by	Date/Time	Company	Received by	Date/Time	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Virginia Beach Service Center

Ver: 06/08/2021

Virginia Beach Service Center


180-174082 Waybill
CRAIG KAISER
FB CULLEY VECTREN CORPORATION
3711 DARLINGTON ROAD
NEWBURGH , IN 47630
UNITED STATES US
TO SAMPLE RECEIVING
EUROFINS
301 ALPHA DR
PITTSBURGH PA 15238
(412) 963-7058
INV:
PO:
REF:
DEPT:
RMA:
Uncorrected temp 5.3 °C
Thermometer ID 23
CF -1.0 Initials BC
PT-WI-SR-001 effective 11/8/18
FedEx Express
FedEx
TRK# 0221 7236 3961 3893
WED - 15 MAY 10:30A
PRIORITY OVERNIGHT
NX AGCA
15238
PA-US
PIT

Eurofins Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone: 412-963-7058 Fax: 412-963-2468

Chain of Custody Record

eurofins Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Johnson, Andy	Carrier Tracking No(s):	COC No: 180-514836.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Andy.Johnson@et.eurofinsus.com	State of Origin: Indiana	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 180-174082-1
Address: 13715 Rider Trail North,	Due Date Requested: 5/25/2024			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: CCR Groundwater Monitoring FB Culley East	Project #: 18016014			
Site:	SSOW#:			

Analysis Requested

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	9315_Ra226/PrecSep_21 Radium-226 (GFPC) by 9315 (21-day decay)	9320_Ra228/PrecSep_0 Radium-228 (GFPC) by 9320	Ra226Ra228_GFPC/ Combined Radium-226 and Radium-228	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
CCR-AP-5 (180-174082-1)	5/13/24	13:17 Eastern		Water			X	X	X	2	
CCR-AP-5I (180-174082-2)	5/13/24	14:02 Eastern		Water			X	X	X	2	
DUP 1 (180-174082-3)	5/13/24	00:01 Eastern		Water			X	X	X	2	

Preservation Codes: -

Other:

Note: Since laboratory accreditations are subject to change, Eurofins Pittsburgh places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Pittsburgh laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Pittsburgh attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Pittsburgh.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* ____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
	5/16/24 1700	TAL PITT	Sierra Worthington	MAY 17 2024 0850	EHSO
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 180-174082-1
SDG Number: FB Culley East

Login Number: 174082
List Number: 1
Creator: Abernathy, Eric L

List Source: Eurofins Pittsburgh

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 180-174082-1
SDG Number: FB Culley East

Login Number: 174082
List Number: 3
Creator: Worthington, Sierra M

List Source: Eurofins St. Louis
List Creation: 05/17/24 02:07 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

PREPARED FOR

Attn: Todd Plating
Haley & Aldrich, Inc.
400 Augusta Street
Suite 100
Greenville, South Carolina 29601

Generated 6/17/2024 4:43:33 PM

JOB DESCRIPTION

CCR Groundwater Monitoring FB Culley East
FB Culley East

JOB NUMBER

180-173881-1

Eurofins Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh PA 15238

See page two for job notes and contact information.

my EOL

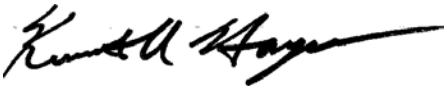
Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

PA Lab ID: 02-00416

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Pittsburgh Project Manager.

Authorization



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6/17/2024 4:43:33 PM

Authorized for release by
Ken Hayes, Project Manager II
Ken.Hayes@et.eurofinsus.com
Designee for
Andy Johnson, Senior Project Manager
Andy.Johnson@et.eurofinsus.com
(615)818-9567

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Job ID: 180-173881-1 Eurofins Pittsburgh

Job Narrative
180-173881-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 5/11/2024 10:00 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperatures of the 2 coolers at receipt time were 2.1°C and 2.6°C.

Gas Flow Proportional Counter
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Rad
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Job ID: 180-173881-2 Eurofins Pittsburgh

180-173881-2

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

- Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 5/11/2024 10:00 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperatures of the 2 coolers at receipt time were 2.1°C and 2.6°C.

HPLC/IC
Method 9056A_ORGFM_28D: The following sample was diluted due to the nature of the sample matrix: CCR-AP-11 (180-173881-3). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Metals
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Definitions/Glossary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173881-1
SDG: FB Culley East

Qualifiers

Metals

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
HF	Parameter with a holding time of 15 minutes. Test performed by laboratory at client's request. Sample was analyzed outside of hold time.

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173881-1
SDG: FB Culley East

Laboratory: Eurofins Pittsburgh

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Arkansas DEQ	State	19-033-0	06-27-24
California	State	2891	04-30-24 *
Connecticut	State	PH-0688	09-30-24
Florida	NELAP	E871008	06-30-24
Georgia	State	PA 02-00416	04-30-25
Illinois	NELAP	004375	07-31-25
Kansas	NELAP	E-10350	01-31-25
Kentucky (UST)	State	162013	04-30-23 *
Kentucky (WW)	State	KY98043	12-31-24
Louisiana	NELAP	04041	06-30-22 *
Louisiana (All)	NELAP	04041	06-30-24
Maine	State	PA00164	03-06-26
Minnesota	NELAP	042-999-482	12-31-24
New Hampshire	NELAP	2030	04-04-24 *
New Jersey	NELAP	PA005	06-30-24
New York	NELAP	11182	04-01-25
North Carolina (WW/SW)	State	434	12-31-24
North Dakota	State	R-227	04-30-24 *
Oregon	NELAP	PA-2151	02-06-25
Pennsylvania	NELAP	02-00416	04-30-25
Rhode Island	State	LAO00362	01-01-25
South Carolina	State	89014	04-30-25
Texas	NELAP	T104704528	03-31-25
US Fish & Wildlife	US Federal Programs	058448	03-31-24 *
USDA	US Federal Programs	P330-16-00211	04-11-26
Utah	NELAP	PA001462019-8	05-31-24
Virginia	NELAP	10043	07-14-24
West Virginia DEP	State	142	01-31-25
Wisconsin	State	998027800	08-31-24

Laboratory: Eurofins Cleveland

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	2927	02-28-25
Georgia	State	4062	02-27-25
Illinois	NELAP	200004	07-31-24
Iowa	State	421	06-01-25
Kentucky (UST)	State	112225	02-27-25
Kentucky (WW)	State	KY98016	12-30-24
Minnesota	NELAP	039-999-348	12-31-24
New Jersey	NELAP	OH001	06-30-24
New York	NELAP	10975	04-02-25
Ohio VAP	State	ORELAP 4062	02-27-25
Oregon	NELAP	4062	02-27-25
Pennsylvania	NELAP	68-00340	08-31-24
Texas	NELAP	T104704517-22-19	08-31-24
USDA	US Federal Programs	P330-18-00281	01-05-27
Virginia	NELAP	460175	09-14-24
West Virginia DEP	State	210	12-31-24

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Job ID: 180-173881-1
Project/Site: CCR Groundwater Monitoring FB Culley East
SDG: FB Culley East

Laboratory: Eurofins St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-25
ANAB	Dept. of Defense ELAP	L2305	04-06-25
ANAB	Dept. of Energy	L2305.01	04-08-25
ANAB	ISO/IEC 17025	L2305	04-06-25
Arizona	State	AZ0813	12-08-24
California	Los Angeles County Sanitation Districts	10259	06-30-22 *
California	State	2886	06-30-24
Connecticut	State	PH-0241	03-31-25
Florida	NELAP	E87689	06-30-24
HI - RadChem Recognition	State	n/a	06-30-24
Illinois	NELAP	200023	11-30-24
Iowa	State	373	12-01-24
Kansas	NELAP	E-10236	10-31-24
Kentucky (DW)	State	KY90125	12-31-24
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-24
Louisiana	NELAP	04080	06-30-22 *
Louisiana (All)	NELAP	04080	06-30-24
Louisiana (DW)	State	LA011	12-31-24
Maryland	State	310	09-30-24
Massachusetts	State	M-MO054	06-30-24
MI - RadChem Recognition	State	9005	06-30-24
Missouri	State	780	06-30-25
Nevada	State	MO00054	07-31-24
New Jersey	NELAP	MO002	06-30-24
New Mexico	State	MO00054	06-30-24
New York	NELAP	11616	03-31-25
North Carolina (DW)	State	29700	07-31-24
North Dakota	State	R-207	06-30-24
Oklahoma	NELAP	9997	08-31-24
Oregon	NELAP	4157	09-01-24
Pennsylvania	NELAP	68-00540	02-28-25
South Carolina	State	85002001	06-30-24
Texas	NELAP	T104704193	07-31-24
US Fish & Wildlife	US Federal Programs	058448	07-31-24
USDA	US Federal Programs	P330-17-00028	05-18-26
Utah	NELAP	MO00054	07-31-24
Virginia	NELAP	460230	06-14-24
Washington	State	C592	08-30-24
West Virginia DEP	State	381	10-31-24

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Sample Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173881-1
SDG: FB Culley East

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
180-173881-1	CCR-AP-7	Water	05/10/24 12:00	05/11/24 10:00
180-173881-2	CCR-AP-8	Water	05/10/24 15:30	05/11/24 10:00
180-173881-3	CCR-AP-11	Water	05/10/24 14:45	05/11/24 10:00
180-173881-4	FIELD BLANK 1	Water	05/10/24 15:45	05/11/24 10:00

Method Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173881-1
SDG: FB Culley East

Method	Method Description	Protocol	Laboratory
9315	Radium-226 (GFPC)	SW846	EET SL
9320	Radium-228 (GFPC)	SW846	EET SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	EET SL
PrecSep_0	Preparation, Precipitate Separation	None	EET SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	EET SL

Protocol References:

None = None

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173881-1
SDG: FB Culley East

Client Sample ID: CCR-AP-7

Date Collected: 05/10/24 12:00
Date Received: 05/11/24 10:00

Lab Sample ID: 180-173881-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	468668	05/15/24 16:14	AM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			613436	05/17/24 03:09	KLC	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			613785	05/20/24 12:53	RKT	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	469056	05/18/24 10:45	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 12:41	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468497	05/13/24 18:05	SNR	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	468762	05/15/24 17:28	LWM	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			1006.02 mL	1.0 g	661791	05/15/24 09:14	MLT	EET SL
Total/NA	Analysis	9315		1	1.0 mL	1.0 mL	665614	06/10/24 19:21	SCB	EET SL
	Instrument ID: GFPCBLUE									
Total/NA	Prep	PrecSep_0			1006.02 mL	1.0 g	661792	05/15/24 09:17	MLT	EET SL
Total/NA	Analysis	9320		1			665181	06/07/24 11:40	SCB	EET SL
	Instrument ID: GFPCORANGE									
Total/NA	Analysis	Ra226_Ra228		1			665833	06/12/24 08:25	FLC	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: CCR-AP-8

Date Collected: 05/10/24 15:30
Date Received: 05/11/24 10:00

Lab Sample ID: 180-173881-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	468668	05/15/24 20:40	AM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			613436	05/17/24 05:00	KLC	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			613785	05/20/24 13:56	RKT	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	469056	05/18/24 10:45	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 12:45	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468497	05/13/24 18:44	SNR	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	468762	05/15/24 17:28	LWM	EET PIT
	Instrument ID: NOEQUIP									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173881-1
SDG: FB Culley East

Client Sample ID: CCR-AP-8

Date Collected: 05/10/24 15:30
Date Received: 05/11/24 10:00

Lab Sample ID: 180-173881-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	PrecSep-21			751.75 mL	1.0 g	661791	05/15/24 09:14	MLT	EET SL
Total/NA	Analysis	9315		1			665614	06/10/24 19:22	SCB	EET SL
	Instrument ID: GFPCBLUE									
Total/NA	Prep	PrecSep_0			751.75 mL	1.0 g	661792	05/15/24 09:17	MLT	EET SL
Total/NA	Analysis	9320		1			665181	06/07/24 11:40	SCB	EET SL
	Instrument ID: GFPCORANGE									
Total/NA	Analysis	Ra226_Ra228		1			665833	06/12/24 08:25	FLC	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: CCR-AP-11

Date Collected: 05/10/24 14:45
Date Received: 05/11/24 10:00

Lab Sample ID: 180-173881-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	468668	05/15/24 20:11	AM	EET PIT
	Instrument ID: CHICS2100B									
Total/NA	Analysis	EPA 9056A		5	1 mL	1 mL	468668	05/15/24 20:25	AM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			613436	05/17/24 05:04	KLC	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			613785	05/20/24 14:04	RKT	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	469056	05/18/24 10:45	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 12:46	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468497	05/13/24 18:39	SNR	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	468762	05/15/24 17:28	LWM	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			999.68 mL	1.0 g	661791	05/15/24 09:14	MLT	EET SL
Total/NA	Analysis	9315		1			665614	06/10/24 19:22	SCB	EET SL
	Instrument ID: GFPCBLUE									
Total/NA	Prep	PrecSep_0			999.68 mL	1.0 g	661792	05/15/24 09:17	MLT	EET SL
Total/NA	Analysis	9320		1			665181	06/07/24 11:41	SCB	EET SL
	Instrument ID: GFPCORANGE									
Total/NA	Analysis	Ra226_Ra228		1			665833	06/12/24 08:25	FLC	EET SL
	Instrument ID: NOEQUIP									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173881-1
SDG: FB Culley East

Client Sample ID: FIELD BLANK 1

Date Collected: 05/10/24 15:45
Date Received: 05/11/24 10:00

Lab Sample ID: 180-173881-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	468668	05/15/24 21:39	AM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			613436	05/17/24 05:09	KLC	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	613145	05/15/24 14:00	GK	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			613785	05/20/24 14:07	RKT	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			25 mL	25 mL	469056	05/18/24 10:45	SJM	EET PIT
Total/NA	Analysis	EPA 7470A		1			469200	05/20/24 12:47	MTW	EET PIT
	Instrument ID: HGY									
Total/NA	Analysis	EPA 9040C		1			468497	05/13/24 18:26	SNR	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	468762	05/15/24 17:28	LWM	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			1002.29 mL	1.0 g	661791	05/15/24 09:14	MLT	EET SL
Total/NA	Analysis	9315		1			665614	06/10/24 19:22	SCB	EET SL
	Instrument ID: GFPCBLUE									
Total/NA	Prep	PrecSep_0			1002.29 mL	1.0 g	661792	05/15/24 09:17	MLT	EET SL
Total/NA	Analysis	9320		1			665181	06/07/24 11:41	SCB	EET SL
	Instrument ID: GFPCORANGE									
Total/NA	Analysis	Ra226_Ra228		1			665833	06/12/24 08:25	FLC	EET SL
	Instrument ID: NOEQUIP									

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173881-1
SDG: FB Culley East

Analyst References:

Lab: EET CLE
- Batch Type: Prep
  - GK = Grace Kessler
- Batch Type: Analysis
  - KLC = Karen Counts
  - RKT = Roger Toth

Lab: EET PIT
- Batch Type: Prep
  - SJM = Shannon Mueller
- Batch Type: Analysis
  - AM = Adzuira Musule
  - LWM = Leslie McIntire
  - MTW = Michael Wesoloski
  - SNR = Sabra Richart

Lab: EET SL
- Batch Type: Prep
  - MLT = Michaela Tiemeyer
- Batch Type: Analysis
  - FLC = Fernando Cruz
  - SCB = Sarah Bernsen

Client Sample ID: CCR-AP-7

Date Collected: 05/10/24 12:00
Date Received: 05/11/24 10:00

Lab Sample ID: 180-173881-1

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**43**		1.0	0.71	mg/L			05/15/24 16:14	1
Fluoride	**0.31**		0.10	0.026	mg/L			05/15/24 16:14	1
Sulfate	**110**		1.0	0.76	mg/L			05/15/24 16:14	1

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	ND		0.10	0.057	mg/L		05/15/24 14:00	05/17/24 03:09	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 12:53	1
Arsenic	**0.00090**	**J**	0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 12:53	1
Barium	**0.10**		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 12:53	1
Beryllium	ND		0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 12:53	1
Cadmium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 12:53	1
Calcium	**120**		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 12:53	1
Chromium	ND		0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 12:53	1
Cobalt	**0.00030**	**J**	0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 12:53	1
Lead	ND		0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 12:53	1
Lithium	**0.011**		0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 12:53	1
Molybdenum	**0.0013**	**J**	0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 12:53	1
Selenium	ND		0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 12:53	1
Thallium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 12:53	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/18/24 10:45	05/20/24 12:41	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	**630**		10	10	mg/L			05/15/24 17:28	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**7.2**	**HF**	0.1	0.1	SU			05/13/24 18:05	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.337**		0.145	0.148	1.00	0.158	pCi/L	05/15/24 09:14	06/10/24 19:21	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.3*		*30 - 110*	*05/15/24 09:14*	*06/10/24 19:21*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.529	U	0.364	0.367	1.00	0.542	pCi/L	05/15/24 09:17	06/07/24 11:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.3*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:40*	*1*

Client Sample ID: CCR-AP-7
Lab Sample ID: 180-173881-1

Date Collected: 05/10/24 12:00
Matrix: Water
Date Received: 05/11/24 10:00

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*80.0*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:40*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**0.866**		0.392	0.396	5.00	0.542	pCi/L		06/12/24 08:25	1

Client Sample ID: CCR-AP-8

Date Collected: 05/10/24 15:30
Date Received: 05/11/24 10:00

Lab Sample ID: 180-173881-2

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	25		1.0	0.71	mg/L			05/15/24 20:40	1
Fluoride	0.22		0.10	0.026	mg/L			05/15/24 20:40	1
Sulfate	2.7		1.0	0.76	mg/L			05/15/24 20:40	1

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	0.13		0.10	0.057	mg/L		05/15/24 14:00	05/17/24 05:00	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00064	J	0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 13:56	1
Arsenic	0.013		0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 13:56	1
Barium	0.27		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 13:56	1
Beryllium	ND		0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 13:56	1
Cadmium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:56	1
Calcium	140		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 13:56	1
Chromium	0.0039	J	0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 13:56	1
Cobalt	0.0044		0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 13:56	1
Lead	0.0030		0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 13:56	1
Lithium	0.0039	J	0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 13:56	1
Molybdenum	0.012		0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 13:56	1
Selenium	0.0021	J	0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 13:56	1
Thallium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 13:56	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/18/24 10:45	05/20/24 12:45	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	770		10	10	mg/L			05/15/24 17:28	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	7.1	HF	0.1	0.1	SU			05/13/24 18:44	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.489		0.205	0.210	1.00	0.223	pCi/L	05/15/24 09:14	06/10/24 19:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.8*		*30 - 110*	*05/15/24 09:14*	*06/10/24 19:22*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.589	U	0.505	0.508	1.00	0.791	pCi/L	05/15/24 09:17	06/07/24 11:40	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.8*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:40*	*1*

Client Sample ID: CCR-AP-8
Date Collected: 05/10/24 15:30
Date Received: 05/11/24 10:00

Lab Sample ID: 180-173881-2
Matrix: Water

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*77.4*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:40*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**1.08**		0.545	0.550	5.00	0.791	pCi/L		06/12/24 08:25	1

Client Sample ID: CCR-AP-11

Date Collected: 05/10/24 14:45
Date Received: 05/11/24 10:00

Lab Sample ID: 180-173881-3

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**26**		1.0	0.71	mg/L			05/15/24 20:11	1
Fluoride	**0.30**		0.10	0.026	mg/L			05/15/24 20:11	1
Sulfate	**450**		5.0	3.8	mg/L			05/15/24 20:25	5

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**0.30**		0.10	0.057	mg/L		05/15/24 14:00	05/17/24 05:04	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 14:04	1
Arsenic	**0.0056**		0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 14:04	1
Barium	**0.15**		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 14:04	1
Beryllium	ND		0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 14:04	1
Cadmium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 14:04	1
Calcium	**120**		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 14:04	1
Chromium	**0.0016**	**J**	0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 14:04	1
Cobalt	**0.036**		0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 14:04	1
Lead	**0.00059**	**J**	0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 14:04	1
Lithium	**0.0048**	**J**	0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 14:04	1
Molybdenum	ND		0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 14:04	1
Selenium	ND		0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 14:04	1
Thallium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 14:04	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/18/24 10:45	05/20/24 12:46	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	**900**		10	10	mg/L			05/15/24 17:28	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**6.5**	**HF**	0.1	0.1	SU			05/13/24 18:39	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.292**		0.146	0.148	1.00	0.184	pCi/L	05/15/24 09:14	06/10/24 19:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.8*		*30 - 110*	*05/15/24 09:14*	*06/10/24 19:22*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.562**		0.344	0.348	1.00	0.494	pCi/L	05/15/24 09:17	06/07/24 11:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.8*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:41*	*1*

Client Sample ID: CCR-AP-11
Date Collected: 05/10/24 14:45
Date Received: 05/11/24 10:00

Lab Sample ID: 180-173881-3
Matrix: Water

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*80.0*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:41*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**0.854**		0.374	0.378	5.00	0.494	pCi/L		06/12/24 08:25	1

Client Sample ID: FIELD BLANK 1

Date Collected: 05/10/24 15:45
Date Received: 05/11/24 10:00

Lab Sample ID: 180-173881-4

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		1.0	0.71	mg/L			05/15/24 21:39	1
Fluoride	ND		0.10	0.026	mg/L			05/15/24 21:39	1
Sulfate	ND		1.0	0.76	mg/L			05/15/24 21:39	1

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	ND		0.10	0.057	mg/L		05/15/24 14:00	05/17/24 05:09	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 14:07	1
Arsenic	ND		0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 14:07	1
Barium	ND		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 14:07	1
Beryllium	ND		0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 14:07	1
Cadmium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 14:07	1
Calcium	ND		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 14:07	1
Chromium	ND		0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 14:07	1
Cobalt	ND		0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 14:07	1
Lead	ND		0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 14:07	1
Lithium	ND		0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 14:07	1
Molybdenum	ND		0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 14:07	1
Selenium	ND		0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 14:07	1
Thallium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 14:07	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/18/24 10:45	05/20/24 12:47	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	ND		10	10	mg/L			05/15/24 17:28	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**5.5**	**HF**	0.1	0.1	SU			05/13/24 18:26	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.0213	U	0.0708	0.0708	1.00	0.163	pCi/L	05/15/24 09:14	06/10/24 19:22	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.3*		*30 - 110*	*05/15/24 09:14*	*06/10/24 19:22*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0176	U	0.303	0.303	1.00	0.579	pCi/L	05/15/24 09:17	06/07/24 11:41	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.3*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:41*	*1*

Client Sample ID: FIELD BLANK 1
Lab Sample ID: 180-173881-4

Date Collected: 05/10/24 15:45
Matrix: Water
Date Received: 05/11/24 10:00

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*80.0*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:41*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	-0.0389	U	0.311	0.311	5.00	0.579	pCi/L		06/12/24 08:25	1

Method: EPA 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 180-468668/6
Matrix: Water
Analysis Batch: 468668

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		1.0	0.71	mg/L			05/15/24 10:48	1
Fluoride	ND		0.10	0.026	mg/L			05/15/24 10:48	1
Sulfate	ND		1.0	0.76	mg/L			05/15/24 10:48	1

Lab Sample ID: LCS 180-468668/7
Matrix: Water
Analysis Batch: 468668

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	50.0	50.2		mg/L		100	80 - 120
Fluoride	2.50	2.49		mg/L		99	80 - 120
Sulfate	50.0	49.9		mg/L		100	80 - 120

Lab Sample ID: 180-173881-1 MS
Matrix: Water
Analysis Batch: 468668

Client Sample ID: CCR-AP-7
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	43		250	286		mg/L		97	80 - 120
Fluoride	0.31		12.5	12.2		mg/L		95	80 - 120
Sulfate	110		250	347		mg/L		96	80 - 120

Lab Sample ID: 180-173881-1 MSD
Matrix: Water
Analysis Batch: 468668

Client Sample ID: CCR-AP-7
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Chloride	43		250	294		mg/L		101	80 - 120	3	15
Fluoride	0.31		12.5	12.6		mg/L		98	80 - 120	3	15
Sulfate	110		250	360		mg/L		101	80 - 120	4	15

Method: EPA 6010D - Metals (ICP)

Lab Sample ID: MB 240-613145/1-A
Matrix: Water
Analysis Batch: 613436

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 613145

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	ND		0.10	0.057	mg/L		05/15/24 14:00	05/17/24 03:00	1

Lab Sample ID: LCS 240-613145/2-A
Matrix: Water
Analysis Batch: 613436

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 613145

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Boron	1.00	1.04		mg/L		104	80 - 120

Method: EPA 6010D - Metals (ICP) (Continued)

Lab Sample ID: 180-173881-1 MS
Matrix: Water
Analysis Batch: 613436

Client Sample ID: CCR-AP-7
Prep Type: Total Recoverable
Prep Batch: 613145

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Boron	ND		1.00	1.05		mg/L		105	75 - 125

Lab Sample ID: 180-173881-1 MSD
Matrix: Water
Analysis Batch: 613436

Client Sample ID: CCR-AP-7
Prep Type: Total Recoverable
Prep Batch: 613145

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Boron	ND		1.00	1.10		mg/L		110	75 - 125	4	20

Method: EPA 6020B - Metals (ICP/MS)

Lab Sample ID: MB 240-613145/1-A
Matrix: Water
Analysis Batch: 613785

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 613145

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		05/15/24 14:00	05/20/24 12:45	1
Arsenic	ND		0.0050	0.00075	mg/L		05/15/24 14:00	05/20/24 12:45	1
Barium	ND		0.0050	0.0022	mg/L		05/15/24 14:00	05/20/24 12:45	1
Beryllium	ND		0.0010	0.00062	mg/L		05/15/24 14:00	05/20/24 12:45	1
Cadmium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 12:45	1
Calcium	ND		1.0	0.25	mg/L		05/15/24 14:00	05/20/24 12:45	1
Chromium	ND		0.0050	0.0012	mg/L		05/15/24 14:00	05/20/24 12:45	1
Cobalt	ND		0.0010	0.00019	mg/L		05/15/24 14:00	05/20/24 12:45	1
Lead	ND		0.0010	0.00045	mg/L		05/15/24 14:00	05/20/24 12:45	1
Lithium	ND		0.0080	0.0017	mg/L		05/15/24 14:00	05/20/24 12:45	1
Molybdenum	ND		0.0050	0.0011	mg/L		05/15/24 14:00	05/20/24 12:45	1
Selenium	ND		0.0050	0.00089	mg/L		05/15/24 14:00	05/20/24 12:45	1
Thallium	ND		0.0010	0.00020	mg/L		05/15/24 14:00	05/20/24 12:45	1

Lab Sample ID: LCS 240-613145/3-A
Matrix: Water
Analysis Batch: 613785

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 613145

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Antimony	0.100	0.0942		mg/L		94	80 - 120
Arsenic	1.00	0.944		mg/L		94	80 - 120
Barium	1.00	0.933		mg/L		93	80 - 120
Beryllium	0.500	0.468		mg/L		94	80 - 120
Cadmium	0.500	0.479		mg/L		96	80 - 120
Calcium	25.0	24.5		mg/L		98	80 - 120
Chromium	0.500	0.481		mg/L		96	80 - 120
Cobalt	0.500	0.482		mg/L		96	80 - 120
Lead	0.500	0.488		mg/L		98	80 - 120
Lithium	0.500	0.518		mg/L		104	80 - 120
Molybdenum	0.500	0.469		mg/L		94	80 - 120
Selenium	1.00	0.951		mg/L		95	80 - 120
Thallium	1.00	0.970		mg/L		97	80 - 120

Method: EPA 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: 180-173881-1 MS
Matrix: Water
Analysis Batch: 613785

Client Sample ID: CCR-AP-7
Prep Type: Total Recoverable
Prep Batch: 613145

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Antimony	ND		0.100	0.0971		mg/L		97	80 - 120
Arsenic	0.00090	J	1.00	0.977		mg/L		98	80 - 120
Barium	0.10		1.00	1.06		mg/L		96	80 - 120
Beryllium	ND		0.500	0.473		mg/L		95	80 - 120
Cadmium	ND		0.500	0.488		mg/L		98	80 - 120
Calcium	120		25.0	148	4	mg/L		105	80 - 120
Chromium	ND		0.500	0.494		mg/L		99	80 - 120
Cobalt	0.00030	J	0.500	0.495		mg/L		99	80 - 120
Lead	ND		0.500	0.488		mg/L		98	80 - 120
Lithium	0.011		0.500	0.540		mg/L		106	80 - 120
Molybdenum	0.0013	J	0.500	0.488		mg/L		97	80 - 120
Selenium	ND		1.00	0.960		mg/L		96	80 - 120
Thallium	ND		1.00	0.979		mg/L		98	80 - 120

Lab Sample ID: 180-173881-1 MSD
Matrix: Water
Analysis Batch: 613785

Client Sample ID: CCR-AP-7
Prep Type: Total Recoverable
Prep Batch: 613145

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Antimony	ND		0.100	0.0966		mg/L		97	80 - 120	0	20
Arsenic	0.00090	J	1.00	0.970		mg/L		97	80 - 120	1	20
Barium	0.10		1.00	1.05		mg/L		95	80 - 120	1	20
Beryllium	ND		0.500	0.468		mg/L		94	80 - 120	1	20
Cadmium	ND		0.500	0.487		mg/L		97	80 - 120	0	20
Calcium	120		25.0	148	4	mg/L		105	80 - 120	0	20
Chromium	ND		0.500	0.494		mg/L		99	80 - 120	0	20
Cobalt	0.00030	J	0.500	0.493		mg/L		99	80 - 120	0	20
Lead	ND		0.500	0.499		mg/L		100	80 - 120	2	20
Lithium	0.011		0.500	0.543		mg/L		106	80 - 120	0	20
Molybdenum	0.0013	J	0.500	0.489		mg/L		98	80 - 120	0	20
Selenium	ND		1.00	0.958		mg/L		96	80 - 120	0	20
Thallium	ND		1.00	0.996		mg/L		100	80 - 120	2	20

Method: EPA 7470A - Mercury (CVAA)

Lab Sample ID: MB 180-469056/1-A
Matrix: Water
Analysis Batch: 469200

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 469056

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		05/18/24 10:45	05/20/24 12:39	1

Lab Sample ID: LCS 180-469056/2-A
Matrix: Water
Analysis Batch: 469200

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 469056

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Mercury	0.00250	0.00249		mg/L		100	80 - 120

Method: EPA 7470A - Mercury (CVAA) (Continued)

Lab Sample ID: 180-173881-1 MS
Matrix: Water
Analysis Batch: 469200

Client Sample ID: CCR-AP-7
Prep Type: Total/NA
Prep Batch: 469056

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Mercury	ND		0.00100	0.000930		mg/L		93	75 - 125

Lab Sample ID: 180-173881-1 MSD
Matrix: Water
Analysis Batch: 469200

Client Sample ID: CCR-AP-7
Prep Type: Total/NA
Prep Batch: 469056

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Mercury	ND		0.00100	0.000943		mg/L		94	75 - 125	1	20

Method: EPA 9040C - pH

Lab Sample ID: LCS 180-468497/24
Matrix: Water
Analysis Batch: 468497

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
pH	7.00	7.0		SU		100	99 - 101

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 180-468762/1
Matrix: Water
Analysis Batch: 468762

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	10	mg/L			05/15/24 17:28	1

Lab Sample ID: LCS 180-468762/2
Matrix: Water
Analysis Batch: 468762

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Dissolved Solids	417	418		mg/L		100	85 - 115

Method: 9315 - Radium-226 (GFPC)

Lab Sample ID: MB 160-661791/1-A
Matrix: Water
Analysis Batch: 665297

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 661791

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.01654	U	0.0608	0.0608	1.00	0.121	pCi/L	05/15/24 09:14	06/10/24 16:32	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.0*		*30 - 110*	*05/15/24 09:14*	*06/10/24 16:32*	*1*

Method: 9315 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCS 160-661791/2-A
Matrix: Water
Analysis Batch: 665297

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 661791

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			11.3	10.47		1.18	1.00	0.156	pCi/L	92	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*78.9*		*30 - 110*

Lab Sample ID: 180-173881-1 DU
Matrix: Water
Analysis Batch: 665614

Client Sample ID: CCR-AP-7
Prep Type: Total/NA
Prep Batch: 661791

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-226	0.337			0.1424	U	0.122	1.00	0.183	pCi/L			0.72	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*84.6*		*30 - 110*

Method: 9320 - Radium-228 (GFPC)

Lab Sample ID: MB 160-661792/1-A
Matrix: Water
Analysis Batch: 665182

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 661792

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.5941		0.362	0.367	1.00	0.526	pCi/L	05/15/24 09:17	06/07/24 11:51	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.0*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:51*	*1*
Y Carrier	*77.4*		*30 - 110*	*05/15/24 09:17*	*06/07/24 11:51*	*1*

Lab Sample ID: LCS 160-661792/2-A
Matrix: Water
Analysis Batch: 665182

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 661792

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.87	10.19		1.45	1.00	0.679	pCi/L	115	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*78.9*		*30 - 110*
Y Carrier	*78.5*		*30 - 110*

Method: 9320 - Radium-228 (GFPC) (Continued)

Lab Sample ID: 180-173881-1 DU
Matrix: Water
Analysis Batch: 665181

Client Sample ID: CCR-AP-7
Prep Type: Total/NA
Prep Batch: 661792

Analyte	Sample Result	Sample Qual		DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit			RER	RER Limit
Radium-228	0.529	U		0.8667		0.426	1.00	0.565	pCi/L			0.43	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Ba Carrier	*84.6*		*30 - 110*
Y Carrier	*78.9*		*30 - 110*

HPLC/IC

Analysis Batch: 468668

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173881-1	CCR-AP-7	Total/NA	Water	EPA 9056A	
180-173881-2	CCR-AP-8	Total/NA	Water	EPA 9056A	
180-173881-3	CCR-AP-11	Total/NA	Water	EPA 9056A	
180-173881-3	CCR-AP-11	Total/NA	Water	EPA 9056A	
180-173881-4	FIELD BLANK 1	Total/NA	Water	EPA 9056A	
MB 180-468668/6	Method Blank	Total/NA	Water	EPA 9056A	
LCS 180-468668/7	Lab Control Sample	Total/NA	Water	EPA 9056A	
180-173881-1 MS	CCR-AP-7	Total/NA	Water	EPA 9056A	
180-173881-1 MSD	CCR-AP-7	Total/NA	Water	EPA 9056A	

Metals

Prep Batch: 469056

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173881-1	CCR-AP-7	Total/NA	Water	7470A	
180-173881-2	CCR-AP-8	Total/NA	Water	7470A	
180-173881-3	CCR-AP-11	Total/NA	Water	7470A	
180-173881-4	FIELD BLANK 1	Total/NA	Water	7470A	
MB 180-469056/1-A	Method Blank	Total/NA	Water	7470A	
LCS 180-469056/2-A	Lab Control Sample	Total/NA	Water	7470A	
180-173881-1 MS	CCR-AP-7	Total/NA	Water	7470A	
180-173881-1 MSD	CCR-AP-7	Total/NA	Water	7470A	

Analysis Batch: 469200

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173881-1	CCR-AP-7	Total/NA	Water	EPA 7470A	469056
180-173881-2	CCR-AP-8	Total/NA	Water	EPA 7470A	469056
180-173881-3	CCR-AP-11	Total/NA	Water	EPA 7470A	469056
180-173881-4	FIELD BLANK 1	Total/NA	Water	EPA 7470A	469056
MB 180-469056/1-A	Method Blank	Total/NA	Water	EPA 7470A	469056
LCS 180-469056/2-A	Lab Control Sample	Total/NA	Water	EPA 7470A	469056
180-173881-1 MS	CCR-AP-7	Total/NA	Water	EPA 7470A	469056
180-173881-1 MSD	CCR-AP-7	Total/NA	Water	EPA 7470A	469056

Prep Batch: 613145

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173881-1	CCR-AP-7	Total Recoverable	Water	3005A	
180-173881-2	CCR-AP-8	Total Recoverable	Water	3005A	
180-173881-3	CCR-AP-11	Total Recoverable	Water	3005A	
180-173881-4	FIELD BLANK 1	Total Recoverable	Water	3005A	
MB 240-613145/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-613145/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-613145/3-A	Lab Control Sample	Total Recoverable	Water	3005A	
180-173881-1 MS	CCR-AP-7	Total Recoverable	Water	3005A	
180-173881-1 MS	CCR-AP-7	Total Recoverable	Water	3005A	
180-173881-1 MSD	CCR-AP-7	Total Recoverable	Water	3005A	
180-173881-1 MSD	CCR-AP-7	Total Recoverable	Water	3005A	

Analysis Batch: 613436

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173881-1	CCR-AP-7	Total Recoverable	Water	EPA 6010D	613145

Metals (Continued)

Analysis Batch: 613436 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173881-2	CCR-AP-8	Total Recoverable	Water	EPA 6010D	613145
180-173881-3	CCR-AP-11	Total Recoverable	Water	EPA 6010D	613145
180-173881-4	FIELD BLANK 1	Total Recoverable	Water	EPA 6010D	613145
MB 240-613145/1-A	Method Blank	Total Recoverable	Water	EPA 6010D	613145
LCS 240-613145/2-A	Lab Control Sample	Total Recoverable	Water	EPA 6010D	613145
180-173881-1 MS	CCR-AP-7	Total Recoverable	Water	EPA 6010D	613145
180-173881-1 MSD	CCR-AP-7	Total Recoverable	Water	EPA 6010D	613145

Analysis Batch: 613785

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173881-1	CCR-AP-7	Total Recoverable	Water	EPA 6020B	613145
180-173881-2	CCR-AP-8	Total Recoverable	Water	EPA 6020B	613145
180-173881-3	CCR-AP-11	Total Recoverable	Water	EPA 6020B	613145
180-173881-4	FIELD BLANK 1	Total Recoverable	Water	EPA 6020B	613145
MB 240-613145/1-A	Method Blank	Total Recoverable	Water	EPA 6020B	613145
LCS 240-613145/3-A	Lab Control Sample	Total Recoverable	Water	EPA 6020B	613145
180-173881-1 MS	CCR-AP-7	Total Recoverable	Water	EPA 6020B	613145
180-173881-1 MSD	CCR-AP-7	Total Recoverable	Water	EPA 6020B	613145

General Chemistry

Analysis Batch: 468497

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173881-1	CCR-AP-7	Total/NA	Water	EPA 9040C	
180-173881-2	CCR-AP-8	Total/NA	Water	EPA 9040C	
180-173881-3	CCR-AP-11	Total/NA	Water	EPA 9040C	
180-173881-4	FIELD BLANK 1	Total/NA	Water	EPA 9040C	
LCS 180-468497/24	Lab Control Sample	Total/NA	Water	EPA 9040C	

Analysis Batch: 468762

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173881-1	CCR-AP-7	Total/NA	Water	SM 2540C	
180-173881-2	CCR-AP-8	Total/NA	Water	SM 2540C	
180-173881-3	CCR-AP-11	Total/NA	Water	SM 2540C	
180-173881-4	FIELD BLANK 1	Total/NA	Water	SM 2540C	
MB 180-468762/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 180-468762/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Rad

Prep Batch: 661791

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173881-1	CCR-AP-7	Total/NA	Water	PrecSep-21	
180-173881-2	CCR-AP-8	Total/NA	Water	PrecSep-21	
180-173881-3	CCR-AP-11	Total/NA	Water	PrecSep-21	
180-173881-4	FIELD BLANK 1	Total/NA	Water	PrecSep-21	
MB 160-661791/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-661791/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
180-173881-1 DU	CCR-AP-7	Total/NA	Water	PrecSep-21	

QC Association Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-173881-1
SDG: FB Culley East

Rad

Prep Batch: 661792

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-173881-1	CCR-AP-7	Total/NA	Water	PrecSep_0	
180-173881-2	CCR-AP-8	Total/NA	Water	PrecSep_0	
180-173881-3	CCR-AP-11	Total/NA	Water	PrecSep_0	
180-173881-4	FIELD BLANK 1	Total/NA	Water	PrecSep_0	
MB 160-661792/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-661792/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
180-173881-1 DU	CCR-AP-7	Total/NA	Water	PrecSep_0	

Eurofins Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone: 412-963-7058 Fax: 412-963-2468

Chain of Custody Record

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Client Information	Sampler: Hayley Tolles	Lab PM: Johnson, Andy	Carrier Tracking No(s):	COC No.: 180-101847-14505.2
Client Contact: Mark Breting	Phone:	E-Mail: Andy.Johnson@et.eurofinsus.com	State of Origin:	Page: Page 2 of 2
Company: Atlas Technical Consultants LLC	PWSID:			Job #:
Address: 7988 Centerpoint Drive Suite 100	Due Date Requested:			
City: Indianapolis	TAT Requested (days):			
State, Zip: IN, 46256	Compliance Project: Δ Yes Δ No			
Phone:	PO #: 0129420-032-001-01			
Email: mark.breting@atcassociates.com	WO #: See Chain			
Project Name: CCR GW Monitoring FB Culley East	Project #: 18016014			
Site: Culley East	SSOW#:			

Analysis Requested

Preservation Codes:
N - None
D - HNO3

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	9040C, 9056A_ORGFM_28D	2540C_Calcd - TDS by 2540C	9315_Ra226, 9320_Ra228	6020B - Metals by 6020B	7470A - Hg by 7470A	Special Instructions/Note:
CCR-AP-7	5-10-24	12:00	G	W	X	X	X	X	X	
CCA-AP-8		15:30	G	W	X	X	X	X	X	
CCR-AP-11		14:45	G	W	X	X	X	X	X	
MS 1		12:00	G	W	X	X	X	X	X	
MSD 1		12:00	G	W	X	X	X	X	X	
Field Blank 1	5-10-24	15:45	G	W	X	X	X	X	X	

180-173881 Chain of Custody

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by: Hayley Tolles	Date/Time: 5-10-24/17:15	Company: ATLAS	Received by: Fedex	Date/Time: 5-10-24/17:15	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time: 05/11/24 1000	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021



ORIGIN ID:GTYA (317) 579-4082
CRAIG KAISER
FB CULLEY VECTREN CORP
3711 DARLINGTON ROAD

NEWBURGH, IN 47630
UNITED STATES US

SHIP DATE: 06MAY24
ACTWGT: 44.00 LB MAN
CAD: 0129689/CAFE3511

570C3/C137/6F4D

TO SAMPLE RECEIVING
EUROFINS ENVIRONMENT TESTING NE
301 ALPHA DRIVE
RIDC PARK
PITTSBURGH PA 152382907

(412) 963-7058 REF:
INV:
PO: DEPT:

RMA:

Uncorrected temp 2.5 °C
Thermometer ID 2G
CF -0.2 Initials PM
PT-WI-SR-001 effective 11/8/18

FedEx Express

J211020121101uv

Part # 156297-435 RRDW2 EXP 01/25

SATURDAY 12:00P
PRIORITY OVERNIGHT

15238
PIT
PA-US

FedEx
TRK# 0221 6772 2904 7044

XO AGCA

#5579144 05/10 5B3J4/C45B/9AE3

180-173881 Waybill

FedEx
TRK# 0221 6772 2904 7055

XO AGCA

SATURDAY 12:00P
PRIORITY OVERNIGHT

15238
PIT
PA-US

Part # 156297-435 RRDW2 EXP 01/25

Uncorrected temp 2.9 °C
Thermometer ID 17
CF -0.3 Initials

PT-WI-SR-001 effective 11/8/18

*5579149 05/10 5B3J4/C458/9AE3

FedEx Express

J211202121101uv

RMA:

DEPT:

TO SAMPLE RECEIVING
EUROFINS ENVIRONMENT TESTING NE
301 ALPHA DRIVE
RIDC PARK
PITTSBURGH PA 152382907
(412) 963-7058

REF:

INV:
PO:

ORIGIN ID:GTYA (317) 579-4082
CRAIG KAISER
FB CULLEY VECTREN CORP
3711 DARLINGTON ROAD
NEWBURGH, IN 47630
UNITED STATES US

SHIP DATE: 06MAY24
ACTWGT: 44.00 LB MAN
CAD: 0128689/CAFE3511

576C9/C137/6F4D

Eurofins Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone: 412-963-7058 Fax: 412-963-2468

Chain of Custody Record

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Client Information (Sub Contract Lab)	Sampler:	Lab PM: Johnson, Andy	Carrier Tracking No(s):	COC No: 180-514536.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Andy.Johnson@et.eurofinsus.com	State of Origin: Indiana	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 180-173881-1
Address: 13715 Rider Trail North,	Due Date Requested: 5/23/2024			Preservation Codes:
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: CCR Groundwater Monitoring FB Culley East	Project #: 18016014			
Site:	SSOW#:			Other:

Analysis Requested

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	9315_Ra226/PrecSep_21 Radium-226 (GFPC) by 9315 (21-day decay)	9320_Ra228/PrecSep_0 Radium-228 (GFPC) by 9320	Ra226Ra228_GFPC/ Combined Radium-226 and Radium-228	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
CCR-AP-7 (180-173881-1DU)	5/10/24	12:00 Eastern	DU	Water			X	X		4	
CCR-AP-8 (180-173881-2)	5/10/24	15:30 Eastern		Water			X	X	X	1	
CCR-AP-11 (180-173881-3)	5/10/24	14:45 Eastern		Water			X	X	X	2	
FIELD BLANK 1 (180-173881-4)	5/10/24	15:45 Eastern		Water			X	X	X	2	

Note: Since laboratory accreditations are subject to change, Eurofins Pittsburgh places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Pittsburgh laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Pittsburgh attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Pittsburgh.

Possible Hazard Identification: Unconfirmed	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month): ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by	Date/Time: 5-13-24 1700	Company: EPINE	Received by	Date/Time:	Company
Relinquished by	Date/Time:	Company	Received by: M. Pinette	Date/Time: MAY 14 2024 0460	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ∆ Yes ∆ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

6/17/2024

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 180-173881-1
SDG Number: FB Culley East

Login Number: 173881
List Number: 1
Creator: Abernathy, Eric L

List Source: Eurofins Pittsburgh

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 180-173881-1
SDG Number: FB Culley East

Login Number: 173881
List Number: 2
Creator: Worthington, Sierra M

List Source: Eurofins St. Louis
List Creation: 05/14/24 01:52 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

PREPARED FOR

Attn: Todd Plating
Haley & Aldrich, Inc.
400 Augusta Street
Suite 100
Greenville, South Carolina 29601

Generated 12/28/2024 8:35:19 AM

JOB DESCRIPTION

CCR Groundwater Monitoring FB Culley East
FB Culley East

JOB NUMBER

180-182961-1

Eurofins Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh PA 15238

See page two for job notes and contact information.

my EOL

Eurofins Pittsburgh

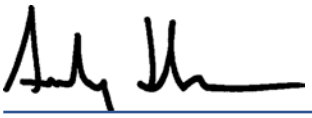
Job Notes

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PA Lab ID: 02-00416

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12/28/2024 8:35:19 AM

Authorized for release by
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Job Narrative
180-182961-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers and/or narrative comments are included to explain any exceptions, if applicable.

- Matrix QC may not be reported if insufficient sample is provided or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 11/16/2024 9:30 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperatures of the 6 coolers at receipt time were 1.6°C, 1.7°C, 2.3°C, 2.7°C, 3.5°C and 4.0°C.

Receipt Exceptions
Only one 1L nitric preserved bottle was received and contained about 600mL of sample volume. CCR-AP-9 (180-182961-6)

Only one 1L nitric preserved container was received and contained about 650mL of sample volume. CCR-AP-2 (180-182961-2)

Only one 1L nitric preserved bottle was received and the container was only filled with about 500mL of sample volume. CCR-AP-1R (180-182961-1)

Only one 1L nitric preserved container was received and contained about 450mL of sample volume. CCR-AP-4 (180-182961-3)

A Chain-of-Custody (COC) was not received with these samples but was provided by the client: CCR-AP-1R (180-182961-1), CCR-AP-2 (180-182961-2), CCR-AP-4 (180-182961-3), CCR-AP-5 (180-182961-4), CCR-AP-6I (180-182961-5), CCR-AP-9 (180-182961-6), CCR-AP-11 (180-182961-7), DUP-1 (180-182961-8) and FIELD BLANK 1 (180-182961-9).

Gas Flow Proportional Counter
Method 9320_Ra228: Radium-228 prep batch 160-689999: The detection goal was not met for the following samples due to the reduced sample volume attributed to the presence of matrix interferences: CCR-AP-1R (180-182961-1), CCR-AP-2 (180-182961-2) and CCR-AP-4 (180-182961-3) . Analytical results are reported with the detection limit achieved.

Method 9320_Ra228: Radium-228 batch 690431: The detection goal was not met for the following sample due to the reduced sample volume attributed to the presence of matrix interferences: CCR-AP-9 (180-182961-6). Analytical results are reported with the detection limit achieved.

Method 9320_Ra228: Radium-228 Prep Batch 160-689999: The sample duplicate (DU) associated with the following samples has a replicate error ratio (RER: 1.1) outside of the upper control limit (1.0): CCR-AP-1R (180-182961-1), CCR-AP-2 (180-182961-2) and CCR-AP-4 (180-182961-3). There is insufficient sample volume to re-prep/re-analyze the samples, so the data have been reported with this narrative.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Rad
No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Job ID: 180-182961-2 Eurofins Pittsburgh

Job Narrative
180-182961-2

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers and/or narrative comments are included to explain any exceptions, if applicable.

- Matrix QC may not be reported if insufficient sample is provided or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 11/16/2024 9:30 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperatures of the 6 coolers at receipt time were 1.6°C, 1.7°C, 2.3°C, 2.7°C, 3.5°C and 4.0°C.

Receipt Exceptions
Only one 1L nitric preserved bottle was received and contained about 600mL of sample volume. CCR-AP-9 (180-182961-6)

Only one 1L nitric preserved container was received and contained about 650mL of sample volume. CCR-AP-2 (180-182961-2)

Only one 1L nitric preserved bottle was received and the container was only filled with about 500mL of sample volume. CCR-AP-1R (180-182961-1)

Only one 1L nitric preserved container was received and contained about 450mL of sample volume. CCR-AP-4 (180-182961-3)

A Chain-of-Custody (COC) was not received with these samples: CCR-AP-1R (180-182961-1), CCR-AP-2 (180-182961-2), CCR-AP-4 (180-182961-3), CCR-AP-5 (180-182961-4), CCR-AP-6I (180-182961-5), CCR-AP-9 (180-182961-6), CCR-AP-11 (180-182961-7), DUP-1 (180-182961-8) and FIELD BLANK 1 (180-182961-9) but was provided by the client.

HPLC/IC
Method 9056A_ORGFM_28D: The following samples were diluted to bring the concentration of target analytes within the calibration range: CCR-AP-2 (180-182961-2), CCR-AP-5 (180-182961-4), CCR-AP-9 (180-182961-6), CCR-AP-11 (180-182961-7), DUP-1 (180-182961-8), (180-182934-D-5), (180-182934-D-5 MS) and (180-182934-D-5 MSD). Elevated reporting limits (RLs) are provided.

Method 9056A_ORGFM_28D: The following samples was diluted due to the nature of the sample matrix: CCR-AP-9 (180-182961-6). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Metals
Method 6020B - Total Recoverable: The laboratory control sample (LCS) for preparation batch 240-636038 and analytical batch 240-636305 recovered outside control limits for the following analytes: Thallium. These analytes were biased high in the LCS and were below the reporting limit in the associated samples; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry
Method 2540C_Calcd: Due to matrix and/or conductivity, initial amount of sample used was reduced. CCR-AP-1R (180-182961-1), CCR-AP-4 (180-182961-3) and CCR-AP-9 (180-182961-6)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Definitions/Glossary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-182961-1
SDG: FB Culley East

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
*+	LCS and/or LCSD is outside acceptance limits, high biased.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
HF	Parameter with a holding time of 15 minutes. Test performed by laboratory at client's request. Sample was analyzed outside of hold time.

Rad

Qualifier	Qualifier Description
G	The Sample MDC is greater than the requested RL.
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
☼	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-182961-1
SDG: FB Culley East

Laboratory: Eurofins Pittsburgh

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Arkansas DEQ	State	19-033-0	06-28-25
California	State	2891	04-30-24 *
Connecticut	State	PH-0688	09-30-24 *
Florida	NELAP	E871008	06-30-25
Georgia	State	PA 02-00416	04-30-25
Illinois	NELAP	004375	07-31-25
Kansas	NELAP	E-10350	01-31-25
Kentucky (UST)	State	162013	04-30-25
Kentucky (WW)	State	KY98043	12-31-24
Louisiana	NELAP	04041	06-30-22 *
Louisiana (All)	NELAP	04041	06-30-25
Maine	State	PA00164	03-06-26
Minnesota	NELAP	042-999-482	12-31-24
New Hampshire	NELAP	2030	04-04-25
New Jersey	NELAP	PA005	06-30-25
New York	NELAP	11182	04-01-25
North Carolina (WW/SW)	State	434	12-31-24
North Dakota	State	R-227	04-30-24 *
Oregon	NELAP	PA-2151	02-06-25
Pennsylvania	NELAP	02-00416	12-05-24
Rhode Island	State	LAO00362	01-01-25
South Carolina	State	89014	11-24-24
Texas	NELAP	T104704528	03-31-25
US Fish & Wildlife	US Federal Programs	058448	04-30-25
USDA	US Federal Programs	P330-16-00211	04-11-26
Utah	NELAP	PA001462024-14	05-31-25
Virginia	NELAP	10043	07-14-24 *
West Virginia DEP	State	142	01-31-25
Wisconsin	State	998027800	08-31-25

Laboratory: Eurofins Cleveland

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	2927	02-28-25
Connecticut	State	PH-0806	12-31-26
Georgia	State	4062	02-27-25
Illinois	NELAP	200004	08-31-25
Iowa	State	421	06-01-25
Kentucky (UST)	State	112225	02-27-25
Kentucky (WW)	State	KY98016	12-30-24
Minnesota	NELAP	039-999-348	12-31-25
New Hampshire	NELAP	225024	09-30-25
New Jersey	NELAP	OH001	07-03-25
New York	NELAP	10975	04-02-25
Ohio VAP	State	ORELAP 4062	02-27-25
Oregon	NELAP	4062	02-27-25
Pennsylvania	NELAP	68-00340	08-31-25
Texas	NELAP	T104704517-22-19	08-31-25
USDA	US Federal Programs	P330-18-00281	01-05-27

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Accreditation/Certification Summary

Client: Haley & Aldrich, Inc.
Job ID: 180-182961-1
Project/Site: CCR Groundwater Monitoring FB Culley East
SDG: FB Culley East

Laboratory: Eurofins Cleveland (Continued)

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Virginia	NELAP	460175	09-14-25
West Virginia DEP	State	210	12-31-24

Laboratory: Eurofins St. Louis

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-001	05-06-25
ANAB	Dept. of Defense ELAP	L2305	04-06-25
ANAB	Dept. of Energy	L2305.01	04-08-25
ANAB	ISO/IEC 17025	L2305	04-06-25
Arizona	State	AZ0813	12-08-25
California	Los Angeles County Sanitation Districts	10259	06-30-22 *
California	State	2886	06-30-25
Connecticut	State	PH-0241	03-31-25
Florida	NELAP	E87689	06-30-25
HI - RadChem Recognition	State	n/a	06-30-25
Illinois	NELAP	200023	11-30-25
Iowa	State	373	12-01-26
Kansas	NELAP	E-10236	10-31-25
Kentucky (DW)	State	KY90125	12-31-24
Kentucky (WW)	State	KY90125 (Permit KY0004049)	12-31-24
Louisiana	NELAP	04080	06-30-22 *
Louisiana (All)	NELAP	04080	06-30-25
Louisiana (DW)	State	LA011	12-31-24
Maryland	State	310	09-30-25
Massachusetts	State	M-MO054	06-30-25
MI - RadChem Recognition	State	9005	06-30-25
Missouri	State	780	06-30-25
Nevada	State	MO00054	07-31-25
New Jersey	NELAP	MO002	06-30-25
New Mexico	State	MO00054	06-30-25
New York	NELAP	11616	03-31-25
North Carolina (DW)	State	29700	07-31-25
North Dakota	State	R-207	12-31-24
Oklahoma	NELAP	9997	12-31-24
Oregon	NELAP	4157	09-01-25
Pennsylvania	NELAP	68-00540	02-28-25
South Carolina	State	85002001	06-30-25
Texas	NELAP	T104704193	07-31-25
US Fish & Wildlife	US Federal Programs	058448	07-31-25
USDA	US Federal Programs	P330-17-00028	05-18-26
Utah	NELAP	MO00054	07-31-25
Virginia	NELAP	460230	06-14-25
Washington	State	C592	08-30-25
West Virginia DEP	State	381	10-31-25

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Sample Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-182961-1
SDG: FB Culley East

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
180-182961-1	CCR-AP-1R	Water	11/14/24 06:45	11/16/24 09:30
180-182961-2	CCR-AP-2	Water	11/14/24 08:05	11/16/24 09:30
180-182961-3	CCR-AP-4	Water	11/14/24 13:20	11/16/24 09:30
180-182961-4	CCR-AP-5	Water	11/14/24 15:45	11/16/24 09:30
180-182961-5	CCR-AP-6I	Water	11/13/24 08:41	11/16/24 09:30
180-182961-6	CCR-AP-9	Water	11/14/24 10:50	11/16/24 09:30
180-182961-7	CCR-AP-11	Water	11/15/24 08:58	11/16/24 09:30
180-182961-8	DUP-1	Water	11/14/24 00:00	11/16/24 09:30
180-182961-9	FIELD BLANK 1	Water	11/15/24 11:55	11/16/24 09:30

Method Summary

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-182961-1
SDG: FB Culley East

Method	Method Description	Protocol	Laboratory
9315	Radium-226 (GFPC)	SW846	EET SL
9320	Radium-228 (GFPC)	SW846	EET SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	EET SL
PrecSep_0	Preparation, Precipitate Separation	None	EET SL
PrecSep-21	Preparation, Precipitate Separation (21-Day In-Growth)	None	EET SL

Protocol References:

None = None

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-182961-1
SDG: FB Culley East

Client Sample ID: CCR-AP-1R

Date Collected: 11/14/24 06:45
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	484985	11/21/24 15:21	SJM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			636493	11/22/24 21:35	KLC	EET CLE
	Instrument ID: I12									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636305	11/21/24 19:52	AJC	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			50 mL	50 mL	636040	11/20/24 14:00	S4FJ	EET CLE
Total/NA	Analysis	EPA 7470A		1			636245	11/21/24 12:08	TQ6W	EET CLE
	Instrument ID: H11									
Total/NA	Analysis	EPA 9040C		1			485167	11/23/24 09:44	BAB	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	484667	11/18/24 11:43	EBA	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			507.78 mL	1.0 g	689970	11/22/24 09:22	BCE	EET SL
Total/NA	Analysis	9315		1			693993	12/16/24 20:57	SCB	EET SL
	Instrument ID: GFPCPURPLE									
Total/NA	Prep	PrecSep_0			507.78 mL	1.0 g	689999	11/22/24 12:14	BCE	EET SL
Total/NA	Analysis	9320		1	1.0 mL	1.0 mL	693093	12/11/24 12:45	SCB	EET SL
	Instrument ID: GFPCPURPLE									
Total/NA	Analysis	Ra226_Ra228		1			695373	12/26/24 09:30	FLC	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: CCR-AP-2

Date Collected: 11/14/24 08:05
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	484985	11/21/24 15:51	SJM	EET PIT
	Instrument ID: CHICS2100B									
Total/NA	Analysis	EPA 9056A		10	1 mL	1 mL	484985	11/21/24 16:06	SJM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			636493	11/22/24 21:39	KLC	EET CLE
	Instrument ID: I12									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636305	11/21/24 19:55	AJC	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			50 mL	50 mL	636040	11/20/24 14:00	S4FJ	EET CLE
Total/NA	Analysis	EPA 7470A		1			636245	11/21/24 12:10	TQ6W	EET CLE
	Instrument ID: H11									
Total/NA	Analysis	EPA 9040C		1			485167	11/23/24 09:44	BAB	EET PIT
	Instrument ID: NOEQUIP									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-182961-1
SDG: FB Culley East

Client Sample ID: CCR-AP-2

Date Collected: 11/14/24 08:05
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	484659	11/18/24 11:34	EBA	EET PIT
Total/NA	Prep	PrecSep-21			507.75 mL	1.0 g	689970	11/22/24 09:22	BCE	EET SL
Total/NA	Analysis	9315		1			693993	12/16/24 20:57	SCB	EET SL
	Instrument ID: GFPCPURPLE									
Total/NA	Prep	PrecSep_0			507.75 mL	1.0 g	689999	11/22/24 12:14	BCE	EET SL
Total/NA	Analysis	9320		1			693093	12/11/24 12:45	SCB	EET SL
	Instrument ID: GFPCPURPLE									
Total/NA	Analysis	Ra226_Ra228		1			695373	12/26/24 09:30	FLC	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: CCR-AP-4

Date Collected: 11/14/24 13:20
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	484985	11/21/24 16:23	SJM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			636493	11/22/24 21:43	KLC	EET CLE
	Instrument ID: I12									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636305	11/21/24 20:03	AJC	EET CLE
	Instrument ID: I14									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636748	11/26/24 02:46	AJC	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			50 mL	50 mL	636040	11/20/24 14:00	S4FJ	EET CLE
Total/NA	Analysis	EPA 7470A		1			636245	11/21/24 12:11	TQ6W	EET CLE
	Instrument ID: H11									
Total/NA	Analysis	EPA 9040C		1			485167	11/23/24 09:44	BAB	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	484667	11/18/24 11:43	EBA	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			479.14 mL	1.0 g	689970	11/22/24 09:22	BCE	EET SL
Total/NA	Analysis	9315		1			693993	12/16/24 20:58	SCB	EET SL
	Instrument ID: GFPCPURPLE									
Total/NA	Prep	PrecSep_0			479.14 mL	1.0 g	689999	11/22/24 12:14	BCE	EET SL
Total/NA	Analysis	9320		1	1.0 mL	1.0 mL	693093	12/11/24 12:45	SCB	EET SL
	Instrument ID: GFPCPURPLE									
Total/NA	Analysis	Ra226_Ra228		1			695373	12/26/24 09:30	FLC	EET SL
	Instrument ID: NOEQUIP									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-182961-1
SDG: FB Culley East

Client Sample ID: CCR-AP-5

Date Collected: 11/14/24 15:45
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	484985	11/21/24 16:53	SJM	EET PIT
	Instrument ID: CHICS2100B									
Total/NA	Analysis	EPA 9056A		5	1 mL	1 mL	484985	11/21/24 17:07	SJM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6010D		5			636691	11/26/24 05:36	RKT	EET CLE
	Instrument ID: I9									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636305	11/21/24 20:06	AJC	EET CLE
	Instrument ID: I14									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636748	11/26/24 02:49	AJC	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			50 mL	50 mL	636040	11/20/24 14:00	S4FJ	EET CLE
Total/NA	Analysis	EPA 7470A		1			636245	11/21/24 12:13	TQ6W	EET CLE
	Instrument ID: H11									
Total/NA	Analysis	EPA 9040C		1			485028	11/21/24 14:10	BAB	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	484737	11/19/24 09:41	EBA	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			1007.13 mL	1.0 g	690430	11/25/24 09:43	BCE	EET SL
Total/NA	Analysis	9315		1			694357	12/18/24 18:10	SCB	EET SL
	Instrument ID: GFPCBLUE									
Total/NA	Prep	PrecSep_0			1007.13 mL	1.0 g	690431	11/25/24 09:46	BCE	EET SL
Total/NA	Analysis	9320		1			693477	12/13/24 11:28	FLC	EET SL
	Instrument ID: GFPCRED									
Total/NA	Analysis	Ra226_Ra228		1			695373	12/26/24 09:30	FLC	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: CCR-AP-6I

Date Collected: 11/13/24 08:41
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-5

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	484985	11/21/24 17:25	SJM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			636493	11/22/24 21:52	KLC	EET CLE
	Instrument ID: I12									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636305	11/21/24 20:09	AJC	EET CLE
	Instrument ID: I14									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636748	11/26/24 02:57	AJC	EET CLE
	Instrument ID: I14									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-182961-1
SDG: FB Culley East

Client Sample ID: CCR-AP-6I

Date Collected: 11/13/24 08:41
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-5

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	7470A			50 mL	50 mL	636040	11/20/24 14:00	S4FJ	EET CLE
Total/NA	Analysis	EPA 7470A		1			636245	11/21/24 12:15	TQ6W	EET CLE
	Instrument ID: H11									
Total/NA	Analysis	EPA 9040C		1			485028	11/21/24 14:05	BAB	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	484667	11/18/24 11:43	EBA	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			989.18 mL	1.0 g	690430	11/25/24 09:43	BCE	EET SL
Total/NA	Analysis	9315		1			694357	12/18/24 18:10	SCB	EET SL
	Instrument ID: GFPCBLUE									
Total/NA	Prep	PrecSep_0			989.18 mL	1.0 g	690431	11/25/24 09:46	BCE	EET SL
Total/NA	Analysis	9320		1			693477	12/13/24 11:28	FLC	EET SL
	Instrument ID: GFPCRED									
Total/NA	Analysis	Ra226_Ra228		1			695373	12/26/24 09:30	FLC	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: CCR-AP-9

Date Collected: 11/14/24 10:50
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-6

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		2.5	1 mL	1 mL	484985	11/21/24 18:10	SJM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			636493	11/22/24 21:56	KLC	EET CLE
	Instrument ID: I12									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636305	11/21/24 20:12	AJC	EET CLE
	Instrument ID: I14									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636748	11/26/24 02:59	AJC	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			50 mL	50 mL	636040	11/20/24 14:00	S4FJ	EET CLE
Total/NA	Analysis	EPA 7470A		1			636245	11/21/24 12:20	TQ6W	EET CLE
	Instrument ID: H11									
Total/NA	Analysis	EPA 9040C		1			485167	11/23/24 09:44	BAB	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Analysis	SM 2540C		1	50 mL	100 mL	484667	11/18/24 11:43	EBA	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			525.00 mL	1.0 g	690430	11/25/24 09:43	BCE	EET SL
Total/NA	Analysis	9315		1			694357	12/18/24 18:10	SCB	EET SL
	Instrument ID: GFPCBLUE									
Total/NA	Prep	PrecSep_0			525.00 mL	1.0 g	690431	11/25/24 09:46	BCE	EET SL
Total/NA	Analysis	9320		1			693477	12/13/24 11:28	FLC	EET SL
	Instrument ID: GFPCRED									

Client Sample ID: CCR-AP-9
Lab Sample ID: 180-182961-6
Date Collected: 11/14/24 10:50
Matrix: Water
Date Received: 11/16/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Ra226_Ra228		1			695373	12/26/24 09:30	FLC	EET SL

Client Sample ID: CCR-AP-11
Lab Sample ID: 180-182961-7
Date Collected: 11/15/24 08:58
Matrix: Water
Date Received: 11/16/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	484985	11/21/24 18:24	SJM	EET PIT
	Instrument ID: CHICS2100B									
Total/NA	Analysis	EPA 9056A		5	1 mL	1 mL	484985	11/21/24 18:39	SJM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			636493	11/22/24 22:01	KLC	EET CLE
	Instrument ID: I12									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636305	11/21/24 20:15	AJC	EET CLE
	Instrument ID: I14									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636748	11/26/24 03:02	AJC	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			50 mL	50 mL	636040	11/20/24 14:00	S4FJ	EET CLE
Total/NA	Analysis	EPA 7470A		1			636245	11/21/24 12:22	TQ6W	EET CLE
	Instrument ID: H11									
Total/NA	Analysis	EPA 9040C		1			485167	11/23/24 09:44	BAB	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	484659	11/18/24 11:34	EBA	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			741.62 mL	1.0 g	690430	11/25/24 09:43	BCE	EET SL
Total/NA	Analysis	9315		1			694358	12/18/24 18:09	SCB	EET SL
	Instrument ID: GFPCPURPLE									
Total/NA	Prep	PrecSep_0			741.62 mL	1.0 g	690431	11/25/24 09:46	BCE	EET SL
Total/NA	Analysis	9320		1			693477	12/13/24 11:28	FLC	EET SL
	Instrument ID: GFPCRED									
Total/NA	Analysis	Ra226_Ra228		1			695373	12/26/24 09:30	FLC	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: DUP-1
Lab Sample ID: 180-182961-8
Date Collected: 11/14/24 00:00
Matrix: Water
Date Received: 11/16/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	484985	11/21/24 18:54	SJM	EET PIT
	Instrument ID: CHICS2100B									
Total/NA	Analysis	EPA 9056A		5	1 mL	1 mL	484985	11/21/24 19:09	SJM	EET PIT
	Instrument ID: CHICS2100B									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-182961-1
SDG: FB Culley East

Client Sample ID: DUP-1

Lab Sample ID: 180-182961-8

Date Collected: 11/14/24 00:00

Matrix: Water

Date Received: 11/16/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			636493	11/22/24 22:13	KLC	EET CLE
	Instrument ID: I12									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636305	11/21/24 20:17	AJC	EET CLE
	Instrument ID: I14									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636748	11/26/24 03:05	AJC	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			50 mL	50 mL	636040	11/20/24 14:00	S4FJ	EET CLE
Total/NA	Analysis	EPA 7470A		1			636245	11/21/24 12:23	TQ6W	EET CLE
	Instrument ID: H11									
Total/NA	Analysis	EPA 9040C		1			485028	11/21/24 14:19	BAB	EET PIT
	Instrument ID: OZ									
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	484645	11/18/24 10:34	EBA	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			985.52 mL	1.0 g	690430	11/25/24 09:43	BCE	EET SL
Total/NA	Analysis	9315		1			694358	12/18/24 18:10	SCB	EET SL
	Instrument ID: GFPCPURPLE									
Total/NA	Prep	PrecSep_0			985.52 mL	1.0 g	690431	11/25/24 09:46	BCE	EET SL
Total/NA	Analysis	9320		1			693477	12/13/24 11:28	FLC	EET SL
	Instrument ID: GFPCRED									
Total/NA	Analysis	Ra226_Ra228		1			695373	12/26/24 09:30	FLC	EET SL
	Instrument ID: NOEQUIP									

Client Sample ID: FIELD BLANK 1

Lab Sample ID: 180-182961-9

Date Collected: 11/15/24 11:55

Matrix: Water

Date Received: 11/16/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9056A		1	1 mL	1 mL	484985	11/21/24 19:27	SJM	EET PIT
	Instrument ID: CHICS2100B									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6010D		1			636493	11/22/24 22:18	KLC	EET CLE
	Instrument ID: I12									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636305	11/21/24 20:20	AJC	EET CLE
	Instrument ID: I14									
Total Recoverable	Prep	3005A			50 mL	50 mL	636038	11/20/24 14:00	S4FJ	EET CLE
Total Recoverable	Analysis	EPA 6020B		1			636748	11/26/24 03:08	AJC	EET CLE
	Instrument ID: I14									
Total/NA	Prep	7470A			50 mL	50 mL	636040	11/20/24 14:00	S4FJ	EET CLE
Total/NA	Analysis	EPA 7470A		1			636245	11/21/24 12:25	TQ6W	EET CLE
	Instrument ID: H11									

Lab Chronicle

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-182961-1
SDG: FB Culley East

Client Sample ID: FIELD BLANK 1

Date Collected: 11/15/24 11:55
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-9

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	EPA 9040C		1			485167	11/23/24 09:44	BAB	EET PIT
Total/NA	Analysis	SM 2540C		1	100 mL	100 mL	484667	11/18/24 11:43	EBA	EET PIT
	Instrument ID: NOEQUIP									
Total/NA	Prep	PrecSep-21			996.81 mL	1.0 g	690430	11/25/24 09:43	BCE	EET SL
Total/NA	Analysis	9315		1			694324	12/18/24 18:12	SCB	EET SL
	Instrument ID: GFPCRED									
Total/NA	Prep	PrecSep_0			996.81 mL	1.0 g	690431	11/25/24 09:46	BCE	EET SL
Total/NA	Analysis	9320		1			693477	12/13/24 11:29	FLC	EET SL
	Instrument ID: GFPCRED									
Total/NA	Analysis	Ra226_Ra228		1			695373	12/26/24 18:01	FLC	EET SL
	Instrument ID: NOEQUIP									

Laboratory References:

EET SL = Eurofins St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Analyst References:

Lab: EET CLE
- Batch Type: Prep
  - S4FJ = Katherine Wise
- Batch Type: Analysis
  - AJC = Alexander Colosi
  - KLC = Karen Counts
  - RKT = Roger Toth
  - TQ6W = Bryan Pere ka

Lab: EET PIT
- Batch Type: Analysis
  - BAB = Brooke Batyi
  - EBA = Elizabeth Arbster
  - SJM = Shannon Mueller

Lab: EET SL
- Batch Type: Prep
  - BCE = Benjamin Celeslie
- Batch Type: Analysis
  - FLC = Fernando Cruz
  - SCB = Sarah Bernsen

Client Sample ID: CCR-AP-1R
Lab Sample ID: 180-182961-1

Date Collected: 11/14/24 06:45
Matrix: Water
Date Received: 11/16/24 09:30

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	28		1.0	0.71	mg/L			11/21/24 15:21	1
Fluoride	0.40		0.10	0.026	mg/L			11/21/24 15:21	1
Sulfate	160		1.0	0.76	mg/L			11/21/24 15:21	1

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	0.79		0.10	0.057	mg/L		11/20/24 14:00	11/22/24 21:35	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0010	J	0.0020	0.00057	mg/L		11/20/24 14:00	11/21/24 19:52	1
Arsenic	0.011		0.0050	0.00075	mg/L		11/20/24 14:00	11/21/24 19:52	1
Barium	0.20		0.0050	0.00077	mg/L		11/20/24 14:00	11/21/24 19:52	1
Beryllium	0.0015		0.0010	0.00027	mg/L		11/20/24 14:00	11/21/24 19:52	1
Cadmium	0.00034	J	0.0010	0.000077	mg/L		11/20/24 14:00	11/21/24 19:52	1
Calcium	55		1.0	0.25	mg/L		11/20/24 14:00	11/21/24 19:52	1
Chromium	0.034		0.0050	0.0012	mg/L		11/20/24 14:00	11/21/24 19:52	1
Cobalt	0.018		0.0010	0.000086	mg/L		11/20/24 14:00	11/21/24 19:52	1
Lead	0.018		0.0010	0.00045	mg/L		11/20/24 14:00	11/21/24 19:52	1
Lithium	0.067		0.0080	0.0034	mg/L		11/20/24 14:00	11/21/24 19:52	1
Molybdenum	0.0056		0.0050	0.0011	mg/L		11/20/24 14:00	11/21/24 19:52	1
Selenium	0.0013	J	0.0050	0.00089	mg/L		11/20/24 14:00	11/21/24 19:52	1
Thallium	0.00092	J *+	0.0010	0.00051	mg/L		11/20/24 14:00	11/21/24 19:52	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		11/20/24 14:00	11/21/24 12:08	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	700		20	20	mg/L			11/18/24 11:43	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	7.4	HF	0.1	0.1	SU			11/23/24 09:44	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	1.10		0.384	0.397	1.00	0.417	pCi/L	11/22/24 09:22	12/16/24 20:57	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*60.2*		*30 - 110*	*11/22/24 09:22*	*12/16/24 20:57*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	2.28	U G	1.74	1.75	1.00	2.68	pCi/L	11/22/24 12:14	12/11/24 12:45	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*60.2*		*30 - 110*	*11/22/24 12:14*	*12/11/24 12:45*	*1*

Client Sample ID: CCR-AP-1R
Lab Sample ID: 180-182961-1

Date Collected: 11/14/24 06:45
Matrix: Water
Date Received: 11/16/24 09:30

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*60.9*		*30 - 110*	*11/22/24 12:14*	*12/11/24 12:45*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**3.38**		1.78	1.79	5.00	2.68	pCi/L		12/26/24 09:30	1

Client Sample ID: CCR-AP-2

Date Collected: 11/14/24 08:05
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-2

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**190**		1.0	0.71	mg/L			11/21/24 15:51	1
Fluoride	**0.24**		0.10	0.026	mg/L			11/21/24 15:51	1
Sulfate	**420**		10	7.6	mg/L			11/21/24 16:06	10

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**9.2**		0.10	0.057	mg/L		11/20/24 14:00	11/22/24 21:39	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		11/20/24 14:00	11/21/24 19:55	1
Arsenic	**0.0021**	**J**	0.0050	0.00075	mg/L		11/20/24 14:00	11/21/24 19:55	1
Barium	**0.045**		0.0050	0.00077	mg/L		11/20/24 14:00	11/21/24 19:55	1
Beryllium	ND		0.0010	0.00027	mg/L		11/20/24 14:00	11/21/24 19:55	1
Cadmium	**0.00011**	**J**	0.0010	0.000077	mg/L		11/20/24 14:00	11/21/24 19:55	1
Calcium	**230**		1.0	0.25	mg/L		11/20/24 14:00	11/21/24 19:55	1
Chromium	**0.0024**	**J**	0.0050	0.0012	mg/L		11/20/24 14:00	11/21/24 19:55	1
Cobalt	**0.0080**		0.0010	0.000086	mg/L		11/20/24 14:00	11/21/24 19:55	1
Lead	**0.0013**		0.0010	0.00045	mg/L		11/20/24 14:00	11/21/24 19:55	1
Lithium	**0.0038**	**J**	0.0080	0.0034	mg/L		11/20/24 14:00	11/21/24 19:55	1
Molybdenum	ND		0.0050	0.0011	mg/L		11/20/24 14:00	11/21/24 19:55	1
Selenium	ND		0.0050	0.00089	mg/L		11/20/24 14:00	11/21/24 19:55	1
Thallium	ND	*+	0.0010	0.00051	mg/L		11/20/24 14:00	11/21/24 19:55	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		11/20/24 14:00	11/21/24 12:10	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	**1500**		10	10	mg/L			11/18/24 11:34	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**6.8**	**HF**	0.1	0.1	SU			11/23/24 09:44	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.401	U	0.304	0.306	1.00	0.450	pCi/L	11/22/24 09:22	12/16/24 20:57	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*55.6*		*30 - 110*	*11/22/24 09:22*	*12/16/24 20:57*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.42	U G	1.50	1.51	1.00	2.44	pCi/L	11/22/24 12:14	12/11/24 12:45	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*55.6*		*30 - 110*	*11/22/24 12:14*	*12/11/24 12:45*	*1*

Client Sample ID: CCR-AP-2
Date Collected: 11/14/24 08:05
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-2
Matrix: Water

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*66.9*		*30 - 110*	*11/22/24 12:14*	*12/11/24 12:45*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.82	U	1.53	1.54	5.00	2.44	pCi/L		12/26/24 09:30	1

Client Sample ID: CCR-AP-4

Date Collected: 11/14/24 13:20
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-3

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	26		1.0	0.71	mg/L			11/21/24 16:23	1
Fluoride	0.89		0.10	0.026	mg/L			11/21/24 16:23	1
Sulfate	12		1.0	0.76	mg/L			11/21/24 16:23	1

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	0.58		0.10	0.057	mg/L		11/20/24 14:00	11/22/24 21:43	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00096	J	0.0020	0.00057	mg/L		11/20/24 14:00	11/21/24 20:03	1
Arsenic	0.089		0.0050	0.00075	mg/L		11/20/24 14:00	11/21/24 20:03	1
Barium	0.52		0.0050	0.00077	mg/L		11/20/24 14:00	11/26/24 02:46	1
Beryllium	0.00099	J	0.0010	0.00027	mg/L		11/20/24 14:00	11/21/24 20:03	1
Cadmium	0.00045	J	0.0010	0.000077	mg/L		11/20/24 14:00	11/21/24 20:03	1
Calcium	140		1.0	0.25	mg/L		11/20/24 14:00	11/21/24 20:03	1
Chromium	0.027		0.0050	0.0012	mg/L		11/20/24 14:00	11/21/24 20:03	1
Cobalt	0.014		0.0010	0.000086	mg/L		11/20/24 14:00	11/21/24 20:03	1
Lead	0.019		0.0010	0.00045	mg/L		11/20/24 14:00	11/21/24 20:03	1
Lithium	0.020		0.0080	0.0034	mg/L		11/20/24 14:00	11/21/24 20:03	1
Molybdenum	0.0073		0.0050	0.0011	mg/L		11/20/24 14:00	11/21/24 20:03	1
Selenium	0.0018	J	0.0050	0.00089	mg/L		11/20/24 14:00	11/21/24 20:03	1
Thallium	ND	*+	0.0010	0.00051	mg/L		11/20/24 14:00	11/21/24 20:03	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		11/20/24 14:00	11/21/24 12:11	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	740		20	20	mg/L			11/18/24 11:43	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	6.9	HF	0.1	0.1	SU			11/23/24 09:44	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.852		0.371	0.379	1.00	0.441	pCi/L	11/22/24 09:22	12/16/24 20:58	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*57.6*		*30 - 110*	*11/22/24 09:22*	*12/16/24 20:58*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.598	U G	1.24	1.24	1.00	2.17	pCi/L	11/22/24 12:14	12/11/24 12:45	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*57.6*		*30 - 110*	*11/22/24 12:14*	*12/11/24 12:45*	*1*

Client Sample ID: CCR-AP-4
Lab Sample ID: 180-182961-3

Date Collected: 11/14/24 13:20
Matrix: Water
Date Received: 11/16/24 09:30

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*69.9*		*30 - 110*	*11/22/24 12:14*	*12/11/24 12:45*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.45	U	1.29	1.30	5.00	2.17	pCi/L		12/26/24 09:30	1

Client Sample ID: CCR-AP-5

Date Collected: 11/14/24 15:45
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-4

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**51**		1.0	0.71	mg/L			11/21/24 16:53	1
Fluoride	**1.7**		0.10	0.026	mg/L			11/21/24 16:53	1
Sulfate	**450**		5.0	3.8	mg/L			11/21/24 17:07	5

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**11**		0.50	0.29	mg/L		11/20/24 14:00	11/26/24 05:36	5

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		11/20/24 14:00	11/21/24 20:06	1
Arsenic	**0.0013**	**J**	0.0050	0.00075	mg/L		11/20/24 14:00	11/21/24 20:06	1
Barium	**0.053**		0.0050	0.00077	mg/L		11/20/24 14:00	11/26/24 02:49	1
Beryllium	ND		0.0010	0.00027	mg/L		11/20/24 14:00	11/21/24 20:06	1
Cadmium	**0.00010**	**J**	0.0010	0.000077	mg/L		11/20/24 14:00	11/21/24 20:06	1
Calcium	**200**		1.0	0.25	mg/L		11/20/24 14:00	11/21/24 20:06	1
Chromium	ND		0.0050	0.0012	mg/L		11/20/24 14:00	11/21/24 20:06	1
Cobalt	**0.0023**		0.0010	0.000086	mg/L		11/20/24 14:00	11/21/24 20:06	1
Lead	ND		0.0010	0.00045	mg/L		11/20/24 14:00	11/21/24 20:06	1
Lithium	**0.080**		0.0080	0.0034	mg/L		11/20/24 14:00	11/21/24 20:06	1
Molybdenum	**0.34**		0.0050	0.0011	mg/L		11/20/24 14:00	11/21/24 20:06	1
Selenium	ND		0.0050	0.00089	mg/L		11/20/24 14:00	11/21/24 20:06	1
Thallium	ND	*+	0.0010	0.00051	mg/L		11/20/24 14:00	11/21/24 20:06	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		11/20/24 14:00	11/21/24 12:13	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	**1200**		10	10	mg/L			11/19/24 09:41	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**7.7**	**HF**	0.1	0.1	SU			11/21/24 14:10	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.158**		0.102	0.103	1.00	0.136	pCi/L	11/25/24 09:43	12/18/24 18:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.7*		*30 - 110*	*11/25/24 09:43*	*12/18/24 18:10*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.153	U	0.355	0.355	1.00	0.701	pCi/L	11/25/24 09:46	12/13/24 11:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*82.7*		*30 - 110*	*11/25/24 09:46*	*12/13/24 11:28*	*1*

Client Sample ID: CCR-AP-5
Lab Sample ID: 180-182961-4

Date Collected: 11/14/24 15:45
Matrix: Water
Date Received: 11/16/24 09:30

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*74.4*		*30 - 110*	*11/25/24 09:46*	*12/13/24 11:28*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.00506	U	0.369	0.370	5.00	0.701	pCi/L		12/26/24 09:30	1

Client Sample ID: CCR-AP-6I

Date Collected: 11/13/24 08:41
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-5

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**31**		1.0	0.71	mg/L			11/21/24 17:25	1
Fluoride	**0.20**		0.10	0.026	mg/L			11/21/24 17:25	1
Sulfate	**140**		1.0	0.76	mg/L			11/21/24 17:25	1

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**0.14**		0.10	0.057	mg/L		11/20/24 14:00	11/22/24 21:52	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		11/20/24 14:00	11/21/24 20:09	1
Arsenic	ND		0.0050	0.00075	mg/L		11/20/24 14:00	11/21/24 20:09	1
Barium	**0.21**		0.0050	0.00077	mg/L		11/20/24 14:00	11/26/24 02:57	1
Beryllium	ND		0.0010	0.00027	mg/L		11/20/24 14:00	11/21/24 20:09	1
Cadmium	ND		0.0010	0.000077	mg/L		11/20/24 14:00	11/21/24 20:09	1
Calcium	**46**		1.0	0.25	mg/L		11/20/24 14:00	11/21/24 20:09	1
Chromium	ND		0.0050	0.0012	mg/L		11/20/24 14:00	11/21/24 20:09	1
Cobalt	**0.00085**	**J**	0.0010	0.000086	mg/L		11/20/24 14:00	11/21/24 20:09	1
Lead	ND		0.0010	0.00045	mg/L		11/20/24 14:00	11/21/24 20:09	1
Lithium	**0.0049**	**J**	0.0080	0.0034	mg/L		11/20/24 14:00	11/21/24 20:09	1
Molybdenum	**0.020**		0.0050	0.0011	mg/L		11/20/24 14:00	11/21/24 20:09	1
Selenium	ND		0.0050	0.00089	mg/L		11/20/24 14:00	11/21/24 20:09	1
Thallium	ND	*+	0.0010	0.00051	mg/L		11/20/24 14:00	11/21/24 20:09	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		11/20/24 14:00	11/21/24 12:15	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	**350**		10	10	mg/L			11/18/24 11:43	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**7.6**	**HF**	0.1	0.1	SU			11/21/24 14:05	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0927	U	0.105	0.106	1.00	0.171	pCi/L	11/25/24 09:43	12/18/24 18:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.6*		*30 - 110*	*11/25/24 09:43*	*12/18/24 18:10*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.844**		0.458	0.465	1.00	0.637	pCi/L	11/25/24 09:46	12/13/24 11:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.6*		*30 - 110*	*11/25/24 09:46*	*12/13/24 11:28*	*1*

Client Sample ID: CCR-AP-6I
Lab Sample ID: 180-182961-5

Date Collected: 11/13/24 08:41
Matrix: Water
Date Received: 11/16/24 09:30

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Y Carrier	76.3		30 - 110	11/25/24 09:46	12/13/24 11:28	1

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.937		0.470	0.477	5.00	0.637	pCi/L		12/26/24 09:30	1

Client Sample ID: CCR-AP-9

Date Collected: 11/14/24 10:50
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-6

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	2.5		2.5	1.8	mg/L			11/21/24 18:10	2.5
Fluoride	0.15	J	0.25	0.065	mg/L			11/21/24 18:10	2.5
Sulfate	ND		2.5	1.9	mg/L			11/21/24 18:10	2.5

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	0.41		0.10	0.057	mg/L		11/20/24 14:00	11/22/24 21:56	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		11/20/24 14:00	11/21/24 20:12	1
Arsenic	0.0022	J	0.0050	0.00075	mg/L		11/20/24 14:00	11/21/24 20:12	1
Barium	0.16		0.0050	0.00077	mg/L		11/20/24 14:00	11/26/24 02:59	1
Beryllium	ND		0.0010	0.00027	mg/L		11/20/24 14:00	11/21/24 20:12	1
Cadmium	0.000077	J	0.0010	0.000077	mg/L		11/20/24 14:00	11/21/24 20:12	1
Calcium	120		1.0	0.25	mg/L		11/20/24 14:00	11/21/24 20:12	1
Chromium	0.0065		0.0050	0.0012	mg/L		11/20/24 14:00	11/21/24 20:12	1
Cobalt	0.0025		0.0010	0.000086	mg/L		11/20/24 14:00	11/21/24 20:12	1
Lead	0.0024		0.0010	0.00045	mg/L		11/20/24 14:00	11/21/24 20:12	1
Lithium	0.035		0.0080	0.0034	mg/L		11/20/24 14:00	11/21/24 20:12	1
Molybdenum	0.0017	J	0.0050	0.0011	mg/L		11/20/24 14:00	11/21/24 20:12	1
Selenium	ND		0.0050	0.00089	mg/L		11/20/24 14:00	11/21/24 20:12	1
Thallium	ND	*+	0.0010	0.00051	mg/L		11/20/24 14:00	11/21/24 20:12	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		11/20/24 14:00	11/21/24 12:20	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	710		20	20	mg/L			11/18/24 11:43	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	7.2	HF	0.1	0.1	SU			11/23/24 09:44	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	2.63		0.589	0.635	1.00	0.522	pCi/L	11/25/24 09:43	12/18/24 18:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*55.6*		*30 - 110*	*11/25/24 09:43*	*12/18/24 18:10*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	3.70	G	1.51	1.55	1.00	2.00	pCi/L	11/25/24 09:46	12/13/24 11:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*55.6*		*30 - 110*	*11/25/24 09:46*	*12/13/24 11:28*	*1*

Client Sample ID: CCR-AP-9
Lab Sample ID: 180-182961-6

Date Collected: 11/14/24 10:50
Matrix: Water
Date Received: 11/16/24 09:30

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*75.1*		*30 - 110*	*11/25/24 09:46*	*12/13/24 11:28*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**6.33**		1.62	1.68	5.00	2.00	pCi/L		12/26/24 09:30	1

Client Sample ID: CCR-AP-11

Date Collected: 11/15/24 08:58
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-7

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**29**		1.0	0.71	mg/L			11/21/24 18:24	1
Fluoride	**0.34**		0.10	0.026	mg/L			11/21/24 18:24	1
Sulfate	**610**		5.0	3.8	mg/L			11/21/24 18:39	5

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**0.45**		0.10	0.057	mg/L		11/20/24 14:00	11/22/24 22:01	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		11/20/24 14:00	11/21/24 20:15	1
Arsenic	**0.051**		0.0050	0.00075	mg/L		11/20/24 14:00	11/21/24 20:15	1
Barium	**0.23**		0.0050	0.00077	mg/L		11/20/24 14:00	11/26/24 03:02	1
Beryllium	ND		0.0010	0.00027	mg/L		11/20/24 14:00	11/21/24 20:15	1
Cadmium	ND		0.0010	0.000077	mg/L		11/20/24 14:00	11/21/24 20:15	1
Calcium	**140**		1.0	0.25	mg/L		11/20/24 14:00	11/21/24 20:15	1
Chromium	**0.0021**	**J**	0.0050	0.0012	mg/L		11/20/24 14:00	11/21/24 20:15	1
Cobalt	**0.065**		0.0010	0.000086	mg/L		11/20/24 14:00	11/21/24 20:15	1
Lead	**0.00051**	**J**	0.0010	0.00045	mg/L		11/20/24 14:00	11/21/24 20:15	1
Lithium	**0.0043**	**J**	0.0080	0.0034	mg/L		11/20/24 14:00	11/21/24 20:15	1
Molybdenum	ND		0.0050	0.0011	mg/L		11/20/24 14:00	11/21/24 20:15	1
Selenium	ND		0.0050	0.00089	mg/L		11/20/24 14:00	11/21/24 20:15	1
Thallium	ND	*+	0.0010	0.00051	mg/L		11/20/24 14:00	11/21/24 20:15	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		11/20/24 14:00	11/21/24 12:22	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	**1200**		10	10	mg/L			11/18/24 11:34	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**6.2**	**HF**	0.1	0.1	SU			11/23/24 09:44	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.243**		0.161	0.163	1.00	0.229	pCi/L	11/25/24 09:43	12/18/24 18:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*78.7*		*30 - 110*	*11/25/24 09:43*	*12/18/24 18:09*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.965	U	0.650	0.656	1.00	0.980	pCi/L	11/25/24 09:46	12/13/24 11:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*78.7*		*30 - 110*	*11/25/24 09:46*	*12/13/24 11:28*	*1*

Client Sample ID: CCR-AP-11
Lab Sample ID: 180-182961-7

Date Collected: 11/15/24 08:58
Matrix: Water
Date Received: 11/16/24 09:30

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Y Carrier	77.4		30 - 110	11/25/24 09:46	12/13/24 11:28	1

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.21		0.670	0.676	5.00	0.980	pCi/L		12/26/24 09:30	1

Client Sample ID: DUP-1

Date Collected: 11/14/24 00:00
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-8

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	54		1.0	0.71	mg/L			11/21/24 18:54	1
Fluoride	1.8		0.10	0.026	mg/L			11/21/24 18:54	1
Sulfate	450		5.0	3.8	mg/L			11/21/24 19:09	5

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	12		0.10	0.057	mg/L		11/20/24 14:00	11/22/24 22:13	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		11/20/24 14:00	11/21/24 20:17	1
Arsenic	0.0015	J	0.0050	0.00075	mg/L		11/20/24 14:00	11/21/24 20:17	1
Barium	0.051		0.0050	0.00077	mg/L		11/20/24 14:00	11/26/24 03:05	1
Beryllium	ND		0.0010	0.00027	mg/L		11/20/24 14:00	11/21/24 20:17	1
Cadmium	0.000088	J	0.0010	0.000077	mg/L		11/20/24 14:00	11/21/24 20:17	1
Calcium	200		1.0	0.25	mg/L		11/20/24 14:00	11/21/24 20:17	1
Chromium	ND		0.0050	0.0012	mg/L		11/20/24 14:00	11/21/24 20:17	1
Cobalt	0.0023		0.0010	0.000086	mg/L		11/20/24 14:00	11/21/24 20:17	1
Lead	ND		0.0010	0.00045	mg/L		11/20/24 14:00	11/21/24 20:17	1
Lithium	0.083		0.0080	0.0034	mg/L		11/20/24 14:00	11/21/24 20:17	1
Molybdenum	0.34		0.0050	0.0011	mg/L		11/20/24 14:00	11/21/24 20:17	1
Selenium	ND		0.0050	0.00089	mg/L		11/20/24 14:00	11/21/24 20:17	1
Thallium	ND	*+	0.0010	0.00051	mg/L		11/20/24 14:00	11/21/24 20:17	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		11/20/24 14:00	11/21/24 12:23	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	1200		10	10	mg/L			11/18/24 10:34	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	7.6	HF	0.1	0.1	SU			11/21/24 14:19	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.212		0.124	0.125	1.00	0.165	pCi/L	11/25/24 09:43	12/18/24 18:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.9*		*30 - 110*	*11/25/24 09:43*	*12/18/24 18:10*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.460	U	0.451	0.453	1.00	0.725	pCi/L	11/25/24 09:46	12/13/24 11:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*76.9*		*30 - 110*	*11/25/24 09:46*	*12/13/24 11:28*	*1*

Client: Haley & Aldrich, Inc.
Project/Site: CCR Groundwater Monitoring FB Culley East

Job ID: 180-182961-1
SDG: FB Culley East

Client Sample ID: DUP-1
Date Collected: 11/14/24 00:00
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-8
Matrix: Water

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	%Yield	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Y Carrier	*75.9*		*30 - 110*	*11/25/24 09:46*	*12/13/24 11:28*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.673	U	0.468	0.470	5.00	0.725	pCi/L		12/26/24 09:30	1

Client Sample ID: FIELD BLANK 1

Date Collected: 11/15/24 11:55
Date Received: 11/16/24 09:30

Lab Sample ID: 180-182961-9

Matrix: Water

Method: SW846 EPA 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		1.0	0.71	mg/L			11/21/24 19:27	1
Fluoride	ND		0.10	0.026	mg/L			11/21/24 19:27	1
Sulfate	ND		1.0	0.76	mg/L			11/21/24 19:27	1

Method: SW846 EPA 6010D - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	ND		0.10	0.057	mg/L		11/20/24 14:00	11/22/24 22:18	1

Method: SW846 EPA 6020B - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		11/20/24 14:00	11/21/24 20:20	1
Arsenic	ND		0.0050	0.00075	mg/L		11/20/24 14:00	11/21/24 20:20	1
Barium	ND		0.0050	0.00077	mg/L		11/20/24 14:00	11/26/24 03:08	1
Beryllium	ND		0.0010	0.00027	mg/L		11/20/24 14:00	11/21/24 20:20	1
Cadmium	ND		0.0010	0.000077	mg/L		11/20/24 14:00	11/21/24 20:20	1
Calcium	ND		1.0	0.25	mg/L		11/20/24 14:00	11/21/24 20:20	1
Chromium	ND		0.0050	0.0012	mg/L		11/20/24 14:00	11/21/24 20:20	1
Cobalt	ND		0.0010	0.000086	mg/L		11/20/24 14:00	11/21/24 20:20	1
Lead	ND		0.0010	0.00045	mg/L		11/20/24 14:00	11/21/24 20:20	1
Lithium	ND		0.0080	0.0034	mg/L		11/20/24 14:00	11/21/24 20:20	1
Molybdenum	ND		0.0050	0.0011	mg/L		11/20/24 14:00	11/21/24 20:20	1
Selenium	ND		0.0050	0.00089	mg/L		11/20/24 14:00	11/21/24 20:20	1
Thallium	ND	*+	0.0010	0.00051	mg/L		11/20/24 14:00	11/21/24 20:20	1

Method: SW846 EPA 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		11/20/24 14:00	11/21/24 12:25	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids (SM 2540C)	ND		10	10	mg/L			11/18/24 11:43	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 EPA 9040C)	**5.6**	**HF**	0.1	0.1	SU			11/23/24 09:44	1

Method: SW846 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.166**		0.108	0.109	1.00	0.144	pCi/L	11/25/24 09:43	12/18/24 18:12	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*77.2*		*30 - 110*	*11/25/24 09:43*	*12/18/24 18:12*	*1*

Method: SW846 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.630**		0.396	0.400	1.00	0.573	pCi/L	11/25/24 09:46	12/13/24 11:29	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*77.2*		*30 - 110*	*11/25/24 09:46*	*12/13/24 11:29*	*1*

Client Sample ID: FIELD BLANK 1
Lab Sample ID: 180-182961-9

Date Collected: 11/15/24 11:55
Matrix: Water
Date Received: 11/16/24 09:30

Method: SW846 9320 - Radium-228 (GFPC) (Continued)

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Y Carrier	*82.6*		*30 - 110*	*11/25/24 09:46*	*12/13/24 11:29*	*1*

Method: TAL-STL Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	**0.796**		0.410	0.415	5.00	0.573	pCi/L		12/26/24 18:01	1

Method: EPA 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 180-484985/6
Matrix: Water
Analysis Batch: 484985

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	ND		1.0	0.71	mg/L			11/21/24 11:58	1
Fluoride	ND		0.10	0.026	mg/L			11/21/24 11:58	1
Sulfate	ND		1.0	0.76	mg/L			11/21/24 11:58	1

Lab Sample ID: LCS 180-484985/7
Matrix: Water
Analysis Batch: 484985

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	50.0	48.9		mg/L		98	80 - 120
Fluoride	2.50	2.57		mg/L		103	80 - 120
Sulfate	50.0	50.8		mg/L		102	80 - 120

Method: EPA 6010D - Metals (ICP)

Lab Sample ID: MB 240-636038/1-A
Matrix: Water
Analysis Batch: 636493

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 636038

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	ND		0.10	0.057	mg/L		11/20/24 14:00	11/22/24 20:55	1

Lab Sample ID: LCS 240-636038/2-A
Matrix: Water
Analysis Batch: 636493

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 636038

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Boron	1.00	1.07		mg/L		107	80 - 120

Method: EPA 6020B - Metals (ICP/MS)

Lab Sample ID: MB 240-636038/1-A
Matrix: Water
Analysis Batch: 636305

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 636038

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	ND		0.0020	0.00057	mg/L		11/20/24 14:00	11/21/24 19:32	1
Arsenic	ND		0.0050	0.00075	mg/L		11/20/24 14:00	11/21/24 19:32	1
Barium	ND		0.0050	0.00077	mg/L		11/20/24 14:00	11/21/24 19:32	1
Beryllium	ND		0.0010	0.00027	mg/L		11/20/24 14:00	11/21/24 19:32	1
Cadmium	ND		0.0010	0.000077	mg/L		11/20/24 14:00	11/21/24 19:32	1
Calcium	ND		1.0	0.25	mg/L		11/20/24 14:00	11/21/24 19:32	1
Chromium	ND		0.0050	0.0012	mg/L		11/20/24 14:00	11/21/24 19:32	1
Cobalt	ND		0.0010	0.000086	mg/L		11/20/24 14:00	11/21/24 19:32	1
Lead	ND		0.0010	0.00045	mg/L		11/20/24 14:00	11/21/24 19:32	1
Lithium	ND		0.0080	0.0034	mg/L		11/20/24 14:00	11/21/24 19:32	1
Molybdenum	ND		0.0050	0.0011	mg/L		11/20/24 14:00	11/21/24 19:32	1
Selenium	ND		0.0050	0.00089	mg/L		11/20/24 14:00	11/21/24 19:32	1
Thallium	ND		0.0010	0.00051	mg/L		11/20/24 14:00	11/21/24 19:32	1

Method: EPA 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 240-636038/1-A
Matrix: Water
Analysis Batch: 636748

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 636038

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Barium	ND		0.0050	0.00077	mg/L		11/20/24 14:00	11/26/24 02:25	1

Lab Sample ID: LCS 240-636038/3-A
Matrix: Water
Analysis Batch: 636305

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 636038

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Antimony	0.100	0.102		mg/L		102	80 - 120
Arsenic	1.00	0.969		mg/L		97	80 - 120
Barium	1.00	0.983		mg/L		98	80 - 120
Beryllium	0.500	0.503		mg/L		101	80 - 120
Cadmium	0.500	0.482		mg/L		96	80 - 120
Calcium	25.0	25.0		mg/L		100	80 - 120
Chromium	0.500	0.497		mg/L		99	80 - 120
Cobalt	0.500	0.505		mg/L		101	80 - 120
Lead	0.500	0.497		mg/L		99	80 - 120
Lithium	0.500	0.509		mg/L		102	80 - 120
Molybdenum	0.500	0.481		mg/L		96	80 - 120
Selenium	1.00	0.966		mg/L		97	80 - 120
Thallium	1.00	1.38	*+	mg/L		138	80 - 120

Lab Sample ID: LCS 240-636038/3-A
Matrix: Water
Analysis Batch: 636748

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 636038

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Barium	1.00	0.996		mg/L		100	80 - 120

Method: EPA 7470A - Mercury (CVAA)

Lab Sample ID: MB 240-636040/1-A
Matrix: Water
Analysis Batch: 636245

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 636040

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020	0.00013	mg/L		11/20/24 14:00	11/21/24 11:59	1

Lab Sample ID: LCS 240-636040/2-A
Matrix: Water
Analysis Batch: 636245

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 636040

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Mercury	0.00500	0.00475		mg/L		95	80 - 120

Method: EPA 9040C - pH

Lab Sample ID: LCS 180-485028/24
Matrix: Water
Analysis Batch: 485028

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
pH	7.00	7.0		SU		100	99 - 101

Lab Sample ID: LCS 180-485167/24
Matrix: Water
Analysis Batch: 485167

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
pH	7.00	7.0		SU		100	99 - 101

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 180-484645/2
Matrix: Water
Analysis Batch: 484645

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	10	mg/L			11/18/24 10:34	1

Lab Sample ID: LCS 180-484645/1
Matrix: Water
Analysis Batch: 484645

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Dissolved Solids	417	394		mg/L		94	85 - 115

Lab Sample ID: 180-182961-8 DU
Matrix: Water
Analysis Batch: 484645

Client Sample ID: DUP-1
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	1200		1180		mg/L		0.2	10

Lab Sample ID: MB 180-484659/1
Matrix: Water
Analysis Batch: 484659

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	10	mg/L			11/18/24 11:34	1

Lab Sample ID: LCS 180-484659/2
Matrix: Water
Analysis Batch: 484659

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Dissolved Solids	417	402		mg/L		96	85 - 115

Method: SM 2540C - Solids, Total Dissolved (TDS) (Continued)

Lab Sample ID: MB 180-484667/1
Matrix: Water
Analysis Batch: 484667

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	10	mg/L			11/18/24 11:43	1

Lab Sample ID: LCS 180-484667/2
Matrix: Water
Analysis Batch: 484667

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Dissolved Solids	417	386		mg/L		93	85 - 115

Lab Sample ID: 180-182961-9 DU
Matrix: Water
Analysis Batch: 484667

Client Sample ID: FIELD BLANK 1
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	ND		ND		mg/L		NC	10

Lab Sample ID: MB 180-484737/1
Matrix: Water
Analysis Batch: 484737

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	ND		10	10	mg/L			11/19/24 09:41	1

Lab Sample ID: LCS 180-484737/2
Matrix: Water
Analysis Batch: 484737

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Total Dissolved Solids	417	398		mg/L		95	85 - 115

Lab Sample ID: 180-182961-4 DU
Matrix: Water
Analysis Batch: 484737

Client Sample ID: CCR-AP-5
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	1200		1220		mg/L		0.2	10

Method: 9315 - Radium-226 (GFPC)

Lab Sample ID: MB 160-689970/1-A
Matrix: Water
Analysis Batch: 693993

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 689970

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.02322	U	0.0781	0.0781	1.00	0.146	pCi/L	11/22/24 09:22	12/16/24 18:01	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.4*		*30 - 110*	*11/22/24 09:22*	*12/16/24 18:01*	*1*

Method: 9315 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCS 160-689970/2-A
Matrix: Water
Analysis Batch: 693993

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 689970

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			9.58	9.841		1.06	1.00	0.138	pCi/L	103	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*91.1*		*30 - 110*

Lab Sample ID: MB 160-690430/1-A
Matrix: Water
Analysis Batch: 694357

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 690430

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.02793	U	0.0747	0.0747	1.00	0.140	pCi/L	11/25/24 09:43	12/18/24 18:09	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*81.5*		*30 - 110*	*11/25/24 09:43*	*12/18/24 18:09*	*1*

Lab Sample ID: LCS 160-690430/2-A
Matrix: Water
Analysis Batch: 694357

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 690430

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-226			9.58	9.247		1.02	1.00	0.121	pCi/L	97	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*87.6*		*30 - 110*

Method: 9320 - Radium-228 (GFPC)

Lab Sample ID: MB 160-689999/1-A
Matrix: Water
Analysis Batch: 693092

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 689999

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.2740	U	0.476	0.477	1.00	0.816	pCi/L	11/22/24 12:14	12/11/24 12:43	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.4*		*30 - 110*	*11/22/24 12:14*	*12/11/24 12:43*	*1*
Y Carrier	*65.4*		*30 - 110*	*11/22/24 12:14*	*12/11/24 12:43*	*1*

Method: 9320 - Radium-228 (GFPC) (Continued)

Lab Sample ID: LCS 160-689999/2-A
Matrix: Water
Analysis Batch: 693092

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 689999

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.27	9.882		1.46	1.00	0.746	pCi/L	119	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*91.1*		*30 - 110*
Y Carrier	*73.6*		*30 - 110*

Lab Sample ID: MB 160-690431/1-A
Matrix: Water
Analysis Batch: 693477

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 690431

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.2666	U	0.347	0.348	1.00	0.578	pCi/L	11/25/24 09:46	12/13/24 11:27	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*81.5*		*30 - 110*	*11/25/24 09:46*	*12/13/24 11:27*	*1*
Y Carrier	*82.2*		*30 - 110*	*11/25/24 09:46*	*12/13/24 11:27*	*1*

Lab Sample ID: LCS 160-690431/2-A
Matrix: Water
Analysis Batch: 693477

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 690431

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec Limits		
Radium-228			8.27	9.885		1.37	1.00	0.548	pCi/L	120	75 - 125		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*87.6*		*30 - 110*
Y Carrier	*79.3*		*30 - 110*

HPLC/IC

Analysis Batch: 484985

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-1	CCR-AP-1R	Total/NA	Water	EPA 9056A	
180-182961-2	CCR-AP-2	Total/NA	Water	EPA 9056A	
180-182961-2	CCR-AP-2	Total/NA	Water	EPA 9056A	
180-182961-3	CCR-AP-4	Total/NA	Water	EPA 9056A	
180-182961-4	CCR-AP-5	Total/NA	Water	EPA 9056A	
180-182961-4	CCR-AP-5	Total/NA	Water	EPA 9056A	
180-182961-5	CCR-AP-6I	Total/NA	Water	EPA 9056A	
180-182961-6	CCR-AP-9	Total/NA	Water	EPA 9056A	
180-182961-7	CCR-AP-11	Total/NA	Water	EPA 9056A	
180-182961-7	CCR-AP-11	Total/NA	Water	EPA 9056A	
180-182961-8	DUP-1	Total/NA	Water	EPA 9056A	
180-182961-8	DUP-1	Total/NA	Water	EPA 9056A	
180-182961-9	FIELD BLANK 1	Total/NA	Water	EPA 9056A	
MB 180-484985/6	Method Blank	Total/NA	Water	EPA 9056A	
LCS 180-484985/7	Lab Control Sample	Total/NA	Water	EPA 9056A	

Metals

Prep Batch: 636038

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-1	CCR-AP-1R	Total Recoverable	Water	3005A	
180-182961-2	CCR-AP-2	Total Recoverable	Water	3005A	
180-182961-3	CCR-AP-4	Total Recoverable	Water	3005A	
180-182961-4	CCR-AP-5	Total Recoverable	Water	3005A	
180-182961-5	CCR-AP-6I	Total Recoverable	Water	3005A	
180-182961-6	CCR-AP-9	Total Recoverable	Water	3005A	
180-182961-7	CCR-AP-11	Total Recoverable	Water	3005A	
180-182961-8	DUP-1	Total Recoverable	Water	3005A	
180-182961-9	FIELD BLANK 1	Total Recoverable	Water	3005A	
MB 240-636038/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-636038/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-636038/3-A	Lab Control Sample	Total Recoverable	Water	3005A	

Prep Batch: 636040

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-1	CCR-AP-1R	Total/NA	Water	7470A	
180-182961-2	CCR-AP-2	Total/NA	Water	7470A	
180-182961-3	CCR-AP-4	Total/NA	Water	7470A	
180-182961-4	CCR-AP-5	Total/NA	Water	7470A	
180-182961-5	CCR-AP-6I	Total/NA	Water	7470A	
180-182961-6	CCR-AP-9	Total/NA	Water	7470A	
180-182961-7	CCR-AP-11	Total/NA	Water	7470A	
180-182961-8	DUP-1	Total/NA	Water	7470A	
180-182961-9	FIELD BLANK 1	Total/NA	Water	7470A	
MB 240-636040/1-A	Method Blank	Total/NA	Water	7470A	
LCS 240-636040/2-A	Lab Control Sample	Total/NA	Water	7470A	

Analysis Batch: 636245

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-1	CCR-AP-1R	Total/NA	Water	EPA 7470A	636040
180-182961-2	CCR-AP-2	Total/NA	Water	EPA 7470A	636040

Metals (Continued)

Analysis Batch: 636245 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-3	CCR-AP-4	Total/NA	Water	EPA 7470A	636040
180-182961-4	CCR-AP-5	Total/NA	Water	EPA 7470A	636040
180-182961-5	CCR-AP-6I	Total/NA	Water	EPA 7470A	636040
180-182961-6	CCR-AP-9	Total/NA	Water	EPA 7470A	636040
180-182961-7	CCR-AP-11	Total/NA	Water	EPA 7470A	636040
180-182961-8	DUP-1	Total/NA	Water	EPA 7470A	636040
180-182961-9	FIELD BLANK 1	Total/NA	Water	EPA 7470A	636040
MB 240-636040/1-A	Method Blank	Total/NA	Water	EPA 7470A	636040
LCS 240-636040/2-A	Lab Control Sample	Total/NA	Water	EPA 7470A	636040

Analysis Batch: 636305

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-1	CCR-AP-1R	Total Recoverable	Water	EPA 6020B	636038
180-182961-2	CCR-AP-2	Total Recoverable	Water	EPA 6020B	636038
180-182961-3	CCR-AP-4	Total Recoverable	Water	EPA 6020B	636038
180-182961-4	CCR-AP-5	Total Recoverable	Water	EPA 6020B	636038
180-182961-5	CCR-AP-6I	Total Recoverable	Water	EPA 6020B	636038
180-182961-6	CCR-AP-9	Total Recoverable	Water	EPA 6020B	636038
180-182961-7	CCR-AP-11	Total Recoverable	Water	EPA 6020B	636038
180-182961-8	DUP-1	Total Recoverable	Water	EPA 6020B	636038
180-182961-9	FIELD BLANK 1	Total Recoverable	Water	EPA 6020B	636038
MB 240-636038/1-A	Method Blank	Total Recoverable	Water	EPA 6020B	636038
LCS 240-636038/3-A	Lab Control Sample	Total Recoverable	Water	EPA 6020B	636038

Analysis Batch: 636493

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-1	CCR-AP-1R	Total Recoverable	Water	EPA 6010D	636038
180-182961-2	CCR-AP-2	Total Recoverable	Water	EPA 6010D	636038
180-182961-3	CCR-AP-4	Total Recoverable	Water	EPA 6010D	636038
180-182961-5	CCR-AP-6I	Total Recoverable	Water	EPA 6010D	636038
180-182961-6	CCR-AP-9	Total Recoverable	Water	EPA 6010D	636038
180-182961-7	CCR-AP-11	Total Recoverable	Water	EPA 6010D	636038
180-182961-8	DUP-1	Total Recoverable	Water	EPA 6010D	636038
180-182961-9	FIELD BLANK 1	Total Recoverable	Water	EPA 6010D	636038
MB 240-636038/1-A	Method Blank	Total Recoverable	Water	EPA 6010D	636038
LCS 240-636038/2-A	Lab Control Sample	Total Recoverable	Water	EPA 6010D	636038

Analysis Batch: 636691

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-4	CCR-AP-5	Total Recoverable	Water	EPA 6010D	636038

Analysis Batch: 636748

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-3	CCR-AP-4	Total Recoverable	Water	EPA 6020B	636038
180-182961-4	CCR-AP-5	Total Recoverable	Water	EPA 6020B	636038
180-182961-5	CCR-AP-6I	Total Recoverable	Water	EPA 6020B	636038
180-182961-6	CCR-AP-9	Total Recoverable	Water	EPA 6020B	636038
180-182961-7	CCR-AP-11	Total Recoverable	Water	EPA 6020B	636038
180-182961-8	DUP-1	Total Recoverable	Water	EPA 6020B	636038
180-182961-9	FIELD BLANK 1	Total Recoverable	Water	EPA 6020B	636038
MB 240-636038/1-A	Method Blank	Total Recoverable	Water	EPA 6020B	636038

Metals (Continued)

Analysis Batch: 636748 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 240-636038/3-A	Lab Control Sample	Total Recoverable	Water	EPA 6020B	636038

General Chemistry

Analysis Batch: 484645

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-8	DUP-1	Total/NA	Water	SM 2540C	
MB 180-484645/2	Method Blank	Total/NA	Water	SM 2540C	
LCS 180-484645/1	Lab Control Sample	Total/NA	Water	SM 2540C	
180-182961-8 DU	DUP-1	Total/NA	Water	SM 2540C	

Analysis Batch: 484659

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-2	CCR-AP-2	Total/NA	Water	SM 2540C	
180-182961-7	CCR-AP-11	Total/NA	Water	SM 2540C	
MB 180-484659/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 180-484659/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Analysis Batch: 484667

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-1	CCR-AP-1R	Total/NA	Water	SM 2540C	
180-182961-3	CCR-AP-4	Total/NA	Water	SM 2540C	
180-182961-5	CCR-AP-6I	Total/NA	Water	SM 2540C	
180-182961-6	CCR-AP-9	Total/NA	Water	SM 2540C	
180-182961-9	FIELD BLANK 1	Total/NA	Water	SM 2540C	
MB 180-484667/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 180-484667/2	Lab Control Sample	Total/NA	Water	SM 2540C	
180-182961-9 DU	FIELD BLANK 1	Total/NA	Water	SM 2540C	

Analysis Batch: 484737

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-4	CCR-AP-5	Total/NA	Water	SM 2540C	
MB 180-484737/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 180-484737/2	Lab Control Sample	Total/NA	Water	SM 2540C	
180-182961-4 DU	CCR-AP-5	Total/NA	Water	SM 2540C	

Analysis Batch: 485028

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-4	CCR-AP-5	Total/NA	Water	EPA 9040C	
180-182961-5	CCR-AP-6I	Total/NA	Water	EPA 9040C	
180-182961-8	DUP-1	Total/NA	Water	EPA 9040C	
LCS 180-485028/24	Lab Control Sample	Total/NA	Water	EPA 9040C	

Analysis Batch: 485167

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-1	CCR-AP-1R	Total/NA	Water	EPA 9040C	
180-182961-2	CCR-AP-2	Total/NA	Water	EPA 9040C	
180-182961-3	CCR-AP-4	Total/NA	Water	EPA 9040C	
180-182961-6	CCR-AP-9	Total/NA	Water	EPA 9040C	
180-182961-7	CCR-AP-11	Total/NA	Water	EPA 9040C	
180-182961-9	FIELD BLANK 1	Total/NA	Water	EPA 9040C	

General Chemistry (Continued)

Analysis Batch: 485167 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 180-485167/24	Lab Control Sample	Total/NA	Water	EPA 9040C	

Rad

Prep Batch: 689970

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-1	CCR-AP-1R	Total/NA	Water	PrecSep-21	
180-182961-2	CCR-AP-2	Total/NA	Water	PrecSep-21	
180-182961-3	CCR-AP-4	Total/NA	Water	PrecSep-21	
MB 160-689970/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-689970/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 689999

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-1	CCR-AP-1R	Total/NA	Water	PrecSep_0	
180-182961-2	CCR-AP-2	Total/NA	Water	PrecSep_0	
180-182961-3	CCR-AP-4	Total/NA	Water	PrecSep_0	
MB 160-689999/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-689999/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Prep Batch: 690430

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-4	CCR-AP-5	Total/NA	Water	PrecSep-21	
180-182961-5	CCR-AP-6I	Total/NA	Water	PrecSep-21	
180-182961-6	CCR-AP-9	Total/NA	Water	PrecSep-21	
180-182961-7	CCR-AP-11	Total/NA	Water	PrecSep-21	
180-182961-8	DUP-1	Total/NA	Water	PrecSep-21	
180-182961-9	FIELD BLANK 1	Total/NA	Water	PrecSep-21	
MB 160-690430/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-690430/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 690431

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-182961-4	CCR-AP-5	Total/NA	Water	PrecSep_0	
180-182961-5	CCR-AP-6I	Total/NA	Water	PrecSep_0	
180-182961-6	CCR-AP-9	Total/NA	Water	PrecSep_0	
180-182961-7	CCR-AP-11	Total/NA	Water	PrecSep_0	
180-182961-8	DUP-1	Total/NA	Water	PrecSep_0	
180-182961-9	FIELD BLANK 1	Total/NA	Water	PrecSep_0	
MB 160-690431/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-690431/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

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NOT FOIL
RAD

	CCR-AP-1R	11/14/24	0645	500mL
1	CCR-AP-2	11/14/24	0805	650mL
1	CCR-AP-4	11/14/24	1320	450mL
2	CCR-AP-5	11/14/24	1545	—
2	CCR-AP-6I	11/13/24	0841	—
1	CCR-AP-9	11/14/24	1050	600mL
2	CCR-AP-11	11/15/24	0858	—
2	DUP-1	11/14/24	—	—
2	Field Blank	1	11/15/24	1155

180-182961 Chain of Custody

NO COC
[illegible] 11/16/24 0930

2 MW3 0364 | | 250 ORP ILF 0104303

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Pittsburgh, PA 15238
Phone: 412-963-7058 Fax: 412-963-2468

Chain of Custody Record

eurofins | Environment Testing

Client Information	Sampler: MARK BRETING	Lab PM: Johnson, Andy	Carrier Tracking No(s):	COC No: 180-106631-14505.2
Client Contact: Mark Breting	Phone: 317 313 8306	E-Mail: Andy.Johnson@et.eurofinsus.com	State of Origin: IN	Page: Page 2 of 2
Company: Atlas Technical Consultants LLC	PWSID:	Analysis Requested		Job #:
Address: 7988 Centerpoint Drive Suite 100	Due Date Requested:			Preservation Codes: N None D HNO3
City: Indianapolis	TAT Requested (days):			
State, Zip: IN, 46256	Compliance Project: Δ Yes Δ No			
Phone:	PO #: 0129420-032-001-01			Other:
Email: mark.breting@atcassociates.com	WO #: See Chain			
Project Name: CCR GW Monitoring FB Culley East	Project #: 18016014			
Site:	SSOW#:			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	9060C, 9056A_ORGFM_28D	2540C_Calcd TDS by 2540C	9315_Ra226, 9320_Ra228	6020B Metals by 6020B	7470A Hg by 7470A	6010D Boron by 6010D	Total Number of Containers	Special Instructions/Note:
			Preservation Code:				N	N	D	D	D	D		
CCR-AP-6I	11/13/24	08:41	G	W	N	N	X	X	X	X	X	X		
CCR-AP-1R	11/14/24	06 45	G	W	N	N	X	X	X	X	X	X		Only 1 Radium Filtered
CCR-AP-2		08:05	G	W	N	N	X	X	X	X	X	X		" " "
CCR-AP-9		10 50	G	W	N	N	X	X	X	X	X	X		" " "
CCR-AP-4R		13 20	G	W	N	N	X	X	X	X	X	X		" " "
CCR-AP-5		15 45	G	W	N	N	X	X	X	X	X	X		
DUP-1		0000	G	W	N	N	X	X	X	X	X	X		
CCR-AP-11	11/15/24	0858	G	W	N	N	X	X	X	X	X	X		
Field Blank 1	11/15/24	1155	G	W	N	N	X	X	X	X	X	X		

180-182961-02 Chain of Custody

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☑ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV Other (specify)

Special Instructions/QC Requirements:

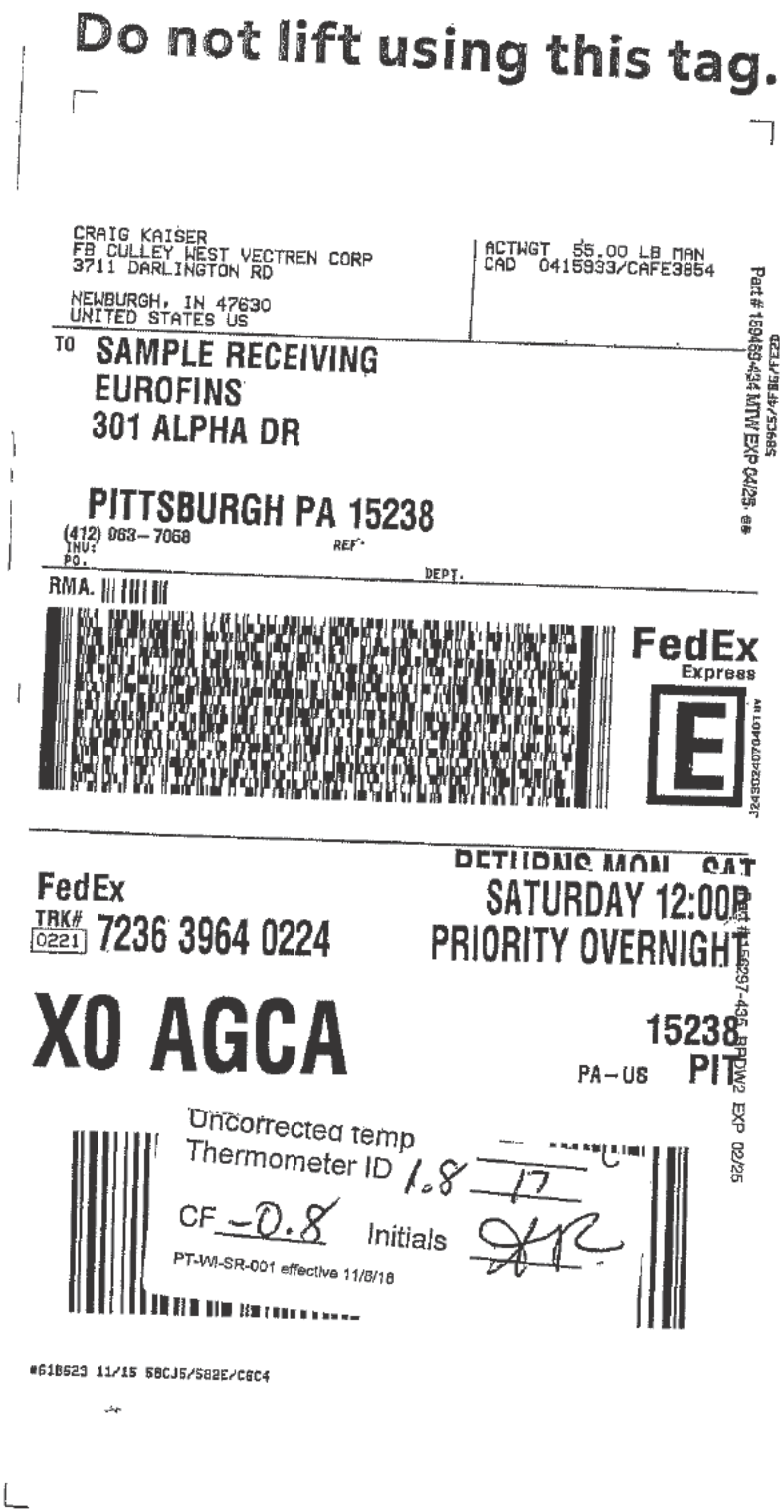
Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Mark Breting	11/15/24 1340	Atlas	FedEx	11/15/24 1340	
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
				11/16/24 0930	ETHV
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.	Cooler Temperature(s) °C and Other Remarks:

Ver: 05/06/2024


Do Not Lift Using This Tag
Ref
Dep
Date 17Oct24
Wgt 55 00 LBS
DV:
SHIPPING 0 00
SPECIAL 0 00
HANDLING 0 00
0 00 TOTAL
Svcs: PRIORITY OVERNIGHT Master 7236 3963 9470
TRCK 7236 3963 9481
ORIGIN ID:ORFA (317) 579-4082
CRAIG KAISER
FB CULLEY VECTREN CORP
3711 DARLINGTON RD
NEWBURGH, IN 47630
UNITED STATES US
SHIP DATE 17OCT24
ACTWGT 55.00 LB MAN
CAD 0416933/CAFE3854
180-182981 Waybill
TO SAMPLE RECEIVING
EUROFINS
301 ALPHA DR
PITTSBURGH PA 15238
(412) 963-7058
REF
INV:
PO:
DEPT.
RMA.
FedEx
Express
Uncorrected temp
Thermometer ID 4.1
CF -0.1
Initials
PT-WI-SR-001 effective 11/8/18
FedEx
TRK# 0221 7236 3963 9481
XO AGCA
SATURDAY 12:00P
PRIORITY OVERNIGH
15238
PA-US
#6190970 11/15 58CJS/582E/C8C4
CRAIG KAISER
FB CULLEY WEST/VECTREN CORP
3711 DARLINGTON RD.
NEWBURGH, IN 47630
UNITED STATES US
ACTWGT 55 00 LB MAN
CAD 0416933/CAFE3854
TO SAMPLE RECEIVING
EUROFINS
301 ALPHA DR
PITTSBURGH PA 15238
(412) 963-7058
REF:
PO:
DEPT.
RMA.
FedEx
Express
Uncorrected temp
Thermometer ID 1.7
CF -0.1
Initials
PT-WI-SR-001 effective 11/8/18
FedEx
TRK# 0221 7236 3964 0280
XO AGCA
SATURDAY 12:00P
PRIORITY OVERNIGH
15238
PA-US
FedEx
Express
SDR
Saturday Delivery



Do not lift using this tag.

CRAIG KAISER
FB CULLEY WEST VECTREN CORP
3711 DARLINGTON RD

NEWBURGH, IN 47630
UNITED STATES US

ACTWGT 55.00 LB MAN
CAD 0415933/CAFE3854

TO SAMPLE RECEIVING
EUROFINS
301 ALPHA DR

PITTSBURGH PA 15238
(412) 963-7058
INV:
PO:
REF:
DEPT:

RMA.

FedEx Express

FedEx
TRK# 0221 7236 3964 0224

SATURDAY 12:00P
PRIORITY OVERNIGHT

XO AGCA

15238
PA-US PIT

Uncorrected temp
Thermometer ID 1.8 17
CF -0.8 Initials
PT-WI-SR-001 effective 11/8/18

#618523 11/15 58CJ5/582E/C8C4

Part # 158469-494 MTW EXP 04/25 ee

Part # 156297-435 BRDW2 EXP 02/25



CRAIG KAISER
FB CULLEY VECTREN CORP
3711 DARLINGTON RD

NEWBURGH, IN 47630
UNITED STATES US

ACTWGT 55.00 LB MAN
CAD 0415933/CAFE3854

TO SAMPLE RECEIVING
EUROFINS
301 ALPHA DR

PITTSBURGH PA 15238
(412) 963-7058
INV:
PO:
REF:
DEPT:

RMA.

FedEx Express

FedEx
TRK# 0221 7236 3963 9492

SATURDAY 12:00
PRIORITY OVERNIGH

XO AGCA

15238
PA-US PIT

Uncorrected temp
Thermometer ID 36 17
CF -0.1 Initials
PT-WI-SR-001 effective 11/8/18

#6190970 11/15 58CJ

Part # 158469-494 MTW EXP 04/25 ee

Part # 156297-435 BRDW2 EXP 08/26

CRAIG KAISER
FB CULLEY VECTREN CORP
3711 DARLINGTON RD

NEWBURGH, IN 47630
UNITED STATES US

CAD 0415933/CAFE3654

TO SAMPLE RECEIVING
EUROFINS
301 ALPHA DR

PITTSBURGH PA 15238
(412) 963-7058 REF:
INV:
PO: DEPT:

RMA.

FedEx Express

FedEx
TRK# 0221 7236 3963 9518

SATURDAY 12:00
PRIORITY OVERNIGH

15238
PA-US PIT

XO AGCA

Uncorrected temp °C
Thermometer ID 24 17
CF -0.1 Initials SR
PT-WI-SR-001 effective 11/8/18

EXP 08/25

#6190970 11/15 58CJ5/582E/C6C4

Ref
Dep

Date 17Oct24
Wgt 35 00 LBS

DV

SHIPPING 0 00
SPECIAL 0 00
0 00
0 00

Svcs PRIORITY OVERNIGHT Master 7236 3963 9470
TRCK 7236 3963 9470

ORIGIN ID ORFA (317) 579-4082
CRAIG KAISER
FB CULLEY VECTREN CORP
3711 DARLINGTON RD

NEWBURGH, IN 47630
UNITED STATES US

9470 11 16
A 12 00
1
639
RT
FZ

TO SAMPLE RECEIVING
EUROFINS
301 ALPHA DR

PITTSBURGH PA 15238
(412) 963-7058 REF
INV:
PO: DEPT:

RMA.

FedEx Express

FedEx
TRK# 0221 7236 3963 9470

SATURDAY 12:00
PRIORITY OVERNIGH

15238
PA-US PIT

XO AGCA

Uncorrected temp °C
Thermometer ID 25 17
CF -0.1 Initials SR
PT-WI-SR-001 effective 11/8/18

EXP 08/25

#6190970 11/15 58CJ5/582E/C6C4

Eurofins Pittsburgh
301 Alpha Drive RIDC Park
Pittsburgh, PA 15238
Phone: 412-963-7058 Fax: 412-963-2468

Chain of Custody Record

eurofins

Client Information (Sub Contract Lab)	Sampler: N/A	Lab PM: Johnson, Andy	Carrier Tracking No(s): N/A	COC No: 180-528237.1
Client Contact: Shipping/Receiving	Phone: N/A	E-Mail: Andy.Johnson@et.eurofinsus.com	State of Origin: Indiana	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): N/A		Job #: 180-182961-1
Address: 13715 Rider Trail North,	Due Date Requested: 12/26/2024			Preservation Codes: -
City: Earth City	TAT Requested (days): N/A			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #: N/A			
Email: N/A	WO #: N/A			
Project Name: CCR Groundwater Monitoring FB Culley East	Project #: 18016014			
Site: N/A	SSOW#: N/A			Other: N/A

Analysis Requested

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	9315_Ra226/PrecSep_21 Radium-226 (GFPC) by 9315 (21-day decay)	9320_Ra228/PrecSep_0 Radium-228 (GFPC) by 9320	Ra226Ra228_GFPC/ Combined Radium-226 and Radium-228	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
CCR-AP-1R (180-182961-1)	11/14/24	06:45 Eastern	G	Water			X	X	X	1	
CCR-AP-2 (180-182961-2)	11/14/24	08:05 Eastern	G	Water			X	X	X	1	
CCR-AP-4R (180-182961-3)	11/14/24	13:20 Eastern	G	Water			X	X	X	1	
CCR-AP-5 (180-182961-4)	11/14/24	15:45 Eastern	G	Water			X	X	X	2	
CCR-AP-6I (180-182961-5)	11/13/24	08:41 Eastern	G	Water			X	X	X	2	
CCR-AP-9 (180-182961-6)	11/14/24	10:50 Eastern	G	Water			X	X	X	1	
CCR-AP-11 (180-182961-7)	11/15/24	08:58 Eastern	G	Water			X	X	X	2	
DUP-1 (180-182961-8)	11/14/24	Eastern	G	Water			X	X	X	2	
FIELD BLANK 1 (180-182961-9)	11/15/24	11:55 Eastern	G	Water			X	X	X	2	

Note: Since laboratory accreditations are subject to change, Eurofins Pittsburgh places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Pittsburgh laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Pittsburgh attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Pittsburgh.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by:	Date/Time: 11/27/1900	Company: EUHT	Received by: M. Pinette	Date/Time: NOV 19 2024 0910	Company
Relinquished by:	Date/Time:	Company	Received by: Meadow Pinette	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 180-182961-1
SDG Number: FB Culley East

Login Number: 182961
List Number: 1
Creator: Ryan, Shannon G

List Source: Eurofins Pittsburgh

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	False	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	False	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

This receipt checklist is generated for all samples received in this Login. It may not be applicable to all Jobs associated with this Login.

Login Sample Receipt Checklist

Client: Haley & Aldrich, Inc.

Job Number: 180-182961-1
SDG Number: FB Culley East

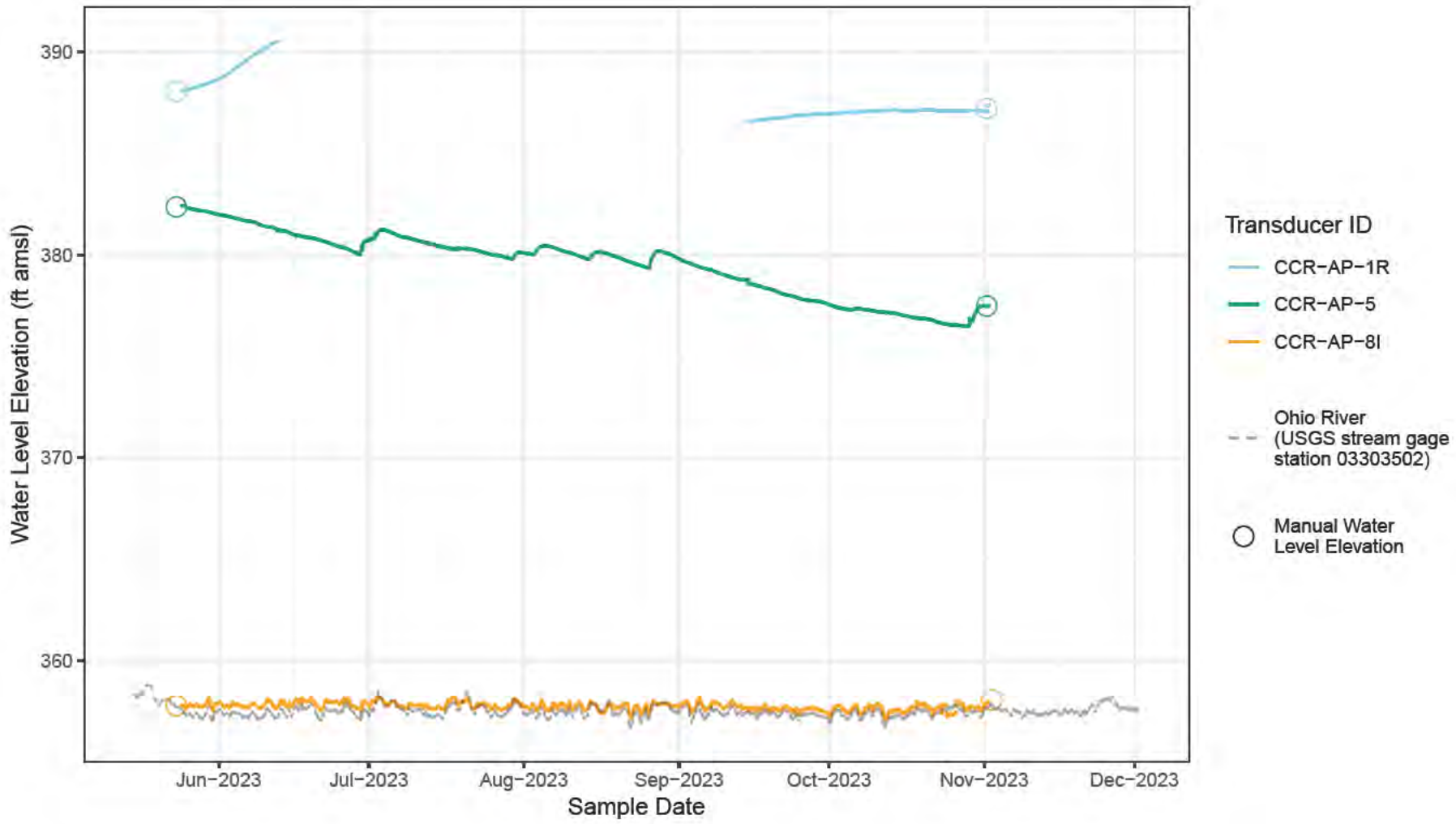
Login Number: 182961
List Number: 3
Creator: Pinette, Meadow L

List Source: Eurofins St. Louis
List Creation: 11/19/24 01:45 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

This receipt checklist is generated for all samples received in this Login. It may not be applicable to all Jobs associated with this Login.

APPENDIX D
Hydrographs



Notes:

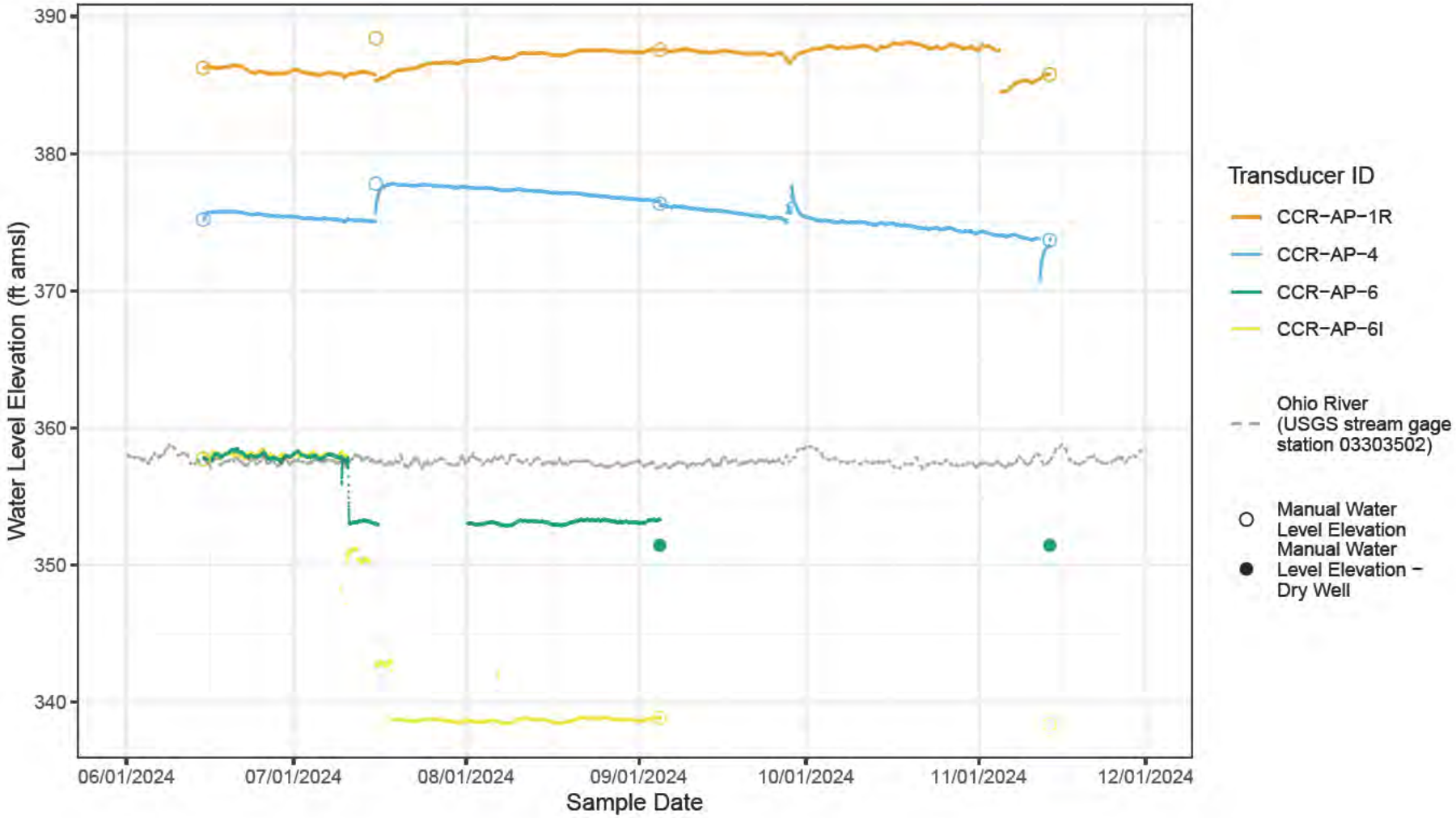
- Water Level Elevation (ft amsl) = top of riser (ft amsl) − adjusted trasducer water level (ft), where adjusted transducer water level = −(manual water level elevation − transducer water level).
- USGS stream gage station 03303502 is located on the Ohio River at Riverport, Owensboro, KY, USA.

APPENDIX D-1

EAST ASH POND HYDROGRAPHS OVER OHIO RIVER AT RIVERPORT GAGE HEIGHT

HALEY ALDRICH

JANUARY 2025



Notes:

- ft NAVD88 = feet relative to the NAVD88 datum
- USGS stream gage station 03303502 is located on the Ohio River at Riverport, Owensboro, KY, USA.

APPENDIX D-2

EAST ASH POND HYDROGRAPHS OVER OHIO RIVER AT RIVERPORT GAGE HEIGHT

HALEY ALDRICH

JANUARY 2025

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 149
New York Times Article on Trump's Coal Plant Policy

Trump Wants to Halt Almost All Coal Plant Shutdowns. It Could Get Messy.

Even as administration officials vowed this week to head off scheduled retirements, some aging plants are now breaking, and costs could run to the billions.

Listen to this article · 11:35 min Learn more




By Claire Brown and Brad Plumer

Jan. 16, 2026

Over the past eight months, the Energy Department has taken the extraordinary step of ordering that generators at five coal-burning power plants that had been headed for retirement stay open and keep running.

That's just the beginning, officials say.

At a White House event on Thursday, Trump administration officials said they planned to keep open as many coal plants as they could and prevent any further retirements over the next three years.

"The goal is to stop the political closure of coal plants," Chris Wright, the energy secretary, said during the first meeting of the National Coal Council, which had lapsed under the Biden administration but which President Trump has revived. Dozens of representatives from the coal industry were present.

The moves are part of a sweeping plan by Mr. Trump to revive America's coal industry, which has been declining for years. Mr. Trump has expressed a certain affection for the fuel, calling it "beautiful clean coal" to goad environmentalists, who note that coal is the dirtiest of fossil fuels and a major driver of global warming.

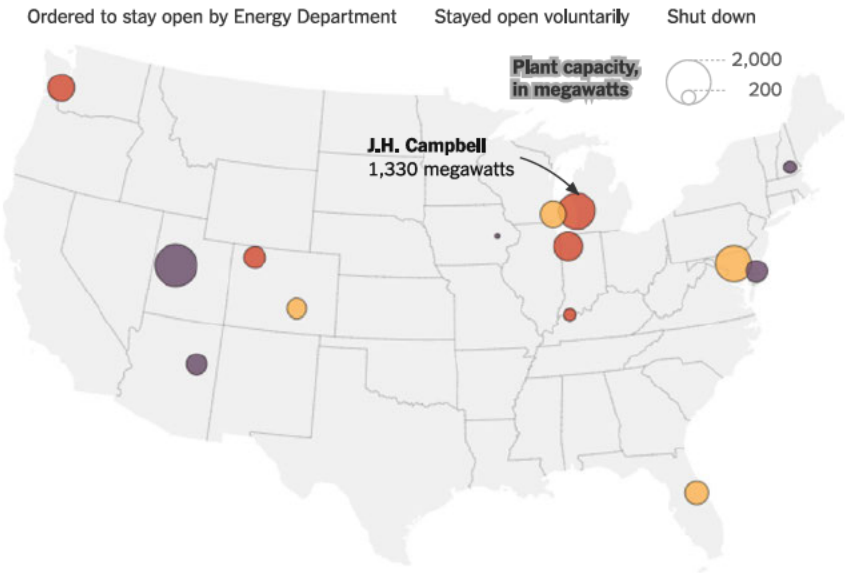
Administration officials say that keeping coal plants open is necessary to avoid blackouts and meet rising energy needs.

On the ground, however, efforts to halt coal retirements are already causing complications. Two of the coal units that the Energy Department ordered to stay online in December are broken, and it's unclear when they might be repaired.

Some plants that were ordered to keep running had already shuttered their coal mines and stopped maintaining old equipment. Now, utilities and operators are straining to revive them. The costs of extending coal-burning plants are significant, and federal and state regulators are embroiled in disputes over who will ultimately pay.

"These are old plants, and they are expensive to refurbish and keep open," said Ari Peskoe, director of Harvard Law School's Electricity Law Initiative. "The costs are going to fall on somebody. The question is whether it's the plant owners or the public."

Most coal units expected to close in 2025 were kept open



Source: U.S. Energy Information Administration. Brad Plumer/The New York Times

The debate over whether to keep aging coal plants open comes amid an astonishing turnaround in the coal industry's political fortunes.

Since 2005, the number of operating coal plants in the United States had been declining precipitously as utilities switched to cheaper and cleaner natural gas, wind and solar power. Even Mr. Trump in his first term couldn't stop the slide; more than 150 coal-burning units shut down between 2017 and 2020.

This time around, the Trump administration has gone much further to rescue coal, with more success. Last year, the amount of electricity produced by coal increased 13 percent, and retirements have slowed.

The administration has been aided by a surge in electricity demand nationwide driven by a boom in data centers, which has led some utilities to postpone coal plant closures. Federal agencies have also rolled back environmental regulations on coal, which produces more air pollution than other sources like natural gas. Burning coal also emits mercury, a powerful neurotoxin, and other heavy metals.



A surge in electricity demand has been driven by a boom in data centers. Scott Ball for The New York Times

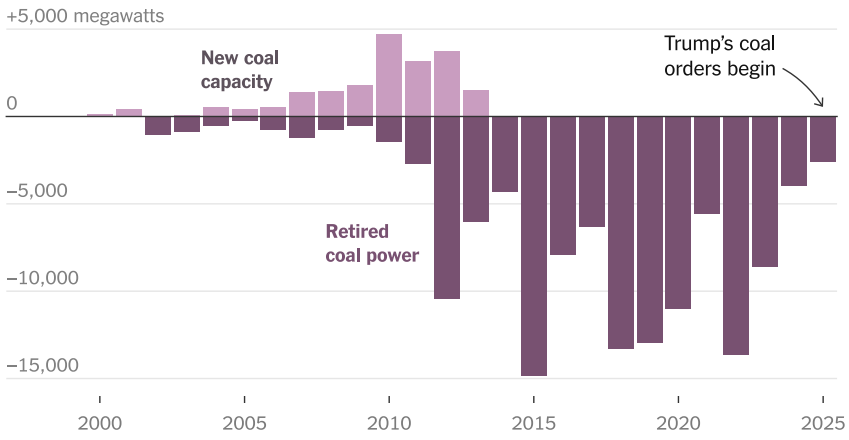
Even more drastic, however, has been the Energy Department's use of emergency orders to mandate that coal plants that had been set to retire keep operating, as the agency has invoked Section 202(c) of the Federal Power Act.

Historically, this provision has been used to keep plants online during temporary emergencies such as hurricanes or heat waves. But the Trump administration has claimed that the emergency this time is an expected shortage of reliable power over the next decade, and officials are trying to avert as many closures as they can.

The impact is already visible: At the start of last year, utilities were expected to close roughly 8.5 gigawatts of coal capacity in 2025, according to federal data. But they ended up retiring only 2.7 gigawatts, the lowest amount since 2011.

Coal retirements slowed in 2025

Changes in annual U.S. coal power capacity



Source: Energy Information Administration. Brad Plumer/The New York Times

At the White House event on Thursday, Mr. Wright said that many states were closing their coal plants for environmental reasons and that the administration would do everything it could to stop that. More than 20 gigawatts of coal capacity is currently scheduled to retire by 2028.

"I think you will not see those plants close during this administration," Mr. Wright said, adding that there might be a few exceptions for the very oldest plants.

Mr. Wright said he hoped other actions by the administration to support coal would eventually make emergency orders "unnecessary." But, he claimed, many utilities were quietly welcoming the orders to save coal plants at imminent risk of closure. "We get a lot of inbound calls now saying, 'Can you 202(c) this plant?'"

Those orders are also facing a backlash. Environmental groups and states like Michigan and Washington are mounting legal challenges. The grid operator in the Midwest and state officials in Colorado have said their regions already have adequate electrical capacity, even with coal retirements.



Mr. Wright, second from the right, said that many states were closing their coal plants for environmental reasons and that the administration would do everything it could to stop that. Tierney L. Cross/The New York Times

Even analysts who agree that the country needs more power plants that can run at all hours say that forcing aging coal units to stay online can be counterproductive, because they can distort energy markets and make it harder for states and companies to plan to bring new power plants online.

“Using a blunt instrument like this to keep the legacy coal fleet online could backfire,” said Devin Hartman, director of energy and environmental policy at the R Street Institute. “There are a ton of risks.”

Broken plants, busy railroads

Reviving a geriatric coal fleet isn’t easy: Many plants are more than 50 years old and need major repairs.

On the shores of Lake Michigan, the J.H. Campbell coal plant was set to retire last May under a plan backed by the state and the electric utility that operates it, Consumers Energy. But, at the last minute, the Energy Department ordered that the plant’s three coal units stay open for 90 days during the summer. The agency has since twice renewed the order and is widely expected to order that the plant remain open indefinitely.

That created headaches for the operator, which had canceled roughly $161 million in maintenance for the plant in the years leading up to the scheduled retirement, according to one engineer’s testimony. The plant has struggled to generate reliable power: One unit faced extended outages in June and produced electricity for only a handful of days, according to legal filings by environmental groups.

Other plants may be in rougher shape.

In December, the Energy Department ordered that the R.M. Schahfer plant in northern Indiana keep two coal units operating past their planned retirement. Yet one of those units has been offline since the summer because of a turbine failure.

Repairing the unit could ultimately take “six months or longer,” Vince Parisi, the chief operating officer of the Northern Indiana Public Service Company, which owns the plant, told regulators last month. “It’s just the reality of that unit being close to retirement.”

In Colorado, a rural electric cooperative had been planning since 2016 to close a coal-burning unit at the Craig Generating Station. Last month, the Energy Department ordered that the unit stay open. Yet the coal unit is offline because of a broken valve, and it is unclear how long it will take to fix it.

There's also the question of where to get fuel.

Until recently, the Craig unit in Colorado obtained some of its coal from a local mine operated by its part owner, the Tri-State Generation and Transmission Association. But that mine closed last year, laying off all its workers.

"This makes no economic sense or functional sense, to extend the life of an effectively broken coal plant," said Gov. Jared Polis, Democrat of Colorado, who opposes the order and says the federal government had done little to consult with the state.

Last month, when Bob Guenther drove past the coal-burning power plant in Centralia, Wash., where he worked for 34 years before retirement, there wasn't much coal in sight. The power plant had been winding down for years and was scheduled to close by Dec. 31 until the Energy Department ordered that it stay open. Coal piles that once filled acres had dwindled.

"It's going to cost a lot of money to put that plant back in shape," Mr. Guenther said.



The coal-burning power plant in Centralia, Wash. Reviving a geriatric coal fleet isn't easy. Evan McGlinn for The New York Times

Some local officials and unions have cheered the lifeline for coal plants, which are often an engine of local economic activity. But environmental groups have pointed to the hazards from air pollution and coal-ash waste.

"Northwest Indiana has long borne the brunt of industrial pollution," said Ashley Williams, the executive director of Just Transition Northwest Indiana, a nonprofit group, criticizing the order to keep the R.M. Schahfer plant open. "We will continue to suffer."

Mounting costs, legal threats

The cost to keep coal plants open could prove especially divisive.

In Michigan, Consumers Energy spent $164 million from May to September to keep its coal plant running, according to regulatory filings. During that time, the plant earned only $84 million in revenue.

It remains to be seen who will ultimately pay for the rest. Consumers Energy has proposed that the costs be shared by ratepayers in multiple states in the Midwestern regional grid, rather than paid for by its customers alone. But other groups have challenged this proposal.

In Colorado, Tri-State has said that its ratepayers may have to bear the full cost of repairing and operating the Craig plant — which state officials say could cost $80 million per year or more. In Washington, state law now forbids utilities to buy electricity from coal plants, raising legal complications.

Preventing the nation's coal plants from retiring over the next three years could cost consumers at least $3 billion per year, according to a report from Grid Strategies, a consulting firm.

"A lot of these plants were retiring because they're no longer economic to operate," said Michael Goggin, an executive vice president at Grid Strategies. "It's expensive to keep them going."

Opponents have challenged the coal orders in court, arguing that Congress intended for emergency powers to be used only in rare, temporary cases. If the orders are struck down, it is unclear who would bear the cost of spending millions of dollars to repair run-down plants.

While federal forecasts still expect coal generation to decline next year, the Trump administration is trying to prevent that from occurring.

The Environmental Protection Agency is rolling back numerous air pollution and climate rules that have made coal plants more costly to operate. It has also given electric utilities more time to clean up contamination from toxic coal ash landfills.

At the same time, the Energy Department has offered up to $350 million to try to bring back to life coal plants that have already closed.

Michelle Bloodworth, chief executive of America's Power, a coal trade group, estimates that at least 29 coal units with roughly 13 gigawatts of capacity have recently closed but are not yet demolished and could be candidates for restarting. She added that more utilities were voluntarily postponing coal retirements and that the future for the industry is looking brighter under the Trump administration.

"There's a huge opportunity for the coal fleet," Ms. Bloodworth said. "It's a big change after years and years of punitive environmental regulations."

Claire Brown covers climate change for The Times and writes for the Climate Forward newsletter.

Brad Plumer is a Times reporter who covers technology and policy efforts to address global warming.

A version of this article appears in print on , Section A, Page 1 of the New York edition with the headline: Trump Pushes To Retain Coal On Power Grid

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 150
May Campbell Order

Order No. 202-25-3

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), and for the reasons set forth below, I hereby determine that an emergency exists in portions of the Midwest region of the United States due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes, and that issuance of this Order will meet the emergency and serve the public interest.

Emergency Situation

The Midcontinent Independent System Operator (MISO) faces potential tight reserve margins during the summer 2025 period, particularly during periods of high demand or low generation resource output. The North American Electric Reliability Corporation (NERC) released its 2025 Summer Reliability Assessment on May 14, 2025. In its assessment, NERC indicated that "[d]emand forecasts and resource data indicate that MISO is at elevated risk of operating reserve shortfalls during periods of high demand or low resource output."[1] In particular, the retirement of thermal generation capacity creates the potential for electricity supply shortfalls. NERC anticipates that the near-term period of highest capacity shortfall for MISO will occur in August.[2]

Multiple generation facilities in Michigan have retired in recent years. According to the U.S. Energy Information Administration (EIA), "[s]ince 2020, about 2,700 megawatts of coal-fired generating capacity have been retired and no new coal-fired facilities are planned."[3] Additionally EIA stated, "[t]ypically Michigan's nuclear power plants have supplied about 30% of in-state electricity, but the amount of electricity generated by nuclear power plants in Michigan has declined as plants have been decommissioned."[4] The state's Big Rock Point nuclear power plant shut down in 1997 and the Palisades nuclear power plant closed in 2022. While the Palisades nuclear power plant may reopen in 2025, it will not be available during the peak demand period this summer.

The 1,560 MW J.H. Campbell coal-fired power plant in West Olive, MI, is scheduled to cease operations on May 31, 2025. Its retirement would further decrease available dispatchable generation within MISO's service territory, removing additional such generation along with the other 1,575 MW of natural gas and coal-fired generation that has retired since the summer of 2024. In 2021, Consumers announced that it planned to "speed closure" of Campbell in 2025, several years before the end of its scheduled design life.[5] Although MISO and Consumers have

[1] 2025 summer reliability assessment. (May 14, 2025). https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2025.pdf
[2] *Id*.
[3] U.S. Energy Information Administration, Michigan State Energy Profile, Oct. 17, 2024, *available at*: https://www.eia.gov/state/print.php?sid=mi.
[4] *Id.*
[5] https://www.consumersenergy.com/news-releases/news-release-details/2021/06/23/consumers-energy-announces-plan-to-end-coal-use-by-2025-lead-michigans-clean-energy-transformation

incorporated the planned retirement into their supply forecasts and acquired a 1,200 MW natural gas power plant in Covert, MI, the NERC Assessment still anticipates "elevated risk of operating reserve shortfalls."

MISO's Planning Resource Auction Results for Planning Year 2025-26, released in April 2025, note that for the northern and central zones, which includes Michigan, "new capacity additions were insufficient to offset the negative impacts of decreased accreditation, suspensions/retirements and external resources." While the results "demonstrated sufficient capacity," the summer months reflected the "highest risk and a tighter supply-demand balance" and the results "reinforce the need to increase capacity."[6]

ORDER

Given the determination that an emergency exists as discussed above, the responsibility of MISO to ensure reliability of its system, and the ability of MISO to identify and dispatch generation necessary to meet load requirements, I have determined that, under the conditions specified below, additional dispatch of the Campbell Plant is necessary to best meet the emergency and serve the public interest for purposes of FPA section 202(c). This determination is based on the insufficiency of dispatchable capacity and anticipated demand during the summer months, and the potential loss of power to homes and local businesses in the areas that may be affected by curtailments or outages, presenting a risk to public health and safety.

This Order is limited in duration to align with the emergency circumstances. Because the additional generation may result in a conflict with environmental standards and requirements, I am authorizing only the necessary additional generation on the conditions contained in this Order, with reporting requirements as described below.

FPA section 202(c) requires the Secretary of Energy to ensure that any 202(c) order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law and minimize any adverse environmental impacts.

Based on my determination of an emergency set forth above, I hereby order:

A. From the time this Order is issued on May 23, 2025, MISO and Consumers Energy shall take all measures necessary to ensure that the Campbell Plant is available to operate. For the duration of this order, MISO is directed to take every step to employ economic dispatch of the Campbell Plant to minimize cost to ratepayers. Following conclusion of this Order, sufficient time for orderly ramp down is permitted, consistent with industry practices. Consumers Energy is directed to comply with all orders from MISO related to the availability and dispatch of the Campbell Plant.

[6] https://cdn misoenergy.org/2025%20PRA%20Results%20Posting%2020250428694160.pdf

B. To minimize adverse environmental impacts, this Order limits operation of dispatched units through the expiration of the Order. MISO shall provide a daily notification to the Department (via AskCR@hq.doe.gov) reporting whether the Campbell Plant has operated in compliance with the allowances contained in this Order.

C. All operation of the Campbell Plant must comply with applicable environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to pay fees or purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators.

D. By June 15, 2025, MISO is directed to provide the Department of Energy (via AskCR@hq.doe.gov) with information concerning the measures it has taken and is planning to take to ensure the operational availability and economic dispatch of the Campbell Plant consistent with the public interest. MISO shall also provide such additional information regarding the environmental impacts of this Order and its compliance with the conditions of this Order, in each case as requested by the Department of Energy from time to time.

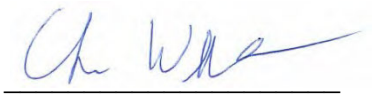
E. The extent to which MISO's current Tariff provisions are inapposite to effectuate the dispatch and operation of the units for the reasons specified herein, the relevant governmental authorities are directed to take such action and make accommodations as may be necessary to do so.

F. Consumers is directed to file with the Federal Energy Regulatory Commission Tariff revisions or waivers necessary to effectuate this order. Rate recovery is available pursuant to 16 U.S.C. § 824a(c).

G. This Order shall not preclude the need for the Campbell Plant to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

H. This Order shall be effective upon its issuance, and shall expire at 00:00 EDT on August 21, 2025, with the exception of the reporting requirements in paragraph D and applicable compliance obligations in paragraph E.

I. Issued in Washington, D.C. at 3:15:pm Eastern Daylight Time on this 23rd day of May 2025.



Chris Wright
Secretary of Energy

cc: **FERC Commissioners**
Chairman Mark Christie
Commissioner David Rosner
Commissioner Lindsay S. See
Commissioner Judy W. Chang

Michigan Public Service Commissioners
Chairman Dan Cripps
Commissioner Katherine Peretick
Commissioner Alessandra Carreon

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 152
CenterPoint Rate Case Discovery Responses

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF SOUTHERN INDIANA GAS AND ELECTRIC COMPANY D/B/A CENTERPOINT ENERGY INDIANA SOUTH ("CEI SOUTH") FOR (1) AUTHORITY TO MODIFY ITS RATES AND CHARGES FOR ELECTRIC UTILITY SERVICE THROUGH A PHASE-IN OF RATES, (2) APPROVAL OF NEW SCHEDULES OF RATES AND CHARGES, AND NEW AND REVISED RIDERS, INCLUDING BUT NOT LIMITED TO A NEW TAX ADJUSTMENT RIDER AND A NEW GREEN POWER RIDER (3) APPROVAL OF A CRITICAL PEAK PRICING ("CPP") PILOT PROGRAM, (4) APPROVAL OF REVISED DEPRECIATION RATES APPLICABLE TO ELECTRIC AND COMMON PLANT IN SERVICE, (5) APPROVAL OF NECESSARY AND APPROPRIATE ACCOUNTING RELIEF, INCLUDING AUTHORITY TO CAPITALIZE AS RATE BASE ALL CLOUD COMPUTING COSTS AND DEFER TO A REGULATORY ASSET AMOUNTS NOT ALREADY INCLUDED IN BASE RATES THAT ARE INCURRED FOR THIRD-PARTY CLOUD COMPUTING ARRANGEMENTS, AND (6) APPROVAL OF AN ALTERNATIVE REGULATORY PLAN GRANTING CEI SOUTH A WAIVER FROM 170 IAC 4-1-16(f) TO ALLOW FOR REMOTE DISCONNECTION FOR NON-PAYMENT.	**CAUSE NO. 45990**

CENTERPOINT ENERGY INDIANA SOUTH'S RESPONSE TO OUCC'S TWENTY-SIXTH SET OF DATA REQUESTS

Southern Indiana Gas & Electric Company d/b/a CenterPoint Energy Indiana South ("CEI South") pursuant to 170 IAC 1-1.1-16 and the discovery provisions of Rules 26 through 37 of the Indiana Rules of Trial Procedure, by its counsel, hereby submits the following Objections and Responses to the OUCC's Twenty-Sixth Set of Data Requests dated February 1, 2024 ("Requests").

General Objections

All of the following General Objections are incorporated by reference in the response to each of the Requests:

1. The responses provided to the Requests have been prepared pursuant to a reasonable and diligent investigation and search conducted in connection with the Requests in those areas where information is expected to be found. To the extent the Requests purport to require more than a reasonable and diligent investigation and search, CEI South objects on grounds that they include an undue burden or unreasonable expense.

2. CEI South objects to the Requests to the extent they seek documents or information which are not relevant to the subject matter of this proceeding and which are not reasonably calculated to lead to the discovery of admissible evidence.

3. CEI South objects to the Requests to the extent they seek responses and information from individuals and entities who are not parties to this proceeding and to the extent they request the production of information and documents not presently in CEI South's possession, custody or control. CEI South further objects to the Requests to the extent they are (i) vague and ambiguous as to the individuals and entities to whom the Request refer, or (ii) overbroad and not reasonably calculated to lead to the discovery of relevant or admissible evidence.

4. CEI South objects to the Requests to the extent they seek an analysis, calculation, or compilation which has not already been performed and which CEI South objects to performing.

5. CEI South objects to the Requests to the extent they are vague and ambiguous and provide no basis from which CEI South can determine what information is sought.

6. CEI South objects to the Requests to the extent they seek information outside the scope of this proceeding, and as such, the Requests seek information not reasonably calculated to lead to the discovery of relevant or admissible evidence.

7. CEI South objects to the extent the Requests purport to require production of (a) information in a particular format; (b) multiple copies of the same document; (c) additional copies of the same document merely because alterations, notes, comments, or other material appear thereon when such other material is not material or relevant; and (d) copies of the same information in multiple formats on the grounds that it is irrelevant, overbroad, unreasonably burdensome and not required by the Commission rules and inconsistent with practice in Commission proceedings.

8. CEI South objects to the Requests to the extent they solicit copies of voluminous documents.

9. CEI South objects to the Requests to the extent the discovery sought is unreasonably cumulative or duplicative; or is obtainable from some other source that is more convenient, less burdensome, or less expensive.

10. CEI South objects to the Requests to the extent the burden or expense of the proposed discovery outweighs its likely benefit, taking into account the needs of the case, the amount in controversy, the parties' resources, the importance of the issues at stake in litigation, and the importance of the proposed discovery in resolving the issues.

11. CEI South objects to the Request on the grounds that it is overbroad, unreasonably burdensome and seeks information that is largely irrelevant to the subject matter of this proceeding.

12. CEI South objects to the Requests to the extent they seek information that is confidential, proprietary, competitively sensitive and/or trade secret.

13. The responses constitute the corporate responses of CEI South and contain information gathered from a variety of sources. CEI South objects to the Requests to the extent they request identification of and personal information about all persons who participated in responding to each data request on the grounds that it is overbroad, unreasonably burdensome and irrelevant given the nature

and scope of the requests and the many people who may be consulted about them. CEI South further objects to the Requests to the extent they purport to require identification of a witness who can answer questions regarding the substance of or origination of information supplied in each response on the ground that CEI South has no obligation to call witnesses to testify as to information provided in discovery.

14. CEI South objects to the Requests to the extent they seek information that is subject to the attorney-client, work product, settlement negotiation or other applicable privileges. CEI South further objects to the Requests to the extent they purport to require the creation of a privilege log on the grounds that given the extremely expedited and informal nature of discovery in this proceeding, contemporaneous privilege logs are inappropriate. CEI South objects to the Requests on the grounds they are unreasonably burdensome, overbroad, inconsistent with discovery practices in Commission proceedings and inconsistent with the informal discovery process applicable to this proceeding.

15. CEI South assumes no obligation to supplement these responses except to the extent required by Ind. Tr. R. 26(E) (1) and (2) and objects to the extent the instructions and/or Requests purport to impose any greater obligation. CEI South denies that Ind. Tr. R. 26(E)(3) applies to the Requests.

Subject to and without waiver of the general and specific objections set forth herein, CEI South responds to the Requests in the manner set forth below.

Data Requests – Set 26

Q 26.1: According to Attachment CMB-1, CEI South (Gas & Electric) had a $779,891,000 long-term debt payable to Vectren Utility Holdings ("VUH") as of 12/31/2022. Petitioner's Exhibit No. 20, Schedule D-2 reflects a zero balance VUH long-term debt (line 38 of Excel file) as of 12/31/2025.

a) Does this indicate Petitioner's intention to refinance the VUH long-term debt with third party long-term debt? If no, please explain why VUH long-term debt is zero as of 12/31/2025.

b) When does Petitioner expect to refinance or otherwise eliminate the VUH long-term debt?

c) Has this elimination (or refinancing) of VUH long-term debt occurred as of 12/31/2023? Please explain.

Response:

a) Yes. As Petitioner issues new third-party long-term debt, it is repaying borrowings from its parent company.

b) Petitioner expects to refinance the VUH long-term debt by the end of 2025.

c) $255,587,000 of VUH long-term debt remains outstanding as of 12/31/2023.

Q 26.2: According to Attachment SEG-3, the Statement of Cash Flows for CEI South (Gas & Electric), there are no cash outflows reflected for intercompany long-term debt in either 2024 or 2025. Does this indicate Petitioner's intention to refinance or otherwise eliminate VUH long-term debt in 2023? Please explain.

Response: As stated in CEI South's Response to OUCC DR 26.1.b (above), CEI South (Gas & Electric) plans to pay down the full balance of VUH long-term intercompany debt in 2025. Please see the attachments listed below. The Company will file corrections to Petitioner's Exhibit No. 3, Attachment SEG-2 & Attachment SEG-3 to show the cash outflow in 2025 to reflect the full paydown of the intercompany long-term debt.

Attachment:

- 45990 OUCC DR26 26.2_Corrected Pet. Ex. No. 3, Att. SEG-2.xlsx
- 45990 OUCC DR26 26.2_Corrected Pet. Ex. No. 3, Att. SEG-3.xlsx

Q 26.3: Is the VUH long-term debt interest bearing? If yes, what is the interest rate or rates on this debt? If no, please explain why not.

Response: Yes, the VUH long-term debt is interest bearing. Of the $255,587,000 VUHI long-term debt outstanding as of 12/31/2023, $75,000,000 has an effective rate of 1.72%; $106,000,000 has an effective rate of 1.21%; and $74,587,000 has an effective rate of 3.315031%.

Q 26.4: Please state the total operating expenses to operate Culley Unit 2 for each of the calendar years 2020, 2021, 2022, and 2023. This information should be provided by FERC Account for each year in Excel format with formulas intact and cells unlocked.

Response: Please refer to the attachment listed below. Note that due to differences in the way data is stored and presented in Oracle versus SAP, the data for periods prior to July 2021 may not be directly comparable to data for periods after July 2021.

Attachment:

- 45990 OUCC DR26 26.4_FBC2 Operating Expense.xlsx[1]

[1] Information for 2023 is limited to January through September since October through December books have not yet been closed. Information for October through December 2023 can be provided upon request after books have closed.

Q 26.5: Regarding Schedule C-3.33, does the $2,865,574 of operating expenses represent the operating costs for Culley Unit 2 as forecasted for the future test year (2025)? If no, please identify the time period these operating expenses pertain to.

Response: No; the $2,865,574 of operating expenses on Schedule C-3.33 represents the forecasted costs associated with Culley Unit 2 that will be eliminated upon its retirement. Note that the retirement of Culley Unit 2 does not fully eliminate the common expenses that have been allocated to Culley Unit 2 prior to its retirement. The $2,865,574 operating expense includes $2,270,673 for Culley Unit 2 direct cost and $594,901 Culley Unit 2 common costs that are related and allocated to Culley Unit 2 operations.

Q 26.6: Did Petitioner forecast increased operating expenses compared to the base period for its Culley Unit 2 plant through the 12 months ending 12/31/2025? If yes, please state the 2022 operating expenses to operate Culley Unit 2 and the additional costs forecasted for each of the years, 2023, 2024, and 2025 by FERC Account. If no, please explain why no increased operating expenses were forecasted for Culley Unit 2.

Response: No, CEI South did not forecast increased operating expenses to operate Culley Unit 2 compared to the base period. During the forecasting process, CEI South did not identify any needs that would drive up the 2025 operating expenses compared to the base period.

Q 26.7: The Internal Revenue Code currently allows taxable entities to deduct certain costs as repair deductions for tax purposes even though these costs were capitalized for book purposes. Does Petitioner deduct repair deductions for Federal Income Tax purposes that were capitalized for book purposes? Please explain. If yes, please state the repair deduction taken for federal income tax purposes associated with or allocated to CEI South Electric for each of the calendar years 2019, 2020, 2021, 2022, and 2023.

Objection: CEI South objects to the Request on the grounds and to the extent the Request seeks information that is trade secret or other proprietary, confidential, and competitively sensitive business information of CEI South, its customers, or third parties. CEI South has made reasonable efforts to maintain the confidentiality of this information. Such information has independent economic value and disclosure of the requested information would cause an identifiable harm to Petitioner, its customers, or third parties. The responses are "trade secret" under law (Ind. Code § 24-2-3-2) and entitled to protection against disclosure. See also Indiana Trial Rule 26(C)(7). All responses containing designated confidential information are being provided pursuant to nondisclosure agreements between Petitioner and the receiving parties.

Response: Subject to and without waiving the foregoing objection, CEI South provides the following response: Yes, the Petitioner deducts repairs and maintenance costs that were capitalized for book purposes on its Federal Income Tax return and provision. Please see below for the repairs and maintenance deduction attributable to CEI South Electric in calendar years 2019, 2020, 2021, 2022 and 2023:

- 12/31/2019: [redacted]
- 12/31/2020: [redacted]
- 12/31/2021: [redacted]
- 12/31/2022: [redacted]
- 12/31/2023: [redacted]

Q 26.8: Regarding the direct testimony of Matthew A. Rice, Pet.'s Ex. No. 19, Attachment MAR-1, page 117-118, please provide calculation support for the following proposed amounts.

a) Reliability costs for the non-fuel related purchase power of $20,583,262.
b) Interruptible Sales billing credit of $725,000
c) Environmental Emission Allowances of $3,519,952.
d) Wholesale power marketing sales of $21,723,254.
e) BAMP Rate Backup generation capacity services revenue of $201,960.

Objection: CEI South objects to the Request on the grounds and to the extent the Request seeks information that is trade secret or other proprietary, confidential, and competitively sensitive business information of CEI South, its customers, or third parties. CEI South has made reasonable efforts to maintain the confidentiality of this information. Such information has independent economic value and disclosure of the requested information would cause an identifiable harm to Petitioner, its customers, or third parties. The responses are "trade secret" under law (Ind. Code § 24-2-3-2) and entitled to protection against disclosure. See also Indiana Trial Rule 26(C)(7). All responses containing designated confidential information are being provided pursuant to nondisclosure agreements between Petitioner and the receiving parties. "HIGHLY CONFIDENTIAL – FOR ATTORNEYS' EYES ONLY" information is provided pursuant to non-disclosure agreements between CEI South and the receiving parties and is solely for the receiving parties' attorneys to review.

Response: Subject to and without waiver of the foregoing objection, CEI South responds as follows:

a) Please see the attachments listed below: $2,026,462 is located on the RCRA 21-PJM Forecast tab in the first attachment; $5,697,000 is included for OVEC Capacity (see the second attachment); and $12,859,800 is included for capacity purchases (see the third attachment).
b) Please see CEI South's Response to 45990 OUCC DR 22.2(c)(I). There is not a calculation to support this amount. There is an estimated [redacted] of available DR, and CEI South received a bid for DR aggregation as a part of its most recent IRP for [redacted] per MW. $725,000 is [redacted].
c) Please see the attachment listed below.
d) Please see the confidential attachment provided in CEI South's Response to SABIC DR03 3.12: 45990 SABIC DR03 Q3.12 (HIGHLY CONFIDENTIAL – ATTORNEYS' EYES ONLY)_WPM.xlsx[2].
e) Please see Schedule E-4.1, Confidential,[3] page 5, line 14 column (G). [redacted] backup kW times 9.8 days of backup times $0.297 CONE per kw per day.

[2] This file contains information designated as "Highly Confidential – Attorneys' Eyes Only" and, pursuant to the Nondisclosure Agreement between CEI South and certain parties to this case must be restricted from any disclosure to anyone outside of attorneys for those parties who have signed the agreement to be bound.
[3] The Confidential Revenue Model Workpaper contains information designated as "Highly Confidential – Attorneys' Eyes Only" and, pursuant to the Nondisclosure Agreement between CEI South and certain parties to this case must be restricted from any disclosure to anyone outside of attorneys for those parties who have signed the agreement to be bound.

Attachments:

- 45990 OUCC DR 26 26.08a_RCRA 21 PJM Forecast through 2028.xlsx
- 45990 OUCC DR26 26.08a (CONFIDENTIAL)_2025 OVEC Demand Projection.xlsx
- 45990 OUCC DR26 26.08a_IE Capacity Forecast 2025.xlsx
- 45990 OUCC DR26 26.08c_NOX Costs 2025.xlsx

Q 26.9: Regarding the direct testimony of Matthew A. Rice, Pet.'s Ex. No. 19, Attachment MAR-1, pages 117-118, please provide a month by month forecasted breakdown of Phase 1 of the following.

a) Reliability costs for the non-fuel related purchase power costs.
b) Interruptible Sales billing credit amount.
c) Environmental Emission Allowances used by retail customers.
d) Wholesale Power Marketing sales amount.
e) Retail portion of the margin from Environmental Emission Allowance sales for the period.
f) BAMP Rate Backup generation capacity services revenue for the period.

Objection: CEI South objects to the Request on the grounds and to the extent the Request seeks information that is trade secret or other proprietary, confidential, and competitively sensitive business information of CEI South, its customers, or third parties. CEI South has made reasonable efforts to maintain the confidentiality of this information. Such information has independent economic value and disclosure of the requested information would cause an identifiable harm to Petitioner, its customers, or third parties. The responses are "trade secret" under law (Ind. Code § 24-2-3-2) and entitled to protection against disclosure. See also Indiana Trial Rule 26(C)(7). All responses containing designated confidential information are being provided pursuant to nondisclosure agreements between Petitioner and the receiving parties.

Response: Subject to and without waiver of the foregoing objection, CEI South responds as follows: Where possible monthly 2025 information is provided in OUCC 26.8 for the test year. CEI South has proposed these base amounts, which will remain the same in Phase 1 through Phase 3.

a) Please see 45990 OUCC DR 26.8a (above).
b) Please see 45990 OUCC DR 26.8b (above).
c) Please see 45990 OUCC DR 26.8c (above).
d) Please see 45990 OUCC DR 26.8d (above).
e) CEI South does not plan to sell any environmental emission allowances in 2025.
f) Please see 45990 OUCC DR 26.8e (above).

Q 26.10: Regarding the direct testimony of Matthew A. Rice, Pet.'s Ex. No. 19, Attachment MAR-1, pages 117-118, please provide a month-by-month forecasted breakdown of Phase 2 of the following.

a) Reliability costs for the non-fuel related purchase power costs.
b) Interruptible Sales billing credit amount.
c) Environmental Emission Allowances used by retail customers.
d) Wholesale Power Marketing sales amount.
e) Retail portion of the margin from Environmental Emission Allowance sales for the period.
f) BAMP Rate Backup generation capacity services revenue for the period.

Response: Please see CEI South's Response to 45990 OUCC 26.9 (above).

Q 26.11: Regarding the Petitioner's Financial Exhibit No. 20, Schedule C3.2, sponsored by witness Chrissy M. Behme, please explain why the increase in TDSIC O&M expense of $27,779 is included in both line 4 and line 7. What purpose is served by this O&M expense adjustment?

Response: The Petitioner's Exhibit No. 20 calculates total revenues for test year 2025, which includes the projected revenue requirement for the TDSIC mechanism. The TDSIC O&M is part of the revenue requirement, and since it is a pass-through cost, it is subsequently removed from the adjustment. It has a net zero impact on net operating income.

Q 26.12: Regarding the Petitioner Financial Exhibit No. 20, Workpaper C3.2a, sponsored by witness Chrissy M. Behme, specifically, the "Large Customer Adjustment – investment" of $1,330,663 and "Large Customer Adjustment – Expense" of $24,507,

a) Please provide how these amounts were calculated.
b) Please provide a schedule support for the periods in which these large customer adjustments are forecasted to take place.
c) Please provide an explanation for how these adjustments are part of the overall TDSIC annualization adjustment.

Objection: CEI South objects to the Request on the grounds and to the extent the Request seeks information that is trade secret or other proprietary, confidential, and competitively sensitive business information of CEI South, its customers, or third parties. CEI South has made reasonable efforts to maintain the confidentiality of this information. Such information has independent economic value and disclosure of the requested information would cause an identifiable harm to Petitioner, its customers, or third parties. The responses are "trade secret" under law (Ind. Code § 24-2-3-2) and entitled to protection against disclosure. See also Indiana Trial Rule 26(C)(7). All responses containing designated confidential information are being provided pursuant to nondisclosure agreements between Petitioner and the receiving parties. "HIGHLY CONFIDENTIAL – FOR ATTORNEYS' EYES ONLY" information is provided pursuant to non-disclosure agreements between CEI South and the receiving parties and is solely for the receiving parties' attorneys to review.

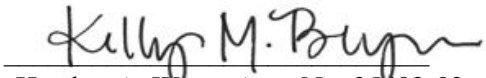
Response: Subject to and without waiver of the foregoing response, CEI South responds as follows:

a) These amounts represent the projected 2025 TDSIC revenues [redacted] based on their expected consumption.
b) Please see Cells P61 and P64 of tab "[redacted]" within 45990_CEI South_Confidential Revenue Model Workpaper.xlsx.[4]
c) The TDSIC related adjustments on Schedule C3.1 and the total adjustment on Schedule C3.2 will net to the total TDSIC annualized adjustment of $1,627,665. The TDSIC only portion of the adjustment on Schedule C3.1 is found on WP-C2.1c lines 25 and 26, column B. This schedule and workpaper can be found within the 45990_CEI South_No 20 Financial Exhibit, as well as within 45990_CEI South_Confidential Revenue Model Workpaper.[5]

[4] The Confidential Revenue Model Workpaper contains information designated as "Highly Confidential – Attorneys' Eyes Only" and, pursuant to the Nondisclosure Agreement between CEI South and certain parties to this case, must be restricted from any disclosure to anyone outside of attorneys for those parties who have signed the agreement to be bound.
[5] See Footnote 4, supra.

Dated: February 12, 2024

As to objections only,



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		Amount	Amount	Amount	Amount
	Company Code	0599	0599	0599	0599
	Fiscal Year	2020	2021	2022	2023 through Sept
FERC Account		$	$	$	$
4081	Other Taxes-Non-Inc	-	27,040.66	67,640.83	40,275.65
4265	Other Deductions	-	-	-	40.30
5000	Oper Supv & Eng	-	223,481.84	358,518.65	202,153.88
5060	Misc Steam Pwr Exps	-	20,316.56	32,592.62	18,377.64
5100	Maint Suprv & Eng	177,466.34	204,990.48	260,740.80	147,020.95
9250	Injuries & Damages	-	441.23	1,408.12	679.59
9260	Empl Pensions&Ben	-	88,674.11	232,965.11	116,417.09
5130	Maint of Elec Plant	-	51,919.64	56,488.74	48,577.90
5120	Maint of Boiler Plt	833,316.39	887,907.28	793,461.69	480,310.53
5020	Steam Exp	733,871.50	484,400.19	228,145.68	122,634.98
5050	Electric Exp	486,956.83	317,563.00	306,087.77	185,586.58
	Total	**2,231,611.06**	**2,306,734.99**	**2,338,050.01**	**1,362,075.09**

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 153
Wayne Games 2018 Testimony

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY

D/B/A

VECTREN ENERGY DELIVERY OF INDIANA, INC.

CAUSE NO. 45052

PUBLIC REBUTTAL TESTIMONY

OF

WAYNE D. GAMES

VICE PRESIDENT OF POWER SUPPLY

SPONSORING PETITIONER'S EXHIBIT NO. 4-R,
ATTACHMENTS WDG-1R THROUGH WDG-4R

REBUTTAL TESTIMONY

OF

WAYNE D. GAMES

VICE PRESIDENT OF POWER SUPPLY

Q. Please state your name and business address.

A. My name is Wayne D. Games, and my business address is One Vectren Square, Evansville, Indiana 47708.

Q. Did you provide Direct Testimony on behalf of Vectren South in this Cause?

A. Yes.

Q. Are you sponsoring any exhibits in support of your testimony?

A. Yes. I am sponsoring the following exhibits:

- Petitioner's Exhibit No. 4-R, Attachment WDG-1R, a list of Brown Corrosion Projects from 2008-2018;
- Petitioner's Exhibit No. 4-R, Attachment WDG-2R, Indianapolis Power & Light's ("IPL") Harding Street Station Energy Information Administration ("EIA") Data.
- Petitioner's Exhibit No. 4-R, Attachment WDG-3R, Timeline For CCGT Construction
- Petitioner's Exhibit No. 4-R, Attachment WDG-4R, Capacity of Unfired CCGT

Q. Were the exhibits identified above prepared or assembled by you or under your direction or supervision?

A. Yes.

Q. What is the purpose of your Rebuttal Testimony in this proceeding?

A. Various witnesses from the Indiana Office of Utility Consumer Counselor ("OUCC"), Alliance Coal, LLC ("Alliance Coal"), the Indiana Coal Council ("ICC") and the Citizens Action Coalition/Valley Watch/Sierra Club ("Joint Intervenors") allege that customers face fewer risks if Southern Indiana Gas and Electric Company, Inc. d/b/a Vectren Energy Delivery of Indiana, Inc. ("Vectren South" or the "Company") retains its aging, uncompetitive, existing generation fleet for some period of time beyond 2024 rather than replacing several of these units with a highly efficient combined cycle gas plant ("CCGT"). While several other Vectren South witnesses will explain why these parties have reached the wrong conclusion, my testimony will focus on the significant risks presented from an operational standpoint by trying to keep these units running beyond 2024. I will explain the competitive challenges faced by our units in the Midcontinent Independent System Operator ("MISO") energy market, the risks with continued reliance on these units, and explain why the efficient CCGT the Company is seeking approval to construct presents lower risks. I also:

- Discuss issues with converting the Brown units from coal to gas fired.
- Discuss the project timeline and risks associated with delaying until the next IRP.
- Address why the preferred IRP plan offers diversity and why it makes sense to duct fire the proposed CCGT.
- Show the reduction in annual wholesale power margin due to Vectren South coal units not being competitive.
- Respond to criticisms from the OUCC that Vectren South's cost estimate is not reliable.
- Discuss recommendations made by the Industrial Group relating to contracting for construction of a CCGT.
- Explain that Vectren South did consider alternative scrubber technology at A.B. Brown.

I. Risk Is Not Mitigated By Delaying The Decision

Q. Can you summarize the position of the other parties regarding Vectren South's proposal?

A. Except for the Industrial Group, who represents specific Indiana customers, the other parties all contend that Vectren South should minimize risk by sticking with its existing resources in one form or another. ICC, Sunrise Coal and Alliance Coal, not surprisingly, want to keep the A.B. Brown facility ("Brown") burning coal, for as long as reasonably possible. This protects their own economic interests in ensuring continued demand for their product. The OUCC urges Vectren South to convert one or both of the Brown baseload units to utilize natural gas, continue operating the remainder of the generation fleet and wait for more certainty. The Joint Intervenors criticize Vectren South's modeling assumptions and make no specific recommendation beyond denial of our requested CPCNs.

Q. Is there a common basis these parties rely on to justify continuing with Vectren South's existing generation resources?

A. Yes. The parties all allege that retiring Vectren South's smaller coal units and building a larger gas plant is risky for customers. Other Vectren South witnesses discuss the modeling Vectren South has done and the assessment of risk involved in that modeling. In my role as Vice President of Power Generating, I am very familiar with the existing Company generation facilities the parties propose to keep running. There are numerous risks with continuing to rely on these units for the foreseeable future that the other parties ignore. I will discuss these risks and explain why Vectren South's proposed CCGT better mitigates customers' risk.

A. Risks From Continuing Vectren South's Heavy Reliance on Coal-Fired Generation

Q. What are the primary risks associated with continuing to operate a coal heavy fleet?

A. A coal heavy fleet, especially one dominated by small, aging plants, is exposed to risks from future environmental regulations, poor MISO market performance and reliability.

Q. Please discuss the risks created by environmental regulations applicable to Vectren South's existing generation fleet.

A. Coal plants face significant risks of rising costs and reduced efficiency from future environmental regulations. Vectren South has already made significant environmental control investments and the variable costs to operate this equipment places further pressure on the economics of the Company's generating facilities. For example, Vectren South spends in excess of [redacted] (an approximate [redacted] premium per MWHr generated) for the chemicals to remove sulfur dioxide (SO_2), nitrogen oxide (NO_x), sulfuric acid (H_2SO_4), particulate and mercury at Brown. The injection of sodium to control for H_2SO_4 at Brown has caused plugged nozzles and sodium build up in duct work necessitating outages to correct. In 2018, the Company must purchase seasonal NO_x allowances for Brown at a cost of $150-$350 per allowance. Brown's water treatment costs associated with its National Pollution Discharge Eliminations System ("NPDES") permit have increased to sample for several constituents and treat for mercury, oil and grease, suspended solids, total residual chlorine and copper and iron. Starting in April of 2020, Brown will incur more cost associated with treating water discharge for selenium, chlorides and copper.

As Company witness Retherford discusses, there continue to be risks of further environmental regulation as administrations change. This includes carbon regulation, stricter NPDES limits and the Environmental Protection Agency ("EPA") ratcheting down on SO_2 and NO_x allowance values and/or potentially changing these and other emission limits associated with coal fired units. The newly announced replacement to the Clean

Power Plan ("CPP") appears to require incremental efficiency improvements at coal fired power plants, necessitating additional capital investments. Vectren South improved the efficiency of Brown by installing dense packs in 2012 and 2013 at an incremental capital cost of $28.6 million. There continues to be a push by some to regulate carbon through a tax or other approach. This creates the risk of additional incremental costs for coal plants because of their significant carbon emissions.

Q. Please discuss the risks for coal-fired generation plants created by the MISO market, intermittent renewable resources, and low natural gas costs.

The MISO energy market dispatches the lowest cost generation required to maintain system reliability, giving MISO members the lowest cost energy available. Highly efficient CCGT natural gas plants and renewable resources are lower cost than the Company's small coal plants, contributing to falling capacity factors for the smallest least efficient coal units. These units must drop to minimum output or cycle off during the off-peak hours because they are higher cost than other resources, driving even higher production costs. These factors have a direct impact on customers. On a daily basis, Vectren South offers all of its units into the MISO market and purchases all of its customers' needs for electricity from the MISO market. On days when the Company's units are dispatched by MISO, the cost of the energy Vectren South purchases to serve its customers can be offset in part by the revenues paid by MISO for the energy sold into the MISO market. The higher costs associated with the low efficiency of Vectren South's coal units greatly reduces the opportunity for additional revenues used to reduce customer daily energy costs. Vectren South's units are particularly vulnerable because they are the smallest and some of the lowest efficiency (highest heat rate) units in the State. **Figure 1** shows the nameplate capacity of Vectren South's coal units compared to other Indiana Investor Owned Utilities ("IOU's") coal units while **Figure 2** shows the

efficiency or heat rate comparison of Vectren South's coal fleet compared to other Indiana IOU coal units. These Figures show only units anticipated to still be in operation in 2023. A lower heat rate indicates higher efficiency.

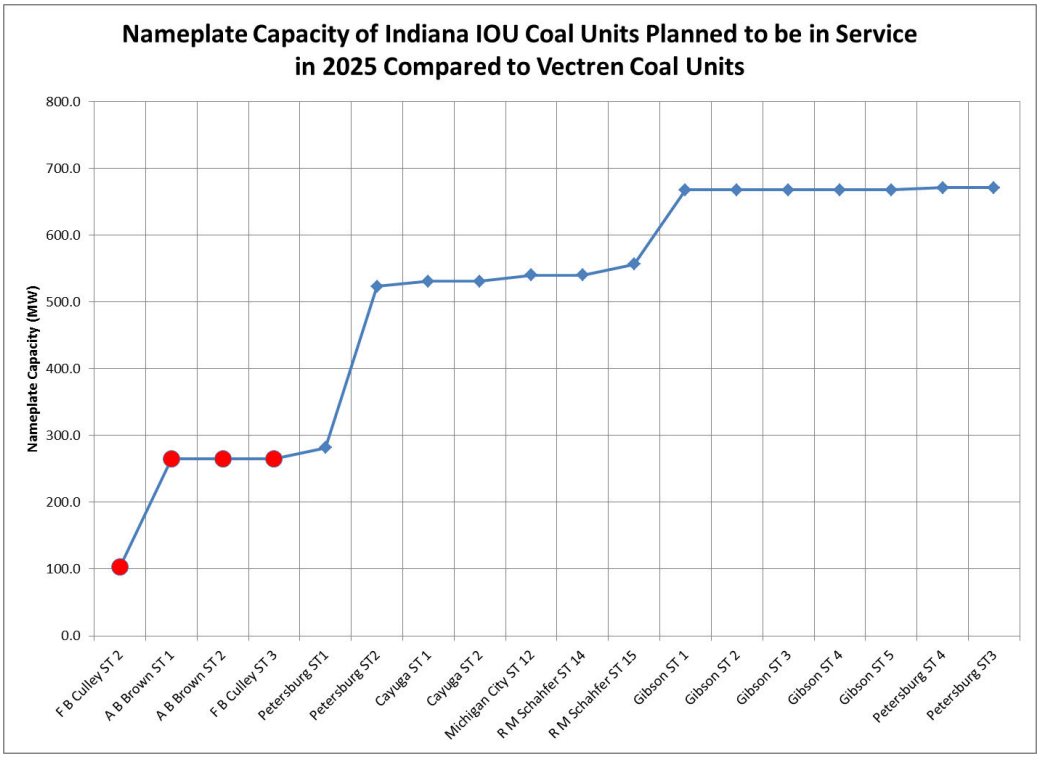


Figure 1

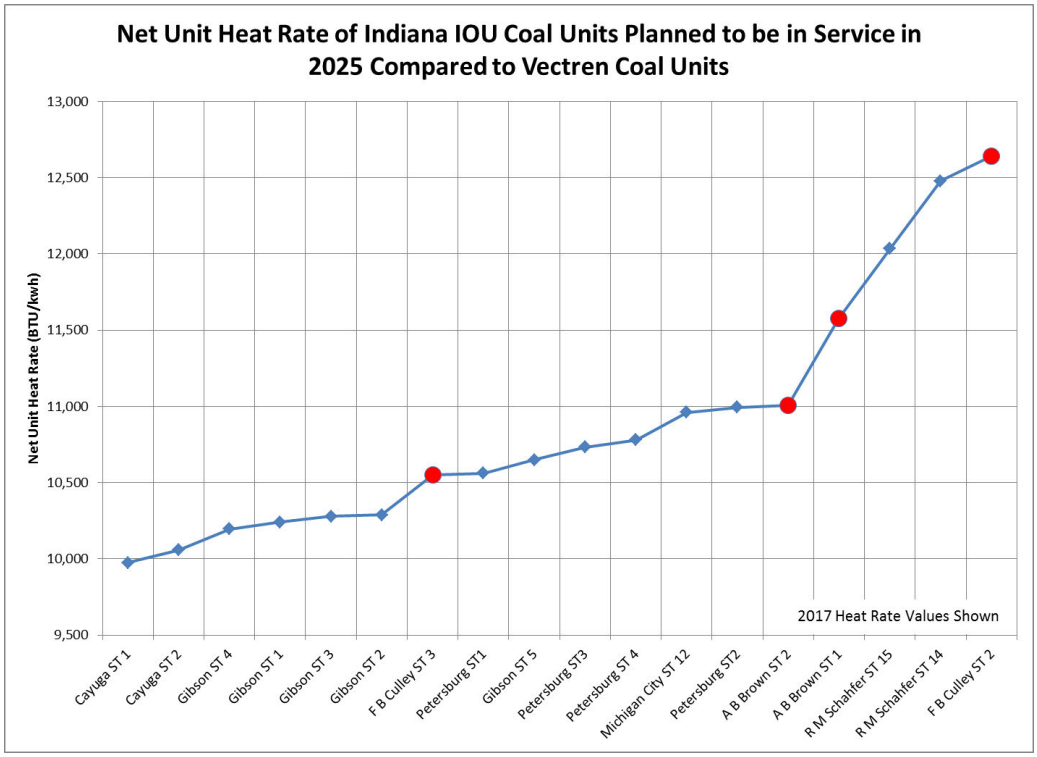


Figure 2

As shown by these Figures, maintaining Culley Units 2&3 and Brown Units 1&2 leaves Vectren South with the four smallest IOU coal units within the State. Except for Culley Unit 3, continuing to rely on these units would leave Vectren South's customers with among the most inefficient coal units within the State. Note that in the interest of maintaining diversity, Vectren South's preferred plan maintains Culley Unit 3 due to it being the largest most efficient coal unit in the current fleet.

Q. Please explain your concerns with the coal units being operated in a manner they were not designed for.

A. Vectren South's coal units were designed as base-load units, meaning that they were designed to continually run at relatively stable levels of output to serve the base needs of our customers. At the time they were constructed, the Company's coal units were very low cost and provided the most cost effective way to meet the demands of customers.

The advancement of technology and the dramatic reduction in the cost and abundance of natural gas have changed the dynamics for coal-fired units. The MISO "Day-Ahead" market dispatches generators that have been offered into the market (starting with the lowest cost source/unit) against hourly forecasted demand. The hourly market energy price is established by the last unit required to meet the demand. Renewables are typically dispatched first because of their low variable operation and maintenance ("O&M") costs and tax incentives that encourage renewable resources to be dispatched whenever they are available. This leaves other forms of generation to fill the gap between what intermittent renewable resources can produce and the changing requirements of retail customers on a real time basis. This gap which can fluctuate rapidly and widely is filled in the MISO "Real-Time" energy market by sources that can adjust (ramp) output quickly.

Due to the production cost (low efficiency) of Vectren South's coal units they are called upon to cycle off/on and ramp up/down more often than more efficient lower cost generation sources including larger super critical coal units. Cycling particularly impacts the Company's generating resources. This has the largest impact on units like Culley Unit 2 and Brown Units 1&2 as they are the smallest and more expensive coal units in the MISO stack. My Direct Testimony referenced a June 3, 2015 U.S. Department of Energy ("DOE") report on coal-fired generation titled "Impact of Load Following on the Economics of Existing Coal Plant Operations". The report recognized that "generally an increase in frequent ramping and/or shutdowns decreases the component life through damage caused by creep, fatigue, thermal shock, acid induced corrosion, erosion, and other stresses".[1] I discussed specific issues outlined in the report and an example of

[1] Creep damage occurs in metals and alloys after prolonged exposure to stress at elevated temperatures.

Solid Particle Erosion ("SPE") that occurred on Brown Unit 1 that caused a 3 month outage and $3.8M repair during the summer of 2016. Since submitting my original testimony other studies have been completed addressing the ramping and cycling issues on coal units designed for baseload operation and we've actually discovered more issues at the Brown plant due to increased cycling over the past 9 years. These include issues that will require more frequent inspections and extensive repairs or future replacement of costly high energy steam piping to ensure reliability of the plant as well as the safety of employees.

Q. How does this create additional risk for Vectren South customers?

A. There is expected to be a significant increase in the Equivalent Forced Outage Rate ("EFOR") and reduction in reliability over time. Vectren South's own experience demonstrates the risk that incremental capital, reduced plant life and increasing outages may result from trying to operate the Company's coal units in a fashion they were not designed for over an extended time period.

Q. Would efforts from the Federal government to monetize coal's resiliency attributes change Vectren South's concerns with continued reliance on its coal units?

A. Not as it is currently being proposed. ICC witness McConnell is referring to a draft memo of the Department of Energy ("DOE") that discussed the possible subsidization of certain coal and nuclear facilities for a two year period. The memo provided no detail regarding how such subsidization would work, the nature of the monetary benefits, and the identification of units selected to benefit from payments. Regardless of such speculation, Vectren South's plan calls for its coal plants to operate through 2023, well beyond this two year period. The Company's operating region is surrounded by large coal units such as Rockport, Gibson and Petersburg that are not currently scheduled to

be retired that would appear to fit more within the DOE's view of resiliency than Vectren South's small coal units.

Q. Do others recognize the same concerns you are raising with continued reliance on coal fired generation?

A. Yes. Just this week a draft report by the National Coal Council ("NCC") entitled "Power Reset: Optimizing the Existing U.S. Coal Fleet to Ensure a Reliable and Resilient Power Grid" became public. ICC witnesses Medine and McConnell, Alliance Coal witness Nasi, and Sunrise Coal witness Dombrowski are all listed authors or committee members. The NCC Report discusses how renewable energy resources impact coal units, and identifies concerns with cycling of coal units, lower revenues for coal units, lower efficiency, and reduced plant life attributable to the same factors I identify for the Company's units. The NCC Report admits that the wear and tear experienced by coal units has led to a point where the reliability of such plants "could be significantly less" and that such cycling conditions result in "increased capital expenditures, increased O&M costs, increased outages and higher fuel consumption."

Q. OUCC witness Alvarez contends that Vectren South's coal units performed at par in some years, and even better in other years, than the entire coal fleet of the country. (Public's Exhibit No. 2, pp. 16-17). Does this history of availability support the proposal to just keep running these plants well beyond 2023?

A. No. While I am pleased the OUCC agrees that Vectren South has done such an effective job operating plants, the more pertinent economic question is how well coal-fired generation is performing in the energy markets. The retirement of coal-fired generation facilities is being announced throughout the country because their high-heat rates and limited ability to ramp is rendering them less economic, especially when

competing with highly efficient gas plants using low cost gas. **Table 1** shows that Brown Units 1&2 and Culley Unit 2 capacity factors have dropped significantly from 2000-2008 to 2009-2017. **Figure 4** shows the Company's annual Wholesale Power Market ("WPM") margin since 2000, establishing that the Company's units are generating wholesale power sales much less frequently since gas prices began dropping in recent years.

	2000-2008	2009-2017
A.B. Brown 1	72%	52%
A.B. Brown 2	76%	55%
F.B. Culley 2	69%	23%

Table 1

WPM ANNUAL MARGIN - 2000 to 2017

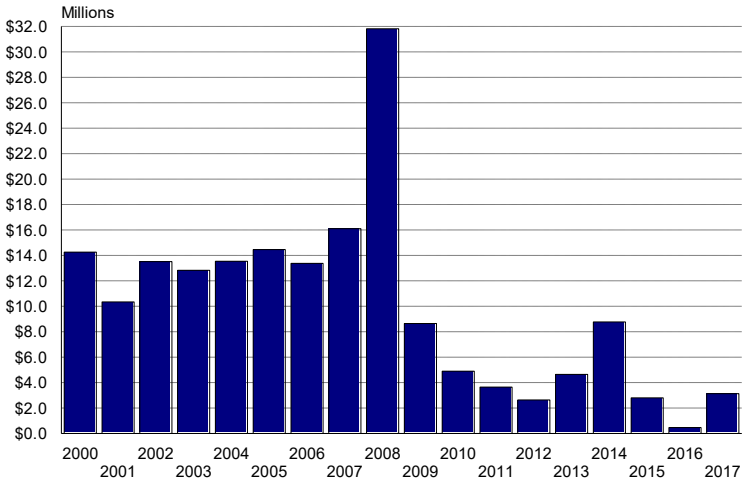


Figure 4

These factors are driving coal plant retirements throughout the country. Data compiled by SNL (S&P Global) shows that 458 coal units constituting over 52 gigawatts ("GWs") of capacity have been retired nationwide since 2012 with 97 of those located in the MISO footprint. Another 85 unit retirements making up another 16 GWs have already been approved for retirement in the U.S. with many others announced but not yet approved. Maintaining a high reliance on aging, small inefficient coal units that require environmental investments and are not designed to provide the flexibility needed to

operate in the MISO market is not a good decision for Vectren South customers. Continuing to rely on coal units to provide 95% of our energy would make the Company an extreme outlier when compared to other US investor owned utilities.

Q. OUCC witness Alvarez contends that replacing the Company's existing smaller units with a single CCGT exposes customers to the risk of reliance on a single unit that could have an outage. (Public's Exhibit No. 2, pp. 11 and 16). Do you agree that this represents greater risk compared to operating the existing coal fleet?

A. No. First, having a new unit designed to effectively ramp production provides greater reliability than operating coal units that simply were never intended to operate in response to dynamic MISO price signals. The risk of older coal units being off line due to either economics or equipment failure is the greater risk. Second, if the CCGT experiences an outage, in the short-term the MISO market can provide energy for customers. Buying energy when needed in the short-term does expose customers to price risk, but that is different than basing a long term resource plan (and meeting MISO Planning Reserve Margin ("PRM") requirements) on the availability and price of market capacity.

B. Specific Risks from Reliance on Brown Units 1 and 2

Q. ICC witness Hayet proposes to continue operating Brown until 2023 (for Unit 1) and 2030 (for Unit 2), ICC witness Medine advocates operating them for another ten years while OUCC witnesses urge converting the units to burn natural gas and continuing their operation indefinitely. What is Vectren South's experience with Brown?

A. Although the Brown units are the newest coal units within Vectren South's fleet (they will be 44 and 37 years of age in 2023), only Culley Unit 2 is more expensive to operate and maintain. Brown requires the largest capital investment among Vectren South's fleet to continue reliable operation beyond 2023. Apart from Coal Combustion Residual ("CCR") regulation compliance costs, a key challenge for these units is their dual-alkali scrubbers. Dual-alkali scrubbers require expensive chemicals to lower emissions and create a highly corrosive environment that impacts the scrubbers and other plant equipment. The industry has abandoned the dual-alkali scrubber as a result of these challenges and the Brown scrubbers are the only dual-alkali scrubbers still operated by a utility in the United States.

The corrosive environment created by the dual-alkali scrubbers causes regular damage to the infrastructure necessitating capital investment to repair the damage so the plants can continue to operate. As shown in Petitioner's Exhibit No. 4-R, Attachment WDG-1R, over $32M (an average of over $2.9M annually) has been invested to address Brown's corrosion issues to keep the facility reliable and safe for employees. Even if the scrubbers were replaced, remaining equipment impacted by the scrubbers' corrosive chemicals would require repairs. In 2005, a bridge spanning a Brown Unit 1 storage tank collapsed due to corrosion, shutting the unit down for an extended period of time to make repairs.[2] In 2017, over $1M was spent to rebuild a support structure holding ductwork that carries flue gas between the absorber tower and the chimney. Vectren South developed estimated capital and O&M projections for investments to keep Brown running for purposes of its integrated resource plan ("IRP") modeling, but it is very

[2] A picture of this bridge is labeled as photo 27 in Petitioner's Exhibit No. 4, Attachment WDG-1.

difficult to accurately project the capital and other expenses necessary to keep a plant operating with two scrubbers that are causing so many issues.

The scrubbers are already beyond their 30-year design life. Burns & McDonnell's ("B&McD") assessment of these scrubbers, attached to my direct testimony as Petitioner's Exhibit 4, Attachment WDG-1, concluded that "it would be prudent for Vectren South to retire and/or replace the Brown scrubbers at a total life of 40-45 years maximum, which implies the scrubbers should be retired and/or replaced sometime over the next 5-10 years". ICC witness Hayet accepts this for purposes of his modeling although Ms. Medine appears to advocate for stretching operation even beyond this recommended period. Vectren South is proposing to retire Brown Unit 1 when its scrubber is 44 years old and Brown Unit 2 when its scrubber is 37 years old, well beyond the 30-year design life. From a safety and reliability perspective, I do not agree that it is prudent to push the life of these scrubbers beyond 2023.

Q. OUCC witness Aguilar dismisses Vectren South's concerns with loading fly ash onto barges at Brown by indicating that the Company "may have to investigate the cost to temporarily store fly ash [at Brown] for occasions when barges cannot be loaded." (Public's Exhibit No. 1, pp. 21-22). What would it cost to address this concern?

A. Options and capital cost to modify Brown dry fly ash system were evaluated by Black & Veatch ("B&V") who estimated the price of viable alternatives would be around [redacted] This further demonstrates the costs of trying to keep Brown operating with coal.

Q. Are there other risks with continuing to rely on the Brown units?

A. Yes. Since 2008, the Brown plants and Culley Unit 2 cycle more than any other Vectren South plant because they are not competitive in the MISO energy market. I have already

discussed the additional wear and tear this creates for coal-fired units. Several specific issues have been identified at Brown as a result of cycling. Recent assessments of High Energy Piping which transports high pressure steam at Brown show signs of creep damage and other fatigue that will rapidly worsen due to cycling and will require replacement if operated beyond 2023. The Brown Unit 1's super-heater outlet header will need to be replaced due to thermal fatigue and scale build-up. Other welds at Brown show signs of creep damage while others have been determined to be at high risk for creep damage. Creep damage places pipe and welds in a condition that will make them more susceptible to the impacts of cycling. I expect more of these issues as routine inspections are completed over time.

Q. What risk does continuing to rely on Brown create for customers?

A. Based on my experience overseeing Brown's operation, there is a significant risk that capital expenditures to keep Brown operating will turn out to be higher than projected in the IRP modeling, and a very low likelihood that costs will be less. The timeline to replace Brown is a multi-year process and Vectren South may be boxed into making investments in Brown to enable it to continue reliably serving its customers while going through the process to procure reliable replacement generation.

Vectren South will minimize near term (2017-2023) investments previously planned while ensuring adequate reliability is maintained if a CPCN for the new CCGT is approved. Some examples of avoided capital and O&M work that would be required to keep Brown operating beyond 2023 are listed in **Table 2**. Completion of this work will not guarantee avoidance of other equipment failures.

Deferred Investment in Brown Due To Retirement	Cost
Water-Wall tube replacements	[redacted]
Additional cyber security investments	[redacted]
FD Fan overhaul dampers and housing (2)	[redacted]
Unit 2 economizer inlet header replacement	[redacted]
Replacement of insulation and ladding	[redacted]
Major ductwork and expansion joint replacement	[redacted]
Units 1 and 2 boiler chemical cleans	[redacted]
U2 catalyst replacement	[redacted]
Coal handling switchgear replacement	[redacted]
Superheater inlet tubes	[redacted]
Unit 1 superheat outlet header	[redacted]
Unit 1 and 2 coal pipe replacements (all straight runs)	[redacted]
Units 1 and 2 air heater overhauls	[redacted]
Unit 2 480 switchgear to operate plant equipment	[redacted]
Replacing the river well piping	[redacted]
Unit 1 480 switchgear to operate plant equipment	[redacted]
Unit 2 partial cooling tower cell rebuild	[redacted]
Turbine generator overhauls on both units	[redacted]
Total	30,290,000

Table 2

Q. The OUCC contends Vectren South should more thoroughly evaluate converting Brown to burn natural gas. Did Vectren South assess this option?

A. Yes. Vectren South engaged Babcock & Wilcox Co. to prepare an analysis of the coal-to-gas conversion. I agree with OUCC witness Alvarez that Brown could be converted to burn natural gas at a much lower up-front capital cost, but a gas-fired Brown would be very inefficient because of its high heat rate and fuel cost and rarely dispatched. In short, customers would be paying rates for capacity and then largely depending on MISO for energy purchases to actually serve their day to day needs. **Table 3** shows that the fuel cost (example has $4.00/mmBtu natural gas price) to generate a MWHr from a gas-converted Brown unit is $20 more expensive than a MWHr generated by the proposed "F" class CCGT.

	Heat Rate	Fuel cost/MMBtu @ $4/MMBtu Transportation	Approximate Fuel cost/ MWHr
Brown Coal Unit Converted to Gas	11,760	4.00	[redacted]
Proposed CCGT	6,560	4.00	[redacted]

Table 3

Q. Did Vectren South include any coal to gas conversion in its modeling?

A. Yes. Vectren South's initial IRP modeling considered, but did not select as a low cost resource, converting Culley Unit 3 to gas. In response to the OUCC's concerns, Vectren South witness Lind evaluated the total cost to ratepayers of a portfolio that converted Brown to operate on gas. This updated modeling demonstrates that it is more expensive when considering total costs to customers to convert Brown to operate on gas, primarily because of the need to make energy purchases to serve customers because of the high cost and inefficiency of a gas-converted Brown.

Q. Why would a utility convert a coal plant to burn gas given its inefficiency and high cost?

A. Utilities with large generation portfolios sometimes convert smaller coal units to burn gas if they need capacity. These utilities use their large, low cost generating units to serve customer load the majority of the time and cost effectively satisfy capacity needs to satisfy MISO's PRM with gas-converted coal plants.[3] In contrast, converting the Brown units to gas would leave Vectren South without sufficient low cost energy to serve its customers on a daily basis. For this reason, Vectren South's IRP modeling did not consider converting Brown to gas.

[3] Company witness Justin Joiner explains MISO's PRM in more detail. In short, MISO requires market participants to maintain a specified amount of capacity to ensure that the MISO region can satisfy needs experienced during peak periods.

Q. Mr. Alverez points to IPL Harding Street coal to gas conversion as an example of a low cost solution that has been successful. Does IPL's experience suggest converting Brown to a gas burning facility would be a prudent course?

A. No. IPL meets the criteria I just discussed—it has constructed a large new CCGT that can meet the majority of its needs and relies on Harding Street primarily for capacity. According to Harding Street EIA data provided as Petitioner's Exhibit No. 4-R, Attachment WDG-1R, the heat rate at Harding Street increased by approximately 15% and capacity factors have fallen from the 70% range into the teens. Harding Street's capacity factor is actually better than most coal to gas conversions and may indicate that transmission limitation around the Indianapolis area or other factors are helping Harding Street perform better than most coal to gas conversions. There have been 51 coal-to-gas conversions across the U.S. between 2013 and 2018. The majority were small units that converted to avoid high dollar investments to comply with the 2016 Mercury and Air Toxic Standard ("MATS") deadlines. The capacity factor for these units dropped from an average of over 40% to below 5% and heat rates rose from 10,800 to 12,500. Nineteen units in MISO have been converted from coal to gas and their heat rate increased from approximately 11,500 to 15,400 and capacity factors declined from a 60% average to less than 5%. Harding Street, MISO and Vectren South coal to gas conversion information is provided as Petitioner's Exhibit No. 4-R, Attachment WDG-2R.

Q. Are there any other potential costs to customers that Mr. Lind's modeling of gas-converted Brown units did not consider?

A. Yes. Because these units would not run frequently, customers could be exposed to congestion charges for the energy they require. The Locational Marginal Price ("LMP") paid for energy purchased from the MISO market consists of the energy, congestion and

line loss.[4] Transmission and distribution systems were designed to serve customers from local generation sources. When energy is imported from long distances, transmission lines can become stressed or overloaded. One way MISO balances the system and ensures reliability of the transmission grid is by assessing a congestion charge component of the LMP to encourage generation to operate (or be constructed) or not operate depending on the needs of the transmission system. Congestion can be positive, increasing the price MISO pays for energy incenting the seller to increase production or negative, which reduces the price MISO pays for energy incenting the seller to reduce or stop production.

Q. Do you have an example of how congestion can impact the LMP of non-localized generation?

A. Yes. Vectren South has two Purchase Power Agreements ("PPAs") in place for wind from Benton County Indiana with Benton County Wind Farm and Fowler Ridge II Wind Farm. **Table 4** shows the average five year congestion component of the LMP paid by Vectren South customers for the two wind farms compared to five year congestion component of local generation at the Brown and Culley locations. The congestion for the wind farms is much higher than for local generation. **Table 5** shows the number of hours that Vectren South has experienced negative LMPs for the two wind farms compared to Brown and Culley over the past 5 years. Note that there is a much higher congestion charge and many more negative LMP hours for generation that is farther from the load it is designated to serve.

[4] LMP is the hourly price for energy set by the last unit needed to meet demand in an area.

Generation Source	Day Ahead Average Congestion Component (Paid By Load) Of The LMP	Real Time Average Congestion Component (Paid By Load) Of The LMP
Brown		
Culley		
Benton County		
Fowler Ridge		

Table 4

Generation Source	Day Ahead Hours with Negative Pricing	Real Time Hours with Negative Pricing
Brown		
Culley		
Benton County		
Fowler Ridge		

Table 5

C. Risks With Continued Reliance on Culley Unit 2

Q. OUCC witness Aguilar contends Vectren South could continue to operate Culley Unit 2 and utilize the benefits of sharing environmental compliance equipment with Unit 3. (Public's Exhibit No. 1., p. 22). Why is the Company proposing to retire Culley Unit 2?

A. I explained in my Direct Testimony (Petitioner's Exhibit No. 4, p. 21) the reasons why retiring Culley Unit 2 is the best option for customers. Ms. Aguilar has not addressed any of the concerns with continued operation of Culley Unit 2 identified in my Direct Testimony. She relies only upon Culley Unit 2's ability to share environmental compliance equipment with Culley Unit 3, but fails to acknowledge that a minimum of $70 million in additional capital investments are required to continue operating Culley Unit 2 through 2036. In part, this investment is driven because Culley Unit 2 cannot solely rely on Culley Unit 3 for environmental compliance costs. A dry bottom ash system must be installed to comply with CCR and further investments may be required to comply with section 316b of the Clean Water Act (designed to protect fish and other aquatic wildlife at water intake and outfall structures) on the design and operation of the current river intake structure. In addition to these environmental costs, Culley Unit 2's

distributed control system ("DCS") is a Honeywell system installed in 2000 and must be updated or replaced because it is obsolete. A few other significant capital investments that would be required to keep Culley Unit 2 operating beyond 2023 include a turbine major overhaul, boiler acid clean, main transformer overhaul/replacement, major boiler component replacement, dry stack ductwork replacement, ID fan discharge ductwork, coal conveyor gallery replacement, boiler/high energy piping condition assessment, air heater basket replacement, continued overhaul of circulating water pumps and traveling water screens, and replacement of two 480-volt motor control center electrical switchgear.

Investing so heavily in a unit as old and inefficient as Culley Unit 2 is not economic. Vectren South's modeling bore this out. Due to the higher cost to operate, the unit has experienced less overall run time and much more unit cycling. Culley Unit 2 has reached the end of its useful life and should be retired rather than continuing to spend capital keeping the inefficient unit operating.

D. Risks From Continued Reliance on Warrick Unit 4

Q. What is the basic contractual arrangement related to Warrick Unit 4 with Alcoa?

A. Vectren South and Alcoa are parties to Joint Operating Agreement ("JOA") pursuant to which each has 50% ownership (150 megawatts ("MW") each) in Warrick Unit 4. Warrick Unit 4 came on line in 1970 and will be 54 years old in 2023. The unit sits on Alcoa property along with three other (150 MW each) units referred to as Warrick Units 1-3. Alcoa personnel are responsible for daily operations and maintenance decisions. Vectren South provides input through an Operating Committee that meets regularly.

Q. OUCC witness Aguilar testifies that she does not agree with Vectren's assessment of the risk of continuing to operate under the agreement and she specifically

describes that the OUCC does not agree with Vectren South's "presentation of the agreement." (Public Exhibit No. 1, p. 23). Please respond.

A. Witness Aguilar does not address Vectren South's specific concern that Alcoa has [redacted]. This concern was explained by the Company in the OUCC data request cited by Ms. Aguilar (Public's Exhibit No. 1, p. 23 fn. 31).

The original agreement provided Alcoa [redacted] and a 2001 amendment afforded either party the ability [redacted]. That [redacted] in a 2017 amendment due to ALCOA's corporate reorganization and operational uncertainty described by Company witness Chapman. Capital investments in Warrick Unit 4 must be evaluated in terms of the risk that Alcoa will exercise its [redacted] and, in effect, [redacted]. The decisions that might lead Alcoa to exercise its contractual rights arise from its own business economics and, particularly, the aluminum business.

Q. Are future environmental capital investments in Warrick Unit 4 necessary?

A. Yes. Due to compliance requirements coming in Alcoa's next NPDES permit, it is anticipated that the unit will require a significant capital investment to eliminate the plant's direct discharge to the Ohio River. This would require a Waste Water Treatment facility to treat the FGD waste stream and any process stream entering the ash pond prior to discharge. Also, Alcoa may be required to comply with section 316b of the Clean Water Act under this new permit which could include a reengineered design to the river intake system. Company witness Retherford discusses the Warrick site environmental risks in greater detail.

Q. Are there other factors that warrant against continued reliance on Warrick Unit 4?

A. Yes. Mr. Chapman notes that Vectren South wanted to keep one coal unit to avoid the all gas portfolio modeling demonstrated was the lowest cost portfolio. We focused on our best performing coal unit, Culley Unit 3. Warrick Unit 4 was considered, but the contractual concerns and the unit's performance led us to select Culley Unit 3.

Q. Please describe the performance issues at Warrick Unit 4 that made Culley Unit 3 a more attractive unit for the future.

A. The operating unit itself has become more susceptible to forced outages in recent years. **Table 6** shows that in all but one of the previous six years, the unit's EFOR has been well above the industry average of 8.56% with the last two years being over 17% (over twice the industry average).

	2012	2013	2014	2015	2016	2017
Warrick Unit 4 EFOR Rate	12.75	11.75	15.2	4.8	17.8	17.3

Source: PowerGADS (MISO) GORP Report
Table 6

Along with boiler tube failures, Alcoa has incurred multiple large mechanical and operational failures contributing to the high EFOR. Recent examples include a prematurely failed selective catalytic reduction ("SCR") catalyst layer, issues with air heater internals, boiler control failures due to DCS feedback and field device failures, and emission restricted shut downs. Warrick Unit 4 is also minimum load restricted (228-350 MWs) due to a failed duct burner on the SCR that maintains the unit's exit gas temperature minimizing unit corrosion due to flu gas reaching acid dew point.

E. Risks from Continued Reliance on BAGS Unit 2

Q. Please describe Vectren South's Broadway Avenue Gas Station ("BAGS") Unit 2.

A. BAGS Unit 2 is a simple cycle, 65 MW gas turbine constructed in 1981. The unit will be 44 years old when Vectren South projects retirement in 2025. BAGS Unit 2 will be well past its expected 30-year life. Due to its age, BAGS Unit 2 is not a very efficient unit, operating with a heat rate of over 14,000 in 2017 compared to the proposed new CCGT's anticipated heat rate less than half of this. Recall that a lower heat rate is indicative of greater efficiency.

Q. Are there risks with continuing to operate BAGS Unit 2 for the foreseeable future?

A. Yes. OUCC witness Alvarez's primary criticism is that Vectren South has provided insufficient support for the proposed retirement of BAGS Unit 2 (Public's Exhibit No. 2, p. 14). The data request response he refers to sought "any engineering or other technical reports performed by or on behalf of Vectren South identifying the need to retire the 'Natural Gas' units. The Company is not relying on engineering or other technical reports to support this conclusion. We are planning to retire it 14 years beyond its estimated useful life. As explained in the data request response, Vectren South has trained staff that includes a turbine engineer that supervises the operation and maintenance of the gas peaking units. Our staff has numerous years of experience operating and maintaining natural gas compressor and turbine/generator sets and intimate knowledge of BAGS Unit 2. They have assessed the condition of the unit and found significant risks with continuing to operate it.

Q. Please identify the specific concerns with continued operation of BAGS Unit 2.

A. During normal operation and maintenance activities, long term issues have been found which would require a major re-build of the unit to keep it operating beyond 2025. Our team has identified a damaged turbine casing, the need for exhaust diffuser replacement, replacements of multiple rows of blades and stationary vanes in both the

compressor and turbine, a requirement to re-wind the generator stator and rotor, first stage shroud block cracks, leading edge blade damage, and axial movement on the inner guide vanes. Vectren South's modeling appropriately called for the retirement of BAGS Unit 2.

Q. Does Vectren South take seriously its responsibility for keeping assets in good operating condition, operating efficiently, and attaining higher capacity factors?

A. Yes. Vectren South's success in this regard is supported by OUCC witness Alvarez's testimony noting how well our coal plants compare from an operational standpoint to other coal facilities in the nation. (Public's Exhibit No. 2, pp. 16-18). However, operating efficiently may mean determining when to retire units that are well past their useful lives rather than continuing to pour money into the units. Theoretically, Vectren South could ensure that it never retired any generation facilities if that was the goal. But that is not the goal. Throughout his testimony, OUCC witness Alvarez suggests that the only thing that matters in efficiently serving customers is maintaining sufficient capacity, by maintaining existing units, to ensure Vectren South can satisfy its MISO PRM requirements. However, determining the value in pouring money into old inefficient units with short life spans requires a more thorough analysis, including determining whether the existing units are still the most cost effective means of providing service.

Q. OUCC witness Alvarez contends the Company should not have included BAGS 1 in its list of units to be retired. (Public's Exhibit No. 2, p. 13) Why did Vectren South identify BAGS Unit 1 as a unit to be retired?

A. While Mr. Alvarez is correct that BAGS Units 1 has not received any capacity credit from MISO since 2014. Vectren South had classified BAGS Unit 1 in MISO's "temporary suspension" status for the allowable three years period. Prior to 2018, BAGS Unit 1 had

not been retired. A temporary suspension status allows a utility time to evaluate the failure of a unit to determine whether investments to bring it back on line are appropriate. BAGS Unit 1 failed in 2015 and the inspection to determine the scope of work and costs to repair the unit concluded that the estimated cost to get the unit operational would be $18 million and that further capital would be required to address several other issues to ensure long term reliability. The unit was 44 years old (same age BAGS 2 will be in 2025 when we are projecting it will retire) and well past its expected life of 30 years. The temporary suspension status provided Vectren South the option to spend the dollars to place the unit back in service prior to mid-2018 if it was determined beneficial. In early 2018, Vectren South submitted the necessary paperwork requesting permission to retire the BAGS Unit 1. The unit was officially retired in early 2018. Therefore, it was appropriate to identify it in the list of resources being retired from Vectren South's fleet.

F. Risks Of Delaying The Decision To Construct a CCGT

Q. Some have suggested that Vectren South should delay the decision to construct a CCGT and wait for the results of the 2019 IRP. Do you agree with this strategy?

A. No. This approach ignores (1) the timing by which Vectren South must make decisions about Brown's continued operation; (2) the timing required to construct a new CCGT and (3) the time required to complete a 2019 IRP and obtain a CPCN. Company witness Retherford explains that environmental regulations will require retirement of the Brown units on or before December 31, 2023 unless significant capital investments are made to have new systems operating well before 2023 as described by Company witness Retherford. When the 2019 IRP modeling is concluded and again recommends construction of a CCGT, there will not be sufficient time to construct the CCGT before Brown must be retired. I have provided a timeline as Petitioner's Exhibit 4-R, Attachment WDG-3R to highlight the challenges. The timeline shows the current

projected schedule in green and the timeline under the 2019 IRP in red. Delaying this would push the schedule out 2-3 years (2026/2027 timeframe), leaving customers vulnerable to market capacity and energy prices to reliably serve our customer base during this period. Such an approach would be highly risky and is not a prudent manner in which to operate a utility with an obligation and commitment to industrial, commercial, government, health care, schools and residential customers relying on us to provide reliable electric service.

II. The CCGT Is Reasonable

Q. Several of the intervenors have challenged the size of the proposed unit. Do you agree with their criticisms?

A. No. The primary unit Vectren South is proposing to build does not result in the Company having more capacity than is necessary to serve the projected load over the twenty year planning horizon. The proposed "F" class unit supplies about 700 MWs of baseload generation (prior to making a reduction for summer output and Unforced Capacity ("UCAP") associated with historical forced outage explained in more detail later in my testimony). A unit this size was required to keep costs low, efficiency high and obtain enough capacity to meet Vectren South's PRM with an extra 51 MWs in 2025. This replaces 730 MWs of baseload coal. Petitioner's Exhibit No. 4-R, Attachment WDG-4R, depicts how the baseload capacity matches Vectren South's anticipated needs from the 2016 IRP.

Q. Are there risks that the MISO PRM requirements change or that Vectren South's load increases rendering the additional capacity beneficial?

A. Yes. I discussed in my direct testimony examples of how the MISO PRM requirements have changed in the past and Company witness Joiner explains how the MISO PRM

requirement is established and several determining criteria that cause the level to fluctuate annually. I also discussed how holding a capacity surplus is necessary to ensure Vectren South can meet the annual changes in PRM requirements as well as attract new business.

Q. What is the basis for the contention made by the OUCC and ICC that the CCGT has more capacity than necessary for Vectren South to meet its projected needs?

A. Vectren South has proposed to add duct-firing to the CCGT. The duct-firing produces additional steam for the steam generator to increase the amount of electricity it can produce. The incremental cost of adding duct-firing is only $15 million and it produces approximately 150 MWs of additional capacity. The fired portion serves as peaking capacity, allowing Vectren South to supply energy during periods of peak demand and high market prices. Firing the unit cannot be cost-effectively added after the facility is constructed. While constructing the CCGT with duct-firing results in more capacity than our projections indicate is required, the relatively small cost and inability to add it later led us to propose this as part of the CPCN. The 2% increase in cost adds 20% of capacity. This extra capacity can be utilized to help attract new industrial and commercial customers to Evansville or sold into the wholesale market.

Q. Why do you refer to the duct firing as peaking capacity?

A. The air permit will limit the annual tons of Volatile Organic Compounds ("VOCs") being released from the CCGT. The VOCs increase on a per MWHr basis when duct firing which will limit the number of annual hours the unit can be duct fired without exceeding the annual VOC emission limit anticipated in the air permit. Vectren South will monitor VOC emissions and employ the duct firing when MISO demand and energy prices are highest, therefore, only operating during peak times. Vectren South's analysis indicates

that VOC emissions limit will not curtail use of the fired piece of the unit, but this limitation supports viewing the duct firing as peaking capacity because it will not be available at all times to serve Vectren South's typical demand.

Q. Does Vectren South have any recommendations if the Indiana Utility Regulatory Commission ("Commission") shares the concern about the need for the capacity resulting from firing the CCGT?

A. Yes. Vectren South witness Chapman has stated that Vectren South is willing to fund the duct-firing portion of the CCGT through shareholder dollars, exclude this piece from future rate base, and accept the risk to recover the investment through wholesale sales energy produced by the duct-firing.

Q. Besides being the lowest cost option for the customer what are some of the other reasons a CCGT is a practical option?

A. The "F" class technology is a highly durable, proven design that has logged numerous operating hours across the power industry. Given the current MISO market and projected market changes discussed by Vectren South witness Joiner, the CCGT has the necessary operating characteristics and flexibility to better react to changing demand and provide the reliable service to our customers. First, the CCGT can ramp output up and down at a rate of 80 MWs per minute providing the flexibility to meet the changing demand requirements created by intermittent resources. This compares to our current coal units that ramp output up and down at a rate of 3 MWs per minute. Second, the unit will be designed with the ability to cycle off and back on nightly if necessary to allow customers to take advantage of low market prices during the off-peak hours when available. The proposed CCGT can start back up from a cold condition in less than an hour, warm condition in 30-40 minutes and hot condition in less than 30 minutes. The

Brown units require 18-24 hours for a cold start, 8-12 hours for a warm start and 4-8 hours for a hot start. The ability to ramp output, cycle on/off quickly and provide reliable capacity as units age are characteristics that have a high probability to create financial benefit in a MISO market that has already moved to a 5 minute pricing settlement period and is exploring market reforms that will reward unit flexibility in the ancillary services market discussed by Company witness Joiner.

The 2x1 "F" class unit consists of 2 sets of compressors, natural gas turbines and generators, heat steam recovery generators (boilers that convert water into steam) and one steam turbine and generator. Simplistically, air is pulled into each of the two compressors where it is compressed to high pressure, is mixed with fuel and ignited. This ignition and combustion moves a hot air fuel mixture through the gas turbine turning blades which drive a shaft within the associated generator producing electricity. The waste heat from each gas turbine enters its associated heat recovery steam generator ("HSRG") where purified water is heated and turned into steam. The high pressure steam enters the turbine. As the steam flows through the turbine blades, the blades turn a shaft connected to the generator. As the generator spins it produces electricity. This design is very efficient as the waste heat from the gas turbines is used to generate more electricity rather than being vented to the atmosphere. The unit has a wide range of output as it can be operated in a 1x1 configuration (one gas turbine/generator, one HRSG and one steam turbine/generator) producing over a range of approximately 180-420 MWs or a 2x1 configuration (two gas turbines/generators, two HRSG's and one steam turbine generator) producing over a range of 380-700 MWs. Duct firing can then be added for peaking. This provides a much wider range of output which is especially beneficial in the off–peak hours when demand and prices are low. Currently the normal minimum output for the Brown units is 135MWs each, Warrick 4 minimum is 114 MWs

and Culley 2 minimum is 50 MWs. This means that there are hours during the off-peak when MISO market prices are lower than the cost of our coal units but they can only turn down to 434MWs as compared to the CCGT which can turn down to 180 MWs in the 1x1 configuration and 380MWs in the 2x1 configuration.

Q. Why is the CCGT the lowest cost option?

A. The two primary reasons are the low cost of natural gas and the high efficiency rating of new CCGT technology as compared to Vectren South's coal fleet. The primary measure of efficiency of an electric generation unit is heat rate. Heat rate is the amount of energy in British thermal units ("Btus") used to generate a kilowatt hour ("kWh") of electricity. Heat rate can be expressed in "gross"; the Btu/kWh of total output of the generator (not including electric consumption to operate plant equipment) or "net"; the Btu/kWh (including electrical consumption to operate plant equipment). The lower the heat rate or number of Btu's required to produce a kWh of electricity the more efficient the generating source.

Q. How does the heat rate of the proposed CCGT compare to the coal units that intervenors are recommending Vectren South continue to operate?

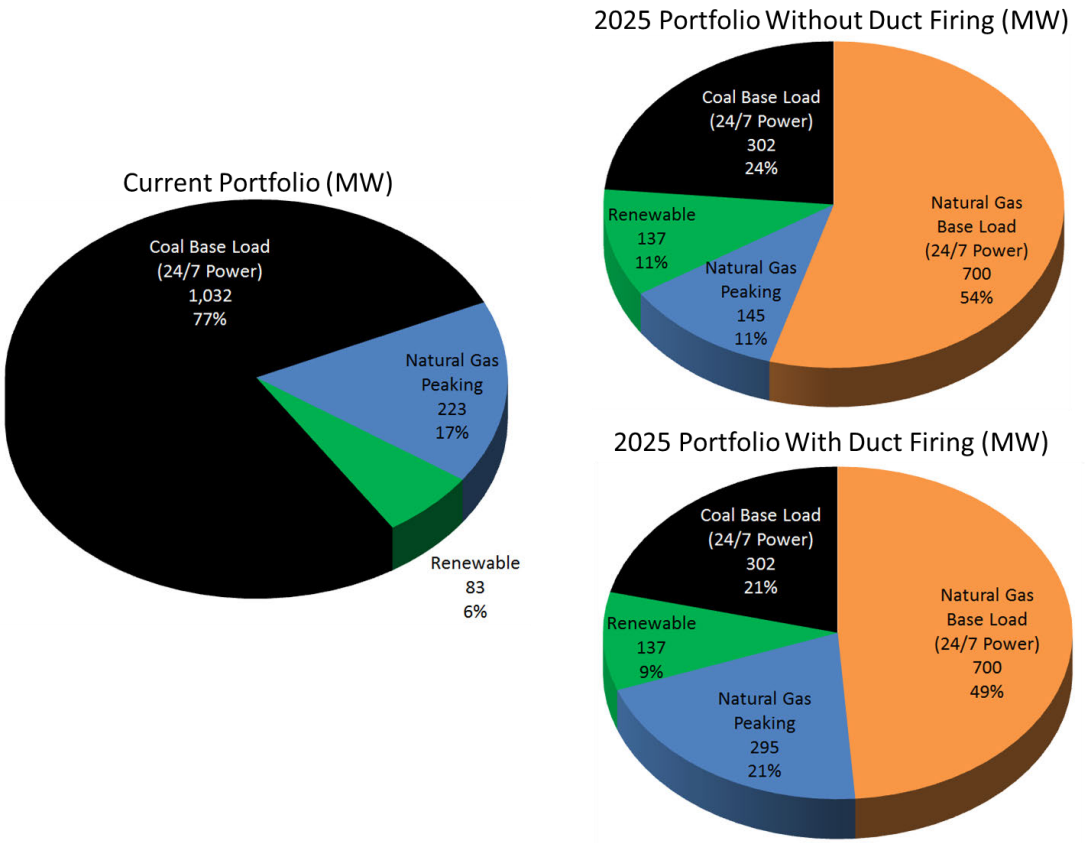
A. The proposed CCGT is expected to operate at an average heat rate of approximately 6,560 Btu/kWh. **Table 7** shows the heat rate of the Vectren South coal fleet.

	2017 Net Heat Rate
AB Brown Unit 1	11,576
AB Brown Unit 2	11,007
FB Culley Unit 2	12,662
FB Culley Unit 3	10,549
Warrick Unit 4	10,896
Vectren Coal Fleet Average	11,001
Typical "F" Class CCGT	6,560

Table 7

Q. OUCC witness Alverez (Public's Exhibit 2, p. 10) claims that Vectren South's preferred plan does not diversify its generation but swings the pendulum from 77% coal to 77% gas. Do you agree with his assessment?

A. No. Fuel diversity can be viewed from the perspective of baseload generation, peaking generation and intermittent generation. As discussed earlier, the Company views duct-firing as peaking generation. As shown in the pie charts below, Vectren South currently has 100% of its baseload capacity supplied by coal. In both the fired and unfired portfolio, this changes to 70% natural gas and 30% coal. When looking at the total portfolio, Vectren South currently has 78% of its total capacity supplied by coal, 16% natural gas peaking and 6% intermittent renewables. In the preferred portfolio with a fired CCGT scenario Vectren South will have 49% baseload gas, 21% baseload coal, 21% peaking gas and 9% intermittent renewables while the unfired portfolio would have 54% baseload gas, 24% baseload coal, 11% peaking gas and 11% intermittent renewables.



Q. Are you concerned that constructing the proposed CCGT is moving to a position of having too much reliance on one unit?

A. No. Although there may be certain advantages to have more than one CCGT, the cost of building the gas pipeline infrastructure, site preparation, engineering, and procurement of equipment construction and interconnect costs of two smaller units outweigh the benefits. The efficiency benefits and cost savings associated with building one larger CCGT is the best option. Building a 2x1 configuration allows Vectren South the flexibility to take one of the gas units off line for planned maintenance in the shoulder months when demand is lowest and operate in a 1x1 configuration producing up to 420 MWs. This energy along with the remainder of Vectren South's fleet will supply enough energy to serve Vectren South shoulder month demand the majority if not all of the time. As mentioned earlier although Vectren South doesn't feel it prudent to rely on the MISO

market for energy and capacity for long stretches we should, as MISO members, be able to rely on the market to supply energy in short stretches. If the entire unit is offline for maintenance or to address an operating issue, Vectren South would still have adequate energy with coal and renewables to meet over 40% of its peak demand.

Q. Does Vectren South expect to receive 850 MWs of capacity credit towards its PRM from the CCGT?

A. No. A CCGT's output is dependent on several variables; one being air density. Air density changes with the temperature. During the winter months air density is higher resulting in a CCGT producing more output. Air density in the summer months when temperatures rise to 90 plus degrees is lower resulting in a reduced output. In addition, as discussed by witness Joiner, MISO also penalizes units based on their UCAP performance history. Simplistically, UCAP is based on the demonstrated output of a unit under peak load conditions and percent of time it is not participating in the market due to being forced off-line as a result of operational or maintenance issues. Until the equipment manufacturer is chosen through a competitive bidding process the final summer output will not be known. Each year the UCAP values will change based on previous performance. As a result capacity credit for the unfired and fired portion of the CCGT can be different each year.

III. Cost Estimate Is Reasonable

Q. Did Vectren South develop a detailed cost estimate for the CCGT?

A. Yes. Vectren South witness Diane M. Fischer described in detail the extensive effort the Company invested in developing a very detailed cost estimate for the CCGT. While Ms. Fischer describes the process in great detail, it is important to emphasize that B&V, on behalf of the Company, solicited and evaluated competitive bids for all equipment and

construction for the CCGT based on conceptual designs of the CCGT. Ms. Fischer states that the cost estimate represents a +/- 10% estimate for equipment and construction.

Q. Mr. Alvarez criticizes Vectren South's cost estimate (Public's Exhibit No. 2, p. 26) alleging that Company witness Fischer "cannot stand behind [the] estimate without qualifications." Is his criticism valid?

A. No. Vectren South, in conjunction with B&V, has produced a very comprehensive and accurate cost estimate with a plus or minus 10% margin of error. It is still a cost estimate and the actual price may deviate somewhat from this estimate. However, the fact that this is an estimate does not render it unreliable for purposes of Commission consideration. Mr. Alvarez implies that rather than presenting the Commission with a cost estimate, it must provide an unqualified bid to construct the project for a set price. His position ignores that Ind. Code § 8-1-8.5-5(a) requires the submission of a cost estimate, not a firm price.

Q. Mr. Alvarez further criticizes the estimate for not being the result of a competitively bid engineering, procurement or construction contract. Do you agree with him?

A. No. As Mr. Alvarez recognizes, Ind. Code § 8-1-8.5(e)(1)(A) requires the estimated costs of the proposed generation facility of more than 80 megawatts to be "the result of competitively bid engineering, procurement, or construction contracts, as applicable" "to the extent commercially practicable." (Emphasis added) He disregards Vectren South witness Fischer's testimony that Vectren South's cost estimate is the result of competitively bid procurement and construction contracts. Petitioner's Exhibit No. 6, pp. 36-37. Mr. Alvarez may be ignoring the use of the conjunctive "or" in the statute and

misreading the statute as requiring presentation of an engineering, procurement and construction or EPC contract. In an EPC contract, the contractor is responsible for obtaining all specified equipment, designing the plant, constructing the plant and assuming the project cost. The statute does not require an EPC contract as evidenced by the language providing the option of competitively bid engineering, procurement or construction contracts.

Q. Would it be commercially practicable for Vectren South to obtain an EPC contract bid and present it to the Commission in conjunction with a CPCN request?

A. No. A contractor offering a bid on a contract incurs significant expense in developing these bids. Costs can range from $300,000 to $1 million for the bid preparation. An EPC contract often includes a firm price, which requires the contractor to be very thorough in providing a bid. Contractors will not put the investment into developing firm bids simply for Vectren South to submit them to the Commission for approval in a CPCN proceeding. The length of time required for approval of a CPCN also makes it commercially impracticable to obtain a firm EPC contract bid as conditions change over time (supply & demand impacting commodity prices, labor market availability, *etc*.) resulting in high contingency being included in the firm bids to ensure adequate profit margins. In addition waiting for a CPCN places Vectren South in a much better position to create a competitive market and negotiate terms as bidders will be much more serious once they know there is an actual project they are investing the time and effort to earn.

Q. Do you agree with Mr. Alvarez that there are "red flags" in the proposed cost estimate that signal price escalation, construction-scheduling uncertainty, and lack of general confidence in its ability to undertake projects of this magnitude (Public's Exhibit No. 2, p. 28)?

A. No. Vectren South employed B&V to develop this +/-10% cost estimate as they have extensive experience as an EPC contractor and an Owners Engineer involved in several CCGT projects. They used the same cost estimating practices and review they use when bidding a project as an EPC. The typical costs for an "F" class combined cycle gas turbine project are well known as there are over 258,000MWs of combined cycle output in the United States. This is in contrast to the Edwardsport and Mississippi Powers Integrated Gasification Combined Cycle ("IGCC") technology that Industrial Group witness Michael Gorman unfairly points to as examples of over budget and over schedule projects. These were first of a kind technology projects that were not proven. Vectren South originally partnered with Duke on Edwardsport but bowed out before the project started largely because of the difficulties confirming the prices.

The OUCC's "red flags" comment ignores the entire body of work performed by Vectren to put together a very detailed estimate for the Commission. Vectren South and B&V performed a significant level of conceptual design to develop the estimate for the CCGT. This includes development of site arrangement drawings, a full set of flow diagrams, a detailed bill of quantities, a detailed project execution plan and construction plan, a level one schedule, one line diagrams and project sequencing plans to ensure that the estimate was suitable for the Company's use in obtaining approval from the Commission. In addition, as stated in Ms. Fischer's testimony, the estimate "represents a +/- 10% estimate for equipment and a +/- 10% estimate for construction."

B&V followed the same procedures and practices for developing the project cost as would be used for projects where they are the EPC Contractor. This same estimating template was used for the following B&V EPC projects listed in **Table 8** (provided by B&V). These examples demonstrate that B&V has the experience with several CCGT

projects that have been completed on schedule and on budget, further supporting the reasonableness of these cost estimates.

Project Name	CT Model	Configuration	% Complete	On Budget	On Schedule
Tenaska Westmoreland	Mitsubishi M501J	2x1 CCPP	90%	Y	Y
Oregon Clean Energy	Siemens SGT6-	2x1 CCPP	100%	Y	Y
Enmax Shepard	MHI M501G	2x1 CCPP	100%	Y	Y
FPL Ft. Myers	GE 7FA.05	2x0 SCPP	100%	Y	Y
FPL Lauderdale	GE 7FA.05	5x0 SCPP	100%	Y	Y
Westar Emporia	GE 7FA & LM6000	7x0 SCPP	100%	Y	Y

Table 8

Q. Did Vectren South omit the costs for the lateral pipeline to serve the proposed CCGT from its cost estimate as Mr. Alvarez alleges (Public's Exhibit No. 2, p. 27)?

A. No. It was included as fixed O&M costs, as was indicated in response to discovery.

IV. Recommendations For CCGT Cost Exposures

Q. Industrial Group witness Gorman makes several recommendations for contractual protections when negotiating an EPC for the CCGT. Will Vectren South consider these recommendations?

A. Yes. Mr. Gorman recommends that Vectren South include appropriate contractual provisions that shift the risk of cost overruns on the CCGT to the Company's major equipment suppliers or the EPC contractor. He also recommends performance obligations in its supply contracts to ensure that a new CCGT can meet these expected operating performances.

Q. Has Vectren South decided what method it will utilize to contract for the engineering, procurement and construction of the CCGT?

A. No. Vectren South leans towards and desires a fixed price EPC contract with payments made as specific quality, productivity and performance milestones are achieved. This approach would shift many of the risks of cost overruns to the EPC contractor. We will hire an Owners Engineer with EPC experience to help guide us through the best way to structure the EPC contract to ensure the project is completed on schedule and within budget. Knowing that EPC contractors will add a premium for taking on the risk associated with a firm price Vectren South will evaluate whether the benefits of a fixed price bid are justified by its costs. Even with a firm price, there are risks of change orders and unanticipated issues that can impact the price.

Q. Has Vectren South decided whether it will require performance obligations in any agreement with an EPC contractor?

A. Yes. Specific performance obligations associated with project milestones will be established. Cost sharing incentives for completing specific phases of work under established budgets is something that has worked well for Vectren South on previous capital projects and will be something we'll explore for this project.

Q. Mr. Gorman also recommends that Vectren South share all of the wholesale power margins generated by the plant with customers. Has Vectren South considered this recommendation?

A. Yes. The parties are correct that a significant benefit of the new CCGT is the enhanced ability to participate in the MISO energy market because of the unit's greater efficiency. Vectren South witness Chapman has agreed that in the Company's next base rate case, it will agree to modify its wholesale power sharing mechanism to adjust the portion of

wholesale sales shared with customers from 50% to 100%. As Company witness Lind explains, this will further improve the benefits to customers from the CCGT.

V. Alternative FGD Options Were Explored

Q. Please describe the process Vectren South engaged in to explore scrubber options for Brown.

A. Vectren South hired B&McD to assess the condition of the Brown Scrubber, the estimated remaining life and estimated replacement cost. B&McD associates visited the Brown plant to view and assess the condition, examine historical maintenance documents, become familiar with other environmental controls and how they interact and understand the characteristics of the coal burned.

Q. Why did Vectren South focus on the wet limestone FGD?

A. Based on its investigation, B&McD considered options and concluded that Wet Limestone Forced Oxidation ("LSFO") was the best option for the Brown plant. They based this decision on size of the Brown units and the long track record of high SO_2 removal rates and high operating reliability on high sulfur coal applications. B&McD did consider other technologies, contrary to OUCC witness Aguilar's assertion that no other technologies were evaluated (Public's Exhibit No. 1, p. 20). These were ruled out by B&McD due to their lack of a track record of performance on high sulfur coal, higher long term O&M costs, addition of new environmental equipment such as a fabric filter downstream of the process, concerns with impact to fly ash quality and interaction with other plant environmental controls. Solid performance with high sulfur coal is critical as there is always the possibility for lowering SO_2 removal requirements and emission allowances.

Q. Is the Company presenting additional evidence to demonstrate that other scrubber technologies are not viable?

A. Yes. Vectren South witness Farber has evaluated the scrubbers the OUCC and ICC claim should have been further reviewed and explains why those options are either economically or operationally problematic.

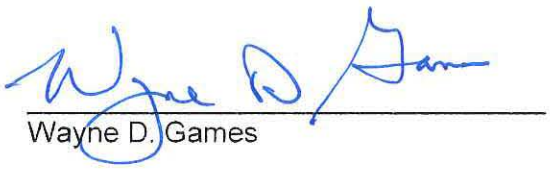
VI. Conclusion

Q. Does this conclude your prepared rebuttal testimony?

A. Yes, at this time.

VERIFICATION

The undersigned, Wayne D. Games, affirms under the penalties of perjury that the answers in the foregoing Rebuttal Testimony in Cause No. 45052 are true to the best of his knowledge, information and belief.



Wayne D. Games

Corrosion Projects 2008-2018

	Grand Total Spend	**$**	**32,081,501**
	Avg Yearly Spend	**$**	**2,916,500**

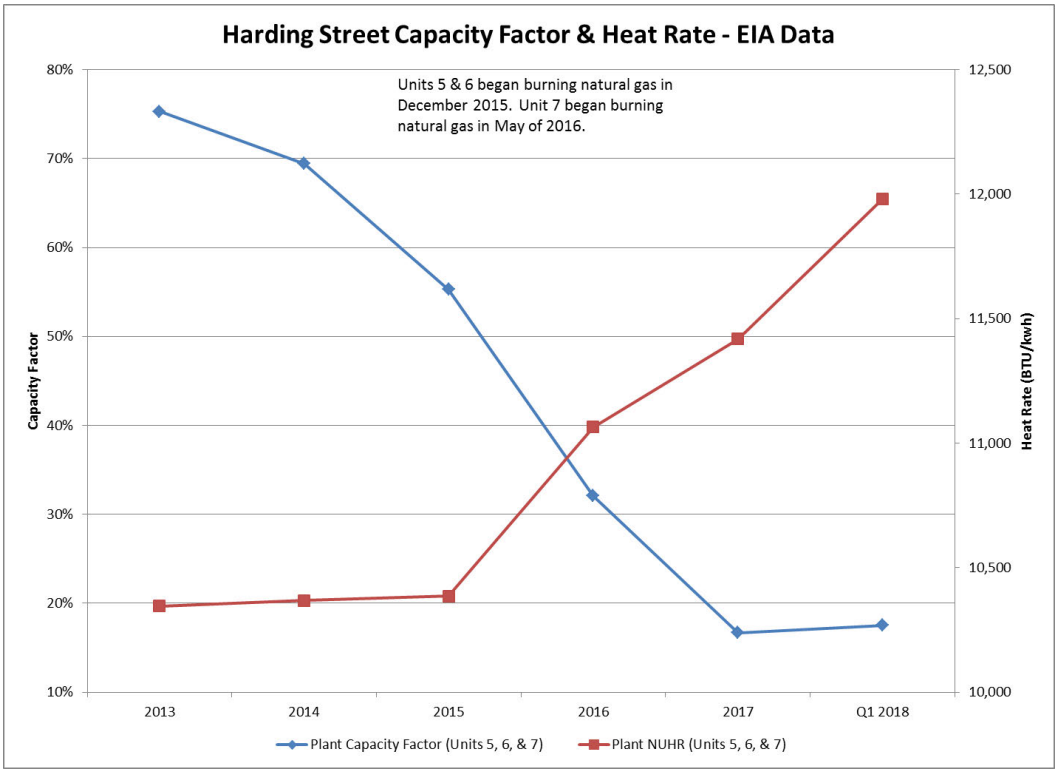
Projects by Year

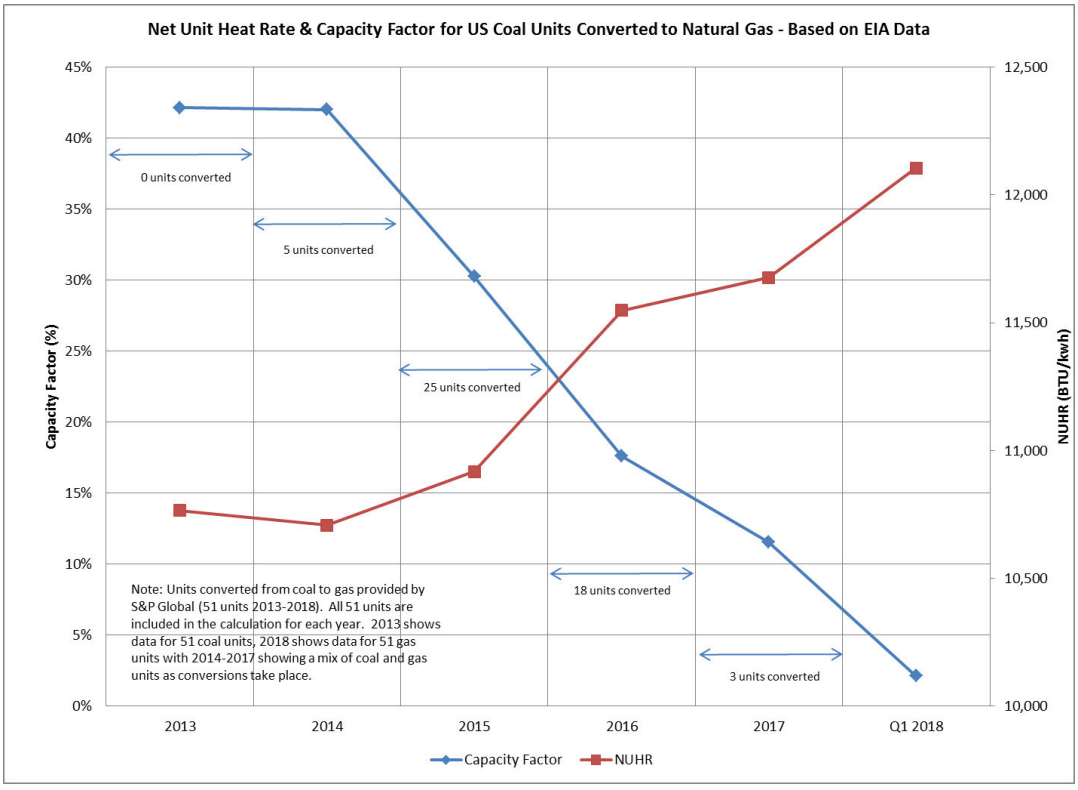
	2018		**Cost**
1	U1 North/South Tower Phase 2	$	886,000
2	U1 - U2 Walk Way	$	350,000
3	U2 Inlet Duct Platforms	$	150,000
	Total	**$**	**1,386,000**
	2017		
1	U2 Coal Silo Replacement/Repair	$	1,000,000
2	U1 North/South Absorber Duct Tower Replacement	$	1,800,000
3	U1 North/South Absorber Duct Tower Replacement Phase 2-4	$	400,000
	Total	**$**	**3,200,000**
	2016		
1	U1 Coal Silo Vertical Wall, Cone Weld Replacement	$	2,900,000
2	U1 Belt Filter Replacement	$	1,300,000
3	U1 Truck Chute Replacement	$	200,000
4	U2 North/ South Tower Absorber Duct Support Tower Phase I	$	250,000
5	U2 Coal Silo Cone Repairs	$	175,000
6	U2 Coal Silo Vertical Wall Assessment	$	25,000
7	U1 Belt Filter Temporary reenforcement	$	10,000
8	U2 Cooling Tower Cell D,E,F &G Structure and Face replacement	$	480,000
9	Coal Yard Hoppers (5)	$	650,000
10	U1/U2 FGD Corrosion Study	$	40,000
11	Ranney Well Floor Sturcture	$	30,000
	Total	**$**	**6,060,000**
	2015		
1	U2 North Belt Filter reenforcement	$	10,000
2	U2 FGD Chute replacement	$	200,000
3	U1 Stack (32) Lower stack band replacement	$	300,000
4	U1 Stack Fan replacement (2)	$	100,000
6	FGD Lime Silo Roof Replacement	$	800,000
7	U2 FGD Building / Floor Structure/ Drains	$	300,000
8	U1 FGD Building Structural/ Columns	$	250,000
9	Coal Hopper (1)	$	200,000
10	U2 FGD Building South Wall Replacement	$	150,000
11	U1 Lime Mixing Tank Stair Tower	$	78,000
	Total	**$**	**2,388,000**
	2014		
1	U2 FGD Thickener Tank Bridge Structure repairs and coating	$	275,000
2	U1 FGD Building Structure and Walls - South and East	$	300,000
3	Carboline Facility Coating Assesment		NA
4	U2 CT Cell Replacement A, B & C	$	3,400,000
5	U2 Lime Mixing Tank Emergency Repairs and Shoring	$	30,000
	Total	**$**	**4,005,000**

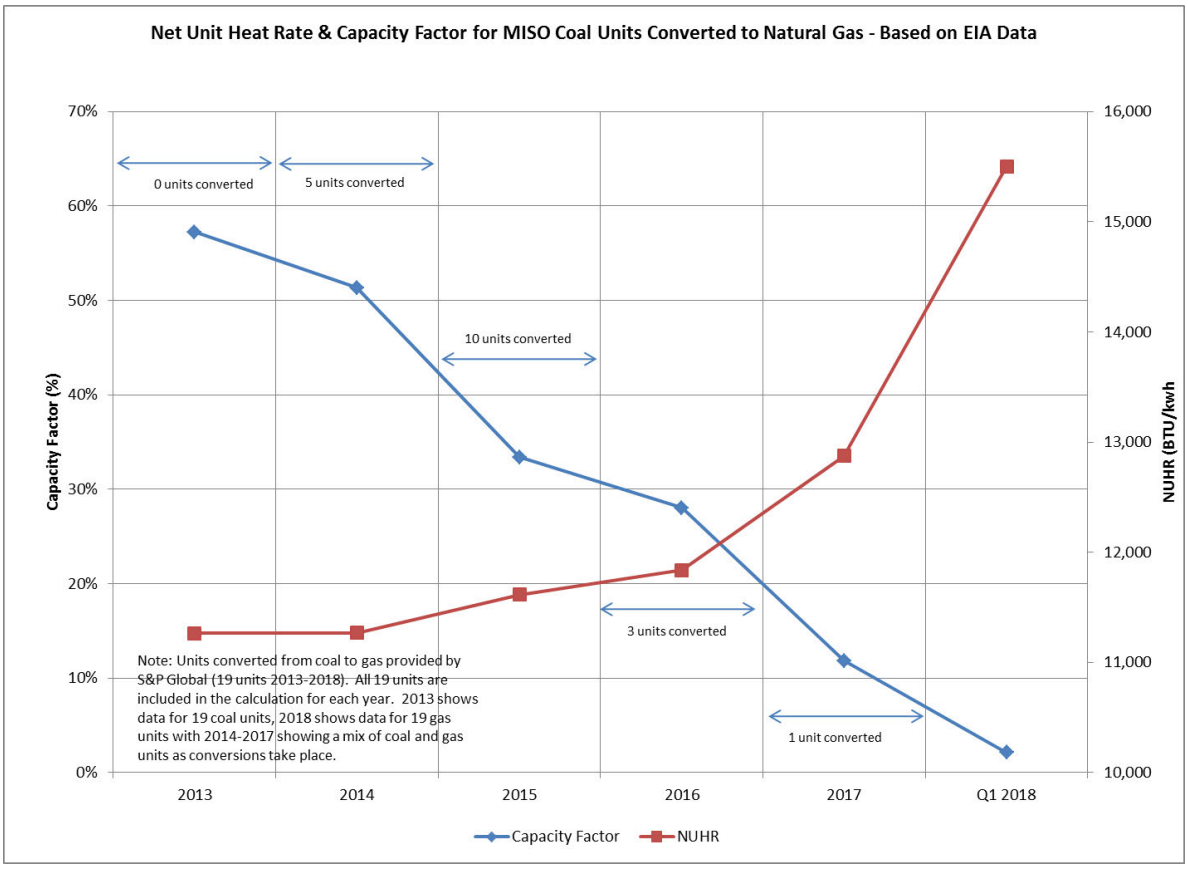
	2013		
1	U2 South Belt Filter Structure Replacement	$	600,000
2	Coal Conveyor C Truss Connecting plate seal and and coating	$	150,000
3	Train Trestle Rebuild	$	2,300,000
4	U2 Absorber Tower Coating	$	800,000
5	U1 Lime Mixing Tank Replacement	$	750,000
6	U1 FGD Pump Room Structure/ Siding and foundation replacement	$	400,000
	Total	**$**	**5,000,000**
	2012		
1	U1 FGD Building Structure and Walls - North and West	$	200,000
2	U1 Cooling Tower Replacement Cells A-G	$	5,950,000
3	U1 Absorber Tower Coating	$	800,000
	Total	**$**	**6,950,000**
	2011		
1	U2 FGD Building Structural Steel and Siding Replacement	$	1,100,000
	Total	**$**	**1,100,000**
	2010		
1	Repair of handrails, ladders, and platform grating on Unit 2 precipitator	$	135,401
2	U1 Outage Cleaning and Patching Holes on Thickener Tank	$	115,851
3	U2 SCR MCC cable enclosure rusted	$	66,767
4	U1 FGD MCC Bldg	$	51,628
	Total	**$**	**369,647**
	2009		
1	PHASE 3 ABB2 FGD (2009) corrosion repair U2	$	395,063
2	3I Eng Study	$	108,170
3	PHASE 3 ABB1 FGD (2009) corrosion repair U1	$	100,264
4	3I Engineering Study	$	93,270
5	Top Edge SE side - Thickner Tank	$	83,299
6	3I Engineering to perform a structural analysis of the FGD area	$	72,784
7	3I Engineering to perform a structural analysis of FGD area	$	63,769
	Total	**$**	**916,619**
	2008		
1	Phase 2 Corrosion repairs - 3I Eng , structural repairs U2 scrubber	$	315,184
2	Phase 2 Corrosion repairs - 3I Eng , structural repairs U1 scrubber	$	211,511
3	UNIT 1 FGD PLATFORM AND HANDRAIL SYSTEM CORROSION REPAIRS	$	179,541
	Total	**$**	**706,236**

Petitioner's Exhibit No. 4-R, Attachment WDG-2R

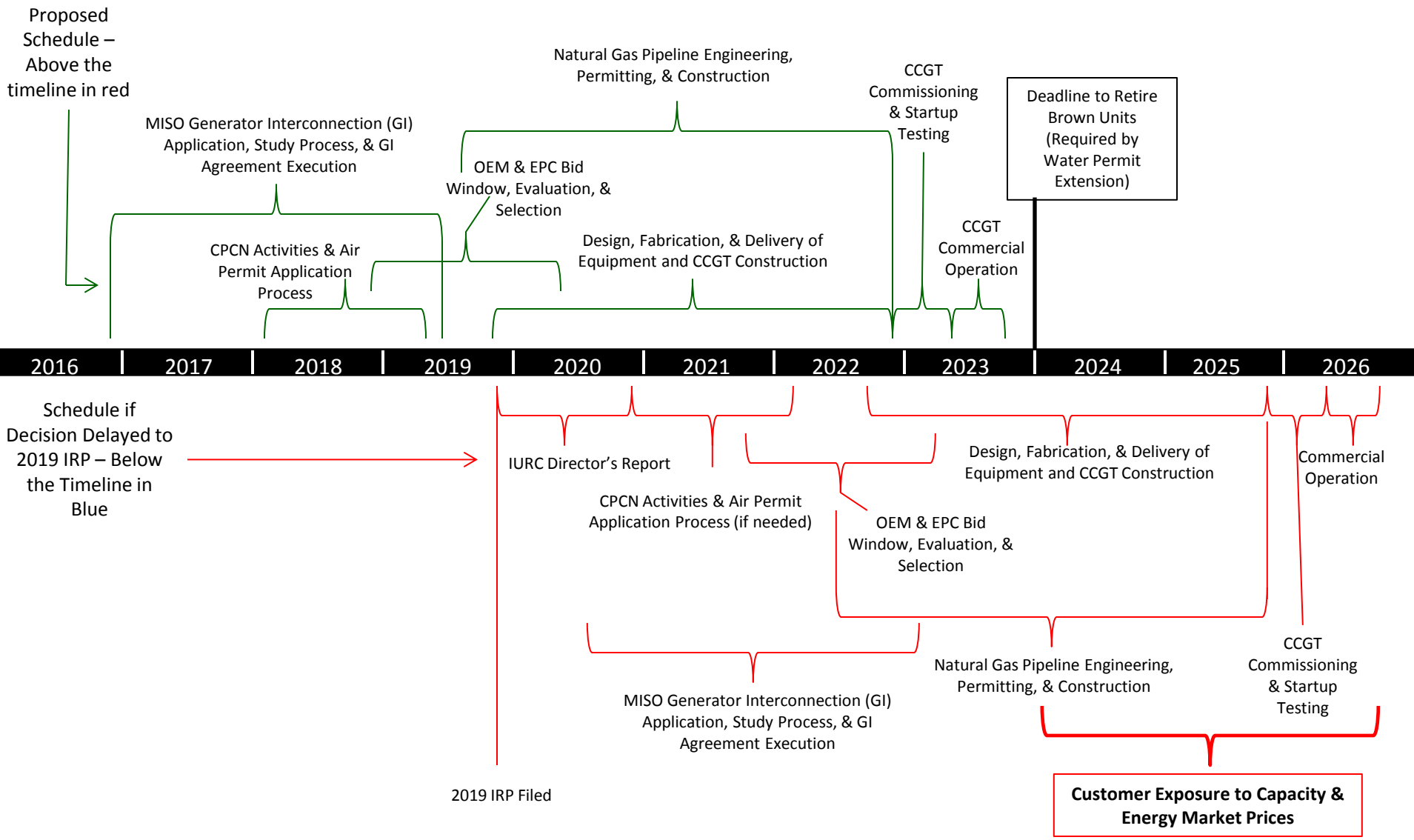
Cause No. 45052

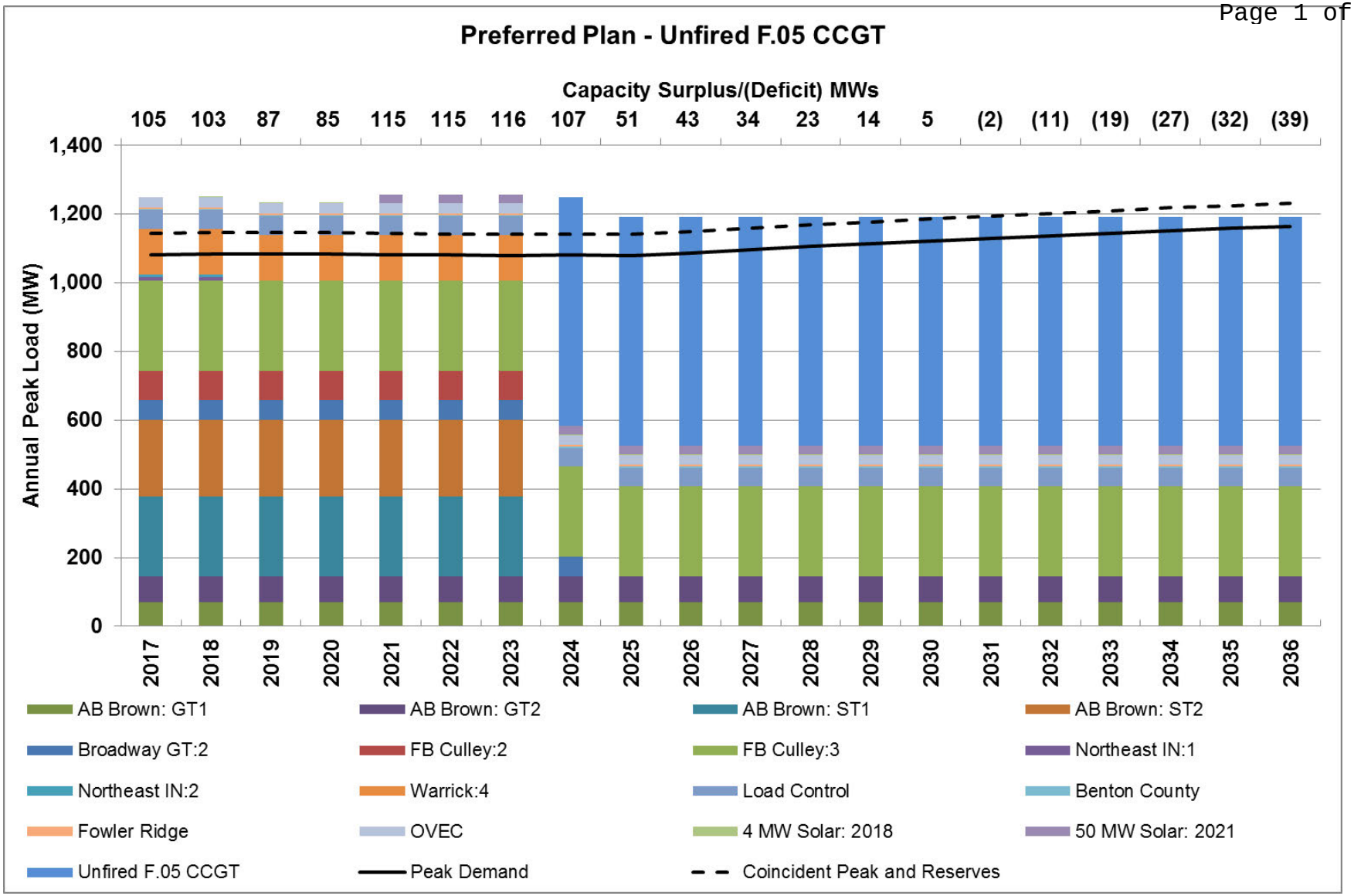





Net Unit Heat Rate & Capacity Factor for MISO Coal Units Converted to Natural Gas - Based on EIA Data
Capacity Factor (%)
NUHR (BTU/kwh
70%
60%
50%
40%
30%
20%
10%
0%
16,000
15,000
14,000
13,000
12,000
11,000
10,000
0 units converted
5 units converted
10 units converted
3 units converted
1 unit converted
Note: Units converted from coal to gas provided by S&P Global (19 units 2013-2018). All 19 units are included in the calculation for each year. 2013 shows data for 19 coal units, 2018 shows data for 19 gas units with 2014-2017 showing a mix of coal and gas units as conversions take place.
2013
2014
2015
2016
2017
Q1 2018
Capacity Factor
NUHR

CCGT Timeline of Activities




Preferred Plan - Unfired F.05 CCGT
Capacity Surplus/(Deficit) MWs
105 103 87 85 115 115 116 107 51 43 34 23 14 5 (2) (11) (19) (27) (32) (39)
Annual Peak Load (MW)
1,400
1,200
1,000
800
600
400
200
0
2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036
AB Brown: GT1
AB Brown: GT2
AB Brown: ST1
AB Brown: ST2
Broadway GT:2
FB Culley:2
FB Culley:3
Northeast IN:1
Northeast IN:2
Warrick:4
Load Control
Benton County
Fowler Ridge
OVEC
4 MW Solar: 2018
50 MW Solar: 2021
Unfired F.05 CCGT
Peak Demand
Coincident Peak and Reserves

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 154
EPA COBRA Schahfer Retirement Analysis

An official website of the United States government.

COBRA Web Edition



CO-Benefits Risk Assessment (COBRA) is a screening tool that enables state, local, and tribal government staff and others interested in the effects of air pollution to estimate the air quality and health benefits of different emissions scenarios.

You are using the web-based version of COBRA. For the COBRA desktop application, visit the COBRA download page.

Step 1: Build Scenario

Complete the sections below and click "Add to Scenario."

A. Select Location REQUIRED

Select the states or counties where the emissions changes will occur.

- Jefferson
- Jennings
- Johnson
- Knox
- Kosciusko
- Lagrange
- Lake
- La Porte
- Lawrence
- Madison

Select All | Deselect All

B. Select Sector REQUIRED

Select the industry or sector where the emissions changes will occur.

Sector

Fuel Combustion: Industrial

Subsector (optional)

All subsectors

Subsector (optional)

All subsectors

C. Modify Emissions REQUIRED

Enter emissions changes for **at least one** of the four pollutants below.

$PM_{2.5}$ (Baseline = 1,409.26 tons)

reduce by | increase by

enter # (•) tons ( ) percent

SO_2 (Baseline = 12,302.81 tons)

reduce by | increase by

enter # (•) tons ( ) percent

NO_x (Baseline = 7,839.23 tons)

reduce by | increase by

enter # (•) tons ( ) percent

VOC (Baseline = 115.38 tons)

reduce by | increase by

enter # (•) tons ( ) percent

NH_3 (Baseline = 35.93 tons)

reduce by | increase by

enter # tons percent

ADD TO SCENARIO

Step 2: Review Scenario

Review the scenario below. To add changes to more locations or sectors, repeat Step 1 to continue building your scenario.

Location(s)	Sector	Emissions Modification(s)	
Jasper, Indiana Porter, Indiana	Fuel Combustion: Industrial	$PM_{2.5}$ reduce by 70 tons SO_2 reduce by 395.04 tons NO_x reduce by 1,351.4 tons	✕

Discount rate:
2%
Custom: enter %

RUN SCENARIO

Step 3: View Results

BUILD NEW SCENARIO

A. Summary of Health Effects Results

Below is a table with the health effects results based on your scenario.

You are viewing results for all contiguous U.S. states. This is because changes in air quality can impact health endpoints in multiple locations due to the transportation of emissions across state and county lines.

Use the filters below to see health effects for a specific state or county.

1. Filter by state:

All contiguous U.S. states

2. Filter by county: (optional)

All counties

Results for: All Contiguous U.S. States

Export: All results | Current filter

Health Endpoint	Pollutant	Change in Incidence (cases, annual)		Monetary Value (dollars, annual)	
		Low	High	Low	High
Mortality *	$PM_{2.5}$ | O_3	9.4	16	$140,000,000	$230,000,000
Nonfatal Heart Attacks	$PM_{2.5}$	3.8	3.8	$320,000	$320,000
Infant Mortality	$PM_{2.5}$	0.049	0.049	$760,000	$760,000
Hospital Admits, All Respiratory	$PM_{2.5}$ | O_3	1	1	$24,000	$24,000
Emergency Room Visits, Respiratory	$PM_{2.5}$ | O_3	12	12	$19,000	$19,000
Asthma Onset	$PM_{2.5}$ | O_3	39	39	$3,000,000	$3,000,000
Asthma Symptoms	$PM_{2.5}$ | O_3	6,400	6,400	$1,500,000	$1,500,000
Emergency Room Visits, Asthma	O_3	0.048	0.048	$40	$40
Lung Cancer Incidence	$PM_{2.5}$	0.38	0.38	$17,000	$17,000
Hospital Admits, Cardio-Cerebro/Peripheral Vascular Disease	$PM_{2.5}$	0.77	0.77	$22,000	$22,000
Hospital Admits, Alzheimers Disease	$PM_{2.5}$	2.7	2.7	$61,000	$61,000

Hospital Admits, Parkinsons Disease	$PM_{2.5}$	0.37	0.37	$8,900	$8,900
Stroke Incidence	$PM_{2.5}$	0.33	0.33	$21,000	$21,000
Hay Fever/Rhinitis Incidence	$PM_{2.5}$ | O_3	250	250	$280,000	$280,000
Cardiac Arrest, Out of Hospital	$PM_{2.5}$	0.078	0.078	$4,800	$4,800
Emergency Room Visits, All Cardiac	$PM_{2.5}$	1.7	1.7	$3,600	$3,600
Minor Restricted Activity Days	$PM_{2.5}$	4,100	4,100	$520,000	$520,000
School Loss Days	O_3	2,400	2,400	$4,000,000	$4,000,000
Work Loss Days	$PM_{2.5}$	690	690	$220,000	$220,000
Total Health Effects from $PM_{2.5}$				**$83,000,000**	**$180,000,000**
Total Health Effects from O_3				**$65,000,000**	**$65,000,000**
Total Health Effects				**$150,000,000**	**$240,000,000**

Note: Dollar amounts shown are based on 2023 currency values. Additionally, all values have been rounded to 2 significant figures. Please export the results in order to see values prior to rounding.

* The Low and High values represent differences in the methods used to estimate some of the health impacts in COBRA. For example, high and low results for avoided premature mortality are based on two different epidemiological studies of the impacts of $PM_{2.5}$ on mortality in the United States.

B. Map of Health Effects and Air Quality Results

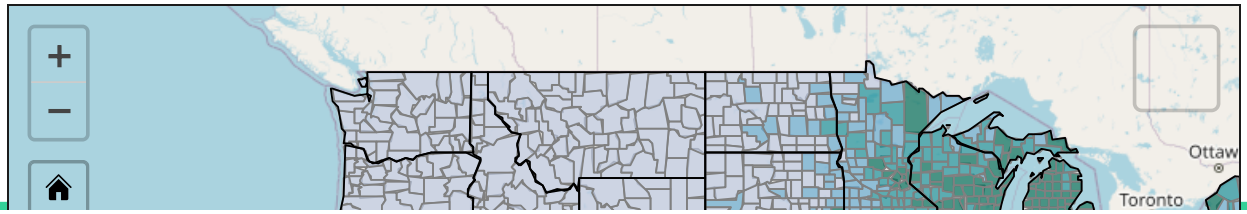
Below is a map showing health effects and air quality data based on your scenario.

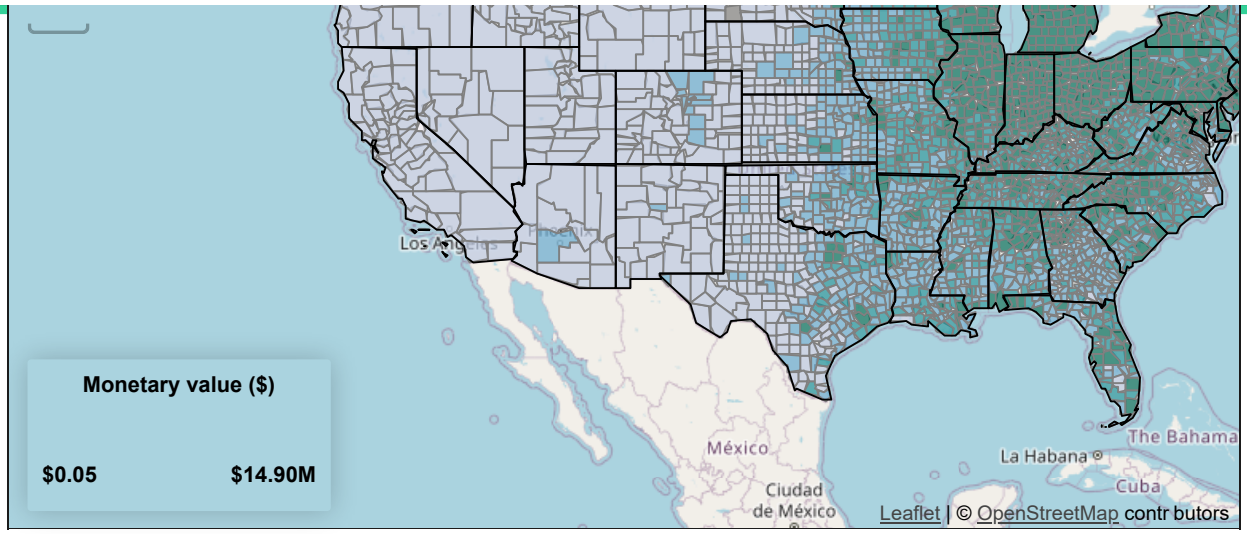
Use the filter below to change the map's data layer. Click on a county on the map to explore the data.

Select the map's data layer:

Total Health Benefits ($, low estimate)

Displaying: Total Health Benefits ($, low estimate)





LAST UPDATED ON APRIL 12, 2021

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 155
EPA COBRA Culley Retirement Analysis

An official website of the United States government.

COBRA Web Edition



CO-Benefits Risk Assessment (COBRA) is a screening tool that enables state, local, and tribal government staff and others interested in the effects of air pollution to estimate the air quality and health benefits of different emissions scenarios.

You are using the web-based version of COBRA. For the COBRA desktop application, visit the COBRA download page.

Step 1: Build Scenario

Complete the sections below and click "Add to Scenario."

A. Select Location REQUIRED

Select the states or counties where the emissions changes will occur.

- [ ] Warren
- [x] Warrick
- [ ] Washington
- [ ] Wayne
- [ ] Wells
- [ ] White
- [ ] Whitley
- [ ] Iowa
- [ ] Kansas

Select All | Deselect All

B. Select Sector REQUIRED

Select the industry or sector where the emissions changes will occur.

Sector

Fuel Combustion: Electric Utility

Subsector (optional)

All subsectors

Subsector (optional)

All subsectors

C. Modify Emissions REQUIRED

Enter emissions changes for **at least one** of the four pollutants below.

$PM_{2.5}$ (Baseline = 2,770.88 tons)

reduce by | increase by

enter # (tons) (percent)

SO_2 (Baseline = 6,509.96 tons)

reduce by | increase by

enter # (tons) (percent)

NO_x (Baseline = 9,745.69 tons)

reduce by | increase by

enter # (tons) (percent)

VOC (Baseline = 282.18 tons)

reduce by | increase by

enter # (tons) (percent)

NH_3 (Baseline = 1.11 tons)

reduce by | increase by

enter # tons percent

ADD TO SCENARIO

Step 2: Review Scenario

Review the scenario below. To add changes to more locations or sectors, repeat Step 1 to continue building your scenario.

Location(s)	Sector	Emissions Modification(s)	
Warrick, Indiana	Fuel Combustion: Electric Utility Coal	$PM_{2.5}$ reduce by 9.2 tons SO_2 reduce by 247.83 tons NO_x reduce by 320.79 tons	✕

Discount rate:
2%
Custom: enter %

RUN SCENARIO

Step 3: View Results

BUILD NEW SCENARIO

A. Summary of Health Effects Results

Below is a table with the health effects results based on your scenario.

You are viewing results for all contiguous U.S. states. This is because changes in air quality can impact health endpoints in multiple locations due to the transportation of emissions across state and county lines.

Use the filters below to see health effects for a specific state or county.

1. Filter by state:

All contiguous U.S. states

2. Filter by county: (optional)

All counties

Results for: All Contiguous U.S. States

Export: All results | Current filter

Health Endpoint	Pollutant	Change in Incidence (cases, annual)		Monetary Value (dollars, annual)	
		Low	High	Low	High
Mortality *	$PM_{2.5}$ | O_3	2.5	3.9	$36,000,000	$58,000,000
Nonfatal Heart Attacks	$PM_{2.5}$	0.92	0.92	$78,000	$78,000
Infant Mortality	$PM_{2.5}$	0.011	0.011	$170,000	$170,000
Hospital Admits, All Respiratory	$PM_{2.5}$ | O_3	0.28	0.28	$6,400	$6,400
Emergency Room Visits, Respiratory	$PM_{2.5}$ | O_3	3.3	3.3	$5,300	$5,300
Asthma Onset	$PM_{2.5}$ | O_3	10	10	$790,000	$790,000
Asthma Symptoms	$PM_{2.5}$ | O_3	1,700	1,700	$430,000	$430,000
Emergency Room Visits, Asthma	O_3	0.014	0.014	$12	$12
Lung Cancer Incidence	$PM_{2.5}$	0.083	0.083	$3,700	$3,700
Hospital Admits, Cardio-Cerebro/Peripheral Vascular Disease	$PM_{2.5}$	0.17	0.17	$4,900	$4,900
Hospital Admits, Alzheimers Disease	$PM_{2.5}$	0.67	0.67	$15,000	$15,000

Hospital Admits, Parkinsons Disease	$PM_{2.5}$	0.078	0.078	$1,900	$1,900
Stroke Incidence	$PM_{2.5}$	0.072	0.072	$4,500	$4,500
Hay Fever/Rhinitis Incidence	$PM_{2.5}$ | O_3	66	66	$74,000	$74,000
Cardiac Arrest, Out of Hospital	$PM_{2.5}$	0.017	0.017	$1,000	$1,000
Emergency Room Visits, All Cardiac	$PM_{2.5}$	0.38	0.38	$820	$820
Minor Restricted Activity Days	$PM_{2.5}$	890	890	$110,000	$110,000
School Loss Days	O_3	690	690	$1,200,000	$1,200,000
Work Loss Days	$PM_{2.5}$	150	150	$47,000	$47,000
Total Health Effects from $PM_{2.5}$				**$19,000,000**	**$40,000,000**
Total Health Effects from O_3				**$20,000,000**	**$20,000,000**
Total Health Effects				**$39,000,000**	**$60,000,000**

Note: Dollar amounts shown are based on 2023 currency values. Additionally, all values have been rounded to 2 significant figures. Please export the results in order to see values prior to rounding.

* The Low and High values represent differences in the methods used to estimate some of the health impacts in COBRA. For example, high and low results for avoided premature mortality are based on two different epidemiological studies of the impacts of $PM_{2.5}$ on mortality in the United States.

B. Map of Health Effects and Air Quality Results

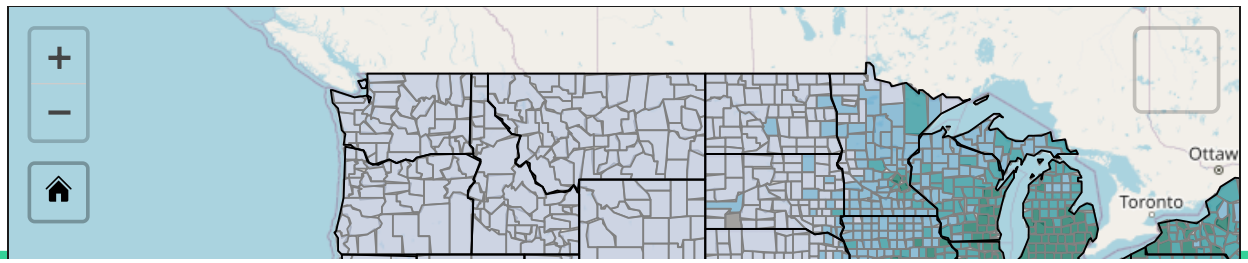
Below is a map showing health effects and air quality data based on your scenario.

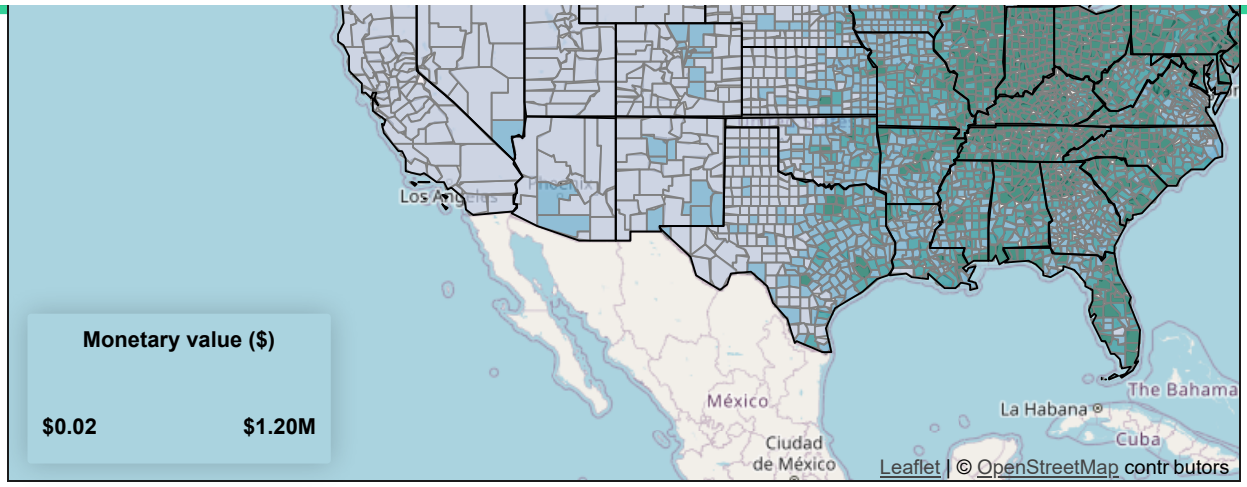
Use the filter below to change the map's data layer. Click on a county on the map to explore the data.

Select the map's data layer:

Total Health Benefits ($, low estimate)

Displaying: Total Health Benefits ($, low estimate)





LAST UPDATED ON APRIL 12, 2021

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 156
CenterPoint Cost Allocation Complaint

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Southern Indiana Gas and Electric Company	)	
	)	Docket No. EL26-___-000
v.	)	
	)	
Midcontinent Independent System Operator, Inc.	)	

COMPLAINT REQUESTING FAST TRACK PROCESSING

Southern Indiana Gas and Electric Company d/b/a CenterPoint Energy Indiana South ("SIGE" or "Company") files this complaint ("Complaint") and request for Fast Track processing against Midcontinent Independent System Operator, Inc. ("MISO"), pursuant to sections 202(c), 306, and 309 of the Federal Power Act ("FPA"),[1] and Rule 206 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission ("FERC" or "Commission").[2] SIGE is the operating utility subsidiary of CenterPoint Energy, Inc. ("CenterPoint") and owns and operates Unit 2 of the F.B. Culley Generating Station, the subject of a recent Department of Energy ("DOE") order under FPA Section 202(c).[3]

On December 23, 2025, the U.S. Secretary of Energy issued an order pursuant to FPA section 202(c) and section 301(b) of the Department of Energy Organization Act ("DOE Organization Act")[4] declaring that "an emergency exists in portions of the Midwest region of the United States due to a shortage of electric energy, a shortage of facilities for the generation of

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1 16 U.S.C. §§ 824a(c), 825e, 825h.

2 18 C.F.R. § 385.206 (2025).

3 16 U.S.C. § 824a(c). F.B. Culley Generating Station ("Culley Plant") is an electric generating facility in Warrick County, Indiana. Culley Plant is owned and operated by SIGE and consists of two coal-fired generation units, Unit 2 ("Culley Unit 2") and Unit 3 ("Culley Unit 3"), with a combined name plate capacity of 368.9 MW. Culley Unit 2 is the focus of the recent DOE Order, which CenterPoint's operating subsidiary, SIGE, owns and is responsible for operating.

4 42 U.S.C. § 7151(b).

electric energy, and other causes."[5] On that basis, the DOE Order directs both the Company and MISO to "take all measures necessary to ensure" that Culley Unit 2, which had been scheduled to cease operations on December 31, 2025, continues to operate.[6] SIGE has complied with its obligations under the DOE Order since it was issued, and Culley Unit 2—while currently in a maintenance outage—is being prepared to be offered into the MISO market and to produce energy when dispatched.

The DOE Order makes clear that "[r]ate recovery is available pursuant to [FPA section 202(c)]," and further directs the Company to "file with the Federal Energy Regulatory Commission Tariff revisions or waivers to effectuate this order."[7] This Complaint is being filed in furtherance of that directive and to ensure that there is a mechanism for SIGE to obtain such rate recovery as is available pursuant to FPA section 202(c) at the appropriate time in the future, likely after the DOE Order expires.[8]

To be clear, ***the specific costs, if any, to be recovered by the Company are not at issue in this Complaint***. Rather, as in the Consumers Energy complaint proceeding, the Company plans

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5 U.S. Department of Energy, Order No. 202-25-13, at 1 (Dec. 23, 2025) (DOE Order) https://www.energy.gov/documents/order-number-202-25-13-culley.

6 *Id.* at 5.

7 *Id.* at Ordering Paragraph E.

8 This Complaint follows a similar complaint filed by Consumers Energy Company after that company was required by the DOE, pursuant to FPA section 202(c), to continue operating a generation facility in MISO. In Docket No. EL25-90-000, Consumers Energy filed a complaint requesting that the Commission order MISO to revise its Tariff to adopt a mechanism to allow the company to recover its costs of compliance with the relevant 202(c) order and to allocate such costs to load serving entities in MISO Zones 1 through 7. The Commission granted the Consumers Energy complaint and recently denied rehearing. *Consumers Energy Co. v. Midcontinent Indep. Sys. Operator, Inc.*, 192 FERC ¶ 61,158 (Consumers Complaint Order); *order on reh'g*, 193 FERC ¶ 61,228 (2025) (Consumers Rehearing Order). In the Consumers Complaint Order, the Commission directed MISO to make a compliance filing to adopt the cost recovery schedule proposed by Consumers Energy, with slight modifications. *See* MISO, Compliance to Consumers Energy Company Complaint, Docket No. ER25-3425-000 (filed Sept. 15, 2025) (pending).

to make a separate section 202(c) cost recovery filing at some point after the expiration of the DOE Order (which currently covers the time period through March 23, 2026).[9] In that separate, future filing, SIGE will present, explain, and support what it believes are its just and reasonable costs associated with running Culley Unit 2 from the date of the DOE Order through March 23, 2026, or as such time may be extended by subsequent order of the Secretary, netting out applicable market revenues ("Order Costs").[10] Thus, the determination of recoverable costs will be the subject of a separate FERC proceeding under section 202(c). The instant Complaint is limited to ensuring that MISO has the requisite Tariff-based *mechanism* to effectuate the Company's cost recovery—which is the same relief that the Commission recently granted to a similarly situated utility in *Consumers Energy*.[11]

Both SIGE and MISO agree that (1) the existing MISO Open Access Transmission, Energy and Operating Reserve Markets Tariff ("Tariff") does not include a mechanism for the Company to recover costs associated with complying with the DOE Order; and (2) MISO lacks Tariff authority to unilaterally offer the Company a section 202(c) rate agreement. Accordingly, SIGE requests that the Commission exercise its authority pursuant to FPA sections 202(c) and 309 to order MISO to adopt a Tariff revision to provide a cost recovery and allocation mechanism for the

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[9] Understanding that the DOE may issue a subsequent order, or subsequent orders, extending the Company's obligation to keep Culley Unit 2 available, the Company reserves the right to determine at a later date whether it will seek cost recovery on a seriatum basis, corresponding to the duration of a given order, or for a longer period, covering more than one order.

[10] *See* Consumers Complaint Order, 192 FERC ¶ 61,158 at P 42 ("While this order approves the cost allocation methodology in the Proposed Tariff Provision, it does not approve recovery of actual costs…Consumers must petition the Commission in a separate proceeding at a later date for approval to recover specific DOE Order Costs before ratepayers can be charged for such costs.") For the avoidance of doubt, consistent with Section 202(c)'s cost recovery language, the Company reserves all rights to make a demonstration of its just and reasonable Order Costs (net of market revenues) in a subsequent Section 202(c) filing discussed herein.

[11] *See id.* P 42; *see also* Consumers Rehearing Order, 193 FERC ¶ 61,228 at P 37.

Company's Order Costs in the form set forth in Attachment A hereto ("Cost Recovery Mechanism").[12] SIGE requests that the proposed MISO Tariff revision, implementing the Cost Recovery Mechanism, be effective as of the issuance of the DOE Order on December 23, 2025, or such other date as the Commission determines will still permit recovery of the Company's Order Costs back to the referenced date of the DOE Order.[13]

I. EXECUTIVE SUMMARY

Pursuant to the DOE Organization Act, the authority under section 202(c) to "determine[] that an emergency exists by reason of a sudden increase in the demand for electric energy, or a shortage of electric energy or of facilities for the generation or transmission of electric energy, or of fuel or water for generating facilities, or other causes" is vested in the Secretary of Energy. That section's authority to "order such temporary connections of facilities and such generation, delivery, interchange, or transmission of electric energy as in its judgment will best meet the emergency and serve the public interest" is similarly vested in the Secretary. The Commission's role under this particular statutory framework is limited to cost recovery.[14]

As detailed below, Culley Unit 2 is a roughly 103.7 MW coal-fired generating station that had been scheduled to cease operations as of December 31, 2025. As soon as the DOE Order was

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[12] The Cost Recovery Mechanism SIGE is proposing materially tracks the one proposed by Consumers Energy in Docket EL25-90-000.

[13] The Company believes that FPA sections 202(c) and 309 provide ample authority for the Commission to grant the relief requested herein. Indeed, in *Consumers Energy*, the Commission relied solely on FPA section 202(c) to grant the requested relief. However, in an abundance of caution, if the Commission finds it must invoke its FPA section 206 authority to grant the relief requested herein, SIGE moves for relief under Section 206 in the alternative. *See infra* Section V. Under section 206, the Commission could make the requested Tariff revision effective as of the date of this Complaint.

[14] *See* Consumers Rehearing Order, 193 FERC ¶ 61,228 at P 31. ("Under the DOE Organization Act, the determination of the need for operation of the Campell Plant rests solely with DOE; the Commission's responsibility is to provide 'for compensation or reimbursement' of the costs of operation.") (citations omitted).

issued, SIGE began incurring and will continue to incur costs to comply with the DOE Order's directive to "take all measures necessary to ensure that the Culley Unit 2 is available to operate" for the duration of the DOE Order.[15] The precise Order Costs will not be known until after the DOE Order expires on March 23, 2026. Thereafter, SIGE will make a separate request to the Commission under section 202(c) for the "compensation or reimbursement" of its Order Costs once known, net of market revenues, as provided by the statute.[16]

The more immediate issue is that the MISO Tariff currently does not contain a mechanism for SIGE to recover the costs being incurred as a result of the DOE Order—nor does it contain a mechanism to allocate such costs to reflect the nature of the emergency declared pursuant to section 202(c). This Complaint, therefore, asks the Commission to order MISO to revise its Tariff to provide for allocation of the Company's (later-to-be-determined) Order Costs, net of market revenues. This relief is necessary and appropriate for several reasons. For its part, SIGE has no contractual privity or Tariff authority to allocate costs directly to MISO customers. Ordering Paragraph E of the DOE Order instructs SIGE to "file with the Federal Energy Regulatory Commission Tariff revisions or waivers necessary to effectuate this order" and the same paragraph makes clear that "[r]ate recovery is available pursuant to 16 U.S.C. § 824a(c)."[17] Further, DOE sent "carbon copies" of the DOE Order to each sitting FERC Commissioner.[18]

The Commission's duties and authority to address this Complaint and issue the requested relief are found in sections 202(c), 306, and 309 of the FPA. Importantly, cost recovery under

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15 SIGE notes that Culley Unit 2 is currently in a maintenance outage but is preparing Culley Unit 2 to be offered into the MISO market and to produce energy when dispatched.

16 *See supra* note 9.

17 DOE Order, at Ordering Paragraph E.

18 *Id.*

section 202(c) does not invoke the normal ratemaking strictures of FPA sections 205 or 206. Section 202(c) provides independent authority to empower the Commission to "prescribe by supplemental order such terms as it finds to be just and reasonable, including the compensation or reimbursement which should be paid to or by any such party."[19] And, to the extent necessary, FPA section 309 supplements the Commission's authority to take action to implement its section 202(c) responsibilities. Specifically, FPA section 309 grants the Commission "power to perform any and all acts, and to prescribe, issue, make, and rescind such orders, rules, and regulations as it may find necessary or appropriate to carry out the provisions of this chapter."[20] To effectuate the Company's right to recover the costs of complying with the DOE Order, the MISO Tariff must be amended to create a recovery mechanism. In the absence of an agreement between the parties affected by a 202(c) order, the Commission has the responsibility for determining cost recovery and allocation. As noted above, the actual costs, if any, SIGE seeks to recover will be the subject of a separate filing with the Commission. However, at this juncture, FPA section 309 authorizes the Commission to take measures to ensure its ability "to carry out" its role, pursuant to section 202(c), by requiring adoption of the Cost Recovery Mechanism.

Finally, the relief requested herein meets the "just and reasonable" standard of section 202(c)(1). In addition to providing MISO the authority to implement a mechanism for cost recovery, SIGE asks the Commission to order MISO to adopt specific Tariff provisions to allocate its Order Costs (net of market revenues) proportionally to load in MISO Zones 1 through 7 – referred to in the DOE Order as the northern and central regions of MISO.[21] This proposed cost

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19 16 U.S.C. §824a(c)(1).

20 16 U.S.C. § 825h.

21 DOE Order at 2.

allocation is just and reasonable because, as the Commission found in *Consumers Energy*, under section 202(c), costs should be allocated based on the scope and nature of the emergency that prompted issuance of the order in question.[22] Further, the DOE Order's emergency declaration is substantially based on concerns about resource adequacy in MISO generally, and the northern and central regions in particular.[23] In other words, the beneficiaries for cost allocation purposes are best determined by reference to the Secretary's definition of the emergency. Under such a regional allocation, Indiana load will of course pay its fair share of SIGE's Order Costs (net of market revenues) because, as the DOE Order points out, MISO Zones 1 through 7 (*i.e.*, the northern and central zones) include Indiana.[24] But SIGE believes that, whatever the Order Costs turn out to be after netting market revenues, they should be allocated regionally rather than only to the State of Indiana. SIGE customers are already paying for the cost to fulfill the capacity needs of Zone 6.

In sum, the Commission's duties and authority to address this cost allocation are clear. SIGE respectfully requests that the Commission set a 10-day comment period on this Complaint, and issue an order at the earliest opportunity directing MISO to adopt the proposed Cost Recovery Mechanism in the form set forth in Attachment A.

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[22] Consumers Complaint Order, 192 FERC ¶ 61,158 at P 39.

[23] Because the DOE Order cites the "northern and central zones," SIGE believes the best read of the DOE Order is that the emergency identified exists in Zones 1 through 7 and would not reach "MISO South." DOE Order, at 2. In *Consumers Energy* the Commission found that it was reasonable to interpret the DOE Order's reliance on MISO statements in the Planning Resource Auction Results for Planning Year 2025-2026, which highlighted that new resources "were insufficient to offset the negative impacts of decreased accreditation, suspension/retirements and external resources" in the MISO North and MISO Central regions, as indicating concerns were the primary driver for the emergency order. Consumers Complaint Order, 192 FERC ¶ 61,158 at P 40. In the Consumers Rehearing Order, the Commission acknowledged that the emergency order in question referenced shortfalls and concerns *outside* of MISO's Local Resources Zones 1 through 7 but continued to rely on the Commission's original finding that the intended scope of the emergency in the DOE's order was focused on Local Resource Zones 1 through 7. Consumers Rehearing Order, 193 FERC ¶ 61,228 at P 38.

[24] DOE Order at 2.

II. BACKGROUND

A. The Parties

1. Southern Indiana Gas and Electric Company d/b/a CenterPoint Energy Indiana South

SIGE is a wholly owned indirect subsidiary of CenterPoint that operates both an electric utility division and a gas utility division in Indiana. SIGE's electric utility division is a vertically integrated public utility serving electric wholesale and retail customers in seven counties in southwest Indiana. The electric utility division owns generation, transmission, and distribution facilities and serves approximately 153,400 retail customers. SIGE's gas utility division transports and distributes gas in southwestern Indiana and has gas storage in its service territory that it uses to serve its approximately 115,990 retail customers, all subject to Indiana regulation.[25] SIGE is a member of MISO, the Reliability First Corporation, and the North American Electric Reliability Corporation ("NERC").

2. MISO

MISO is an Independent System Operator and Regional Transmission Organization and is authorized by the Commission to provide open access transmission service and to administer wholesale energy, capacity, and ancillary services markets in portions of the Midwest region of the United States, as well as certain other regions. MISO also administers the MISO Tariff, which governs such markets. MISO includes ten separate zones. MISO's northern and central regions are Zones 1 through 7.

[25] SIGE's gas utility division is exempt from Natural Gas Act (the "NGA") regulation under the NGA's §1(c) Hinshaw provision.

B. Factual Background

1. The Culley Plant

The Culley Plant is a coal-fired electric generation plant located in Warrick County, Indiana, with a nameplate capacity of approximately 368.9 MW. The Culley Plant consists of two units, both of which are wholly owned and operated by SIGE:

- Culley Unit 2 commenced commercial operations in 1966 and has a nameplate capacity of 103.7 MW; and
- Culley Unit 3 commenced commercial operations in 1973 and has a nameplate capacity of approximately 265.2 MW.

Culley Unit 2 is the Company's oldest, smallest, and least efficient coal unit and given that the unit has long been slated for retirement, minimal capital investment has been made in the last decade. Culley Unit 2's non-reheat turbine design makes the unit inherently less efficient than Culley Unit 3, resulting in higher dispatch costs. As a result, the Culley Unit 2 operates infrequently within the MISO market, with an annual capacity factor of roughly 25%. MISO reviewed the Company's suspension request for Culley Unit 2 and found no reliability criteria violations. Additionally, the Independent Market Monitor ("IMM") confirmed that the suspension request complies with market rules and supports efficient, least-cost regional planning.

Every three years, SIGE prepares, and submits, an Integrated Resource Plan ("IRP") to the Indiana Utility Regulatory Commission ("IURC"). Each IRP evaluates the costs of continuing to operate certain existing, but aging, generation resources compared to the costs of retiring and replacing the generation with different resources. The retirement analysis in three of SIGE's last four IRPs – specifically, its 2016, 2019/2020 and 2023 IRPs[26] – concluded that SIGE could not

[26] SIGE's 2016 IRP submitted to the IURC (Cause No. 44890) on December 19, 2016 (SIGECO 2016 IRP. (n.d.). Indiana Utility Regulatory Commission. *https://www.in.gov/iurc/files/SIGECO-2016-IRP.pdf*, *See* Executive Summary, Section VI. The Preferred Portfolio and Executive Summary, Section VII. Next

continue to operate Culley Unit 2 beyond October 2023 without making some investment, or beyond December 2025 without making significant investment, to bring the facility into compliance with then applicable environmental standards. Based on that analysis, SIGE concluded its customers would pay lower costs over the next two decades by retiring Culley Unit 2 and investing in other generation resources. Consequently, Culley Unit 2 was scheduled to cease operations at the end of calendar year 2023; but later extended to December 31, 2025 because it was determined, at the time, to be a lower cost option for its customers. On November 26, 2024, SIGE timely submitted an Attachment Y Notice to MISO to suspend operation of Culley Unit 2 effective December 31, 2025; MISO approved the request on June 3, 2025, after performing its reliability analysis. Pursuant to commitments SIGE made in an IURC approved settlement agreement in Cause No. 45990 (IURC 2/3/2025, as modified on rehearing dated 3/19/2025), SIGE had Culley Unit 2 scheduled to cease operations and be retired from its utility records on December 31, 2025.

2. The DOE Order

The DOE Order states that MISO's "year-round resource adequacy concerns are well documented" and "that an emergency exists in portions of the Midwest region of the United States due to a shortage of electric energy, a shortage of facilities for the generation of electric energy,

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Steps); SIGE's 2019/2020 IRP submitted to the IURC (Cause No. 45397) on June 29, 2020 (2019–2020 Vectren IRP Volume 1 of 2. (n.d.). Indiana Utility Regulatory Commission. *2019-2020-Vectren-IRP-Volume-1-of-2.pdf*, See Executive Summary, Section VI. The Preferred Portfolio); SIGE's 2023 IRP submitted to the IURC (Cause No. 45897) on May 26, 2023 (2022–2023 CNP IRP Volume 1 of 2 (Redacted). (n.d.). Indiana Utility Regulatory Commission. *2022-2023-CNP-IRP-Volume-1-of-2-Redacted.pdf*, *See Executive Summary*, Section VI. The Preferred Portfolio); and SIGE's 2025 IRP submitted to the IURC (Cause No. 46333 on December 5, 2025 (CEIS 2025 IRP Volume 1 of 2. (n.d.). Indiana Utility Regulatory Commission. *https://www.in.gov/iurc/files/CEIS_2025_IRP_Volume_1_of_2.pdf*, See Executive Summary, Preferred Portfolio).

and other causes."[27] The DOE Order determined that the "continued additional dispatch of Culley Unit 2 is necessary to best meet the emergency arising from increased demand, determined shortage, and other causes, and serve the public interest."[28] The DOE Order also points out that "MISO's Planning Resource Auction Results for Planning Year 2025-26, released in April 2025, note that for the northern and central zones, which includes Indiana, 'new capacity additions were insufficient to offset the negative impacts of decreased accreditation, suspensions/retirements and external resources.'"[29]

Based on the foregoing determination, the DOE Order directs the Company and MISO to "take all measures necessary to ensure that Culley Unit 2 is available to operate" until the DOE Order's expiration on March 23, 2026.[30] The DOE Order explains that "[r]ate recovery is available pursuant to 16 U.S.C. § 824a(c)" and directs the Company "to file with the Federal Energy Regulatory Commission Tariff revisions or waivers necessary to effectuate" the DOE Order.[31] The DOE Order also directs MISO, among other things, to "take every step to employ economic dispatch of the Culley Unit 2 to minimize cost to ratepayers"[32] and "provide the Department of

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27 DOE Order at 1.

28 *Id.* at 5.

29 *Id.* at 2 (citation omitted). The language from the DOE Order is virtually identical to the language in the relevant emergency order directed at Consumers Energy. *See* U.S. Dep't of Energy, May 30, 2025 Emergency Order No. 202-25-3, at 2 (May 30, 2025) https://www.energy.gov/sites/default/files/2025-05/Midcontinent%20Independent%20System%20Operator%20%28MISO%29%20202%28c%29%20Order_1.pdf. Therefore, the Company assumes that the DOE Order is focused on the same geographic location as was at issue in *Consumers Energy*, i.e., MISO Local Resource Zones 1 through 7.

30 DOE Order at Ordering Paragraph A.

31 *Id.* at Ordering Paragraph E.

32 *Id.* at Ordering Paragraph A.

Energy . . . with information concerning the measures it has taken and is planning to take to ensure the operational availability and economic dispatch of Culley Unit 2 consistent with this order."[33]

3. Company Actions to Comply with the DOE Order

Upon receiving the DOE Order, SIGE has undertaken significant efforts to comply with its directives, including ensuring adequate fuel supply, reviewing and planning related to ongoing operations and maintenance and capital investments, and numerous other undertakings.

In accordance with the DOE 202(c) Order, SIGE is entitled to cost recovery of the costs associated with SIGE's efforts to comply with the order.[34] SIGE has coordinated with MISO to facilitate the attached proposed Schedule {XYZ} (Attachment A), which provides for SIGE to submit a FPA Section 202(c) filing at the Commission to recover all costs to comply with the DOE 202(c) Order. The Company intends to establish a regulatory asset to account for all costs of running Culley Unit 2 from the date the DOE Order was issued and will seek recovery of such costs in a future filing. The Cost Recovery Mechanism being requested herein will be the Tariff mechanism for the recovery of Order Costs, subject to Commission approval.

C. Overview of FPA Section 202 and DOE's Implementing Regulations

FPA section 202(c) was established by the Public Utility Act of 1935 and originally provided the emergency authority to the Federal Power Commission.[35] In 1977, the DOE Organization Act transferred the authority to determine the existence of an emergency to the Secretary of the Energy.[36]

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33 *Id.* at Ordering Paragraph D.

34 *Id.* at Ordering Paragraph E.

35 *See* Public Utility Holding Company Act of 1935, Pub. L. No. 74-333, pt. II at 849 (1935) (codified at 16 U.S.C. § 824a(c)).

36 *See* Department of Energy Organization Act, Pub. L. No. 95-91, tit. III, 91 Stat. 577-78 (1977) (codified at 42 U.S.C. § 7151). As a result, the word "Commission" refers to the Secretary of Energy for purposes of determining the emergency and ordering the emergency generation.

Section 202(c) of the FPA provides, in relevant part, as follows:

> During the continuance of any war in which the United States is engaged, or whenever the Commission determines that an emergency exists by reason of a sudden increase in the demand for electric energy, or a shortage of electric energy or of facilities for the generation or transmission of electric energy, or of fuel or water for generating facilities, or other causes, the Commission shall have authority, either upon its own motion or upon complaint, with or without notice, hearing, or report, to require by order such temporary connections of facilities and such generation, delivery, interchange, or transmission of electric energy as in its judgment will best meet the emergency and serve the public interest. *If the parties affected by such order fail to agree upon the terms of any arrangement between them in carrying out such order, the Commission, after hearing held either before or after such order takes effect, may prescribe by supplemental order such terms as it finds to be just and reasonable, including the compensation or reimbursement which should be paid to or by any such party*.

16 U.S.C. 824a(c)(1) (emphasis added).

In 1981, the DOE promulgated a rule to implement the rate aspects of FPA section 202(c). That rule provides, in relevant part:

> In the event that the DOE determines that an emergency exists under [FPA] section 202(c), and the "entities" are unable to agree on the rates to be charged, *the DOE shall* prescribe the conditions of service and *refer the rate issues to the Federal Energy Regulatory Commission for determination by that agency in accordance with its standards and procedures*.

10 C.F.R. § 205.376 (emphasis added) ("DOE Referral Regulation").

III. RELIEF REQUESTED

SIGE requests that the Commission direct MISO to revise the MISO Tariff to include a Cost Recovery Mechanism in the form included herewith as Attachment A in such manner as to provide recovery of SIGE's Order Costs dating back to the issuance of the DOE Order.

IV. ARGUMENT

A. The Company Has a Right to Recover Costs Associated with the DOE Order, and Such Costs Can Be Determined After-the-Fact

FPA section 202(c) confers the right to recover costs associated with an order issued pursuant to its emergency authority. When the parties affected cannot agree on such costs, the statute charges the Commission with the responsibility to determine them.[37] Importantly, FERC's rate determinations pursuant to section 202(c) can occur after a section 202(c) order terminates, and after the conclusion of the compelled generation or provision of jurisdictional service.

1. Parties Subject to a Section 202(c) Order Are Entitled to Recover Associated Costs, Subject to Commission Approval

There can be no question that SIGE has a right to recover its Order Costs, net of market revenues. This is confirmed by the plain language of FPA section 202(c), the DOE Referral Regulation, and the DOE Order, itself:

- FPA section 202(c): If the parties affected by such order fail to agree upon the terms of any arrangement between them in carrying out such order, the Commission, after hearing held either before or after such order takes effect, may prescribe by supplemental order such terms as it finds to be just and reasonable, *including the compensation or reimbursement* which should be paid to or by any such party.[38]
- DOE Referral Regulation: In the event that the DOE determines that an emergency exists under [FPA] section 202(c), and the "entities" are unable to agree on the rates to be charged, *the DOE shall* prescribe the conditions of service and *refer the rate*

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37 *See* Consumers Rehearing Order, 193 FERC ¶ 61,228 at P 37.

38 16 U.S.C. § 824a(c)(1) (emphasis added).

issues to the Federal Energy Regulatory Commission for determination by that agency in accordance with its standards and procedures.[39]

- DOE Order: "Rate recovery is available pursuant to [FPA section 202(c)]."[40]

Indeed, recovery of Order Costs is mandated by the U.S. Constitution. Specifically, the Fifth Amendment Takings Clause bars the federal government from taking private property for public use without just compensation.[41] For the avoidance of doubt, SIGE only seeks to recover its Order Costs *net of market revenues* earned from Culley Unit 2's operation.

2. Pursuant to the Commission's Section 202(c) Rate Authority, Costs Can Be Determined and Recovered *After* the Emergency Generation or Provision of Jurisdictional Service Without Violating the Filed Rate Doctrine

As described below, both the plain language of section 202(c) and prior Commission precedent demonstrate that appropriate compensation can be determined and recovered after the term of an order declaring an emergency and/or requiring provision of jurisdictional service and costs have begun to be incurred. Moreover, the prior notice requirements and related filed rate doctrine and rule against retroactive ratemaking pursuant to FPA sections 205 and 206 do not apply in the context of determining compensation pursuant to FPA section 202(c), which provides independent ratemaking authority and includes its own "just and reasonable" standard.

First, section 202(c)'s plain language: After an emergency section 202(c) order "takes effect," the statute expressly contemplates "supplemental" orders regarding "compensation or

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39 10 C.F.R. § 205.376 (emphasis added).

40 DOE Order at Ordering Paragraph E.

41 U.S. CONST. AMEND. V ("[N]or shall private property by taken for use, without just compensation."); *see, e.g.*, *Duquesne Light Co. v. Barasch*, 488 U.S. 299, 308 (1989) ("If the rate does not afford sufficient compensation, the State has taken the use of utility property without paying just compensation . . . .").

reimbursement."[42] The use of the word "reimbursement" indicates an after-the-fact approach. Together, this language demonstrates that, unlike FPA section 205 (which requires prior notice and approval of rates), or section 206 (which allows only prospective fixing of rates or charges by the Commission), the Commission's rate authority under section 202(c) is broader, and not constrained in the same ways that it is under sections 205 and 206.

Second, Commission precedent: SIGE's proposed Cost Recovery Mechanism is consistent with the Schedule that the Commission ordered MISO to file for Consumers Energy in Docket Nos. EL25-90-000 and AD25-14-000.[43] Indeed, *Consumers Energy* confirms the retrospective nature of cost recovery through a subsequent filing to be made "at a later date for approval to recover specific DOE Order Costs."[44]

Third, the inapplicability of constraints on the Commission's ratemaking authority pursuant to FPA sections 205 and 206: The Commission's core responsibility of ensuring just and reasonable rates for jurisdictional sales and services is typically carried out pursuant to FPA sections 205 and 206 – and it is subject to certain well-established doctrines that arise directly from the statutory language of those two FPA provisions.

Section 205 of the FPA requires public utilities to file with the Commission any rates and charges that are subject to the Commission's jurisdiction, with the required prior notice, and it requires the Commission to ensure the justness and reasonableness of such rates.[45] A public utility

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[42] 16 U.S.C. § 824a(c).

[43] Consumers Complaint Order, 192 FERC ¶ 61,158 at P 35; *see also U.S. Dept. of Energy*, 107 FERC ¶ 61,258 (2004).

[44] Consumers Complaint Order, 192 FERC ¶ 61,158 at P 42. *See also U.S. Dept. of Energy*, 101 FERC ¶ 61,389 (2002); *U.S. Dept. of Energy*, 107 FERC ¶ 61,258.

[45] 16 U.S.C. § 824d(c).

is only authorized to charge the rate on file with the Commission, and changes to such rates must be prospective.[46]

Section 206 of the FPA empowers the Commission, upon its own motion or in response to a complaint, to address existing rates that may have become unjust or unreasonable.[47] If FERC makes such a determination, it has the authority to determine the "just and reasonable rate, charge, classification, rule, regulation, practice or contract to be thereafter observed" – but this authority is prospective.

These statutory provisions "mandating the open and transparent filing of rates and broadly proscribing their retroactive adjustment are known collectively as the 'filed rate doctrine.'"[48] The filed rate doctrine prevents "'a regulated seller of [power] . . . from collecting a rate other than the one filed with the Commission,' and 'the Commission itself' cannot retroactively 'impos[e] a rate increase for [power] already sold.'"[49] Similarly, the rule against retroactive ratemaking "prohibits the Commission from adjusting current rates to make up for a utility's over- or under-collection in prior periods."[50]

The prior notice and other strictures associated with ratemaking pursuant to FPA sections 205 and 206 do not apply under section 202(c) because those requirements are recognized to be rooted in the statutory language of FPA sections 205 and 206.[51] In contrast to FPA sections 205(c)

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46 *W. Deptford Energy, LLC v. FERC*, 766 F.3d 10, 12 (D.C. Cir. 2014) ("[U]tilities are forbidden to charge any rate other than the one on file with the Commission."); *Okla. Gas & Elec. Co. v. FERC*, 11 F.4th 821, 829 (D.C. Cir. 2021).

47 16 U.S.C. § 824e(a).

48 *Old Dominion Elec. Coop. v. FERC*, 892 F.3d 1223, 1226-27 (D.C. Cir. 2018).

49 *Id.* at 1227 (quoting *Ark.-La. Gas Co. v. Hall*, 453 U.S. 571, 578 (1981)).

50 *Towns of Concord, Norwood, & Wellesley Mass. v. FERC*, 955 F.2d 67, 71 n.2 (D.C. Cir. 1992).

51 *Id.* at 71-72 ("[I]t is generally agreed that with respect to the Federal Power Act, the filed rate doctrine rests on two provisions: section 205(c), which requires utilities to file rate schedules with the

and 206(a), FPA section 202(c) does not have a prior notice requirement and it does not mandate the filing of rate schedules or the prospective fixing of charges. Rather, in the absence of agreement between "the parties affected by such [emergency] order," section 202(c) permits the Commission to "prescribe by supplemental order such terms as it finds to be just and reasonable, including the compensation or reimbursement which should be paid to or by any such party."[52]

The independent nature of the Commission's rate authority under section 202(c) is further supported by the fact that it is only triggered if the parties affected by the relevant 202(c) order are unable to reach an agreement.[53] In *San Diego Gas & Electric Co. v. Sellers of Energy and Ancillary Services*, the Commission explained that "[t]he statute provides *no role* for the Commission in the event the parties agree on the rates that will apply to the transactions [pursuant to FPA section 202(c)]."[54] The primacy that the FPA accords to the 202(c) rate determination reached by agreement of the parties is very different from traditional ratemaking rules under sections 205 and 206, which prescribe detailed filing and cost support requirements.[55]

Finally, section 202(c) includes its own "just and reasonable" standard when making rate determinations.

For all of the foregoing reasons, the recovery of costs associated with a FPA section 202(c) order is separate and distinct from rate determinations made under FPA sections 205 and 206.

Commission, and section 206(a), which allows the Commission to fix rates and charges, but only prospectively.") (footnotes omitted).

[52] 16 U.S.C. § 824a(c)(1).

[53] *Id.* ("If the parties affected by such order fail to agree upon the terms of any arrangement between them in carrying out such order, the Commission, . . . may prescribe . . . .").

[54] 97 FERC ¶ 61,275, at 62,196 (2001) (emphasis added) (subsequent history omitted).

[55] *See, e.g.*, 18 C.F.R § 35.13 and § 385.206 (2024).

B. The Commission Should Require MISO to Revise the Tariff to Include the Proposed 202(c) Cost Recovery Mechanism

1. Regional Allocation of Costs is Appropriate to Reflect the Scope and Nature of the Emergency Identified by the Secretary

As discussed above in Section II.B.2, the DOE Order identifies reliability risks in MISO, particularly in the northern and central zones, as the basis for declaring an emergency and ordering the continued operation of Culley Unit 2 until March 23, 2026. In light of the scope and nature of the declared emergency, allocating SIGE's Order Costs (net of market revenues) to load serving entities ("LSEs") in MISO's northern and central zones (which as the DOE Order notes, include Indiana) comports with section 202(c)'s just and reasonable standard because the DOE Order identified reliability risks in those MISO zones as the basis for declaring the emergency.

While this case is not governed by sections 205 or 206, general beneficiary pays/cost-causation principles commonly invoked in connection with the Commission's rate authority nevertheless provide a useful framework for analyzing cost allocation under 202(c).[56] Here, the Secretary of Energy has determined the scope and nature of an emergency, and the compelled generation or jurisdictional service needed to address it. Consequently, to determine appropriate cost recovery pursuant to FPA section 202(c), the beneficiary pays/cost-causation determination should track the emergency identified in the 202(c) order at issue. Any other approach would create a risk of conflict between the emergency 202(c) order and a subsequent analysis of cost-causation and benefits. In *Consumers Energy*, the Commission held that, in the context of a 202(c) order, applying the cost causation principle that requires "all approved rates reflect to some degree

[56] The beneficiary pays/cost-causation principle requires costs to be allocated to those who cause the costs to be incurred and reap the resulting benefits. *S.C. Pub. Serv. Auth. v. FERC*, 762 F.3d 41, 87 (D.C. Cir. 2014) (citing *Nat'l Ass'n of Regul. Util. Comm'rs v. FERC*, 475 F.3d 1277, 1285 (D.C. Cir. 2007)).

the costs actually caused by the customer who must pay them"[57] means allocating costs in accordance with the scope of the emergency described in the relevant 202(c) order.[58]

As applied here, this means that LSEs in MISO's northern and central zones should share the costs associated with the DOE Order on a load ratio share basis.[59] The geographic scope identified in the DOE Order is virtually identical to the scope identified in *Consumers Energy* and thus it makes sense for the relief in this case to track the relief granted in *Consumers Energy* as far as cost allocation is concerned. The Cost Recovery Mechanism set forth in Attachment A is designed to accomplish this outcome.

2. No MISO Tariff Provision Presently Would Permit Such Allocation and Recovery

Currently, there is no MISO Tariff provision that would permit SIGE's costs of complying with the DOE Order to be allocated to LSEs in MISO's northern and central zones, which, if unaddressed, would effectively prevent SIGE from recovering its costs via FPA section 202(c) even though, as discussed above, that statute, as well as DOE regulations and the DOE Order, all provide for full cost recovery. While full cost recovery is clearly contemplated, there is no provision in the MISO Tariff that would allow SIGE to recover costs associated with the DOE Order, SIGE has no authority to bill anyone in MISO for such costs, and MISO cannot unilaterally offer SIGE a section 202(c) rate agreement. Therefore, in order for SIGE to have a means of

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57 Consumers Complaint Order, 192 FERC ¶ 61,158 at P 38 (citation omitted).

58 Consumers Complaint Order at P 39 ("In applying the cost causation principle here, we find that it is just and reasonable for the cost allocation method to allocate costs in accordance with the scope of the emergency as described in the DOE Order.").

59 SIGE has proposed a load ratio share basis consistent with the proposed Cost Recovery Mechanism that was approved in *Consumers Energy*. *See id.* PP 35, 43. SIGE notes that MISO's compliance filing to define and describe "load ratio share" remains pending in Docket No. ER25-3425-000 and the proposed Cost Recovery Mechanism is intended to reflect the MISO's definition once approved by the Commission.

recovering the costs that it has a right to recover, the MISO Tariff must be amended to include an appropriate recovery mechanism.

C. The Commission Has Authority Pursuant to FPA Section 309 to Require Revisions to the MISO Tariff to Implement the DOE Order

FPA section 309 authorizes the Commission "to perform any and all acts . . . as it may find necessary or appropriate to carry out the provisions of [the FPA]."[60] Courts have made clear that the Commission has significant authority under section 309 when employed to give effect to other substantive authority under the Act.[61] Here, the Commission's underlying substantive authority is clearly provided by section 202(c). Because section 202(c) makes the Commission responsible for ensuring just and reasonable compensation for emergency generation or service, and because the MISO Tariff does not presently have a mechanism for addressing the Company's Order Costs, the Commission should order MISO to implement the Cost Recovery Mechanism the Company has included in Attachment A. This requested relief falls squarely within the Commission's broad implementation authority under FPA section 309 and is "necessary . . . to carry out the provisions of"[62] FPA section 202(c).

V. ALTERNATIVE REQUEST FOR RELIEF PURSUANT TO FPA SECTION 206

The Company believes that FPA sections 202(c) and 309 provide ample authority for the Commission to grant the relief requested herein. Nonetheless, if the Commission finds it must invoke its FPA section 206 authority to grant the relief requested herein, SIGE moves for relief under section 206 in the alternative. Under section 206, the Commission could make the requested Tariff revision effective as of the date of this Complaint.

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60 15 U.S.C. § 717o.

61 *TNA Merchant Projects, Inc. v. FERC*, 857 F.3d 354, 359 (D.C. Cir. 2017); *Verso Corp. v. FERC*, 898 F.3d 1, 11-12 (D.C. Cir. 2018); *Xcel Energy Servs. Inc. v. FERC*, 815 F.3d 947 (D.C. Cir. 2016).

62 16 U.S.C. § 825h.

"Section 206 permits, indeed requires, the Commission to determine whether an existing rate is 'unjust, unreasonable, unduly discriminatory, or preferential.'"[63] This statutory mandate includes determining whether a rate is unjust and unreasonable *as applied* to certain parties or to certain circumstances.[64] Upon reaching a determination that an existing rate is unjust and unreasonable, section 206 mandates that the Commission "determine the just and reasonable rate, charge, classification, rule, regulation, practice, or contract to be thereafter observed and in force, and shall fix the same by order."[65]

As explained above, the Secretary of Energy has determined "that an emergency exists in portions of the Midwest region of the United States due to a shortage of electric energy, a shortage of facilities for the generation of electricity, and other causes"[66] and that the "continued additional dispatch of Culley Unit 2 is necessary to best meet the emergency arising from increased demand, determined shortage, and other causes, and serve the public interest."[67]

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63 *Emera Me. v. FERC*, 854 F.3d 9, 21 (D.C. Cir. 2017) (quoting 16 U.S.C. § 824e(a)) (alteration incorporated).

64 *See, e.g.*, *Pub. Serv. Elec. & Gas Co. v. FERC*, 989 F.3d 10, 18 (D.C. Cir. 2021) ("[T]he Commission reasonably found that the solution–based DFAX method was unjust and unreasonable as applied to the Artificial Island Project."); *Am. Wind Energy Ass'n v. Sw. Power Pool, Inc.*, 167 FERC ¶ 61,033 at P 49 (2019) ("We find that SPP's membership exit fee, as applied to non-transmission owners, is unjust and unreasonable because it creates a barrier to SPP membership for non-transmission owners and because it appears to be excessive based on the record before us."), *order denying stay*, 168 FERC ¶ 61,006; *PJM Interconnection, L.L.C.*, 169 FERC ¶ 61,049 at P 138 (2019) (opening an FPA section 206 proceed to, *inter alia*, examine "the justness and reasonableness of PJM's minimum run-time requirements as applied to Capacity Storage Resources"); *PJM Interconnection, L.L.C.*, 137 FERC ¶ 61,145 at P 99 (2011) ("[T]he ultimate vehicle that will be required to establish that mitigation rules are unjust and unreasonable as applied to a particular project is a section 206 complaint.") (subsequent history omitted).

65 16 U.S.C. § 824e(a).

66 DOE Order, at 1.

67 *Id.* at 5.

SIGE will incur costs associated with the DOE Order, but the MISO Tariff does not presently include a mechanism that would allow MISO to compensate the Company for such costs or allocate those costs to load in the MISO region.

The MISO Tariff is thus unjust and unreasonable as applied to the Company and its compliance with the DOE Order, and the Commission should order MISO to adopt a Tariff revision to provide a Cost Recovery Mechanism for SIGE's Order Costs net of market revenues. Should the Commission proceed under FPA section 206, however, SIGE respectfully notes that the refund effective date that the Commission establishes pursuant to FPA section 206(b) has no bearing on, and does not limit, SIGE's right to recover the Order Costs it has already incurred and will continue to incur going forward.

VI. REQUEST FOR FAST TRACK PROCESSING AND EXPEDITED ACTION

SIGE respectfully requests Fast Track processing and expedited action on this Complaint under Rule 206(h) of the Commission's Rules of Practice and Procedure. The Complaint merits expeditious resolution because SIGE must establish a Cost Recovery Mechanism for the costs that have been incurred, and are continuing to be incurred, to comply with the DOE Order. Expeditious action from the Commission to modify the MISO Tariff is appropriate in order to avoid challenges to SIGE's right to cost recovery.

SIGE respectfully requests that the Commission issue its ruling on the Complaint as soon as possible. SIGE also respectfully requests a shortened comment period of ten days.

VII. ADDITIONAL INFORMATION REQUIRED BY RULE 206 OF THE COMMISSION'S RULES OF PROCEDURE

To the extent not already provided herein, the Company provides the following additional information required by Rule 206(b) of the Commission's Rules of Practice and Procedure:

1. Clearly identify the action or inaction which is alleged to violate applicable statutory standards or regulatory requirements; explain how the action or inaction violates applicable statutory standards or regulatory requirements.

Despite SIGE's right to recover costs incurred associated with the DOE Order, the MISO Tariff does not presently include a mechanism for the recovery and allocation of such costs, and MISO lacks Tariff authority to unilaterally offer SIGE a section 202(c) rate agreement. The Commission should therefore require MISO to revise the MISO Tariff to include the proposed Cost Recovery Mechanism.

2. Set forth the business, commercial, economic or other issues presented by the action or inaction as such relate to or affect the complainant.

The information in Sections I through V of this Complaint sets forth the business, commercial, and economic issues at stake for the Company.

3. Make a good faith effort to quantify the financial impact or burden (if any) created for the complainant as a result of the action or inaction.

SIGE intends to seek recovery of all costs for the continued operation of Culley Unit 2; and, as such, intends to establish a regulatory asset to track all costs of operating Culley Unit 2 from the date of the DOE Order. The total of such costs, net of market revenues, is not presently known. After the DOE Order expires, any costs that SIGE seeks to recover through the section 202(c) Cost Recovery Mechanism will be addressed in a future filing with the Commission.

4. Indicate the practical, operational, or other nonfinancial impacts imposed as a result of the action or inaction, including, where applicable, the environmental, safety or reliability impacts of the action or inaction.

The DOE Order concludes that it is in the public interest for the Company to ensure that Culley Unit 2 is "available to operate" in order to address the emergency conditions identified by the Secretary. The Company has a constitutional and statutory right to recover costs associated with the DOE Order. Failure of the Commission to provide the relief requested herein would

conflict with the DOE Order and create unfair and unwarranted risk for the Company's right to cost recovery.

5. State whether the issues presented are pending in an existing Commission proceeding or a proceeding in any other forum in which the complainant is a party, and if so, provide an explanation why timely resolution cannot be achieved in that forum.

The issues raised in this Complaint are not pending in an existing Commission proceeding or a proceeding in any other forum in which SIGE is a party. Resolution of these issues cannot be achieved in any pending docket.

6. State the specific relief or remedy requested, including any request for stay or extension of time, and the basis for that relief.

The specific relief requested is identified in Sections I and III of this Complaint.

7. Include all documents that support the facts in the complaint in possession of, or otherwise attainable by, the complainant, including, but not limited to, contracts and affidavits.

The only relevant document is the DOE Order, which is attached as Attachment C.

8. State (i) whether the Enforcement Hotline, Dispute Resolution Service, tariff-based dispute resolution mechanisms, or other informal dispute resolution procedures were used, or why these procedures were not used; (ii) whether the complainant believes that alternative dispute resolution (ADR) under the Commission's supervision could successfully resolve the complaint; (iii) what types of ADR procedures could be used; and (iv) Any process that has been agreed on for resolving the complaint.

As discussed above, SIGE and MISO have cooperated extensively to evaluate and implement their respective responsibilities pursuant to the DOE Order. However, the MISO Tariff does not include a mechanism for the Company to recover costs associated with the DOE Order, and MISO does not possess unilateral authority to offer the Company a 202(c) rate agreement. Therefore, SIGE believes Commission action on this Complaint is required in order to effectuate the relief requested.

9. Include a form of notice of the complaint suitable for publication in the *Federal Register* in accordance with the specifications in § 385.203(d) of this part. The form of notice shall be on electronic media as specified by the Secretary.

A form of notice suitable for publication in the *Federal Register* is attached to this Complaint as Attachment B.

10. Any person filing a complaint must serve a copy of the complaint on the respondent, affected regulatory agencies, and others the complainant reasonably knows may be expected to be affected by the complaint. Service must be simultaneous with filing at the Commission for respondents. Simultaneous or overnight service is permissible for other affected entities. Simultaneous service can be accomplished by electronic mail in accordance with § 385.2010(f)(3), facsimile, express delivery, or messenger.

A copy of this Complaint has been served on the following via email:

Timothy Caister
Vice President, Legal and Federal Affairs
Midcontinent Independent System Operator, Inc.
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Telephone: 317-249-5400
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VIII. CORRESPONDENCE AND COMMUNICATIONS

All correspondence and communications regarding this Complaint should be addressed to the following persons:[68]

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IX. CONCLUSION

For the reasons discussed above, SIGE respectfully requests that the Commission swiftly issue an order granting the Complaint.

Respectfully submitted,

/s/ Heather Watts
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Counsel to Southern Indiana Gas and Electric Company

[68] To the extent necessary, SIGE respectfully requests waiver of Rule 203(b)(3) of the Commission's Rules of Practice and Procedure to permit all of the following representatives to be placed on the official service list for this proceeding.

Filed January 5, 2026

Attachment A

Cost Recovery Mechanism

ATTACHMENT A

SCHEDULE {XYZ}

Allocation of Costs Associated with Continued Availability of Unit 2 of F.B. Culley Generation Station
Pursuant to DOE Order No. 202-25-13

On December 23, 2025, the U.S. Secretary of Energy ("Secretary") issued an order pursuant to section 202(c) of the Federal Power Act ("FPA"), 16 U.S.C. § 824a(c), and section 301(b) of the Department of Energy Organization Act, 42 U.S.C. § 7151(b), determining that an emergency exists in portions of the Midwest region of the United States due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes ("202(c) Emergency"). *See* Department of Energy, Order No. 202-25-13 ("DOE Order"). The DOE Order compelled MISO and Southern Indiana Gas and Electric Company ("SIGE") to ensure the continued operation and availability the 103.7 MW Unit 2 of the F.B. Culley Generating Station coal-fired power plant ("Culley Unit 2") from December 23, 2025, through March 23, 2026, as such time may be extended by subsequent order of the Secretary (the "Order Duration Period").

The Secretary ordered MISO and SIGE to take all measures necessary to ensure that the Culley Unit 2 is available to operate during the Order Duration Period. The DOE Order also orders MISO to "take every step to employ economic dispatch of Culley Unit 2 to minimize cost to ratepayers." The DOE Order confirms that rate recovery is available pursuant to FPA section 202(c).

Costs associated with the DOE Order have been incurred, and will continue to be incurred, during the Order Duration Period ("Order Costs"). SIGE shall petition FERC to approve recovery of Order Costs, net of market revenues, that FERC determines are recoverable pursuant to section 202(c) ("Recoverable Order Costs").

This Schedule {XYZ} shall allocate the Recoverable Order Costs incurred during the Order Duration Period, and any extensions of the same or subsequent orders by the Secretary, in the following manner. MISO shall allocate the Recoverable Order Costs to LSEs in the Zones 1-7 (or such successor zone designations reflecting the Northern and Central MISO Zones) ("Affected LSEs") on a load ratio share basis.

The charge to each Affected LSE (AFF_LSE_CHG) is obtained by multiplying Affected LSE load ratio share (AFF_LSE_SHARE) by the Recoverable Order Costs (REC_ EMERG_ORDER_COSTS):

AFF_LSE_CHG = AFF_LSE_SHARE × REC_ EMERG_ ORDER_COSTS

Effective On: {DATE}

Attachment B

Form of Notice

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Southern Indiana Gas and Electric Company	)	
	)	Docket No. EL26-___-000
v.	)	
	)	
Midcontinent Independent System Operator, Inc.	)	

NOTICE OF COMPLAINT

(_____)

Take notice that on January 5, 2025, Southern Indiana Gas and Electric Company d/b/a CenterPoint Energy Indiana South ("SIGE") filed a complaint ("Complaint") against Midcontinent Independent System Operator, Inc. ("MISO") pursuant to sections 202(c), 306, and 309 of the Federal Power Act ("FPA")[1] and Rule 206 of the Federal Energy Regulatory Commission's ("FERC" or "Commission") Rules of Practice and Procedure.[2] SIGE requests the Commission direct MISO to revise its Open Access Transmission, Energy and Operating Reserve Markets Tariff to effectuate an emergency order issued by the Secretary of Energy on May 23, 2025, pursuant to FPA section 202(c).[3]

SIGE certifies that a copy of the Complaint was served on representatives of MISO.

Any person desiring to intervene or protest this filing must file in accordance with Rules 211 and 214 of the Commission's Rules of Practice and Procedure (18 C.F.R. §§ 385.211 and 214). Protests will be considered by the Commission in determining the appropriate action to be taken but will not serve to make protestants parties to the proceeding. Any person wishing to become a party must file a notice of intervention or motion to intervene, as appropriate. The Respondent's answer and all interventions or protests must be filed on or before the comment date. The Respondent's answer, motions to intervene, and protests must be served on the Complainant.

The Commission encourages electronic submission of protests and interventions in lieu of paper using the "eFiling" link at http://www.ferc.gov. Persons unable to file electronically should submit an original and five (5) copies of the protest to the Federal Energy Regulatory Commission, 888 First Street NE, Washington, DC 20426.

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1 16 U.S.C. §§ 824e, 825e, 825h (2024).

2 18 C.F.R. § 385.206 (2025).

3 U.S. Department of Energy, Order No. 202-25-13 (December 23, 2025) ("DOE Order").

This filing is accessible online at http://www.ferc.gov, using the “eLibrary” link and is available for review in the Commission’s Public Reference Room in Washington, DC. There is an “eSubscription” link on the website that enables subscribers to receive email notification when a document is added to a subscribed docket(s). For assistance with any FERC Online service, please email FERCOnlineSupport@ferc.gov, or call (866) 208-3676 (toll-free). For TTY, call (202) 502-8659.

Comment Date: 5:00 pm Eastern Time on (_____).

Debbie-Anne A. Reese
Secretary

Attachment C

DOE Order 202-25-13

Department of Energy
Washington, DC 20585

Order No. 202-25-13

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA),[1] and section 301(b) of the Department of Energy Organization Act,[2] and for the reasons set forth below, I hereby determine that an emergency exists in portions of the Midwest region of the United States due to a shortage of electric energy, a shortage of facilities for the generation of electricity, and other causes. Issuance of this Order will meet the emergency and serve the public interest.

BACKGROUND

The F.B. Culley Generating Station (Culley) is an electric generating facility in Warrick County, Indiana. Culley is owned and operated by CenterPoint Energy and consists of two coal-fired generation units, Unit 2 (103.7 MW) and Unit 3 (265.2 MW), with a combined name plate capacity of 368.9 MW. Unit 2 and Unit 3 began operations in 1966 and 1973, respectively. Unit 2 is slated to cease operations in December 2025.[3]

EMERGENCY SITUATION

Midcontinent Independent System Operator, Inc.'s (MISO) year-round resource adequacy concerns are well documented. In 2022, MISO requested Federal Energy Regulatory Commission (FERC) approval of its filing to revise its resource adequacy construct (including the Planning Resource Auction or PRA) to establish capacity requirements for each of the four seasons of the year rather than on an annual basis determined by peak summer demand.[4] MISO justified this revision by explaining that "Reliability risks associated with Resource Adequacy have shifted from 'Summer only' to a year-round concern."[5] MISO noted that over 60% of all "MaxGen" events (events when MISO initiates emergency procedures because of concerns over the adequacy of available generation) occurred outside of the summer season.[6]

In December of 2023, MISO released an "Attributes Roadmap," in which it presented "an in-depth look at the challenges of operating a reliable bulk electric system in a rapidly

[1] 16 U.S.C. § 824a(c).
[2] 42 U.S.C. § 7151(b).
[3] As a coal-fired facility, it would be difficult for Culley Unit 2 to resume operations once it has been retired. Specifically, any stop and start of operation creates heating and cooling cycles that could cause an immediate failure that could take 30-60 days to repair if a unit comes offline. In addition, other practical issues, such as employment, contracts, and permits may greatly increase the timeline for resumption of operations. Further, if Culley were to begin disassembling the plant or other related facilities, the associated challenges would be greatly exacerbated. Thus, continuous operation is required in such cases so long as the Secretary determines a shortage exists and is likely to persist.
[4] *Midcontinent Independent System Operator, Inc.,* FERC Docket No. ER22-495-000 (Nov. 30, 2021). This request was approved by FERC on August 31, 2022. *See Midcontinent Independent System Operator, Inc.*, 180 FERC ¶ 61,141 (2022).
[5] MISO Transmittal Letter at 3, FERC Docket No. ER22-495-000 (Nov. 30, 2021).
[6] *Id.* at 3-4.

transforming energy landscape."[7] Among other things, this report described changes in the time of year during which the risk of the loss of load was greatest. For the 2023/24 Planning Year, the greatest risk of loss of load was in the summer, but it is expected that by the summer of 2027, there will be an equal loss of load risk in both the summer and fall seasons. MISO also projected that the risk of loss of load in the winter and spring seasons, although not as high as in the summer or fall, will nevertheless increase over time.[8]

More recently, MISO affirmed the resource adequacy problems occurring outside of its summer season in its 2024 report entitled, "*MISO's Response to the Reliability Imperative."*[9] In a section of that report entitled "Risks in Non-Summer Seasons," MISO again stressed that it has resource reliability concerns outside of the summer season:

> Widespread retirements of dispatchable resources, lower reserve margins, more frequent and severe weather events and increased reliance on weather-dependent renewables and emergency-only resources have altered the region's highest historic risk profile, creating risks in non-summer months that rarely posed challenges in the past.[10]

These MISO studies indicate that the emergency conditions caused by the loss of generation capacity in MISO extend past the summer season. The evidence indicates that there is also a potential longer term resource adequacy emergency in MISO.

In its 2024 Long-Term Reliability Assessment (LTRA), the North American Electric Reliability Corporation (NERC) notes that the MISO assessment area is at an elevated risk "because probabilistic assessments indicate above-normal generator outages during extreme weather can result in unserved energy or load loss. With uncertainty around new resource additions and existing generator retirements, MISO is also at risk of falling below [Reference Margin Levels] within the next five years."[11]

When MISO reported the results of its PRA for the 2025-26 Planning Year, it noted that "new capacity additions were insufficient to offset the negative impacts of decreased accreditation, suspensions/retirements and external resources" in the northern and central zones, which include Indiana.[12]

On June 6, 2025, the Organization of MISO States (OMS) and MISO issued the results of their survey, which has been conducted annually for many years to determine the degree to

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[7] MISO, *Attributes Roadmap*, at 3 (Dec. 2023), https://cdn.misoenergy.org/2023%20Attributes%20Roadmap631174.pdf.
[8] *Id.* at 11.
[9] MISO, *MISO's Response to the Reliability Imperative* (Updated Feb. 2024), https://cdn.misoenergy.org/2024+Reliability+Imperative+report+Feb.+21+Final504018.pdf.
[10] *Id.* at 12.
[11] *NERC 2024 Long-Term Reliability Assessment*, at 13 (December 2024, corrected July 11, 2025), https://www.nerc.com/globalassets/our-work/assessments/2024-ltra_corrected_july_2025.pdf.
[12] MISO, *Planning Resource Auction: Results for Planning Year 2025-26*, at 13 (April 2025), https://cdn.misoenergy.org/2025%20PRA%20Results%20Posting%2020250529_Corrections694160.pdf.

which expected capacity resources satisfy planning reserve margin requirements.[13] The 2025 Survey presented projections of resource adequacy for the summer of 2026 and subsequent years. Although the survey projected a potential capacity surplus for the summer of 2026, it also projected that at least 3.1 GW of additional generation capacity beyond currently committed generation capacity must be added to meet the projected planning reserve margin.[14] The survey also projected that there would be insufficient capacity to meet the peak demand for electricity in each of the following four summers, increasing from a deficit of 1.4 GW in 2027 to 8.2 GW in 2030.[15] Similar results were projected for MISO's winter seasons, with a small surplus of generation capacity in 2026, followed by increasing deficits the following four years.[16]

The primary reasons for these projected deficits also are shown on the OMS-MISO survey. Large quantities of existing generation capacity are projected to be retired each year while, at the same time, the demand for electricity is projected to increase at an accelerating pace.[17] Although the OMS-MISO survey projects generation capacity to continue to increase in the coming years with the addition of new potential generation assets, the increase in capacity is largely offset by the projected retirements, and does not keep up with the growth in demand.[18]

MISO has been taking steps to address these projected deficits, but the solution is years away. For example, on June 6, 2025, MISO submitted a proposal to FERC to establish an Expedited Resource Addition Study (ERAS) process to provide a framework for the expedited study of interconnection requests to address urgent resource adequacy and reliability needs in the near term. This proposal was approved by FERC on July 21, 2025.[19] The ERAS process should help expedite the construction of needed new capacity. However, resources studied under the ERAS will have commercial operation dates that are at least three years away, and are provided an additional three-year grace period to commence commercial operations.[20] In addition, supply chain constraints impeding the acquisition of critical grid components, including large natural gas turbines and transformers, are likely to further hinder rapid construction and exacerbate reliability concerns.[21] Consequently, it is not at all clear that the new ERAS process will result in the addition of new capacity in the next few years.

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[13] OMS and MISO, *OMS-MISO Survey Results* (Updated June 6, 2025), https://cdn.misoenergy.org/20250606%20OMS%20MISO%20Survey%20Results%20Workshop%20Presentation702311.pdf.

[14] *Id.* at 2.

[15] *Id.* at 7.

[16] *Id.* at 9.

[17] *Id.* at 7, 9.

[18] *Id.*

[19] *Midcontinent Independent System Operator, Inc.,* 192 FERC ¶ 61,064 (2025).

[20] *Id.* P 84.

[21] *See generally*, S&P Global, *US Gas-Fired Turbine Wait Times as Much as Seven Years; Costs Up Sharply*, (May 2025), ("With demand for natural gas-fired turbines in the US rapidly accelerating amid power demand growth forecasts driven by AI, manufacturing, and electrification, wait times for turbines are anywhere between one and seven years depending on the model, and costs have increased considerably, experts told Platts."), https://www.spglobal.com/commodity-insights/en/news-research/latest-news/electric-power/052025-us-gas-fired-turbine-wait-times-as-much-as-seven-years-costs-up-sharply.

More broadly, executive orders issued by President Donald J. Trump on January 20, 2025, and April 8, 2025, underscore the dire energy challenges facing the Nation due to growing resource adequacy concerns. President Trump likewise declared a national energy emergency in Executive Order 14156, "Declaring a National Energy Emergency," that the "United States' insufficient energy production, transportation, refining, and generation constitutes an unusual and extraordinary threat to our Nation's economy, national security, and foreign policy."[22] The Executive Order adds: "Hostile state and non-state foreign actors have targeted our domestic energy infrastructure, weaponized our reliance on foreign energy, and abused their ability to cause dramatic swings within international commodity markets."[23] In a subsequent Executive Order 14262, "Strengthening the Reliability and Security of the United States Electric Grid," President Trump emphasized that "the United States is experiencing an unprecedented surge in electricity demand driven by rapid technological advancements, including the expansion of artificial intelligence data centers and increase in domestic manufacturing."[24]

Further, the Department detailed the myriad challenges affecting the Nation's energy systems in its July 2025 "Resource Adequacy Report: Evaluating the Reliability and Security of the United States Electric Grid," issued pursuant to the President's directive in Executive Order 14262. The Department concluded that "[a]bsent decisive intervention, the Nation's power grid will be unable to meet projected demand for manufacturing, re-industrialization, and data centers driving artificial intelligence (AI) innovation."[25]

ORDER

FPA section 202(c)(1) provides that whenever the Secretary of Energy determines "that an emergency exists by reason of a sudden increase in the demand for electric energy, or a shortage of electric energy or of facilities for the generation or transmission of electric energy," then the Secretary has the authority "to require by order . . . . such generation, delivery, interchange, or transmission of electric energy as in its judgment will best meet the emergency and serve the public interest."[26] This statutory language constitutes a specific grant of authority to the Secretary to require the continued operation of Culley Unit 2 when the Secretary has determined that such continued operation will best meet an emergency caused by a sudden increase in the demand for electric energy or a shortage of generation capacity.

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[22] Executive Order No. 14156, 90 Fed. Reg. 8433 (Jan. 20, 2025) (*Declaring a National Energy Emergency*), https://www.federalregister.gov/documents/2025/01/29/2025-02003/declaring-a-national-energy-emergency.

[23] *Id*.

[24] Executive Order No. 14262, 90 Fed. Reg. 15521 (Apr. 8, 2025) (*Strengthening the Reliability and Security of the United States Electric Grid*), https://www.federalregister.gov/documents/2025/04/14/2025-06381/strengthening-the-reliability-and-security-of-the-united-states-electric-grid.

[25] U.S. Department of Energy, *Resource Adequacy Report: Evaluating the Reliability and Security of the United States Electric Grid*, at 1 (July 2025), https://www.energy.gov/sites/default/files/2025-07/DOE%20Final%20EO%20Report%20%28FINAL%20JULY%207%29.pdf.

[26] Although the text of FPA section 202(c) grants this authority to "the Commission," section 301(b) of the Department of Energy Organization Act transferred this authority to the Secretary of Energy. *See* 42 U.S.C. § 7151(b).

Such is the case here. As described above, the emergency conditions resulting from increasing demand and shortage from accelerated retirement of generation facilities will continue in the near term and are also likely to continue in subsequent years. This could lead to the loss of power to homes and businesses in the areas that may be affected by curtailments or power outages, presenting a risk to public health and safety. Given the responsibility of MISO to identify and dispatch generation necessary to meet load requirements, I have determined that, under the conditions specified below, continued additional dispatch of Culley Unit 2 is necessary to best meet the emergency arising from increased demand, determined shortage, and other causes, and serve the public interest under FPA section 202(c).

To ensure Culley Unit 2 will be available if needed to address emergency conditions, Culley Unit 2 shall remain in operation until March 23, 2026.

Based on my determination of an emergency set forth above, I hereby order:

A. From December 23, 2025, MISO and CenterPoint Energy shall take all measures necessary to ensure that Culley Unit 2 is available to operate. For the duration of this Order, MISO is directed to take every step to employ economic dispatch of Culley Unit 2 to minimize cost to ratepayers. Following the conclusion of this Order, sufficient time for orderly ramp down is permitted, consistent with industry practices. CenterPoint Energy is directed to comply with all orders from MISO related to the availability and dispatch of Culley Unit 2.

B. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters as determined by MISO, pursuant to paragraph A. MISO shall provide a daily notification to the Department (via AskCR@hq.doe.gov) reporting whether Culley Unit 2 has operated in compliance with the allowances contained in this Order.

C. All operations of Culley Unit 2 must comply with applicable environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to pay fees or purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators.

D. By January 13, 2026, MISO is directed to provide the Department of Energy (via AskCR@hq.doe.gov) with information concerning the measures it has taken and is planning to take to ensure the operational availability of Culley Unit 2 consistent with this Order. MISO and CenterPoint Energy shall also provide such additional information regarding the environmental impacts of this Order and its compliance with the conditions of this Order, in each case as requested by the Department of Energy from time to time.

E. CenterPoint Energy is directed to file with the Federal Energy Regulatory Commission tariff revisions or waivers to effectuate this Order. Rate recovery is available pursuant to 16 U.S.C. § 824a(c).

F. This Order shall not preclude the need for Culley Unit 2 to comply with applicable state, local, or Federal laws or regulations following the expiration of this Order.

G. Because this Order is predicated on the shortage of facilities for generation of electric energy and other causes, Culley Unit 2 shall not be considered a capacity resource.

H. This Order shall be effective from 11:59 PM Eastern Standard Time (EST) on December 23, 2025, and shall expire at 11:59 PM Eastern Daylight Time (EDT) on March 23, 2026, with the exception of applicable compliance obligations in paragraph D.

Issued in Denver, Colorado at 6:39 PM EST on this 23rd day of December 2025.

Chris Wright
Secretary of Energy

cc: **FERC Commissioners**
Chairman Laura V. Swett
Commissioner David Rosner
Commissioner Lindsay S. See
Commissioner Judy W. Chang
Commissioner David A. LaCerte

Indiana Utility Regulatory Commission
Chairman Jim Huston
Commissioner David Veleta
Commissioner David Ziegner

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 158
March Schahfer Order

Department of Energy
Washington, DC 20585

Order No. 202-26-19

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA),[1] and section 301(b) of the Department of Energy Organization Act,[2] and for the reasons set forth below, I hereby determine that an emergency exists in portions of the Midwest region of the United States (U.S.) due to a shortage of electric energy, a shortage of facilities for the generation of electricity, and other causes. Issuance of this Order will meet the emergency and serve the public interest.

BACKGROUND

The R.M. Schahfer Generating Station ("Schahfer") is an electric generating facility in Wheatfield, Indiana. Schahfer is owned and operated by Northern Indiana Public Service Company (NIPSCO), a division of NiSource Inc. Schahfer consists of two 129 MW natural-gas fired units and two coal-fired units, Unit 17 (423.5 MW) and Unit 18 (423.5 MW).[3] Unit 17 and Unit 18 began operations in 1983 and 1986, respectively. Unit 17 and Unit 18 were both slated to cease operations in December 2025.[4]

Order No. 202-25-12, issued pursuant to FPA section 202(c), required that Schahfer remain in operation for 90 days, through March 23, 2026. This order was based on my determination that emergency conditions existed in the region served by the Midcontinent Independent System Operator, Inc. (MISO).

Specifically, I determined that MISO faced tight reserve margins due to well documented year-round resource adequacy concerns, particularly during periods of high

[1] 16 U.S.C. § 824a(c).

[2] 42 U.S.C. § 7151(b).

[3] U.S. Energy Information Administration, *Form EIA-860, Schedule 3: Generator Data* (2024), https://www.eia.gov/electricity/data/eia860/.

[4] As coal-fired facilities, it would be difficult for Schahfer Units 17 and 18 to resume operations once they have been retired. Specifically, any stop and start of operation creates heating and cooling cycles that could cause an immediate failure that could take 30–60 days to repair if a unit comes offline. In addition, other practical issues, such as employment, contracts, and permits may greatly increase the timeline for resumption of operations. Further, if Schahfer were to begin disassembling the plant or other related facilities, the associated challenges would be greatly exacerbated. Thus, continuous operation is required in such cases so long as the Secretary determines a shortage exists and is likely to persist.

demand or low generation resource output.[5] I determined that the continued operation of Schahfer would provide additional generation capacity during these periods, which would help prevent the loss of power to homes and businesses that would otherwise pose a risk to public health and safety.[6] I determined that the continued operation of Schahfer was necessary to alleviate immediate and anticipated threats to reliability.[7]

My determination was based on several facts.

First, in its 2024 Long-Term Reliability Assessment (LTRA), the North American Electric Reliability Corporation (NERC) notes that the MISO assessment area, which covers portions of Arkansas, Illinois, Indiana, Iowa, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Montana, North Dakota, South Dakota, Texas, and Wisconsin, is at an elevated risk "because probabilistic assessments indicate above-normal generator outages during extreme weather can result in unserved energy or load loss. With uncertainty around new resource additions and existing generator retirements, MISO is also at risk of falling below [Reference Margin Levels] within the next five years."[8] Additionally, the LTRA notes that "[t]he departure of MISO's coal fleet has continued with a reduction in capacity of around 6 GW in the past year, and a projected reduction of a further 12 GW over the next five years."[9]

Second, MISO's year-round resource adequacy concerns are well-documented. In 2022, MISO requested Federal Energy Regulatory Commission (FERC) approval of its filing to revise its resource adequacy construct (including the Planning Resource Auction (PRA)) to establish capacity requirements for each of the four seasons of the year rather than on an annual basis determined by peak summer demand.[10] MISO justified this revision by explaining that "Reliability risks associated with [r]esource [a]dequacy have shifted from 'Summer only' to a year-round concern."[11] MISO noted that over 60% of all "MaxGen" events (events when MISO initiates emergency procedures because of concerns over the adequacy of available generation) occurred outside of the summer season.[12]

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[5] *See*, *e.g.*, *Midcontinent Indep. Sys. Operator, Inc., and Northern Indiana Public Service Company*, Order No. 202-25-12, at 1–4 (Dec. 23, 2025).

[6] *See, e.g.*, *id.* at 1–4.

[7] *See, e.g.*, *id.* at 5.

[8] NERC*, 2024 Long-Term Reliability Assessment*, at 13 (December 2024, corrected July 11, 2025), https://www.nerc.com/globalassets/our-work/assessments/nerc_ltra_2025.pdf.

[9] *Id.* at 44.

[10] *Midcontinent Independent System Operator, Inc.,* FERC Docket No. ER22-495-000 (Nov. 30, 2021). This request was approved by FERC on August 31, 2022. *See Midcontinent Independent System Operator, Inc.*, 180 FERC ¶ 61,141 (2022).

[11] *MISO Transmittal Letter*, FERC Docket No. ER22-495-000, at 3 (Nov. 30, 2021).

[12] *Id.* at 3–4.

CONTINUING EMERGENCY CONDITIONS

The emergency conditions that necessitated the issuance of Order No. 202-25-12 continue, both in the near and long term.[13] The production of electricity from Schahfer will continue to be critical to maintain reliability in MISO. MISO's resource adequacy concerns were most recently demonstrated during Winter Storm Fern, when Schahfer operated under a cold weather alert and declared conservative operations from January 23–February 1, 2026. On January 24, MISO declared an Energy Emergency Alert (EEA) 1, as well as an EEA 2 "MaxGen" event for MISO's North and Central Regions due to generation outages, high demand, and transfer capability limits.[14] From January 21–February 1, 2026, Schahfer operated at over 285 MW every day.[15]

In December of 2023, MISO released an "Attributes Roadmap," in which it presented "an in-depth look at the challenges of operating a reliable bulk electric system in a rapidly transforming energy landscape."[16] Among other things, this report described changes in the time of year during which the risk of the loss of load was greatest. For the 2023/2024 Planning Year, the greatest risk of loss of load was in the summer, but it is expected that by the summer of 2027, there will be an equal loss of load risk in both the summer and fall seasons. MISO also projected risk of loss of load in the winter and spring seasons, which, although not as high as in the summer or fall, will nevertheless increase over time.[17]

[13] Further, as noted in Order No. 202-25-12, as a coal-fired facility, it would be difficult for Schahfer to resume operations once it has been retired. Specifically, any stop and start of operation creates heating and cooling cycles that could cause an immediate failure that could take 30–60 days to repair. In addition, other practical issues, such as employment, contracts, and permits may greatly increase the timeline for resumption of operations. If NIPSCO were to begin disassembling the plant or other related facilities, the associated challenges would be greatly exacerbated. Thus, continuous operation is required so long as I determine a shortage exists. *See* Order No. 202-25-12 at 1.

[14] *See* Midcontinent ISO on X, (Jan. 24, 2026), https://x.com/MISO_energy/status/2015072060876140805?s=20.

[15] U.S. Dep't of Energy, *FACT SHEET: Energy Department Prevented Blackouts & Saved American Lives During Winter Storms*, (February 2026), https://www.energy.gov/articles/fact-sheet-energy-department-prevented-blackouts-saved-american-lives-during-winter-storms.

[16] MISO, *Attributes Roadmap*, at 3 (Dec. 2023), https://cdn.misoenergy.org/2023%20Attributes%20Roadmap631174.pdf.

[17] *Id.* at 11.

More recently, MISO affirmed the resource adequacy problems occurring outside of its summer season in its 2024 report entitled, "*MISO's Response to the Reliability Imperative*."[18] In a section of that report entitled, "Risks in Non-Summer Seasons," MISO again stressed that it has resource reliability concerns outside of the summer season.

> Widespread retirements of dispatchable resources, lower reserve margins, more frequent and severe weather events and increased reliance on weather-dependent renewables and emergency-only resources have altered the region's historic risk profile, creating risks in non-summer months that rarely posed challenges in the past.[19] These MISO studies indicate that the emergency conditions caused by the loss of generation capacity in MISO extend past the summer season.

In January 2026, NERC released its 2025 Long-Term Reliability Assessment.[20] NERC assessed that the MISO region is at high risk of energy shortfalls over the next five years,[21] stating that it faces significant reliability challenges as "projected resource additions do not keep pace with escalating demand forecasts and announced generator retirements."[22] This determination is based on the combination of accelerating demand growth from new data centers and the retirement of existing thermal generators.[23] The 2025 NERC Long-Term Reliability Assessment notes that "MISO's accredited thermal capacity has decreased by 8.8 GW, driven primarily by reductions in accredited capacity of existing facilities and retirements."[24] The report observes that winter peak periods are a particular concern, with projections showing "shortfalls in planned resources for winter peak periods."[25] However, NERC also concluded that "risks could expand into spring and fall generator maintenance periods when the available dispatchable generation is not enough to counter wind and solar variability when demand is high."[26]

While the 2025–2026 NERC Winter Reliability Assessment found the MISO region to be at normal risk in 2026 and elevated risk in 2027, two earlier winter studies were more critical. The 2023–2024 NERC Winter Reliability Assessment characterized MISO as a region at elevated risk with the "[p]otential for insufficient operating reserves

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[18] MISO, *MISO's Response to the Reliability Imperative* (Updated February 2024), https://cdn.misoenergy.org/2024+Reliability+Imperative+report+Feb.+21+Final504018.pdf.

[19] *Id.* at 12.

[20] NERC, *2025 Long-Term Reliability Assessment* (Jan. 2026), https://www.nerc.com/globalassets/our-work/assessments/nerc_ltra_2025.pdf.

[21] *Id.* at 7.

[22] *Id.* at 8.

[23] *Id.* at 43.

[24] *Id.* at 15.

[25] *Id.*

[26] *Id.*

in above-normal conditions."[27] These findings were echoed in NERC's 2024–2025 Winter Reliability Assessment, which noted that "[g]enerating capacity is 10 GW lower (-6.8%) compared to the prior winter as generators have retired, withdrawn from MISO's capacity market, or received lower winter accredited capacity."[28]

The evidence indicates that there is also a potential longer-term resource adequacy emergency in MISO. When MISO reported the results of its PRA for the 2025–26 Planning Year, it noted that "new capacity additions were insufficient to offset the negative impacts of decreased accreditation, suspensions/retirements and external resources" in the northern and central zones, which include Indiana.[29]

On June 6, 2025, the Organization of MISO States (OMS) and MISO issued the results of their annual survey, which reported the degree to which expected capacity resources satisfy planning reserve margin requirements.[30] The 2025 Survey presented projections of resource adequacy for the summer of 2026 and subsequent years. Although the survey projected a potential capacity surplus for the summer of 2026, it also projected that at least 3.1 GW of additional generation capacity beyond currently committed generation capacity must be added to meet the projected planning reserve margin.[31] The survey also projected that there would be insufficient capacity to meet the peak demand for electricity in each of the following four summers, increasing from a deficit of 1.4 GW in 2027 to 8.2 GW in 2030.[32] It also projected similar results for MISO's winter seasons, with a small surplus of generation capacity in 2026, followed by increasing deficits the following four years.[33]

The primary reasons for these projected deficits also are shown on the OMS-MISO survey. Large amounts of existing generation capacity are projected to be retired each year, while, at the same time, the demand for electricity is projected to increase at an accelerating pace.[34]

Although the OMS-MISO survey projects generation capacity to continue to increase in the coming years with the addition of new potential generation assets, the

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[27] NERC, *2023–2024 Winter Reliability Assessment*, at 5 (Nov. 2023), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_WRA_2023.pdf.

[28] NERC, *2024–2025 Winter Reliability Assessment*, at 15 (Nov. 2024), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_WRA_2024.pdf.

[29] MISO, *Planning Resource Auction: Results for Planning Year 2025–26*, at 13 (April 2025), https://cdn.misoenergy.org/2025%20PRA%20Results%20Posting%2020250529_Corrections694160.pdf.

[30] OMS and MISO, *OMS-MISO Survey Results* (Updated June 6, 2025) https://cdn.misoenergy.org/20250606%20OMS%20MISO%20Survey%20Results%20Workshop%20Presentation702311.pdf.

[31] *Id.* at 2.

[32] *Id.* at 7.

[33] *Id.* at 9.

[34] *Id.* at 7, 9.

increase in capacity is largely offset by the projected retirements and does not keep up with the growth in demand.[35]

According to the U.S. Energy Information Administration, coal-fired electricity generation in Indiana has declined from 85% of total generation in 2014 to 42% in 2024. Since 2014, approximately 5,000 MW of coal-fired capacity in Indiana have retired, with almost another 3,900 MW of coal-fired capacity scheduled for retirement by the end of 2028, including Schahfer.[36]

MISO has been taking steps to address these projected deficits, but the solution is years away. For example, on June 6, 2025, MISO submitted a proposal to FERC to establish an Expedited Resource Addition Study (ERAS) process to provide a framework for the expedited study of interconnection requests to address urgent resource adequacy and reliability needs in the near term. This proposal was approved by FERC on July 21, 2025.[37] The ERAS process should help expedite the construction of needed new capacity. However, resources studied under the ERAS will have commercial operation dates that are at least three years away and are provided an additional three-year grace period to commence commercial operations.[38] In addition, supply chain constraints impeding the acquisition of critical grid components, including large natural gas turbines and transformers, are likely to further hinder rapid construction and exacerbate reliability concerns.[39] Consequently, the new ERAS process is unlikely to result in the addition of any new generation capacity in the next few years.

Order No. 202-25-12 was preceded by executive orders on January 20, 2025, and April 8, 2025, in which President Donald J. Trump underscored the dire energy challenges facing the Nation due to growing resource adequacy concerns. President Trump declared a national energy emergency in Executive Order 14156, *Declaring a National Energy Emergency*, in which he determined that the "United States' insufficient energy production, transportation, refining, and generation constitutes an unusual and

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[35] *Id*.

[36] *See Electricity,* Energy Information Administration, Indiana Analysis, https://www.eia.gov/states/in/analysis.

[37] *Midcontinent Independent System Operator, Inc.*, 192 FERC ¶ 61,064 (2025).

[38] *Id.* P 84.

[39] *See generally*, S&P Global, *US Gas-Fired Turbine Wait Times as Much as Seven Years; Costs Up Sharply* (May 2025) ("With demand for natural gas-fired turbines in the US rapidly accelerating amid power demand growth forecasts driven by AI, manufacturing, and electrification, wait times for turbines are anywhere between one and seven years depending on the model, and costs have increased considerably, experts told Platts."), https://www.spglobal.com/commodity-insights/en/news-research/latest-news/electric-power/052025-us-gas-fired-turbine-wait-times-as-much-as-seven-years-costs-up-sharply.

extraordinary threat to our Nation's economy, national security, and foreign policy."[40] The Executive Order adds, "hostile state and non-state foreign actors have targeted our domestic energy infrastructure, weaponized our reliance on foreign energy, and abused their ability to cause dramatic swings within international commodity markets."[41] In a subsequent Executive Order 14262, *Strengthening the Reliability and Security of the United States Electric Grid*, President Trump emphasized that "the United States is experiencing an unprecedented surge in electricity demand driven by rapid technological advancements, including the expansion of artificial intelligence data centers and increase in domestic manufacturing."[42]

Further, the Department detailed the myriad challenges affecting the Nation's energy systems in its July 2025 "Resource Adequacy Report: Evaluating the Reliability and Security of the United States Electric Grid," issued pursuant to the President's directive in Executive Order 14262. The Department concluded that "[a]bsent decisive intervention, the Nation's power grid will be unable to meet projected demand for manufacturing, re-industrialization, and data centers driving artificial intelligence (AI) innovation."[43] The prolific growth of data centers for the development of AI, as well as their immense energy needs, presents a new and unexpected source of load growth.

Grid operators—including MISO itself—have also acknowledged the Nation's current energy crisis. For instance, during a March 25, 2025, hearing before the House Committee on Energy and Commerce, Jennifer Curran, Senior Vice President, Planning and Operations, MISO, testified that "the MISO region faces resource adequacy and reliability challenges due to the changing characteristics of the electric generating fleet, inadequate transmission system infrastructure, growing pressures from extreme weather, and rapid load growth."[44]

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[40] Exec. Order No. 14156, 90 Fed. Reg. 8433 (Jan. 20, 2025) (*Declaring a National Energy Emergency*), https://www.whitehouse.gov/presidential-actions/2025/01/declaring-a-national-energy-emergency/.

[41] *Id*.

[42] Exec. Order No. 14262, 90 Fed. Reg. 15521 (Apr. 8, 2025) (*Strengthening the Reliability and Security of the United States Electric Grid*), https://www.whitehouse.gov/presidential-actions/2025/04/strengthening-the-reliability-and-security-of-the-united-states-electric-grid/.

[43] U.S. Dep't of Energy, *Resource Adequacy Report: Evaluating the Reliability and Security of the United States Electric Grid*, at 1 (July 2025), https://www.energy.gov/sites/default/files/2025-11/DOE%20Final%20EO%20Report%20%28REVISED%20OCT%2027%29.pdf.

[44] *Keeping the Lights On: Examining the State of Regional Grid Reliability Before the House Committee on Energy and Commerce*, Subcomm. on Energy, 119th Cong., at 5 (Mar. 25, 2025) (statement of Ms. Jennifer Curran, Senior Vice President for Planning and Operations, Midcontinent Independent System Operator), https://democrats-energycommerce.house.gov/sites/evo-subsites/democrats-energycommerce.house.gov/

Ms. Curran also described "much stronger growth [in demand for electricity] from continued electrification efforts, a resurgence in manufacturing, and an unexpected demand for energy-hungry data centers to support artificial intelligence."[45] She added, "[a] growing reliability risk is that the rapid retirement of existing coal and gas power plants threatens to outpace the ability of new resources with the necessary operational characteristics to replace them."[46]

ORDER

FPA section 202(c)(1) provides that whenever the Secretary of Energy determines "that an emergency exists by reason of a sudden increase in the demand for electric energy, or a shortage of electric energy or of facilities for the generation or transmission of electric energy," then the Secretary has the authority "to require by order . . . such generation, delivery, interchange, or transmission of electric energy as in [his] judgment will best meet the emergency and serve the public interest."[47] This statutory language constitutes a specific grant of authority to the Secretary to require the continued operation of Schahfer Units 17 and 18 when the Secretary has determined that such continued operation will best meet an emergency caused by a sudden increase in the demand for electric energy or a shortage of generation capacity.

Such is the case here. As described above, the emergency conditions resulting from increasing demand and shortage from accelerated retirement of generation facilities will continue in the near term and are also likely to continue in subsequent years. This could lead to the loss of power to homes and businesses in the areas that may be affected by curtailments or power outages, presenting a risk to public health and safety.

I have also made the determination that, to best meet the emergency arising from increased demand, determined shortage, and other causes, and serve the public interest under FPA section 202(c), Schahfer Units 17 and 18 shall be made available for operation through June 21, 2026.

Based on my determination of an emergency set forth above, I hereby order:

A. From March 24, 2026, MISO and NIPSCO, shall take all measures necessary to ensure that Schahfer Units 17 and 18 are available to operate. For the duration of this Order, MISO is directed to take every step to employ economic dispatch of Schahfer Units 17 and 18 to minimize cost to ratepayers. Following the

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files/evo-media-document/witness-testimony_asthana_eng_grid-operators_03.25.2025.pdf.

[45] *Id.* at 6.

[46] *Id.* at 7.

[47] Although the text of FPA section 202(c) grants this authority to "the Commission," section 301(b) of the Department of Energy Organization Act transferred this authority to the Secretary of the Department of Energy. *See* 42 U.S.C. § 7151(b).

conclusion of this Order, sufficient time for orderly ramp down is permitted, consistent with industry practices. NIPSCO is directed to comply with all orders from MISO related to the availability and dispatch of Schahfer Units 17 and 18.

B. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters as determined by MISO, pursuant to paragraph A. MISO shall provide a daily notification to the Department (via AskCR@hq.doe.gov) reporting whether Schahfer Units 17 and 18 have operated in compliance with the allowances contained in this Order.

C. All operation of Schahfer must comply with applicable environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions.

D. By April 8, 2026, MISO is directed to provide the Department of Energy (via AskCR@hq.doe.gov) with information concerning the measures it has taken and is planning to take to ensure the operational availability of Schahfer Units 17 and 18 consistent with this Order. MISO shall also provide such additional information regarding the environmental impacts of this Order and its compliance with the conditions of this Order, in each case as requested by the Department of Energy from time to time.

E. NIPSCO is directed to file with the Federal Energy Regulatory Commission Tariff revisions or waivers to effectuate this Order, as needed. Rate recovery is available pursuant to 16 U.S.C. § 824a(c).

F. This Order shall not preclude the need for Schahfer Units 17 and 18 to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

G. Because this Order is predicated on the shortage of facilities for generation of electric energy and other causes, Schahfer Units 17 and 18 shall not be considered capacity resources.

H. This Order shall be effective from March 24, 2026 through June 21, 2026, with the exception of applicable compliance obligations in paragraph D.

Issued in Washington, D.C. on this 23rd day of March 2026.

Chris Wright

Chris Wright
Secretary of Energy

cc: **FERC Commissioners**
Chairman Laura V. Swett
Commissioner David Rosner
Commissioner Lindsay S. See
Commissioner Judy W. Chang
Commissioner David A. LaCerte

Indiana Utility Regulatory Commissioners
Chairman Andy Zay
Commissioner Bob Deig
Commissioner Anthony Swinger
Commissioner David Veleta
Commissioner David Ziegner

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 159
March Culley Order

Department of Energy
Washington, DC 20585

Order No. 202-26-20

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA),[1] and section 301(b) of the Department of Energy Organization Act,[2] and for the reasons set forth below, I hereby determine that an emergency exists in portions of the Midwest region of the United States (U.S.) due to a shortage of electric energy, a shortage of facilities for the generation of electricity, and other causes. Issuance of this Order will meet the emergency and serve the public interest.

BACKGROUND

The F.B. Culley Generating Station (Culley) is an electric generating facility in Warrick County, Indiana. Culley is owned and operated by CenterPoint Energy and consists of two coal-fired generation units, Unit 2 (103.7 MW) and Unit 3 (265.2 MW), with a combined name plate capacity of 368.9 MW.[3] Unit 2 and Unit 3 began operations in 1966 and 1973, respectively. Unit 2 was slated to cease operations in December 2025.[4]

Order No. 202-25-13, issued pursuant to FPA section 202(c), required that Culley Unit 2 remain in operation for 90 days, through March 23, 2026. This order was based on my determination that emergency conditions existed in the region served by the Midcontinent Independent System Operator, Inc. (MISO).

Specifically, I determined that MISO faced tight reserve margins due to well-documented year-round resource adequacy concerns, particularly during periods of high demand or low generation resource output.[5] I determined that the continued operation of

[1] 16 U.S.C. § 824a(c).

[2] 42 U.S.C. § 7151(b).

[3] U.S. Energy Information Administration, *Form EIA-860, Schedule 3: Generator Data* (2024), https://www.eia.gov/electricity/data/eia860/.

[4] As a coal-fired facility, it would be difficult for Culley Unit 2 to resume operations once it has been retired. Specifically, any stop and start of operation creates heating and cooling cycles that could cause an immediate failure that could take 30–60 days to repair if a unit comes offline. In addition, other practical issues, such as employment, contracts, and permits may greatly increase the timeline for resumption of operations. Further, if Culley were to begin disassembling Unit 2 or other related facilities, the associated challenges would be greatly exacerbated. Thus, continuous operation is required in such cases so long as the Secretary determines a shortage exists and is likely to persist.

[5] *See*, *e.g.*, *Midcontinent Indep. Sys. Operator, Inc., and Northern Indiana Public Service Company*, Order No. 202-25-12, at 1–4 (Dec. 23, 2025).

Culley Unit 2 would provide additional generation capacity during these periods, which would help prevent the loss of power to homes and businesses that would otherwise pose a risk to public health and safety.[6] I determined that the continued operation of Culley Unit 2 was necessary to alleviate immediate and anticipated threats to reliability.[7]

My determination was based on several facts.

First, in its 2024 Long-Term Reliability Assessment (LTRA), the North American Electric Reliability Corporation (NERC) notes that the MISO assessment area, which covers portions of Arkansas, Illinois, Indiana, Iowa, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Montana, North Dakota, South Dakota, Texas, and Wisconsin, is at an elevated risk "because probabilistic assessments indicate above-normal generator outages during extreme weather can result in unserved energy or load loss. With uncertainty around new resource additions and existing generator retirements, MISO is also at risk of falling below [Reference Margin Levels] within the next five years."[8] Additionally, the LTRA notes that "[t]he departure of MISO's coal fleet has continued with a reduction in capacity of around 6 GW in the past year, and a projected reduction of a further 12 GW over the next five years."[9]

Second, MISO's year-round resource adequacy concerns are well-documented. In 2022, MISO requested Federal Energy Regulatory Commission (FERC) approval of its filing to revise its resource adequacy construct (including the Planning Resource Auction or PRA) to establish capacity requirements for each of the four seasons of the year rather than on an annual basis determined by peak summer demand.[10] MISO justified this revision by explaining that "Reliability risks associated with [r]esource [a]dequacy have shifted from 'Summer only' to a year-round concern."[11] MISO noted that over 60% of all "MaxGen" events (events when MISO initiates emergency procedures because of concerns over the adequacy of available generation) occurred outside of the summer season.[12]

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[6] *See*, *e.g.*, *id.* at 1–4.

[7] *See*, *e.g.*, *id.* at 5.

[8] NERC*, 2024 Long-Term Reliability Assessment*, at 13 (December 2024, corrected July 11, 2025), https://www.nerc.com/globalassets/our-work/assessments/nerc_ltra_2025.pdf.

[9] *Id.* at 44.

[10] *Midcontinent Independent System Operator, Inc.,* FERC Docket No. ER22-495-000 (Nov. 30, 2021). This request was approved by FERC on August 31, 2022. *See Midcontinent Independent System Operator, Inc.*, 180 FERC ¶ 61,141 (2022).

[11] *MISO Transmittal Letter*, FERC Docket No. ER22-495-000, at 3 (Nov. 30, 2021).

[12] *Id.* at 3–4.

CONTINUING EMERGENCY CONDITIONS

The emergency conditions that necessitated the issuance of Order No. 202-25-13 continue, both in the near and long term.[13] The production of electricity from Culley Unit 2 will continue to be critical to maintain reliability in MISO. MISO's resource adequacy concerns were most recently demonstrated during Winter Storm Fern, when Culley operated under a cold weather alert and declared conservative operations from January 23–February 1, 2026. On January 24, MISO declared an Energy Emergency Alert (EEA) 1, as well as an EEA 2 "MaxGen" event for MISO's North and Central Regions due to generation outages, high demand, and transfer capability limits.[14] From January 21–February 1, 2026, Culley operated at roughly 30 MW almost every day, providing vital generation capacity to the region.[15]

In December of 2023, MISO released an "Attributes Roadmap," in which it presented "an in-depth look at the challenges of operating a reliable bulk electric system in a rapidly transforming energy landscape."[16] Among other things, this report described changes in the time of year during which the risk of the loss of load was greatest. For the 2023/2024 Planning Year, the greatest risk of loss of load was in the summer, but it is expected that by the summer of 2027, there will be an equal loss of load risk in both the summer and fall seasons. MISO also projects risk of loss of load in the winter and spring seasons; although not as high as in the summer or fall, losses will nevertheless increase over time.[17]

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[13] Further, as noted in Order No. 202-25-13, as a coal-fired facility, it would be difficult for Culley Unit 2 to resume operations once it has been retired. Specifically, any stop and start of operation creates heating and cooling cycles that could cause an immediate failure that could take 30–60 days to repair. In addition, other practical issues, such as employment, contracts, and permits may greatly increase the timeline for resumption of operations. If CenterPoint Energy were to begin disassembling the unit or other related facilities, the associated challenges would be greatly exacerbated. Thus, continuous operation is required so long as I determine a shortage exists. *See* Order No. 202-25-13 at 1.

[14] *See* Midcontinent ISO on X, (Jan. 24, 2026), https://x.com/MISO_energy/status/2015072060876140805?s=20.

[15] U.S. Dep't of Energy, *FACT SHEET: Energy Department Prevented Blackouts & Saved American Lives During Winter Storms*, (February 2026), https://www.energy.gov/articles/fact-sheet-energy-department-prevented-blackouts-saved-american-lives-during-winter-storms.

[16] MISO, *Attributes Roadmap*, at 3 (Dec. 2023), https://cdn.misoenergy.org/2023%20Attributes%20Roadmap631174.pdf.

[17] *Id.* at 11.

More recently, MISO affirmed the resource adequacy problems occurring outside of its summer season in its 2024 report entitled, "*MISO's Response to the Reliability Imperative.*"[18] In a section of that report entitled, "Risks in Non-Summer Seasons," MISO again stressed that it has resource reliability concerns outside of the summer season.

Widespread retirements of dispatchable resources, lower reserve margins, more frequent and severe weather events and increased reliance on weather-dependent renewables and emergency-only resources have altered the region's historic risk profile, creating risks in non-summer months that rarely posed challenges in the past.[19] These MISO studies indicate that the emergency conditions caused by the loss of generation capacity in MISO extend past the summer season.

In January 2026, NERC released its 2025 Long-Term Reliability Assessment.[20] NERC assessed that the MISO region is at high risk of energy shortfalls over the next five years,[21] stating that it faces significant reliability challenges as "projected resource additions do not keep pace with escalating demand forecasts and announced generator retirements."[22] This determination is based on the combination of accelerating demand growth from new data centers and the retirement of existing thermal generators.[23] The 2025 NERC Long-Term Reliability Assessment notes that "MISO's accredited thermal capacity has decreased by 8.8 GW, driven primarily by reductions in accredited capacity of existing facilities and retirements."[24] The report observes that winter peak periods are a particular concern, with projections showing "shortfalls in planned resources for winter peak periods."[25] However, NERC also concluded that "risks could expand into spring and fall generator maintenance periods when the available dispatchable generation is not enough to counter wind and solar variability when demand is high."[26]

While the 2025–2026 NERC Winter Reliability Assessment found the MISO region to be at normal risk in 2026 and elevated risk in 2027, two earlier winter studies were more critical. The 2023–2024 NERC Winter Reliability Assessment characterized MISO as a region at elevated risk with the "[p]otential for insufficient operating reserves

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[18] MISO, *MISO's Response to the Reliability Imperative* (Updated February 2024), https://cdn.misoenergy.org/2024+Reliability+Imperative+report+Feb.+21+Final 504018.pdf.

[19] *Id.* at 12.

[20] NERC, *2025 Long-Term Reliability Assessment* (Jan. 2026), https://www.nerc.com/globalassets/our-work/assessments/nerc_ltra_2025.pdf.

[21] *Id.* at 7.

[22] *Id.* at 8.

[23] *Id.* at 43.

[24] *Id.* at 15.

[25] *Id.*

[26] *Id.*

in above-normal conditions."[27] These findings were echoed in NERC's 2024–2025 Winter Reliability Assessment, which noted that "[g]enerating capacity is 10 GW lower (-6.8%) compared to that of the prior winter as generators have retired, withdrawn from MISO's capacity market, or received lower winter accredited capacity."[28]

The evidence indicates that there is also a potential longer-term resource adequacy emergency in MISO. When MISO reported the results of its PRA for the 2025-26 Planning Year, it noted that "new capacity additions were insufficient to offset the negative impacts of decreased accreditation, suspensions/retirements and external resources" in the northern and central zones, which include Indiana.[29]

On June 6, 2025, the Organization of MISO States (OMS) and MISO issued the results of their annual survey, which reports the degree to which expected capacity resources satisfy planning reserve margin requirements.[30] The 2025 Survey presented projections of resource adequacy for the summer of 2026 and subsequent years. Although the survey projected a potential capacity surplus for the summer of 2026, it also projected that at least 3.1 GW of additional generation capacity beyond currently committed generation capacity must be added to meet the projected planning reserve margin.[31] The survey also projected that there would be insufficient capacity to meet the peak demand for electricity in each of the following four summers, increasing from a deficit of 1.4 GW in 2027 to 8.2 GW in 2030.[32] Similar results were projected for MISO's winter seasons, with a small surplus of generation capacity in 2026, followed by increasing deficits the following four years.[33]

The primary reasons for these projected deficits also are shown on the OMS-MISO survey. Large amounts of existing generation capacity are projected to be retired each year, while, at the same time, the demand for electricity is projected to increase at an accelerating pace.[34]

Although the OMS-MISO survey projects generation capacity to continue to increase in the coming years with the addition of new potential generation assets, the

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[27] NERC, *2023 – 2024 Winter Reliability Assessment*, at 5 (Nov. 2023), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_WRA_2023.pdf.

[28] NERC, *2024–2025 Winter Reliability Assessment*, at 15 (Nov. 2024), https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_WRA_2024.pdf.

[29] MISO, *Planning Resource Auction: Results for Planning Year 2025–26*, at 13 (April 2025), https://cdn.misoenergy.org/2025%20PRA%20Results%20Posting%20250529_Corrections694160.pdf.

[30] OMS and MISO, *OMS-MISO Survey Results* (Updated June 6, 2025) https://cdn.misoenergy.org/20250606%20OMS%20MISO%20Survey%20Results%20Workshop%20Presentation702311.pdf.

[31] *Id.* at 2.

[32] *Id.* at 7.

[33] *Id.* at 9.

[34] *Id.* at 7, 9.

increase in capacity is largely offset by the projected retirements and does not keep up with the growth in demand.[35]

According to the U.S. Energy Information Administration, coal-fired electricity generation in Indiana has declined from 85% of total generation in 2014 to 42% in 2024. Since 2014, approximately 5,000 MW of coal-fired capacity in Indiana have retired, with almost another 3,900 MW of coal-fired capacity scheduled for retirement by the end of 2028, including Culley.[36]

MISO has been taking steps to address these projected deficits, but the solution is years away. For example, on June 6, 2025, MISO submitted a proposal to FERC to establish an Expedited Resource Addition Study (ERAS) process to provide a framework for the expedited study of interconnection requests to address urgent resource adequacy and reliability needs in the near term. This proposal was approved by FERC on July 21, 2025.[37] The ERAS process should help expedite the construction of needed new capacity. However, resources studied under the ERAS will have commercial operation dates that are at least three years away and are provided an additional three-year grace period to commence commercial operations.[38] In addition, supply chain constraints impeding the acquisition of critical grid components, including large natural gas turbines and transformers, are likely to further hinder rapid construction and exacerbate reliability concerns.[39] Consequently, the new ERAS process is unlikely to result in the addition of any new generation capacity in the next few years.

Order No. 202-25-13 was preceded by executive orders on January 20, 2025, and April 8, 2025, in which President Donald J. Trump underscored the dire energy challenges facing the Nation due to growing resource adequacy concerns. President Trump declared a national energy emergency in Executive Order 14156, *Declaring a National Energy Emergency*, in which he determined that the "United States' insufficient energy production, transportation, refining, and generation constitutes an unusual and

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[35] *Id*.

[36] *See Electricity,* Energy Information Administration, Indiana Analysis, https://www.eia.gov/states/in/analysis.

[37] *Midcontinent Independent System Operator, Inc.*, 192 FERC ¶ 61,064 (2025).

[38] *Id.* P 84.

[39] *See generally*, S&P Global, *US Gas-Fired Turbine Wait Times as Much as Seven Years; Costs Up Sharply* (May 2025) ("With demand for natural gas-fired turbines in the US rapidly accelerating amid power demand growth forecasts driven by AI, manufacturing, and electrification, wait times for turbines are anywhere between one and seven years depending on the model, and costs have increased considerably, experts told Platts."), https://www.spglobal.com/commodity-insights/en/news-research/latest-news/electric-power/052025-us-gas-fired-turbine-wait-times-as-much-as-seven-years-costs-up-sharply.

extraordinary threat to our Nation's economy, national security, and foreign policy."[40] The Executive Order adds, "hostile state and non-state foreign actors have targeted our domestic energy infrastructure, weaponized our reliance on foreign energy, and abused their ability to cause dramatic swings within international commodity markets."[41] In a subsequent Executive Order 14262, *Strengthening the Reliability and Security of the United States Electric Grid*, President Trump emphasized that "the United States is experiencing an unprecedented surge in electricity demand driven by rapid technological advancements, including the expansion of artificial intelligence data centers and increase in domestic manufacturing."[42]

Further, the Department detailed the myriad challenges affecting the Nation's energy systems in its July 2025 "Resource Adequacy Report: Evaluating the Reliability and Security of the United States Electric Grid," issued pursuant to the President's directive in Executive Order 14262. The Department concluded that "[a]bsent decisive intervention, the Nation's power grid will be unable to meet projected demand for manufacturing, re-industrialization, and data centers driving artificial intelligence (AI) innovation."[43] The prolific growth of data centers for the development of AI, as well as their immense energy needs, presents a new and unexpected source of load growth.

Grid operators — including MISO itself — have also acknowledged the Nation's current energy crisis. For instance, during a March 25, 2025, hearing before the House Committee on Energy and Commerce, Jennifer Curran, Senior Vice President, Planning and Operations, MISO, testified that "the MISO region faces resource adequacy and reliability challenges due to the changing characteristics of the electric generating fleet, inadequate transmission system infrastructure, growing pressures from extreme weather, and rapid load growth."[44]

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[40] Exec. Order No. 14156, 90 Fed. Reg. 8433 (Jan. 20, 2025) (*Declaring a National Energy Emergency*), https://www.whitehouse.gov/presidential-actions/2025/01/declaring-a-national-energy-emergency/.

[41] *Id*.

[42] Exec. Order No. 14262, 90 Fed. Reg. 15521 (Apr. 8, 2025) (*Strengthening the Reliability and Security of the United States Electric Grid*), https://www.whitehouse.gov/presidential-actions/2025/04/strengthening-the-reliability-and-security-of-the-united-states-electric-grid/.

[43] U.S. Dep't of Energy, *Resource Adequacy Report: Evaluating the Reliability and Security of the United States Electric Grid*, at 1 (July 2025), https://www.energy.gov/sites/default/files/2025-11/DOE%20Final%20EO%20Report%20%28REVISED%20OCT%2027%29.pdf.

[44] *Keeping the Lights On: Examining the State of Regional Grid Reliability Before the House Committee on Energy and Commerce*, Subcomm. on Energy, 119th Cong., at 5 (Mar. 25, 2025) (statement of Ms. Jennifer Curran, Senior Vice President for Planning and Operations, Midcontinent Independent System Operator), https://democrats-energycommerce.house.gov/sites/evo-subsites/democrats-energycommerce.house.gov/

Ms. Curran also described "much stronger growth [in demand for electricity] from continued electrification efforts, a resurgence in manufacturing, and an unexpected demand for energy-hungry data centers to support artificial intelligence."[45] She added, "[a] growing reliability risk is that the rapid retirement of existing coal and gas power plants threatens to outpace the ability of new resources with the necessary operational characteristics to replace them."[46]

ORDER

FPA section 202(c)(1) provides that whenever the Secretary of Energy determines "that an emergency exists by reason of a sudden increase in the demand for electric energy, or a shortage of electric energy or of facilities for the generation or transmission of electric energy," then the Secretary has the authority "to require by order . . . such generation, delivery, interchange, or transmission of electric energy as in [his] judgment will best meet the emergency and serve the public interest."[47] This statutory language constitutes a specific grant of authority to the Secretary to require the continued operation of Culley Unit 2 when the Secretary has determined that such continued operation will best meet an emergency caused by a sudden increase in the demand for electric energy or a shortage of generation capacity.

Such is the case here. As described above, the emergency conditions resulting from increasing demand and shortage from accelerated retirement of generation facilities will continue in the near term and are also likely to continue in subsequent years. This could lead to the loss of power to homes and businesses in the areas that may be affected by curtailments or power outages, presenting a risk to public health and safety.

I have also made the determination that, to best meet the emergency arising from increased demand, determined shortage, and other causes, and serve the public interest under FPA section 202(c), Culley Unit 2 shall be made available for operation through June 21, 2026.

Based on my determination of an emergency set forth above, I hereby order:

A. From March 24, 2026, MISO and CenterPoint Energy shall take all measures necessary to ensure that Culley Unit 2 is available to operate. For the duration of this Order, MISO is directed to take every step to employ economic dispatch of Culley Unit 2 to minimize cost to ratepayers. Following the conclusion of this

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files/evo-media-document/witness-testimony_asthana_eng_grid-operators_03.25.2025.pdf.

[45] *Id.* at 6.

[46] *Id.* at 7.

[47] Although the text of FPA section 202(c) grants this authority to "the Commission," section 301(b) of the Department of Energy Organization Act transferred this authority to the Secretary of the Department of Energy. *See* 42 U.S.C. § 7151(b).

Order, sufficient time for orderly ramp down is permitted, consistent with industry practices. CenterPoint Energy is directed to comply with all orders from MISO related to the availability and dispatch of Culley Unit 2.

B. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters as determined by MISO, pursuant to paragraph A. MISO shall provide a daily notification to the Department (via AskCR@hq.doe.gov) reporting whether Culley Unit 2 has operated in compliance with the allowances contained in this Order.

C. All operations of Culley Unit 2 must comply with applicable environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions.

D. By April 8, 2026, MISO is directed to provide the Department of Energy (via AskCR@hq.doe.gov) with information concerning the measures it has taken and is planning to take to ensure the operational availability of Culley Unit 2 consistent with this Order. MISO shall also provide such additional information regarding the environmental impacts of this Order and its compliance with the conditions of this Order, in each case as requested by the Department of Energy from time to time.

E. CenterPoint Energy is directed to file with the Federal Energy Regulatory Commission Tariff revisions or waivers to effectuate this Order, as needed. Rate recovery is available pursuant to 16 U.S.C. § 824a(c).

F. This Order shall not preclude the need for Culley Unit 2 to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

G. Because this Order is predicated on the shortage of facilities for generation of electric energy and other causes, Culley Unit 2 shall not be considered a capacity resource.

H. This Order shall be effective from March 24, 2026 through June 21, 2026, with the exception of applicable compliance obligations in paragraph D.

Issued in Washington, D.C. on this 23rd day of March 2026.

Chris Wright

Chris Wright
Secretary of Energy

cc: **FERC Commissioners**

Chairman Laura V. Swett
Commissioner David Rosner
Commissioner Lindsay S. See
Commissioner Judy W. Chang
Commissioner David A. LaCerte

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Commissioner David Ziegner

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 160
Department Order No. 202-26-01

Department of Energy
Washington, DC 20585

Order No. 202-26-01

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA),[1] and section 301(b) of the Department of Energy (DOE) Organization Act,[2] and for the reasons set forth below, I hereby determine that a statutory emergency exists in the Electric Reliability Council of Texas, Inc. (ERCOT) region, due to a sudden increase in demand, a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes. I direct ERCOT (Reliability Coordinator) and its Balancing Authorities and backup generation resources defined below, to comply with this Order.[3] Issuance of this Order will meet the emergency and serve the public interest.

BACKGROUND

Throughout the United States, demand is outpacing generation supply. Generation resource inadequacy is especially problematic during prolonged winter cold snaps. According to the North American Electric Reliability Corporation (NERC), "[w]inter electricity demand is rising at the fastest rate in recent years," and the "total internal demand for the [bulk power system] is forecast to increase by 20.2 GW (2.5%) over last winter's forecast.[4] While NERC assesses that there are "adequate resources for normal winter peak-load conditions," NERC cautions that "more extreme winter conditions extending over a wide area could result in electricity supply shortfalls."[5] According to NERC, areas in the continental United States are at an elevated risk during extreme cold, which jeopardizes American lives, our economy, and national security.[6]

In its 2025–2026 Winter Reliability Assessment, NERC finds that the ERCOT assessment area is at elevated risk. According to NERC, above-normal winter peak and outage

[1] 16 U.S.C. § 824a(c).

[2] 42 U.S.C. § 7151(b).

[3] For all geographical or electrical areas of the Bulk Power System, all areas are under the oversight of one and only one Reliability Coordinator. NERC Rules of Procedure, section 501.1.4.1. All Balancing Authorities are under the responsibility of one and only one Reliability Coordinator. *Id.*, section 501.1.4.2. All Loads and generators are under the responsibility and control of one and only one Balancing Authority. *Id.*, section 501.1.4.4.

[4] *2025-2026 Winter Reliability Assessment*, NERC (NERC 2025-2026 Winter Assessment), at 8 (November 2025), https://www.nerc.com/globalassets/our-work/assessments/nerc_wra_2025.pdf. The NERC 2025-2026 Winter Assessment "identifies, assesses, and reports on areas of concern regarding the reliability of the North American [bulk power system] for the upcoming winter season." *Id*. at 4.

[5] *Id.* at 5.

[6] *Id.* at 6.

conditions could result in the need for operating mitigations and Energy Emergency Alerts (EEAs). NERC states that strong load growth is driving higher winter electricity demand forecasts and contributing to continued risk of supply shortfalls. For this winter season, NERC explains that ERCOT is expected to continue facing reserve shortage risks, particularly under extreme load conditions that accompany freezing temperatures. NERC cautions that load shedding may be needed under wide-area cold weather events.[7]

Under President Trump's leadership, this administration is determined to take swift and decisive action to protect the American people from tragedies, such as Winter Storm Uri, which resulted in "billions of dollars in damages and over 200 deaths."[8]

In Executive Order 14156, "Declaring a National Energy Emergency," President Trump determined that the "United States' insufficient energy production, transportation, refining, and generation constitutes an unusual and extraordinary threat to our Nation's economy, national security, and foreign policy."[9] In Executive Order 14262, "Strengthening the Reliability and Security of the United States Electric Grid," President Trump emphasized that "the United States is experiencing an unprecedented surge in electricity demand driven by rapid technological advancements, including the expansion of artificial intelligence data centers and increase in domestic manufacturing."[10] These Executive Orders underscore the dire energy challenges facing the Nation due to growing resource adequacy concerns.

The Department's July 2025 "Resource Adequacy Report: Evaluating the Reliability and Security of the United States Electric Grid," issued pursuant to the President's directive in Executive Order 14262, details the myriad challenges affecting the Nation's energy systems. "Absent decisive intervention, the Nation's power grid will be unable to meet projected demand for manufacturing, re-industrialization, and data centers driving artificial intelligence (AI)

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[7] NERC, *2025 – 2026 Winter Reliability Assessment*, at 5-6, 31 (Nov. 2025), https://www.nerc.com/globalassets/our-work/assessments/nerc_wra_2025.pdf.

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In July 2025, President Trump released America's AI Action Plan for Winning the Race.[12] It recognizes that the "U.S. electric grid is one of the largest and most complex machines on Earth . . . [that] will need to be upgraded to support data centers and other energy-intensive industries of the future."[13] That plan recommended that we stabilize the grid of today as much as possible, including leveraging extant backup power sources to bolster grid reliability during peak demand and optimize existing grid resources as much as possible, including investigating "new and novel ways for large power consumers to manage their power consumption during critical grid periods to enhance reliability and unlock additional power on the system."[14]

NERC-certified Reliability Coordinators and Balancing Authorities[15] are responsible for identifying and addressing emergency conditions on the bulk power system. As discussed below, this is squarely addressed in the mandatory and enforceable NERC Reliability Standard EOP-011-4. Today, calls for voluntary curtailment are authorized under that standard. However, this action gives Reliability Coordinators and Balancing Authorities another tool to avoid the impacts experienced as a result of Winter Storm Uri.

Currently, there are tens of gigawatts of readily available backup generation that have remained largely untapped until now. Deployment of backup generation resources (whether auxiliary, standby, directly-connected, battery storage or other, and whether synchronized or not to the bulk power system) at data centers (including but not limited to hyperscaler facilities), and at other large load industrial and commercial customer sites, can prevent avoidable blackouts, thereby saving lives and reducing costs to the American people.

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[13] *Id.* at 15.

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[15] The North American Electric Reliability Corporation (NERC) certifies Reliability Coordinators and Balancing Authorities in accordance with its Rules of Procedures.

APPLICATION OF EOP-011-4

Section 215 of the Federal Power Act[16] established a framework for development and implementation of mandatory and enforceable Reliability Standards that apply to Bulk Power System owners, operators, and users, such as Reliability Coordinators and Balancing Authorities. NERC certifies Reliability Coordinators and Balancing Authorities pursuant to an Organization Certification program set forth in its Rules of Procedure,[17] because of the significant roles these two functional entity category types have in ensuring bulk power system reliability. A Reliability Coordinator is defined as:

> the entity that is the highest level of authority who is responsible for the Reliable Operation of the [Bulk Electric System (BES)], has the Wide Area view of the BES, and has the operating tools, processes, and procedures, including the authority to prevent or mitigate emergency operating situations in both next-day analysis and real-time operations. The Reliability Coordinator has the purview that is broad enough to enable the calculation of Interconnection Reliability Operating Limits, which may be based on the operating parameters of transmission systems beyond any Transmission Operator's vision.[18]

A Balancing Authority is "the responsible entity that integrates resource plans ahead of time, maintains Load-interchange-generation balance within a Balancing Authority Area, and supports Interconnection frequency in real time."[19]

Because of the criticality of their respective roles, Reliability Coordinators and Balancing Authorities are subject to NERC's Organization Certification Program to ensure that they have "the tools, processes, training, and procedures to demonstrate their ability to meet the Requirements/sub-Requirements of all of the Reliability Standards applicable to the function(s) . . . ."[20]

NERC Reliability Standard EOP-011-4 addresses Emergency Operations. Requirement 2 states "[e]ach Balancing Authority shall develop, maintain, and implement one or more Reliability Coordinator-reviewed Operating Plan(s) to mitigate Capacity Emergencies and Energy Emergencies within its Balancing Authority Area." Balancing Authorities are responsible for

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[16] 16 U.S.C. § 824o.

[17] *See generally* NERC Rules of Procedure, https://www.nerc.com/globalassets/who-we-are/rules-of-procedure/nerc-rop-effective-20231128_with-appendicies.pdf; *see also id.* section 500.

[18] NERC Rules of Procedure, Appendix 5B; *see also id.* Appendix 2. Other capitalized terms in this definition also are defined in the NERC Rules of Procedure at Appendix 2.

[19] NERC Rules of Procedure, Appendix 5B; *see also id.* Appendix 2.

[20] NERC Rules of Procedure, section 501.

requesting that their respective Reliability Coordinators issue an Energy Emergency Alert in accordance with Requirement 2 and Attachment 1 to EOP-011-4. Among other things, Balancing Authorities are authorized to make "[p]ublic appeals for voluntary Load reductions" in Requirement 2.2.4. Balancing Authority Operating plans must include provisions in accordance with Requirement 2.2.9 for "Transmission Operators to implement operator-controlled manual Load shedding, undervoltage Load shedding, or underfrequency Load shedding" and provisions in accordance with Requirement 2.2.10 to determine reliability impacts of cold weather conditions.

According to Requirement 5,

> Each Reliability Coordinator that receives an Emergency notification from a Transmission Operator or Balancing Authority within its Reliability Coordinator Area shall notify, within 30 minutes from the time of receiving notification, other Balancing Authorities and Transmission Operators in its Reliability Coordinator Area, and neighboring Reliability Coordinators.

According to Requirement 6,

> Each Reliability Coordinator that has a Balancing Authority experiencing a potential or actual Energy Emergency within its Reliability Coordinator Area shall declare an Energy Emergency Alert, as detailed in Attachment 1.

Attachment 1 provides,

> **Initiation by Reliability Coordinator.** An Energy Emergency Alert (EEA) may be initiated only by a Reliability Coordinator at 1) the Reliability Coordinator's own request, or 2) upon the request of an energy deficient Balancing Authority.

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To ensure that all Reliability Coordinators clearly understand potential and actual Energy Emergencies in the Interconnection, NERC has established three levels of EEAs. The Reliability Coordinators will use these terms when communicating Energy Emergencies to each other. An EEA is an Emergency procedure, not a daily operating practice, and is not intended as an alternative to compliance with NERC Reliability Standards.

The Reliability Coordinator may declare whatever alert level is necessary, and need not proceed through the alerts sequentially.

***

Before requesting an EEA 3, the energy deficient Balancing Authority must make use of all available resources; this includes, but is not limited to:

2.5.1 All available generation units are on line. All generation capable of being on line in the time frame of the Emergency is on line.

2.5.2 Demand-Side Management. Activate Demand-Side Management within provisions of any applicable agreements.

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3.3.1 Energy deficient Balancing Authority obligations. The energy deficient Balancing Authority, upon notification from its Reliability Coordinator of the situation, will immediately take whatever actions are necessary to mitigate any undue risk to the Interconnection. These actions may include Load shedding.

Of particular note, NERC's 2025-2026 Winter Assessment recognizes that "[p]roactive issuance of winter advisories and other steps directed at generator availability contributed to improved reliability during cold weather events of the past two winters."[21] NERC further cautions that Reliability Coordinators and Balancing Authorities "should prepare their operating plans to manage potential supply shortfalls and take proactive steps for generator readiness, fuel availability, load curtailment, and sustained operations in extreme conditions."[22]

EMERGENCY SITUATION

Winter Storm Fern poses significant risks to electric reliability in the Reliability Coordinator's footprint. Consistent with NERC's cautionary notes and this Administration's commitment to grid stability, this order seeks to unlock and deploy backup generation resources (whether auxiliary, standby, directly-connected, battery storage or other, and whether synchronized or not to the bulk power system) at data centers (including but not limited to hyperscaler facilities), and at other large load industrial and commercial customer sites as another tool to mitigate any undue risk to the bulk power system. The employment of this backup generation is expected to reduce stress on the grid. This will permit orderly, safe, and secure operations during Winter Storm Fern.

Consistent with my letter issued on January 22, 2026, ERCOT requested today that DOE issue an order pursuant to FPA section 202(c) to allow the deployment of backup generation during emergency conditions.

ORDER

FPA section 202(c)(1) provides that whenever the Secretary of Energy determines "that an emergency exists by reason of a sudden increase in the demand for electric energy, or a shortage of electric energy or of facilities for the generation or transmission of electric energy," then the Secretary has the authority "to require by order . . . such generation, delivery, interchange, or

[21] NERC 2025-2026 Winter Assessment at 7.

[22] *Id*.

transmission of electric energy as in its judgment will best meet the emergency and serve the public interest."[23] This statutory language constitutes a specific grant of authority to the Secretary to authorize the operation of generation, delivery, and transmission resources that the Secretary has determined will best meet an emergency.

I have made the determination that an emergency exists, due to an abrupt, unexpected increase in demand for electric energy relative to prior forecasts, a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes. As discussed above, taking into account the historical data, past projections and planning, and the projections for the upcoming winter season, together with the increasing demand for electricity that has substantially outpaced net generating capacity additions, a statutory emergency exists this winter across the continental United States. As noted above, NERC has warned that winter electricity demand is rising at the fastest rate in recent years and the total internal demand for the bulk power system is forecast to increase by 20.2 GW (2.5%) over last winter's forecast. Even prolonged cold snaps can be expected to lead to the potential loss of power to homes and businesses in the areas that may be affected by curtailments or power outages, presenting a risk to public health and safety during the upcoming winter.

To best meet the emergency and serve the public interest, backup generation resources shall be made available to run during the emergency conditions specified below.

Based on my determination of an emergency set forth above, I hereby order:

A. From January 24, 2026, the Reliability Coordinator and its Balancing Authorities are authorized to direct backup generation resources at data centers (including but not limited to hyperscaler facilities), and at other large load industrial and commercial customer sites (whether auxiliary, standby, directly-connected, battery storage or other, and whether synchronized or not to the bulk power system), to operate as a last resort before declaring an Energy Emergency Alert (EEA) 3 (i.e., before firm load interruption) or during an EEA 3.[24]

B. This Order requires the operation of the backup generation resources described in paragraph A. Following the conclusion of the EEA conditions described in paragraph A, sufficient time for orderly ramp down is permitted, consistent with industry practices.

[23] Although the text of FPA section 202(c) grants this authority to "the Commission," section 301(b) of the Department of Energy Organization Act transferred this authority to the Secretary of the Department of Energy. *See* 42 U.S.C. § 7151(b).

[24] *See* NERC Reliability Standard EOP-011-4, Attachment 1, at 3.1 ("The Reliability Coordinators and the energy deficient Balancing Authority shall continue to take all actions initiated during EEA 2.").

C. This order is not applicable to any backup generation resource serving a critical reliability or backup need, including those at defense, homeland security, first responder, air traffic control, hospital facilities, 911 call centers, water treatment or wastewater facilities, natural gas pipeline facilities, natural gas gathering facilities, or other similar facilities.

D. To minimize adverse environmental impacts, this Order limits operation of deployed units to the times and within the parameters as determined by the Reliability Coordinator and its Balancing Authorities pursuant to paragraphs A-C.

E. All operations of backup generation resources authorized under this order must otherwise comply with ancillary environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to pay fees or purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators.

F. ERCOT shall provide notification to the Department (via AskCR@hq.doe.gov) within one day following the date any backup generation resources have been directed to operate pursuant to this Order. The reporting shall include a list of all backup generation resources directed to operate pursuant to this Order. ERCOT shall provide such additional information regarding the environmental and other impacts of this Order and their compliance with the conditions of this Order, as requested by the Department of Energy from time to time.

G. Each party affected by this order is directed to file with the Federal Energy Regulatory Commission any tariff, tariff revisions or waivers necessary to effectuate this Order, as applicable. Rate recovery is available pursuant to 16 U.S.C. § 824a(c).

H. This Order shall not preclude the need for the backup generation resources subject to this Order to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

I. Because this Order is predicated on the shortage of facilities for generation of electric energy and other causes, any backup generation resource subject to this Order shall not be considered a capacity resource.

J. This Order shall be effective upon its issuance, and shall expire at 11:59 PM EST on January 27, 2026, with the exception of applicable compliance obligations in paragraph D.

Issued in Washington, D.C. at 7:34 PM EST on this 24th day of January 2026.

_____

Chris Wright
Secretary of Energy

cc: **FERC Commissioners**
Chairman Laura V. Swett
Commissioner David Rosner
Commissioner Lindsay S. See
Commissioner Judy W. Chang
Commissioner David A. LaCerte

State Commissioners
See Attachment A

Attachment A: State Contact Information

The table below provides contact information for state commissioners within the NERC Reliability Coordinator.

State	Office	Name
TX	Public Utility Commission of Texas	Thomas Gleeson
		Kathleen Jackson
	Railroad Commission of Texas	Christi Craddick
		Wayne Christian
		Jim Wright

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 161
Department Order No. 202-26-01A

Department of Energy
Washington, DC 20585

Amended Order No. 202-26-01A

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA),[1] and section 301(b) of the Department of Energy (DOE) Organization Act,[2] and for the reasons set forth below, I hereby determine that a statutory emergency exists in the Electric Reliability Council of Texas, Inc. (ERCOT) region, due to a sudden increase in demand, a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes. I direct ERCOT (Reliability Coordinator) and its Balancing Authorities and backup generation resources defined below, to comply with this Order.[3] Issuance of this Order will meet the emergency and serve the public interest.

BACKGROUND

Throughout the United States, demand is outpacing generation supply. Generation resource inadequacy is especially problematic during prolonged winter cold snaps. According to the North American Electric Reliability Corporation (NERC), "[w]inter electricity demand is rising at the fastest rate in recent years," and the "total internal demand for the [bulk power system] is forecast to increase by 20.2 GW (2.5%) over last winter's forecast.[4] While NERC assesses that there are "adequate resources for normal winter peak-load conditions," NERC cautions that "more extreme winter conditions extending over a wide area could result in electricity supply shortfalls."[5] According to NERC, areas in the continental United States are at an elevated risk during extreme cold, which jeopardizes American lives, our economy, and national security.[6]

In its 2025–2026 Winter Reliability Assessment, NERC finds that the ERCOT assessment area is at elevated risk. According to NERC, above-normal winter peak and outage

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Consistent with my letter issued on January 22, 2026, ERCOT requested today that DOE issue an order pursuant to FPA section 202(c) to allow the deployment of backup generation during emergency conditions.

ORDER

FPA section 202(c)(1) provides that whenever the Secretary of Energy determines "that an emergency exists by reason of a sudden increase in the demand for electric energy, or a shortage of electric energy or of facilities for the generation or transmission of electric energy," then the Secretary has the authority "to require by order . . . such generation, delivery, interchange, or

[21] NERC 2025-2026 Winter Assessment at 7.

[22] *Id*.

transmission of electric energy as in its judgment will best meet the emergency and serve the public interest."[23] This statutory language constitutes a specific grant of authority to the Secretary to authorize the operation of generation, delivery, and transmission resources that the Secretary has determined will best meet an emergency.

I have made the determination that an emergency exists, due to an abrupt, unexpected increase in demand for electric energy relative to prior forecasts, a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes. As discussed above, taking into account the historical data, past projections and planning, and the projections for the upcoming winter season, together with the increasing demand for electricity that has substantially outpaced net generating capacity additions, a statutory emergency exists this winter across the continental United States. As noted above, NERC has warned that winter electricity demand is rising at the fastest rate in recent years and the total internal demand for the bulk power system is forecast to increase by 20.2 GW (2.5%) over last winter's forecast. Even prolonged cold snaps can be expected to lead to the potential loss of power to homes and businesses in the areas that may be affected by curtailments or power outages, presenting a risk to public health and safety during the upcoming winter.

To best meet the emergency and serve the public interest, backup generation resources shall be made available to run during the emergency conditions specified below.

Based on my determination of an emergency set forth above, I hereby order:

A. From January 24, 2026, the Reliability Coordinator and its Balancing Authorities are authorized to direct backup generation resources at data centers (including but not limited to hyperscaler facilities), and at other large load industrial and commercial customer sites (whether auxiliary, standby, directly-connected, battery storage or other, and whether synchronized or not to the bulk power system), to operate after ERCOT deploys all available market services, except for frequency responsive services, before declaring an Energy Emergency Alert (EEA) 3 (i.e., before firm load interruption) or during an EEA 3.[24]

B. This Order requires the operation of the backup generation resources described in

[23] Although the text of FPA section 202(c) grants this authority to "the Commission," section 301(b) of the Department of Energy Organization Act transferred this authority to the Secretary of the Department of Energy. *See* 42 U.S.C. § 7151(b).

[24] *See* NERC Reliability Standard EOP-011-4, Attachment 1, at 3.1 ("The Reliability Coordinators and the energy deficient Balancing Authority shall continue to take all actions initiated during EEA 2."). *Cf.* Tex. Util. Code § 37.0561(e) ("After the independent organization deploys all available market services, except for frequency responsive services, the independent organization may direct the applicable electric utility or municipally owned utility to require the large load customer to either deploy the customer's on-site backup generating facilities or curtail load. The independent organization shall include a deployment under this section as firm load shed when calculating any price adjustments for reliability deployments.").

paragraph A. Following the conclusion of the EEA conditions described in paragraph A, sufficient time for orderly ramp down is permitted, consistent with industry practices.

C. This order is not applicable to any backup generation resource serving a critical reliability or backup need, including those at defense, homeland security, first responder, air traffic control, hospital facilities, 911 call centers, water treatment or wastewater facilities, natural gas pipeline facilities, natural gas gathering facilities, or other similar facilities.

D. To minimize adverse environmental impacts, this Order limits operation of deployed units to the times and within the parameters as determined by the Reliability Coordinator and its Balancing Authorities pursuant to paragraphs A-C.

E. All operations of backup generation resources authorized under this order must otherwise comply with ancillary environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to pay fees or purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators.

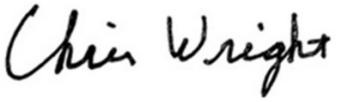
F. ERCOT shall provide notification to the Department (via AskCR@hq.doe.gov) within one day following the date any backup generation resources have been directed to operate pursuant to this Order. The reporting shall include a list of all backup generation resources directed to operate pursuant to this Order. ERCOT shall provide such additional information regarding the environmental and other impacts of this Order and their compliance with the conditions of this Order, as requested by the Department of Energy from time to time.

G. This Order shall not preclude the need for the backup generation resources subject to this Order to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

H. Because this Order is predicated on the shortage of facilities for generation of electric energy and other causes, any backup generation resource subject to this Order shall not be considered a capacity resource.

I. This Order shall be effective upon its issuance, and shall expire at 11:59 PM EST on January 27, 2026, with the exception of applicable compliance obligations in paragraph D.

Issued in Washington, D.C. at 1:46 PM EST on this 25th day of January 2026.



Chris Wright
Secretary of Energy

cc: **FERC Commissioners**
Chairman Laura V. Swett
Commissioner David Rosner
Commissioner Lindsay S. See
Commissioner Judy W. Chang
Commissioner David A. LaCerte

State Commissioners
See Attachment A

Attachment A: State Contact Information

The table below provides contact information for state commissioners within the NERC Reliability Coordinator.

State	Office	Name
TX	Public Utility Commission of Texas	Thomas Gleeson
		Kathleen Jackson
		Courtney K. Hjaltman
		Morgan Johnson
	Railroad Commission of Texas	Christi Craddick
		Wayne Christian
		Jim Wright

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 162
Department Order No. 202-26-03

Department of Energy
Washington, DC 20585

Order No. 202-26-03

Pursuant to the authority vested in the Secretary of Energy by section 202(c) of the Federal Power Act (FPA),[1] and section 301(b) of the Department of Energy (DOE) Organization Act,[2] and for the reasons set forth below, I hereby determine that a statutory emergency exists within the ISO New England Inc. (ISO-NE) service territory due to a shortage of electric energy, a shortage of facilities for the generation of electric energy, and other causes. Issuance of this Order will meet the emergency and serve the public interest.

Emergency Situation

On January 25, 2026, ISO-NE, the Regional Transmission Organization (RTO) spanning six states,[3] filed a *Request for Emergency Order Under Section 202(c) of the Federal Power Act,* (Application) with DOE.[4] ISO-NE has indicated that "[i]n many parts of the ISO-NE Balancing Authority Area, temperatures for January 25, 26, and 27, 2026 are forecasted to drop well below average, and abnormally low temperatures are expected to persist through January 30, 2026."[5] As of the time of filing its Application, ISO-NE is anticipating a "sustained high level of demand for electricity."[6] According to ISO-NE, "[w]hile the vast majority of generating units in the ISO-NE region continue to function adequately, some units may experience difficulty due to emissions/air permitting limitations, or other operating constraints."[7] ISO-NE states that all generating resources may be needed to meet the expected demand of the cold weather event.[8]

[1] 16 U.S.C. § 824a(c).

[2] 42 U.S.C. § 7151(b).

[3] The six states are Connecticut, Rhode Island, Maine, Massachusetts, New Hampshire, and Vermont.

[4] Application at 1.

[5] *Id.* at 2.

[6] *Id.*

[7] *Id.*

[8] *Id.*

Description of Mitigation Measures

In anticipation of the cold weather event, ISO-NE states that it already issued a cold weather watch.[9] ISO-NE has also indicated that it is prepared to employ measures in its Operating Procedures designed to address abnormal conditions or deficiencies to "ensure the supply of generation will continue to be sufficient to meet demand and reserve."[10]

Request for Order

ISO-NE requests that the Secretary issue an order effective immediately and through January 31, 2026, the expected period to address high load related to Winter Storm Fern, authorizing "the provision of additional energy from all [Specified Resources], as well as any other generating units subject to emissions or other permit limitations."[11] The generating units (Specified Resources) to which this Order related are listed in Exhibit A of the Application for instant Order 202-26-3, as described below.

ORDER

FPA section 202(c)(1) provides that whenever the Secretary of Energy determines "that an emergency exists by reason of a sudden increase in the demand for electric energy, or a shortage of electric energy or of facilities for the generation or transmission of electric energy," then the Secretary has the authority "to require by order . . . such generation, delivery, interchange, or transmission of electric energy as in [his] judgment will best meet the emergency and serve the public interest."[12] This statutory language constitutes a specific grant of authority to the Secretary to authorize the operation of generation, delivery, and transmission resources that the Secretary has determined will best meet an emergency.

Given the emergency caused by the expected load stress, the responsibility of ISO-NE to ensure maximum reliability on its system, and the ability of ISO-NE to identify and dispatch generation necessary to meet load requirements, I have determined that, under the conditions specified below, additional dispatch of the Specified Resources is necessary to best meet the emergency and serve the public interest for purposes of FPA section 202(c). This determination is based on the expected load stress, shortage of electric energy, shortage of facilities for the generation of electric energy, and other causes by Winter Storm Fern and its aftermath, and the potential loss of power to homes and local businesses in the areas that may be affected by curtailments or outages, presenting a risk to public health and safety.

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[9] *Id.* at 2-3.

[10] *Id*. at 2.

[11] *Id.*

[12] Although the text of FPA section 202(c) grants this authority to "the Commission," section 301(b) of the Department of Energy Organization Act transferred this authority to the Secretary of the Department of Energy. *See* 42 U.S.C. § 7151(b).

Consistent with the anticipated circumstances, this Order is limited to the period of time that Winter Storm Fern is expected to impact the ISO-NE service territory. Because the additional generation may result in a conflict with environmental standards and requirements, I am authorizing only the necessary additional generation under the conditions contained in this Order, with reporting requirements as described below.

FPA section 202(c)(2) requires the Secretary of Energy to ensure that any 202(c) order that may result in a conflict with a requirement of any environmental law be limited to the "hours necessary to meet the emergency and serve the public interest, and, to the maximum extent practicable," be consistent with any applicable environmental law and minimize any adverse environmental impacts. ISO-NE anticipates that this Order may result in exceedance of permit restrictions on emissions, effluent, or other environmental permit limitations.[13] To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by ISO-NE for reliability purposes.

Based on my determination of an emergency set forth above, I hereby order:

A. In the event that ISO-NE determines that generation from the Specified Resources is necessary to meet the electricity demand that ISO-NE anticipates in its service territory, I direct ISO-NE to dispatch such unit or units and to order their operation only as needed to maintain reliability. Specified Resources are those generating units set forth in Exhibit A to their Application for the instant order (i.e., Order 202-26-3 Resource List), subject to updates directed here and as described in paragraph D, which DOE shall post on www.energy.gov.

B. To minimize adverse environmental impacts, this Order limits operation of dispatched units to the times and within the parameters determined by ISO-NE for maintaining grid reliability and to the maximum extent practicable is consistent with any applicable environmental law. ISO-NE shall provide a daily notification to DOE (via AskCR@hq.doe.gov) reporting each generating unit that has been designated to use the allowance and operated in reliance on the allowances contained in this Order.

C. All operation of the Specified Resource must comply with applicable environmental requirements, including but not limited to monitoring, reporting, and recordkeeping requirements, to the maximum extent feasible while operating consistent with the emergency conditions. This Order does not provide relief from any obligation to pay fees or purchase offsets or allowances for emissions that occur during the emergency condition or to use other geographic or temporal flexibilities available to generators.

D. In the event that ISO-NE identifies additional generation units that it deems necessary to maintain the reliability of the power grid, ISO-NE shall provide prompt written

[13] *Id*. at 1, 4.

notice to DOE at AskCR@hq.doe.gov with the name and location of those units that ISO-NE has identified. Such additional generation unit shall be deemed a Specified Resource for the purpose of this Order for the hours prior to the required written notice to DOE updating Exhibit A of the Application, and ISO-NE may dispatch such additional generation units, provided that if the DOE notifies ISO-NE that it does not approve of such generation unit being designated as a Specified Resource, such generation unit shall not constitute a Specified Resource upon notification from DOE.

E. ISO-NE shall also provide such additional information regarding the environmental impacts of this Order and its compliance with the conditions of this Order, in each case as requested by DOE from time to time.

F. This Order shall not preclude the need for the Specified Resources to comply with applicable state, local, or Federal law or regulations following the expiration of this Order.

G. This Order shall be effective upon its issuance, and shall expire at 11:59PM EST on January 31, 2026, with the exception of the reporting requirements in paragraph D and applicable compliance obligations in paragraph E. Renewal of this Order, should it be needed, must be requested before this Order expires.

Issued in Washington, D.C. at 7:38 AM EST on this 25th day of January 2026.

Chris Wright

Chris Wright
Secretary of Energy

cc: **FERC Commissioners**
Chairman Laura V. Swett
Commissioner David Rosner
Commissioner Lindsay S. See
Commissioner Judy W. Chang
Commissioner David A. LaCerte

State Commissioners
See Attachment A

Attachment A: State Contact Information

The table below provides contact information for state commissioners within ISO-NE.

State	Office	Name
CT	Connecticut Public Utilities Regulatory Authority	Thomas Wiehl
		David Arconti
		Janice Beecher
		Holly Cheeseman
		Everett Smith
RI	Rhode Island Public Utilities Commission	Ronald T. Gerwatowski
		Abigail Anthony
		Karen Bradbury
MA	Massachusetts Department of Public Utilities	Jeremy McDiarmid
		Staci Rubin
		Elizabeth Anderson
	Massachusetts Department of Telecommunications and Cable	Karen Charles
VT	Vermont Public Utility Commission	Ed McNamara
		Riley Allen
		Margaret Cheney
	Vermont Department of Public Service	Kerrick Johnson
NH	New Hampshire Public Utilities Commission	Pradip Chattopadhyay
		Mark W. Dell'Orfano
	New Hampshire Department of Energy	Jared S. Chicoine
ME	Maine Public Utilities Commission	Philip L. Bartlett
		Carrie Gilbert
		Patrick Scully

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 163
DOE Order No. 202-22-2 Amendment No. 1

Department of Energy

Washington, DC 20585

Amendment Number 1 to Order No. 202-22-2

On September 4, 2022, because of a shortage of currently operational electric generating facilities, high demand for electricity, and other adverse conditions resulting from the extreme heat event in California, I issued Order No. 202-22-2. Order No. 202-22-2 authorized the Balancing Authority of Northern California (BANC) to direct the identified electric generating resource (Covered Resources) to operate in BANC's Balancing Authority Area (BAA), under specified conditions, to prevent or mitigate potential power disruptions and provide relief to the bulk power system during stressed grid conditions caused by extreme heat until September 8, 2022. Order No. 202-22-2 expires at the end of the day on September 8, 2022, by its own terms.

On September 7, 2022, BANC submitted a *Request for Extension and Limited Amendment of Emergency Order Pursuant to Section 202(c) of the Federal Power Act* (Renewal Application) to the Department. In its Renewal Application, BANC requests an extension of Order 202-22-1 through September 11, 2022 and certain modifications to the run time hour limitations contained in Order No. 202-22-2. On September 8, 2022, BANC filed a Revised Request for *Request for Extension and Limited Amendment of Emergency Order Pursuant to Section 202(c) of the Federal Power Act* in response to questions from DOE.

Emergency Situation

In its Renewal Application, BANC states that "the actual heat event has been more severe and records loads have been experienced." The emergency conditions brought about by the ongoing extreme heat event in California have continued and worsened and the supply of electricity is at increased risk for meeting system demand. As stated in its Renewal Application, BANC established a new record peak of approximately 4943 MW on September 6. BANC entered into an EEA-2 as of 1330 hours that same day. During this period BANC had forced outages of significant generation but was able to return units to service in approximately 90 minutes. It is believed that BANC members Roseville and Modesto exceeded their all-time peaks. Consequently, BANC requests the expiration date of Order No. 202-22-2 be extended through September 11, 2022.

In addition to the extension of Order No. 202-22-2, BANC has requested that the Order be modified to remove the 2 PM to 10 PM run time limitation so as to allow additional operational flexibility. BANC specifically requests that the Covered Resource be allowed to run during anytime that they have received notice of an Energy Emergency Alert Level 2 (EEA2) condition or greater. The practical impact of this will be to allow the Covered Resource more notice to follow their protocols for ramping up their diesel-fired generator units. In addition, BANC has requested the ramp down of the Covered Resource could extend beyond the period in which the EEA 2 condition exists. Specifically, the ramp down would commence at the time the EEA 2 condition is declared ended and should be completed as soon as possible consistent with good utility and operational

Consultation

In considering renewal or reissuance of an order under FPA section 202(c) that may conflict with an environmental law or regulation, DOE is required to "consult with the primary Federal agency with expertise in the environmental interest protected by such law or regulation" and to include "conditions as such Federal agency determines necessary . . . to the extent practicable." 16 U.S.C. § 824a(c)(4). The Environmental Protection Agency (EPA) is the primary federal agency in this case with expertise in the protected environmental interest, specifically Title V of the Clean Air Act and the Department consulted with EPA after receiving the Renewal Application and EPA did not request any additional conditions be included in this Order. Email from Acting Assistant Administrator Larry Starfield, EPA Office of Enforcement and Compliance Assurance to Kathleen Hogan, Acting Under Secretary for Infrastructure for DOE, September 7, 2022.

Based on the information submitted to the Department, I have determined that an emergency continues to exist in California due to a shortage of electric energy. I find that the issuance of this Order will help to meet the emergency conditions and serve the public interest as required by FPA section 202(c).

ORDER

For the reasons set forth above, pursuant to Section 202(c) of the FPA, I hereby grant BANC's Renewal Application and issue this Order, with modifications as explained below, to extend the expiration date of Order No. 202-22-2 through September 11, 2022.

1. Ordering Paragraph A appearing on page 4 of Order No. 202-22-2 is hereby deleted and replaced in its entirety by the following:

   A. From September 8, 2022, to September 11, 2022, in the event that BANC determines that generation from the Covered Resource is necessary to preserve the reliability of the bulk electric power system in California, I direct BANC to dispatch such unit or units and to order their operation solely under the following conditions: the notification of an Energy Emergency Alert Level 2[1] condition or greater after exhausting all reasonably and practically available resources, together with such reasonable and limited time as is necessary for a Covered Resource to ramp down following an Energy Emergency Alert Level 2 or greater, consistent with good utility practice as directed by the BANC with the goal of limited operation outside of an Energy Emergency Alert Level 2 or greater to the greatest extent possible.

[1] For the purposes of this Order, "Energy Emergency Alert Level 2" has the meaning set forth in Section 3.6.3 of the California ISO System Emergency Operating Procedure, Procedure No. 4420, Version 14.0, Effective Date May 1, 2022 (CAISO Emergency Operating Procedure).

2. The date September 8, 2022 where it appears in Ordering Paragraphs D and H of Order No. 202-22-2 is hereby replaced by the date September 11, 2022.

3. All other terms of Order No. 202-22-2 remain the same and in effect, including Ordering Paragraphs A-H, except as modified herein.

4. This Amendment Number 1 to Order No. 202-22-2 shall be effective upon its issuance, and shall expire at 23:59 Pacific Time on September 11, 2022.

Issued in Washington, D.C. at 16:38 Eastern Time on this 8th day of September, 2022.



Kathleen Hogan
Acting Under Secretary for
Infrastructure

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 164
Starfield Email to Hoffman

From: Starfield, Lawrence <Starfield.Lawrence@epa.gov>
Date: Monday, Sep 11, 2017, 11:27 AM
To: Hoffman, Patricia <Pat.Hoffman@hq.doe.gov>
Cc: Lucas, John T. <John.T.Lucas@hq.doe.gov>, Minoli, Kevin <Minoli.Kevin@epa.gov>, Kelley, Rosemarie <Kelley.Rosemarie@epa.gov>, Chapman, Apple <Chapman.Apple@epa.gov>
Subject: DOE section 202(c) order

To: Pat Hoffman, DOE Acting Under Secretary for Science and Energy

On August 24, 2017, PJM submitted a renewal application requesting a 90-day renewal of the Order issued on June 16, 2017, by the Secretary of Energy. This email confirms that the Department of Energy (DOE) consulted with the Environmental Protection Agency (EPA), the primary Federal agency with expertise in the Mercury and Air Toxics Standard and section 316(b) of the Clean Water Act, with respect to a renewal order under Section 202(c) of the Federal Power Act related to Virginia Electric and Power Company's Units 1 and 2 at its Yorktown Power Station, near Yorktown, Virginia. See 16 U.S.C. § 824a(c)(4)(B) (Federal Power Act, Section 202(c)(4)(B)). DOE's proposed operational conditions for the order are generally consistent with EPA's Administrative Compliance Order, AED-CAA-113(a)-2016-002, as amended.

Thank you for your coordination on this matter.

Larry Starfield
Acting Assistant Administrator
Office of Enforcement and Compliance Assurance
U.S. EPA
Washington, DC

(202) 564-2440 (office)
(202) 564-8179 (direct)

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 166
Grid Strategies LTRA Review

Grid Strategies

Review of NERC's 2025 Long-Term Reliability Assessment

Adria E. Brooks, Michael Goggin, John D. Wilson

March 5, 2026

Prepared for Earthjustice, Natural Resource Defense Council, Sierra Club, and Environmental Defense Fund

Table of Contents

1. Executive Summary
2. Generation resource assumptions
3. Interregional transmission assumptions
4. Demand assumptions
5. Extreme event energy adequacy
6. Conclusions and solutions
7. Methodology

Executive Summary

The NERC LTRA assesses future regional resource adequacy risk. Re-assessment using a more complete accounting of generation, imports, and demand from other data sources results in lower risk.

Overall, the LTRA resource margins are much tighter than what may occur for four reasons.

First, the LTRA underestimates likely-to-connect power resources. Power resources in advanced development stages are projected to provide enough capacity to resolve the majority of shortfalls identified in the LTRA.

Second, the most significant risk to resource adequacy shortfalls are delays to generator interconnection. Actions that delay interconnection study, permitting, and/or construction for generation facilities increase the likelihood of shortfalls.

Third, the LTRA underestimates imports from one region to another. At levels seen historically during extreme events, these are sufficient to further alleviate resource inadequacy.

Furthermore, additional interregional transmission would lessen shortfall risk. The NERC-identified interregional transfer capability additions would help resolve many of the identified seasonal capacity and energy shortfalls.

Fourth, data centers may require significantly less power than expected. Combined with the other three corrections, this scenario could allow all regions to meet 2030 peak summer load and reserve needs.

With a clearer vision of the future and rapid action, the grid could be even more reliable in five years than it is today.

NERC's 2025 Long-Term Reliability Assessment is too pessimistic. This analysis explores three major categories of input assumptions that impact the regional risks NERC identified.

North American Electric Reliability Corporation (NERC)'s Long-Term Reliability Assessment (LTRA) importantly captures potential reliability issues for a snapshot in time. NERC relies on utility-reported input data in making its assessments. This data, by definition, does not account for national power sector trends or limitations—such as double-counting of prospective demand or generation—that can have large impacts on future risk.

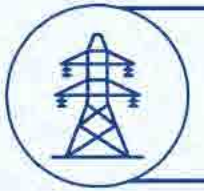
In this analysis we compare NERC's input data and assumptions against other sources to explore how changes to inputs impact the severity of risk identified in the LTRA. We explore three categories of inputs: demand, generation resources, and interregional transmission.

As the LTRA highlights, reserve margins—the difference between electricity demand and available supply—are tightening across the country. We find that while these margins are tightening, the severity of that risk is likely less than reported in the LTRA.

Three major factors:



Generation Resources



Interregional Transmission



Demand for electricity

GridStrategies

SOURCE | NERC "2025 Long-Term Reliability Assessment (LTRA)" (Jan. 2026)

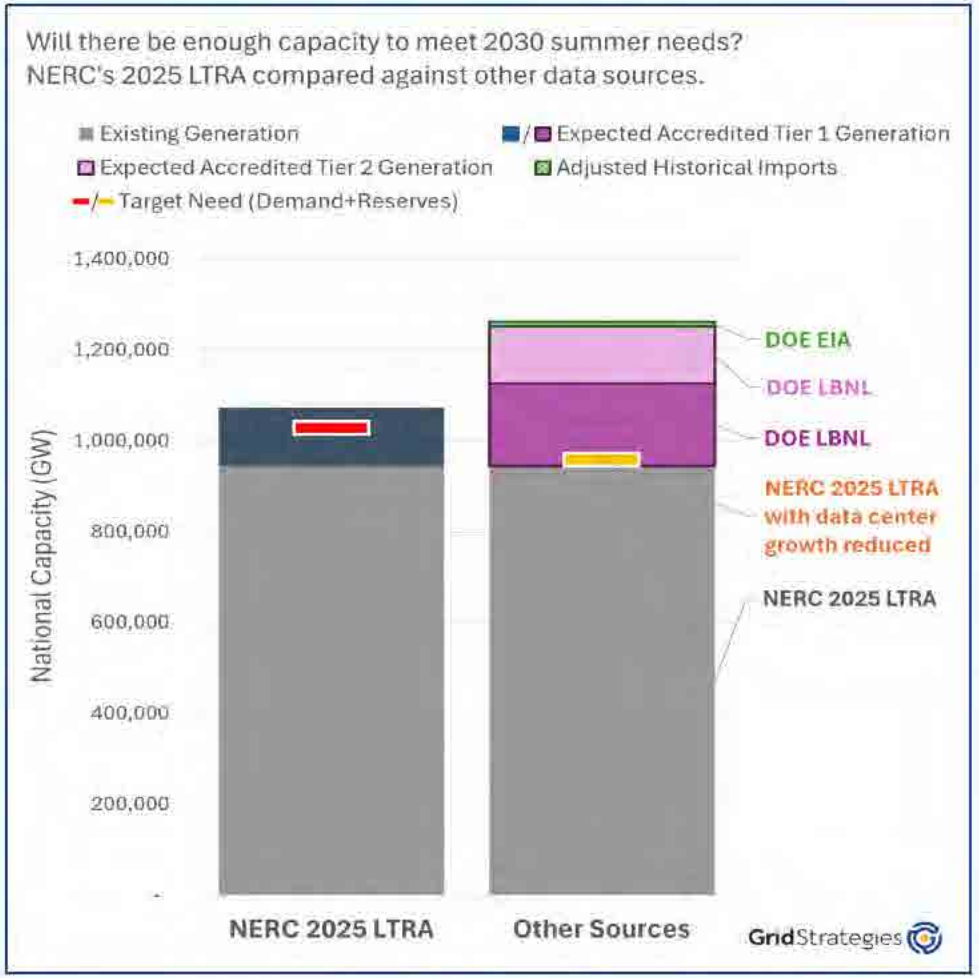
NERC's 2025 LTRA highlights important reliability concerns, but the severity of these concerns depends on the data used.

A reassessment of the LTRA regional seasonal adequacy using a more complete accounting of generation, imports, and demand from other data sources reveals different—and in many cases less dire—risk assessments for some regions.

- The LTRA generation forecast is based on an incomplete accounting of nearly built generation projects. A more reasonable expectation for generation growth can be determined from each region's interconnection queue.
- The LTRA import forecast excludes the opportunity for increased imports from new interregional transfer capability.
- The LTRA demand forecast is supplied by utilities and regional planners. The vast majority of the load growth in the LTRA forecast is based on utility large load forecasts. Some of this load is uncommitted and may not materialize or it may curtail during peak periods.

The combination of low generation, low import, and high demand assumptions used in the 2025 LTRA resulted in resource margins appearing tighter than may actually materialize.

A comparison of the aggregated resource margins from NERC's LTRA and other national, reputable data sources, which account for the above three factors, is shown to the right. This chart is explained in the Methodology.



GridStrategies

SOURCE | NERC "2025 LTRA" (2026); NERC "ES&D" (2026); Wilson, J., et al. (2025; Rand, J. et al. (2025); EIA, "About the EIA-930 data" (accessed Feb. 2026)

Implementing currently available solutions will help all regions alleviate the identified capacity and energy risks.



Resource supply is available to meet rising needs but is encountering roadblocks. Potential solutions include:

- More efficient interconnection queues for all resources
- Permitting certainty and reduced construction delays for needed grid infrastructure
- Adopting reforms to increase coordination between transmission planning and generator interconnection



Additional import capability would help alleviate tight reserve margins. Potential solutions include:

- Appropriately valuing the resource adequacy (capacity) contribution of interregional transmission
- Comprehensive transmission planning processes that consider both firm and non-firm imports
- Acting on NERC's recommended interregional transfer capability additions



Tightening reserve margins are driven primarily by demand growth from large source loads, such as data centers. Potential solutions include:

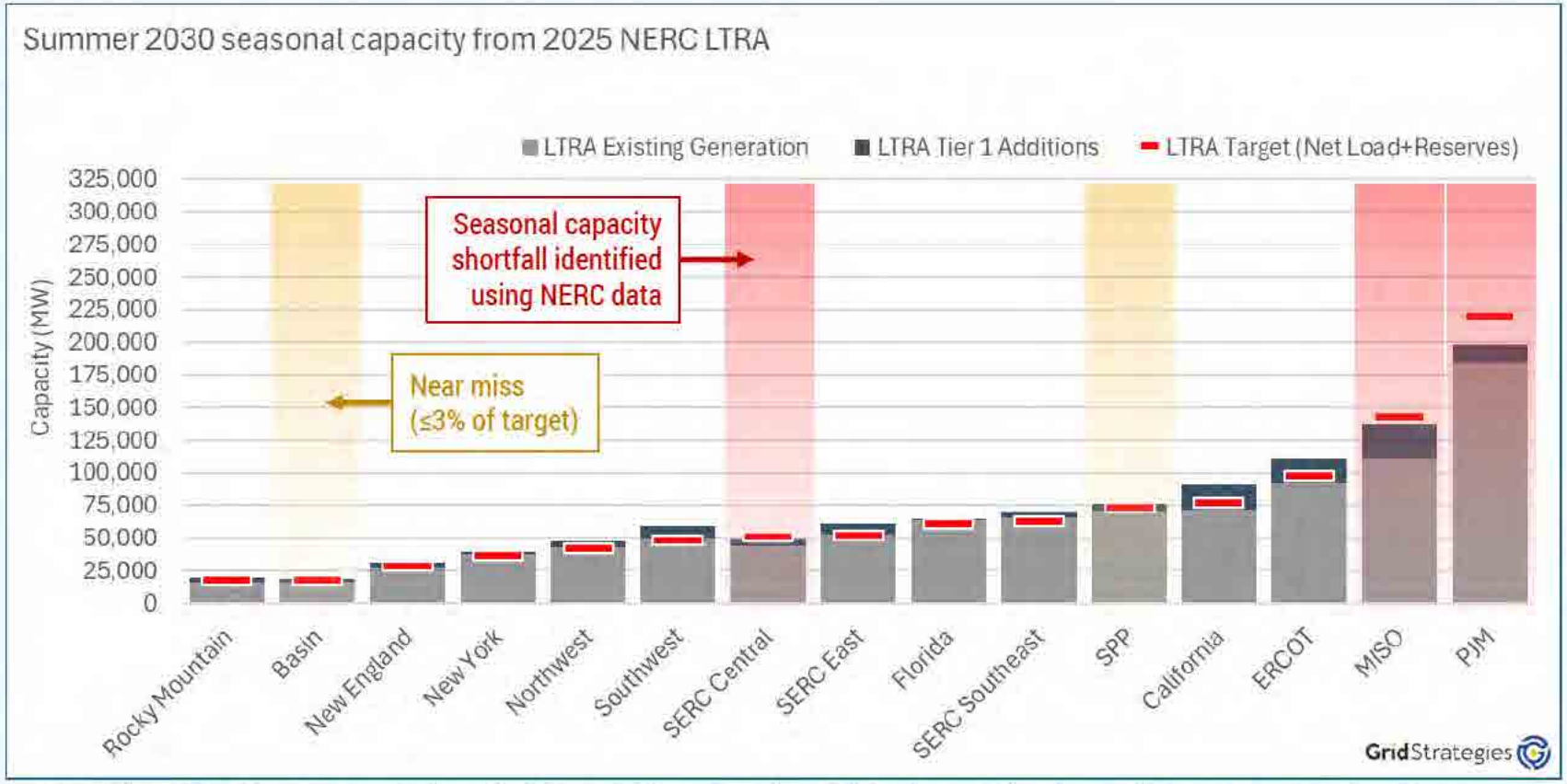
- Reducing the uncertainty and lack of transparency in load forecasts
- Regulatory solutions to connect large loads reliably

Generation Resource Assumptions

NERC only considered resources with executed interconnection agreements when determining shortfall risk.

All resources must undergo interconnection studies to identify any grid upgrades that may be necessary to reliably connect. At the end of the interconnection queue process, an interconnection agreement (IA) is executed. NERC considers any resource that has an executed IA as **Tier 1**.

To be resource adequate, a region must have enough future capacity and imports to meet load and reserve margins ("target"). NERC only counts Tier 1 resources toward future resources in the LTRA. NERC identifies three regions* that may be short of 2030 summer capacity needs using its assumptions. Two regions only exceed their target by less than 3%, marked here as "near miss" regions.



*NERC did not identify SERC Central as a heightened risk region though it is shown to be short of future capacity using the LTRA source data, perhaps because they did not identify elevated energy inadequacy risk despite the seasonal capacity shortfall in the region. We highlight it as elevated risk given the identified seasonal capacity shortfall.

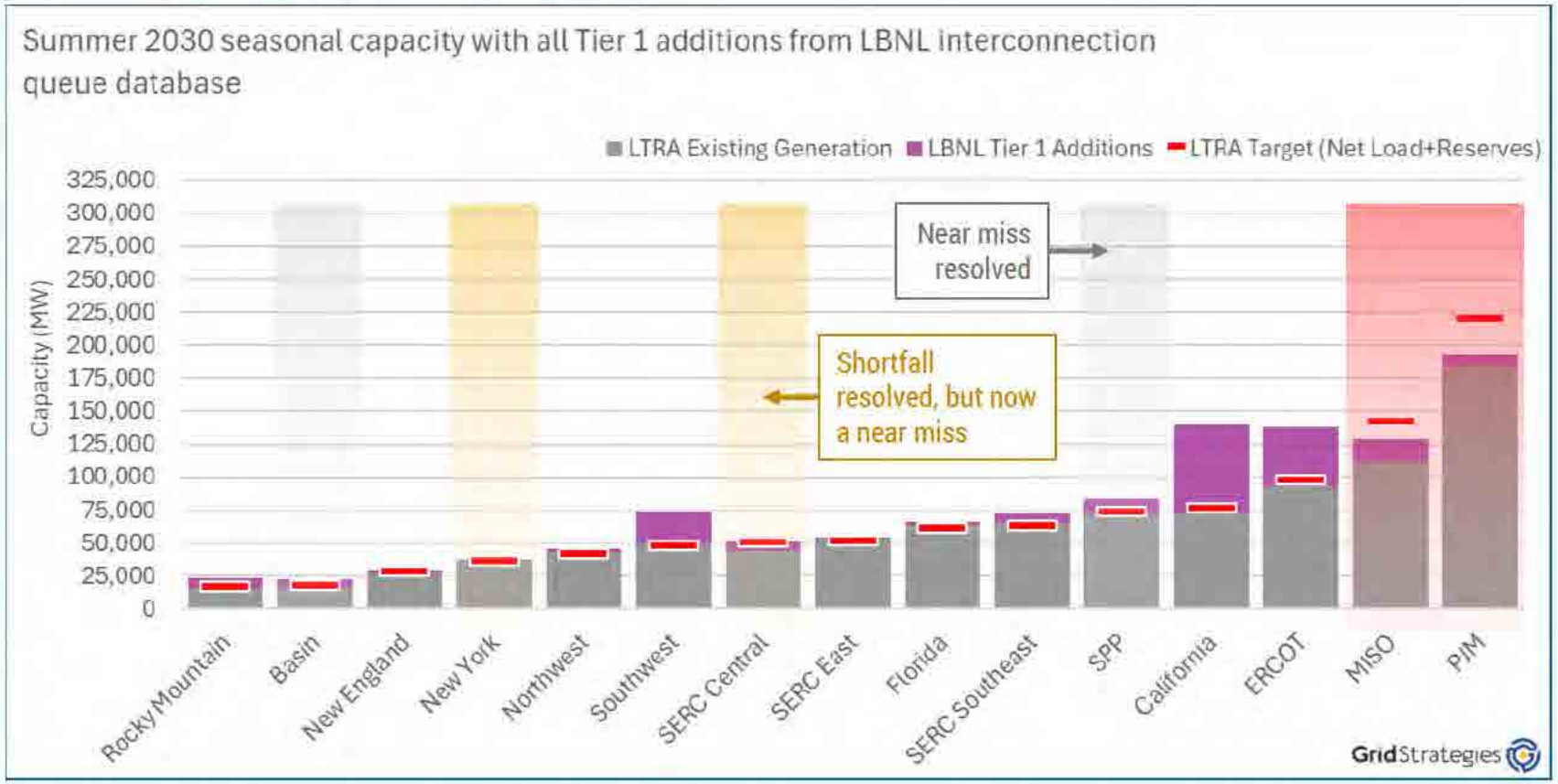
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SOURCE | NERC "2025 LTRA" (2026); NERC "2025 Electricity Supply & Demand (ES&D)" (Jan. 2026)

The amount of resource capacity with executed interconnection agreements in the LTRA is lower than that compiled by LBNL.

The U.S. Department of Energy (DOE)'s Lawrence Berkley National Laboratory (LBNL) tracks interconnection queue data across all regions and is a reputable source of high-quality data. The LBNL data suggests more accredited **Tier 1** resource capacity is available nationwide than is recorded in the LTRA, though regional allocations vary. The mismatch in data could be due to different processing methods, collection periods, and, importantly, resource accreditation methods.*

Using the LBNL data paints a different future risk picture than the LTRA—only two regions show 2030 summer shortfalls. This highlights how sensitive risk assessments are to their input data.



*All LBNL generation capacity used in this analysis has been discounted using regional, seasonal, and resource-specific accreditation methods, to show the expected generation capacity during peak load. Utilities do not uniformly report seasonal or resource-specific accredited capacity to NERC for use in the LTRA, which, as NERC highlights, may inaccurately account for the capacity availability during peak load (LTRA at 9, 44, 60, 71, 76, 122). See the Methodology for more information.

GridStrategies

SOURCE | NERC "2025 LTRA" (2026); NERC "ES&D" (2026); Rand, J. et al. "Interconnection Queue Dataset & Summarized Data Files, through 2024" (Aug. 2025)

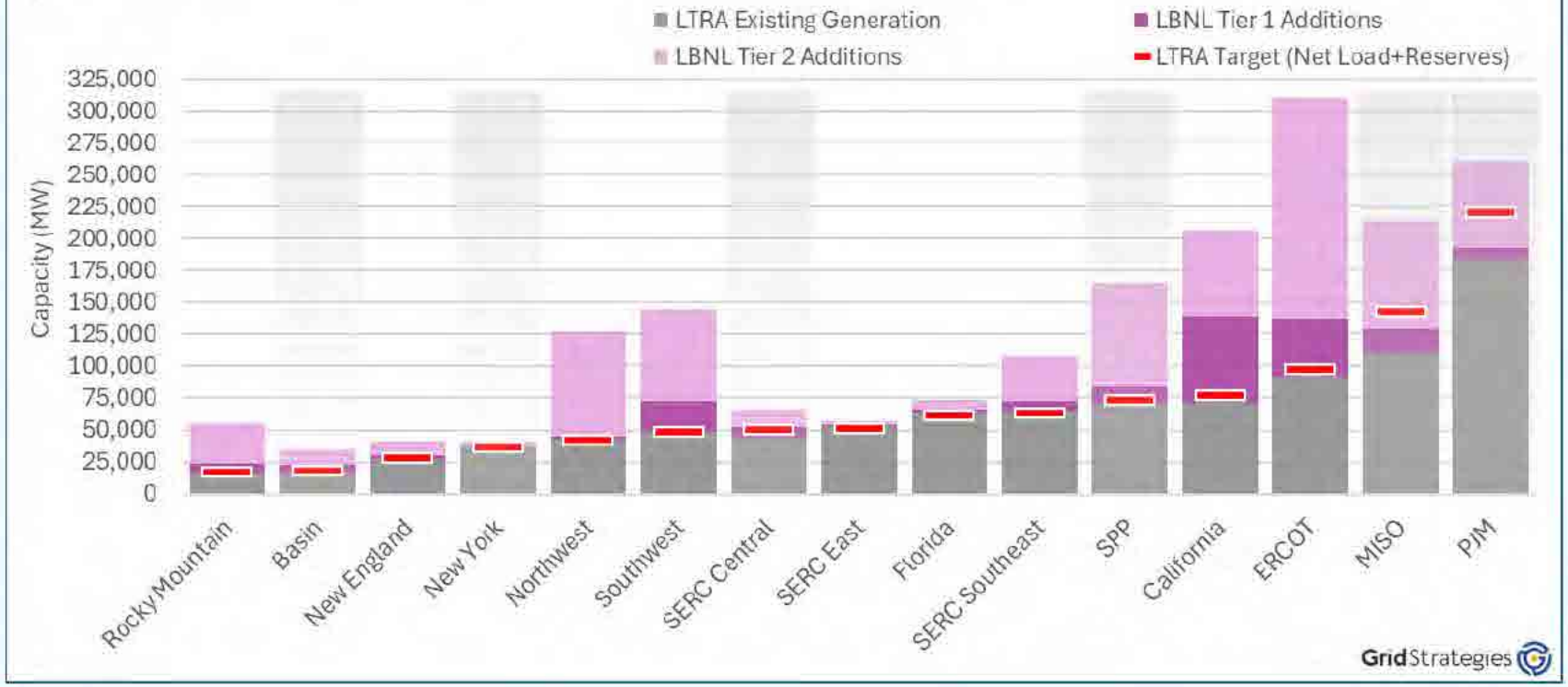
There are more resources under development in each region than those with executed IAs. Providing a path to interconnection for these resources helps alleviate risk.

NERC considers any resource that has begun system studies, but has not yet completed them, to be a **Tier 2** resource. According to LBNL data, there is nearly five times the accredited Tier 2 resource capacity with planned in-service dates by 2030 nationwide than NERC-counted Tier 1 as well as three times the NERC-counted Tier 2 summer 2030 resource capacity.

NERC does not include any Tier 2 capacity in the LTRA shortfall analysis. Inclusion of this capacity suggests that regions could be at less risk of seasonal shortfalls than illustrated in the LTRA.

But this is only true if there are clear pathways for interconnection of these resources. LBNL research shows that generators are facing increasing delays in the interconnection study and post-study phases. These delays contribute to project cancellations, which is dangerous for seasonal resource adequacy.

Summer 2030 seasonal capacity with all Tier 1 and 2 additions from LBNL interconnection queue database



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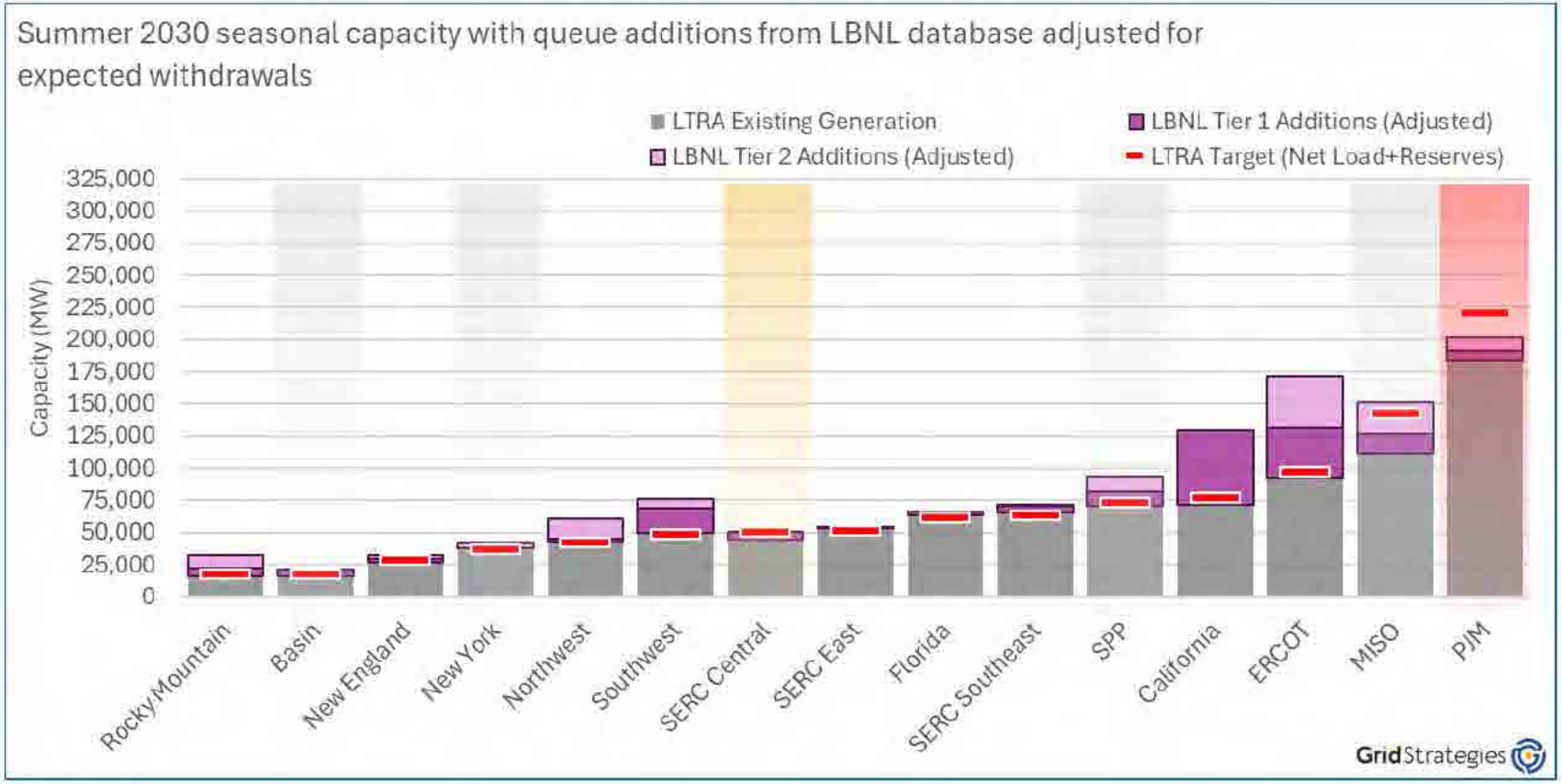
SOURCE | NERC "2025 LTRA" (2026); NERC "ES&D" (2026); Rand, J. et al. (2025)

Even when accounting for likely resource cancellations in the queue and post-queue phases, LBNL data suggests enough resources could connect to meet most regions' 2030 capacity needs.

It is unlikely that all Tier 1 and Tier 2 resources will connect to the grid. LBNL analysis shows as much as 85% of resources that enter the queues fails to connect to the grid ("withdrawal rates"), including facilities with executed IAs.

Rather than omit all Tier 2 data to account for the risk of cancellations (as done in the LTRA), we apply historic region-specific and phase-specific withdrawal rates to the LBNL data to estimate how much may connect to the grid by 2030.

Consideration of likely-to-connect resources currently in the interconnection queues resolves the majority of identified seasonal adequacy shortfalls. The resolution of shortfalls shown here is accomplished without a delay to announced resource retirements.



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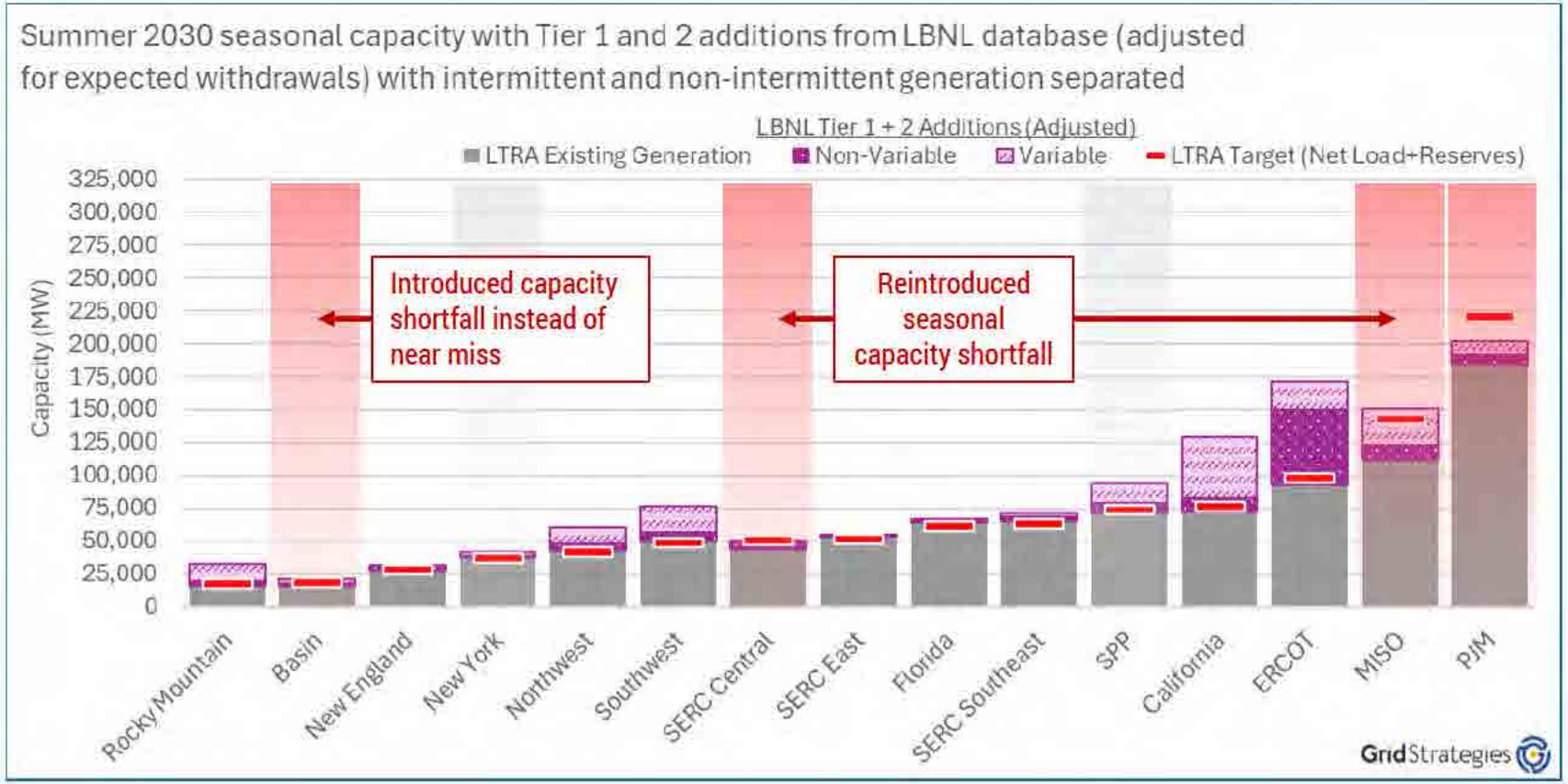
SOURCE | NERC "2025 LTRA" (2026); NERC "ES&D" (2026); Rand, J. et al. (2025)

Delays in the study, permitting, and/or construction phases to resources already in the queues—including wind and solar facilities—could jeopardize meeting regional seasonal capacity needs.

Additional permitting or equipment procurement steps applied to facilities increases their time to interconnection or results in project cancellation outright. Unnecessary hurdles for facilities waiting to interconnect could jeopardize huge amounts of resource capacity in advanced stages of development.

Shown here is the amount of likely-to-connect Tier 1 and 2 resource capacity from the LBNL data, broken out into variable (wind and solar) and non-variable resources.

Actions which delay permitting or construction for variable generation facilities could prevent large portions of the Midwestern, Southeastern, and Western regions from maintaining resource adequacy where they otherwise would be able to.



GridStrategies

SOURCE | NERC "2025 LTRA" (2026); NERC "ES&D" (2026); Rand, J. et al. (2025)

Interregional Transmission Assumptions

Interregional transmission helps to alleviate capacity adequacy concerns, especially during times of grid stress.

One of the many benefits of interregional transmission is the ability to move power between regions during times of grid stress. The availability of imports is primarily due to net load diversity among regions due to timing differences in peak demand and generation unavailability, particularly during severe weather events. Weather patterns and extreme grid events do not impact all regions equally, so there is often spare capacity in a neighboring region that could be shared during times of need. As a result, this benefit will largely persist even if reserve margins in neighboring regions are lower going forward. This phenomenon is well documented in several studies.

The LTRA only includes firm interregional capacity transfers in assessing anticipated reserve margins, which NERC defines as transfers with firm contracts. This ignores the historical role of "non-firm" imports, which are available during extreme events. For example, MISO imported over 13 GW during Winter Storm Uri, of which 5 GW was in turn exported to SPP, imports that literally kept the lights on in those regions.

Sharing of power can only occur, of course, if enough interregional transmission exists to move the available power. NERC acknowledged this in their 2024 Interregional Transfer Capability Study (ITCS) where they measured the amount of interregional transmission capacity that should be added to each region to help support energy adequacy. The ITCS analysis looks at peak grid stress days for each region and determines if excess capacity is likely to be available in neighboring regions during those same hours. It then suggests interregional transmission capacity be added to move that excess generation.



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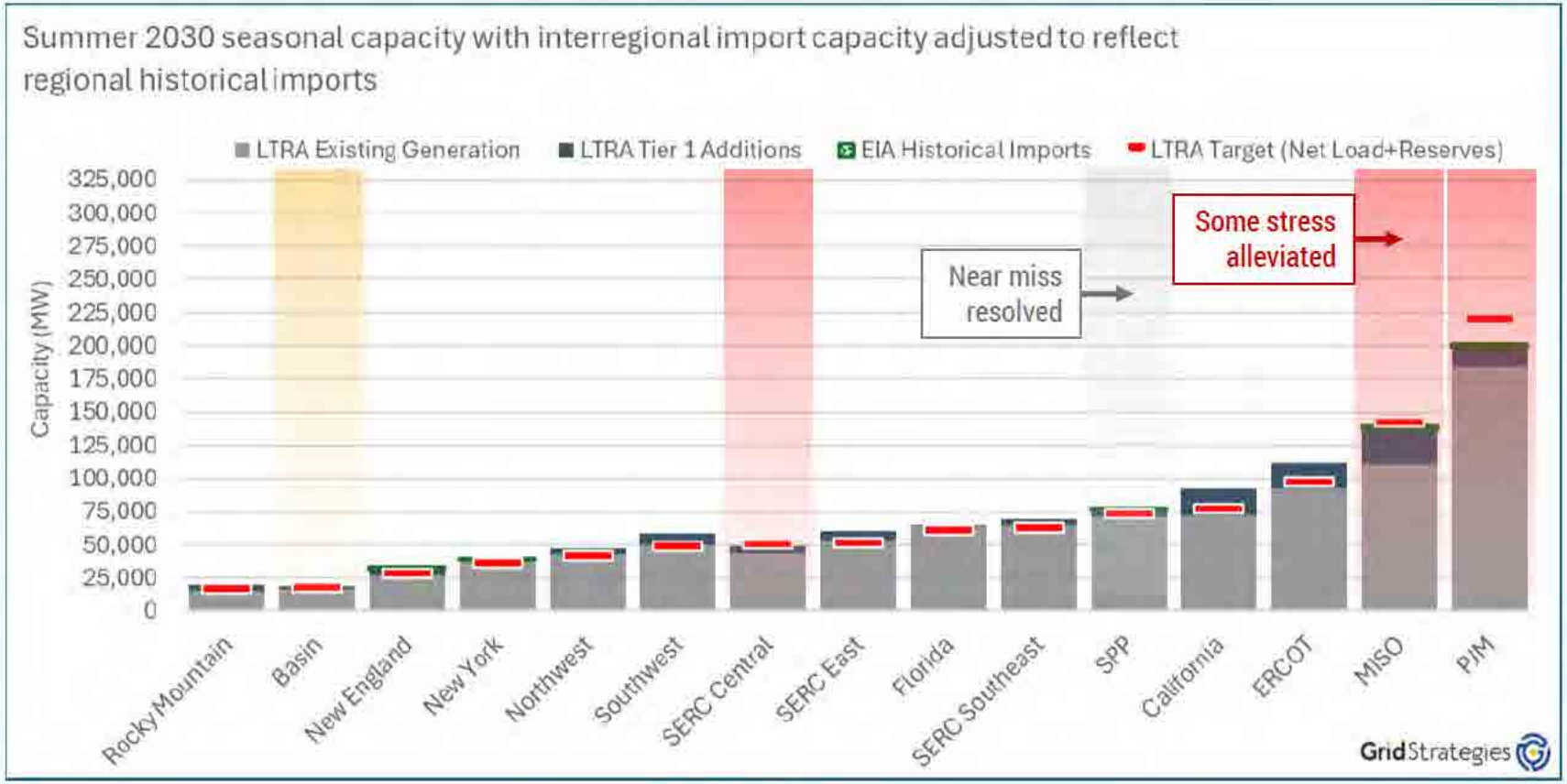
Source | NERC "Interregional Transfer Capability Study" (2024); Goggin, M., Zimmerman, Z., Amman, D., "NERC's Recommended Grid Expansion would Save Consumers Billions" (2025); Brooks, A., Silverstein, A., Gramlich, R., "The Resource Adequacy Value of Interregional Transmission" (2025)

The LTRA only counts firm imports, omitting non-firm imports. Some regional stress is alleviated when combining the LTRA capacity assumptions with historical non-firm import availability.

The LTRA only includes firm interregional capacity transfers in assessing anticipated reserve margins, which NERC defines as transfers with firm contracts. This ignores non-firm imports over interregional transmission lines that have been available during historical grid stress events.

Hourly regional import and export data collected by the U.S. Energy Information Administration (EIA) confirm regions import significantly more during periods of peak demand than the LTRA assumes.

The inclusion of non-firm imports that are historically available during extreme events helps further alleviate resource inadequacy.



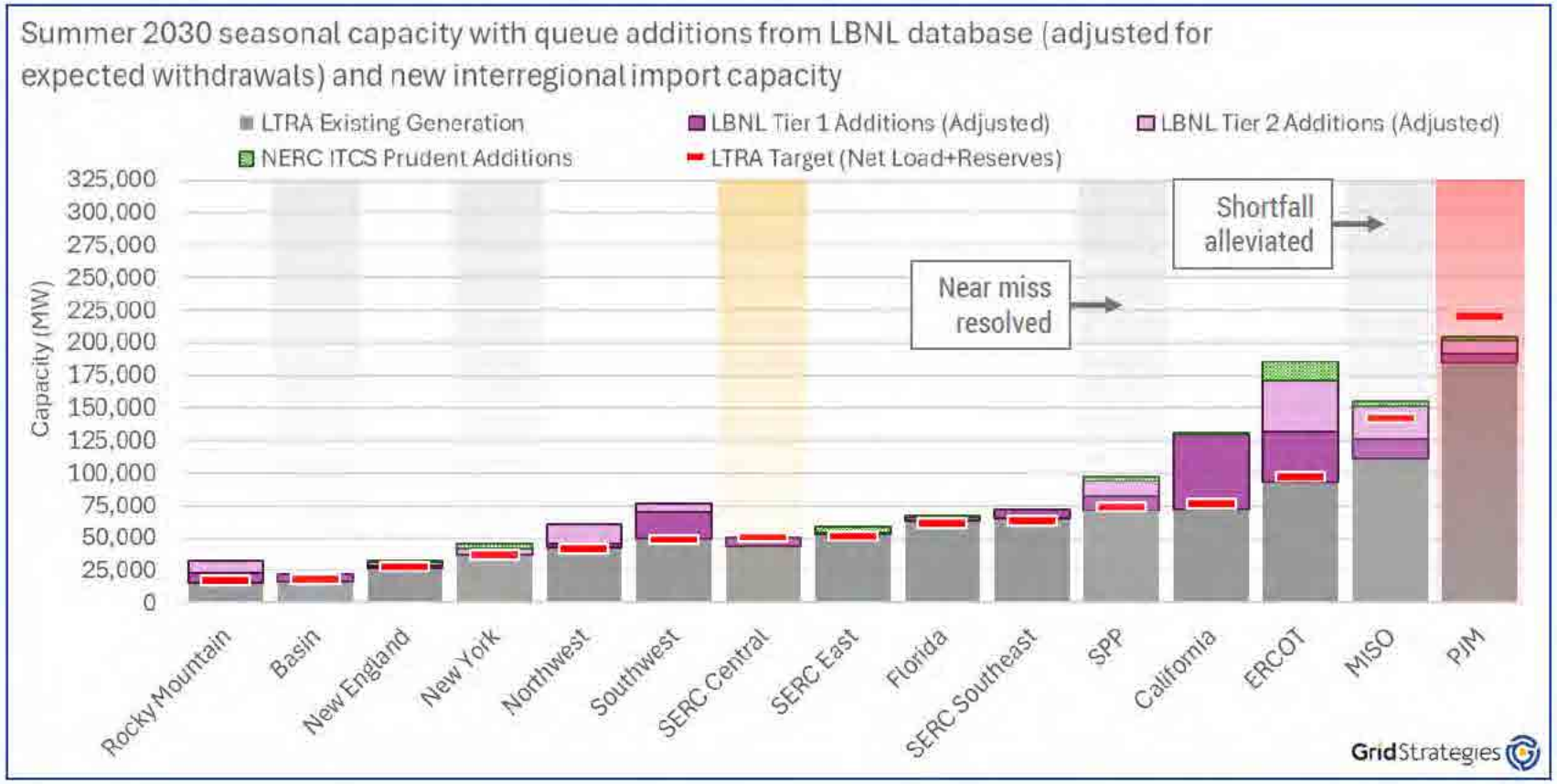
SOURCE | NERC "LTRA" (Jan. 2026); NERC "ES&D" (Jan. 2026); U.S. EIA "About the EIA-930 data" (accessed Feb 2026)

The combination of NERC-identified increased transfer capability and reasonable resource assumptions from the interconnection queues provides even more security to avoid shortfalls.

The combination of interregional transmission additions suggested by NERC's ITCS and reasonable generation additions using LBNL queue data would provide regions with additional capacity to weather seasonal grid stress events.

The addition of new NERC-identified transfer capability would likely resolve many of the identified seasonal capacity and energy shortfalls.

All transmission takes a long time to develop, but this is especially true for interregional transmission. Unfortunately, the NERC-identified interregional transfer capability additions are unlikely to be built by 2030 under the status quo. Legislative and regulatory action taken now could accelerate the construction of these prudent additions.



GridStrategies

SOURCE | NERC "2025 LTRA" (2026); NERC "ES&D" (2026); Rand, J. et al. (2025)

Demand Assumptions

The load growth in the LTRA is based on utility projections that, in some cases, are based on overstated assumptions.

NERC compiled the LTRA load growth forecast by rolling up projections from utilities and regional grid operators. Large load forecasts are uncertain and could overstate load growth for several reasons.

Reliance on customer data: Large load forecasts rely primarily on customer-supplied information.

- Data centers, in particular, are constrained by global supply chains. There is no clear method for individual load forecasts to account for how supply chain constraints will affect specific projects.
- Load forecasts lack visibility into customers' overall business plans. There may be "double counting" as data center operators develop more sites as options than they intend to build. The LTRA includes all loads with "development commitments necessary to drive grid planning studies." In contrast, the LTRA only counts generators that have completed all planning studies and signed an interconnection agreement.
- Many regulated utilities have an incentive to overstate load growth and interconnection success rates to justify additional rate-based investments in generation and other infrastructure.

Time lags: Producing and compiling load growth projections occurs months before the LTRA is released. Mounting delays in large load interconnection and policy changes appear to have slowed load growth since their compilation.

- Load interconnection queue backlogs and long lead times for power transformers and circuit breakers needed for interconnection are likely to delay commercial operation of many large load projects.
- As outlined in the following slides, new large loads from data centers, cryptocurrency mining, and hydrogen electrolysis could each face headwinds that are not fully accounted for in the LTRA.
- Recent policy changes are reducing load growth, such as the recent termination or restriction of federal tax credits for electric vehicles, heat pumps, hydrogen electrolysis, and advanced manufacturing.

Drivers of Load Growth (2025 – 2030)



Load flexibility: Regulations and utility tariffs are beginning to require some large loads to provide demand response or backup generation during periods of peak demand. ERCOT's load forecast includes substantial demand response for crypto mining facilities and assumes that new requirements for large load emergency curtailment would reduce peak demand growth by 84%.

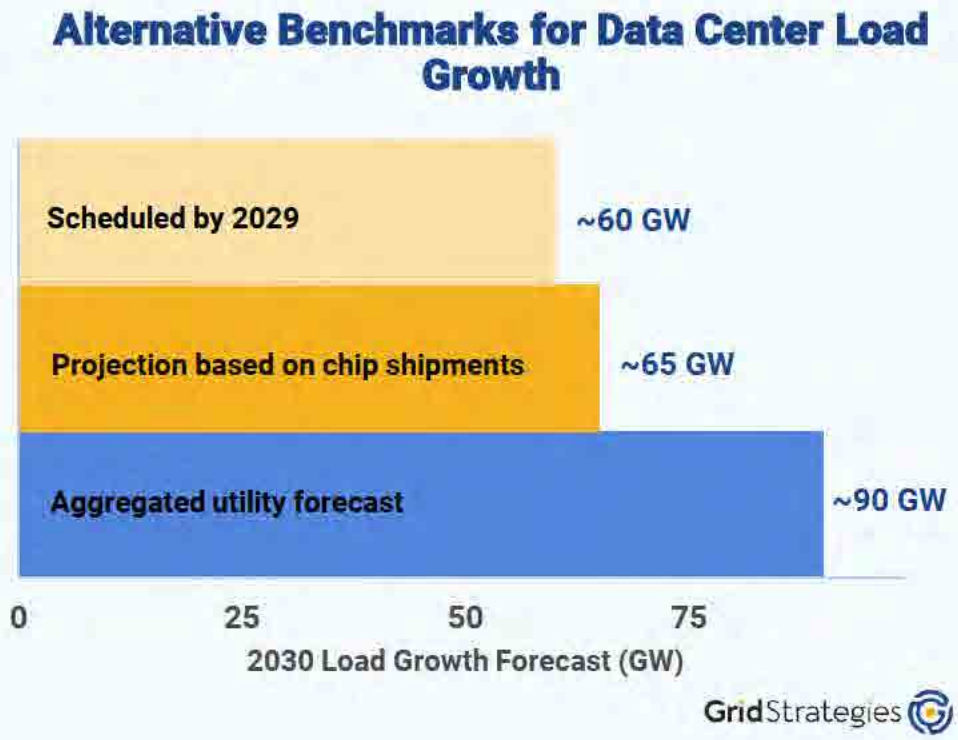
GridStrategies

SOURCE | Wilson, J., et al. "Power Demand Forecasts Revised Up for Third Year Running, Led by Data Centers" (Nov. 2025)

Assumed data center load

The LTRA reasonably states that, "New data centers for artificial intelligence and the digital economy account for most of the projected increase in North American electricity demand over the next 10 years." However, the growth of data centers and their contribution to peak demand may be overstated due to:

- **Supply chain shortages of chips and other key inputs.** TD Cowen estimated that due to chip limitations, U.S. data center growth would be limited to 65 GW (orange bar), about two-thirds of the data center growth assumed for the U.S. alone in the LTRA (blue).
- **Financial constraints.** Wall Street analysts have expressed concerns that expected revenues are insufficient to sustain the overall industry trajectory for AI data center investment.
- **Load flexibility.** Data centers may be able to use local generation and storage resources to reduce or eliminate their on-peak demand for grid power. Additionally, some types of data centers may opt to curtail their demand during peak periods without local supply. Curtailment activities such as these are unlikely to appear in utility forecasts of expected load. These practices may drive up annual energy use.



GridStrategies

SOURCE | TD Cowen, Data Centers, Generative AI, & Power Constraints: The Path Forward (May 2024); Bain & Company, "$2 trillion in new revenue needed to fund AI's scaling trend" (Sept. 2025); Wilson, J., et al. (2025)

Assumed cryptocurrency mining load

Cryptocurrency mining accounts for about 7 GW or 15% of ERCOT's projected large load growth through 2030, though it is likely lower in other regions.

However, cryptocurrency mining data centers are understood to be more speculative than other data center types. Cryptocurrency mining facilities are highly modular and can be readily moved to different sites, even after they have been installed and put into service at a site. Unlike some types of data centers, they do not face major siting constraints due to concerns about latency or access to fiber networks. These factors increase the likelihood of "double counting."

In ERCOT, cryptocurrency mines routinely use demand response or price-sensitive demand bids to curtail demand during peak periods. If properly incentivized to do so, their contribution to peak demand can be reduced or eliminated.

Assumed Hydrogen Electrolyzer Load

Most hydrogen production load is forecast in ERCOT, where planned electrolyzers account for about 8-9 GW or 20% of ERCOT's projected large load growth through 2030. NYISO's load forecast used to include substantial hydrogen production, but it has been adjusted downward. Only a few other load forecasts mention hydrogen production, and at much lower volumes than in ERCOT. According to EIA data, the U.S. had only 116 MW of hydrogen electrolyzers in operation in 2024.

ERCOT's forecast may not reflect a full market response to congressional action to tighten the timeframe for projects to qualify for the Section 45V Clean Hydrogen Production Credit. The credit is now only available for facilities that begin construction by the end of 2027 instead of 2032.

The operation of planned electrolyzers is also difficult to forecast, but they are unlikely to fully contribute to peak load for two reasons:

- The tax credit depends on the carbon-intensity of electricity consumption. This will drive electrolyzers operation to hours with high renewable generation, which are unlikely to be periods of peak net load.
- Regardless of the tax credit, electrolyzers will tend not to operate on-peak because the electricity would be too expensive.

SOURCE | U.S. EIA "Electrolyzers are a small but growing source of U.S. hydrogen production" (2024)

Load flexibility can reduce the capacity needed for large loads

Nearly all the preceding categories of large loads can use demand response, on-site generation and storage, or price-responsive loads to reduce or eliminate their contribution to peak demand.

The LTRA assessment of ERCOT's planning reserve margin assumes that new requirements for large load emergency curtailment would reduce peak demand growth by 84%. Through 2035, as load grows by 59 GW, demand response grows by 50 GW. NERC states that it made this assumption because "signed into law in June 2025, Texas Senate Bill 6 directs the Public Utility Commission of Texas to establish uniform large-load interconnection standards that, among other things, provide ERCOT with new large-load curtailment management tools and ERCOT's authority to direct (or require transmission service providers to direct) large loads to curtail their load prior to and during declared energy emergency situations."

While there is considerable debate about the feasibility for some types of data centers to provide flexibility, ERCOT's requirement shows the potential impact on resource adequacy. Nonetheless, no other load forecasts used to inform the LTRA include similar load flexibility assumptions. As a result, a large share of the projected load growth in the LTRA for other regions could be negated if NERC likewise assumed, as it did for ERCOT, that large loads use some type of flexibility during peak periods. Large loads in these regions could use similar flexibility solutions. For example, Google has signed agreements with utilities to use flexibility to reduce peak load contributions from data centers in Indiana, Nebraska, Arkansas, and the Tennessee Valley Authority footprint (Google 2025).

A recent study estimates 30% of data centers may install flexible capability anyway to curtail during localized transmission system overload or contingency events, as a way to move to the front of lengthy interconnection backlogs by reducing the need for cost- and time-intensive grid upgrades (Thomas 2026). Data centers that are unable to curtail could use behind-the-meter resources during peak periods to reduce or eliminate their reliance on grid power.

SOURCE | Google "How we're making data centers more flexible to benefit power grids" (Aug. 2025); Thomas, M. "Bypassing the Grid: How Data Centers Are Building Their Own Power Plants" (Feb. 2026)

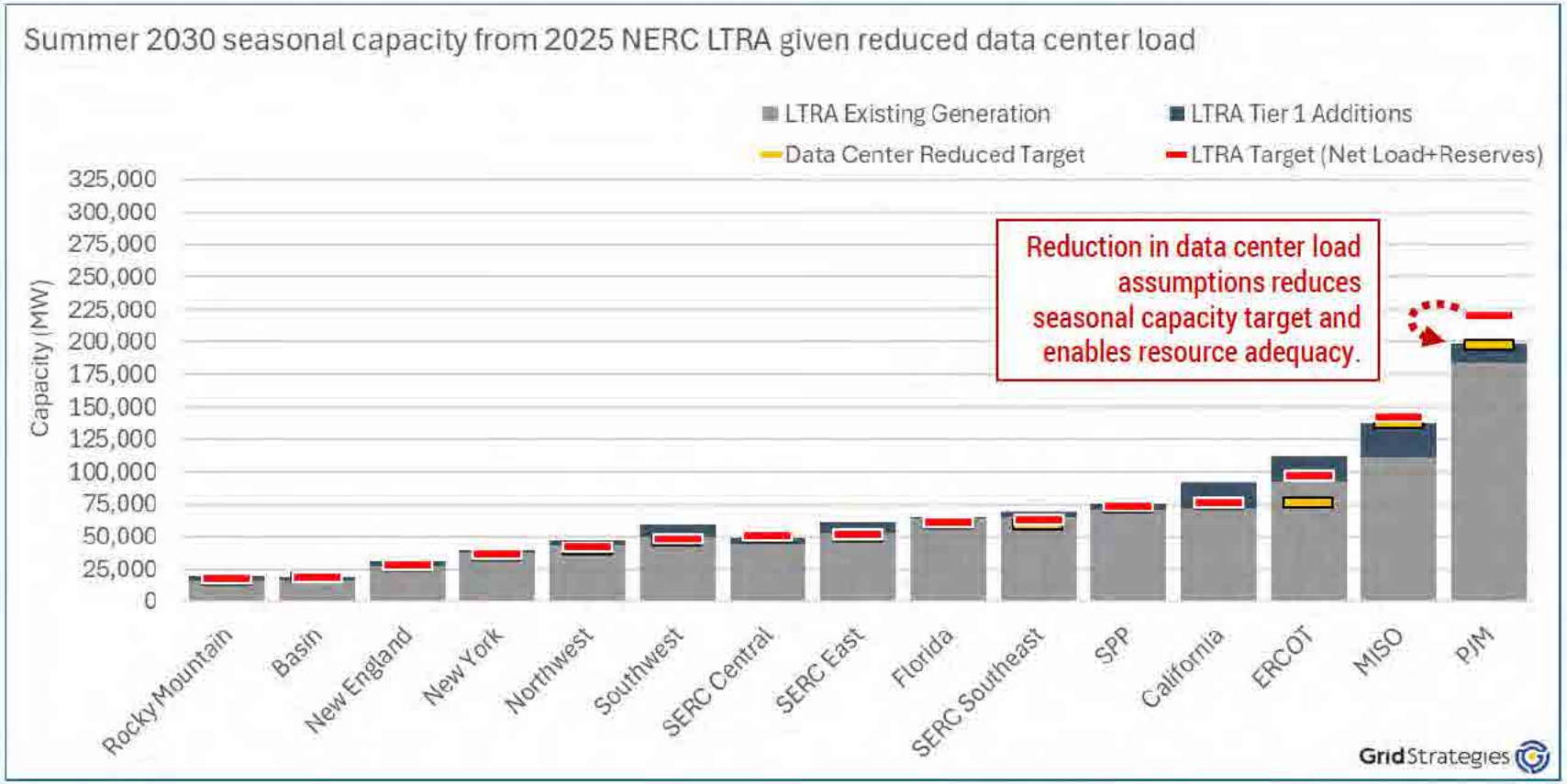
Updating data center load forecasts based on chip-industry forecasts would allow nearly all regions to meet their 2030 target needs

NERC indicates that load growth in several regions is dominated by data centers. To highlight the impacts of uncertainty in data center growth projections in the LTRA, we introduce a scenario which reduces national 2030 data center growth by two-thirds. This reduction is distributed among the regions based on their individual forecasted data center load and is shown as a yellow target in the chart.

A one-third reduction is based on chip industry forecasts and an additional one-third is based on assumed use of on-site generation during peak demand.

Consideration of potential reductions in data center load growth enables all regions to meet their 2030 peak summer load and reserve needs.

Note: If no red target is visible, then the two targets appear to overlap. All regions' net load was reduced.



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SOURCE | NERC "ES&D" (2026); Wilson, J., et al. (2025); Thomas, M. (2026)

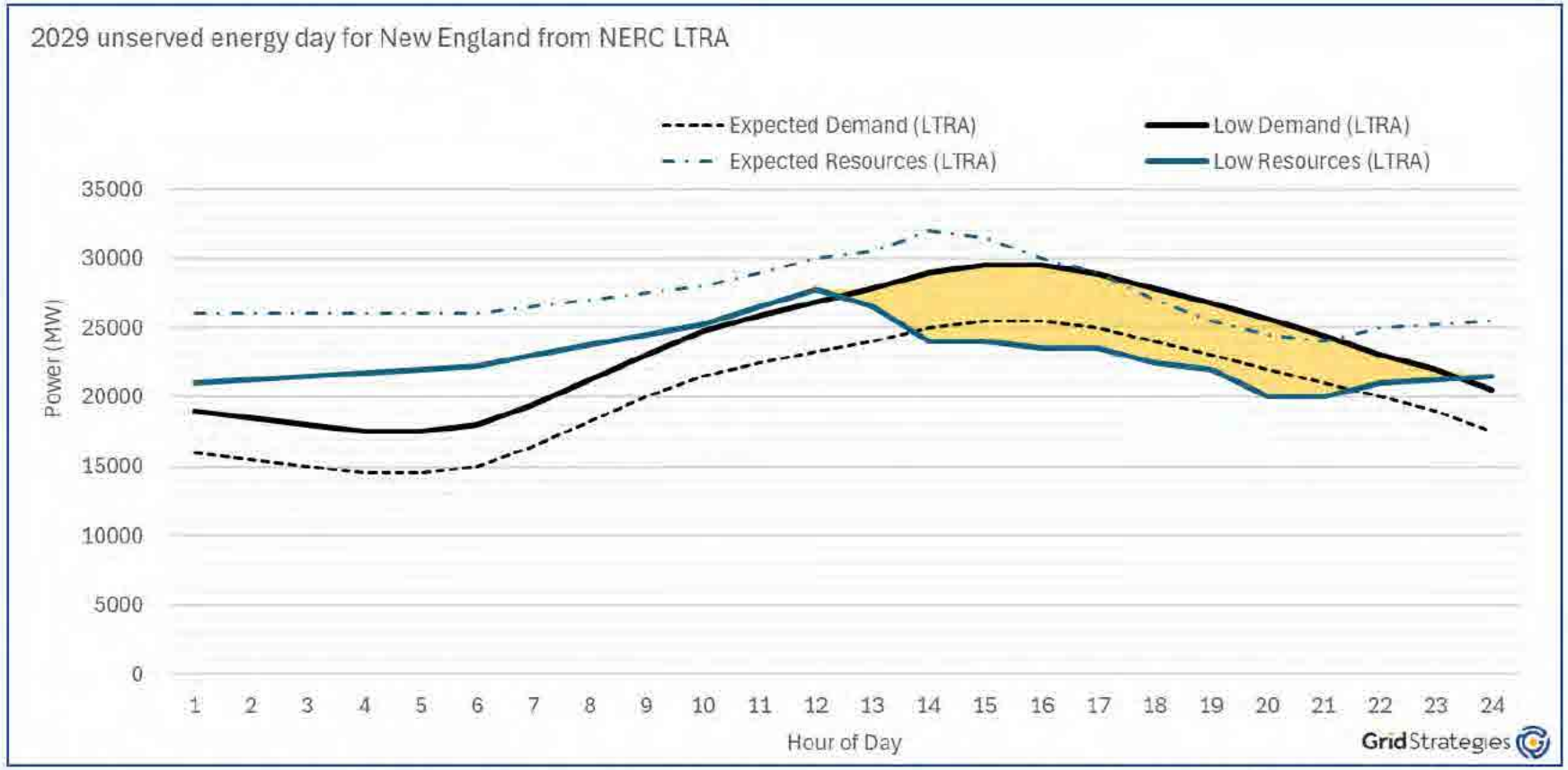
Extreme Event Energy Adequacy

Energy inadequacy risk during extreme events can exist even without seasonal capacity shortfalls. An increase in resource and interregional transfer capability also helps to alleviate extreme event risk.

The risk of energy shortfalls during extreme grid events can exist even without there being a risk of capacity shortfalls when considering only seasonal peak load. It is important to study both capacity and energy adequacy.

For example, NERC found energy shortfalls could occur during extreme heat days in New England,* even though it did not find seasonal capacity shortfalls.

Expected resource production is enough to meet expected demand (dotted lines) on most days, but sensitivity testing shows that the combination of lower-than-expected resources and high demand (solid lines) could result in energy shortfalls (yellow area). Energy shortfalls are often referred to as "unserved energy" or energy inadequacy.



*This figure is a recreation of the extreme event energy analysis shown in the LTRA for New England. We did not independently reproduce this analysis.

GridStrategies

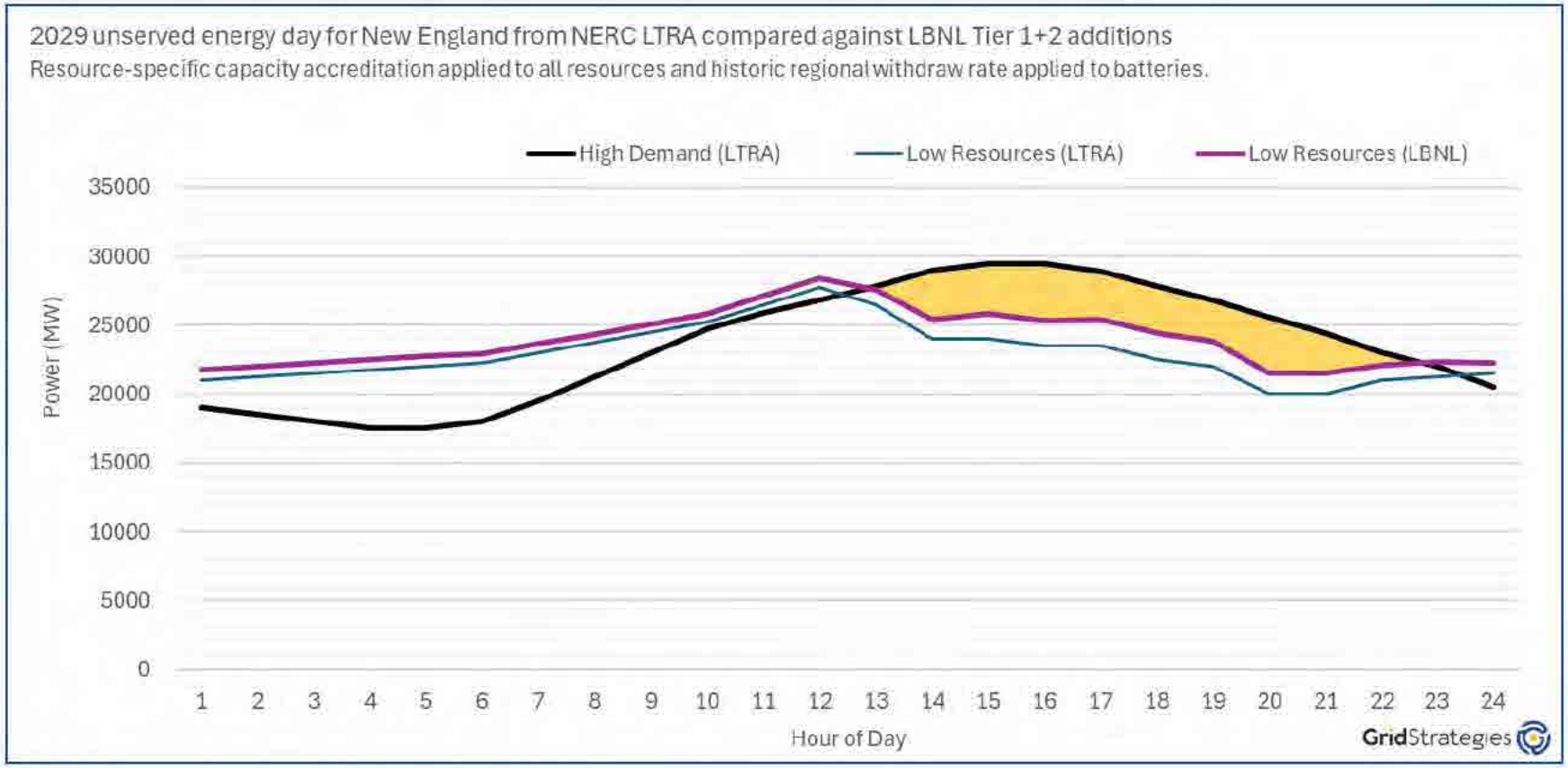
SOURCE | NERC "2025 LTRA" (2026); NERC "ES&D" (2026); Rand, J. et al. (2025)

Using LBNL resource assumptions for New England greatly reduces unserved energy risk during peak load days.

LBNL data records more solar, offshore wind, and storage resources than the NERC data.* Lower-than expected production from the LBNL-identified resource mix (purple line) better matches the times of high demand (black) than the NERC-identified resource mix (blue).

Given accredited, likely-to-connect Tier 1 and 2 resource capacity from LBNL, the amount of potential unserved energy on peak summer days in New England is reduced by nearly 40% of that calculated using NERC data. If capacity had not been reduced by expected withdrawals, the unserved energy shown here would be completely resolved.

Diverse resource mixes—especially those matched to the load profiles of the region—provide major benefits to withstand extreme grid events.



*See the Methodology section for more details.

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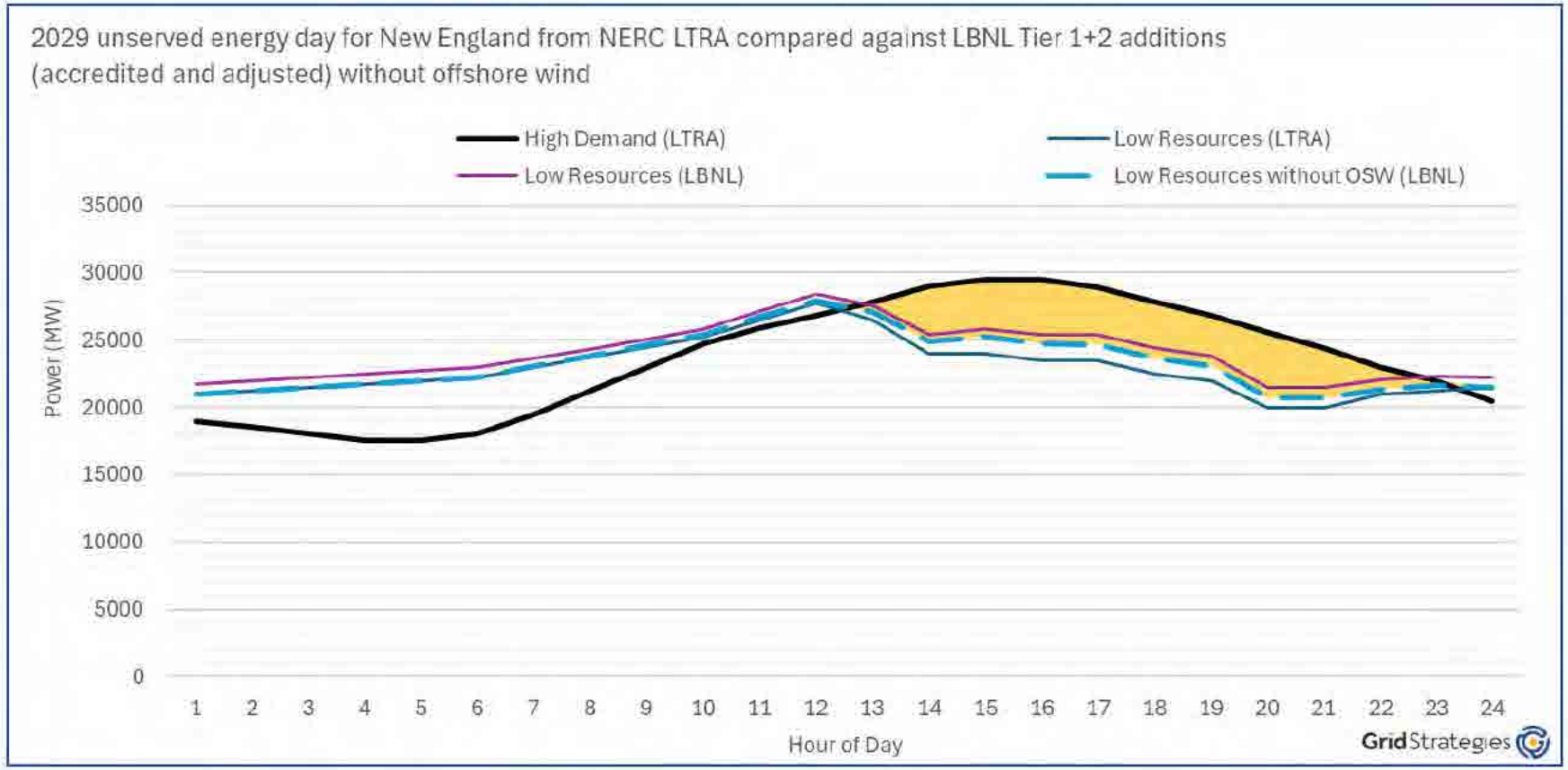
SOURCE | NERC "2025 LTRA" (2026); NERC "ES&D" (2026); Rand, J. et al. (2025)

As with seasonal capacity adequacy, permitting and/or construction delays of resources with executed IAs are likely to exacerbate energy inadequacy risk during extreme grid events.

Delays of resources progressing through the queues or with executed IAs, whatever the cause, will exacerbate the risk of unserved energy during extreme grid events. Currently, offshore wind is facing additional permitting and construction hurdles. This is especially noteworthy for New England, where strong afternoon offshore wind output could directly reduce unserved energy risk during peak load hours.

Near-term unserved energy risk increases substantially given the delay or cancellation of planned offshore wind generation.

Given the low production of a resource mix without offshore wind (shown as the blue dotted line), the unserved energy risk is only reduced by 20% instead of 40% of that calculated in the LTRA.



SOURCE | NERC "2025 LTRA" (2026); NERC "ES&D" (2026); Rand, J. et al. (2025)

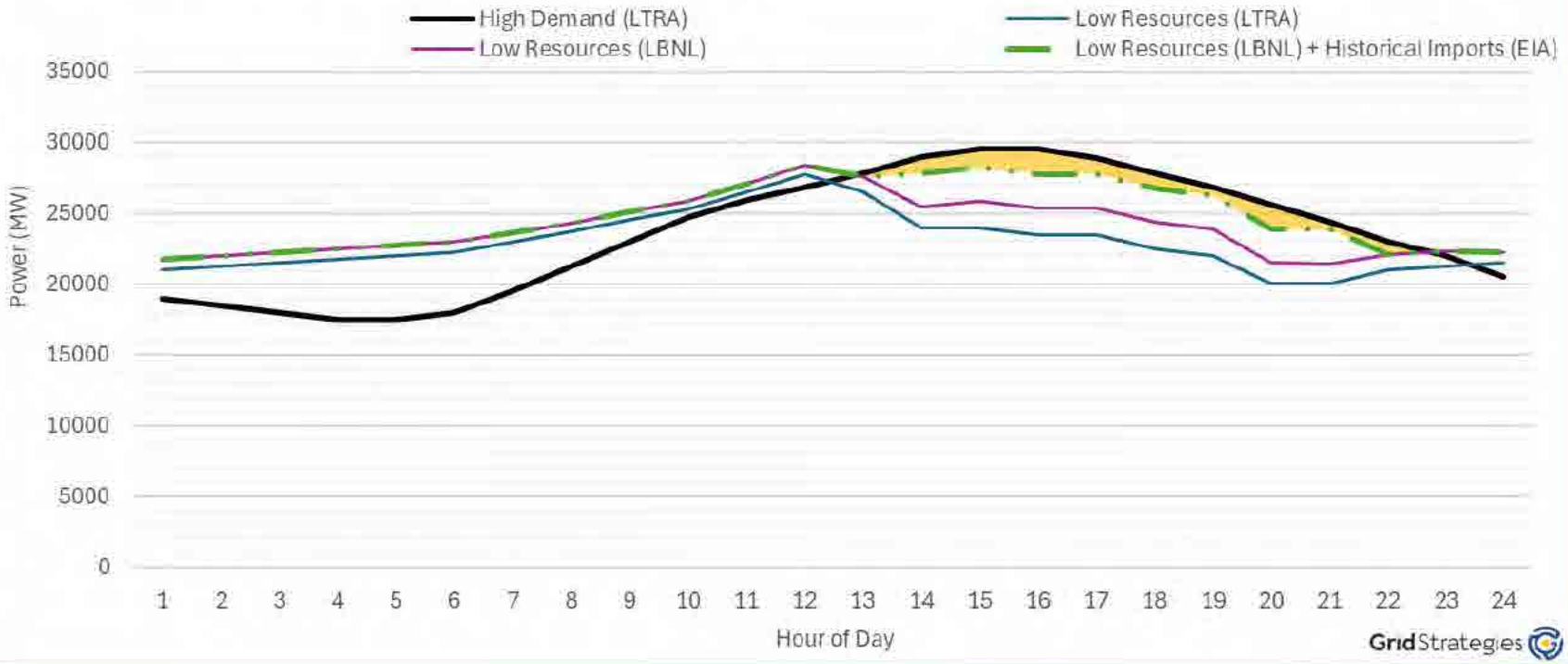
Interregional transmission designed to move power between regions during times of grid stress further reduces unserved energy risk.

As explained in slides 15-17, NERC only includes firm imports in its seasonal capacity or energy adequacy analysis. This ignores the likelihood of additional "non-firm" imports which are historically available to regions during extreme events. Non-firm imports are those which are not contracted for use during normal operations, but that neighboring regions can export to regions experiencing heightened stress.

Adding the imports which have been historically available to New England during extreme events further reduces expected unserved energy.

The combination of likely-to-connect generation from the interconnection queues and historically available non-firm import data nearly eliminates the unserved energy risk calculated using the LTRA assumptions.

2029 unserved energy day for New England from NERC LTRA compared against LBNL Tier 1+2 additions (accredited and adjusted) and historical import availability from EIA



GridStrategies

SOURCE | NERC "2025 LTRA" (2026); NERC "ES&D" (2026); Rand, J. et al. (2025)

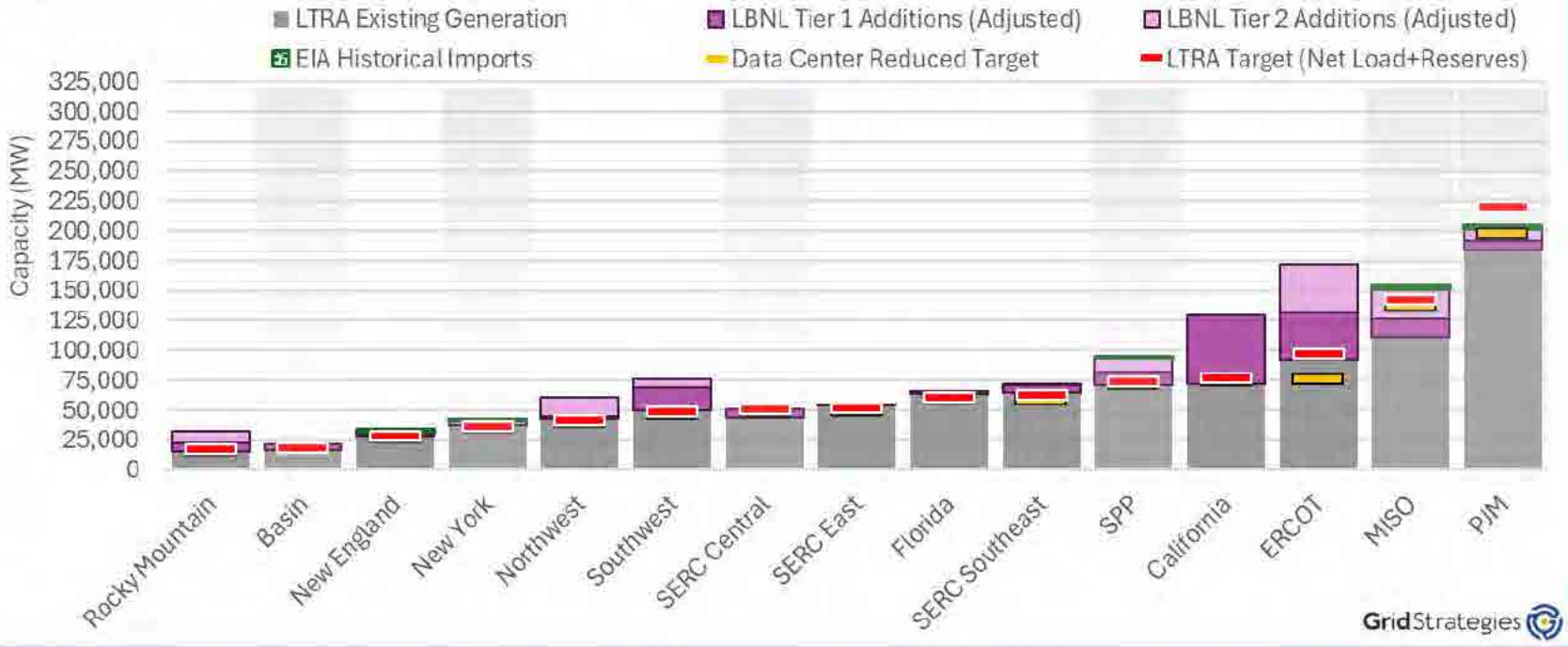
Conclusions and Solutions

In this analysis, we considered different assumptions for generation resource, interregional transmission, and demand than the LTRA. The combination of all three suggest all regions could be resource adequate.

The regional seasonal resource adequacy risks identified in the 2025 NERC LTRA are all resolved when evaluated under different input assumptions:

- Including generation that is actively working through the interconnection queues in each region (Tiers 1 & 2)
- Discounting all generation nameplate capacity by the resource and region-specific accreditation methods
- Discounting generation queue data by historic regional and phase-specific withdraw rates
- Consideration of historic non-firm imports during extreme events
- Including increased interregional transfer capability capacity (albeit low likelihood of 2030 in-service date)
- Reduced data center load to account for microchip industry supply chain constraints and generation flexibility

Summer 2030 seasonal capacity with queue additions from LBNL database (adjusted for expected withdrawals), interregional import capacity (adjusted for historical imports), and reduced data center load



GridStrategies

SOURCE | NERC "2025 LTRA" (2026); NERC "ES&D" (2026); Rand, J. et al. (2025)

While reduced risk is likely given different assumptions, these results should not be taken for granted. Enacting existing solutions is needed to stave off future reliability risk.



Resource supply is available to meet rising needs but is encountering roadblocks. Potential solutions include:

- More efficient interconnection queues for all resources
- Permitting certainty and reduced construction delays for needed grid infrastructure
- Adopting reforms to increase coordination between transmission planning and generator interconnection



Additional import capability would help alleviate tight reserve margins. Potential solutions include:

- Appropriately valuing the resource adequacy (capacity) contribution of interregional transmission
- Comprehensive transmission planning processes that consider both firm and non-firm imports
- Acting on NERC's recommended interregional transfer capability additions



Tightening reserve margins are driven primarily by demand growth from large source loads, such as data centers. Potential solutions include:

- Reducing the uncertainty and lack of transparency in load forecasts
- Regulatory solutions to connect large loads reliably

Methodology

The NERC LTRA assesses each region's ability to meet both its future capacity and energy adequacy needs.

NERC's LTRA importantly captures potential reliability issues for a snapshot in time. Risk is defined by tightening reserve margins—the difference between electricity demand and available supply.

In its 2025 version, NERC identified several regions* as either **High** or **Elevated** risk of not being able to meet their future capacity and energy needs.

Seasonal capacity shortfall risk: MISO, PJM, and SERC-Central (with SPP and Basin on the margin)

Extreme event energy shortfall risk: MISO, PJM, New England, New York, SERC-East, Basin, Northwest, and ERCOT

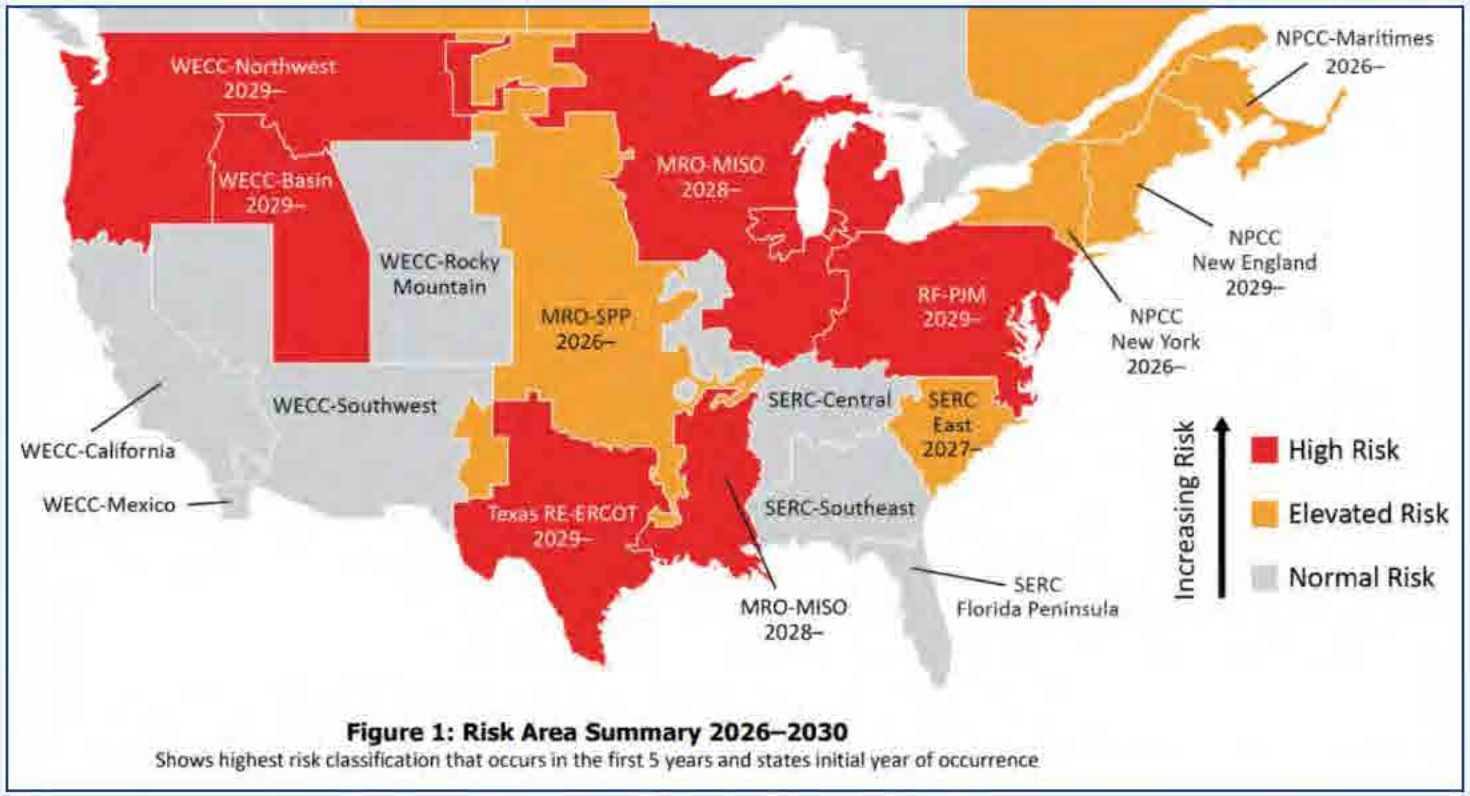


Figure 1: Risk Area Summary 2026–2030
Shows highest risk classification that occurs in the first 5 years and states initial year of occurrence

*NERC did not mark SERC-Central as elevated risk despite showing large seasonal shortfalls while SPP was marked as elevated risk despite having neither seasonal capacity shortalls nor extreme event energy shortfalls.

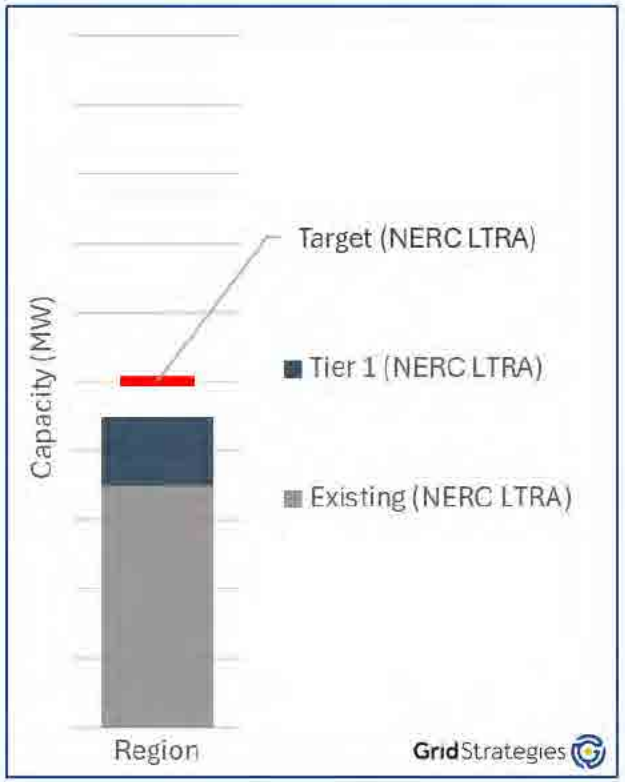
GridStrategies

SOURCE | NERC "2025 LTRA" (2026)

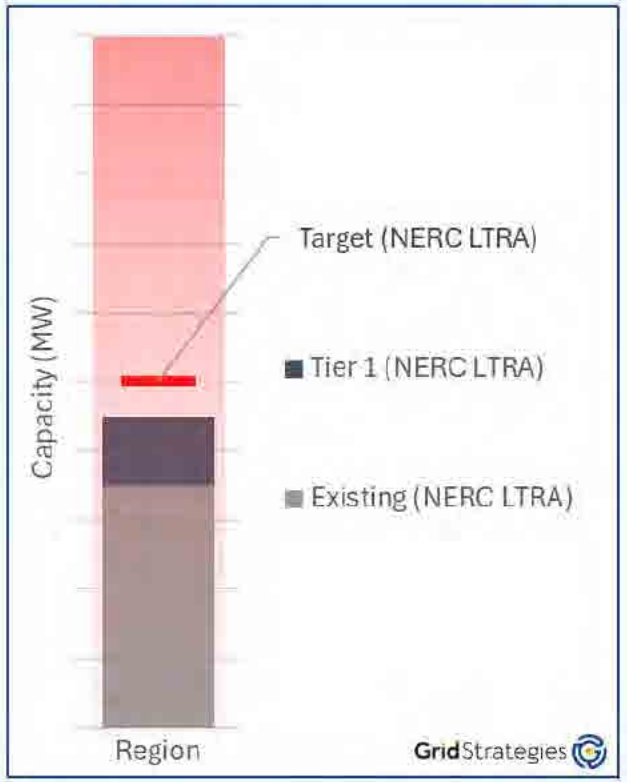
Illustrative walkthrough of seasonal capacity slides

Bar charts showing the existing (light grey) and future (dark blue) resource capacity in each region using NERC LTRA data. The target capacity (red line) is also shown. These charts were created by Grid Strategies using NERC data.

A red highlight is used to signify a shortfall between the existing + future resource capacity and the needed target to meet future load and reserves. A yellow highlight would be used to signify a "near miss."



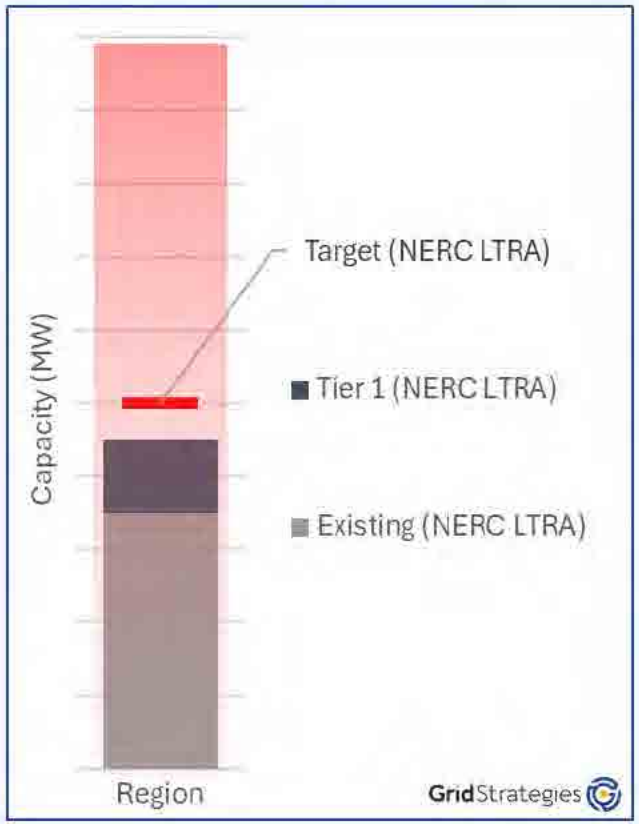
Highlight important features of chart



Illustrative walkthrough of seasonal capacity slides

Replace the NERC LTRA resource capacity data with accredited LBNL interconnection queue data (purple) for comparison. Existing and target data is from LTRA and remains unchanged unless specified.

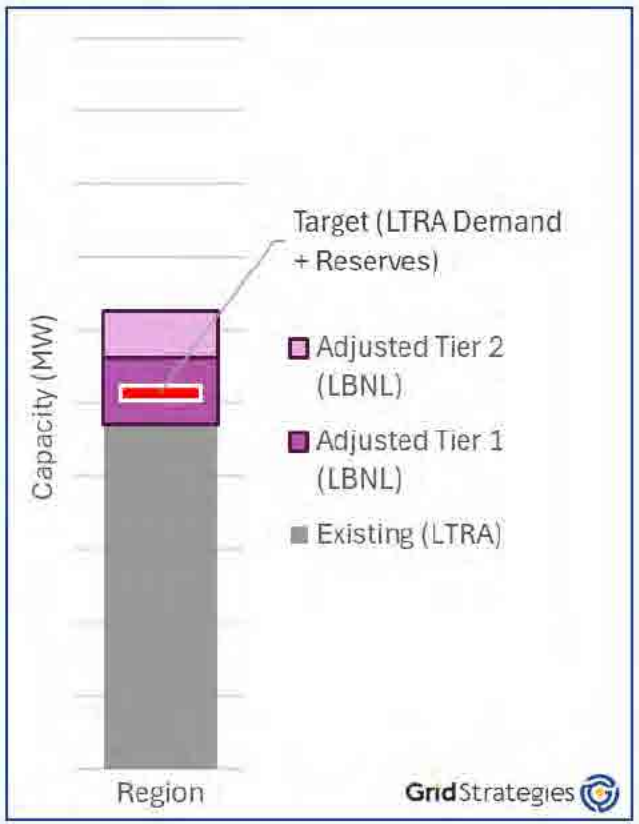
To avoid overcounting queue generation, the LBNL data is discounted based on regional- and study phase-specific withdraw rates.



Replace NERC data with resource-accredited LBNL data



Reduce LBNL data based on expected withdraws



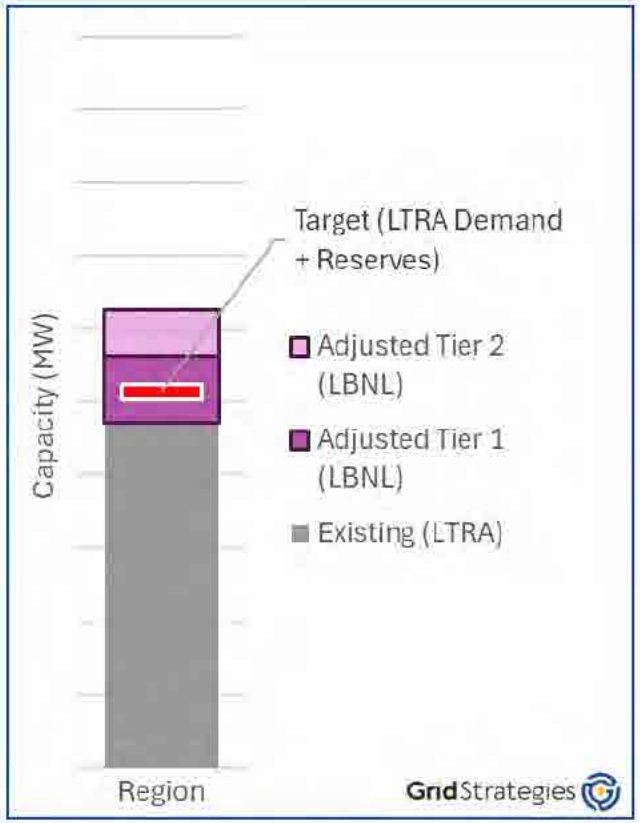
Note red highlight is removed because adequacy has been achieved

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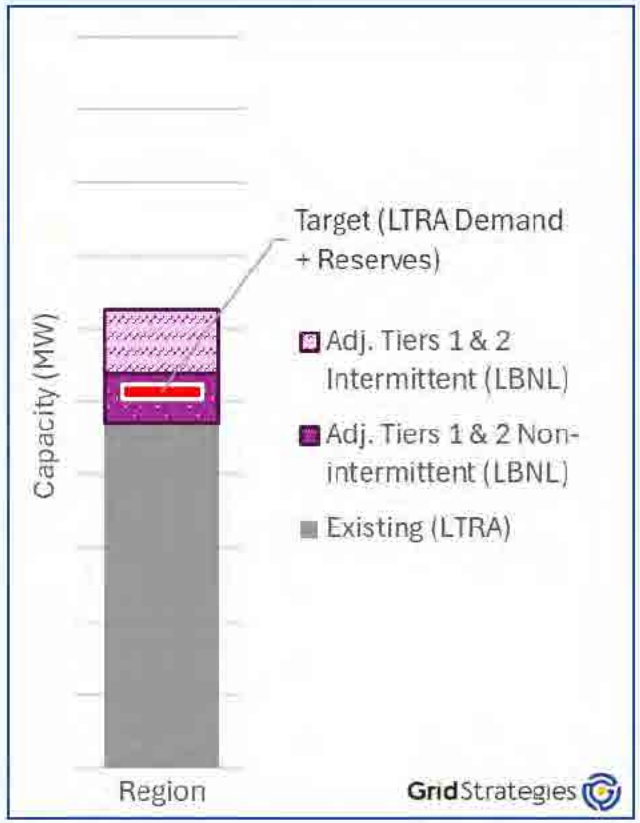
Illustrative walkthrough of seasonal capacity slides

Analyze the LBNL resource data to gain insight into future capacity risk. Purple is still used for LBNL data while different bar borders or pattern are used to indicate interesting features of the data.

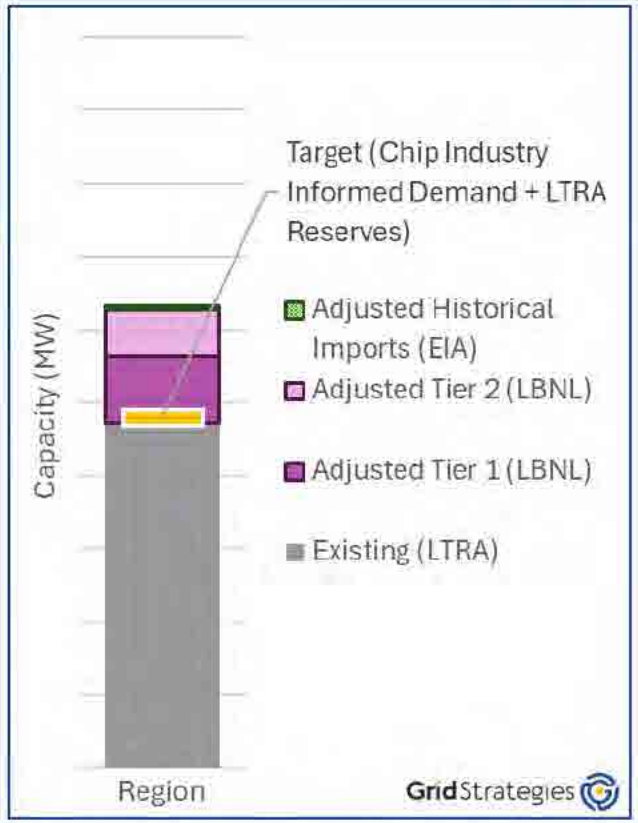
Interregional transfer capability data is adjusted using EIA data to better illustrate available capacity. In some cases, the expected load is changed to match demand forecasts from other sources.



Look at different features of LBNL data



Continue to add more data for analysis



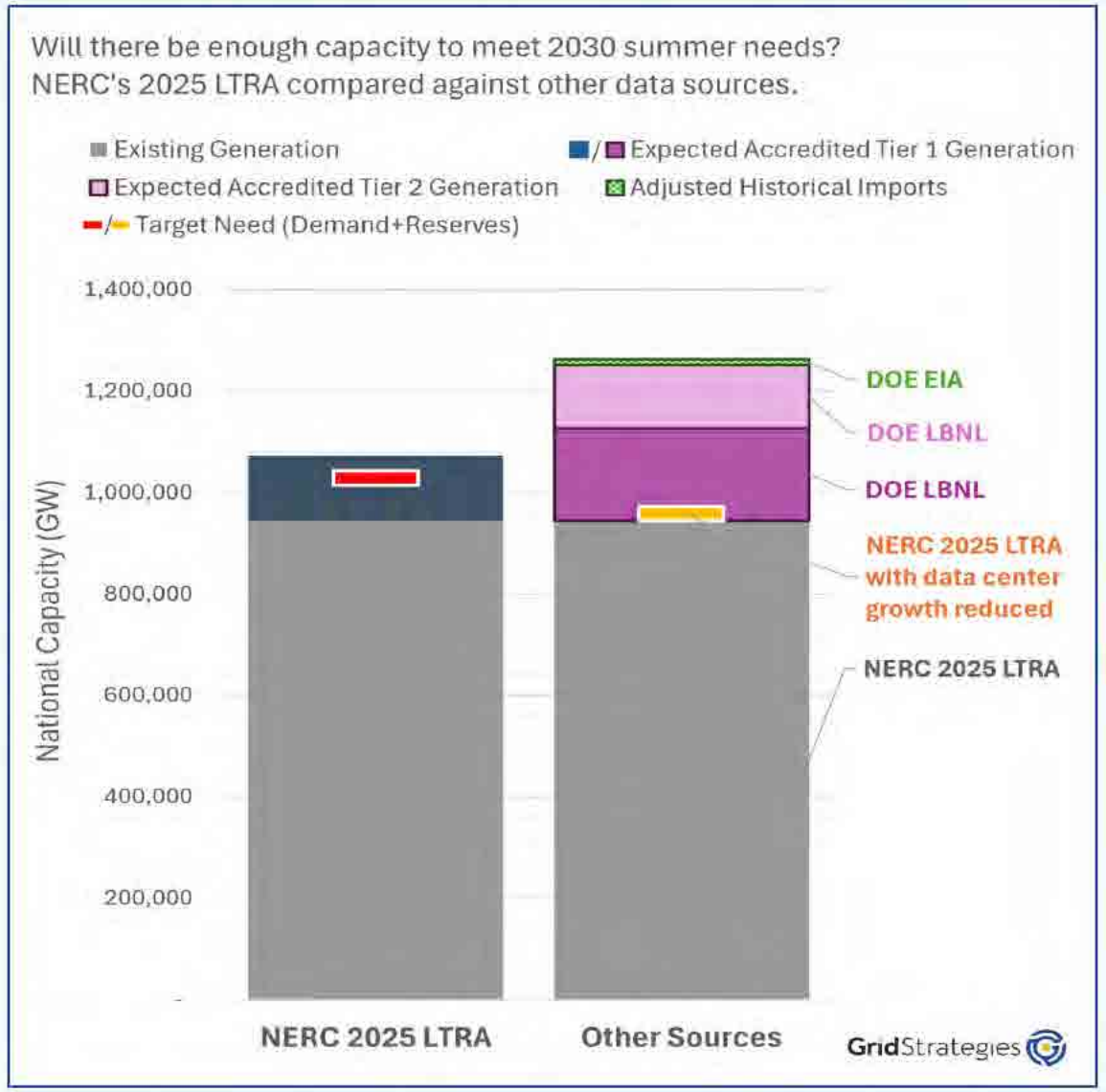
Summary slide of seasonal capacity differences in 2030

On Slide 6, the comparison of NERC 2025 LTRA analysis against our analysis using other sources is meant as an illustrative comparison of the national risk given the use of different credible data sources.

The NERC 2025 LTRA bar was made by summing the forecasted 2030 summer load + reserves (target), existing generation, and Tier 1 data for each region directly from the NERC data.

The target value shown in "Other Sources" was created by applying a one third derate to known data center load growth in all regions. The one-third derate factor is the ratio of estimated data center growth in 2030 from chip shipments to the estimated growth from utility roll-ups as used by LTRA (Wilson, J., et al. 2025). Another one-third derate factor is from the assumption that many data centers are likely to use some form of on-site generation or storage to curtail their peak demand (Thomas, M., 2026). The known data center load growth is from Grid Strategies analysis of total system load growth that is attributable to data centers (Wilson, J., et al. 2025). The impact of this data center growth reduction scenario on individual regions is shown in slide 24.

The generation resources shown in "Other Sources" is the sum of resources available in the LBNL dataset that are reasonably expected to connect by 2030. Adjusted historical imports represent the non-firm imports that have been available during grid stress events from the Energy Information Administration. More detail on the other sources data is provided in subsequent slides.



SOURCE | NERC "2025 LTRA" (2026); NERC "ES&D" (2026); Wilson, J., et al. (2025); Thomas, M. (2026); Rand, J. et al. (2025); EIA, "About the EIA-930 data" (accessed Feb. 2026)

Analysis using LBNL data: Regional assessment areas

The DOE's Lawrence Berkeley National Laboratory collects data from the generation interconnection queues for seven ISOs / RTOs and 49 non-ISO balancing areas (including utilities and Power Marketing Administrations), representing roughly 97% of currently installed U.S. generating capacity. This data is compiled annually with help from Interconnection.fyi and is posted for public view at emp.lbl.gov/queues. The 2025 dataset includes data through the end of 2024.

The 56 entities in the LBNL database were mapped to the NERC LTRA assessment areas by geography (maps to the right). The non-RTO utilities were mapped as follows:

WECC California
- LADWP
- SMUD
- WAPA-SN

WECC Rocky Mtn
- CLPT
- BHCT
- CSU
- PacifiCorp
- PRPA
- PSCo
- TSGT
- WAPA-RM

WECC Northwest
- Avista
- BHP
- BPA
- CPUD
- GrantPUD
- MPC
- NWMT
- PGE
- PSE
- TPU
- WAPA-IS

WECC Basin
- IdahoPower

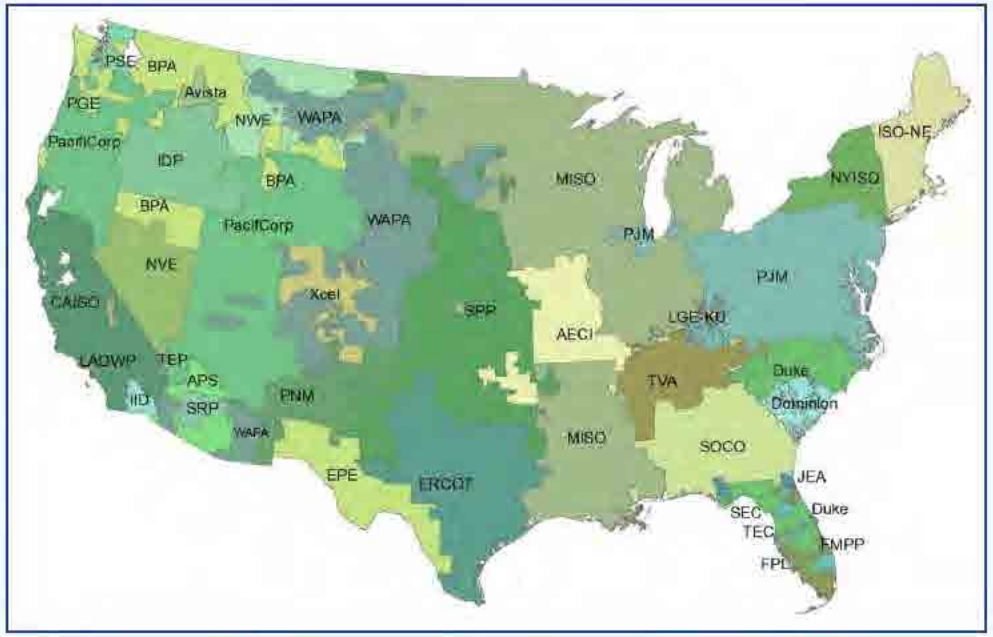
WECC Southwest
- APS
- EPE
- IID
- N-C
- NVE
- PNM
- SRP_ANPP
- SRP
- SRP_Gila
- SRP_PV-PC
- SRP_SWV
- TEP
- WAPA-DSW
- WAPA-MPP

SERC Central
- AEC
- LGE-KU
- TVA

SERC Southeast
- GTC
- SOCO

SERC Florida
- OUC
- TEC
- Duke (FL)

SERC East
- Dominion
- S-C
- Duke (non-FL)



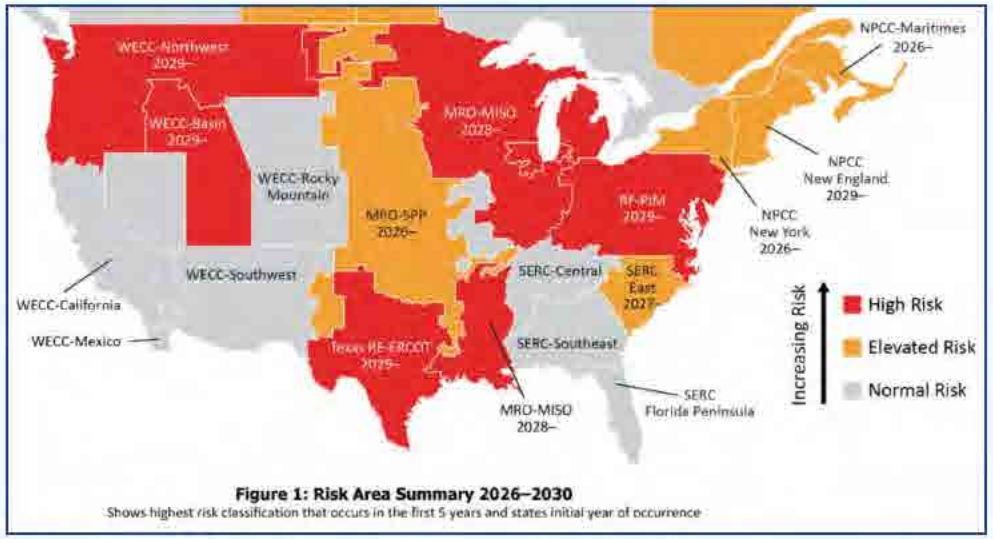


Figure 1: Risk Area Summary 2026–2030
Shows highest risk classification that occurs in the first 5 years and states initial year of occurrence

GridStrategies

SOURCE | NERC "2025 LTRA" (2026) and Rand, J. et al. (2025)

Analysis of LBNL data: Generation tier status

LBNL interconnection data is organized by its queue status and study phase in the interconnection queues. Queue status refers to if the facility is completed, withdrawn, or actively progressing through the queues.

NERC organizes in-development generation resources by Tiers, where:

- Tier 1 are resources with executed interconnection agreements
- Tier 2 are any resource that is in the study process, and
- Tier 3 are those that have submitted interconnection requests but are not yet under study.

The cross-walk between LBNL's "Queue Status" and "IA Status Clean" fields and the NERC Tiers used in this analysis are shown to the right. Interconnection requests marked as Active in the Queue Status are organized into Tiers based on their IA Status.

Resources considered in to be in advanced Tier 2 status were those with either "IA Pending" or "Facility Study" status in the LBNL data. Suspended interconnection requests are considered Tier 2 because they have already completed some study phases but have paused their continuation of progress. Requests that un-pause often enter at the same study stage. Requests of Unknown or N/A status are considered Tier 3 because their existence in the database indicates an interconnection request has been made, but whether studies have begun cannot be said for sure.

LBNL Queue Status	NERC Tier
Active	(see IA Status)
Withdrawn	Cancelled
Operational	Operational
Suspended	Tier 2
Unknown	Tier 3

LBNL IA Status Clean	NERC Tier
Withdrawn	Cancelled
Operational	Operational
IA Executed	Tier 1
Construction	Tier 1
IA Pending	Tier 2
Facility Study	Tier 2
Cluster Study	Tier 2
System Impact Study	Tier 2
Feasibility Study	Tier 2
Combined	Tier 2
In Progress (unknown study)	Tier 2
Suspended	Tier 2
Not Started	Tier 3
N/A	Tier 3

SOURCE | NERC "2025 LTRA" (2026) and Rand, J. et al. (2025)

Analysis using LBNL data: Expected withdraw rates

To reduce the likelihood of overcounting generation resources that may not interconnect, we reduced all Tier 1 and 2 resource data in the LBNL queue dataset given region- and status-specific historic withdraw rates.

LBNL publishes the completion rates (as of 2024) of all resources in the regional queues that entered the queue between 2000 and 2019. The withdraw rates vary regionally between 64% and 85%. LBNL also provides information about the queue study phase that projects were in when they withdrew. In general, fewer projects withdraw once they reach advanced stages of the interconnection queue process.

Applying the regional withdraw rates to all generation without regard for its queue location would overly discount generation in Tier 1 and advanced Tier 2 status. Instead, we adjust the amount of generation that is expected to withdraw from each Tier separately. See illustrative figure to the bottom right.

We first calculate the total amount of expected regional withdraws by applying the appropriate withdraw rate to the sum of all Tiers 1, 2, and 3 generation in each region's queue. We assume that 15% of generation in Tier 1 status will withdraw, equivalent to the share of withdrawn requests between 2019 – 2023 in the IA executed phase from LBNL's analysis. Because no generation in Tier 3 is expected to interconnect by 2030, we assume 100% of Tier 3 generation withdraws for every region. The difference between the total amount of expected regional withdraws and that which is assumed to withdraw from Tiers 1 and 3 in each region is applied to the Tier 2 data.

LBNL: Historical completion by region for requests submitted 2000-2019 (as of 2024)

Region	Active	Operational	Withdrawn
CAISO	14%	9%	77%
ERCOT	14%	22%	64%
ISO-NE	8%	18%	74%
MISO	9%	15%	76%
NYISO	7%	8%	85%
PJM	8%	14%	77%
SPP	9%	14%	76%
Southeast	5%	9%	85%
West	13%	9%	79%

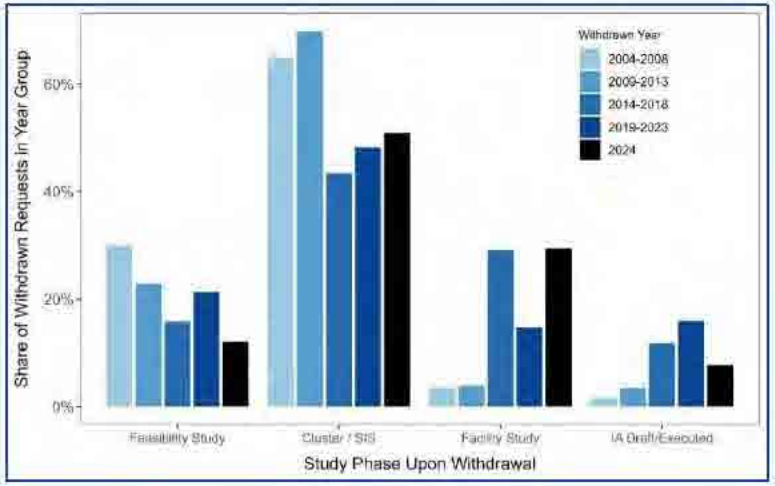
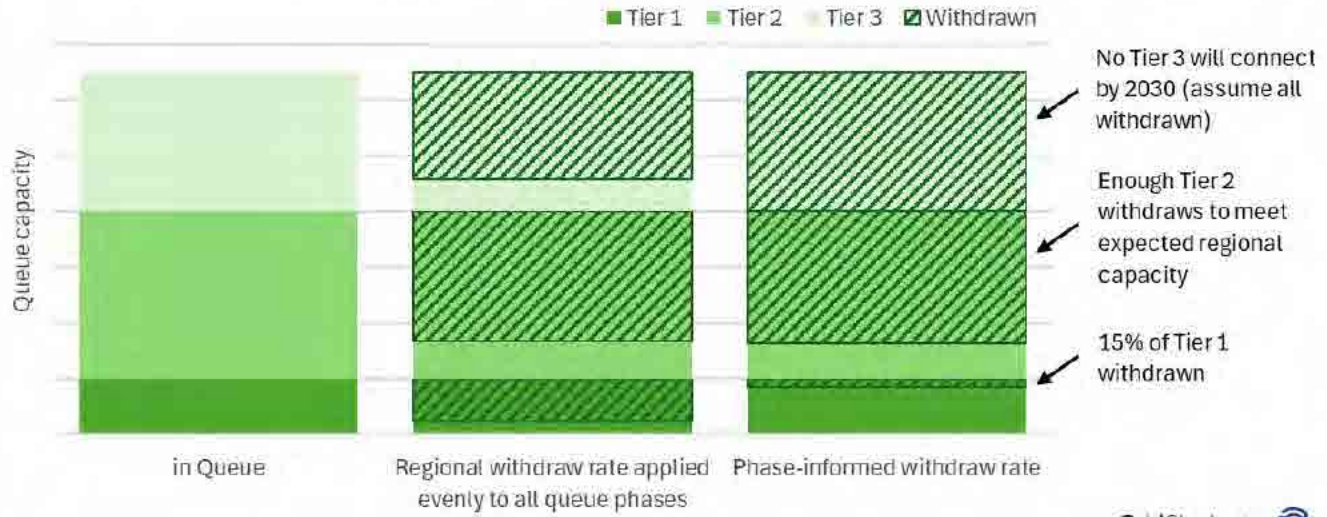


Illustration of two different methods to apply regional withdraw rates to interconnection queue data. The same amount of generation capacity withdraws in both methods.



GridStrategies

SOURCE | Rand, J., et al. (2025)

Analysis using LBNL data: Resource type

LBNL interconnection data is organized by generation resource type. When multiple resource types (e.g., gas and battery storage) are combined into one interconnection request, LBNL lists each resource type. The LBNL database includes a "type_clean" field, which summarizes all types of resources included in the interconnection entry.

These "clean" resource types are organized into a fewer number of categories in our analysis for simplicity. The cross-walk is provided in the two tables to the right.

LBNL Clean Type	Resource Type
Battery	Battery
Offshore Wind+Battery	Battery Hybrid
Other+Battery	Battery Hybrid
Solar+Battery	Battery Hybrid
Solar+Other+Battery	Battery Hybrid
Solar+Wind+Battery	Battery Hybrid
Wind+Battery	Battery Hybrid
Geothermal	Geothermal
Solar+Other	Hybrid
Solar+Wind	Hybrid
Wind+Other	Hybrid
Hydro	Hydro
Offshore Wind	Offshore Wind
Other	Other
Hydrogen	Other Storage
Other Storage	Other Storage
Solar	Solar
Battery+Other Storage	Storage Hybrid
Other+Battery+Other Storage	Storage Hybrid
Solar+Battery+Other Storage	Storage Hybrid
Solar+Wind+Other Storage	Storage Hybrid
Wind	Wind

LBNL Clean Type	Resource Type
Coal	Coal
Gas+Battery	Firm Hybrid
Gas+Battery+Diesel	Firm Hybrid
Gas+Coal	Firm Hybrid
Gas+Diesel	Firm Hybrid
Gas+Oil	Firm Hybrid
Gas+Other	Firm Hybrid
Geothermal+Battery	Firm Hybrid
Hydro+Battery	Firm Hybrid
Oil+Battery	Firm Hybrid
Oil+Coal	Firm Hybrid
Oil+Other	Firm Hybrid
Other+Coal	Firm Hybrid
Other+Diesel	Firm Hybrid
Solar+Diesel	Firm Hybrid
Solar+Gas	Firm Hybrid
Solar+Gas+Battery	Firm Hybrid
Solar+Geothermal	Firm Hybrid
Solar+Hydro	Firm Hybrid
Wind+Gas	Firm Hybrid
Gas	Gas
Diesel	Oil
Oil	Oil
Nuclear	Nuclear

GridStrategies

SOURCE | NERC "ES&D" (2026) and Rand, J. et al. (2025)

Analysis using LBNL data: Accredited capacity

No resource will produce electricity at its rated capacity ("nameplate") all the time. To account for this, regions apply an accredited value to a resource to indicate a percentage of the nameplate capacity that can be expected to perform during peak demand. The accredited value of a resource varies by fuel type, season, year, and geographic location.

Each region calculates accredited capacity differently. Some consider historic forced outages of a resource type (which tend to overestimate availability) while others use modeling tools to determine how much load a resource can be expected to carry in future years given numerous system dynamics.

The LBNL interconnection queue database provides nameplate values for all generators in the queues. To ensure only a reasonable amount of new resources are accounted for in our analysis, we seasonally accredit each resource type based on the region-specific method used locally for resource accreditation. If a region does not use seasonal or resource-specific accreditation, a neighboring region's method is used.

Unless otherwise noted:

- Battery Hybrid resources are equivalent to battery resources' accredited values
- Firm Hybrid resources are the average of firm resources' accredited values
- Hybrid resources are the average of wind and solar resources' accredited values
- Other resources are the average of any remaining resources' accredited values not otherwise listed

Region	Accreditation Method & Source	Notes
MISO	2025-2026 DLOL	Summer & winter values. Battery resource uses storage (blended) and storage hybrid uses pumped storage DLOL. MISO values are also used for all other regions' resources that are not otherwise noted.
SPP	ELCC for Summer 2026	Summer values for battery (6-hr), solar, and wind resources. Values also used for WECC-Basin & CAISO summer battery.
SPP	ELCC for Winter 24/25	Winter values for battery (6-hr), solar, and wind resources. Values also used for WECC-Basin & CAISO summer battery.
SPP	25/26 EFORd	Summer & winter values used for all non variable resources. Oil and other resources are RICE with on-site storage, gas is CC. Values also used for ERCOT other; WECC summer other storage.
ISO-NE	CAR-SA: Impact Analysis 1/14/26	Summer & winter values. Used for solar, wind, and hydro resources
ISO-NE	2025 Capacity, Energy, Loads, and Transmission (CELT) Report	Summer & winter values. CELT used for battery, battery hybrid, coal, gas, nuclear, offshore wind, oil, other, and other (pumped) storage resources.
NYISO	2025-2026 Final Capacity Accreditation Factors	Summer values used for both seasons. Rest of state values used for battery (6-hour), hydro, offshore wind, other, other storage (pumped storage), solar, wind.
NYISO	2024 Review of EFORd	Summer & winter values. NYCA values used for coal (steam turbine), gas (CC), nuclear (steam turbine), oil (jet engine). NYISO values are also used for SERC-E summer battery and summer wind.
PJM	2027/2028 ELCC Class Ratings	Summer values used for both seasons for all resources. Battery is 6-hour CSR, battery hybrid is configuration 3, gas is CC, other is waste-to-energy, other storage is other unlimited resources, solar is fixed-tilt, storage hybrid is configuration 1. PJM values also used for SERC-E hydro, nuclear, oil, other, and other storage resources.
ERCOT	25/29 CDR	Summer & winter values for battery (6-hr), other storage (12-hr), solar, and wind. Values also used for SERC-FP and SERC-SE battery.
SERC	2025 CRP Chapter 3	Winter values used for both seasons. 2030 Reference case used for battery (standalone BESS), battery hybrid (synergistic BESS), offshore wind (avg. ELCC for first 800MW), solar (avg. ELCC for first 10 GW of standalone), wind (avg. ELCC for DEP and DEC for first 300 MW).
SERC	2023 Wind ELCC Study	Average ELCC of 5GW and 15GW standalone solar used for all SERC regions' summer solar.
Southwest	E3 2023 Resource Adequacy in the Desert Southwest	2033 values also used for WECC regions' winter battery, summer hydro, summer nuclear, winter and summer wind (unless otherwise stated).
Northwest	E3 2025 Resource Adequacy and the Energy Transition in the Pacific Northwest: Phase 1 Results	Winter values for Greater Northwest used for WECC regions' gas, other storage, solar, wind (unless otherwise stated).
Northwest	E2 2019 Resource Adequacy in the Pacific Northwest	Winter values for 2030 Reference scenario used for WECC regions' coal, geothermal, hydro, nuclear (unless otherwise stated).
CAISO	2026 Net Qualifying Capacity (NQC) for RA Resources	Summer and winter values used for CAISO geothermal, hydro, other (biomass), solar, wind. Values also used for other WECC regions' other, solar, hydro and geothermal (unless otherwise stated).
National	NREL VRE ELCC Study	Median offshore wind used for SERC-FP (SERC), ERCOT, WECC-NW (NorthernGrid), CAISO

Adding historically available interregional transfer capability to the seasonal capability analysis

The EIA historical imports included in the charts on slides 16 and 29 take the difference between the historical import availability (2015 and 2025) from the U.S. EIA Form 930 data and the 2030 firm import assumptions in the LTRA. The last column subtracts imports from demand in all peak hours over the last decade and shows the minimum reduction in in-region generation due to imports.

For New York, an additional 1,250 MW of import availability was added to the EIA Form 930 data to account for the energization of the Champlain Hudson Power Express transmission line.

Comparison of on-peak net imports in four regions as assumed by LTRA against actual, in MW. Exports are negative.

	LTRA 2026 Assumption	LTRA 2030 Assumption	Historical Availability (2015-2025)
MISO	2,809	2,509	5,344
SPP	-18	-78	1,421
ISONE*	567	84	2,464
NYISO	3,405	3,486	2,730†
PJM	3,840	0	2,937‡

*Data for New England (ISONE) predates completion of the 1200 MW New England Clean Energy Connect with Hydro Quebec, so on-peak imports will likely be higher going forward.

† EIA data for New York does not include the Champlain Hudson Power Express, a 1,250 MW line connecting Quebec to New York City that is slated for completion in 2026. Once that is included, NYISO imports should be roughly in line with the LTRA.

‡ The EIA data show PJM was exporting during most peak demand periods over the last decade, so it is not possible to estimate the historical availability of imports for PJM. PJM administratively sets its capacity benefit of ties (non-firm imports) at 1.5% of nameplate generation procured in the capacity market, calculated here as 1.5% for 195,831 MW in the 2025/2026 Base Residual Auction. In its 2023 reserve margin analysis, PJM calculated 6,474 MW in total diversity benefit with its neighbors, much higher than the capacity benefit of ties shown in the table.

SOURCE | EIA, "About the EIA-930 data" (accessed Feb. 2026); PJM, "2025/26 Base Residual Auction Report" (2024); Brooks, A. et al. (2025)

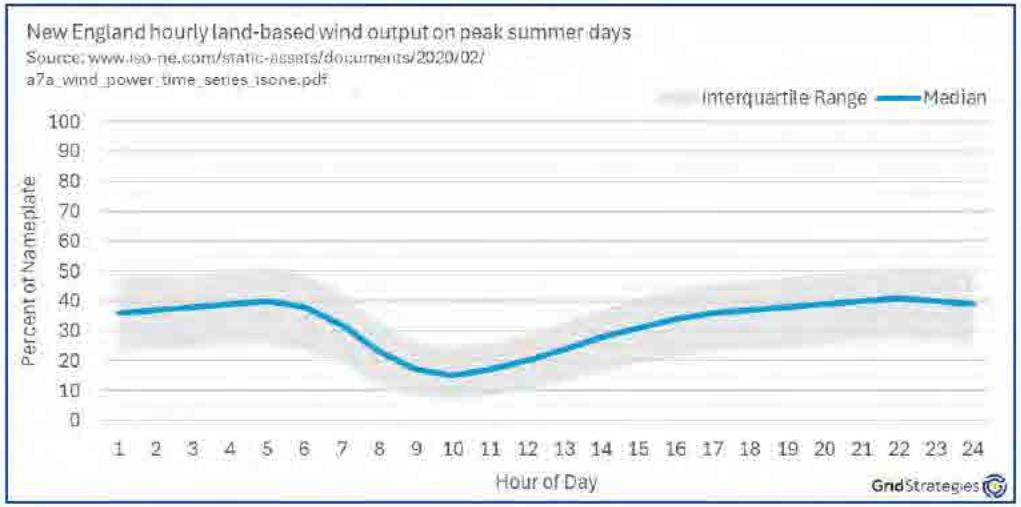
Analysis using LBNL data: New England wind and solar production

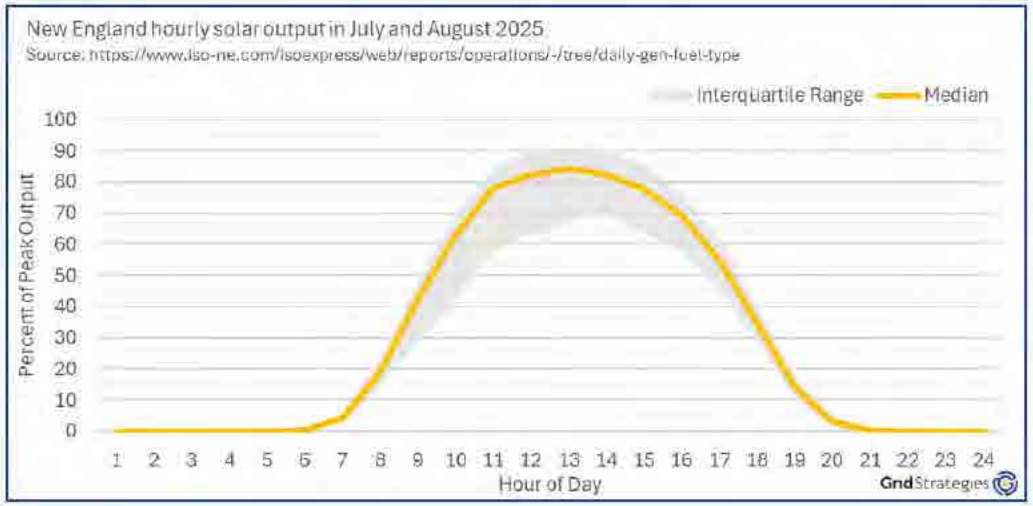
In order to use LBNL data for energy analysis for New England, we compare the amount of Tier 1 and Tier 2 LBNL data against NERC (slide 46). This required an understanding of the generation output in New England during summer months for different resource types.

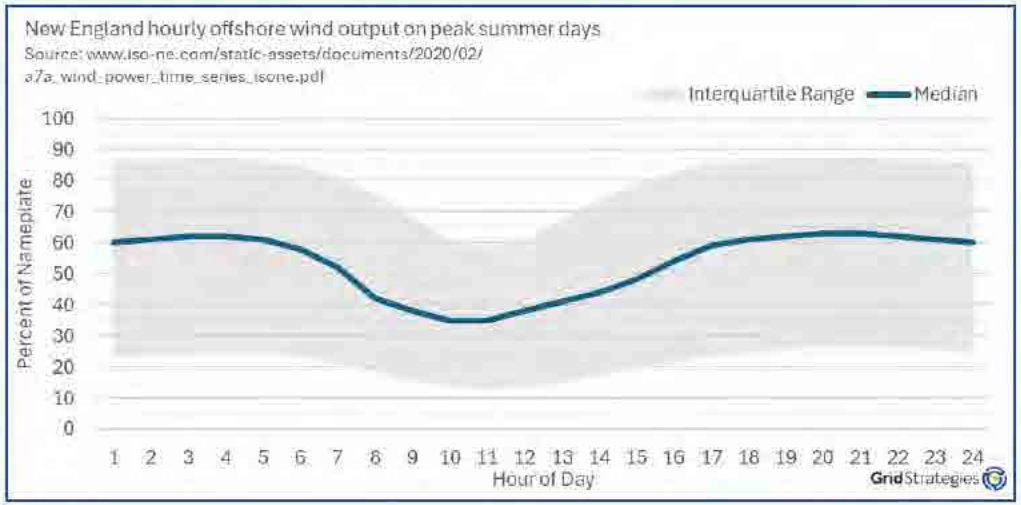
On the right are the hourly median and interquartile range for wind and offshore wind production in New England during peak demand days. This data was collected between 2012 and 2018 by ISONE to help them understand wind output during times of grid stress.

Also shown is the median and interquartile range for average hourly solar output in July and August of 2025, also from data collected by ISONE.

The hourly median data was used to estimate the output of both land-based and offshore wind in New England during peak summer 2029.







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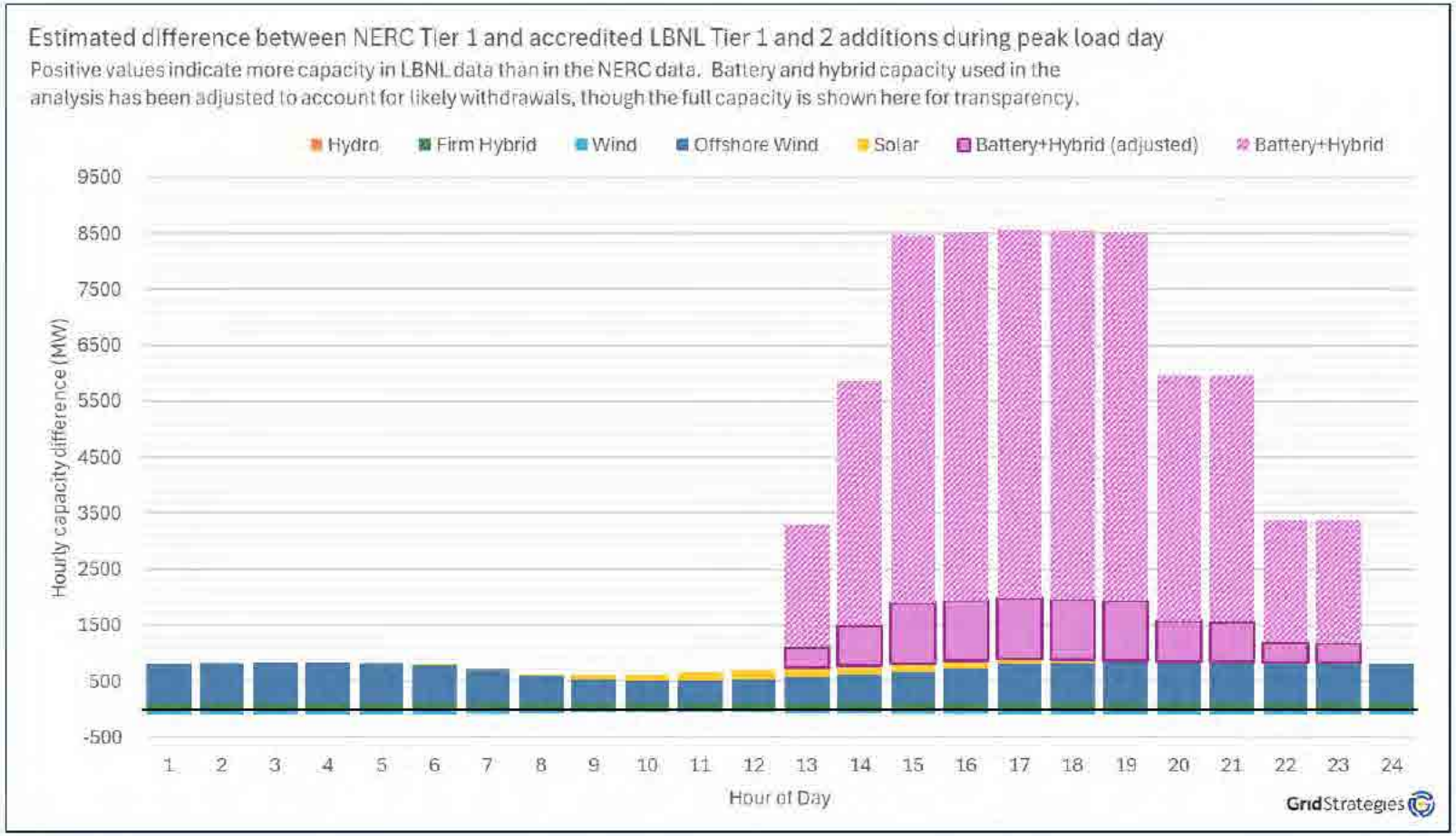
SOURCE | Judd, S. "Wind and Power Time Series Modeling of ISO-NE Wind Plants" (2020); ISONE "2025 Hourly Solar Generation" (2026)

Analysis using LBNL data: New England hourly production

Shown here is the potential change in hourly energy output for New England on peak load days given the different resource mixes between the LBNL and NERC data. Positive values indicate LBNL recorded more capacity for that resource type while negative values indicate NERC recorded more capacity.

As explained on slide 45, we adjusted the hourly production of each resource type to match expected peak day behavior, given regional resource accreditation methods. Battery and battery hybrid resources are expected to discharge at partial capacity for all hours of unserved energy, modulating their output so that no one resource discharges for longer than 6 hours. Given the large quantity of battery and hybrid resources in the LBNL data, these resources were additionally discounted by the historic withdraw rate of the region.

Given the data available, we cannot replicate the energy inadequacy analysis presented in the LTRA exactly. We provide this rough estimate to understand how different generation assumptions would impact unserved energy results.



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SOURCE | NERC "2025 LTRA" (2026); NERC "2024 LTRA" (2025); NERC "ES&D" (2026); Rand, J. et al. (Aug. 2025)

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 167
DOE Order No. 202-22-1 Amendment No. 2

Department of Energy
Washington, DC 20585

Amendment Number 2 to Order No. 202-22-1

On September 2, 2022, because of a shortage of currently operational electric generating facilities, high demand for electricity, and other adverse conditions resulting from the extreme heat event in California, I issued Order No. 202-22-1. Order No. 202-22-1 authorizes the California Independent System Operator Corporation (CAISO), to direct the operation of the Covered Resources identified in Order No. 202-22-1 and on the terms set forth therein. On September 7, 2022, because of the continuing shortage of electric energy and the need for continued operation of the two units at Calpine's Greenleaf Unit 1 site in Yuba City, California (Greenleaf Units), I issued Amendment No. 1 to Order No. 202-22-1. Amendment No. 1 to Order No. 202-22-1 added the Greenleaf Units as Covered Resources subject to the terms of Order No. 202-22-1, except that the Greenleaf Units may be operated through September 9, 2022. By its terms, Order No. 202-22-1 as amended by Amendment No. 1 expires at the end of the day on September 8, 2022 with respect to the Covered Resources other than the Greenleaf Units, and at the end of the day on September 9, 2022 with respect to the Greenleaf Units. Order No. 202-22-1 as amended by Amendment No. 1 is sometimes referred to herein as Amended Order No. 202-22-1.

On September 7, 2022, CAISO submitted a *Request for Extension of Emergency Order Pursuant to Section 202(c) of the Federal Power Act* (Renewal Application) to the Department. In its Renewal Application, CAISO requests an extension of the expiration date of Order No. 202-22-1 through September 12, 2022.

Emergency Situation

In its Renewal Application, CAISO states that California is experiencing extreme heat, which the CAISO forecasts to continue through at least September 9, 2022. Further, CAISO explains that unpredictable conditions could exacerbate grid reliability issues at any time. The threat of wildfire to the reliable operation of the bulk power system remains significant, and drought conditions are affecting the availability of hydroelectric power. Ambient conditions facing generating facilities are causing de-rates at some units and forcing other units offline. Wildfire threats arising from the extreme heat event are unpredictable and could force transmission and resources out of service. Consequently, the CAISO believes it prudent to ask that the expiration date of Order No. 202-22-1 be extended through September 12, 2022.

Consultation

In considering renewal or reissuance of an order under FPA section 202(c) that may conflict with an environmental law or regulation, DOE is required to "consult with the primary Federal agency with expertise in the environmental interest protected by such law or regulation" and to include "conditions as such Federal agency determines necessary . . . to the extent practicable." 16 U.S.C. § 824a(c)(4). The Environmental

Protection Agency (EPA) is the primary federal agency in this case with expertise in the protected environmental interest, specifically Title V of the Clean Air Act and the Department consulted with EPA after receiving the Renewal Application and EPA did not request any additional conditions be included in this Order. Email from Acting Assistant Administrator Larry Starfield, EPA Office of Enforcement and Compliance Assurance to Kathleen Hogan, Acting Under Secretary for Infrastructure for DOE, September 7, 2022.

Based on the information submitted to the Department, I have determined that an emergency continues to exist in California due to a shortage of electric energy. I find that the issuance of this Order will help to meet the emergency conditions and serve the public interest as required by FPA section 202(c).

ORDER

For the reasons set forth above, pursuant to Section 202(c) of the FPA, I hereby grant CAISO's Renewal Application and issue this Order to extend the expiration date of Amended Order No. 202-22-1 through September 12, 2022.

1. In accordance with the foregoing, (a) the date September 8, 2022 where it appears in Ordering Paragraphs A, D, and H of Order No. 202-22-1 is hereby replaced by the date September 12, 2022, and (b) the date September 9, 2022 where it appears in the Ordering Paragraph of Amendment No. 1 to Order No. 202-22-1 is hereby replaced by the date September 12, 2022.

2. All other terms of Amended Order No. 202-22-1 remain the same and in effect, including Ordering Paragraphs A-H, except as modified herein.

3. This Amendment Number 2 to Order No. 202-22-1 shall be effective upon its issuance and shall expire at 23:59 Pacific Time on September 12, 2022.

Issued in Washington, D.C. at 15:52 Eastern Time on this 8th day of September, 2022.



Kathleen Hogan
Acting Under Secretary for
Infrastructure

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 168
PIOs' January Rehearing Request

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator (MISO) and Northern Indiana Public Service Company LLC	)	Order No. 202-25-12
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator (MISO) and CenterPoint Energy Indiana South	)	Order No. 202-25-13

Motion to Intervene and Request for Rehearing and Stay of
Sierra Club, Citizens Action Coalition of Indiana, Just Transition Northwest Indiana, Hoosier Environmental Council, Environmental Law and Policy Center, and Public Citizen (collectively, "Public Interest Organizations" or "PIOs")

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I. INTRODUCTION

Both Units 17 and 18 of the R.M. Schahfer Generating Station ("Schahfer") and Unit 2 of the F.B. Culley Generating Station ("Culley 2") in Indiana (collectively, the "Plants") are very expensive and very toxic to operate. For example, operating Schahfer beyond 2025 would require *more than one billion dollars* in expenditures, according to its owner, Northern Indiana Public Service Company LLC ("NIPSCO"). Ex. 4 at 13 (Powers January Declaration).

NIPSCO and Southern Indiana Gas and Electric Company d/b/a CenterPoint Energy Indiana South ("CenterPoint Indiana"), which owns Culley 2, determined pursuant to years-long, state-mandated integrated resource planning ("IRP") processes that the Plants are no longer needed to serve customer demand past 2025. Accordingly, NIPSCO and CenterPoint Indiana long ago resolved to close the Plants in December 2025.

That long-anticipated transition was disrupted last month when the Department of Energy ("Department") issued two 90-day orders under Section 202(c) of the Federal Power Act, 16 U.S.C. § 824a(c). See Order No. 202-25-12 (Exhibit 1, the "December Schahfer Order") and Order No. 202-25-13 (Exhibit 2, the "December Culley Order") (collectively, the "Orders"). The Department justifies these intrusive orders by alleging concerns about resource adequacy and reliability, but its concerns are based on selective quotations of some documents, elementary misunderstandings or mischaracterizations of additional documents, and disregard of governing law to engage in a forbidden effort to usurp others' authority. Moreover, the concerns expressed in the Orders are not primarily focused on the actual 90-day period at issue (*i.e.*, the period starting on December 23, 2025 and extending to late March of 2026). The evidence shows there is every reason to believe that the actors with authority over resource adequacy and reliability—FERC, NERC, MISO, Indiana regulators, the electric utility owners, and others—have provided for adequate resources and reliability in the Winter 2025–26 and Spring 2026 seasons, in all arguably relevant geographies, and will continue doing so going forward.

The Department is acting pursuant to a new and unprecedented policy to exceed its carefully constrained emergency authority under Section 202(c) in order to prevent coal plant retirements. The policy is unlawful because Section 202(c) applies only to imminent, unexpected shortfalls, not to the Department's preference for specific types of energy generation.

The Orders will cause significant harm. The significant cost of running the Plants, hundreds of thousands of dollars a day, are likely to be borne by households and families in the area. *See infra* sec. IV.C.3; Ex. 5 (Synapse Report).

And there are other more deadly costs as well. Schahfer and Culley 2 are dirty, old plants that spew pollution into the air and into the Kankakee and Ohio Rivers. *See infra* sec. IV.C.3. Operation of all these units leads to premature deaths and deepens the harms to communities already injured by decades of environmental pollution. *See id*.

Public Interest Organizations thus respectfully request that the Department grant intervention; stay the Orders; grant rehearing and rescind the Orders (and any renewals of the Orders); and allow the two Indiana Plants at issue—Schahfer and Culley 2—to retire as planned.[1]

II. Statement of Issues and Specification of Error

The undersigned Public Interest Organizations move to intervene and request rehearing and a stay of both Orders pursuant to Section 313(a) of the Federal Power Act, 16 U.S.C. § 825*l*(a), and the applicable rules of practice and procedure, 18 C.F.R. §§ 385.203, .212, .214, .713; *see* Ex. 8 (Cooke Email to Alle-Murphy) (recommending that "a party seeking rehearing can look for procedural guidance to [Federal Energy Regulatory Commission's ("FERC")] Rules of Practice and Procedure, 18 CFR Part 385.").[2] Public Interest Organizations' motion and requests are based upon the following errors and issues:

A. The Department has not demonstrated that an emergency exists in any portion of MISO as required by Section 202(c) of the Federal Power Act; nor has the Department demonstrated that an emergency exists as defined in the

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[1] Because the two Orders employ nearly identical language and reasoning and are both addressed to power generating plants in the Indiana zone of the MISO transmission grid, Public Interest Organizations are here submitting a single Request for Rehearing applicable to each of the Orders.

[2] Until sometime after June 18, 2025, the Department maintained a webpage with procedures for intervention and rehearing requests. U.S. Dep't of Energy, *DOE 202(c) Order Rehearing Procedures* (visited June 18, 2025), https://www.energy.gov/ceser/doe-202c-order-rehearing-procedures (attached as Ex. 30) [hereinafter "DOE Rehearing Procedures"]. The Department maintains another website which currently states, "All public comments and requests related to FPA section 202(c) should be sent via email to AskCR@hq.doe.gov. . . . Additional information about 202(c) procedures, if necessary, will be announced on this page. The provision of this process for submission of correspondence or comments on any pending application is for purposes of ensuring the receipt by the appropriate office and personnel within the Department. Establishment of this email address does not establish a 'docket,' and those submitting correspondence do not constitute parties or intervenors to any proceeding." U.S. Dep't of Energy, *DOE's Use of Federal Power Act Emergency Authority* (last visited Jan. 22, 2025), https://www.energy.gov/ceser/does-use-federal-power-act-emergency-authority (attached as Ex. 74) [hereinafter "DOE 202(c) Webpage"]. Public Interest Organizations' instant motion and requests are also pursuant to the DOE 202(c) Webpage and the DOE Rehearing Procedures.

implementing regulations for Section 202(c). *See, e.g.*, 16 U.S.C §§ 824(a)–(b), 824a(a)–(c); 10 C.F.R. §§ 205.371–.375; *Emergency Interconnection of Elec. Facilities and the Transfer of Elec. to Alleviate an Emergency Shortage of Elec. Power,* 46 Fed. Reg. 39,984 (Aug. 6, 1981); *Hughes v. Talen Energy Mktg., LLC*, 578 U.S. 150 (2016); *FDA v. Brown & Williamson Tobacco Corp.*, 529 U.S. 120 (2000); *Jarecki v. G.D. Searle & Co.*, 367 U.S. 303 (1961); *Citizens Action Coal. v. FERC*, 125 F.4th 229 (D.C. Cir. 2025); *Conn. Dep't of Pub. Util. Control v. FERC*, 569 F.3d 477 (D.C. Cir. 2009); *Alcoa Inc. v. FERC*, 564 F.3d 1342 (D.C. Cir. 2009); *Cal. Indep. Sys. Op. Corp. v. FERC*, 372 F.3d 395 (D.C. Cir. 2004); *Otter Tail Power Co. v. Federal Power Commission*, 429 F.2d 232 (8th Cir. 1970); *Richmond Power & Light v. FERC*, 574 F.2d 610, 615 (D.C. Cir. 1978); *Duke Power Co. v. Fed. Power Com.,* 401 F.2d 930, 938 (D.C. Cir. 1968).

B. Even if the emergency described by the Orders did exist—it does not—the Department has not demonstrated a reasoned basis for its determination that additional dispatch of Schahfer and Culley 2 is necessary to "best meet the emergency and serve the public interest." See, e.g., 16 U.S.C. § 824a(c); 10 C.F.R. § 205.373; Dep't of Homeland Sec. v. Regents of the Univ. of Calif., 591 U.S. 1 (2020); Entergy Corp. v. Riverkeeper, Inc., 556 U.S. 208 (2009); *Allentown Mack Sales & Service, Inc. v. NLRB*, 522 U.S. 359 (1998); *Motor Vehicle Mfrs. Ass'n of the U.S. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29 (1983); *NAACP v. Fed. Power Comm'n*, 425 U.S. 662 (1976); *Gulf States Utils. Co. v. Fed. Power Comm'n*, 411 U.S. 747 (1973); *Otter Tail Power Co. v. United States*, 410 U.S. 366 (1973); *California v. Fed. Power Comm'n*, 369 U.S. 482 (1962); *Pa. Water & Power Co. v. Fed. Power Comm'n*, 343 U.S. 414 (1952); *Nat'l Shooting Sports Found., Inc. v. Jones*, 716 F.3d 200 (D.C. Cir. 2013); *Chamber of Com. of the U.S. v. Secs. & Exch. Comm'n*, 412 F.3d 133 (D.C. Cir. 2005); *Sierra Club v. Env't. Prot. Agency*, 353 F.3d 976, 980 (D.C. Cir. 2004); *Wabash Valley Power Ass'n, Inc. v. FERC*, 268 F.3d 1105 (D.C. Cir. 2001).

C. The Orders' availability requirements and the Orders' override of Schahfer and Culley 2's tariff-defined capacity treatment each exceed the Department's authority and are unreasoned. *See, e.g.*, 16 U.S.C. §§ 824(a)–(b), 824a(b)–(c); *Gallardo v. Marstiller*, 596 U.S. 420 (2022); *Hughes v. Talen Energy Mktg., LLC*, 578 U.S. 150 (2016); *FERC v. Elec. Power Supply Ass'n*, 577 U.S. 260 (2016); *Gomez-Perez v. Potter*, 553 U.S. 474 (2008); *Fed. Power Comm'n v. Fla. Power & Light Co.*, 404 U.S. 453 (1972); *Conn. Light & Power v. Fed. Power Comm'n*, 324 U.S. 515 (1945); *Conn. Dep't of Pub. Util. Control v. FERC*, 569 F.3d 477 (D.C. Cir. 2009).

D. The Department has unlawfully failed to ensure that the Orders compel generation only during hours necessary to meet the emergency and serve the public interest, that operations are consistent with any applicable environmental laws to the maximum extent practicable, and that any adverse environmental impacts are minimized. *See, e.g.*, 16 U.S.C. § 824a(c)(2); *Kingdomware Techs., Inc. v. United States*, 579 U.S. 162 (2016); *Fla. Power & Light Co. v. FERC*, 88 F.3d 1239 (D.C. Cir. 1996); *City of New Orleans v. FERC*, 67 F.3d 947 (D.C. Cir. 1995); Ex. 9 (DOE Order No. 202-22-4); Ex. 6 (DOE Order No. 202-17-4 Summary of Findings); Ex. 110 (DOE Order No. 202-24-1).

III. INTERVENORS' INTERESTS

As further discussed below, each of the Public Interest Organizations has interests that may be directly and substantially affected by the outcome of these proceedings. Each party may therefore intervene in these proceedings. 18 C.F.R. § 385.214; *see* Ex. 30 (DOE Rehearing Procedures); Ex. 74 (DOE 202(c) Webpage); Ex. 8 (Cooke Email to Alle-Murphy).

The Public Interest Organizations also demonstrate concrete injuries arising from the Orders that are redressable by a favorable outcome. Each organization is therefore aggrieved by the Department's Orders and may properly apply for rehearing. *See* Federal Power Act, § 313(a), 16 U.S.C. § 825*l*(a); *Wabash Valley Power Ass'n, Inc. v. FERC*, 268 F.3d 1105, 1112 (D.C. Cir. 2001); 18 C.F.R. §§ 385.203, 385.713; Ex. 30 (DOE Rehearing Procedures); Ex. 74 (DOE 202(c) Webpage); Ex. 8 (Cooke Email to Alle-Murphy).

A. Sierra Club

As of December 2025, over 8,000 Sierra Club members reside in Indiana. Sierra Club members are harmed by pollution produced by operating the Culley and Schahfer coal units. Sierra Club has over 900 members in Jasper County, Indiana, where Schahfer is located, and the adjoining counties. Sierra Club has approximately 300 members in Warrick County, Indiana, where Culley is located, and the adjoining counties. The Orders to operate these Plants beyond their planned retirement date will subject Sierra Club members to additional air and water pollution in the areas where they live, work, and recreate. In addition, Sierra Club members include people who pay for electricity from CenterPoint Indiana and NIPSCO.

Sierra Club has demonstrated an organizational commitment to the interests of reducing pollution from these coal-burning power plants. Sierra Club's Beyond Coal Campaign seeks to reduce the pollution currently being produced by coal-burning

power plants such as Culley and Schahfer, and to reduce energy bills by ensuring that ratepayers do not fund the cost of continuing to operate uneconomic coal plants like Culley and Schahfer. To those ends, Sierra Club has advocated for the retirement of the Culley plant in multiple regulatory proceedings, including CenterPoint Indiana's 2016, 2020, 2023, and 2025 Integrated Resource Plan stakeholder processes, a fuel adjustment clause docket related to forced outages at the Culley plant, and electric rate cases. Sierra Club has also submitted comments to the Indiana Department of Environmental Management on draft air and water permits for the Culley plant, advocating for more stringent pollution requirements. Sierra Club has advocated for the retirement of Schahfer in several regulatory proceedings, including a certificate of public necessity proceeding for retrofits at the Schahfer plant in 2017, and NIPSCO's 2014, 2016, and 2018 Integrated Resource Plan stakeholder processes. In 2019, Sierra Club signed a multi-party settlement in NIPSCO's electric rate case that adjusted the depreciation schedule for the Schahfer plant to align with a 2023 retirement and that provided that electric customers were to receive a bill credit upon the plant's retirement.

Sierra Club has invested staff and volunteer time, as well as significant financial resources to hire experts, to advocate for the retirement of Culley and Schahfer. Sierra Club has submitted hundreds of individual comments to the utilities and Indiana Commission advocating for the retirement of these coal units. By denying these and other benefits of the Culley 2 and Schahfer Plants' retirements, the Orders harm Sierra Club and its members.

B. Citizens Action Coalition of Indiana

Citizens Action Coalition of Indiana, Inc. ("CAC") is Indiana's oldest and largest consumer and environmental advocacy organization. Since 1974, CAC has helped Hoosiers save more than $10 billion in excess utility charges. CAC advocates on behalf of Hoosiers on issues regarding energy policy, utility reform, health care, pollution prevention, and family farms. CAC's activities include research, public education, organizing citizens, lobbying, intervening in utility cases before the Indiana Utility Regulatory Commission ("IURC"), and litigating when necessary. CAC engages in rate cases, cost recovery proceedings, certificates of public convenience and necessity proceedings, demand side management proceedings, and numerous other matters impacting the cost or reliability of Hoosiers' energy services, including numerous proceedings associated with the planned retirements of Schahfer and Culley 2. CAC also participates in the rigorous Integrated Resource Plan stakeholder processes required for Indiana's jurisdictional electric utilities

submitting integrated resource plans every three years according to Indiana Code § 8-1-8.5-3(e)(2).

C. Just Transition Northwest Indiana

Just Transition Northwest Indiana ("JTNWI"), a nonprofit corporation chartered under the laws of Indiana, is a grassroots environmental justice organization serving the Northwest Indiana region, primarily Lake, Porter, LaPorte, and Jasper Counties, that centers on organizing and base-building activities. JTNWI's mission is to educate and organize Northwest Indiana communities and workers, give voice to our shared stories, and support a just transition to a regenerative economy that protects the environment, climate, and future generations. Since the organization's formation in 2020, JTNWI has worked tirelessly on issues related to utility affordability, pollution response and accountability, and industrial decarbonization within the NIPSCO service territory, including Wheatfield and Jasper County, Indiana, where the R.M. Schahfer Generating Station is located, communities JTNWI serves whose health and livelihoods will be adversely impacted by the 202(c) emergency order. JTNWI works across the local, state, and federal levels, including advocating for coal ash waste clean closures, plant retirements, and just transition planning in fossil fuel-impacted communities in the region, and is actively involved in public comment periods and interventions in NIPSCO electric rate cases before the Indiana Utility Regulatory Commission and in environmental permits with the Indiana Department of Environmental Management and the United States Environmental Protection Agency.

D. Hoosier Environmental Council

Hoosier Environmental Council, Inc. ("HEC") is a 501(c)(3), non-profit, public interest environmental policy and advocacy organization chartered under the laws of Indiana. Since its formation in 1983, HEC has been and continues to be committed to protecting Indiana's air, land, waterways and wildlife habitat through initiatives in education, research, technical assistance, public policy advocacy, and legal action including the enforcement of federal and state laws that protect Indiana's natural resources. To further its mission, HEC actively seeks federal and state agency implementation and enforcement of environmental laws and regulations, and when necessary initiates enforcement actions on behalf of HEC and its members. For more than 40 years, HEC has advocated for measures to reduce the harm that coal-fired power does to land, air, water, and human health. HEC has been active regarding the Schahfer and Culley 2 sites, as well as many current and former coal-fired power plants, advocating on behalf of its members for safe closure of coal-fired power stations and proper closure of coal combustion

residual waste ponds and landfills. HEC's interest is in protection of air, water and land quality at and around these sites.

E. Public Citizen

Established in 1971, Public Citizen is a national research and advocacy organization representing the interests of household consumers. Public Citizen has members and supporters in every state, including those who pay electric utility bills in Indiana and the Midwest. Public Citizen is active before the Federal Energy Regulatory Commission promoting just and reasonable rates, and in supporting efforts for utilities to be accountable to the public. Financial details about the organization are on its website. Public Citizen, Annual Reports, www.citizen.org/about/annualreport/.

F. Environmental Law and Policy Center

Environmental Law and Policy Center ("ELPC") is a not-for-profit environmental organization headquartered in Chicago with members and contributors throughout the Midwest, including in Indiana. Among other things, ELPC advocates before the Indiana Utility Regulatory Commission and the Federal Energy Regulatory Commission for clean, reliable energy generation in order to reduce ratepayer costs and improve environmental outcomes. ELPC has participated in IURC cases and matters involving NIPSCO and other Indiana utilities. See, *e.g.*, IURC Cause No. 44688 (NIPSCO 2015 Rate Case); IURC Cause No. 45378 (Vectren Distributed Generation Rider); Duke Energy Indiana 2024 IRP.

IV. BACKGROUND

A. The Primary Actors in the Electric Industry Already Protect Resource Adequacy Without Intrusion from the Department.

1. The Federal Energy Regulatory Commission Regulates Wholesale Electricity Markets and Mechanisms that Acquire Adequate Resources.

FERC regulates wholesale sales and transmissions of electric energy in interstate commerce. 16 U.S.C. § 824(b)(1). Federal authority over the electric grid dates back at least to 1935, when the Federal Power Act became law and the Federal Power Commission administered the Act.

The Federal Power Act did not give the federal agency plenary authority over the electric grid. Instead, Congress provided that federal regulation shall "extend only to those matters which are not subject to regulation by the States" and provided that "[t]he Commission" does not have jurisdiction, "except as specifically

provided in [the Federal Power Act], over facilities used for the generation of electric energy." *Id.* at § 824(a)–(b)(1). As such, authority over generation facilities belongs to the states. *See id.*

In 1977, through the Department of Energy Organization Act, Congress reorganized the agencies that administer the Federal Power Act. Congress created the Department of Energy and FERC. 42 U.S.C. §§ 7131, 7171(a). Congress also transferred certain functions of "the Commission" in the Federal Power Act to the Department and other functions to FERC, thereby abolishing the Federal Power Commission. *See id.* §§ 7151(b), 7172(a)(1). FERC retained authority over rates and charges for the transmission of electric energy or sale of electric energy at wholesale (in both cases, in interstate commerce), and the non-emergency interconnection of facilities for the generation, transmission, and sale of electric energy. *Id.* § 7172(a)(1)(B); 16 U.S.C. § 824(a). The Department's authority over functions of "the Commission" in the Federal Power Act include functions under some subsections of Section 202 of the Act. *See* 42 U.S.C. § 7151(b). The 1977 reorganization did not expand the role of the "the Commission" at the expense of state authority or shrink states' authority over generation facilities. *See, e.g.*, *id.* § 7113 ("Nothing in this chapter shall affect the authority of any State over matters exclusively within its jurisdiction.").

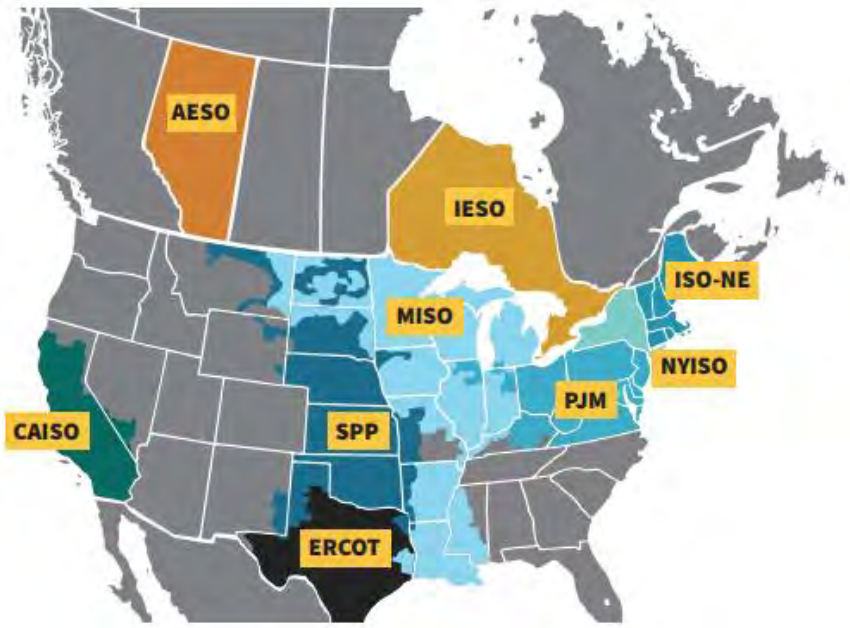
As part of its regulatory oversight, FERC has promoted the role of nonprofit entities, known as Independent System Operators or Regional Transmission Organizations, in bulk power system operations and planning. *See FERC v. Elec. Power Supply Ass'n*, 577 U.S. 260, 267 (2016); *Regional Transm. Orgs.*, Order No. 2000, 65 Fed. Reg. 810, 811 (Jan. 6, 2000); *Promoting Wholesale Competition Through Open Access Non-Discriminatory Transm. Servs. by Pub. Utils. and Recovery of Stranded Costs by Pub. Utils. and Transm. Utils.*, Order No. 888, 61 Fed. Reg. 21,540, 21,542 (May 10, 1996). FERC generally regulates these entities pursuant to its authority over rates and charges for wholesale sales and transmissions of electric energy. *See, e.g.*, Order No. 2000, 65 Fed. Reg. at 811. These entities, referred to here as ISOs or RTOs, perform a variety of functions, including:

- Ensuring the electric grid operates reliably in a defined geographic footprint;
- Balancing supply and demand instantaneously and maintaining sufficient operating reserves;
- Dispatching system resources as economically as possible;
- Coordinating system dispatch with neighboring balancing authority areas ("BAAs");

- Planning for transmission in its footprint;
- Coordinating system development with neighboring systems and participating in regional planning efforts; and
- Providing non-discriminatory transmission access.

Ex. 46 at 53 (FERC Energy Primer). Some ISOs "also operate capacity markets, which, along with underlying resource adequacy rules, ensure sufficient capacity is available." *Id.* at 68.

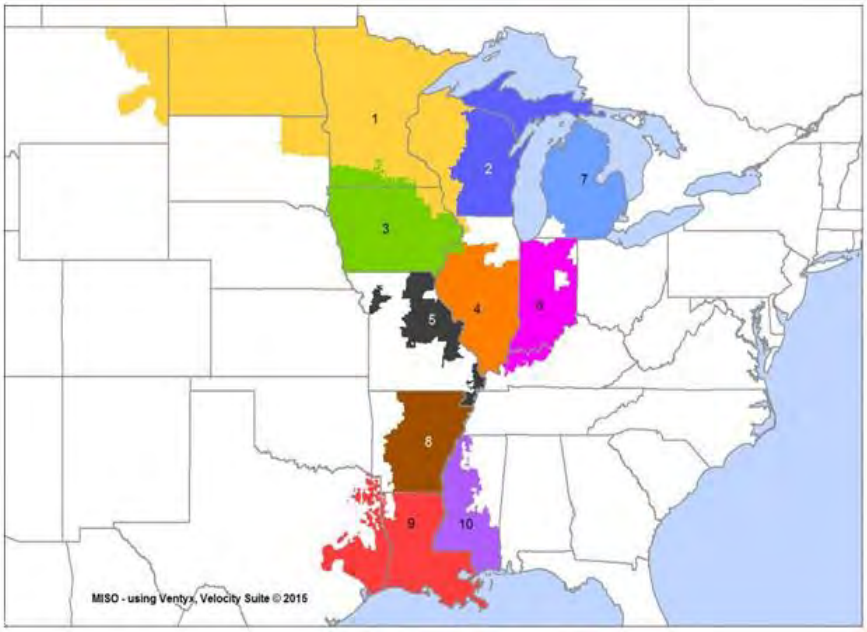
Independent System Operators now span much of the country, excluding portions of the Southeast, Southwest, and Northwest regions of the country. *See id.* at 37. The map below depicts the geographic footprint of the various ISOs.



Source: Ex. 46 at 67 (FERC Energy Primer).

2. *MISO Protects Reliability and Resource Adequacy Through FERC-Regulated Reserve Margin Requirements, a Residual Capacity Auction, and Retirement Approvals.*

MISO is an Independent System Operator and the grid operator for territory stretching roughly from North Dakota to Michigan and down to Louisiana. This territory is organized into zones numbered 1 through 10, as shown in MISO's FERC-approved tariff and reproduced below.



Source: Ex. 75 (MISO Tariff Zonal Map).

MISO implements resource adequacy standards across its territory to ensure it achieves a level of grid reliability meeting both industry standards and those of the North American Electric Reliability Corporation ("NERC"). To meet its resource adequacy requirements, MISO utilizes a series of interrelated mechanisms that both measure current and future system needs and help the utilities in its region secure the resources that best meet those needs at least cost. *See generally* Ex. 46 at 66–75, 87–90 (FERC Energy Primer); Ex. 3 at 8–9 (EFG Report).

i. Reserve Margin Requirements.

The foundation of MISO's resource adequacy implementation process is its Loss of Load Expectation ("LOLE") study, which measures whether available generation capacity is capable of meeting load demand under various conditions, including low probability but high impact events (such as extreme weather). *See generally* Ex. 38 (MISO LOLE Presentation). MISO runs its LOLE study every year, based on the latest available data. It utilizes a systemic model, taking inputs from the past thirty years of weather data as well as resource performance characteristics from a broad range of operating conditions. Using this wealth of information, MISO then runs thousands of simulations looking to future years. Each of the simulations examines the system at every individual hour of each year being studied. These simulations identify circumstances that could most stress the system, while also predicting how the system's fleet of resources will perform. *See* Ex. 58 (MISO Tariff Module E-1); Ex. 38 (MISO LOLE Presentation); Ex. 81 at 47-54 (Joundi Testimony). MISO runs this model annually, based on the latest available data.

MISO uses its LOLE study results in conjunction with its system-wide peak demand forecast, which it develops from projections provided by each of the load-serving entities within its territory. It combines these inputs to determine how much generating capacity is required to meet MISO's industry-standard goal of expecting no more than one day with a loss of load event every ten years. *See* Ex. 10 at 2–5 (Grid Strategies June Report). The result of this calculation is a reasonable buffer of extra capacity to account for potential emergencies and other conditions, which is known as the regional Planning Reserve Margin ("Reserve Margin"). The Reserve Margin, stated as a percentage, reflects the amount of generating capacity that must be procured in each season to meet resource adequacy standards across the region. MISO develops a separate Reserve Margin for each season of the year. An illustrative calculation of a Reserve Margin is below.

Illustrative Reserve Margin Calculation

Expected Peak Demand	100,000 MW
Extra Buffer	7,000 MW
Reserve Margin	**7%**

After developing the system-wide Reserve Margin, MISO uses it to convert the peak demand projection for each zone into a capacity requirement (in accredited megawatts, or "MW") that each zone must meet for each season. The requirement for each zone is known as that zone's Planning Reserve Margin Requirement ("Reserve Margin Requirement"), which is the amount of megawatts of capacity that must be procured for each zone. These megawatts can come from inside or outside the zone, so long as they are deliverable to the zone. *See* Ex. 3 at 8–9 (EFG Report).

As with the zonal calculation, MISO also converts each individual load-serving entity's projected peak demand into a capacity requirement using the system-wide Reserve Margin. A load-serving entity is, like NIPSCO and CenterPoint Indiana, an entity that "has undertaken an obligation to serve [l]oad for end-use customers by statute, franchise, regulatory requirement or contract." *See* MISO's FERC-Approved Tariff at Module A (as currently effective), *available at* https://etariff.ferc.gov/TariffBrowser.aspx?tid=1162 (defining "Load Serving Entity"). And the Reserve Margin Requirement for each zone is, roughly speaking, the sum of all load-serving entities' obligations in that zone.

Finally, MISO assigns to each individual resource a capacity value based on MISO's conservative estimate of how likely that generator is to be able to provide energy during peak net demand conditions. The purpose of this estimate is to determine a percentage of resources' maximum capacity (their "accredited capacity") that can be used by load-serving entities or in the Planning Resource Auction to achieve Reserve Margin Requirements, and it reflects that resources cannot always ensure that they will operate at their maximum possible capacity. Generally

speaking, MISO's approach combines probabilistic modeling with historic and unit-specific performance. Through the capacity accreditation process, MISO fully accounts for the limitations of each resource's ability to contribute to MISO's resource adequacy during peak demand conditions or during times of overall system stress (*e.g.*, when extreme weather affects unit performance). And MISO's capacity accreditation rules are regulated and overseen by FERC. *See, e.g.*, *Midcontinent Indep. Sys. Op., Inc.*, 180 FERC ¶ 61,141, at P 1 (2022) (approving MISO's seasonal resource adequacy construct); *see also Midcontinent Indep. Sys. Op., Inc.*, 189 FERC ¶ 61,065, at P 1 (2024) (approving new methodology applicable to 2028–2029 delivery year).

Once MISO (1) establishes the regional Reserve Margin, (2) converts it to a Reserve Margin Requirement for each zone using peak demand projections, (3) apportions each zone's Reserve Margin Requirement among load-serving entities, and (4) determines all eligible resources' accredited capacity, the load-serving entities must meet their capacity obligations. *See* Ex. 3 at 8–9 (EFG Report).

Load-serving entities have a few options for procuring capacity. First, they can use generating capacity they already own. Second, they can contract with another entity that owns generating capacity to promise to sell energy in the future when called upon by MISO to do so. Third, as a final fallback option they can obtain capacity through a residual capacity market run by MISO known as the Planning Resource Auction ("Planning Auction" or "PRA"). *See id*.

ii. MISO's Residual Capacity Market.

MISO conducts the Planning Auction every year. The Planning Auction is actually four separate simultaneous seasonal auctions. In each auction, MISO solicits operational commitments for each season from a suite of generation resources that will ensure resource adequacy. Many resources provide an "offer" identifying what price they would need to be paid to keep operational (*i.e.*, remain capable of delivering power upon command) all or part of the resource's accredited capacity for each of the four seasons. Other resources, including those already committed to operate via outside contracts, are self-scheduled into the auction process, meaning that MISO treats them as price takers or $0 offers. MISO then stacks each of these resources in ascending cost order, forming a supply curve.

The supply curve crosses a preset sloped demand curve, known as the Reliability Based Demand Curve. The sloped demand curve is designed by MISO to procure a certain amount of capacity at each price point; although it is tethered around MISO's goal of experiencing no more than one loss of load event per decade, it will obtain more capacity if it is cheaper and less if it is more expensive. This is

consistent with the general principle that grid operators must always balance the tradeoff between resource adequacy and cost. *See* Ex. 10 at 2–3 (Grid Strategies June Report); Ex. 3 at 8–9 (EFG Report); Ex. 31 at 4 (MISO 2025–26 Auction Results).

The point where the supply and demand curves intersect is called the capacity market clearing price. All resources on the supply curve with offers at or below that amount are then committed to remain operational and be available for the respective season(s) in which they cleared, with the owners of those resources' capacity rights receiving the clearing price. Ex. 58 (MISO Tariff Module E-1).

iii. MISO's Approvals of Generator Retirements.

Pursuant to MISO's FERC-approved tariff, a utility within MISO seeking to suspend the operation of a generating unit must provide an "Attachment Y" notice to MISO. Ex. 60 at 1 (MISO Tariff Sec. 38.2.7); Ex. 61 (MISO Tariff Attachment Y). The purpose of the notice is to enable MISO to evaluate the potential local grid reliability impacts of such suspension. If retirement would cause unacceptable reliability impacts, MISO may offer compensation to keep the resource active as a System Support Resource. *See* Ex. 60 at PDF p. 5 (MISO Tariff Sec. 38.2.7).

3. MISO Also Continuously Monitors the Grid to Balance Supply and Demand, and to Prevent Blackouts Using an Escalating Sequence of Real-Time Alerts that Activate Reserve Resources in a Specific, Predetermined Order.

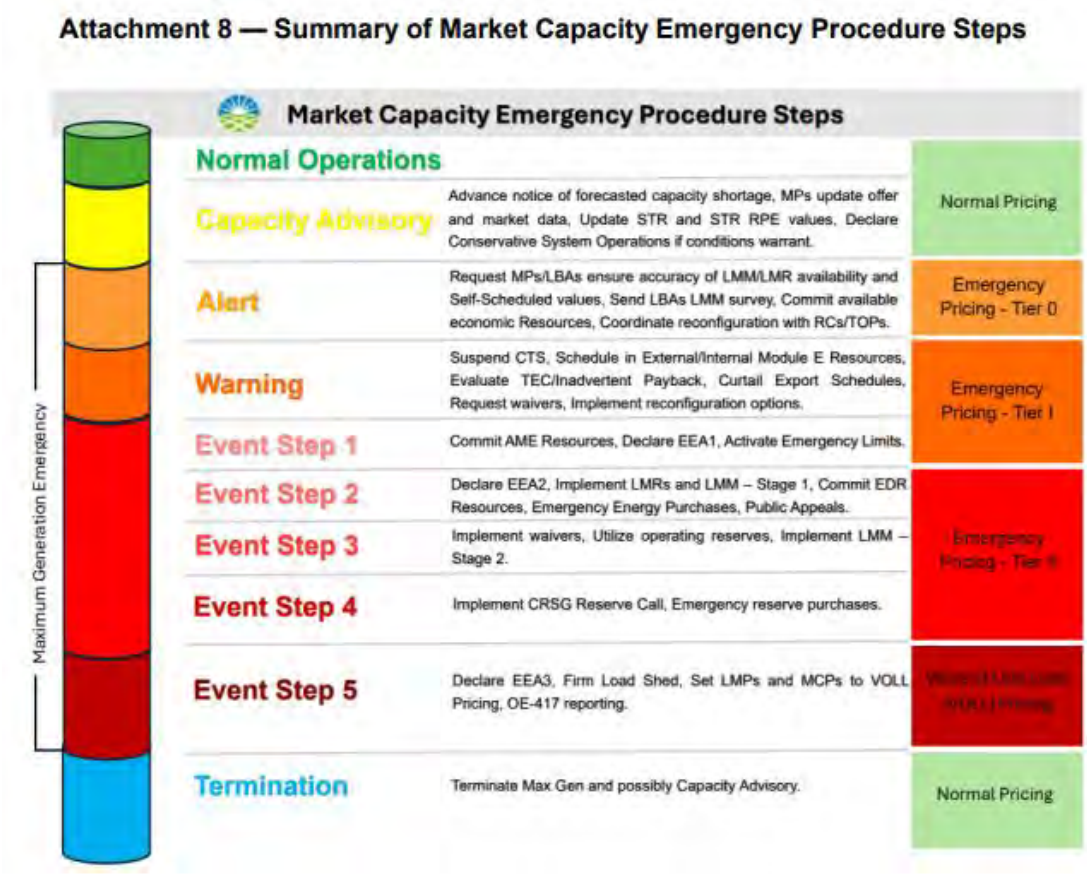
In addition to annually securing the set of resources it has determined will meet its regional reliability standard, MISO also operates the grid on a daily and hourly basis to match the resources it has available with load (*i.e.*, demand) over the course of each day. During normal operational periods, MISO uses its energy markets to receive information from every potential resource in the region (generators, batteries, etc.) about how much power they believe they can provide and at what price, and then issues instructions to the set of resources it needs to meet projected demand at least cost to the system. *See generally Elec. Power Supply Ass'n*, 577 U.S. at 268 ("Each administers a portion of the grid, providing generators with access to transmission lines and ensuring that the network conducts electricity reliably. And still more important for present purposes, each operator conducts a competitive auction to set wholesale prices for electricity. These wholesale auctions serve to balance supply and demand on a continuous basis, producing prices for electricity that reflect its value at given locations and times throughout each day." (internal citation omitted)).

On occasion, the total electric generation that is freely offered in MISO's day-ahead market is less than the MISO region's projected demand. That mismatch

between projected demand and voluntary supply does not, however, of itself produce any disruption to the grid. In these instances, MISO implements a well-defined process to identify additional resources until the projected shortfall is addressed.

MISO has enshrined its process for securing extra resources to address projected shortfalls, which it deems "Max Gen Emergencies," in its operational tariff. Ex. 33 at §§ 4.2–4.3 (MISO Market Capacity Emergency) (describing Max Gen Emergency Event procedures). As described there, MISO often can address any shortfall simply by issuing a capacity advisory to double check its numbers, followed by a so-called "max-gen" alert to facility operators to suspend any optional maintenance or other activities that might be interfering with resources' power output (*i.e.*, to achieve maximum generation from all available resources). *Id.* at §§ 4.1, 4.2.2. MISO can then issue a warning of a potential shortfall and start curtailing exports and coordinating with its neighbors to bring in imports from adjacent regions. *Id.* at § 4.2.3. If these preliminary measures don't address the shortfall, MISO will then proceed step by step through a series of five steps with subparts (labeled "1a" through "5") of increasingly stringent mitigation measures to increase generation or reduce usage of electricity during the period at issue. Only on the final step (step "5") does any involuntary load shedding (*i.e.*, a blackout) occur; Steps "1a" through "4b" describe an escalating sequence of mitigation measures MISO will employ, including requesting power transfers from neighboring regions, turning on backup generators, utilizing contracted demand response resources, and asking the public for voluntary reductions. *See* Ex. 33 (MISO Market Capacity Emergency); Ex. 3 at 7 (EFG Report). The following table, prepared by MISO, describes these steps (without delineating between "step 1a," "step 1b," etc.).[3]

[3] The following is a partial explanation of acronyms in the table: MPs means Market Participants; LBAs means Load Balancing Authorities; AME means Available Maximum Emergency; EEA means Energy Emergency Alert; LMM means Load Management Measures; LMRs means Load Modifying Resources; EDR means Emergency Demand Response; LMPs means Locational Marginal Prices; MCPs means Market Clearing Prices; and VOLL means Value of Lost Load. Ex. 33 (MISO Market Capacity Emergency) at 2, 3, 8, 13, 19, 34.



Source: Ex. 33 at 43 (MISO Market Capacity Emergency).

Through a combination of responsible grid management and capacity retention policies, MISO has avoided the need to utilize the full five steps of its emergency process in recent years. MISO has not faced a Market Footprint Maximum Generation Emergency Event Step of 3 or higher since 2009, according to the most recent summation available (through June 2024)—and highest Max Gen event reached only Step 1b in the Summer 2025 season that recently concluded. *See* Ex. 32 at 4–27 (MISO Emergency Declarations); Ex. 68 at 3–4 (Grid Strategies Sept. Report). For the Fall 2025 season that recently concluded, PIOs are not aware of any EEA alert having been issued. Moreover, MISO Staff's December 2025 presentation to MISO's Board of Directors indicated that "No reliability actions were needed this fall" and showed on a granular daily level that no alerts, warnings, or reliability actions or events occurred in the Fall 2025 season. Ex. 138 at 11 (MISO Fall 2025 Operations Report).

4. Indiana Evaluates Resource Adequacy Through Integrated Resource Planning and Annual Capacity Procurement Requirements.

Electric utilities in Indiana are required, pursuant to legislation enacted over a decade ago, to submit to the Indiana Utility Regulatory Commission (the "Indiana Commission") an "integrated resource plan that assesses a variety of demand side management and supply side resources to meet future customer electricity service needs in a cost effective and reliable manner." Ind. Code § 8-1-8.5-3(e)(2). By rule, the Indiana Commission requires utilities—including NIPSCO and CenterPoint Indiana—to submit their IRP for review every three years. 170 IAC 4-7-2(a). Following submission of the IRP, customers and interested parties may submit comments to the Indiana Commission; this is followed by a draft report issued by the Indiana Commission's designated director, another round of stakeholder comment, and then a final report from the Indiana Commission's designated director. The director's report is to comment on the IRP's compliance with requirements for its contents. 170 IAC 4-7-2.2(a)–(g).

And those required contents are extensive. A utility's integrated resource plan must include the following, among other requirements:[4]

(1) At least a twenty-year future period for predicted or forecasted analyses;

(2) An analysis of historical and forecasted levels of peak demand and energy usage, including historical load shapes, actual and weather-normalized energy and demand levels; assumptions as to demographic, economic, and technological changes;

(3) At least three alternative forecasts of peak demand and energy usage;

(4) A description of the utility's existing resources, including expected retirements, deratings, life extensions, repowerings, and refurbishments; fuel price forecasts by generating unit; and analysis of the transmission system's effects on power supply;

(5) A description of the utility's process for selecting possible alternative future resources for meeting future demand, including a cost-benefit analysis, if performed;

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[4] The following partial description of requirements is condensed slightly from the language used in Indiana's regulatory code.

(6) A description of the possible alternative future resources for meeting future demand, including demand-side, supply-side, and transmission resources;

(7) . . .

(8) A description of candidate resource portfolios and the process for developing those portfolios, including how the candidate portfolios performed across a wide range of scenarios, and the cost of each portfolio;

(9) A description of the utility's preferred resource portfolio, including a description of how the preferred resource portfolio balances cost effectiveness, reliability, and portfolio risk and uncertainty;

(10) A short-term action plan for the next three-year period to implement the utility's preferred resource portfolio and its workable strategy, including an implementation schedule and budget;

(11) A discussion of inputs, methods, and definitions used in the IRP;

(12) Appendices of data sets and sources used in the IRP;

(13) A description of the utility's effort to develop and maintain a database of electricity consumption patterns, disaggregated by several classes of users;

(14) . . .

(15) A proposed schedule for industrial, commercial, and residential customer surveys;

(16) A discussion of the use of advanced metering infrastructure for enhancing usage data and improving load forecasts, DSM programs, and other aspects of planning;

(17) . . .

(18) A discussion of distributed generation and its effect on planning;

(19) . . .

(20) A discussion of how the utility's fuel inventory and procurement planning practices have been taken into account;

(21) . . .

(22) A description of the generation expansion planning criteria;

(23) A discussion of how compliance costs for existing or reasonably anticipated air, land, or water environmental regulations impacting generation assets have been taken into account;

(24) A discussion of how the utilities balanced resource planning objectives including cost effectiveness, rate impacts, risks, and uncertainty;

(25) A description of the base case scenario;

(26) A description and analysis of alternative scenarios;

(27) A brief description of transmission modeling in the Indiana system;

(29) An explanation of the avoided cost calculation for demand side resources;

(30) A summary of the utility's most recent public advisory process.

170 IAC 4-7-4 to 4-7-9; *see also* Ex. 3 at 1 (EFG Report).

While the Indiana Commission does not directly approve or reject the utility's integrated resource plan (beyond the director's reports described above), any action an Indiana utility takes that impacts its generation mix, including applying for a Certificate of Public Convenience and Necessity for a generating resource, must be consistent with its most recently submitted IRP, unless differences between the most recent IRP and the resource action are fully explained and justified with supporting evidence. Ind. Code § 8-1-8.5-5(b)(2)(B); 170 IAC 4-7-2.5(b). Thus, IRPs are stable and consequential utility planning documents that are given considerable scrutiny by the Indiana Commission.

In addition to submitting IRP analyses, electric utilities located within Indiana's MISO transmission area are required to pass on to the Indiana Commission their annual planning reserve margin report submitted to MISO. Utilities are also required to submit their annual resource adequacy assessment to the Indiana Commission within twenty-five days of submitting the report to MISO. 170 IAC 4-7-2.3(a). Additionally, an electric utility in Indiana is required to demonstrate annually to the Indiana Commission that for both the Summer and Winter seasons, no more than 15% of its allocated capacity requirement will be acquired from the relevant RTO capacity auction. In other words, each utility must demonstrate that it either owns or has under contract 85% of its capacity requirement. Ind. Code § 8-1-8.5-13.

5. NERC Protects Reliability via Standards and Regular Assessments.

NERC is the "Electric Reliability Organization" under Section 215 of the Federal Power Act. *N. Am. Elec. Reliab. Corp.*, 116 FERC ¶ 61,062, at P 3, *order on reh'g &*

compliance, 117 FERC ¶ 61,126 (2006); *see* 16 U.S.C. § 824o(a)(2). This role dates back to 2005, after Congress added Section 215 to the Act and FERC certified NERC as the Electric Reliability Organization. Energy Policy Act of 2005, Pub. L. No 109-58, Title XII, Subtitle A, section 1211(a), 119 Stat. 594, 941 (2005), 16 U.S.C. § 824o (2000 & Supp. V 2005); 116 FERC ¶ 61,062, at P 16.

As the Electric Reliability Organization, NERC is responsible for establishing and enforcing reliability standards for the Bulk-Power System. 16 U.S.C. § 824o(a)(2); 18 C.F.R.§ 39.1. NERC's reliability standards are subject to FERC's review and approval. 16 U.S.C. § 824o(d); Ex. 10 at 7 (Grid Strategies June Report).

The NERC-developed and FERC-approved reliability standards apply to all users, owners, and operators of the Bulk-Power System within the continental United States. 16 U.S.C. § 824o(b)(1); 18 C.F.R. §§ 39.2, 40.1(a), 40.2(a); *see* 18 C.F.R. § 39.1 (defining "Bulk-Power System"). Each reliability standard identifies the types of entities that must comply with the standard, such as generator owners, transmission owners, or transmission operators. *Reliability Standard Compliance and Enforcement in Regions with Regional Transm. Orgs. or Indep. Sys. Ops.*, 122 FERC ¶ 61,247, at P 4 (2008); *e.g.*, Ex. 130 (NERC Emergency Ops., EOP-011-4) (stating requirements applicable to, *inter alia*, balancing authorities, reliability coordinators, and transmission operators for the purpose of "address[ing] the effects of operating Emergencies by ensuring each Transmission Operator and Balancing Authority has developed plan(s) to mitigate operating Emergencies and that those plans are implemented and coordinated within the Reliability Coordinator Area as specified within the requirements"). Independent System Operators like MISO must comply with applicable NERC standards, and they are subject to penalties for noncompliance. 122 FERC ¶ 61,247, at PP 1, 5, 16; *see also* MISO Tariff Schedule 34 (setting forth allocation costs associated with monetary penalties assessed against MISO for violation of NERC standards).

NERC performs other functions in addition to development and enforcement of reliability standards. For instance, NERC annually assesses seasonal and long-term reliability of the bulk power system and monitors system performance. *See* 18 C.F.R. § 39.11. As part of these assessments, an "elevated risk" designation does not constitute an emergency because it does not indicate the possibility of imminent shortfalls; indeed, it is only the second of three risk levels offered by NERC. NERC typically provides specific context and details associated with its determination. Since it began providing standardized "risk" assessments by region in the summer of 2021, NERC has adhered to a three-tiered assessment of risk: areas facing the least risk are "low" or "normal" risk regions, areas facing the most risk are "high" risk regions, and areas in between are "elevated" risk regions. *See* Ex. 42 at PDF pp. 75, 124, 170, 218 (2019–24 NERC Summer Reliability Assessments). NERC's

determination of "elevated" risk often indicates only that there is a "[p]otential for insufficient operating reserves in above-normal conditions." Ex. 41 at 6 (NERC 2025 Summer Reliability Assessment). Planning Reserve Margins *do generally* meet Reference Margin Levels in "elevated" risk regions. *Id.* at 10, 41.

Table 2: Seasonal Risk Assessment Summary

Category	Criteria[1]
High Potential for insufficient operating reserves in normal peak conditions	• Planning Reserve Margins do not meet Reference Margin Levels (RML); or • Probabilistic indices exceed benchmarks, e.g., loss of load hours (LOLH) of 2.4 hours over the season; or • Analysis of the risk hour(s) indicates resources will not be sufficient to meet operating reserves under **normal peak-day demand and outage scenarios**[2]
Elevated Potential for insufficient operating reserves in above-normal conditions	• Probabilistic indices are low but not negligible (e.g., LOLH above 0.1 hours over the season); or • Analysis of the risk hour(s) indicates resources will not be sufficient to meet operating reserves under **extreme peak-day demand with normal resource scenarios** (i.e., typical or expected outage and derate scenarios for conditions);[2] or • Analysis of the risk hour(s) indicates resources will not be sufficient to meet operating reserves under **normal peak-day demand with reduced resources** (i.e., extreme outage and derate scenarios)[3]
Normal Sufficient operating reserves expected	• Probabilistic indices are negligible • Analysis of the risk hour(s) indicates resources will be sufficient to meet operating reserves under normal and extreme peak-day demand and outage scenarios[4]

Table Notes:
[1]The table provides general criteria. Other factors may influence a higher or lower risk assessment.
[2]**Normal resource scenarios** include planned and typical forced outages as well as outages and derates that are closely correlated to the extreme peak demand.
[3]**Reduced resource scenarios** include planned and typical forced outages and low-likelihood resource scenarios, such as extreme low-wind scenarios, low-hydro scenarios during drought years, or high thermal outages when such a scenario is warranted.
[4]Even in normal risk assessment areas, extreme demand and extreme outage scenarios that are not closely linked may indicate risk of operating reserve shortfall.

Source: Ex. 143 at 11 (NERC 2025–2026 Winter Reliability Assessment).

B. The Evidence Shows No Reliability or Resource Adequacy Crisis in MISO for Winter 2025–2026, Spring 2026, or Thereafter.

1. There Is No Evidence of a Resource Adequacy Crisis in the current Winter or upcoming Spring Seasons.

MISO conducted its annual four-season capacity auction (the Planning Auction, discussed above in sec. IV.A.2) as scheduled in the spring of 2025. The 2025–2026 Planning Auction procured adequate supplies for MISO as a whole and for Local

Resource Zone 6 (which includes the MISO portion of Indiana[5]) for both the Winter 2025–2026 and Spring 2026 seasons.[6] Notably, the 2025–2026 auction did not include Schahfer or Culley 2 as capacity resources for the Winter 2025–2026 and Spring 2026 seasons. Ex. 11 at PDF p. 4 (NIPSCO 2025 Planning Reserve Margin Report); Ex. 12 at 4 (CenterPoint 2025 Planning Reserve Margin Report). For the Winter 2025–2026 period, cleared offers from Zone 6 totaled 14,331.5 megawatts, which exceeded the Zone 6 Local Clearing Requirement by nearly *30 percent*. The Planning Auction, accounting for inter-zonal transfer capability, calculated that surplus capacity from other areas of MISO could provide adequate imports—specifically, 4,354.1 megawatts—to meet the total Reserve Margin Requirement for Zone 6. Ex. 31 at 20 (MISO 2025–2026 Planning Auction Results); Ex. 3 at 7 (EFG Report). For Spring 2026, cleared offers from Zone 6 totaled 15,181.0 megawatts, which exceeded the Zone 6 Local Clearing Requirement by over *46 percent*. Similar to the Winter results, the Planning Auction calculated that surplus capacity could provide adequate imports—2,985.6 megawatts—towards meeting Zone 6's Reserve Margin Requirement for Spring. Ex. 31 at 21 (MISO 2025–2026 Planning Auction Results); Ex. 3 at 7 (EFG Report).

In addition to Zone 6 fully meeting its capacity requirements, every other Local Resource Zone in MISO successfully met its capacity requirements within the 2025–2026 Planning Auction, resulting in MISO finding that there were no capacity deficits in the region during the planning year. *See* Ex. 31 at 12 (MISO 2025–26 Auction Results) ("The 2025 PRA demonstrated sufficient capacity at the regional, subregional and zonal levels"); Ex. 34 at 9 (Ramey MISO Comments) (testifying just after the 2025–2026 Planning Auction that no capacity deficits for the period beginning in 2025 materialized).

As required by Indiana law, both NIPSCO and CenterPoint Indiana completed their triennial IRP analysis within the past fourteen months: NIPSCO in December 2024 and CenterPoint Indiana in December 2025. Ex. 100 (NIPSCO 2024 IRP); Ex. 21 (CenterPoint Indiana 2025 IRP). NIPSCO's 2024 IRP assumed that Schahfer Units 17 and 18 would retire at the end of 2025, with reliability maintained through previously approved transmission upgrades and approximately 2,100 MW of replacement resources (renewables plus a new 400-MW gas peaker) entering

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[5] MISO Local Resource Zone 6 includes most of Indiana, including the CenterPoint Indiana and NIPSCO service territories, and a portion of Kentucky. *See* Ex. 75 (MISO Tariff Zonal Map).

[6] MISO defines the Winter season for its Planning Auction as December through February, and defines the Spring season as March through May.

service. Ex. 100 at 6-7 (NIPSCO 2024 IRP); Ex. 3 at 3–4 (EFG Report). NIPSCO's resource planning analysis indicated no sign of a Summer reliability shortfall in 2026, and the retirement of Schahfer would not create a capacity deficiency under the current rules. Ex. 100 at 26 (NIPSCO 2024 IRP); Ex. 3 at 4–5 (EFG Report). NIPSCO's analysis also showed that for the Winter 2025–2026 season, total accredited capacity is well above the Planning Reserve Margin, including because of higher winter accreditation for wind resources and generally lower winter peak loads. Ex. 100 at 26 (NIPSCO 2024 IRP); Ex. 3 at 5 (EFG Report). Thus, the IRP record supports the conclusion that continued operation of Schahfer 17 and 18 is not required for resource adequacy in early 2026. Ex. 3 at 5–6 (EFG Report). NIPSCO also submitted a Planning Reserve Margin Annual Report to the Indiana Commission last year to demonstrate how it meets the 85% threshold for each season of 2025–2026 pursuant to Ind. Code § 8-1-8.5-13(*l*), as discussed above in section IV.A.4. Ex. 11 at 3–4 (NIPSCO Planning Reserve Margin 2025 Report).

Similarly, CenterPoint Indiana's most recent IRP, filed just last month, assumes Culley Unit 2 would retire at the end of 2025 as part of its Reference Case. Ex. 21 at 151 (CenterPoint Indiana 2025 IRP). CenterPoint Indiana's analysis and projections show no capacity shortage in Winter 2026 or in subsequent years. *Id.* at 152; Ex. 3 at 5 (EFG Report). Specifically, for the Winter 2025–2026 season, CenterPoint Indiana projected a capacity surplus of 161 MW. Additionally, CenterPoint Indiana submitted its Planning Reserve Margin Annual Report to the Indiana Commission in May 2025, again pursuant to Ind. Code § 8-1-8.5-13(*l*). The report showed that CenterPoint Indiana more than meets its minimum 85% requirement of owned or contracted resources, with 100% of the utility's allocated Reserve Margin Requirement in Winter 2025–2026 being owned or contracted for and 99% of its allocated Reserve Margin Requirement for Spring 2026 owned or contracted for. Ex. 12 at 4 (CenterPoint 2025 Planning Reserve Margin Report).

At the IURC's 2025 Winter Reliability Forum last month, both NIPSCO and CenterPoint Indiana presented data on their resource adequacy for the Winter 2025–2026 season, in line with state law requirements. NIPSCO described how it entered the 2025–2026 MISO Planning Auction with "295 MW of capacity requirement for winter season and surplus capacity of 192 MW in the spring season." Ex. 59 at 12 (NIPSCO 2025 Winter Reliability Presentation). Notably, 295 MW is just over 10% of NIPSCO's allocated Reserve Margin Requirement of 2,897 MW for Winter 2025–26, meaning that NIPSCO achieved well over its mandated target of 85% owned or bilaterally contracted capacity. Ex. 11 at 4 (NIPSCO 2025 Planning Reserve Margin Report). NIPSCO emphasized that "[n]o extraordinary measures are needed to operate wind and solar facilities during extreme cold weather events" because "wind turbines have cold weather packages that operate normally in ambient temperatures down to -22°F." NIPSCO also highlighted that

the utility's solar assets are "designed to operate in [a] sub-freezing temperature environment" and "primarily consist of bi-facial modules which are significantly more efficient at shedding snow than mono-facial modules." Ex. 59 at 8 (NIPSCO 2025 Winter Reliability Presentation).

CenterPoint Indiana also reported that it had "procured sufficient capacity to meet customer demand and MISO planning reserve margin requirements [] for the winter season" at the Winter Reliability Forum. CenterPoint Indiana attained its allocated Reserve Margin Requirement of 1,031 megawatts, which significantly exceeds the utility's projected peak demand of 863 megawatts. Ex. 67 at 23 (CenterPoint Indiana 2025 Winter Reliability Presentation).

2. There Is No Evidence of a Resource Adequacy Crisis After Spring 2026.

The MISO system is also positioned to operate reliably for years beyond the 90-day timeframe of the Orders. There is ample evidence demonstrating that this is true for the remainder of the 2025–2026 planning year; for the next couple years after that; and even out through the 2030 time horizon that the Department identifies as a long-term source of concern.

First and most directly, MISO has secured the stability of its grid through at least the end of May 2026 by operation of its 2025–2026 Planning Auction. The auction secures in April of each year the resources necessary to ensure grid reliability individually for each of the four subsequent seasons. *See supra* sec. IV.A.2.ii. The 2025–2026 Planning Auction exceeded its target Reserve Margin Requirements for the Spring season by 1.5%, meaning that (as it did for the Summer, Fall, and Winter seasons) MISO will enter the Spring season with *more* resources than its own analysis has indicated are actually needed to ensure grid reliability. Ex. 31 at 5 (MISO 2025–26 Auction Results). Furthermore, MISO's modeling in conjunction with its shift to a seasonal resource adequacy construct indicated that the loss of load risk in Spring (as with Fall 2025 and Winter 2025–2026) is very low. Ex. 81 at 49:15–17 (Joundi Testimony); *see also* Ex. 82 at 33 (MISO 2024–25 LOLE Study Report); Ex. 83 at 34 (MISO 2025–26 LOLE Study Report). Thus, there is no basis for any resource adequacy concern for the Spring season.

Second, although MISO has not yet conducted its 2026–2027 Planning Auction (or the auctions for subsequent years), MISO is not projecting any possibility of a regional resource adequacy shortfall through May 2027. MISO's joint annual survey with the Organization of MISO States ("OMS"), which forecasts generation capacity supply and system load (the "OMS-MISO Survey"), evaluates a range of potential outcomes years into the future, using a set of assumptions ranging from extremely

conservative to a match of utility projections. *See supra* sec. IV.A.2. The most recent edition of that survey, completed June 2025, predicts a *surplus* of between 1.4 and 6.1 gigawatts ("GW") for Planning Year 2026–2027 (*i.e.*, June 2026–May 2027), and its projection range for Planning Year 2027–2028 ranges from a surplus of 6.4 GWs to a small deficit of 1.4 GWs. Ex. 89 at 7 (2025 OMS-MISO Survey). In other words, the survey provides no basis for any concern about MISO's ability to meet resource adequacy needs through at least May 2027. And a series of unlikely events would have to occur for the region to see even a minor (1–2 GW) deficit through May 2028, as further explained below. MISO's system is robust, and even before its new approach to generator interconnection (also discussed below), it was on track as of early June 2025 to ensure that its grid remains robust for approximately the next three years.

The evidence also confirms sufficient resources in the months and years after Spring 2026 in the utility territories of both NIPSCO and CenterPoint Indiana, where the subject generating Plants are located. CenterPoint Indiana's Planning Reserve Margin Report submitted to the Indiana Commission last year shows that it has secured accredited resources totaling over 100% of its allocated Reserve Margin Requirement in <u>each</u> season of planning year 2026–2027 and 2027–2028. Ex. 12 at PDF pp. 5–6 (CenterPoint 2025 Planning Reserve Margin Report). And NIPSCO's IRP "indicates no sign of a summer reliability shortfall in 2026 or even in 2027." Ex. 3 at 5 (EFG Report).

To the extent there are capacity gaps in the NIPSCO and CenterPoint Indiana IRPs in years 2028 and beyond, such gaps are not predictions of the shortage of capacity needed to meet demand. Rather, consistent with the planning purpose of IRPs, both NIPSCO and CenterPoint Indiana's IRPs calculate the amount of accredited capacity needed to meet demand plus, maintain a Reserve Margin as determined by MISO. Ex. 21 at 81 (CenterPoint Indiana 2025 IRP); Ex. 100 at 24 (NIPSCO 2024 IRP). Any "surplus" or "shortfall" shows whether the utility has more or fewer resources than are needed to achieve MISO's Reserve Margin given expected future load and utility-owned generation and capacity purchases.

For Summer 2028 and Summer 2029, CenterPoint Indiana shows a capacity shortfall of 115 MW and 114 MW respectively. Ex. 21 at 152 (CenterPoint Indiana 2025 IRP). NIPSCO shows a shortfall starting in Summer 2028. Ex. 100 at 26 (NIPSCO 2024 IRP). But these projected capacity deficits are not a basis on which to declare an imminent shortfall or an emergency. They are a planning signal to guide medium- and long-term utility planning. And they are being treated as such by CenterPoint Indiana and NIPSCO. CenterPoint Indiana does not have a projected shortfall in 2028 because it is unable to procure or interconnect enough capacity. Rather, the utility has not decided on whether to purchase capacity from

the MISO market or construct a battery using Culley 2's interconnection rights and is conducting an RFP to see which would be more cost-effective for its customers. *See* Ex. 21 at 190 (CenterPoint Indiana 2025 IRP); Ex. 3 at 3 (EFG Report). Likewise, NIPSCO's existing capacity projection showing a shortfall starting in 2028 should be understood as a "foundational starting point" upon which "NIPSCO developed six different portfolio concepts around accreditation and emission intensity through least cost portfolio optimization analysis." Ex. 100 at 26 (NIPSCO 2024 IRP); s*ee also* Ex. 100 at 1 (describing NIPSCO's selected solution of "add[ing] between 900 and 1,150 MW of new storage capacity and 350 MW of short-term thermal PPAs by 2028-2029. . . . NIPSCO will continue to track accreditation trends as the rule is implemented and adjust its storage procurement plan accordingly.") (NIPSCO 2024 IRP). The capacity supply-demand balance graphs in NIPSCO's IRP "are NIPSCO's going-in position to its 2024 IRP (including existing and planned resources) and do not contemplate unidentified, additional resources that NIPSCO would plan to acquire as a result of its IRP to fill gaps in need in 2028 and beyond." Ex. 3 at 5 (EFG Report) (referring to Ex. 100 at 26 (NIPSCO 2024 IRP)).

Third, although MISO has spoken publicly about its long-term resource adequacy concerns heading into Summer 2028 and beyond, those concerns can be addressed through traditional, non-emergency, policy measures and other strategies to ensure no shortfall actually occurs. And MISO is not standing still in this regard; as MISO has explained,

> "State regulators along with utilities have the responsibility of ensuring resource adequacy. MISO remains focused on reliably operating the grid using the resources our members provide, while working closely with stakeholders and regulatory partners, providing visibility into system needs and sending market signals to inform long-term resource planning."

Ex. 117 at PDF p. 4 (RTO Insider Article).

Generally speaking, from FERC down to stakeholders, everyone working regularly in the energy regulatory world recognizes that the industry is dynamic, and everyone is engaging to ensure there are adequate resources going forward. At the end of May 2025, FERC hosted a technical conference where MISO, the MISO Independent Market Monitor, and other contributors highlighted that the system is in good shape today, and outlined plans to ensure that remains the case down the road. *See, e.g.*, Ex. 35 at 1 (Patton MISO Comments) ("The resource adequacy challenges and risks in MISO are not nearly daunting as portrayed by MISO planning reports or the NERC 2024 Long-Term Reliability Assessment."); *see also* Ex. 62 at 13 (FERC Technical Conference Notice).

In fact, MISO has already taken tangible steps to address what it perceived to be a potential for resource adequacy shortfalls down the road: it developed, and secured FERC approval for, an Expedited Resource Addition Study (ERAS) pathway for generator interconnection. *See generally* Ex. 90 (MISO ERAS Transmittal Letter); Ex. 91 at P 1 (MISO ERAS Decision). The ERAS proceeding demonstrates that in response to somewhat conjectural resource adequacy shortfall projections, MISO launched an entirely new interconnection process that is currently underway. ERAS has already accepted, in its first two cycles, twenty-five projects totaling around 11,400 megawatts of new capacity, most of which will be provided by gas plants. *See* Ex. 140 at PDF p. 2 (MISO ERAS December Release); *See also* Ex. 48 at PDF p. 2 (Utility Dive, MISO begins reviewing 6.1 GW — 70% of it gas — in fast-track interconnection study). These projects will receive fast-tracked interconnection studies, with projected in-service dates no later than three years from now. Including the twenty-five projects already accepted in the first two cycles, projects totaling nearly 30,000 megawatts have been accepted or are pending validation into the ERAS study program. Ex. 140 at PDF p. 2 (MISO ERAS December Release). Of the first ten projects in the program, accepted in September of last year, at least three have already executed interconnection agreements and the remainder were expected to complete agreements last month. Ex. 140 at PDF p. 2 (MISO ERAS December Release). That approximately 30 GW of nameplate capacity by itself would more than cover the OMS-MISO Survey's maximum projected needs under the most conservative assumptions.[7] The OMS-MISO Survey did not account for ERAS projects because it predated FERC's approval of ERAS. Thus, MISO does not simply have a plan to address the possibility of shortfalls three-plus years down the road; actually, a key pillar of its plan is already underway.

[7] While the 30 GW of capacity is nameplate capacity, not accredited capacity, the accredited capacity of the produced resources will almost certainly exceed the 1.4 GW capacity gap identified in the OMS-MISO survey. For combined cycle turbines, accredited capacity is, on average, between 84.7% and 91.4% of the generator's nameplate capacity. *See* Ex. 47 (MISO Schedule 53 Class Averages). Gas generation is 70% by size of the current ERAS queue. Ex. 48 (Utility Dive, MISO begins reviewing 6.1 GW — 70% of it gas — in fast-track interconnection study).

C. Schahfer and Culley Should Retire As Soon As Possible.

1. Schahfer and Culley Were Built Four to Six Decades Ago.

i. Schahfer Units 17 and 18 Are Electric Generating Units in Indiana Originally Built in the Mid-1980s.

The R.M. Schahfer Generating Station is a coal and gas-burning power plant in Wheatfield, Indiana, owned and operated by NIPSCO, the retail electric utility that serves portions of northwest Indiana. Four coal-burning units were commissioned at the Schahfer site between 1976 and 1986: Units 14, 15, 17, and 18. Coal is delivered to Schahfer by rail. Two smaller gas combustion turbines, Units 16A and 16B, were commissioned in 1979. The Indiana Commission has approved NIPSCO's plan to install new combustion turbine gas units at the site upon the retirement of Units 17 and 18, using the retiring units' interconnection rights. *See* Ex. 20 (IURC Schahfer Gas Plant Order); Ex. 132 (NIPSCO Rate Case Discovery Responses).

NIPSCO is a member of MISO and offers the output of the Schahfer coal units in the MISO energy markets. In its 2018 IRP, NIPSCO determined that retiring and replacing all four Schahfer units would reduce costs for its customers. Ex. 71 at 6-7 (NIPSCO 2018 IRP). The two largest of the four original Schafer units were retired in 2021. Ex. 72 at 9 (NIPSCO 2021 IRP). The remaining Schahfer coal units, Units 17 and 18, were slated to retire in December 2025. Ex. 102 (MISO Attachment Y Response to NIPSCO).

The Schahfer coal units are no longer competitive in the MISO energy market and have exhibited a long-term decline in generation over the last two decades. *See infra* sec. IV.C.3. Due to their lack of economic competitiveness, NIPSCO has planned and executed a decade-long process to replace these aging coal units with modern generation units.

ii. Culley Unit 2 Is an Electric Generating Unit in Indiana Built in 1966.

The F.B. Culley Generating Station is a coal-burning power plant located in Warrick County, Indiana, near Newburgh. It is owned and operated by CenterPoint Energy Indiana South (formerly Southern Indiana Gas & Electric Company) and sits on the north bank of the Ohio River. CenterPoint Energy Indiana South is the retail electric utility that serves southwest Indiana. Three coal-burning units were built at the Culley facility between 1955 and 1973: Units 1, 2, and 3. Unit 1 has retired.

2. The Owners of Schahfer and Culley 2 Are Investor-Owned Utilities Subject to Extensive Regulation.

i. R.M. Schahfer Generating Station Is Owned by Northern Indiana Public Service Company LLC.

NIPSCO has owned the Schahfer plant since it was built in the 1980s. NIPSCO is a subsidiary of NiSource Inc., a publicly traded corporation based in Indiana with subsidiary utilities in five other states. Ex. 78 at 15, 19, 23 (NiSource 2024 Annual Report). NIPSCO qualifies as a "public utility" under Indiana law, rendering it subject to extensive regulation of its operations by the Indiana Commission: *see, e.g.,* Ind. Code § 8-1-2-1(a), ch. 8-1-2, ch. 8-1-8.5. NIPSCO owns several generating plants in Indiana, including the Michigan City Unit 12 coal generating plant with a capacity of 455 megawatts, the Sugar Creek Generating Station combined-cycle gas plant with a capacity of 563 megawatts, and numerous wind and solar generating facilities around the state of Indiana (plus one solar facility in Kentucky). Ex. 100 at 7 (NIPSCO 2024 IRP). NIPSCO is also constructing a 400 MW gas combustion turbine facility at the site of Schahfer Units 17 and 18, as discussed below in section IV.C.4.i. NIPSCO is subject to the Indiana Commission's triennial integrated resource planning requirement and submitted its most-recent IRP to the Indiana Commission in December 2024. 170 IAC 4-7-2(a)(3)(C); Ex. 100 (NIPSCO 2024 IRP).

ii. Culley Unit 2 Is Owned by CenterPoint Energy Indiana South.

The F.B. Culley Generating Station is owned by CenterPoint Energy Indiana South (CenterPoint Indiana), which is a subsidiary of CenterPoint Energy, Inc., a publicly traded corporation based in Houston, Texas with subsidiary electric and gas utilities in four states including Indiana. Ex. 79 at 19-20 (CenterPoint 2024 Annual Report). Like NIPSCO, CenterPoint Indiana qualifies as a "public utility" under Indiana Code § 8-1-2-1, rendering it subject to the state's comprehensive utility regulatory scheme. CenterPoint Indiana owns or controls several generating assets in Indiana, including the two Culley coal units totaling 360 MW; gas turbines totaling 620 MW at A.B. Brown; and hundreds of megawatts worth of owned or contracted wind and solar generating assets. Ex. 80 at 13 (CenterPoint 2025 IRP Summary). Culley Unit 2 is the only CenterPoint Indiana coal unit that lacks post-combustion pollution controls for nitrogen oxides. Ex. 115 at 162-163 (Vectren[8] 2020 IRP). CenterPoint Indiana is also subject to the Indiana Commission's triennial integrated resource planning requirement and submitted its most-recent IRP to the

[8] CenterPoint Energy Indiana South was formerly known by the trade name Vectren South or Vectren.

Indiana Commission in December 2025. 170 IAC 4-7-2(a)(3)(C); Ex. 21 (CenterPoint Indiana 2025 IRP).

3. Schahfer and Culley 2 Are Old, Unreliable, Inflexible, Dirty, and Expensive.

i. Schahfer Exemplifies these Unwanted Attributes.

a. Schahfer Is Old and Unreliable.

Schahfer Units 17 and 18 are 43 and 40 years old, respectively, beyond the typical economic design life of 40 years for a coal unit, and approaching the end of the typical operational life of coal units (40 to 50 years). Ex. 4 at 7 (Powers January Decl.) (citing Ex. 63 (Palgrave Handbook) and Ex. 64 (IEA Report)). Both units have experienced long and recurrent outages in recent years that reflect aged, worn components that are expensive and may be difficult to repair or replace. *Id.* at 7–8; Ex. 132 at PDF p. 16 (NIPSCO Rate Case Discovery Responses) ("NIPSCO calculates that operating Schahfer Units 17 and 18 beyond 2025 would require more than $1 billion of additional investment through 2027."). In the tables below, and with further context in his declaration, PIOs' expert engineer Bill Powers identifies the duration and reasons for the units' longest outages in the past two years based on NIPSCO's filings with the Indiana Commission. Ex. 4 at 7–8 (Powers January Decl.). For reference, there are 8,760 hours in a year.

Longest 2025 Outages by Type

Unit	Outage Description	Total Duration (hours)
17	• Boiler tube leaks (5 outages)	1,044
18	• Boiler tube leak (1 outage) • Steam turbine bearing vibration / failure • High turbine bearing vibration	150 2,980 1,996

The numbers above are rounded to the nearest hour.

Longest 2024 Outages by Type

Unit	Outage Description	Total Duration (hours)
17	• Boiler tube leaks (2 outages)	1,645
18	• ESP problems (1 outage) • Boiler tube leaks (3 outages) • Pulverizer mill trip, extensive damage	147 159 614

The numbers above are rounded to the nearest hour.

Ex. 4 at 6 (Powers January Declaration) (citing NIPSCO public filings including Exs. 14-16 (Saffran Q1, Q2, Q3 2025 Outage Testimony)).

These outages demonstrate Schahfer's increasing inability to consistently perform even under normal conditions, let alone to meet an emergency. Both units have been unexpectedly unable to produce power during significant portions of recent years. This unexpected downtime is known as a "forced outage" with the "forced outage rate" being the percent of hours in which a unit was in forced outage. The Schahfer units experienced the following forced outage rates over the past two years, which were well above the national coal unit forced outage average rate of 12.0%.

Unit	Forced Outage Rate	
	2024	2025*
17	18.8%	15.9%
18	13.2%	78.2%

* *through September*

Ex. 4 at 5 (citing NIPSCO public filings including Exs. 14-16 (Saffran Q1, Q2, Q3 2025 Outage Testimony)). Mr. Powers, drawing on his experience of over 40 years in the fields of power plant operations and environmental engineering, opined that these high outage rates "reflect[] the impact of worn and difficult-to-repair or replace coal unit components on operational reliability" and "point to degraded Schahfer 17 and 18 reliability [that] will degrade further if the units are required to run for extended periods of time, are required to stop and start numerous times, or attempt to start up at an accelerated rate in response to extreme demand

conditions." Ex. 4 at 1, 6–7 (Powers January Decl.). Mr. Powers noted that the jump in the forced outage rate in 2025 was "likely exacerbated" by underspending on operating and maintenance ("O&M") and capital outlays as the Schahfer units reached their expected end of life. *Id.* at 8. He described how elements of the Schahfer units' air emissions control system—including electrostatic precipitators, the wet limestone scrubber, and ultra-low NO_x burners—need regular maintenance to stave off degradation. *Id.* at 19. He further opined, "It cannot be assumed that the Schahfer 17 and 18 pollution control equipment is in good working order and will operate reliably to control the facility's emissions beyond December 2025." *Id.*

b. Schahfer Is Inflexible.

In addition to its reliability problems outlined above, the Schahfer plant also takes significant time to start up from a cold condition, as shown in the following table:

Unit 17	Unit 18
23 hours	23 hours

Ex. 4 at 10 (Powers January Decl.) (citing Ex. 19, NIPSCO CPCN Discovery Responses). These startup times are very long, even for coal units. *See* Ex. 118 at PDF p. 3 (RMI Analysis of Coal Plants' Threats to Reliability) (stating that the average coal plant takes 12 hours to reach max capacity from a cold start); Ex. 55 at 26 (IEA Flexibility Report) (similar). Even if Schahfer could provide power reliably—and it cannot—the units' long start times mean the plant is ill-suited to provide peaking power during periods of high demand—precisely the periods the December Schahfer Order appears intended to address. A peak demand event may not become apparent to system operators at MISO until just a few hours before the actual peak. Ex. 4 at 10-11 (Powers January Declaration) (citing Ex. 85 (MISO Attributes Roadmap)). Moreover, bringing the Schahfer units from a cold start condition to full output to meet extreme demand would cost around $300,000 each time. *Id.* at 11 (citing Ex. 54 at 16 (NARUC Coal Report)). The alternative to incurring those costs would be the costly approach of running the units on a "Must Run" or "Self-Scheduled" basis. *Id.*

c. Schahfer Is Dirty.

Schahfer has been a significant source of pollution. Each year when operating, the plant emitted hundreds of thousands of pounds of air toxics, hundreds of thousands of pounds of particulate matter ("PM"), many millions of pounds of nitrogen oxides and sulfur dioxide, and billions of pounds of carbon dioxide. *See* U.S. Envtl. Prot. Agency ("EPA"), ECHO, https://echo.epa.gov/air-pollutant-

report?fid=110000493706 (last visited Jan. 6, 2026). In 2023, the plant discharged nearly 29 million pounds of pollution into nearby water bodies, including the Kankakee River, including 23,000 pounds of toxic metals. EPA, ECHO, https://echo.epa.gov/detailed-facility-report?fid=110000493706 (last visited Jan. 6, 2026). PIOs' expert engineer, Mr. Powers, calculated that if Schahfer 17 and 18 operated during the 90-day period of the December Schahfer Order with the same level of production they maintained in January-March 2025, more than 140,000 pounds of SO_2, 675,000 pounds of NO_x, 535,000 tons of CO_2, and 104,000 pounds of PM would be emitted. (As Mr. Powers notes, that analysis ignores that Unit 18 actually needs extensive repairs to become operable, as discussed *infra* in sec. V.B.2.) Ex. 4 at 14-15 (Powers January Decl.).

Emissions from Schahfer have serious health harms. EPA's Co-Benefits Risk Assessment ("COBRA") tool demonstrates that retiring Schahfer would reduce nationwide mortality by 9.4 to 16 deaths per year due to reductions in $PM_{2.5}$, SO_2, and NO_x emissions. Ex. 154 at PDF p. 5 (EPA COBRA Schahfer Retirement Analysis).[9]

Additionally, burning coal at Schahfer creates toxic coal ash. The plant already holds roughly 1 million cubic yards of coal ash in an on-site impoundment. Ex. 88 at 2 (Schahfer Waste Disposal Area Closure Plan). Groundwater monitoring at Schahfer's Waste Disposal Area has consistently, over several years, shown statistically significant levels of lithium, molybdenum, and arsenic at downgradient groundwater monitoring wells. Ex. 147 at 5-7 (Schahfer 2024 Groundwater Monitoring Report).

d. Schahfer Is Expensive.

Schahfer costs significantly more money to run than it can earn in the market. If Units 17 and 18 run at their average capacity factor from 2020 through 2025 (and ignoring for purposes of analysis the fact that Unit 18 is broken), they are expected to lose $9.8 million and $8.9 million, respectively, during the 90-day term of the Order. Ex. 5 at 6 (Synapse Report).

Schahfer has gotten even more expensive to run since 2021. In 2024, the cost of Schahfer's power rose to $80.93 per MWh, a 66% increase over the 2021 cost. Ex. 49

[9] PIOs obtained this analysis in the public COBRA portal by entering the annual Schahfer emissions of $PM_{2.5}$, SO_x, and NO_x, based on data from EPA's CAMPD database, as reductions from the Jasper County and Porter County (Indiana) "Fuel Combustion: Industrial" source.

at PDF p. 2 (2025 Energy Innovation Dataset). This means the cost of Schahfer's power grew significantly faster than inflation (roughly 16%) over the same period. Ex. 50 at 3 (2025 Energy Innovation Coal Cost Report); *see also* Ex. 51 at 12-13 (2023 Energy Innovation Coal Cost Report) (describing the same methodology used in the 2025 report).

ii. Culley Unit 2 Exemplifies These Unwanted Attributes.

a. Culley 2 Is Old and Unreliable.

Culley 2, at sixty years old, is at least ten years beyond the typical operational life of coal units. Ex. 4 at 9 (Powers January Declaration). CenterPoint Indiana has stated that Culley 2 has "run past its useful life" as the basis for its planned retirement in 2025. Ex. 80 at 30 (CenterPoint Indiana 2025 IRP Summary). In the table below, and with further context in his declaration, PIOs' expert engineer Bill Powers identifies how Culley 2's forced outage rate has steadily increased over the past half-decade, based on CenterPoint Indiana's filings with the Indiana Commission.

Culley 2 Forced Outage Rate, 2020-2024

Unit	2020	2021	2022	2023	2024
Culley 2	6.3%	21.9%	26.6%	24.8%	32.4%

Ex. 4 at 8 (Powers January Decl.) (citing Ex. 22, CenterPoint 2024 Performance Report). Mr. Powers states that this data "points to degraded Culley 2 reliability." Ex. 4 at 8-9 (Powers January Decl.). Mr. Powers further highlighted CenterPoint's public disclosure that its maintenance expenditure declined about 20% from 2022 to 2023 in account 512 (Maintenance of Boiler Plant). *Id.* at 9 (citing Ex. 152, CenterPoint Rate Case Discovery Responses). Mr. Powers noted that increased maintenance spending (missing recently at Culley 2) "is necessary to minimize the effect of equipment degradation with age and changing operating regimes." *Id.* at 9.

b. Culley 2 Is Inflexible.

To gauge the startup time of Culley 2, it is instructive to consider the startup time for another coal generating plant formerly within CenterPoint Indiana's portfolio. The A.B. Brown coal units required 18 to 24 hours for a cold start. Ex. 153 at 30 (Wayne Games 2018 Testimony). And Culley 2 is over a decade older than the two A.B. Brown units. *Id.* at 13. As noted above in section IV.C.3.i.b, the startup time of an average coal unit is 12 hours. A cold start time in this range renders Culley 2 unhelpful for responding in real time to emergency conditions. PIOs' expert Mr. Powers opined that like Schahfer, "Culley 2 would not be able to meet a

previously unanticipated exceptional MISO peak demand unless it was already online." Ex. 4 at 12 (Powers January Decl.). A cold start of Culley 2 would also cost approximately $37,000 each time; and the cost of running Culley 2 on "Must Run" or "Self Scheduled" commitment status to avoid cold starts solely to be prepared for a potential demand peak would be higher. *Id.* at 12.

c. Culley 2 Is Dirty.

Culley 2 has been a significant source of pollution. Each year when operating, the plant emitted tens of thousands of pounds of air toxics, hundreds of thousands of pounds of particulate matter, millions of pounds of nitrogen oxides and sulfur dioxide, and billions of pounds of carbon dioxide. *See* EPA, ECHO, https://echo.epa.gov/air-pollutant-report?fid=110000403723 (last visited Jan. 11, 2026). In 2023, the plant discharged approximately 92.5 million pounds of pollution into the Ohio River, including nearly 2,000 pounds of toxic metals. EPA, ECHO, https://echo.epa.gov/detailed-facility-report?fid=110000403723 (last visited Jan. 11, 2026). In 2024, under the National Emissions Standards for Hazardous Air Pollutants, EPA initiated an administrative penalty action against CenterPoint Indiana for alleged exceedance of Culley 2's 30-boiler-operating-day rolling average emissions limit for mercury. Allegedly, the exceedance began when Unit 3 experienced a catastrophic boiler feed pump turbine failure in June 2022 and remained out of service through mid-March 2023. CenterPoint Indiana agreed to a Consent Agreement and Final Order involving payment of an $81,500 civil penalty. EPA, ECHO, Civil Enforcement Case Report (Docket No. CAA-05-2024-0031), https://echo.epa.gov/enforcement-case-report?activity_id=3603947405.

PIOs' expert engineer, Mr. Powers, calculated that if Culley 2 operated during the 90-day period of the December Culley Order with the same level of production it maintained in January–March 2025, more than 113,000 pounds of SO_2, 160,000 pounds of NO_x, 60,000 tons of CO_2, and 153,000 pounds of PM would be emitted. Ex. 4 at 16–17 (Powers January Decl.). The COBRA tool demonstrates that retiring Culley 2 would reduce nationwide mortality by 2.5 to 3.9 deaths per year due to reductions in $PM_{2.5}$, SO_2, and NO_x emissions. Ex. 155 at PDF p. 5 (EPA COBRA Culley Retirement Analysis).[10]

[10] PIOs obtained this analysis in the public COBRA portal by entering the annual Culley 2 emissions of $PM_{2.5}$, SO_x, and NO_x, based on data from EPA's CAMPD database, as reductions from the Warrick County (Indiana) Fuel Combustion: Electric Utility source. Ex. 155 at 4 (Culley COBRA Analysis).

Additionally, burning coal at Culley 2 creates toxic coal ash. The plant already holds roughly 350,000 cubic yards of coal ash in the on-site East Ash Pond, which receives bottom ash sluice water and FGD wastewater from Unit 2. Ex. 98 at 2-2 (Culley East Ash Pond Closure Plan); Ex. 109 at 4-1–4-2 (Culley East Ash Pond Extension Demonstration). Groundwater monitoring data around Culley's East Ash Pond show that releases of the toxic pollutant molybdenum exceed federally set safety levels. Ex. 148 at 2, 4, 7 (Culley 2024 Groundwater Monitoring Report).

d. Culley 2 Is Expensive.

Culley 2 costs significantly more money to run than it can earn in the market. CenterPoint Indiana Vice President of Power Supply Wayne Games testified in 2018 that "[s]ince 2008, the [A.B.] Brown plants and Culley Unit 2 cycle more than any other Vectren South [CenterPoint Indiana] plant because they are not competitive in the MISO energy market." Ex. 153 at 14 (Wayne Games 2018 Testimony). He referred to Culley 2 (together with the A.B. Brown coal plant) as "among the most inefficient units within the State" and "the smallest and more expensive coal units in the MISO stack." *Id.* at 7, 8.

Moreover, if the unit runs at its average capacity factor from 2020 through 2025, the unit is expected to cost $1.8 million during the 90-day term of the December Culley Order. Ex. 5 at 6 (Synapse Report). Looking beyond the near term of the December Culley Order, Culley 2 would need extensive capital upgrades to run over a longer period. As CenterPoint Indiana's executive, Mr. Games, stated in 2018 as the company first explained its retirement plan for Culley 2:

> "[A] minimum of $70 million in additional capital investments are required to continue operating Culley Unit 2 through 2036. In part, this investment is driven because Culley Unit cannot solely rely on Culley Unit 3 for environmental compliance costs. A dry bottom ash system must be installed to comply with CCR and further investments may be required to comply with section 316b of the Clean Water Act (designed to protect fish and other aquatic wildlife at water intake and outfall structures) on the design and operation of the current river intake structure. In addition to these environmental costs, Culley Unit 2's distributed control system ('DCS') is a Honeywell system 1 installed in 2000 and must be updated or replaced because it is obsolete. A few other significant capital investments that would be required to keep Culley Unit 2 operating beyond 2023 include a turbine major overhaul, boiler acid clean, main transformer overhaul/replacement, major boiler component replacement, dry stack ductwork replacement, ID fan

> discharge ductwork, coal conveyor gallery replacement, boiler/high energy piping condition assessment, air heater basket replacement, continued overhaul of circulating water pumps and traveling water screens, and replacement of two 480-volt motor control center electrical switchgear."

Ex. 153 at 20-21 (Wayne Games 2018 Testimony). The referenced ash handling system was later approved for construction in 2022, with a capital cost equaling a portion of $19 million. Ex. 125 at 12 (IURC AB Brown CT Order).

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All of these harms could be avoided by retiring Culley 2 and Schahfer 17 and 18 as planned. As further discussed below, CenterPoint Indiana South and NIPSCO wanted to retire these Plants at the end of 2025. MISO approved the retirements, and the Indiana Commission approved utility actions contemplating both Schahfer and Culley 2 retirements.

4. Schahfer's Retirement Has Been Carefully Planned and Well Executed to Ensure Resource Adequacy.

NIPSCO has been diligently planning the retirement of Schahfer's coal units since at least 2018. In Indiana, IRPs are rigorous processes that involve sophisticated modeling and scrutiny by diverse stakeholders and regulators. *See* section IV.A.4, above. In its 2018 IRP, NIPSCO announced a preferred resource plan that included the retirement of all four Schahfer coal units by 2023. NIPSCO's short term action plan from the 2018 IRP focused on initiating the retirement process for all four of the Schahfer coal units and acquiring replacement resources to fill the energy and capacity gap resulting from the retirements. NIPSCO's 2018 IRP determined that the retirement of Schahfer coal units provided "significant cost savings versus the status quo and offer[ed] an acceptable outcome for portfolio flexibility and with regard to the impact on employees and the local economy." Ex. 71 at 156 (NIPSCO 2018 IRP).

In its 2021 IRP, published in November of that year, NIPSCO noted that Schahfer Units 14 and 15—the larger coal generating units at the site—had been retired earlier that year, and NIPSCO stated that "Units 17 and 18 are on track to retire by the end of 2023." Ex. 72 at 9 (NIPSCO 2021 IRP). NIPSCO again confirmed that retiring these coal units was economically advantageous. In the 2021 IRP, NIPSCO noted that it continued to make progress on over a dozen Indiana Commission-approved generation projects to replace the retired capacity at Schahfer. Ex. 72 at 9 (NIPSCO 2021 IRP).

In May 2022, NIPSCO announced plans to delay the retirement of Schahfer Units 17 and 18 until 2025 after several solar projects faced delays associated with a United States Department of Commerce anti-dumping investigation. Ex. 73 (NIPSCO May 2022 Investor Call).

NIPSCO's 2024 IRP confirmed that Schahfer Units 17 and 18 "remain on track to retire by the end of 2025." Ex. 100 at 6 (NIPSCO 2024 IRP). To replace the retiring capacity at Schahfer, NIPSCO noted that it continued to make progress on its fourteen Indiana Commission-approved renewable energy projects, including wind, solar, and solar plus battery storage resources, while also gaining regulatory approval for a natural gas peaking resource that will be located at the Schahfer property and use the interconnection rights associated with the retiring Units 17 and 18. Ex. 100 at 1, 6–7 (NIPSCO 2024 IRP); Ex. 20 at 10, 17, 41 (IURC Schahfer Gas Plant Order); Ex. 132 at PDF pp. 14–16 (NIPSCO Rate Case Discovery Responses).

In sum, the retirement of Schahfer Units 17 and 18 results from nearly a decade of planning. In each of these successive resource planning exercises, NIPSCO confirmed that its customers would benefit from the retirement of Schahfer coal units.

i. Schahfer's Retirement Was the Product of a Generation Replacement Strategy that Improves Resource Adequacy.

Over the last decade, NIPSCO has brought forward and the Indiana Commission has approved a suite of generation resources that replace the output of the Schahfer coal units. As NIPSCO is moving from reliance on large single-station generation to a fleet of modern, smaller, more nimble generating units, the replacement of Schahfer is expected to improve reliability and grid resilience. *See* Ex. 132 (NIPSCO Rate Case Discovery Responses).

Figure 1, excerpt from Ex. 100 at Summary p. 7 (NIPSCO 2024 IRP).

CURRENT & FUTURE NIPSCO GENERATION PORTFOLIO

Robust Renewable Investments in Indiana

NEW GENERATION FACILITIES*	INSTALLED CAPACITY (MW)	COUNTY	IN SERVICE
ROSEWATER WIND	102 MW	WHITE	2020 COMPLETE
JORDAN CREEK WIND	400 MW	BENTON & WARREN	2020 COMPLETE
INDIANA CROSSROADS WIND	302 MW	WHITE	2021 COMPLETE
DUNNS BRIDGE SOLAR I	265 MW	JASPER	2022 COMPLETE
INDIANA CROSSROADS SOLAR	200 MW	WHITE	2023 COMPLETE
INDIANA CROSSROADS II WIND	200 MW	WHITE	2023 COMPLETE
CAVALRY SOLAR	200 MW + 60 MW BATTERY	WHITE	2024 COMPLETE
GREEN RIVER SOLAR	200 MW	BRECKINRIDGE & MEADE (KY)	2025 CONSTRUCTION
DUNNS BRIDGE SOLAR II	435 MW + 75 MW BATTERY	JASPER	2025 CONSTRUCTION
GIBSON SOLAR	200 MW	GIBSON	2026 CONSTRUCTION
FAIRBANKS SOLAR	250 MW	SULLIVAN	2026 CONSTRUCTION
TEMPLETON WIND	200 MW	BENTON	2025 PRE-CONSTRUCTION
CARPENTER WIND	200 MW	JASPER	2025 PRE-CONSTRUCTION
APPLESEED SOLAR	200 MW	CASS	2025 PRE-CONSTRUCTION
GAS PEAKING RESOURCE	400 MW	JASPER	2027 PRE-CONSTRUCTION



In Cause No. 45947, the Indiana Commission approved ~400 MW of gas peaking capacity to be located at the Schahfer site. Ex. 20 (IURC Schahfer Gas Plant Order). NIPSCO relied on its planned retirement of Schahfer to demonstrate that the gas plant was displacing coal and eligible for construction-work-in-progress financing incentives under Indiana law. *Id.* at 21 ("Partial displacement of retiring coal-fired energy generation with a gas peaking resource has been a component of NIPSCO's IRP modeling and related CPCN regulatory filings since 2021. As such, we find the CT Project is being constructed to displace energy from an existing coal-fired generation facility and is therefore eligible for [construction-work-in-progress financing]."). The IDEM-issued air permit for these new peaking units provides that NIPSCO must retire Schahfer Units 17 and 18 before the combustion turbines begin to operate. Ex. 101 at 34 (Schahfer Title V Permit Modification) ("Upon the commencement of operation of the natural gas-fired simple cycle combustion turbines, identified as 19A, 19B, 19C, and Unit 20, the two (2) dry bottom pulverized coal-fired boilers, identified as Unit 17 and Unit 18, shall be permanently shutdown and subsequently decommissioned from the source.").

Collectively, these projects improve reliability. These projects will allow NIPSCO to continue to meet its resource adequacy requirements. *See* section IV.A.4. The battery and peaking gas units are capable of responding to disturbance on the grid and to changing generation needs much more quickly than the coal units. Ex. 132 (NIPSCO Rate Case Discovery Responses).

ii. MISO and the Indiana Commission Continue to Take Actions in Reliance on Schahfer's Retirement.

For MISO asset owners like NIPSCO, no generating unit is permitted to retire without first being approved by MISO for retirement through a process that assures transmission system stability and resource adequacy. In January 2023, NIPSCO requested that MISO approve a retirement date of December 31, 2025, for Schahfer Units 17 and 18. In February 2023, MISO approved the retirement of Schahfer Units 17 and 18, finding no impact on reliability:

> "After being reviewed for power system reliability impacts as provided for under Section 38.2.7 of MISO's Open Access Transmission, Energy, and Operating Reserve Markets Tariff ('Tariff'), the suspension of Schahfer Units 17 and 18 would not result in violations of applicable reliability criteria. Therefore, Schahfer Units 17 and 18 may suspend without the need for the generators to be designated as System Support Resource ('SSR') units as defined in the Tariff."

Ex. 102 at PDF p. 12 (MISO Attachment Y Response to NIPSCO).

The Indiana Commission has also endorsed the retirement of Schahfer Units 17 and 18 in two distinct regulatory processes.

First, in 2019, 2023, and 2025 electric rate case final orders, the Indiana Commission approved depreciation rates and operations and maintenance spending for Schahfer that assumed NIPSCO's expected retirement dates. *See* Ex. 103 at 120 (NIPSCO 2019 Rate Order) (summarizing approved depreciation adjustment and noting NIPSCO's associated plan to retire Schahfer coal units); Ex. 104 at 13-14 (NIPSCO 2023 Rate Order) (approving demolition costs for Schahfer and adjusting depreciation recovery for Schahfer units); Ex. 106 at 23 (NIPSCO 2025 Rate Order) (describing approved settlement's reduction of O&M spending in revenue requirement for Schahfer Units 17 and 18 with their expected retirement in December 2025). While depreciation timelines and adjustments to O&M spending included in base rates do not legally require that a retirement occur on the projected retirement date, in each of these cases a broad coalition of stakeholders, including the Indiana Office of Utility Consumer Counselor (the statutory ratepayer representative), entered into a settlement agreement with NIPSCO that assumed the units would retire as projected by the utility, and agreed to adjust depreciation schedules and O&M spending accordingly. In each of these cases, the Indiana Commission approved the Schahfer depreciation schedule or O&M spending, while noting the utility's intention to retire the units.

Second, the Indiana Commission approved Certificates of Public Convenience and Necessity ("CPCNs") that NIPSCO received for new generation resources from

2018 through 2025, that were justified, in part, on a stated need to replace the Schahfer coal units. In approving these projects, the Indiana Commission explicitly noted that the generation was intended to replace Schahfer. The Indiana Commission order approving the 400 MW of gas peaking capacity for the Schahfer site, for example, found that "[Combustion Turbine] Project is designed to reliably cycle in response to the MISO market and will displace the retiring Schahfer coal units with more efficient and controllable load-following capacity." Ex. 20 at 28 (IURC Schahfer Gas Plant Order). Other CPCN orders approving NIPSCO's replacement generation include Indiana Commission Cause Nos. 45818, 45936, 45500, 46028, 45908, and 45887. In other words, the Commission has relied on and not objected to the plan for Schahfer retirements as it has approved NIPSCO's requests to build and charge customers for the cost of projects explicitly designed to replace the Schahfer units.

5. Culley 2's Retirement Has Been Carefully Planned and Well Executed, and Overseen by the Indiana Commission to Ensure Resource Adequacy.

CenterPoint Indiana has been planning the retirement of Culley 2—its "oldest, smallest (83 MW), and most inefficient coal generating unit"—for over a decade. Ex. 107 at 33 (Vectren 2014 IRP). In its 2014 IRP, CenterPoint Indiana found that retiring Culley 2 in 2020 would save customers money, but deferred making a decision due to load-growth and regulatory uncertainty. *Id.* at 25-26. The 2016 IRP confirmed that retiring Culley 2 in 2024 was part of the preferred plan for serving its customers. Ex. 108 at 44 (Vectren 2016 IRP). CenterPoint Indiana official Wayne Games informed the Indiana Commission two years later that:

> "Investing so heavily in a unit as old and inefficient as Culley Unit 2 is not economic. Vectren South's modeling bore this out. Due to the higher cost to operate, the unit has experienced less overall run time and much more unit cycling. Culley Unit 2 has reached the end of its useful life and should be retired rather than continuing to spend capital keeping the inefficient unit operating."

Ex. 153 at 21 (Wayne Games 2018 Testimony).

i. Culley 2's Retirement Was the Product of a Generation Replacement Strategy that Improves Resource Adequacy.

CenterPoint Indiana's initial plan to replace Culley 2 and the A.B. Brown coal plant with a combined-cycle gas facility at the A.B. Brown site was rejected by the Indiana Commission in 2019. *See* Ex. 114 (IURC 2019 CCGT Order). The Indiana Commission rejected this replacement gas facility because it found that the utility had failed to adequately consider alternatives, including the ability of renewables to

replace some of the retiring coal energy and capacity. *Id*. at 25-28. The Indiana Commission directed CenterPoint Indiana to reevaluate its plan to replace its retiring coal units.

In its 2020 IRP, CenterPoint Indiana announced its revised coal-replacement preferred plan, responding to the Indiana Commission's order in Cause No. 45052. Instead of replacement with a single combined cycle gas facility, the revised plan called for replacement of the majority of CenterPoint Indiana's coal fleet—including A.B. Brown and Culley 2—by the end of 2023 with 700-1,000 MWs of solar, 300 MWs of wind, energy efficiency, and two gas combustion turbines ("CTs") totaling 460 MW. Ex. 115 at 51 (Vectren 2020 IRP). CenterPoint Indiana found that the fast-ramping CTs, combined with the wind and solar resources, enabled the utility "to maintain constant electric supply during potentially extended periods of low output" from renewables. *Id.* at 34-35. CenterPoint Indiana found that the 2020 preferred plan would save its customers $320 million over the study period compared to continued operation of its existing coal generation. *Id.* at 35.

In its 2023 IRP, CenterPoint Indiana observed that the Indiana Commission's approval of five generation projects from its 2020 preferred plan "affirms the direction taken" in replacing its coal units. Ex. 116 at 36 (CenterPoint 2023 IRP). The 2023 IRP modeling again found that a preferred portfolio that included the retirement of Culley 2 in 2025 would save its customers money. *Id.* at 38, 56; *see also id*. at 57 (preferred portfolio "[s]aves customers nearly $80 million over the next 20 years when compared to continued operation of F.B. Culley with coal."). CenterPoint's 2025 IRP again found that retiring Culley 2 in 2025 was a part of the utility's preferred plan. Ex. 80 at 20 (CenterPoint Indiana 2025 IRP Summary).

ii. MISO Likely Approved Culley 2's Retirement, and the Indiana Commission has Approved Adjustments to the Culley Depreciation Schedule and Repeatedly Approved Generation Projects Specifically Designed to Allow Culley 2 to Retire.

CenterPoint Indiana submitted an Attachment Y notice to MISO, as required under MISO's FERC-approved tariff, seeking approval to retire Culley 2 at the end of 2025. Ex. 21 at 52 (CenterPoint Indiana 2025 IRP). While the MISO response to this Attachment Y filing has not been made public, CenterPoint noted that Culley 2 had operated "past its useful life" and remained on track for a 2025 retirement. *Id.* at 30.CenterPoint noted in a recent filing at FERC that "MISO reviewed the Company's suspension request for Culley Unit 2 and found no reliability criteria violations." Ex. 128 at 9 (CenterPoint Cost Allocation Complaint).

The Indiana Commission has supervised CenterPoint's resource planning and endorsed the retirement of Culley 2 in two categories of regulatory proceedings.

Since 2020, the Indiana Commission has approved a series of generating resources that were explicitly premised on replacing Culley 2 and other now-retired coal units. For example, in Cause No. 45564, in approving the construction of 460 MW of gas peaking capacity, the Indiana Commission observed that the "Preferred Portfolio identified through the 2019/2020 IRP called for the retirement or exit of energy provided by coal-burning units at the Brown and Culley generating stations." Ex. 125 at 16 (IURC AB Brown CT Order). The Indiana Commission further observed of this replacement plan:

> "The Preferred Portfolio mapped a shift from a generating fleet of predominantly coal-burning resources to one of intermittent renewable resources supported by gas generation to ensure reliability. One early step in implementing the Preferred Portfolio was the addition of solar generating resources approved by the Commission in Cause Nos. 45501 on October 27, 2021 and 45600 on May 4, 2022. A next step is the addition of the two new CTs requested in this Cause."

Id. at 16. Thus, in approving CPCNs for replacement resources, the "steps" in CenterPoint Indiana's replacement plan, the Indiana Commission approved CenterPoint Indiana's plan to retire and replace Culley 2.

Second, in Cause No. 45990, a CenterPoint Indiana electric rate case, the Indiana Commission approved an adjustment in test-year spending associated with the retirement of Culley 2. Ex. 126 at 58 (IURC 2025 CenterPoint Rate Order); *see also* Ex. 127 at 30 (Chrissy Behme Testimony) (rate schedules filing "reflects a pro forma adjustment decrease to test year expense associated with F.B. Culley Unit 2, which is forecasted to retire at the end of the test year."). In other words, the Indiana Commission has already approved a reduction in rate recovery associated with the Culley 2 retirement.

V. Request for Rehearing

The Orders are a manifestation of the Department's overarching policy to systematically misapply Section 202(c) of the Federal Power Act to preserve fossil-fueled power plants, including coal-fired plants, that otherwise would be retired. That policy aims to bolster the fossil energy industry, irrespective of need, expense, and harm. In its zeal to implement its policy through issuance of the Orders, (1) the Department has exceeded the authority Congress gave it, using its "emergency" powers in the absence of any imminent shortfall to impose federal control of basic generation and supply decisions; and (2) the Department has done so without reasoned decision-making and on the basis of purported "facts" that are not supported by any credible evidence. *See Allentown Mack Sales & Serv., Inc. v. Nat'l Labor Rel. Bd.*, 522 U.S. 359, 374 (1998) (explaining agency obligation to undertake

reasoned-decision-making); *Motor Vehicle Mfrs. Assn. of United States, Inc. v. State Farm Mut. Automobile Ins. Co.,* 429 U.S. 29, 43 (1983) *same); *Burlington Truck Lines, Inc. v. United States*, 371 U.S. 156, 168 (1962) ("The agency must make findings that support its decision, and those findings must be supported by substantial evidence."); *Butte Cnty. v. Hogen*, 613 F.3d 190, 194 (D.C. Cir. 2010) ("[A]n agency cannot ignore evidence contradicting its position."); *Michigan v. EPA*, 268 F.3d 1075, 1081 (D.C. Cir. 2001) (explaining that, absent statutory authorization, an agency's action is contrary to law). Numerous examples of the Department's unreasoned and unlawful decision-making are described throughout this section V. The only plausible explanation for these repeated legal errors is that the Department has prioritized implementing its policy over compliance with law.

Congress never conferred on the Department the broad authority over the country's mix of power generation resources that the Department seeks to wield under the pretense of responding to claimed "emergencies." To the contrary Congress explicitly reserved authority over resource adequacy and grid reliability to the states, FERC, and NERC. *See, e.g.*, 16 U.S.C. §§ 824(a)–(b), 824o; *Pac. Gas & Elec.*, 461 U. S. at 205. Both the agency's new policy and the Orders exceed the Department's authority and are therefore contrary to law.

Before tackling the Orders' legal faults and issues*, see infra* sections V.A through V.D, it is useful to understand the broader context of the Department's policy. The Department acknowledges that its Orders are based on a government-wide policy—dictated by Executive Order—of promoting fossil-based energy through the use of any emergency powers executive departments and agencies could try to invoke. The Orders rely upon the Energy Emergency EO, 90 Fed. Reg. 8,433, which directs the heads of all executive departments and agencies to use "emergency authorities" and "other lawful authorities" to facilitate the production, extraction, creation, and generation of coal and other fossil fuels.

The Orders also rely on another executive order, the Grid EO (Ex. 93). The Grid EO was issued at the same time as three other executive actions aimed at supporting the coal industry, and was announced at a White House political event focused on promoting coal. Ex. 94 (NY Times Coal Article). In essence, the Grid EO calls on the Department to assume the authority for resource adequacy and grid reliability decision-making that the Federal Power Act reserves to others, and to "systemize" the issuance of Section 202(c) orders for that improper purpose. *See* Ex. 93, 90 Fed. Reg. at 15,521–22 (Grid EO) (directing the Department to "streamline, systemize and expedite" the issuance of Section 202(c) orders; to develop a "uniform methodology" for assessing reserve margins and a protocol to retain generators the Secretary deems critical to system reliability; and to prevent

certain generators from leaving the bulk-power system or converting to a different fuel source).

The Department's words and actions following issuance of the Grid EO reveal its efforts to unlawfully arrogate to itself others' lawful authority through systematic misapplication of Section 202(c) to prop up coal-burning power plants. The Department's initial steps included issuing a Section 202(c) order to prevent the well-planned retirement of the J.H. Campbell Generating Plant in Michigan. *See* Ex. 150 (May Campbell Order). The Department's order was clear on one point—Campbell cannot be allowed to retire—but left vague and unclear almost everything else. *See, e.g.*, *Consumers Energy Co. v. Midcontinent Indep. Sys. Op., Inc.*, 192 FERC ¶ 61,158, at PP 39–40 (2025) (recognizing the variety of interpretations of the Campbell order and settling on "the most reasonable reading of the DOE Order's intended scope"). The Campbell order failed to make clear even where the grid supposedly needed energy from Campbell, selectively quoted sources without examining their context and core findings, and flouted Congress' explicit limitations on the Department's Section 202(c) powers. *See* Motion to Intervene and Request for Rehearing and Stay of Sierra Club et al. at *passim* (June 18, 2025), https://www.energy.gov/sites/default/files/2025-07/PIO%20Request%20for%20Rehearing%20of%20Order%20No.%20202-25-3.pdf.

After preventing Campbell's retirement, the Department has continued to implement its policy. In addition to the Orders on the NIPSCO and CenterPoint Indiana Plants, the Department has issued Section 202(c) orders to prevent fossil-burning plant retirements in Pennsylvania, Order Nos. 202-25-4, 202-25-8, & 202-25-10, in Indiana, Order Nos. 202-25-12 & 202-25-13, and in Colorado, Order No. 202-25-14.

Additionally, on July 7, 2025, the Department published the "methodology" required by the Grid EO, which the Department explained will "guide reliability interventions," including the use of Section 202(c) orders. Ex. 96 at vi (July Resource Adequacy Report); *see also* Ex. 97 at 3–4 (DOE July 7 Press Release) ("The methodology also informs the potential use of DOE's emergency authority under Section 202(c) of the Federal Power Act."). The report identifies no present or imminent emergency; at most, using deeply flawed methodology, it identifies a theoretical shortfall of generation in 2030.

Taken together, the Energy Emergency EO, Grid EO, July Resource Adequacy Report, and the Department's recent Section 202(c) orders reflect a policy to promote the long-term preservation of fossil-fueled electric generation, including coal-fired generation, by using the Department's emergency authority under Section 202(c). To the extent these actions left any room for doubt that the Department has

such a policy, Energy Secretary Wright's own words have removed it. In his statement to the press when the Centralia Order issued, Secretary Wright emphasized, "The Trump administration will continue taking action to keep America's coal plants running." Ex. 133 (Department Press Release on Centralia Order); *see also* Ex. 149 at *passim* (New York Times Article on Trump's Coal Plant Policy); Ex. 76 (Secretary Wright's West Virginia Remarks) (reporting Secretary Wright's stated intention to stop the closure of coal plants and claiming authority to do so).

The Department has further reinforced this policy by applying it in the Orders.

A. The Orders Address Circumstances Beyond the Lawful Scope of an Emergency Under Section 202(c), and Fail to Provide Evidence or Reasoned Decision-Making Substantiating the Existence of an Emergency that Can Come Within Section 202(c).

1. Legal Framework: Section 202(c) Empowers the Department to Respond Only to Imminent, Certain, and Unexpected Shortfalls in Electricity Supply.

The Orders invoke Section 202(c) of the Federal Power Act, which provides:

> "During the continuance of any war in which the United States is engaged, or whenever the Commission determines that an emergency exists by reason of a sudden increase in the demand for electric energy, or a shortage of electric energy or of facilities for the generation of transmission of electric energy . . . the Commission shall have authority . . . with or without notice, hearing, or report, to require by order such temporary connections of facilities and such generation, deliver, interchange, or transmission of electric energy as in its judgment will best meet the emergency and serve the public interest."

16 U.S.C. § 824a(c)(1). That authority was transferred to the Department by the Department of Energy Organization Act. *See* 42 U.S.C. § 7151(b).

Section 202(c)'s text and context establish that an "emergency" enabling the Department to over-ride state and private decision-making must be an event that is imminent, certain, and unexpected. 16 U.S.C. § 824a(c). The constrained scope of Section 202(c)'s emergency authority is confirmed by the broader statutory context—in particular, the separate regime delineating federal authority over bulk-system reliability in Section 215 of the Federal Power Act, *id.* § 824o—as well the Department's regulations, caselaw applying Section 202(c), and the Department's consistent past practice.

i. The Text and Context of Section 202(c) Confine an Emergency to Imminent, Certain, and Unexpected Events

Section 202(c)'s text empowers the Department to require generation only in an "emergency." *Id.* § 824a(c). Both the ordinary meaning of the term (which the statute does not expressly define) and statutory context limit the Department's emergency authority to imminent, unexpected, and certain events. At the time Congress enacted Section 202(c), Webster's New International Dictionary of the English Language (1930) defined "emergency" as, with emphasis added here, a "*sudden* or *unexpected* appearance or occurrence… An *unforeseen* occurrence or combination of circumstances which calls for *immediate* action or remedy; *pressing* necessity; exigency." Contemporary dictionaries similarly define "emergency" as demanding imminence: an emergency is "an *unforeseen* combination of circumstances or the resulting state that calls for *immediate* action." Merriam Webster's Dictionary 407 (11th ed. 2009) (emphasis added); *see* 3 Oxford English Dictionary 119 (1st ed. 1913) (defining emergency similarly as "a state of things *unexpectedly* arising, and urgently demanding *immediate* action" (emphasis added)); *see also* Benjamin Rolsma, *The New Reliability Override*, 57 Conn. L. Rev. 789, 812 n.147 (2025) (noting that dictionaries have given the term "emergency" the "same meaning for many years").

The remainder of Section 202(c) underscores the exigency inherent in the governing term "emergency." The authority granted by Section 202(c) is, in the first instance, a war-time power. 16 U.S.C. § 824a(c) (beginning with "[d]uring the continuance of any war in which the United States is engaged"); *see Jarecki v. G.D. Searle & Co.*, 367 U.S. 303, 307 (1961) (noting that statutory terms should be interpreted in the context of nearby parallel terms "in order to avoid the giving of unintended breadth to the Acts of Congress"). An "emergency" under the statute is limited to circumstances of similar urgency: "a *sudden* increase in the demand for electric energy," for example. 16 U.S.C. § 824a(c) (emphasis added); *see Richmond Power & Light v. FERC*, 574 F.2d 610, 615 (D.C. Cir. 1978) (holding that Section 202(c) "speaks of 'temporary' emergencies, epitomized by wartime disturbances"); S. Rep. No. 74-621, at 49 (1935) (explaining that Section 202(c) provides "temporary power designed to avoid a repetition of the conditions during the last war, when a serious power shortage arose").

The text's use of the present tense accentuates its focus on imminent and certain shortfalls: It empowers the Department to act only where "an emergency *exists*." 16 U.S.C. § 824a(c) (emphasis added). The Section's title and text both emphasize that it provides a "temporary" authority, further emphasizing that its emphasis on immediate—not distant—needs. *Id.* § 824a(c), (c)(1); *see Dubin v. United States*, 599 U.S. 110, 120–21 (2023) (cleaned up) ("The title of a statute and the heading of a

section are tools available" to resolve "the meaning of a statute," and "a title is especially valuable where it reinforces what the text's nouns and verbs independently suggest."). That near-term focus precludes use of Section 202(c) to pursue broader or long-term energy-policy goals, such as a "fear of overdependence" on foreign oil supplies, *Richmond Power & Light*, 574 F.2d at 617, or "energy independence," Ex. 96 at 1 (July Resource Adequacy Report); *see also Richmond Power & Light*, 574 F.2d at 614 (Section 202(c) "speaks of 'temporary' emergencies, epitomized by wartime disturbances, and is aimed at situations in which demand for electricity exceeds supply and not those in which supply is adequate but a means of fueling its production is in disfavor.").

Section 202's overall structure further highlights Section 202(c)'s emphasis on imminent, near-term concerns. The preceding subsections (202(a) and (b)) together define and limit the tools by which the federal government may pursue "abundant" energy supplies in the normal course. 16 U.S.C. § 824a(a) (seeking "abundant supply of electric energy" by directing the federal government to "divide the country into regional districts for the voluntary interconnection and coordination of facilities for the generation, transmission, and sale of electric energy"); *id.* § 824a(b) (allowing federal government to order "physical connection . . . to sell energy to or exchange energy" upon application, and after an opportunity for hearing). The resulting statutory "machinery for the promotion of the coordination of electric facilities" comprises the following: in subsection (a), an instruction to establish a general framework meant to facilitate "coordination by voluntary action;" in subsection (b), "limited authority to compel interstate utilities to connect their lines and sell or exchange energy," subject to defined procedural and substantive requirements, when "interconnection cannot be secured by voluntary action;" and in subsection (c), "much broader" but "temporary" authority "to compel the connection of facilities and the generation, delivery, or interchange of energy during times of war or other emergency." S. Rep. No. 74-651 at 49 (1935).

That tiered structure—placing primary emphasis on voluntary resource adequacy planning, 16 U.S.C. § 824a(a), specifying limited authority where that voluntary system fails, *id.* § 824a(b), and allowing for "temporary" central command-and-control only in case of an "emergency," *id.* § 824a(c)—requires that Section 202(c) remain narrowly confined to instances of an immediate and unavoidable "break-down in electric supply," S. Rep. No. 74-651 at 49 (1935), rather than a mere desire for more abundant supply in the future, *cf.* Ex. 1 at 4 (December Schahfer Order); Ex. 2 at 5 (December Culley Order) (emphasis added) (pointing to conditions that "will continue in the near term" and "are also *likely* to continue in *subsequent years*" that "*could* lead to the loss of power . . . in the areas that *may* be affected by curtailments or power outages, presenting a *risk* to public health and safety"). The tiered structure authorizes increasingly intrusive federal intervention,

but under increasingly narrow circumstances. Interpreting Section 202(c)'s "emergency" powers to permit the Department to compel generation based on nothing more than the generalized challenges of operating a reliable bulk electric system in a rapidly transforming energy landscape, or concerns over longer term resource adequacy, *see* Ex. 1 at 2 (December Schahfer Order), Ex. 2 at 1, 2 (December Culley Order), would unwind the careful balance of voluntary, market-driven action and federal power set out in Sections 202(a) and 202(b). Such an interpretation cannot be squared with the statutory text and structure. *See Otter Tail Power Co. v. Fed. Power Comm'n*, 429 F.2d 232, 233–34 (8th Cir. 1970) (holding that Section 202(c) "enables the Commission to react to a war or national disaster," while Section 202(b) "applies to a crisis which is likely to develop in the foreseeable future").

ii. Congress' Enactment of a Specific, Cabined Scheme to Address Reliability Concerns Confirms That Generalized or Long-Term Bulk-Power System Reliability Concerns Are Not an "Emergency" Under Section 202(c).

That the Department's Section 202(c) emergency powers do not extend to general supervision of bulk-power-system reliability is confirmed by Section 215 of the Federal Power Act—which specifically and directly delineates the scope of federal authority to enforce mandatory reliability requirements for the bulk-power system. 16 U.S.C. § 824o. Congress added Section 215 to the Federal Power Act in 2005 precisely because the Act as it then existed—including Section 202—did not give the federal government with the power to enforce measures designed to ensure bulk-system reliability. *See Rules Concerning Certification of the Elec. Reliab. Org.; and Procedures for the Establishment, Approval, and Enforcement of Elec. Reliab. Standards*, 70 Fed. Reg. 53,117, 53,118 (Sept. 7, 2005) ("In 2001, President Bush proposed making electric Reliability Standards mandatory and enforceable," leading to enactment of Section 215 in 2005); Ex. 139 at 7-6 (*Report of the Nat'l Energy Pol'y Dev. Grp.*) (noting that "[r]egional shortages of generating capacity and transmission constraints combine to reduce the overall reliability of electric supply in the country" and that "one factor limiting reliability is the lack of enforceable reliability standards" because "the reliability of the U.S. transmission grid has depended entirely on *voluntary* compliance," and then recommending "legislation providing for enforcement" of reliability standards (emphasis added)); S. Rep. No. 109-78 at 48 (2005) (stating that Section 215 "changes our current voluntary rules system" for bulk-system reliability "to a mandatory rules system"); *see also Alcoa, Inc. v. FERC*, 564 F.3d 1342, 1344 (D.C. Cir. 2009) (noting that prior to the Energy Policy Act of 2005, "the reliability of the nation's bulk-power system depended on participants' voluntary compliance with industry standards").

By enacting Section 215, Congress provided a comprehensive and carefully circumscribed scheme to empower the federal government to enforce bulk-system reliability requirements. That statutory scheme strikes a careful balance between state and federal authority, and between private, market-driven decisions and top-down control. Reliability standards are devised by NERC independent "of the users and owners and operators of the bulk-power system" but with "fair stakeholder representation." 16 U.S.C. § 824o(c)–(d); *see also id.* § 824o(a)(3) (defining reliability standards as "a requirement . . . to provide for reliable operation of the bulk-power system"). FERC may approve or remand those standards (but not replace them with its own) and is required to "give due weight" to NERC's "technical expertise" while independently assessing effects on "competition." *Id.* § 824o(d)(2)–(4). Section 215 provides specified enforcement mechanisms and procedures for reliability standards—which mechanisms conspicuously exclude the power to command specific generation resources to remain operational. *Id.* § 824o(e). And Section 215 carefully preserves state authority over "the construction of additional generation" and in-state resource adequacy, establishing regional advisory boards to ensure appropriate state input on the administration of reliability standards. *Id.* § 824o(i)–(j).

Interpreting Section 202(c) to permit the Department to mandate generation based on its own unfettered assessment of bulk-system reliability needs would effectively allow the Department to bypass Section 215's procedural safeguards, constraints on federal authority, and protection of state power. Such a bypass would impermissibly "contradict Congress' clear intent as expressed in its more recent," reliability-specific legislation, enacted "with the clear understanding" that the Department had "no authority" to address long-term reliability through Section 202(c). *See FDA v. Brown & Williamson Tobacco Corp.*, 529 U.S. 120, 142 & 149 (2000); s*ee also Cal. Indep. Sys. Operator Corp. v. FERC*, 372 F.3d 395, 401–02 (D.C. Cir. 2004) ("Congress's specific and limited enumeration of [agency] power" over a particular matter in one Section of the Federal Power Act "is strong evidence that [a separate Section] confers no such authority on [agency]."). Congress has, in Section 215, directly established the mechanisms (and limitations) by which the federal government may compel action to ensure the reliability of bulk-power electric system. In so doing, it has confirmed that the Department may not, through Section 202(c) "emergency" orders, use those reliability concerns to mandate the generation it views as required to address broad "resource adequacy problems," Ex. 1 at 2 (December Schahfer Order); Ex. 2 at 2 (December Culley Order); its emergency authority is confined to specific and imminent supply shortfalls requiring immediate response.

iii. The Department's Regulations Similarly Establish that Section 202(c) Emergency Authority Can Only Be Invoked to Address Imminent, Certain Supply Shortfalls Requiring Immediate Response.

The Department's regulations demonstrate its own long-standing understanding that Section 202(c)'s emergency authority is confined to imminent, certain, and otherwise unavoidable resource shortages, and does not provide a mechanism to address broad, long-term concerns as to the reliability of the bulk-power system. The regulations recognize that an emergency under Section 202(c) requires, first, "a *specific* inadequate power supply situation." 10 C.F.R. § 205.371 (emphasis added). The Department's non-specific dissatisfaction with regional power planning does not, consequently, empower the Department to override that planning by emergency order. The need for both specificity and certainty is repeated in the Department's regulations defining an inadequate energy supply: "A system may be considered to have" inadequate supply when "the projected energy deficiency . . . *will* cause the applicant [for a 202(c) Order] to be unable to meet its normal peak load requirements based upon use of all of its otherwise available resources so that it *is* unable to supply adequate electric service to its customers." 10 C.F.R. § 205.375 (emphasis added). The same provision suggests that an emergency will generally exist only when "the projected energy deficiency . . . without emergency action by the [Department], will equal or exceed 10 percent of the applicant's then normal daily net energy for load." *Id.*

The regulations further recognize that Section 202(c) does not provide a means of planning against months-off expectations or risks. They define an emergency as "an *unexpected* inadequate supply of electric energy which may result from the *unexpected* outage or breakdown" of generating, transmission, or distribution facilities—not a tool to ensure future energy abundance, or override state and private planning that the Department deems inadequate. 10 C.F.R. § 205.371 (emphasis added). Emergencies are characterized by shortages produced by "weather conditions, acts of God, or unforeseen occurrences not reasonably within the power of the affected 'entity' to prevent." *Id.* Where the culprit is increased demand, it must be "a *sudden* increase in customer demand," *id.* (emphasis added), rather than demand projections producing non-immediate reliability concerns.

And while the regulations suggest that "inadequate planning or the failure to construct necessary facilities can result in an emergency," they recognize that the Department may not utilize a "continuing emergency order" to mandate long-term system planning. *Id.* The regulations also recognize that "where a shortage of electricity is projected due solely to the failure of parties to agree to terms, conditions, or other economic factors" there is no emergency "unless the inability to supply electric service is *imminent*." *Id.* (emphasis added). An emergency may exist

where past planning failures produce an immediate, present-tense shortfall (that is where, a shortfall *results* from insufficient planning); the Department has no authority to commandeer bulk-system reliability planning merely because it deems current plans inadequate. *See* 10 C.F.R. § 205.375 (requiring present inability to meet demand to demonstrate inadequate energy supply). As the Department stated when it promulgated those regulations, the statute allows the Department to provide "assistance [to a utility] during a period of unexpected inadequate supply of electricity," but does not empower it to "solve long-term problems." *Emergency Interconnection of Elec. Facilities and the Transfer of Elec. to Alleviate an Emergency Shortage of Elec. Power,* 46 Fed. Reg. 39,984, 39,985–86 (Aug. 6, 1981).

iv. Courts Have Uniformly Held that Section 202(c) Can Be Invoked Only in Immediate Crises.

Caselaw applying Section 202(c) further supports the narrow circumstances under which it permits the Department to seize command of the power system. *Richmond Power and Light* arose out of the 1973 oil embargo. The Federal Power Commission responded to the embargo by calling for voluntary transfer of electricity from non-oil power plants to areas of the country that relied heavily on oil, such as New England. 574 F.2d at 613. The New England Power Pool was not convinced that the voluntary program would work and petitioned the Commission for a 202(c) order. *Id*. Rather than issue such an order, the Commission facilitated an agreement between state commissions and supplying utilities, which satisfied the New England Power Pool, leading it to withdraw its petition. *Id*. A dissatisfied utility sought judicial review of the Commission's decision to allow the withdrawal of the Section 202(c) petition. *Id*. at 614.

The court easily upheld the Commission's decision not to invoke Section 202(c). *Id*. Though the oil embargo had ended, the utility argued that the "high cost and uncertain supply of imported oil" justified an emergency order. *Id*. The Commission countered that the voluntary program had worked, the New England Power Pool never interrupted service, and there was no need for a Section 202(c) order. *Id*. at 615. The D.C. Circuit agreed. *Id.* The utility alternatively argued that "dependence on imported oil leaves this country with a *continuing* emergency." *Id*. (emphasis added). The court observed that Section 202(c) "speaks of 'temporary' emergencies, epitomized by wartime disturbances." *Id*. Interpreting this statutory language, the court upheld the Commission's view that Section 202(c) cannot be used when "supply is adequate but a means of fueling its production is in disfavor." *Id*.

Richmond Power & Light thus teaches that Section 202(c) is not an appropriate means to implement long-term national policy to switch fuels. The provision allows only a temporary fix for a temporary problem.

The Eighth Circuit has similarly held that Section 202(c) can only be used to respond to immediate crises. In *Otter Tail Power*, a utility insisted that the only way for the Federal Power Commission to properly order the utility to connect to a municipal power provider was to issue a Section 202(c) order. 429 F.2d at 234. Demand for electricity in the city had increased, and the peak load of the municipal power provider was getting to be so high that both of its two generators would likely need to be used simultaneously in the near future, "causing a possible loss of service should one malfunction during a peak period." *Id.* at 233–34. To avoid this possible loss of service, the Federal Power Commission issued a Section 202(b) order, requiring the utility to connect to the municipal power provider. *Id.* The utility argued that the Federal Power Commission used the wrong provision and should have used Section 202(c) instead. *See id.*

The court explained that Section 202(c) "enables the Commission to react to a war or national disaster" by ordering "immediate" interconnection during an "emergency." *Id.* at 234. For non-emergency situations, "[o]n the other hand, Section 202(b) applies," including when there is a "crisis which is likely to develop in the foreseeable future but which does not necessitate immediate action on the part of the Commission." *Id.* The court upheld the Commission's use of Section 202(b) instead of Section 202(c) because there was no immediate emergency. *See id.* The case law uniformly supports the interpretation that Section 202(c) can only be used in acute, short-term, urgent emergencies.

v. The Department's Prior Orders Recognize that Section 202(c) Does Not Confer Plenary Authority Over Bulk-System Resource Adequacy.

The Department's consistent application of Section 202(c) prior to 2025 further corroborates the urgency of the emergency conditions that are the necessary predicate for any Department intervention under Section 202(c). *See Fed. Trade Comm'n v. Bunte Bros., Inc.*, 312 U.S. 349, 352 (1941) ("[J]ust as established practice may shed light on the extent of power conveyed by general statutory language, so the want of assertion of power by those who presumably would be alert to exercise it is equally significant in determining whether such power was actually conferred."). Since obtaining authority under Section 202(c) in the 1970s and prior to 2025, the Department has consistently used Section 202(c) to address specific, imminent, and unexpected shortages—not to address longer-term reliability concerns or demand forecasts. *See, e.g.*, Ex. 9 at 1 (DOE Order No. 202-22-4) (responding to ongoing severe winter storm producing immediate and "unusually high peak load" between Christmas Eve and Boxing Day); Ex. 17 at 1–2 (DOE Order No. 202-20-2) (responding to shortages produced by ongoing extreme heat and wildfires); Ex. 105 at 1 (DOE Order No. 202-08-1) (ordering temporary connection of facilities in response to "massive devastation caused by Hurricane

Ike," leaving "large portions" of Texas "without electricity"); *see also* Rolsma, 57 Conn. L. Rev. at 803–04 (describing "sparing[]" use of Section 202(c) outside of wartime shortages during the twentieth century).[11] Public Interest Organizations are not aware of any instance in which, before 2025, the Department utilized Section 202(c) to mandate generation the Department viewed as necessary to ensure long-term resource sufficiency, or in response to generalized regional risks that had not produced any particular, defined generation shortfall, and for good reason: Any such use would exceed the Department's statutory authority.

2. The Orders' Primary Focus is Long-Term Bulk-System Reliability, Which Is Not a Basis to Mandate Generation Under Section 202(c).

The Orders primarily rely upon assertions of long-term bulk-system reliability concerns. *See* Ex. 1 at 1–4 (December Schahfer Order); Ex. 2 at 1–4 (December Culley Order). Those concerns—even if fully substantiated—would not be a basis to mandate Culley's and Schahfer's continued operation. And they are not substantiated. MISO, the Indiana Commission, NIPSCO and CenterPoint Indiana have taken and are continuing to take steps to address longer-term concerns to ensure no resource shortfall arises.

i. Even Assuming Arguendo *Evidentiary Support, the Department's 2027-Onwards Concerns Are Not an "Emergency" Within the Meaning of 202(c).*

The Orders claim "a potential longer term resource adequacy emergency in MISO," acknowledging a "capacity surplus for the summer of 2026," but citing projections of possible "insufficient capacity to meet the peak demand for electricity in each of the following four summers"—that is, arising no earlier than the Summer of 2027. Ex. 1 at 3 (December Schahfer Order); Ex. 2 at 3 (December Culley Order) (also noting "surplus of generation capacity" in the Winter of 2026, "followed by increasing deficits the following four years."). Even if the Orders' claimed emergency conditions were established (they are not), reliability concerns arising

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[11] The Department has also narrowly tailored the remedies in Section 202(c) orders to ensure that the orders only address the stated emergency, to limit the order to the minimum period necessary, and to mitigate violations of environmental requirements and impacts to the environment. *See, e.g.*, Ex. 9 at 4–7 (DOE Order No. 202-22-4) (limiting order to the 3 days of peak load, directing PJM to exhaust all available resources beforehand, requiring detailed environmental reporting, notice to affected communities, and calculation of net revenue associated with actions violating environmental laws); Ex. 17 at 3–4 (DOE Order No. 202-20-2) (limiting order to the 7 days of peak load, directing CAISO to exhaust all available resources beforehand, requiring detailed environmental reporting).

beyond "the near term . . . in subsequent years," Ex. 1 at 4 (December Schahfer Order); Ex. 2 at 5 (December Culley Order), do not qualify as an emergency under Section 202(c). Such concerns are neither imminent nor unexpected. The Department's stated concerns cannot plausibly be characterized as a "*sudden* increase in the demand for electric energy" or a "shortage" in electric energy, generation, or transmission" constituting an emergency. 16 U.S.C. § 824a(c)(1).

At most the Orders describe long-term trends that may affect the reliability of the bulk power system in the future if left unaddressed. The Orders' longer-term concerns are based on projections of demand increases, changes in the mix of power supply resources, challenges in resource development, and the Administration's view of foreign actors. *See* Ex. 1 at 1–4 (December Schahfer Order); Ex. 2 at 1–4 (December Culley Order).

While many of the Orders' stated concerns are the province of state, regional, and private entities, Congress has provided certain mechanisms for the federal government to address the reliability concerns raised in the Orders. The emergency provision in Section 202(c), along with the Department's claimed power to seize command-and-control authority over generating resources like Schahfer and Culley 2, are not among those mechanisms.

The congressionally provided mechanisms to the federal government include Section 202(a), which allows the federal government to pursue "an abundant supply of electric energy" but only by facilitating "*voluntary* interconnection and coordination of facilities for the generation, transmission, and sale of electric energy" 16 U.S.C. § 824a(a) (emphasis added). Additionally, under certain circumstances, Section 202(b) allows the federal government to require utilities to sell or exchange energy with other facilities, but only upon application and with "no authority to compel the enlargement of generating facilities for such purposes." *Id.* § 824a(b).

Another mechanism, Section 215, provides for mandatory, nationwide reliability standards developed and enforced by a federally certified but independent entity. 16 U.S.C. § 824o(d), (e). "These standards," the Department explains, "ensure that all owners, operators, and users of the bulk-power system have an obligation to maintain system security and reliability." Ex. 52 at 7 (Department Export Authorization EA-365-C (Oct. 21, 2025)). The standards cannot be enforced by ordering generation facilities to operate, and Section 215 specifically disallows requiring the "construction of additional generation" or "enforc[ing] compliance" with "adequacy" standards. 16 U.S.C. § 824o(e), (i)(2).

The Orders purport to mandate generation based upon the Department's assessment of the bulk-power system's long-term reliability needs, a power

Congress chose not to provide *any* federal agency. *See* 16 U.S.C. § 824o(e) (specifying enforcement mechanisms for federal reliability standards). And what authority Congress has authorized to implement mandatory reliability standards, it provided to FERC—not the Department. *Alcoa,* 564 F.3d at 1344. Reliability concerns in future years simply do not constitute an emergency within the meaning of Section 202(c).

Section 202(c) provides an explicitly "temporary" authority, 16 U.S.C. § 824(a)(c), preventing any interpretation of its terms that might encompass a potential longer term resource adequacy emergency. The expansive interpretation of Section 202(c) implicit in the Order, stretching the meaning of "emergency" to cover resource planning concerns over "years" subsequent to the near term, is further precluded by the Federal Power Act's express background principles of permitting "Federal regulation" only of "matters which are not subject to regulation by the States," and disavowing "jurisdiction, except as specifically provided" over "facilities used for the generation of electric energy." 16 U.S.C. § 824(a), (b)(1); *see Duke Power Co. v. Fed. Power Com.,* 401 F.2d 930, 938 (D.C. Cir. 1968) (explaining that the Federal Power Act's policy declarations are "relevant and entitled to respect as a guide in resolving any ambiguity or indefiniteness in the specific provisions which purport to carry out its intent"). The Department knows that "resource adequacy planning and capacity requirements . . . have traditionally been the domain of state regulatory commissions, NERC-certified Regional Entities, and RTOs/ISOs," *i.e.*, not the Department. Ex. 52 at 5 n.4 (Department Export Authorization EA-365-C (Oct. 21, 2025)).

Through the Order, the Department expressly seeks to override the decisions of state, regional, and utility planners pursuant to the procedures established by Congress to ensure abundant electricity supplies and the reliability of the bulk-electric system. 16 U.S.C. §§ 824a(a)–(b), 824o. Section 202(c) does not permit that effort to transform the statutory scheme from one driven primarily by market- and state-based decision-making to one consolidating centralized federal command-and-control in the Department. And it especially does not permit that transformation in service of the Department's desire to dictate "how much coal-based generation there should be over the coming decades"—a power that the Supreme Court has found Congress "highly unlikely" to have left to agency discretion. *West Virginia v. EPA*, 597 U.S. 697, 729 (2022).

ii. The Order Does Not Demonstrate Any Long-Term Resource Adequacy Concerns that Are Not Already Being Addressed Through the Appropriate Processes Under the Federal-State Balance of Responsibilities.

In addition to being an invalid basis for Department action under Section 202(c), the Orders' discussion of long-term concerns is unreasoned and without substantial evidence, including because the Orders both overestimate the potential of a shortfall and underestimate the ability of existing processes to address any projected shortfall. The following sections examine the several bases for the Department's claim of a long-term emergency; as they explain, none of those bases provide any actual evidence that Department intervention is necessary.

a. The Department Misinterprets the OMS-MISO Survey.

One of the Department's principal citations for its claim that MISO faces a long-term shortfall is the OMS-MISO Survey. Ex. 1 at 3 (December Schahfer Order); Ex. 2 at 3 (December Culley Order) (discussing Ex. 89 at 2, 7, 9 (2025 OMS-MISO Survey)). The Department's description of the OMS-MISO Survey is fundamentally flawed.

Broadly speaking, the purpose of the OMS-MISO Survey is to explore a wide range of potential outcomes based on current trends, to ensure that MISO is aware of the full spectrum of possibilities (including remote ones) for which it may need to secure adequate resources to ensure grid reliability. See *supra* section IV.B.3 (discussing the OMS-MISO Survey). In keeping with that purpose, the Survey applies assumptions to the bottom end of its forecasts that are extremely unlikely to reflect reality. This worst-case scenario contains extremely conservative assumptions about how much of the new generation that utilities have actively planned for is able to become operational. See Ex. 89 at 5–6 (2025 OMS-MISO Survey).

In attempting to create the illusion of a long-term emergency, the Department cites only to this bottom edge, studiously ignoring the rest of the range of outcomes that were considered. In short, the Department cherry-picks the data in the Survey that confirm the Department's own biases.

No example of the Department's selective interpretation of the evidence is more obvious than the Department glossing over the fact that the OMS-MISO Survey projects a near-certain surplus of resources through at least May 2027. *See* Ex. 1 at 3 (December Schahfer Order); Ex. 2 at 2–3 (December Culley Order). In other words, the Department's own citation provides no basis to think that Schahfer or Culley are needed for almost one and a half years. The Department attempts to undermine this projection by calling it "potential" and suggesting that "at least 3.1

GW of additional generation capacity" would need to be added." *Id*. But this phrasing is not consistent with the study, whose most conservative estimate concludes there will be a surplus in 2026; and the phrasing ignores the reality that new resources are built in MISO every year. 3.1 GW is fewer resources than came online per year over the past three years, and that was before utilities began accelerating new resource development in response to increasing load projections. *See* Ex. 89 at 6 (2025 OMS-MISO Survey). The Department's claim that MISO needs at least 3.1 GW of new generation is also factually incorrect because it ignores 1.4 GW of existing resources that are not currently committed to retire, but which were excluded from the Survey's projections because they were identified as having a "low certainty" of continued operation in 2026—if even one of those resources doesn't end up retiring, it would reduce the need for new resources below 3.1 GW. Ex. 89 at 5, 7 (2025 OMS-MISO Survey).

The Department's discussion of later-year projections is even more misleading. *See* Ex. 1 at 3 (December Schahfer Order); Ex. 2 at 3 (December Culley Order). The OMS-MISO Survey examines MISO's resource adequacy projections using two alternate assumptions for how quickly new resources can be built. The first assumption relies on a "historical" projection. The historical projection predicts 3.5 GW of new resources per year based on a three-year historical average, plus 1.2 GW of replacement resources per year based on historical levels. The Survey's "historical" projection also assumes that only half of utilities' planned upgrades to existing facilities will actually take place. *Id*.

The second assumption relies on an "emerging" projection "based on member submittals to the OMS-MISO Survey" (*i.e*., what utilities have told OMS-MISO they are actually planning to build). The emerging projection predicts 6.2 GW of new resources per year and 2.4 GW of replacements per year. Ex. 89 at 5–6 (2025 OMS-MISO Survey).

The Department cites exclusively to the "historical" projection, ignoring the "emerging" projection entirely—but this paints an excessively pessimistic picture of the future. The Survey's estimated 1.4 to 8.2 GW deficits from 2027/28 to 2030/31 in the historical projection are more than matched by its forecast 6.4 to 11.4 GW surpluses over the same period in its emerging projection. *Id*. at 7. And again, both of these projections ignore entirely the possibility that any of the 1.4 to 3.8 GW of "potentially unavailable resources" turns out to in fact still be available. The Department's decision to ignore the half of the OMS-MISO Survey that is inconsistent with its emergency declaration has no basis in the structure of the Survey: the two projections are explicitly presented as "bookend capacity forecasts." *Id*. at 6.

In ignoring the emerging projection, the Department unreasonably fails to take into account several key factors that support that projection. First, the historical 2022 to 2024 new capacity build rate is not likely to be reflective of future build because the scope of the need for new generation only became clear in the past year or two: indeed, MISO added almost 5 GW of new resources in 2024, which was about 50 percent more than the MISO region had ever built before. *Id*. Second, the historical projection underestimates future contributions of storage, because MISO currently only has roughly 164 MW of operational storage,6 meaning that the historical trend still does not account for the coming influx of battery storage resources. And third, the historical projection's assumption that only half of utilities' "replacement" and "surplus" projects will actually occur has no actual historical basis, because these are new categories of projects that MISO therefore has no historical data on. *Id*. at 5 (indicating that replacement and surplus projects were not considered for the 2024 Survey).

The Department has also ignored other information in the OMS-MISO Survey that indicates the possibility of even more new generation coming online than either of the two projections in the Survey anticipate. For instance, the survey indicates that 54 GW of projects have a signed generator interconnection agreement but are waiting to interconnect. *Id*. at 6. A review of historic trends is instructive here: ninety percent of projects with signed generator interconnection agreements ultimately get built. See Ex. 120 at 6 n.* (2024 OMS-MISO Survey). Assuming that trend continues—and the circumstances of increasing demand provide good reason to think it will—48 GW of the total 54 GW projects currently with signed generator interconnection agreements will come online.

Additionally, there are about 291 GW of projects currently in MISO's interconnection queue. Ex. 121 at 7:15–17 (Witmeier 2025 ERAS Testimony). MISO's historic interconnection queue completion rate is twenty-one percent, see Ex. 112 at 21:2–5 (Witmeier 2024 Queue Cap Testimony), which would equate to another 61 GW (291 GW × 21% = 61.1 GW) of new projects interconnecting from the current queue. Together, those two groups represent more than 109 GW of new resource additions that MISO could reasonably expect to come online in the next several years.

b. <u>Neither the Energy Emergency Executive Order nor the Grid Reliability Executive Order provides a valid basis to declare an emergency under Section 202(c)</u>.

The Department also cites to the Energy Emergency EO and the Grid EO claiming that there is an energy emergency and that the grid is being stressed by unprecedented demand. Ex. 1 at 3-4 (December Schahfer Order); Ex. 2 at 3

(December Culley Order). Neither of these executive orders is valid evidence of an actual energy emergency.

If the Orders' reference to a national energy emergency is meant to serve as evidence of an emergency as defined under Section 202(c), it is insufficient. Claims recited in an Executive Order are not substantial evidence supporting agency action. Substantial evidence is "such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." *Chritton v. Nat'l Transp. Safety Bd.,* 888 F.2d 854, 856 (1989) (internal quotation marks omitted). And an emergency under Section 202(c) must be a specific inadequate power supply situation. See *supra* sec. V.A.1; *e.g.*, 10 C.F.R. § 205.371 (emphasis added). In the quoted passages from the Energy Emergency EO, the President offered his perspective on issues relating to the nexus between energy usage and "our Nation's economy, national security, and foreign policy." But these themes are simply not relevant to assessing whether an "emergency" exists under Section 202(c)(1) and the Department's regulations under 10 C.F.R. § 205.371. Thus, the Orders provide no specific evidence of inadequate generation nationwide, let alone in Indiana or even in MISO specifically. An emergency under Section 202(c) also must be imminent. See *supra* sec. V.A.1. But even the Department's other cited evidence demonstrates clearly that there is nothing imminent about even the most tenuous projected shortfalls. Nothing in the Orders refers to a shortage in the Winter 2025–2026 or Spring 2026 seasons, the actual time period covered by those Orders.

Even if the declared national energy emergency were legitimate, a presidential declaration of an emergency does not unlock unlimited agency powers. *See Biden v. Nebraska*, 600 U.S. 477, 500-01 (2023) (presidential declaration of national emergency does not change the limitations on agency's emergency authority as written into statute). President Trump issued the Energy Emergency EO pursuant to authority from the National Emergencies Act.[12] Congress explained that the National Emergencies Act "is not intended to enlarge or add to Executive power. Rather, the statute is an effort by Congress to establish clear procedures and

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[12] Under the National Emergencies Act, no emergency powers unlocked by a Presidential declaration of a national emergency "shall be exercised unless and until the President specifies the provisions of law under which he proposes that he, or other officers will act." 50 U.S.C. § 1631 (emphasis added). The Energy Emergency EO does not adhere to this requirement. Ex. 92, 90 Fed. Reg. at 8,434 (Energy Emergency EO) (generically directing agencies to "identify and exercise any lawful emergency authorities available to them, as well as all other lawful authorities they may possess, to facilitate the . . . generation of domestic energy resources.").

safeguards for the exercise by the President of emergency powers conferred on him by other statutes." S. Rep. No. 94-1168, 3 (1976), (emphasis added). But Section 202(c)'s authority is not triggered by a Presidential emergency declaration; the statute requires that "the Commission determine[] that an emergency exists." 16 U.S.C. § 824a (emphasis added).[13] Thus, the burden is on the Department to demonstrate that there is an emergency pursuant to the narrow language of Section 202(c); simply pointing to the Energy Emergency EO or the Grid Reliability EO without providing actual evidence that an emergency exists results in an arbitrary and capricious order.

c. The Department's July Resource Adequacy Report does not substantiate its claim of a long-term resource adequacy shortfall.

The Order also briefly cites to the Department's July Resource Adequacy Report as evidence of a potential emergency years down the road. Ex. 1 at 4 (December Schahfer Order); Ex. 2 at 4 (December Culley Order) (citing Ex. 96 (July Resource Adequacy Report)). But that Report does not credibly project conditions in 2030 because of its many inaccurate assumptions and methodological errors.[14] Moreover, that Report offers no actual evidence of any near-term shortfall.

Most glaringly, the Report overestimates demand growth and expected facility retirements while underestimating the likelihood of new entry. This biases the entire report in the direction of over-identifying resource adequacy concerns. Ex. 113 at 21–25 (Inst. Pol'y Integrity Report); see also Ex. 68 at 7 (Grid Strategies Sept. Report) (explaining that the July Resource Adequacy Report relies on load growth and capacity retirement assumptions that are "drastically higher" than those provided by the U.S. Energy Information Administration, the arm of the Department tasked with "independent statistics and analysis"); Ex. 122 at 2–3 (GridLab Report) (noting that the July Resource Adequacy Report fails to account for the potential flexibility of data center load additions; that the Report assumes double the retirements and only a quarter of the firm resource additions assumed by the Energy Information Administration; and that the report ignores "fast-track" interconnection processes recently approved by FERC for multiple RTOs); Ex. 99 at 34-35 (PIOs' RFR of July Resource Adequacy Report) (citing multiple expert reports

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[13] The Department has exercised certain powers under Section 202(c) since the DOE Organization Act of 1977. 42 U.S.C. § 7151(b).

[14] A group of organizations including several of the PIOs here have raised several concerns with this Report in a separate rehearing request. See generally Ex. 99 (RFR of July Resource Adequacy Report).

and initiatives demonstrating the potential for flexibility of large data center loads, including Ex. 123 (Duke University Rethinking Load Growth Study)).

The Report also "departs from best [modeling] practices by using a deterministic modeling rather than a probabilistic approach," and thereby fails to account for necessary uncertainties. Ex. 113 at 19 (Inst. Pol'y Integrity Report). And in many places the Department simply does not explain its own methodology. The report states that its model is derived from NERC's Interregional Transfer Capability Study, which is focused on the ability of the transmission system to transfer power between regions. Ex. 96 at 2 (July Resource Adequacy Report). However, the report inexplicably excludes new transmission projects from its analysis, ignoring that transmission improvements can be the most cost-effective way to improve grid reliability. The Department's report also appears to misunderstand certain principles of statistical reasoning, calling out PJM for failing loss-of-load criteria under one realization of a possible weather year that would include Winter Storm Elliott, without considering that a system's LOLE is averaged across all simulated weather years. Ex. 113 at 19 (Inst. Pol'y Integrity Report); Ex. 96 at 7, 9, 27 (July Resource Adequacy Report). The Department also added more "perfect capacity" (in megawatts) within its modeling than actually needed to bring regions to its targeted Normalized Unserved Energy level. Ex. 113 at 26 (Inst. Pol'y Integrity Report); Ex. 96 at 19, 27, 30, 32, 40. These analytical failings in and of themselves disqualify the report as a viable source of evidence for an emergency finding.

The lack of evidence for a long-term emergency is underscored by the fact that the Department's own analysis premises a resource adequacy shortfall on a type of demand increase (large load buildout), Ex. 96 at 2–3, 15–17 (July Resource Adequacy Report), that the report goes on to admit would likely never actually be allowed to destabilize the grid. Specifically, the report notes that its analysis "is not an indication that reliability coordinators would allow this level of load growth to jeopardize the reliability of the system." *Id*. at 14. In other words, even taking the report at face value, it does not identify a shortfall of a type and nature that could ever justify invocation of the Department's Section 202(c) emergency authority. At best, the report highlights that data centers cannot be built at projected rates unless new generation is built, which is far from the type of emergency situation that could ever provide the basis for a Section 202(c) order.

Finally, on its opening page, the report acknowledges that its analysis is general in nature, looking at the country as a whole, and that the various "entities responsible for the maintenance and operation of the grid" have information "that could further enhance the robustness of reliability decisions" in the sections of the grid they administer. *Id*. at i. This type of generalized analysis based on incomplete

information is simply insufficient to justify a Section 202(c) emergency finding for MISO or any other specific region.

d. MISO has designed its ERAS proposals to address claimed shortfalls and has not suggested that any further generation/capacity is needed.

There is one place where MISO has projected a distant resource adequacy need: in the course of requesting FERC approval for its proposed Expedited Resource Addition Study, which FERC approved in July 2025. Ex. 90 at 6, 13–17 (MISO ERAS Transmittal Letter); Ex. 91 (MISO ERAS Decision). But as explained above, *supra* sec. IV.B.3, that projected need spurred MISO to initiate a process that will add at least 26.5 GW (and likely more) of new capacity to MISO's system over the next several years.

The Department minimizes the import of this approval by suggesting that the projects won't reach commercial operation for at least three years and could be further delayed by supply chain constraints. Ex. 1 at 3 (December Schahfer Order); Ex. 2 at 3 (December Culley Order). But the Department's first statement is factually incorrect—projects that are selected for ERAS could begin operation sooner than three years from the application date; they just have up to six years of leeway—and its second statement is far too conjectural to provide a basis for an emergency declaration. Ex. 91 at P 84 (MISO ERAS Decision). The Department cannot defensibly declare an emergency justifying use of its 202(c) authority based on a concern that the expedited interconnection process MISO has established specifically to meet projected resource adequacy needs won't work—absent substantial and specific evidence of that fact, it is pure conjecture.

3. The Orders Do Not, and Could Not, Provide any Valid Evidence or Reasoned Decision-Making to Support Their Stated Near-Term Resource Adequacy Concerns.

i. The Described Concerns Are Insufficiently Specific and Certain to Meet the Statutory Definition of an Emergency.

The Orders gesture at the possibility of electricity shortfalls in the "near" term, but offer no plausible evidence of such shortfalls. See *infra* sec. V.A.3.ii.

That failure to adduce plausible evidence to one side, the generalized, speculative risks described by the Orders are neither specific nor certain enough to qualify as an "emergency" within the meaning of Section 202(c). 16 U.S.C. § 824a(c). A notional suggestion of some possible shortfall, which might (or might not) require generation from Schahfer or Culley 2, is not a "specific inadequate power supply

situation" enabling the use of the Department's Section 202(c) authority. 10 C.F.R. § 205.371.

The Department does not find that there will be a single supply shortfall during the entirety of the 90-day term of the two Orders. Ex. 1 at *passim* (December Schahfer Order); Ex. 2 at *passim* (December Culley Order). Nor does the Department point to any specific circumstances even giving rise to a risk of such a shortfall. Ex. 1 at *passim* (December Schahfer Order); Ex. 2 at *passim* (December Culley Order). For the duration of the two Orders—from December 23, 2025 through March 23, 2026—the Department's near-term justification amounts to the simple assertion that "MISO's year-round resource adequacy concerns are well documented." *See* Ex. 1 at 1 (December Schahfer Order); Ex. 2 at 1 (December Culley Order). At most, this conclusory statement asserts the possibility that some resource inadequacy might (or might not) emerge somewhere in MISO—but that does not, and cannot, demonstrate that "an emergency exists by reason of a sudden increase in the demand for electric energy" or an identified "shortage of electric energy" or of "facilities for the generation or transmission of electric energy." 16 U.S.C. § 824a(c)(1); *see also Louisville & N.R. Co. v. Sullivan*, 617 F.2d 793, 795 (D.C. Cir 1980) (explaining that where statute permits emergency orders based on determination that a "facility or piece of equipment [is] in unsafe condition, the agency may not issue order based on "a generalized poor safety record" without showing of "particular" safety hazard). The Orders do not describe or provide support for—even taken on their own terms—any imminent, specific, or certain electricity shortfall. The Orders therefore fail to describe an "emergency" within the meaning of Section 202(c).

ii. The Claimed Shortfall Is Unreasoned and Not Supported by Substantial Evidence.

a. <u>None of the MISO Proceedings and Reports Cited by the Order Support Its Claim that the Midwest Faces a Near-Term Resource Adequacy Emergency</u>.

The Orders fail to employ reasoned decision-making and fail to offer substantial evidence of an emergency in the Winter 2025–2026 season (which is most of the period it covers). Instead, the Orders review and recite information from several MISO documents, misinterpreting and misrepresenting the materials to allege a resource adequacy crisis that simply does not exist.

The first example of this flawed reasoning is the Orders' statement that " 'new capacity additions were insufficient to offset the negative impacts of decreased accreditation, suspensions/retirements and external resources' in the northern and central zones, which include Indiana." Ex. 1 at 2 (December Schahfer Order)

(quoting Ex. 31 at 13 (MISO 2025–26 Auction Results)); Ex. 2 at 2 (December Culley Order) (quoting same). As in prior Section 202(c) orders last year, *e.g.*, Ex. 124 at 2 (November Campbell Order), the Department fails to note that this statement referred to *offers* rather than available supply, and particularly only to the netting of additions and subtractions causing total North/Central offers to decrease in absolute terms from Summer 2024 to Summer 2025. *See* Ex. 31 at 13 (MISO 2025–26 Auction Results). The Department also fails to acknowledge that overall resource offerings in MISO North/Central were sufficient relative to the Reserve Margin Requirement, which also decreased from 2024 to 2025. *Compare* Ex. 84 at 16 (MISO 2024–25 Auction Results) (showing a Summer 2024 Reserve Margin Requirement of 100,710 MW in Zones 1–7), *with* Ex. 31 at 18 (MISO 2025–26 Auction Results) (showing a Summer 2025 Reserve Margin Requirement of 99,770.5 MW in Zones 1–7).

This result also tracks MISO's Planning Auction results which, as explained above, *supra* secs. IV.A.2.ii, IV.B, resulted in MISO securing more resources for Winter 2025 than it determined were necessary to ensure resource adequacy. In short, it was clear in April 2025, when MISO released its 2025–2026 Planning Auction results, that the MISO system had no resource adequacy crisis this Winter and upcoming Spring even after accounting for announced plant retirements, including the Schahfer and Culley retirements. The Orders fail to acknowledge these critical facts undercutting the Orders' emergency determination.

The Orders also gesture to various recent reports in which MISO has forecasted an increasing resource adequacy risk in non-Summer seasons. See Ex. 1 at 1–2 (December Schahfer Order); Ex. 2 at 1–2 (December Culley Order). However, the Department does not appear to have carefully examined what MISO was actually saying in any of these materials.

First, the Department quotes from MISO's 2021 capacity accreditation filing, in which MISO described a shift of reliability risks "from 'Summer only' to a year-round concern," apparently for the proposition that the Winter season also experiences meaningful systemic risks. Ex. 1 at 1 (December Schahfer Order) (quoting Ex. 77 at 3 (MISO 2021 Transmittal Letter)); Ex. 2 at 1 (December Culley Order) (quoting same). The relevant graph in the 2021 Transmittal Letter shows an incidence of MaxGen events across all four seasons from 2014 through 2022 but says nothing about how serious these events were. *See* Ex. 77 at 3 (MISO 2021 Transmittal Letter). A simple review of MISO's actual MaxGen events would have revealed that none of the Winter events exceeding the "MaxGen Warning" level ascended to the level (MaxGen Event Step 5) that entails manual shedding of load. Ex. 32 at *passim* (MISO Emergency Declarations); see *supra* sec. IV.A.3, IV.B.1. In other words, recent winter storms have presented a challenge for MISO—but even

the most severe episodes in recent years have failed to cause actual load shedding. And as explained above, MISO's own assessment is that the Winter does not yet have anything close to the grid vulnerability of Summer.

Next, the Orders cite MISO's 2023 Attributes Roadmap, which (according to the Orders) established that "by the summer of 2027, there will be an equal loss of load risk in both the summer and fall seasons" and "the risk of loss of load in the winter and spring seasons, although not as high as in the summer or fall, will nevertheless increase over time." Ex. 1 at 2 (December Schahfer Order) (citing Ex. 85 at 11 (MISO Attributes Roadmap)); Ex. 2 at 1–2 (December Culley Order) (citing same). But again, the Orders fail to discuss the magnitude of risk at issue. The implicated graph on page 11 of the MISO Attributes Roadmap identifies loss of load risks that peak around hour 20 with around 150 hours of expected lost load, Ex. 85 at 11 (MISO Attributes Roadmap), but those 150 hours (from 3,750 runs of the model)[15] correspond to a lower risk than the industry-standard acceptable risk target. Specifically, the LOLE risk is .05 days/year, or 50% of the industry-standard target of 0.1 days per year. Ex. 86 at 7, 19 (MISO Attributes Roadmap Technical Appendix); *see generally* Ex. 10 at 2–3 (Grid Strategies June Report) (discussing LOLE risk targets). The Department thus fails to make a reasoned determination and fails to account for record evidence detracting from its determination, because its discussion of "equal" risk fails to mention that the absolute risk in both seasons remains extremely low.

Furthermore, the graph the Order cites in the MISO Attributes Roadmap doesn't even refer to the present Winter season. *See* Ex. 85 at 11 (MISO Attributes Roadmap). Instead, it refers to projected risk in Winter 2027–28 and makes clear that there was minimal such risk in Winter 2023–24; but it is entirely silent as to the risk profile in Winter 2025–26, which is the only Fall season that is relevant to the Orders' claim of a near-term emergency. *See id.* And the resource mix for Winter 2025–26 looks much more similar to that in Winter 2023–24 (when risk was not concentrated in the Winter season) than to MISO's projected Winter 2027–28 mix—so the 2023 chart is a more useful predictor of likely risk allocation in Winter 2025–26. *See* Ex. 68 at 1–2 (Grid Strategies Sept. Report). As further discussed below, the Orders may not use the possibility of risks in future Winter seasons as evidence that actual risks exist in the current Winter season—particularly where, as here, there is concrete evidence demonstrating that no such risk exists.

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[15] For a given season, 15 weather years and 250 random outage samples per weather year are modeled. Ex. 86 at 7 (MISO Attributes Roadmap Technical Appendix). 15 × 250 = 3,750.

Finally, the Orders gesture to MISO's 2024 Reliability Imperative Report, which mentions "risks in non-summer months that rarely posed challenges in the past." Ex. 1 at 2 (December Schahfer Order) (quoting Ex. 87 at 12 (MISO's Response to the Reliability Imperative); Ex. 2 at 2 (December Culley Order) (quoting same). But the "Response to the Reliability Imperative" offers no specific information about Winter season risks other than its qualitative discussion of recent winter storms. *See generally* Ex. 87 at *passim* (MISO's Response to the Reliability Imperative).

Notably, while the Orders attempt without justification to sow doubt about resource adequacy in non-summer seasons generally, they provide no evidence indicating any actual risk of inadequate supply in the Winter 2025–26 season. Indeed, the word "Winter" is mentioned only twice in each of the two Orders, and there is no substantive discussion of circumstances of the 2025–2026 Winter. In one passage that is common to both Orders, the Department cites the 2025 OMS-MISO Survey results for evidence of a capacity surplus in the Winter 2026–2027 season. Ex. 1 at 3 (December Schahfer Order): Ex. 2 at 3 (December Culley Order); Ex. 89 at 9 (2025 OMS-MISO Survey). This is a staggering abdication of the Department's obligation to provide sound evidentiary backing for its emergency declarations and further confirms that there is no remotely sound reason to be concerned about resource adequacy shortfalls in Winter 2025–2026.

b. <u>The Orders Ignore Evidence Undercutting any Claimed Emergency in MISO</u>.

MISO staff indicated less than three months ago that the system will have "sufficient capacity to cover both Coincident and Non-Coincident peak forecast load(s)" this Winter, with available resources generally exceeding the forecasted peaks by around 30 percent in each of December, January, and February. Ex. 141 at 20 (MISO 2025–26 Winter Readiness Presentation); *see also* Ex. 138 at 7 (MISO Fall 2025 Operations Report) ("The MISO Seasonal Resource Adequacy Construct cleared sufficient resources to cover demand this winter[.]"). MISO also confirmed that its system will have adequate transmission capability to move power across the region (or into the region) as needed. *See* Ex. 141 at 23–32 (MISO 2025–26 Winter Readiness Presentation).

NERC's 2025–2026 Winter Reliability Assessment, which was published prior to the Orders, did not include MISO among the regions it identified with "risks of electricity supply shortfalls during periods of more extreme conditions." Ex. 143 at 5–6 (NERC 2025–2026 Winter Reliability Assessment). The report identified MISO as facing "limited risk" in Winter 2025–2026, as "MISO was able to procure 6.1% more resources through the [Planning Auction] than required by its minimum resource adequacy target," and "[a] further 3.3 GW of resources were available but

not chosen to be committed for the winter season." *Id.* at 17; *see also* Ex. 144 at 34–35 (FERC Staff Winter Reliability Assessment) (recognizing that MISO is "anticipated to have sufficient available generation resources and net transfers to meet [its] expected loads under normal winter conditions" and omitting MISO from a list of regions that "[i]n extreme scenarios . . . face a higher likelihood of challenges").

Furthermore, after MISO's Winter 2025–2026 season began on December 1, 2025, there is no evidence that MISO has needed to implement any emergency procedures beyond a pair of non-actionable Capacity Advisories, which are essentially communications to stakeholders, and which applied only to the MISO South subregion, not to the North/Central subregion that includes Indiana. MISO's monthly Operations Report for December 2025 indicates three weather alerts, two geomagnetic disturbance alerts or warnings, and one System Status Level 1 event, but no Max Gen alerts, warnings, or events. Ex. 111 at 2 (MISO December Operations Report); Ex. 33 at 9–12 (MISO Market Capacity Emergency) (discussing capacity advisories). Notably, Schahfer 18 was— as discussed above—in forced outage status throughout December due to broken equipment, and there is no reason to believe any of the Plants were needed by MISO to serve load throughout the month without incident.

Despite this clear guidance from NERC about the winter season, the Orders regarding Schahfer and Culley 2 failed to acknowledge NERC's winter assessment or the actual experience of MISO's early Winter season. At the time it issued the Orders, the Department had the information about NERC's Winter Reliability Assessment squarely before it because the PIOs had raised the NERC report in a rehearing and stay request in December 2025 (over a week before the Orders) related to the Department's most recent Section 202(c) order on the J.H. Campbell Generating Plant, and the Department cited the same report one week earlier in another section 202(c) order, *see* Order No. 202-25-11 at 1, so ignoring it here is especially striking.

The Orders are also unreasoned and without substantial evidence in failing to consider MISO's available mechanisms during grid-straining events. MISO's declaration of various levels of "Max Gen" events at times when system margins grew relatively smaller is a feature, not a bug, of MISO's resource adequacy management. *See* Ex. 68 at 3–4 (Grid Strategies Sept. Report). And this past Summer, MISO's Max Gen event declarations only rose to the first "Max Gen" level out of five, indicating that the system was not close to a blackout. *See id.*; *supra* secs. IV.A.3, IV.B.1. MISO's protocols allow it to call on several tranches of resources, including Load Modifying Resources, Voluntary Load Reduction, resources currently on outage, and emergency headroom, as needed. Ex. 70 at

¶¶ 10–23 (Konidena Decl.). In short, MISO effectively stewarded all the resources at its disposal this past Summer to avoid a true grid emergency, exactly as the RTO (and intervenors) predicted it would.

B. The Orders Are Not Based on Reasoned Decision-Making and Substantial Evidence in Imposing Requirements to Best Meet the Claimed Emergency and Serve the Public Interest.

The Orders determine that additional dispatch of Schahfer and Culley 2 are necessary to best meet the purported emergency and serve the public interest. But the Orders provide no rational basis for that determination. The Orders do not address the limitations of either the Schahfer or Culley 2 plant, or explain how, in light of those limitations the Plants could even meet the claimed emergency. In fact, both Plants are unlikely to be able to do so. The Orders do not examine the expense of running any of the units or the associated environmental damage, factors which cause additional dispatch of the plant to harm, rather than serve, the public interest. And the Orders do not address readily available and obvious alternatives which, in point of fact, would better meet the claimed emergency. The Orders also fail to consider how they are causing economic damage by, *inter alia*, crowding out otherwise competitive resources, disrupting planning, and creating policy-driven uncertainty. See Ex. 137 at PDF pp. 2–3 (R Street Institute Commentary: *DOE "Zombies" Are Eating Competitive Power Markets*). Consequently, and for the reasons further discussed in the following subsections, the Order is without support in the record, unreasoned, and unlawful. *Allentown Mack*, 522 U.S. at 374; *State Farm*, 463 U.S. at 42–43, 51; *Burlington Truck Lines*, 371 U.S. at 168; *Butte Cnty.*, 613 F.3d at 194.

1. Legal Framework: Section 202(c)(1) Authorizes the Department to Require Only Generation that Best Meets the Emergency and Serves the Public Interest.

Section 202(c)(1) authorizes the Department to impose only those requirements that (i) "best" (ii) "meet the emergency and" (iii) "serve the public interest." 16 U.S.C. § 824a(c)(1).

The term "best" demands a comparative judgment that there are no better alternatives. The word "best" is inherently a comparative term and means "that which is 'most advantageous.'" *Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208, 218 (2009) (*quoting* Webster's New International Dictionary 258 (2d ed.1953)); *cf. Sierra Club v. Env't. Prot. Agency*, 353 F.3d 976, 980, 983–84 (D.C. Cir. 2004) (explaining that statutory "best available control technology" requirement demands sources in a category clean up emissions to the level that peers have shown can be achieved). Consequently, the Department must, at minimum, consider alternatives and

evaluate whether and to what extent a given alternative addresses the emergency and serves the public interest, including deficiencies associated with the alternative.[16]

The Department's obligation to exercise reasoned decision-making further requires consideration of alternatives. The Department need not consider every conceivable alternative, but it must consider alternatives within the ambit of the regulatory context as well as alternatives which are significant and viable or obvious. *See Dep't of Homeland Sec. v. Regents of the Univ. of Calif.*, 591 U.S. 1, 30 (2020); *Motor Vehicle Manufs. Ass'n of the U.S. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 51 (1983); *Nat'l Shooting Sports Found., Inc. v. Jones*, 716 F.3d 200, 215 (D.C. Cir. 2013). Intervenors and the public may also introduce information that requires the Department to evaluate alternatives and reconsider its decision to impose or maintain a requirement. *See, e.g.*, *Chamber of Com. of the U.S. v. Secs. & Exch. Comm'n*, 412 F.3d 133, 144 (D.C. Cir. 2005) (evaluating agency failure to consider alternative raised by dissenting Commissioners and introduced by commenters); *cf.* 10 C.F.R. § 205.370 (stating ability to cancel, modify, or otherwise change an order).

The Department's regulations and practice identify relevant alternatives for its consideration. The regulations specify information the Department shall consider in deciding to issue an order under Section 202(c), and require an applicant for a 202(c) order to provide the information. 10 C.F.R. § 205.373. The specified information includes "conservation or load reduction actions," "efforts . . . to obtain additional power through voluntary means," and "available imports, demand response, and identified behind-the-meter generation resources selected to minimize an increase in emissions." *Id.* § 205.373(g)–(h); Ex. 9 at 4 (DOE Order No. 202-22-4).

The Department may then choose only the best alternative. The best alternative is the one which is most advantageous for meeting the stated emergency and serving the public interest.

The statutory command to take only measures that serve the public interest, including with respect to environmental considerations, further constrains the Department's authority. The public interest element demands that the Department advance, or at least consider, the various policies of the Federal Power Act. *Cf.*

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[16] To be sure, the nature and extent to which the Department must consider alternatives depends on the emergency. An emergency that truly requires the Department to act within hours, for instance, permits a more abbreviated consideration than an emergency for which the Department has days to decide.

Wabash Valley Power Ass'n, 268 F.3d at 1115 (interpreting the "consistent with the public interest" standard in Section 203 of the Federal Power Act); *see Gulf States Utils. Co. v. Fed. Power Comm'n*, 411 U.S. 747, 759 (1973); *California v. Fed. Power Comm'n*, 369 U.S. 482, 484–86, 488 (1962). Primary policies of the Federal Power Act include protecting consumers against excessive prices; maintaining competition to the maximum extent possible consistent with the public interest; and encouraging the orderly development of plentiful supplies of electricity at reasonable prices. *NAACP v. Fed. Power Comm'n*, 425 U.S. 662, 670 (1976) (orderly development); *Otter Tail Power Co. v. United States*, 410 U.S. 366, 374 (1973) (maintaining competition); *Pa. Water & Power Co. v. Fed. Power Comm'n*, 343 U.S. 414, 418 (1952) (excessive prices). And because Section 202(c) expressly protects environmental considerations, these are part of the public interest element too. *See NAACP*, 425 U.S. at 669 ("[T]he words 'public interest' . . . . take meaning from the purposes of the regulatory legislation.").

2. The Orders do not address the generators' unreliability or explain how, in light of that unreliability, the generators could meet the claimed emergency.

The Orders are unreasoned and not based on substantial evidence in requiring the Plants' availability and operation while failing to address the Plants' unreliability.

Schahfer is old and creaky, with significant reliability issues, as discussed above in section IV.C.3.i. In anticipation of its retirement, NIPSCO has deferred maintenance on Units 17 and 18, further exacerbating the reliability of the plant. These reliability issues raise significant doubt that Schahfer is capable of reliable operation such that it could meet the claimed emergency. In fact, forcing the unreliable Schahfer to continue operating actually threatens grid reliability.

Both Schahfer Unit 17 and Unit 18 have seen repeated and significant unforced outages in recent months, reflecting the units' deteriorating state. In 2024, NIPSCO's equivalent forced outage rate ("EFOR"), which represents the percentage of time (in hours) a unit was unable to generate power for reasons other than planned maintenance, was 18.8% and 13.2% for Schahfer Units 17 and 18 respectively. Ex. 4 at 5 (Powers January Declaration). These rates are substantially worse than the national average for coal-fired units of 12 percent. *Id.*; *see* Ex. 40 at 59 (NERC 2024 Reliability Report). This is driven in part by the fact that the units are so uneconomical. As NIPSCO explains,

> "NIPSCO's coal EFOR has been significantly affected by changing power markets, which has changed the economical dispatch for coal. Infrequent operation for years, which imposes high thermal stresses on

> a unit, leading to an increase in forced and maintenance outage hours, followed by an increase in the demand for operating hours later in the year, exacerbates the issues."

Ex. 13 at 21 (NIPSCO Performance Metric Collaborative Update).

NIPSCO's coal units are both dilapidated and expensive enough that their net capacity factor—that is, the percentage of a unit's nameplate capacity that it actually produces considering both outages and how often it is scheduled to dispatch—was at 25% for 2024. *Id.* at 22.

The units' outage rate in 2025 has been similarly dismal. Unit 18 has spent more than 5,000 hours, over 212 days, in unforced outages during the first three quarters of 2025. *See* Ex. 4 at 6 (Powers January Declaration) (citing Ex. 14 at attachment 4-A (Saffran Q1 2025 Outage Testimony); Ex. 15 at attachment 4-A (Saffran Q2 2025 Outage Testimony); Ex. 16 at attachment 4-A, p. 2 (Saffran Q3 2025 Outage Testimony)). Unit 18's L-1 turbine blade separated from the root and fell into the condenser in February, causing an unforced outage that left the unit offline until late June. *See* Ex. 15 at attachment 4-A, p. 2 (Saffran Q2 2025 Outage Testimony). In early July, the unit experienced another outage when one of the L-0 blades on the governor end fell off one third of the way down from the tip. Ex. 16 at attachment 4-A (Saffran Q3 2025 Outage Testimony). The same November 20, 2025 filing from a NIPSCO official reports "significant damage to the upper portion of the condenser tubes on the governor end." *Id.* Unit 18 is quite literally falling apart, and treating the unit as a critical energy asset needed to maintain reliability is facially absurd. Unit 17, while perhaps a bit less dramatically enfeebled, is also falling apart. Unit 17 spent 1,044 hours in unforced outages in 2025. *See* Ex. 4 at 6 (Powers January Declaration) (citing Ex. 14 at attachment 4-A (Saffran Q1 2025 Outage Testimony); Ex. 15 at attachment 4-A (Saffran Q2 2025 Outage Testimony); Ex. 16 at attachment 4-A, p. 2 (Saffran Q3 2025 Outage Testimony)). On September 6, the unit experienced a 201 hour unforced outage to "replace bad tubes and repair previously installed dutchmen." Ex. 16 at attachment 4-A, p. 2 (Saffran Q3 2025 Outage Testimony).

Repair of Unit 18 to get it to a working state looks impossible within the timeframe of the December Schahfer Order. As NIPSCO's president explained recently before the Indiana Commission:

> "Unit 18 is in a forced outage; that one will take more time and effort to ultimately get it to where it needs to be, and at some point, if we do get a 202(c) [order], and it continues, we'll likely have to do some work on [Unit] 17 as well. . . . We've taken some steps to be prepared—long

> lead time equipment, in particular, that ultimately would have to be ordered for us to come in. Frankly, that unit needs to be rebuilt. . . . We're taking some steps to be able to do that, but it will take time; it can take six months or longer for us to ultimately be able to get that unit back to where it would need to be to operate for an extended period of time. It's just the reality of that unit being close to retirement. We're not completely unprepared, but it will take time to get that long lead time items in to be able to make the repairs necessary.

Ex. 53 at 51:35 timestamp (IURC 2025 Winter Reliability Forum (December 2, 2025)); Ex. 53A (video recording available at https://www.youtube.com/watch?v=bCzALF4V45M). VP Bryan McCaul explained that, in anticipation of a 202(c) order from the Department, NIPSCO has "had a lot of negotiations with the [original equipment manufacturer], and trying to pull in future possible deliveries on those [replacement turbine] blades, and also looking at the [high pressure and intermediate pressure] turbines. . . . There's a lot of contract stuff happening trying to make sure we are positioned to not have what was originally an 18 month lead time on those blades, maybe be more like March or May." *Id.* at 58:44. Even in NIPSCO's most optimistic case, Schahfer Unit 18 will not be able to operate through most of the 90-day order period.

At a minimum, the Orders are inconsistent with the long-term and orderly planning processes that utilities undertake to shore up reliable operations; at worst, they set MISO up to rely on generators that will fail unexpectedly.

Even if Schahfer were not falling apart, there is significant reason to think that Units 17 and 18 could not act as reliability resources during the pendency of the December Schahfer Order. NIPSCO has depleted Schahfer's coal stocks as it prepared for retirement. *See* Ex. 18 at 23 & 23 n.14 (Wagner Testimony) (stating that Schahfer had 16 days coal inventory supply at the end of September 2025, whereas the target is a supply for 40 days with a plus or minus 10 day window of variability). And it seems unlikely that NIPSCO would be able to easily return to having reasonable coal stockpiles. As NIPSCO' fuel manager explained to the Indiana Commission, "NIPSCO's [rail] fleet size at the end of [September 2025] can provide 76% of NIPSCO's maximum coal unit demand and at average railroad cycle times." *Id.* at 22. NIPSCO is hampered in its ability to supply Schahfer with coal, and it has limited coal reserves on-site that it can draw from. Nor could NIPSCO easily obtain more train capacity to provide Schahfer additional coal. The same NIPSCO expert explained:

> [T]he availability of coal gondolas is extremely limited and relying on that market to obtain railcars for short-term needs can adversely impact coal supply reliability and is not prudent. In addition, the timing of lease terms can preclude fleet size changes as leasing decisions are made on a forward-looking basis. . . . [I]t can take several months to bring cars into the fleet, and it is an even longer process when returning cars. In addition, moving rail cars in and out of service is a costly process. Therefore, the forward-looking nature of lease agreements and the time and costs required to place cars in and out of service make it difficult to make short-term changes to the size of the fleet and it is not prudent, practical, nor economic to dynamically change the fleet size when coal demand deviates from the forecast.

Id. at 20–21 (footnote omitted).

Moreover, even if it had the train cars to get the coal to the plant, NIPSCO sees risk in its ability to source the coal. As NIPSCO explained:

> [V]ariable coal demand impacts supply chain efficiency and can lead to unpredictable coal supplier and railroad performance. . . . Given the uncertainty in the energy markets due to delayed coal generation retirements, projected increases in electricity demand due to the emergence of data centers, crypto mining, and other load growth drivers, there could be volatility in all energy commodity prices that could impact supply. . . . [I]f coal demand increases, utilities may struggle to schedule deliveries as railroads and coal producers have rationalized assets, labor, and production, and it may take time for production and shipments to rise to meet any rapid increase in demand.

Id. at 15–17, 23.

These limitations severely undercut any reliability role Schahfer could reasonably play and are entirely ignored in the Department's December Schahfer Order.

Culley 2 is likewise an unreliable and creaky generator. Culley 2 had an EFOR in 2024 of 32.4% and a net capacity factor of 31.8%. Ex. 22 at 24 (CenterPoint 2024 Performance Report); Ex. 4 at 8 (Powers January Declaration). Like the Schahfer units, the Culley EFOR rates are substantially worse than the national average for coal-fired units of 12 percent. Ex. 4 at 8 (Powers January Declaration); *see also* Ex. 40 at 59 (NERC 2024 Reliability Report). Culley 2 has been experiencing boiler tube leaks that have been causing outages and forcing the unit offline. Ex. 22 at 24

(CenterPoint 2024 Performance Report). And the maintenance issues are likely to get worse, not better. CenterPoint Indiana has anticipated the retirement of Culley 2 and therefore not invested in major maintenance needed to keep the plant operating smoothly, as CenterPoint Indiana's vice president of power operations relayed to the Indiana Commission. "In 2025, the plant will be years past due for a turbine and generator overhaul and will require major boiler work and other capital investments to maintain safe and reliable operation." Ex. 23 at 6 (Wayne Games 2021 Testimony). CenterPoint Indiana reported that its "Culley 2 maintenance expenditure declined about 20% from 2022 to 2023 in [FERC Uniform System of A]ccount[s] 512 (Maintenance of Boiler Plant)." Ex. 4 at 9 (Powers January Declaration) (citing Ex. 152 at PDF pp. 8, 20 (CenterPoint Rate Case Discovery Responses)). "Increased maintenance spending is necessary to minimize the effect of equipment degradation with age and changing operating regimes. Plants such as F.B. Culley that have likely underspent on capital investment and O&M are at greater risk of future forced outages." Ex. 4 at 9 (Powers January Decl.). It is unlikely that the plant can stay online and operational to address the purported emergency identified by the December Culley Order.

The Orders fail to come to grips with the dangers to grid reliability that they create. Unreliable coal plants like Culley 2 and Schahfer are particularly likely to cause grid disturbances. .

> "Cold snaps, heat waves, and storms have all exposed coal's fragility during grid stress events. Reliability is not just about being dispatchable, it's about delivering performance under stress. Coal plants struggle to do that consistently. For coal plants to truly meet the constant demands of data centers, they would need to run at high capacity factors and avoid major outages, all of which fly in the face of current performance trends. If a large coal plant trips offline while supporting a cluster of data centers, the sudden loss of supply could lead to cascading failures across the grid. This is because generation must equal load at all times, datacenter or no datacenter. As a result, relying on coal plants to support these high-density digital loads doesn't enhance reliability, it endangers it. And it's not a matter of *if* the coal plant will fail, but *when*."

Ex. 118 at PDF pp. 2–3 (RMI Analysis of Coal Plants' Threats to Reliability).

The Department avers that it is concerned with reliability, *see* Ex. 1 at 4 (December Schahfer Order); Ex. 2 at 5 (December Culley Order), yet puts forward no analysis to address the likelihood that its Orders might actually create the (otherwise unproven) problem they are supposedly trying to address. The

Department mandates generation from old plants which, in anticipation of their retirements, deferred significant maintenance needs, while stylizing the generators as needed for reliability, risking sudden break-downs and grid stability concerns. This ostrich-like approach to record evidence and public information is not reasoned decision-making. *Butte Cnty*., 613 F.3d at 194; *cf. Ky. Mun. Energy Agency v. FERC*, 45 F.4th 162, 177 (D.C. Cir. 2022) (rejecting "ostrich-like approach" to agency decision-making).

3. The Orders Do Not Address the Plants' Continued Demonstration of Their Technical Inability to Meet the Claimed Emergency.

Separately, the Orders provide no reasoned basis to conclude that Schahfer and Culley 2, even if fully maintained and operational, could meet the claimed emergency, let alone that these Plants are the best way to do so, given the technical specifications and operational limits of the Plants.

Schahfer and Culley 2 are not designed to turn on quickly in response to extreme demand, nor are they capable of ramping their output up and down quickly. The Orders point to projections of demand growth, including from "data centers driving artificial intelligence (AI) innovation." Ex. 1 at 4 (December Schahfer Order) (internal quotation marks omitted); Ex. 2 at 4 (December Culley Order) (same). Even assuming *arguendo* the Department has authority under Section 202(c) to address that claimed circumstance (it does not), coal plants' "always-on nature" and "rigidity" are "a poor match for the dynamic and often unpredictable nature of data center demand." Ex. 118 at PDF p. 3 (RMI Analysis of Coal Plants' Threats to Reliability); *see also* Ex. 129 at 3 (Energy Innovation Report) (explaining that data center loads "are not 24/7 blocks. Instead, they are choppy, with swings of hundreds of megawatts over short intervals, undermining assumptions of steady baseload behavior and potentially affecting the stability of the grid if safeguards are not put in place."). "[L]arge, voltage-sensitive loads like data centers require flexible, responsive grid solutions, not slow-ramping generators that can take 12 or more hours to come online." Ex. 118 at PDF p. 3 (RMI Analysis of Coal Plants' Threats to Reliability) (relying on NERC). Fast-ramping generators are also needed to respond to extreme emergency demand increases in cases when an emergency is declared only a few hours before the demand must be met. Ex. 4 at 10 (Powers January Declaration).

Schahfer has slow ramp and startup times, as noted above in section IV.C.3.i.b. The two coal generating units have start-up targets of 22 hours after a 1-hour notice and ramp rates of 3 MWs per minute. Ex. 19 at 6 (NIPSCO CPCN Discovery Responses). NIPSCO has recognized that its coal units at Schahfer are ill suited to meet its customers' needs because of their slow ramp and start times. NIPSCO

sought and received permission to decommission and reuse the interconnection rights associated with Units 17 and 18 for gas fired generators that would not face these problems. *See* Ex. 20 at 18 (IURC Schahfer Gas Plant Order) (describing NIPSCO's finding that it needed generation with faster ramp rates and start up times); *id.* at 14, 17 (discussing how the proposed CTs would use the interconnection rights associated with retiring units 17 and 18); *id.* at 42 (the Indiana Commission approving NIPSCO's plan to build the CTs in question). The new CT units, in contrast to Units 17 and 18, can start up in as few as 11 minutes and have a ramp rate of 140 MWs per minute, making them significantly more responsive than Units 17 and 18 to swinging demand. Ex. 19 at 6 (NIPSCO CPCN Discovery Responses). The Department's order forcing Schahfer to stay online risks delaying the in service date for these new responsive units, because the new CT units were designed to come online using the interconnection rights of the retiring units 17 and 18. If the new CT units have delayed in-service dates, the December Schahfer Order risks degraded reliability for NIPSCO and MISO customers.

CenterPoint Indiana has reached similar conclusions with regard to Culley 2. CenterPoint Indiana created two proposed generation portfolios for its 2025 integrated resource plan: a "preferred portfolio" which offered among the lowest cost and most flexible operating futures for CenterPoint Indiana in a range of possible future scenarios, and an "alternate preferred portfolio," which offers lowest cost generation solutions assuming significant large load growth. Ex. 21 at 10–11, 165–68, 185–86 (CenterPoint Indiana 2025 IRP). CenterPoint Indiana's analysis found that in the high data center load growth scenario, Culley 2 should be retired and have its interconnection rights used for a battery storage installation at the site to support system capacity and provide additional ramping capability. *See id.* at 10, 185–186; *see also* Ex. 2 at 4 (December Culley Order) (asserting emergency conditions because of data center demand). Even without the large load assumption, use of the Culley 2 interconnection for a battery storage installation is in the preferred portfolio. Ex. 71 at 139, 165–166 (CenterPoint Indiana 2025 IRP).

The Plants are ill-suited to meet the highly variable and rapidly changing load of data centers, even compared to other coal units. The average coal plant takes 12 hours to reach maximum capacity from a cold start. Ex. 55 at 26 (IEA Flexibility Report); Ex. 118 at PDF p. 3 (RMI Analysis of Coal Plants' Threats to Reliability). By comparison, utility-scale battery storage can dispatch from a cold start to full power in a matter of seconds. Ex. 4 at 10 (Powers January Decl.). Schahfer and Culley 2, with their long startup times, are ill-suited to serve as peaking plants that respond to extreme peak demand on short notice. Ex. 4 at 10–12 (Powers January Decl.).

In short, the Orders fail to examine the inherent mismatch between the problem they diagnose and the mandates they impose. Schahfer and Culley 2 are both

falling apart, and unsuited to meet the rapid ramping needs associated with the data center load growth the Orders identify as driving the purported emergency.

4. The Orders Do Not Address or Reflect Consideration of Alternatives.

Other alternatives are available to the Department that better meet the claimed emergency and serve the public interest. MISO has access to robust transmission connectivity between itself and neighboring regions to support the stability of its grid. *See, e.g.*, Ex. 35 at 2 (Patton MISO Comments) ("[I]t is important to recognize that, unlike some other RTOs, MISO has tremendous import capability that is routinely utilized during tight conditions to supplement its internal resources."). During the entire period of the Orders, MISO Zone 6 can import more than 7.5 GW. Ex. 3 at 8 (EFG Report); Ex. 37 at 12 (MISO 2025–2026 CIL/CEL Final Results); *see generally* Ex. 65 at 52–53 (DOE Transmission Planning Study) (documenting interregional variability in electricity demand); Ex. 66 at 22–35 (NERC 2024 Interregional Transfer Capability Study, Part 1) (describing transfer capabilities between MISO and other regions). The Department has long recognized that power pools and utility coordination "are a basic element in resolving electric energy shortages." *Emergency Interconnection of Elec. Facilities and the Transfer of Elec. to Alleviate an Emergency Shortage of Elec. Power*, 46 Fed. Reg. 39,984, 39,985–86 (Aug. 6, 1981). And recent history bears out the important role of transmission connectivity along with imports and exports. *See, e.g.*, Ex. 43 at 64 (Winter Storm Elliott System Operations Inquiry) ("Despite tightening conditions on the MISO system as the morning progressed, MISO maintained steadily increasing exports to TVA throughout the day."); Ex. 44 at 43, 83–84 (PJM Elliott Report) (describing PJM exports of between 8 and 11 GW to TVA, and exports to MISO and other regions); Ex. 36 at 6 (MISO Elliott Max. Gen. Event Overview) ("MISO consistently exported power to southern neighbors with a maximum value of nearly 5 GW[.]"); *see also* Ex. 7 at 1 (DOE Order No. 202-02-1) (providing for usage of interregional transmission).

The Order fails to consider the alternative of imports and transmission connectivity to meet the claimed emergency. The Order includes no reasonable basis to question the availability of resources from neighboring regions, nor why the two Orders provide a better means of ensuring resource sufficiency than addressing those barriers directly through its power to require "interchange" and "transmission" of electric energy from those neighboring regions. 16 U.S.C. § 824a(c)(1); *see* 10 C.F.R. §§ 205.373(f) & 205.375 (providing for consideration of available resources, including power transfers). The Order's failure to consider

imports and interregional transmission connectivity is unreasoned, and the Order is not based on substantial evidence.[17]

C. The Orders Exceed Other Limits on the Department's Statutory Jurisdiction.

1. The Department Lacks Jurisdiction to Impose the Availability Requirements.

In directing MISO, NIPSCO, and CenterPoint Indiana to take "all measures" to ensure that Schahfer and Culley 2 are "available to operate," Ex. 1 at 5 (December Schahfer Order); Ex. 2 at 5 (December Culley Order), the Department exceeds its authority under Section 202(c) of the Federal Power Act and impermissibly intrudes on the authority over generating facilities that Section 201(b) of the statute reserves to the states, 16 U.S.C. §§ 824(b)(1), 824a(c)(1). The sweeping language in the Department's Orders would encompass physical and all other changes necessary to revive a decrepit generating plant undergoing closure pursuant to a state-approved retirement process. The Federal Power Act's language, structure, legislative history, and interpretation by the courts all confirm that the Department's Orders are unlawful.

The structure and language of the Federal Power Act reflect Congress's deliberate choices to preserve the states' traditional authority over generating facilities and to circumscribe the Department's emergency authority in light of the states' role. The first sentence of the Federal Power Act declares that federal regulation extends "only to those matters which are not subject to regulation by the States." *Id.* § 824(a). Section 201(b)(1) states that, except as otherwise "specifically" provided, federal jurisdiction does not attach to "facilities used for the generation of electric energy." *Id.* § 824(b)(1). The courts have held that Section 201(b)(1) reserves to the states authority over electric generating facilities, *see, e.g., Hughes v. Talen Energy Mktg., LLC*, 578 U.S. 150, 155 (2016), including the authority to order their closure, *Conn. Dep't of Pub. Util. Control v. FERC*, 569 F.3d 477, 481 (D.C. Cir. 2009) (explaining that under Section 201(b), states retain the right "to require the retirement of existing generators" or to take any other action in their "role as

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[17] The Department must also incorporate demand response and other alternatives in determining whether an emergency exists, and as a condition precedent to calling for generation by a polluting resource like Schahfer or Culley 2, a requirement consistent with Departmental practice. See 16 U.S.C. §§ 824a(c)(1)–(2); 10 C.F.R. § 205.375; e.g., Ex. 39 at 4–5 (DOE Order No. 202-22-2); Ex. 45 at 2–3 (DOE Order No. 202-21-1); Ex. 17 at 3 (DOE Order No. 202-20-2). MISO has access to demand response and authority over generator outages. See Ex. 70 at ¶¶ 20–23 (Konedina Decl.)

regulators of generation facilities"). Congress also recognized the states' exclusive authority over generating facilities in Section 202(b), which provides that FERC's interconnection authority does not include the power to "compel the enlargement of generating facilities for such purposes." 16 U.S.C. § 824a(b).

There is a clear distinction between authority to regulate generation facilities and the Department's authority under Section 202(c) to require generation of electric energy. Electric energy is an electromagnetic wave, and its "generation, delivery, interchange, and transmission" is the creation and propagation of that wave. *See* Brief *Amicus Curiae* of Electrical Engineers, Energy Economists and Physicists in Support of Respondents at 2, *New York v. FERC*, 535 U.S. 1 (2002); *see also* Edison Electric Institute Glossary of Electric Utility Terms (1991 ed.) (defining electric generation as "the act or process of transforming other forms of energy into electric energy"). Section 202(c)(1), like the rest of the Federal Power Act, is written "in the technical language of the electric art" and federal jurisdiction generally "follow[s] the flow of electric energy, an engineering and scientific, rather than a legalistic or governmental test." *Conn. Light & Power v. Fed. Power Comm'n*, 324 U.S. 515, 529 (1945); *see also Fed. Power Comm'n v. Fla. Power & Light Co.*, 404 U.S. 453, 454, 467 (1972).

The scope of the Department's emergency power under Section 202(c) is bounded both by the provision's specific language and Congress's clear intention and repeated direction in the Federal Power Act to respect the states' authority over generating facilities. When an actual emergency exists, Section 202(c)(1) authorizes the Department to order only two specific things: (1) "temporary connections of facilities" and (2) "generation, delivery, interchange, or transmission of electric energy." *Id.* § 824a(c)(1). The only reference to "facilities" in the authorizing provision of Section 202(c)(1) appears in the clause relating to temporary connections, not in the clause pertaining to "generation" of electric energy. And that clause only authorizes connections "of" facilities; it does not provide authority to regulate the facilities. The differences in Congress's word choice in these clauses—referencing "facilities" in one authorizing provision but not the other—must be given effect. *See, e.g.*, *Gallardo v. Marstiller*, 596 U.S. 420, 430 (2022); *Gomez-Perez v. Potter*, 553 U.S. 474, 486 (2008).

Given Congress's use of the term "generating facilities" elsewhere in the statute, if it had intended to give the Department authority over generating facilities in Section 202(c)(1), it would have done so explicitly. Instead, the provision conspicuously excludes authority to manage the physical characteristics of power plants. Congress purposely limited and particularized the Department's emergency powers, carefully avoiding intrusion on the states' authority over generating facilities recognized in Section 201(b)(1). *See* S. Rep. No. 74-621, at 19 (explaining

that the emergency powers in Section 202(c)(1) "which were indefinite in the original bill have been spelled out with particularity"); *compare* S. 1725, Cong. Tit. II § 203(a) (providing in original, unenacted bill that control of the production and transmission of electric energy "except in time of war or other emergency declared to exist by proclamation of the President, shall, as far as practicable, be by voluntary coordination"), *with* 16 U.S.C. § 824a(c)(1) (providing particularized, specific authorities and circumstances in which the authorities may be exercised).

In certain circumstances, the Department may require generation of electric power and a utility may properly take steps at the facility to produce the power. It is commonplace in the electric sector for the federal regulator properly acting within its authority to cause effects in a state regulator's jurisdictional sphere, and vice versa. *See Elec. Power Supply Ass'n*, 577 U.S. at 281. But the federal regulator may neither directly regulate generation facilities nor impose requirements aimed at the facilities, even if nominally regulating within its sphere. *See id.* at 281–82; see also *Hughes*, 578 U.S. at 164–65. Such encroachment is impermissible, be it in a real emergency or in a wrongly claimed one. *See Conn. Light & Power*, 324 U.S. at 530 ("Congress is acutely aware of the existence and vitality of these state governments. It sometimes is moved to respect state rights and local institutions even when some degree of efficiency of a federal plan is thereby sacrificed."). Thus, the Department may not require generation that necessitates the utility taking steps under state authority, such as building a new generating unit or refurbishing a broken one.

The Federal Power Act does not give the Department sweeping authority to order "all measures" needed to make a generation facility "available to operate." Ex. 1 at 5 (December Schahfer Order); Ex. 2 at 5 (December Culley Order); *see* 16 U.S.C. § 824a(c). Nowhere does the statute empower the Department to order "all" steps that may be needed to resuscitate Culley 2 and Schahfer, which could include repairs or modifications to physical facilities and other measures going far beyond electric power generation. Because generating units at both Plants are at the end of their useful lives, with years of forgone maintenance and capital expenditures, rendering the units capable of meeting a short-term supply shortfall could essentially require rebuilding significant parts of the Plants. On their face, the Department's Orders are *ultra vires*. The Orders also contravene the Federal Power Act's repeated direction to respect the states' authority over generating facilities,

which includes the authority reserved to Indiana to ensure responsible closures of both generators. The Orders therefore are unlawful and should be withdrawn.[18]

2. The Department Lacks Jurisdiction to Disallow Treatment of Schahfer or Culley 2 as a Capacity Resource.

The Orders state that "[b]ecause this order is predicated on the shortage of facilities for generation of electric energy and other causes," Schahfer and Culley "shall not be considered capacity resources." Ex. 1 at 5 (December Schahfer Order); *see also* Ex. 2 at 6 (December Culley Order) (directing that Culley 2 shall not be considered a capacity resource). This provision serves only to increase costs to customers, who will be required to procure duplicative capacity as a result. It is also illegal. Section 202(c) authorizes the Commission to "require by order . . . temporary connections of facilities and . . . generation, delivery, interchange, or transmission of electric energy," and then shields facilities that operate pursuant to a Section 202(c) order from liability for unavoidable violations of federal, state, or local environmental laws or regulations. 16 U.S.C. §§ 824a(c)(1), (3). Nowhere does the Federal Power Act suggest that the Department may predetermine or override the reasoned decisions of FERC in its determination of whether just and reasonable wholesale rates require an operating resource to be considered a capacity resource.

The explanation the Orders offer for this override, essentially that Schahfer and Culley 2 cannot be capacity resources because the orders do not deem them capacity resources, is clearly circular. As a result, the true reasoning behind this provision remains unclear—but its clear effect is to prevent MISO from considering the continued existence of Schahfer or Culley 2 as it works to ensure resource adequacy across its footprint. MISO's tariff defines a "capacity resource" as any of several types of resources "that are available to meet demand," and its definition of "Planning Resource" makes clear that generators like Schahfer and Culley 2 must be a Capacity Resource in order to satisfy a region's Reserve Margin Requirement. MISO Tariff Sec. 1.C, 1.P (Definitions). The Tariff also establishes clear procedures for calculating capacity contribution from all resources. *Id*. at Sec. 69A.4–69A.4.5; Schedule 53, Seasonal Accredited Capacity Calculation; Schedule 53A, Extended Seasonal Accredited Capacity Calculation. Thus, the Orders' elimination of capacity treatment for Schahfer and Culley 2 prevents MISO from following its own tariff in the wake of Schahfer and Culley's 2 continued operation and what will presumably

[18] A utility that takes steps subject to state authority cannot point to a Section 202(c) order as the basis for a right to recover associated costs. *See* 16 U.S.C. § 824a(c)(1) (providing for compensation or reimbursement to be paid based on just and reasonable terms for carrying out an authorized order).

be indefinitely renewed 202(c) orders to force Schahfer and Culley 2 to remain operational.[19] *See* Exhibit 124, U.S. Department of Energy's November 18, 2025 Emergency Order No. 202-25-9 (issuing a third 90-day 202(c) order forcing the J.H. Campbell Power Plant to remain online); Exhibit 131, U.S. Department of Energy's November 25, 2025 Emergency Order No. 202-25-10 (issuing a third 90-day 202(c) order forcing the Eddystone Generating Station to remain online).

The Orders also represent a significant and improper intrusion into FERC's authority to ensure that RTOs like MISO justly and reasonably ensure resource adequacy in their footprint. In particular, the Orders undermine years of FERC's regulatory oversight of MISO's resource adequacy construct, as codified in MISO's FERC-approved tariff. It is within FERC's purview under Section 205 of the Federal Power Act to provide that oversight, 16 U.S.C. Sec. 824d; and it is within MISO's purview to apply its own tariff in the first instance and decide whether generators, including Schahfer and Culley 2, should qualify as a "Capacity Resource" within MISO's FERC-approved resource adequacy construct. 18 C.F.R. § 35.1(e) ("No public utility shall . . . impose any classification, practice, rule, [or] regulation . . . which is different from that provided in a rate schedule required to be on file with this Commission unless otherwise specifically provided by order of the Commission for *good cause shown*." (emphasis added)).

The Department's intrusion into the oversight relationship between FERC and the RTOs also runs afoul of the filed rate doctrine, which holds that "no change shall be made [in] any [approved] . . . rate, charge, classification, or service, or in any rule, regulation, or contract relating thereto, except after sixty days' notice to the Commission and to the public" in another filing with FERC. 16 U.S.C. § 824d(d); *Okla. Gas & Elec. Co. v. FERC*, 11 F.4th 821, 829 (D.C. Cir. 2021). Interference in MISO's capacity accreditation procedures effectuates a *de facto* change to its tariff, without the legally required notice. And more generally, "Congress rejected a pervasive regulatory scheme for controlling the interstate distribution of power in favor of voluntary commercial relationships. . . . governed in the first instance by business judgment and not regulatory coercion." *Otter Tail Power*, 410 U.S. at 374.

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[19] PIOs recognize that the MISO tariff would likely allow Schahfer Unit 18 to not be considered a capacity resource given the extensive repairs needed to return the unit to operation. *See infra* section V.B.2 (discussing the extensive repairs needed to return Schahfer Unit 18 to service); MISO Tariff Sec. 64.1.1.xi (describing how units expected to be on outage for more than 31 days in a planning season can decline to participate in the Planning Auction). Regardless, however, the capacity eligibility of Schahfer and Culley 2 should be determined pursuant to the MISO tariff.

The Department's interference here in the core operational procedures of MISO's resource adequacy construct improperly upends that relationship.

More broadly, the result of the Orders not allowing MISO to include Schahfer or Culley 2 in its resource adequacy planning will be MISO securing resources it determines will adequately maintain grid security without Schahfer and Culley 2, pursuant to its FERC-approved tariff. And there are only two plausible reasons for the Department to seek that outcome by including these provisions: either 1) the Department does not trust MISO's assessment of MISO's resource adequacy; or 2) the Department does not trust its own assessment of MISO's resource adequacy.

In either case, the Department's actions are improper. The Orders provide no evidence that MISO cannot be trusted to ensure resource adequacy, so a Department determination that MISO cannot be trusted would be arbitrary and capricious. It would also conflict with the Department's heavy reliance on MISO's statements and studies in support of its assertion that the region faces an emergency in the first place. Conversely, if the Department lacks the confidence that its own dire predictions that the system does not have enough resources will come true, then it is well short of the confidence necessary for an emergency declaration under Section 202(c).

If left unchecked, this provision could impose completely avoidable cost increases on Indiana and MISO ratepayers. During the pendency of these (unlawful) Orders, the principal effect of this provision will be to remove Schahfer and Culley 2's ability to provide replacement capacity in the event one of the resources that cleared the auction suffers a catastrophic outage or is otherwise suspended, retired, or shut down for more than 31 days in a season. Ex. 134 at 16 (MISO Manual on Resource Adequacy); *see* Ex. 119 (MISO, ZRC Replacement Guidance). Eliminating this compensation pathway will increase the financial cost of the Orders by removing a potential income stream that might have offset Schahfer and Culley 2's extremely high operational costs, and by forcing any other MISO zone that is impacted by an unexpected plant closure to look for potentially more expensive alternatives for replacement capacity.

Additionally, this provision will have an outsized impact in April 2026 if the Department continues renewing the Orders every 90 days; that is when MISO conducts its 2026-27 Planning Auction. Schahfer and Culley 2's exclusion from the list of facilities that might offer capacity would ensure that Indiana ratepayers and MISO ratepayers writ large likely would be forced to pay for Schahfer and Culley 2's continued operation without any countervailing benefits: they would miss out on a major revenue stream that would have reduced Schahfer and Culley 2's operating losses, and, by operation of MISO's sloped demand curve in the Planning Auction

which pays more for capacity the scarcer it is, consumers will end up paying a higher premium for any capacity their utilities secure from the Planning Auction.

In short, including this provision is yet another way in which the Department has misapplied the statute: its inclusion only further ensures that Schahfer and Culley 2's principal impact will not be plugging a gap but rather sabotaging MISO's resource planning process and heightening cost burdens in a manner that does not serve the public interest.

D. The Orders Fail to Provide the Conditions Required Under Section 202(c) to Lessen Conflicts with Environmental Standards and Minimize Environmental Harm.

Where an order "may result in a conflict with a requirement of any Federal, State, or local environmental law or regulation, Section 202(c) imposes several requirements. 16 U.S.C. § 824a(c). The Department must "ensure" that the order "requires generation, delivery, interchange, or transmission of electric energy only during hours necessary to meet the emergency and serve the public interest." Id. § 824a(c)(2). The Department must also "ensure," "to the maximum extent practicable," that the order "is consistent with any applicable Federal, State or local environmental law or regulation." *Id.* Additionally, the Department must ensure that the order minimizes any adverse environmental impacts, regardless of the facility's compliance (or non-compliance) with environmental standards. *See id.* The Orders violate these statutory obligations.

1. Legal Framework: Section 202(c) Further Limits the Department's Authority and Mandates Affirmative Steps to Maximize Environmental Compliance and Minimize Environmental Harm Where the Order "May Result in a Conflict" with a Federal, State, or Local Environmental Law or Regulation.

The Federal Power Act obligates the Department to include precautions in a Section 202(c) order where the order "may result in a conflict" with environmental laws or regulations. This is a forward-looking inquiry with a low threshold.[20]

The word "may" in this context denotes a mere possibility, not a certainty. This is especially apparent when matched against the term "shall" used in Section 202(c)(2) and the other provisions added to Section 202(c) at the same time. *See* Fixing America's Surface Transportation Act of 2015, Pub. L. No. 114-94, 129 Stat. 1312 § 61002 (codified at 16 U.S.C. § 824a). Congress' use of the two disparate terms must

[20] If actual noncompliance with environmental laws and regulations occurs to carry out the order, the statute provides a safe harbor. 16 U.S.C. § 824a(c)(3).

be given effect. *See, e.g.*, *Kingdomware Techs., Inc. v. United States*, 579 U.S. 162, 172 (2016) (discussing significance of the words "may" and "shall" in the same statutory provision).

Moreover, the consequences need not be "noncompliance" or "violation" of environmental law, both of which are terms Congress also used in 2015 adding other provisions to Section 202(c). A potential "conflict" suffices. *Cf. Crosby v. Nat'l Foreign Trade Council*, 530 U.S. 363, 372–73 (2000) (explaining that courts find "conflict" in the preemption context where, for instance, a law or order "stands as an obstacle to the accomplishment and execution of the full purposes and objectives of Congress"). Taken together, anytime a Department order creates circumstances that might obstruct the accomplishment or execution of environmental laws or regulations, Section 202(c)(2) imposes duties on the Department to maximize compliance with the law and minimize adverse environmental effects.

Congress adopted the requirements of Section 202(c)(2) to address environmental issues arising in response to emergencies on the grid. Congress was well aware of environmental issues stemming from 202(c) orders when it imposed the requirements in Section 202(c)(2). *See, e.g.*, Rolsma, 57 Conn. L. Rev. at 807–09 (discussing prior incidents of tension between environmental requirements and responses to emergencies on the grid, and congressional hearings addressing the matter as part of the passage of Section 202(c)(2)). Congress struck a reasonable balance requiring that environmental concerns not be left by the wayside while the Department responds to actual emergencies. Rather than requiring the Department to engage in a probing review of environmental laws and permits at all levels of our federalist system before acting, Congress set a low threshold for imposition of the mandatory Section 202(c)(2) duties to minimize conflicts with environmental laws and environmental harms flowing from a Section 202(c) order.

2. The Orders May Result in a Conflict with a Federal, State, or Local Environmental Law or Regulation.

Here, the Department implicitly acknowledges the possible conflicts. The Orders are limited to a 90-day duration. Ex. 1 at 5 (December Schahfer Order); Ex. 2 at 5 (December Culley Order). That temporal limitation exists for a 202(c) order that may result in a conflict with environmental requirements. 16 U.S.C. § 824a(c)(4).

Moreover, the evidence shows that the Orders may result in conflicts with environmental requirements. The Schahfer generating plant is subject to the Best Technology Available for Minimizing Adverse Environmental Impact ("BTA") standards under the National Pollutant Discharge Elimination System ("NPDES"). Specifically, 40 C.F.R. § 125.94 requires that NIPSCO use best technology available to minimize impingement mortality associated with water cooling systems in the

Schahfer units. The Units each feature a closed-cycle cooling via a single multi-cell mechanical draft cooling tower. Ex. 24 at 55 (Schahfer 2020 NPDES Permit). The Indiana Department of Environmental Management ("IDEM") approved Schahfer's cooling systems as meeting the BTA standard, but stated that: "Primary in this entrainment BTA determination is that the facility will cease operations no later than December 31, 2022 and the permittee does have closed-cycle cooling via a single multi-cell mechanical draft cooling tower on each unit which has allowed the permittee to achieve substantial reductions in water usage." *Id.* at 55. In other words, IDEM approved Schahfer's NPDES permit on the flawed assumption that Units 17 and 18 would retire as of December 31, 2022. *Id.* at 1. The NPDES permit expired September 20, 2025. Ex. 24 at 1 (Schahfer 2020 NPDES Permit). As NIPSCO noted, in order to operate Schahfer Units 17 and 18 "for one day beyond 2025," the Schahfer NPDES permit would require NIPSCO "to install a wastewater treatment system and convert the [retired] Unit 14 and 15 bottom ash handling system" so that it could be used on Units 17 and 18. Ex. 132 at PDF p. 16 (NIPSCO Rate Case Discovery Responses).

The Order also may result in a conflict with the federal coal combustion residuals ("CCR") Rule. In 2015 and in subsequent rulemakings, the EPA promulgated rules pursuant to the Resource Conservation and Recovery Act ("RCRA") which created standards for legacy surface impoundments of CCR. EPA provided an alternative compliance mechanism that extended the deadline for owners and operators to complete closure of their unlined CCR surface impoundments larger than 40 acres until October 17, 2028 if the coal-fired boiler associated with the generator would permanently retire by that same date. 40 C.F.R. § 257.103(f)(2). In its latest compliance filings for the rule, NIPSCO explained that if it ceases combustion of coal at Schahfer by December 31, 2025 as expected, it would be able to close its CCR impoundment (the Waste Disposal Area) by September 17, 2028, a month ahead of EPA's deadline. Ex. 25 at 6 (Schahfer CCR Part A Demonstration Addendum). But the Department's December Schahfer Order prevents that closure, which, given the long timeline of closing the Waste Disposal Area, would cause Schahfer to breach the deadline of current federal law..

The December Culley Order also may result in a conflict with environmental laws and regulations. Culley 2 shares pollution control equipment with Culley 3, another generating unit at Culley which is not subject to an order from the Department. Culley 3 contains a flue gas desulfurization ("FGD") system which serves both units. Ex. 26 at 7 (Culley 2025 Air Permit Modification). Culley Units 3 and 2 also share equipment critical to meeting the units' NPDES permit requirements. Ex. 56 at 14 (Bradford Coal Inventory Testimony). The result of this setup is that Culley 3 outages can force Culley 2 offline for environmental compliance reasons. Culley 3 saw sustained outages in 2025 that, due to shared

pollution control systems, also forced Culley 2 offline. *See* Ex. 27 at 3 (CenterPoint Fuel Cost Order) (describing how "due to the environmental parameters associated with the Culley Unit 3 outage, Culley Unit 2's availability will be limited until Unit 3 comes back online"). As a result, even if Culley 2 is operational, any downtime needed to service Culley 3 may result in a conflict with environmental requirements.

Independently, running Culley 2 may result in clear conflict with the plant's NPDES permit. The permit mandates that "[b]eginning December 31, 2025, there shall be no discharge of bottom ash transport water from Unit 2." Ex. 28 at 6 (Culley 2024 NPDES Permit).

The Orders may result in additional conflicts with air pollution laws and regulations. For example, EPA has approved Indiana's regional haze state implementation plan revision. Ex. 57 (2026 EPA IN Haze SIP Approval). Indiana conducted its regional haze state implementation analysis under the assumption that owners of electric generating unit sources would "continue to shutdown units, convert to natural gas, and rely more on renewable energy." Ex. 69 at 2 (IN Haze SIP Responses to Public Comments); *see also* 90 Fed. Reg. 25,951 (finding Indiana's choice not to apply the four factor test to all of the state's EGUs reasonable because given "historical data showing relatively consistent or declining NO_X and SO_2 annual emissions and emission rates, as well as 2028 projections, the overall emissions are not expected to increase in the future"). The Department's Orders prevent the retirement of Schahfer and Culley 2 and affect how the Plants are dispatched. *See* Ex. 1 at 5 (December Schahfer Order); Ex. 2 at 5 (December Culley Order). As such, the Orders may result in a conflict with environmental requirements.

3. The Orders Lack the Conditions Required by Section 202(c).

i. The Orders' Terms Fail to Require Generation Only During Hours Necessary to Meet the Purported Emergency.

The Orders directly contradict the Department's obligation to require generation "only during hours necessary to meet the emergency." 16 U.S.C. § 824a(c)(2). The Orders instead state: "For the duration of this Order, MISO is directed to take every step to employ *economic* dispatch" of the Schahfer and Culley 2 Plants "to *minimize cost* to ratepayers." Ex. 1 at 5 (December Schahfer Order) (emphasis added); Ex. 2 at 5 (December Culley Order) (emphasis added). The "emergency" nominally described by the Orders is the potential "loss of power to homes and businesses in the areas that may be affected by curtailments or power outages." Ex. 1 at 4 (December Schahfer Order); Ex. 2 at 5 (December Culley Order). Even if the

Department had substantiated that emergency (which it has not), the Federal Power Act would allow the Department to compel generation only when needed to prevent such involuntary curtailments or outages. 16 U.S.C. 824a(c)(2); *see, e.g.*, Ex. 6 at 9 (DOE Order No. 202-17-4 Summary of Findings) ("authorizing operation of" units subject to emergency order "only when called upon . . . for reliability purposes," according to "dispatch methodology" approved by the Department). "Economic dispatch," in sharp contrast, requires "the lowest-cost resources [to] run first," in pursuit of "the lowest-cost energy available." *City of New Orleans v. FERC,* 67 F.3d 947, 948–49 (D.C. Cir. 1995)*; see also Fla. Power & Light Co. v. FERC,* 88 F.3d 1239, 1241 (D.C. Cir. 1996) (noting distinction between economic dispatch and reserve capacity rules).

By instructing MISO to employ economic dispatch, the Orders' terms permit (indeed, direct) operation of Schahfer 17, Schahfer 18, and Culley 2 even when other—albeit potentially higher cost—resources are available that would prevent any "curtailments or power outages"—that is, the claimed emergency. Ex. 1 at 4 (December Schahfer Order); Ex. 2 at 5 (December Culley Order). The Orders' further instructions—limiting "dispatched units to the times and within the parameters as determined by MISO pursuant to paragraph A," *id.*—just repeats that initial instruction to "employ economic dispatch," without any further limitation that would "ensure" that generation occurs "only during hours necessary to meet the emergency" described by the Orders, *id.*; 16 U.S.C. § 824a(c)(2). Moreover, to the extent the Department directs that offering Schahfer and Culley 2 "on a must run basis may be necessary to ensure the units are available to operate," *see* Ex. 146 at P 49 (Campbell September Rehearing Order), that too violates the Department's obligation under Section 202(c)(2) to require generation only during hours needed to meet the claimed emergency and serve the public interest. As such, the Orders' terms fail to require operation "only during the hours necessary to meet the emergency" described by the two Orders and violate Section 202(c)(2). 16 U.S.C. § 824a(c)(2).[21]

ii. The Orders Fail to Ensure Maximum Practicable Consistency with Environmental Rules and to Minimize Adverse Environmental Impacts.

The Orders further fail to "ensure" that Schahfer and Culley 2 operate, "to the maximum extent practicable," in conformity with applicable environmental rules. *Id.* The Orders paraphrase the statutory text—that "operation of the [affected units] must comply with applicable environmental requirements . . . to the maximum

[21] That direction further fails to conform to the statute's command to compel only the generation that will "best meet the emergency." 16 U.S.C. § 824(c)(1).

extent feasible," but fail to specify *who* bears that responsibility or *what* such operation entails. Ex. 1 at 5 (December Schahfer Order); see also Ex. 2 at 5 (December Culley Order). The Orders impose no further substantive conditions beyond stating that they provide no relief from any obligation to "pay fees or purchase offsets or allowances for emissions." *Id.* The direction to "comply . . . to the maximum extent feasible" is, as a result, wholly unenforceable; the Orders provide no basis for the Department, or anyone else, to determine whether each plant is in fact complying or who might face the consequences of any failure to do so. *See* Ex. 9 at 5–7 (DOE Order No. 202-22-4) (requiring, *inter alia,* reporting of "number and actual hours each day" of operation "in excess of permit limits or conditions," and information describing how generators complied with environmental requirements to maximum extent feasible). Consequently, the Orders do not meet the Department's statutory obligation to "*ensure*" the maximum feasible consistency with applicable environmental standards—an obligation that requires the Department to offer some discrete guidance as to the Plants' operations, rather than merely parroting the statutory text. 16 U.S.C. § 824a(c)(2) (emphasis added).

In addition, the Orders fail to "minimize[] any adverse environmental impacts." 16 U.S.C. § 824a(c)(2). That mandate is textually and substantively distinct from the Department's (also unfulfilled) obligation to ensure maximum practicable compliance with environmental standards. *Id.* The Orders claim to minimize environmental impacts by "limit[ing] operation of dispatched units to the times and within the parameters as determined by MISO, pursuant" to the Orders' "paragraph A." Ex. 1 at 5 (December Schahfer Order); Ex. 2 at 5 (December Culley Order). But in both Orders, paragraph A contains only a command that MISO "take all measures necessary to ensure" that the Schahfer and Culley 2 Plants are "available to operate" and "employ economic dispatch . . . to minimize cost to ratepayers," and requires a directive that NIPSCO and CenterPoint Indiana comply with MISO's orders implementing the Orders' commands.[22] *Id.* An instruction minimizing ratepayer costs and demanding availability has no rational relationship to a requirement to minimize environmental impacts. The Orders contain no

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[22] To the extent the Orders allow MISO to independently devise conditions limiting environmental impacts, that mere possibility, first, cannot satisfy the Department's own statutory obligation to "ensure" that its "order" minimizes environmental impacts (and limits hours to those necessary to meet the emergency, and mandates the maximum practicable compliance). 16 U.S.C. § 824a(c)(2). And even if it could, the Orders require MISO to employ "economic dispatch" and "ensure" that Schahfer and Culley are "available to operate"—directions that are flatly inconsistent with the statute's requirements related to Schahfer's and Culley 2's environmental impacts.

requirement similar to the requirements recommended by PIOs' expert engineer Mr. Powers: "DOE should require verification of the good working order of the Schahfer 17 and 18 air emission control systems before authorizing Schahfer 17 and 18 to operate under extreme demand conditions" or a similar recommendation for Culley 2. Ex. 4 at 19–20, 22 (Powers January Decl.).

Additionally, the Orders include no measures that would mitigate impacts when compliance with environmental standards proves impracticable—measures that have been routinely included in past orders. *See, e.g.*, Ex. 6 at 9 (DOE Order No. 202-17-4 Summary of Findings) (permitting non-compliant operation only during specified hours, and requiring exhaustion of "all reasonably and practically available resources," including demand response and identified behind-the-meter generation resources selected to minimize an increase in emissions); Ex. 9 at 7 (DOE Order No. 202-22-4) (requiring "reasonable measures to inform affected communities" of non-compliant operations). At a minimum the statute requires the Department to include sufficiently detailed reporting obligations to ascertain what impacts result from emergency operations; without such reporting, the Department has no ability to "ensure" that adverse impacts are minimized. *See, e.g.*, Ex. 110 at 5 (DOE Order No. 202-24-1) (requiring detailed data on emissions of pollutants). The Orders here instead only require "such additional information" as the Department, in the future, may (or may not) "request[] . . . from time to time." Ex. 1 at 5 (December Schahfer Order); Ex. 2 at 5 (December Culley Order). That possibility of future, unspecified inquiry cannot satisfy the statute's demand that the Department "ensure" that its Orders minimize environmental impacts. 16 U.S.C. § 824a(c)(2). As one example of mitigation measures, PIOs' expert engineer, Mr. Powers, suggested that if permit limits for PM, NO_x, or SO_2 are exceeded (as measured on the onsite monitors) during operation of Schahfer 17 and 18 or of Culley 2, the respective units should be shut down. Ex. 4 at 20, 22 (Powers January Decl.). Declining to include such a measure, particularly when there is no apparent risk of loss of power to homes and businesses in the area absent power from Schahfer and Culley 2, does not conform with the requirement of Section 202(c)(2) that the Department order generation only during hours needed to meet the claimed emergency and best serve the public interest.

VI. REQUEST FOR STAY

PIOs further move the Department for a stay of the Orders until the conclusion of judicial review. 18 C.F.R. § 385.212.[23] The Department has the authority to issue such a stay under the Administrative Procedure Act and should do so where "justice so requires." 5 U.S.C. § 705. In deciding whether to grant a request for stay, agencies consider (1) whether the party requesting the stay will suffer irreparable injury without a stay; (2) whether issuing a stay may substantially harm other parties; and (3) whether a stay is in the public interest. *Nken v. Holder*, 556 U.S. 418, 434, 436 (2010); *Ohio v. EPA*, 603 U.S. 279, 291 (2024); *see, e.g.*, *Midcontinent Indep. Sys. Operator, Inc.,* 184 FERC ¶ 61,020, at P 41 (2023); *ISO Eng. Inc.*, 178 FERC ¶ 61,063, at P 13 (2022), *rev'd on other grounds sub nom. In re NTE Conn., LLC*, 26 F.4th 980, 987–88 (D.C. Cir. 2022).

Injuries under this standard must be actual, certain, imminent, and beyond remediation. *Mexichem Specialty Resins, Inc. v. EPA*, 787 F.3d 544, 555 (D.C. Cir. 2015); *Wis. Gas Co. v. FERC*, 758 F.2d 669, 674 (D.C. Cir. 1985); *ANR Pipeline Co.*, 91 FERC ¶ 61,252, at 61,887 (2000); *City of Tacoma*, 89 FERC ¶ 61,273, at 61,795 (1999) (recognizing that, absent a stay, options for "meaningful judicial review would be effectively foreclosed"). Financial injury is only irreparable where no "adequate compensatory or other corrective relief will be available at a later date, in the ordinary course of litigation." *Wis. Gas Co.*, 758 F.2d at 674 (*quoting Va. Petroleum Jobbers Ass'n v. Fed. Power Comm'n*, 259 F.2d 921, 925 (D.C. Cir. 1958)); *see also In re NTE Conn., LLC*, 26 F.4th 980, 991 (D.C. Cir. 2022). Environmental injury, however, "can seldom be adequately remedied by money damages and is often permanent or at least of long duration, *i.e.*, irreparable. If such injury is sufficiently likely, therefore, the balance of harms will usually favor the issuance of an injunction to protect the environment." *Amoco Prod. Co. v. Vill. of Gambell*, 480 U.S. 531, 545 (1987).

Under those standards, a stay of the Orders is appropriate.

A. Intervenors Will Suffer Irreparable Harm Without a Stay of the Orders.

A stay is necessary to protect PIOs, their members, and the public from harm from continued coal-fired power operations caused by the Department's Orders.

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[23] Pursuant to FPA Section 313(c) and Rule 713(e) of the applicable rules, the filing of a request for rehearing does not automatically stay a Department order. 16 U.S.C. § 825*l*(c); 18 C.F.R. § 385.713(e).

As noted extensively *supra* sec. IV.C.3.i.c and ii.c, Schahfer and Culley 2 emit health- and environment-harming air pollutants like nitrogen oxides, sulfur dioxide, particulate matter, and volatile organic compounds.

The health and environmental harms from this pollution flow directly from the Department's Orders and are actual, specific, and imminent, and can be deadly. They will affect the lives and well-being of PIOs and their members. The stark public health stakes of PIOs' request for stay require the Department to pause implementation of its Orders until a court reviews their validity.

Additionally, without a stay, the Orders create other injuries too. The Orders needlessly force NIPSCO and CenterPoint Indiana to continue to divert attention and investment dollars away from planned reuse of the Schahfer and Culley 2 interconnection rights for other generation projects. In doing so, the Department denies PIOs' members the benefits of Indiana's energy policies which are designed to benefit them and the public. In addition to forcing ratepayers to pay for the availability and dispatch of uneconomic, unreliable, and obsolete resources that the State, stakeholders, and owners want to close, *see supra* sec. IV.C, the Department's Orders jeopardize the diversification of generating resources the Department itself has said increases grid reliability. Ex. 142 (Dep't of Energy, *Energy Reliability and Resilience*). There is no clear recourse to remedy those injuries either.

B. A Stay Would Not Result in Harm to Any Other Interested Parties.

No other interested parties would be harmed by a stay. The issuance of a stay would not harm end-use electricity consumers because the lack of an actual emergency means that a stay would not disrupt the provision of electricity. *See supra* secs. IV.B–.C, V.A. Furthermore, because MISO, the Indiana Commission, NIPSCO, and CenterPoint Indiana have already planned for Schahfer and Culley 2's closures and continue to plan for resource adequacy, a stay would only have the effect of relieving them of the administrative, compliance, and planning burdens imposed by the Orders. On the balancing of equities, there is therefore no meaningful countervailing harm that would follow from a stay.

C. A Stay Is in the Public Interest Given the Significant Evidence Demonstrating There is No Factual or Legal Support for These Orders, and Given the Harm they Produce to the Broader Public.

There is no public interest served by the Orders, and a stay will only benefit the public. First, the Orders exceed the Department's authority; the Orders have provided no reasonable grounds to substantiate any near-term or imminent shortfall in electricity supply that would justify Schahfer and Culley 2's continued operation. *See League of Women Voters v. Newby*, 838 F.3d 1, 12 (D.C. Cir. 2016)

(noting "there is a substantial public interest 'in having governmental agencies abide by the federal laws that govern their existence and operations'") (quoting *Washington v. Reno*, 35 F.3d 1093, 1103 (6th Cir. 1994)). Second, the Orders override Indiana's exercise of its "authority to choose [its] preferred mix of energy generation resources." *Citizens Action*, 125 F.4th at 239. By doing so, the Orders unlawfully intrude into states' reserved authority over in-state "facilities used for the generation of electric energy." 16 U.S.C. §824(b)(1); *see Pac. Gas & Elec.*, 461 U. S. at 205 ("Need for new power facilities, their economic feasibility, and rates and services, are areas that have been characteristically governed by the States."); *see also Hughes*, 578 U.S. at 154 (cleaned up) ("Under the [Federal Power Act], FERC has exclusive authority to regulate the sale of electric energy at wholesale in interstate commerce. . . . But the law places beyond FERC's power, and leaves to the States alone, the regulation of any other sale—most notably, any retail sale—of electricity."). And third, a stay would protect the broader public—beyond PIOs and their members—from the onerous costs, and dangerous pollution, produced by unnecessary operation of the Schahfer and Culley 2 Plants.

VII. CONCLUSION

For the reasons set forth above, the undersigned Public Interest Organizations respectfully request that the Department grant intervention with respect to each Order; grant rehearing and rescind the Orders (and any renewals of the Orders); and stay the Orders.

Filed on January 22, 2026.

Submitted by:

[Continued to next page for signatures.]

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Attachment: Index of Exhibits

Index of Exhibits

No.	Exhibit Name	Document Name	URL
1	December Schahfer Order	U.S. Department of Energy's December 23, 2025 Emergency Order No. 202-25-12	https://www.energy.gov/documents/order-number-202-25-12-schahfer
2	December Culley Order	U.S. Department of Energy's December 23, 2025 Emergency Order No. 202-25-13	https://www.energy.gov/documents/order-number-202-25-13-culley
3	EFG Report	Carlos Peña and Anna Sommer of Energy Futures Group, Reliability and Capacity Assessment of F.B. Culley 2 and R.M. Schahfer 17 and 18, January 21, 2026	
4	Powers January Declaration	Schahfer 17 & 18 and Culley 2 Declaration of Bill Powers, P.E., January 21, 2026	
5	Synapse Report	Report of Lucy Metz and Devi Glick of Synapse Energy Economics on cost of continued operation of Culley Unit 2 and Schahfer Units 17–18 under Federal Power Act orders, January 21, 2026	
6	DOE Order No. 202-17-4 Summary of Findings	Summary of Findings DOE Order No. 202-17-4 (Sep. 14, 2017)	https://www.energy.gov/sites/default/files/2017/09/f36/Order%20202-17-4%20Summary%20of%20Findings.pdf
7	DOE Order No. 202-02-1	DOE, Order No. 202-02-1 (Aug. 16, 2002)	https://www.energy.gov/sites/default/files/202%28c%29%20order%20202-02-1%20August%2016%2C%202002%20-%20CSC.pdf

No.	Exhibit Name	Document Name	URL
8	Cooke Email to Alle-Murphy	Email from Lot Cooke, DOE to Linda Alle-Murphy Re: Rehearing procedures for DOE Order No. 202-05-3	https://www.energy.gov/oe/articles/question-and-answer-procedural-questions-application-rehearing-order-no-202-05-02?nrg_redirect=397676
9	DOE Order No. 202-22-4	DOE, Order No. 202-22-4 (Dec. 24, 2022)	https://www.energy.gov/sites/default/files/2022-12/PJM%20202%28c%29%20Order.pdf
10	Grid Strategies June Report	Michael Goggin, *A Review of DOE's 202(c) Order for the Campbell Coal Plant* (June 18, 2025)	
11	NIPSCO 2025 Planning Reserve Margin Report	NIPSCO 2025 Annual Report in Compliance With Ind. Code § 8-1-8.5-13	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/1a22a22e-cc26-f011-8c4e-001dd8084fd9/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=46233_NIPSCO_Submission%20of%20Redacted%20Report_05012025.pdf
12	CenterPoint 2025 Planning Reserve Margin Report	CenterPoint Energy Indiana South 2025 HEA 1520 Report Pursuant to I.C. § 8-1-8.5-13 (May 23, 2025)	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/e865df14-0c38-f011-8c4e-001dd80846ac/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=46236_CEIS_Notice%20of%20Submission%20of%20HEA%201520%20Report_052325.pdf
13	-NIPSCO Performance Metric Collaborative Update	Northern Indiana Public Service Company LLC's Annual Performance Metric Collaborative Update, IURC Cause No. 44688, July 1, 2025	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/9847a67d-a756-f011-877b-001dd8084fd9/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=44688_NIPSCO_Compliance%20Filing%20-%20PMC%20Update_07012025.pdf
14	Saffran Q1 2025 Outage Testimony	Direct Testimony of David Saffran on behalf of Northern Indiana Public Service Company LLC, IURC Cause No. 38706 FAC 147, May 23, 2025	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/0f58f29b-f637-f011-8c4e-001dd80846ac/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=38706FAC147_NIPSCO_Petitioners%20Exhibit%204%20(Saffran)_05232025.pdf

No.	Exhibit Name	Document Name	URL
15	Saffran Q2 2025 Outage Testimony	Direct Testimony of David Saffran on behalf of Northern Indiana Public Service Company LLC, IURC Cause No. 38706 FAC 148, Aug. 18, 2025	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/635d1149-747c-f011-b4cc-001dd80846ac/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=38706FAC148_NIPSCO_Petitioners%20Exhibit%204%20(Saffran)_08182025.pdf
16	Saffran Q3 2025 Outage Testimony	Direct Testimony of David Saffran on behalf of Northern Indiana Public Service Company LLC, IURC Cause No. 38706 FAC 149, Nov. 20, 2025	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/e268e77b-52c6-f011-bbd3-001dd8084fd9/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=38706FAC149_NIPSCO_Petitioners%20Exhibit%204%20(Saffran)_11202025.pdf
17	DOE Order No. 202-20-2	Department of Energy Order No. 202-20-2 (Sept. 6. 2020)	https://www.energy.gov/oe/articles/federal-power-act-section-202c-caiso-september-2020?nrg_redirect=454296
18	Wagner Testimony	Direct Testimony of John A. Wagner on behalf of Northern Indiana Public Service Company LLC, IURC Cause No. 38706 FAC 149, Nov. 20, 2025	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/08174aa0-52c6-f011-bbd3-001dd8084fd9/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=38706FAC149_NIPSCO_Petitioners%20Exhibit%203%20(Wagner)_11202025.pdf
19	NIPSCO CPCN Discovery Responses	IURC Cause No. 45947, NIPSCO-CAC Joint Exhibit 6 (NIPSCO's Public Responses to CAC Data Requests), July 11, 2024	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/98b5e199-824b-ef11-a316-001dd8073c71/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=45947%20NIPSCO.CAC%20Joint%20Exhibit%20No.%206.pdf
20	IURC Schahfer Gas Plant Order	Indiana Utility Regulatory Commission Order in Cause No. 45947 dated October 16, 2024	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/8d902453-cd8b-ef11-ac21-001dd80bd98a/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=ord_45947_101624.pdf

No.	Exhibit Name	Document Name	URL
21	CenterPoint Indiana 2025 IRP	CenterPoint Energy Indiana South 2025 Integrated Resource Plan	https://www.in.gov/iurc/files/CEIS_2025_IRP_Volume_1_of_2.pdf
22	CenterPoint 2024 Performance Report	CenterPoint Energy Indiana South 2024 Electric Performance Report	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/ec855054-7c53-f011-877a-001dd80846ac/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=45564_CEI%20South_Electric%20Performance%20Report_062725.pdf
23	Wayne Games 2021 Testimony	Rebuttal Testimony of Wayne D. Games To The Direct Testimony Of Intervening Parties On Need For Resources To Replace Existing Inefficient Units, Cause No. 45501 (May 24, 2021).	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/76eb9f24-6ebd-eb11-8236-001dd802dc58/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=45501_CenterPoint%20Energy%20Indiana%20South_Games%20Rebuttal%20Testimony%20Petitioners%20Exhibit%20No%203-R%20(PUBLIC)_052421.pdf
24	Schahfer 2020 NPDES Permit	Indiana Dept. of Envtl. Mgmt. Approval of Schahfer Generating Station NPDES Permit Application (Sep. 24, 2020)	https://ecm.idem.in.gov/cs/idcplg?IdcService=GET_FILE&dID=83057089&dDocName=83057294&Rendition=web&allowInterrupt=1&noSaveAs=1
25	Schahfer CCR Part A Demonstration Addendum	NIPSCO R.M. Schahfer Generating Station: Demonstration of Site-Specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment Due to Permanent Cessation of Coal-fired Boilers by a Date Certain – Addendum 2. . .	https://www.nipsco.com/docs/librariesprovider11/rates-and-tariffs/ccr/r.m.-schahfer/r.m.-schahfer-generating-station-groundwater-moniitoring-and-corrective-action/rm-schahfer-generating-station-wda-part-a-addendum-2-summer-2022.pdf?sfvrsn=d2e31151_3
26	Culley 2025 Air Permit Modification	Indiana Dept. of Envtl. Management, Minor Permit Modification to Part 70 Operating	https://ecm.idem.in.gov/cs/idcplg?IdcService=GET_FILE&dID=83826642&dDocName=83830685&Rendition=web&allowInterrupt=1&noSaveAs=1

No.	Exhibit Name	Document Name	URL
		Permit No. T173-43264-00001, July 7, 2025	
27	CenterPoint Fuel Cost Order	IURC Order, Cause No. 38708 FAC 146, April 30, 2025	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/08b0fe52-d625-f011-998a-001dd80b1717/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=ord_38708FAC146_043025.pdf
28	Culley 2024 NPDES Permit	Indiana Dept. of Envtl. Management, Modification to NPDES Permit No. IN0002259, May 3, 2024	https://ecm.idem.in.gov/cs/idcplg?IdcService=GET_FILE&dID=83630044&dDocName=83634089&Rendition=web&allowInterrupt=1&noSaveAs=1
29	Bradford 2025 CCR Testimony	Direct Testimony of F. Shane Bradford on behalf of CenterPoint Energy Indiana South, IURC Cause No. 45052 ECA 6, May 7, 2025	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/1f3f3a58-3b2c-f011-8c4e-001dd8084fd9/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=45052%20ECA%206_CEI%20South_Pet.%27s%20Ex.%20No.%201_Bradford%20Direct%20Testimony%20and%20Attachment_050725%20(2).pdf
30	DOE Rehearing Procedures	U.S. Dep't of Energy, DOE 202(c) Order Rehearing Procedures (last visited June 17, 2025)	https://www.energy.gov/ceser/doe-202c-order-rehearing-procedures
31	MISO 2025–26 Auction Results	MISO, Planning Resource Auction, Results for Planning Year 2025-2026 (Apr. 2025)	https://cdn.misoenergy.org/2025%20PRA%20Results%20Posting%2020250529_Corrections694160.pdf
32	MISO Emergency Declarations	MISO, Maximum Generation Emergency Declarations through June 2024 (Aug. 30, 2024)	https://www.oasis.oati.com/woa/docs/MISO/MISOdocs/Capacity_Emergency_Historical_Information.pdf

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33	MISO Market Capacity Emergency	MISO, Market Capacity Emergency, SO-P-EOP-11-002 Rev: 23 (Oct. 15, 2025)	https://cdn.misoenergy.org/SO-P-EOP-11-002%20Rev%2023%20MISO%20Market%20Capacity%20Emergency683501.pdf
34	Ramey MISO Comments	Comments of Todd Ramey on Behalf of Midcontinent ISO, Inc. (May 28, 2025), Docket No. AD24-11-000, Accession No. 20250528-4032	https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20250528-4032&optimized=false&sid=4f4f3475-8309-4416-8289-2aee6d84c1a8
35	Patton MISO Comments	Technical Conference Comments of David B. Patton, Ph.D., MISO Independent Market Monitor (May 28, 2025), Docket No. AD25-7-000, Accession No. 20250528-4006	https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20250528-4006&optimized=false&sid=2c5ac909-a7f0-47eb-9bb3-c35f89976250
36	MISO Elliott Max. Gen. Event Overview	MISO, Overview of Winter Storm Elliott December 23, Maximum Generation Event (Jan. 17, 2023)	https://cdn.misoenergy.org/20230117%20RSC%20Item%2005%20Winter%20Storm%20Elliott%20Preliminary%20Report627535.pdf
37	MISO 2025–2026 CIL/CEL Final Results	MISO, 2025-2026 PY Seasonal CIL/CEL Final Results (Oct. 24, 2024)	https://cdn.misoenergy.org/20241024%20LOLEWG%20Item%2004%20PY%202025-2026%20Final%20CIL_CEL%20Results654989.pdf
38	MISO LOLE Presentation	MISO, *LOLE 101: Probabilistic Analyses*	https://cdn.misoenergy.org/LOLE%20101%20Training624875.pdf
39	DOE Order No. 202-22-2	Department of Energy Order No. 202-22-2 (Sept. 4, 2022)	https://www.energy.gov/ceser/federal-power-act-section-202c-banc-september-2022
40	NERC 2024 Reliability Report	NERC, 2024 State of Reliability (June 2024) (excerpt)	https://www.nerc.com/pa/RAPA/PA/Performance%20Analysis%20DL/NERC_SOR_2024_Technical_Assessment.pdf

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41	NERC 2025 Summer Reliability Assessment	NERC, 2025 Summer Reliability Assessment (May 2025)	https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2025.pdf
42	2019–24 NERC Summer Reliability Assessments	NERC, Summer Reliability Assessments for 2019-2024 (Compiled)	2019 Reliability Assessment: https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2019.pdf 2020 Reliability Assessment: https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2020.pdf 2021 Reliability Assessment: https://nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC%20SRA%202021.pdf 2022 Reliability Assessment: https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2022.pdf 2023 Reliability Assessment: https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2023.pdf 2024 Reliability Assessment: https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2024.pdf
43	Winter Storm Elliott System Operations Inquiry	FERC, NERC, and Regional Entity Staff Report, Inquiry into Bulk-Power System Operations During December 2022 Winter Storm Elliott (Oct. 2023)	https://www.ferc.gov/media/winter-storm-elliott-report-inquiry-bulk-power-system-operations-during-december-2022#

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44	PJM Elliott Report	PJM, *Winter Storm Elliott: Event Analysis and Recommendation Report* (July 17, 2023)	https://www.pjm.com/-/media/DotCom/library/reports-notices/special-reports/2023/20230717-winter-storm-elliott-event-analysis-and-recommendation-report.pdf?ref=blog.gridstatus.io
45	DOE Order No. 202-21-1	Department of Energy Order No. 202-21-1 (Feb. 14, 2021)	https://www.energy.gov/oe/articles/federal-power-act-section-202c-ercot-february-2021?nrg_redirect=364318
46	FERC Energy Primer	FERC, Energy Primer: A Handbook of Energy Market Basics (Dec. 2023) (excerpt)	https://www.ferc.gov/media/energy-primer-handbook-energy-market-basics
47	MISO Schedule 53 Class Averages	MISO, Planning Year 2026-2027 Preliminary Schedule 53 Class Averages	https://cdn.misoenergy.org/Initial%20Schedule%2053%20Class%20Average%20for%20PY26-27733034.pdf
48	Utility Dive, MISO begins reviewing 6.1 GW — 70% of it gas — in fast-track interconnection study (Dec. 2, 2025)	Ethan Howland, Utility Dive, MISO begins reviewing 6.1 GW — 70% of it gas — in fast-track interconnection study (Dec. 2, 2025)	https://www.utilitydive.com/news/miso-eras-fast-track-interconnection-study-gas/806747/
49	2025 Energy Innovation Dataset	Energy Innovation, dataset for Coal Power 28 Percent More Expensive In 2024 Than In 2021 (June 5, 2025)	https://energyinnovation.org/report/coal-power-28-percent-more-expensive-in-2024-than-in-2021/
50	2025 Energy Innovation Coal Cost Report	Energy Innovation, Coal Power 28 Percent More Expensive In 2024 Than In 2021 (June 5, 2025)	https://energyinnovation.org/wp-content/uploads/Coal-Cost-Update.pdf

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51	2023 Energy Innovation Coal Cost Report	Energy Innovation, Coal Cost Crossover 3.0 (Jan. 2023)	https://energyinnovation.org/wp-content/uploads/Coal-Cost-Crossover-3.0-2.pdf
52	Department Export Authorization EA-365-C (Oct. 21, 2025)	Research Power Corp., Order No. EA365-C (Oct. 21, 2025)	https://www.energy.gov/gdo/ea-365-c-research-power-corporation
53	IURC 2025 Winter Reliability Forum (December 2, 2025)	Physical copy of video recording of IURC 2025 Winter Reliability Forum (December 2, 2025), delivered by courier to the United States Department of Energy	
53A	IURC 2025 Winter Forum Internet Link	Internet link hosted on YouTube of video recording of IURC 2025 Winter Reliability Forum (December 2, 2025)	https://www.youtube.com/watch?v=bCzALF4V45M
54	NARUC Coal Report	National Association of Regulatory Utility Commissioners, Recent Changes to U.S. Coal Plant Operations and Current Compensation Practices (Jan. 2020) (excerpt)	https://www.osti.gov/servlets/purl/1869928
55	IEA Flexibility Report	C. Henderson, International Energy Agency, Increasing the flexibility of coal-fired power plants (Sept. 2014) (excerpt)	https://usea.org/sites/default/files/092014_Increasing%20the%20flexibility%20of%20coal-fired%20power%20plants_ccc242.pdf
56	Bradford Coal Inventory Testimony	Direct Testimony of F. Shane Bradford on behalf of CenterPoint Energy Indiana South, IURC Cause No. 38708 FAC 149, Nov. 17, 2025	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/54dd55d5-bbc4-f011-bbd3-001dd8084346/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=38708FAC149_CEI%20South%20Electric_No%201%20Bradford%20

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			Testimony%20and%20Attachments%20PUBLIC_111725.pdf
57	2026 EPA IN Haze SIP Approval	Air Plan Approval; Indiana; Regional Haze Plan for the Second Implementation Period	(Pre-print not yet published in Federal Register.)
58	MISO Tariff Module E-1	MISO Tariff Module E-1 – Resource Adequacy	https://docs.misoenergy.org/miso12-legalcontent/Module_E-1_-_Resource_Adequacy.pdf
59	NIPSCO 2025 Winter Reliability Presentation	NIPSCO 2025 Winter Reliability Forum Presentation (Dec. 2, 2025)	https://www.in.gov/iurc/files/3_25-WRF_NIPSCO_FINAL.pdf
60	MISO Tariff Section 38.2.7	MISO Tariff Section 38.2.7	https://docs.misoenergy.org/miso12-legalcontent/Module_C_-_Energy_and_Operating_Reserve_Markets.pdf
61	MISO Tariff Attachment Y	MISO Tariff Attachment Y	https://docs.misoenergy.org/miso12-legalcontent/Attachment_Y_-_Notification_of_Potential_Resource_-_SCU_Change_of_Status.pdf
62	FERC Technical Conference Notice	FERC, *Meeting the Challenge of Resource Adequacy in Regional Transmission Organization and Independent System Operator Regions* (June 2, 2025)	https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20250602-3068&optimized=false&sid=457eb824-f5ed-41fa-a043-a0cd8c55cb4b
63	Palgrave Handbook	M. Hafner & G. Luciana, Palgrave Handbook of International Economics (2022) (excerpt)	https://link.springer.com/book/10.1007/978-3-030-86884-0

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64	IEA Report	International Energy Agency, The role of CCUS in low-carbon power systems (2020) (excerpt)	https://www.iea.org/reports/the-role-of-ccus-in-low-carbon-power-systems
65	DOE Transmission Planning Study	DOE, Nat'l Transmission Planning Study, Ch. 2: Long-Term U.S. Transmission Planning Scenarios (2024)	https://www.energy.gov/sites/default/files/2024-10/NationalTransmissionPlanningStudy-Chapter2.pdf
66	NERC 2024 Interregional Transfer Capability Study, Part 1	NERC, Interregional Transfer Capability Study: (ITCS) Strengthening Reliability Through the Energy Transformation, Transfer Capability Analysis (Part 1) (Aug. 2024)	https://www.nerc.com/pa/RAPA/Documents/ITCS_Part_1_Results.pdf
67	CenterPoint Indiana 2025 Winter Reliability Presentation	CenterPoint Energy Indiana South 2025 Winter Reliability Forum Presentation (Dec. 2, 2025)	https://www.in.gov/iurc/files/4_25-WRF_CNP_FINAL.pdf
68	Grid Strategies Sept. Report	Michael Goggin, *A Review of DOE's Second 202(c) Order for the Campbell Coal Plant* (Sept. 2025)	
69	IN Haze SIP Responses to Public Comments	Appendix V, Regional Haze State Implementation Plan Responses to Public Comments (Dec. 29, 2021)	https://downloads.regulations.gov/EPA-R05-OAR-2021-0963-0002/attachment_22.pdf
70	Konidena Decl.	Declaration of Rao Konidena (Sept. 3, 2025) (including attachment)	

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71	NIPSCO 2018 IRP	Northern Indiana Public Company LLC 2018 Integrated Resource Plan, October 2018	https://www.in.gov/iurc/files/2018-NIPSCO-IRP.pdf
72	NIPSCO 2021 IRP	Northern Indiana Public Company LLC 2021 Integrated Resource Plan, October 2021	https://www.in.gov/iurc/files/NIPSCO_2021-Integrated-Resource-Plan-Document-1.pdf
73	NIPSCO May 2022 Investor Call	NiSource reports first quarter 2022 results	https://www.nisource.com/news/article/nisource-reports-first-quarter-2022-results-20220504
74	DOE 202(c) Webpage as of Jan. 22, 2026	U.S. Dep't of Energy, DOE's Use of Federal Power Act Emergency Authority (last visited Jan. 22, 2026), https://www.energy.gov/ceser/does-use-federal-power-act-emergency-authority	https://www.energy.gov/ceser/does-use-federal-power-act-emergency-authority
75	MISO Tariff Zonal Map	MISO, Attachment VV to FERC-Approved Tariff	https://etariff.ferc.gov/TariffBrowser.aspx?tid=1162
76	Secretary Wright's West Virginia Remarks	Charles Young, West Virginia News, *Energy Secretary Chris Wright: Future of U.S. Coal is "long and bright"* (July 5, 2025)	https://www.wvnews.com/news/wvnews/energy-secretary-chris-wright-future-of-u-s-coal-is-long-and-bright/article_948eb88e-2509-42a3-b985-07c47f1ee151.html
77	MISO 2021 Transmittal Letter	Transmittal Letter, FERC Docket No. ER22-495-000 (Nov. 30, 2021), Accession No. 20211130-5166	https://elibrary.ferc.gov/eLibrary/filelist?accession_Number=20211130-5166
78	NiSource 2024 Annual Report	NiSource Inc. 2024 Annual Report (Form 10-K)	https://www.nisource.com/docs/librariesprovider2/sustainability-archives/2024/nisource-2024-annual-report.pdf?sfvrsn=2068f951_6

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79	CenterPoint 2024 Annual Report	CenterPoint Energy, Inc. Form 10-K (2024 Annual Report) dated March 4, 2025	https://investors.centerpointenergy.com/static-files/b4884cf5-749f-46ad-9f89-3507d71a725c
80	CenterPoint Indiana 2025 IRP Summary	Executive Summary, CenterPoint Energy Indiana South 2025 Integrated Resource Plan	https://www.in.gov/iurc/files/CEIS_2025_IRP-Non-Technical_Summary.pdf
81	Joundi Testimony	Testimony of Zakaria Joundi, FERC Docket No. ER24-1638 (Mar. 28, 2024), Accession No. 20240328-5329 (Tab E)	https://elibrary.ferc.gov/eLibrary/filelist?accession_Number=20240328-5329
82	MISO 2024–25 LOLE Study Report	MISO, Planning Year 2024-2025 Loss of Load Expectation Study Report (April 2024)	https://cdn.misoenergy.org/LOLE%20Study%20Report%20PY%202024-2025631112.pdf
83	MISO 2025–26 LOLE Study Report	MISO, Planning Year 2025-2026 Loss of Load Expectation Study Report (April 2025)	https://cdn.misoenergy.org/PY%202025-2026%20LOLE%20Study%20Report685316.pdf?v=20250313114401
84	MISO 2024–25 Auction Results	MISO, Planning Resource Auction Results for Planning Year 2024-25 (Corrected) (April 26, 2024)	https://cdn.misoenergy.org/2024%20PRA%20Results%20Posting%2020240425632665.pdf
85	MISO Attributes Roadmap	MISO Attributes Roadmap (Dec. 2023)	https://cdn.misoenergy.org/2023%20Attributes%20Roadmap631174.pdf
86	MISO Attributes Roadmap Technical Appendix	MISO, Technical Appendix: Attributes Roadmap (June 2024)	https://cdn.misoenergy.org/2023%20Attributes%20Technical%20Appendix631176.pdf

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87	MISO's Response to the Reliability Imperative	MISO's Response to the Reliability Imperative (Feb. 2024)	https://cdn.misoenergy.org/2024+Reliability+Imperative+report+Feb.+21+Final504018.pdf
88	Schahfer Waste Disposal Area Closure Plan	NIPSCO LLC R.M. Schahfer Generating Station Waste Disposal Area Closure Plan – Version #5 (October 2020)	https://www.nipsco.com/docs/librariesprovider11/rates-and-tariffs/ccr/r.m.-schahfer/r.m.-schahfer-generating-station-closure-and-post-closure-care/r-m-schahfer-generating-station---waste-disposal-area-closure-plan.pdf?sfvrsn=78977151_8
89	2025 OMS-MISO Survey	2025 OMS-MISO Survey Results (June 6, 2025)	https://cdn.misoenergy.org/20250606%20OMS%20MISO%20Survey%20Results%20Workshop%20Presentation702311.pdf
90	MISO ERAS Transmittal Letter	Re: Midcontinent Independent System Operator, Inc. Revisions to the Open Access Transmission, Energy and Operating Reserve Tariff Expedited Resource Addition Study Filing, Docket No. ER25-2454-000 (June 6, 2025), Accession No. 20250606-5228	https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20250606-5228&optimized=false&sid=c2678d58-1762-48e9-bcca-059a2a848538
91	MISO ERAS Decision	Order Accepting Tariff Revisions, Subject to Condition, 192 FERC 61,064 (July 21, 2025)	https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20250721-3077&optimized=false&sid=c2678d58-1762-48e9-bcca-059a2a848538
92	Energy Emergency EO	Exec. Order No. 14,156, Declaring a National Energy Emergency	90 Fed. Reg. 8433 (Jan. 29, 2025)

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93	Grid EO	Exec. Order No. 14,262, Strengthening the Reliability and Security of the U.S. Electric Grid	90 Fed. Reg. 15,521 (Apr. 14, 2025)
94	NY Times Coal Article	Brad Plumer & Mira Rojanasakul, *Trump Signs Orders Aimed at Reviving a Struggling Coal Industry*, NY Times (Sept. 3, 2025).	https://www.nytimes.com/2025/04/08/climate/trump-order-coal-mining.html
95	EIA Table 8.4	U.S. Energy Information Administration Electric Power Annual, Table 8.4: Average power plant operating expenses for major U.S. investor-owned electric utilities	https://www.eia.gov/electricity/annual/table.php?t=epa_08_04.html
96	July Resource Adequacy Report	DOE, Resource Adequacy Report: Evaluating the Reliability and Security of the United States Grid (July 2025)	https://www.energy.gov/sites/default/files/2025-07/DOE%20Final%20EO%20Report%20%28FINAL%20JULY%207%29.pdf
97	DOE July 7 Press Release	*DOE, Department of Energy Releases Report on Evaluating U.S. Grid Reliability and Security* (July 7, 2025)	https://www.energy.gov/articles/department-energy-releases-report-evaluating-us-grid-reliability-and-security
98	Culley East Ash Pond Closure Plan	Southern Indiana Gas and Electric Company Written Closure Plan 257.102(b) and (d) for the East Ash Pond at the F.B. Culley Generating Station, Revision 1 (September 2021)	https://www.centerpointenergy.com/en-us/Documents/CCR-Reporting/Culley-Station-Closure/Culley-East-Closure-Plan-Rev-1.pdf

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99	RFR of July Resource Adequacy Report	Motion to Intervene and Request for Rehearing of Natural Resources Defense Council, the Ecology Center, Environmental Defense Fund, Environmental Law and Policy Center, Public Citizen, Sierra Club, and Vote Solar, DOE Resource Adequacy Report (Aug. 8, 2025).	https://sustainableferc.org/wp-content/uploads/2025/08/2025-08-06_NRDC-et-al-Request-for-Rehearing-DOE-Resource-Adequacy-Report.pdf
100	NIPSCO 2024 IRP	Northern Indiana Public Service Company LLC 2024 Integrated Resource Plan, Dec. 9, 2024	https://www.in.gov/iurc/files/NIPSCO-2024-Integrated-Resource-Plan-Document.pdf
101	Schahfer Title V Permit Modification, Feb. 2025	Northern Indiana Public Service Company LLC - R.M. Schahfer Generating Station, Significant Permit Modification No. 073-48085-00008, February 4, 2025	https://ecm.idem.in.gov/cs/idcplg?IdcService=GET_FILE&dID=83755127&dDocName=83759170&Rendition=web&allowInterrupt=1&noSaveAs=1
102	MISO Attachment Y Response to NIPSCO	NIPSCO Notice of Planned Participation under 40 C.F.R. 423.19(h), Oct. 29, 2025 (including letter from MISO dated Feb. 3, 2023)	https://www.nipsco.com/docs/librariesprovider11/rates-and-tariffs/elg/schahfer-notice-of-planned-participation---elg-rule-2034-subcategory.pdf?sfvrsn=58f9f251_1
103	NIPSCO 2019 Rate Order	IURC Order, Cause No. 45159, Dec. 4, 2019	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/ac4c36e7-ae16-ea11-a997-001dd800b582/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=45159%20ORDER%20201912041017168 36.pdf
104	NIPSCO 2023 Rate Order	IURC Order, Cause No. 45772, Aug. 2, 2023	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/a4adc395-4031-ee11-bdf4-001dd80abde3/bb9c6bba-fd52-45ad-

No.	Exhibit Name	Document Name	URL
			8e64-a444aef13c39?file=ord_45772_080223.pdf
105	DOE Order No. 202-08-1	DOE Order No. 202-08-1 (Sept. 14, 2008)	https://www.energy.gov/sites/prod/files/2025%28c%29%20order%20202-08-1%20September%2014%2C%202008%20-%20CenterPoint%20Energy.pdf
106	NIPSCO 2025 Rate Order	IURC Order, Cause No. 46120, June 26, 2025	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/05bff4f4-a952-f011-877a-001dd80b1717/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=ord_46120_062625.pdf
107	Vectren 2014 IRP	Vectren Energy Delivery of Indiana, Inc. 2014 Integrated Resource Plan, November 2014	https://www.in.gov/iurc/files/SIGECO-Vectren_2014_IRP_Report.pdf
108	Vectren 2016 IRP	Vectren Energy Delivery of Indiana, Inc. 2016 Integrated Resource Plan, December 2016	https://www.in.gov/iurc/files/SIGECO-2016-IRP.pdf
109	Culley East Ash Pond Extension Demonstration	Southern Indiana Gas and Electric Company Request for Site-Specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment (November 2020)	https://www.centerpointenergy.com/en-us/Documents/CCR-Reporting/Culley-Station-Closure/Culley-East-Site-Specific-Alternative-to-Initiate-Closure_FINAL.pdf
110	DOE Order No. 202-24-1	DOE Order No. 202-24-1 (Oct. 9, 2024)	https://www.energy.gov/sites/default/files/2024-10/Duke%20202%28c%29%20Order_100924%20FINAL_JMG%20signed.pdf
111	MISO December Operations Report	MISO Monthly Operations Report, December 2025	https://cdn.misoenergy.org/202512%20Market%20and%20Operations%20Report737032.pdf

No.	Exhibit Name	Document Name	URL
112	Witmeier 2024 Queue Cap Testimony	Errata to Att. X Queue Cap Proposal and Exemptions to Queue Cap, Tab A, Prepared Direct Testimony of Andrew Witmeier, at 21:4, Docket No. ER25-507-000 (Nov. 21, 2024) ("Witmeier 2024 Queue Cap Testimony"), Accession No. 20241213-5063.	https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20241213-5063&optimized=false&sid=1e90ede4-da17-4482-8e6d-e346192d0609
113	Inst. Pol'y Integrity Report	Inst. Pol'y Integrity, Enough Energy: A Review of DOE's Resource Adequacy Methodology (July 2025)	https://policyintegrity.org/files/publications/IPI_EnoughEnergy_FinalReport.pdf
114	IURC 2019 CCGT Order	IURC Order, Cause No. 45052, April 24, 2019	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/4dfb39e0-9f66-e911-8151-1458d04ef938/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=45052_ord_20190424102046480.pdf
115	Vectren 2020 IRP	Vectren 2019/2020 Integrated Resource Plan, June 2020	https://www.in.gov/iurc/files/2019-2020-Vectren-IRP-Volume-1-of-2.pdf
116	CenterPoint 2023 IRP	CenterPoint Energy Indiana South 2022/2023 Integrated Resource Plan, May 2023	https://www.in.gov/iurc/files/2022-2023-CNP-IRP-Volume-1-of-2-Redacted.pdf
117	RTO Insider Article	John Cropley & Amanda Durish Cook, DOE Orders Mich. Coal Plant to Remain Available Another 90 Days, RTO Insider (Aug. 21, 2025).	https://www.rtoinsider.com/113044-doe-orders-mich-coal-plant-to-remain-available-another-90-days/

No.	Exhibit Name	Document Name	URL
118	RMI Analysis of Coal Plants' Threats to Reliability	Gabriella Tosado, Ashtin Massie & Joe Daniel, *Reality Check: We Have What's Needed to Reliably Power the Data Center Boom, and It's Not Coal Plants*, RMI (Aug. 12, 2025)	https://rmi.org/reality-check-we-have-whats-needed-to-reliably-power-the-data-center-boom-and-its-not-coal-plants/
119	MISO, ZRC Replacement Guidance	ZRC replacement and instructions in the MECT, Resource Adequacy Subcommittee (May 5, 2023	https://cdn.misoenergy.org/20230524%20RASC%20Item%2004b%20ZRC%20Replacement628921.pdf
120	2024 OMS-MISO Survey	2024 OMS-MISO Survey Results (June 20, 2024)	https://cdn.misoenergy.org/20240620%20OMS%20MISO%20Survey%20Results%20Workshop%20Presentation635585.pdf
121	Witmeier 2025 ERAS Testimony	Prepared Direct Testimony of Andrew Witmeier, FERC Docket No. ER25-2454-000, (June 6, 2025), Accession No. 20250606-5228	https://elibrary.ferc.gov/eLibrary/filelist?accession_Number=20250606-5228
122	GridLab Report	GridLab Analysis: Department of Energy Resource Adequacy Report (July 11, 2025)	https://gridlab.org/gridlab-analysis-department-of-energy-resource-adequacy-report/
123	Duke University Rethinking Load Growth Study	Tyler H. Norris et al., Rethinking Load Growth: Assessing the Potential for Integration of Large Flexible Loads in US Power Systems, Duke University Nicholas Institute for Energy, Environment & Sustainability (Feb. 2025)	https://nicholasinstitute.duke.edu/sites/default/files/publications/rethinking-load-growth.pdf

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124	November Campbell Order	DOE Order No. 202-25-9 (November 18, 2025)	https://www.energy.gov/sites/default/files/2025-11/Order%20No%20202-25-9.pdf
125	IURC AB Brown CT Order	IURC Order, Cause No. 45664, June 28, 2022	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/1b5e5448-13f7-ec11-bb3b-001dd80095d7/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=ord_45564_062822%20.pdf
126	IURC 2025 CenterPoint Rate Order	IURC Order, Cause No. 45990, Feb. 3, 2025	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/4355f179-6be2-ef11-8eea-001dd8067cf7/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=ord_45990_020325.pdf
127	Chrissy Behme Testimony	Direct Testimony of Chrissy M. Behme on behalf of CenterPoint Energy Indiana South, Cause No. 45990, Dec. 5, 2023	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/63d5d9a2-4594-ee11-8178-001dd8065be9/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=45990_CEI%20South_Ex%202%20-%20Behme%20(PUBLIC)_120523.pdf
128	[Omitted.]		
129	Energy Innovation Report	Eric G. Gimon, Senior Fellow, Energy Innovation, *Dodging the Firm Fixation for Data Centers and the Grid* (Nov. 2025)	https://energyinnovation.org/wp-content/uploads/Dodging-the-Firm-Fixation-for-Data-Centers-and-the-Grid.pdf
130	NERC Emergency Operations	N. Am. Elec. Reliab.Corp., EOP-011-4 Emergency Operations (last visited Jan. 8, 2026)	https://www.nerc.com/globalassets/standards/reliability-standards/eop/eop-011-4.pdf
131	Eddystone November Order	DOE Order No. 202-25-10 (Nov. 25, 2025)	https://www.energy.gov/sites/default/files/2025-11/Order%20No.%20202-25-10.pdf

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132	NIPSCO Rate Case Discovery Responses	NIPSCO Responses to Indiana Office of the Utility Consumer Counselor's Ninth Set of Data Requests in IURC Cause No. 46120, Nov. 4, 2024	
133	Department Press Release on Centralia Order	U.S. Dep't of Energy, Energy Secretary Ensures Washington Coal Plant Remains Open to Ensure Affordable, Reliable and Secure Power Heading into Winter(Dec. 17, 2025)	https://www.energy.gov/articles/energy-secretary-ensures-washington-coal-plant-remains-open-ensure-affordable-reliable-and
134	MISO Manual on Resource Adequacy	MISO, BPM-011-r31, *Resource Adequacy Business Practices Manual* (Feb. 21, 2025)	https://www.misoenergy.org/legal/rules-manuals-and-agreements/business-practice-manuals/
135	Holtec News Release	Holtec Int'l, *Holtec Receives Coveted "Tier 1 First Mover Award" from the USDOE to Accelerate Deployment of its Dual-Unit SMR-300 Plant at the Company's Palisades Energy Site* (Dec. 2, 2025)	https://holtecinternational.com/hh-40-24/
136	Utility Dive Article on Palisades Plant	Meris Lutz, UtilityDive, *Palisades Becomes First Decommissioned US Nuclear Plant to Reach 'Operations' Status* (Aug. 28, 2025)	https://www.utilitydive.com/news/palisades-nuclear-plant-holtec-nrc-operations/758845/
137	R Street Institute Commentary: *DOE "Zombies" Are Eating Competitive Power Markets*	Michael Giberson, Senior Fellow, R Street Institute, *Low-Energy Fridays: DOE "Zombies" Are Eating Competitive Power Markets* (Nov. 13, 2025)	https://www.rstreet.org/commentary/low-energy-fridays-doe-zombies-are-eating-competitive-power-markets/

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138	MISO Fall 2025 Operations Report	Bd. of Directors Mkts. Committee, MISO, *Operations Report* (Dec. 9, 2025)	https://cdn.misoenergy.org/20251209%20Markets%20Committee%20of%20the%20BOD%20Item%2006%20MISO%20Operations%20Report730265.pdf
139	Report of the Nat'l Energy Pol'y Dev. Grp	*Reliable, Affordable, and Environmentally Sound Energy for America's Future*: Report of the National Energy Policy Development Group (May 2001)	https://www.nrc.gov/docs/ml0428/ml0428000056.pdf
140	MISO ERAS December Release	MISO, *MISO Announces Second Cycle of ERAS Projects* (Dec. 1, 2025)	https://www.misoenergy.org/meet-miso/media-center/2025---news-releases/miso-announces-second-cycle-of-eras-projects/
141	MISO 2025–26 Winter Readiness Presentation	MISO, *2025–26 Winter Readiness Workshop* (Oct. 29, 2025)	https://cdn.misoenergy.org/20251029%20Winter%20Readiness%20Workshop%20Presentation723831.pdf
142	Energy Reliability and Resilience	U.S. Dep't of Energy, Energy Reliability and Resilience(webpage as of Oct. 21, 2025)	https://web.archive.org/web/20251021071021/https:/www.energy.gov/eere/energy-reliability-and-resilience
143	NERC 2025–2026 Winter Reliability Assessment	NERC, *2025–2026 Summer Reliability Assessment* (Nov. 18 2025)	https://www.nerc.com/globalassets/our-work/assessments/nerc_wra_2025.pdf
144	FERC Staff Winter Reliability Assessment	Office of Technical Reporting & Office of Electric Reliability, FERC, *Winter Energy Market and Electric Reliability Assessment 2025–2026: A Staff Report to the Commission* (Nov. 20, 2025)	https://www.ferc.gov/news-events/news/2025-2026-winter-energy-market-and-reliability-assessment

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145	NERC Email	Email from NERC Communications Announcements to Rachel Sherrard et al. Re: Announcement | NERC 2025-2026 Winter Reliability Assessment | Rising Demand, Evolving Resources Continue to Challenge Winter Grid Reliability (Nov. 18, 2025 at 2:02:44 PM EST)	
146	Campbell September Rehearing Order	DOE Order No. 202-25-3B (Sept. 8, 2025)	https://www.energy.gov/sites/default/files/2025-09/Campbell%20Order%20Addressing%20Arguments%20Raised%20on%20Rehearing.pdf
147	Schahfer 2024 Groundwater Monitoring Report	Northern Indiana Public Service Company LLC, R.M. Schahfer Generating Station Waste Disposal Area 2024 Annual Groundwater Monitoring and Corrective Action Report	https://www.nipsco.com/docs/librariesprovider11/rates-and-tariffs/ccr/r.m.-schahfer/r.m.-schahfer-generating-station-groundwater-moniitoring-and-corrective-action/2025-rm-schahfer-generating-station-waste-disposal-area-annual-groundwater-monitoring-and-corrective-action-report.pdf?sfvrsn=1fc2fa51_3
148	Culley 2024 Groundwater Monitoring Report	Southern Indiana Gas and Electric Company Annual Groundwater Monitoring and Corrective Action Report, East Ash Pond, F.B. Culley Generating Station, January 2025	https://www.centerpointenergy.com/en-us/Documents/CCR-Reporting/Culley-Station-Groundwater-Monitoring/Culley_East_Ash_Pond_Annual_GroundWater_Report_2025.pdf
149	New York Times Article on Trump's Coal Plant Policy	Claire Brown and Brad Plumer, New York Times, *Trump Wants to Halt Almost All Coal Plant Shutdowns. It Could Get Messy* (Jan. 16, 2026)	https://www.nytimes.com/2026/01/16/climate/trump-coal-plants.html

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150	May Campbell Order	DOE Order No. 202-25-3 (May 23, 2025)	https://www.energy.gov/sites/default/files/2025-05/Midcontinent%20Independent%20System%20Operator%20%28MISO%29%20202%28c%29%20Order_1.pdf
151	August Campbell Order	DOE Order No. 202-25-7, August 20,, 2025	https://www.energy.gov/sites/default/files/2025-08/MISO%20Order%20No.%20202-25-7.pdf
152	CenterPoint Rate Case Discovery Responses	IURC Cause No. 45990, CenterPoint Energy Indiana South Responses to the Indiana Office of the Utility Consumer Counselor's Twenty-Sixth Set of Data Requests	
153	Wayne Games 2018 Testimony	IURC Cause No. 45052, Public Rebuttal Testimony of Wayne D. Games on behalf of Southern Indiana Gas and Electric Company d/b/a Vectren Energy Delivery of Indiana, Inc., Sep. 10, 2018	https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/e4ded2b4-c5b5-e811-8144-1458d04ef938/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=45052%20VectrenSouth%20PublicExhibit4RRebuttalTestimonyWayneGames%20091018.pdf
154	EPA COBRA Schahfer Retirement Analysis	U.S. Environmental Protection Agency, CO-Benefits Risk Assessment (COBRA) for nationwide benefit based on reduction of annual emissions from Schahfer 17 and 18	
155	EPA COBRA Culley Retirement Analysis	U.S. Environmental Protection Agency, CO-Benefits Risk Assessment (COBRA) for nationwide benefit based	

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		on reduction of annual emissions from Culley 2	
156	CenterPoint Cost Allocation Complaint	Southern Indiana Gas and Electric Company, Complaint Requesting Fast Track Processing, FERC Docket No. EL26-38-000, Jan. 5, 2026	https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20260105-5189
157	MISO Comments to FERC	Answer of the Midcontinent Independent System Operator, Inc., FERC Docket No. EL26-36-000, Jan. 20, 2026	https://elibrary.ferc.gov/eLibrary/filelist?accession_Number=20260120-5226&optimized=false&sid=07e217b3-76d9-4e6a-9a2b-99ee7f2229d4

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC	)))))	Order No. 202-26-46
Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South	)))))	Order No. 202-26-47

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 169
CenterPoint Letter to USDOE

CenterPoint Energy

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February 17, 2026

The Honorable Chris Wright
Secretary of Energy
United States Department of Energy
1000 Independence Ave., SW
Washington, DC 20585
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Dear Secretary Wright:

As a proud Indiana energy provider, we remain focused on the state's energy pillars of reliability, resilience, affordability, and stability. While we remain engaged complying with the current December 23, 2025, DOE 202c order, maintaining F.B. Culley Unit 2 ("Unit 2") will require **substantial investment to support an inefficient and increasingly unreliable asset**, rather than advancing affordable and reliable service for customers in southwestern Indiana.

We respectfully request that the Department of Energy allow Order No. 202-25-13 (the "Order") to expire on March 23, 2026, and abstain from issuing subsequent Section 202(c) directives for Unit 2.

We acknowledge the concerns outlined in the Order and recognize the complexity inherent in balancing increasing demand with the obligation to serve the public interest. However, **Unit 2 accounts for less than 1% of the total installed capacity in MISO's North/Central region.**[1] In addition, current industry data shows sufficient capacity without Unit 2:

MISO members expect to meet their capacity needs through 2031, with more than 11 GWs of excess capacity.

- NERC's 2025 Long-Term Reliability Assessment reduces MISO's Capacity and Energy Risk level to "Normal" for 2026. The Assessment states, "**For Summer 2026, MISO projects** a prospective resource **surplus ranging from 3.4 to 5.8 GW**".[2]
- The 2025 OMS-MISO Survey shows **MISO members expect** to meet their capacity needs through 2031, with **more than 11 GWs of excess capacity**.[3]

We have adequate generation capacity – without Unit 2 – to meet MISO's Planning Reserve Margin Requirement through the 2027-2028 Planning Year – reflecting our commitment to continued system reliability.

Three consecutive IRPs concluded that retirement of Unit 2 is the most prudent option.

Affordability, reliability, and resiliency remain foundational elements of our Integrated Resource Planning (IRP) process, which guides our long-term resource decisions. Our three most recent IRPs – in 2016, 2019/2020, and 2023 – concluded that the retirement of Unit 2 was the most prudent option. The IRP analysis has repeatedly demonstrated that keeping the unit online would demand **costly investments to**

[1] MISO PY 2026-2027 Seasonal Preliminary PRA Report, Released January 28, 2026; PY 2026-2027 Seasonal Preliminary PRA Report 01-28-2026738710.xlsx
[2] North American Electric Reliability Corporation (NERC), Long-Term Reliability Assessment, Released January 2026 – Pages 8 and 42; https://www.nerc.com/globalassets/our-work/assessments/nerc_ltra_2025.pdf
[3] 2025 OMS-MISO Survey, Released June 6, 2025 – Slide 7; https://cdn.misoenergy.org/20250606%20OMS%20MISO%20Survey%20Results%20Workshop%20Presentation702311.pdf

maintain operational reliability and environmental compliance. Consequently, Unit 2 was approved by MISO to cease operations on December 31, 2025.

Operational data from the Order's effective date (December 23, 2025) through February 8, 2026, support the IRP findings. Following is the operational status for Unit 2 over the past 48 days:

- **26 days:** Unit 2 was **on outage** due to equipment issues
- **5 days:** Unit 2 was on reserve shut down – available but **not economically dispatched** by MISO
- **17 days**: Unit 2 was online but **limited** to between 45MW and 78MW (net) due to maintenance issues.

Unit 2's performance during the recent MISO cold weather event underscores a pattern of unreliability of that unit. Although the unit was dispatched on January 24 – 25, 2026, Unit 2 was limited to 45MW (net) due to a significant derate. One day later, on January 26, systemic equipment failures forced another outage, further demonstrating the unit's ongoing inability to provide dependable service.

Safe operation beyond March 2026 requires an estimated 14 weeks of outages.

Safe and reliable operation beyond March 2026 hinges on major and costly interventions, including acid cleaning of the boiler and replacement of boiler tubes—necessitating a four-week or longer outage, with projected cost of approximately $1.9 million – $2.5 million. Additionally, Unit 2's turbine-generator is currently operating beyond the original equipment manufacturers overhaul specifications—significantly increasing the risk of catastrophic mechanical failure. To avoid that, turbine overhaul is unavoidable, requiring extensive work made even more challenging by long lead times for critical components and a 10-week outage. The turbine-generator overhaul, together with other anticipated outage-related work, is currently estimated to result in total expenditures of approximately $14 million – $18 million. Our team continues evaluating additional operational factors as there may be additional investments needed, driving estimated costs higher. These factors make clear that extending the life of Unit 2 is neither practical nor financially responsible, underscoring the need for a more prudent and economically sound path forward.

Again, we respectfully request that the Department of Energy allow the current 202 Order to end on March 23, 2026, and abstain from issuing subsequent 202 Orders for Unit 2. We appreciate DOE's leadership in safeguarding the nation's electric reliability and trust that this request will be given full consideration.

Respectfully submitted,

Michael Roeder
CenterPoint Energy
President, Indiana Region

Cc: Indiana Gov. Mike Braun