San Juan Generating Station
Remediation and Restoration Study

New Mexico Environment Department
Ground Water Quality Bureau

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Acknowledgments

The New Mexico Environment Department (NMED) appreciates the opportunity to prepare a remediation study as directed by the San Juan Generating Station Facility and Mine Remediation and Restoration Study Act (House Bill 142, 2023 Regular Session), to inform on-going efforts to remedy environmental contamination associated with operation of the San Juan Generating Station. NMED is grateful for the Legislature's attention to this facility and the efforts of the Act's sponsors (Former Representative Anthony Allison, District 4; Representative Reena Szczepanski, District 47; and Representative Marian Matthews, District 27) to secure funding for NMED's preparation of this study. These targeted resources supported the analyses and data collection covered in this report and will bolster NMED's oversight of remedial activities pursuant to the Water Quality Act and Ground and Surface Water Protection Regulations.

Executive Summary

In 2023, the New Mexico Legislature passed the San Juan Generating Station Facility and Mine Remediation and Restoration Study Act (House Bill 142, HB-142) to strengthen oversight, transparency, and accountability related to potential legacy contamination at the San Juan Generating Station (SJGS), a former coal-fired power plant near Waterflow, New Mexico. The bill directed NMED and the Energy, Minerals and Natural Resources Department (EMNRD) to coordinate in developing a remediation and restoration study. This report constitutes NMED's part of those efforts. To implement HB-142, NMED initiated a comprehensive investigation into environmental conditions at the site, with a primary focus on groundwater contamination, regulatory compliance, and long-term public health protection.

SJGS ceased operations in 2022 and is currently undergoing demolition. Historical records, monitoring data, and past site activities indicate that the discharge of process wastewater, coal combustion by-products, and chemical waste may have contributed to contamination of both shallow and deep groundwater systems. Contaminants of concern include nitrate, sulfate, arsenic, selenium, uranium, boron, and volatile organic compounds (VOCs), with concentrations in several monitoring wells exceeding New Mexico's groundwater quality standards.

To address these concerns and in accordance with HB-142, NMED is conducting a data gap assessment and a preliminary Phase II Environmental Site Assessment (ESA), coordinated with formal discharge permit reviews under the New Mexico WQA. These efforts are centered around three active permits: DP-1327 (regulating process water and impoundments), DP-306 (solid waste disposal), and DP-1843 (the Shumway Arroyo groundwater recovery system). Each permit is undergoing technical review, including Requests for Additional Information (RAIs), to assure that protective measures remain in place and site conditions are accurately understood.

Key findings to date include a lack of background groundwater data to distinguish naturally occurring water quality data from site-related contamination; limited downgradient monitoring near high-risk areas such as the raw water reservoir and disposal units; ongoing uncertainty about the effectiveness of recovery systems in capturing migrating contaminants; and persistent exceedances of state groundwater

standards for multiple pollutants. These findings highlight the need for continued investigation and regulatory oversight.

In response, NMED has initiated several actions, including the installation of new groundwater monitoring wells to capture both shallow and deep aquifer conditions; expanded sampling for metals, VOCs, semi-volatile compounds (SVOCs), and inorganic contaminants; development of a site-wide Conceptual Site Model (CSM) to integrate existing and new data; and updates to the site's groundwater flow model to evaluate contaminant movement and infrastructure performance.

NMED remains committed to transparency, accountability, and meaningful public engagement throughout this process. Community input has helped shape priorities for monitoring, sampling, and site evaluation. NMED has provided regular public updates and hosted both in-person and virtual meetings, and published responses to community questions and concerns. These efforts will continue as additional findings become available and cleanup strategies are developed. This report reflects NMED's dedication to protecting groundwater, environmental quality, and public health through independent investigation, science-based decision-making, and collaborative oversight.

Introduction

In 2023, the New Mexico Legislature passed House Bill 142 (HB-142) to improve oversight, transparency, and accountability related to the San Juan Generating Station (SJGS), located near Waterflow in San Juan County, New Mexico. The law requires the New Mexico Environment Department (NMED) to identify confirmed or suspected contamination and report on their investigation, cleanup status, and risks to human health and the environment at SJGS.

SJGS ceased operation in 2022 and is currently undergoing demolition and decommissioning activities. NMED prioritized this site due to its extensive operational history, evidence of historical releases, and the potential for contamination to affect both groundwater and downgradient surface waters.

As part of our oversight responsibilities under HB-142, NMED is conducting an extensive historical document review and data evaluation to support monitoring and compliance through the permitting process. These efforts are being carried out to ensure environmental and public health are protected during the decommissioning of SJGS and before the facility is considered to have met closure requirements under applicable standards. In parallel with this legislative reporting requirement, NMED is reviewing and updating regulatory controls through the groundwater discharge permitting program to support continued investigation and remediation at the site.

Specifically, NMED is currently reviewing the three groundwater discharge permits (DPs) that apply to SJGS: DP-1327, DP-1843, and DP-306. These site-specific permits are issued under the authority of the New Mexico Water Quality Act (WQA), NMSA 1978, §§ 74-6-1 through 74- 6-17, and the Water Quality Control Commission's Ground and Surface Water Protection Regulations (20.6.2 NMAC). The purpose of these permits is to control the discharge of water contaminants from the facility to protect groundwater and any surface water segments that may gain flow from groundwater inflow, for both present and potential future uses, including domestic and agricultural water supply. It is NMED's determination that the permittee has met the administrative requirements of Subsection C of 20.6.2.3109 NMAC. Compliance with all permit conditions is required under Section 20.6.2.3104 NMAC, and failure to do so may result in the commencement of a civil enforcement action pursuant to Section 20.6.2.1220 NMAC.

Historically, SJGS consisted of four coal-fired units. Units 2 and 3 were shut down in December 2017, reducing freshwater consumption and wastewater generation by approximately 50%. The estimated discharge rate under the site's discharge permits is 1.3 million gallons per day (mgd), down from a previous peak of 2.6 mgd. The site is located in Sections 17 and 20, Township 30N, Range 15W, approximately 15 miles west of Farmington and east of Shiprock. Groundwater at the site is typically encountered between 10 and 40 feet below ground surface and has total dissolved solids (TDS) concentrations ranging from 4,000 to 13,000 milligrams per liter, indicating a mineralized, but usable, groundwater resource that requires protection.

In support of both the HB-142 legislative mandate and the ongoing review of site permits, NMED oversaw a comprehensive data gap assessment and a preliminary Phase II Environmental Site Assessment (ESA). These evaluations are intended to characterize environmental conditions, identify potential risks, and guide future remediation strategies. Prior assessments, including historic discharge permits and studies of geology and hydrogeology, indicate likely impacts to soil and groundwater resulting from historical discharge, spills, storage practices, and coal combustion by-products. Groundwater contamination is the primary environmental concern at the site. Groundwater flow direction is generally to the east-southeast toward Westwater Arroyo, through both shallow alluvial and deeper bedrock aquifers, where contaminants could migrate beyond the facility boundary.

The current monitoring network primarily observes shallow groundwater near waste management units permitted under DP-1327 and DP-1843. However, it lacks sufficient coverage to characterize background conditions or fully assess potential impacts near the operational process areas and the Raw Water Reservoir. In addition, the cessation of mine dewatering has introduced changes to groundwater flow patterns that may affect contaminant migration and the stability of existing plumes. NMED has determined a detailed groundwater study is needed to clarify the extent of contamination, identify sources, and support long-term management.

This report details the actions NMED has taken to date pursuant to HB-142, the current environmental status of the SJGS site, and the ongoing efforts to address identified risks. It also outlines the department's recommendations and regulatory approach to ensure that closure of the facility does not leave behind long-term risk to public health or New Mexico's water resources.

1. Site Information and Historical Background

SJGS operated from 1973 until its closure in 2022. The Environmental Improvement Division (EID, predecessor to NMED) issued a letter to the Public Service Company of New Mexico (PNM) on February 22, 1979, notifying PNM discharge permits would be required for the SJGS. Initially, PNM submitted 10 discharge permit applications. Two were not approved by EID, but eight went through the approval process. Over the years, the original eight discharge permits were combined into DP-1327. DP-306 was approved in 1983 for the solid waste disposal pit and DP-1843 was approved in 2018 for the Shumway Arroyo Groundwater Recover system. Additionally, PNM had a National Pollution Elimination System (NPDES) Permit NM0028606 effective March 30, 1979, which allowed EPA to control discharge of pollutants into the waters of the United States. PNM requested termination of the NPDES permit on August 27, 2015, and EPA terminated the NPDES permit on September 21, 2015.

At its peak, SJGS included four coal-fired generating units and a complex infrastructure of evaporation ponds, process water systems, groundwater recovery trenches, and solid waste disposal areas. The plant's operations produced wastewater, coal combustion by-products, solid chemical waste, and process residues, many of which were managed on-site. The site is currently in the decommissioning phase, and NMED is actively overseeing its environmental monitoring and closure under the three site-specific groundwater discharge permits: DP-1327, DP-306, and DP-1843. NMED may also issue a requirement to enter Stage 1 of abatement to assess and remediate contamination not covered by the discharge permits.

These permits were issued under the New Mexico Water Quality Act (WQA) and regulate the discharge of wastewater, solid waste, and recovered groundwater with the goal of protecting both groundwater and downgradient surface water segments. Due to the long operational history, extensive industrial activities, and complex hydrogeological conditions, SJGS presents multiple potential sources of groundwater and soil contamination. Known or suspected contaminants include nitrate, sulfate, TDS, arsenic, selenium, uranium, boron, manganese, and other organic compounds related to historic operations.

I. DP-306 – Solid Waste Disposal Pit

Discharge Permit DP-306 authorizes the disposal of up to 2,290 cubic yards per year of non- hazardous solid waste into a synthetically lined Solid Waste Disposal Pit at the SJGS. The pit, with a total capacity of approximately 50,000 cubic yards, historically managed various solid waste materials including sulfur dioxide (SO_2) sump cleanings, spilled lime, calcium sulfate/sulfite residuals, pond sludge, spent demineralizer resins, sandblasting grit, and other miscellaneous non-hazardous dry chemicals generated from routine facility operations and maintenance activities.

Closure of the Solid Waste Disposal Pit involves encapsulation of non-hazardous wastes, installation of an engineered soil cover (a minimum of three feet thick), grading for erosion control, revegetation, and ongoing groundwater monitoring to ensure compliance and detect potential leachate migration. Historical operations and the diverse chemical nature of the stored materials present a risk for groundwater contamination if the liner breaches or infiltration events occur.

Table 1. Groundwater contaminants of concern related to DP-306 (based on 2024 Q3 monitoring data).

Contaminant	Detected Range (mg/L)	NMAC Standard (mg/L)	Environmental or Public Health Impact
Total Dissolved Solids (TDS)	up to 25,000	1,000	High TDS affects groundwater usability, agricultural productivity, and negatively impacts ecosystem health and potable water quality.
Sulfate	up to 14,000	600	Excessive sulfate concentrations can cause gastrointestinal discomfort, aesthetic issues in drinking water, and degrade agricultural uses.
Chloride	up to 3,700	250	Elevated chloride causes corrosion, reduces water quality, negatively affects plant growth, and contributes to soil degradation.
Boron	up to 22	0.75 (advisory)	High boron concentrations adversely affect agricultural productivity, human reproductive health, and ecological stability.

Arsenic	up to 0.013	0.01	Chronic arsenic exposure is linked to increased cancer risks and can cause skin, cardiovascular, and neurological health impacts.
Selenium	up to 0.19	0.05	Elevated selenium levels cause reproductive and developmental toxicity in humans and wildlife.
Fluoride	up to 4.5	1.6	Excess fluoride concentrations lead to dental and skeletal fluorosis, negatively affecting bone and dental health.
Nickel	up to 0.25	0.2	Elevated nickel levels cause dermatitis, respiratory issues, allergic reactions, and potentially carcinogenic effects.
Manganese	up to 3.9	0.5	Elevated manganese concentrations lead to neurological disorders, aesthetic water quality impacts, and water usability concerns.
Uranium	up to 0.21	0.03	High uranium levels present kidney toxicity risks, radiological hazards, and long-term chronic exposure health concerns.

Notes:
mg/L – milligrams per liter
NMAC – New Mexico Administrative Code 20.6.2
TDS – total dissolved solids

II. DP-1327 – Primary Site-wide Groundwater Permit

Discharge Permit DP-1327 regulates the discharge of up to 1.3 million gallons per day (mgd) of process water, stormwater runoff, trench recovery water, groundwater recovery return flows, and other wastewater types into a system of 15 lined and unlined surface impoundments at the SJGS. These include the North Evaporation Ponds (NEPs) 1-3, South Evaporation Ponds (SEPs) 1-5, Process Ponds 1–3, Runoff Basin Pre-pond, and Coal Pile Runoff Basins along with the Memorial Trench Groundwater Recovery System. Historically, these impoundments managed and evaporated various high- TDS and chemically enriched waters, including boiler

blowdown, cooling tower discharges, limestone wash-down waters, and wastewater from flue gas desulfurization (FGD) processes.

The discharge areas authorized by DP-1327 pose significant environmental concern due to the diversity and concentration of contaminants historically detected at the site. Groundwater monitoring indicates persistent exceedances of state groundwater quality standards, including notably elevated concentrations of TDS (ranging from 9,000 to 25,000 milligrams per liter [mg/L]), chloride, sulfate, nitrate, selenium, arsenic, boron, fluoride, uranium, nickel, and manganese. These contaminants reflect the varied chemical composition of wastewaters historically discharged into these ponds, basins, and associated facilities. Ongoing groundwater monitoring demonstrates consistent contamination near discharge locations, with particular concern arising from multiple monitoring wells such as CB-1, CB-2, RTW-E2, RTW-W2, and the QAL-series wells.

Currently, portions of the South Evaporation Ponds and most of the Process Ponds are undergoing formal closure activities, including sludge removal, sediment and liner characterization, engineered soil cap installation, grading, and revegetation efforts. The North Evaporation Ponds 1, 2, and 3 were closed and covered in 2017. The South Evaporation Pond #2 and Process Ponds 2A and 2B remain active, receiving ongoing discharge primarily from two groundwater recovery systems. Inspections conducted by NMED in 2024 and 2025 raised concerns regarding freeboard adequacy and stormwater management in these ponds. These issues, along with the effectiveness of groundwater recovery infrastructure, are being carefully reviewed and addressed as part of the discharge permit renewal process and in response to HB-142 monitoring responsibilities.

Table 2. Groundwater contaminants of concern related to DP-1327 (based on 2024 Q3 monitoring data).

Contaminant	Detected Range (mg/L)	NMAC Standard (mg/L)	Environmental or Public Health Impact
Total Dissolved Solids (TDS)	9,000–25,000	1,000	High TDS reduces groundwater usability, degrades water quality, and negatively affects agricultural productivity.
Chloride	up to 3,700	250	Elevated chloride is corrosive, negatively impacts soil and plant health, and reduces groundwater quality for potable uses.

Sulfate	up to 14,000	600	Excessive sulfate can cause gastrointestinal irritation, negatively impact taste and odor,and degrade water for agricultural use.
Nitrate/Nitrite (as Nitrogen)	up to 190	10	Elevated nitrate/nitrite concentrations can cause methemoglobinemia (“blue baby syndrome”) and other significant health effects.
Selenium	up to 0.19	0.05	Selenium toxicity at elevated levels can cause adverse reproductive and developmental effects in wildlife and humans.
Arsenic	up to 0.013	0.01	Chronic exposure to arsenic increases the risk of cancer and causes skin, cardiovascular, and neurological impacts.
Boron	up to 22	0.75 (advisory)	High boron concentrations significantly impact agricultural productivity, human reproductive health, and ecological balance.
Fluoride	up to 4.5	1.6	Elevated fluoride concentrations cause dental and skeletal fluorosis and negatively impact bone health.
Uranium	up to 0.21	0.03	High uranium concentrations pose risks of kidney toxicity, radiological health concerns, and chronic chemical exposure impacts.
Nickel	up to 0.25	0.2	Nickel exposure can cause dermatitis, allergic reactions, respiratory effects, and potential carcinogenic impacts.
Manganese	up to 3.9	0.5	Excess manganese exposure can lead to neurological disorders and aesthetic water quality issues such as taste, odor, and staining.

Notes:
mg/L – milligrams per liter
NMAC – New Mexico Administrative Code 20.6.2
TDS – total dissolved solids

III. DP-1843 – Shumway Arroyo Groundwater Recovery System

Discharge Permit DP-1843 regulates the discharge of up to 50,000 gallons per day of contaminated groundwater recovered by the Shumway Arroyo Groundwater Recovery System. The recovered groundwater is conveyed via an HDPE pipeline to Process Ponds 2A and 2B and South Evaporation Pond #2 for evaporation, which are separately regulated under DP-1327. The Shumway Arroyo Groundwater Recovery System was constructed pursuant to a binding 2012 Consent Decree (U.S. District Court, Case No. 10-cv-00320- MCA-LAM) involving Public Service Company of New Mexico (PNM), BHP Billiton, and the Sierra Club. This legal settlement resolved Clean Water Act violations and established enforceable commitments for groundwater and surface water protection related to historical contamination at the SJGS.

The recovery system at Shumway Arroyo includes a subsurface trench excavated down to bedrock, a low-permeability slurry wall, piezometers, a wet well, and associated conveyance infrastructure. The system was strategically designed to intercept shallow alluvial groundwater flowing southeast from the plant site, preventing contaminant migration toward downgradient surface water features, including the Westwater Arroyo and ultimately the San Juan River.

Historical groundwater monitoring data collected near the Shumway system consistently indicate concentrations of chloride, sulfate, TDS, boron, manganese, and uranium significantly above state groundwater quality standards established by NMAC. These elevated contaminants are linked primarily to historical waste disposal practices, leakage from process ponds, and infiltration of coal combustion residuals (CCR). Monitoring results and groundwater flow dynamics suggest that without effective containment, contamination would likely impact downstream aquatic ecosystems and potentially pose risks to public health.

Operational and infrastructure performance concerns have been documented during NMED inspections conducted in 2024 and 2025. Observed issues include surface caving along the trench alignment, telemetry system failures affecting pump operation monitoring, and concerns about the adequacy of hydraulic capture by the trench. PNM transitioned from a two-pump system to a single-pump configuration due to reliability concerns. Stormwater management near the trench, while

regulated separately under the Consent Decree, remains an integral component influencing overall recovery system performance and contaminant containment.

Under DP-1843 renewal, NMED will require comprehensive capture zone analysis and ongoing performance evaluations. Recent evaluations prompted NMED to request additional upgradient and downgradient monitoring wells to better distinguish between SJGS-sourced contamination and impacts potentially originating from adjacent activities at the San Juan Mine. DP-1843 thus remains a critical compliance tool and a central element in ongoing remediation and closure oversight at SJGS.

Table 3. Groundwater contaminants of concern related to DP-1843 (based on 2024 Q3 monitoring data).

Contaminant	Detected Range (mg/L)	NMAC Standard (mg/L)	Environmental or Public Health Impact
TDS	9,000–25,000	1,000	Elevated TDS reduces groundwater quality, negatively impacts aquatic habitats, and limits water use for drinking and agricultural purposes.
Chloride	up to 3,700	250	High chloride levels contribute to soil and groundwater degradation, plant toxicity, and corrosion of infrastructure, impacting agriculture and ecosystem health.
Sulfate	up to 14,000	600	Excessive sulfate concentrations can cause gastrointestinal problems, aesthetic issues (taste, odor), and degrade water usability for agriculture and drinking.
Boron	up to 22	0.75 (advisory)	Elevated boron concentrations adversely affect agricultural productivity, reduce plant growth, and pose reproductive health risks to wildlife and humans.
Manganese	up to 3.9	0.5	Elevated manganese exposure can lead to neurological impacts, aesthetic degradation of water quality, staining, and odor issues.

Uranium	up to 0.21	0.03	High uranium levels pose significant risks of kidney toxicity, radiological exposure, and chronic health concerns for humans and wildlife.

Notes:
mg/L – milligrams per liter
NMAC – New Mexico Administrative Code 20.6.2
TDS – total dissolved solids

2. Actions Taken and Progress

As part of the remediation and restoration study mandated by HB-142, NMED contracted Jacobs Engineering to conduct a comprehensive Data Gap Assessment and Preliminary Phase II Environmental Site Assessment (ESA) for the SJGS. The goal of this work was to identify and begin addressing key uncertainties in groundwater and soil contamination to inform enforcement, permitting, and remediation actions.

This work supports—and does not replace—NMED's independent regulatory oversight under the WQA and 20.6.2 NMAC Ground and Surface Water Protection Regulations, which remain the primary tools to hold the Public Service Company of New Mexico (PNM) accountable for contamination at the site. As part of this effort, NMED is critically reviewing all submitted permit applications, closure plans, monitoring reports, and supporting documentation to verify claims, identify gaps, and ensure that PNM's responsibilities under Discharge Permits DP-1327, DP-306, and DP-1843 are fully enforced.

Assessment activities included:

- Historical Records Review: Jacobs reviewed all available environmental records, including aerial imagery, permit files, closure documentation, groundwater monitoring reports, and site operational records. These records were scrutinized to identify data gaps.
- Site Reconnaissance and Interviews: A visual site inspection and interviews with current and former facility personnel were conducted to validate historical records and inform field investigation priorities.

- Hydrogeological Modeling: Using groundwater elevation and lithologic data, Jacobs created a 3D hydrogeologic model to characterize aquifer properties, groundwater flow direction and stability, and potential contaminant transport pathways. This model will help assess the effectiveness of the existing recovery system and guide future monitoring locations.
- Monitoring Well Installation: Additional groundwater monitoring wells were installed, including nested shallow and deep wells. These wells are targeted for areas lacking coverage, such as downgradient of the Raw Water Reservoir, process area, Solid Waste Disposal Pit, and beyond the current footprint of the Shumway Arroyo Recovery System.
  Soil and Groundwater Sampling: Groundwater samples were analyzed for major ions, trace metals, nutrients, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), and other contaminants of concern. Samples were collected and analyzed to assess surface deposition, leaching potential, and legacy impacts from operational activities.
- Waste Characterization and Management: Investigation-derived waste, including purge water and soil cuttings, was tested, profiled, and managed according to applicable regulations to ensure no additional risk to human health or the environment.
- Reporting and Recommendations: Preliminary environmental site assessment provided information from field activities, third-party validated data, result comparison to applicable screening levels, and provide science-based recommend actions for additional work. This includes updated monitoring plans, long-term sampling strategies, and preliminary considerations for remediation. Final reports will be completed in Q3 2025 based on results from the above activities.

This work enhances NMED's capacity to independently verify site conditions, support future abatement or corrective action decisions, and ensure that remediation is aligned with both community concerns and statutory obligations. The process ensures that PNM remains responsible for cleanup and closure, and that no discharge permit will be terminated until all water quality standards are met and documented through rigorous, independent evaluation.

I. Historical Records Review and Discharge Permit Action

NMED used its regulatory authority under the WQA and 20.6.2 NMAC to evaluate historical records and take formal action on site-related discharge permits. This work complements the HB-142 remediation study and ensures PNM is held accountable for legacy contamination and ongoing environmental responsibilities.

Historical Records Review for Source Identification and Accountability

NMED, supported by Jacobs Engineering, completed a systematic review of historical records to identify known and potential sources of contamination. This included:

- Evaluating past Discharge Permit applications, renewals, and closure plans for compliance with groundwater protection standards.
- Reviewing monitoring reports, as-built drawings, and engineering summaries to determine the effectiveness of pollution controls and identify possible unpermitted discharges.
- Analyzing historical aerial imagery and operations logs to detect legacy waste disposal practices, infrastructure changes, and environmental releases that may not have been previously documented.

This detailed review process helped to cross-reference site features with contamination patterns, assess the completeness and accuracy of PNM's permit documentation, and inform areas of investigation for the ESA.

Formal Discharge Permit Oversight and Action

NMED actively engaged in reviewing and updating the following key discharge permits to ensure they reflect current site conditions and incorporate required corrective measures:

- DP-1327 (Evaporation and Process Ponds): NMED evaluated closure activities and water quality trends to ensure pond

dewatering, sludge removal, and capping comply with closure standards. Historical monitoring revealed exceedances of groundwater standards for nitrate, sulfate, TDS, and metals, prompting continued oversight.

- DP-306 (Solid Waste Disposal Pit): This permit underwent review and renewal by NMED. The closure plan for this synthetically lined unit was reviewed to confirm that encapsulated waste will not pose long-term risks.
- DP-1843 (Shumway Arroyo Recovery System): This permit underwent review and renewal by NMED. NMED issued two Requests for Additional Information (RAI) to PNM in 2025. The RAIs required submittal of all historical monitoring well locations and data along with installation of new monitoring wells to delineate the extent of contamination and assess the effectiveness of the recovery system. The permit renewal will require a detailed evaluation of hydraulic capture and infrastructure performance (e.g., telemetry, trench stability) performance of the Shumway Arroyo Groundwater Recovery System.

The RAI process provides a formal enforcement mechanism to ensure that groundwater protection measures are functioning and that all contamination sources are fully addressed. Responses from PNM are subject to critical technical review, and permit conditions will be updated accordingly to strengthen performance and closure requirements.

Commitment to Long-Term Oversight

NMED will not terminate or modify any discharge permit until it is clearly demonstrated— through validated data and independent evaluation—that all groundwater quality standards are met for eight consecutive quarters and contaminant sources are remediated. This ongoing oversight is integral to NMED's mission to protect environmental and public health and is being conducted transparently alongside HB-142 implementation and public engagement efforts.

II. Data Gap Assessment

As part of the HB-142 remediation and restoration study, NMED and Jacobs Engineering conducted a comprehensive data gap assessment to determine where critical information is lacking to fully understand environmental conditions at the SJGS. This assessment included extensive reviews of historical groundwater monitoring data, discharge permits, environmental work plans, prior site inspections, and reconnaissance-level field observations. Jacobs completed the *San Juan Generating Station Data Gaps Analysis Report* on June 3, 2025 to detail these findings.

The primary objective of the assessment was to identify where existing data are insufficient to:

- Confirm the extent and sources of groundwater contamination;
- Differentiate between on-site and off-site contamination;
- Evaluate risks to downgradient receptors;
- Develop a science-based, enforceable remediation plan.

Key Data Gaps Identified

- Absence of Background Groundwater Wells: There are no existing monitoring wells upgradient of the site in either the shallow alluvial aquifer or the deeper Pictured Cliffs Sandstone (Kpc) aquifer. Without background data, it is difficult to determine whether detected contaminants are attributable to SJGS operations or natural or off-site sources.
- Limited Soil Data in Process Areas: No soil sampling has been conducted in the former operations and maintenance areas, which were subject to spills, firefighting foam use, coal ash deposition, and surface runoff. The absence of data on VOCs, SVOCs, perfluoroalkyl and poly fluoroalkyl substances (PFAS), and heavy metals in surface and subsurface soils limits the ability to evaluate long-term risks and potential leaching into groundwater.
- Inadequate Groundwater Monitoring for Organics and PFAS: Existing monitoring wells have not been sampled for PFAS, VOCs, or SVOCs, despite the likelihood that these contaminants may be present due to historic plant operations, use of fire suppression systems, and surface discharges.

- Insufficient Downgradient Monitoring at Key Source Areas: Monitoring wells are lacking downgradient of high-risk areas, including the process ponds, South Evaporation Ponds, Raw Water Reservoir, and the Solid Waste Disposal Pit. Some wells are screened only in the shallow zone, without paired deeper wells to evaluate vertical plume migration.
- No Wells South of the Shumway–Westwater Confluence: Groundwater flow models suggest that off-site sources, including adjacent mine activities, may be influencing water quality. However, there are no monitoring wells south of the Shumway Recovery System to evaluate this potential.
- Unclear Groundwater Flow Direction and Capture Efficiency: Data are insufficient to confirm the extent to which the Shumway Arroyo Recovery Trench is hydraulically containing contaminated groundwater. Issues with telemetry and changes in pump configuration have created uncertainty about the effectiveness of the current system.
- No Systematic Data on Nitrogen or Isotopic Signatures: Nitrate concentrations in some wells exceed groundwater standards, but the source (e.g., sewage, fertilizer, combustion-related waste) remains unclear due to the lack of supporting nitrogen isotope analysis.

Planned Actions to Address Data Gaps

- Installation of New Monitoring Wells: Five high-priority locations have been selected for installation of nested monitoring well pairs (shallow alluvial and deeper Kpc zones). These locations are designed to:
- Provide background data
- Capture downgradient conditions at key release points
- Assess off-site migration potential
- Support hydrogeological modeling
- Expanded Groundwater Analysis: All existing and new wells will be sampled for general water chemistry (Table 4), inorganic compounds (Table 5), VOCs, SVOCs, and PFAS (Table 6), and metals (Table 7). Select wells will also be analyzed for nitrogen isotopes to help differentiate sources of elevated nitrate.
- Hydrogeological Modeling and Capture Zone Analysis: The groundwater model will be updated to incorporate new monitoring data and evaluate contaminant fate, transport, and the effectiveness of existing recovery systems.

- Use of Historical Geophysical Survey Data: NMED will evaluate whether previously conducted geophysical surveys (e.g., electrical resistivity, seismic) can be used to improve siting of wells and interpretation of subsurface geology, especially in areas with complex bedrock channels.

Table 4. General water quality analyte list and primary health and environmental impacts.

Contaminant	Detected Range (mg/L)	NMAC Standard (mg/L)
Alkalinity (bicarbonate and carbonate)	N/A	Affects buffering capacity; not directly toxic
Alkalinity, total	N/A	Affects buffering capacity; not directly toxic
Conductivity	N/A	Indicator of salinity; potential mobility of contaminants
TDS	1000	Taste, scaling, ecological stress

Notes:
mg/L – milligrams per liter
NMAC – New Mexico Administrative Code 20.6.2
N/A – Not Applicable
TDS – total dissolved solids

Table 5. Inorganics analyte list and primary health and environmental impacts.

Parameter	NM GW Standard (mg/L)	Impacts
Bromide	N/A	Forms disinfection byproducts in treated water
Chloride	250	Corrosive, taste issues
Cyanide, total	0.2	Respiratory, cardiovascular toxicity

Fluoride	4.0	Dental and skeletal fluorosis
Nitrate + Nitrite (as N)	10	Methemoglobinemia ("blue baby syndrome")
Sulfate	250	Laxative effects; taste and odor problems
TKN	N/A	Nutrient loading; contributes to eutrophication

Notes:
mg/L – milligrams per liter
N – nitrogen
N/A – Not Applicable
TDS – total dissolved solids
TKN – total Kjeldahl nitrogen

Table 6. VOC and SVOC analyte list and primary health and environmental impacts.

Parameter	NM GW Standard (mg/L)	Impacts
PAHs (e.g., benzo(a)pyrene)	0.0002	Carcinogenic; persistent insoil/sediment
Phenols	0.001	Endocrine disruption; taste and odor
SVOCs (e.g., naphthalene, phenols)	Varies	Persistent, bioaccumulative, toxic
VOCs (e.g., TCE)	Varies (e.g., 0.005 (TCE)	Carcinogenic; neurotoxic; volatilization risk

Notes:
mg/L – milligrams per liter
NMAC – New Mexico Administrative Code 20.6.2
N/A – Not Applicable
TCE - trichloroethene
SVOCs – semi-volatile organic compounds

Table 7. Metals analyte list and primary health and environmental impacts.

Parameter	NM GW Standard (mg/L)	Primary Health/Environmental Impacts
Aluminum (Al)	0.2 (secondary)	Affects aquatic life; potential neurotoxic effects
Antimony (Sb)	0.006	Gastrointestinal effects; potential carcinogen
Arsenic (As)	0.01	Carcinogenic; skin, lung, and cardiovascular effects
Barium (Ba)	2.0	Hypertension; effects on kidneys and heart
Beryllium (Be)	0.004	Carcinogenic; respiratory and skeletal toxicity
Boron (B)	N/A	Reproductive and developmental effects
Cadmium (Cd)	0.005	Kidney damage; bone demineralization
Calcium (Ca)	N/A	Generally not harmful; affects hardness of water
Chromium (Cr)	0.1	Carcinogenic; skin and respiratory effects
Cobalt (Co)	N/A	Potential carcinogen; thyroid and cardiovascular effects
Copper (Cu)	1.3 (action level)	Gastrointestinal distress; liver/kidney damage
Iron (Fe)	0.3 (secondary)	Taste, staining, and bacterial growth
Lead (Pb)	0.015 (action level)	Developmental neurotoxicity in children
Magnesium (Mg)	N/A	Affects hardness; laxative effect at high levels
Manganese (Mn)	0.05 (secondary)	Neurological impacts, especially in infants
Mercury (Hg)	0.002	Neurotoxic; developmental harm to fetuses
Molybdenum (Mo)	N/A	Potential liver effects at high levels
Nickel (Ni)	0.1	Skin allergies; possible carcinogen
Potassium (K)	N/A	Typically not toxic in drinking water

Selenium (Se)	0.05	Hair/nail brittleness, nervous system effects
Silver (Ag)	0.05	Argyria (skin discoloration), potential ecological effects
Sodium (Na)	20 (guideline)	Taste; hypertension at very high intake
Strontium (Sr)	N/A	Bone development effects at high levels
Uranium (U)	0.03	Kidney toxicity; radioactive risk
Vanadium (V)	N/A	Potential blood sugar and cholesterol effects
Zinc (Zn)	5.0 (secondary)	Taste and appearance issues

Notes:
mg/L – milligrams per liter
N/A – not applicable

3. Implementation of Actions and Early Findings

I. Historical Records Review and Data Analysis

NMED began its investigation of SJGS by conducting a thorough review of historical data, discharge permits, monitoring results, and site operational records. This review revealed multiple areas of concern. Groundwater monitoring has historically been sparse or inconsistent downgradient of potential release points, including the Shumate Ash Landfill, Arroyo Recharge Basins, and other operational infrastructure. Additionally, there is no baseline or background groundwater quality data for either the shallow alluvial aquifer or the deeper Kirtland shale Pictured Cliff (Kpc) zone, making it difficult to determine the extent of contamination and distinguish site-related impacts from natural conditions. Contaminants of concern identified from historical data include elevated nitrate concentrations, dissolved metals such as arsenic, selenium, and boron, VOCs, and high levels of TDS. These findings are now being integrated into a conceptual site model (CSM) to guide further field investigations and eventual remediation decisions.

II. Installation of New Monitoring Wells

To fill the critical data gaps identified during the records review, Jacobs oversaw the installation of six new monitoring wells at four high-priority locations (Figure 1). Two of the eight planned wells were not installed because no groundwater was encountered while drilling. These wells were constructed as nested pairs, allowing for monitoring in both the shallow alluvial zone and the deeper Kpc unit. The new wells are strategically placed to provide missing background groundwater quality data, assess conditions downgradient of suspected contaminant sources, evaluate the potential for off-site contaminant migration, and support updates to the site's groundwater model. These installations represent a foundational step toward understanding the extent and movement of contamination across the site.

III. Expanded Groundwater Evaluation

In tandem with the well installation, Jacobs conducted an expanded groundwater sampling effort. All new and existing monitoring wells were sampled for a comprehensive suite of parameters. This includes general water chemistry (e.g., pH, conductivity), inorganic constituents (e.g., chloride, sulfate, nitrate), metals, VOCs, semi-volatile organic compounds (SVOCs), and PFAS. Additionally, selected wells were sampled for nitrogen isotopes to help distinguish between natural and site-related nitrate sources. This enhanced sampling program will provide a more complete picture of site conditions and support effective decision-making around cleanup and long-term monitoring.

IV. Conceptual Site Model

As part of the ongoing investigation at the SJGS, NMED developed a comprehensive CSM. The CSM serves as a living framework that integrates available data to characterize site conditions, identify contaminant sources and pathways, and inform decision-making around monitoring, modeling, and remediation. This model is central to understanding how contaminants may have been released, how they move through the environment, and where they pose potential risks to human health and groundwater resources.

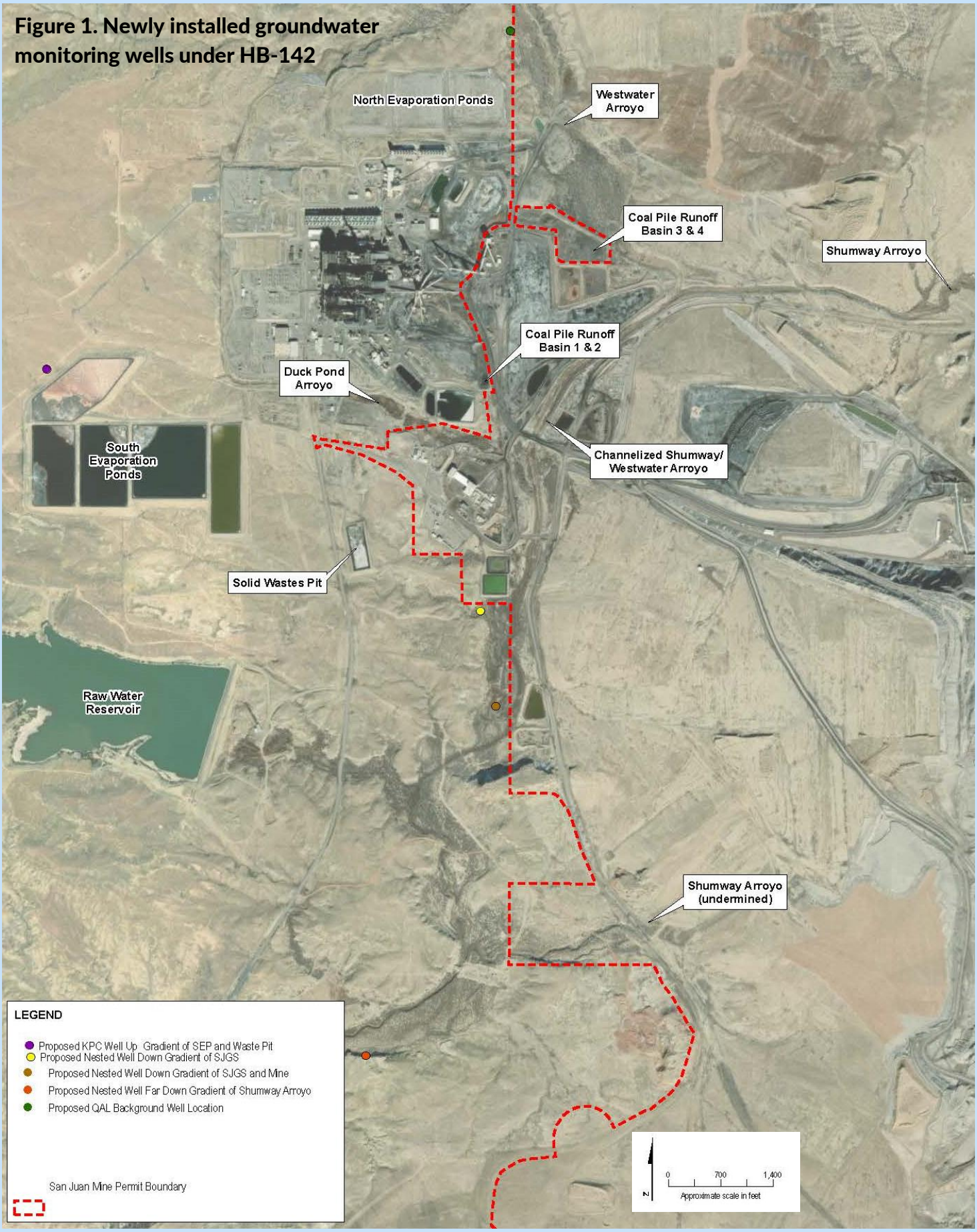
The CSM was built using a phased approach. Initial inputs include historical records, site operations data, discharge permit histories, and results from previous and current groundwater and soil sampling efforts. These inputs are being synthesized to delineate source areas—such as the Shumate Ash Landfill and Arroyo Recharge Basins—and toestablish a preliminary understanding of groundwater flow through both the shallow alluvial and deeper Kirtland shale (Kpc) zones. The model also maps known and suspected release points, surface and subsurface features, and downgradient receptor locations, which are essential for identifying data gaps and refining the placement of monitoring wells.

As field work continues, the CSM will evolve to incorporate new findings from the expanded sampling program, nitrogen isotope analyses, and updated hydrogeological modeling. It will be used to evaluate potential off-site migration of contaminants, assess the effectiveness of recovery systems, and guide future corrective actions. The development of the CSM is a critical step toward ensuring a complete understanding of site dynamics and establishing a strong technical foundation for long-term environmental protection and accountability.

v. Hydrogeological Modeling and Analysis

As new data became available, NMED updated the site-wide groundwater flow model. This updated model incorporates both historical and newly collected information to improve understanding of groundwater movement and contaminated transport. It also supports a revised capture zone analysis to evaluate how well current recovery systems are performing and identify areas where improvements or additional actions may be needed. This modeling work is key to ensuring that remediation strategies are based on the best available science and tailored to site-specific hydrogeological conditions.

Figure 1. Newly installed groundwater monitoring wells under HB-142



4. Public Involvement

NMED is committed to meaningful public involvement throughout the environmental assessment and remediation process for the SJGS. Recognizing the critical role community input plays in ensuring comprehensive environmental protection, NMED has proactively facilitated opportunities for citizen engagement and input. Through the development of Public Involvement Plans for the associated DPs and site-wide assessment for the facility, NMED identified five Chapter Governments of the Navajo Nation who are contacted directly via email, as well as the Executive Director of the Navajo Nation EPA, Director of the Southern Ute Indian Tribe, and the contacts maintained by the Indian Affairs Department.

An initial in-person public meeting was held on February 12, 2025, providing an update on the ongoing progress of the data gap assessment, environmental investigations, and planning for site remediation. The meeting served as a platform to directly engage with community members, communicate current findings, and actively solicit community questions, feedback, and concerns. Meeting materials and informational handouts were provided to attendees and remain accessible online via NMED's public resource portal at: February 12, 2025 Meeting Handout. Attendees included property owners in the area and representatives from the Tó Nizhóní Ání nonprofit organization and the Ute Mountain Ute Tribe.

Since the February meeting, NMED has carefully reviewed and addressed public comments received through May 12, 2025. Formal responses to these comments are documented and publicly available online, demonstrating transparency and accountability regarding community concerns. Responses can be accessed at the following link: Public Comments Response Document (May 12, 2025).

Community feedback obtained through these public engagement efforts directly informs NMED's decisions and the development of the final investigation and remediation plans. NMED remains dedicated to incorporating local perspectives, addressing community concerns proactively, and ensuring transparency throughout the ongoing environmental management and closure process at SJGS.

I. Public Comment Summary

Since the February meeting, NMED has carefully reviewed and addressed public comments received through May 12, 2025. Formal responses to these comments are documented and publicly available online, demonstrating transparency and accountability regarding community concerns. Responses can be accessed at the following link: Public Comments Response Document (May 12, 2025).

Transparency and Accountability: Community members emphasized the need for transparency throughout the investigation and remediation process. NMED committed to regular updates and will submit a formal report to the Legislature by July 1, 2025, per HB- 142.

Regulatory Authority and Enforcement: The public asked whether NMED has the legal authority to enforce cleanup. NMED affirmed its authority under the WQA, 20.6.2 NMAC, and HB-142, and confirmed that PNM is legally responsible for contamination cleanup until all standards are met.

Contamination Scope and Remediation: Concerns were raised about the extent of groundwater and soil contamination and whether demolition would interfere with cleanup. NMED is conducting a site-wide assessment of both groundwater and soil to determine sources and extent of contamination. Demolition is being monitored to prevent interference.

Future Site Use: Community members asked whether the site will be used for future development. NMED stated that no future use plans have been submitted or evaluated. The focus remains on remediation and compliance.

Funding Responsibility: Several comments questioned why state funds (via HB-142) are being used instead of requiring PNM to pay for all work. NMED clarified that PNM is responsible for cleanup under its permits, while HB-142 provides an independent state-led investigation to verify and strengthen enforcement.

Monitoring Wells and Data Gaps: Questions were raised about whether new monitoring wells would be drilled and who would pay. NMED confirmed that new wells are necessary. Some will be funded by HB-142, others are the responsibility of PNM under discharge permits. This dual approach ensures comprehensive site understanding.

Relationship Between Permits and Consent Decree: Public requested clarification on how DP-1327, DP-1843, and the Consent Decree intersect with HB-142. NMED is using both the permit framework and HB-142 to hold PNM accountable and to ensure all contamination is addressed before closure.

Land Contamination: Concern was expressed about contamination of land in addition to groundwater. NMED is assessing soil contamination and how it may contribute to groundwater impacts, using both historical data and new sampling.

Underground Infrastructure: Community questions focused on whether buried pipes and older infrastructure are being considered. NMED is evaluating pipes, trenches, and impoundments as part of the contamination source review. Groundwater and soil sampling are being used to detect past leaks.

Financial Assurance: Concern was raised about financial accountability if cleanup obligations are not fulfilled. NMED confirmed that a $45.96 million surety bond is in place for DP-1327 and DP-306. Future updates to DP-1843 will include financial assurance requirements.

Long-Term Monitoring and Closure: Community members asked about post-closure monitoring. NMED will require long-term groundwater monitoring and will only approve closure once all contamination is remediated and groundwater standards are met.

Independent vs. Permit-Driven Studies: Concern was expressed about whether PNM's own studies can be trusted. NMED is independently verifying data through the HB-142-funded study, while still requiring PNM to fulfill all regulatory and remediation obligations.

Access to Information: Public asked whether study documents will be made available. NMED confirmed that public-facing documents are posted at: https://www.env.nm.gov/gwqb/gwqb-sites-of-interest/

5. Timeline of Selected Activities

Activity	Date
Public Meeting #1	February 12, 2025
Public comment period	February 12, 2025 – May 12, 2025
NMED contracted with Jacobs Engineering	October 15, 2024
Data Gap Analysis Report completion	June 3, 2025
Drill rig mobilization	May 28, 2025
Monitoring well completion	June 9, 2025
Preliminary Hydrogeologic Model	June 30, 2025
Requirement to enter abatement per 20.6.2 NMAC and the WQA	August 2025 (Estimated)
PNM submittal of Stage 1 Abatement Plan proposal to NMED	Within 60 days of receipt of written notice; up to 120 days for good cause shown*
NMED News Release	Within 30 days of receipt of Stage 1 Abatement Plan proposal*
NMED approval or notification of deficiencies of the Stage 1 proposal	Within 60 days of receipt *
* All timeframes are defined in 20.6.2 NMAC	

6. Spending Summary – NMED HB-142 Activities

The General Appropriation Act of 2023 included $860,000 in funding that is available through Fiscal Year 2027.

Spending through June 27, 2025	
Personnel & Benefits	$ 214,096.18
Contractual (Data Gap Assessment; preliminary Phase II Environmental Site Assessment planning)	$ 55,651.88
Contractual (preliminary Phase II Environmental Site Assessment; hydrogeology model development)*	$ 400,000.00 (estimated)
Travel	$ 748.00

** Contractual costs for preliminary Phase II Environmental Site Assessment (monitoring well installation and ground water sampling) not billed as of June 27, 2025, estimated cost provided.*

Total estimated expenditure through June 19, 2025: $ 670,496.06

Total estimated funds remaining: $ 189,503.94

- Remaining funds to be used for Personnel & Benefits (NMED regulatory oversight of Discharge Permits and abatement activities) and Contractual (continued development of hydrogeology model).