UPDATED

Draft

Regional Groundwater Assessment of Impacts from Historic Releases of the NECR Mine and UNC Mill Facilities

Navajo Nation

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EPA has updated the 2011 *draft Regional Groundwater Assessment of Impacts from Historic Releases of the NECR Mine and UNC Mill Facilities Navajo Nation* to include recently collected data and to replace a table in the original report that had incorrect units.

The updated report includes:

1. The 2011 report, in its entirety.

2. Revised Table 3. *Summary of Groundwater Sampling Results*. The revised table , replaced in the original report, corrects unit error in original table and incorporates data from water samples collected in the summer of 2022 from five wells around the UNC Mill/NECR Mine and Quivira Mine Sites.

3. Lab Data results from water samples collected in the summer of 2022. The lab reports are included in Attachment A.

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Acronyms and Abbreviations

a.k.a.	also know as
bgs	below ground surface
CDC	Center for Disease Control
CRUMP	Church Rock Uranium Monitoring Project
DO	dissolved oxygen
EE/CA	Engineering Evaluation/Cost Analysis
ERRG	Engineering/Remediation Resources Group, Inc.
HASL	Health and Safety Laboratory
MCL	Maximum Contaminant Limit
NECR	Northeast Church Rock Mine
NMEID	New Mexico Environmental Improvement Division
NNEPA	Navajo Nation Environmental Protection Agency
NPDES	National Pollution Discharge Elimination System
NRC	Nuclear Regulatory Commission
NURE	National Uranium Resource Evaluation Program
ORP	oxygen/reduction potential
TDS	total dissolve solids
UNC	United Nuclear Corporation
US EPA	U.S. Environmental Protection Agency
USGS	United States Geological Survey
ft^3	cubic feet
gpm	gallons per minute
mg/L	milligrams per liter
µg/L	micrograms per liter
pCi/L	picoCuries per liter

Section 1. Introduction

The purpose of this report is to summarize the impacts to groundwater due to historical mining and milling activities of the Northeast Church Rock, and the United Nuclear Corporation (UNC) Mill in the Church Rock area of the Navajo Nation.

The United States Environmental Protection Agency (US EPA) issued the "Engineering Evaluation/Cost Analysis, Northeast Church Rock (NECR) Mine Site, Gallup, New Mexico" (EE/CA) on May 30, 2009, which presented its preferred remedy for clean-up of waste material from the NECR Mine Site. The preferred remedy included excavation of approximately 871,000 cubic yards of waste material and placement in a disposal cell to be constructed on the United Nuclear Corporation (UNC) Mill Site tailings disposal cells located approximately 0.5 miles southeast of the NECR mine. The EE/CA specifically stated:

> "The scope of this EE/CA is to present alternatives for surface and near-surface soil removal actions only. A detailed groundwater characterization has not been performed at the NECR mine facility to date."

US EPA received numerous comments expressing concern that the EE/CA did not address groundwater. The local community and the Navajo Nation requested that further evaluation and understanding of the area-wide impacts to groundwater from local mining activities be conducted prior to the NECR surface soil cleanup. This groundwater assessment was conducted in response to the local community and the Navajo Nation's request to evaluate the potential groundwater impacts.

To determine aquifers that were likely to be impacted, this assessment analyzed the historic releases from the NECR mine and UNC mill sites, and the groundwater flow direction. Historical well data was reviewed to determine which wells were screened in potentially impacted aquifers, followed by review of historical and current groundwater chemistry data from representative wells.

The historical sources of potential groundwater contamination analyzed in this report include mine water discharges from the NECR and Quivira Mines, the 1979 spill due to the dam failure at the UNC Mill Site, ponding at the NECR Mine Site, historical seepage from the mill tailings, the dewatering of the Westwater Canyon Formation during mining operations and the placement of waste rock back into the Westwater Canyon Formation. The three local aquifers impacted by these releases include the Alluvium aquifer along the Rio Puerco, the Upper Gallup aquifer, and the Westwater Canyon aquifer. The historical releases from the mill cell tailings are the subject of a current investigation and enforcement action of US EPA Region 6.

Similarly, this report references and discusses the findings and conclusions of several other historical reports that examined the effects of releases of the mine water discharge and 1979 spill on the soils and groundwater along the Rio Puerco. However, this report focuses only on regional groundwater impacts of mining and milling in the local area.

Section 2. Geology

2.1. SAN JUAN BASIN GEOLOGY

The prominent geologic feature in northwestern New Mexico is the San Juan Basin, which encompasses over 26,000 square miles extending into southwestern Colorado (Figure 1). The central portion of the basin is a circular, bowl-shaped depression containing sedimentary rocks up to 14,400 feet thick and ranging in age from approximately 2 million to 570 million years old. The uplifted, folded, and faulted rocks of the adjacent mountain ranges define the margins of the San Juan Basin. (Brister and Hoffman, 2002).

The geologic description of the San Juan Basin was developed through observations of the subsurface rock outcrops at the basin margins and from wells and mines within the basin. The northern margin of the basin is defined by the San Juan uplift, La Plata Mountains, and Sleeping Ute Mountain of southern Colorado (Figure 1). The western margin is defined by the Carrizo and Chuska Mountains and the Defiance uplift (monocline). The southern margin of the San Juan Basin is defined by the Zuni Mountains (a result of the Zuni uplift), and the southeastern margin by the Lucero uplift and Ignacio monocline. The eastern margin is defined by the Nacimiento Mountains (uplift) and the Gallina-Archuleta arch. The mountains and highlands at the margins of the basin receive most of the rainfall and have more vegetation than the semiarid San Juan Basin (Brister and Hoffman, 2002).

Following the west, north, and east margins is the Hogback monocline, whose rocks dip steeply into the basin. Following the southern margin is the Chaco slope, a gently dipping platform with upper elevations approximately 2,500 feet above the central basin (Brister and Hoffman, 2002).

The basin terrain consists of mesas, canyons, and valleys eroded from nearly flat-lying Upper Cretaceous and Tertiary (approximately 95 to 2 million years ago) sedimentary rock units. In the early Paleocene epoch (approximately 65 million years ago), the mountains and hogbacks that define the basin boundary began to form (Brister and Hoffman, 2002).

The NECR mine is located on the Chaco slope adjacent to the Zuni uplift.

2.1.1. San Juan Basin Stratigraphy in the Zuni Uplift

The layers of sedimentary rock in the San Juan Basin slope down (dip) toward the center of the basin from the highlands at the margins. Older sedimentary rocks are exposed at the margins of the basin and are successively overlain by younger layers of rock toward the center, “similar to a set of nested bowls” (Figure 2) (Brister and Hoffman, 2002).

The oldest rocks in the San Juan Basin are the Precambrian basement rocks (approximately 1,500 to 1,750 million years old), which underlie all of the sedimentary rocks within the basin. Outcrops of the Precambrian rocks appear in uplifts along the basin margins, including the Nacimiento Mountains, the Zuni uplift, and the San Juan uplift in Colorado. Common Precambrian rock types in the area are Granite and quartzite (Brister and Hoffman, 2002).

Sedimentary deposition occurred in the San Juan Basin from the Pennsylvanian through Tertiary periods (from approximately 330 to 2 million years ago) when the basin went through cycles of marine, coastal, and nonmarine deposition. The Pennsylvanian and Permian formations (approximately 330 to 240 million years ago) also outcrop in the uplifts at the basin margins, prominently in the Zuni uplift east of Gallup. The Pennsylvanian and Permian rocks are marine and composed predominantly of limestone, shale, sandstone, and gypsum; and are fractured ground-water aquifers in the Zuni uplift region (Brister and Hoffman, 2002).

The Pennsylvanian and Permian rocks are overlain by nonmarine Triassic rocks (approximately 240 million years old) including sandstone, siltstone, and mudstone of the Chinle Group and the Rock Point Formation. These nonmarine deposits occurred mainly from rivers and streams that flowed into the area from the southeast (Brister and Hoffman, 2002).

This period of nonmarine deposition was followed by windblown sand dunes approximately 170 million years ago. These dunes were preserved as cross bedded layers of sand in the Middle Jurassic Entrada Sandstone (Brister and Hoffman, 2002).

During the Late Jurassic period (approximately 145 million years ago), stream-laid sands were deposited throughout the basin creating the Morrison Formation. The United States Geological Survey (USGS) recognizes four members of the Morrison Formation in the southern margin of the San Juan Basin (aka Grants uranium district): the Recapture Member (oldest), the Westwater Canyon Member, the Brushy Basin Member, and the Jackpile Sandstone Member (youngest). The Recapture Member is a grayish-red siltstone and claystone. The Westwater Canyon Member overlies the Recapture Member and consists principally of medium- to coarse-grained, arkosic sandstones interbedded with mudstone units of variable thicknesses. It is approximately 270 feet thick in NECR mine. The Brushy Basin Member overlies the Westwater Canyon member, is approximately 70 feet thick, and consists of mudstone formed from volcanic ash falls. The Jackpile Sandstone Member is the uppermost fluvial sandstone in the formation, and does not appear in the NECR area (Roca Honda Resources, 2009). The Morrison is one of several well-known uranium-bearing rock units in the mining districts along the southern flank of the basin (Brister and Hoffman, 2002).

The Late Jurassic period was followed by approximately 50 million years of no deposition and erosion, and no sediments were preserved in the San Juan Basin during the Early Cretaceous period (Brister and Hoffman, 2002).

The western U.S. was bisected by a large interior seaway during the Late Cretaceous (approximately 95 to 65 million years ago), which had a northwest-to-southeast-trending shoreline in northwest New Mexico. The shoreline migrated back and forth (northeastward and southwestward) across the basin, depositing approximately 6,500 feet of marine, coastal plain, and nonmarine sediments. The back and forth migration of the shoreline across the basin shifted the depositional environment from nonmarine to marine (transgression), and back to nonmarine (regression), until the seaway retreated from the basin and nonmarine deposits dominated the area at the end of the Cretaceous. The marine deposits in the area consist of sandstone, shale, and a few thin limestone beds; the coastal plain deposits include sandstone, mudstone, and coal; and nonmarine deposits include mudstone, sandstone, and conglomerate (Brister and Hoffman, 2002).

The transgression/regression sequence was repeated throughout the Late Cretaceous period and was preserved in the formations in the San Juan Basin. The Late Cretaceous rocks include the following units from the oldest to the youngest: the Dakota Sandstone, the Mancos Shale, the Mesa Verde Group (which includes the Gallup Sandstone, the Crevasse Canyon Formation, and the Point Lookout Sandstone), the Menefee Formation, the Cliffhouse Sandstone, the Lewis Shale, the Pictured Cliffs Sandstone, the Fruitland Formation, and the Kirtland Shale (Brister and Hoffman, 2002). The youngest rock outcrops in the NECR area are from the Mesa Verde Group (Canonie, 1988).

The Dakota Formation dates from the Late Cretaceous and consists of fine to medium grained, well sorted sandstone with siltstone and shale interbeds (Hilpert, 1963). The Formation is about 100 feet thick in the NECR mine (Canonie, 1988).

The Mancos Shale Formation dates from the Late Cretaceous and consists of three Members. The lowermost (oldest) Whitewater Arroyo Shale Member is about 60 feet thick, the middle Two Wells Sandstone Member is about 50 feet thick and the uppermost Mancos Shale Member is about 700 feet (Hilpert, 1963 and Canonie, 1988). The upper 200 feet of the Mancos Shale is interbedded with the lower Gallup sandstone of the Mesa Verde Group (Canonie, 1988).

In the NECR Mine, the Gallup formation occurs as the Lower Gallup Sandstone and the Upper Gallup Sandstone with the Lower Gallup Sandstone interbedded in the upper portion of the Mancos Shale (Figure 3 and Figure 4). The lower Gallup Sandstone is approximately 160 feet thick and the Upper Gallup Sandstone is approximately 150 feet thick. The Crevasse Canyon Formation overlies the Gallup Formation and includes the Dilco Coal Member, the Mulato Tongue, and the Dalton Sandstone Member. The basal unit of the Crevasse Canyon Formation is the Dilco Coal Member, which is approximately 100 feet thick and consists of interbedded sandstone, siltstone, shale and coal beds. The Mulatto Tongue is actually a member of the Mancos Shale but occurs between the Dilco Coal Member and the Dalton Sandstone in the Church Rock area and is included in the Crevasse Formation locally. The Mulatto Tongue consists of shale, siltstone, and marine sandstone and is approximately 70 feet thick. The Dalton Sandstone Member is above the Mulatto Shale and is approximately 90 feet thick at the top of the NECR

Mine. The Dalton Sandstone is a light gray very fine grained to fine grained marine sandstone. The Dalton Sandstone comprises the surface rocks at the NECR Mine (Canonie, 1988, and Brister and Hoffman, 2002) The Dalton Sandstone is non-producing formation in the vicinity of NECR, and as a consequence, there are no wells drawing from that formation.

Nonmarine deposition in stream channels, floodplains, lakes, and windblown sands were the dominant forms of sediments in the San Juan Basin from the end of the Cretaceous through the Tertiary (approximately 65 to 2 million years ago). These deposits are found primarily in the central basin area away from the margins (Brister and Hoffman, 2002).

2.2. HYDROGEOLOGY

There are two main sources of sources of water in the Churchrock area: surface water and groundwater.

2.2.1. Surface Water

Average annual precipitation in the area is approximately 12 to 16 inches and generally occurs as localized, short-duration, high-intensity thunderstorms from July to October causing streams in the area to be primarily ephemeral (EPA, 2007c). Water records from 1948 through 1962 indicate the annual evaporation rate is nearly 5 times the precipitation rate, which means more water is lost to the atmosphere than is absorbed by the ground, creating a semi-arid climate. Native vegetation consists of grasses, shrubs and trees, but is generally sparse in the region and provides minimal protection from surface erosion (Stone, 1981).

The dry conditions and high intensity rains cause the surface soils to quickly saturate and prevent precipitation from penetrating deeper below the ground surface and much of the rain fall in the canyons washes over the ground surface. During periods of increased precipitation the discharge rate in the streams increases allowing more sediment to be suspended in the river. Short-term, fast moving streams and arroyos are produced that cut-through the bedrock in the canyons and washes, carrying the sediments downstream, and depositing them as alluvium. Drainage ways and washes in the area tend to be long rectilinear channels following the direction of local fracture zones, suggesting influence from the underlying bedrock and regional uplift. This stream pattern is especially apparent where channels cross the Upper Gallup Sandstone (USGS, 1994).

The alluvium in the canyons and on valley floors consists of fine grained sand inter-fingered with silty clay layers deposited from eroded bedrock material. The alluvium directly overlies sedimentary bedrock in the Puerco River basin and aids in transferring surface water through the shallow groundwater zone in the alluvium to the deeper bedrock aquifers (Figure 5). The water table elevation in the area remains relatively constant through the year allowing the river channel to act as a zone of recharge, losing water downward through sediments when water is flowing in the river, and as zone of evaporation when water is not actively flowing in the channel (USGS, 1994). When surface water is present near the NECR mine, the flow direction is from northwest to southeast along unnamed arroyos and into the northeast- to southwest-trending Pipeline arroyo.

2.2.2. Groundwater

The sandstone units in and near the NECR mine and the UNC Mill area mine overlying the basement faults show passive bending or draping as evidenced by fracturing in the sedimentary rock layers. The fracturing increases near the hinge of the folds over the basement faulting. Recharge for the aquifers primarily occurs where the water bearing strata are exposed at the ground surface or where they are in direct contact with potentially saturated alluvial deposits. The ability of the sandstone units to capture water increases as it is weathered from exposure, fractured from faulting, or chemically altered through dissolution. The main water bearing strata in the NECR mine and the UNC Mill area, from shallowest to deepest, are the alluvial deposits, the Upper Gallup Sandstone, the Lower Gallup Sandstones, and the Westwater Canyon Sandstone (Raymondi, R. & Conrad, R., 1983). Because of the northward dip of the rock units, each of these strata outcrop along the Pipeline Arroyo and the North Fork of the Puerco River with the deeper units appearing further south. The rock outcrops comprise a narrow east-to-west belt that forms the southern outline of the San Juan Basin along the north side of the Zuni Uplift. The narrow exposures dip northward locally from 3 to 30 degrees, and occur at elevations of approximately 6,500 feet above mean sea level. As stated previously, rainfall infiltrates into the shallow subsurface and become the alluvium groundwater moving southwesterly with the ground surface contours. Groundwater is transmitted to the underlying water bearing strata where the alluvium comes in contact. Once in the water bearing strata, the groundwater flows northward following the regional dip in the area (Kerr-McGee Corporation, 1976). A piezometric surface map for the Upper Gallup Sandstone shows a northeast flow direction following the regional dip in the area of the NECR Mines (EPA, 2010). Regional dip at the east end and south of the Zuni Uplift becomes nearly level and may not have much effect on groundwater flow direction (Stone, 1981).

Prior to mine dewatering a continuous shallow groundwater system in the alluvium was not likely present in Pipeline Arroyo area. The alluvium in the Pipeline canyon became saturated and generated an artificial groundwater system once dewatering of the mine began.

Measurements and calculations conducted by the USGS on water flowing in the Pipeline Arroyo from March through June 1981 estimated a daily water loss of 47,500 cubic feet (ft^3) of water per day. The areas of loss were evapotranspiration (5,000 ft^3/day), alluvial underflow (4,000 ft^3/day), absorbed by the Upper Gallup Sandstone[i] (32,000 ft^3/day), and absorbed by the Torrivio Sandstone[1] and Dilco Coal

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[1] Raymondi and Conrad identified the Torrivio Sandstone Member as located just above the Upper Gallup Sandstone Member; however, subsequent geologic review of drilling logs and fieldwork found the Torrivio Sandstone Member cannot be distinguished from the underlying Upper Gallup Sandstone Member. This groundwater assessment report includes the Former Torrivio Sandstone Member as part of the Upper Gallup Sandstone Member.

Members (6,500 ft^3/day) (Raymondi, R. & Conrad, R., 1983). The amount was approximately 7% of the total flow in the arroyo and indicates substantial recharge occurred from surface precipitation along fractured sections of the bedrock.

According to a study conducted by Canonie, the alluvium sandstone layers within the Upper Gallup Sandstone Member are in direct contact with the tailings or tailings seepage. Figure 5 provides a conceptual model of how surface water and tailings can be transported to the shallow and deep aquifers in the region.

Section 3. Potential Location of Mining Impact

3.1. MINING HISTORY IN THE CHURCHROCK AREA

Uranium was mined near Church Rock from the 1950's until 1962, and to a greater extent from 1967 to 1986. The NECR Mine and the Quivira Mine (a.k.a. Kerr-McGee Mine) mined uranium ore form the Westwater Canyon member of the Morrison Formation from shafts between 1500 and 2000 feet below ground surface (bgs). Because the ore body was located below the groundwater table; large quantities of groundwater had to be pumped from the shafts to allow access to the ore. Prior to the mining and milling activities, no near-surface ground water system existed in the site area. During mining operations the Pipeline Arroyo had a steady flow of water from the mine water discharge.

Initially, mine water pumped from the shafts and mining works was discharged directly into an unnamed arroyo that feed into the Pipeline arroyo. In 1973, UNC applied for a National Pollution Discharge Elimination System (NPDES) permit for NECR Mine and in 1974, Kerr-McGee applied for the Quivira Mine. The permits granted effective January 1975, set the maximum uranium concentration of 2 milligrams per liter (mg/L) and dissolved radium-226 at 30 picocuries per liter (pCi/L). The dissolved radium-226 standard was subsequently lowered in 1977 to 3.3 pCi/L. Both mines used settling ponds followed by ion-exchange to meet the NPDES permit requirements. There were numerous daily exceedences during the mine discharge permit period. The USGS estimates that over the period of operations of the mines, a total of approximately 600 tons of uranium were released into the Pipeline Arroyo/Rio Puerco from the mine water discharges alone. The NECR mine ceased operations in 1982 and the Quivira Mine in 1986.

The mill facility at UNC was licensed to operate in May 1977. The mill used conventional acid leach, solvent extraction methods to extract uranium. The acid-waste tailings mix was pumped to three disposal cells located adjacent to the Pipeline Arroyo. Acidic waste water seeped into two underlying Gallup sandstone formations and the Alluvium material underneath the Pipeline Arroyo.

In July 1979, the dam on the south disposal cell failed and an estimated 94 million gallons and 18,000 tons of suspended solids were released into the Pipeline Arroyo, and ultimately in the Rio Puerco. Details of the release are presented in Section 4.2 Uranium Mine Releases.

In May 1982, the UNC Mill site was closed and in 1987, UNC submitted a reclamation plan for permanent closure to the Nuclear Regulatory Commission (NRC). A final Reclamation Plan was approved in 1991, which included dewatering of Borrow Pit #2, regrading and recontouring the tailings piles, dismantling the Mill buildings and equipment, and placing them in Borrow Pit #1 in compacted layers. A soil and rock cover was placed over the 100 acre tailings disposal cells. The final element for closure is groundwater corrective action program that is ongoing.

3.2. URANIUM MINE/MILL RELEASES

The releases that occurred as a result of uranium mining at NECR: mine water discharges from the NECR and Quivira Mines, the 1979 spill due to the dam failure at the UNC Mill Site, ponding at the NECR Mine Site, and historical seepage from the mill tailings cells. In addition, the dewatering during mining operation and the placement of waste rock back into the ore body may have impacted the Westwater Canyon formation. (Figure 6).

The largest historic release associated with mining in the area was the discharge of groundwater pumped from the uranium mines. Because the ore deposits were below the water table, groundwater was pumped from the mine workings to allow access to the ore bodies, tunnels, and shafts during operations. At its peak, mine water from NECR and neighboring Quivira Mine was discharged at 5,000 gallons per minute (gpm) to the unnamed arroyo which fed into the Pipeline Arroyo (Figure 7). Mine discharges began in 1967 but were not treated until after 1975 under an NPDES permit. The USGS estimates that approximately 140 million cubic meters of mine water discharge (37 billion gallons) and 600 tons of uranium was released into the Pipeline Arroyo/Rio Puerco from the discharges conducted from 1967 through 1985 when the UNC mining operations ceased.

In 1979, a catastrophic release occurred when the dam on the south tailings disposal cell at the UNC Mill facility failed and approximately 94 million gallons of acidic mine tailings were released into the Pipeline Arroyo. The release increased flows in the Rio Puerco and carried mine tailings as far as 80 miles downstream into the State of Arizona. The release left deposits of tailings sludge along the Pipeline Arroyo which contained radioactive thorium, uranium and other metals. Under oversight of the State of New Mexico (NMEID), UNC conducted a cleanup of tailings containing high levels of thorium-230 along approximately 8 miles on the Pipeline Arroyo and Rio Puerco downstream of the spill. Sediment samples collected after the cleanup indicated that most Thorium-230 levels were below NMEID standards. A comprehensive human health assessment of the spill was conducted by NMEID, NRC, and US EPA, and included water samples, sediment samples, air monitoring, and human and animal tissue analyses. The study found increased levels of radionuclides, specifically uranium, in animal tissue and bone radioactivity, although the high levels could not be directly associated with the 1979 spill, but may have been associated with the mine water discharges (Centers for Disease Control [CDC], 1980).

A sustained release in the form of seepage from the tailings disposal cells occurred, when UNC discharged an estimated 820 million gallons of acidic mine water and sludge into unlined tailings disposal cells located adjacent to the Pipeline Arroyo. Of the estimated 820 million discharged, an estimated 380 million gallons were lost to evaporation during this period and 94 million gallons were lost in the dam failure, leaving approximately 346 million gallons that seeped into the underlying formations or were retained in the tailings sludge. Whenever possible during closure of the tailings disposal cells, UNC removed excess liquid and mixed lime into the disposal pits in an attempt to neutralize the remaining acidic material. The Closure Report for the Mine Site stated that the tailings were no longer discharging into the underlying units. The contamination associated with the historic release is being cleaned up by UNC with oversight by US EPA Region 6 (UNC, 2011).

In response to a concern about the continued movement of the groundwater plumes, UNC conducted an assessment of the tailings to determine if contaminated liquids were still seeping into the formation aquifers below the site in 2004. The study included installation of piezometers near the former borrow area that had been the original source of acid seepage. Based on the field work and evaluation of historic data, the report concluded that the disposal cells had in fact stopped leaching to the aquifers. In 2011, in response to a request by US EPA, UNC modeled the saturation rate in the tailings over time and concluded that saturation exists in locations but the fluid is bound into the soil matrix.

There were also ponds on the NECR Mill site as part of the NPDES treatment process. The mine water pumped from the Westwater Canyon Formation was held for settlement prior to treatment and discharge into the Unnamed Arroyo. Theoretically, mine water could seep into the underlying formation that is located at the surface. The formation that outcrops at the NECR Mine is the Dalton sandstone which is a non-producing formation in the area.

The mining of uranium ore in the Westwater Canyon Formation at NECR involved sinking a shaft to the ore zone and dewatering since the ore resided below the top of the water table elevation. The dewatering, open shaft, tunnels, and stopes introduced air into the rock layers that were previously saturated. Opening of the underground through dewatering and exposure to air caused the geochemical setting to change from a reducing environment to an oxidizing environment. . After mining ended, the groundwater has been re-saturating the ore zones that were dewatered. The re-saturation is likely to have occurred slowly, but it would still trap some air that likely entered the ground water as dissolved oxygen. It would likely take a period before the geochemical condition of the ground water will change from an oxidizing to a reducing environment again. The oxidizing environment is more conducive to uranium solubilization and mobilization. At the end of mining and the beginning of closure, some parts of the NECR Mine were filled with washed tailings sands from the UNC mill using a slurry mixture that was pumped from the surface and down into the mine. After backfilling was completed, the NECR Mine was closed and sealed.

Section 4. Conceptual Model

Major releases uranium, radium and gross alpha that occurred in the NECR area are dewatering of the mine and discharges of mine water in to the unnamed Arroyo, catastrophic release from the tailings disposal cells, and seepage to the subsurface from water in the tailings disposal cells. These releases are discussed in more detail in Section 3.2. To assess the impact of all historic releases, wells that may have been impacted by the releases were selected. The wells were selected by reviewing the release, determining the movement of water from the release through in the subsurface, and identifying wells in the pathway.

The mine water discharges and the spill from the 1979 dam breach flowed south-southwesterly along the Pipeline Arroyo and into the Rio Puerco. The water infiltrated into the shallow groundwater unit in the Alluvium. The Alluvium beneath the Pipeline Arroyo is shallow and no wells were drilled in that part of the formation. However, shallow hand dug wells in the Alluvium beneath the Rio Puerco have been used in the area since before mining began.

To a lesser extent, mine water discharges would have also seeped through the Alluvium into the Upper Gallup formation where the Upper Gallup contacts the base of the Alluvium along the Pipeline Arroyo at the UNC Mill site. The Upper Gallup formation was unsaturated in the vicinity of the UNC Mill Site prior to mining operations, but became saturated once mine dewatering began (Canonie, 1988). Once mining operations ceased, the water levels in the Upper Gallup decreased.

Seepage from the tailings disposal cells infiltrated into the Upper Gallup Sandstone where it contacts the base of the Alluvium beneath the tailings disposal cells. Because groundwater flow in the Upper Gallup Sandstone Member is northerly at the UNC mill site, the closest well north of the site screened in the Upper Gallup Sandstone Member was selected for this assessment.

The Dalton Sandstone Member outcrop is present at the NECR Mine site where the historic holding ponds were operated for the NPDES permit compliance treatment before releasing into the Pipeline Arroyo. Theoretically, any seepage from the surface at the NECR Mine site would infiltrate into the Dalton Sandstone; however, the sandstone has been described in several wells logs in the area as dry or non-producing. A review of available well logs for the area at Navajo Nation Division of Natural Resources Department of Water Resources did not find any wells screened across the Dalton Sandstone Member in the vicinity of the site, further indicating that the sandstone does not produce water. The shallowest water producing formation at the NECR Mine site is the Upper Gallup.

The mining operations and subsequent closure may have impacted or altered the Westwater Canyon aquifer in the area of the mine. An oxidation/reduction environment is required for uranium to leach into the groundwater. Dewatering the mine workings and exposing the ore to air may have accelerated oxidation of the uranium ore, and once groundwater was allowed to fill the mine workings when the mine closed operations a larger oxidation/reduction environment may have been created than previously existed. In addition, waste rock from the mining and milling processes was placed in the mines to fill the workings and remove the waste rock from the surface. The waste rock also may have added oxidized and partially processed ore to the subsurface environment also increasing the oxidation/reduction environment in the mine area. Groundwater from the Westwater Canyon formation is used for drinking water up gradient in the aquifer (south of the mine) and near Crownpoint, New Mexico, approximately 40 miles cross gradient. The Westwater Canyon aquifer is too deep in the mine vicinity and wells for assessing water quality are limited to the NECR Mine Well (abandoned in 2004) and Mill Well[2].

Table 2 provides a summary of the rationale in selecting the wells used to assess groundwater quality for this assessment. The five historic releases are listed across the heading and the water bearing units are listed in the first column. If the water bearing unit had a potential impact from a specific release based on water flow in the area, the closest well to that impact was chosen. A review of the well locations in the Alluvium identified two old wells in the Rio Puerco Alluvium immediately down gradient of mouth of the Pipeline Arroyo. These wells would have been the first to see a potential impact from mine water discharges and 1979 spill. Two wells in the Upper Gallup formation north of the UNC Mill site and north of the NECR Mine Site were identified to assess impacts from the UNC Mill tailing seepage and the Mine water discharge historic releases. The UNC Mill well and the abandoned NECR Mine well are the only wells located in the Westwater Canyon aquifer in the area. There are no wells in the Dalton formation.

Figure 8 presents the well locations.

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[2] Documents reviewed indicated that the Mill well is located in the Westwater Canyon member. However, one reference indicates that it might be located in the sandstone above the Westwater Canyon Member: the Dakota Sandstone.

Section 5. Area-wide Groundwater Sampling Events

After mining operations began in the area, several sampling programs were instituted in response to increased community concern regarding the quality of the water for domestic and livestock purposes. This section describes these sampling programs and their findings in the area. Most of the programs were broader in scope than the impact of historic releases at the NECR Mine and the UNC Mill Site, and included wells that are not hydrogeologically connected to these sources.

The chemicals of concern in groundwater in the NECR mine area include radionuclides, TDS, nitrates, and arsenic. The primary contaminants are radium-226, radium-228, uranium, and TDS. The primary risk to human health and the environment from the chemicals of concern is through direct ingestion of contaminated groundwater or ingestion of meat from livestock that have ingested contaminated groundwater. The cleanup criteria for groundwater in the areas are the US EPA maximum contaminant levels (MCLs) for drinking water.

The US EPA established primary and secondary MCLs to protect public health and provide guidelines to state and local enforcement agencies. Primary MCLs are legally enforceable standards that apply to public water systems and were established to protect public health by limiting the levels of contaminants in drinking water. The secondary MCLs are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. The US EPA recommends secondary standards to water systems but does not require systems to comply.

The MCLs for the contaminants of concern for NECR are:

Contaminants	Primary MCL	Secondary MCL
Gross Alpha	15 pCi/L	
Radium-226	not established	not established
Radium-228	not established	not established
Radium-226 + Radium-228	5 pCi/L	
Uranium	30 mg/L	
TDS	not established	500 mg/L
Nitrates	10 mg/L	
Arsenic	10 mg/L	
Sulfate	not established	250 mg/L
pH	Less than 6.5 greater than 8.5	

Water samples have been collected from many unregulated wells and springs throughout the Navajo Nation region under various investigations and programs. From 1977 to 1979, Los Alamos Scientific Laboratory collected samples in the Church Rock area as part of the National Uranium Resource Evaluation Program (NURE) during the hydrogeochemical and stream sediment reconnaissance phase. In July 2002, a water quality sample was collected from a domestic well in the Westwater Canyon Member in the area of the UNC Mill. In 2003 and 2004, Navajo Nation Environmental Protection Agency (NNEPA) collected samples under the Church Rock Uranium Monitoring Project (CRUMP). EPA collected additional samples in the Church Rock area from 2008 through 2010. Because the wells are unregulated sources of water, limited or no information on well development is available and groundwater samples were not collected regularly. Available analytical results summarized below are from limited grab groundwater samples.

5.1. NURE 1977 TO 1979 SAMPLING EVENT

From September 1977 to October 1979, NURE collected thirteen groundwater samples in the Church Rock area from twelve wells. Data from the samples were compiled and transferred to a database by USGS. Ten samples were collected in September 1977; one sample was collected in October 1978; and two samples were collected in October 1979 after the UNC Mill tailings spill in July 1979, including a resample of a well from the 1977 event (EPA, 2009d). Samples are identified in the database with unique identifiers; however, no information is available to correlate the samples with wells from other sampling events or specific aquifers in the area. Sample identification, dates collected, and uranium concentrations are presented below.

Sample ID	Date Collected	Uranium Concentration
1081950	9/20/1977	0.89
1081951	9/20/1977	0.22
1081952	9/20/1977	0.18
1081953	9/20/1977	0.64
1081954	9/20/1977	2.4
1081955	9/20/1977	1.24
1081956	9/20/1977	2.62
1081958	9/20/1977	0.44
1081962	9/20/1977	0.63
1082210	10/01/1978	1.46
1082328 (resample of 1081958)	10/17/1979	0.24
1082365	10/18/1979	0.95
1082366	10/18/1979	1007.4

Uranium concentrations in the samples ranged from 0.17 µg/L to 2.62 µg/L, except for sample 1082366 that had a uranium concentration of 1,007.4 µg/L, which exceeded the MCL of 30 µg/L. Sample 1082366 was collected from the drainage directly across Pipeline Arroyo from the UNC Mill .

5.2. 2002 UNC MILL SAMPLING EVENT

In July 2002, MWH collected a water quality sample from the Westwater Canyon Member in the area of the UNC Mill from a domestic well located in Section 2 of Township 16 north and Range 16 west. Dissolved uranium was detected at a concentration of 70 µg/L, and gross alpha activity was not detected at a level greater than the laboratory reporting limit of 1.0 pCi/L (MWH, 2003).

5.3. CHURCH ROCK URANIUM MONITORING PROJECT 2003 AND 2004 SAMPLING EVENTS

EPA and NNEPA collected water samples near the Church Rock and NECR Mines in October 2003 as part of the CRUMP. The pollutants and water quality parameters included in the analyses were concentrations of arsenic, iron, selenium, sulfate, pH, total hardness, fluoride, chloride, and total dissolved solids. Many of the wells sampled during the CRUMP October 2003 study were deemed unsuitable for human and domestic uses based on water quality parameters of the samples, and various pollutants detected. Thirteen wells were sampled in the area and analyzed for uranium (EPA, 2009):

- Well 14K-313 contained 0.05 µg/L of uranium
- Well 14K-586 contained 3 µg/Lof uranium
- Well 15T-303 (listed as 15K-303) contained 0.69 µg/L of uranium
- Well 16-4-10 contained 69.37 µg/L of uranium
- Well 16K-336 contained 0.57 µg/L of uranium
- Well 16K-340 contained 2.92 µg/L of uranium
- Well 16T-348 contained 0.29 µg/L of uranium
- Well 16T-534 contained 0.15 µg/L of uranium
- Well 16T-559 contained 0.09 µg/L of uranium
- Well 16T-606 contained 6.99 µg/L of uranium
- Well 16T-608 contained 5.76 µg/L of uranium
- Well Grey contained 14.84 µg/L of uranium
- Well Solar contained 0.24 µg/L of uranium

Of the 13 wells sampled during this sampling event, only the groundwater sample collected from well 16-4-10 contained uranium at a concentration greater than the MCL of 30 µg/L. Well 16-4-10 is a shallow well (less than 10 feet) and located approximately 6.5 miles downgradient of the UNC Mill site. It appears to be located in an outcrop of the Morrison Formation along a tributary drainage running northwest into the Rio Puerco.

5.4. EPA 2008 TO 2009 SAMPLING EVENT

EPA collected and analyzed water samples from 2008 to 2009 from the following wells:

- Well 15K-303 contained 0.38 µg/L of uranium
- Well 14T-586 contained 1.5 µg/L of uranium
- Well 14K-313 did not contained uranium at a concentration greater than or equal to the laboratory reporting limit
- Well Grey contained 5.2 µg/L of uranium
- Well 16-4-10 contained 260 µg/L of uranium
- Well 16-3-4 did not contained uranium at a concentration greater than or equal to the laboratory reporting limit
- Well 16T-513 did not contained uranium at a concentration greater than or equal to the laboratory reporting limit
- Becenti Trail Spring contained 110 µg/L of uranium

The uranium concentrations in the samples collected from well 16-4-10 in 2008 and the Becenti Trail Spring in 2009 exceeded the MCL of 30 µg/L. As mentioned earlier, Well 16-4-10 is downstream of the mines; however, it is along a different drainage running northwest into the Rio Puerco and therefore is not influenced by the releases analyzed in this report. Becenti Trail Spring is a shallow water source with an aquifer listed as 231CHNL, the Chinle Formation, although the spring depth does not correlate well with the expected formation depth. The measured depth to water at the Becenti Trail Spring was reported as 12 feet bgs. The spring may be an associated with the same source as Well 16-4-10.

5.5. EPA 2010 SAMPLING EVENT

EPA collected and analyzed water samples from the following wells on October 19, 2010:

- Well 15K-303 had uranium activity of 0.978 pCi/L
- Well 14T-586 had uranium activity of 2.474 pCi/L
- Well Mill Well had uranium activity of 5.604 pCi/L
- Well 16K-336 had uranium activity of 0.743 pCi/L
- Well 16K-340 had uranium activity of 1.812 pCi/L

- Mine Well was not sampled because it had previously been abandoned in place and filled with concrete.

Water from the wells were analyzed in the field for pH, temperature, conductivity, dissolved oxygen (DO), salinity, total dissolved solids (TDS), turbidity, and oxygen reduction potential (ORP). Samples were collected from each of the wells and analyzed for gross alpha, beta, and photon radioactivity by EPA Method 900, radium-226 by EPA Method 903.1, radium-228 by EPA Method 904.0, isotropic uranium by Health and Safety Laboratory (HASL) Method 300 U-01-RC mod, and thorium by HASL Method Th-01-RC mod. All wells met the maximum contaminant level (MCL) for radionuclides in drinking water, except 16K-336 that had a Radium (226 and 228) activity level of 5.78 pCi/L, which is greater than the MCL of 5 pCi/L. Groundwater samples from all wells exceeded the TDS secondary MCL of 500 mg/L. (Secondary MCLs are not health-based and for aesthetic considerations, such as taste, color and odor.) Wells 16K-340, 14K-586, 15T-303 and Mill Well had concentrations of sulfate greater than the secondary MCL of 250 mg/L. Well 16K-336 contained arsenic at a concentration of 11 mg/L, slightly greater than the MCL of 10 mg/L. A summary of the analytical results from the 2010 sampling event are presented in Table 1.

Section 6. Historical Groundwater Data for Select Wells

Water quality data including radionuclides and general chemistry were evaluated for the selected wells identified in Section 4. Table 3 summarizes data from the selected wells. Evaluation of the well data was problematic because:

- very few wells had groundwater data from before mining began,
- samples from different wells were rarely collected concurrently, making comparison of water quality parameters difficult,
- sampling methods and procedures could not be verified for most of the data,
- analytical procedures have modified and become more sensitive since sampling began,
- Infrequent sampling events providing a small data set.

The most recent laboratory analytical data for groundwater indicate that all wells met the federal standard for radionuclides contaminants, except 16K-336 that had a Radium (226 and 228) activity level of 5.78 pCi/L, which is greater than the MCL of 5 pCi/L. Well 16K-336 contained arsenic at a concentration of 11 mg/L, slightly greater than the MCL of 10 mg/L. Groundwater samples from all wells exceeded the Total Dissolved Solids (TDS) secondary MCL of 500 mg/L. Wells 16K-340, 14K-586, 15T-303 and Mill Well had concentrations of sulfate greater than the secondary MCL of 250 mg/L. The secondary MCLs are not health-based but established considering aesthetic qualities such as odor, taste and color. Primarily due to the high TDS concentrations, the water from the wells is considered poor quality for human consumption.

The data show indicates:

Alluvium wells:

- Decreases in the conductivity from >1,330 to 150 and >1,180 to 190
- Decreases in nitrates from 13.02 mg/L to <7 mg/L, and >13.0 mg/L to 5.97 mg/L
- A temporary increase in sulfate followed by decreasing concentrations, to concentrations approximately the same sulfate concentrations from the first sample event pre-mining. (368 mg/L and 118 mg/L)

Gallup Wells:

- Both wells exhibit increases in sulfate from 580.68 mg/L to 1,380 mg/L in well 14K-586 and 520 mg/L to 2,000 mg/L in well 15T-303.

Westwater Canyon:

- The Mill Well exhibited a decrease in uranium concentrations from 65 mg/L in 1984 to 3 mg/L in 2010. No radionuclide data was available for this well prior to 1984. However, the Mine well that draws water from the same formation had dissolved uranium concentrations between 0.725 mg/L and 3.71 mg/L in 1979
- The Mill Well showed an increase in TDS and sulfate from 335 mg/L to 2,300 mg/L and from 32 mg/L to 1,460 mg/L, respectively.

Section 7. Summary of Prior Groundwater Assessments

The US EPA and USGS conducted assessments of the groundwater in response to growing concern over the possible impact to the groundwater quality in the area around and down gradient of the NECR Mine.

7.1. WATER QUALITY IMPACTS OF URANIUM MINING AND MILLING ACTIVITIES IN THE GRANTS MINERAL BELT,

In 1975, at the request of NMEIA, US EPA Region 6 assessed the impacts of mining and mine water discharge in the Grants Mineral belt, specifically in relation to the applicable regulations and standards (US EPA, 1975). The water quality assessment evaluated discharges, potable water supply and limited stream data for the Ambrosia Lake, Church Rock and Jackpile-Paguate Mining areas. A representative sample of the mine discharge water could not be collected during the initial sampling event at the NECR Mine (referred to as United Nuclear Corporation Churchrcok Mine) because a power failure caused the mine to flood and mining operations were temporarily suspended for repairs. The report stated that even without a representative sample "Indications are that the present treatment facility is inadequate to meet existing NPDES permit conditions." NMEIA returned to the mine on March 14, 1975, and collected a sample after the mining operations had resumed. The concentration of radium-226 in the sample was 57 pCi/L, which exceed the NPDES permit condition of 30 pCi/L.

The assessment also found that concentrations of radium-226 and selenium in drinking water at the NECR Mine and mobile home area for workers and families exceeded the United States Public Health Service limits of 3 pCi/L and 0.01 mg/L, respectively. Radium was detected at concentrations of 12.6 pCi/L at the mine and 39.7 pCi/Lin a mobile home used by mine workers, and selenium was detected at a concentration of 0.06 mg/L in both locations. The US EPA recommended finding an alternate source of potable water for the workers and families of miners who use the wells (US EPA, 1975).

7.2. HISTORIC WATER QUALITY DATA, PUERCO RIVER BASIN, ARIZONA AND NEW MEXICO

In 1988, the USGS began a five-year study of the occurrence and movement of radionuclides and trace metals in the Puerco River basin in Northeastern Arizona and northwestern New Mexico (USGS, 1991). The report presented historical water quality data for select wells in the Puerco river basin and a bibliography of geology, hydrology, and water quality references. The purpose of the report was to summarize data for surface water and groundwater quality indicators in the Puerco River basin dating from before the mine tailings release up to 1988. The report included water quality information for 72 stream locations and 323 groundwater wells. Several of the 323 wells were located in the study area for this report, including wells 16K-340 and 16K-336. The historic stream water data presented several samples collected immediately after the July 16, 1979, tailings dam failure that contained high levels of thorium (54.6 pCi/L maximum result on August 4, 1979) and uranium (900 ug/L maximum result on July 26, 1979)

7.3. RADIOACTIVITIY IN THE ENVIRONMENT – A CASE STUDY OF THE PUERCO AND LITTLE COLOROADO RIVER BASINS, ARIZONA AND NEW MEXICO

The USGS presented a second study of the Puerco River basin to determine the distribution of radioactive elements (USGS, 1994). The second study included sampling surface water, sediment, and groundwater down to 150 feet bgs in the Puerco River basin. Nine surface water sampling stations were established in the basin: three on the Puerco River; three on the Little Colorado River, and three on tributaries not affected by mining (Black Creek, Zuni River, and the Little Colorado River at Woodruff). The groundwater strategy included sixty-nine wells along the Puerco and Little Colorado Rivers, including thirty-eight wells in ten well clusters. Each well cluster consisted of three to nine wells of varying depths and distances from the river channel to allow determination of vertical and horizontal extent of radioactive contamination. The screen lengths were typically short – from a foot screened interval to about 10 feet length. The USGS also sampled groundwater from wells on tributaries where no mining had occurred and wells screened in the underlying bedrock aquifers.

Because radium and uranium adsorb to sediments, water samples were filtered so that the unfiltered water, filtered water, and sediment components of the sample could be assessed separately. Ninety-three of 95 filtered samples contained gross-alpha activity less than the federal drinking water standards of 15 pCi/L, and twenty out of twenty-three filtered samples contained uranium concentrations less than the proposed Federal standard in 1994 of 20 mg/L. In comparison to the filtered samples, unfiltered samples contained up to 10 times more uranium and generally exceeded Federal drinking-water standards for total uranium in 51 out of 54 samples, and exceeded total gross alpha standards in 82 out of 91 samples.

There was no significant difference in the radioactivity levels in sediments collected from areas that were potentially impacted by mining and in sediments collected from tributaries with no mining history. Differences in radioactivity in the sediments appeared to be related to the geology of the surrounding area and not proximity to uranium mines.

The groundwater study concluded that groundwater samples collected from shallow depths (less than 40 feet), closest to the abandoned uranium mines, and near the center of the riverbed had higher concentrations of dissolved uranium. In 1989, concentrations of dissolved uranium greater than 35 μg/L were detected in shallow groundwater samples from the mouth of the Pipeline Arroyo to the Arizona/New Mexico border. In 1990, the area containing concentrations of dissolved uranium greater than 35 μg/L only reached from the mouth of the Pipeline Arroyo to just East of Gallup, New Mexico

7.4. EFFECTS OF URANIUM-MINING RELEASES ON GROUND-WATER QUALITY IN THE PUERCO RIVER BASIN, ARIZONA AND NEW MEXICO

In 1997, the USGS published the “Effects of Uranium Mining Releases on Ground-Water Quality in Puerco River Basin, Arizona and New Mexico” to describe the water quality of the Rio Puerco Alluvium aquifer, the movement of water between the Puerco River and the underlying alluvial aquifer, and changes in the water quality of the alluvial and bedrock aquifers related to the mine releases. The report used the data presented in the previous USGS reports and additional previously published data to develop models and evaluate the geology and geochemistry of the Puerco River basin.

Reviewing historic stream gages and estimating evaporation rates, the USGS estimated that in 1990 the source of the almost half of the groundwater in the Alluvium between the mouth of the Pipeline Arroyo and the Nuria Monocline (approximately 3 miles east of Gallup) could have been mine water discharge. Background samples collected upstream of the mouth of the Pipeline Arroyo in the Rio Puerco contained tritium concentrations indicating recent source of water, and uranium concentrations between 6 and 13 ug/L. Groundwater samples downstream of the Pipeline Arroyo had tritium concentrations indicating an older source of water similar to the tritium concentrations from the mine water in the Westwater Canyon formation and uranium concentrations as high as 870 μg/L.

USGS reported groundwater concentrations of uranium ranged from 1 to 220 μg/L in 1990, which was less than the maximum uranium concentration of 870 μg/L detected in groundwater in 1989. The report also confirmed that higher concentrations were detected in shallow wells, close to the center of the riverbed, and closest to the abandoned mines. Water in the Alluvium was generally alkaline, with high concentrations of sulfate and TDS. All samples of radium-226 and radium-228 were less than federal standards.

The USGS assessed the fate of the uranium released through mine dewatering discharge and concluded that sorption of uranium on the sediment is the probable fate of the dissolved uranium. This conclusion was based on analyses of sediment samples for uranium and thorium isotopes. In most natural cases, the ratio of uranium activity to thorium activity should be close to one. If significant amount of uranium leached in to the environment or sorbed onto the sediments, the ratio would be greater than one. The calculated U/Th ratios for the sediment samples closer the centerline of the streambed were greater than one indicating uranium had been added to the sediments from mine releases. However, the changes were small because USGS could not distinguish between uranium concentrations in sediments containing mine water discharges and sediments without mine discharge water.

The USGS study determined that the groundwater and sediments in the Alluvium had been impacted by the mine water discharges. Concentrations of dissolved uranium had decreased over time but were still present in limited areas in 1990 at concentrations greater than 35 μg/L. Except for a few shallow samples in the center of the channel, gross alpha, uranium, and radium met federal standards downstream of Gallup. Groundwater samples east of Gallup showed improvement over the study period. As indicated in the analysis of the Alluvium aquifer, sorption on to the sediment is probably where the dissolved uranium resides. Isotope analyses of the sediments suggest that the concentrations of uranium in the sediments near the center of the channel are more likely to be associated with the mine water discharge than concentrations in the sediments away from the center.

Section 8. Conclusions

During the mining operations at NECR mines and the UNC Mill Site operations, dissolved uranium, radium, gross alpha and other contaminants were introduced into the groundwater in the area by several different releases: mine water discharges, the 1979 dam breach release, seepage from the tailings disposal cells at the UNC Mill site, dewatering of the ore body formation during mining, and disposal of waste rock back into the mine workings..

Surface water flowing in the Pipeline Arroyo and Rio Puerco seeps into the underlying Alluvium forming the shallow groundwater in the area. Groundwater in the Alluvium generally flows from northeast to southwest, in the same the direction as the Pipeline Arroyo and Rio Puerco. Groundwater can seep from the Alluvium into the underlying sandstone bedrock, such as the Upper Gallup Sandstone Member, where it contacts the Alluvium. Surface water can also seep directly into the sandstone formations where they outcrop at the surface. Groundwater in the sandstone formations flows northward following the regional dip in the area.

Based on the historic releases and the hydrogeology of the Area, three aquifers were identified as potentially impacted from the historic releases: the Alluvium aquifer, the Upper Gallup Sandstone Member aquifer, and the Westwater Canyon Formation aquifer.

8.1. IMPACTS TO THE ALLUVIUM AQUIFER

The Alluvium beneath the Rio Puerco is a source of groundwater for the neighboring communities. The largest impact on the Alluvium aquifer was from the mine water discharge where an estimated 37 billion gallons of water containing 600 tons of uranium was released into the Pipeline Arroyo/Rio Puerco over a 16 year period. The second major impact to the Alluvium Aquifer was the 1979 dam breach that released of approximately 94 million gallons of water containing radioactive mill tailings. While considered one of the largest radioactive spills in history, contamination from the 1979 spill occurred as a single event and had a brief period during which it could be absorbed into the underlying aquifers as it flowed down the Rio Puerco. Investigations conducted by USGS determined that the Alluvium beneath the Rio Puerco had been impacted by the mine water discharge and to a lesser extent by the 1979 dam breach. The USGS reports documented dissolved uranium in the Alluvium groundwater and indicated that the uranium had adsorbed on to the Alluvium sediments. The USGS investigations constructed numerous monitoring wells targeting zones in the Alluvium where groundwater impacts from the previous releases were expected (i.e. shallow, center of stream wells).

This groundwater assessment utilized data from wells installed prior to mining operations. This assessment of existing livestock wells found that mining in the area had a possible influence on secondary water quality constituents in the Alluvium groundwater, such as the decrease in TDS, and the spike and subsequent decrease in sulfate concentrations wells 16K-336 and 16K-340. The wells used in this assessment may not have shown impacts from uranium or radium 226/228 because they were not located in an optimal location relative to the center of the stream channel and the depth of screen, or they had an insufficient historical data.

TDS concentrations have remained consistent in the Alluvium groundwater wells from pre-mining to present. Pre-mining data indicate TDS concentrations ranged from 832 mg/L to 1,423 mg/L and data from October 2010 detected concentrations of TDS ranging from 1,000 mg/L to 1,200 mg/L. Concentrations of TDS in drinking water are regulated under the EPA’s National Secondary Drinking Water Standards and is considered and aesthetic effect causing and undesirable taste or odor. The elevated concentrations of TDS detected in the Alluvium groundwater are considered poor water quality for human consumption.

Based on the limited data for wells in this assessment, the uranium concentrations in the Alluvium groundwater appears to have been consistent over the past 50 years and are below federal safe drinking water levels. The well furthermost from the NECR mine within the study area, 16K-336, had an anomalous concentration of 5.78 pCi/L of Radium-226/228 during the October 2010 sampling event, which exceeded the MCL of 5 pCi/L. Previous groundwater samples collected in 1989 and 1990 by the USGS were less than the MCL for of radium-226 and radium-228, as well as all other historic samples collected from the livestock wells in this assessment.

The Alluvium in the Pipeline Arroyo has also been impacted by historical tailing seepage. The lateral extent of this impact is approximately 2000 feet southeast of the UNC Mill Site; however, there are no livestock wells located in the Pipeline Arroyo Alluvium in the impacted area.

8.2. IMPACTS TO THE UPPER GALLUP SANDSTONE MEMBER AQUIFER

The Upper Gallup Sandstone Member wells may also have been affected by the mine water discharge but to a lesser extent because the mine water would have passed through the Alluvium before entering the Upper Gallup Sandstone Member. The Friendship well, 14K-586, and the Pipeline Canyon Well, 15T-303 showed an increase in sulfate concentrations but have not shown a subsequent decrease as seen in the Alluvium wells All other constituent’s concentrations appear constant over the historic record.

Current groundwater in Upper Gallup Sandstone Member wells contains elevated concentrations of TDS ranging from 1,700 mg/L to 2,200 mg/L. Groundwater in the region that is not impacted by mining can also have high concentrations of TDS from dissolved formation material as groundwater passes through. Uranium and radium 226/228 concentrations in the groundwater in the livestock wells within the study area are less than federal safe drinking water levels, and based on the limited data; appear to have been fairly consistent over the past 33 years.

The greatest impact from releases of radionuclides and secondary contaminants on the quality of Upper Gallup Sandstone Member groundwater is at the UNC Mill Site, where the Upper Gallup Sandstone Member has been affected by the acidic seepage from the tailings disposal cells during mining operations. These releases are currently being remediated under oversight of US EPA Region 6 and the State of New Mexico. The extent of the release from the tailing seepage currently extends approximately 3000 feet in the Upper Gallup Sandstone Member.

8.3. IMPACTS TO THE WESTWATER CANYON AQUIFER

A large quantity of mine water was extracted from the Westwater Canyon Formation to allow access to ore during mining operations. This process introduced oxygen and temporarily changed the aquifer around the ore rock from anaerobic to aerobic. After mining operations ceased, groundwater around the ore returned to the original oxidation state. In addition, waste rock was disposed in the mine shafts and stopes as part of the mine closure.

The Westwater Canyon Sandstone Member Aquifer showed a decrease in water quality with elevated uranium concentrations occurring in the Mill well immediately following the cessation of mining, but has since declined to below federal levels. Radium-226 concentrations in the Mine well were high during mining operations but decreased to less than the MCL after mining ceased. Radionuclide concentrations appear to have improved, but secondary contaminant concentrations indicate a decrease in water quality in the Westwater Canyon Sandstone Member. The Mine well sample collected in 1973 and Mill well sample collected in 1976 contained high quality water with low TDS concentrations (300 mg/L to 400 mg/L). After mining ceased in 1986, the TDS concentrations increased to 2,258 mg/L in 1993 and have remained greater than the MCL of 500 mg/L.

Section 9. Summary

In response to concerns voiced by the community, US EPA evaluated the impacts to groundwater due to historical mining and milling activities of the Northeast Church Rock, and the UNC Mill in the Church Rock area of the Navajo Nation.

The prominent geologic feature in northwestern New Mexico is the San Juan Basin, which is a circular, bowl-shaped depression containing sedimentary rocks. The uplifted, folded, and faulted rocks of the adjacent mountain ranges define the margins of the San Juan Basin. The southern margin of the San Juan Basin, where NECR is located, is defined by the Zuni Mountains. The layers of sedimentary rock in the San Juan Basin slope down toward the center of the basin from the highlands at the margins. During the Late Jurassic period, stream-laid sands were deposited throughout the basin creating the Morrison Formation which includes the Westwater Canyon Sandstone Member. The Morrison is one of several well-known uranium-bearing rock units in the mining districts.

A prominent feature of the Late Cretaceous was northwest to southeast shoreline that migrated back and forth across the basin, depositing marine, coastal plain, and nonmarine sediments. The marine deposits in the area consist of sandstone, shale, and a few thin limestone beds. The Late Cretaceous rocks include the following units from the oldest to the youngest: the Dakota Sandstone, the Mancos Shale, the Mesa Verde Group (which includes the Upper Gallup Sandstone Member and the Crevasse Canyon Formation).

River deposited alluvium overlies the sedimentary bedrock in the Puerco River basin. The Alluvium consists of fine grained sand interfingered with silty clay layers. When surface water is present near the NECR mine, the flow direction is from northwest to southeast along unnamed arroyos, into the northeast- to southwest-trending Pipeline arroyo and into the Rio Puerco. Groundwater can seep from the Alluvium into the underlying sandstone bedrock, such as the Upper Gallup, where it contacts the Alluvium. Surface water can also enter the sandstone formations where the formation outcrops at the surface. Groundwater in the sandstone units flows to the north following the regional dip of bedrock.

During operations of the UNC Mill and the NECR Mine, the largest releases of uranium, radium and gross alpha were surface water discharges (water pumped from the mines, and the 1979 catastrophic release from the tailings disposal cells) whose impacts would first be observed in the Alluvium groundwater wells. The tailing disposal cells at the UNC Mill Site and the settlement ponds at the NECR Mill would affect groundwater by seeping into the underlying formations. The Upper Gallup Sandstone Member outcrops at the UNC Mill Site and the Dalton Sandstone Member outcrops at the NECR Mill site. The Dalton Sandstone Member is a non-producing sandstone in the NECR area; therefore, very little seepage would have passed through the Dalton into the groundwater. In addition, groundwater quality in the Westwater Canyon Sandstone Member Aquifer could have been affected by the disposal of waste rock in the mine workings and dewatering of the mine during operation.

Water samples have been collected from many unregulated wells and springs throughout region under various investigations and programs. From 1977 to 1979, Los Alamos Scientific Laboratory collected samples during the hydrogeochemical and stream sediment reconnaissance phase. In 2003 and 2004, Navajo Nation Environmental Protection Agency collected samples under the Church Rock Uranium Monitoring Project. EPA collected additional samples in the Church Rock area from 2008 through 2010. Uranium concentrations were greatest after the 1979 spill event in the Pipeline Arroyo. There also exceedences of federal standards for Uranium in wells within 15 miles of the area but were located in geologic formations or watersheds that would not have been impacted by releases at the NECR Mine or UNC Mill Site.

Historical groundwater quality data including radionuclides and general chemistry were compiled for select wells. These select wells were identified after evaluating release and groundwater flow patterns to identify pre-mining wells closest to the releases. Generally, most Alluvium and Upper Gallup wells showed a general increase in secondary contaminant concentrations (such as sulfate and TDS) since mining had ceased. The Westwater Canyon Sandstone Member well, Mill Well 1, has shown improvement in quality for uranium concentrations but a worsening in quality for the secondary contaminants. The most recent laboratory analytical data for groundwater indicate that all wells met the federal standard for radionuclides contaminants, except the furthermost Alluvium well, 16K-336, had a Radium 226/228 activity level of 5.78 pCi/L. Groundwater samples from all wells exceeded the Total Dissolved Solids (TDS) secondary MCL of 500 mg/L and some wells had concentrations of sulfate greater than the secondary MCL of 250 mg/L.

Finally, a literature search was conducted and results summarized. The USGS conducted a detailed study of the Alluvium under the Rio Puerco between 1988 and 1991.   Using short-screened, specifically-located monitoring wells in the Alluvium, the USGS documented that releases from the NECR Mine and the UNC Mill Site had resulted in increased uranium concentrations in the Alluvium groundwater. Concentrations of dissolved uranium decreased over time but were still present in limited areas in 1990 when the study was completed. The USGS assessed the fate of the uranium released through mine dewatering discharge and concluded that sorption of uranium on the sediment is the probable fate of the dissolved uranium; however, the changes in sediment concentrations were within the range of non-mining impact sediment concentrations.

In summary, the three major water sources in the NECR Mine and UNC Mill area, the Alluvium groudwater, the Upper Gallup Sandstone Member aquifer, and the Westwater Canyon Sandstone Member aquifer have shown impacts to water quality associated with the mining operations. Water quality in the groundwater has generally improved since cessation of mining operations. Current water quality is considered poor due to the TDS concentrations that are normal for the region. Uranium concentrations and Radium-226/228 are below federal health levels with the exception of an anomalous result from one Alluvium well, and the plume for the historical Tailing Disposal cells seepage, which is under investigation and enforcement by EPA Region 6.

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Figures

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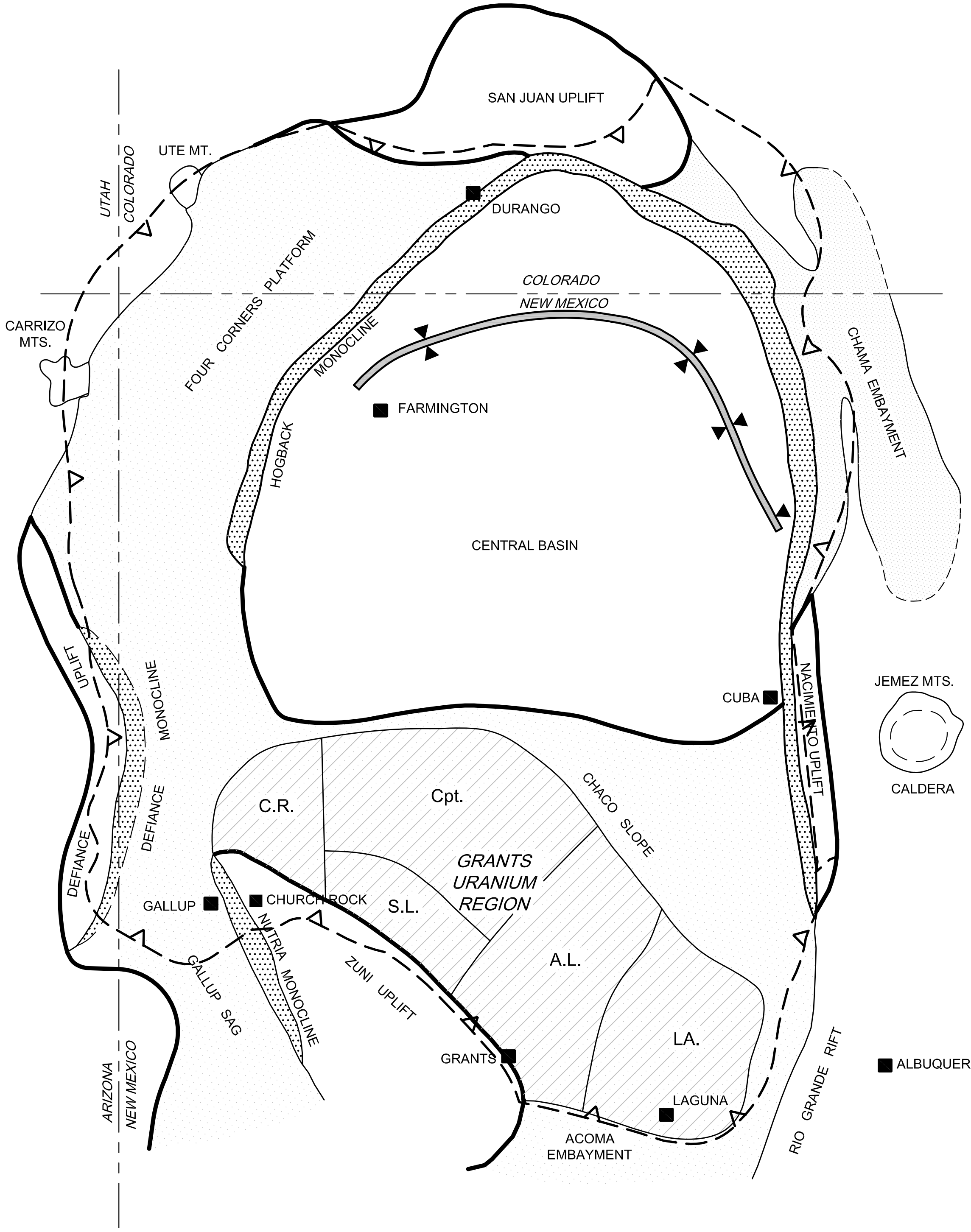

INDIVIDUAL DISTRICTS OF THE URANIUM REGION ARE OUTLINED. PRINCIPAL DISTRICTS: C.R.=CHURCH ROCK; Cpt.=CROWNPOINT; S.L.=SMITH LAKE - MARIANO LAKE; A.L.=AMBROSIA LAKE; LA.=LAGUNA. (AFTER SANTOS AND TURNER PETERSON 1986 BASED ON KELLY 1951) (REPRINTED BY PERMISSION OF AAPG).

N

0' 20 MI

APPROXIMATE SCALE: 1"=20 MI

LEGEND:

- —△—△— BOUNDARY OF SAN JUAN STRUCTURAL BASIN
- ▬▬ UPLIFT BOUNDARY

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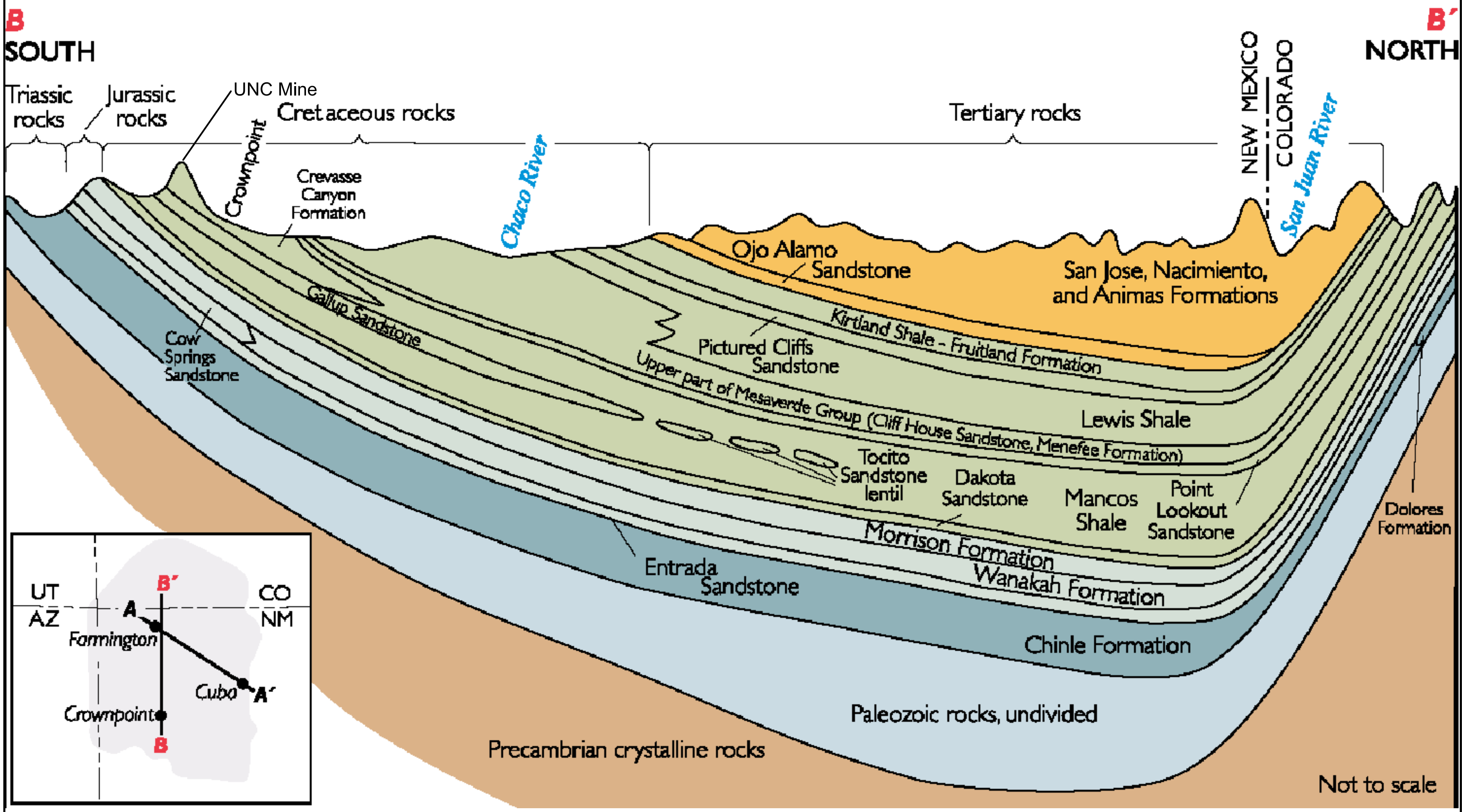
LOCATION: NEW MEXICO NAVAJO NATION

GEOLOGIC FEATURES OF THE SAN JUAN BASIN

DRAWN BY:	CHECKED BY:	PROJECT NO.	FIG NO.
SC 08/08/11	MF 08/08/11	2010-202	1



Source:
Brister and Hoffman, 2002. New Mexico's Energy, Present and Future: Policy, Production, Economics, and the Environment. Brian S. Brister and L. Greer Price editors. New Mexico Bureau of Geology and Mineral Resources.

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LOCATION: CHURCH ROCK AREA
NEW MEXICO, NAVAJO AREA

GEOLOGIC CROSS–SECTION OF THE SAN JUAN BASIN

DRAWN BY:	CHECKED BY:	PROJECT NO.	FIG NO.
SC 08/08/11	MHF 08/08/11	2010–202	2

FILE NAME: N:\Projects\2010 Projects\2010-202_EPA_NEChurchRock_GWResearch\N_Maps&Dwgs\Figs_1_2_3.dwg LAYOUT NAME: 2 PLOTTED: Monday, August 08, 2011 - 7:58am

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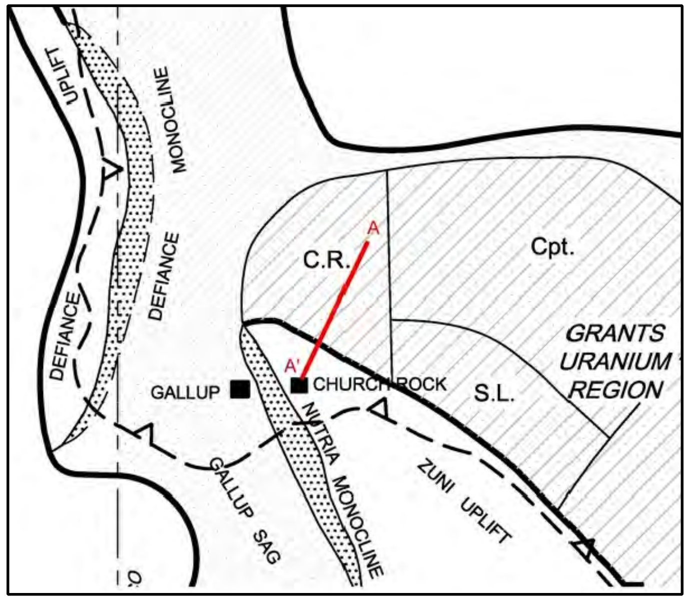

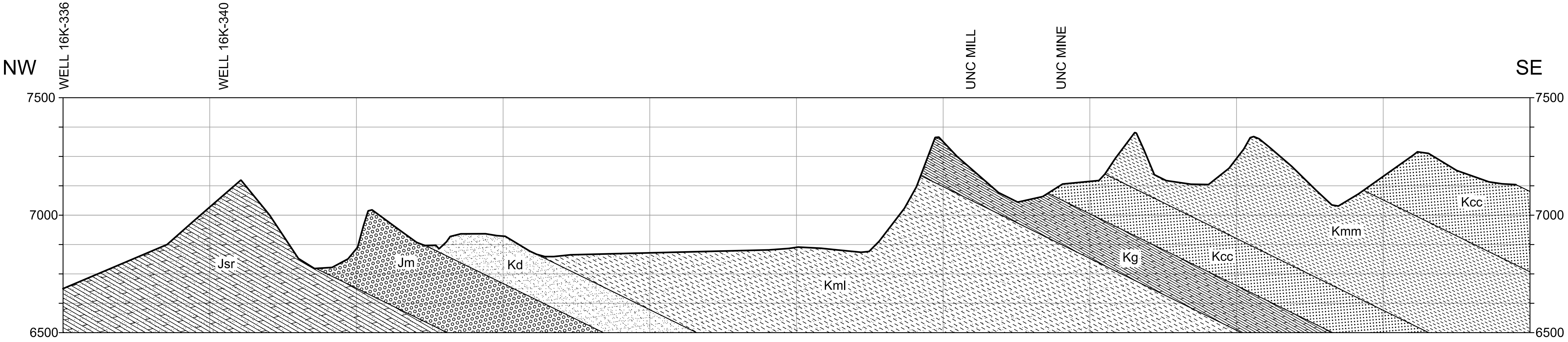

CROSS SECTION VIEW WITH EXAGGERATED VERTICAL SCALE

HORIZONTAL SCALE: 1"=5000'
VERTICAL SCALE: 1"=500'

0' 1000'

LEGEND:

- ▨ Trc - CHINLE GROUP
- ▨ Jsr - SAN RAFAEL FROUP (ENTRADA; TODILTO; SUMERVILLE)
- ▨ Jm - MORRISON GROUP
- ▨ Kd - DAKOTA
- ▨ Kml - MANCOS SHALE
- ▨ Kg - GULLOP SANDSTONE
- ▨ Kcc - CREVASSE CANYON
- ▨ Kmm - MULATTO TONGUE OF MANKOS

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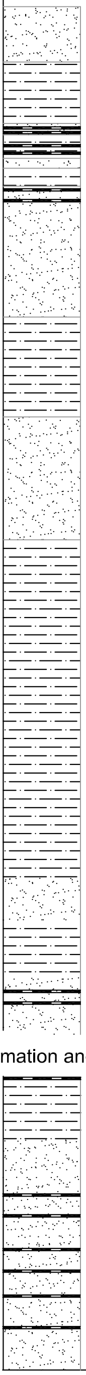
LOCATION: CHURCH ROCK AREA NEW MEXICO, NAVAJO AREA

GEOLOGIC CROSS SECTION
CHURCH ROCK AREA

DRAWN BY:	CHECKED BY:	PROJECT NO.	FIG NO.
SC 09/08/11	MHF 09/08/11	2010-202	3

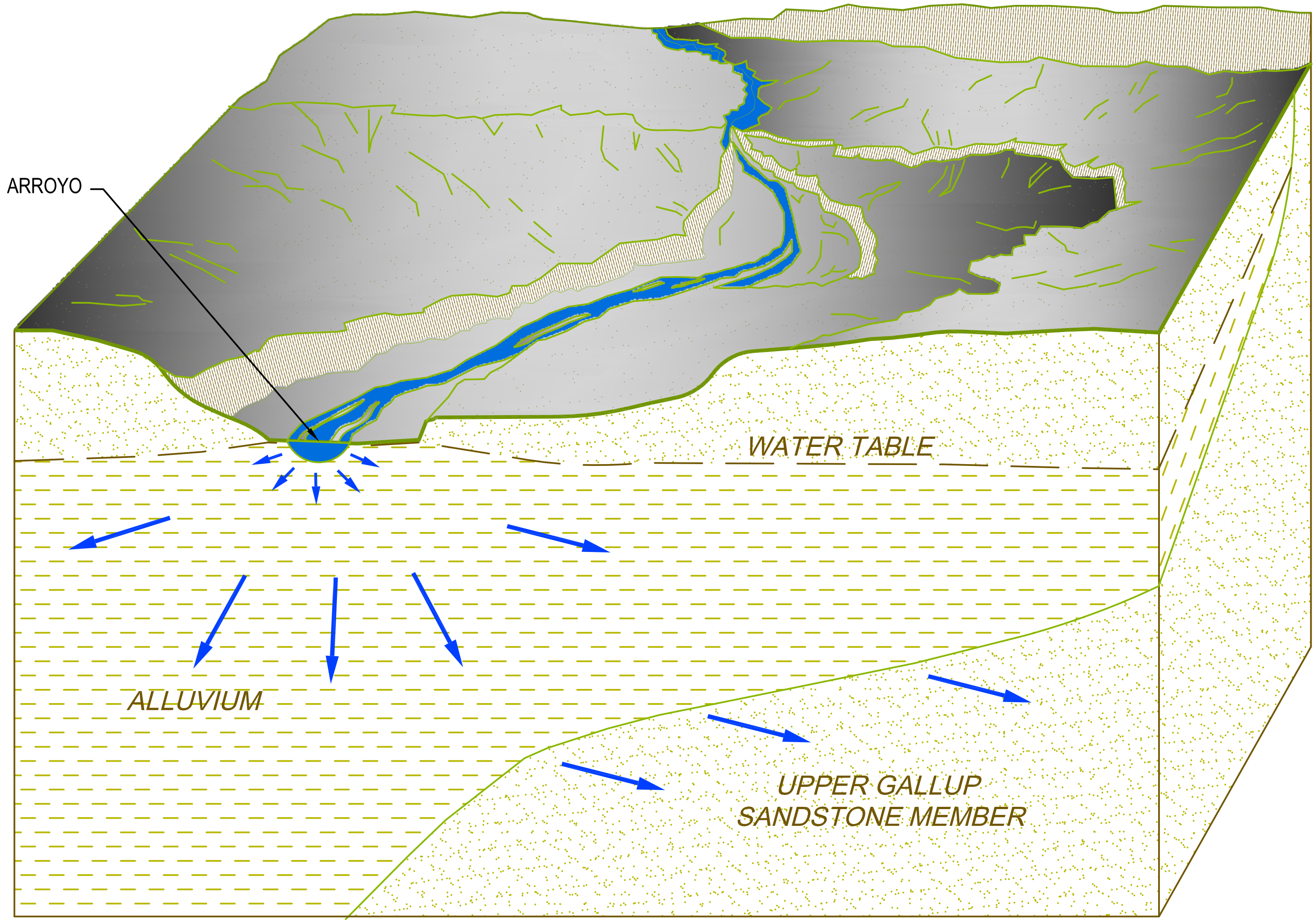
FILE NAME: N:\Projects\2010 Projects\2010-202_EPA_NEChurchRock_GWResearch\N_Maps&Dwgs\Figs_1_2_3.dwg LAYOUT NAME: 4 PLOTTED: Tuesday, August 02, 2011 - 8:37am



GEOLOGIC TIME			ROCK UNIT		DESCRIPTION
LATE CRETACEOUS PERIOD	MESA VERDE GROUP	CREVASSE CANYON FORMATION	DALTON SANDSTONE MEMBER	7092	Massive clean white to buff, medium to coarse-grained sandstone. This sand outcrops at the site, forms cap of Ram Mesa. Regressive coastal barrier sand. Gradational with Mulatto Tongue.
			MULATTO TONGUE	6962	Chiefly dark gray mudstone and silty sandstone with scattered thin beds of sandstone. Disconformable with Dilco Coal. Offshore marine deposit.
			DILCO COAL MEMBER	6882	Paludal and fluvial deposits. Chiefly irregular buff to gray medium-grained sandstone, light gray clay and lenticular coal beds and carbonaceous shales. Interfingered with underlying Gallup Sandstone. Mill site complex lies in this member.
			UPPER GALLUP SANDSTONE MEMBER	6780	Predominantly a gray to tan, fine to coarse-grained sandstone interbedded with gray siltstone and mudstone, and minor amounts of coal Coastal barrier deposit.
	MANCOS SHALE FORMATION		CROSS TONGUE	6630	Sandy marine shales and thin lenticular sandstone. Transgressive marine deposits.
			LOWER GALLUP SANDSTONE MEMBER	6500	Interbed of Gallap Sandstone. Generally gray to tan, fine-grained and silty becoming gradually finer grained towards the base merging with the rather thick transition zone which comprises the upper 100 ft. of the underlying Mancos Shale Regressive, littoral or nearshore deposits.
			MANCOS SHALE MEMBER	6340	Fissile shale with calcareous zone. Thin sandstone and/or siltstone beds Late Cretaceous subregional marine transgression. Limey medium gray to black marine shale interbedded with platey laminated light gray to grayish yellow to white limestone and gypsum.
			TWO WELLS SANDSTONE MEMBER	5900	Tongue of Dakota Sandstone; soft white and light-gray sandstone with irregular, hard, brown, indurated masses.
			WHITE ARROYO SHALE MEMBER	5845	
			DAKOTA FORMATION	5770	Continental and marginal marine uniformly fine to medium grained well sorted gray to pure white sandstone, with some interbedded siltstone and coal.
Unconformity between the Dakota Formation and Morrison Formation. No deposit during Early Cretaceous Period.					
LATE JURASSIC PERIOD	MORRISON FORMATION		BRUSHY BASIN MEMBER	5705	A green to grayish-green mudstone of continental deposition, split occasionally by discontinuous sandstone lenses.
			WEST WATER CANYON SANDSTONE MEMBER	5630	Gray to light grayish-red to yellowish-gray, locally conglomeratic fine to coarse-grained sandstone characterized by scour-and-fill crossbedding and by angular grains of unweathered feldspar. Discontinuous lenses of grayish-green sandy mudstone are present.
			COWSPRING SANDSTONE MEMBER	5362	Chiefly gray to light yellowish-gray, fine to medium-grained sandstone with some interbedded siltstone.
				5330	

Source:
Canonie Environmental, 1988. "Transmittal, Pre–Mining/Pre–Milling Water Level Data, United Nuclear Corporation's Church Rock Site, Gallup, New Mexico." July 26.
Specific source for Two Wells SS – Cobban, W.A., and Hook, S.C., 1989, Mid–Cretaceous molluscan record from west–central New Mexico, IN Anderson, O.J., and others, eds., Southeastern Colorado Plateau: New Mexico Geological Society Guidebook, no. 40, p. 247–264

ERRG Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, California 94104 (415) 395-9974	CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY LOCATION: CHURCH ROCK AREA NEW MEXICO, NAVAJO NATION	NORTHEAST CHURCH ROCK MINE SITE STRATIGRAPHIC COLUMN			
		DRAWN BY: SC 08/03/11	CHECKED BY: MHF 08/03/11	PROJECT NO. 2010–202	FIG NO. 4



LEGEND:

← Ground Water Recharge

NOT TO SCALE

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LOCATION: CHURCH ROCK AREA NAVAJO NATION

CONCEPTUAL DRAWINGS OF GROUNDWATER RECHARGE FROM STREAM FLOW

DRAWN BY:	CHECKED BY:	PROJECT NO.	FIG NO.
SC 09/08/11	MF 09/08/11	2010–202	5

FILE NAME: N:\Graphics\2010\2010–202 US EPA Navajo Nation\Fig5_sectionVIEW.dwg LAYOUT NAME: 5 PLOTTED: Friday, September 09, 2011 – 10:50am

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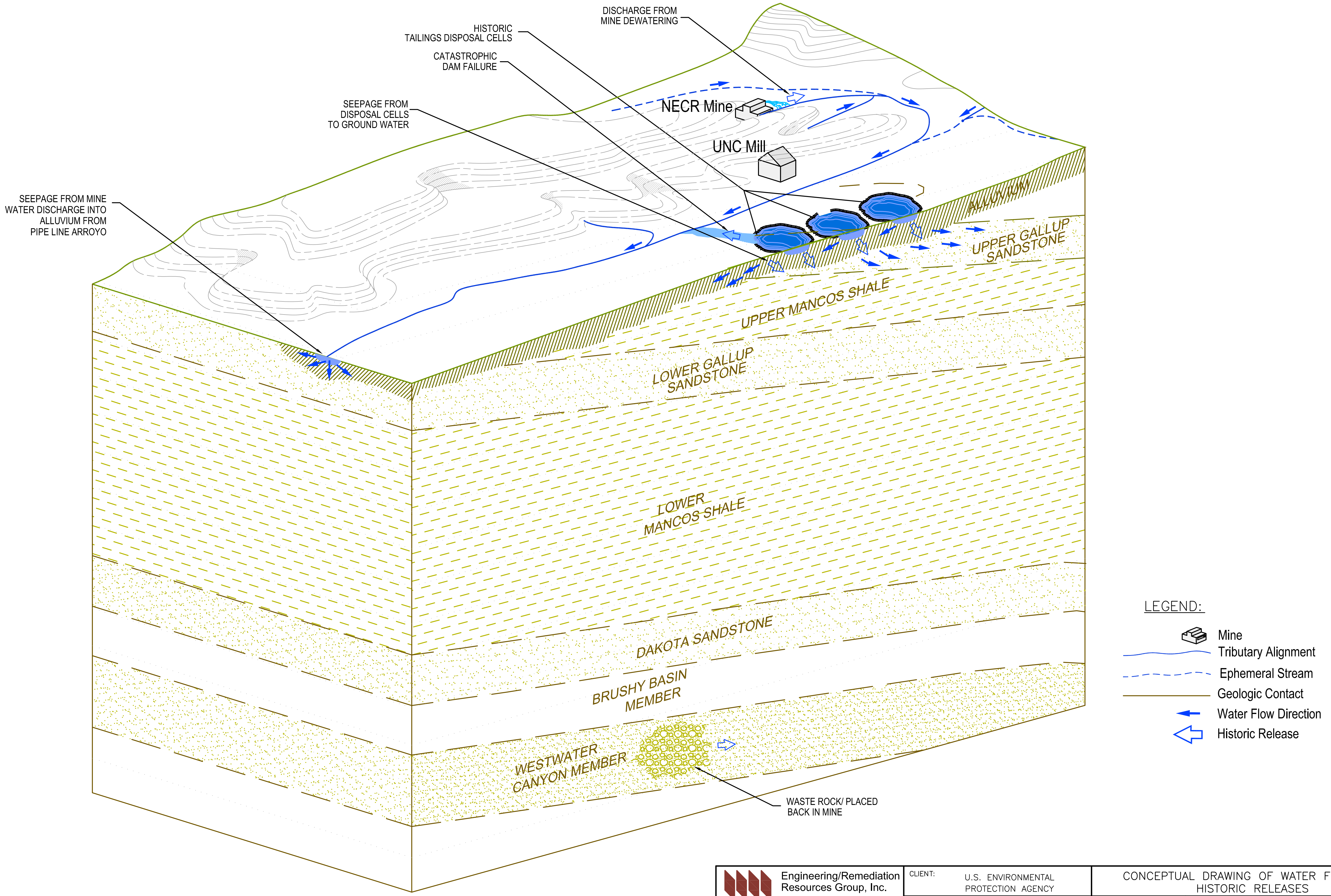

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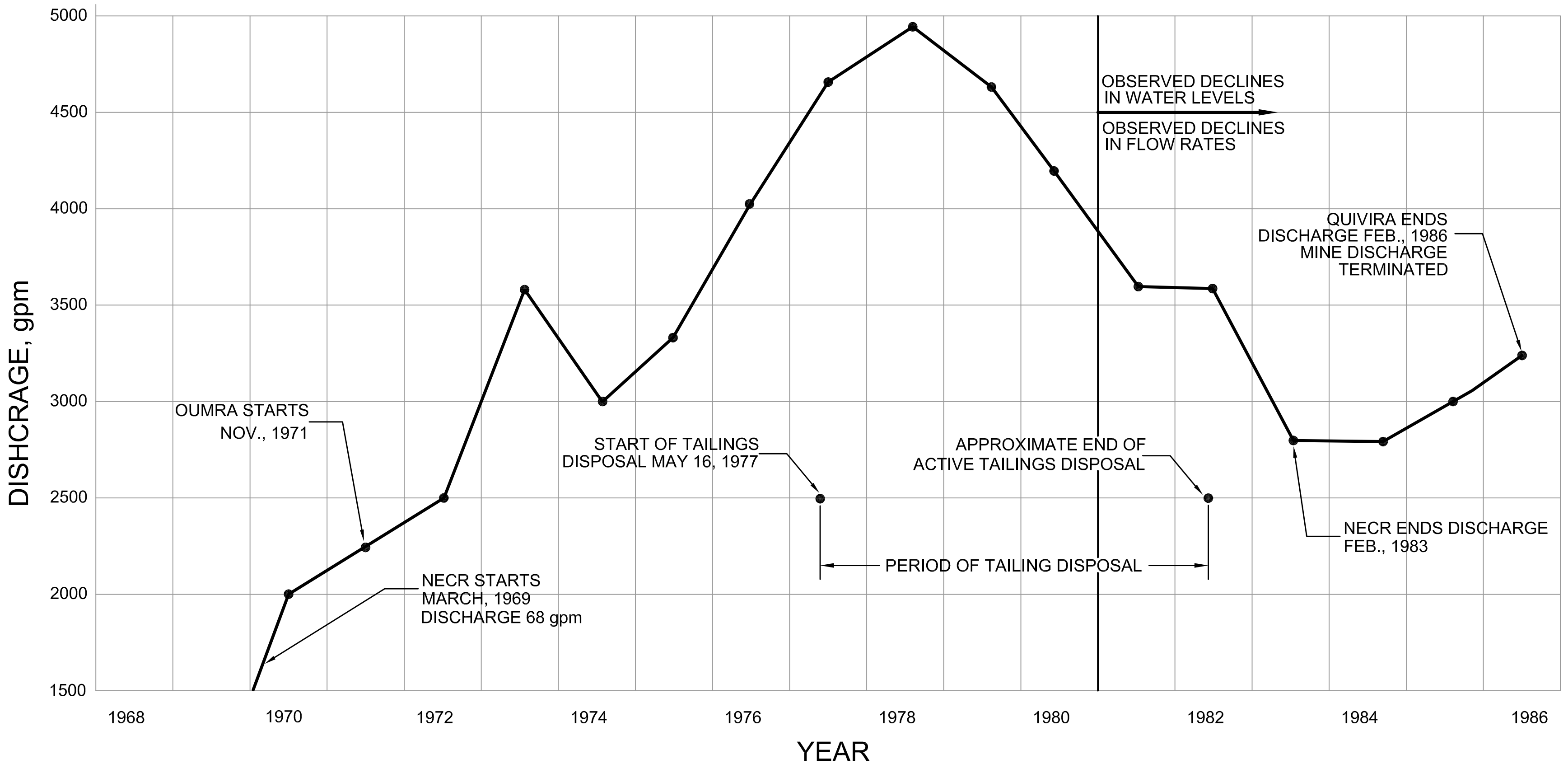
LOCATION: CHURCH ROCK AREA NAVAJO NATION

CONCEPTUAL DRAWING OF WATER FLOW AND HISTORIC RELEASES

DRAWN BY:	CHECKED BY:	PROJECT NO.	FIG NO.
SC 09/08/11	MF 09/08/11	2010-202	6

FILE NAME: N:\Graphics\2010\2010-202 US EPA Navajo Nation\Fig7_yearly_dschrg.dwg LAYOUT NAME: 7 PLOTTED: Thursday, September 08, 2011 - 1:57pm



NOTES:

1. MINE WATER WAS DISCHARGED FROM BOTH THE NORTHEAST CHURCH ROCK MINE AND THE QUIVA MINE.
2. SOURCE OF OBSERVED DATA: UNC MINING AND MILLING MEMORANDUM DATED SEPTEMBER 30, 1986.

SOURCE: "CANONIE ENVIRONMENTAL, 1991. TAILING RECLAMATION PLAN AS APPROVED BY NRC MARCH 01,1991, LICENSE NO. SUA-1475."

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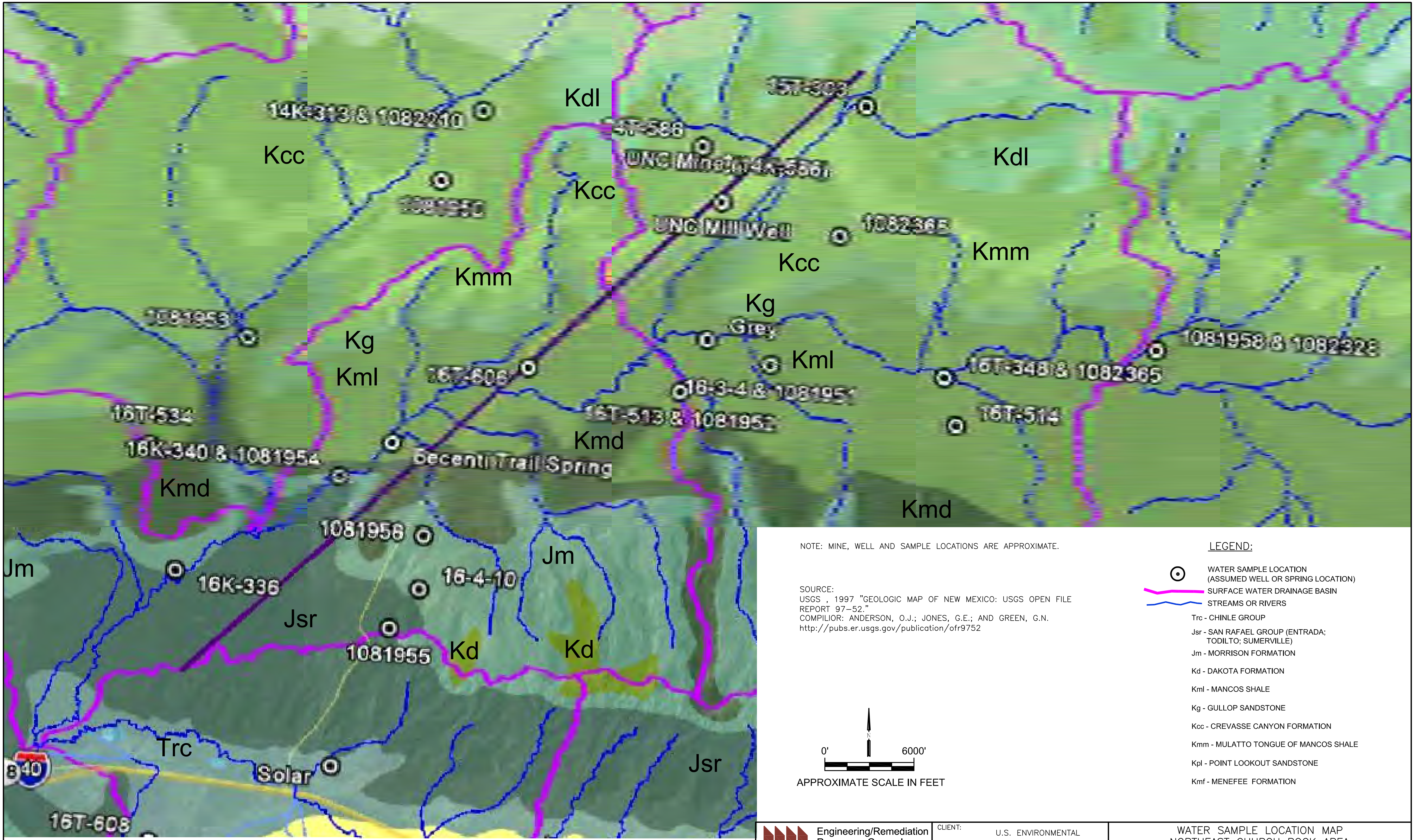
CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY	AVERAGE YEARLY MINE WATER DISCHARGE
LOCATION: CHURCH ROCK AREA NEW MEXICO, NAVAJO AREA	DRAWN BY: SC 08/03/11
	CHECKED BY: MHF 08/03/11
	PROJECT NO. 2010-202
	FIG NO. 7



NOTE: MINE, WELL AND SAMPLE LOCATIONS ARE APPROXIMATE.

SOURCE:
USGS , 1997 "GEOLOGIC MAP OF NEW MEXICO: USGS OPEN FILE REPORT 97–52."
COMPILIOR: ANDERSON, O.J.; JONES, G.E.; AND GREEN, G.N.
http://pubs.er.usgs.gov/publication/ofr9752

LEGEND:

- ⊙ WATER SAMPLE LOCATION (ASSUMED WELL OR SPRING LOCATION)
- SURFACE WATER DRAINAGE BASIN
- STREAMS OR RIVERS
- Trc - CHINLE GROUP
- Jsr - SAN RAFAEL GROUP (ENTRADA; TODILTO; SUMERVILLE)
- Jm - MORRISON FORMATION
- Kd - DAKOTA FORMATION
- Kml - MANCOS SHALE
- Kg - GULLOP SANDSTONE
- Kcc - CREVASSE CANYON FORMATION
- Kmm - MULATTO TONGUE OF MANCOS SHALE
- Kpl - POINT LOOKOUT SANDSTONE
- Kmf - MENEFEE FORMATION

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LOCATION: CHURCH ROCK AREA
NEW MEXICO, NAVAJO AREA

WATER SAMPLE LOCATION MAP
NORTHEAST CHURCH ROCK AREA

DRAWN BY:	CHECKED BY:	PROJECT NO.	FIG NO.
SC 09/08/11	MHF 09/08/11	2010–202	8

FILE NAME: N:\Graphics\2010\2010–202 US EPA Navajo Nation\Fig8_wellmap.dwg LAYOUT NAME: 8 PLOTTED: Friday, September 09, 2011 – 7:24am

Tables

Table 1. NECR Water Well Sampling Data – EPA START October 2010

Analyte	Units	MCL	Well Name					
			14T-586	14T-586 100(dup)	15T-303	16K-336	16K-340	Mill Well
Water Quality								
pH			7.1	7.1	6.8	7.4	7.6	7.4
Conductivity	S/m		0.26	0.26	0.35	0.15	0.19	0.36
Turbidity	NTU		10.1	10.1	10.1	29.9	5.5	14.7
Dissolved Oxygen	mg/L		6.30	6.30	7.99	3.05	5.26	6.39
Temperature	°C		7.6	7.6	12.1	15.5 °C	Temperature	
Salinity	%		0.1	0.1	0.2	0.1	0.1	0.2
Total Dissolved Solids	g/L		1.7	1.7	2.2	1	1.2	2.3
Oxidation Reduction Potential	mV		100	100	mV	86	76	-127
Metals								
Aluminum	μg/L		220	82	68.0	229	126	68.0
Antimony	μg/L	6	3.00	7.34	6.83	3.00	3.00	3.00
Arsenic	μg/L	10	5.00	5.00	7.54	11	8.53	5.00
Barium	μg/L	2,000	13.1	13.4	8.24	450	140	1.64
Beryllium	μg/L	4	1.00	1.00	1.00	1.00	1.00	1.00
Bromide	μg/L		0.200	0.200	0.200	0.234	0.295	0.361
Cadmium	μg/L	5	1.00	1.00	1.17	1.00	1.00	1.00
Calcium	μg/L		270000	281000	373000	76800	99800	2420
Chromium	μg/L	100	13.9	1.00	1.16	1.00	1.03	1.43
Cobalt	μg/L		1.13	1.00	1.00	1.00	1.00	1.00
Copper	μg/L	1,300	3.00	3.00	3.00	29.7	3.00	20.4
Iron	μg/L		482	468	685	2720	181	9870
Lead	μg/L	15	3.30	3.30	3.30	3.58	3.30	3.74
Magnesium	μg/L		119000	122000	144000	20600	43500	470
Manganese	μg/L		320	319	162	95.9	122	51
Mercury	μg/L	2	0.066	0.066	0.066	0.066	0.066	0.066
Nickel	μg/L		71.3	1.51	1.50	1.50	1.50	2.38
Potassium	μg/L		7430	7690	5650	2540	3940	3200
Selenium	μg/L	50	7.7	37.7	43.8	10.2	5.00	26.7
Silver	μg/L		1.00	1.00	1.00	1.00	1.00	1.00
Sodium	μg/L		135000	140000	188000	202000	233000	694000
Thallium	μg/L	2	5.00	5.00	8.9	5.00	5.00	6.45
Vanadium	μg/L		1.00	1.00	1.00	1.00	1.00	1.00
Zinc	μg/L		338	355	839	153	148	659
Radionuclides								
ALPHA	pCi/L	15	2.62	5.80	-0.526	0.129	5.46	9.79
BETA	pCi/L	ne	6.58	6.02	2.62	4.99	2.37	2.72
Pct Uranium-235	percent	ne	0.00	0.00	0.00	0.00	0.00	0.00
Radium-226	pCi/L		0.880	0.540	1.18	1.20	0.464	0.639
Radium-228	pCi/L		3.41	3.71	3.34	4.58	0.747	1.77
Radium 226 + 228	pCi/L	5	4.29	4.25	4.52	5.78	1.211	2.409

Table 1. NECR Water Well Sampling Data – EPA START October 2010 (continued)

Analyte	Units	MCL	Well Name					
			14T-586	14T-586 100(dup)	15T-303	16K-336	16K-340	Mill Well
Thorium-228	pCi/L		-0.0147	0.155	-0.139	0.298	-0.0682	0.139
Thorium-230	pCi/L		-0.185	0.818	-0.158	-0.524	0.0264	0.480
Thorium-232	pCi/L		-0.133	-0.0195	-0.0195	-0.0195	-0.0722	-0.0195
Uranium-233/234	pCi/L		1.16	1.73	0.317	-0.171	0.297	2.61
Uranium-235/236	pCi/L		0.114	0.0569	0.219	0.181	0.115	0.174
Uranium-238	pCi/L		1.20	0.790	0.442	0.392	1.40	2.82
Uranium[1]	μg/L	30	3.69	3.85	1.46	0.60	2.70	8.36
Anions								
Chloride	mg/L		14.0	14.1	10.5	18.8	22.1	154
Nitrate	mg/L		0.267	0.266	0.100	2.89	5.97	0.100
Nitrite	mg/L		0.100	0.100	0.100	0.100	0.100	0.100
Ortho-phosphate	mg/L		0.200	0.200	2.00	0.291	0.163	2.00
Sulfate	mg/L	250[2]	1380	1310	2000	118	368	1460
Fluoride	mg/L		1.19	1.24	1.52	0.861	0.483	1.73
Miscellaneous								
δD H_2O	%		-80.8	-81.2	-73.1	-91.4	-82.6	-107.3
δ^{18}O H_2O	%		-10.44	-10.53	-8.56	-12.04	-11.01	-14.14

Notes:

1. Uranium in μg/L was calculated by summing the pCi/l for uranium 233 through 238 and multiplying by a conservative conversion factor of 0.67 pCi/μg.
2. Secondary drinking water standard for sulfate is presented in the table.

MCL – maximum contaminant level for EPA drinking water standards
S/m – Siemens per meter
NTU – Nephelometric Turbidity Units
mg/L – milligram per liter
°C – degrees Celsius
g/L – grams per liter
mV – millivolts
μg/L – micrograms per liter
pCi/L – picoCuries per liter
% - percent
ne – not established

Table 2. Summary of NECR Aquifer Formations and Associated Wells

		Mine Site			UNC Mill Site	
Geologic Unit	Description	Mine Dewatering	Waste placed back in ore body	Pond/ Waste Seepage	Tailings Seepage	1979 Spill
Alluvium	Shallow water bearing zone in under Pipeline Arroyo and Rio Puerco	Majority of water infiltrated into Alluvium. **16K-336** **16K-340**			Under Region 6, GE is addressing plume from tailings remanating about 1400 feet d/g from tailings pile.	Dam breached resulted in thorium-230 contamination in Pipeline Arroyo sediments. Clean-up was completed. **16K-336** **16K-340**
Dalton Sandstone Member	Non- producing sandstone/shale			No wells. Formation not a large producer		
Upper Gallup Sandstone Member	First producing sandstone in are	Fraction of Mine water may infiltrate from Alluvium into Gallup and back under Mine Site **14K-586**			Two areas impacted : Zone 1 – Plume stable, remedy suspended; MNA proposed and Zone 3 – Plume migrating towards north **15T-303**	
Westwater Canyon Sandstone Member	Ore body aquifer	Large radius of influence may have resulted in change of geochemistry which could increase Uranium dissolution rates **NECR Mine Well; Mill Well**	Waste placed back in ore body **NECR Mine Well; Mill Well**			

UPDATED Table 3. Summary of Groundwater Sampling Results w/corrected units

			Radionuclides							General Chemistry						
Geologic Formation	Well ID/ Sample ID	Sample Date**	Total Uranium (pCi/L)	Uranium (ug/L)	Radium-226 (pCi/L)	Radium-228 (pCi/L)	Radium-226 + Radium 228 (pCi/L)	Gross Alpha (pCi/L)	Gross Alpha excluding U (pCi/L)	TDS (mg/L)	Conductivity	Field pH	pH	Arsenic (ug/L)	Sulfate (mg/L)	Nitrate (mg/L)
							A-Zone Aquifer Wells									
Gallup	14K-586 (Friendship-1; 14T-586)	12-Apr-76	--	--	--	--	--	--	--	**4,890**	1,690	--	8.0	--	581	trace
		17-May-78	--	2 [a]	1.2 [a]	2 [a]	3.2 [a]	--	--	--	--	--	--	--	--	--
		06-Mar-79	--	--	--	--	--	<17	--	--	--	--	--	<5	--	0.5
		31-Jul-79	--	--	--	--	--	<5	--	--	--	--	--	--	--	--
		07-Nov-79	--	--	--	--	--	<3	--	--	--	--	--	--	--	--
		11-Feb-80	--		--	--		<4	--	--	2,134	--	7.87	--	887	--
		30-May-85	--	--	--	--	--	--	--	**922**	--	7	7.3	**23.9**	1,042	0.42
		18-Jul-85	--	--	--	--	--	<2	--	--	--	--	--	--	--	--
		17-Mar-88	--	--	--	--	--		--	--	--	--	--	--	886	--
		05-Aug-03	--	3	2.60	--	--	10.80	--	**2,136**	--	8.07	--	8	1,097	--
		Feb - Mar 2008	--	1.50	1.19	2.25	3.44	7.85	6.85	**1,810**	2,250	6.98	7.80	0.97	--	<0.3
		09-Oct-10	2.47		0.88	3.41		2.62		**1,700**	2,600		7.1	5	1,380	0.267
		22-Jun-22		2.00	1.50	1.40		--		**2,100**	2,317	7.57		<5	955	0.300
	15T-303* (Pipeline Cyn./ 15K303 in 1948)	Jun-55								**2,450**	3,120				520	0.6
		24-Sept-87[b]	--	--	1.6 ± 0.1	0 ± 1	--	-5.1 ± 3.2	--	**2,593**	1910.00	8.00	7.20	<5	1,770	0.24
		28-Oct-03	0.46	0.69	0.47	1.50	--	4.0	--	**3,043**	--	8.13	--	<5	1,940	--
		Feb - Mar 2008	--	0.38	1.19	3.73	4.9	0.9	1	**2,528**	2,890	7.20	7	1	--	<0.3
		09-Oct-10	0.978		1.18	3.34		-0.526		**2,200**	3,500		6.8	7.54	2,000	0.100
		21-Jun-22		0.374	2.50	0.90		--		**2,490**	2,671	7.23		1.02	1,490	<0.1
Alluvium	16K-336 (Puerco North Fork; Superman 2)	Sep-53	--	--	--	--	--	--	--	**832**	1,330	--	--	--	91	0.3
		26-Mar-74	--	--	--	--	--	--	--	**892**	1,380	--	8.2	<10 (trace)	136	**13.02**
		29-Oct-03	0.38	0.57	0.83	0.30	--	5.9	--	**888**	--	8.05	--	6	122	--
		01-Oct-08	--	0.80	0.40	0.67	--	--	--	**904**	--	--	--	--	158	7
		09-Oct-10	0.402		1.20	4.58		0.129		**1,000**	150		7	**11**	118	2.89
		21-Jun-22		0.422	0.60	<0.4		--		**970**	1,244	7.63		4.07	122	1.00
	16K-340 (1081954)	Jun-54	--	--	--	--	--	--	--	**1,250**	1,810	--	--	--	314	**13.0**
		02-May-72	--	--	--	--	--	--	--	**1,423**	2,190	--	8.3	--	490	**20.46**
		20-Sep-77	--	2.4	--	--	--	--	--	--	2,150	--	7.1	--	--	--
		29-Oct-03	1.96	2.92	0.40	0.40	--	nd	--	**1,469**	--	8.16	--	<5	419	--
		Oct-09[b]	--	2.20	--	0.34	--	--	--	--	--	--	--	--	--	--
		09-Oct-10	1.812		0.464	0.747		5.46		**1,200**	190.0		7.6	8.5	368	5.97
		22-Jun-22		2	0	<0.2		--		**1,170**	1,655	8.24		<5	334	6.70
Westwater Canyon Member	Mine Well	Nov-73	--	--	--	--	--	--	--	412	663	--	--	--	110	--
	Mine Water	13-Feb-79		**1,250**	77	1.0				**552**			8	10	77	1
		14-Feb-79		**725**	103	1.0				421			8	<10	79	1
		16-Feb-79		**2,070**	0.6	5.0				415			8	<10	81	1
		17-Feb-79		**2,100**	49	<1				483			8	<10	76	1
		21-Feb-79		**960**	82	<1				386			8	<10	73	0
		27-Feb-79		**3,710**	155	<1				383			7	<10	70	1
		14-Mar-79		**1,570**	67	<1				386			7	<10	70	1
		27-Mar-79		**1,530**	90	2.0				404			8	<10	76	1

UPDATED Table 3. Summary of Groundwater Sampling Results w/corrected units

Geologic Formation	Well ID/ Sample ID	Sample Date**	Radionuclides							General Chemistry						
			Total Uranium (pCi/L)	Uranium (ug/L)	Radium-226 (pCi/L)	Radium-228 (pCi/L)	Radium-226 + Radium 228 (pCi/L)	Gross Alpha (pCi/L)	Gross Alpha excluding U (pCi/L)	TDS (mg/L)	Conductivity	Field pH	pH	Arsenic (ug/L)	Sulfate (mg/L)	Nitrate (mg/L)
A-Zone Aquifer Wells																
		11-Apr-79		**2,290**	22	5.0				381			8	<10	76	13
		2-May-79		**1,700**	11	--				371			8	--	73	1
		11-Jun-79		**3,620**	36	5.2				450			8	12	112	<0.1
		30-Apr-80		**2,840**	490	<1				381			8		71	
		16-Jul-80		**2,700**	86.1	1.3				**538**			6.7		272	
	Mill Well I	12-Aug-76	--							335			7.98	1	32	5
		9-Oct-84	--	**65**	1.8	--	--	**43**	--	228	--	--	8.49	1	18	--
		23-Apr-92	--	**576**	0.4	2		2		292			**8.83**	4	33	0.1
		28-Jul-93	--	2	1.6	1.4	3	1.8	--	**2258**	--	--	8.5	1.0	1,260	0.1
		3rd Quarter 1998	--	**65**	--	--	<0.2	--	--	--	--	--	--	--	--	--
		4th Quarter 1998	--	1	--	--	<0.2	--	--	--	--	--	--	--	--	--
		1st Quarter 1999	--	**48**	--	--	<0.2	--	--	--	--	--	--	--	--	--
		2nd Quarter 1999	--	**33**	--	--	<0.2	--	--	--	--	--	--	--	--	--
		18-Jun-02	--	**70**	0.7	2.7	3.4	1	--	**2,090**	--	--	8.34	1	1,100	0.1
		Feb-06	--	8.1	--	--	2.4	--	--	--	--	--	--	--	--	--
		Sep-10	--	3	0.92	1.7	2.6	--	1.7	**2,240**	--	--	**8.80**	<1	1270	<0.1
		09-Oct-10	5.604	8	0.639	1.77		9.79		**2,300**	360		7.4	5.0	1,460	0.100
		19-Jul-22		0.3	0.400	<-0.2	<0.2			**1,020**			8.3	2.0	469	0.170
MCLs				30	ne	ne	5	15	15	500	ne	6.5 to 8.5	6.5 to 8.5	10	ne	10

Notes:

▨ Shaded cells indicate data from before the July 16, 1979 spill.

a = Radio isotope data for Well 14K-586 is a compilation of data from the same formation in neighboring wells.

Values in **bold** exceed MCLs.

* - listed as 15K-303 No. 3 (In powerhouse) for Crownpoint

MCLs = maximum contaminant levels

mg/L = milligrams per liter

nd = non-detect (detection limit not available)

pCi/L = picoCuries per liter

TDS = total dissolved solids

-- = not analyzed for

<0.5 = not detected at concentrations greater than the laboratory reporting limit of 0.5 µg/L.

µg/L = micrograms per liter

Appendix A. Historic Select Well Groundwater Data

WELL

14K-586

WELL

14T-586

ecology and environment, inc.
International Specialists in the Environment
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Tel: (510) 893-6700, Fax: (510) 550-2760

January 24, 2011

U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, CA 94105

TDD No: T02-09-10-08-0005
Project No: 002693.2103.01RA

14T-586
15T-303
16k-336
16k-340
mill well

Attention: Harry Allen, USEPA On-Scene Coordinator
Andrew Bain, USEPA

Subject: **NECR Water Well Sampling**
Church Rock Chapter
Navajo Nation

INTRODUCTION

In October 2010 the U.S. Environmental Protection Agency (USEPA) tasked the Ecology and Environment Inc. Superfund Technical Assessment and Response Team (START) with technical assistance relating to residential water well sampling in the vicinity of the former Northeast Church Rock Mine located in the Church Rock Chapter of the Navajo Nation. (Figure 1, Attachment A).

The purpose of this sampling event was to generate additional data to measure the impact of the former Northeast Church Rock Mine uranium mine on wells within the adjacent areas.

SAMPLING ACTIVITIES

Well sampling was conducted on October 19, 2010. A total of five wells were sampled. Four of the wells were residential wells and one (Mill Well) well was part of the former United Nuclear Corporation (UNC) facility in the area. Every effort was made to collect water samples in a manner consistent with resident collection and use (i.e. taps, pumps or bucket collect).

A Time Critical Quality Assurance and Sampling (QASP) Plan (Appendix D) was developed prior to sampling and followed with the following exceptions:

- Well NR#1 is no longer in use and was not sampled as the casing has been filled with concrete.
- The Mine Well is no longer in use and was not sampled as the casing has been filled with concrete.

Water quality parameters were measured in the field using a Horiba, Ltd. multi-parameter water quality meter. The meter was calibrated daily using a buffer solution. Samples were collected and analyzed for metals, radionuclides and anions by GEL Laboratories Inc. (Charleston, SC). Samples were collected and analyzed for oxygen and hydrogen isotopic ratio by Isotech Laboratories, Inc (Champaign, Il). The QASP (Appendix D) contains all methods and volumes used in sample analysis.

WELL DESCRIPTIONS

Well 15T-303

Well 15T-303 is a windmill powered well that feeds into an approximately 40,000 gallon uncovered metal tank. The well is currently in use and there is a trough and locked tap in the vicinity of the tank that are used to water livestock. Samples were collected from the top of the tank using a bucket.

14T-586

14T-586 is a diesel engine powered well that feeds into an approximately 10,000 gallon covered metal tank. The well is currently in use and there is a trough and tap in the vicinity of the tank that are used to water livestock. Samples were collected from the tap in manner consistent with residential use.

Mill Well

The Mill Well is located on the former UNC facility property. The well is electric powered well, housed in a wooden pump house, north of the former UNC offices and equipment yard. There is no storage tank affiliated with the well and the well is not currently in use. Samples were collected from a tap inside the pump house with pump turned on.

Mine Well

The mine well is located within the boundary of the former Northeast Church Mine. The well is currently not in use and has been non-operational for at least 15 years. The well opening is currently plugged with concrete.

NR#1

The NR#1 well is located within the boundary of the former Northeast Church Mine. The well is currently not in use and has been non-operational for at least 15 years. The well opening is currently plugged with concrete.

16K-340

Well 16K-340 is a windmill powered well that feeds into an approximately 40,000 gallon covered metal tank. The well is currently in use and there is a trough and tap in the vicinity of the tank that are used to water livestock. Samples were collected from the tap in manner consistent with residential use.

RESULTS

Table 1 (Appendix B) gives a well specific summary of all applicable data. All laboratory data was validated by a START chemist using the *Region 9 Draft Superfund Data Evaluation/Validation Guidance.* Data validation indicated the laboratory data was acceptable with qualification as definitive data. A separate data validation report was generated under this project and is included in the project file.

This letter summarizes all activities conducted on the Tuba City Removal project. If you have any questions regarding START's activities associated with this project, please do not hesitate to contact me.

Respectfully,

Mike Folan

START Member

Attachments: A – Homesite Location Map
B –Data Tables
C – Photographic Documentation
D- QASP

cc: file

ATTACHMENT A:
Well Location Map

TDD: 09-10-08-0004
PAN: 002693.2103.01RA

Source: NGS Topo US 2D, Inlet: ESRI Streetmaps USA

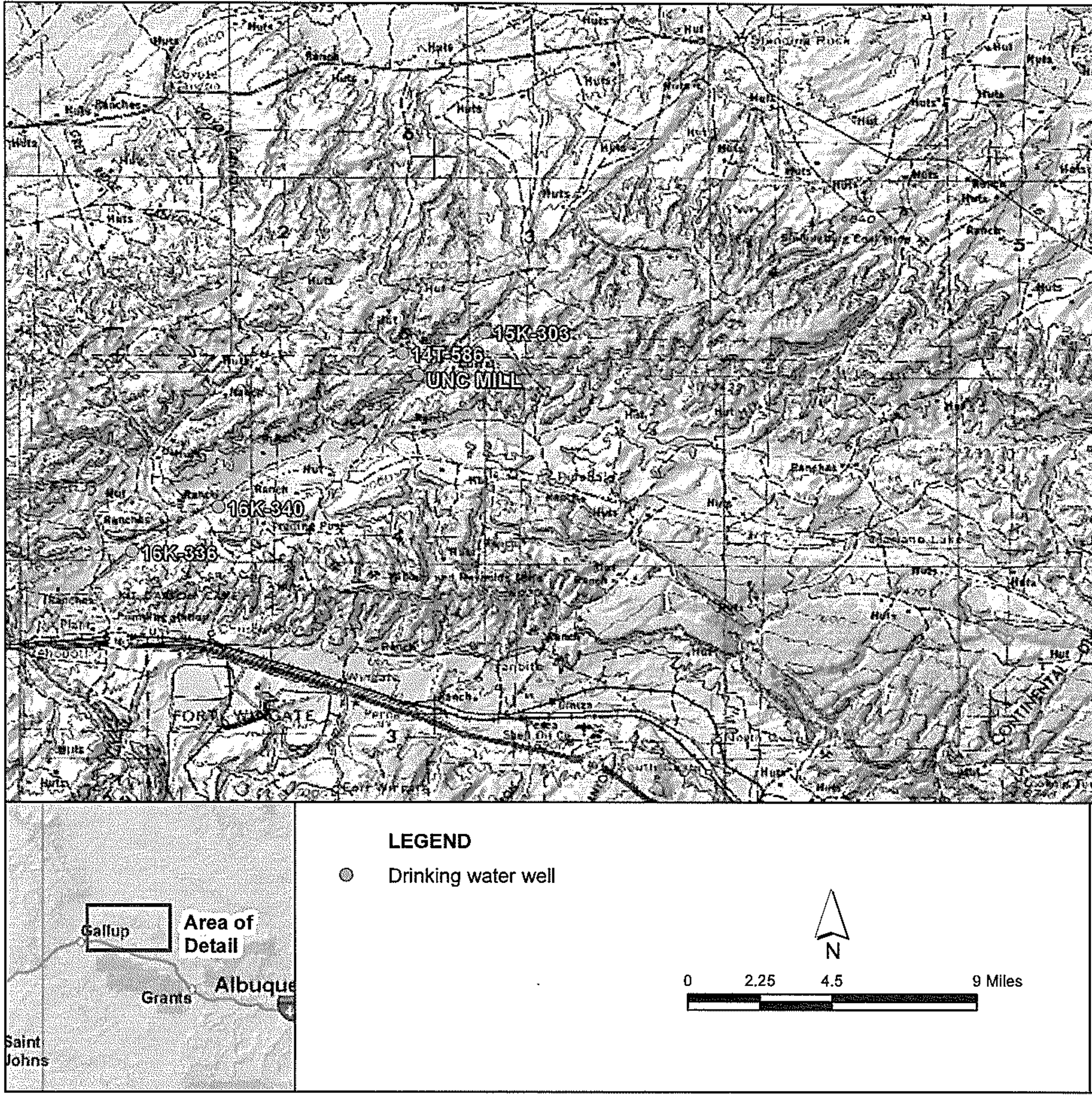


Figure 1
NECR
Water Well Sampling

Navajo Nation

ecology and environment, inc.
International Specialists in the Environment

ATTACHMENT B:
Data Tables

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005

PAN:002693.2104.01RA

	14T-586			14T-586100 (duplicate)			15T-303		
		Result	Units		Result	Units		Result	Units
Water Quality	pH	7.1		pH	7.1		pH	6.8	
	Conductivity	0.26	S/m	Conductivity	0.26	S/m	Conductivity	0.35	S/m
	Turbidity	10.1	NTU	Turbidity	10.1	NTU	Turbidity	10.1	NTU
	Dissolved Oxygen	6.30	mg/L	Dissolved Oxygen	6.30	mg/L	Dissolved Oxygen	7.99	mg/L
	Temperature	7.6	°C	Temperature	7.6	°C	Temperature	12.1	°C
	Salinity	0.1	%	Salinity	0.1	%	Salinity	0.2	%
	Total Dissolved Solids	1.7	g/L	Total Dissolved Solids	1.7	g/L	Total Dissolved Solids	2.2	g/L
	Oxidation Reduction Potential	100	mV	Oxidation Reduction Potential	100	mV	Oxidation Reduction Potential	129	mV
Metals	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Aluminum	220	ug/L	Aluminum	82	ug/L	Aluminum	68.0	ug/L
	Antimony	3.00	ug/L	Antimony	7.34	ug/L	Antimony	6.83	ug/L
	Arsenic	5.00	ug/L	Arsenic	5.00	ug/L	Arsenic	7.54	ug/L
	Barium	13.1	ug/L	Barium	13.4	ug/L	Barium	8.24	ug/L
	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L
	Bromide	0.200	ug/L	Bromide	0.200	ug/L	Bromide	0.200	ug/L
	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L	Cadmium	1.17	ug/L
	Calcium	270000	ug/L	Calcium	281000	ug/L	Calcium	373000	ug/L
	Chromium	13.9	ug/L	Chromium	1.00	ug/L	Chromium	1.16	ug/L
	Cobalt	1.13	ug/L	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L
	Copper	3.00	ug/L	Copper	3.00	ug/L	Copper	3.00	ug/L
	Iron	482	ug/L	Iron	468	ug/L	Iron	685	ug/L
	Lead	3.30	ug/L	Lead	3.30	ug/L	Lead	3.30	ug/L
	Magnesium	119000	ug/L	Magnesium	122000	ug/L	Magnesium	144000	ug/L
	Manganese	320	ug/L	Manganese	319	ug/L	Manganese	162	ug/L
	Mercury	0.066	ug/L	Mercury	0.066	ug/L	Mercury	0.066	ug/L
	Nickel	71.3	ug/L	Nickel	1.51	ug/L	Nickel	1.50	ug/L
	Potassium	7430	ug/L	Potassium	7690	ug/L	Potassium	5650	ug/L
	Selenium	7.7	ug/L	Selenium	37.7	ug/L	Selenium	43.8	ug/L
	Silver	1.00	ug/L	Silver	1.00	ug/L	Silver	1.00	ug/L
	Sodium	135000	ug/L	Sodium	140000	ug/L	Sodium	188000	ug/L
	Thallium	5.00	ug/L	Thallium	5.00	ug/L	Thallium	8.9	ug/L
	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L
	Zinc	338	ug/L	Zinc	355	ug/L	Zinc	839	ug/L
Radionuclide's	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	ALPHA	2.62	pCi/L	ALPHA	5.80	pCi/L	ALPHA	-0.526	pCi/L
	BETA	6.58	pCi/L	BETA	6.02	pCi/L	BETA	2.62	pCi/L
	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent
	Radium-226	0.880	pCi/L	Radium-226	0.540	pCi/L	Radium-226	1.18	pCi/L
	Radium-228	3.41	pCi/L	Radium-228	3.71	pCi/L	Radium-228	3.34	pCi/L
	Thorium-228	-0.0147	pCi/L	Thorium-228	0.155	pCi/L	Thorium-228	-0.139	pCi/L
	Thorium-230	-0.185	pCi/L	Thorium-230	0.818	pCi/L	Thorium-230	-0.158	pCi/L
	Thorium-232	-0.133	pCi/L	Thorium-232	-0.0195	pCi/L	Thorium-232	-0.0195	pCi/L
	Uranium-233/234	1.16	pCi/L	Uranium-233/234	1.73	pCi/L	Uranium-233/234	0.317	pCi/L
	Uranium-235/236	0.114	pCi/L	Uranium-235/236	0.0569	pCi/L	Uranium-235/236	0.219	pCi/L
	Uranium-238	1.20	pCi/L	Uranium-238	0.790	pCi/L	Uranium-238	0.442	pCi/L

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005 PAN:002693.2104.01RA

	14T-586			14T-586100 (duplicate)			15T-303		
Anions	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Chloride	14.0	mg/L	Chloride	14.1	mg/L	Chloride	10.5	mg/L
	Nitrate	0.267	mg/L	Nitrate	0.266	mg/L	Nitrate	0.100	mg/L
	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L
	Ortho-phosphate	0.200	mg/L	Ortho-phosphate	0.200	mg/L	Ortho-phosphate	2.00	mg/L
	Sulfate	1380	mg/L	Sulfate	1310	mg/L	Sulfate	2000	mg/L
	Fluoride	1.19	mg/L	Fluoride	1.24	mg/L	Fluoride	1.52	mg/L
	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	δD H_2O	-80.8	%	δD H_2O	-81.2	%	δD H_2O	-73.1	%
	$\delta^{18}O$ H_2O	-10.44	%	$\delta^{18}O$ H_2O	-10.53	%	$\delta^{18}O$ H_2O	-8.56	%

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005 PAN:002693.2104.01RA

	16K-336			16K-340			MILLWELL		
		Result	Units		Result	Units		Result	Units
Water Quality	pH	7.4		pH	7.6		pH	7.4	
	Conductivity	0.15	S/m	Conductivity	0.19	S/m	Conductivity	0.36	S/m
	Turbidity	29.9	NTU	Turbidity	5.5	NTU	Turbidity	14.7	NTU
	Dissolved Oxygen	3.05	mg/L	Dissolved Oxygen	5.26	mg/L	Dissolved Oxygen	6.39	mg/L
	Temperature	15.5	°C	Temperature	16.8	°C	Temperature	15.2	°C
	Salinity	0.1	%	Salinity	0.1	%	Salinity	0.2	%
	Total Dissolved Solids	1	g/L	Total Dissolved Solids	1.2	g/L	Total Dissolved Solids	2.3	g/L
	Oxidation Reduction Potential	86	mV	Oxidation Reduction Potential	76	mV	Oxidation Reduction Potential	-127	mV
Metals	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Aluminum	229	ug/L	Aluminum	126	ug/L	Aluminum	68.0	ug/L
	Antimony	3.00	ug/L	Antimony	3.00	ug/L	Antimony	3.00	ug/L
	Arsenic	11	ug/L	Arsenic	8.53	ug/L	Arsenic	5.00	ug/L
	Barium	450	ug/L	Barium	140	ug/L	Barium	1.64	ug/L
	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L
	Bromide	0.234	ug/L	Bromide	0.295	ug/L	Bromide	0.361	ug/L
	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L
	Calcium	76800	ug/L	Calcium	99800	ug/L	Calcium	2420	ug/L
	Chromium	1.00	ug/L	Chromium	1.03	ug/L	Chromium	1.43	ug/L
	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L
	Copper	29.7	ug/L	Copper	3.00	ug/L	Copper	20.4	ug/L
	Iron	2720	ug/L	Iron	181	ug/L	Iron	9870	ug/L
	Lead	3.58	ug/L	Lead	3.30	ug/L	Lead	3.74	ug/L
	Magnesium	20600	ug/L	Magnesium	43500	ug/L	Magnesium	470	ug/L
	Manganese	95.9	ug/L	Manganese	122	ug/L	Manganese	51	ug/L
	Mercury	0.066	ug/L	Mercury	0.066	ug/L	Mercury	0.066	ug/L
	Nickel	1.50	ug/L	Nickel	1.50	ug/L	Nickel	2.38	ug/L
	Potassium	2540	ug/L	Potassium	3940	ug/L	Potassium	3200	ug/L
	Selenium	10.2	ug/L	Selenium	5.00	ug/L	Selenium	26.7	ug/L
	Silver	1.00	ug/L	Silver	1.00	ug/L	Silver	1.00	ug/L
	Sodium	202000	ug/L	Sodium	233000	ug/L	Sodium	694000	ug/L
	Thallium	5.00	ug/L	Thallium	5.00	ug/L	Thallium	6.45	ug/L
	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L
	Zinc	153	ug/L	Zinc	148	ug/L	Zinc	659	ug/L
Radionuclide's	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	ALPHA	0.129	pCi/L	ALPHA	5.46	pCi/L	ALPHA	9.79	pCi/L
	BETA	4.99	pCi/L	BETA	2.37	pCi/L	BETA	2.72	pCi/L
	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent
	Radium-226	1.20	pCi/L	Radium-226	0.464	pCi/L	Radium-226	0.639	pCi/L
	Radium-228	4.58	pCi/L	Radium-228	0.747	pCi/L	Radium-228	1.77	pCi/L
	Thorium-228	0.298	pCi/L	Thorium-228	-0.0682	pCi/L	Thorium-228	0.139	pCi/L
	Thorium-230	-0.524	pCi/L	Thorium-230	0.0264	pCi/L	Thorium-230	0.480	pCi/L
	Thorium-232	-0.0195	pCi/L	Thorium-232	-0.0722	pCi/L	Thorium-232	-0.0195	pCi/L
	Uranium-233/234	-0.171	pCi/L	Uranium-233/234	0.297	pCi/L	Uranium-233/234	2.61	pCi/L
	Uranium-235/236	0.181	pCi/L	Uranium-235/236	0.115	pCi/L	Uranium-235/236	0.174	pCi/L
	Uranium-238	0.392	pCi/L	Uranium-238	1.40	pCi/L	Uranium-238	2.82	pCi/L

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005 PAN:002693.2104.01RA

	16K-336			16K-340			MILLWELL		
Anions	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Chloride	18.8	mg/L	Chloride	22.1	mg/L	Chloride	154	mg/L
	Nitrate	2.89	mg/L	Nitrate	5.97	mg/L	Nitrate	0.100	mg/L
	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L
	Ortho-phosphate	0.291	mg/L	Ortho-phosphate	0.163	mg/L	Ortho-phosphate	2.00	mg/L
	Sulfate	118	mg/L	Sulfate	368	mg/L	Sulfate	1460	mg/L
	Fluoride	0.861	mg/L	Fluoride	0.483	mg/L	Fluoride	1.73	mg/L
	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	δD H_2O	-91.4	%	δD H_2O	-82.6	%	δD H_2O	-107.3	%
	$\delta^{18}O$ H_2O	-12.04	%	$\delta^{18}O$ H_2O	-11.01	%	$\delta^{18}O$ H_2O	-14.14	%

ATTACHMENT C:
Photographic Documentation

PHOTOGRAPHIC LOG

NECR Water Well Sampling

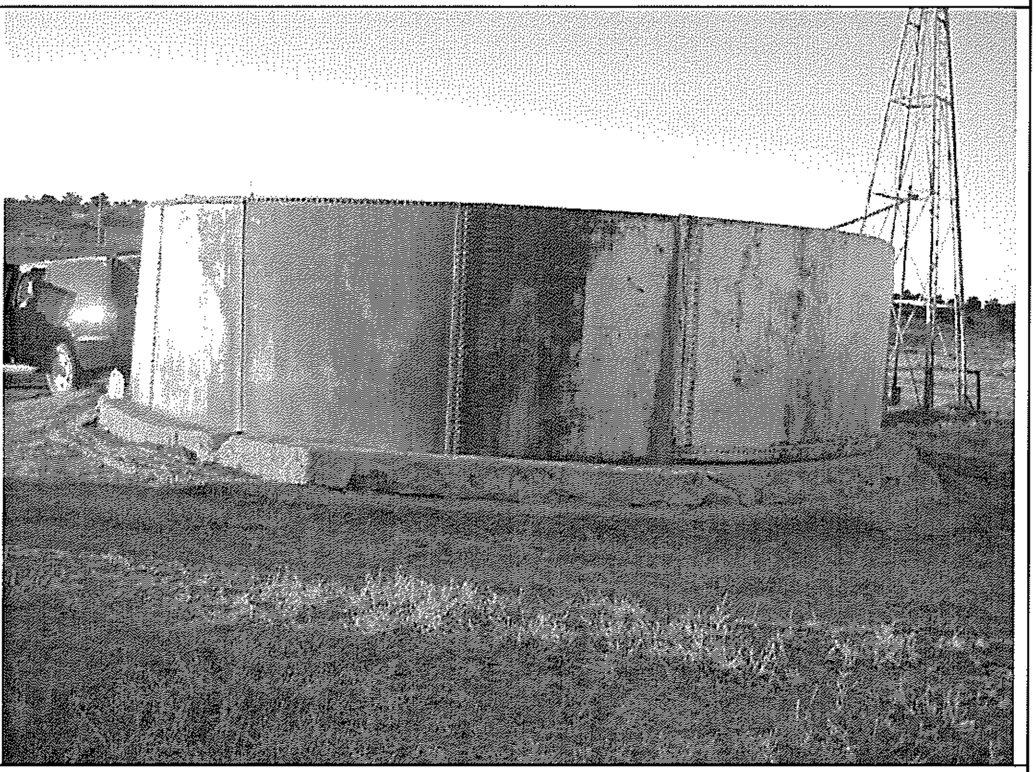
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date:
10/19/10

Description:

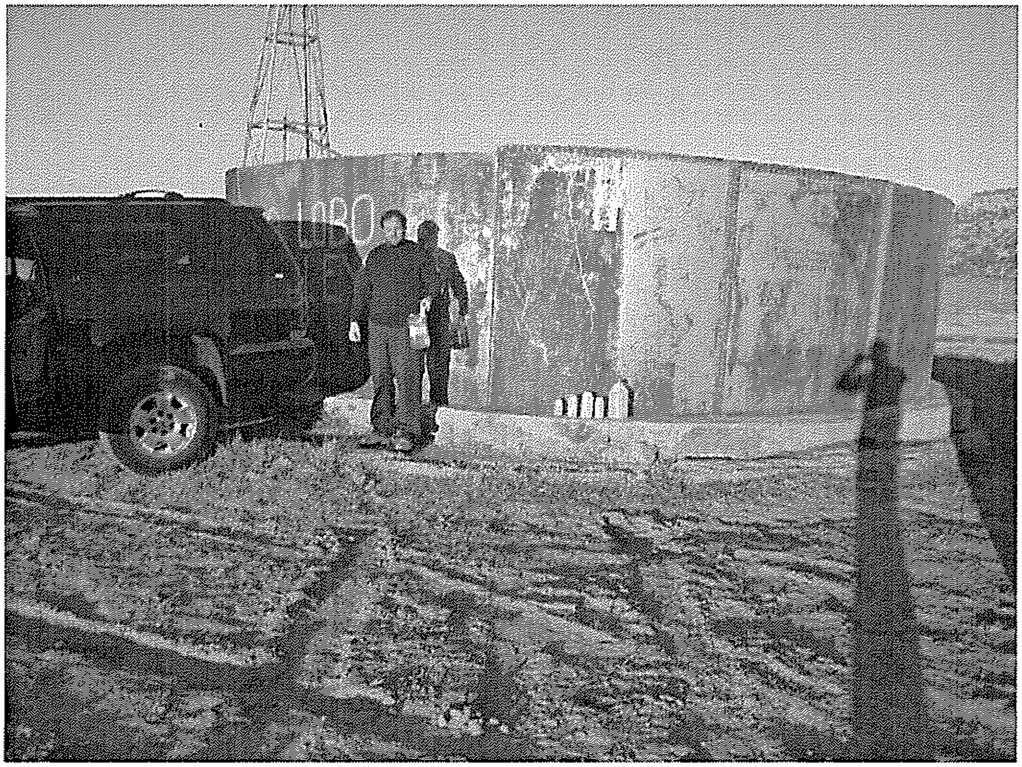
Well 15T-303



Date:
10/19/10

Description:

Well 15T-303



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

002693.2103.01RA

T02-09-10-08-0005

	Date: 10/19/10

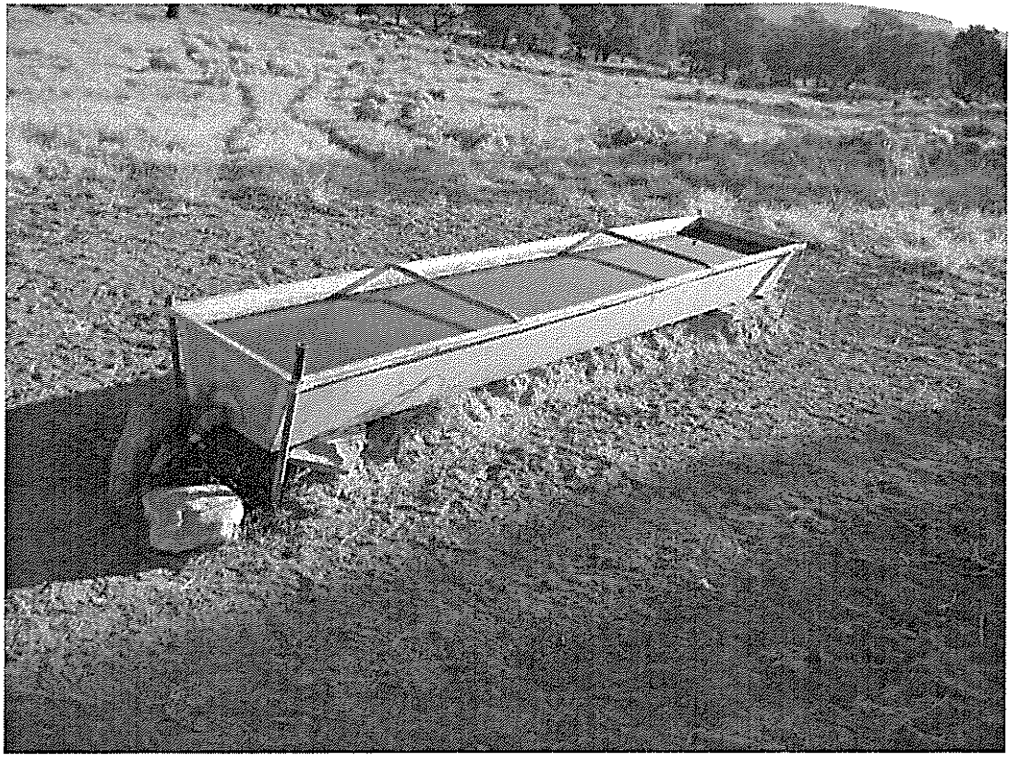
Description:

Well 14T-586

	Date: 10/19/10

Description:

Well 14T-586



PHOTOGRAPHIC LOG

NECR Water Well Sampling

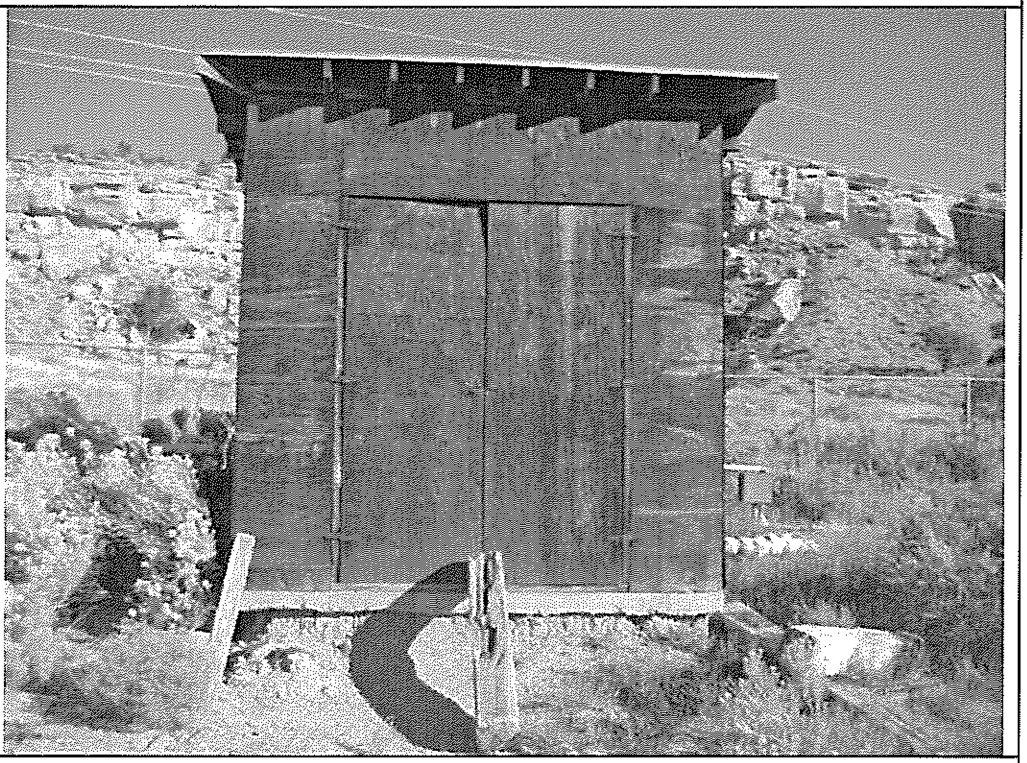
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

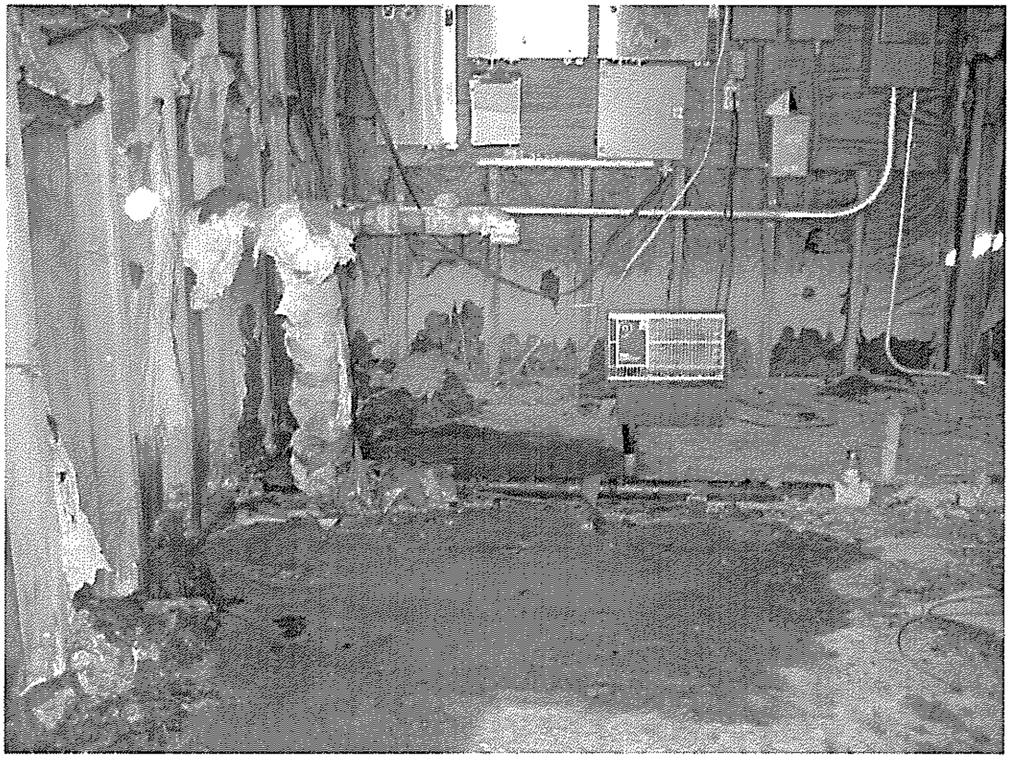
Mill Well



Date: 10/19/10

Description:

Mill Well



PHOTOGRAPHIC LOG

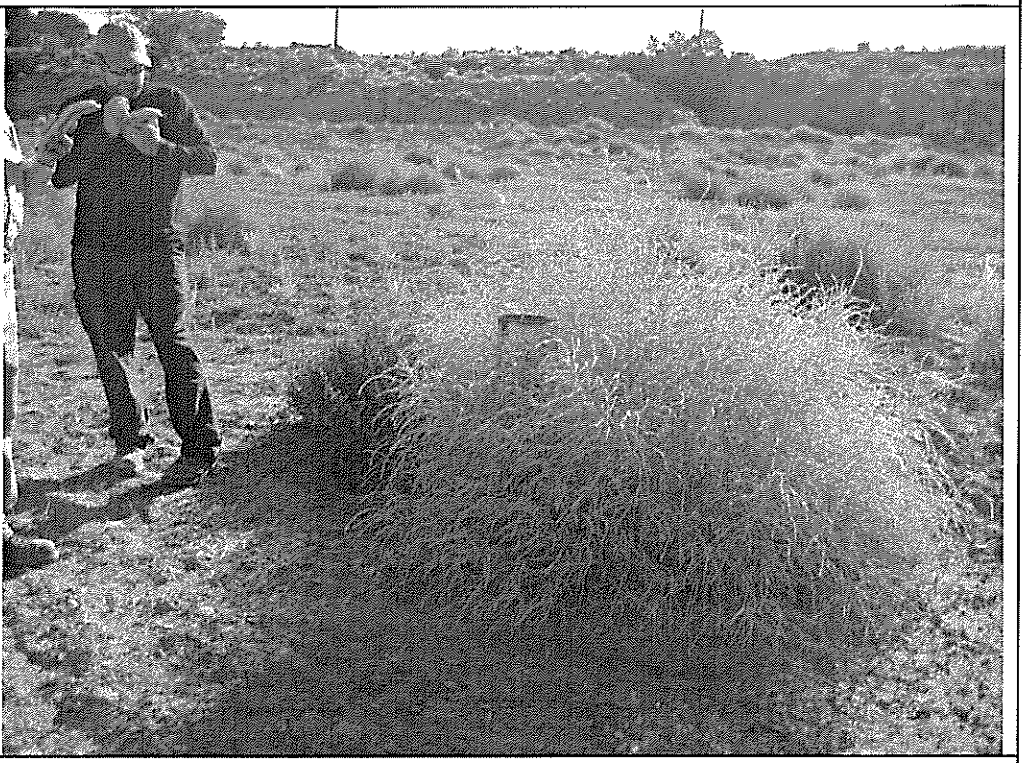
NECR Water Well Sampling

Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date:
10/19/10

Description:
Mine Well



Date:
10/19/10

Description:

Well NR#1

PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

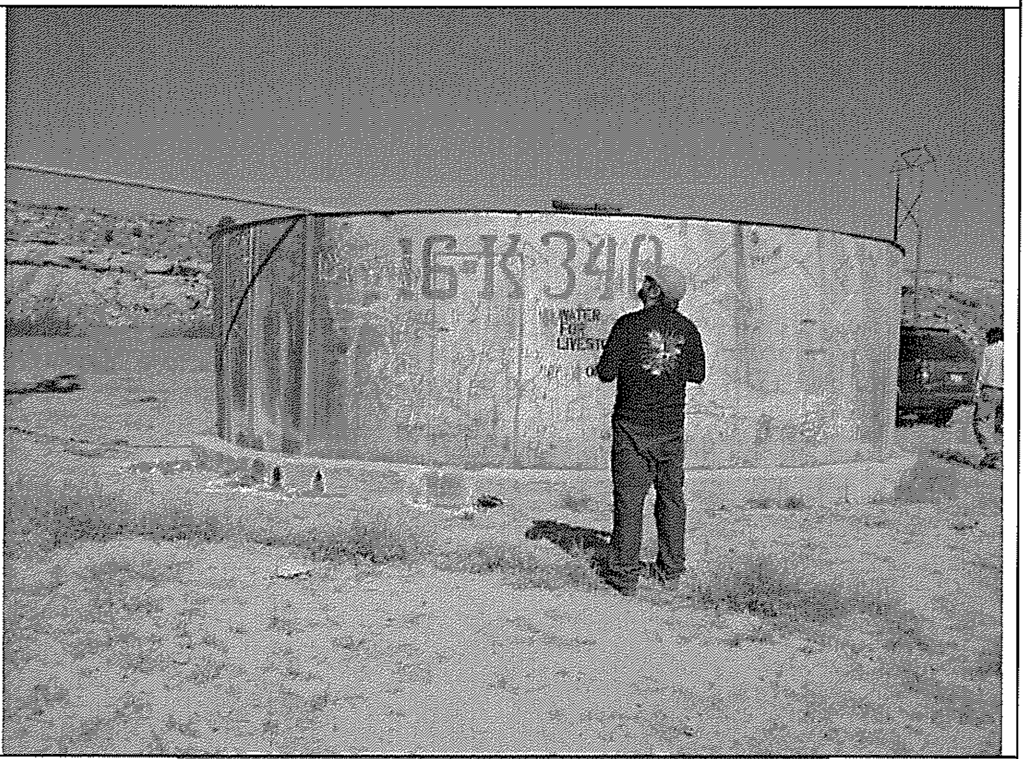
002693.2103.01RA

T02-09-10-08-0005

Date:
10/19/10

Description:

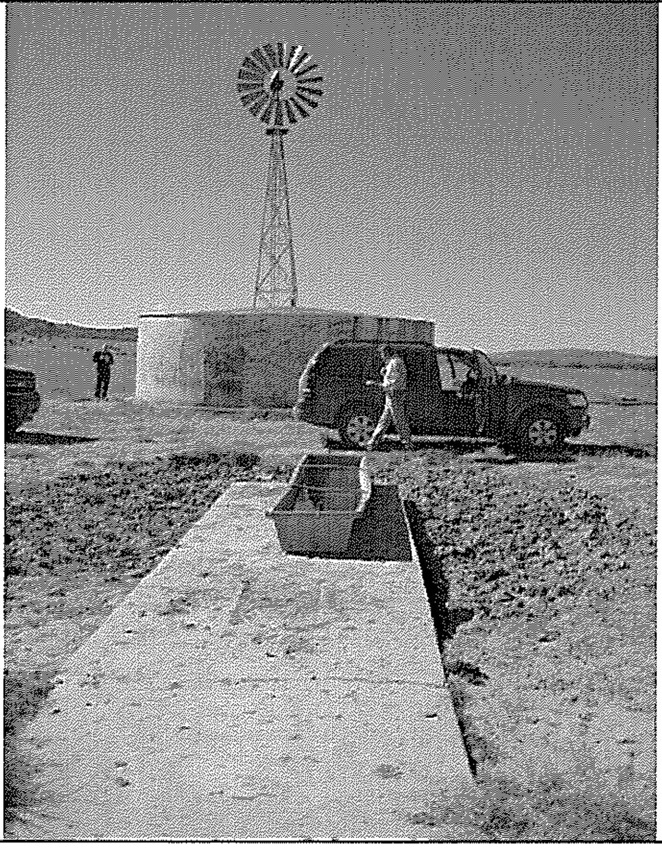
16K-340



Date:
10/19/10

Description:

16K-340



PHOTOGRAPHIC LOG

NECR Water Well Sampling

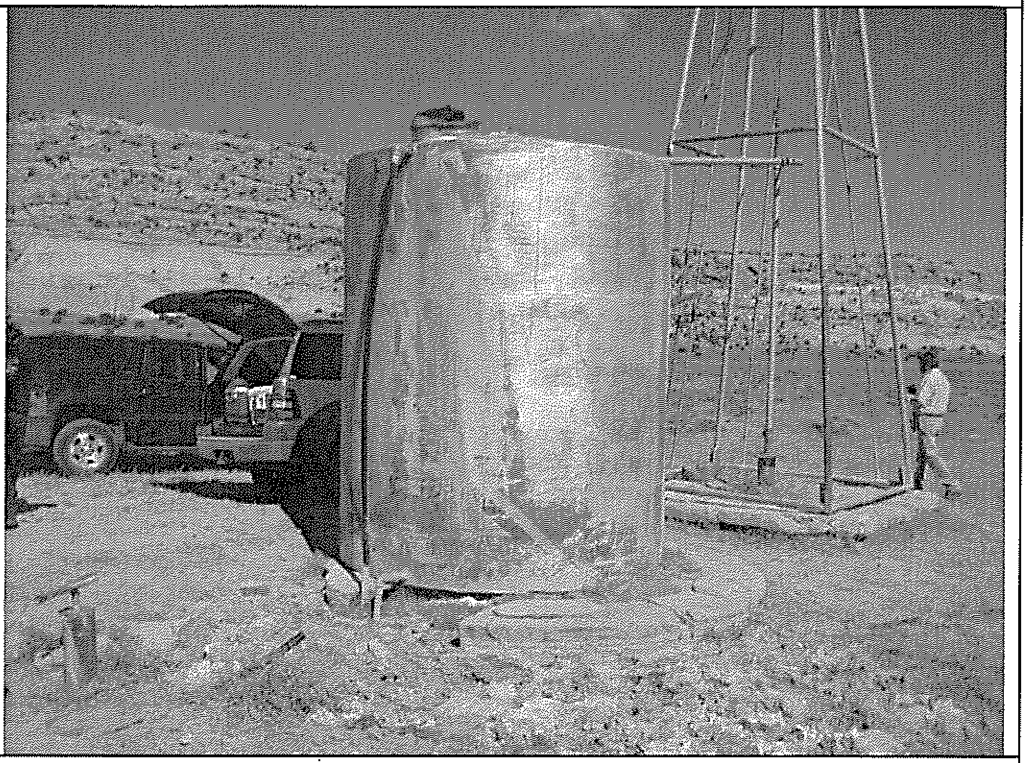
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

16K-336



Date: 10/19/10

Description:

16K-336

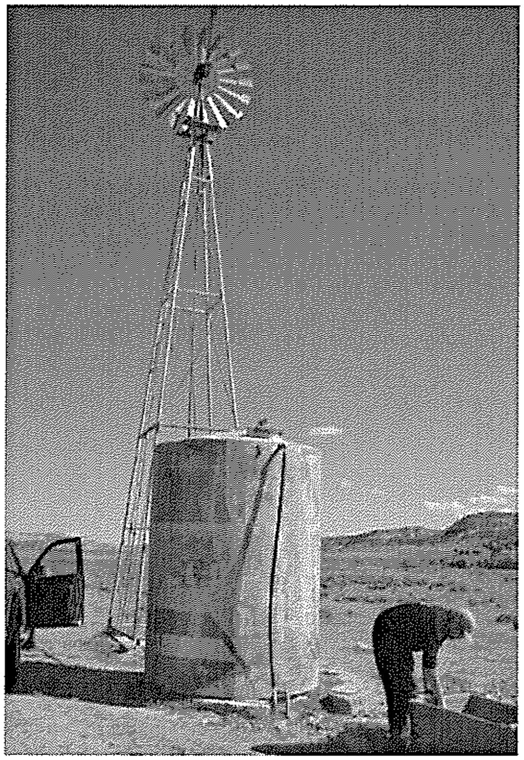


Table J
Reporting Limits, Action Levels, and Quality Control Limits

Analysis	Analyte	Action Level (mg/L)	Quantitation Limit (µg/L)	Duplicate RPD	Matrix Spike	Matrix Spike RPD
Anions by 300.0	Fluoride	4	0.10	25	75-125	20
Anions by 300.0	Chloride	250	1.0	25	75-125	20
Anions by 300.0	Nitrite as N	1	0.10	25	75-125	20
Anions by 300.0	Nitrate as N	10	0.10	25	75-125	20
Anions by 300.0	o-Phosphate, as P	Not Available	1.0	25	75-125	20
Anions by 300.0	Sulfate	250 (s)	0.50	25	75-125	20
Metals by 6010B	Aluminum	0.1	100	25	75-125	20
Metals by 6010B	Antimony	0.1	100	25	75-125	20
Metals by 6010B	Arsenic	0.01	10	25	75-125	20
Metals by 6010B	Barium	2	20	25	75-125	20
Metals by 6010B	Beryllium	0.005	5	25	75-125	20
Metals by 6010B	Cadmium	0.01	10	25	75-125	20
Metals by 6010B	Calcium	Not Available	1000	25	75-125	20
Metals by 6010B	Chromium	0.10	10	25	75-125	20
Metals by 6010B	Cobalt	Not Available	20	25	75-125	20
Metals by 6010B	Copper	1.3 (s)	20	25	75-125	20
Metals by 6010B	Iron	Not Available	50	25	75-125	20
Metals by 6010B	Lead	0.015	5	25	75-125	20
Metals by 6010B	Magnesium	Not Available	600	25	75-125	20
Metals by 6010B	Manganese	0.05 (s)	15	25	75-125	20
Metals by 6010B	Mercury	0.002	0.5	25	75-125	20
Metals by 6010B	Nickel	Not Available	20	25	75-125	20
Metals by 6010B	Potassium	Not Available	5000	25	75-125	20
Metals by 6010B	Selenium	0.05	10	25	75-125	20
Metals by 6010B	Silver	0.10 (s)	10	25	75-125	20
Metals by 6010B	Thallium	0.002	10	25	75-125	20
Metals by 6010B	Vanadium	Not Available	20	25	75-125	20
Metals by 6010B	Zinc	5 (s)	10	25	75-125	20
Gross alpha by 900.0	alpha	See table A-1	1.0 piC/L	25	75-125	20
Gross beta by 900.0	beta	See table A-1	1.0 piC/L	25	75-125	20
903.1	Ra-226	See table A-1	1.0 piC/L	25	75-125	20
904.0	Ra-228	See table A-1	1.0 piC/L	25	75-125	20
Isotopic Th by HASL 300 Th-01-RCmod	Th-238, 230, 232	See table A-1	1.0 piC/L	25	75-125	20
Isotopic U by HASL 300 U-02-RC mod	U-233/234, U-235/236, U-238	See table A-1	1.0 piC/L	25	75-125	20

Key: RPD = relative percent difference; mg/L = milligrams per liter; µ/L = micrograms per Liter NA = Not Applicable

(s) = National Secondary Drinking Water Regulation not enforceable and not an action limit for this assessment

MAY 2 0 1976.

(14T-58

BUREAU OF INDIAN AFFAIRS
SOIL, WATER & MATERIALS [illegible]ING LABORATORY
P. O. BOX 1060, GALLUP, NEW MEXICO 87301
LABORATORY DATA SHEET FOR WATER SAMPLES

LAB. NO. 76-NT-894 FIELD NO. ' ANALYZED BY N PD
COLLECTOR Russ Brangan - Kerr McGee TRANSCRIBED BY napodaca
LOCATION Sec 35 T 17 R 16W CHECKED BY
DATE RECEIVED BY LABORATORY April 13,1976 REPORTED BY
DATE ANALYSIS COMPLETED 4-27-76 AUTHORIZED BY George B. Soce
DATE COLLECTED April 12,1976 SOURCE OF WATER 14-T-586
DEPARTMENT Navajo Tribe AGENCY Ft. Defiance BRANCH Water & Sanitation

		Meq/1	Mg/1
Temperature (^oF)____(^oC)		—	—
Silica (SiO_2)			
Boron (B)			0.19
Iron (Fe)		trace	trace
Calcium (Ca)		5.10	102.20
Magnesium (Mg)		4.20	51.07
Sodium (Na)		9.60	220.70
Potassium (K)		0.19	7.43
Cations		19.09	
Phosphorus (P)			trace
Bicarbonate (HCO_3)		6.20	408.83
Carbonate (CO_3)		trace	trace
Sulfate (SO_4)		12.09	580.68
Chloride (Cl)		0.43	15.25
Fluoride (F)		0.04	0.68
Nitrate (N)		trace	Trace
Anions		19.26	
Total Solids Mg/1			4890
Dissolved Solids Mg/1			1222
Dissolved Solids Tons Per Acre Foot	1.66		
Hardness as Mg/1 Ca CO_3 Calcium, Magnesium			465
Hardness as Mg/1 Ca CO_3 Non Carbonate			130
Alkalinity as Mg/1 Ca CO_3 Bicarbonate Alkalinity			335
Alkalinity as Mg/1 Ca CO_3 Carbonate Alkalinity			—
Alkalinity as Mg/1 Ca CO_3 Hydroxide Alkalinity			—
Total Alkalinity			335
Soluble Sodium Percentage (SSP)	51		
Sodium Absorption Ratio (SAR)	4.45		
Specific Conductance (Micromhos at 25^{o}C)	1690		
Residual Sodium Carbonate (RSC)		—	
PH	8.0		
Class for Irrigation Water	$C_3 S_1$		

REMARKS:

14T-586 Friendship-1 PWSID NN3500323

d/s of mill

2008

EPA sample
0.970 Arsenic MCL 10 ug/L
1.500 Uranium MCL 30 ug/L
1.190 Ra226 pCi/L
2.250 Ra228 pCi/L
3.440 RaTotal MCL 5 pCi/L
7.850 Gross Alpha pCi/L
6.845 Gr. Alpha (excluding U) MCL 15 pCi/L
4.450 Beta
7.80 pH Secondary MCL 6.5 - 8.5
6.98 Field pH
2250.00 Conductivity umhos/cm
14.900 Turbidity MCL 1ntu
-0.37 Corrosivity
3.78 Collection temperature celsius
325.0 T. Alkalinity (CaCO3) mg/L
830.0 Total Hardness NTUA desired maximum 500 mg/L
150.4 Calcium NTUA desired range 75-200 mg/L
376.0 Calcium (CaCO3) NTUA desired range 75-200 mg/L
110.40 Magnesium mg/L
454.0 Magnesium (CaCO3) mg/L
1810.0 Dissolved Solids Secondary MCL 500 mg/L
16.40 Chloride Secondary MCL 250 mg/L
0.388 Fluoride Primary MCL 4.0; Secondary MCL 2.0 mg/L
<0.3 Phosphate mg/L
Sulfate Secondary MCL 250 mg/L
<0.3 Nitrate Primary MCL 10
<0.3 Nitrite Primary MCL 1 mg/L
ND Mercury Primary MCL .002 ug/L
100 Boron ug/L
240000 Calcium ug/L
2.100 Iron Secondary MCL .3 mg/L
120000 Magnesium ug/L
8000 Potassium ug/L
160000 Sodium ug/L
1100.0 Hardness as CaCO3 (calculated) mg/L
ND AluminumSecondary MCL .05-.2 mg/L
ND Antimony Primary MCL .006 mg/L
0.0200 Barium Primary MCL 2 mg/L
ND Beryllium Primary MCL .004 mg/L
ND Cadmium Primary MCL .005 mg/L
ND ChromiumPrimary MCL .1mg/L
1.30 Cobalt ug/L
0.0029 Copper Primary MCL action level 1.3 mg/L
ND Lead Primary MCL action level .015 mg/L
2.0000 Manganese Secondary MCL .05 mg/L
13.00 Molybdenum ug/L
13.000 NickelB ug/L
0.00110 SeleniumPrimary MCL .05 mg/L
ND Silver Secondary MCL .10 mg/L
ND ThalliumPrimary MCL .002 mg/L
ND Vanadiumug/L
2.0000 Zinc Secondary MCL 5 mg/L

15K-303 Pipeline Canyon Well

d/s of mine

EPA

2008?

EPA sample
0.710 Arsenic MCL 10 ug/L
0.380 Uranium MCL 30 ug/L
1.190 Ra226 pCi/L
3.730 Ra228 pCi/L
4.920 RaTotal MCL 5 pCi/L
0.895 Gross Alpha pCi/L
0.640 Gr. Alpha (excluding U) MCL 15 pCi/L
13.800 Beta
6.54 pH Secondary MCL 6.5 - 8.5
7.20 Field pH

2890.00 Conductivity umhos/cm
11.200 Turbidity MCL 1ntu
-0.45 Corrosivity
3.70 Collection temperature celsius
195.0 T. Alkalinity (CaCO3) mg/L
1040.0 Total Hardness NTUA desired maximum 500 mg/L
129.6 Calcium NTUA desired range 75-200 mg/L
324.0 Calcium (CaCO3) NTUA desired range 75-200 mg/L
174.10 Magnesium mg/L
716.0 Magnesium (CaCO3) mg/L
2528.0 Dissolved Solids Secondary MCL 500 mg/L
10.50 Chloride Secondary MCL 250 mg/L
0.738 Fluoride Primary MCL 4.0; Secondary MCL 2.0 mg/L
<0.3 Phosphate mg/L
Sulfate Secondary MCL 250 mg/L
<0.3 Nitrate Primary MCL 10
<0.3 Nitrite Primary MCL 1 mg/L
ND Mercury Primary MCL .002 ug/L
110 Boron ug/L
370000 Calcium ug/L
1.000 Iron Secondary MCL .3 mg/L
140000 Magnesium ug/L
5300 Potassium ug/L
140000 Sodium ug/L
1500.0 Hardness as CaCO3 (calculated) mg/L
ND AluminumSecondary MCL .05-.2 mg/L
ND Antimony Primary MCL .006 mg/L
0.0067 Barium Primary MCL 2 mg/L
ND Beryllium Primary MCL .004 mg/L
ND Cadmium Primary MCL .005 mg/L
ND ChromiumPrimary MCL .1mg/L
0.77 Cobalt ug/L
0.0024 Copper Primary MCL action level 1.3 mg/L
ND Lead Primary MCL action level .015 mg/L
0.3100 Manganese Secondary MCL .05 mg/L
0.84 Molybdenum ug/L
16.000 NickelB ug/L
0.00083 SeleniumPrimary MCL .05 mg/L
ND Silver Secondary MCL .10 mg/L
ND ThalliumPrimary MCL .002 mg/L
ND Vanadiumug/L
0.0400 Zinc Secondary MCL 5 mg/L

Annie Grey HP

EPA sample
2.400 Arsenic MCL 10 ug/L
5.200 Uranium MCL 30 ug/L
0.948 Ra226 pCi/L
0.566 Ra228 pCi/L
1.514 RaTotal MCL 5 pCi/L
12.200 Gross Alpha pCi/L
8.716 Gr. Alpha (excluding U) MCL 15 pCi/L
35.400 Beta
8.57 pH Secondary MCL 6.5 - 8.5
6.90 Field pH
332.00 Conductivity umhos/cm
22.400 Turbidity MCL 1ntu
-1.54 Corrosivity
6.82 Collection temperature celsius
143.0 T. Alkalinity (CaCO3) mg/L
55.2 Total Hardness NTUA desired maximum 500 mg/L
17.6 Calcium NTUA desired range 75-200 mg/L
44.0 Calcium (CaCO3) NTUA desired range 75-200 mg/L

Mill well
6/18/02
8/12/76
'84
'92
'93

Mine Well
'79
'80

MWH

To: Roy Blickwedel
Larry Bush

Date: August 3, 2004

From: Jed Thompson

Job No: 1010139.011802

Subject: Groundwater Quality in the Westwater Canyon Member at the Northeast Church Rock Mine

---

This memorandum was prepared in response to comments to the Northeast Church Rock (NECR) Mine Closeout Plan received from the State of New Mexico, Mining and Minerals Division (MMD) in their memo dated June 23, 2004. This memorandum presents available information about:

- Regional groundwater quality within the Westwater Canyon Member, Dakota Sandstone and Gallup Formation near the NECR Mine site (the Site),
- Historic groundwater quality analyses of NECR mine water; and,
- Comparisons of regional and historic water quality data to the groundwater sample collected at the Site on May 17, 2004.

HISTORIC AND REGIONAL DATA

Historic and regional groundwater quality data sources used in this report are listed below.

- *Water Quality Impacts of Uranium Mining and Milling Activities in the Grants Mineral Belt, New Mexico.* (EPA, 1975)
- *Water Quality Data for Discharges from New Mexico Uranium Mines and Mills.* (NMEID, 1980)
- *Hydrogeology and Water Resources of San Juan Basin, New Mexico. Hydrologic Report 6.* (Stone, 1983)
- *Reclamation Engineering Services, Geohydrologic Report.* (Canonie, 1987)
- *Five-year Review Report, United Nuclear Corporation Ground Water Operable Unit McKinley County, New Mexico.* (USEPA, 1998)
- Discharge Permit (DP) 63 sampling results

The primary aquifers in the Church Rock region are the Dakota Sandstone and Westwater Canyon Member. Higher geologic units, including the Gallup Formation and the alluvium are not historic aquifers (Canonie, 1987).

The alluvium and Gallup Formation at the Northeast Church Rock mine and mill were unsaturated. Occurrences of groundwater in both units are derived from mine dewatering seepage from multiple mines (USEPA, 1998), and are hydraulically separated from the Dakota Sandstone and Westwater Canyon Member by the Upper D-Cross Tongue Member of the Mancos Shale which is a very

effective aquiclude (Canonie, 1987). Minewater that seeped into the alluvium and Gallup Formation is being regulated and addressed under the Church Rock Mill Superfund site under NRC Source Materials License SUA-1475. Minewater was discharged to Pipeline Arroyo in accordance with the Federal Clean Water Act under NPDES Permit Number NM0020401.

Groundwater flows downdip in bedrock (Canonie, 1987). The local dip and groundwater flow direction in the Gallup Formation, Dakota Sandstone and Westwater Canyon Member is to the north (Stone, 1983).

Available analytical data for Site minewater are summarized in Table 1 and listed in Attachment 1. All data are reported results from DP-63 for minewater before comingling with decant from sand backfill. These data represent the ambient groundwater quality in the Westwater Canyon Member at the Site.

TABLE 1
NECR MINEWATER QUALITY DATA SUMMARY[1]

	Data Points	Average[2]	Max	Min	St Dev	NMED Std.[3]
MAJOR IONS						
Alkalinity (CaCO3)	2	179.5	232	127	--	
Bicarbonate	1	155	155	155	--	
Calcium	2	20.55	31	10.1	--	
Chloride	13	7.6	14.9	5	3.0	250
Fluoride	11	0.50	0.55	0.42	0.03	1.6
Magnesium	2	2.6	4.2	1	--	
Nitrogen, Nitrate (as N)	11	1.7	13	0.1	3.7	10
Potassium	2	2.1	2.2	1.9	--	
Sodium	5	282.9	1009.1	10	410.5	
Sulfate	13	93	272	70	55	600
PHYSICAL PROPERTIES						
TDS	13	426.9	552	370.5	61.3	1000
pH[4]	13	7.88	8.45	6.70	0.52	6 to 9
Conductivity[5]	5	683	950	485	171	
METAL – DISSOLVED						
Aluminum	13	0.5	2.8	0.1	0.7	5.0
Arsenic	10	0.0102	0.0118	0.0100	0.0006	0.1
Barium	13	0.20	0.70	0.01	0.18	1.0
Boron	10	0.20	0.30	0.01	0.09	0.75
Cadmium	11	0.003	0.010	0.001	0.004	0.01
Chromium	11	0.011	0.041	0.001	0.015	0.05
Cobalt	11	0.0146	0.0500	0.0001	0.0137	0.05
Copper	11	0.0066	0.0235	0.001	0.0075	1.0
Iron	13	0.85	4.9	0.01	1.46	1.0
Lead	11	0.01	0.05	0.001	0.020	0.05
Manganese	13	0.112	1.3	0.002	0.357	0.2
Mercury	11	0.0005	0.001	0.0004	0.0002	0.002
Molybdenum	11	0.012	0.04	0.001	0.017	1.0
Nickel	11	0.0250	0.1349	0.01	0.0376	0.2
Selenium	12	0.031	0.05	0.004	0.013	0.05
Silver	10	0.0095	0.01	0.0054	0.0015	0.05
Uranium	13	2.082	3.71	0.725	0.936	5.0
Vanadium	3	0.1	0.1	0.1	0	
Zinc	13	0.0117	0.02	0.0022	0.0052	10.0
RADIONUCLIDES – DISSOLVED						
Radium-226	13	97.6	490	0.6	125.1	30[6]
Radium-228	12	2.1	5.2	1	1.8	30[6]

Notes:
1. Summary of selected parameters from Attachment 1.
2. All values in mg/L except as otherwise noted
3. Standards for arsenic, cadmium, barium, chromium, fluoride, mercury, nitrate, lead, selenium, silver, and uranium are human health standards
   Standards for chloride, copper, sulfate, TDS, pH, iron, and zinc are secondary domestic water supply standards
   Standards for aluminum, boron, cobalt, manganese, molybdenum, and nickel are for irrigation water
4. pH in standard units
5. Conductivity in uS/cm
6. Combined Radium 226 and 228 cannot exceed 30 pCi/L

There is no groundwater quality data for the Dakota Sandstone near the Site.

Average historic minewater data exceeded standards for radium 226 in the Westwater Canyon Member.

Four wells are located within a one mile radius of the Site. The locations of the wells are shown in Figure 1. The Church Rock Mill Well and NECR-1 Well are completed in the Westwater Canyon Member. The Friendship Well is completed in the Gallup Formation. NR-1 is completed in the alluvium. The Church Rock Mill Well is used as a non-potable water supply for the mine office and to supplement the water in the tailings impoundment evaporation ponds to prevent the pond liner from drying out. NECR-1, NR-1 and the Friendship wells are not currently used. Completion data for these wells are provided in Table 2. The Pipeline Canyon Well mentioned in the Closeout Plan is located approximately 1.5 miles to the northeast of the Permit Boundary.

TABLE 2
WELL COMPLETION DATA

Well Name	Completion Date	Total Depth (ft bgs)	Top of Screen (ft bgs)	Screened Interval (ft)	Completion Unit
Church Rock Mill	6/6/76	1,600	Unk	100	Westwater Canyon
NECR Well	Unk	1,228	Unk	Unk	Westwater Canyon
Friendship	Unk	718	Unk	40	Gallup
NR-1	5/28/91	105	74.6	30.4	Alluvium

CURRENT SITE CONDITIONS

A groundwater sample was collected at the Site on May 17, 2004. The sample was collected from the well located approximately 200 feet south of shaft NECR-1 on the north end of the Site. The sample was collected in accordance with the SOP presented in the Section 27 Closeout Plan.

The sample was collected from approximately the center of the water column in the well. The depth to water was 524.68 feet below the top of casing. The total depth of the vent is 1,230 feet below the top of casing. The sample was collected at approximately 900 feet below the top of casing. The sample was collected using multiple trips with a PVC double ball bailer. The double ball bailer works the same as a single ball bailer, with the balls floating as the bailer is lowered, allowing water to enter and flow through the device freely. When the designated depth is reached, the bailer is hoisted and the balls at the top and bottom of the bailer are seated preventing the water from leaving the bottom of the bailer and preventing water above the bailer from mixing with the water in the bailer.

Sufficient trips were made with the bailer to provide the quantity of water required for NMED and UNC to analyze for the analytes included in the Closeout Plan. Results of the analytical analyses of UNC's samples are provided in Table 3 along with the average minewater quality from Table 1 and the water quality from the Church Rock Mill Well which is also completed in the Westwater Canyon Member. The laboratory report is included in Attachment 2.

Water bailed from the NECR well was black in color and smelled of hydrogen sulfide. The field pH of the sample was 10.2 standard units, and the conductivity was 1800 μmhos/cm at 18.0 degrees Celsius.

As shown in Table 3, the pH and concentrations of alkalinity, sulfate, sodium, TDS, and boron are elevated above average mine water concentrations from the DP-63 monitoring. Several constituents, particularly radium and uranium, are less concentrated currently than when mining was active. pH and alkalinity values in the recent NECR sample are also greater than those seen in the Church Rock Mill Well, while sulfate and sodium concentrations (which make up the bulk of TDS) are less

concentrated. Concentrations of boron and TDS, and the pH exceed NMED standards in the NECR sample.

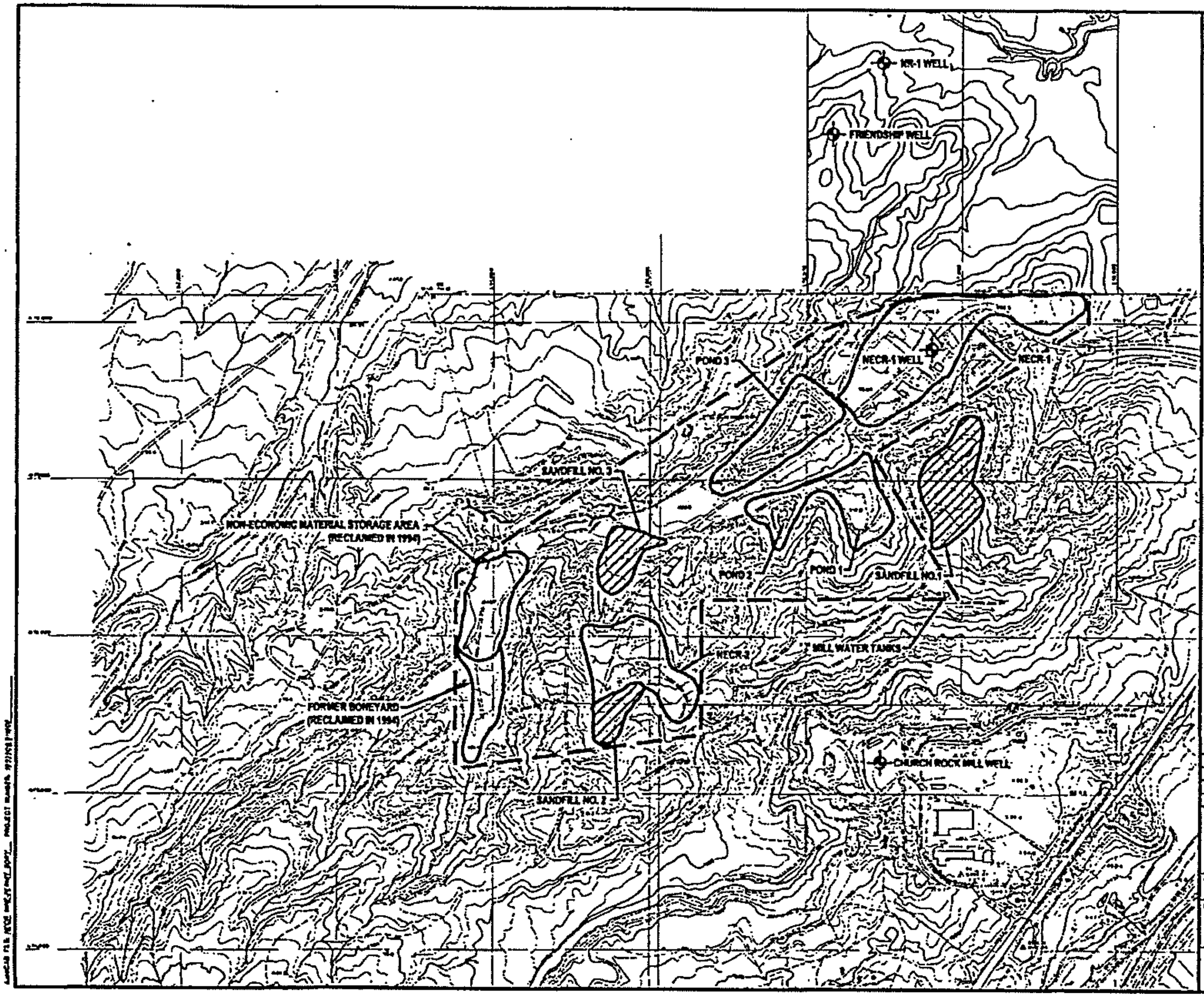
TABLE 3
SECTION 27 MINE WATER ANALYTICAL RESULTS

Constituent	Units	Mill Well 6/18/02[1]	Average Mine Water[2]	Mine ~~NECR~~ Well 5/17/04[3]	NMED Std.[4]
MAJOR IONS					
Alkalinity, Total as $CaCO_3$	mg/L	--	179.5	365	
Bicarbonate	mg/L	225	155	--	
Calcium	mg/L	16.0	20.55	3.38	
Chloride	mg/L	160	7.6	21.8	250
Fluoride	mg/L	--	0.50	0.7	1.6
Magnesium	mg/L	4.2	2.6	0.58	
Nitrate + Nitrite as N	mg/L	<0.10	1.7[5]	<0.10	10.0
Potassium	mg/L	3.5	2.1	5.57	
Sodium	mg/L	644	282.9	388	
Sulfate	mg/L	1100	93	450	600
PHYSICAL PROPERTIES					
TSS	mg/L	--	--	243	
TDS	mg/L	2090	426.9	1150	1000
pH	s.u.	8.34	7.88	9.90	6 to 9
Conductivity	umhos/cm	--	683	1840	
METALS – DISSOLVED					
Aluminum	mg/L	<0.10	0.5	<0.10	5.0
Arsenic	mg/L	<0.001	0.0102	0.001	0.1
Barium	mg/L	--	0.20	0.014	1.0
Beryllium	mg/L	<0.01	--	<0.01	
Boron	mg/L	--	0.20	4.47	0.75
Cadmium	mg/L	<0.005	0.003	<0.01	0.01
Cobalt	mg/L	<0.01	0.0146	<0.01	
Iron	mg/L	--	0.85	0.140	1.0
Lead	mg/L	<0.05	0.01	<0.001	0.05
Manganese	mg/L	0.05	0.112	0.003	
Molybdenum	mg/L	<0.10	0.012	0.056	1.0
Nickel	mg/L	<0.05	0.025	<0.05	
Selenium	mg/L	<0.001	0.031	0.002	0.05
Uranium	mg/L	0.0700	2.082	0.134	5.0
Vanadium	mg/L	<0.10	0.1	<0.005	
RADIONUCLIDES – DISSOLVED					
Gross Alpha	pCi/l	<1	--	93 ± 3.6	
Radium-226	pCi/l	0.7	97.6	2.4 ± 0.5	30[6]
Radium-228	pCi/l	2.7	2.1	<1.0	30[6]

Notes:
1. Samples collected from Church Rock Mill Well as reported in Closeout Plan
2. Average mine water quality as reported in Table 1
3. Sample collected from well located near shaft NECR-1
4. Standards for fluoride, nitrate, arsenic, barium, cadmium, lead, selenium, uranium, and radium are human health standards.
   Standards for chloride, sulfate, TDS, pH, and iron are secondary domestic water supply standards.
   Standards for aluminum, boron and molybdenum are for irrigation water.
5. Value represents nitrate as N
6. Combined Radium 226 and 228 cannot exceed 30 pCi/L

Figures 2 through 6 show the concentration trends for alkalinity, sulfate, TDS, pH and boron. The figures plot the trends over time by data source. All available data is plotted in the graphs.

Elevated values for pH and alkalinity in the recent NECR sample are likely due to the presence of sulfate reducing bacteria (SRB) in the well water, adding alkalinity to the water as they reduce sulfate to sulfide. The presence of SRB's would explain the black coloring and hydrogen sulfide smell of the water bailed from the well. This might also explain why uranium and iron concentrations are lower



LEGEND

- PERMIT BOUNDARY
- FACILITY BOUNDARY (Approx.)
- ▨ SANDFILL (Subsurface Tailings Placement) Reclaimed under NRC Radioactive Material License
- CULVERT
- NECR-1 WELL LOCATION

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT:
NECR GROUNDWATER TECHNICAL MEMORANDUM

DRAWING TITLE:
WELL LOCATIONS

MWH

Sheet 1 Of 1 Sheets
SCALE: As Shown
FIGURE No. 1

today than during active mining. Uranium is less mobile in reducing environments and iron will react with the sulfide and precipitate as iron sulfide.

The likely role of sulfate-reducing conditions in the current NECR sample chemistry is further supported by the following differences between the NECR sample and the Mill Well:

- Sulfate is about a factor of two less in the NECR sample compared to the Mill Well indicating sulfate reduction,
- Bicarbonate is concentrated in the NECR sample in stoichiometric proportion to sulfate reduction according to the reaction:

$$2\,CH_2O + SO_4^{-2} = H_2S + 2\,HCO_3^{-}$$

There is currently no explanation for the elevated concentration of boron in the recent NECR sample. There are no data for boron from the Mill Well.

CONCLUSIONS

Groundwater quality at the Site is within NMED standards with the exception of pH, TDS and boron. Sulfate and TDS concentrations and radium activity at the site have dropped since the peak concentration recorded in 1993 possibly because of sulfate reduction. A sulfate reducing environment would explain the increase in pH and alkalinity seen in the recent NECR sample.

The source of boron in the water is unknown.

Water quality has improved since mining ceased. This is especially true for constituents of greatest concern, radium and uranium. In addition, metals concentrations meet water quality standards. While dissolved solids are greater today than during mining, they are comprised of common ions that do not pose a health risk.

While the pH of the NECR is higher than historic results, it is not recommended that it be considered for abatement. Treatment to reduce pH could produce adverse environmental consequences. Metals and radionuclides are geochemically fixed under current and anticipated conditions; to alter this equilibrium would be to run the risk of mobilizing them.

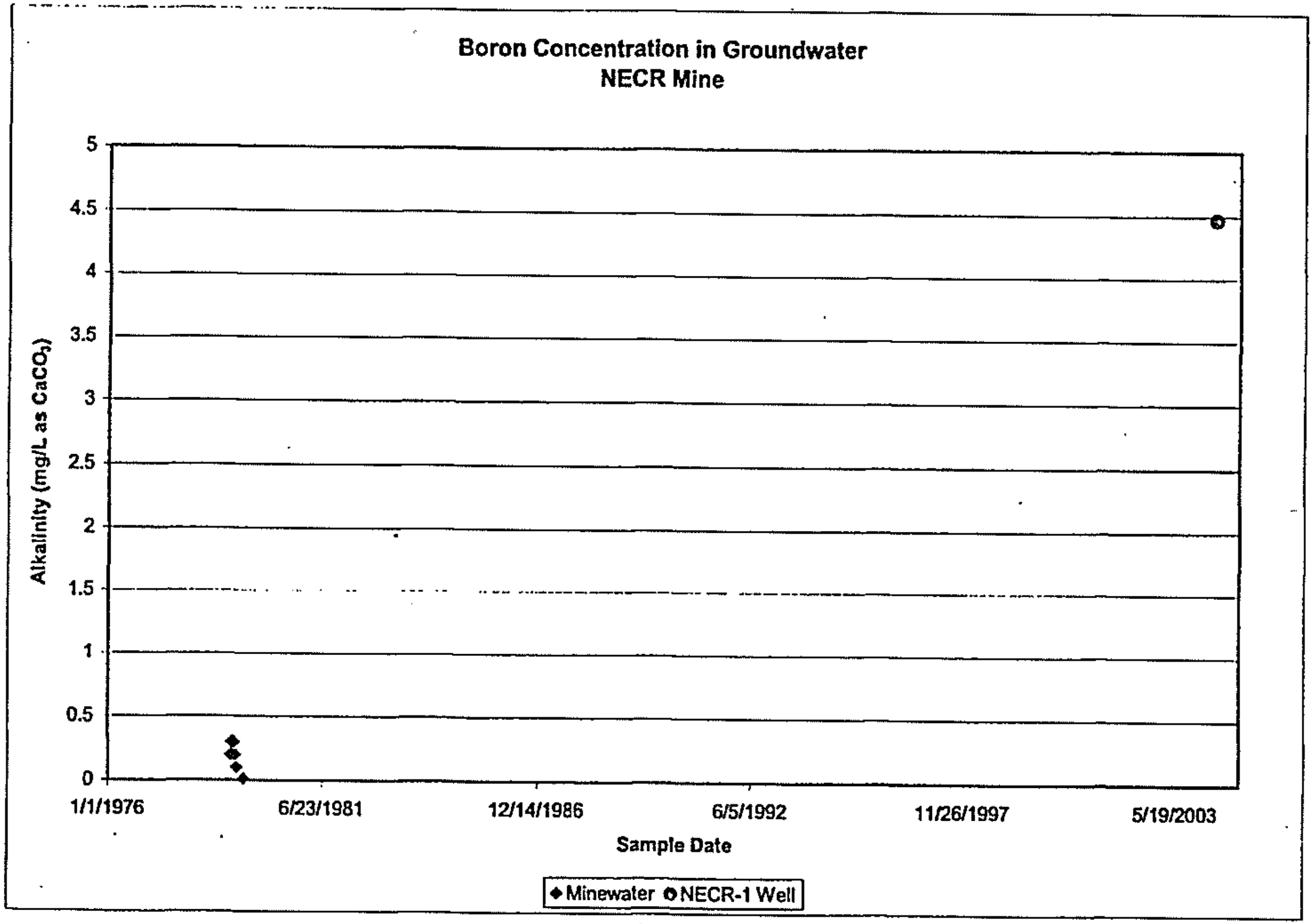


FIGURE 2
ALKALINITY CONCENTRATION IN GROUNDWATER NEAR NECR MINE

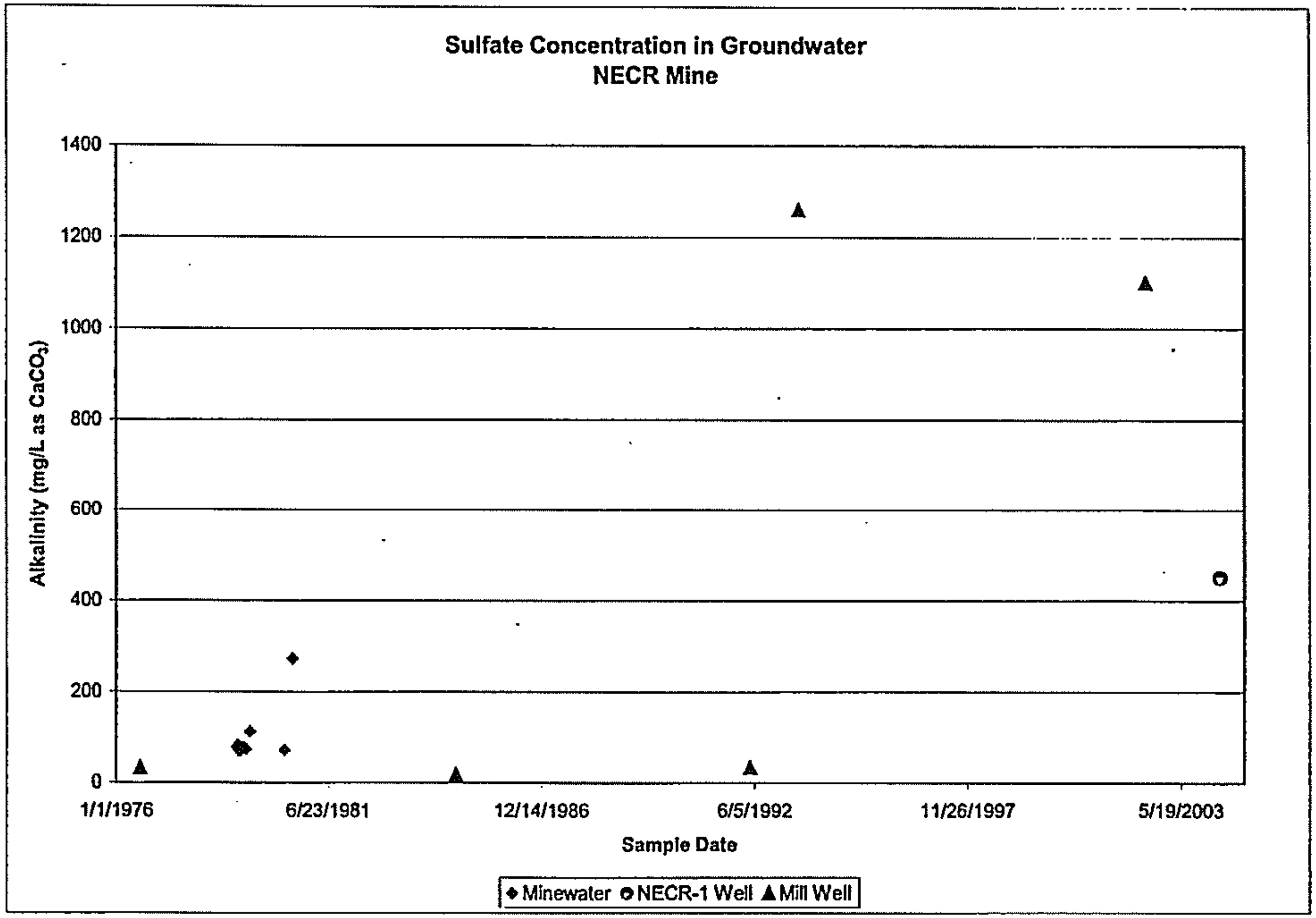


FIGURE 3
SULFATE CONCENTRATION IN GROUNDWATER NEAR NECR MINE

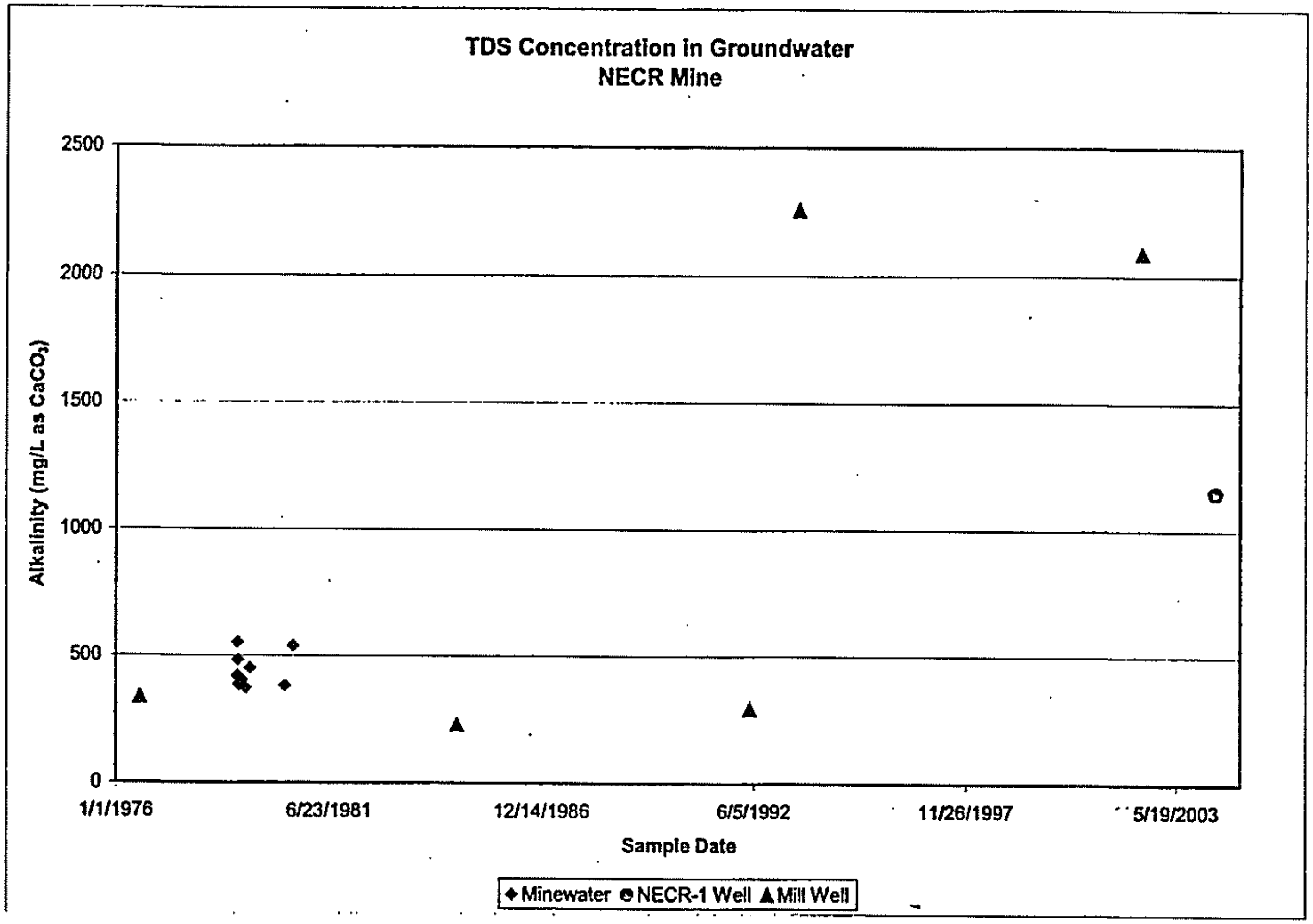


FIGURE 4
TDS CONCENTRATION IN GROUNDWATER NEAR NECR MINE

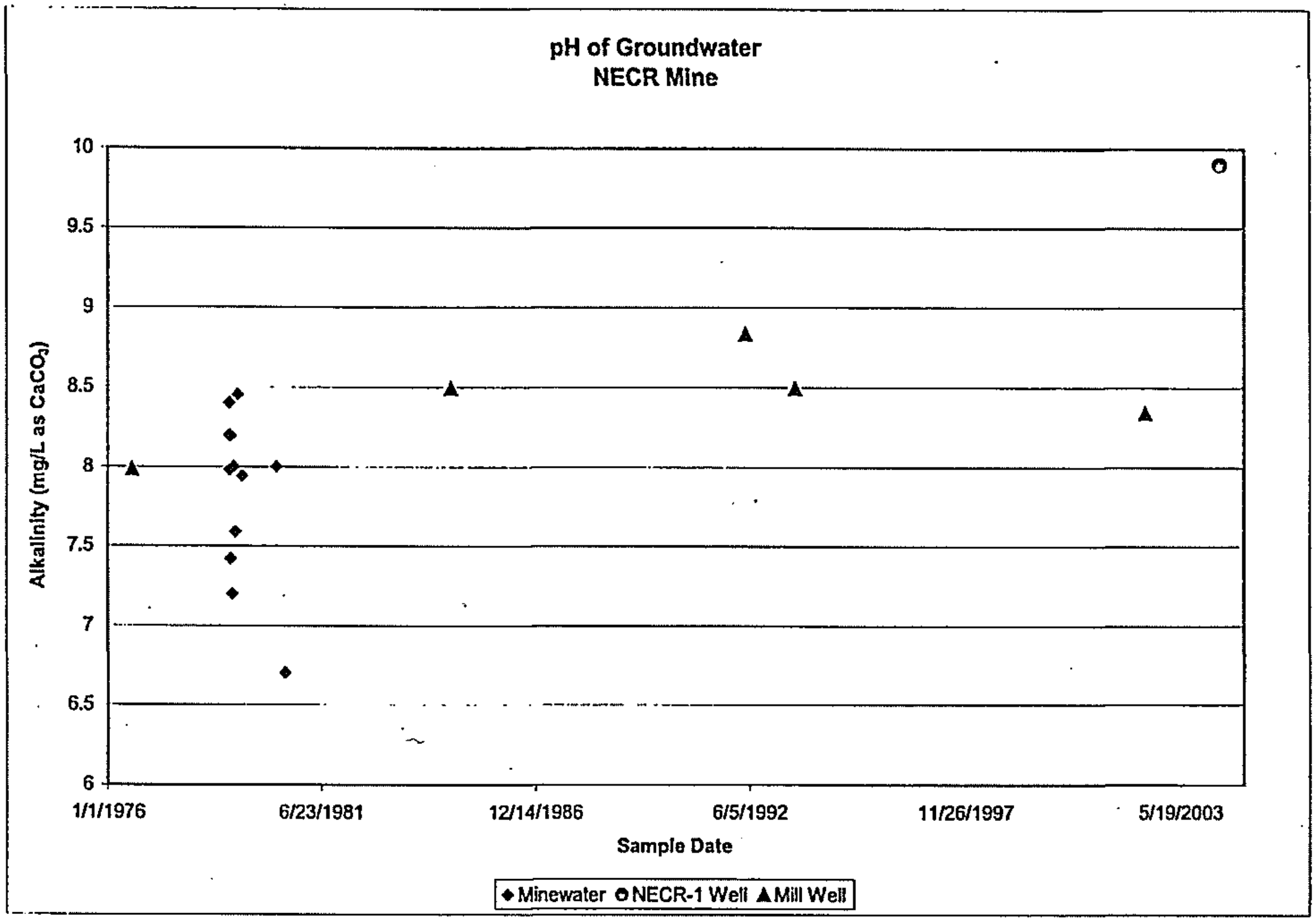


FIGURE 5
pH OF GROUNDWATER NEAR NECR MINE

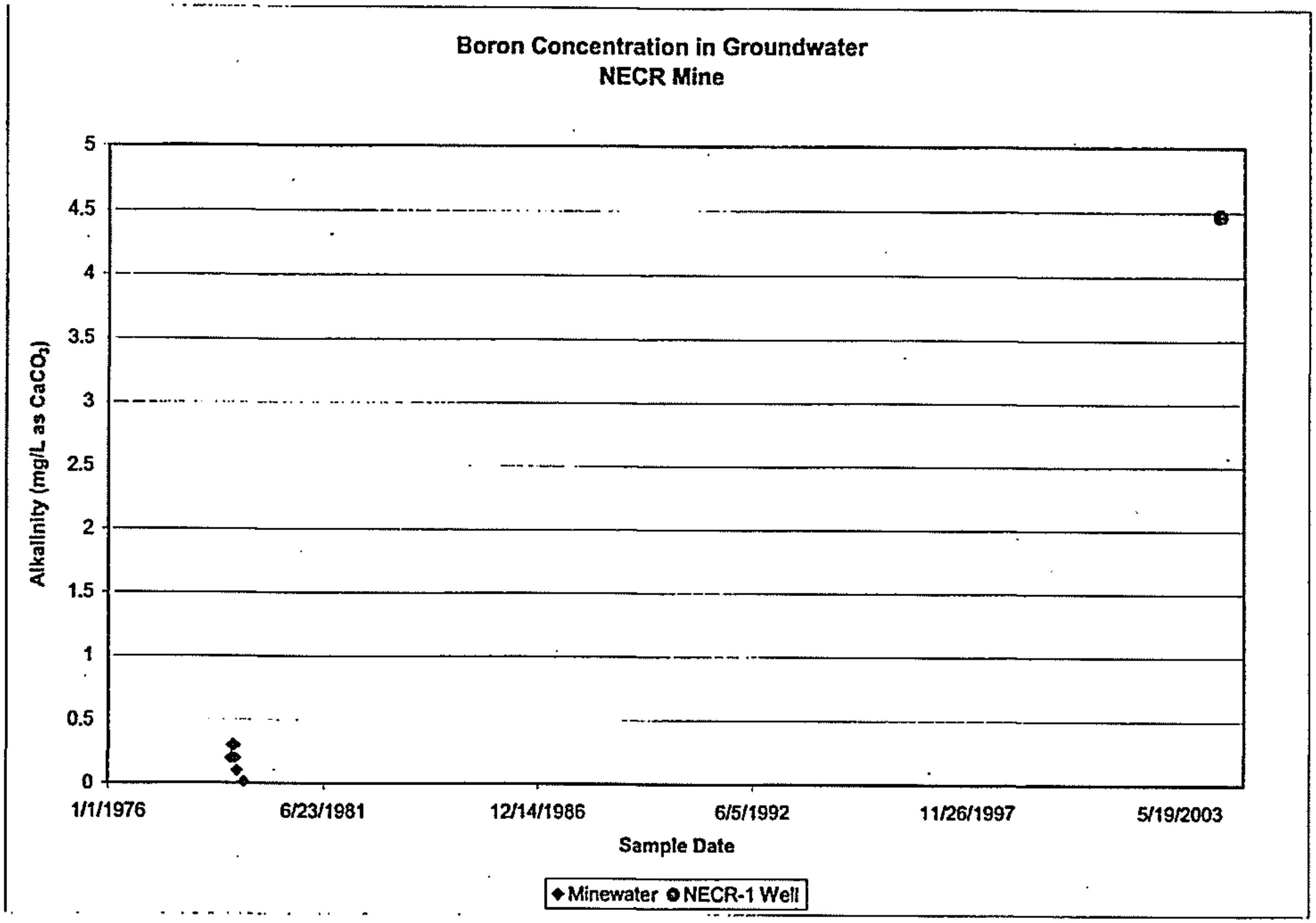


FIGURE 6
BORON CONCENTRATION OF GROUNDWATER NEAR NECR MINE

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LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: UNC Closeout Plan
Lab ID: C04050789-001
Client Sample ID: NECR-Well 1

Report Date: 06/24/04
Collection Date: 05/17/04 09:40
Date Received: 05/20/04
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	365	mg/L		1.0		A2320 B	05/21/04 10:36 / nlm
Calcium	3.38	mg/L		0.20		E200.7	05/24/04 15:27 / ts
Chloride	21.8	mg/L		1.0		A4500-Cl B	05/21/04 09:34 / jl
Fluoride	0.7	mg/L		0.1		A4500-F C	05/24/04 09:42 / elb
Magnesium	0.58	mg/L		0.20		E200.7	05/24/04 15:27 / ts
Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.10		E353.2	05/24/04 12:10 / jal
Potassium	5.57	mg/L		0.30		E200.7	05/24/04 15:27 / ts
Sodium	388	mg/L		0.30		E200.7	05/24/04 15:27 / ts
Sulfate	450	mg/L	D	9.8		A4500-SO4 E	06/01/04 12:47 / dd
PHYSICAL PROPERTIES							
Conductivity	1840	umhos/cm		1.0		A2510 B	05/21/04 09:55 / dd
pH	9.90	s.u.		0.01		A4500-H B	05/21/04 11:02 / js
Solids, Total Dissolved TDS @ 180 C	1150	mg/L		10		A2540 C	05/21/04 15:40 / js
Solids, Total Suspended TSS @ 105 C	243	mg/L		1.0		E160.2	05/21/04 09:07 / js
METALS - DISSOLVED							
Aluminum	ND	mg/L		0.1		E200.8	05/25/04 16:31 / eli-b
Arsenic	0.001	mg/L		0.001		E200.8	05/25/04 16:31 / eli-b
Barium	0.014	mg/L		0.003		E200.8	06/18/04 01:48 / bws
Beryllium	ND	mg/L		0.01		E200.8	05/25/04 16:31 / eli-b
Boron	4.47	mg/L		0.0010		E200.7	05/24/04 15:27 / ts
Cadmium	ND	mg/L		0.01		E200.8	05/25/04 16:31 / eli-b
Cobalt	ND	mg/L		0.01		E200.8	05/25/04 16:31 / eli-b
Iron	0.140	mg/L		0.010		E200.7	05/24/04 15:27 / ts
Lead	ND	mg/L		0.001		E200.8	06/18/04 01:48 / bws
Manganese	0.003	mg/L		0.001		E200.8	06/18/04 01:48 / bws
Molybdenum	0.056	mg/L		0.001		E200.8	06/18/04 01:48 / bws
Nickel	ND	mg/L		0.05		E200.8	05/25/04 16:31 / eli-b
Selenium	0.002	mg/L		0.001		E200.8	05/25/04 16:31 / eli-b
Uranium	0.134	mg/L		0.0001		E200.8	06/18/04 01:48 / bws
Vanadium	ND	mg/L		0.005		E200.8	06/18/04 01:48 / bws
RADIONUCLIDES - DISSOLVED							
Gross Alpha	93.0	pCi/L		1.0		E900.0	05/24/04 09:00 / rs
Gross Alpha precision (±)	3.6	pCi/L				E900.0	05/24/04 09:00 / rs
Radium 226	2.4	pCi/L		0.2		E903.0	05/25/04 12:50 / df
Radium 226 precision (±)	0.5	pCi/L				E903.0	05/25/04 12:50 / df
Radium 228	ND	pCi/L		1.0		E904.0	05/28/04 09:24 / pj

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: UNC Closeout Plan
Lab ID: C04050789-001
Client Sample ID: NECR-Well 1

Report Date: 06/24/04
Collection Date: 05/17/04 09:40
Date Received: 05/20/04
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
DATA QUALITY							
A/C Balance (± 5)	-0.170	%				Calculation	06/11/04 14:47 / tae
Anions	17.3	meq/L				Calculation	06/11/04 14:47 / tae
Cations	17.3	meq/L				Calculation	06/11/04 14:47 / tae
Solids, Total Dissolved Calculated	1090	mg/L				Calculation	06/11/04 14:47 / tae
TDS Balance (0.80 - 1.20)	1.06	dec. %				Calculation	06/11/04 14:47 / tae

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: UNC Closeout Plan
Lab ID: C04050789-002
Client Sample ID: SECT27-Vent 3

Report Date: 06/24/04
Collection Date: 05/17/04 14:30
Date Received: 05/20/04
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	308	mg/L		1.0		A2320 B	05/21/04 10:47 / nlm
Calcium	339	mg/L	D	0.57		E200.7	05/24/04 15:35 / ts
Chloride	23.2	mg/L		1.0		A4500-Cl B	05/21/04 09:35 / jl
Fluoride	0.4	mg/L		0.1		A4500-F C	05/24/04 00:44 / elb
Magnesium	41.8	mg/L		0.20		E200.7	05/24/04 15:30 / ts
Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.10		E353.2	05/24/04 12:20 / jal
Potassium	13.4	mg/L		0.30		E200.7	05/24/04 15:30 / ts
Sodium	492	mg/L		0.30		E200.7	05/24/04 15:30 / ts
Sulfate	1780	mg/L	D	30		A4500-SO4 E	06/01/04 12:50 / dd
PHYSICAL PROPERTIES							
Conductivity	3520	umhos/cm		1.0		A2510 B	05/21/04 09:55 / dd
pH	7.10	s.u.		0.01		A4500-H B	05/21/04 11:03 / js
Solids, Total Dissolved TDS @ 180 C	2810	mg/L		10		A2540 C	05/21/04 15:46 / js
Solids, Total Suspended TSS @ 105 C	100	mg/L		1.0		E160.2	05/21/04 09:07 / js
METALS - DISSOLVED							
Aluminum	ND	mg/L		0.1		E200.8	05/25/04 16:43 / eli-b
Arsenic	0.011	mg/L		0.001		E200.8	05/25/04 16:43 / eli-b
Barium	0.017	mg/L		0.003		E200.8	06/18/04 01:41 / bws
Beryllium	ND	mg/L		0.01		E200.8	05/25/04 16:43 / eli-b
Boron	0.379	mg/L		0.0010		E200.7	05/24/04 15:30 / ts
Cadmium	ND	mg/L		0.01		E200.8	05/25/04 16:43 / eli-b
Cobalt	ND	mg/L		0.01		E200.8	05/25/04 16:43 / eli-b
Iron	18.8	mg/L		0.010		E200.7	05/24/04 15:30 / ts
Lead	ND	mg/L		0.001		E200.8	06/18/04 01:41 / bws
Manganese	2.6	mg/L		0.01		E200.8	05/27/04 23:26 / eli-b
Molybdenum	0.7	mg/L		0.1		E200.8	05/27/04 23:26 / eli-b
Nickel	ND	mg/L		0.05		E200.8	05/25/04 16:43 / eli-b
Selenium	0.003	mg/L		0.001		E200.8	05/25/04 16:43 / eli-b
Uranium	7.84	mg/L		0.0001		E200.8	06/18/04 01:41 / bws
Vanadium	ND	mg/L		0.005		E200.8	06/18/04 01:41 / bws
RADIONUCLIDES - DISSOLVED							
Gross Alpha	5660	pCi/L		1.0		E900.0	05/24/04 09:00 / rs
Gross Alpha precision (±)	27.8	pCi/L				E900.0	05/24/04 09:00 / rs
Radium 226	24.2	pCi/L		0.2		E903.0	05/25/04 12:50 / df
Radium 226 precision (±)	1.5	pCi/L				E903.0	05/25/04 12:50 / df
Radium 228	ND	pCi/L		1.0		E904.0	05/28/04 09:24 / pj

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: UNC Closeout Plan
Lab ID: C04050789-002
Client Sample ID: SECT27-Vent 3

Report Date: 06/24/04
Collection Date: 05/17/04 14:30
Date Received: 05/20/04
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
DATA QUALITY							
A/C Balance (± 5)	-0.944	%				Calculation	06/11/04 14:48 / tae
Anions	43.8	meq/L				Calculation	06/11/04 14:48 / tae
Cations	43.0	meq/L				Calculation	06/11/04 14:48 / tae
Solids, Total Dissolved Calculated	2090	mg/L				Calculation	06/11/04 14:48 / tae
TDS Balance (0.80 - 1.20)	0.970	dec. %				Calculation	06/11/04 14:48 / tae

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

UNC Mining and Milling ChurchRock Operations

GroundWater Monitoring Summary: Closeout Plan

Well ID:		NECR-Well 1
Collection Date:		5/17/2004 9:40
Receive Date:		5/20/2004 10:00
Report Date:		6/18/2004 14:30
Analytes	Units	C04050789-001
Alkalinity, Total as CaCO3	mg/L	365
Calcium	mg/L	3.38
Chloride	mg/L	21.8
Fluoride	mg/L	0.7
Magnesium	mg/L	0.58
Nitrogen, Nitrate+Nitrite as N	mg/L	ND(0.10)
Potassium	mg/L	5.57
Sodium	mg/L	388
Sulfate	mg/L	450
Conductivity	umhos/cm	1840
pH	s.u.	9.90
Solids, Total Dissolved TDS @ 180 C	mg/L	1150
Solids, Total Suspended TSS @ 105 C	mg/L	243
Aluminum	mg/L	ND(0.1)
Arsenic	mg/L	0.001
Barium	mg/L	0.014
Beryllium	mg/L	ND(0.01)
Boron	mg/L	4.47
Cadmium	mg/L	ND(0.01)
Cobalt	mg/L	ND(0.01)
Iron	mg/L	0.140
Lead	mg/L	ND(0.001)
Manganese	mg/L	0.003
Molybdenum	mg/L	0.056
Nickel	mg/L	ND(0.05)
Selenium	mg/L	0.002
Uranium	mg/L	0.134
Vanadium	mg/L	ND(0.005)
Gross Alpha	pCi/L	93.0
Gross Alpha precision (±)	pCi/L	3.6
Radium 226	pCi/L	2.4
Radium 226 precision (±)	pCi/L	0.5
Radium 228	pCi/L	ND(1.0)
Radium 228 precision (±)	pCi/L	
A/C Balance (± 5)		-0.170
Anions		17.3
Cations		17.3
Solids, Total Dissolved Calculated		1090
TDS Balance (0.80 - 1.20)		1.06

***Note: The data presented on this form is intended for summary purposes only. Laboratory approved data is contained within the quarterly reports.**

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UNC Mining and Milling ChurchRock Operations

GroundWater Monitoring Summary: Closeout Plan

Well ID:	SECT27-Vent 3
Collection Date:	5/17/2004 14:30
Receive Date:	5/20/2004 10:00
Report Date:	6/18/2004 14:30

Analyte	Units	C04050789-002
Alkalinity, Total as CaCO3	mg/L	308
Calcium	mg/L	339
Chloride	mg/L	23.2
Fluoride	mg/L	0.4
Magnesium	mg/L	41.8
Nitrogen, Nitrate+Nitrite as N	mg/L	ND(0.10)
Potassium	mg/L	13.4
Sodium	mg/L	492
Sulfate	mg/L	1780
Conductivity	umhos/cm	3520
pH	s.u.	7.10
Solids, Total Dissolved TDS @ 180 C	mg/L	2810
Solids, Total Suspended TSS @ 105 C	mg/L	100
Aluminum	mg/L	ND(0.1)
Arsenic	mg/L	0.011
Barium	mg/L	0.017
Beryllium	mg/L	ND(0.01)
Boron	mg/L	0.017
Cadmium	mg/L	ND(0.01)
Cobalt	mg/L	ND(0.01)
Iron	mg/L	18.8
Lead	mg/L	ND(0.001)
Manganese	mg/L	2.6
Molybdenum	mg/L	0.7
Nickel	mg/L	ND(0.5)
Selenium	mg/L	0.003
Uranium	mg/L	7.84
Vanadium	mg/L	ND(0.005)
Gross Alpha	pCi/L	5660
Gross Alpha precision (±)	pCi/L	27.8
Radium 226	pCi/L	24.2
Radium 226 precision (±)	pCi/L	1.5
Radium 228	pCi/L	ND(1.0)
Radium 228 precision (±)	pCi/L	
A/C Balance (± 5)		-0.944
Anions		43.8
Cations		43.0
Solids, Total Dissolved Calculated		2890
TDS Balance (0.80 - 1.20)		0.970

****Note: The data presented on this form is intended for summary purposes only. Laboratory approved data is contained within the quarterly reports.**

tae: r:\clients2004\unc_mining\unc_gallop-2nd2004_final.xls

QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2320 B									Analytical Run: ORION_040521A
Sample ID: CCV1_040521_1	Continuing Calibration Verification Standard								05/21/04 09:32
Alkalinity, Total as CaCO3	4820	mg/L	1.0	96.3	90	110			
Method: A2320 B									Batch: 040521_1_ALK-W
Sample ID: MBLK1_040521_1	Method Blank								05/21/04 07:46
Alkalinity, Total as CaCO3	ND	mg/L	1.0						
Sample ID: C04050718-004DMS	Matrix Spike								05/21/04 08:21
Alkalinity, Total as CaCO3	349	mg/L	1.0	95.7	90	110			
Sample ID: C04050718-004DMSD	Matrix Spike Duplicate								05/21/04 08:31
Alkalinity, Total as CaCO3	349	mg/L	1.0	96	90	110	0.1	10	
Sample ID: C04050790-002BMS	Matrix Spike								05/21/04 11:18
Alkalinity, Total as CaCO3	266	mg/L	1.0	94.2	90	110			
Sample ID: C04050790-002BMSD	Matrix Spike Duplicate								05/21/04 11:20
Alkalinity, Total as CaCO3	265	mg/L	1.0	93.6	90	110	0.3	10	
Sample ID: LCS1_040521_1	Laboratory Control Spike								05/21/04 11:47
Alkalinity, Total as CaCO3	4900	mg/L	1.0	98.1	90	110			
Method: A2510 B									Batch: 040521A-COND-PROBE-W
Sample ID: LCS1_040521A	Laboratory Control Spike								05/21/04 09:55
Conductivity	1450	umhos/cm	1.0	103	90	110			
Sample ID: MBLK1_040521A	Method Blank								05/21/04 09:55
Conductivity	ND	umhos/cm	1.0						
Sample ID: C04050789-002BDUP	Sample Duplicate								05/21/04 09:55
Conductivity	3510	umhos/cm	1.0				0.3	10	
Sample ID: LCS2_040521A	Laboratory Control Spike								05/21/04 09:55
Conductivity	1460	umhos/cm	1.0	103	90	110			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2540 C									Batch: 040521A-SLDS-TDS-W
Sample ID: LCS1_040521A	Laboratory Control Spike								05/21/04 15:46
Solids, Total Dissolved TDS @ 180 C	996	mg/L	10	99.6	90	110			
Sample ID: MBLK1_040521A	Method Blank								05/21/04 15:46
Solids, Total Dissolved TDS @ 180 C	ND	mg/L	10						
Sample ID: C04050814-003BMS	Matrix Spike								05/21/04 15:48
Solids, Total Dissolved TDS @ 180 C	3280	mg/L	10	99	90	110			
Sample ID: C04050814-003BMSD	Matrix Spike Duplicate								05/21/04 15:48
Solids, Total Dissolved TDS @ 180 C	3270	mg/L	10	98.3	90	110	0.5	10	
Sample ID: C04050814-004BMS	Matrix Spike								05/21/04 15:49
Solids, Total Dissolved TDS @ 180 C	3680	mg/L	10	99.6	90	110			
Sample ID: C04050814-004BMSD	Matrix Spike Duplicate								05/21/04 15:49
Solids, Total Dissolved TDS @ 180 C	3660	mg/L	10	98.5	90	110	0.7	10	
Sample ID: LCS2_040521A	Laboratory Control Spike								05/21/04 15:50
Solids, Total Dissolved TDS @ 180 C	1000	mg/L	10	100	90	110			
Method: A4500-Cl B									Batch: 040521A-CL-TTR-W
Sample ID: MBLK9-040521A	Method Blank								05/21/04 09:20
Chloride	ND	mg/L	1.0						
Sample ID: C04050756-001BMS	Matrix Spike								05/21/04 09:38
Chloride	5700	mg/L	1.0	100	90	110			
Sample ID: C04050756-001BMSD	Matrix Spike Duplicate								05/21/04 09:39
Chloride	5680	mg/L	1.0	99.6	90	110	0.2	10	
Sample ID: LCS35-040521A	Laboratory Control Spike								05/21/04 09:41
Chloride	3510	mg/L	1.0	99.1	90	110			
Method: A4500-F C									Batch: 040524_1_F-ISE-W
Sample ID: MBLK1_040524_1	Method Blank								05/24/04 09:14
Fluoride	ND	mg/L	0.10						
Sample ID: C04050714-001IMS	Matrix Spike								05/24/04 09:21
Fluoride	1.80	mg/L	0.10	90	90	110			
Sample ID: C04050714-001IMSD	Matrix Spike Duplicate								05/24/04 09:24
Fluoride	1.80	mg/L	0.10	90	90	110	0	10	

Qualifiers:

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ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A4500-H B									Analytical Run: ORION-PH_040521A
Sample ID: (CCV)=ph7	Continuing Calibration Verification Standard								05/21/04 10:56
pH	6.97	s.u.	0.010	99.6	90	110			
Method: A4500-H B									Batch: pH05-21-041108
Sample ID: C04050775-001A(DUP)	Sample Duplicate								05/21/04 11:04
pH	8.15	s.u.	0.010				0.5	10	
Method: A4500-SO4 E									Batch: 040601_1_SO4-TURB-W
Sample ID: MBLK-1_040601	Method Blank								06/01/04 12:26
Sulfate	ND	mg/L	1.0						
Sample ID: C04050789-001BMS	Matrix Spike								06/01/04 13:09
Sulfate	1410	mg/L	30	100	90	110			
Sample ID: C04050789-001BMSD	Matrix Spike Duplicate								06/01/04 13:10
Sulfate	1400	mg/L	30	99.1	90	110	0.7	10	
Sample ID: C04050874-005DMS	Matrix Spike								06/01/04 13:25
Sulfate	110	mg/L	1.5	96.8	90	110			
Sample ID: C04050874-005DMSD	Matrix Spike Duplicate								06/01/04 13:26
Sulfate	111	mg/L	1.5	97.7	90	110	0.4	10	
Sample ID: LCS-1_040601	Laboratory Control Spike								06/01/04 13:27
Sulfate	41.7	mg/L	1.0	104	90	110			
Method: E160.2									Batch: 040521A-SLDS-TSS-W
Sample ID: MBLK1_040521A	Method Blank								05/21/04 09:07
Solids, Total Suspended TSS @ 105 C	ND	mg/L	1.0						
Sample ID: C04050789-002BDUP	Sample Duplicate								05/21/04 09:08
Solids, Total Suspended TSS @ 105 C	122	mg/L	1.0				20	25	
Method: E200.7									Analytical Run: ICP1-C_040524A
Sample ID: CONT 120103-96	Continuing Calibration Verification Standard								05/24/04 14:23
Boron	1.01	mg/L	0.10	101	89.5	110.5			
Iron	1.05	mg/L	0.030	105	89.5	110.5			
Calcium	53.2	mg/L	1.0	106	89.5	110.5			
Magnesium	53.1	mg/L	1.0	106	89.5	110.5			
Potassium	51.5	mg/L	1.0	103	89.5	110.5			
Sodium	53.2	mg/L	1.0	106	89.5	110.5			

Qualifiers:

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ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8									Analytical Run: ICPMS1-C_040617B
Sample ID: CCV	Continuing Calibration Verification Standard								06/18/04 01:06
Barium	0.0638	mg/L	0.0010	106	90	110			
Lead	0.0619	mg/L	0.0010	103	90	110			
Uranium	0.0615	mg/L	0.0010	102	90	110			
Vanadium	0.0619	mg/L	0.0010	103	90	110			
Method: E200.8									Batch: R36342
Sample ID: C04050789-001DMS	Matrix Spike								06/18/04 01:55
Barium	0.0632	mg/L	0.0010	97.3	70	130			
Lead	0.0502	mg/L	0.0010	100	70	130			
Uranium	0.186	mg/L	0.0010	105	70	130			
Vanadium	0.0494	mg/L	0.0010	97.5	70	130			
Sample ID: C04050789-001DMSD	Matrix Spike Duplicate								06/18/04 02:02
Barium	0.0632	mg/L	0.0010	97.5	70	130	0.1	20	
Lead	0.0500	mg/L	0.0010	99.6	70	130	0.5	20	
Uranium	0.180	mg/L	0.0010	92.2	70	130	3.4	20	
Vanadium	0.0489	mg/L	0.0010	96.4	70	130	1.1	20	

Qualifiers:

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QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E353.2									Analytical Run: TECHNICON_040524A
Sample ID: CCV-16	Continuing Calibration Verification Standard								05/24/04 11:55
Nitrogen, Nitrate+Nitrite as N	0.930	mg/L	0.10	93	90	110			
Sample ID: CCV-25	Continuing Calibration Verification Standard								05/24/04 12:18
Nitrogen, Nitrate+Nitrite as N	1.07	mg/L	0.10	107	90	110			
Method: E353.2									Batch: A2004-05 24_1_NO3_01
Sample ID: MBLK-1	Method Blank								05/24/04 09:43
Nitrogen, Nitrate+Nitrite as N	ND	mg/L	0.10						
Sample ID: C04050727-001BMS	Matrix Spike								05/24/04 10:01
Nitrogen, Nitrate+Nitrite as N	2.00	mg/L	0.10	100	90	110			
Sample ID: C04050727-001BMSD	Matrix Spike Duplicate								05/24/04 10:03
Nitrogen, Nitrate+Nitrite as N	2.01	mg/L	0.10	101	90	110	0.5	10	
Sample ID: MBLK-17	Method Blank								05/24/04 11:58
Nitrogen, Nitrate+Nitrite as N	ND	mg/L	0.10						
Sample ID: C04050789-001CMS	Matrix Spike								05/24/04 12:13
Nitrogen, Nitrate+Nitrite as N	2.02	mg/L	0.10	101	90	110			
Sample ID: C04050789-001CMSD	Matrix Spike Duplicate								05/24/04 12:15
Nitrogen, Nitrate+Nitrite as N	2.04	mg/L	0.10	102	90	110	1.0	10	
Sample ID: MBLK-32	Method Blank								05/24/04 12:35
Nitrogen, Nitrate+Nitrite as N	ND	mg/L	0.10						
Sample ID: C04050845-005CMS	Matrix Spike								05/24/04 12:53
Nitrogen, Nitrate+Nitrite as N	2.29	mg/L	0.10	95.5	90	110			
Sample ID: C04050845-005CMSD	Matrix Spike Duplicate								05/24/04 12:58
Nitrogen, Nitrate+Nitrite as N	2.31	mg/L	0.10	96.5	90	110	0.9	10	
Sample ID: MBLK-48	Method Blank								05/24/04 13:18
Nitrogen, Nitrate+Nitrite as N	ND	mg/L	0.10						
Sample ID: C04050845-014CMS	Matrix Spike								05/24/04 13:57
Nitrogen, Nitrate+Nitrite as N	14.5	mg/L	0.15	90.9	90	110			
Sample ID: C04050845-014CMSD	Matrix Spike Duplicate								05/24/04 13:59
Nitrogen, Nitrate+Nitrite as N	14.5	mg/L	0.15	90.9	90	110	0	10	

Qualifiers:

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QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E900.0								**Batch: R35580**	
Sample ID: C04050732-001A	Matrix Spike							05/24/04 09:00	
Gross Alpha	543	pCi/L	1.0	106	70	130			
Sample ID: C04050732-001A	Matrix Spike Duplicate							05/24/04 09:00	
Gross Alpha	562	pCi/L	1.0	110	70	130	3.3	30	
Sample ID: MB-R35580	Method Blank							05/24/04 09:00	
Gross Alpha	ND	pCi/L	1.0						
Sample ID: LCS-R35580	Laboratory Control Spike							05/24/04 09:00	
Gross Alpha	507	pCi/L	1.0	99.5	70	130			
Sample ID: C04050910-001A	Sample Duplicate							05/24/04 09:00	
Gross Alpha	ND	pCi/L	1.0		70	130	0	30	
Sample ID: C04040049-001B	Sample Duplicate							05/24/04 09:00	
Gross Alpha	ND	pCi/L	1.0				0	30	
Method: E903.0								**Batch: RA226-0589**	
Sample ID: C04050805-001AMS	Matrix Spike							05/25/04 12:50	
Radium 226	24.8	pCi/L	0.20	92.7	70	130			
Sample ID: C04050805-001AMSD	Matrix Spike Duplicate							05/25/04 12:50	
Radium 226	25.4	pCi/L	0.20	94.8	70	130	2.1	30	
Sample ID: MB-RA226-0589	Method Blank							05/25/04 12:50	
Radium 226	ND	pCi/L	0.20						
Sample ID: LCS-RA226-0589	Laboratory Control Spike							05/25/04 12:50	
Radium 226	14.9	pCi/L	0.20	98.1	70	130			
Method: E904.0								**Batch: 04228-602A**	
Sample ID: C04050891-001A	Matrix Spike							05/28/04 09:24	
Radium 228	25	pCi/L	1.0	107	70	130			
Sample ID: C04050891-001A	Matrix Spike Duplicate							05/28/04 09:24	
Radium 228	22	pCi/L	1.0	96.8	70	130	9.8	30	

Qualifiers:

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Energy Laboratories Inc.
2393 Salt Creek Highway
PO Box 3258
Casper, WY 82602-

TEL: (307) 235-0515
FAX: (307) 234-1639

Quotation Date: 29-Apr-04
Submitted By: Tracy DeWitt

Quotation for Analytical Services # C1212

Company:	Montgomery Watson Harza	Quote ID:	C 1212
Contact:	Jed Thompson	Project:	Groundwater Sampling
Address:	1475 Pine Grove Road Ste 109 PO Box 774018 Steamboat Springs, CO 80477	TAT:	15 Working Days
		QC Level:	STD
Phone:	(970) 879-6260 Fax: (970) 879-9048	Expires:	21-Apr-05

Matrix	Test Name	Test	Remarks	# Samp	Unit Price	Test Total
Aqueous	Alkalinity	A2320 B		1	$10.00	$10.00
Aqueous	Chloride	A4500-Cl B		1	$10.00	$10.00
Aqueous	Conductivity	A2510 B		1	$10.00	$10.00
Aqueous	Fluoride	A4500-F C		1	$10.00	$10.00
Aqueous	Gross Alpha	E900.0		1	$50.00	$50.00
Aqueous	Metals by ICP, Dissolved	E200.7	Ca,Fe,Mg,K,Na	1	$50.00	$50.00
Aqueous	Metals by ICP/ICPMS, Total	E200.7_8	Boron only (analyzed in ELI-Billings)	1	$10.00	$10.00
Aqueous	Metals by ICP-MS, Dissolved	E200.8	Ba,V,Unat,Pb	1	$40.00	$40.00
Aqueous	Nitrogen, Nitrate + Nitrite	E353.2		1	$15.00	$15.00
Aqueous	pH	A4500-H B		1	$10.00	$10.00
Aqueous	Radium 226, Dissolved	E903.0		1	$75.00	$75.00
Aqueous	Radium 228, Dissolved	E904.0		1	$75.00	$75.00
Aqueous	Solids, Total Dissolved	A2540 C		1	$10.00	$10.00
Aqueous	Solids, Total Suspended	E160.2		1	$10.00	$10.00
Aqueous	Sulfate	A4500-SO4 E		1	$10.00	$10.00

To assure that the quoted analysis and pricing specifications are provided, please include the Quote ID number referenced above on the Chain of Custody or sample submittal documents.

Subcontracting of sample analyses to an outside laboratory may be required. If so, Energy Laboratories will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report.

the Project Manager and the laboratory's project manager, will decide whether or not to analyze the samples.

3.4 FIELD DOCUMENTATION

All aspects of sample collection and handling as well as visual observations will be documented in the field logbooks. Field logbooks will note the following information:

- Site location
- Sampler name(s)
- Date and time of sample collection
- Sample identification number(s)
- Field water quality measurements (pH, conductivity, temperature)
- Sample handling (including preservation, as appropriate)
- How sample collected (e.g. grab, composite, bailer)
- Number and type of any QA/QC or split samples collected
- Field observations, including any unusual conditions or activities in the area

4.0 WATER QUALITY PARAMETERS

Water quality parameters to be analyzed for the collected sample are presented in Table 4.1 below.

TABLE 4.1
WATER QUALITY MONITORING PARAMETERS

Parameter	Fraction	Method	Detection Limit	UNITS
GENERAL CHEMISTRY AND ANIONS				
pH		EPA 150.1	0.1	mg/l
Electrical Conductivity		EPA 120.1	1	umhos/cm
Total Dissolved Solids		EPA 160.1	10	mg/l
Total Suspended Solids		EPA 160.2	5	mg/l
Alkalinity		EPA 310.1	2.0	mg/l (as CaCO3)
Chloride		EPA 325.2	1.0	mg/l
Fluoride		EPA 340.2	0.1	mg/l
Nitrate (NO3+NO2 as N)		EPA 353.2	0.02	mg/l
Sulfate		EPA 375.3	10.0	mg/l
CATIONS AND TRACE METALS				
Barium	Dissolved	EPA 200.7, ICP	0.003 0.1	mg/l
Boron	Dissolved	EPA 200.7, ICP	0.001 0.1	mg/l
Calcium	Dissolved	EPA 200.7, ICP	0.2 ✓	mg/l
Iron	Dissolved	EPA 200.7, ICP	0.01 0.1	mg/l
Lead	Dissolved	EPA 200.7, ICP	0.04 0.1	mg/l
Magnesium	Dissolved	EPA 200.7, ICP	0.2 ✓	mg/l
Potassium	Dissolved	EPA 200.7, ICP	0.30 ✓	mg/l
Sodium	Dissolved	EPA 200.7, ICP	0.30 ✓	mg/l
Uranium	Dissolved	EPA 200.8, ICP-MS	0.0001	mg/l
Vanadium	Dissolved	EPA 200.7, ICP	0.005 0.1	mg/l
RADIONUCLIDES				
Radium 226	Dissolved	EPA 903.0	1	pCi/l
Radium 228	Dissolved	EPA 904.0	1	pCi/l
Gross Alpha	Dissolved	EPA 900.0	1	pCi/l

ABORATORIES

Chain of Custody and Analytical Request Record

Page 1 of 1

PLEASE PRINT, provide as much information as possible. Refer to corresponding notes on reverse side.

ompany Name: UNC

Project Name, PWS #, Permit #, Etc.: UNC CLOSEOUT PLAN

eport Mail Address: MWH
ATTN: JED THOMPSON
PO BOX 774018
1475 PINEGROVE RD, STE 109
STEAMBOAT SPRINGS, CO 80477

Contact Name, Phone, Fax, E-mail:
JED THOMPSON
(970) 879-6260
JAMES.THOMPSON@MWHGLOBAL.COM

Sampler Name if other than Contact: SAME

nvoice Address:
UNC
PO BOX 3077
GALLUP, NM 87305-3077

Invoice Contact & Phone #:
DORREEN BROWN
(505)722-6651

Purchase Order #:

ELI Quote #: C1212

eport Required For: POTW/WWTP ☐ DW ☐
Other ______

pecial Report Formats - ELI must be notified prior to ample submittal for the following:
ELAC ☐ A2LA ☐ Level IV ☐
ther ______
DD/EDT ☐ Format ______

Notify ELI prior to RUSH sample submittal for additional charges and scheduling

Comments:

Receipt Temp 18 °C
Cooler ID(s) Client
Custody Seal [✓ Y] N
Intact [✓ Y] N
Signature Match [✓ Y] N

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers Sample Type: A W S V B O Air Water Soils/Solids Vegetation Bioassay Other MATRIX	ANALYSIS REQUESTED									SEE ATTACHED	Normal Turnaround (TAT)	RUSH Turnaround (TAT)	Comments	LABORATORY USE ONLY Lab ID
NECR-WELL1	17MAY04	0940	4-W										X				[illegible]
SECT27-VENT3	17MAY04	1430	4-W										X				

Custody Record MUST be Signed

Relinquished by: Date/Time: 18 MAY 04/1415 Shipped by: UPS GRND Received by: Date/Time: [illegible]

Relinquished by: Date/Time: Shipped by: Received by: Date/Time:

Sample Disposal: Return to client: ______ Lab Disposal: X

LABORATORY USE ONLY
Sample Type: ______ # of fractions ______

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.

Visit our web site at *www.energylab.com* for additional information, downloadable fee schedule, forms, & links.

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Energy Laboratories Inc.

Sample Receipt Checklist

Client Name: United Nuclear Corporation

Date and Time Received: 5/20/2004 10:00:00

Work Order Number C04050789

Received by: sp

Checklist completed by: 5/20/04
Signature | Date

Reviewed by
Initials | Date

Carrier name: UPS

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☐	No ☑	18 °C
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Adjusted? ________ Checked by ________

Any No and/or NA (not applicable) response must be detailed in the comments section below.

Client contacted: ________ Date contacted: ________ Person contacted ________

Contacted by: ________ Regarding: ________

Comments:
Split and preserved for total metals.

Corrective Action ________

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ANALYTICAL SUMMARY REPORT

June 24, 2004

Max Chischilly
United Nuclear Corporation
1475 Pine Grove Road
Ste 109
PO Box 774018
Gallup, NM 87305

Workorder No.: C04050789 Quote ID: C1247 - Groundwater Sampling

Energy Laboratories Inc. received the following 2 samples from United Nuclear Corporation on 5/20/2004 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C04050789-001	NECR-Well 1	05/17/04 9:40	05/20/04	Aqueous	Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Total Alkalinity QA Calculations Chloride Conductivity Fluoride Metals by ICP, Dissolved Metals by ICP-MS, Dissolved Nitrogen, Nitrate + Nitrite pH Gross Alpha Radium 226, Dissolved Radium 228, Dissolved Solids, Total Dissolved Solids, Total Suspended Sulfate
C04050789-002	SECT27-Vent 3	05/17/04 14:30	05/20/04	Aqueous	Same As Above

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative or Report.

If you have any questions regarding these tests results, please call.

Report Approved By:

[illegible]
Laboratory Supervisor

Date: *24-Jun-04*

CLIENT: *United Nuclear Corporation*
Project: UNC Closeout Plan
Sample Delivery Group: C04050789

CASE NARRATIVE

THIS IS THE FINAL PAGE OF THE LABORATORY ANALYTICAL REPORT

COMMENTS
Additional metals added per client's request 6/23/04.

BRANCH LABORATORY LOCATIONS
eli-b - Energy Laboratories, Inc. - Billings, MT
eli-cs - Energy Laboratories, Inc. - College Station, TX
eli-g - Energy Laboratories, Inc. - Gillette, WY
eli-h - Energy Laboratories, Inc. - Helena, MT
eli-r - Energy Laboratories, Inc. - Rapid City, SD

ORIGINAL SAMPLE SUBMITTAL(S)
All original sample submittals have been returned with the data package. A copy of the submittal(s) has been included and tracked in the data package.

SUBCONTRACTING ANALYSIS
Subcontracting of sample analyses to an outside laboratory may be required. If so, ENERGY LABORATORIES will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report.

SAMPLE TEMPERATURE COMPLIANCE: 4°C (±2°C)
Temperature of samples received may not be considered properly preserved by accepted standards. Samples that are hand delivered immediately after collection shall be considered acceptable if there is evidence that the chilling process has begun.

ENERGY LABORATORIES, INC. - CASPER,WY certifies that certain method selections contained in this report meet requirements as set forth by NELAC. Some client specific reporting requirements may not require NELAC reporting protocol. NELAC Certification Number E87641.

ELI appreciates the opportunity to provide you with this analytical service. For additional information and services visit our web page www.energylab.com.

The total number of pages of this report are indicated by the page number located in the lower right corner.

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
8/12/1976		Mill Well	Alkalinity (CaCO3)	mg/L	100	
8/12/1976		Mill Well	Arsenic	mg/L	0.001	
8/12/1976		Mill Well	Bicarbonate	mg/L	121.7	
8/12/1976		Mill Well	Cadmium	mg/L	0.01	
8/12/1976		Mill Well	Calcium	mg/L	5.5	
8/12/1976		Mill Well	Chloride	mg/L	17	
8/12/1976		Mill Well	Magnesium	mg/L	0.8	
8/12/1976		Mill Well	Manganese	mg/L	0.08	
8/12/1976		Mill Well	Nitrate + Nitrate as N	mg/L	5.3	
8/12/1976		Mill Well	pH	s.u.	7.98	
8/12/1976		Mill Well	Potassium	mg/L	6.6	
8/12/1976		Mill Well	Selenium	mg/L	0.01	
8/12/1976		Mill Well	Sodium	mg/L	60	
8/12/1976		Mill Well	Sulfate	mg/L	32	
8/12/1976		Mill Well	TDS	mg/L	335	
2/13/1979	TS-24A	Minewater	Aluminum	mg/l	0.2	
2/13/1979	TS-24A	Minewater	Arsenic	mg/l	0.01	
2/13/1979	TS-24A	Minewater	Barium	mg/l	0.1	<
2/13/1979	TS-24A	Minewater	Boron	mg/l	0.2	
2/13/1979	TS-24A	Minewater	Cadmium	mg/l	0.001	<
2/13/1979	TS-24A	Minewater	Chloride	mg/l	5.8	
2/13/1979	TS-24A	Minewater	Chromium	mg/l	0.001	<
2/13/1979	TS-24A	Minewater	Cobalt	mg/l	0.01	<
2/13/1979	TS-24A	Minewater	Copper	mg/l	0.001	
2/13/1979	TS-24A	Minewater	Cyanide	mg/l	0.1	<
2/13/1979	TS-24A	Minewater	Fluoride	mg/l	0.5	
2/13/1979	TS-24A	Minewater	Iron	mg/l	0.05	
2/13/1979	TS-24A	Minewater	Lead	mg/l	0.001	<
2/13/1979	TS-24A	Minewater	Manganese	mg/l	0.006	
2/13/1979	TS-24A	Minewater	Mercury	mg/l	0.0004	<
2/13/1979	TS-24A	Minewater	Molybdenum	mg/l	0.003	
2/13/1979	TS-24A	Minewater	Nickel	mg/l	0.01	<
2/13/1979	TS-24A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.7	
2/13/1979	TS-24A	Minewater	pH, lab	SU	8.4	
2/13/1979	TS-24A	Minewater	Phenols	mg/l	0.003	
2/13/1979	TS-24A	Minewater	Radium-226	pCi/l	76.7	± 2.8
2/13/1979	TS-24A	Minewater	Radium-228	pCi/l	1	± 1
2/13/1979	TS-24A	Minewater	Selenium	mg/l	0.04	
2/13/1979	TS-24A	Minewater	Silica	mg/l	0.01	<
2/13/1979	TS-24A	Minewater	Sulfate	mg/l	77	
2/13/1979	TS-24A	Minewater	TDS	mg/l	552	
2/13/1979	TS-24A	Minewater	Uranium	mg/l	1.25	
2/13/1979	TS-24A	Minewater	Zinc	mg/l	0.02	
2/14/1979	TS-28A	Minewater	Aluminum	mg/l	0.3	
2/14/1979	TS-28A	Minewater	Arsenic	mg/l	0.01	<
2/14/1979	TS-28A	Minewater	Barium	mg/l	0.1	<
2/14/1979	TS-28A	Minewater	Boron	mg/l	0.2	
2/14/1979	TS-28A	Minewater	Cadmium	mg/l	0.001	<
2/14/1979	TS-28A	Minewater	Chloride	mg/l	6.1	
2/14/1979	TS-28A	Minewater	Chromium	mg/l	0.001	<
2/14/1979	TS-28A	Minewater	Cobalt	mg/l	0.01	<
2/14/1979	TS-28A	Minewater	Copper	mg/l	0.002	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
2/14/1979	TS-28A	Minewater	Cyanide	mg/l	0.1	<
2/14/1979	TS-28A	Minewater	Fluoride	mg/l	0.5	
2/14/1979	TS-28A	Minewater	Iron	mg/l	0.01	
2/14/1979	TS-28A	Minewater	Lead	mg/l	0.001	<
2/14/1979	TS-28A	Minewater	Manganese	mg/l	0.002	
2/14/1979	TS-28A	Minewater	Mercury	mg/l	0.0004	<
2/14/1979	TS-28A	Minewater	Molybdenum	mg/l	0.001	
2/14/1979	TS-28A	Minewater	Nickel	mg/l	0.01	
2/14/1979	TS-28A	Minewater	Nitrogen, Nitrate (as N)	mg/l	1.2	
2/14/1979	TS-28A	Minewater	pH, lab	SU	8.4	
2/14/1979	TS-28A	Minewater	Phenols	mg/l	0.003	
2/14/1979	TS-28A	Minewater	Radium-226	pCi/l	103	± 3
2/14/1979	TS-28A	Minewater	Radium-228	pCi/l	1	± 2
2/14/1979	TS-28A	Minewater	Selenium	mg/l	0.04	
2/14/1979	TS-28A	Minewater	Silver	mg/l	0.01	<
2/14/1979	TS-28A	Minewater	Sulfate	mg/l	79	
2/14/1979	TS-28A	Minewater	TDS	mg/l	421	
2/14/1979	TS-28A	Minewater	Uranium	mg/l	0.725	
2/14/1979	TS-28A	Minewater	Zinc	mg/l	0.01	
2/16/1979	TS-33A	Minewater	Aluminum	mg/l	1.2	
2/16/1979	TS-33A	Minewater	Arsenic	mg/l	0.01	<
2/16/1979	TS-33A	Minewater	Barium	mg/l	0.3	
2/16/1979	TS-33A	Minewater	Boron	mg/l	0.2	
2/16/1979	TS-33A	Minewater	Cadmium	mg/l	0.001	<
2/16/1979	TS-33A	Minewater	Chloride	mg/l	7.7	
2/16/1979	TS-33A	Minewater	Chromium	mg/l	0.002	
2/16/1979	TS-33A	Minewater	Cobalt	mg/l	0.01	<
2/16/1979	TS-33A	Minewater	Copper	mg/l	0.004	
2/16/1979	TS-33A	Minewater	Cyanide	mg/l	0.1	<
2/16/1979	TS-33A	Minewater	Fluoride	mg/l	0.48	
2/16/1979	TS-33A	Minewater	Iron	mg/l	4.9	
2/16/1979	TS-33A	Minewater	Lead	mg/l	0.001	<
2/16/1979	TS-33A	Minewater	Manganese	mg/l	0.011	
2/16/1979	TS-33A	Minewater	Mercury	mg/l	0.0004	<
2/16/1979	TS-33A	Minewater	Molybdenum	mg/l	0.003	
2/16/1979	TS-33A	Minewater	Nickel	mg/l	0.01	<
2/16/1979	TS-33A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.7	
2/16/1979	TS-33A	Minewater	pH, lab	SU	7.98	
2/16/1979	TS-33A	Minewater	Phenols	mg/l	0.004	
2/16/1979	TS-33A	Minewater	Radium-226	pCi/l	0.6	± 0.4
2/16/1979	TS-33A	Minewater	Radium-228	pCi/l	5	± 2
2/16/1979	TS-33A	Minewater	Selenium	mg/l	0.04	
2/16/1979	TS-33A	Minewater	Silver	mg/l	0.01	<
2/16/1979	TS-33A	Minewater	Sulfate	mg/l	81	
2/16/1979	TS-33A	Minewater	TDS	mg/l	415	
2/16/1979	TS-33A	Minewater	Uranium	mg/l	2.07	
2/16/1979	TS-33A	Minewater	Zinc	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Aluminum	mg/l	0.3	
2/17/1979	TS-38A	Minewater	Arsenic	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Barium	mg/l	0.7	
2/17/1979	TS-38A	Minewater	Boron	mg/l	0.2	
2/17/1979	TS-38A	Minewater	Cadmium	mg/l	0.001	<

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
2/17/1979	TS-38A	Minewater	Chloride	mg/l	6.2	
2/17/1979	TS-38A	Minewater	Chromium	mg/l	0.001	<
2/17/1979	TS-38A	Minewater	Cobalt	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Copper	mg/l	0.001	<
2/17/1979	TS-38A	Minewater	Cyanide	mg/l	0.1	<
2/17/1979	TS-38A	Minewater	Fluoride	mg/l	0.48	
2/17/1979	TS-38A	Minewater	Iron	mg/l	2.5	
2/17/1979	TS-38A	Minewater	Lead	mg/l	0.001	<
2/17/1979	TS-38A	Minewater	Manganese	mg/l	0.003	
2/17/1979	TS-38A	Minewater	Mercury	mg/l	0.0004	<
2/17/1979	TS-38A	Minewater	Molybdenum	mg/l	0.002	
2/17/1979	TS-38A	Minewater	Nickel	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.5	
2/17/1979	TS-38A	Minewater	pH, lab	SU	8.2	
2/17/1979	TS-38A	Minewater	Phenols	mg/l	0.005	
2/17/1979	TS-38A	Minewater	Radium-226	pCi/l	49.3	± 2.1
2/17/1979	TS-38A	Minewater	Radium-228	pCi/l	1	<
2/17/1979	TS-38A	Minewater	Selenium	mg/l	0.03	
2/17/1979	TS-38A	Minewater	Silver	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Sulfate	mg/l	76	
2/17/1979	TS-38A	Minewater	TDS	mg/l	483	
2/17/1979	TS-38A	Minewater	Uranium	mg/l	2.1	
2/17/1979	TS-38A	Minewater	Zinc	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Aluminum	mg/l	0.3	
2/21/1979	TS-43A	Minewater	Arsenic	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Barium	mg/l	0.4	
2/21/1979	TS-43A	Minewater	Boron	mg/l	0.3	
2/21/1979	TS-43A	Minewater	Cadmium	mg/l	0.001	<
2/21/1979	TS-43A	Minewater	Chloride	mg/l	7	
2/21/1979	TS-43A	Minewater	Chromium	mg/l	0.001	<
2/21/1979	TS-43A	Minewater	Cobalt	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Copper	mg/l	0.003	
2/21/1979	TS-43A	Minewater	Cyanide	mg/l	0.1	<
2/21/1979	TS-43A	Minewater	Fluoride	mg/l	0.46	
2/21/1979	TS-43A	Minewater	Iron	mg/l	0.07	
2/21/1979	TS-43A	Minewater	Lead	mg/l	0.001	<
2/21/1979	TS-43A	Minewater	Manganese	mg/l	0.01	
2/21/1979	TS-43A	Minewater	Mercury	mg/l	0.0004	<
2/21/1979	TS-43A	Minewater	Molybdenum	mg/l	0.002	
2/21/1979	TS-43A	Minewater	Nickel	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.4	
2/21/1979	TS-43A	Minewater	pH, lab	mg/l	8.19	
2/21/1979	TS-43A	Minewater	Phenols	mg/l	0.003	
2/21/1979	TS-43A	Minewater	Radium-226	pCi/l	82	± 1.7
2/21/1979	TS-43A	Minewater	Radium-228	pCi/l	1	<
2/21/1979	TS-43A	Minewater	Selenium	mg/l	0.03	
2/21/1979	TS-43A	Minewater	Silver	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Sulfate	mg/l	73	
2/21/1979	TS-43A	Minewater	TDS	mg/l	386	
2/21/1979	TS-43A	Minewater	Uranium	mg/l	0.96	
2/21/1979	TS-43A	Minewater	Zinc	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Aluminum	mg/l	0.3	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
2/27/1979	TS-47A	Minewater	Arsenic	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Barium	mg/l	0.1	
2/27/1979	TS-47A	Minewater	Boron	mg/l	0.3	
2/27/1979	TS-47A	Minewater	Cadmium	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Chloride	mg/l	7	
2/27/1979	TS-47A	Minewater	Chromium	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Cobalt	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Copper	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Cyanide	mg/l	0.2	
2/27/1979	TS-47A	Minewater	Fluoride	mg/l	0.48	
2/27/1979	TS-47A	Minewater	Iron	mg/l	0.61	
2/27/1979	TS-47A	Minewater	Lead	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Manganese	mg/l	0.02	
2/27/1979	TS-47A	Minewater	Mercury	mg/l	0.0004	
2/27/1979	TS-47A	Minewater	Molybdenum	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Nickel	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.5	
2/27/1979	TS-47A	Minewater	pH, lab	mg/l	7.42	
2/27/1979	TS-47A	Minewater	Phenols	mg/l	0.002	
2/27/1979	TS-47A	Minewater	Radium-226	pCi/l	155	± 3
2/27/1979	TS-47A	Minewater	Radium-228	pCi/l	1	<
2/27/1979	TS-47A	Minewater	Selenium	mg/l	0.04	
2/27/1979	TS-47A	Minewater	Silver	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Sulfate	mg/l	70	
2/27/1979	TS-47A	Minewater	TDS	mg/l	383	
2/27/1979	TS-47A	Minewater	Uranium	mg/l	3.71	
2/27/1979	TS-47A	Minewater	Zinc	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Aluminum	mg/l	0.3	
3/14/1979	TS-52A	Minewater	Arsenic	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Barium	mg/l	0.2	
3/14/1979	TS-52A	Minewater	Boron	mg/l	0.3	
3/14/1979	TS-52A	Minewater	Cadmium	mg/l	0.001	<
3/14/1979	TS-52A	Minewater	Chloride	mg/l	6.5	
3/14/1979	TS-52A	Minewater	Chromium	mg/l	0.041	
3/14/1979	TS-52A	Minewater	Cobalt	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Copper	mg/l	0.016	
3/14/1979	TS-52A	Minewater	Cyanide	mg/l	0.1	
3/14/1979	TS-52A	Minewater	Fluoride	mg/l	0.52	
3/14/1979	TS-52A	Minewater	Iron	mg/l	0.62	
3/14/1979	TS-52A	Minewater	Lead	mg/l	0.001	<
3/14/1979	TS-52A	Minewater	Manganese	mg/l	0.081	
3/14/1979	TS-52A	Minewater	Mercury	mg/l	0.0004	<
3/14/1979	TS-52A	Minewater	Molybdenum	mg/l	0.003	
3/14/1979	TS-52A	Minewater	Nickel	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.5	
3/14/1979	TS-52A	Minewater	pH, lab	mg/l	7.2	
3/14/1979	TS-52A	Minewater	Phenols	mg/l	0.006	
3/14/1979	TS-52A	Minewater	Radium-226	pCi/l	67	± 2.7
3/14/1979	TS-52A	Minewater	Radium-228	pCi/l	1	<
3/14/1979	TS-52A	Minewater	Selenium	mg/l	0.03	
3/14/1979	TS-52A	Minewater	Silver	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Sulfate	mg/l	70	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
3/14/1979	TS-52A	Minewater	TDS	mg/l	386	
3/14/1979	TS-52A	Minewater	Uranium	mg/l	1.57	
3/14/1979	TS-52A	Minewater	Zinc	mg/l	0.02	
3/27/1979	TS-56A	Minewater	Aluminum	mg/l	0.1	<
3/27/1979	TS-56A	Minewater	Arsenic	mg/l	0.01	<
3/27/1979	TS-56A	Minewater	Barium	mg/l	0.2	
3/27/1979	TS-56A	Minewater	Boron	mg/l	0.2	
3/27/1979	TS-56A	Minewater	Cadmium	mg/l	0.001	<
3/27/1979	TS-56A	Minewater	Chloride	mg/l	7	
3/27/1979	TS-56A	Minewater	Chromium	mg/l	0.002	
3/27/1979	TS-56A	Minewater	Cobalt	mg/l	0.01	<
3/27/1979	TS-56A	Minewater	Copper	mg/l	0.001	
3/27/1979	TS-56A	Minewater	Cyanide	mg/l	0.1	<
3/27/1979	TS-56A	Minewater	Fluoride	mg/l	0.48	
3/27/1979	TS-56A	Minewater	Iron	mg/l	0.02	
3/27/1979	TS-56A	Minewater	Lead	mg/l	0.001	<
3/27/1979	TS-56A	Minewater	Manganese	mg/l	0.002	
3/27/1979	TS-56A	Minewater	Mercury	mg/l	0.0004	<
3/27/1979	TS-56A	Minewater	Molybdenum	mg/l	0.001	
3/27/1979	TS-56A	Minewater	Nickel	mg/l	0.01	<
3/27/1979	TS-56A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.5	
3/27/1979	TS-56A	Minewater	pH, lab	mg/l	8	
3/27/1979	TS-56A	Minewater	Phenols	mg/l	0.001	<
3/27/1979	TS-56A	Minewater	Radium-226	pCi/l	89.8	± 2.3
3/27/1979	TS-56A	Minewater	Radium-228	pCi/l	2	± 1
3/27/1979	TS-56A	Minewater	Selenium	mg/l	0.03	
3/27/1979	TS-56A	Minewater	Silver	mg/l	0.01	<
3/27/1979	TS-56A	Minewater	Sulfate	mg/l	76	
3/27/1979	TS-56A	Minewater	TDS	mg/l	404	
3/27/1979	TS-56A	Minewater	Uranium	mg/l	1.53	
3/27/1979	TS-56A	Minewater	Zinc	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Aluminum	mg/l	0.2	<
4/11/1979	TS-63	Minewater	Arsenic	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Barium	mg/l	0.2	
4/11/1979	TS-63	Minewater	Boron	mg/l	0.1	<
4/11/1979	TS-63	Minewater	Cadmium	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Chloride	mg/l	5	
4/11/1979	TS-63	Minewater	Chromium	mg/l	0.02	<
4/11/1979	TS-63	Minewater	Cobalt	mg/l	0.03	<
4/11/1979	TS-63	Minewater	Copper	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Cyanide	mg/l	0.1	<
4/11/1979	TS-63	Minewater	Fluoride	mg/l	0.51	
4/11/1979	TS-63	Minewater	Iron	mg/l	0.05	<
4/11/1979	TS-63	Minewater	Lead	mg/l	0.05	<
4/11/1979	TS-63	Minewater	Manganese	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Mercury	mg/l	0.0004	<
4/11/1979	TS-63	Minewater	Molybdenum	mg/l	0.04	<
4/11/1979	TS-63	Minewater	Nickel	mg/l	0.02	
4/11/1979	TS-63	Minewater	Nitrogen, Nitrate (as N)	mg/l	13	
4/11/1979	TS-63	Minewater	pH, lab	mg/l	7.59	
4/11/1979	TS-63	Minewater	Phenols	mg/l	0.001	<
4/11/1979	TS-63	Minewater	Radium-226	pCi/l	22	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
4/11/1979	TS-63	Minewater	Radium-228	pCi/l	5	
4/11/1979	TS-63	Minewater	Sc	umhos/cm	600	
4/11/1979	TS-63	Minewater	Selenium	mg/l	0.02	
4/11/1979	TS-63	Minewater	Silver	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Sodium	mg/l	85.3	
4/11/1979	TS-63	Minewater	Sulfate	mg/l	75.8	
4/11/1979	TS-63	Minewater	TDS	mg/l	380.5	
4/11/1979	TS-63	Minewater	Thorium-230	pCi/l	0.6	<
4/11/1979	TS-63	Minewater	Uranium	mg/l	2.29	
4/11/1979	TS-63	Minewater	Vanadium	mg/l	0.1	<
4/11/1979	TS-63	Minewater	Zinc	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Aluminum	mg/l	0.2	<
5/2/1979	TS-69	Minewater	Barium	mg/l	0.1	<
5/2/1979	TS-69	Minewater	Cadmium	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Chloride	mg/l	5	
5/2/1979	TS-69	Minewater	Chromium	mg/l	0.02	<
5/2/1979	TS-69	Minewater	Cobalt	mg/l	0.05	<
5/2/1979	TS-69	Minewater	Copper	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Fluoride	mg/l	0.42	
5/2/1979	TS-69	Minewater	Iron	mg/l	0.04	<
5/2/1979	TS-69	Minewater	Lead	mg/l	0.05	<
5/2/1979	TS-69	Minewater	Manganese	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Mercury	mg/l	0.0004	<
5/2/1979	TS-69	Minewater	Molybdenum	mg/l	0.04	<
5/2/1979	TS-69	Minewater	Nickel	mg/l	0.04	<
5/2/1979	TS-69	Minewater	Nitrogen, Nitrate (as N)	mg/l	1	
5/2/1979	TS-69	Minewater	pH, lab	mg/l	8.45	
5/2/1979	TS-69	Minewater	Phenols	mg/l	0.001	<
5/2/1979	TS-69	Minewater	Radium-226	pCi/l	11.2	
5/2/1979	TS-69	Minewater	Sc	umhos/cm	485	
5/2/1979	TS-69	Minewater	Silver	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Sodium	mg/l	1009.1	
5/2/1979	TS-69	Minewater	Sulfate	mg/l	73.3	
5/2/1979	TS-69	Minewater	TDS	mg/l	370.5	
5/2/1979	TS-69	Minewater	Thorium-230	pCi/l	5.8	
5/2/1979	TS-69	Minewater	Uranium	mg/l	1.7	
5/2/1979	TS-69	Minewater	Vanadium	mg/l	0.1	<
5/2/1979	TS-69	Minewater	Zinc	mg/l	0.01	<
6/11/1979		Minewater	Aluminum	mg/l	0.339	
6/11/1979		Minewater	Arsenic	mg/l	0.0118	
6/11/1979		Minewater	Barium	mg/l	0.043	
6/11/1979		Minewater	Boron	mg/l	0.01	
6/11/1979		Minewater	Cadmium	mg/l	0.0038	
6/11/1979		Minewater	Chloride	mg/l	13.4	
6/11/1979		Minewater	Chromium	mg/l	0.0356	
6/11/1979		Minewater	Cobalt	mg/l	0.0001	<
6/11/1979		Minewater	Copper	mg/l	0.0235	
6/11/1979		Minewater	Fluoride	mg/l	0.55	
6/11/1979		Minewater	Iron	mg/l	0.059	
6/11/1979		Minewater	Lead	mg/l	0.0138	
6/11/1979		Minewater	Manganese	mg/l	0.0026	
6/11/1979		Minewater	Mercury	mg/l	0.001	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
6/11/1979		Minewater	Molybdenum	mg/l	0.0373	
6/11/1979		Minewater	Nickel	mg/l	0.1349	
6/11/1979		Minewater	Nitrogen, Nitrate (as N)	mg/l	0.1	<
6/11/1979		Minewater	pH, lab	SU	7.94	
6/11/1979		Minewater	Radium-226	pCi/l	36.1	
6/11/1979		Minewater	Radium-228	pCi/l	5.2	
6/11/1979		Minewater	Sc	umhos/cm	690	
6/11/1979		Minewater	Selenium	mg/l	0.0149	
6/11/1979		Minewater	Silver	mg/l	0.0054	
6/11/1979		Minewater	Sodium	mg/l	10	
6/11/1979		Minewater	Sulfate	mg/l	111.5	
6/11/1979		Minewater	TDS	mg/l	449.6	
6/11/1979		Minewater	Thorium-230	pCi/l	120.5	
6/11/1979		Minewater	Uranium	mg/l	3.62	
6/11/1979		Minewater	Vanadium	mg/l	0.1	
6/11/1979		Minewater	Zinc	mg/l	0.0022	
4/30/1980		Minewater	Alkalinity (CaCO3)	mg/l	232	
4/30/1980		Minewater	Aluminum	mg/l	2.8	
4/30/1980		Minewater	Barium	mg/l	0.1	
4/30/1980		Minewater	Calcium	mg/l	10.1	
4/30/1980		Minewater	Chloride	mg/l	6.5	
4/30/1980		Minewater	Iron	mg/l	1.99	
4/30/1980		Minewater	Lead-210	pCi/l	240	± 7.0
4/30/1980		Minewater	Magnesium	mg/l	1	<
4/30/1980		Minewater	Manganese	mg/l	0.003	
4/30/1980		Minewater	pH, lab	SU	8	
4/30/1980		Minewater	Potassium	mg/l	2.2	
4/30/1980		Minewater	Radium-226	pCi/l	490	± 12
4/30/1980		Minewater	Radium-228	pCi/l	1	<
4/30/1980		Minewater	Sc	umhos/cm	691	
4/30/1980		Minewater	Selenium	mg/l	0.004	
4/30/1980		Minewater	Silica	mg/l	21	
4/30/1980		Minewater	Sodium	mg/l	170	
4/30/1980		Minewater	Sulfate	mg/l	71	
4/30/1980		Minewater	TDS	mg/l	381	
4/30/1980		Minewater	Thorium-230	pCi/l	0.6	<
4/30/1980		Minewater	Uranium	mg/l	2.84	
4/30/1980		Minewater	Zinc	mg/l	0.02	
7/16/1980		Minewater	Alkalinity (CaCO3)	mg/l	127	
7/16/1980		Minewater	Aluminum	mg/l	0.1	<
7/16/1980		Minewater	Barium	mg/l	0.01	<
7/16/1980		Minewater	Bicarbonate	mg/l	155	
7/16/1980		Minewater	Calcium	mg/l	31	
7/16/1980		Minewater	Carbonate	mg/l	0.1	<
7/16/1980		Minewater	Chloride	mg/l	14.9	
7/16/1980		Minewater	Iron	mg/l	0.1	<
7/16/1980		Minewater	Lead-210	pCi/l	0	± 3.42
7/16/1980		Minewater	Magnesium	mg/l	4.2	
7/16/1980		Minewater	Manganese	mg/l	1.3	
7/16/1980		Minewater	pH, lab	SU	6.7	
7/16/1980		Minewater	Potassium	mg/l	1.9	
7/16/1980		Minewater	Radium-226	pCi/l	86.1	± 1.7

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
7/16/1980		Minewater	Radium-228	pCi/l	1.3	± 5.0
7/16/1980		Minewater	Sc	umhos/cm	950	
7/16/1980		Minewater	Selenium	mg/l	0.05	
7/16/1980		Minewater	Silicon	mg/l	6.9	
7/16/1980		Minewater	Sodium	mg/l	140	
7/16/1980		Minewater	Sulfate	mg/l	272	
7/16/1980		Minewater	TDS	mg/l	538	
7/16/1980		Minewater	Thorium-230	pCi/l	5.3	± 2.6
7/16/1980		Minewater	Uranium	mg/l	2.7	
7/16/1980		Minewater	Zinc	mg/l	0.01	
10/9/1984		Mill Well	Alkalinity (CaCO3)	mg/L	197	
10/9/1984		Mill Well	Aluminum	mg/L	0.05	
10/9/1984		Mill Well	Ammonium as N	mg/L	0.05	
10/9/1984		Mill Well	Arsenic	mg/L	0.001	
10/9/1984		Mill Well	Bicarbonate	mg/L	239.7	
10/9/1984		Mill Well	Cadmium	mg/L	0.01	
10/9/1984		Mill Well	Calcium	mg/L	4.7	
10/9/1984		Mill Well	Chloride	mg/L	4.1	
10/9/1984		Mill Well	Cobalt	mg/L	0.05	
10/9/1984		Mill Well	Gross Alpha	pCi/L	43	
10/9/1984		Mill Well	Lead	mg/L	0.05	
10/9/1984		Mill Well	Lead 210	pCi/L	9.3	
10/9/1984		Mill Well	Magnesium	mg/L	3.24	
10/9/1984		Mill Well	Manganese	mg/L	0.01	
10/9/1984		Mill Well	Molybdenum	mg/L	0.01	
10/9/1984		Mill Well	Nickel	mg/L	0.05	
10/9/1984		Mill Well	pH	s.u.	8.49	
10/9/1984		Mill Well	Potassium	mg/L	1.6	
10/9/1984		Mill Well	Radium 226	pCi/L	1.8	
10/9/1984		Mill Well	Selenium	mg/L	0.001	
10/9/1984		Mill Well	Sodium	mg/L	103.2	
10/9/1984		Mill Well	Sulfate	mg/L	17.7	
10/9/1984		Mill Well	TDS	mg/L	228	
10/9/1984		Mill Well	Thorium 230	pCi/L	61.3	
10/9/1984		Mill Well	Uranium	mg/L	0.065	
10/9/1984		Mill Well	Vanadium	mg/L	0.01	
4/23/1992		Mill Well	Alkalinity (CaCO3)	mg/L	201	
4/23/1992		Mill Well	Aluminum	mg/L	0.1	
4/23/1992		Mill Well	Ammonium as N	mg/L	0.1	
4/23/1992		Mill Well	Arsenic	mg/L	0.004	
4/23/1992		Mill Well	Beryllium	mg/L	0.1	
4/23/1992		Mill Well	Bicarbonate	mg/L	245	
4/23/1992		Mill Well	Cadmium	mg/L	0.01	
4/23/1992		Mill Well	Calcium	mg/L	3.2	
4/23/1992		Mill Well	Chloride	mg/L	6.3	
4/23/1992		Mill Well	Cobalt	mg/L	0.01	
4/23/1992		Mill Well	Gross Alpha	pCi/L	2.3	
4/23/1992		Mill Well	Lead	mg/L	0.05	
4/23/1992		Mill Well	Lead 210	pCi/L	1	
4/23/1992		Mill Well	Magnesium	mg/L	0.4	
4/23/1992		Mill Well	Manganese	mg/L	0.01	
4/23/1992		Mill Well	Molybdenum	mg/L	0.1	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
4/23/1992		Mill Well	Nickel	mg/L	0.05	
4/23/1992		Mill Well	Nitrate + Nitrate as N	mg/L	0.1	
4/23/1992		Mill Well	pH	s.u.	8.83	
4/23/1992		Mill Well	Potassium	mg/L	1	
4/23/1992		Mill Well	Radium 226	pCi/L	0.4	
4/23/1992		Mill Well	Radium 228	pCi/L	2.1	
4/23/1992		Mill Well	Selenium	mg/L	0.218	
4/23/1992		Mill Well	Sodium	mg/L	123	
4/23/1992		Mill Well	Sulfate	mg/L	33.3	
4/23/1992		Mill Well	TDS	mg/L	292	
4/23/1992		Mill Well	Thorium 230	pCi/L	0.2	
4/23/1992		Mill Well	Uranium	mg/L	0.576	
4/23/1992		Mill Well	Vanadium	mg/L	0.1	
7/28/1993		Mill Well	Alkalinity (CaCO3)	mg/L	188	
7/28/1993		Mill Well	Aluminum	mg/L	0.16	
7/28/1993		Mill Well	Ammonium as N	mg/L	0.05	
7/28/1993		Mill Well	Arsenic	mg/L	0.001	
7/28/1993		Mill Well	Beryllium	mg/L	0.005	
7/28/1993		Mill Well	Bicarbonate	mg/L	229	
7/28/1993		Mill Well	Cadmium	mg/L	0.01	
7/28/1993		Mill Well	Calcium	mg/L	15	
7/28/1993		Mill Well	Chloride	mg/L	182	
7/28/1993		Mill Well	Cobalt	mg/L	0.01	
7/28/1993		Mill Well	Gross Alpha	pCi/L	1.8	
7/28/1993		Mill Well	Lead	mg/L	0.05	
7/28/1993		Mill Well	Magnesium	mg/L	4.9	
7/28/1993		Mill Well	Manganese	mg/L	0.24	
7/28/1993		Mill Well	Molybdenum	mg/L	0.1	
7/28/1993		Mill Well	Nickel	mg/L	0.05	
7/28/1993		Mill Well	Nitrate + Nitrate as N	mg/L	0.1	
7/28/1993		Mill Well	pH	s.u.	8.49	
7/28/1993		Mill Well	Potassium	mg/L	3	
7/28/1993		Mill Well	Radium 226	pCi/L	1.6	
7/28/1993		Mill Well	Radium 228	pCi/L	1.4	
7/28/1993		Mill Well	Selenium	mg/L	0.003	
7/28/1993		Mill Well	Sodium	mg/L	708	
7/28/1993		Mill Well	Sulfate	mg/L	1260	
7/28/1993		Mill Well	TDS	mg/L	2258	
7/28/1993		Mill Well	Thorium 230	pCi/L	0.2	
7/28/1993		Mill Well	Uranium	mg/L	0.002	
7/28/1993		Mill Well	Vanadium	mg/L	0.1	
6/18/2002		Mill Well	Alkalinity (CaCO3)	mg/L	185	
6/18/2002		Mill Well	Aluminum	mg/L	0.1	
6/18/2002		Mill Well	Ammonium as N	mg/L	0.5	
6/18/2002		Mill Well	Arsenic	mg/L	0.001	
6/18/2002		Mill Well	Beryllium	mg/L	0.01	
6/18/2002		Mill Well	Bicarbonate	mg/L	225	
6/18/2002		Mill Well	Cadmium	mg/L	0.005	
6/18/2002		Mill Well	Calcium	mg/L	16	
6/18/2002		Mill Well	Chloride	mg/L	160	
6/18/2002		Mill Well	Cobalt	mg/L	0.01	
6/18/2002		Mill Well	Gross Alpha	pCi/L	1	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
6/18/2002		Mill Well	Lead	mg/L	0.05	
6/18/2002		Mill Well	Lead 210	pCi/L	1	
6/18/2002		Mill Well	Magnesium	mg/L	4.2	
6/18/2002		Mill Well	Manganese	mg/L	0.05	
6/18/2002		Mill Well	Molybdenum	mg/L	0.1	
6/18/2002		Mill Well	Nickel	mg/L	0.05	
6/18/2002		Mill Well	Nitrate + Nitrate as N	mg/L	0.1	
6/18/2002		Mill Well	pH	s.u.	8.34	
6/18/2002		Mill Well	Potassium	mg/L	3.5	
6/18/2002		Mill Well	Radium 226	pCi/L	0.7	
6/18/2002		Mill Well	Radium 228	pCi/L	2.7	
6/18/2002		Mill Well	Selenium	mg/L	0.001	
6/18/2002		Mill Well	Sodium	mg/L	644	
6/18/2002		Mill Well	Sulfate	mg/L	1100	
6/18/2002		Mill Well	TDS	mg/L	2090	
6/18/2002		Mill Well	Thorium 230	pCi/L	0.02	
6/18/2002		Mill Well	Uranium	mg/L	0.07	
6/18/2002		Mill Well	Vanadium	mg/L	0.1	

Notes:
Qualifier of < signifies that concentration was less than detection limit shown
Qualifier of ± represents precision of radionuclides analysis

10/29/03

Water Sources in Church Rock Area Sampled in 2003 by CRUMP Water Assessment Team

Well #	Well Name	Chapter	Latitude	Longitude	TRS Coordinates	Formation	Well Type	TD (ft)	Use(s)
Grey	Annie Grey	Pinedale	35,37 457	108,30 670	16 16 14 1111	Qal	dug, HP	8	LS, DOM
Solar	Solar St	Church Rock	35,32 158	108,35 753	15 17 13 1	Qal?	drilled, HP	unk	LS
14K-313	Brown Bull	Coyote Cyn	35,39 982	108,34 113	17 16 32 or 29	Kg	drilled, WM	622	LS, DOM
14K-586	Friendship I	Coyote Cyn	35,39 432	108,30 557	17 16 35	Kmv or Kg	drilled, PWS	750	abd-CWS
15K-303	Pipeline Cyn	Standing Rk	35,40 277	108,28 698	17 15 29 421	Kg	drilled, WM	614	LS
16-4-10	Lime Ridge	Church Rock	35,34 315	108,34 633	16 16 31 33	Jmw?	dug, HP	<1	LS, DOM
16K-336	Puerco No Fork	Church Rock	35,34 362	108,38 202	16 17 33 4223	Qal	drilled, WM	122	LS
16K-340	Windmill Cluster	Church Rock	35,35 582	108,35 890	16 17 25 1132	Qal	drilled, WM	141	LS
16T-348	Lobo Valley	Pinedale	35,37 178	108,27 195	16 15 17 1431	Kd	drilled, WM	410	LS
16T-534	Superman Cyn	Church Rock	35,35 818	108,38 675	16 17 21 344	Jmw	drilled, WM	410	DOM, LS
16T-559	Coal Mine/ Henry's	Church Rock	35,27 560	108,39 207	15 17 33 43	unk	drilled, WM	unk	LS
16T-606	King Ranch	Church Rock	35,36 998	108,33 237	16 16 17 411	Kd	drilled, WM	417	LS
16T-608	Yazzie Family	Church Rock	35,31 123	108,38 332	15 17 21 4	unk	drilled, WM	unk	DOM, LS

Following Pages

Summary of General Chemistry
Summary of Heavy Metals
Summary of Radionuclides
Complete field chemistry reported by NMED
Complete radionuclide analyses reported by NMED
Complete uranium analyses reported by USEPA

Abbreviations and Symbols

TRS = Township, Range, Section
TD = Total Depth of well, in feet, unk = unknown depth
Uses abd-CWS = abandoned community water system, DOM = domestic, LS = livestock,
Type HP = hand pump, WM = windmill
Formation Qal = alluvium, Kd = Dakota SS, Kg = Gallup SS, Kmv = Mesa (?) Verde, Jmw = Morrison/Westwater
NNEPA = Navajo Nation Environmental Protection Agency
USEPA = U S Environmental Protection Agency

Summary of General Chemistry

Well #	Sampling Date	Dissolved Solids (mg/L)	Calcium (CaCO$_3$) (mg/L)	Magnesium (mg/L)	Potassium (mg/l)	Sodium (mg/L)	Total Hardness (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	pH (Units)
USEPA or NNEPA MCL		500	75-200	none	none	none	500	250	250	6 5-8 5
Lab		NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	field
Grey	10/28/2003	**553 5**	**376 0**	(???) -36	6 69	24 1	240 0	4 5	**305 0**	7 72
Solar	10/29/2003	**561 8**	38 0	120 0	4 00	27 9	148 0	4 64	**352 0**	**8 61**
14K-313	10/29/2003	**1,095 0**	**640 0**	440 0	4 36	105 0	**1,080 0**	10 7	**1,070 0**	8 31
14K-586	8/5/2003	**2,136 0**	**251 8**	125 1	7 10	143 1	**1,143 9**	19 1	**1,097 2**	8 07
15K-303	10/28/2003	**3,043 0**	**980 0**	(???) -940	5 97	191 0	40 0	12 1	**1,940 0**	8 13
16-4-10	10/29/2003	237 5	152 0	32 0	1 61	8 37	184 0	14 3	27 1	7 45
16K-336	10/29/2003	**887 6**	200 0	88 0	2 84	207 0	288 0	20 9	122 0	8 05
16K-340	10/29/2003	**1,469 0**	**420 0**	180 0	3 65	256 0	**600 0**	25 5	**419 0**	8 16
16T-348	10/29/2003	**660 9**	4 0	8 0	0 86	222 0	12 0	3 48	155 0	**9 63**
16T-534	10/29/2003	**811 8**	132 0	76 0	3 00	179 0	208 0	8 0	**314 0**	**8 67**
16T-559	10/28/2003	498 4	12 0	15 0	1 71	162 0	27 0	4 59	148 0	**8 87**
16T-606	10/28/2003	**3,500 0**	196 0	1,740 0	6 91	245 0	**1,940 0**	23 3	**1,130 0**	7 45
16T-608	10/28/2003	**1,015 0**	24 0	36 0	0 86	390 0	60 0	**251 0**	134 0	**8 82**

Boldface numbers indicate values exceeding standards

Abbreviations MCL = maximum contaminant level, mg/L = milligrams per liter, NMSLD = New Mexico Scientific Laboratory Division, NTUA = Navajo Tribal Utility Authority, ??? = data are questionable

Summary of Heavy Metals and Aesthetic Parameters

Well #	Sampling Date	Arsenic (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Fluoride (mg/L)	Iron (mg/L)
USEPA or NNEPA MCL		0 010	0 005	0 05	1 3	0 02	0 1	0 05	1 6 (WQCC)	0 3
Lab		NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	field*	field*
Grey	10/28/2003	<0 005	<0 0002	<0 001	<0 02	0 001	<0 04	<0 005	0 92	0 01
Solar	10/29/2003	<0 005	<0 0002	<0 001	0 062	<0 001	<0 04	<0 005	0 32	4 10
14K 313	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	1 34	**0 54**
14K 586	8/5/2003	0 008**	<0 001**	<0 001**	<0 1**	<0 001**	<0 1**	<0 005**	not tested	**5 10****
15K 303	10/28/2003	<0 005	<0 0002	<0 001	0 026	<0 001	<0 04	<0 005	**1 60**	**0 68**
16 4 10	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	0 043	0 58	0 10
16K 336	10/29/2003	0 006	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	1 03	**2 00**
16K 340	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 71	**0 40**
16T 348	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 47	0 02
16T 534	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 44	**0 49**
16T 559	10/28/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 64	0 07
16T 606	10/28/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	1 16	**3 28**
16T 608	10/28/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	0 006	**1 96**	0 12

*field tests by New Mexico Environment Department **lab results reported by NMSLD

Boldface numbers indicate values exceeding standards

Abbreviations MCL = maximum contaminant level mg/L = milligrams per liter NMSLD = New Mexico Scientific Laboratory Division
NTUA = Navajo Tribal Utility Authority WQCC = N M Water Quality Control Commission groundwater standard ??? = data are questionable

Summary of Selected Radionuclides*

Well #	Sampling Date	Gr Alpha (U Nat Ref) (pCi/L)	Gr Beta (Sr/Y 90 Ref) (pCi/L)	Radium 226 (pCi/L)	Radium 228 (pCi/L)	Total Uranium (pCi/L)	Uranium mass (ug/L)
USEPA or NNEPA MCL		15	none	combined 5 0		none	30
Grey	10/28/2003	7 20	9 40	0 10	0 40	9 94	14 84
Solar	10/29/2003	nd	4 40	0 08	0 20	0 16	0 24
14K 313	10/29/2003	nd	4 40	0 04	0 50	0 04	0 05
14K 586	8/5/2003	10 80	14 90✓	2 60	not tested	not tested	3 00
15K 303	10/28/2003	4 00	9 00	0 47	1 50	0 46	0 69
16 4 10	10/29/2003	**44 10**	26 00	0 33	0 70	46 48	**69 37**
16K 336	10/29/2003	5 90	4 40	0 83	0 30	0 38	0 57
16K 340	10/29/2003	nd	4 90	0 40	0 40	1 96	2 92
16T 348	10/29/2003	nd	1 60	nd	0 60	0 20	0 29
16T 534	10/29/2003	nd	2 70	0 20	0 50	0 10	0 15
16T 559	10/28/2003	nd	1 50	0 05	nd	0 06	0 09
16T 606	10/28/2003	**40 00**	20 40	**8 34**	**0 80**	4 68	6 99
16T 608	10/28/2003	5 40	nd	0 04	1 40	3 86	5 76

*All samples except for 14T 586 analyzed at USEPA lab in Las Vegas NV 14T 586 analysis at N M State Laboratory

Boldface numbers indicate values exceeding standards

Abbreviations MCL = maximum contaminant level pCi/L = picoCuries per liter

REPORT OF SANITARY SURVEY OF PUBLIC WATER SYSTEM

KERR MCGEE WATER SYSTEM
PWSID # NM-00323

14T-586
July '85
compliance in 3/79
2/80

3/88
7/85
3/79

CONDUCTED BY

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
NAVAJO AREA INDIAN HEALTH SERVICE
OFFICE OF ENVIRONMENTAL HEALTH AND ENGINEERING

FOR

ENVIRONMENTAL PROTECTION AGENCY
SAN FRANCISCO, CALIFORNIA

I. INTRODUCTION

The biennial survey of the Kerr McGee community water system was completed on May 25, 1988. The system is located about 16 miles north and east of Gallup, New Mexico. The last survey was completed on June 27, 1985 by a representative of the Environmental Protection Agency. The purposes of this latest survey were to evaluate and make recommendations on the operation and maintenance of the system, determine compliance with the Safe Drinking Water Act (SDWA) and to determine possible unmet needs.

The survey was conducted in accordance with the Safe Drinking Water Act (PL 93-523) and its amendments. The procedure manual "A Guide to Be Used in Conducting a Sanitary Survey", an interim guideline developed for use in the Navajo Area, was used as a rough guideline during the survey. The survey was conducted by Don Payne, Senior Sanitarian, Navajo Area Office of Environmental Health and Engineering.

II. BACKGROUND

The responsibility for operation and maintenance of this system has been that of the Navajo Tribe since the Kerr McGee mine closed and left the source unattended. The water system serves the rural community of Kerr McGee. It was built under separately funded P.L. 86-121 projects NA-74-542 and NA-74-543a during 1977. The water system has a total of 8 connections which serve an approximate population of 44 persons. The main system components are one well with tribal well number 14T-586, one ground level storage tank of 4,000 gallon capacity and PVC water service lines to serve the 8 connections.

> Well 14T-586 is the source of water for the system. The well is 750 feet deep with a 7 inch diameter steel casing. It is equipped with a Jenson pump jack powered by an electric motor. The pump is operated from a manual, wall mounted switch.

For those who are interested in obtaining more indepth technical information for the system a copy of the design analysis sheet may be found in the master service unit file for this community water system.

III. OPERATION AND MAINTENANCE

The operation and maintenance (O&M) evaluation was not carried out to the extent that valve boxes were checked for leakage, water line markers specifically checked, etc. Instead, the surveyors tried to get a general idea of the quality of O&M by noting the general appearance of the pumphouse, presence of water line markers and the degree that the operator has been satisfying the requirements of the Safe Drinking Water Act.

Personnel responsible for operation of this water system are not certified as water treatment plant operators. Some of them have attended training courses sponsored by the Environmental Protection Agency and the Indian

Health Service. However, they have not passed any of the tests for certification.

Monthly water samples for bacteriological analysis are collected from the system and analyzed at the NTUA laboratory in Ft. Defiance, Arizona. The sample results are sent to EPA, Region IX as required. The system has had no monitoring nor reporting or maximum concentration level (MCL) violations for bacteriology during the last twelve months.

The baseline samples for inorganic analyses were collected in March, 1979. Initial data indicated that all results, with the exception of selenium at 0.02 mg/l, were in compliance with Federal standards. Follow up samples collected for further selenium analysis indicated that the first result was probably an anomaly as the follow up samples analysis results were less than the MCL for selenium. (0.01 mg/l) Sampling for inorganics was most recently done again in June, 1986. The concentration of selenium was again below the MCL. Results of all other inorganic baseline analyses were within the Federal standards as before.

Baseline radionuclide sampling was completed in February, 1980. Results were in compliance with Federal standards. The system was again sampled in July, 1985. The latest radionuclide analyses results, (gross alpha = <2pCi/l), were also within the Federal standards.

Water samples for a complete series of secondary chemical analyses were collected in May, 1985. All of the results were within the recommended range of concentrations.

Sodium is a special case when you consider that approximately 3% of the American population are on low sodium diets prescribed for reasons of illness. The low sodium diets most commonly prescribed limit the patient to either 2.0, 1.0, or 0.5 grams of sodium over a 24 hour period. Where water supplies contain more than 20 mg/l, limiting dietary sodium to less than 1.0 grams/day is difficult to achieve and maintain. For this reason, the SDWA requires that each water system using well water collect samples every three years and submit the results to EPA. (If a system has several wells, all drawing water from the same aquifer, the operator is only required to sample one well.) The frequency of sampling can be varied if the sodium concentration is significantly greater or less than the 20 mg/l. This particular system had a measured sodium concentration of 238 mg/l, well above the 20 mg/l recommended for hypertensives. It is highly recommended that the system operator notify the medical community of the sodium concentration of this public water system.

> NOTE: The above information was obtained from "Drinking Water and Health", SAFE DRINKING WATER COMMITTEE, Advisory Center on Toxicology, Assembly of Life Sciences, National Research Council. NATIONAL ACADEMY OF SCIENCES, Washington, D.C. 1977. (4th Printing, 1984.)

The corrosivity of the water has not been determined.

The water for this system is neither chlorinated nor fluoridated. The water contains natural fluoride at 0.77 mg/1.

Information concerning chemical, radiological and bacteriological sampling and analyses records are included in Attachment A.

IV. SUMMARY

The water system is very simple. However, the pumphouse and storage tank area have apparently never received much attention from any operator. Numerous problems such as the following were noted:

1. The pumphouse and storage tank are not protected from trespass by a fence.
2. The crude pumphouse has a large hole in the roof directly over the well. The plate sealing the well casing has a hole approximately 1 1/2 inches in diameter. A portion of the pumphouse wall has also been removed and left open for easy access.
3. The electric cable supplying power to the motor lies on the floor in water.
4. The water storage tank is badly rusted inside and out.

This water system is poorly maintained. Therefore, no new connections should be made until the pumphouse, well, and storage tank area have been significantly improved.

The water is very high in sodium. Emphasis should be placed upon notification of health officials of the sodium concentration of the raw water supply. The corrosivity of the water should also be determined so the operator can know if there is any potential problem with lead leaching from lead solder in houses. None of the operators for this particular system are certified. However, they have had some training. Even though the operators may not become certified they should be encouraged and allowed to attend short refresher courses that may be offered in the area. The items noted during the sanitary survey are found on the attached field survey sheet.

The items recommended for correction, listed in priority order, and estimated cost of corrections are presented below:

Findings and Recommendations	Estimated Cost to Correct
1. The access hole in the roof of the pumphouse had been left open, leaving the top of the unsealed well casing open to contaminated rain water. The access hole should be sealed.	

2. One of the large bridge timbers in the side of the pumphouse had been removed to provide access to the inside of the building.

   The old lock for which no one apparently has a key should be cut off and replaced. The timber should be nailed back up at the open side of the building.

3. The top of the well had an unsealed hole of about 1 1/2 inches in diameter.

   The hole should be repaired.

4. The pumphouse was poorly drained. Consequently, water that leaks from around the sucker rod collects in a large puddle in and around the building.

   The water should be drained from the inside of the building.

5. The building was not heated.

   An electric, thermostatically controlled heater should be installed in the building after it has been renovated.

6. A sampling tap was not available in the pumphouse.

   A sampling tap with vacuum breaker should be installed inside the pumphouse.

7. There was no means of adequate treatment of the water. Lask of treatment will probably become a problem when the forthcoming amendment to the SDWA become effective.

The operator should begin planning for the installation and operation of a chlorinator.

8. The storage tank was badly rusted inside and out. One welded joint appeared to be nearly rusted through. The cover was off the hatch at the top of the tank.

   Plans should be made to replace the storage tank.

9. A stock tank was located next to the water storage tank and pumphouse. Standing water was noted.

   The stock tank should be relocated 50-100 yards downgradient from the present site.

Submitted By: Charles C Freeman For
Donald W. Payne
Senior Sanitarian
Navajo Area Office

8-15-88
Date

Submitted By: Charles C Freeman
Charles Freeman, R.S.
District Sanitarian
Gallup District

8-15-88
Date

Submitted By: William O. Mace Jr
Bill Mace, P.E.
District Engineer
Gallup District

8/16/88
Date

ATTACHMENT A

SURVEY OF
COMMUNITY WATER SUPPLY SYSTEM

Type of Survey (check one)
☐ Follow-up ☒ Annual
☐ Revisit ☐ Other
Date 3/17/88

PWSID #/Well # 147-586 / NM-80323
Date(s) System Constructed 1977

Ownership
The Navajo Tribe

SURVEYOR(S)
Don Payne
Steve Keller

COMMUNITY
Kerr McGee

RESERVATION

ITEM	EXISTING	DEFECTS*	ITEM	EXISTING	DEFECTS*	ITEM	EXISTING	DEFECTS*
A. SOURCE			4. RECORDS			F. UTIL. MGMT. & OPER.		
			5. HOUSEKEEPING			1. WATER AUTHORITY		X
1. COMPOUND		X	6. PIPING/VALVES	X	X	2. SCHEDULE		X
2. WELL	X		7. PUMP CONTROLS	X		3. RECORDS		X
3. SPRING			8. TREATMENT		X	4. EMERGENCY PLAN		X
4. INFIL. GALLERY			9. SAFETY		X	5. OPERATOR		X
5. OTHER			D. STORAGE FAC.			G. SDWA/SPDS		
B. PUMPS & MOTORS								
			1. COMPOUND		X	1. BACT. MONITORING	X	
1. PUMP	X	X	2. FOUNDATION		X	2. BACT. QLTY.	X	
2. ELECTRIC MOTOR	X		3. STORAGE TANK		X	3. INORGANICS	X	
C. PUMP HOUSE			E. DIST. SYSTEM			4. ORGANICS		
						5. TURBIDITY		
1. STRUCTURE	X	X	1. W/L APPURT.	X		6. RADIOLOGICAL	X	
2. HEATING		X	2. VALVE/VAL. BX.	X		7. SECONDARY CHEMICAL	X	X
3. ELECTRICITY	X	X				8. FLUORIDE LEVEL	X	

COMMENTS: (D-1/C-1) - The pumphouse and storage tank are located side by side. They are not protected by a fenced compound. A chain link fence should be built to restrict access to the pumphouse and storage tank.

(B-1), - The packing around the sucker rod of the Jensen pump jack was in bad need of replacement. The pump jack does not provide sufficient capacity to adequately supply the system. It should be replaced with a submersible pump.

(A-2/G-7) - The water for the system is high in manganese and sulfate; 0.61 mg/l and 886 mg/l, respectively. Consideration should be given to treating the water to remove the contaminants.

(C-1) - The pumphouse is constructed with mere timber. There are large gaps between the boards. One board has been completely removed to allow access to the pumphouse. The building should be replaced or re-built to create a secure, weatherproof structure.

(C-2) The facility is not heated. A thermostatically controlled heater should be installed in the pumphouse after it is upgraded.

(C-3/C-9) - The cable supplying power to the large electric motor is lying on the floor in several inches of water. The cable should be re-run off the floor in conduit.

(C-6) - A sampling tap is not available in the pumphouse. A sampling tap with vacuum breaker should be made available in the pumphouse.

SYSTEM: Kerr McGee
PWSID: NM - 00323
YEAR: 87-88

MICROBIOLOGICAL COMPLIANCE DATA

MON	SAM	RES	DAY	RES	DAY	RES	DAY	RES	DAY	RES	DAY	RES	DAY	RES	DAY	RES	DAY	RTN TOT	QTR AVG
1987																			
OCT	RTN	33/0	10/14																>>>>>
	CHK																	<<<<<	>>>>>
NOV	RTN	0/0	11/12																>>>>>
	CHK																	<<<<<	>>>>>
DEC	RTN	0/0	12/10																
	CHK																	<<<<<	>>>>>
1988																			
JAN	RTN	17/0	1/25																>>>>>
	CHK																	<<<<<	>>>>>
FEB	RTN	0/0	2/18																>>>>>
	CHK																	<<<<<	>>>>>
MAR	RTN	0/0	3/10																
	CHK																	<<<<<	>>>>>
1987																			
APR	RTN	0/0	4/15																>>>>>
	CHK																	<<<<<	>>>>>
MAY	RTN	0/0	5/14																>>>>>
	CHK																	<<<<<	>>>>>
JUN	RTN	31/0	6/11																
	CHK																	<<<<<	>>>>>
1987																			
JUL	RTN	30/0	7/14																>>>>>
	CHK																	<<<<<	>>>>>
AUG	RTN	32/0	8/13																>>>>>
	CHK																	<<<<<	>>>>>
SEP	RTN	38/0	9/16																
	CHK	2																<<<<<	>>>>>

REPORT OF ANALYSIS

LAB # 85-08-08

SAMPLE IDENTIFICATION	DATE COLLECTED	ALPHA1 pCi/liter
Kerr McGee	07/18/85 12:30:00	<2

POTABLE WATER ANALYSIS
BACTERIOLOGICAL

NAVAJO TRIBAL UTILITY AUTHORITY
LABORATORY

31088
DATE RECEIVED

OWNER COPY

1058
SPECIMEN NUMBER

PWSID# NM0323

☑ BACKGROUND BACTERIA PRESENT 0 / 100 ML
☑ TOTAL COLIFORM (MF) ______ / 100 ML
☐ FECAL COLIFORM (MF) ______ / 100 ML
☐ CONFIRMED COLIFORM ______

NAME OF CLIENT: Water operation Maint,
ADDRESS: Box 6K6
CITY: Ft Def STATE: AZ. ZIP:

COLLECTED BY: Billie Holtie
DATE COLLECTED: 3/10/88 HOUR:
LOCATION (TOWN): Kerr McGee

______ pH ______ Fl_2 ______ LAB TEMP.
______ Cl_2 ______ TEMP 2:45 TIME IN LAB.

☑ ROUTINE
☐ RESAMPLE
☐ CHECK SAMPLE

☑ COMMUNITY
☐ NON-COMMUNITY
☐ INDIVIDUAL

MAILING ADDRESS OF REPORT:
ADDRESS:
CITY: STATE: ZIP:

DETAILED DESCRIPTION AND LOCATION OF SAMPLING POINT: Alice Hood outside Faucet,

REMARKS:

DATE REPORTED 3/11/88 ANALYST
FORM NO. 5462

REV. 9-84 Ⓟ

CHEMICAL ANALYSIS

NAVAJO TRIBAL UTILITY AUTHORITY
LABORATORY

SAMPLE NUMBER 6099
PWSID NUMBER NM# 0323
SAMPLE LOCATION Kerr McGee 14T-586
DATE COLLECTED 5-30-85.
DATE RECEIVED 6-5-85
COLLECTED BY C. Mike
DATE OUT 10-7-85
ADDRESS WHS Dept.
TECHNICIAN A. Becenti / F.S. White

TEST	PARAMETER	METHOD	RESULTS	MCL
	ARSENIC	ATOMIC ABSORPTION		0.05
	BARIUM	ATOMIC ABSORPTION		1.0
	CADMIUM	ATOMIC ABSORPTION		0.01
	CHROMIUM	ATOMIC ABSORPTION		0.05
	IRON	ATOMIC ABSORPTION		N/A
	LEAD	ATOMIC ABSORPTION		0.05
	MANGANESE	ATOMIC ABSORPTION		N/A
	MERCURY	FLAMELESS ATOMIC ABSORPTION		0.002
	SELENIUM	ATOMIC ABSORPTION		0.01
	SILVER	ATOMIC ABSORPTION		0.05
*	NITRATE (AsN)	~~CADMIUM REDUCTION~~ IC	0.42	10.0
	FLUORIDE	ELECTRODE		1.4

FORM NO. 5460 Ⓟ

REV 8-83

1012

Speedisel ® Moore Business Forms, Inc. m

MCP ® Moore Business Forms, Inc. Patents 3,016,308; 3,429,827

CHEMICAL ANALYSIS

NAVAJO TRIBAL UTILITY A IORITY
LABORATORY

SAMPLE NUMBER 6099
SAMPLE LOCATION Kerr McGee
DATE RECEIVED 6-5-85
DATE OUT 6-16-86
TECHNICIAN Anelson

PWSID NUMBER
DATE COLLECTED
COLLECTED BY
ADDRESS O/M

TEST	PARAMETER	METHOD	RESULTS	MCL
*	ARSENIC	ATOMIC ABSORPTION	.0239	0.05
*	BARIUM	ATOMIC ABSORPTION	.0816	1.0
*	CADMIUM	ATOMIC ABSORPTION	.001	0.01
*	CHROMIUM	ATOMIC ABSORPTION	<.001	0.05
*	IRON	~~ATOMIC ABSORPTION~~ Hach	1.4	N/A
*	LEAD	ATOMIC ABSORPTION	.0059	0.05
*	MANGANESE	~~ATOMIC ABSORPTION~~ Hach	<.5	N/A
*	MERCURY	FLAMELESS ATOMIC ABSORPTION	.0019	0.002
*	SELENIUM	ATOMIC ABSORPTION	.0085	0.01
*	SILVER	ATOMIC ABSORPTION	<.001	0.05
	NITRATE (AsN)	CADMIUM REDUCTION		10.0
	FLUORIDE	ELECTRODE		1.4

FORM NO. 5460 ⓟ

REV 8-83

WATER CHEMICAL ANALYSIS

NAVAJO TRIBAL UTILITY AUTHORITY
OWNER COPY

SAMPLE NO. 6099
SAMPLE LOCATION Kerr McGee. NM# 0323 14T-5B6
DATE RECEIVED 6-5-85
DATE OF FINAL ANALYSIS 10-7-85
TECHNICIAN A. Becenti / F. S. White

DATE COLLECTED 5-30-85
COLLECTED BY C. Mike
ADDRESS Wts Dept.

TEST	PARAMETER	METHOD	RESULTS	mg/l
	ALKALINITY	TITRAMETRIC as $CaCO_3$	362mg/l	
	CALCIUM	[✓ TITRAMETRIC] OR AA as $CaCO_3$	561	75-200
	CHLORIDE	~~TITRAMETRIC~~ IC	6.7	250
	TOTAL HARDNESS	TITRAMETRIC as $CaCO_3$	940	500
	MAGNESIUM	[✓ CALCULATED] OR AA as $CaCO_3$	379	-
	MANGANESE	SPECTROPHOTOMETRIC OR AA		0.05
	IRON	SPECTROPHOTOMETRIC OR AA		0.3
	pH	ELECTRODE	7.3	6.5-8.5
	PHOSPHATE	~~SPECTROPHOTOMETRIC~~ IC	<0.1	
	POTASSIUM	~~FLAME PHOTOMETER~~ calc.	<0.1	1000-2000
	SODIUM	~~FLAME PHOTOMETER~~ calc.	238	
	SULFATE	~~TITRAMETRIC~~ IC	1042	250
	TOTAL DISSOLVED SOLIDS	ELECTRODE as $CaCO_3$	922	500
	TURBIDITY	NEPHELOMETER		
	FLUORIDE	~~ELECTRODE~~ IC	.77	1.4

REMARKS
FORM NO 5408

EPA-6 (CIN)
(REV. 2-72)

Kerr McGee Camp Residence - Tom Bonallie

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF WATER PROGRAMS
WATER SUPPLY PROGRAMS DIVISION

LABORATORY REPORT OF DRINKING WATER EXAMINATION

CHEMICAL

SERIAL NO. OF WATER SAMPLE 45866 (1–6)

DATE OF SAMPLING	DATE COMPOSITE STARTED (MO. DAY)	
	ENDING DATE OF COMPOSITE OR DATE OF GRAB SAMPLE (MO. DAY)	030679 (7 8)

TURBIDITY (5 s.u.)*	.	9–12
COLOR (15 s.u.)*	.	13
ODOR (3 s.u.)*	.	15
TOTAL DISSOLVED SOLIDS (500)*	.	16–20
CHLORIDE (250)*	.	21–24
SULFATE (250)*	.	25–28
[illegible] 10 NITRATE (45)*	.5	29–31
SODIUM	.	32–35
LITHIUM	.	36–39
BARIUM (1.0)**	< .2	40–44
M. B. A. S. (0.5)*	.	46–49
ARSENIC (0.01)* (0.05)**	< .005	51–54
SELENIUM (0.01)**	.02	56–58
CCE	.	61–64
FLUORIDE (1.4 TO 2.4)**	.	66–68
CYANIDE (0.01)* (0.2)**	.	70–73

CAE	.	75–78
END CARD 2 - DUPLICATE COLS. 1-8 FOR CARD 3		80
SPECIFIC CONDUCTANCE	. (MICROMOHS AT 25°C)	9–12
pH	.	14–16
CHROMIUM (TOTAL) CR^{+6} (.05)**	< .005	17–21
SILVER (0.05)**	< .03	23–27
COPPER (1.0)*	.03	28–32
MANGANESE (0.05)* (SPECT.)	.64	34–38
LEAD (0.05)**	.006	40–44
IRON (0.3)* (SPECT.)	.14	46–50
COBALT	.	52–56
CADMIUM (0.01)**	< .002	58–62
ZINC (5.0)*	.02	64–68
NICKEL	.	70–74
MERCURY	< .0005	75–79

REMARKS

Lab. No. 1258 END CARD 3. 3 (80)

Date Completed 4-13-79

*RECOMMENDED LIMIT **MANDATORY LIMIT

ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.

[1]NOT INCLUDED IN 1962 PHS DRINKING WATER STANDARDS

(REV. 4-80)

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
DRINKING WATER RESEARCH DIVISION
LABORATORY REPORT OF DRINKING WATER EXAMINATION
CHEMICAL ANALYSIS

SERIAL NO. OF WATER SAMPLE: 57949 (1–6)

DATE OF SAMPLING

DATE COMPOSITE STARTED — MO. ☐☐ DAY ☐☐

ENDING DATE OF COMPOSITE OR DATE OF GRAB SAMPLE — MO. 05 DAY 28 YR. 80 (7–8)

TURBIDITY (I t.u.)*	(9–12)	CALCIUM	(27–31)
COLOR (15c.u.)**	(13)	MAGNESIUM	(33–37)
TOTAL DISSOLVED SOLIDS (500)**	(16–20)	HARDNESS as $CaCO_3$	(11–14)
CHLORIDE (250)**	(21–24)	ALKALINITY as $CaCO_3$	(17–20)
SULFATE (250)**	(25–28)	SPECIFIC CONDUCTANCE (MICROMOHS AT 25° C)	(9–12)
NITRATE -N (10.)*	(29–31)	pH (6.5-8.5)**	(14–16)
SODIUM	(32–35)	CHROMIUM (TOTAL) (FURNACE) (.05)*	(17–21)
LITHIUM	(36–39)	SILVER (0.05)*	(23–27)
BARIUM (1.)*	(40–44)	COPPER (1.0)**	(28–32)
ARSENIC (0.05)*(FURNACE)	(51–54)	MANGANESE (0.05)** (SPECT.)	(34–38)
SELENIUM (0.01)* (FURNACE)	< .005 (56–59)	LEAD (0.05)* (FURNACE)	(40–44)
FLUORIDE (1.4 to 2.4)*	(66–68)	IRON (0.3)** (SPECT.)	(46–50)
SILICON	(22–25)	CADMIUM (0.010)* (FURNACE)	(58–62)
ALUMINUM	(51–55)	ZINC (5)**	(64–68)
____________	(56–61)	MERCURY (0.002)*	(75–79)
____________	(62–67)	REMARKS:	

*Primary MCL **Secondary MCL

LAB. NO. 2945

EPA-6 (CIN)
(REV. 4-80)

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
DRINKING WATER RESEARCH DIVISION
LABORATORY REPORT OF DRINKING WATER EXAMINATION
CHEMICAL ANALYSIS

Kerr McGee
Rural [illegible]

NM 0000323.

SERIAL NO. OF WATER SAMPLE 57549 (1–6)

DATE OF SAMPLING

DATE COMPOSITE STARTED	MO. DAY:		ENDING DATE OF COMPOSITE OR DATE OF GRAB SAMPLE	MO. DAY YR.: 08 18 80 (7–8)

TURBIDITY (1 t.u.)*	☐☐.☐☐	9–12	CALCIUM	☐☐☐☐.☐	27–31
COLOR (15c.u.)**	☐☐.	13	MAGNESIUM	☐☐☐.☐☐	33–37
TOTAL DISSOLVED SOLIDS (500)**	☐☐☐☐.☐	16–20	HARDNESS as $CaCO_3$	☐☐☐☐.	11–14
CHLORIDE (250)**	☐☐☐.☐	21–24	ALKALINITY as $CaCO_3$	☐☐☐☐.	17–20
SULFATE (250)**	☐☐☐.☐	25–28	SPECIFIC CONDUCTANCE (MICROMOHS AT 25° C)	☐☐☐☐.	9–12
NITRATE -N (10.)*	☐☐.☐	29–31	pH (6.5-8.5)**	☐☐.☐	14–16
SODIUM	☐☐☐.☐	32–35	CHROMIUM (TOTAL) (FURNACE) (.05)*	☐.☐☐☐☐	17–21
LITHIUM	☐☐.☐☐	36–39	SILVER (0.05)*	☐.☐☐☐☐	23–27
BARIUM (1.)*	☐.☐☐☐☐	40–44	COPPER (1.0)**	☐.☐☐☐☐	28–32
ARSENIC (0.05)*(FURNACE)	☐.☐☐☐	51–54	MANGANESE (0.05)** (SPECT.)	☐.☐☐☐☐	34–38
SELENIUM (0.01)* (FURNACE)	☐.008	56–59	LEAD (0.05)* (FURNACE)	☐.☐☐☐☐	40–44
FLUORIDE (1.4 to 2.4)*	☐.☐☐	66–68	IRON (0.3)** (SPECT.)	☐.☐☐☐☐	46–50
SILICON	☐☐☐.☐	22–25	CADMIUM (0.010)* (FURNACE)	☐.☐☐☐☐	58–62
ALUMINUM	☐☐☐.☐☐	51–55	ZINC (5)**	☐.☐☐☐☐	64–68
________	☐☐☐.☐☐☐	56–61	MERCURY (0.002)*	☐.☐☐☐☐	75–79
________	☐☐☐.☐☐☐	62–67	REMARKS:		

*Primary MCL **Secondary MCL

LAB. NO. 2942

New Mexico
Health and Environment Department
SCIENTIFIC LABORATORY DIVISION

RECEIVED
MAR 6 1980

CHEMICAL and PHYSICAL ANALYSES for WATER SAMPLES

Date received	Lab No.	SLD user code No.
2/19/80	WC 2839	51.67

CONSULT SLD Lab Annex L for proper presentation of sample(s). TYPE or PRINT with Ball Point Pen

G.I.M.C.-O.E.H.

CHEMICAL ANALYSES: *Check individual items for analysis [Mark appropriate box(es)]*
INTERIM PRIMARY PARAMETER GROUP ☐ 1 ☐ 2 ☐ 3
TYPE of CHEMICAL ANALYSIS ☒ Complete Secondary ☐ Organic ☐ Radiological

Water Supply System Name: Kerr McGee 14T-586
Water Supply System Code No.:
City or Location: Kerr McGee Mine, County: Mckinley Co.
Check one: ☐ TREATED WATER ☒ RAW WATER
Collection Date: 2/11/80
Collection Time: 11:00am
Collection Point: [redacted] Benallie's Home
Collector's remarks:
Report to: Don Payne, OEH
Address: GIMC, P.O. Box 1337
Gallup, NM 87301
Collected By: A. Smiley
Owner:
TYPE of SYSTEM *(Check one)* ☐ PRIVATE PUBLIC: ☒ Community ☐ Non-community
SOURCE: ☐ Spring ☐ Lake ☐ Well-Depth ☐ Drain ☐ Stream ☐ Pool ☐ Other *(specify)*
LAT. ° ' "
LONG ° ' "

CATIONS	mg/l	ANIONS	mg/l	PHYSICAL		HEAVY METALS	mg/l	PARAMETER		ORGANIC	mg/l
00930 Sodium (as Na)	236.9	00940 Chloride (as Cl)	10.0	70300 Total Filterable Residue	mg/l 1714	01000 Arsenic	.			39390 Endrin	.
00935 Potassium (as K)	5.07	00950 Fluoride (as F)	0.48	38260 Foaming Agents (as Las)	/(.01	01005 Barium	.			39732 Lindane	.
00900 Tot. Hardness (as $CaCO_3$)	791	00620 Nitrate (as N)	.	00095 Conductance Micromhos 25°C	2134	01025 Cadmium	.			38270 Methoxychlor	.
00915 Calcium (as Ca)	144.0	00430 Alkalinity (as $CaCO_3$)	354	00400 pH	7.87	01030 Chromium	.	RADIOLOGICAL pCi/l 01501 Gross Alpha		39400 Toxaphene	.
00925 Magnesium (as Mg)	78.4	00440 Bicarbonate (as HCO_3)	432.0	01330 Odor	0	01049 Lead	.	03501 Gross Beta	pCi/l	39730 2, 4-D	.
01045 Iron-Total (as Fe)	10.21	00445 Carbonate (as CO_3)	0.	00080 Color	mg/l 7.	07180 Mercury	.	09501 Radium-226	pCi/l	39740 2, 4, 5-TP (Silvex)	.
01056 Manganese (as Mn)	✓ 0.61	00945 Sulfate (as SO_4)	✓ 446.9	00070 Turbidity	0.5	01145 Selenium	.	11501 Radium-228	pCi/l		
			.			01075 Silver	.				

LABORATORY REMARKS:

Reviewed by:
Date reported: 3/3/80

SLD 702 Form Revised 4/78

DISTRIBUTION: White - Water Supply Regulation, SF • Canary - WS System • Pink - EIA Regional Office • Goldenrod - SLD Lab

LFE Environmental Analysis Laboratories
2030 Wright Avenue
Richmond, California 94804
(415) 235-2633
CORPORATION (TWX) 910-382-8132

RECEIVED
A. REGION IX

DRINKING WATER ANALYSIS REPORT

Ms. Laura Tom
EPA Region IX
215 Fremont Street
San Francisco, California 94105

TO: AUDREY
Rec'd 4/1/80

Ref: LFE No.: 4137-58,59,61,6
Purchase Order No.: SO 416 NTSE
Date Received: 2/4-2/21/80
Date Reported: Prelim. 3/21/80
No. of Samples: 26

Sample Number and Collection Date	Results pCi/1 ± 2 σ							
	Gross Alpha	^{226}Ra	^{228}Ra	Total Uranium	Gross Beta	^{3}H	^{90}Sr	
45646 1/21/80	17 ± 1	Incomplete		Incomplete				NV 161 - Carson Colony C.S.
45647 1/21/80	< 3							NV 162 - Dresslerville C.S.
45648 1/24/80	< 3							NV 166 - Fallon Res. C.S.
45649 1/23/80	< 3							NV 168 - Nixon C.S.
45650 1/23/80	< 2							NV 169 - Wadsworth C.S.
45651 1/22/80	< 3							NV 171 - Campbell Ranch C
52016 2/4/80	< 2							NV 160 - Battle Mtn Ind. Color
54676 2/11/80	< 2							NM 273/294 Bass Lakes
54677 2/11/80	< 2							NM 262/267 Mexican Spring 86 I
54678 2/11/80	< 2							NM 237 Tohatchi NTUA
54679 2/11/80	< 3							? NM 274 Coyote Canyon PL 86
54680 2/11/80	6 ± 1	Incomplete						NM 265 Black Springs Wash
54681 2/11/80	< 3							? NM 274 Coyote Canyon Sy
54682 2/11/80	< 2							? NM Roman Smith System
54683 2/12/80	< 2							NM 225 Chuska BIA System C
54684 2/12/80	< 3							NM 268 Naschitti
54685 2/12/80	< 2							NM 264 Buffalo Springs System
54686 2/12/80	< 2							NM 291 Tohatchi BIA System
✓54689 2/11/80	< 4							NM Kerr-Mcgee
54771 1/22/80	< 2							CA 5025 Klamath Glen - Blake Alltma

Environmental Chemist
Nuclear Science Department

Environ ntal Analysis Laboratories
2030 Wright Avenue
Richmond, California 94804
(415) 235-2633
(TWX) 910-382-8132

RECEIVED
REGION I
JAN 24 9 3 AM '80

DRINKING WATER ANALYSIS REPORT

Ms. Vera Moritz
Environmental Protection Agency
215 Fremont St.
San Francisco, California 94105

Ref: LFE No.: 4137-30
Purchase Order No.: SO 416 NTSE
Date Received: 11/7/79
Date Reported: Prelim. 1/23/80
No. of Samples: 36

Sample Number and Collection Date	Results pCi/l ± 2 σ							
	Gross Alpha	^{226}Ra	^{228}Ra	Total Uranium	Gross Beta	^{3}H	^{90}Sr	
54550	12 ± 1	Incomplete						
54552	< 2							NM265 Black Springs Wash
54556	< 3							AZ280 Houck Chapter House
54553	< 3							Manuelito Comm. Syst.
54554	9 ± 2	Incomplete						AZ280 Houck Community System
54555	< 3							AZ282 Lupton Community System
54557	< 4							NM278 Tsa Ya Toh Ch. House
54558	< 3							NM259 S. Church Rock Comm. Syst
54559	< 3							NM260 Church Rock Ch. House
✓54560	< 3							NM275 Pinedale Ch. House
54561	< 4							Kerr. McGee Camp
54562	< 3							NM229 Ft. Wingate BIA
54801	< 3							NM 232 BIA Training Center, Cont. Divi
54804	< 2							NM 233 Ojo Encino BIA School
54806	< 3							NM 238 Whitehorse Lake Ch. House
54811	< 3							NM235 Standing Rock BIA School
54812	< 4							NM244 Lake Valley BIA Boarding Schoo
54813	< 4							NM248 Lake Valley Chapter Water Syst
54814	< 2							NM283 Whiterock Ch. Water Syst.
								NM251 Crownpoint BIA Hq. Water Syst.

Environmental Chemist
Nuclear Science Department

Environm tal Analysis Laboratories
2030 Wright Avenue
Richmond, California 94804
(415) 235-2633
CORPORATION (TWX) 910-382-8132

Oct DRINKING WATER ANALYSIS REPORT

Ms. Vera Moritz
EPA Region IX
215 Fremont Street
San Francisco, California 94105

Ref: LFE No.: 5106-106-8
Purchase Order No.: SB-197-NTLX
Date Received: 8/1, 8/3/79
Date Reported: Prelim. 10/4/79
No. of Samples: 32

Sample Number and Collection Date	Results pCi/l ± 2 σ						
	Gross Alpha	^{226}Ra	^{228}Ra	Total Uranium	Gross Beta	^3H	^{90}Sr
33853 7/12/79	2 ± 1	Inscription House AZ 283					
33862 7/14/79	< 5	Many Farms NTUA AZ 252					
33867 7/12/79	< 3	Rock Point AZ 3048					
33870 7/13/79	< 3	Chinle – Canyon de Chelly Nat'l Monument AZ 3022					
34181 7/14/79	6 ± 2	Not Completed Rough Rock High School AZ 3061					
34182 7/14/79	< 3	Lukachukai AZ 192					
34196 7/13/79	< 3	Hardrock – Navajo Gospel Mission AZ 257					
Ft. Wingate 7/31/79	< 3						
Ft. Wingate BIA 7/31/79	< 4						
✓Kerr McGee Camp 7/31/79	< 5						
Churchrock Comm. 7/31/79	< 5						
Navajo Training Center Continental Divide, NM 232 7/31/79	< 3						
Lupton Church House, AZ 281, 7/31/79	4 ± 1						
Pinedale Church House, NM 275 7/31/79	< 4						
South Churchrock, NM 259, 7/31/79	< 4						
Chi Chil Tah Cheechiltah, NM 224 7/31/79	< 3						
Houck Community 7/31/79	< 3						

Environmental Chemist
Nuclear Science Department

```
REGION NINE WATER SURVEY

CALIFORNIA          REPORTED  79/05/10
-------------------------------------------ANALYSIS---RESULT----2SIGMA---UNITS--

✓KERR MCGEE CAMP NM 45866              BETA      <1.1E01411             PCI/L
19 3040 075 04 09 23                   ALPHA     <1.7E01417             PCI/L
199970 P9IWS          DATE- 79 03 06 7
  SIZE-         L

PINEDALE NM 45865                      BETA      <1.1E01411             PCI/L
19 3040 075 04 09 23                   ALPHA     <1.3E01413             PCI/L
200488 P9IWS          DATE- 79 03 07
  SIZE-         L

HOUCK ARIZ 45878                       ALPHA     <9.2E00                PCI/L
19 3040 075 04 09 23                   BETA      <1.1E01411             PCI/L
199968 P9IWS          DATE- 79 03 09
  SIZE-         L

LUPTON ARIZ 45876                      BETA      <1.1E01411             PCI/L
19 3040 075 04 09 23                   ALPHA     <5.3E00                PCI/L
199969 P9IWS          DATE- 79 03 09
  SIZE-         L

DEFIANCE NM 45879                      BETA      <1.1E01411             PCI/L
19 3040 075 04 09 23                   ALPHA     <9.1E00                PCI/L
200489 P9IWS          DATE- 79 03 09
  SIZE-         L

TSA YAH TOH NM 45884                   BETA      <5.4E00                PCI/L
19 3040 075 04 09 23                   ALPHA     <2.8E00                PCI/L
200490 P9IWS          DATE- 79 03 09
  SIZE-         L

FT MC DERMITT NEV 45640                BETA      <5.4E00                PCI/L
19 3040 075 04 09 23                   ALPHA     <2.5E00                PCI/L
199967 P9IWS          DATE- 79 03 11
  SIZE-         L

CHILCHINBETO ARIZ 42019                BETA      <5.4E00                PCI/L
19 3040 075 04 09 23                   ALPHA     <2.4E00                PCI/L
200492 P9IWS          DATE- 79 03 12
  SIZE-         L

CHILCHINBETO ARIZ 42018                BETA      <5.4E00                PCI/L
19 3040 075 04 09 23                   ALPHA     <2.5E00                PCI/L
200493 P9IWS          DATE- 79 03 12
  SIZE-         L

MARIANO LAKE NM 42065                  SEE 189096
19 3040 075 04 09 23                   235U      2.4E-01.247.7E-02      PCI/L
200494 P9IWS          DATE- 79 03 12   234U      1.5E01 15  1.2E00      PCI/L
  SIZE-         L                      238U      5.7E00      5.3E-01    PCI/L
```

off. reservation
watering point
Is this a PWS? Hold 6/24

See p11

Navajo Nation Water Management Branch
Well Log and Drilling Report

*PO Box 678 Fort Defiance, Arizona * PH: 928.729.4004 * FAX: 928.729.4126*

WELL NO: **14T-586** *PWSID:* **NM3500323**

WELL NAME/OTHER NO: **KERR MCGEE PUB. WTR. SYS.**

WELL TYPE: **WW** *WELL STATUS:* **ACT** *WELL USE:* **DOM**

LOCATION: **.75 M. SW OF KERR MCGEE MINE OFF.**

UTM : X(EAST) **724991** *Y (NORTH)* **3949101** *ZONE:* **12** *OPERATOR:* **TRIBE O&M**

WATERSHED CODE: **15020006000** *STATE:* **NM** *COUNTY:* **MK** *CHAPTER CODE:* **COYO**

GRAZING DISTRICT: **14** *LOCATION DATA SOURCE:* **FIELD CHECKED 06/16/94**

WELLNO: **14T-586** *STARTED:* **3/26/1976** *COMPLETED:* **3/27/1976**

ELEVATION: **7090** **FT.** *DEPTH:* **750** **FT.** *DEPTH MEASURED:* **3/26/1976**

DIAMETER: **9.88** **IN.** *DEPTH IS:* **R** *Measured, Estimated, Reported*

CASING_DIAMETER: **7** **IN.** *FROM:* **-1** **FT.** *TO:* **750** **FT.** *MATL:* **STL**

CASING_DIAMETER: **0** **IN.** *FROM:* **0** **FT.** *TO:* **0** **FT.** *MATL:*

CASING_DIAMETER: **0** **IN.** *FROM:* **0** **FT.** *TO:* **0** **FT.** *MATL:*

CASING_DIAMETER: **0** **IN.** *FROM:* **0** **FT.** *TO:* **0** **FT.** *MATL:*

CASING PERFORATED FROM: **0** **FT.** *TO:* **0** **FT.** *OPENING TYPE:*

CASING PERFORATED FROM: **0** **FT.** *TO:* **0** **FT.** *OPENING TYPE:*

CASING PERFORATED FROM: **0** **FT.** *TO:* **0** **FT.** *OPENING TYPE:*

CASING PERFORATED FROM: **0** **FT.** *TO:* **0** **FT.** *OPENING TYPE:*

CASING PERFORATED FROM: **0** **FT.** *TO:* **0** **FT.** *OPENING TYPE:*

DATE WELL TURNED OVER TO TRIBE:

FUNDED BY: **PRIVATE** *CONTRACTOR:* **SALAZAR DRILL.**

SITE IMPROVEMENTS: **TA-WL** *TYPE OF LIFT:* **SU** *ENERGY:* **EM**

HORSEPOWER RATING OF PUMP: **3** *ON SITE STORAGE CAPACITY:* **13000** **GAL.**

STRUCTURE DATA SOURCE: **WELL FILE/FLD CHK**

WELLNO: **14T-586** *USGS PRINCIPLE AQUIFER CODE:* **211MVRD**

THICKNESS: **0** **FT.** *NOMINAL YIELD:* **10** **GPM** *DATE YEILD MEASURED:*

BAILER/PUMP TEST: **PT** *RATE:* **16** **GPM** *TEST PERIOD:* **24** **HR.** *TEST DATE:* **10/28/1991**

DRAWDOWN: **10** **FT.** *OBSERVATION WELL DATA AVAILABLE:* **N**

HORIZONTAL CONDUCTIVITY: **0** **FT/DAY** *SPECIFIC CAPACITY:* **1.6** **GAL./MIN./FT.**

VERTICAL CONDUCTIVITY: **0** **FT/DAY** *STORAGE COEFFICIENT:* **0**

COEFFICIENT OF TRANSMISSIVITY: **0** **FT2/DAY**

AVAILABITY OF TEST DATA: **NYNY** *DRILLERS/ELECTRIC LOGS:* **DLEL**

HYDROLOGY DATA SOURCE: **WTR DVLPMNT/WELL FILE**

WELL NO: **14T-586**

STATIC WATER LEVEL(S):

381	FT.	10/28/1991
388	FT.	5/22/1990
380	FT.	3/27/1976

GEOLOGIC INTERVAL(S):

TOP	*BOTTOM*	*UNIT*	*LITHOLOGY*
0	164	211BRLB	SDSL
164	238	211DLTN	SDSL
238	418	211MLTT	SDSL
418	560	211GLLP	SDSL
560	690	210MNCS	SHLE
690	703	211TLLS	SNDS
703	718	210MCDK	SHLE
718	0	211DKOT	SDSL

COMMENT(S):

WELL PROJECT NO. NA-74-543a\NO APPROX. LOCATION OPERATES ON PUMP JACK. 14T-584 & 14T-586 (SAME WELL) WELL CONFIRMED-UPDATED PER * O&M SURVEY OF FALL 91 * TRIBAL WELL RECORD INDICATES PERFORATION SLOTTED 40 FT. WITH 1/16" MESH DEPTH OF PERFORATED INTERVAL UNKNOWN. WELL RECORD DOES NOT SHOW THE DEPTH OF PERFORATION. WELL WAS DEVELOPED BY KERR MCGEE AND IHS. DRILLERS LOG/E LOG/WATER QUALITY AVAILABLE IN WELL FOLDER. ALSO PUMP TEST DATA FROM 10/28/91 TEST. PUMP RATE DURING TEST VARIED FROM 10.5 GPM TO 19.0 GPM; AVERAGE OF 16 GPM CALCULATED BY DIVIDING TOTAL GALLONS WITHDRAWN (FROM METER READINGS) BY TOTAL PUMPING TIME. BECAUSE DEPTH OF PERFORATED INTERVAL IS UNKNOWN AQUIFER COULD BE ANY OF THE GEOHYDROLOGIC UNITS IN THE MESA VERDE GROUP (211MVRD); WELL MAY ALSO BE PRODUCING FROM THE DAKOTA SANDSTONE(211DKOT). GEOHYDROLOGIC UNITS INTERPRETED FROM GEOPHYSICAL LOG AS CORRELATED WITH OTHER LOGS IN THE AREA. INTERVAL INTERPRETED AS 211MLTT PROBABLY ALSO DILCO COAL MEMBER OF CREVASSE CANYON FORMATION (211DLCOC). LOCATION COORDINATES MEASURED WITH GPS DEVICE 7 SATELLITES VISIBLE. ELEVATION INTERPOLATED FROM 1:24000 TOPO. THE IMPROVEMENTS AT THIS SITE ARE IN FAIR CONDITION. STORAGE TANK IS COVERED. L. NOTAH/M.S. JOHNSON 12/18/1994

LOCATION FILE

update

UPDATED JUL 10 1996

TRIBAL WELL NO 14T-586

PWSID NM3500323

WELL NAME/OTHER NO KERR McGEE PUB. WATER SYS.

WELL TYPE
(MARK ONLY ONE)

☒ WW WATER WELL
☐ WA ARTESIAN WELL
☐ WS SPRING
☐ NS NATURAL SPRING
☐ OW OBSERVATION WELL
☐ GS GAS WELL
☐ OP OIL PRODUCTION
☐ MW MINERAL WELL
☐ XX UNKNOWN

WELL STATUS
(MARK ONLY ONE)

☒ ACT ACTIVE
☐ INA INACTIVE
☐ ABA ABANDONED
☐ UNK UNKNOWN

WELL USE
(MARK ONLY ONE)

☒ DOM DOMESTIC
☐ AGR AGRICULTURE
☐ LIV LIVESTOCK
☐ IND INDUSTRIAL MINING
☐ REC RECREATION
☐ MUN MUNICIPAL
☐ OTH OTHER
☐ UNK UNKNOWN

QUAD NO 5261 MILES WEST . MILES SOUTH .

NE SE SW NW / NE SE SW NW / NE SE SW NW
10 ACRE 40 ACRE 160 ACRE

SECT. T . TOWNSHIP R . RANGE

APPROXIMATE LOCATION .75 mile SW of KERR McGEE MINE OFF.

LATITUDE LONGITUDE

UTM COORDINATES: X(EAST) 724991 Y(NORTH) 3949101 ZONE 12

OPERATOR NAVAJO OEM TRIBE USGS WATERSHED CODE 15020006000

STATE: ☐ AZ ARIZONA ☒ NM NEW MEXICO ☐ UT UTAH ☐ CO COLORADO

COUNTY:

☐ AP APACHE
☐ NA NAVAJO
☐ CO COCONINO

☒ MK MCKINLEY
☐ VL VALENCIA
☐ BL BERNALILLO
☐ SD SANDOVAL
☐ SO SOCORRO
☐ RA RIO ARRIBA
☐ SA SAN JUAN

☐ SJ SAN JUAN
☐ KA KANE

☐ MT MONTEZUMA
☐ LP LA PLATA

GRAZING DISTRICT 14

CHAPTER NAME: COYOTE CANYON CHAPTER CODE COYO

LOCATION DATA SOURCE: FIELD CHECKED 6/16/94

LOCATION FILE COMPLETED BY: L. NOTAH DATE 6/ /94

FIELD CHECKED BY: L. NOTAH/GKINSEL DATE 6/16/94

revised 07 April 93

/dbase/wells/loc/Loc-Form.wp

STRUCTURE FILE

UPDATED JUL 19 95

TRIBAL WELL NO 14T-586 STARTED 3/26/1976 COMPLETED 3/27/1976

ELEVATION 7090 FT DEPTH 750 DEPTH MEASURED 3/26/1976

DEPTH IS ☐ MEASURED ☐ ESTIMATED ☒ REPORTED WELL DIA. 9.88 IN

1 CASING DIA 7.00 FROM -1.0 FT TO 750 FT MATL STL
2 CASING DIA . FROM FT TO FT MATL
3 CASING DIA . FROM FT TO FT MATL
4 CASING DIA . FROM FT TO FT MATL

CASING MATL CODES: brs=brass cop=copper evd=everdur irn=iron mon=monel
pls=plastic stl=steel sst=stainless steel

1 CASING PERFORATED FROM FT TO FT OPENING TYPE ☐
2 CASING PERFORATED FROM FT TO FT OPENING TYPE ☐
3 CASING PERFORATED FROM FT TO FT OPENING TYPE ☐
4 CASING PERFORATED FROM FT TO FT OPENING TYPE ☐
5 CASING PERFORATED FROM FT TO FT OPENING TYPE ☐

OPENING CODES: f=fractured rock l=louvered/shutter-type screen m=mesh screen
p=perforated/porous/slotted casing r=wire-wound screen
s=screen/type unknown t=sand point w=walled/shored x=open hole
z=other

DATE WELL TURNED OVER TO TRIBE: ____/____/____

FUNDED BY: PRIVATE CONTRACTOR: SALAZAR DRILL.

SITE IMPROVEMENTS

- ☐ WM WINDMILL
- ☐ WP WATERING POINT
- ☒ TA TANK
- ☒ WL WATER LINE
- ☐ TR TROUGH
- ☐ CS CISTERN
- ☐ HP HAND PUMP
- ☐ NO NONE

TYPE OF LIFT

- ☐ AL AIRLIFT
- ☐ PS PISTON
- ☐ TU TURBINE
- ☐ MT MULTIPLE TURBINE
- ☐ CN CENTRIFUGAL
- ☐ MC MULTIPLE CENTRIFUGAL
- ☐ BU BUCKET
- ☒ SU SUBMERSIBLE

ENERGY SOURCE

- ☒ EM ELECTRIC MOTOR
- ☐ DE DIESEL ENGINE
- ☐ HA HAND
- ☐ GS GAS ENGINE
- ☐ LP LP GAS ENGINE
- ☐ NG NATURAL GAS ENGINE
- ☐ WM WINDMILL
- ☐ SO SOLAR

PUMP HP 3 ON SITE STORAGE CAPACITY 13000 GAL

STRUCTURE DATA SOURCE: WELL FILE/FLD CHK

STRUCTURE FILE COMPLETED BY: L. NOTAH/M.S. Johnson DATE 12/08/94

revised 08 April 93

/dbase/wells/doc/str-form.wp

TRIBAL WELL RECORD

HYDROLOGY FILE

UPDATED JUL 19 95

TRIBAL WELL NO 14T-586

USGS AQUIFER CODE 211MVRD

THICKNESS ☐ FT

NOMINAL YIELD 10 GPM

YIELD MEASURED ___/___/___

☐ BAILER ☒ PUMP TEST @ ~~149~~ 16 GPM FOR 24.0 HOURS DATE 10/28/1991

DRAWDOWN ~~391~~ 10 FT

OBSERVATION WELL DATA AVAILABLE ☐ YES ☒ NO

HORIZ CONDUCTIVITY ___ . ___ FT/DAY

SPECIFIC CAPACITY 1.60 GPM/FT

VERT. CONDUCTIVITY ___ . ___ FT/DAY

STORAGE COEF . ______

COEF OF TRANSMISSIVITY ______ FT2/DAY

INDICATE ADDITIONAL PUMPING TEST DATA AVAILABLE AS HARD COPY:

☐ YES ☒ NO MULTIPLE RATE DRAWDOWN PUMPING TEST

☒ YES ☐ NO SINGLE RATE DRAWDOWN PUMPING TEST

☐ YES ☒ NO MULTIPLE RATE DRAWDOWN/RECOVERY TEST

☒ YES ☐ NO RECOVERY TEST

LOG AVAILABLE: ☒ DL DRILLER'S ☒ EL ELECTRIC LOG

HYDROLOGY DATA SOURCE: WATER DEVOLPMENT/WELL FILE

HYDROLOGY FILE COMPLETED BY: L. NOTAH/M.S. Johnson DATE 12/08/94

ENTERED JUL 19 1995

STATIC WATER LEVEL FILE

DEPTH TO SWL 381.00 FT DATE 10/28/1991 DEPTH TO SWL ______ FT DATE ___/___/___

DEPTH TO SWL 380.00 FT DATE 03/27/76 DEPTH TO SWL ______ FT DATE ___/___/___

DEPTH TO SWL ______ FT DATE ___/___/___ DEPTH TO SWL ______ FT DATE ___/___/___

DEPTH TO SWL ______ FT DATE ___/___/___ DEPTH TO SWL ______ FT DATE ___/___/___

DEPTH TO SWL ______ FT DATE ___/___/___ DEPTH TO SWL ______ FT DATE ___/___/___

DEPTH TO SWL ______ FT DATE ___/___/___ DEPTH TO SWL ______ FT DATE ___/___/___

DEPTH TO SWL ______ FT DATE ___/___/___ DEPTH TO SWL ______ FT DATE ___/___/___

DEPTH TO SWL ______ FT DATE ___/___/___ DEPTH TO SWL ______ FT DATE ___/___/___

DEPTH TO SWL ______ FT DATE ___/___/___ DEPTH TO SWL ______ FT DATE ___/___/___

DEPTH TO SWL ______ FT DATE ___/___/___ DEPTH TO SWL ______ FT DATE ___/___/___

DEPTH TO SWL ______ FT DATE ___/___/___ DEPTH TO SWL ______ FT DATE ___/___/___

TRIBAL WELL RECORD

GEOHYDROLOGIC UNITS

ENTERED JUL 19 1995

TRIBAL WELL NO 14T-586

SEQ-NO 001

DEPTH TO TOP	DEPTH TO BOTTOM	GEOHYDRO-UNIT	LITH.
0	164	211BRLB	SDSL

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE U

SEQ-NO 002

DEPTH TO TOP	DEPTH TO BOTTOM	GEOHYDRO-UNIT	LITH.
164	238	211DLTN	SDSL

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE U

SEQ-NO 003

DEPTH TO TOP	DEPTH TO BOTTOM	GEOHYDRO-UNIT	LITH.
238	418	211MLTT	SDSL

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE U

SEQ-NO 004

DEPTH TO TOP	DEPTH TO BOTTOM	GEOHYDRO-UNIT	LITH.
418	560	211GLLP	SDSL

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE U

SEQ-NO 005

DEPTH TO TOP	DEPTH TO BOTTOM	GEOHYDRO-UNIT	LITH.
560	590	210MNCS	SHLE

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE U

INTERVAL FILE COMPLETED BY: M.S. Johnson

DATE 12/8/94

revised 08 April 93

/dbase/wells/doc/Int-Form.wp

TRIBAL WELL RECORD
GEOHYDROLOGIC UNITS

TRIBAL WELL NO 147-586

ENTERED JUL 19 1995

SEQ-NO 006

DEPTH TO TOP 690

DEPTH TO BOTTOM 703

GEOHYDRO-UNIT 211~~DKOT~~ TLLS

LITH. ~~SDSL~~ SNDS

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE u

SEQ-NO 007

DEPTH TO TOP 703

DEPTH TO BOTTOM 718

GEOHYDRO-UNIT ~~211DKOT~~ 210MCDK

LITH. ~~SDSL~~ SHLE

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE u

SEQ-NO 008

DEPTH TO TOP 718

DEPTH TO BOTTOM

GEOHYDRO-UNIT 211DKOT

LITH. SDSL

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE u

SEQ-NO

DEPTH TO TOP

DEPTH TO BOTTOM

GEOHYDRO-UNIT

LITH.

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE

SEQ-NO

DEPTH TO TOP

DEPTH TO BOTTOM

GEOHYDRO-UNIT

LITH.

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE

INTERVAL FILE COMPLETED BY: M. S. Johnson

DATE 12/18/94

revised 08 April 93

/dbase/wells/doc/Int-Form.wp

COMMENTS FILE

TRIBAL WELL NO 14T-586

ENTERED JUL 19 1995

PERTINENT COMMENTS: ~~Former windmill.~~ Tribal well record indicates perforation slotted 40 FT. with 1/16" mesh, depth of perforated

interval unknown.

well record does Not show the depth of perforation.

Well was developed by Kerr McGee and IHS.

Drillers Log / E Log / Water Quality available in well Folder. Also pump test data from 10/28/91 test.

Pump rate during test varied from 10.5 GPM to 19.0 GPM; average of 16 GPM calculated ~~fo~~ by dividing total gallons withdrawn (from meter readings) by total pumping time.

Because depth of perforated interval is unknown, aquifer could be any of the geohydrologic units in the Mesa Verde Group (211MVRD); well may also be producing from the Dakota Sandstone (211DKOT).

Geohydrologic units interpreted from geophysical log, as correlated with other logs in the area. Interval interpreted as 211MLTT probably also ~~contains~~ includes Dilco Coal Member of Crevasse Canyon Formation (211DLCOC).

☒ LOCATION COORDINATES MEASURED WITH GPS DEVICE 7 SATELLITES VISIBLE

☐ LOCATION COORDINATES PICKED OFF TOPO MAP -SCALE= ______

☐ ELEVATION PRINTED ON TOPO MAP -SCALE= ______

☐ ELEVATION MEASURED WITH GPS UNIT -4 SATELLITES VISIBLE

☒ ELEVATION INTERPOLATED FROM 1:24000 TOPO

THE IMPROVEMENTS AT THIS SITE ARE:

☐ IN GOOD CONDITION
☒ IN FAIR CONDITION
☐ IN POOR CONDITION
☐ NEED SOME MAINTENANCE
☐ NEED MAJOR MAINTENANCE

STORAGE TANK IS ☒ COVERED ☐ UNCOVERED

COMMENTS BY: L. NOTAH / M.S. Johnson

DATE 12/18/94

revised 07 April 93

/dbase/wells/doc/Com-Form.wp

WELL RECORD

Water Well Development
Navajo Tribe
Window Rock, Arizona

WELL NO. 14T-586
Kerr McGee Cap.

Quad. No. 106 SW¼ Miles west 7.34 Miles south 12.23

Location T17N, R16W Sec. 34

Began well 3-26-76 Finished well 3-27-76

Diameter of well 9 7/8" Depth of well 750'

Static water level 380' Drawdown N.A. Recovery N.A.

Quantity of water on test run: bailer: pump: G. P. M. Tested for hours

Kind of casing: 7" 0.0 metal Sizes and length 7" 0.0 x 750'

Screen kind slotted Length 40' Mesh 1/16"

Contractor Salazar Brothers Drlg. Inc. Address Box# 2958, Milan, N.M.

LOG

DEPTH				
From	To	Formation	Acquifer	Remarks

Remarks:

S.P.

Tota Salts	Calcium Ca.	Magnesium Mg.	Sodium Na.	Chlorides CL	Sulfates SO_4	Carbonates HCO_3	P.H.	CO_3

Excellent Good Fair Poor Doubtful Not suitable for domestic, livestock use

NTRD-81

TRIBAL WELL NO >14T-586 PWSID > NM 3500323 *******
STATE NUMBER

WELL NAME/OTHER NO >35 WATERWELL/KERR McGEE

WELL TYPE >WW WELL STATUS ACT WELL USE Dom ~~>UNK~~

QUAD NO 5261 ~~>106~~ MILES WEST > ~~7.34~~ MILES SOUTH >~~12.23~~

10 ACRE > 40 ACRE > 160 ACRE > SECT >35 TWNSHP >T17.0 RANGE >R16.0W

APPROXIMATE LOCATION >KERR MCGEE MINING CAMP .75 miles S.W. of mining offices

UTM COORD: X(EAST) 724991 >~~714243~~ Y(NORTH) 3949101 >~~3939221~~ ZONE >12 ~~8~~ OPERATOR >TRIBE O&M

WATERSHED CODE >15020006000 STATE >NM COUNTY >MK CHAPTER CODE COYO ~~>CHUR.~~

GRAZING DISTRICT >14 LOCATION DATA SOURCE >WELL FILES

FIELD CHECKED BY > L. NOTAH 6-16-94

WELLNO 14T-586 STARTED 3-26-1976 **/**/**** COMPLETED 3/27/1976

ELEVATION 7120 FT DEPTH 750 FT DEPTH MEASURED 3/26/1976

DEPTH IS m WELL DIA 9.88 IN

1 CASING DIA 7.00 IN FROM -1.0 FT TO 750 FT MATL STL

2 CASING DIA IN FROM FT TO FT MATL

3 CASING DIA IN FROM FT TO FT MATL

4 CASING DIA IN FROM FT TO FT MATL

WELL NO= 14T-586

1 CASING PERFORATED FROM FT TO FT OPENING TYPE

2 CASING PERFORATED FROM FT TO FT OPENING TYPE

3 CASING PERFORATED FROM FT TO FT OPENING TYPE

4 CASING PERFORATED FROM FT TO FT OPENING TYPE

5 CASING PERFORATED FROM FT TO FT OPENING TYPE

DATE WELL TURNED OVER TO TRIBE / /

FUNDED BY CONTRACTOR

SITE IMPROVEMENTS TA ~~TK~~ WL TYPE OF LIFT SU ENERGY SOURCE EM

PUMP HP 3 ON SITE STORAGE CAPACITY 13,000

STRUCTURE DATA SOURCE O&M MAINTAINANCE STATION

....no hydrology data available

```
$RECNO   WELLNO           SWL DATE
 14653   14T-586        388.0  5/22/1990
```

...no geologic interval data available

..~~no~~ field water quality data available

WELL PROJECT NO. NA-74-543a\NO APPROX. LOCATION

OPERATES ON PUMP JACK. 14T-584 & 14T-586 (SAME WELL)

WELL CONFIRMED-UPDATED PER * O&M SURVEY OF FALL 91 *

WELL RECORD

Water Well Development
Navajo Tribe
Window Rock, Arizona

WELL NO. 14T-586
Kerr McGee Cap.

Quad. No. 106 SW¼ Miles west 7.34 Miles south 12.23

T17N, R16W Sec. 34
Location

Began well 3-26-76 Finished well 3-27-76

Diameter of well 9 7/8" Depth of well 750'

Static water level 380' Drawdown N.A. Recovery N.A.

Quantity of water on test run: bailer: pump: ______ G. P. M. Tested for ______ hours

Kind of casing: 7" 0.0 metal Sizes and length 7" 0.0 x 750'

Screen kind slotted Length 40' Mesh 1/16"

Contractor Salazar Brothers Drlg. Inc. Address Box# 2958, Milan, N.M.

LOG

DEPTH				
From	To	Formation	Acquifer	Remarks
0'	750'	MESAVARDE		

Remarks:

S.P.

Teta Salts	Calcium Ca.	Magnesium Mg.	Sodium Na.	Chlorides CL	Sulfates SO_4	Carbonates HCO_3	P.H.	CO_3

Excellent Good Fair Poor Doubtful Not suitable for domestic, livestock use

NTRD-81

SALAZAR BROS. DRILLING

DRILLING REPORT

DATE 3/26/76
PROJECT
REPORT NO.

LOCATION AREA Church Rock | COMPANY Kerr McGee | STATE OF New Mexico

SECTION TWN RNG | TYPE RIG G.D. 1500 | RIG NO. 2

DRILLING AND CORING LOG

HOLE NO.	DEPTH		ROCK TYPE	BIT USED					REMARKS OR FEET OF CORE RECOVERED
	FROM	TO		NAME	TYPE	SIZE	RUN	SER. NO.	
	0	100	MESAVARDE					R.T.	

DRILLERS TIME DISTRIBUTION

R.U. 30 min
Drilling 5 5/8 Hole 1 hR

MATERIALS USED

WATER—GALLONS FROM

LOST CIRCULATION—MIX MUD

FROM ' TO '
FROM ' TO '
FROM ' TO '
FROM ' TO '
FROM ' TO '

REMARKS:

SIGNED—DRILLER

SERVICE PRINTING CO. GRANTS, N.M.

SALAZAR BROS. DRILLING

DRILLING REPORT

DATE 3/26/76

PROJECT

REPORT NO.

LOCATION AREA Church Rock

COMPANY KERR McGEE

STATE OF New Mexico

SECTION

TWN

RNG

TYPE RIG CD 1500

RIG NO. 2

DRILLING AND CORING LOG

HOLE NO.	DEPTH		ROCK TYPE	BIT USED					REMARKS OR FEET OF CORE RECOVERED
	FROM	TO		NAME	TYPE	SIZE	RUN	SER. NO.	
	100	640	mesa verde			5 5/8			

DRILLERS TIME DISTRIBUTION

8 hr Drilling

MATERIALS USED

WATER-GALLONS

FROM

LOST CIRCULATION—MIX MUD

FROM ' TO '

FROM ' TO '

FROM ' TO '

FROM ' TO '

FROM ' TO '

REMARKS:

SIGNED-DRILLER Charlie Jaramillo

SERVICE PRINTING CO. GRANTS, N.M.

SALAZAR BROS. DRILLING

DRILLING REPORT

DATE 3-26-76

PROJECT

REPORT NO.

LOCATION	AREA Church Rock	COMPANY Kerr-McGee	STATE OF New Mexico
SECTION	TWN	RNG	TYPE RIG R.D. 1500 — RIG NO. 5

DRILLING AND CORING LOG

HOLE NO.	DEPTH		ROCK TYPE	BIT USED					REMARKS OR FEET OF CORE RECOVERED
	FROM	TO		NAME	TYPE	SIZE	RUN	SER. NO.	
Water Well	600	750	MESAVERDE	QM	3	3"		Rot ip	660
Remedial Hole	0	300	MESAVERDE						

DRILLERS TIME DISTRIBUTION	MATERIALS USED
RTCB :30 mins	18 gel
LDIOD :40 mins Start Big Lapping [illegible]	1 sk. [illegible]
Mix mud to start reaming	
started reaming at 11:30 pm	

WATER—GALLONS FROM

LOST CIRCULATION—MIX MUD	REMARKS:
FROM ' TO '	
FROM ' TO '	
FROM ' TO '	
FROM ' TO '	
FROM ' TO '	

SIGNED—DRILLER

SERVICE PRINTING CO. GRANTS, N.M.

SALAZAR BROS. DRILLING

DRILLING REPORT

DATE 3/27/76

PROJECT

REPORT NO.

LOCATION AREA Church Rock

COMPANY [illegible]-Mcgee

STATE OF New Mexico

SECTION TWN RNG

TYPE RIG G.D 1500

RIG NO. 2

DRILLING AND CORING LOG

HOLE NO.	DEPTH		ROCK TYPE	BIT USED					REMARKS OR FEET OF CORE RECOVERED
	FROM	TO		NAME	TYPE	SIZE	RUN	SER. NO.	
	300	160	M.V						

DRILLERS TIME DISTRIBUTION	MATERIALS USED
Working on pump 20 min	

WATER—GALLONS FROM

LOST CIRCULATION—MIX MUD

FROM ' TO '

FROM ' TO '

FROM ' TO '

FROM ' TO '

FROM ' TO '

REMARKS:

SIGNED—DRILLER Lee Sandoval

SERVICE PRINTING CO. GRANTS, N.M.

SALAZAR BROS. DRILLING

DRILLING REPORT

DATE 3/27/76

PROJECT

REPORT NO.

LOCATION AREA Church Rock

COMPANY ~~[illegible]~~ Kerr McGee

STATE OF New Mexico

SECTION TWN RNG

TYPE RIG CD 1500

RIG NO. 2

DRILLING AND CORING LOG

HOLE NO.	DEPTH		ROCK TYPE	BIT USED					REMARKS OR FEET OF CORE RECOVERED
	FROM	TO		NAME	TYPE	SIZE	RUN	SER. NO.	
	660	750	MESA VARDE						

DRILLERS TIME DISTRIBUTION	MATERIALS USED
mix mud 30 min	12 sk Red Devil Gel
L O/D P 55 min	
rig set coring from 1130 to 4:00	

WATER-GALLONS FROM

LOST CIRCULATION—MIX MUD

FROM ' TO '

FROM ' TO '

FROM ' TO '

FROM ' TO '

FROM ' TO '

REMARKS:

SIGNED-DRILLER Camilo Jaramillo

SERVICE PRINTING CO. GRANTS, N.M.

T. Benalli, Well

DRILLING REPORT

DATE 3-27-76

PROJECT

REPORT NO.

ATION AREA Church Rock

COMPANY Kerr McGee

STATE OF New Mexico

SECTION

TWN

RNG

TYPE RIG G.D. 1500

RIG NO. 2

DRILLING AND CORING LOG

HOLE NO.	DEPTH		ROCK TYPE	BIT USED					REMARKS OR FEET OF CORE RECOVERED
	FROM	TO		NAME	TYPE	SIZE	RUN	SER. NO.	
Water									
Well									

DRILLERS TIME DISTRIBUTION

from 4:00 - 500 p.m.
(flushing out well

500 - 6:00 L.D.D.P. &
Tearing Down

MATERIALS USED

WATER-GALLONS

FROM

LOST CIRCULATION—MIX MUD

FROM ' TO '
FROM ' TO '
FROM ' TO '
FROM ' TO '
FROM ' TO '

REMARKS:

SIGNED-DRILLER Clifford Joe

SERVICE PRINTING CO. GRANTS, N.M.

Ok

MILL

WELL

ecology and environment, inc.
International Specialists in the Environment
1940 Webster Street, Suite 100
Oakland, California 94612
Tel: (510) 893-6700, Fax: (510) 550-2760

January 24, 2011

U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, CA 94105

TDD No: T02-09-10-08-0005
Project No: 002693.2103.01RA

14T-586
15T-303
16K-336
16K-340
mill well

Attention: Harry Allen, USEPA On-Scene Coordinator
Andrew Bain, USEPA

Subject: **NECR Water Well Sampling**
Church Rock Chapter
Navajo Nation

OCT 10

INTRODUCTION

In October 2010 the U.S. Environmental Protection Agency (USEPA) tasked the Ecology and Environment Inc. Superfund Technical Assessment and Response Team (START) with technical assistance relating to residential water well sampling in the vicinity of the former Northeast Church Rock Mine located in the Church Rock Chapter of the Navajo Nation. (Figure 1, Attachment A).

The purpose of this sampling event was to generate additional data to measure the impact of the former Northeast Church Rock Mine uranium mine on wells within the adjacent areas.

SAMPLING ACTIVITIES

Well sampling was conducted on October 19, 2010. A total of five wells were sampled. Four of the wells were residential wells and one (Mill Well) well was part of the former United Nuclear Corporation (UNC) facility in the area. Every effort was made to collect water samples in a manner consistent with resident collection and use (i.e. taps, pumps or bucket collect).

A Time Critical Quality Assurance and Sampling (QASP) Plan (Appendix D) was developed prior to sampling and followed with the following exceptions:

- Well NR#1 is no longer in use and was not sampled as the casing has been filled with concrete.
- The Mine Well is no longer in use and was not sampled as the casing has been filled with concrete.

Water quality parameters were measured in the field using a Horiba, Ltd. multi-parameter water quality meter. The meter was calibrated daily using a buffer solution. Samples were collected and analyzed for metals, radionuclides and anions by GEL Laboratories Inc. (Charleston, SC). Samples were collected and analyzed for oxygen and hydrogen isotopic ratio by Isotech Laboratories, Inc (Champaign, Il). The QASP (Appendix D) contains all methods and volumes used in sample analysis.

WELL DESCRIPTIONS

Well 15T-303

Well 15T-303 is a windmill powered well that feeds into an approximately 40,000 gallon uncovered metal tank. The well is currently in use and there is a trough and locked tap in the vicinity of the tank that are used to water livestock. Samples were collected from the top of the tank using a bucket.

14T-586

14T-586 is a diesel engine powered well that feeds into an approximately 10,000 gallon covered metal tank. The well is currently in use and there is a trough and tap in the vicinity of the tank that are used to water livestock. Samples were collected from the tap in manner consistent with residential use.

Mill Well

The Mill Well is located on the former UNC facility property. The well is electric powered well, housed in a wooden pump house, north of the former UNC offices and equipment yard. There is no storage tank affiliated with the well and the well is not currently in use. Samples were collected from a tap inside the pump house with pump turned on.

Mine Well

The mine well is located within the boundary of the former Northeast Church Mine. The well is currently not in use and has been non-operational for at least 15 years. The well opening is currently plugged with concrete.

NR#1

The NR#1 well is located within the boundary of the former Northeast Church Mine. The well is currently not in use and has been non-operational for at least 15 years. The well opening is currently plugged with concrete.

16K-340

Well 16K-340 is a windmill powered well that feeds into an approximately 40,000 gallon covered metal tank. The well is currently in use and there is a trough and tap in the vicinity of the tank that are used to water livestock. Samples were collected from the tap in manner consistent with residential use.

RESULTS

Table 1 (Appendix B) gives a well specific summary of all applicable data. All laboratory data was validated by a START chemist using the *Region 9 Draft Superfund Data Evaluation/Validation Guidance*. Data validation indicated the laboratory data was acceptable with qualification as definitive data. A separate data validation report was generated under this project and is included in the project file.

This letter summarizes all activities conducted on the Tuba City Removal project. If you have any questions regarding START's activities associated with this project, please do not hesitate to contact me.

Respectfully,

Mike Folan

START Member

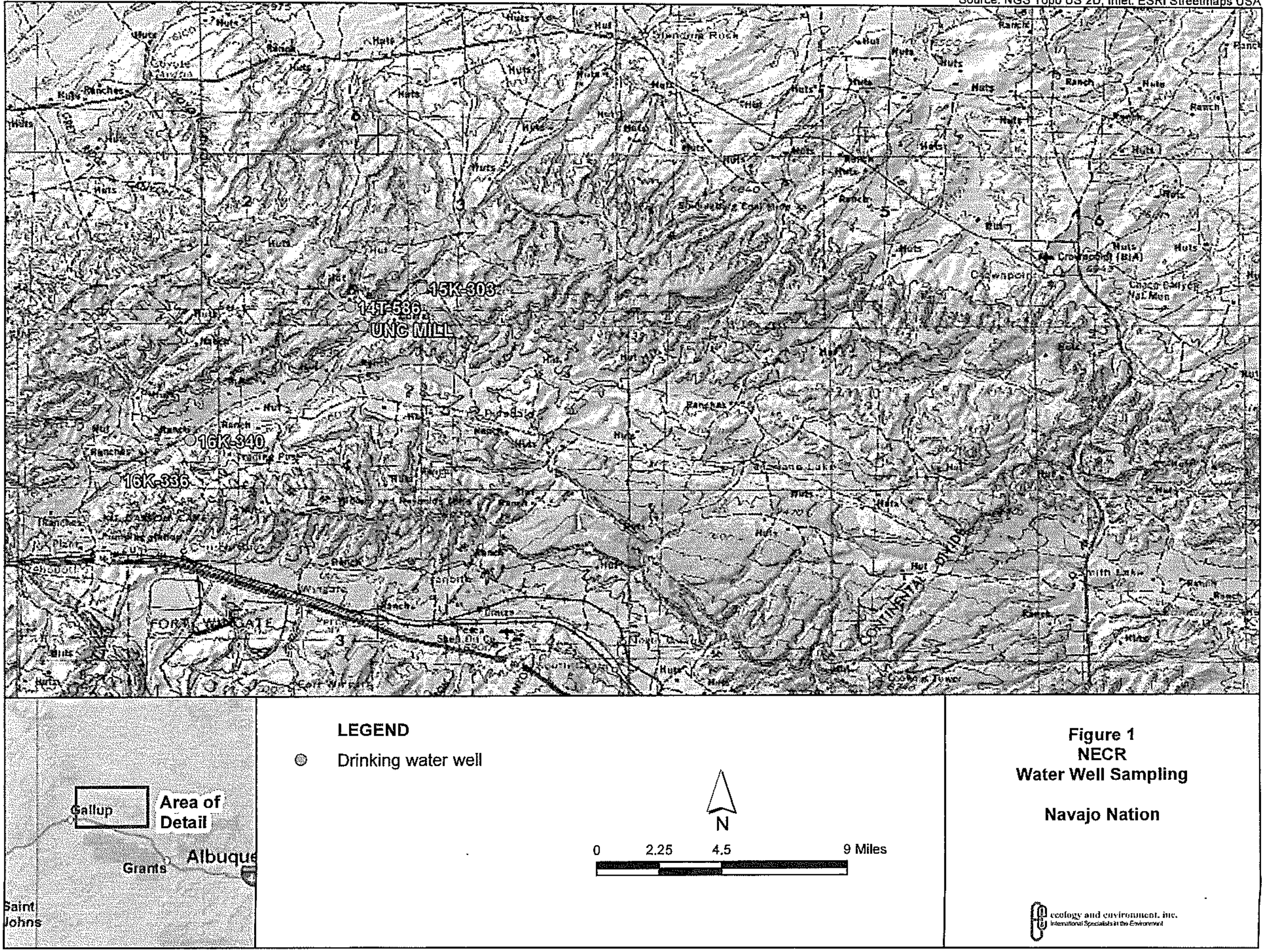
Attachments:
A – Homesite Location Map
B –Data Tables
C – Photographic Documentation
D- QASP

cc: file

ATTACHMENT A:
Well Location Map

TDD: 09-10-08-0004
PAN: 002693.2103.01RA

Source: NGS Topo US 2D, Inlet: ESRI Streetmaps USA



LEGEND

● Drinking water well

Figure 1
NECR
Water Well Sampling

Navajo Nation

ecology and environment, inc.
International Specialists in the Environment

ATTACHMENT B:
Data Tables

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005

PAN:002693.2104.01RA

	14T-586			14T-586100 (duplicate)			15T-303		
		Result	Units		Result	Units		Result	Units
Water Quality	pH	7.1		pH	7.1		pH	6.8	
	Conductivity	0.26	S/m	Conductivity	0.26	S/m	Conductivity	0.35	S/m
	Turbidity	10.1	NTU	Turbidity	10.1	NTU	Turbidity	10.1	NTU
	Dissolved Oxygen	6.30	mg/L	Dissolved Oxygen	6.30	mg/L	Dissolved Oxygen	7.99	mg/L
	Temperature	7.6	°C	Temperature	7.6	°C	Temperature	12.1	°C
	Salinity	0.1	%	Salinity	0.1	%	Salinity	0.2	%
	Total Dissolved Solids	1.7	g/L	Total Dissolved Solids	1.7	g/L	Total Dissolved Solids	2.2	g/L
	Oxidation Reduction Potential	100	mV	Oxidation Reduction Potential	100	mV	Oxidation Reduction Potential	129	mV
Metals	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Aluminum	220	ug/L	Aluminum	82	ug/L	Aluminum	68.0	ug/L
	Antimony	3.00	ug/L	Antimony	7.34	ug/L	Antimony	6.83	ug/L
	Arsenic	5.00	ug/L	Arsenic	5.00	ug/L	Arsenic	7.54	ug/L
	Barium	13.1	ug/L	Barium	13.4	ug/L	Barium	8.24	ug/L
	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L
	Bromide	0.200	ug/L	Bromide	0.200	ug/L	Bromide	0.200	ug/L
	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L	Cadmium	1.17	ug/L
	Calcium	270000	ug/L	Calcium	281000	ug/L	Calcium	373000	ug/L
	Chromium	13.9	ug/L	Chromium	1.00	ug/L	Chromium	1.16	ug/L
	Cobalt	1.13	ug/L	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L
	Copper	3.00	ug/L	Copper	3.00	ug/L	Copper	3.00	ug/L
	Iron	482	ug/L	Iron	468	ug/L	Iron	685	ug/L
	Lead	3.30	ug/L	Lead	3.30	ug/L	Lead	3.30	ug/L
	Magnesium	119000	ug/L	Magnesium	122000	ug/L	Magnesium	144000	ug/L
	Manganese	320	ug/L	Manganese	319	ug/L	Manganese	162	ug/L
	Mercury	0.066	ug/L	Mercury	0.066	ug/L	Mercury	0.066	ug/L
	Nickel	71.3	ug/L	Nickel	1.51	ug/L	Nickel	1.50	ug/L
	Potassium	7430	ug/L	Potassium	7690	ug/L	Potassium	5650	ug/L
	Selenium	7.7	ug/L	Selenium	37.7	ug/L	Selenium	43.8	ug/L
	Silver	1.00	ug/L	Silver	1.00	ug/L	Silver	1.00	ug/L
	Sodium	135000	ug/L	Sodium	140000	ug/L	Sodium	188000	ug/L
	Thallium	5.00	ug/L	Thallium	5.00	ug/L	Thallium	8.9	ug/L
	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L
	Zinc	338	ug/L	Zinc	355	ug/L	Zinc	839	ug/L
Radionuclide's	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	ALPHA	2.62	pCi/L	ALPHA	5.80	pCi/L	ALPHA	-0.526	pCi/L
	BETA	6.58	pCi/L	BETA	6.02	pCi/L	BETA	2.62	pCi/L
	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent
	Radium-226	0.880	pCi/L	Radium-226	0.540	pCi/L	Radium-226	1.18	pCi/L
	Radium-228	3.41	pCi/L	Radium-228	3.71	pCi/L	Radium-228	3.34	pCi/L
	Thorium-228	-0.0147	pCi/L	Thorium-228	0.155	pCi/L	Thorium-228	-0.139	pCi/L
	Thorium-230	-0.185	pCi/L	Thorium-230	0.818	pCi/L	Thorium-230	-0.158	pCi/L
	Thorium-232	-0.133	pCi/L	Thorium-232	-0.0195	pCi/L	Thorium-232	-0.0195	pCi/L
	Uranium-233/234	1.16	pCi/L	Uranium-233/234	1.73	pCi/L	Uranium-233/234	0.317	pCi/L
	Uranium-235/236	0.114	pCi/L	Uranium-235/236	0.0569	pCi/L	Uranium-235/236	0.219	pCi/L
	Uranium-238	1.20	pCi/L	Uranium-238	0.790	pCi/L	Uranium-238	0.442	pCi/L

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005

PAN:002693.2104.01RA

	14T-586			14T-586100 (duplicate)			15T-303		
Anions	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Chloride	14.0	mg/L	Chloride	14.1	mg/L	Chloride	10.5	mg/L
	Nitrate	0.267	mg/L	Nitrate	0.266	mg/L	Nitrate	0.100	mg/L
	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L
	Ortho-phosphate	0.200	mg/L	Ortho-phosphate	0.200	mg/L	Ortho-phosphate	2.00	mg/L
	Sulfate	1380	mg/L	Sulfate	1310	mg/L	Sulfate	2000	mg/L
	Fluoride	1.19	mg/L	Fluoride	1.24	mg/L	Fluoride	1.52	mg/L
	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	$\delta D\ H_2O$	-80.8	%	$\delta D\ H_2O$	-81.2	%	$\delta D\ H_2O$	-73.1	%
	$\delta^{18}O\ H_2O$	-10.44	%	$\delta^{18}O\ H_2O$	-10.53	%	$\delta^{18}O\ H_2O$	-8.56	%

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005

PAN:002693.2104.01RA

	16K-336			16K-340			MILLWELL		
		Result	Units		Result	Units		Result	Units
Water Quality	pH	7.4		pH	7.6		pH	7.4	
	Conductivity	0.15	S/m	Conductivity	0.19	S/m	Conductivity	0.36	S/m
	Turbidity	29.9	NTU	Turbidity	5.5	NTU	Turbidity	14.7	NTU
	Dissolved Oxygen	3.05	mg/L	Dissolved Oxygen	5.26	mg/L	Dissolved Oxygen	6.39	mg/L
	Temperature	15.5	°C	Temperature	16.8	°C	Temperature	15.2	°C
	Salinity	0.1	%	Salinity	0.1	%	Salinity	0.2	%
	Total Dissolved Solids	1	g/L	Total Dissolved Solids	1.2	g/L	Total Dissolved Solids	2.3	g/L
	Oxidation Reduction Potential	86	mV	Oxidation Reduction Potential	76	mV	Oxidation Reduction Potential	-127	mV
Metals	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Aluminum	229	ug/L	Aluminum	126	ug/L	Aluminum	68.0	ug/L
	Antimony	3.00	ug/L	Antimony	3.00	ug/L	Antimony	3.00	ug/L
	Arsenic	11	ug/L	Arsenic	8.53	ug/L	Arsenic	5.00	ug/L
	Barium	450	ug/L	Barium	140	ug/L	Barium	1.64	ug/L
	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L
	Bromide	0.234	ug/L	Bromide	0.295	ug/L	Bromide	0.361	ug/L
	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L
	Calcium	76800	ug/L	Calcium	99800	ug/L	Calcium	2420	ug/L
	Chromium	1.00	ug/L	Chromium	1.03	ug/L	Chromium	1.43	ug/L
	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L
	Copper	29.7	ug/L	Copper	3.00	ug/L	Copper	20.4	ug/L
	Iron	2720	ug/L	Iron	181	ug/L	Iron	9870	ug/L
	Lead	3.58	ug/L	Lead	3.30	ug/L	Lead	3.74	ug/L
	Magnesium	20600	ug/L	Magnesium	43500	ug/L	Magnesium	470	ug/L
	Manganese	95.9	ug/L	Manganese	122	ug/L	Manganese	51	ug/L
	Mercury	0.066	ug/L	Mercury	0.066	ug/L	Mercury	0.066	ug/L
	Nickel	1.50	ug/L	Nickel	1.50	ug/L	Nickel	2.38	ug/L
	Potassium	2540	ug/L	Potassium	3940	ug/L	Potassium	3200	ug/L
	Selenium	10.2	ug/L	Selenium	5.00	ug/L	Selenium	26.7	ug/L
	Silver	1.00	ug/L	Silver	1.00	ug/L	Silver	1.00	ug/L
	Sodium	202000	ug/L	Sodium	233000	ug/L	Sodium	694000	ug/L
	Thallium	5.00	ug/L	Thallium	5.00	ug/L	Thallium	6.45	ug/L
	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L
	Zinc	153	ug/L	Zinc	148	ug/L	Zinc	659	ug/L
Radionuclide's	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	ALPHA	0.129	pCi/L	ALPHA	5.46	pCi/L	ALPHA	9.79	pCi/L
	BETA	4.99	pCi/L	BETA	2.37	pCi/L	BETA	2.72	pCi/L
	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent
	Radium-226	1.20	pCi/L	Radium-226	0.464	pCi/L	Radium-226	0.639	pCi/L
	Radium-228	4.58	pCi/L	Radium-228	0.747	pCi/L	Radium-228	1.77	pCi/L
	Thorium-228	0.298	pCi/L	Thorium-228	-0.0682	pCi/L	Thorium-228	0.139	pCi/L
	Thorium-230	-0.524	pCi/L	Thorium-230	0.0264	pCi/L	Thorium-230	0.480	pCi/L
	Thorium-232	-0.0195	pCi/L	Thorium-232	-0.0722	pCi/L	Thorium-232	-0.0195	pCi/L
	Uranium-233/234	-0.171	pCi/L	Uranium-233/234	0.297	pCi/L	Uranium-233/234	2.61	pCi/L
	Uranium-235/236	0.181	pCi/L	Uranium-235/236	0.115	pCi/L	Uranium-235/236	0.174	pCi/L
	Uranium-238	0.392	pCi/L	Uranium-238	1.40	pCi/L	Uranium-238	2.82	pCi/L

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005

PAN:002693.2104.01 RA

	16K-336			16K-340			MILLWELL		
Anions	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Chloride	18.8	mg/L	Chloride	22.1	mg/L	Chloride	154	mg/L
	Nitrate	2.89	mg/L	Nitrate	5.97	mg/L	Nitrate	0.100	mg/L
	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L
	Ortho-phosphate	0.291	mg/L	Ortho-phosphate	0.163	mg/L	Ortho-phosphate	2.00	mg/L
	Sulfate	118	mg/L	Sulfate	368	mg/L	Sulfate	1460	mg/L
	Fluoride	0.861	mg/L	Fluoride	0.483	mg/L	Fluoride	1.73	mg/L
	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	δD H_2O	-91.4	%	δD H_2O	-82.6	%	δD H_2O	-107.3	%
	$\delta^{18}O$ H_2O	-12.04	%	$\delta^{18}O$ H_2O	-11.01	%	$\delta^{18}O$ H_2O	-14.14	%

ATTACHMENT C:
Photographic Documentation

PHOTOGRAPHIC LOG

NECR Water Well Sampling

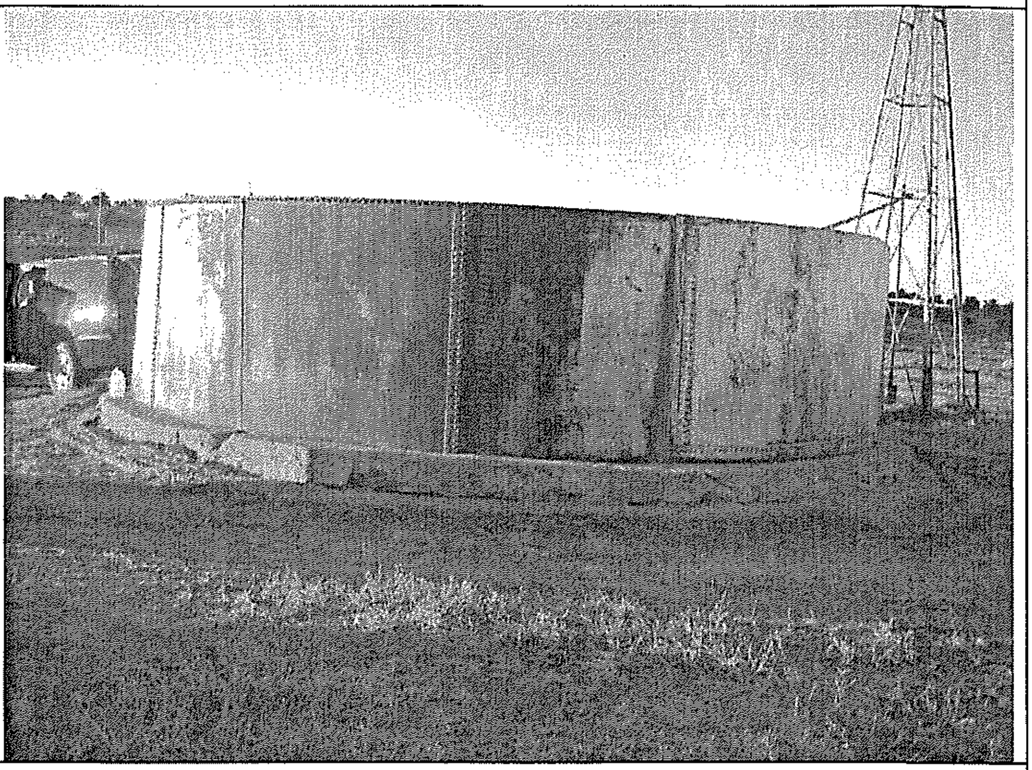
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date:
10/19/10

Description:

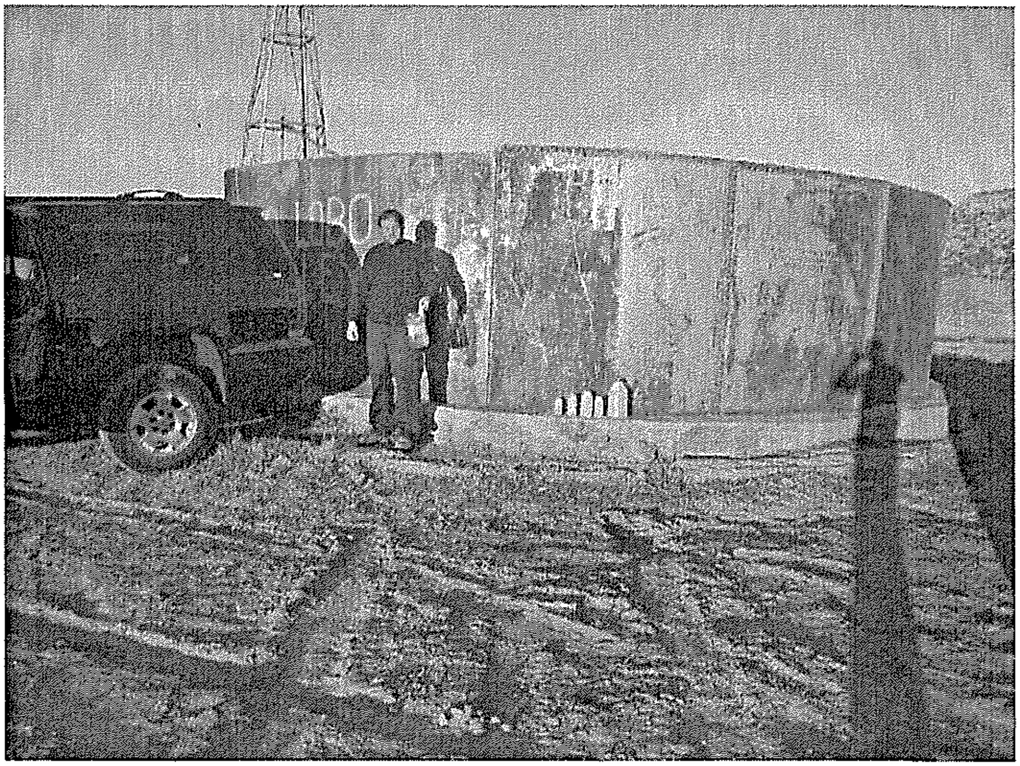
Well 15T-303



Date:
10/19/10

Description:

Well 15T-303



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

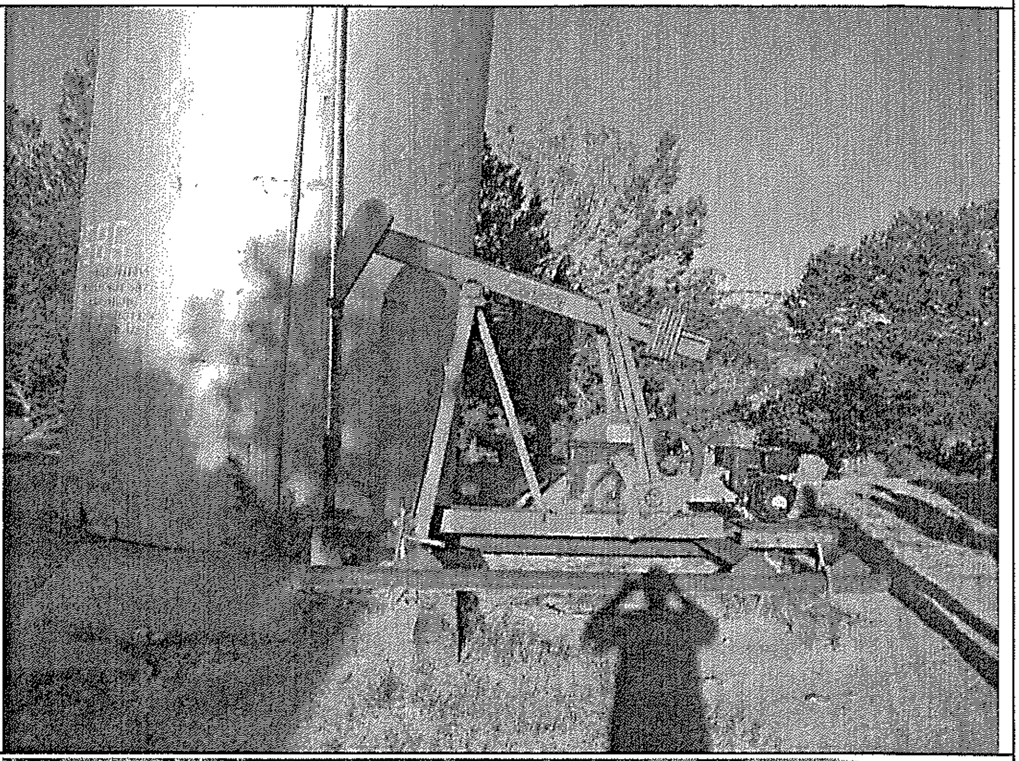
002693.2103.01RA

T02-09-10-08-0005

	Date: 10/19/10

Description:

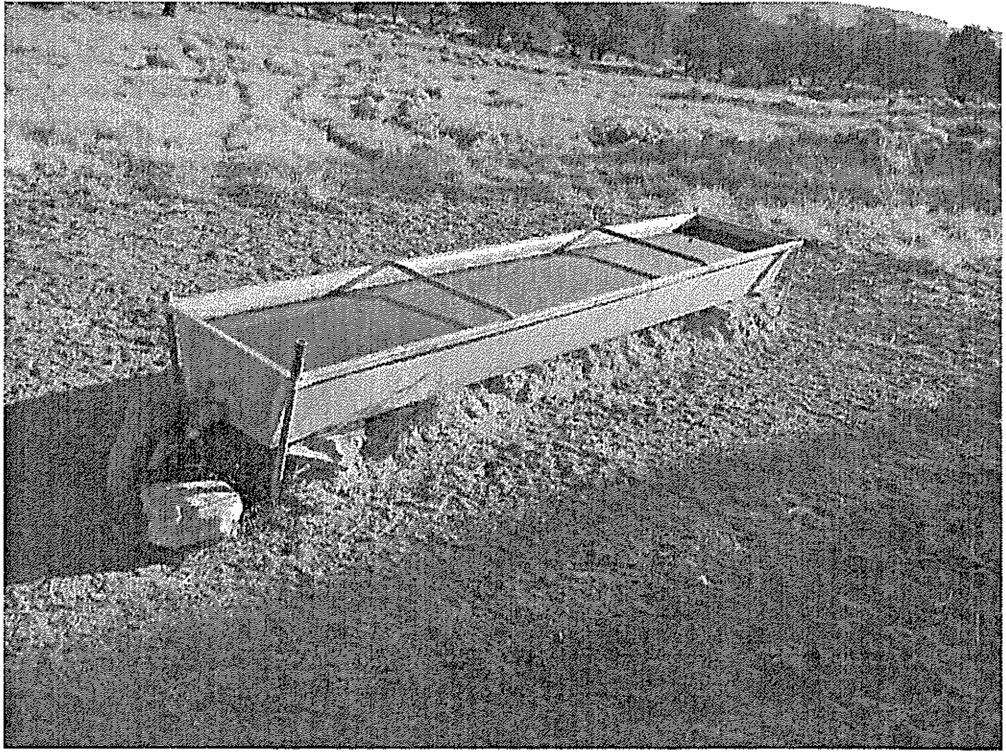
Well 14T-586



	Date: 10/19/10

Description:

Well 14T-586



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

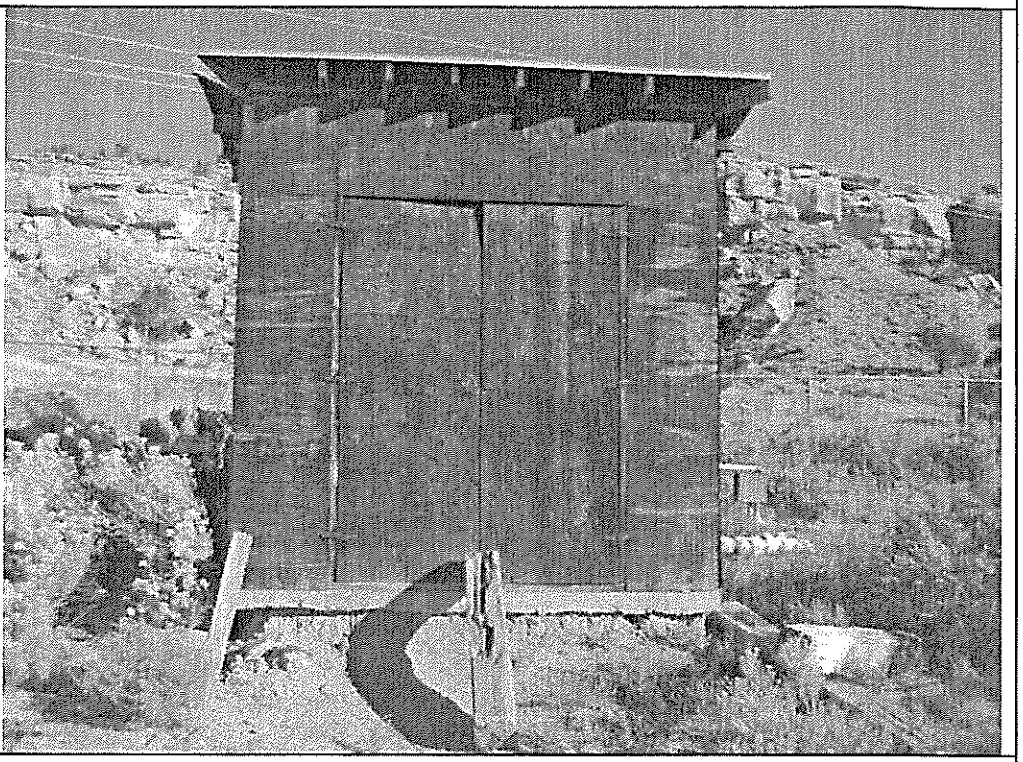
002693.2103.01RA

T02-09-10-08-0005

Date: 10/19/10

Description:

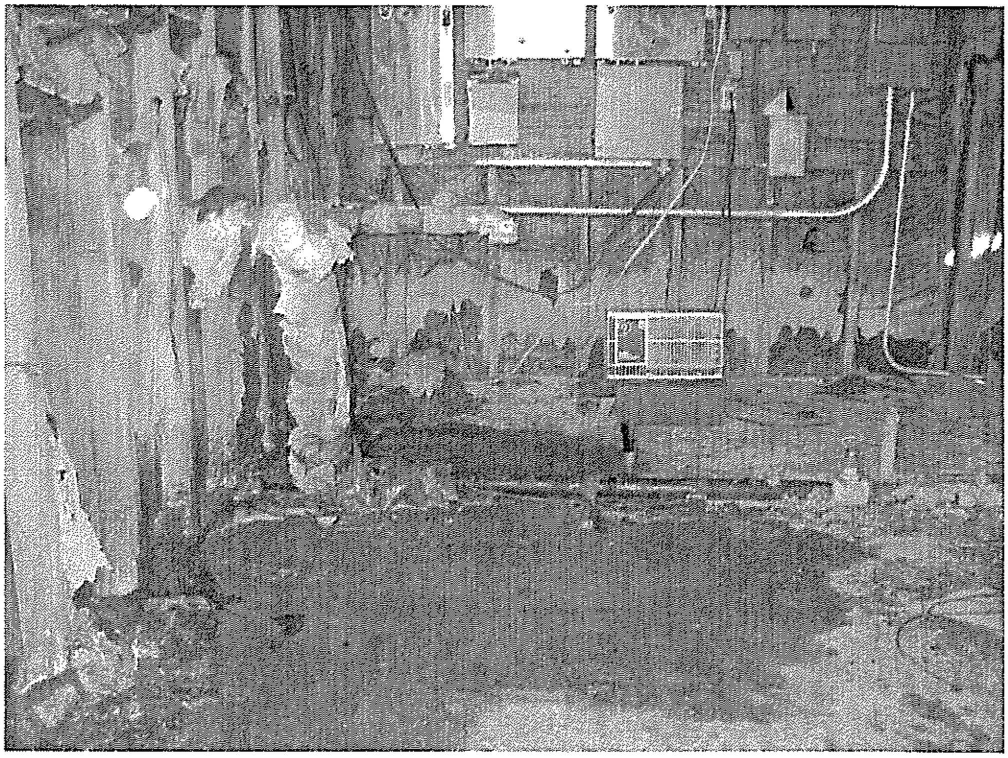
Mill Well



Date: 10/19/10

Description:

Mill Well



PHOTOGRAPHIC LOG

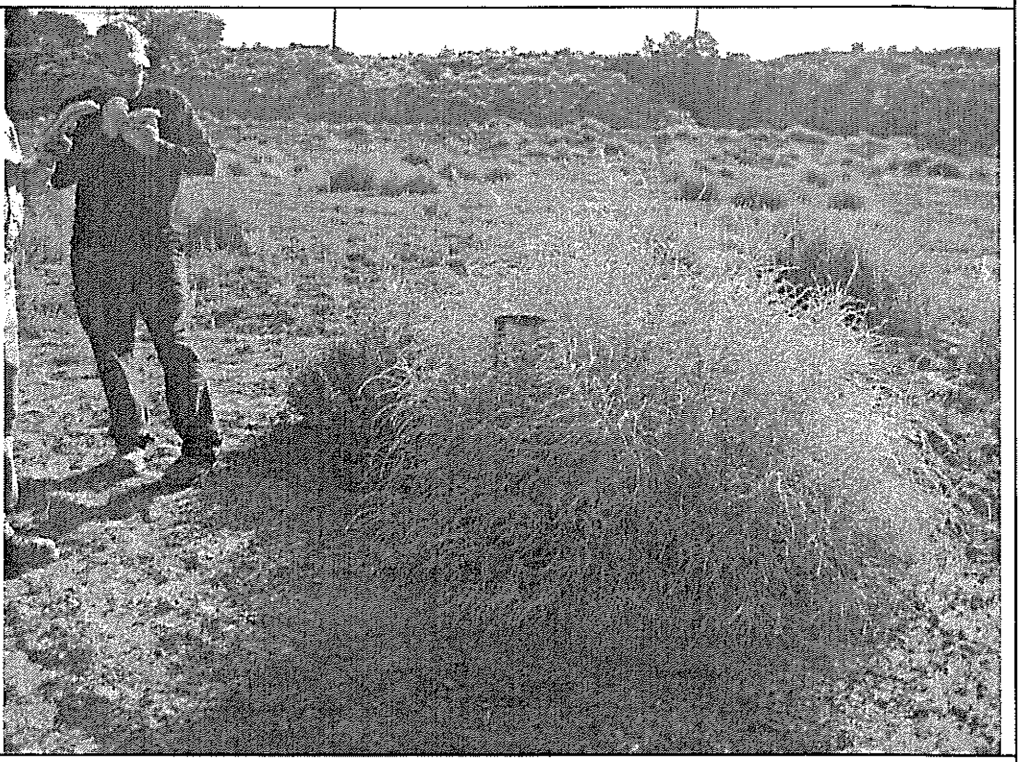
NECR Water Well Sampling

Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:
Mine Well



Date: 10/19/10

Description:

Well NR#1

PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

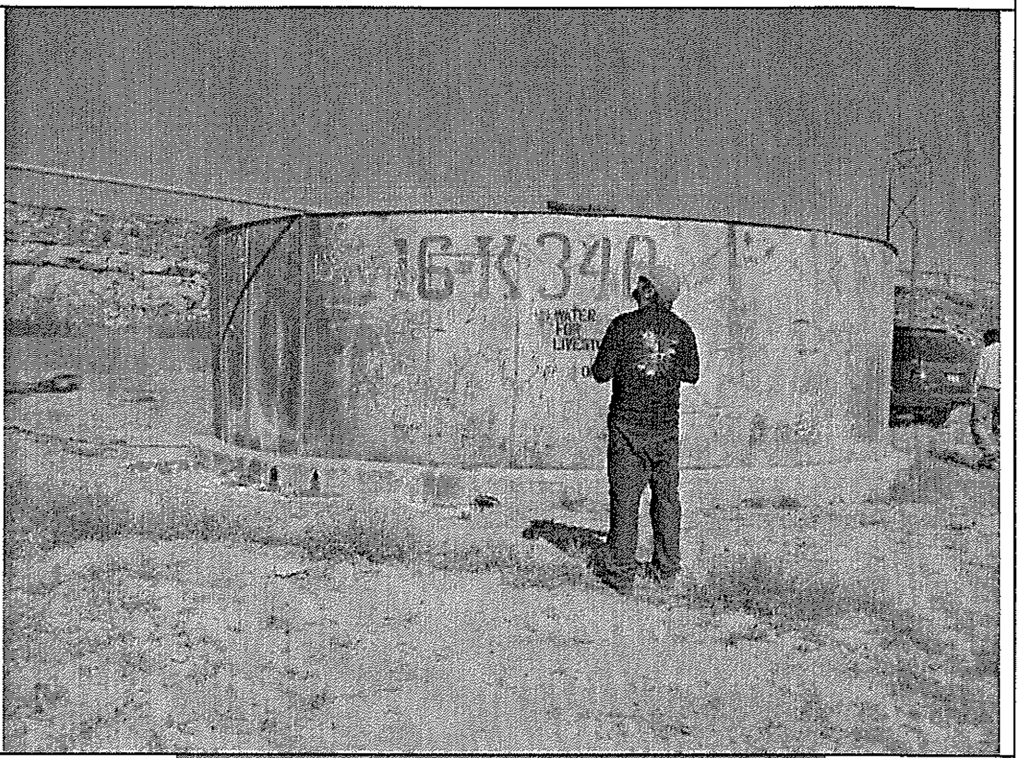
002693.2103.01RA

T02-09-10-08-0005

Date:
10/19/10

Description:

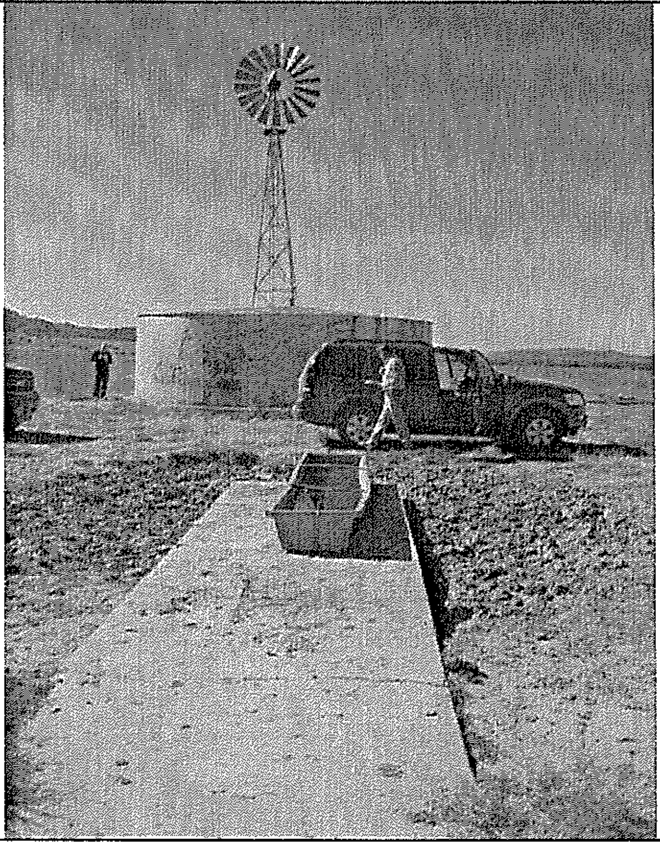
16K-340



Date:
10/19/10

Description:

16K-340



PHOTOGRAPHIC LOG

NECR Water Well Sampling

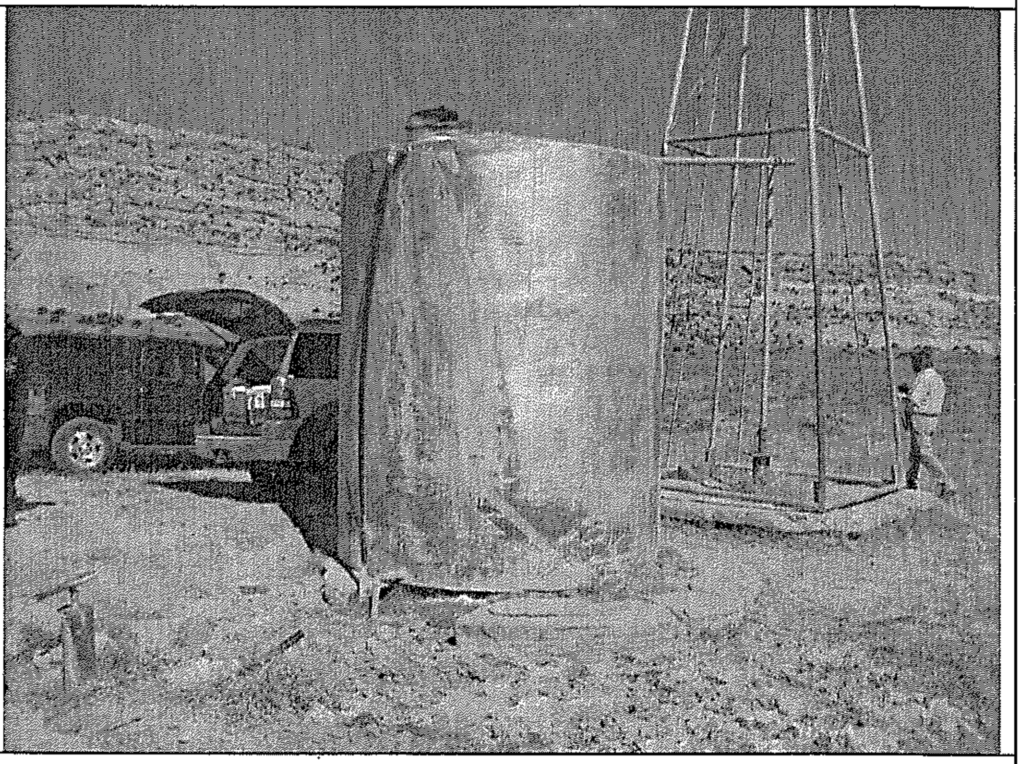
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

16K-336



Date: 10/19/10

Description:

16K-336

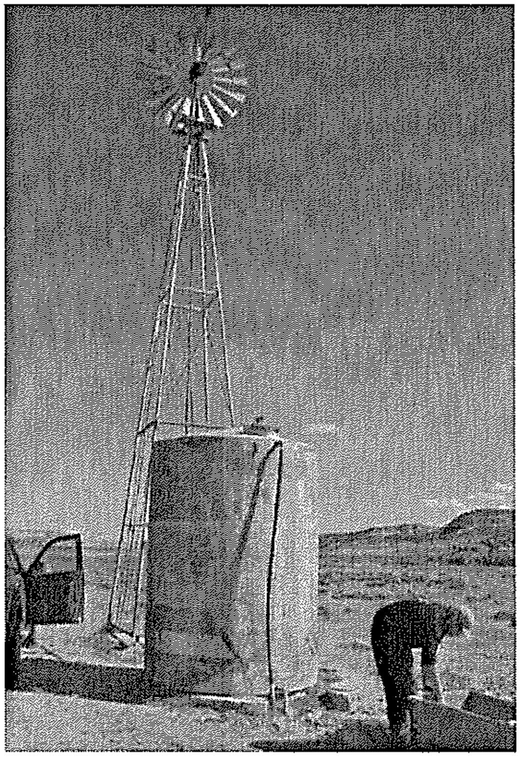


Table J
Reporting Limits, Action Levels, and Quality Control Limits

Analysis	Analyte	Action Level (mg/L)	Quantitation Limit (µg/L)	Duplicate RPD	Matrix Spike	Matrix Spike RPD
Anions by 300.0	Fluoride	4	0.10	25	75-125	20
Anions by 300.0	Chloride	250	1.0	25	75-125	20
Anions by 300.0	Nitrite as N	1	0.10	25	75-125	20
Anions by 300.0	Nitrate as N	10	0.10	25	75-125	20
Anions by 300.0	o-Phosphate, as P	Not Available	1.0	25	75-125	20
Anions by 300.0	Sulfate	250 (s)	0.50	25	75-125	20
Metals by 6010B	Aluminum	0.1	100	25	75-125	20
Metals by 6010B	Antimony	0.1	100	25	75-125	20
Metals by 6010B	Arsenic	0.01	10	25	75-125	20
Metals by 6010B	Barium	2	20	25	75-125	20
Metals by 6010B	Beryllium	0.005	5	25	75-125	20
Metals by 6010B	Cadmium	0.01	10	25	75-125	20
Metals by 6010B	Calcium	Not Available	1000	25	75-125	20
Metals by 6010B	Chromium	0.10	10	25	75-125	20
Metals by 6010B	Cobalt	Not Available	20	25	75-125	20
Metals by 6010B	Copper	1.3 (s)	20	25	75-125	20
Metals by 6010B	Iron	Not Available	50	25	75-125	20
Metals by 6010B	Lead	0.015	5	25	75-125	20
Metals by 6010B	Magnesium	Not Available	600	25	75-125	20
Metals by 6010B	Manganese	0.05 (s)	15	25	75-125	20
Metals by 6010B	Mercury	0.002	0.5	25	75-125	20
Metals by 6010B	Nickel	Not Available	20	25	75-125	20
Metals by 6010B	Potassium	Not Available	5000	25	75-125	20
Metals by 6010B	Selenium	0.05	10	25	75-125	20
Metals by 6010B	Silver	0.10 (s)	10	25	75-125	20
Metals by 6010B	Thallium	0.002	10	25	75-125	20
Metals by 6010B	Vanadium	Not Available	20	25	75-125	20
Metals by 6010B	Zinc	5 (s)	10	25	75-125	20
Gross alpha by 900.0	alpha	See table A-1	1.0 piC/L	25	75-125	20
Gross beta by 900.0	beta	See table A-1	1.0 piC/L	25	75-125	20
903.1	Ra-226	See table A-1	1.0 piC/L	25	75-125	20
904.0	Ra-228	See table A-1	1.0 piC/L	25	75-125	20
Isotopic Th by HASL 300 Th-01-RCmod	Th-238, 230, 232	See table A-1	1.0 piC/L	25	75-125	20
Isotopic U by HASL 300 U-02-RC mod	U-233/234, U-235/236, U-238	See table A-1	1.0 piC/L	25	75-125	20

Key: RPD = relative percent difference; mg/L = milligrams per liter; µ/L = micrograms per Liter NA = Not Applicable
(s) = National Secondary Drinking Water Regulation not enforceable and not an action limit for this assessment

MWH
BUILDING A BETTER WORLD

MEMORANDUM

Mill Well
9/22/10
Rad data for:
'93
'98
'99
'02
'06

TO: Ms. Sara Jacobs
U.S. EPA, Region 9

DATE: December 7, 2010

FROM: Toby Leeson, Bruce Narloch

REFERENCE: 1008501

SUBJECT: *Risk Analysis of Mill Site Well Water Used for Construction Dust Control Northeast Church Rock Mine Site, New Mexico*

MWH is submitting this technical memorandum to U.S. EPA, Region 9 on behalf of United Nuclear Corporation (UNC). This memorandum describes an assessment of potential risk associated with the use of a well water in connection with investigations or construction activities at or nearby NECR and related areas (e.g., on the adjacent Navajo Reservation). This memorandum has been developed to address concerns recently expressed by the local community with respect to the quality of the water used for dust suppression during the NECR investigation and removal activities and whether such use poses a potential risk to humans or the environment.

Introduction and Background

UNC has been using water from a well on its property at NECR in connection with site investigations since 2006 and most recently for dust control during the Interim Removal Action (IRA) (*Interim Removal Action Construction Plan* (MWH, 2009)). The primary use of the water has been for suppression of dust generated during construction activities, by utilizing a spray truck, in accordance with standard operating procedures. The source of water used for dust suppression has been a well at the Church Rock Mill Site, herein referred to as or "*Mill Well 1*".

Mill Well 1 is completed in the Westwater Canyon Member of the Morrison Formation at a total depth of 1,600 feet below ground surface (bgs). Water from the well has historically been sampled and analyzed for a variety of constituents, including radionuclides. The results of these analyses are summarized in Table 1, *Historical Water Analytical Results from Mill Well 1*. This well was most recently sampled by UNC in September 2010 for chemical analysis of metals, general water quality parameters, and radionuclides. Table 1 lists historical results for total uranium and radium-226 plus radium-228. Results for other analyses from the September 2010 sampling event are shown in Table 2, *Summary of Mill Well 1 Water Analytical Results, September 2010*. A copy of the laboratory report for this most recent sampling event is included as an attachment.

Although not applicable to water used for dust control, analytical results were compared to applicable New Mexico water quality standards (i.e., NMAC 20.6.2) to determine if any compounds warrant further evaluation. As presented in Tables 1 and 2, three constituents (uranium, sulfate and total dissolved solids) have been detected above the standards. However, uranium was last detected above its standard in 2002 and has been below the standard in the last two sampling events, including during the time period of water use for the IRA.

As can be seen in Table 2, both sulfate and total dissolved solids (TDS) exceeded NMAC 20.6.2 standards. Both constituents are classified as general water quality parameters, and are not considered constituents of potential concern. Sulfates are naturally occurring in mineral compounds, many of which are found dissolved in groundwater and are non-toxic. Consumption of water containing sulfate or sulfate compounds may have a laxative effect at high concentrations (e.g., greater than 1000 mg/l) and can impart an unpleasant taste to the water. Due to the lack of toxicity, there are no health-based guidelines for sulfate in drinking water.

TDS represents the sum of the cations (positively charged) and anions (negatively charged) in the water and is a qualitative measure of the amount of dissolved ions, but does not indicate the levels of individual ions or specific water quality issues. As such, there is no toxicity issue directly related to TDS.

Risk Assessment

The water used during dust suppression was applied conservatively and the amount used was only enough to suppress dust. At no time was the water allowed to pool or runoff the construction areas. Based on the location and methods used to apply the water from Mill Well 1 for dust suppression, water mist applied to the surface evaporates quickly and has no potential to impact surface water or groundwater. The lack of impact to surface was demonstrated by the post-IRA status survey results.

Because water from Mill Well 1 is not used for drinking, the only possible complete exposure pathway is inhalation of water mist by a construction worker or observer while the water is being applied. Therefore, potential risks to human health from uranium through this potential exposure pathway were evaluated. Sulfate and TDS were not included in the risk assessment for the reasons stated above and because there are no toxicity values with which to conduct risk calculations.

The general approach used in this risk evaluation was based on screening-level human health risk assessment (HHRA) methods presented in the *Final Removal Site Evaluation Report Northeast Church Rock Mine Site* (MWH, 2007). A preliminary remediation goal (PRG) for uranium in water that is used for dust suppression was calculated using the U.S. Environmental Protection Agency (USEPA) Online PRG Calculator for Chemicals (2010a). The general framework for conducting HHRAs under CERCLA is provided in USEPA's *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part A* (1989). The PRGs were calculated using the methodologies described in USEPA's *Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual, Part B* (1991a) and updated input parameters and equations as noted in USEPA's Online PRG Calculator for Chemicals (2010a).

As described above, the primary exposure scenario for the Site involves potential exposure of Site workers or remediation observers to uranium in water used in dust suppression through inhalation of mist generated during dust suppression activities. Currently, the USEPA does not have a method, or exposure model, for the evaluation of non-volatile constituents (e.g., uranium) in water mist. Therefore, an oral exposure model was used and it was conservatively assumed that a Site worker or remediation observer could be exposed to up to 1 liter per day (L/day) of dust suppression water as inhaled mist. While USEPA's Online PRG Calculator for Chemicals (2010a) cites the water ingestion rate of an adult as 2 L/day, USEPA's Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors (1991b) further clarifies that it should be assumed that half of a site worker's daily water intake (1 liter out of 2) occurs at work, with all water ingested being conservatively assumed to come from drinking water at work and not a bottled water source. The assumption that a site worker would inhale a volume of inhaled mist equivalent to the daily drinking water intake at work (i.e., 1 L/day) is highly conservative, as it is unlikely that a worker would inhale that much mist. Additional assumptions included an exposure frequency (EF) of 250 days per year (d/yr) and exposure duration (ED) of 15 years (yr). The oral reference dose (RfD) for uranium of 3.0E-03 milligrams per kilogram per day (mg/kg-day) was obtained from USEPA's Integrated Risk Information System (IRIS) database (USEPA, 2010b). Based on these exposure assumptions and toxicity information, a PRG for uranium in dust suppression water of 0.31 mg/L was calculated (Table 3).

In accordance with MWH (2007), only non-carcinogenic hazards of uranium were evaluated; potential carcinogenic risks associated with possible exposure to uranium daughter products (e.g., radium-226) were not evaluated in the above PRG. It should also be noted that this PRG does not include potential contributions of background concentrations of uranium to non-carcinogenic hazard. A screening-level non-carcinogenic hazard quotient (HQ) for Site workers and remediation observers assuming exposure to uranium in dust suppression water as mist was calculated based upon the following equation:

$$HQ = EPC / PRG \qquad \text{(Equation 1)}$$

Where:

EPC = exposure point concentration (mg/L)
HQ = hazard quotient (unitless)
PRG = preliminary remediation goal (mg/L)

An EPC for uranium in dust suppression water was conservatively assumed as 0.07 mg/L, the highest concentration measured in samples collected from Mill Well 1 historically.

For Site workers and remediation observers potentially exposed to uranium in water used for dust suppression, a non-carcinogenic HQ estimate was calculated as 0.2 (Table 3). This screening-level non-carcinogenic HQ estimate does not exceed the USEPA's point of departure risk management criterion for evaluation of non-carcinogenic hazards equal to 1. Based on the above results, the presence of uranium in water used for dust suppression does not pose a significant risk to Site workers or remediation observers.

IRA Air Monitoring and Soil Data Evaluation

During the IRA, a comprehensive Health and Safety Program, including Radiation Safety, was implemented by the construction contractor (MACTEC, 2009) for both field personnel as well as the general public or remediation observers (e.g., at the boundaries of the construction areas and from the viewing area used during the IRA). The results of the H&S sampling confirmed that there was no exposure during the IRA. Personnel and vehicle monitoring included:

- Uranium bioassay monitoring
- External radiation monitoring
- Breathing-zone air monitoring
- Radioactive contamination monitoring
- Fugitive dust monitoring

No exceedances of applicable occupational exposure limits were detected for any of these tests, as described in the *Interim Removal Action Status Survey Report* (MWH, 2010). Additionally, radioactive contamination was not detected on any person or any vehicle leaving the IRA construction area. Fugitive dust monitoring was also conducted and all results were less than applicable occupational exposure limits (MACTEC, 2010).

Environmental monitoring was also performed during the IRA, as described in the *Interim Removal Action Completion Report* (MWH, 2010). Monitoring included:

- Air monitoring of internal and external radiation dose
- Radon exposure
- Environmental external radiation dose
- Respirable dust

All results were within EPA-approved monitoring criteria (MWH, 2010).

After the conclusion of IRA construction activities, a post-construction status survey was conducted that included surface soil sampling and analysis of Ra-226 concentrations, as described in the Interim *Removal Action Post-IRA Status Survey Report* (MWH, 2010). The soil samples were collected at 22 locations within the IRA construction area from 0 to 0.5 feet below ground surface (bgs) on a regular grid over the whole area. The results of the soil analyses indicated post-IRA Ra-226 concentrations (pCi/g) were within the range of background concentrations as demonstrated using the methods of the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (EPA, 2000).

Conclusions

The results of this analysis indicate that use of water from Mill Well 1 for dust suppression during construction activities does not result in significant risk of exposure to humans or the environment, and that if comparable methods of control and monitoring are used during future investigation and construction activities, no significant risk of exposure will occur. While water from Mill Well 1 meets current drinking water standards for uranium, this analysis indicates that, even at historically maximum levels, concentrations of uranium in site water from Mill Well 1would not pose a significant risk to site workers or remediation observers as result of its use for dust suppression.

References

MWH, 2010. *Interim Removal Action Status Survey Report*, Northeast Church Rock Mine Site.

MWH, 2007. *Final Removal Site Evaluation Report*, Northeast Church Rock Mine Site.

U.S. Environmental Protection Agency, 2010a. Online Preliminary Remediation Goals Calculator for Chemicals. http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search (2010).

USEPA, 2010b. Integrated Risk Information System (IRIS) Database. U.S. Environmental Protection Agency. http://www.epa.gov/iris/

USEPA, 2000. Multi-*Agency Radiation Survey and Site Investigation Manual* (MARSSIM), EPA 402-R-97-016, Rev. 1.

USEPA, 1991a. *Risk Assessment Guidance for Superfund: Volume I,* Human Health Evaluation Manual (Part B – Development of Risk-based Preliminary Remediation Goals), EPA/540/R-92/003. December.

USEPA, 1991b. Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Supplemental Guidance: Standard Default Exposure Factors) Interim Final. OSWER Directive: 9285.6-03. March.

USEPA, 1989. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual,* (Part A), Interim Final, EPA/540/1-89/002. December.

Attachments: Table 1- Historical Water Analytical Results from Mill Well 1
Table 2 - Summary of Mill Well 1 Water Analytical Results, September 2010
Table 3 - Summary of Human Health Risk Estimates, Groundwater Use for Dust Suppression
Laboratory Analytical Report

cc: Lance Hauer – GE
Larry Bush – UNC
Jed Thompson – MWH

ATTACHMENTS

Table 1
Historical Water Analytical Results from Mill Well 1
United Nuclear Corp. Mining and Milling

Date	Uranium (mg/L)	Ra-226 + Ra-228 (pCi/L)
September 2010[1]	0.003	2.6
February 2006[2]	0.0081	2.4
June 2002[3]	0.07	3.4
2nd Qtr 1999[4]	0.033	<0.2
1st Qtr 1999[4]	0.048	<0.2
4th Qtr 1998[4]	0.001	<0.2
3rd Qtr 1998[4]	0.065	<0.2
July 1993[5]	0.002	3

Notes:

[1] Laboratory analytical report, United Nuclear Corporation (Energy Labs, Inc., 2010).

[2] Table 1 from the *In-Situ Alkalinity Stabilization Pilot Study Report* (2006).

[3] *Laboratory Analysis Report*, UNC Mining and Milling (Energy Labs, 2002). Uranium

[4] UNC Domestic Waterwell Analysis Summary. Footnote to the table states:
"On 1/11/96 NMED determined that this water system is no longer classified under 'Non-Transient.' 'Non-Community' or defined as a Public Water System and therefore sampling is not required."

[5] Water Analysis Report, UNC Mining and Milling (Energy Labs, 1993).

[6] All results represent the dissolved fraction.

TABLES

Table 2
Summary of Mill Well 1 Water Analytical Results

Analyte	Result	Units	Precision	RL	NMAC 20.6.2 Standard
MAJOR IONS					
Bicarbonate as HCO3	246	mg/L		1	n/a
Calcium	13	mg/L		2	n/a
Magnesium	3	mg/L		1	n/a
Nitrogen, Ammonia as N	0.49	mg/L		0.05	n/a
Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.1	n/a
Potassium	3	mg/L		1	n/a
Sodium	806	mg/L		1	n/a
Sulfate	1270	mg/L		8	600
PHYSICAL PROPERTIES					
pH	8.8	s.u.			6 - 9
TDS @ 180 C	2240	mg/L			1000
METALS					
Aluminum	ND	mg/L		0.1	5
Arsenic	ND	mg/L		0.001	0.1
Beryllium	ND	mg/L		0.01	n/a
Cadmium	ND	mg/L		0.005	0.01
Cobalt	ND	mg/L		0.01	0.05
Lead	ND	mg/L		0.05	0.05
Manganese	0.07	mg/L		0.01	0.2
Molybdenum	ND	mg/L		0.1	1
Nickel	ND	mg/L		0.05	0.2
Selenium	ND	mg/L		0.001	0.05
Uranium	0.003	mg/L		0.0003	0.03
Vanadium	ND	mg/L		0.1	n/a
RADIONUCLIDES					
Gross Alpha (- Rn & U)	1.7	pCi/L	(±) 0.5		n/a
Lead 210	2.7	pCi/L	(±) 1.2		n/a
Radium 226	0.92	pCi/L	(±) 0.25		30
Radium 228	1.7	pCi/L	(±) 0.58		
Thorium 230	0.06	pCi/L	(±) 0.07		n/a

Notes:

Sample collected September 22, 2010.

RL = reporting limit.

n/a = not applicable

Table 3
Summary of Human Health Risk Estimates
Groundwater Use for Dust Suppression - Site Worker

	Groundwater Concentration	Pathway-Specific Cancer Risk and Noncancer Hazard Estimates [1]			
		Ingestion of Groundwater			
Constituent	**EPC[2]**	**Cancer-based PRG[3]**	**ILCR [3]**	**Noncancer-based PRG [3]**	**HQ [3]**
Uranium	0.07	NA	NA	3.1E-01	0.23
	Cumulative ILCR/HQ[4]:		0E+00		0.2

Notes:

[1] Based on the Soil Screening Guidance for Chemicals, and the Online PRG Calculator for chemicals (USEPA, 2010). Risk and hazard estimates are for site worker exposure to groundwater used for dust suppression at the Site.

[2] The exposure point concentration (EPC) is the most recent groundwater monitoring concentration as of September 2010.

[3] Calculated using tap water equations within USEPA's online PRG calculator for chemicals (USEPA, 2010) adjusting for site-specific exposure parameters for the site worker. Primary exposure pathway for the site worker is inhalation of water vapor, yet no model exists to evaluate this pathway for metals. Therefore it was assumed that the exposure would be through ingestion of groundwater for the purposes of these risk estimates.

[4] The ILCR and HQ are calculated as a ratio of the EPC divided by the cancer-based or the noncancer-based PRGs, respectively.

HQ - Hazard quotient.
ILCR - Incremental lifetime cancer risk.
NA - Not applicable
PRG - Preliminary remediation goal

LABORATORY ANALYTICAL REPORT

ANALYTICAL SUMMARY REPORT

October 11, 2010

United Nuclear Corporation
21 Miles NE Of Gallup
Gallup, NM 87305

Workorder No.: C10090864 Quote ID: C129 - Quarterly Long List

Project Name: Not Indicated

Energy Laboratories, Inc. received the following 1 sample for United Nuclear Corporation on 9/22/2010 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C10090864-001	Domestic Water Well	09/20/10 13:58	09/22/10	Aqueous	Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Total Alkalinity QA Calculations Arsenic Speciation Selenium-IV, Total CVAA Selenium Prep E300.0 Anions Nitrogen, Ammonia Nitrogen, Nitrate + Nitrite pH Metals Preparation by EPA 200.2 Gross Alpha minus Rn222 and Uranium Lead 210, Total Radium 226, Total Radium 228, Total Thorium, Isotopic Solids, Total Dissolved E624 Purgeable Organics

This report was prepared by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:

CLIENT: United Nuclear Corporation
Project: Not Indicated
Sample Delivery Group: C10090864

Report Date: 10/11/10

CASE NARRATIVE

BRANCH LABORATORY SUBCONTRACT ANALYSIS
Tests associated with analyst identified as ELI-H were subcontracted to Energy Laboratories, 3161 E.Lyndale Ave., Helena, MT, EPA Number MT00945.

Tests associated with analyst identified as ELI-CS were subcontracted to Energy Laboratories, 415 Graham Rd., College Station, TX, EPA Number TX01520.

LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: Not Indicated
Lab ID: C10090864-001
Client Sample ID: Domestic Water Well

Report Date: 10/11/10
Collection Date: 09/20/10 13:58
DateReceived: 09/22/10
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Bicarbonate as HCO3	246	mg/L		5		A2320 B	09/22/10 17:21 / ja
Calcium	13	mg/L		1		E200.7	09/23/10 15:06 / cp
Chloride	151	mg/L	D	2		E300.0	09/22/10 19:49 / ljl
Magnesium	3	mg/L		1		E200.7	09/23/10 15:06 / cp
Nitrogen, Ammonia as N	0.49	mg/L		0.05		A4500-NH3 G	09/22/10 21:11 / ljl
Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.1		E353.2	09/22/10 15:19 / ljl
Potassium	3	mg/L		1		E200.7	09/23/10 15:06 / cp
Sodium	806	mg/L		1		E200.7	09/23/10 15:06 / cp
Sulfate	1270	mg/L	D	8		E300.0	09/22/10 19:49 / ljl
PHYSICAL PROPERTIES							
pH	8.80	s.u.		0.01		A4500-H B	09/22/10 15:12 / lr
Solids, Total Dissolved TDS @ 180 C	2240	mg/L		10		A2540 C	09/23/10 10:55 / lr
METALS - TOTAL							
Aluminum	ND	mg/L		0.1		E200.7	09/28/10 23:07 / cp
Beryllium	ND	mg/L		0.01		E200.8	09/28/10 02:45 / sml
Cadmium	ND	mg/L		0.005		E200.8	09/24/10 18:39 / sml
Cobalt	ND	mg/L		0.01		E200.8	09/24/10 18:39 / sml
Lead	ND	mg/L		0.05		E200.8	09/24/10 18:39 / sml
Manganese	0.07	mg/L		0.01		E200.8	09/24/10 18:39 / sml
Molybdenum	ND	mg/L		0.1		E200.8	09/24/10 18:39 / sml
Nickel	ND	mg/L		0.05		E200.8	09/28/10 02:45 / sml
Uranium	0.0030	mg/L		0.0003		E200.8	09/24/10 18:39 / sml
Vanadium	ND	mg/L		0.1		E200.8	09/24/10 18:39 / sml
METALS - SPECIATED							
Arsenic-III	ND	mg/L		0.001		E1632AM	09/24/10 15:36 / eli-h
Selenium-IV	ND	mg/L		0.001		A3114 B	09/28/10 09:56 / rdw
RADIONUCLIDES - TOTAL							
Gross Alpha minus Rn & U	1.7	pCi/L				E900.1	09/27/10 15:46 / ep
Gross Alpha minus Rn & U Precision (±)	0.5	pCi/L				E900.1	09/27/10 15:46 / ep
Gross Alpha minus Rn & U MDC	0.5	pCi/L				E900.1	09/27/10 15:46 / ep
Lead 210	2.7	pCi/L				E909.0M	10/05/10 12:13 / eli-cs
Lead 210 precision (±)	1.2	pCi/L				E909.0M	10/05/10 12:13 / eli-cs
Lead 210 MDC	1.9	pCi/L				E909.0M	10/05/10 12:13 / eli-cs
Radium 226	0.92	pCi/L				E903.0	10/04/10 12:38 / dmf
Radium 226 precision (±)	0.25	pCi/L				E903.0	10/04/10 12:38 / dmf
Radium 226 MDC	0.21	pCi/L				E903.0	10/04/10 12:38 / dmf
Radium 228	1.7	pCi/L				RA-05	09/28/10 09:18 / plj
Radium 228 precision (±)	0.58	pCi/L				RA-05	09/28/10 09:18 / plj
Radium 228 MDC	0.84	pCi/L				RA-05	09/28/10 09:18 / plj

Report Definitions:

RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
U - Not detected at minimum detectable concentration

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: Not Indicated
Lab ID: C10090864-001
Client Sample ID: Domestic Water Well

Report Date: 10/11/10
Collection Date: 09/20/10 13:58
DateReceived: 09/22/10
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES - TOTAL							
Thorium 230	0.06	pCi/L	U			E907.0	09/27/10 13:31 / dmf
Thorium 230 precision (±)	0.07	pCi/L				E907.0	09/27/10 13:31 / dmf
Thorium 230 MDC	0.1	pCi/L				E907.0	09/27/10 13:31 / dmf
DATA QUALITY							
A/C Balance (± 5)	1.49	%				Calculation	09/30/10 12:39 / kbh
Anions	35.0	meq/L				Calculation	09/30/10 12:39 / kbh
Cations	36.1	meq/L				Calculation	09/30/10 12:39 / kbh
Solids, Total Dissolved Calculated	2390	mg/L				Calculation	09/30/10 12:39 / kbh
TDS Balance (0.80 - 1.20)	0.940					Calculation	09/30/10 12:39 / kbh
VOLATILE ORGANIC COMPOUNDS							
Bromodichloromethane	ND	ug/L		1.0		E624	09/29/10 06:12 / jlr
Bromoform	ND	ug/L		1.0		E624	09/29/10 06:12 / jlr
Chlorodibromomethane	ND	ug/L		1.0		E624	09/29/10 06:12 / jlr
Chloroform	ND	ug/L		1.0		E624	09/29/10 06:12 / jlr
Trihalomethanes, Total	ND	ug/L		1.0		E624	09/29/10 06:12 / jlr
Surr: 1,2-Dichlorobenzene-d4	98.0	%REC		80-120		E624	09/29/10 06:12 / jlr
Surr: Dibromofluoromethane	98.0	%REC		80-120		E624	09/29/10 06:12 / jlr
Surr: p-Bromofluorobenzene	98.0	%REC		80-120		E624	09/29/10 06:12 / jlr
Surr: Toluene-d8	96.0	%REC		80-120		E624	09/29/10 06:12 / jlr

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2320 B										Batch: R137570
Sample ID: MBLK	2	Method Blank				Run: MANTECH_100922B				09/22/10 16:56
Alkalinity, Total as CaCO3		ND	mg/L	1						
Bicarbonate as HCO3		1	mg/L	1						
Sample ID: LCS1		Laboratory Control Sample				Run: MANTECH_100922B				09/22/10 17:12
Alkalinity, Total as CaCO3		210	mg/L	5.0	105	90	110			
Sample ID: C10090851-003ADUP		Sample Duplicate				Run: MANTECH_100922B				09/22/10 17:44
Alkalinity, Total as CaCO3		69.0	mg/L	5.0				0.7	10	
Sample ID: C10090859-001AMS		Sample Matrix Spike				Run: MANTECH_100922B				09/22/10 19:38
Alkalinity, Total as CaCO3		1680	mg/L	5.0	106	80	120			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2540 C								Batch: 100923_1_SLDS-TDS-W		
Sample ID: MBLK1_100923	Method Blank					Run: BAL-1_100923A			09/23/10 10:48	
Solids, Total Dissolved TDS @ 180 C		ND	mg/L	10						
Sample ID: LCS1_100923	Laboratory Control Sample					Run: BAL-1_100923A			09/23/10 10:48	
Solids, Total Dissolved TDS @ 180 C		995	mg/L	10	99	90	110			
Sample ID: C10090804-002AMS	Sample Matrix Spike					Run: BAL-1_100923A			09/23/10 10:51	
Solids, Total Dissolved TDS @ 180 C		4080	mg/L	10	103	90	110			
Sample ID: C10090804-002AMSD	Sample Matrix Spike Duplicate					Run: BAL-1_100923A			09/23/10 10:51	
Solids, Total Dissolved TDS @ 180 C		4030	mg/L	10	102	90	110	1.4	10	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A3114 B										Batch: 27612
Sample ID: MB-27612		Method Blank				Run: CVAA-C202_100928D				09/28/10 14:57
Selenium		ND	mg/L	0.0003						
Sample ID: LCS-27612		Laboratory Control Sample				Run: CVAA-C202_100928D				09/28/10 14:59
Selenium		0.0547	mg/L	0.0010	109	90	110			
Sample ID: C10090864-001BMS		Sample Matrix Spike				Run: CVAA-C202_100928D				09/28/10 15:03
Selenium		0.0558	mg/L	0.0010	112	85	115			
Sample ID: C10090864-001BMSD		Sample Matrix Spike Duplicate				Run: CVAA-C202_100928D				09/28/10 15:06
Selenium		0.0562	mg/L	0.0010	112	85	115	0.7	15	

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A4500-H B										Analytical Run: ORION555A-2_100922B
Sample ID: ICV1_100922_2		Initial Calibration Verification Standard								09/22/10 14:22
pH		6.85	s.u.	0.010	100	98	102			
Method: A4500-H B										Batch: 100922_2_PH-W_555A-2
Sample ID: C10090851-005ADUP		Sample Duplicate				Run: ORION555A-2_100922B				09/22/10 14:57
pH		7.64	s.u.	0.010				0.4	10	

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A4500-NH3 G										Batch: R137582
Sample ID: MBLK-1	Method Blank					Run: TECHNICON_100922B				09/22/10 21:03
Nitrogen, Ammonia as N		ND	mg/L	0.02						
Sample ID: LCS-2	Laboratory Control Sample					Run: TECHNICON_100922B				09/22/10 21:05
Nitrogen, Ammonia as N		19.2	mg/L	0.50	96	80	120			
Sample ID: C10090831-002EMS	Sample Matrix Spike					Run: TECHNICON_100922B				09/22/10 21:17
Nitrogen, Ammonia as N		2.22	mg/L	0.050	105	80	120			
Sample ID: C10090831-002EMSD	Sample Matrix Spike Duplicate					Run: TECHNICON_100922B				09/22/10 21:19
Nitrogen, Ammonia as N		2.18	mg/L	0.050	103	80	120	1.8	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated
Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E1632AM										Batch: H_R65633
Sample ID: AS100924-LFB		Laboratory Control Sample				Run: SUB-H65633				09/24/10 15:29
Arsenic-III		45.4	ug/L	5.0	91	90	110			
Sample ID: C10090864-001E		Sample Matrix Spike				Run: SUB-H65633				09/24/10 15:42
Arsenic-III		52.0	ug/L	5.0	104	55	146			
Sample ID: C10090864-001E		Sample Matrix Spike Duplicate				Run: SUB-H65633				09/24/10 15:48
Arsenic-III		45.5	ug/L	5.0	91	55	146	13	20	
Sample ID: ICB_13r		Method Blank				Run: SUB-H65633				09/24/10 14:55
Arsenic-III		ND	ug/L	0.3						

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration
ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.7										Batch: R137628
Sample ID: MB-100923A	4	Method Blank				Run: ICP2-C_100923A				09/23/10 11:00
Calcium		ND	mg/L	0.2						
Magnesium		ND	mg/L	0.05						
Potassium		ND	mg/L	0.02						
Sodium		ND	mg/L	0.3						
Sample ID: LFB-100923A	4	Laboratory Fortified Blank				Run: ICP2-C_100923A				09/23/10 11:04
Calcium		49.3	mg/L	0.50	99	85	115			
Magnesium		49.5	mg/L	0.50	99	85	115			
Potassium		44.3	mg/L	0.50	89	85	115			
Sodium		49.0	mg/L	0.50	98	85	115			
Sample ID: C10090529-001BMS2	4	Sample Matrix Spike				Run: ICP2-C_100923A				09/23/10 15:50
Calcium		131	mg/L	1.0	96	70	130			
Magnesium		104	mg/L	1.0	94	70	130			
Potassium		97.9	mg/L	1.0	92	70	130			
Sodium		311	mg/L	1.0	98	70	130			
Sample ID: C10090529-001BMSD	4	Sample Matrix Spike Duplicate				Run: ICP2-C_100923A				09/23/10 15:54
Calcium		130	mg/L	1.0	95	70	130	1.1	20	
Magnesium		106	mg/L	1.0	96	70	130	1.9	20	
Potassium		97.1	mg/L	1.0	91	70	130	0.8	20	
Sodium		315	mg/L	1.0	101	70	130	1.2	20	
Method: E200.7										Batch: 27551
Sample ID: MB-27551		Method Blank				Run: ICP2-C_100928A				09/28/10 22:51
Aluminum		ND	mg/L	0.01						
Sample ID: LCS3-27551		Laboratory Control Sample				Run: ICP2-C_100928A				09/28/10 22:55
Aluminum		2.60	mg/L	0.10	104	85	115			
Sample ID: C10090864-001CMS3		Sample Matrix Spike				Run: ICP2-C_100928A				09/28/10 23:11
Aluminum		2.78	mg/L	0.10	107	70	130			
Sample ID: C10090864-001CMSD		Sample Matrix Spike Duplicate				Run: ICP2-C_100928A				09/28/10 23:16
Aluminum		2.60	mg/L	0.10	100	70	130	6.9	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: United Nuclear Corporation **Report Date:** 10/11/10
Project: Not Indicated **Work Order:** C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8										Batch: 27551
Sample ID: MB-27551	7	Method Blank				Run: ICPMS4-C_100924A				09/24/10 17:33
Cadmium		4E-05	mg/L	4E-05						
Cobalt		ND	mg/L	4E-05						
Lead		5E-05	mg/L	5E-05						
Manganese		0.0001	mg/L	2E-05						
Molybdenum		0.0010	mg/L	0.00010						
Uranium		ND	mg/L	4E-05						
Vanadium		0.004	mg/L	4E-05						
Sample ID: LCS3-27551	7	Laboratory Control Sample				Run: ICPMS4-C_100924A				09/24/10 18:07
Cadmium		0.268	mg/L	0.010	107	85	115			
Cobalt		0.499	mg/L	0.010	100	85	115			
Lead		0.521	mg/L	0.050	104	85	115			
Manganese		2.39	mg/L	0.010	96	85	115			
Molybdenum		0.519	mg/L	0.10	104	85	115			
Uranium		0.557	mg/L	0.00030	111	85	115			
Vanadium		0.477	mg/L	0.10	95	85	115			
Sample ID: C10090864-001CMS3	7	Sample Matrix Spike				Run: ICPMS4-C_100924A				09/24/10 18:46
Cadmium		0.242	mg/L	0.010	97	70	130			
Cobalt		0.514	mg/L	0.010	103	70	130			
Lead		0.542	mg/L	0.050	108	70	130			
Manganese		2.56	mg/L	0.010	100	70	130			
Molybdenum		0.549	mg/L	0.10	109	70	130			
Uranium		0.609	mg/L	0.00030	121	70	130			
Vanadium		0.527	mg/L	0.10	102	70	130			
Sample ID: C10090864-001CMSD	7	Sample Matrix Spike Duplicate				Run: ICPMS4-C_100924A				09/24/10 18:53
Cadmium		0.240	mg/L	0.010	96	70	130	0.8	20	
Cobalt		0.518	mg/L	0.010	104	70	130	0.9	20	
Lead		0.545	mg/L	0.050	109	70	130	0.4	20	
Manganese		2.59	mg/L	0.010	101	70	130	1.1	20	
Molybdenum		0.546	mg/L	0.10	109	70	130	0.4	20	
Uranium		0.612	mg/L	0.00030	122	70	130	0.4	20	
Vanadium		0.523	mg/L	0.10	101	70	130	0.9	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8										Batch: 27551
Sample ID: MB-27551	2	Method Blank				Run: ICPMS4-C_100927A				09/28/10 02:18
Beryllium		ND	mg/L	3E-05						
Nickel		9E-05	mg/L	4E-05						
Sample ID: LCS3-27551	2	Laboratory Control Sample				Run: ICPMS4-C_100927A				09/28/10 02:24
Beryllium		0.263	mg/L	0.010	105	85	115			
Nickel		0.554	mg/L	0.050	111	85	115			
Sample ID: C10090864-001CMS3	2	Sample Matrix Spike				Run: ICPMS4-C_100927A				09/28/10 02:52
Beryllium		0.227	mg/L	0.010	91	70	130			
Nickel		0.528	mg/L	0.050	105	70	130			
Sample ID: C10090864-001CMSD	2	Sample Matrix Spike Duplicate				Run: ICPMS4-C_100927A				09/28/10 03:26
Beryllium		0.233	mg/L	0.010	93	70	130	2.8	20	
Nickel		0.528	mg/L	0.050	105	70	130	0	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E300.0										Batch: R137577
Sample ID: LCS	2	Laboratory Control Sample				Run: IC2-C_100922A				09/22/10 11:53
Chloride		9.40	mg/L	1.0	94	90	110			
Sulfate		37.4	mg/L	1.0	93	90	110			
Sample ID: MBLK	2	Method Blank				Run: IC2-C_100922A				09/22/10 12:07
Chloride		ND	mg/L	0.06						
Sulfate		ND	mg/L	0.2						
Sample ID: C10090812-001AMS	2	Sample Matrix Spike				Run: IC2-C_100922A				09/22/10 12:51
Chloride		989	mg/L	2.0		80	120			A
Sulfate		445	mg/L	8.0	97	80	120			
Sample ID: C10090812-001AMSD	2	Sample Matrix Spike Duplicate				Run: IC2-C_100922A				09/22/10 13:05
Chloride		986	mg/L	2.0		80	120	0.3	20	A
Sulfate		445	mg/L	8.0	97	80	120	0	20	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E353.2									Batch: R137559	
Sample ID: MBLK-1	Method Blank					Run: TECHNICON_100922A			09/22/10 12:19	
Nitrogen, Nitrate+Nitrite as N		ND	mg/L	0.04						
Sample ID: LCS-2	Laboratory Control Sample					Run: TECHNICON_100922A			09/22/10 12:22	
Nitrogen, Nitrate+Nitrite as N		2.43	mg/L	0.10	97	90	110			
Sample ID: C10090689-007DMS	Sample Matrix Spike					Run: TECHNICON_100922A			09/22/10 12:37	
Nitrogen, Nitrate+Nitrite as N		2.66	mg/L	0.10	99	90	110			
Sample ID: C10090689-007DMSD	Sample Matrix Spike Duplicate					Run: TECHNICON_100922A			09/22/10 12:39	
Nitrogen, Nitrate+Nitrite as N		2.68	mg/L	0.10	101	90	110	0.7	10	

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E624										Batch: R137927
Sample ID: 092810_LCS_4	9	Laboratory Control Sample				Run: SATURNCA_100928C				09/28/10 13:43
Bromodichloromethane		9.20	ug/L	1.0	92	70	130			
Bromoform		10.3	ug/L	1.0	103	70	130			
Chlorodibromomethane		10.6	ug/L	1.0	106	70	130			
Chloroform		9.44	ug/L	1.0	94	70	130			
Trihalomethanes, Total		39.6	ug/L	1.0	99	70	130			
Surr: 1,2-Dichlorobenzene-d4				1.0	101	80	120			
Surr: Dibromofluoromethane				1.0	100	80	120			
Surr: p-Bromofluorobenzene				1.0	98	80	120			
Surr: Toluene-d8				1.0	93	80	120			
Sample ID: 092810_MBLK_6	9	Method Blank				Run: SATURNCA_100928C				09/28/10 14:56
Bromodichloromethane		ND	ug/L	1.0						
Bromoform		ND	ug/L	1.0						
Chlorodibromomethane		ND	ug/L	1.0						
Chloroform		ND	ug/L	1.0						
Trihalomethanes, Total		ND	ug/L	1.0						
Surr: 1,2-Dichlorobenzene-d4				1.0	97	80	120			
Surr: Dibromofluoromethane				1.0	97	80	120			
Surr: p-Bromofluorobenzene				1.0	92	80	120			
Surr: Toluene-d8				1.0	90	80	120			
Sample ID: C10090864-001HMS	9	Sample Matrix Spike				Run: SATURNCA_100928C				09/29/10 08:04
Bromodichloromethane		106	ug/L	10	106	70	130			
Bromoform		86.8	ug/L	10	87	70	130			
Chlorodibromomethane		114	ug/L	10	114	70	130			
Chloroform		103	ug/L	10	103	70	130			
Trihalomethanes, Total		410	ug/L	10	102	70	130			
Surr: 1,2-Dichlorobenzene-d4				1.0	99	80	120			
Surr: Dibromofluoromethane				1.0	96	80	120			
Surr: p-Bromofluorobenzene				1.0	100	80	120			
Surr: Toluene-d8				1.0	98	80	120			
Sample ID: C10090864-001HMSD	9	Sample Matrix Spike Duplicate				Run: SATURNCA_100928C				09/29/10 08:40
Bromodichloromethane		103	ug/L	10	103	70	130	3.1	20	
Bromoform		104	ug/L	10	104	70	130	18	20	
Chlorodibromomethane		109	ug/L	10	109	70	130	4.3	20	
Chloroform		102	ug/L	10	102	70	130	1.2	20	
Trihalomethanes, Total		418	ug/L	10	104	70	130	1.9	20	
Surr: 1,2-Dichlorobenzene-d4				1.0	99	80	120			
Surr: Dibromofluoromethane				1.0	97	80	120			
Surr: p-Bromofluorobenzene				1.0	103	80	120			
Surr: Toluene-d8				1.0	98	80	120			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E900.1										Batch: GA-0360
Sample ID: MB-GA-0360	3	Method Blank				Run: G5000W_100924A				09/27/10 14:12
Gross Alpha minus Rn & U		0.1	pCi/L							U
Gross Alpha minus Rn & U Precision (±)		0.3	pCi/L							
Gross Alpha minus Rn & U MDC		0.5	pCi/L							
Sample ID: LCS-GA-0360		Laboratory Control Sample				Run: G5000W_100924A				09/27/10 14:12
Gross Alpha minus Rn & U		8.43	pCi/L		32	70	130			S
- LCS response is outside of the acceptance range for this analysis. Since the MB, MS, and MSD are acceptable the batch is approved.										
Sample ID: C10090851-007FMS		Sample Matrix Spike				Run: G5000W_100924A				09/27/10 15:46
Gross Alpha minus Rn & U		28.4	pCi/L		103	70	130			
Sample ID: C10090851-007FMSD		Sample Matrix Spike Duplicate				Run: G5000W_100924A				09/27/10 15:46
Gross Alpha minus Rn & U		28.2	pCi/L		103	70	130	0.7	23.6	

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration
U - Not detected at minimum detectable concentration
ND - Not detected at the reporting limit.
S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E903.0									Batch: RA226-4829	
Sample ID: C10090619-011DMS		Sample Matrix Spike				Run: BERTHOLD 770-2_100924A			10/04/10 12:38	
Radium 226		21	pCi/L		124	70	130			
Sample ID: C10090619-011DMSD		Sample Matrix Spike Duplicate				Run: BERTHOLD 770-2_100924A			10/04/10 12:38	
Radium 226		20	pCi/L		118	70	130	3.8	24.5	
Sample ID: MB-RA226-4829	3	Method Blank				Run: BERTHOLD 770-2_100924A			10/04/10 14:10	
Radium 226		-0.1	pCi/L							U
Radium 226 precision (±)		0.09	pCi/L							
Radium 226 MDC		0.2	pCi/L							
Sample ID: LCS-RA226-4829		Laboratory Control Sample				Run: BERTHOLD 770-2_100924A			10/04/10 14:10	
Radium 226		11	pCi/L		141	70	130			S

- LCS response is outside of the acceptance range for this analysis. Since the MB, MS, and MSD are acceptable the batch is approved.

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration
U - Not detected at minimum detectable concentration
ND - Not detected at the reporting limit.
S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E907.0										Batch: RA-TH-ISO-1250
Sample ID: LCS-RA-TH-ISO-1250		Laboratory Control Sample				Run: EGG-ORTEC_100923A				09/27/10 13:31
Thorium 230		5.8	pCi/L		110	70	130			
Sample ID: C10090852-001DMS		Sample Matrix Spike				Run: EGG-ORTEC_100923A				09/27/10 13:31
Thorium 230		13	pCi/L		104	70	130			
Sample ID: C10090852-001DMSD		Sample Matrix Spike Duplicate				Run: EGG-ORTEC_100923A				09/27/10 13:31
Thorium 230		12	pCi/L		91	70	130	13	40.6	
Sample ID: MB-RA-TH-ISO-1250	3	Method Blank				Run: EGG-ORTEC_100923A				09/27/10 13:31
Thorium 230		0.008	pCi/L							U
Thorium 230 precision (±)		0.06	pCi/L							
Thorium 230 MDC		0.1	pCi/L							

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E909.0M									Batch: T_PB-210-0019	
Sample ID: MB-PB-210-0019	3	Method Blank				Run: SUB-T37150			10/04/10 23:05	
Lead 210		ND	pCi/L							U
Lead 210 precision (±)		1	pCi/L							
Lead 210 MDC		2	pCi/L							
Sample ID: LCS-PB-210-0019		Laboratory Control Sample				Run: SUB-T37150			10/05/10 03:28	
Lead 210		59	pCi/L		107	70	130			
Sample ID: TAP WATER-MS		Sample Matrix Spike				Run: SUB-T37150			10/05/10 07:51	
Lead 210		130	pCi/L		119	70	130			
Sample ID: TAP WATER-MSD		Sample Matrix Spike Duplicate				Run: SUB-T37150			10/05/10 10:02	
Lead 210		140	pCi/L		124	70	130	4.1	15.7	

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

QA/QC Summary Report

Client: United Nuclear Corporation
Project: Not Indicated

Report Date: 10/11/10
Work Order: C10090864

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: RA-05										Batch: RA228-3398
Sample ID: LCS-228-RA226-4829		Laboratory Control Sample				Run: TENNELEC-3_100924A				09/28/10 09:18
Radium 228		7.43	pCi/L		94	70	130			
Sample ID: MB-RA226-4829	3	Method Blank				Run: TENNELEC-3_100924A				09/28/10 09:18
Radium 228		0.5	pCi/L							U
Radium 228 precision (±)		0.6	pCi/L							
Radium 228 MDC		0.9	pCi/L							
Sample ID: C10090793-001GMS		Sample Matrix Spike				Run: TENNELEC-3_100924A				09/28/10 09:18
Radium 228		14.7	pCi/L		95	70	130			
Sample ID: C10090793-001GMSD		Sample Matrix Spike Duplicate				Run: TENNELEC-3_100924A				09/28/10 09:18
Radium 228		13.6	pCi/L		88	70	130	7.8	30.5	

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

Workorder Receipt Checklist

United Nuclear Corporation

C10090864

Login completed by: Corinne Wagner

Reviewed by: BL2000\tedwards

Reviewed Date: 9/22/2010

Date Received: 9/22/2010

Received by: ha

Carrier name: FedEx

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature:	5°C On Ice		
Water - VOA vials have zero headspace?	Yes ☑	No ☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Contact and Corrective Action Comments:

None

UNITED NUCLEAR CORPORATION
(State Road 566 - 21 Miles NE of Gallup)
P.O. Box 3077
Gallup, NM 87305-3077
505-905-6651

CHAIN OF CUSTODY

Energy Laboratories, Inc.
Laboratory

2393 N. Salt Creek Highway
Address

Casper WY 82601
City State Zip

307-235-0515
Phone No.

All analysis will be performed in accordance with EPA approved procedures and/or 15th Edition of Standard Methods

UNC Submittal No. TE- 7-9-2010

Sample Description	Date	Time	Filter 0.45u	PRESERVATION plain	HNO$_3$	H$_2$SO$_4$	Na$_2$S$_2$O$_3$	HCl	Preserved By	Analysis Required (For all samples listed)
DOMESTIC	9-20-10	1358	✓ mc	✓ mc	✓ mc	✓ mc	✓ mc	✓ mc	M. Chischilly	As, Be, Ca, Cd, Cl, HCO_3,
WATER WELL										K, Mg, Mn, Na, NH_4, Ni,
										NO_3, Pb, Pb-210, pH, Se,
										SO_4, TDS, Th-230, U, V,
										Chloroform, Gross
										Alpha (-) U & Rn,
										Combined Ra-226 & Ra-228, Al,
										Co, Mo & Total Trihalomethanes (TTHMs)
										Note: Please report result
										as soon as possible
										(Rush Priority).

Sampled by: Max Chischilly Jr.
Dispatched by:
Carrier: FedEx-Priority Overnight
1 iced cooler
Method of Shipment

Received by Ronald B. Sam
9-21-10 Date
12:10 Time

9-20-10 Date
1400 Time

H Ackerman
Lab Receipt Signature
9/22/10 Date
09:00 Time

The above analysis to be performed is authorized by:
Signature
9-21-2010
Date

Express
5°C
Seals

SFUND RECORDS CTR
2091990

Mill Well
6/18/02
8/12/76
'84
'92
'93

Mine Well
'79
'80

MWH

To: Roy Blickwedel
Larry Bush

Date: August 3, 2004

From: Jed Thompson

Job No: 1010139.011802

Subject: Groundwater Quality in the Westwater Canyon Member at the Northeast Church Rock Mine

---

This memorandum was prepared in response to comments to the Northeast Church Rock (NECR) Mine Closeout Plan received from the State of New Mexico, Mining and Minerals Division (MMD) in their memo dated June 23, 2004. This memorandum presents available information about:

- Regional groundwater quality within the Westwater Canyon Member, Dakota Sandstone and Gallup Formation near the NECR Mine site (the Site),
- Historic groundwater quality analyses of NECR mine water; and,
- Comparisons of regional and historic water quality data to the groundwater sample collected at the Site on May 17, 2004.

HISTORIC AND REGIONAL DATA

Historic and regional groundwater quality data sources used in this report are listed below.

- *Water Quality Impacts of Uranium Mining and Milling Activities in the Grants Mineral Belt, New Mexico.* (EPA, 1975)
- *Water Quality Data for Discharges from New Mexico Uranium Mines and Mills.* (NMEID, 1980)
- *Hydrogeology and Water Resources of San Juan Basin, New Mexico. Hydrologic Report 6.* (Stone, 1983)
- *Reclamation Engineering Services, Geohydrologic Report.* (Canonie, 1987)
- *Five-year Review Report, United Nuclear Corporation Ground Water Operable Unit McKinley County, New Mexico.* (USEPA, 1998)
- Discharge Permit (DP) 63 sampling results

The primary aquifers in the Church Rock region are the Dakota Sandstone and Westwater Canyon Member. Higher geologic units, including the Gallup Formation and the alluvium are not historic aquifers (Canonie, 1987).

The alluvium and Gallup Formation at the Northeast Church Rock mine and mill were unsaturated. Occurrences of groundwater in both units are derived from mine dewatering seepage from multiple mines (USEPA, 1998), and are hydraulically separated from the Dakota Sandstone and Westwater Canyon Member by the Upper D-Cross Tongue Member of the Mancos Shale which is a very

effective aquiclude (Canonie, 1987). Minewater that seeped into the alluvium and Gallup Formation is being regulated and addressed under the Church Rock Mill Superfund site under NRC Source Materials License SUA-1475. Minewater was discharged to Pipeline Arroyo in accordance with the Federal Clean Water Act under NPDES Permit Number NM0020401.

Groundwater flows downdip in bedrock (Canonie, 1987). The local dip and groundwater flow direction in the Gallup Formation, Dakota Sandstone and Westwater Canyon Member is to the north (Stone, 1983).

Available analytical data for Site minewater are summarized in Table 1 and listed in Attachment 1. All data are reported results from DP-63 for minewater before comingling with decant from sand backfill. These data represent the ambient groundwater quality in the Westwater Canyon Member at the Site.

TABLE 1
NECR MINEWATER QUALITY DATA SUMMARY[1]

	Data Points	Average[2]	Max	Min	St Dev	NMED Std.[3]
MAJOR IONS						
Alkalinity (CaCO3)	2	179.5	232	127	--	
Bicarbonate	1	155	155	155	--	
Calcium	2	20.55	31	10.1	--	
Chloride	13	7.6	14.9	5	3.0	250
Fluoride	11	0.50	0.55	0.42	0.03	1.6
Magnesium	2	2.6	4.2	1	--	
Nitrogen, Nitrate (as N)	11	1.7	13	0.1	3.7	10
Potassium	2	2.1	2.2	1.9	--	
Sodium	6	282.9	1009.1	10	410.5	
Sulfate	13	93	272	70	55	600
PHYSICAL PROPERTIES						
TDS	13	426.9	552	370.5	61.3	1000
pH[4]	13	7.88	8.45	6.70	0.52	6 to 9
Conductivity[5]	5	683	950	485	171	
METAL – DISSOLVED						
Aluminum	13	0.5	2.8	0.1	0.7	5.0
Arsenic	10	0.0102	0.0118	0.0100	0.0006	0.1
Barium	13	0.20	0.70	0.01	0.18	1.0
Boron	10	0.20	0.30	0.01	0.09	0.75
Cadmium	11	0.003	0.010	0.001	0.004	0.01
Chromium	11	0.011	0.041	0.001	0.015	0.05
Cobalt	11	0.0146	0.0500	0.0001	0.0137	0.05
Copper	11	0.0066	0.0235	0.001	0.0075	1.0
Iron	13	0.85	4.9	0.01	1.46	1.0
Lead	11	0.01	0.05	0.001	0.020	0.05
Manganese	13	0.112	1.3	0.002	0.357	0.2
Mercury	11	0.0005	0.001	0.0004	0.0002	0.002
Molybdenum	11	0.012	0.04	0.001	0.017	1.0
Nickel	11	0.0250	0.1349	0.01	0.0376	0.2
Selenium	12	0.031	0.05	0.004	0.013	0.05
Silver	10	0.0095	0.01	0.0054	0.0015	0.05
Uranium	13	2.082	3.71	0.725	0.936	5.0
Vanadium	3	0.1	0.1	0.1	0	
Zinc	13	0.0117	0.02	0.0022	0.0052	10.0
RADIONUCLIDES – DISSOLVED						
Radium-226	13	97.6	490	0.6	125.1	30[6]
Radium-228	12	2.1	5.2	1	1.8	30[6]

Notes:
1. Summary of selected parameters from Attachment 1.
2. All values in mg/L except as otherwise noted
3. Standards for arsenic, cadmium, barium, chromium, fluoride, mercury, nitrate, lead, selenium, silver, and uranium are human health standards
   Standards for chloride, copper, sulfate, TDS, pH, iron, and zinc are secondary domestic water supply standards
   Standards for aluminum, boron, cobalt, manganese, molybdenum, and nickel are for irrigation water
4. pH in standard units
5. Conductivity in uS/cm
6. Combined Radium 226 and 228 cannot exceed 30 pCi/L

There is no groundwater quality data for the Dakota Sandstone near the Site.

Average historic minewater data exceeded standards for radium 226 in the Westwater Canyon Member.

Four wells are located within a one mile radius of the Site. The locations of the wells are shown in Figure 1. The Church Rock Mill Well and NECR-1 Well are completed in the Westwater Canyon Member. The Friendship Well is completed in the Gallup Formation. NR-1 is completed in the alluvium. The Church Rock Mill Well is used as a non-potable water supply for the mine office and to supplement the water in the tailings impoundment evaporation ponds to prevent the pond liner from drying out. NECR-1, NR-1 and the Friendship wells are not currently used. Completion data for these wells are provided in Table 2. The Pipeline Canyon Well mentioned in the Closeout Plan is located approximately 1.5 miles to the northeast of the Permit Boundary.

TABLE 2
WELL COMPLETION DATA

Well Name	Completion Date	Total Depth (ft bgs)	Top of Screen (ft bgs)	Screened Interval (ft)	Completion Unit
Church Rock Mill	6/6/76	1,600	Unk	100	Westwater Canyon
NECR Well	Unk	1,228	Unk	Unk	Westwater Canyon
Friendship	Unk	718	Unk	40	Gallup
NR-1	5/28/91	105	74.6	30.4	Alluvium

CURRENT SITE CONDITIONS

A groundwater sample was collected at the Site on May 17, 2004. The sample was collected from the well located approximately 200 feet south of shaft NECR-1 on the north end of the Site. The sample was collected in accordance with the SOP presented in the Section 27 Closeout Plan.

The sample was collected from approximately the center of the water column in the well. The depth to water was 524.68 feet below the top of casing. The total depth of the vent is 1,230 feet below the top of casing. The sample was collected at approximately 900 feet below the top of casing. The sample was collected using multiple trips with a PVC double ball bailer. The double ball bailer works the same as a single ball bailer, with the balls floating as the bailer is lowered, allowing water to enter and flow through the device freely. When the designated depth is reached, the bailer is hoisted and the balls at the top and bottom of the bailer are seated preventing the water from leaving the bottom of the bailer and preventing water above the bailer from mixing with the water in the bailer.

Sufficient trips were made with the bailer to provide the quantity of water required for NMED and UNC to analyze for the analytes included in the Closeout Plan. Results of the analytical analyses of UNC's samples are provided in Table 3 along with the average minewater quality from Table 1 and the water quality from the Church Rock Mill Well which is also completed in the Westwater Canyon Member. The laboratory report is included in Attachment 2.

Water bailed from the NECR well was black in color and smelled of hydrogen sulfide. The field pH of the sample was 10.2 standard units, and the conductivity was 1800 µmhos/cm at 18.0 degrees Celsius.

As shown in Table 3, the pH and concentrations of alkalinity, sulfate, sodium, TDS, and boron are elevated above average mine water concentrations from the DP-63 monitoring. Several constituents, particularly radium and uranium, are less concentrated currently than when mining was active. pH and alkalinity values in the recent NECR sample are also greater than those seen in the Church Rock Mill Well, while sulfate and sodium concentrations (which make up the bulk of TDS) are less

concentrated. Concentrations of boron and TDS, and the pH exceed NMED standards in the NECR sample.

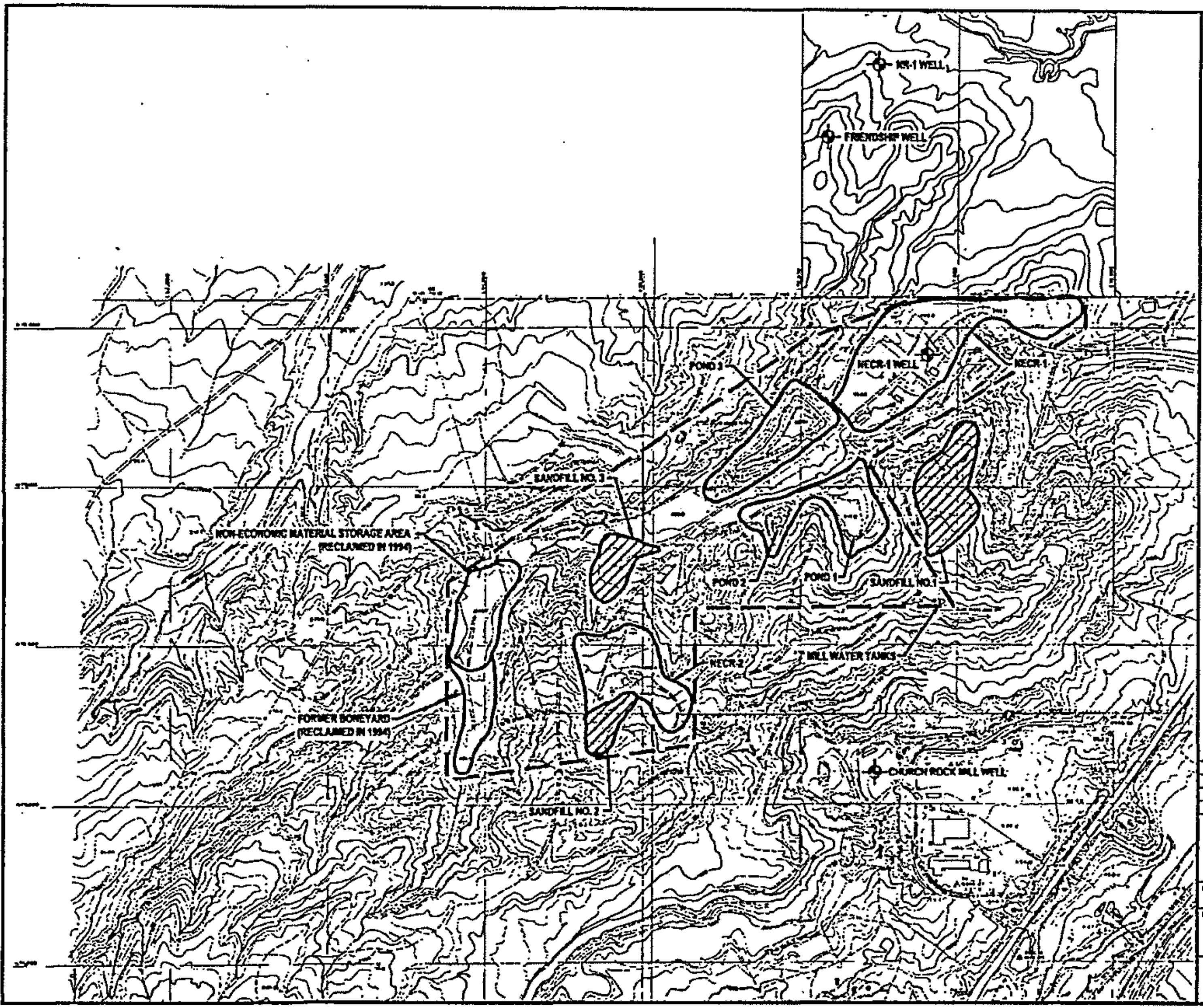
TABLE 3
SECTION 27 MINE WATER ANALYTICAL RESULTS

Constituent	Units	Mill Well 6/18/02[1]	Average Mine Water[2]	NECR Well 5/17/04[3]	NMED Std.[4]
MAJOR IONS					
Alkalinity, Total as $CaCO_3$	mg/L	--	179.5	365	
Bicarbonate	mg/L	225	155	--	
Calcium	mg/L	16.0	20.55	3.38	
Chloride	mg/L	160	7.6	21.8	250
Fluoride	mg/L	--	0.50	0.7	1.6
Magnesium	mg/L	4.2	2.6	0.58	
Nitrate + Nitrite as N	mg/L	<0.10	1.7[5]	<0.10	10.0
Potassium	mg/L	3.5	2.1	5.57	
Sodium	mg/L	644	282.9	388	
Sulfate	mg/L	1100	93	450	600
PHYSICAL PROPERTIES					
TSS	mg/L	--	--	243	
TDS	mg/L	2090	426.9	1150	1000
pH	s.u.	8.34	7.88	9.90	6 to 9
Conductivity	umhos/cm	--	683	1840	
METALS – DISSOLVED					
Aluminum	mg/L	<0.10	0.5	<0.10	5.0
Arsenic	mg/L	<0.001	0.0102	0.001	0.1
Barium	mg/L	--	0.20	0.014	1.0
Beryllium	mg/L	<0.01	--	<0.01	
Boron	mg/L	--	0.20	4.47	0.75
Cadmium	mg/L	<0.005	0.003	<0.01	0.01
Cobalt	mg/L	<0.01	0.0146	<0.01	
Iron	mg/L	--	0.85	0.140	1.0
Lead	mg/L	<0.05	0.01	<0.001	0.05
Manganese	mg/L	0.05	0.112	0.003	
Molybdenum	mg/L	<0.10	0.012	0.056	1.0
Nickel	mg/L	<0.05	0.025	<0.05	
Selenium	mg/L	<0.001	0.031	0.002	0.05
Uranium	mg/L	0.0700	2.082	0.134	5.0
Vanadium	mg/L	<0.10	0.1	<0.005	
RADIONUCLIDES – DISSOLVED					
Gross Alpha	pCi/l	<1	--	93 ± 3.6	
Radium-226	pCi/l	0.7	97.6	2.4 ± 0.5	30[6]
Radium-228	pCi/l	2.7	2.1	<1.0	30[6]

Notes:
1. Samples collected from Church Rock Mill Well as reported in Closeout Plan
2. Average mine water quality as reported in Table 1
3. Sample collected from well located near shaft NECR-1
4. Standards for fluoride, nitrate, arsenic, barium, cadmium, lead, selenium, uranium, and radium are human health standards.
   Standards for chloride, sulfate, TDS, pH, and iron are secondary domestic water supply standards.
   Standards for aluminum, boron and molybdenum are for irrigation water.
5. Value represents nitrate as N
6. Combined Radium 226 and 228 cannot exceed 30 pCi/L

Figures 2 through 6 show the concentration trends for alkalinity, sulfate, TDS, pH and boron. The figures plot the trends over time by data source. All available data is plotted in the graphs.

Elevated values for pH and alkalinity in the recent NECR sample are likely due to the presence of sulfate reducing bacteria (SRB) in the well water, adding alkalinity to the water as they reduce sulfate to sulfide. The presence of SRB's would explain the black coloring and hydrogen sulfide smell of the water bailed from the well. This might also explain why uranium and iron concentrations are lower



LEGEND

— —	PERMIT BOUNDARY
——	FACILITY BOUNDARY (Approx.)
▨	SANDFILL (Subsurface Tailings Placement) Reclaimed under NRC Radioactive Material License
)—(	CULVERT
⊕ NECR-1	WELL LOCATION

N

APPROXIMATE SCALE
0 300' 600'
FEET

UNC
P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT:
NECR GROUNDWATER TECHNICAL MEMORANDUM

DRAWING TITLE:
WELL LOCATIONS

MWH

Sheet 1 Of 1 Sheets

SCALE:
As Shown

FIGURE No.
1

today than during active mining. Uranium is less mobile in reducing environments and iron will react with the sulfide and precipitate as iron sulfide.

The likely role of sulfate-reducing conditions in the current NECR sample chemistry is further supported by the following differences between the NECR sample and the Mill Well:

- Sulfate is about a factor of two less in the NECR sample compared to the Mill Well indicating sulfate reduction,

- Bicarbonate is concentrated in the NECR sample in stoichiometric proportion to sulfate reduction according to the reaction:

$$2\,CH_2O + SO_4^{-2} \;=\; H_2S + 2\,HCO_3^- \,.$$

There is currently no explanation for the elevated concentration of boron in the recent NECR sample. There are no data for boron from the Mill Well.

CONCLUSIONS

Groundwater quality at the Site is within NMED standards with the exception of pH, TDS and boron. Sulfate and TDS concentrations and radium activity at the site have dropped since the peak concentration recorded in 1993 possibly because of sulfate reduction. A sulfate reducing environment would explain the increase in pH and alkalinity seen in the recent NECR sample.

The source of boron in the water is unknown.

Water quality has improved since mining ceased. This is especially true for constituents of greatest concern, radium and uranium. In addition, metals concentrations meet water quality standards. While dissolved solids are greater today than during mining, they are comprised of common ions that do not pose a health risk.

While the pH of the NECR is higher than historic results, it is not recommended that it be considered for abatement. Treatment to reduce pH could produce adverse environmental consequences. Metals and radionuclides are geochemically fixed under current and anticipated conditions; to alter this equilibrium would be to run the risk of mobilizing them.

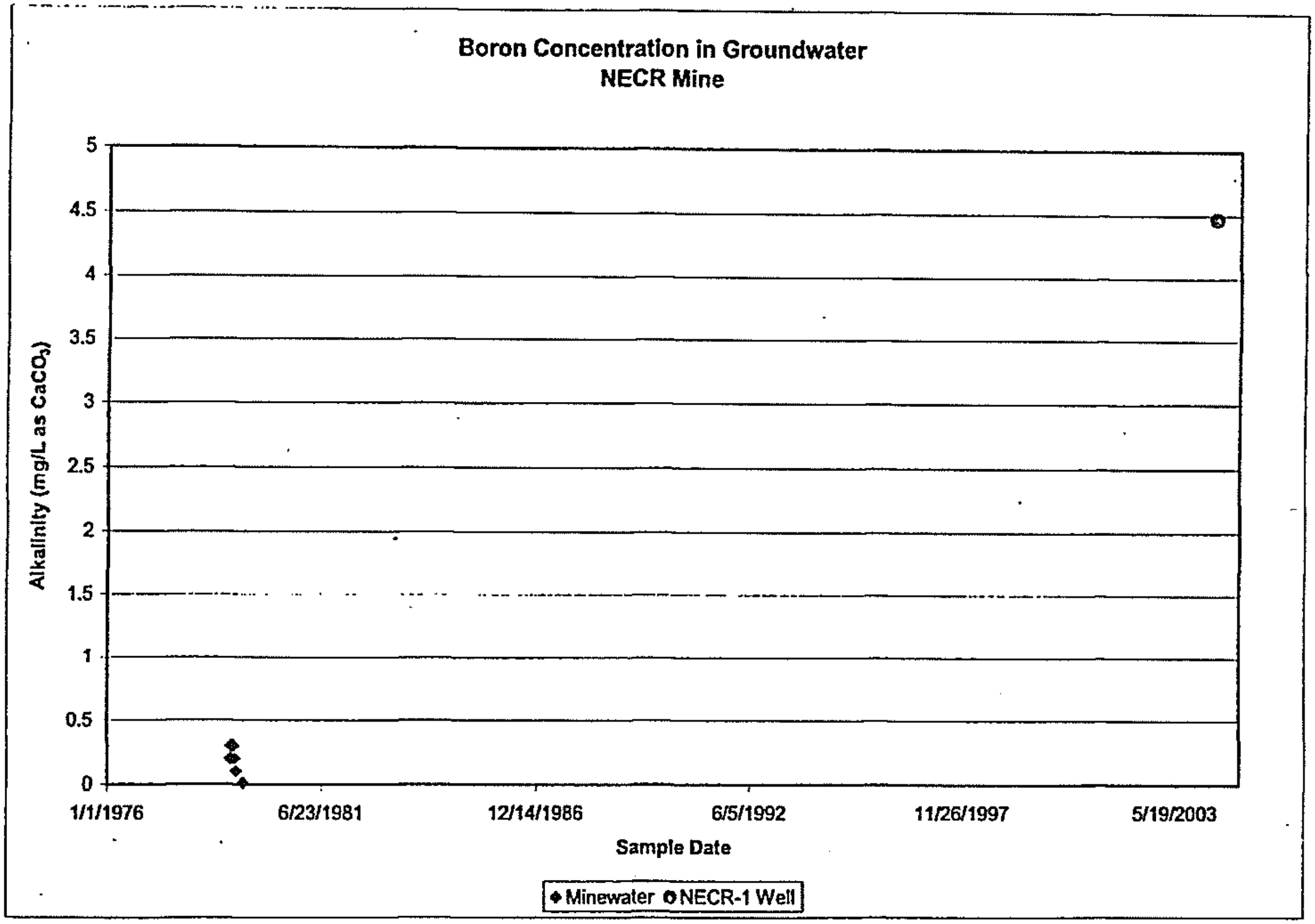


FIGURE 2
ALKALINITY CONCENTRATION IN GROUNDWATER NEAR NECR MINE

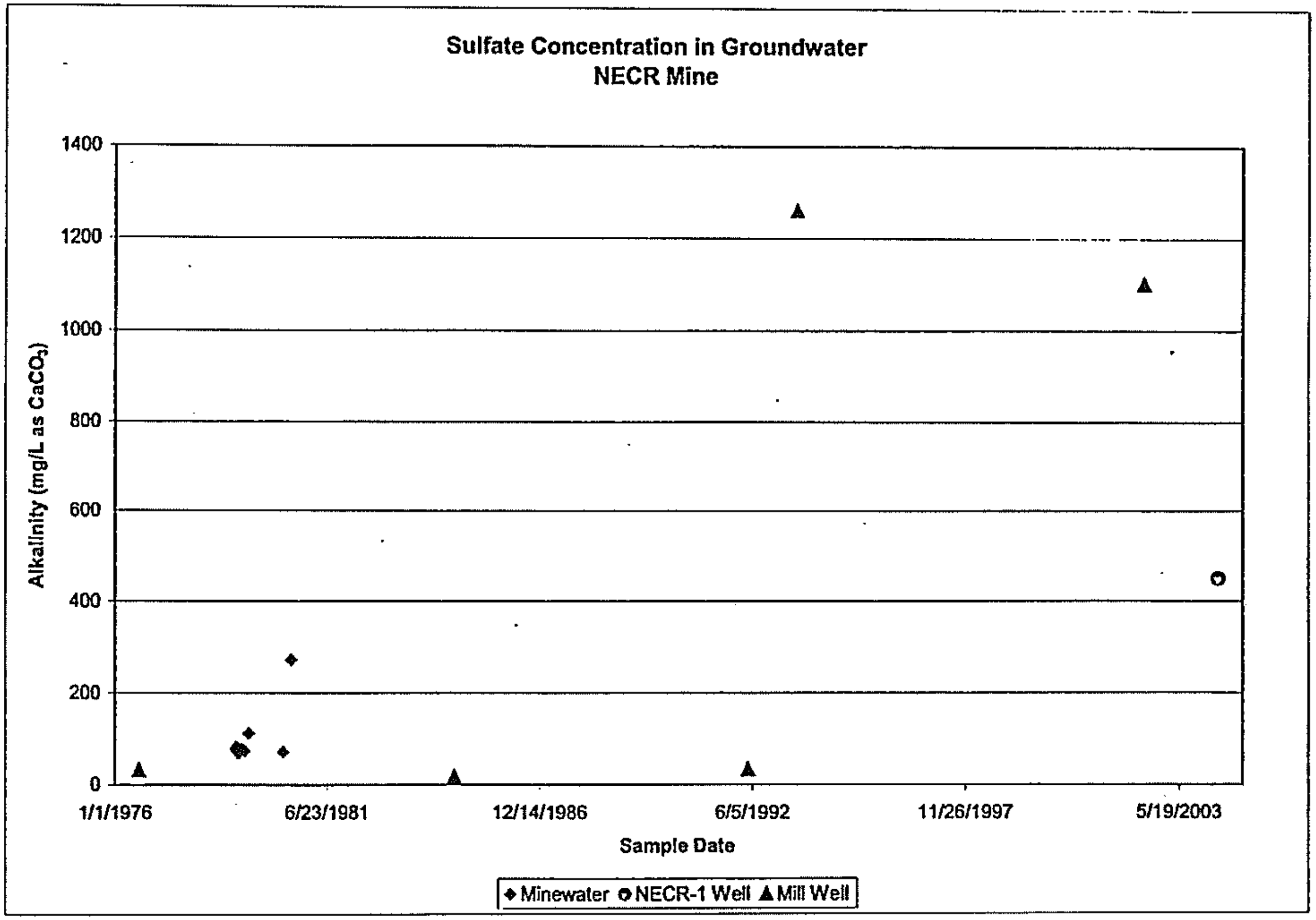


FIGURE 3
SULFATE CONCENTRATION IN GROUNDWATER NEAR NECR MINE

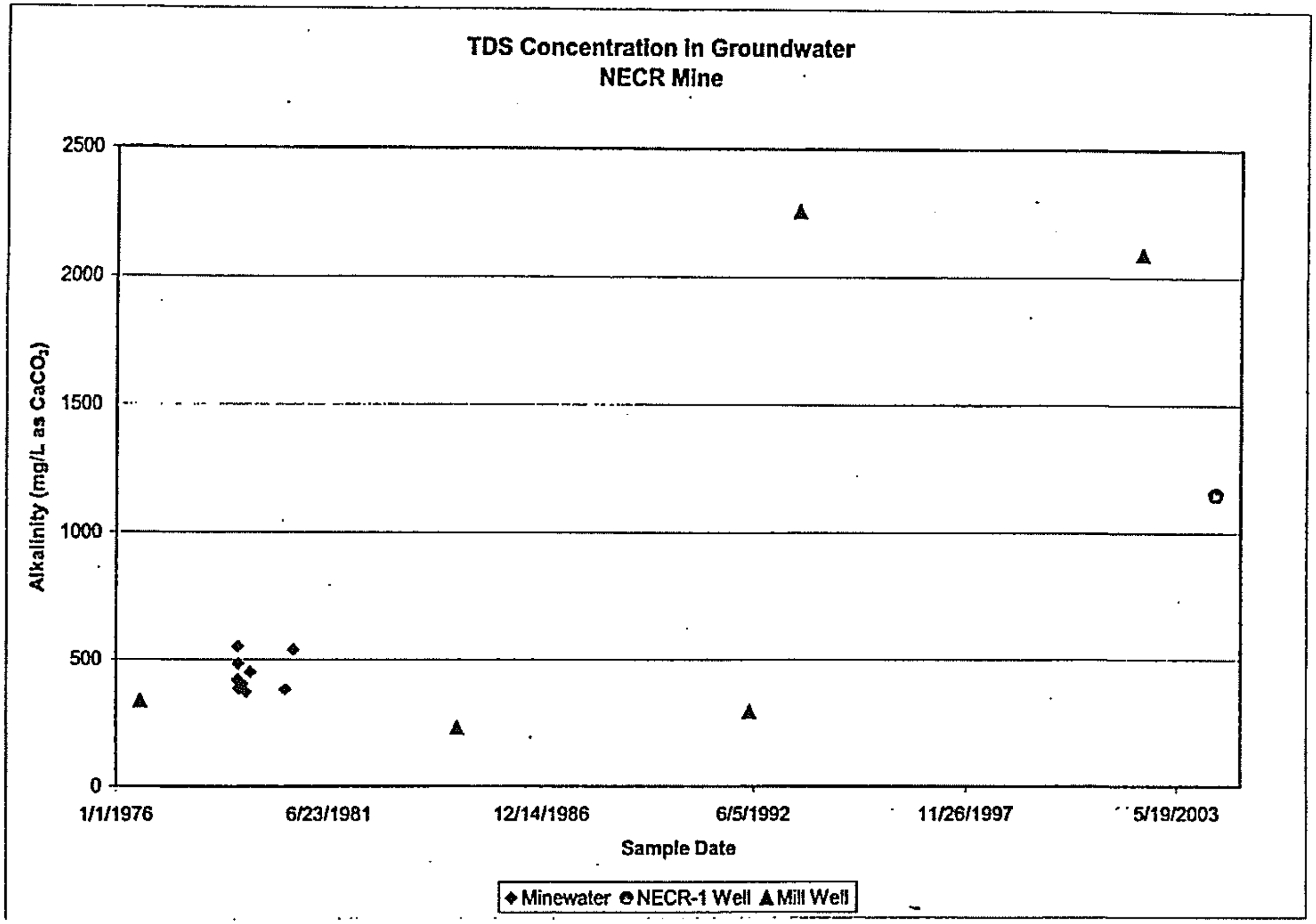


FIGURE 4
TDS CONCENTRATION IN GROUNDWATER NEAR NECR MINE

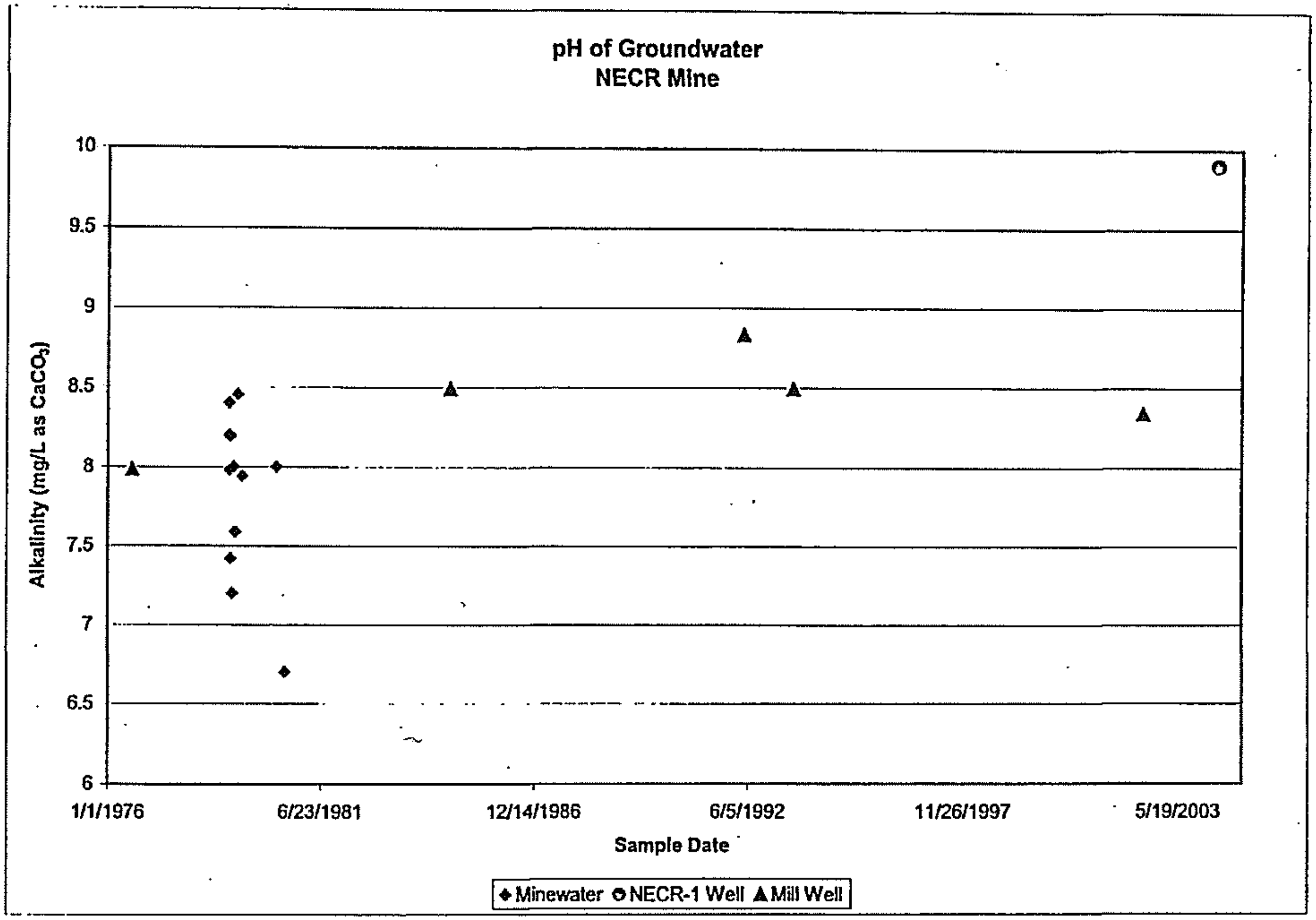


FIGURE 5
pH OF GROUNDWATER NEAR NECR MINE

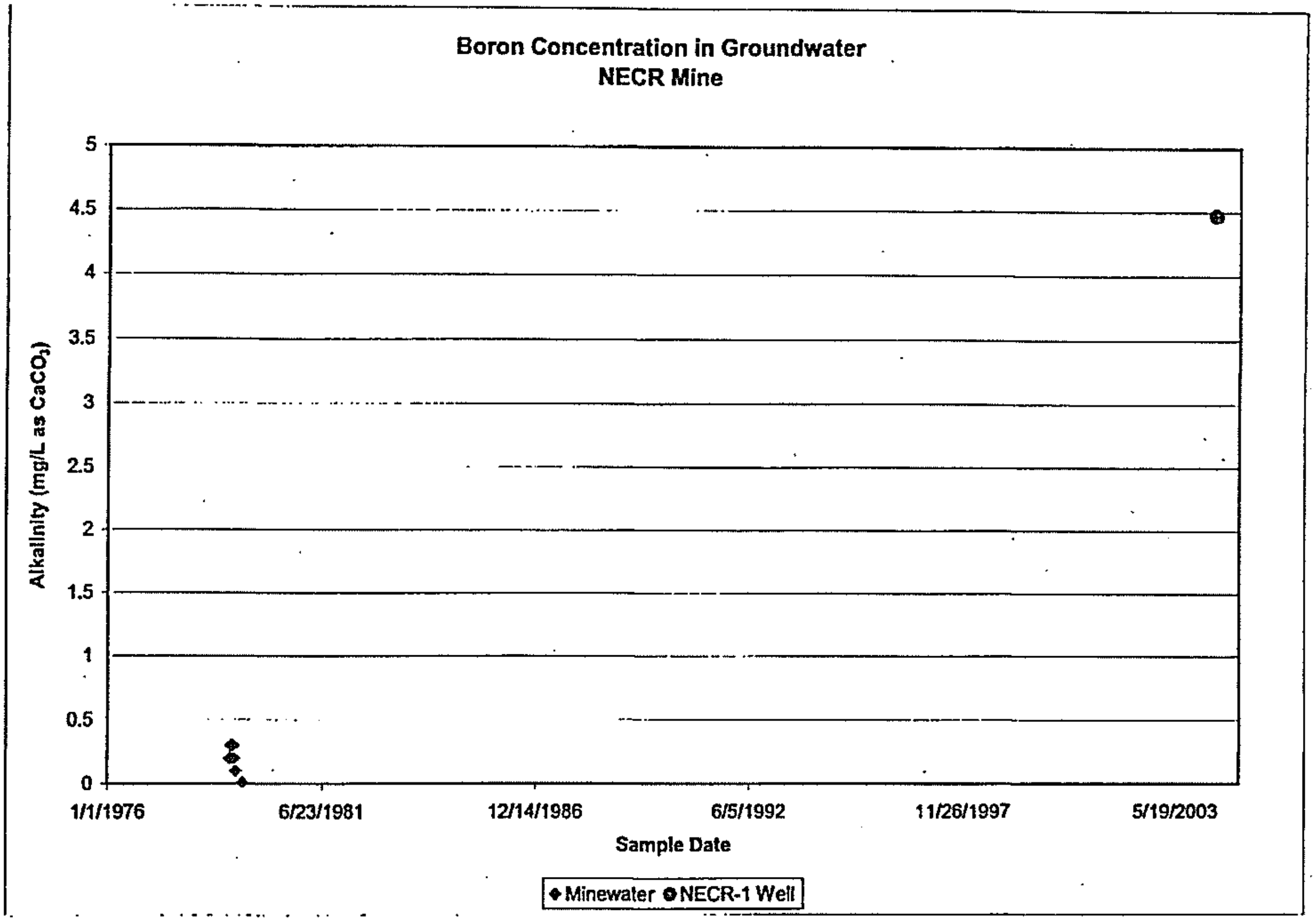


FIGURE 6
BORON CONCENTRATION OF GROUNDWATER NEAR NECR MINE

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LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: UNC Closeout Plan
Lab ID: C04050789-001
Client Sample ID: NECR-Well 1

Report Date: 06/24/04
Collection Date: 05/17/04 09:40
Date Received: 05/20/04
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	365	mg/L		1.0		A2320 B	05/21/04 10:36 / nlm
Calcium	3.38	mg/L		0.20		E200.7	05/24/04 15:27 / ts
Chloride	21.8	mg/L		1.0		A4500-Cl B	05/21/04 09:34 / jl
Fluoride	0.7	mg/L		0.1		A4500-F C	05/24/04 09:42 / elb
Magnesium	0.58	mg/L		0.20		E200.7	05/24/04 15:27 / ts
Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.10		E353.2	05/24/04 12:10 / jal
Potassium	5.57	mg/L		0.30		E200.7	05/24/04 15:27 / ts
Sodium	388	mg/L		0.30		E200.7	05/24/04 15:27 / ts
Sulfate	450	mg/L	D	9.8		A4500-SO4 E	06/01/04 12:47 / dd
PHYSICAL PROPERTIES							
Conductivity	1840	umhos/cm		1.0		A2510 B	05/21/04 09:55 / dd
pH	9.90	s.u.		0.01		A4500-H B	05/21/04 11:02 / js
Solids, Total Dissolved TDS @ 180 C	1150	mg/L		10		A2540 C	05/21/04 15:46 / js
Solids, Total Suspended TSS @ 105 C	243	mg/L		1.0		E160.2	05/21/04 09:07 / js
METALS - DISSOLVED							
Aluminum	ND	mg/L		0.1		E200.8	05/25/04 16:31 / eli-b
Arsenic	0.001	mg/L		0.001		E200.8	05/25/04 16:31 / eli-b
Barium	0.014	mg/L		0.003		E200.8	06/18/04 01:48 / bws
Beryllium	ND	mg/L		0.01		E200.8	05/25/04 16:31 / eli-b
Boron	4.47	mg/L		0.0010		E200.7	05/24/04 15:27 / ts
Cadmium	ND	mg/L		0.01		E200.8	05/25/04 16:31 / eli-b
Cobalt	ND	mg/L		0.01		E200.8	05/25/04 16:31 / eli-b
Iron	0.140	mg/L		0.010		E200.7	05/24/04 15:27 / ts
Lead	ND	mg/L		0.001		E200.8	06/18/04 01:48 / bws
Manganese	0.003	mg/L		0.001		E200.8	06/18/04 01:48 / bws
Molybdenum	0.056	mg/L		0.001		E200.8	06/18/04 01:48 / bws
Nickel	ND	mg/L		0.05		E200.8	05/25/04 16:31 / eli-b
Selenium	0.002	mg/L		0.001		E200.8	05/25/04 16:31 / eli-b
Uranium	0.134	mg/L		0.0001		E200.8	06/18/04 01:48 / bws
Vanadium	ND	mg/L		0.005		E200.8	06/18/04 01:48 / bws
RADIONUCLIDES - DISSOLVED							
Gross Alpha	93.0	pCi/L		1.0		E900.0	05/24/04 09:00 / rs
Gross Alpha precision (±)	3.6	pCi/L				E900.0	05/24/04 09:00 / rs
Radium 226	2.4	pCi/L		0.2		E903.0	05/25/04 12:50 / df
Radium 226 precision (±)	0.5	pCi/L				E903.0	05/25/04 12:50 / df
Radium 228	ND	pCi/L		1.0		E904.0	05/28/04 09:24 / pj

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: UNC Closeout Plan
Lab ID: C04050789-001
Client Sample ID: NECR-Well 1

Report Date: 06/24/04
Collection Date: 05/17/04 09:40
Date Received: 05/20/04
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
DATA QUALITY							
A/C Balance (± 5)	-0.170	%				Calculation	06/11/04 14:47 / tae
Anions	17.3	meq/L				Calculation	06/11/04 14:47 / tae
Cations	17.3	meq/L				Calculation	06/11/04 14:47 / tae
Solids, Total Dissolved Calculated	1090	mg/L				Calculation	06/11/04 14:47 / tae
TDS Balance (0.80 - 1.20)	1.06	dec. %				Calculation	06/11/04 14:47 / tae

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: UNC Closeout Plan
Lab ID: C04050789-002
Client Sample ID: SECT27-Vent 3

Report Date: 06/24/04
Collection Date: 05/17/04 14:30
Date Received: 05/20/04
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	308	mg/L		1.0		A2320 B	05/21/04 10:47 / nlm
Calcium	339	mg/L	D	0.57		E200.7	05/24/04 15:35 / ls
Chloride	23.2	mg/L		1.0		A4500-Cl B	05/21/04 09:35 / jl
Fluoride	0.4	mg/L		0.1		A4500-F C	05/24/04 00:44 / elb
Magnesium	41.8	mg/L		0.20		E200.7	05/24/04 15:30 / ls
Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.10		E353.2	05/24/04 12:20 / jal
Potassium	13.4	mg/L		0.30		E200.7	05/24/04 15:30 / ts
Sodium	492	mg/L		0.30		E200.7	05/24/04 15:30 / ts
Sulfate	1780	mg/L	D	30		A4500-SO4 E	06/01/04 12:50 / dd
PHYSICAL PROPERTIES							
Conductivity	3520	umhos/cm		1.0		A2510 B	05/21/04 09:55 / dd
pH	7.10	s.u.		0.01		A4500-H B	05/21/04 11:03 / js
Solids, Total Dissolved TDS @ 180 C	2810	mg/L		10		A2540 C	05/21/04 15:46 / js
Solids, Total Suspended TSS @ 105 C	100	mg/L		1.0		E160.2	05/21/04 09:07 / js
METALS - DISSOLVED							
Aluminum	ND	mg/L		0.1		E200.8	05/25/04 16:43 / eli-b
Arsenic	0.011	mg/L		0.001		E200.8	05/25/04 16:43 / eli-b
Barium	0.017	mg/L		0.003		E200.8	06/18/04 01:41 / bws
Beryllium	ND	mg/L		0.01		E200.8	05/25/04 16:43 / eli-b
Boron	0.379	mg/L		0.0010		E200.7	05/24/04 15:30 / ts
Cadmium	ND	mg/L		0.01		E200.8	05/25/04 16:43 / eli-b
Cobalt	ND	mg/L		0.01		E200.8	05/25/04 16:43 / eli-b
Iron	18.8	mg/L		0.010		E200.7	05/24/04 15:30 / ts
Lead	ND	mg/L		0.001		E200.8	06/18/04 01:41 / bws
Manganese	2.6	mg/L		0.01		E200.8	05/27/04 23:26 / eli-b
Molybdenum	0.7	mg/L		0.1		E200.8	05/27/04 23:26 / eli-b
Nickel	ND	mg/L		0.05		E200.8	05/25/04 16:43 / eli-b
Selenium	0.003	mg/L		0.001		E200.8	05/25/04 16:43 / eli-b
Uranium	7.84	mg/L		0.0001		E200.8	06/18/04 01:41 / bws
Vanadium	ND	mg/L		0.005		E200.8	06/18/04 01:41 / bws
RADIONUCLIDES - DISSOLVED							
Gross Alpha	5660	pCi/L		1.0		E900.0	05/24/04 09:00 / rs
Gross Alpha precision (±)	27.8	pCi/L				E900.0	05/24/04 09:00 / rs
Radium 226	24.2	pCi/L		0.2		E903.0	05/25/04 12:50 / df
Radium 226 precision (±)	1.5	pCi/L				E903.0	05/25/04 12:50 / df
Radium 228	ND	pCi/L		1.0		E904.0	05/28/04 09:24 / pj

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: UNC Closeout Plan
Lab ID: C04050789-002
Client Sample ID: SECT27-Vent 3

Report Date: 06/24/04
Collection Date: 05/17/04 14:30
Date Received: 05/20/04
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
DATA QUALITY							
A/C Balance (± 5)	-0.944	%				Calculation	06/11/04 14:48 / tae
Anions	43.8	meq/L				Calculation	06/11/04 14:48 / tae
Cations	43.0	meq/L				Calculation	06/11/04 14:48 / tae
Solids, Total Dissolved Calculated	2090	mg/L				Calculation	06/11/04 14:48 / tae
TDS Balance (0.80 - 1.20)	0.970	dec. %				Calculation	06/11/04 14:48 / tae

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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UNC Mining and Milling ChurchRock Operations

GroundWater Monitoring Summary: Closeout Plan

Well ID:	NECR-Well 1
Collection Date:	5/17/2004 9:40
Receive Date:	5/20/2004 10:00
Report Date:	6/18/2004 14:30

Analytes	Units	C04050789-001
Alkalinity, Total as CaCO3	mg/L	365
Calcium	mg/L	3.38
Chloride	mg/L	21.8
Fluoride	mg/L	0.7
Magnesium	mg/L	0.68
Nitrogen, Nitrate+Nitrite as N	mg/L	ND(0.10)
Potassium	mg/L	5.07
Sodium	mg/L	388
Sulfate	mg/L	450
Conductivity	umhos/cm	1840
pH	s.u.	9.90
Solids, Total Dissolved TDS @ 180 C	mg/L	1150
Solids, Total Suspended TSS @ 105 C	mg/L	243
Aluminum	mg/L	ND(0.1)
Arsenic	mg/L	0.001
Barium	mg/L	0.014
Beryllium	mg/L	ND(0.01)
Boron	mg/L	4.47
Cadmium	mg/L	ND(0.01)
Cobalt	mg/L	ND(0.01)
Iron	mg/L	0.140
Lead	mg/L	ND(0.001)
Manganese	mg/L	0.003
Molybdenum	mg/L	0.056
Nickel	mg/L	ND(0.05)
Selenium	mg/L	0.002
Uranium	mg/L	0.134
Vanadium	mg/L	ND(0.005)
Gross Alpha	pCi/L	93.0
Gross Alpha precision (±)	pCi/L	3.6
Radium 226	pCi/L	2.4
Radium 226 precision (±)	pCi/L	0.5
Radium 228	pCi/L	ND(1.0)
Radium 228 precision (±)	pCi/L	
A/C Balance (± 5)		-0.170
Anions		17.3
Cations		17.3
Solids, Total Dissolved Calculated		1090
TDS Balance (0.80 - 1.20)		1.06

****Note: The data presented on this form is intended for summary purposes only. Laboratory approved data is contained within the quarterly reports.***

tae: r:\clients2004\unc_mining\unc_gallup-2nd2004_final.xls

UNC Mining and Milling ChurchRock Operations

GroundWater Monitoring Summary: Closeout Plan

Well ID:	SECT27-Vent 3
Collection Date:	5/17/2004 14:30
Receive Date:	5/20/2004 10:00
Report Date:	6/18/2004 14:30

Analyte	Units	[illegible]04050789-002
Alkalinity, Total as CaCO3	mg/L	308
Calcium	mg/L	339
Chloride	mg/L	23.2
Fluoride	mg/L	0.4
Magnesium	mg/L	41.8
Nitrogen, Nitrate+Nitrite as N	mg/L	ND(0.10)
Potassium	mg/L	13.4
Sodium	mg/L	492
Sulfate	mg/L	1780
Conductivity	umhos/cm	3520
pH	s.u.	7.10
Solids, Total Dissolved TDS @ 180 C	mg/L	2810
Solids, Total Suspended TSS @ 105 C	mg/L	100
Aluminum	mg/L	ND(0.1)
Arsenic	mg/L	0.011
Barium	mg/L	0.017
Beryllium	mg/L	ND(0.01)
Boron	mg/L	0.017
Cadmium	mg/L	ND(0.01)
Cobalt	mg/L	ND(0.01)
Iron	mg/L	18.8
Lead	mg/L	ND(0.001)
Manganese	mg/L	2.6
Molybdenum	mg/L	0.7
Nickel	mg/L	ND(0.5)
Selenium	mg/L	0.003
Uranium	mg/L	7.84
Vanadium	mg/L	ND(0.005)
Gross Alpha	pCi/L	5660
Gross Alpha precision (±)	pCi/L	27.8
Radium 226	pCi/L	24.2
Radium 226 precision (±)	pCi/L	1.5
Radium 228	pCi/L	ND(1.0)
Radium 228 precision (±)	pCi/L	
A/C Balance (± 5)		-0.944
Anions		43.8
Cations		43.0
Solids, Total Dissolved Calculated		2890
TDS Balance (0.80 - 1.20)		0.970

****Note: The data presented on this form is intended for summary purposes only. Laboratory approved data is contained within the quarterly reports.**

tae: r:\clients2004\unc_mining\unc_gallop-2nd2004_final.xls

QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual	
Method: A2320 B										Analytical Run: ORION_040521A
Sample ID: CCV1_040521_1	Continuing Calibration Verification Standard									05/21/04 09:32
Alkalinity, Total as CaCO3	4820	mg/L	1.0	96.3	90	110				
Method: A2320 B										Batch: 040521_1_ALK-W
Sample ID: MBLK1_040521_1	Method Blank									05/21/04 07:46
Alkalinity, Total as CaCO3	ND	mg/L	1.0							
Sample ID: C04050718-004DMS	Matrix Spike									05/21/04 08:21
Alkalinity, Total as CaCO3	349	mg/L	1.0	95.7	90	110				
Sample ID: C04050718-004DMSD	Matrix Spike Duplicate									05/21/04 08:31
Alkalinity, Total as CaCO3	349	mg/L	1.0	96	90	110	0.1	10		
Sample ID: C04050790-002BMS	Matrix Spike									05/21/04 11:18
Alkalinity, Total as CaCO3	266	mg/L	1.0	94.2	90	110				
Sample ID: C04050790-002BMSD	Matrix Spike Duplicate									05/21/04 11:20
Alkalinity, Total as CaCO3	265	mg/L	1.0	93.6	90	110	0.3	10		
Sample ID: LCS1_040521_1	Laboratory Control Spike									05/21/04 11:47
Alkalinity, Total as CaCO3	4900	mg/L	1.0	98.1	90	110				
Method: A2510 B										Batch: 040521A-COND-PROBE-W
Sample ID: LCS1_040521A	Laboratory Control Spike									05/21/04 09:55
Conductivity	1450	umhos/cm	1.0	103	90	110				
Sample ID: MBLK1_040521A	Method Blank									05/21/04 09:55
Conductivity	ND	umhos/cm	1.0							
Sample ID: C04050789-002BDUP	Sample Duplicate									05/21/04 09:55
Conductivity	3510	umhos/cm	1.0				0.3	10		
Sample ID: LCS2_040521A	Laboratory Control Spike									05/21/04 09:55
Conductivity	1460	umhos/cm	1.0	103	90	110				

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2540 C									Batch: 040521A-SLDS-TDS-W
Sample ID: LCS1_040521A	Laboratory Control Spike								05/21/04 15:46
Solids, Total Dissolved TDS @ 180 C	996	mg/L	10	99.6	90	110			
Sample ID: MBLK1_040521A	Method Blank								05/21/04 15:46
Solids, Total Dissolved TDS @ 180 C	ND	mg/L	10						
Sample ID: C04050814-003BMS	Matrix Spike								05/21/04 15:48
Solids, Total Dissolved TDS @ 180 C	3280	mg/L	10	99	90	110			
Sample ID: C04050814-003BMSD	Matrix Spike Duplicate								05/21/04 15:48
Solids, Total Dissolved TDS @ 180 C	3270	mg/L	10	98.3	90	110	0.5	10	
Sample ID: C04050814-004BMS	Matrix Spike								05/21/04 15:49
Solids, Total Dissolved TDS @ 180 C	3680	mg/L	10	99.6	90	110			
Sample ID: C04050814-004BMSD	Matrix Spike Duplicate								05/21/04 15:49
Solids, Total Dissolved TDS @ 180 C	3660	mg/L	10	98.5	90	110	0.7	10	
Sample ID: LCS2_040521A	Laboratory Control Spike								05/21/04 15:50
Solids, Total Dissolved TDS @ 180 C	1000	mg/L	10	100	90	110			
Method: A4500-Cl B									Batch: 040521A-CL-TTR-W
Sample ID: MBLK9-040521A	Method Blank								05/21/04 09:20
Chloride	ND	mg/L	1.0						
Sample ID: C04050756-001BMS	Matrix Spike								05/21/04 09:38
Chloride	5700	mg/L	1.0	100	90	110			
Sample ID: C04050756-001BMSD	Matrix Spike Duplicate								05/21/04 09:39
Chloride	5680	mg/L	1.0	99.6	90	110	0.2	10	
Sample ID: LCS35-040521A	Laboratory Control Spike								05/21/04 09:41
Chloride	3510	mg/L	1.0	99.1	90	110			
Method: A4500-F C									Batch: 040524_1_F-ISE-W
Sample ID: MBLK1_040524_1	Method Blank								05/24/04 09:14
Fluoride	ND	mg/L	0.10						
Sample ID: C04050714-001IMS	Matrix Spike								05/24/04 09:21
Fluoride	1.80	mg/L	0.10	90	90	110			
Sample ID: C04050714-001IMSD	Matrix Spike Duplicate								05/24/04 09:24
Fluoride	1.80	mg/L	0.10	90	90	110	0	10	

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QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A4500-H B									Analytical Run: ORION-PH_040521A
Sample ID: (CCV)=ph7	Continuing Calibration Verification Standard								05/21/04 10:56
pH	6.97	s.u.	0.010	99.6	90	110			
Method: A4500-H B									Batch: pH05-21-041108
Sample ID: C04050775-001A(DUP)	Sample Duplicate								05/21/04 11:04
pH	8.15	s.u.	0.010				0.5	10	
Method: A4500-SO4 E									Batch: 040601_1_SO4-TURB-W
Sample ID: MBLK-1_040601	Method Blank								06/01/04 12:26
Sulfate	ND	mg/L	1.0						
Sample ID: C04050789-001BMS	Matrix Spike								06/01/04 13:09
Sulfate	1410	mg/L	30	100	90	110			
Sample ID: C04050789-001BMSD	Matrix Spike Duplicate								06/01/04 13:10
Sulfate	1400	mg/L	30	99.1	90	110	0.7	10	
Sample ID: C04050874-005DMS	Matrix Spike								06/01/04 13:25
Sulfate	110	mg/L	1.5	96.8	90	110			
Sample ID: C04050874-005DMSD	Matrix Spike Duplicate								06/01/04 13:26
Sulfate	111	mg/L	1.5	97.7	90	110	0.4	10	
Sample ID: LCS-1_040601	Laboratory Control Spike								06/01/04 13:27
Sulfate	41.7	mg/L	1.0	104	90	110			
Method: E160.2									Batch: 040521A-SLDS-TSS-W
Sample ID: MBLK1_040521A	Method Blank								05/21/04 09:07
Solids, Total Suspended TSS @ 105 C	ND	mg/L	1.0						
Sample ID: C04050789-002BDUP	Sample Duplicate								05/21/04 09:08
Solids, Total Suspended TSS @ 105 C	122	mg/L	1.0				20	25	
Method: E200.7									Analytical Run: ICP1-C_040524A
Sample ID: CONT 120103-96	Continuing Calibration Verification Standard								05/24/04 14:23
Boron	1.01	mg/L	0.10	101	89.5	110.5			
Iron	1.05	mg/L	0.030	105	89.5	110.5			
Calcium	53.2	mg/L	1.0	106	89.5	110.5			
Magnesium	53.1	mg/L	1.0	106	89.5	110.5			
Potassium	51.5	mg/L	1.0	103	89.5	110.5			
Sodium	53.2	mg/L	1.0	106	89.5	110.5			

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QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8								Analytical Run: ICPMS1-C_040617B	
Sample ID: CCV	Continuing Calibration Verification Standard							06/18/04 01:06	
Barium	0.0638	mg/L	0.0010	106	90	110			
Lead	0.0619	mg/L	0.0010	103	90	110			
Uranium	0.0615	mg/L	0.0010	102	90	110			
Vanadium	0.0619	mg/L	0.0010	103	90	110			
Method: E200.8								Batch: R36342	
Sample ID: C04050789-001DMS	Matrix Spike							06/18/04 01:55	
Barium	0.0632	mg/L	0.0010	97.3	70	130			
Lead	0.0502	mg/L	0.0010	100	70	130			
Uranium	0.186	mg/L	0.0010	105	70	130			
Vanadium	0.0494	mg/L	0.0010	97.5	70	130			
Sample ID: C04050789-001DMSD	Matrix Spike Duplicate							06/18/04 02:02	
Barium	0.0632	mg/L	0.0010	97.5	70	130	0.1	20	
Lead	0.0500	mg/L	0.0010	99.6	70	130	0.5	20	
Uranium	0.180	mg/L	0.0010	92.2	70	130	3.4	20	
Vanadium	0.0489	mg/L	0.0010	96.4	70	130	1.1	20	

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QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E353.2									Analytical Run: TECHNICON_040524A
Sample ID: CCV-16	Continuing Calibration Verification Standard								05/24/04 11:55
Nitrogen, Nitrate+Nitrite as N	0.930	mg/L	0.10	93	90	110			
Sample ID: CCV-25	Continuing Calibration Verification Standard								05/24/04 12:18
Nitrogen, Nitrate+Nitrite as N	1.07	mg/L	0.10	107	90	110			
Method: E353.2									Batch: A2004-05-24_1_NO3_01
Sample ID: MBLK-1	Method Blank								05/24/04 09:43
Nitrogen, Nitrate+Nitrite as N	ND	mg/L	0.10						
Sample ID: C04050727-001BMS	Matrix Spike								05/24/04 10:01
Nitrogen, Nitrate+Nitrite as N	2.00	mg/L	0.10	100	90	110			
Sample ID: C04050727-001BMSD	Matrix Spike Duplicate								05/24/04 10:03
Nitrogen, Nitrate+Nitrite as N	2.01	mg/L	0.10	101	90	110	0.5	10	
Sample ID: MBLK-17	Method Blank								05/24/04 11:58
Nitrogen, Nitrate+Nitrite as N	ND	mg/L	0.10						
Sample ID: C04050789-001CMS	Matrix Spike								05/24/04 12:13
Nitrogen, Nitrate+Nitrite as N	2.02	mg/L	0.10	101	90	110			
Sample ID: C04050789-001CMSD	Matrix Spike Duplicate								05/24/04 12:15
Nitrogen, Nitrate+Nitrite as N	2.04	mg/L	0.10	102	90	110	1.0	10	
Sample ID: MBLK-32	Method Blank								05/24/04 12:35
Nitrogen, Nitrate+Nitrite as N	ND	mg/L	0.10						
Sample ID: C04050845-005CMS	Matrix Spike								05/24/04 12:53
Nitrogen, Nitrate+Nitrite as N	2.29	mg/L	0.10	95.5	90	110			
Sample ID: C04050845-005CMSD	Matrix Spike Duplicate								05/24/04 12:58
Nitrogen, Nitrate+Nitrite as N	2.31	mg/L	0.10	96.5	90	110	0.9	10	
Sample ID: MBLK-48	Method Blank								05/24/04 13:18
Nitrogen, Nitrate+Nitrite as N	ND	mg/L	0.10						
Sample ID: C04050845-014CMS	Matrix Spike								05/24/04 13:57
Nitrogen, Nitrate+Nitrite as N	14.5	mg/L	0.15	90.9	90	110			
Sample ID: C04050845-014CMSD	Matrix Spike Duplicate								05/24/04 13:59
Nitrogen, Nitrate+Nitrite as N	14.5	mg/L	0.15	90.9	90	110	0	10	

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QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E900.0									Batch: R35580
Sample ID: C04050732-001A	Matrix Spike								05/24/04 09:00
Gross Alpha	543	pCi/L	1.0	106	70	130			
Sample ID: C04050732-001A	Matrix Spike Duplicate								05/24/04 09:00
Gross Alpha	562	pCi/L	1.0	110	70	130	3.3	30	
Sample ID: MB-R35580	Method Blank								05/24/04 09:00
Gross Alpha	ND	pCi/L	1.0						
Sample ID: LCS-R35580	Laboratory Control Spike								05/24/04 09:00
Gross Alpha	507	pCi/L	1.0	99.5	70	130			
Sample ID: C04050910-001A	Sample Duplicate								05/24/04 09:00
Gross Alpha	ND	pCi/L	1.0		70	130	0	30	
Sample ID: C04040049-001B	Sample Duplicate								05/24/04 09:00
Gross Alpha	ND	pCi/L	1.0				0	30	
Method: E903.0									Batch: RA226-0589
Sample ID: C04050805-001AMS	Matrix Spike								05/25/04 12:50
Radium 226	24.8	pCi/L	0.20	92.7	70	130			
Sample ID: C04050805-001AMSD	Matrix Spike Duplicate								05/25/04 12:50
Radium 226	25.4	pCi/L	0.20	94.8	70	130	2.1	30	
Sample ID: MB-RA226-0589	Method Blank								05/25/04 12:50
Radium 226	ND	pCi/L	0.20						
Sample ID: LCS-RA226-0589	Laboratory Control Spike								05/25/04 12:50
Radium 226	14.9	pCi/L	0.20	98.1	70	130			
Method: E904.0									Batch: 04228-602A
Sample ID: C04050891-001A	Matrix Spike								05/28/04 09:24
Radium 228	25	pCi/L	1.0	107	70	130			
Sample ID: C04050891-001A	Matrix Spike Duplicate								05/28/04 09:24
Radium 228	22	pCi/L	1.0	96.8	70	130	9.8	30	

Qualifiers:

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-04; 2:14PM;Energy Labs Casper

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Energy Laboratories Inc.
2393 Salt Creek Highway
PO Box 3258
Casper, WY 82602-

TEL: (307) 235-0515
FAX: (307) 234-1639

Quotation Date: 29-Apr-04
Submitted By: Tracy DeWitt

Quotation for Analytical Services # C1212

Company: Montgomery Watson Harza
Contact: Jed Thompson
Address: 1475 Pine Grove Road
Ste 109
PO Box 774018
Steamboat Springs, CO 80477
Phone: (970) 879-6260 Fax: (970) 879-9048

Quote ID: C 1212
Project: Groundwater Sampling
TAT: 15 Working Days
QC Level: STD
Expires: 21-Apr-05

Matrix	Test Name	Test	Remarks	# Samp	Unit Price	Test Total
Aqueous	Alkalinity	A2320 B		1	$10.00	$10.00
Aqueous	Chloride	A4500-Cl B		1	$10.00	$10.00
Aqueous	Conductivity	A2510 B		1	$10.00	$10.00
Aqueous	Fluoride	A4500-F C		1	$10.00	$10.00
Aqueous	Gross Alpha	E900.0		1	$50.00	$50.00
Aqueous	Metals by ICP, Dissolved	E200.7	Ca,Fe,Mg,K,Na	1	$50.00	$50.00
Aqueous	Metals by ICP/ICPMS, Total	E200.7_8	Boron only (analyzed in ELI-Billings)	1	$10.00	$10.00
Aqueous	Metals by ICP-MS, Dissolved	E200.8	Ba,V,Unat,Pb	1	$40.00	$40.00
Aqueous	Nitrogen, Nitrate + Nitrite	E353.2		1	$15.00	$15.00
Aqueous	pH	A4500-H B		1	$10.00	$10.00
Aqueous	Radium 226, Dissolved	E903.0		1	$75.00	$75.00
Aqueous	Radium 228, Dissolved	E904.0		1	$75.00	$75.00
Aqueous	Solids, Total Dissolved	A2540 C		1	$10.00	$10.00
Aqueous	Solids, Total Suspended	E160.2		1	$10.00	$10.00
Aqueous	Sulfate	A4500-SO4 E		1	$10.00	$10.00

To assure that the quoted analysis and pricing specifications are provided, please include the Quote ID number referenced above on the Chain of Custody or sample submittal documents.

Subcontracting of sample analyses to an outside laboratory may be required. If so, Energy Laboratories will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report.

the Project Manager and the laboratory's project manager, will decide whether or not to analyze the samples.

3.4 FIELD DOCUMENTATION

All aspects of sample collection and handling as well as visual observations will be documented in the field logbooks. Field logbooks will note the following information:

- Site location
- Sampler name(s)
- Date and time of sample collection
- Sample identification number(s)
- Field water quality measurements (pH, conductivity, temperature)
- Sample handling (including preservation, as appropriate)
- How sample collected (e.g. grab, composite, bailer)
- Number and type of any QA/QC or split samples collected
- Field observations, including any unusual conditions or activities in the area

4.0 WATER QUALITY PARAMETERS

Water quality parameters to be analyzed for the collected sample are presented in Table 4.1 below.

TABLE 4.1
WATER QUALITY MONITORING PARAMETERS

Parameter	Fraction	Method	Detection Limit	UNITS
GENERAL CHEMISTRY AND ANIONS				
pH		EPA 150.1	0.1	mg/l
Electrical Conductivity		EPA 120.1	1	umhos/cm
Total Dissolved Solids		EPA 160.1	10	mg/l
Total Suspended Solids		EPA 160.2	5	mg/l
Alkalinity		EPA 310.1	2.0	mg/l (as $CaCO_3$)
Chloride		EPA 325.2	1.0	mg/l
Fluoride		EPA 340.2	0.1	mg/l
Nitrate (NO3+NO2 as N)		EPA 353.2	0.02	mg/l
Sulfate		EPA 375.3	10.0	mg/l
CATIONS AND TRACE METALS				
Barium	Dissolved	EPA 200.7, ICP	0.003 0.1	mg/l
Boron	Dissolved	EPA 200.7, ICP	0.001 0.1	mg/l
Calcium	Dissolved	EPA 200.7, ICP	0.2 ✓	mg/l
Iron	Dissolved	EPA 200.7, ICP	0.01 0.1	mg/l
Lead	Dissolved	EPA 200.7, ICP	0.04 0.1	mg/l
Magnesium	Dissolved	EPA 200.7, ICP	0.2 ✓	mg/l
Potassium	Dissolved	EPA 200.7, ICP	0.30 ✓	mg/l
Sodium	Dissolved	EPA 200.7, ICP	0.30 ✓	mg/l
Uranium	Dissolved	EPA 200.8, ICP-MS	0.0001	mg/l
Vanadium	Dissolved	EPA 200.7, ICP	0.005 0.1	mg/l
RADIONUCLIDES				
Radium 226	Dissolved	EPA 903.0	1	pCi/l
Radium 228	Dissolved	EPA 904.0	1	pCi/l
Gross Alpha	Dissolved	EPA 900.0	1	pCi/l

ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

Page 1 of 1

PLEASE PRINT, provide as much information as possible. Refer to corresponding notes on reverse side.

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ompany Name: UNC

Project Name, PWS #, Permit #, Etc.: UNC CLOSEOUT PLAN

eport Mail Address: MWH
ATTN: JED THOMPSON
PO BOX 774018
1475 PINEGROVE RD, STE 109
STEAMBOAT SPRINGS, CO 80477

Contact Name, Phone, Fax, E-mail:
JED THOMPSON
(970) 879-6260
JAMES.THOMPSON@MWHGLOBAL.COM

Sampler Name if other than Contact: SAME

nvoice Address:
UNC
PO BOX 3077
GALLUP, NM 87305-3077

Invoice Contact & Phone #:
DOREEN BROWN
(505) 722-6651

Purchase Order #:

ELI Quote #: C12/2

eport Required For: POTW/WWTP ☐ DW ☐
Other ______

pecial Report Formats - ELI must be notified prior to ample submittal for the following:
ELAC ☐ A2LA ☐ Level IV ☐
ther ______
DD/EDT ☐ Format ______

Notify ELI prior to RUSH sample submittal for additional charges and scheduling

Receipt Temp 18 °C
Cooler ID(s) Client
Custody Seal [✓ Y] N
Intact [✓ Y] N
Signature Match [✓ Y] N

ANALYSIS REQUESTED

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX (Number of Containers; Sample Type: A W S V B O; Air Water Soils/Solids Vegetation Bioassay Other)	SEE ATTACHED	Normal Turnaround (TAT)	RUSH Turnaround (TAT)	Comments:	Lab ID (LABORATORY USE ONLY)
NECR-WELL 1	17MAY04	0940	4-W	X				[illegible]
SECT27-VENT 3	17MAY04	1430	4-W	X				

Custody Record MUST be Signed

Relinquished by: KETA Date/Time: 18 MAY 04/1415 Shipped by: UPS GRND Received by: [illegible] Date/Time: [illegible]

Relinquished by: Date/Time: Shipped by: Received by: Date/Time:

Sample Disposal: Return to client: ______ Lab Disposal: X

LABORATORY USE ONLY
Sample Type: ______ # of fractions ______

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.

Visit our web site at *www.energylab.com* for additional information, downloadable fee schedule, forms, & links.

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Energy Laboratories Inc.

Sample Receipt Checklist

Client Name: United Nuclear Corporation

Date and Time Received: 5/20/2004 10:00:00

Work Order Number C04050789

Received by: sp

Checklist completed by: Shana Peavy 5/20/04
Signature | Date

Reviewed by ______ | ______
Initials | Date

Carrier name: UPS

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☐	No ☑	18 °C
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Adjusted? ______ Checked by ______

Any No and/or NA (not applicable) response must be detailed in the comments section below.

Client contacted: ______ Date contacted: ______ Person contacted ______

Contacted by: ______ Regarding: ______

Comments:
Split and preserved for total metals.

Corrective Action ______

ENERGY LABORATORIES
ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

ANALYTICAL SUMMARY REPORT

June 24, 2004

Max Chischilly
United Nuclear Corporation
1475 Pine Grove Road
Ste 109
PO Box 774018
Gallup, NM 87305

Workorder No.: C04050789 Quote ID: C1247 - Groundwater Sampling

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Energy Laboratories Inc. received the following 2 samples from United Nuclear Corporation on 5/20/2004 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C04050789-001	NECR-Well 1	05/17/04 9:40	05/20/04	Aqueous	Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Total Alkalinity QA Calculations Chloride Conductivity Fluoride Metals by ICP, Dissolved Metals by ICP-MS, Dissolved Nitrogen, Nitrate + Nitrite pH Gross Alpha Radium 226, Dissolved Radium 228, Dissolved Solids, Total Dissolved Solids, Total Suspended Sulfate
C04050789-002	SECT27-Vent 3	05/17/04 14:30	05/20/04	Aqueous	Same As Above

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative or Report.

If you have any questions regarding these tests results, please call.

Report Approved By:

LABORATORY SUPERVISOR

Date: *24-Jun-04*

CLIENT: *United Nuclear Corporation*
Project: UNC Closeout Plan
Sample Delivery Group: C04050789

CASE NARRATIVE

THIS IS THE FINAL PAGE OF THE LABORATORY ANALYTICAL REPORT

COMMENTS

Additional metals added per client's request 6/23/04.

BRANCH LABORATORY LOCATIONS

eli-b - Energy Laboratories, Inc. - Billings, MT
eli-cs - Energy Laboratories, Inc. - College Station, TX
eli-g - Energy Laboratories, Inc. - Gillette, WY
eli-h - Energy Laboratories, Inc. - Helena, MT
eli-r - Energy Laboratories, Inc. - Rapid City, SD

ORIGINAL SAMPLE SUBMITTAL(S)

All original sample submittals have been returned with the data package. A copy of the submittal(s) has been included and tracked in the data package.

SUBCONTRACTING ANALYSIS

Subcontracting of sample analyses to an outside laboratory may be required. If so, ENERGY LABORATORIES will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report.

SAMPLE TEMPERATURE COMPLIANCE: 4°C (±2°C)

Temperature of samples received may not be considered properly preserved by accepted standards. Samples that are hand delivered immediately after collection shall be considered acceptable if there is evidence that the chilling process has begun.

ENERGY LABORATORIES, INC. - CASPER,WY certifies that certain method selections contained in this report meet requirements as set forth by NELAC. Some client specific reporting requirements may not require NELAC reporting protocol. NELAC Certification Number E87641.

ELI appreciates the opportunity to provide you with this analytical service. For additional information and services visit our web page www.energylab.com.

The total number of pages of this report are indicated by the page number located in the lower right corner.

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
8/12/1976		Mill Well	Alkalinity (CaCO3)	mg/L	100	
8/12/1976		Mill Well	Arsenic	mg/L	0.001	
8/12/1976		Mill Well	Bicarbonate	mg/L	121.7	
8/12/1976		Mill Well	Cadmium	mg/L	0.01	
8/12/1976		Mill Well	Calcium	mg/L	5.5	
8/12/1976		Mill Well	Chloride	mg/L	17	
8/12/1976		Mill Well	Magnesium	mg/L	0.8	
8/12/1976		Mill Well	Manganese	mg/L	0.08	
8/12/1976		Mill Well	Nitrate + Nitrate as N	mg/L	5.3	
8/12/1976		Mill Well	pH	s.u.	7.98	
8/12/1976		Mill Well	Potassium	mg/L	6.6	
8/12/1976		Mill Well	Selenium	mg/L	0.01	
8/12/1976		Mill Well	Sodium	mg/L	60	
8/12/1976		Mill Well	Sulfate	mg/L	32	
8/12/1976		Mill Well	TDS	mg/L	335	
2/13/1979	TS-24A	Minewater	Aluminum	mg/l	0.2	
2/13/1979	TS-24A	Minewater	Arsenic	mg/l	0.01	
2/13/1979	TS-24A	Minewater	Barium	mg/l	0.1	<
2/13/1979	TS-24A	Minewater	Boron	mg/l	0.2	
2/13/1979	TS-24A	Minewater	Cadmium	mg/l	0.001	<
2/13/1979	TS-24A	Minewater	Chloride	mg/l	5.8	
2/13/1979	TS-24A	Minewater	Chromium	mg/l	0.001	<
2/13/1979	TS-24A	Minewater	Cobalt	mg/l	0.01	<
2/13/1979	TS-24A	Minewater	Copper	mg/l	0.001	
2/13/1979	TS-24A	Minewater	Cyanide	mg/l	0.1	<
2/13/1979	TS-24A	Minewater	Fluoride	mg/l	0.5	
2/13/1979	TS-24A	Minewater	Iron	mg/l	0.05	
2/13/1979	TS-24A	Minewater	Lead	mg/l	0.001	<
2/13/1979	TS-24A	Minewater	Manganese	mg/l	0.006	
2/13/1979	TS-24A	Minewater	Mercury	mg/l	0.0004	<
2/13/1979	TS-24A	Minewater	Molybdenum	mg/l	0.003	
2/13/1979	TS-24A	Minewater	Nickel	mg/l	0.01	<
2/13/1979	TS-24A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.7	
2/13/1979	TS-24A	Minewater	pH, lab	SU	8.4	
2/13/1979	TS-24A	Minewater	Phenols	mg/l	0.003	
2/13/1979	TS-24A	Minewater	Radium-226	pCi/l	76.7	± 2.8
2/13/1979	TS-24A	Minewater	Radium-228	pCi/l	1	± 1
2/13/1979	TS-24A	Minewater	Selenium	mg/l	0.04	
2/13/1979	TS-24A	Minewater	Silica	mg/l	0.01	<
2/13/1979	TS-24A	Minewater	Sulfate	mg/l	77	
2/13/1979	TS-24A	Minewater	TDS	mg/l	552	
2/13/1979	TS-24A	Minewater	Uranium	mg/l	1.25	
2/13/1979	TS-24A	Minewater	Zinc	mg/l	0.02	
2/14/1979	TS-28A	Minewater	Aluminum	mg/l	0.3	
2/14/1979	TS-28A	Minewater	Arsenic	mg/l	0.01	<
2/14/1979	TS-28A	Minewater	Barium	mg/l	0.1	<
2/14/1979	TS-28A	Minewater	Boron	mg/l	0.2	
2/14/1979	TS-28A	Minewater	Cadmium	mg/l	0.001	<
2/14/1979	TS-28A	Minewater	Chloride	mg/l	6.1	
2/14/1979	TS-28A	Minewater	Chromium	mg/l	0.001	<
2/14/1979	TS-28A	Minewater	Cobalt	mg/l	0.01	<
2/14/1979	TS-28A	Minewater	Copper	mg/l	0.002	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
2/14/1979	TS-28A	Minewater	Cyanide	mg/l	0.1	<
2/14/1979	TS-28A	Minewater	Fluoride	mg/l	0.5	
2/14/1979	TS-28A	Minewater	Iron	mg/l	0.01	
2/14/1979	TS-28A	Minewater	Lead	mg/l	0.001	<
2/14/1979	TS-28A	Minewater	Manganese	mg/l	0.002	
2/14/1979	TS-28A	Minewater	Mercury	mg/l	0.0004	<
2/14/1979	TS-28A	Minewater	Molybdenum	mg/l	0.001	
2/14/1979	TS-28A	Minewater	Nickel	mg/l	0.01	
2/14/1979	TS-28A	Minewater	Nitrogen, Nitrate (as N)	mg/l	1.2	
2/14/1979	TS-28A	Minewater	pH, lab	SU	8.4	
2/14/1979	TS-28A	Minewater	Phenols	mg/l	0.003	
2/14/1979	TS-28A	Minewater	Radium-226	pCi/l	103	± 3
2/14/1979	TS-28A	Minewater	Radium-228	pCi/l	1	± 2
2/14/1979	TS-28A	Minewater	Selenium	mg/l	0.04	
2/14/1979	TS-28A	Minewater	Silver	mg/l	0.01	<
2/14/1979	TS-28A	Minewater	Sulfate	mg/l	79	
2/14/1979	TS-28A	Minewater	TDS	mg/l	421	
2/14/1979	TS-28A	Minewater	Uranium	mg/l	0.725	
2/14/1979	TS-28A	Minewater	Zinc	mg/l	0.01	
2/16/1979	TS-33A	Minewater	Aluminum	mg/l	1.2	
2/16/1979	TS-33A	Minewater	Arsenic	mg/l	0.01	<
2/16/1979	TS-33A	Minewater	Barium	mg/l	0.3	
2/16/1979	TS-33A	Minewater	Boron	mg/l	0.2	
2/16/1979	TS-33A	Minewater	Cadmium	mg/l	0.001	<
2/16/1979	TS-33A	Minewater	Chloride	mg/l	7.7	
2/16/1979	TS-33A	Minewater	Chromium	mg/l	0.002	
2/16/1979	TS-33A	Minewater	Cobalt	mg/l	0.01	<
2/16/1979	TS-33A	Minewater	Copper	mg/l	0.004	
2/16/1979	TS-33A	Minewater	Cyanide	mg/l	0.1	<
2/16/1979	TS-33A	Minewater	Fluoride	mg/l	0.48	
2/16/1979	TS-33A	Minewater	Iron	mg/l	4.9	
2/16/1979	TS-33A	Minewater	Lead	mg/l	0.001	<
2/16/1979	TS-33A	Minewater	Manganese	mg/l	0.011	
2/16/1979	TS-33A	Minewater	Mercury	mg/l	0.0004	<
2/16/1979	TS-33A	Minewater	Molybdenum	mg/l	0.003	
2/16/1979	TS-33A	Minewater	Nickel	mg/l	0.01	<
2/16/1979	TS-33A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.7	
2/16/1979	TS-33A	Minewater	pH, lab	SU	7.98	
2/16/1979	TS-33A	Minewater	Phenols	mg/l	0.004	
2/16/1979	TS-33A	Minewater	Radium-226	pCi/l	0.6	± 0.4
2/16/1979	TS-33A	Minewater	Radium-228	pCi/l	5	± 2
2/16/1979	TS-33A	Minewater	Selenium	mg/l	0.04	
2/16/1979	TS-33A	Minewater	Silver	mg/l	0.01	<
2/16/1979	TS-33A	Minewater	Sulfate	mg/l	81	
2/16/1979	TS-33A	Minewater	TDS	mg/l	415	
2/16/1979	TS-33A	Minewater	Uranium	mg/l	2.07	
2/16/1979	TS-33A	Minewater	Zinc	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Aluminum	mg/l	0.3	
2/17/1979	TS-38A	Minewater	Arsenic	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Barium	mg/l	0.7	
2/17/1979	TS-38A	Minewater	Boron	mg/l	0.2	
2/17/1979	TS-38A	Minewater	Cadmium	mg/l	0.001	<

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
2/17/1979	TS-38A	Minewater	Chloride	mg/l	6.2	
2/17/1979	TS-38A	Minewater	Chromium	mg/l	0.001	<
2/17/1979	TS-38A	Minewater	Cobalt	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Copper	mg/l	0.001	<
2/17/1979	TS-38A	Minewater	Cyanide	mg/l	0.1	<
2/17/1979	TS-38A	Minewater	Fluoride	mg/l	0.48	
2/17/1979	TS-38A	Minewater	Iron	mg/l	2.5	
2/17/1979	TS-38A	Minewater	Lead	mg/l	0.001	<
2/17/1979	TS-38A	Minewater	Manganese	mg/l	0.003	
2/17/1979	TS-38A	Minewater	Mercury	mg/l	0.0004	<
2/17/1979	TS-38A	Minewater	Molybdenum	mg/l	0.002	
2/17/1979	TS-38A	Minewater	Nickel	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.5	
2/17/1979	TS-38A	Minewater	pH, lab	SU	8.2	
2/17/1979	TS-38A	Minewater	Phenols	mg/l	0.005	
2/17/1979	TS-38A	Minewater	Radium-226	pCi/l	49.3	± 2.1
2/17/1979	TS-38A	Minewater	Radium-228	pCi/l	1	<
2/17/1979	TS-38A	Minewater	Selenium	mg/l	0.03	
2/17/1979	TS-38A	Minewater	Silver	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Sulfate	mg/l	76	
2/17/1979	TS-38A	Minewater	TDS	mg/l	483	
2/17/1979	TS-38A	Minewater	Uranium	mg/l	2.1	
2/17/1979	TS-38A	Minewater	Zinc	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Aluminum	mg/l	0.3	
2/21/1979	TS-43A	Minewater	Arsenic	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Barium	mg/l	0.4	
2/21/1979	TS-43A	Minewater	Boron	mg/l	0.3	
2/21/1979	TS-43A	Minewater	Cadmium	mg/l	0.001	<
2/21/1979	TS-43A	Minewater	Chloride	mg/l	7	
2/21/1979	TS-43A	Minewater	Chromium	mg/l	0.001	<
2/21/1979	TS-43A	Minewater	Cobalt	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Copper	mg/l	0.003	
2/21/1979	TS-43A	Minewater	Cyanide	mg/l	0.1	<
2/21/1979	TS-43A	Minewater	Fluoride	mg/l	0.46	
2/21/1979	TS-43A	Minewater	Iron	mg/l	0.07	
2/21/1979	TS-43A	Minewater	Lead	mg/l	0.001	<
2/21/1979	TS-43A	Minewater	Manganese	mg/l	0.01	
2/21/1979	TS-43A	Minewater	Mercury	mg/l	0.0004	<
2/21/1979	TS-43A	Minewater	Molybdenum	mg/l	0.002	
2/21/1979	TS-43A	Minewater	Nickel	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.4	
2/21/1979	TS-43A	Minewater	pH, lab	mg/l	8.19	
2/21/1979	TS-43A	Minewater	Phenols	mg/l	0.003	
2/21/1979	TS-43A	Minewater	Radium-226	pCi/l	82	± 1.7
2/21/1979	TS-43A	Minewater	Radium-228	pCi/l	1	<
2/21/1979	TS-43A	Minewater	Selenium	mg/l	0.03	
2/21/1979	TS-43A	Minewater	Silver	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Sulfate	mg/l	73	
2/21/1979	TS-43A	Minewater	TDS	mg/l	386	
2/21/1979	TS-43A	Minewater	Uranium	mg/l	0.96	
2/21/1979	TS-43A	Minewater	Zinc	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Aluminum	mg/l	0.3	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
2/27/1979	TS-47A	Minewater	Arsenic	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Barium	mg/l	0.1	
2/27/1979	TS-47A	Minewater	Boron	mg/l	0.3	
2/27/1979	TS-47A	Minewater	Cadmium	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Chloride	mg/l	7	
2/27/1979	TS-47A	Minewater	Chromium	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Cobalt	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Copper	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Cyanide	mg/l	0.2	
2/27/1979	TS-47A	Minewater	Fluoride	mg/l	0.48	
2/27/1979	TS-47A	Minewater	Iron	mg/l	0.61	
2/27/1979	TS-47A	Minewater	Lead	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Manganese	mg/l	0.02	
2/27/1979	TS-47A	Minewater	Mercury	mg/l	0.0004	
2/27/1979	TS-47A	Minewater	Molybdenum	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Nickel	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.5	
2/27/1979	TS-47A	Minewater	pH, lab	mg/l	7.42	
2/27/1979	TS-47A	Minewater	Phenols	mg/l	0.002	
2/27/1979	TS-47A	Minewater	Radium-226	pCi/l	155	± 3
2/27/1979	TS-47A	Minewater	Radium-228	pCi/l	1	<
2/27/1979	TS-47A	Minewater	Selenium	mg/l	0.04	
2/27/1979	TS-47A	Minewater	Silver	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Sulfate	mg/l	70	
2/27/1979	TS-47A	Minewater	TDS	mg/l	383	
2/27/1979	TS-47A	Minewater	Uranium	mg/l	3.71	
2/27/1979	TS-47A	Minewater	Zinc	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Aluminum	mg/l	0.3	
3/14/1979	TS-52A	Minewater	Arsenic	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Barium	mg/l	0.2	
3/14/1979	TS-52A	Minewater	Boron	mg/l	0.3	
3/14/1979	TS-52A	Minewater	Cadmium	mg/l	0.001	<
3/14/1979	TS-52A	Minewater	Chloride	mg/l	6.5	
3/14/1979	TS-52A	Minewater	Chromium	mg/l	0.041	
3/14/1979	TS-52A	Minewater	Cobalt	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Copper	mg/l	0.016	
3/14/1979	TS-52A	Minewater	Cyanide	mg/l	0.1	
3/14/1979	TS-52A	Minewater	Fluoride	mg/l	0.52	
3/14/1979	TS-52A	Minewater	Iron	mg/l	0.62	
3/14/1979	TS-52A	Minewater	Lead	mg/l	0.001	<
3/14/1979	TS-52A	Minewater	Manganese	mg/l	0.081	
3/14/1979	TS-52A	Minewater	Mercury	mg/l	0.0004	<
3/14/1979	TS-52A	Minewater	Molybdenum	mg/l	0.003	
3/14/1979	TS-52A	Minewater	Nickel	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.5	
3/14/1979	TS-52A	Minewater	pH, lab	mg/l	7.2	
3/14/1979	TS-52A	Minewater	Phenols	mg/l	0.006	
3/14/1979	TS-52A	Minewater	Radium-226	pCi/l	67	± 2.7
3/14/1979	TS-52A	Minewater	Radium-228	pCi/l	1	<
3/14/1979	TS-52A	Minewater	Selenium	mg/l	0.03	
3/14/1979	TS-52A	Minewater	Silver	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Sulfate	mg/l	70	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
3/14/1979	TS-52A	Minewater	TDS	mg/l	386	
3/14/1979	TS-52A	Minewater	Uranium	mg/l	1.57	
3/14/1979	TS-52A	Minewater	Zinc	mg/l	0.02	
3/27/1979	TS-56A	Minewater	Aluminum	mg/l	0.1	<
3/27/1979	TS-56A	Minewater	Arsenic	mg/l	0.01	<
3/27/1979	TS-56A	Minewater	Barium	mg/l	0.2	
3/27/1979	TS-56A	Minewater	Boron	mg/l	0.2	
3/27/1979	TS-56A	Minewater	Cadmium	mg/l	0.001	<
3/27/1979	TS-56A	Minewater	Chloride	mg/l	7	
3/27/1979	TS-56A	Minewater	Chromium	mg/l	0.002	
3/27/1979	TS-56A	Minewater	Cobalt	mg/l	0.01	<
3/27/1979	TS-56A	Minewater	Copper	mg/l	0.001	
3/27/1979	TS-56A	Minewater	Cyanide	mg/l	0.1	<
3/27/1979	TS-56A	Minewater	Fluoride	mg/l	0.48	
3/27/1979	TS-56A	Minewater	Iron	mg/l	0.02	
3/27/1979	TS-56A	Minewater	Lead	mg/l	0.001	<
3/27/1979	TS-56A	Minewater	Manganese	mg/l	0.002	
3/27/1979	TS-56A	Minewater	Mercury	mg/l	0.0004	<
3/27/1979	TS-56A	Minewater	Molybdenum	mg/l	0.001	
3/27/1979	TS-56A	Minewater	Nickel	mg/l	0.01	<
3/27/1979	TS-56A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.5	
3/27/1979	TS-56A	Minewater	pH, lab	mg/l	8	
3/27/1979	TS-56A	Minewater	Phenols	mg/l	0.001	<
3/27/1979	TS-56A	Minewater	Radium-226	pCi/l	89.8	± 2.3
3/27/1979	TS-56A	Minewater	Radium-228	pCi/l	2	± 1
3/27/1979	TS-56A	Minewater	Selenium	mg/l	0.03	
3/27/1979	TS-56A	Minewater	Silver	mg/l	0.01	<
3/27/1979	TS-56A	Minewater	Sulfate	mg/l	76	
3/27/1979	TS-56A	Minewater	TDS	mg/l	404	
3/27/1979	TS-56A	Minewater	Uranium	mg/l	1.53	
3/27/1979	TS-56A	Minewater	Zinc	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Aluminum	mg/l	0.2	<
4/11/1979	TS-63	Minewater	Arsenic	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Barium	mg/l	0.2	
4/11/1979	TS-63	Minewater	Boron	mg/l	0.1	<
4/11/1979	TS-63	Minewater	Cadmium	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Chloride	mg/l	5	
4/11/1979	TS-63	Minewater	Chromium	mg/l	0.02	<
4/11/1979	TS-63	Minewater	Cobalt	mg/l	0.03	<
4/11/1979	TS-63	Minewater	Copper	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Cyanide	mg/l	0.1	<
4/11/1979	TS-63	Minewater	Fluoride	mg/l	0.51	
4/11/1979	TS-63	Minewater	Iron	mg/l	0.05	<
4/11/1979	TS-63	Minewater	Lead	mg/l	0.05	<
4/11/1979	TS-63	Minewater	Manganese	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Mercury	mg/l	0.0004	<
4/11/1979	TS-63	Minewater	Molybdenum	mg/l	0.04	<
4/11/1979	TS-63	Minewater	Nickel	mg/l	0.02	
4/11/1979	TS-63	Minewater	Nitrogen, Nitrate (as N)	mg/l	13	
4/11/1979	TS-63	Minewater	pH, lab	mg/l	7.59	
4/11/1979	TS-63	Minewater	Phenols	mg/l	0.001	<
4/11/1979	TS-63	Minewater	Radium-226	pCi/l	22	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
4/11/1979	TS-63	Minewater	Radium-228	pCi/l	5	
4/11/1979	TS-63	Minewater	Sc	umhos/cm	600	
4/11/1979	TS-63	Minewater	Selenium	mg/l	0.02	
4/11/1979	TS-63	Minewater	Silver	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Sodium	mg/l	85.3	
4/11/1979	TS-63	Minewater	Sulfate	mg/l	75.8	
4/11/1979	TS-63	Minewater	TDS	mg/l	380.5	
4/11/1979	TS-63	Minewater	Thorium-230	pCi/l	0.6	<
4/11/1979	TS-63	Minewater	Uranium	mg/l	2.29	
4/11/1979	TS-63	Minewater	Vanadium	mg/l	0.1	<
4/11/1979	TS-63	Minewater	Zinc	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Aluminum	mg/l	0.2	<
5/2/1979	TS-69	Minewater	Barium	mg/l	0.1	<
5/2/1979	TS-69	Minewater	Cadmium	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Chloride	mg/l	5	
5/2/1979	TS-69	Minewater	Chromium	mg/l	0.02	<
5/2/1979	TS-69	Minewater	Cobalt	mg/l	0.05	<
5/2/1979	TS-69	Minewater	Copper	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Fluoride	mg/l	0.42	
5/2/1979	TS-69	Minewater	Iron	mg/l	0.04	<
5/2/1979	TS-69	Minewater	Lead	mg/l	0.05	<
5/2/1979	TS-69	Minewater	Manganese	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Mercury	mg/l	0.0004	<
5/2/1979	TS-69	Minewater	Molybdenum	mg/l	0.04	<
5/2/1979	TS-69	Minewater	Nickel	mg/l	0.04	<
5/2/1979	TS-69	Minewater	Nitrogen, Nitrate (as N)	mg/l	1	
5/2/1979	TS-69	Minewater	pH, lab	mg/l	8.45	
5/2/1979	TS-69	Minewater	Phenols	mg/l	0.001	<
5/2/1979	TS-69	Minewater	Radium-226	pCi/l	11.2	
5/2/1979	TS-69	Minewater	Sc	umhos/cm	485	
5/2/1979	TS-69	Minewater	Silver	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Sodium	mg/l	1009.1	
5/2/1979	TS-69	Minewater	Sulfate	mg/l	73.3	
5/2/1979	TS-69	Minewater	TDS	mg/l	370.5	
5/2/1979	TS-69	Minewater	Thorium-230	pCi/l	5.8	
5/2/1979	TS-69	Minewater	Uranium	mg/l	1.7	
5/2/1979	TS-69	Minewater	Vanadium	mg/l	0.1	<
5/2/1979	TS-69	Minewater	Zinc	mg/l	0.01	<
6/11/1979		Minewater	Aluminum	mg/l	0.339	
6/11/1979		Minewater	Arsenic	mg/l	0.0118	
6/11/1979		Minewater	Barium	mg/l	0.043	
6/11/1979		Minewater	Boron	mg/l	0.01	
6/11/1979		Minewater	Cadmium	mg/l	0.0038	
6/11/1979		Minewater	Chloride	mg/l	13.4	
6/11/1979		Minewater	Chromium	mg/l	0.0356	
6/11/1979		Minewater	Cobalt	mg/l	0.0001	<
6/11/1979		Minewater	Copper	mg/l	0.0235	
6/11/1979		Minewater	Fluoride	mg/l	0.55	
6/11/1979		Minewater	Iron	mg/l	0.059	
6/11/1979		Minewater	Lead	mg/l	0.0138	
6/11/1979		Minewater	Manganese	mg/l	0.0026	
6/11/1979		Minewater	Mercury	mg/l	0.001	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
6/11/1979		Minewater	Molybdenum	mg/l	0.0373	
6/11/1979		Minewater	Nickel	mg/l	0.1349	
6/11/1979		Minewater	Nitrogen, Nitrate (as N)	mg/l	0.1	<
6/11/1979		Minewater	pH, lab	SU	7.94	
6/11/1979		Minewater	Radium-226	pCi/l	36.1	
6/11/1979		Minewater	Radium-228	pCi/l	5.2	
6/11/1979		Minewater	Sc	umhos/cm	690	
6/11/1979		Minewater	Selenium	mg/l	0.0149	
6/11/1979		Minewater	Silver	mg/l	0.0054	
6/11/1979		Minewater	Sodium	mg/l	10	
6/11/1979		Minewater	Sulfate	mg/l	111.5	
6/11/1979		Minewater	TDS	mg/l	449.6	
6/11/1979		Minewater	Thorium-230	pCi/l	120.5	
6/11/1979		Minewater	Uranium	mg/l	3.62	
6/11/1979		Minewater	Vanadium	mg/l	0.1	
6/11/1979		Minewater	Zinc	mg/l	0.0022	
4/30/1980		Minewater	Alkalinity (CaCO3)	mg/l	232	
4/30/1980		Minewater	Aluminum	mg/l	2.8	
4/30/1980		Minewater	Barium	mg/l	0.1	
4/30/1980		Minewater	Calcium	mg/l	10.1	
4/30/1980		Minewater	Chloride	mg/l	6.5	
4/30/1980		Minewater	Iron	mg/l	1.99	
4/30/1980		Minewater	Lead-210	pCi/l	240	± 7.0
4/30/1980		Minewater	Magnesium	mg/l	1	<
4/30/1980		Minewater	Manganese	mg/l	0.003	
4/30/1980		Minewater	pH, lab	SU	8	
4/30/1980		Minewater	Potassium	mg/l	2.2	
4/30/1980		Minewater	Radium-226	pCi/l	490	± 12
4/30/1980		Minewater	Radium-228	pCi/l	1	<
4/30/1980		Minewater	Sc	umhos/cm	691	
4/30/1980		Minewater	Selenium	mg/l	0.004	
4/30/1980		Minewater	Silica	mg/l	21	
4/30/1980		Minewater	Sodium	mg/l	170	
4/30/1980		Minewater	Sulfate	mg/l	71	
4/30/1980		Minewater	TDS	mg/l	381	
4/30/1980		Minewater	Thorium-230	pCi/l	0.6	<
4/30/1980		Minewater	Uranium	mg/l	2.84	
4/30/1980		Minewater	Zinc	mg/l	0.02	
7/16/1980		Minewater	Alkalinity (CaCO3)	mg/l	127	
7/16/1980		Minewater	Aluminum	mg/l	0.1	<
7/16/1980		Minewater	Barium	mg/l	0.01	<
7/16/1980		Minewater	Bicarbonate	mg/l	155	
7/16/1980		Minewater	Calcium	mg/l	31	
7/16/1980		Minewater	Carbonate	mg/l	0.1	<
7/16/1980		Minewater	Chloride	mg/l	14.9	
7/16/1980		Minewater	Iron	mg/l	0.1	<
7/16/1980		Minewater	Lead-210	pCi/l	0	± 3.42
7/16/1980		Minewater	Magnesium	mg/l	4.2	
7/16/1980		Minewater	Manganese	mg/l	1.3	
7/16/1980		Minewater	pH, lab	SU	6.7	
7/16/1980		Minewater	Potassium	mg/l	1.9	
7/16/1980		Minewater	Radium-226	pCi/l	86.1	± 1.7

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
7/16/1980		Minewater	Radium-228	pCi/l	1.3	± 5.0
7/16/1980		Minewater	Sc	umhos/cm	950	
7/16/1980		Minewater	Selenium	mg/l	0.05	
7/16/1980		Minewater	Silicon	mg/l	6.9	
7/16/1980		Minewater	Sodium	mg/l	140	
7/16/1980		Minewater	Sulfate	mg/l	272	
7/16/1980		Minewater	TDS	mg/l	538	
7/16/1980		Minewater	Thorium-230	pCi/l	5.3	± 2.6
7/16/1980		Minewater	Uranium	mg/l	2.7	
7/16/1980		Minewater	Zinc	mg/l	0.01	
10/9/1984		Mill Well	Alkalinity (CaCO3)	mg/L	197	
10/9/1984		Mill Well	Aluminum	mg/L	0.05	
10/9/1984		Mill Well	Ammonium as N	mg/L	0.05	
10/9/1984		Mill Well	Arsenic	mg/L	0.001	
10/9/1984		Mill Well	Bicarbonate	mg/L	239.7	
10/9/1984		Mill Well	Cadmium	mg/L	0.01	
10/9/1984		Mill Well	Calcium	mg/L	4.7	
10/9/1984		Mill Well	Chloride	mg/L	4.1	
10/9/1984		Mill Well	Cobalt	mg/L	0.05	
10/9/1984		Mill Well	Gross Alpha	pCi/L	43	
10/9/1984		Mill Well	Lead	mg/L	0.05	
10/9/1984		Mill Well	Lead 210	pCi/L	9.3	
10/9/1984		Mill Well	Magnesium	mg/L	3.24	
10/9/1984		Mill Well	Manganese	mg/L	0.01	
10/9/1984		Mill Well	Molybdenum	mg/L	0.01	
10/9/1984		Mill Well	Nickel	mg/L	0.05	
10/9/1984		Mill Well	pH	s.u.	8.49	
10/9/1984		Mill Well	Potassium	mg/L	1.6	
10/9/1984		Mill Well	Radium 226	pCi/L	1.8	
10/9/1984		Mill Well	Selenium	mg/L	0.001	
10/9/1984		Mill Well	Sodium	mg/L	103.2	
10/9/1984		Mill Well	Sulfate	mg/L	17.7	
10/9/1984		Mill Well	TDS	mg/L	228	
10/9/1984		Mill Well	Thorium 230	pCi/L	61.3	
10/9/1984		Mill Well	Uranium	mg/L	0.065	
10/9/1984		Mill Well	Vanadium	mg/L	0.01	
4/23/1992		Mill Well	Alkalinity (CaCO3)	mg/L	201	
4/23/1992		Mill Well	Aluminum	mg/L	0.1	
4/23/1992		Mill Well	Ammonium as N	mg/L	0.1	
4/23/1992		Mill Well	Arsenic	mg/L	0.004	
4/23/1992		Mill Well	Beryllium	mg/L	0.1	
4/23/1992		Mill Well	Bicarbonate	mg/L	245	
4/23/1992		Mill Well	Cadmium	mg/L	0.01	
4/23/1992		Mill Well	Calcium	mg/L	3.2	
4/23/1992		Mill Well	Chloride	mg/L	6.3	
4/23/1992		Mill Well	Cobalt	mg/L	0.01	
4/23/1992		Mill Well	Gross Alpha	pCi/L	2.3	
4/23/1992		Mill Well	Lead	mg/L	0.05	
4/23/1992		Mill Well	Lead 210	pCi/L	1	
4/23/1992		Mill Well	Magnesium	mg/L	0.4	
4/23/1992		Mill Well	Manganese	mg/L	0.01	
4/23/1992		Mill Well	Molybdenum	mg/L	0.1	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
4/23/1992		Mill Well	Nickel	mg/L	0.05	
4/23/1992		Mill Well	Nitrate + Nitrate as N	mg/L	0.1	
4/23/1992		Mill Well	pH	s.u.	8.83	
4/23/1992		Mill Well	Potassium	mg/L	1	
4/23/1992		Mill Well	Radium 226	pCi/L	0.4	
4/23/1992		Mill Well	Radium 228	pCi/L	2.1	
4/23/1992		Mill Well	Selenium	mg/L	0.218	
4/23/1992		Mill Well	Sodium	mg/L	123	
4/23/1992		Mill Well	Sulfate	mg/L	33.3	
4/23/1992		Mill Well	TDS	mg/L	292	
4/23/1992		Mill Well	Thorium 230	pCi/L	0.2	
4/23/1992		Mill Well	Uranium	mg/L	0.576	
4/23/1992		Mill Well	Vanadium	mg/L	0.1	
7/28/1993		Mill Well	Alkalinity (CaCO3)	mg/L	188	
7/28/1993		Mill Well	Aluminum	mg/L	0.16	
7/28/1993		Mill Well	Ammonium as N	mg/L	0.05	
7/28/1993		Mill Well	Arsenic	mg/L	0.001	
7/28/1993		Mill Well	Beryllium	mg/L	0.005	
7/28/1993		Mill Well	Bicarbonate	mg/L	229	
7/28/1993		Mill Well	Cadmium	mg/L	0.01	
7/28/1993		Mill Well	Calcium	mg/L	15	
7/28/1993		Mill Well	Chloride	mg/L	182	
7/28/1993		Mill Well	Cobalt	mg/L	0.01	
7/28/1993		Mill Well	Gross Alpha	pCi/L	1.8	
7/28/1993		Mill Well	Lead	mg/L	0.05	
7/28/1993		Mill Well	Magnesium	mg/L	4.9	
7/28/1993		Mill Well	Manganese	mg/L	0.24	
7/28/1993		Mill Well	Molybdenum	mg/L	0.1	
7/28/1993		Mill Well	Nickel	mg/L	0.05	
7/28/1993		Mill Well	Nitrate + Nitrate as N	mg/L	0.1	
7/28/1993		Mill Well	pH	s.u.	8.49	
7/28/1993		Mill Well	Potassium	mg/L	3	
7/28/1993		Mill Well	Radium 226	pCi/L	1.6	
7/28/1993		Mill Well	Radium 228	pCi/L	1.4	
7/28/1993		Mill Well	Selenium	mg/L	0.003	
7/28/1993		Mill Well	Sodium	mg/L	708	
7/28/1993		Mill Well	Sulfate	mg/L	1260	
7/28/1993		Mill Well	TDS	mg/L	2258	
7/28/1993		Mill Well	Thorium 230	pCi/L	0.2	
7/28/1993		Mill Well	Uranium	mg/L	0.002	
7/28/1993		Mill Well	Vanadium	mg/L	0.1	
6/18/2002		Mill Well	Alkalinity (CaCO3)	mg/L	185	
6/18/2002		Mill Well	Aluminum	mg/L	0.1	
6/18/2002		Mill Well	Ammonium as N	mg/L	0.5	
6/18/2002		Mill Well	Arsenic	mg/L	0.001	
6/18/2002		Mill Well	Beryllium	mg/L	0.01	
6/18/2002		Mill Well	Bicarbonate	mg/L	225	
6/18/2002		Mill Well	Cadmium	mg/L	0.005	
6/18/2002		Mill Well	Calcium	mg/L	16	
6/18/2002		Mill Well	Chloride	mg/L	160	
6/18/2002		Mill Well	Cobalt	mg/L	0.01	
6/18/2002		Mill Well	Gross Alpha	pCi/L	1	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
6/18/2002		Mill Well	Lead	mg/L	0.05	
6/18/2002		Mill Well	Lead 210	pCi/L	1	
6/18/2002		Mill Well	Magnesium	mg/L	4.2	
6/18/2002		Mill Well	Manganese	mg/L	0.05	
6/18/2002		Mill Well	Molybdenum	mg/L	0.1	
6/18/2002		Mill Well	Nickel	mg/L	0.05	
6/18/2002		Mill Well	Nitrate + Nitrate as N	mg/L	0.1	
6/18/2002		Mill Well	pH	s.u.	8.34	
6/18/2002		Mill Well	Potassium	mg/L	3.5	
6/18/2002		Mill Well	Radium 226	pCi/L	0.7	
6/18/2002		Mill Well	Radium 228	pCi/L	2.7	
6/18/2002		Mill Well	Selenium	mg/L	0.001	
6/18/2002		Mill Well	Sodium	mg/L	644	
6/18/2002		Mill Well	Sulfate	mg/L	1100	
6/18/2002		Mill Well	TDS	mg/L	2090	
6/18/2002		Mill Well	Thorium 230	pCi/L	0.02	
6/18/2002		Mill Well	Uranium	mg/L	0.07	
6/18/2002		Mill Well	Vanadium	mg/L	0.1	

Notes:
Qualifier of < signifies that concentration was less than detection limit shown
Qualifier of ± represents precision of radionuclides analysis

ok

MINE WELL

Pa7 – Don't have

STATION NAME: Church Rock Mine - Backfilling 6/02/81

LOCATION: Gallup, N.M

ug/ml ≈ ppm *

Parameter/Date-Time Water Level from MP Ft	decant CR-1 DECANT	mine H_2O CR-2 MINE H2O	Comingled H_2O CR-3 COMM H2O	mine H_2O CR-4 MINE H2O	comingled H_2O CR-5 COM H2O	sump H_2O CR-6 SUMP H2O	slurry/ H_2O mix CR-7 SLR H2O	IX H_2O CR-9 IX H2O
Water Level Elevation Ft								
Staff Gage Ft								
pH	5.2	8.2	8.6	8.3	8.3	6.8	8.1	7.9
Temp °C	23	23	~~1820~~ 21.5	21.5	21.7	21.5	21.1	21.2
Uncorrected Field Cond. µmhos	5900	490	1820	408	670	1800	780	710
G. Alpha pCi/l								
Ra-226 pCi/l								
Ra-228 pCi/l								
Pb-210 pCi/l								
As µg/ml	0.059	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ba µg/ml	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.1	<0.1
Cd µg/ml	0.011	<0.01	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Pb µg/ml	0.028	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mo µg/ml	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	0.014	0.015
Se µg/ml	0.048	0.058	0.020	0.043	<0.01	0.011	0.061	0.050
U-nat. µg/ml	97.46	1.90	1.0	0.56	0.070	3.88	5.83	1.50
V µg/l	0.061	0.017	<0.005	0.009	<0.005	<0.005	0.015	0.017
Zn µg/l	17.34	0.036	0.966	<0.03	<0.03	1.585	0.041	<0.03
NO_2+NO_3 mg/l								
NH_3 mg/l								
COD mg/l								
Ca mg/l	530.0	6.0	69.4	5.6	10.6	161.0	21.4	25.9
K mg/l	163.8	1.17	1.95	1.56	1.95	2.34	1.95	2.34
Na mg/l	434.7	112.7	130.0	110.4	158.7	161.0	158.7	161.0
HCO_3 mg/l	0	253.7	51.1	247.1	307.3	0	232.8	201.6
Cl mg/l	96.3	6.14	11.54	5.8	7.6	17.5	9.5	13.9
SO_4 mg/l	6439	47.3	576	30.9	104.4	1187	207.2	241.0
TFR mg/l	9140	325	708	310	552	1608	523	557
Lab Cond. -25°C µmhos								
Mg mg/l	213	0.5	9.5	0	0	17.2	3.3	1.65

TABLE C

CHEMICAL GROUND-WATER ANALYSES OF TRIBAL WELLS AND SPRINGS OPERATED BY THE GROUND-WATER DEVELOPMENT AND SHALLOW WELL AND SPRING DEVELOPMENT DEPARTMENTS (continued)

Quad. #	Miles from NE-Corner West South	Field # or Name	Date Col-lect	SiO_2	Ca	Mg	Na	HCO_3	CO_3	SO_4	Cl	F	NO_3	Hard-ness ppm	Dis-solved Solids	Conduc-tance	pH	Geological Formation
				Parts Per Million (ppm)														
				District 16 (continued)														
106	0.55 x 16.15	16B-12	5/50	11	169	87	24	247	0	596	5	.2	..3	779	1010	1350		Glorieta
	5.35 x 14.70	16B-40A	2/64		356	236		220	0	385	20			592	1125	1500	8.1	Glorieta
	7.60 x 12.10	16K-336	9/53	58	80	19	227	776	0	91	26	1.4	.3	278	832	1330		Alluvium
	5.45 x 10.80	16K-340	6/54	12	139	44	264	890	0	314	24	.6	13	528	1250	1810		Alluvium
	12.92 x 10.30	16T-525	12/53					458	52		10					1080	8.6	Crevasse Canyon
	4.65 x 12.80	16-3-7	8/49					153	0		8					268		Westwater Canyon
107	4.60 x 10.00	16K-328 16-18	8/53	5.1	20	11	262	498	11	210	12	.0	1.9	95	778	1280		Menefee
	8.55 x 16.70	16T-339	8/54	14	48	13	157	364	0	138	13	.5	.2	174	613	937		Gallup
	4.75 x 7.20	16T-524	11/53					310	67		8			14		842	8.8	Menefee
	0.25 x 8.55	16T-526	12/53					548	55		9			50		1260	8.4	Menefee+ Crevasse Canyon
108	2.15 x 6.35	16-2-8	3/50					590	0	2430						4320		Landslide
119	10.50 x 10.00	16T-521	11/63	10	19	1.5	204	416	0	124	15	2.0	.7	54	581	912	7.9	Entrada
120	12.05 x 5.55	16B-39	12/48		1.2	.5	141	244	16	54	19	.4	.9	5	353	576		Sonsela
	7.35 x 4.20	16-5-9	3/53					114	0		4650			373		13400		Petrified Forest,
	7.75 x 4.50	San Antone Spr.	11/48		2.0	3.3	219	436	0	77	33	1.2	8.6	18	559	881		Upper Wingate (Rock Point)
121	0.50 x 4.55	16T-529	3/64	7.1	10	2.4	147	236	0	92	44	.8	.0	35	419	687	8.2	Glorieta
123	0.35 x 3.40	16K-321 16-4-20	5/51	10	58	21	287	587	0	314	30	1.6	.8	231	1010	1560		Gallup

SFUND RECORDS CTR
2091990

Mill Well
6/18/02
8/12/76
'84
'92
'93

Mine Well
'79
'80

MWH

To: Roy Blickwedel
Larry Bush

Date: August 3, 2004

From: Jed Thompson

Job No: 1010139.011802

Subject: Groundwater Quality in the Westwater Canyon Member at the Northeast Church Rock Mine

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This memorandum was prepared in response to comments to the Northeast Church Rock (NECR) Mine Closeout Plan received from the State of New Mexico, Mining and Minerals Division (MMD) in their memo dated June 23, 2004. This memorandum presents available information about:

- Regional groundwater quality within the Westwater Canyon Member, Dakota Sandstone and Gallup Formation near the NECR Mine site (the Site),
- Historic groundwater quality analyses of NECR mine water; and,
- Comparisons of regional and historic water quality data to the groundwater sample collected at the Site on May 17, 2004.

HISTORIC AND REGIONAL DATA

Historic and regional groundwater quality data sources used in this report are listed below.

- *Water Quality Impacts of Uranium Mining and Milling Activities in the Grants Mineral Belt, New Mexico.* (EPA, 1975)
- *Water Quality Data for Discharges from New Mexico Uranium Mines and Mills.* (NMEID, 1980)
- *Hydrogeology and Water Resources of San Juan Basin, New Mexico. Hydrologic Report 6.* (Stone, 1983)
- *Reclamation Engineering Services, Geohydrologic Report.* (Canonie, 1987)
- *Five-year Review Report, United Nuclear Corporation Ground Water Operable Unit McKinley County, New Mexico.* (USEPA, 1998)
- Discharge Permit (DP) 63 sampling results

The primary aquifers in the Church Rock region are the Dakota Sandstone and Westwater Canyon Member. Higher geologic units, including the Gallup Formation and the alluvium are not historic aquifers (Canonie, 1987).

The alluvium and Gallup Formation at the Northeast Church Rock mine and mill were unsaturated. Occurrences of groundwater in both units are derived from mine dewatering seepage from multiple mines (USEPA, 1998), and are hydraulically separated from the Dakota Sandstone and Westwater Canyon Member by the Upper D-Cross Tongue Member of the Mancos Shale which is a very

effective aquiclude (Canonie, 1987). Minewater that seeped into the alluvium and Gallup Formation is being regulated and addressed under the Church Rock Mill Superfund site under NRC Source Materials License SUA-1475. Minewater was discharged to Pipeline Arroyo in accordance with the Federal Clean Water Act under NPDES Permit Number NM0020401.

Groundwater flows downdip in bedrock (Canonie, 1987). The local dip and groundwater flow direction in the Gallup Formation, Dakota Sandstone and Westwater Canyon Member is to the north (Stone, 1983).

Available analytical data for Site minewater are summarized in Table 1 and listed in Attachment 1. All data are reported results from DP-63 for minewater before comingling with decant from sand backfill. These data represent the ambient groundwater quality in the Westwater Canyon Member at the Site.

TABLE 1
NECR MINEWATER QUALITY DATA SUMMARY[1]

	Data Points	Average[2]	Max	Min	St Dev	NMED Std.[3]
MAJOR IONS						
Alkalinity (CaCO3)	2	179.5	232	127	--	
Bicarbonate	1	155	155	155	--	
Calcium	2	20.55	31	10.1	--	
Chloride	13	7.6	14.9	5	3.0	250
Fluoride	11	0.50	0.55	0.42	0.03	1.6
Magnesium	2	2.6	4.2	1	--	
Nitrogen, Nitrate (as N)	11	1.7	13	0.1	3.7	10
Potassium	2	2.1	2.2	1.9	--	
Sodium	5	282.9	1009.1	10	410.5	
Sulfate	13	93	272	70	55	600
PHYSICAL PROPERTIES						
TDS	13	426.9	552	370.5	61.3	1000
pH[4]	13	7.88	8.45	6.70	0.52	6 to 9
Conductivity[5]	5	683	950	485	171	
METAL – DISSOLVED						
Aluminum	13	0.5	2.8	0.1	0.7	5.0
Arsenic	10	0.0102	0.0118	0.0100	0.0006	0.1
Barium	13	0.20	0.70	0.01	0.18	1.0
Boron	10	0.20	0.30	0.01	0.09	0.75
Cadmium	11	0.003	0.010	0.001	0.004	0.01
Chromium	11	0.011	0.041	0.001	0.015	0.05
Cobalt	11	0.0146	0.0500	0.0001	0.0137	0.05
Copper	11	0.0066	0.0235	0.001	0.0075	1.0
Iron	13	0.85	4.9	0.01	1.46	1.0
Lead	11	0.01	0.05	0.001	0.020	0.05
Manganese	13	0.112	1.3	0.002	0.357	0.2
Mercury	11	0.0005	0.001	0.0004	0.0002	0.002
Molybdenum	11	0.012	0.04	0.001	0.017	1.0
Nickel	11	0.0250	0.1349	0.01	0.0376	0.2
Selenium	12	0.031	0.05	0.004	0.013	0.05
Silver	10	0.0095	0.01	0.0054	0.0015	0.05
Uranium	13	2.082	3.71	0.725	0.936	5.0
Vanadium	3	0.1	0.1	0.1	0	
Zinc	13	0.0117	0.02	0.0022	0.0052	10.0
RADIONUCLIDES – DISSOLVED						
Radium-226	13	97.6	490	0.6	125.1	30[6]
Radium-228	12	2.1	5.2	1	1.8	30[6]

Notes:
1. Summary of selected parameters from Attachment 1.
2. All values in mg/L except as otherwise noted
3. Standards for arsenic, cadmium, barium, chromium, fluoride, mercury, nitrate, lead, selenium, silver, and uranium are human health standards
   Standards for chloride, copper, sulfate, TDS, pH, iron, and zinc are secondary domestic water supply standards
   Standards for aluminum, boron, cobalt, manganese, molybdenum, and nickel are for irrigation water
4. pH in standard units
5. Conductivity in uS/cm
6. Combined Radium 226 and 228 cannot exceed 30 pCi/L

There is no groundwater quality data for the Dakota Sandstone near the Site.

Average historic minewater data exceeded standards for radium 226 in the Westwater Canyon Member.

Four wells are located within a one mile radius of the Site. The locations of the wells are shown in Figure 1. The Church Rock Mill Well and NECR-1 Well are completed in the Westwater Canyon Member. The Friendship Well is completed in the Gallup Formation. NR-1 is completed in the alluvium. The Church Rock Mill Well is used as a non-potable water supply for the mine office and to supplement the water in the tailings impoundment evaporation ponds to prevent the pond liner from drying out. NECR-1, NR-1 and the Friendship wells are not currently used. Completion data for these wells are provided in Table 2. The Pipeline Canyon Well mentioned in the Closeout Plan is located approximately 1.5 miles to the northeast of the Permit Boundary.

TABLE 2
WELL COMPLETION DATA

Well Name	Completion Date	Total Depth (ft bgs)	Top of Screen (ft bgs)	Screened Interval (ft)	Completion Unit
Church Rock Mill	6/6/76	1,600	Unk	100	Westwater Canyon
NECR Well	Unk	1,228	Unk	Unk	Westwater Canyon
Friendship	Unk	718	Unk	40	Gallup
NR-1	5/28/91	105	74.6	30.4	Alluvium

CURRENT SITE CONDITIONS

A groundwater sample was collected at the Site on May 17, 2004. The sample was collected from the well located approximately 200 feet south of shaft NECR-1 on the north end of the Site. The sample was collected in accordance with the SOP presented in the Section 27 Closeout Plan.

The sample was collected from approximately the center of the water column in the well. The depth to water was 524.68 feet below the top of casing. The total depth of the vent is 1,230 feet below the top of casing. The sample was collected at approximately 900 feet below the top of casing. The sample was collected using multiple trips with a PVC double ball bailer. The double ball bailer works the same as a single ball bailer, with the balls floating as the bailer is lowered, allowing water to enter and flow through the device freely. When the designated depth is reached, the bailer is hoisted and the balls at the top and bottom of the bailer are seated preventing the water from leaving the bottom of the bailer and preventing water above the bailer from mixing with the water in the bailer.

Sufficient trips were made with the bailer to provide the quantity of water required for NMED and UNC to analyze for the analytes included in the Closeout Plan. Results of the analytical analyses of UNC's samples are provided in Table 3 along with the average minewater quality from Table 1 and the water quality from the Church Rock Mill Well which is also completed in the Westwater Canyon Member. The laboratory report is included in Attachment 2.

Water bailed from the NECR well was black in color and smelled of hydrogen sulfide. The field pH of the sample was 10.2 standard units, and the conductivity was 1800 µmhos/cm at 18.0 degrees Celsius.

As shown in Table 3, the pH and concentrations of alkalinity, sulfate, sodium, TDS, and boron are elevated above average mine water concentrations from the DP-63 monitoring. Several constituents, particularly radium and uranium, are less concentrated currently than when mining was active. pH and alkalinity values in the recent NECR sample are also greater than those seen in the Church Rock Mill Well, while sulfate and sodium concentrations (which make up the bulk of TDS) are less

concentrated. Concentrations of boron and TDS, and the pH exceed NMED standards in the NECR sample.

TABLE 3
SECTION 27 MINE WATER ANALYTICAL RESULTS

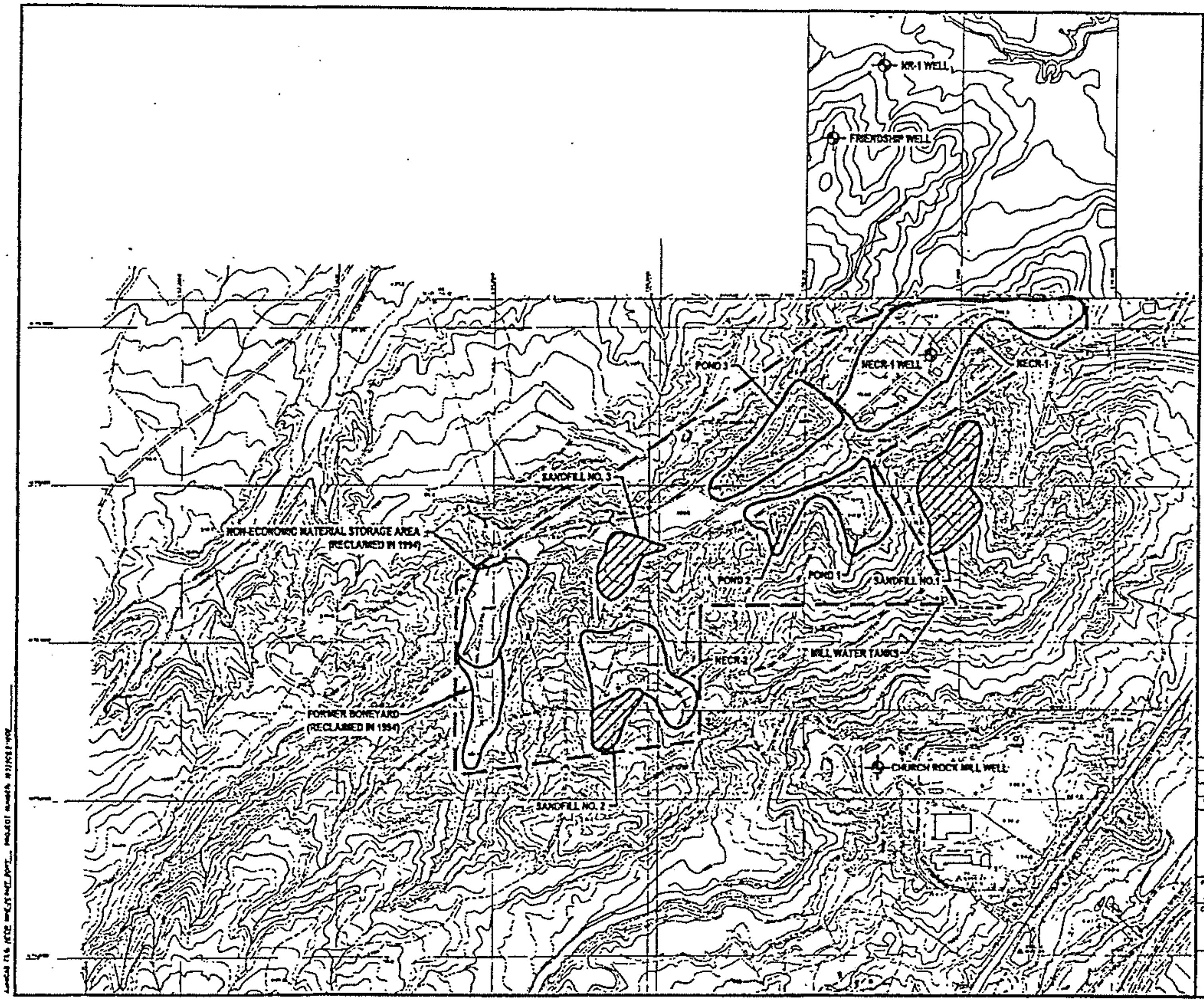
Constituent	Units	Mill Well 6/18/02[1]	Average Mine Water[2]	NECR Well 5/17/04[3]	NMED Std.[4]
MAJOR IONS					
Alkalinity, Total as $CaCO_3$	mg/L	--	179.5	365	
Bicarbonate	mg/L	225	155	--	
Calcium	mg/L	16.0	20.55	3.38	
Chloride	mg/L	160	7.6	21.8	250
Fluoride	mg/L	--	0.60	0.7	1.6
Magnesium	mg/L	4.2	2.6	0.58	
Nitrate + Nitrite as N	mg/L	<0.10	1.7[5]	<0.10	10.0
Potassium	mg/L	3.5	2.1	5.57	
Sodium	mg/L	644	282.9	388	
Sulfate	mg/L	1100	93	450	600
PHYSICAL PROPERTIES					
TSS	mg/L	--	--	243	
TDS	mg/L	2090	426.9	1150	1000
pH	s.u.	8.34	7.88	9.90	6 to 9
Conductivity	umhos/cm	--	683	1840	
METALS – DISSOLVED					
Aluminum	mg/L	<0.10	0.5	<0.10	5.0
Arsenic	mg/L	<0.001	0.0102	0.001	0.1
Barium	mg/L	--	0.20	0.014	1.0
Beryllium	mg/L	<0.01	--	<0.01	
Boron	mg/L	--	0.20	4.47	0.75
Cadmium	mg/L	<0.005	0.003	<0.01	0.01
Cobalt	mg/L	<0.01	0.0146	<0.01	
Iron	mg/L	--	0.85	0.140	1.0
Lead	mg/L	<0.05	0.01	<0.001	0.05
Manganese	mg/L	0.05	0.112	0.003	
Molybdenum	mg/L	<0.10	0.012	0.056	1.0
Nickel	mg/L	<0.05	0.025	<0.05	
Selenium	mg/L	<0.001	0.031	0.002	0.05
Uranium	mg/L	0.0700	2.082	0.134	5.0
Vanadium	mg/L	<0.10	0.1	<0.005	
RADIONUCLIDES – DISSOLVED					
Gross Alpha	pCi/l	<1	--	93 ± 3.6	
Radium-226	pCi/l	0.7	97.6	2.4 ± 0.5	30[6]
Radium-228	pCi/l	2.7	2.1	<1.0	30[6]

Notes:

1. Samples collected from Church Rock Mill Well as reported in Closeout Plan
2. Average mine water quality as reported in Table 1
3. Sample collected from well located near shaft NECR-1
4. Standards for fluoride, nitrate, arsenic, barium, cadmium, lead, selenium, uranium, and radium are human health standards.
   Standards for chloride, sulfate, TDS, pH, and iron are secondary domestic water supply standards.
   Standards for aluminum, boron and molybdenum are for irrigation water.
5. Value represents nitrate as N
6. Combined Radium 226 and 228 cannot exceed 30 pCi/L

Figures 2 through 6 show the concentration trends for alkalinity, sulfate, TDS, pH and boron. The figures plot the trends over time by data source. All available data is plotted in the graphs.

Elevated values for pH and alkalinity in the recent NECR sample are likely due to the presence of sulfate reducing bacteria (SRB) in the well water, adding alkalinity to the water as they reduce sulfate to sulfide. The presence of SRB's would explain the black coloring and hydrogen sulfide smell of the water bailed from the well. This might also explain why uranium and iron concentrations are lower



LEGEND

— —	PERMIT BOUNDARY
——	FACILITY BOUNDARY (Approx.)
▨	SANDFILL (Subsurface Tailings Placement) Reclaimed under NRC Radioactive Material License
>—<	CULVERT
⌖ NECR-1	WELL LOCATION

N

APPROXIMATE SCALE
0 300' 600'
FEET

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT:
NECR GROUNDWATER TECHNICAL MEMORANDUM

DRAWING TITLE:
WELL LOCATIONS

MWH

Sheet 1 Of 1 Sheets
SCALE: As Shown
FIGURE No. 1

today than during active mining. Uranium is less mobile in reducing environments and iron will react with the sulfide and precipitate as iron sulfide.

The likely role of sulfate-reducing conditions in the current NECR sample chemistry is further supported by the following differences between the NECR sample and the Mill Well:

- Sulfate is about a factor of two less in the NECR sample compared to the Mill Well indicating sulfate reduction,

- Bicarbonate is concentrated in the NECR sample in stoichiometric proportion to sulfate reduction according to the reaction:

$$2\,CH_2O + SO_4^{-2} \;=\; H_2S + 2\,HCO_3^{-}\ .$$

There is currently no explanation for the elevated concentration of boron in the recent NECR sample. There are no data for boron from the Mill Well.

CONCLUSIONS

Groundwater quality at the Site is within NMED standards with the exception of pH, TDS and boron. Sulfate and TDS concentrations and radium activity at the site have dropped since the peak concentration recorded in 1993 possibly because of sulfate reduction. A sulfate reducing environment would explain the increase in pH and alkalinity seen in the recent NECR sample.

The source of boron in the water is unknown.

Water quality has improved since mining ceased. This is especially true for constituents of greatest concern, radium and uranium. In addition, metals concentrations meet water quality standards. While dissolved solids are greater today than during mining, they are comprised of common ions that do not pose a health risk.

While the pH of the NECR is higher than historic results, it is not recommended that it be considered for abatement. Treatment to reduce pH could produce adverse environmental consequences. Metals and radionuclides are geochemically fixed under current and anticipated conditions; to alter this equilibrium would be to run the risk of mobilizing them.

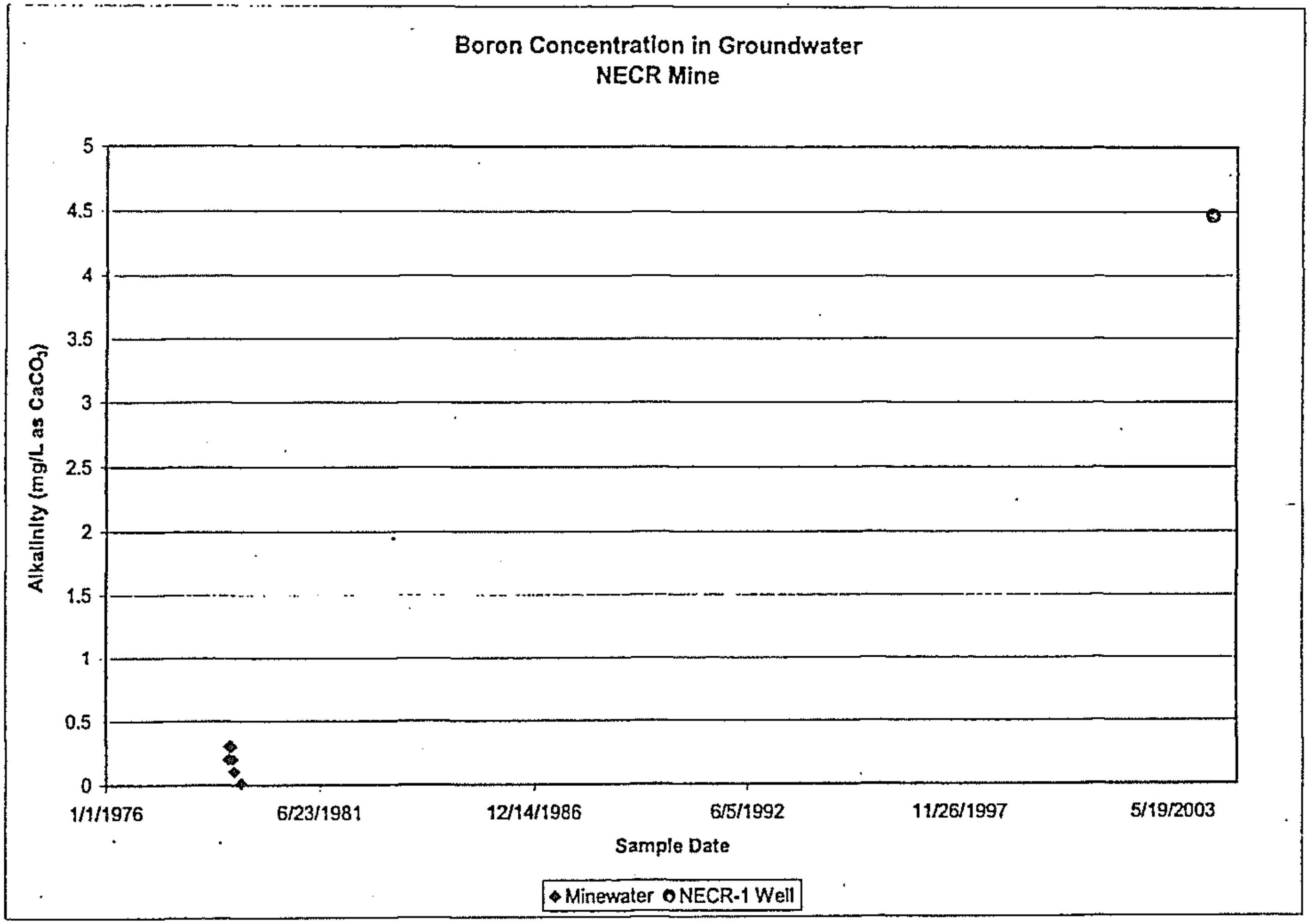


FIGURE 2
ALKALINITY CONCENTRATION IN GROUNDWATER NEAR NECR MINE

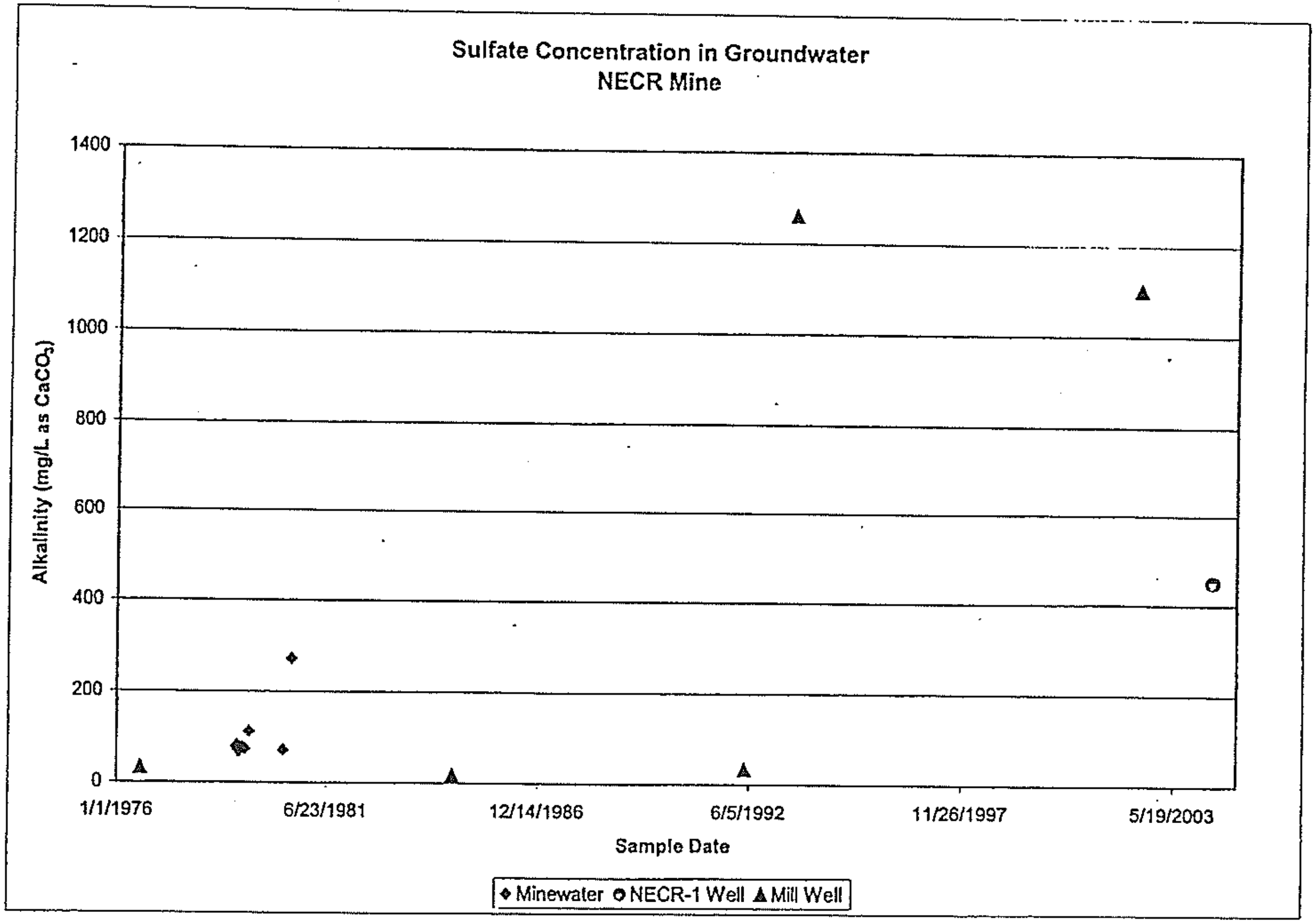


FIGURE 3
SULFATE CONCENTRATION IN GROUNDWATER NEAR NECR MINE

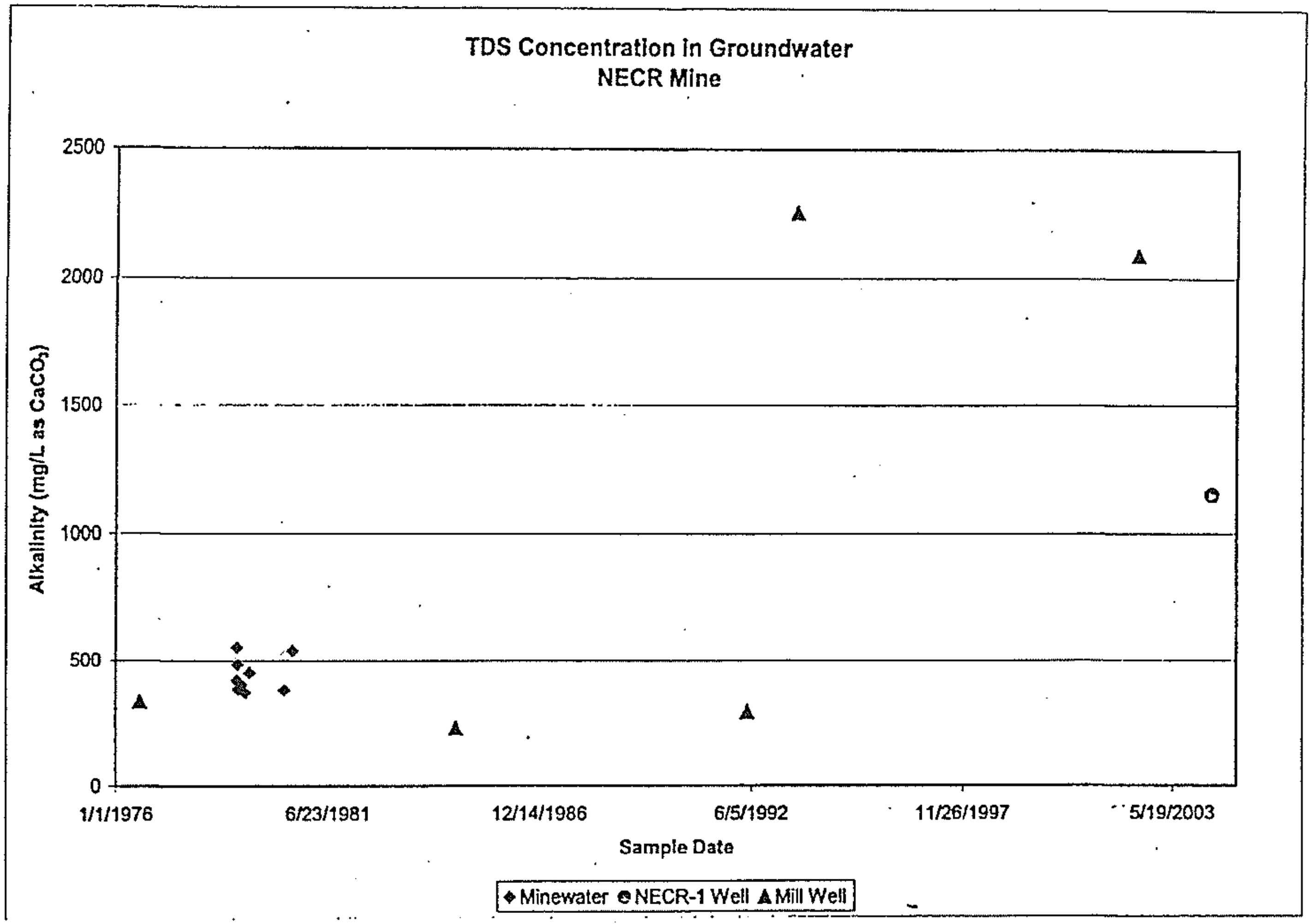


FIGURE 4
TDS CONCENTRATION IN GROUNDWATER NEAR NECR MINE

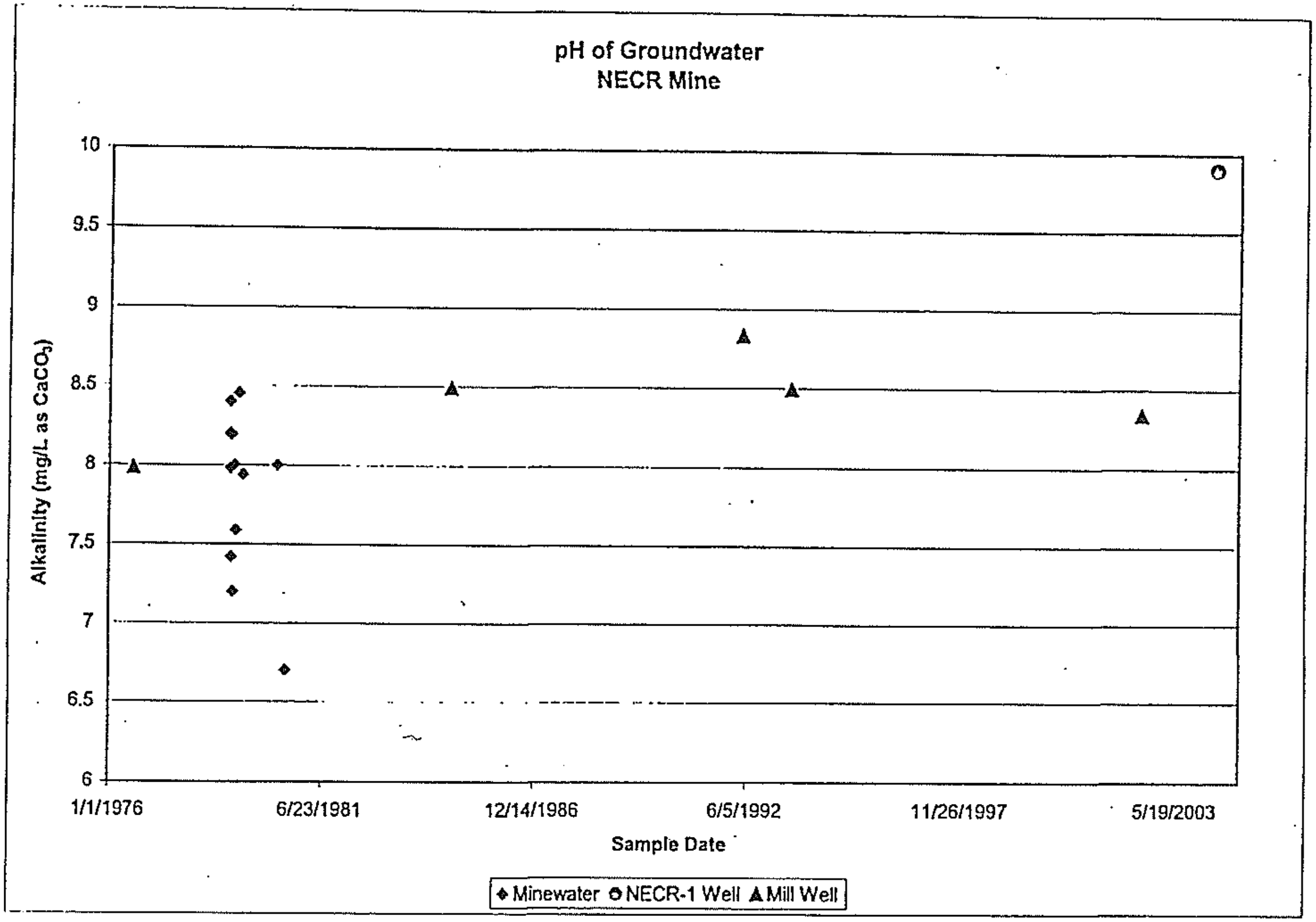


FIGURE 5
pH OF GROUNDWATER NEAR NECR MINE

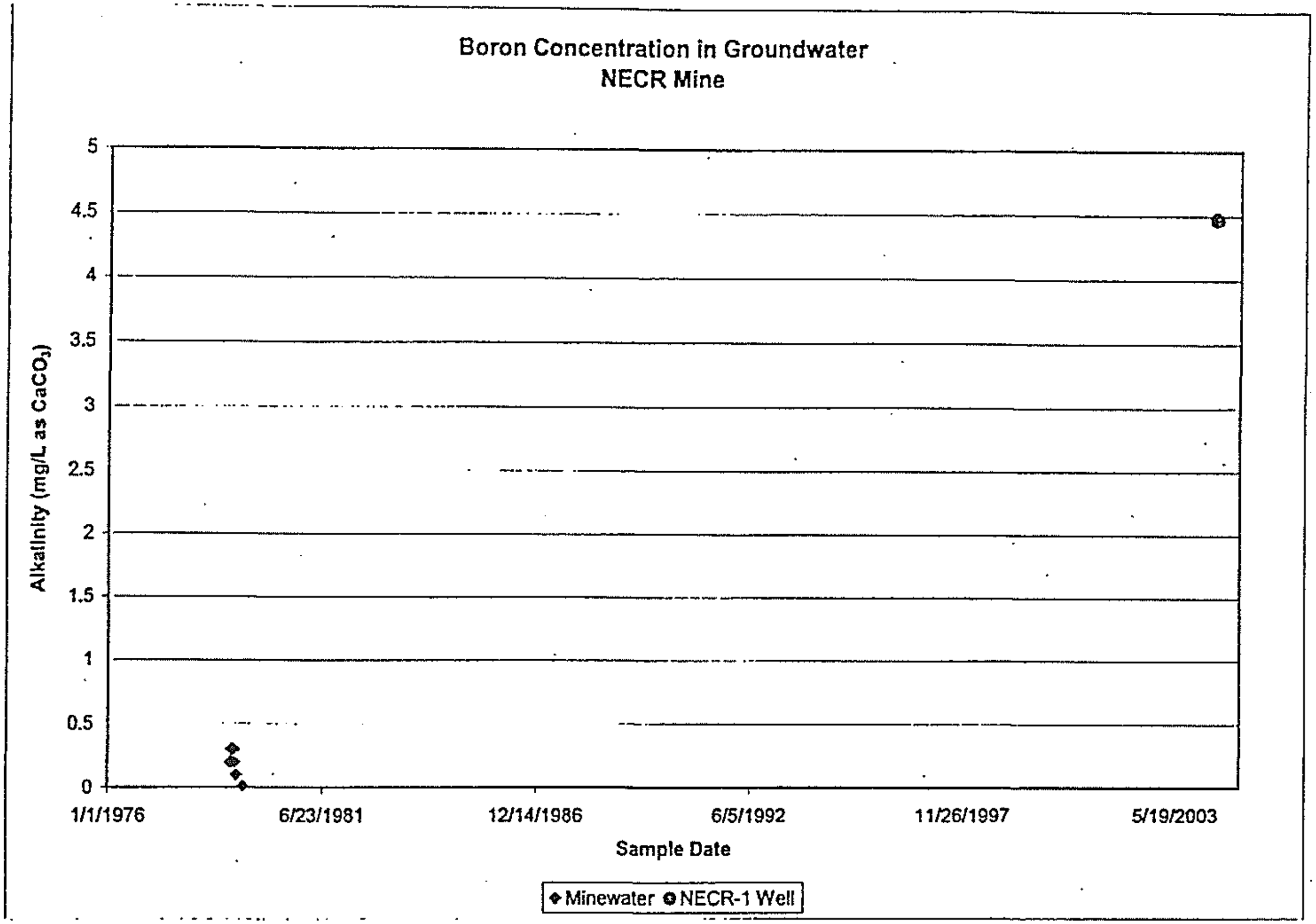


FIGURE 6
BORON CONCENTRATION OF GROUNDWATER NEAR NECR MINE

ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: UNC Closeout Plan
Lab ID: C04050789-001
Client Sample ID: NECR-Well 1

Report Date: 06/24/04
Collection Date: 05/17/04 09:40
Date Received: 05/20/04
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	365	mg/L		1.0		A2320 B	05/21/04 10:36 / nlm
Calcium	3.38	mg/L		0.20		E200.7	05/24/04 15:27 / ts
Chloride	21.8	mg/L		1.0		A4500-Cl B	05/21/04 09:34 / jl
Fluoride	0.7	mg/L		0.1		A4500-F C	05/24/04 09:42 / elb
Magnesium	0.58	mg/L		0.20		E200.7	05/24/04 15:27 / ts
Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.10		E353.2	05/24/04 12:10 / jal
Potassium	5.57	mg/L		0.30		E200.7	05/24/04 15:27 / ts
Sodium	388	mg/L		0.30		E200.7	05/24/04 15:27 / ts
Sulfate	450	mg/L	D	9.8		A4500-SO4 E	06/01/04 12:47 / dd
PHYSICAL PROPERTIES							
Conductivity	1840	umhos/cm		1.0		A2510 B	05/21/04 09:55 / dd
pH	9.90	s.u.		0.01		A4500-H B	05/21/04 11:02 / js
Solids, Total Dissolved TDS @ 180 C	1150	mg/L		10		A2540 C	05/21/04 15:40 / js
Solids, Total Suspended TSS @ 105 C	243	mg/L		1.0		E160.2	05/21/04 09:07 / js
METALS - DISSOLVED							
Aluminum	ND	mg/L		0.1		E200.8	05/25/04 16:31 / eli-b
Arsenic	0.001	mg/L		0.001		E200.8	05/25/04 16:31 / eli-b
Barium	0.014	mg/L		0.003		E200.8	06/18/04 01:48 / bws
Beryllium	ND	mg/L		0.01		E200.8	05/25/04 16:31 / eli-b
Boron	4.47	mg/L		0.0010		E200.7	05/24/04 15:27 / ts
Cadmium	ND	mg/L		0.01		E200.8	05/25/04 16:31 / eli-b
Cobalt	ND	mg/L		0.01		E200.8	05/25/04 16:31 / eli-b
Iron	0.140	mg/L		0.010		E200.7	05/24/04 15:27 / ts
Lead	ND	mg/L		0.001		E200.8	06/18/04 01:48 / bws
Manganese	0.003	mg/L		0.001		E200.8	06/18/04 01:48 / bws
Molybdenum	0.056	mg/L		0.001		E200.8	06/18/04 01:48 / bws
Nickel	ND	mg/L		0.05		E200.8	05/25/04 16:31 / eli-b
Selenium	0.002	mg/L		0.001		E200.8	05/25/04 16:31 / eli-b
Uranium	0.134	mg/L		0.0001		E200.8	06/18/04 01:48 / bws
Vanadium	ND	mg/L		0.005		E200.8	06/18/04 01:48 / bws
RADIONUCLIDES - DISSOLVED							
Gross Alpha	93.0	pCi/L		1.0		E900.0	05/24/04 09:00 / rs
Gross Alpha precision (±)	3.6	pCi/L				E900.0	05/24/04 09:00 / rs
Radium 226	2.4	pCi/L		0.2		E903.0	05/25/04 12:50 / df
Radium 226 precision (±)	0.5	pCi/L				E903.0	05/25/04 12:50 / df
Radium 228	ND	pCi/L		1.0		E904.0	05/28/04 09:24 / pj

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: UNC Closeout Plan
Lab ID: C04050789-001
Client Sample ID: NECR-Well 1

Report Date: 06/24/04
Collection Date: 05/17/04 09:40
Date Received: 05/20/04
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
DATA QUALITY							
A/C Balance (± 5)	-0.170	%				Calculation	06/11/04 14:47 / lae
Anions	17.3	meq/L				Calculation	06/11/04 14:47 / lae
Cations	17.3	meq/L				Calculation	06/11/04 14:47 / lae
Solids, Total Dissolved Calculated	1090	mg/L				Calculation	06/11/04 14:47 / lae
TDS Balance (0.80 - 1.20)	1.06	dec. %				Calculation	06/11/04 14:47 / lae

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: UNC Closeout Plan
Lab ID: C04050789-002
Client Sample ID: SECT27-Vent 3

Report Date: 06/24/04
Collection Date: 05/17/04 14:30
Date Received: 05/20/04
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Alkalinity, Total as CaCO3	308	mg/L		1.0		A2320 B	05/21/04 10:47 / nlm
Calcium	339	mg/L	D	0.57		E200.7	05/24/04 15:35 / ts
Chloride	23.2	mg/L		1.0		A4500-Cl B	05/21/04 09:35 / jl
Fluoride	0.4	mg/L		0.1		A4500-F C	06/24/04 00:44 / alb
Magnesium	41.8	mg/L		0.20		E200.7	05/24/04 15:30 / ts
Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.10		E353.2	05/24/04 12:20 / jal
Potassium	13.4	mg/L		0.30		E200.7	05/24/04 15:30 / ts
Sodium	492	mg/L		0.30		E200.7	05/24/04 15:30 / ts
Sulfate	1780	mg/L	D	30		A4500-SO4 E	06/01/04 12:50 / dd
PHYSICAL PROPERTIES							
Conductivity	3520	umhos/cm		1.0		A2510 B	05/21/04 09:55 / dd
pH	7.10	s.u.		0.01		A4500-H B	05/21/04 11:03 / js
Solids, Total Dissolved TDS @ 180 C	2810	mg/L		10		A2540 C	05/21/04 15:46 / js
Solids, Total Suspended TSS @ 105 C	100	mg/L		1.0		E160.2	05/21/04 09:07 / js
METALS - DISSOLVED							
Aluminum	ND	mg/L		0.1		E200.8	05/25/04 16:43 / eli-b
Arsenic	0.011	mg/L		0.001		E200.8	05/25/04 16:43 / eli-b
Barium	0.017	mg/L		0.003		E200.8	06/18/04 01:41 / bws
Beryllium	ND	mg/L		0.01		E200.8	05/25/04 16:43 / eli-b
Boron	0.379	mg/L		0.0010		E200.7	05/24/04 15:30 / ts
Cadmium	ND	mg/L		0.01		E200.8	05/25/04 16:43 / eli-b
Cobalt	ND	mg/L		0.01		E200.8	05/25/04 16:43 / eli-b
Iron	18.8	mg/L		0.010		E200.7	05/24/04 15:30 / ts
Lead	ND	mg/L		0.001		E200.8	06/18/04 01:41 / bws
Manganese	2.6	mg/L		0.01		E200.8	05/27/04 23:26 / eli-b
Molybdenum	0.7	mg/L		0.1		E200.8	05/27/04 23:26 / eli-b
Nickel	ND	mg/L		0.05		E200.8	05/25/04 16:43 / eli-b
Selenium	0.003	mg/L		0.001		E200.8	05/25/04 16:43 / eli-b
Uranium	7.84	mg/L		0.0001		E200.8	06/18/04 01:41 / bws
Vanadium	ND	mg/L		0.005		E200.8	06/18/04 01:41 / bws
RADIONUCLIDES - DISSOLVED							
Gross Alpha	5660	pCi/L		1.0		E900.0	05/24/04 09:00 / rs
Gross Alpha precision (±)	27.8	pCi/L				E900.0	05/24/04 09:00 / rs
Radium 226	24.2	pCi/L		0.2		E903.0	05/25/04 12:50 / df
Radium 226 precision (±)	1.5	pCi/L				E903.0	05/25/04 12:50 / df
Radium 228	ND	pCi/L		1.0		E904.0	05/28/04 09:24 / pj

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: United Nuclear Corporation
Project: UNC Closeout Plan
Lab ID: C04050789-002
Client Sample ID: SECT27-Vent 3

Report Date: 06/24/04
Collection Date: 05/17/04 14:30
Date Received: 05/20/04
Matrix: Aqueous

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
DATA QUALITY							
A/C Balance (± 5)	-0.944	%				Calculation	06/11/04 14:48 / tae
Anions	43.8	meq/L				Calculation	06/11/04 14:48 / tae
Cations	43.0	meq/L				Calculation	06/11/04 14:48 / tae
Solids, Total Dissolved Calculated	2090	mg/L				Calculation	06/11/04 14:48 / tae
TDS Balance (0.80 - 1.20)	0.970	dec. %				Calculation	06/11/04 14:48 / tae

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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UNC Mining and Milling ChurchRock Operations

GroundWater Monitoring Summary: Closeout Plan

Well ID:		NECR-Well 1
Collection Date:		5/17/2004 9:40
Receive Date:		5/20/2004 10:00
Report Date:		6/18/2004 14:30
Analytes	Units	C04050789-001
Alkalinity, Total as CaCO3	mg/L	365
Calcium	mg/L	3.38
Chloride	mg/L	21.8
Fluoride	mg/L	0.7
Magnesium	mg/L	0.68
Nitrogen, Nitrate+Nitrite as N	mg/L	ND(0.10)
Potassium	mg/L	5.07
Sodium	mg/L	368
Sulfate	mg/L	450
Conductivity	umhos/cm	1840
pH	s.u.	9.80
Solids, Total Dissolved TDS @ 180 C	mg/L	1150
Solids, Total Suspended TSS @ 105 C	mg/L	243
Aluminum	mg/L	ND(0.1)
Arsenic	mg/L	0.001
Barium	mg/L	0.014
Beryllium	mg/L	ND(0.01)
Boron	mg/L	4.47
Cadmium	mg/L	ND(0.01)
Cobalt	mg/L	ND(0.01)
Iron	mg/L	0.140
Lead	mg/L	ND(0.001)
Manganese	mg/L	0.003
Molybdenum	mg/L	0.056
Nickel	mg/L	ND(0.05)
Selenium	mg/L	0.002
Uranium	mg/L	0.134
Vanadium	mg/L	ND(0.005)
Gross Alpha	pCi/L	93.0
Gross Alpha precision (±)	pCi/L	3.6
Radium 226	pCi/L	2.4
Radium 226 precision (±)	pCi/L	0.5
Radium 228	pCi/L	ND(1.0)
Radium 228 precision (±)	pCi/L	
A/C Balance (± 5)		-0.170
Anions		17.3
Cations		17.3
Solids, Total Dissolved Calculated		1090
TDS Balance (0.80 - 1.20)		1.06

Note: The data presented on this form is intended for summary purposes only. Laboratory approved data is contained within the quarterly reports.

file: r:\clients2004\unc_mining\unc_gallup-2nd2004_final.xls

UNC Mining and Milling ChurchRock Operations		
GroundWater Monitoring Summary: Closeout Plan		
Well ID:		SECT27-Vent 3
Collection Date:		5/17/2004 14:30
Receive Date:		5/20/2004 10:00
Report Date:		6/18/2004 14:30
Analyte	Units	[illegible]04050789-002
Alkalinity, Total as CaCO3	mg/L	308
Calcium	mg/L	339
Chloride	mg/L	23.2
Fluoride	mg/L	0.4
Magnesium	mg/L	41.8
Nitrogen, Nitrate+Nitrite as N	mg/L	ND(0.10)
Potassium	mg/L	13.4
Sodium	mg/L	492
Sulfate	mg/L	1780
Conductivity	umhos/cm	3520
pH	s.u.	7.10
Solids, Total Dissolved TDS @ 180 C	mg/L	2810
Solids, Total Suspended TSS @ 105 C	mg/L	100
Aluminum	mg/L	ND(0.1)
Arsenic	mg/L	0.011
Barium	mg/L	0.017
Beryllium	mg/L	ND(0.01)
Boron	mg/L	0.017
Cadmium	mg/L	ND(0.01)
Cobalt	mg/L	ND(0.01)
Iron	mg/L	18.8
Lead	mg/L	ND(0.001)
Manganese	mg/L	2.6
Molybdenum	mg/L	0.7
Nickel	mg/L	ND(0.5)
Selenium	mg/L	0.003
Uranium	mg/L	7.84
Vanadium	mg/L	ND(0.005)
Gross Alpha	pCi/L	5660
Gross Alpha precision (±)	pCi/L	27.8
Radium 226	pCi/L	24.2
Radium 226 precision (±)	pCi/L	1.5
Radium 228	pCi/L	ND(1.0)
Radium 228 precision (±)	pCi/L	
A/C Balance (± 5)		-0.944
Anions		43.8
Cations		43.0
Solids, Total Dissolved Calculated		2890
TDS Balance (0.80 - 1.20)		0.970

****Note: The data presented on this form is intended for summary purposes only. Laboratory approved data is contained within the quarterly reports.**

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QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2320 B									Analytical Run: ORION_040521A
Sample ID: CCV1_040521_1	Continuing Calibration Verification Standard								05/21/04 09:32
Alkalinity, Total as CaCO3	4820	mg/L	1.0	96.3	90	110			
Method: A2320 B									Batch: 040521_1_ALK-W
Sample ID: MBLK1_040521_1	Method Blank								05/21/04 07:46
Alkalinity, Total as CaCO3	ND	mg/L	1.0						
Sample ID: C04050718-004DMS	Matrix Spike								05/21/04 08:21
Alkalinity, Total as CaCO3	349	mg/L	1.0	95.7	90	110			
Sample ID: C04050718-004DMSD	Matrix Spike Duplicate								05/21/04 08:31
Alkalinity, Total as CaCO3	349	mg/L	1.0	96	90	110	0.1	10	
Sample ID: C04050790-002BMS	Matrix Spike								05/21/04 11:18
Alkalinity, Total as CaCO3	266	mg/L	1.0	94.2	90	110			
Sample ID: C04050790-002BMSD	Matrix Spike Duplicate								05/21/04 11:20
Alkalinity, Total as CaCO3	265	mg/L	1.0	93.6	90	110	0.3	10	
Sample ID: LCS1_040521_1	Laboratory Control Spike								05/21/04 11:47
Alkalinity, Total as CaCO3	4900	mg/L	1.0	98.1	90	110			
Method: A2510 B									Batch: 040521A-COND-PROBE-W
Sample ID: LCS1_040521A	Laboratory Control Spike								05/21/04 09:55
Conductivity	1450	umhos/cm	1.0	103	90	110			
Sample ID: MBLK1_040521A	Method Blank								05/21/04 09:55
Conductivity	ND	umhos/cm	1.0						
Sample ID: C04050789-002BDUP	Sample Duplicate								05/21/04 09:55
Conductivity	3510	umhos/cm	1.0				0.3	10	
Sample ID: LCS2_040521A	Laboratory Control Spike								05/21/04 09:55
Conductivity	1460	umhos/cm	1.0	103	90	110			

Qualifiers:

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ND - Not detected at the reporting limit.

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QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2540 C									Batch: 040521A-SLDS-TDS-W
Sample ID: LCS1_040521A	Laboratory Control Spike								05/21/04 15:46
Solids, Total Dissolved TDS @ 180 C	996	mg/L	10	99.6	90	110			
Sample ID: MBLK1_040521A	Method Blank								05/21/04 15:46
Solids, Total Dissolved TDS @ 180 C	ND	mg/L	10						
Sample ID: C04050814-003BMS	Matrix Spike								05/21/04 15:48
Solids, Total Dissolved TDS @ 180 C	3280	mg/L	10	99	90	110			
Sample ID: C04050814-003BMSD	Matrix Spike Duplicate								05/21/04 15:48
Solids, Total Dissolved TDS @ 180 C	3270	mg/L	10	98.3	90	110	0.5	10	
Sample ID: C04050814-004BMS	Matrix Spike								05/21/04 15:49
Solids, Total Dissolved TDS @ 180 C	3680	mg/L	10	99.6	90	110			
Sample ID: C04050814-004BMSD	Matrix Spike Duplicate								05/21/04 15:49
Solids, Total Dissolved TDS @ 180 C	3660	mg/L	10	98.5	90	110	0.7	10	
Sample ID: LCS2_040521A	Laboratory Control Spike								05/21/04 15:50
Solids, Total Dissolved TDS @ 180 C	1000	mg/L	10	100	90	110			
Method: A4500-Cl B									Batch: 040521A-CL-TTR-W
Sample ID: MBLK9-040521A	Method Blank								05/21/04 09:20
Chloride	ND	mg/L	1.0						
Sample ID: C04050756-001BMS	Matrix Spike								05/21/04 09:38
Chloride	5700	mg/L	1.0	100	90	110			
Sample ID: C04050756-001BMSD	Matrix Spike Duplicate								05/21/04 09:39
Chloride	5680	mg/L	1.0	99.6	90	110	0.2	10	
Sample ID: LCS35-040521A	Laboratory Control Spike								05/21/04 09:41
Chloride	3510	mg/L	1.0	99.1	90	110			
Method: A4500-F C									Batch: 040524_1_F-ISE-W
Sample ID: MBLK1_040524_1	Method Blank								05/24/04 09:14
Fluoride	ND	mg/L	0.10						
Sample ID: C04050714-001IMS	Matrix Spike								05/24/04 09:21
Fluoride	1.80	mg/L	0.10	90	90	110			
Sample ID: C04050714-001IMSD	Matrix Spike Duplicate								05/24/04 09:24
Fluoride	1.80	mg/L	0.10	90	90	110	0	10	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A4500-H B									Analytical Run: ORION-PH_040521A
Sample ID: (CCV)*ph7	Continuing Calibration Verification Standard								05/21/04 10:56
pH	6.97	s.u.	0.010	99.6	90	110			
Method: A4500-H B									Batch: pH05-21-041108
Sample ID: C04050775-001A(DUP)	Sample Duplicate								05/21/04 11:04
pH	8.15	s.u.	0.010				0.5	10	
Method: A4500-SO4 E									Batch: 040601_1_SO4-TURB-W
Sample ID: MBLK-1_040601	Method Blank								06/01/04 12:26
Sulfate	ND	mg/L	1.0						
Sample ID: C04050789-001BMS	Matrix Spike								06/01/04 13:09
Sulfate	1410	mg/L	30	100	90	110			
Sample ID: C04050789-001BMSD	Matrix Spike Duplicate								06/01/04 13:10
Sulfate	1400	mg/L	30	99.1	90	110	0.7	10	
Sample ID: C04050874-005DMS	Matrix Spike								06/01/04 13:25
Sulfate	110	mg/L	1.5	96.8	90	110			
Sample ID: C04050874-005DMSD	Matrix Spike Duplicate								06/01/04 13:26
Sulfate	111	mg/L	1.5	97.7	90	110	0.4	10	
Sample ID: LCS-1_040601	Laboratory Control Spike								06/01/04 13:27
Sulfate	41.7	mg/L	1.0	104	90	110			
Method: E160.2									Batch: 040521A-SLDS-TSS-W
Sample ID: MBLK1_040521A	Method Blank								05/21/04 09:07
Solids, Total Suspended TSS @ 105 C	ND	mg/L	1.0						
Sample ID: C04050789-002BDUP	Sample Duplicate								05/21/04 09:08
Solids, Total Suspended TSS @ 105 C	122	mg/L	1.0				20	25	
Method: E200.7									Analytical Run: ICP1-C_040524A
Sample ID: CONT 120103-96	Continuing Calibration Verification Standard								05/24/04 14:23
Boron	1.01	mg/L	0.10	101	89.5	110.5			
Iron	1.05	mg/L	0.030	105	89.5	110.5			
Calcium	53.2	mg/L	1.0	106	89.5	110.5			
Magnesium	53.1	mg/L	1.0	106	89.5	110.5			
Potassium	51.5	mg/L	1.0	103	89.5	110.5			
Sodium	53.2	mg/L	1.0	106	89.5	110.5			

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QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte		Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8									Analytical Run: ICPMS1-C_040617B	
Sample ID: CCV	Continuing Calibration Verification Standard								06/18/04 01:06	
Barium		0.0638	mg/L	0.0010	106	90	110			
Lead		0.0619	mg/L	0.0010	103	90	110			
Uranium		0.0615	mg/L	0.0010	102	90	110			
Vanadium		0.0619	mg/L	0.0010	103	90	110			
Method: E200.8									Batch: R36342	
Sample ID: C04050789-001DMS	Matrix Spike								06/18/04 01:55	
Barium		0.0632	mg/L	0.0010	97.3	70	130			
Lead		0.0502	mg/L	0.0010	100	70	130			
Uranium		0.186	mg/L	0.0010	105	70	130			
Vanadium		0.0494	mg/L	0.0010	97.5	70	130			
Sample ID: C04050789-001DMSD	Matrix Spike Duplicate								06/18/04 02:02	
Barium		0.0632	mg/L	0.0010	97.5	70	130	0.1	20	
Lead		0.0500	mg/L	0.0010	99.6	70	130	0.5	20	
Uranium		0.180	mg/L	0.0010	92.2	70	130	3.4	20	
Vanadium		0.0489	mg/L	0.0010	96.4	70	130	1.1	20	

Qualifiers:

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ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E353.2									Analytical Run: TECHNICON_040524A
Sample ID: CCV-16	Continuing Calibration Verification Standard								05/24/04 11:55
Nitrogen, Nitrate+Nitrite as N	0.930	mg/L	0.10	93	90	110			
Sample ID: CCV-25	Continuing Calibration Verification Standard								05/24/04 12:18
Nitrogen, Nitrate+Nitrite as N	1.07	mg/L	0.10	107	90	110			
Method: E353.2									Batch: A2004-05-24_1_NO3_01
Sample ID: MBLK-1	Method Blank								05/24/04 09:43
Nitrogen, Nitrate+Nitrite as N	ND	mg/L	0.10						
Sample ID: C04050727-001BMS	Matrix Spike								05/24/04 10:01
Nitrogen, Nitrate+Nitrite as N	2.00	mg/L	0.10	100	90	110			
Sample ID: C04050727-001BMSD	Matrix Spike Duplicate								05/24/04 10:03
Nitrogen, Nitrate+Nitrite as N	2.01	mg/L	0.10	101	90	110	0.5	10	
Sample ID: MBLK-17	Method Blank								05/24/04 11:58
Nitrogen, Nitrate+Nitrite as N	ND	mg/L	0.10						
Sample ID: C04050789-001CMS	Matrix Spike								05/24/04 12:13
Nitrogen, Nitrate+Nitrite as N	2.02	mg/L	0.10	101	90	110			
Sample ID: C04050789-001CMSD	Matrix Spike Duplicate								05/24/04 12:15
Nitrogen, Nitrate+Nitrite as N	2.04	mg/L	0.10	102	90	110	1.0	10	
Sample ID: MBLK-32	Method Blank								05/24/04 12:35
Nitrogen, Nitrate+Nitrite as N	ND	mg/L	0.10						
Sample ID: C04050845-005CMS	Matrix Spike								05/24/04 12:53
Nitrogen, Nitrate+Nitrite as N	2.29	mg/L	0.10	95.5	90	110			
Sample ID: C04050845-005CMSD	Matrix Spike Duplicate								05/24/04 12:58
Nitrogen, Nitrate+Nitrite as N	2.31	mg/L	0.10	96.5	90	110	0.9	10	
Sample ID: MBLK-48	Method Blank								05/24/04 13:18
Nitrogen, Nitrate+Nitrite as N	ND	mg/L	0.10						
Sample ID: C04050845-014CMS	Matrix Spike								05/24/04 13:57
Nitrogen, Nitrate+Nitrite as N	14.5	mg/L	0.15	90.9	90	110			
Sample ID: C04050845-014CMSD	Matrix Spike Duplicate								05/24/04 13:59
Nitrogen, Nitrate+Nitrite as N	14.5	mg/L	0.15	90.9	90	110	0	10	

Qualifiers:

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QA/QC Summary Report

Client: United Nuclear Corporation
Project: UNC Closeout Plan

Report Date: 06/18/04
Work Order: C04050789

Analyte		Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E900.0										Batch: R35580
Sample ID: C04050732-001A	Matrix Spike									05/24/04 09:00
Gross Alpha		543	pCi/L	1.0	106	70	130			
Sample ID: C04050732-001A	Matrix Spike Duplicate									05/24/04 09:00
Gross Alpha		562	pCi/L	1.0	110	70	130	3.3	30	
Sample ID: MB-R35580	Method Blank									05/24/04 09:00
Gross Alpha		ND	pCi/L	1.0						
Sample ID: LCS-R35580	Laboratory Control Spike									05/24/04 09:00
Gross Alpha		507	pCi/L	1.0	99.5	70	130			
Sample ID: C04050910-001A	Sample Duplicate									05/24/04 09:00
Gross Alpha		ND	pCi/L	1.0		70	130	0	30	
Sample ID: C04040049-001B	Sample Duplicate									05/24/04 09:00
Gross Alpha		ND	pCi/L	1.0				0	30	
Method: E903.0										Batch: RA226-0589
Sample ID: C04050805-001AMS	Matrix Spike									05/25/04 12:50
Radium 226		24.8	pCi/L	0.20	92.7	70	130			
Sample ID: C04050805-001AMSD	Matrix Spike Duplicate									05/25/04 12:50
Radium 226		25.4	pCi/L	0.20	94.8	70	130	2.1	30	
Sample ID: MB-RA226-0589	Method Blank									05/25/04 12:50
Radium 226		ND	pCi/L	0.20						
Sample ID: LCS-RA226-0589	Laboratory Control Spike									05/25/04 12:50
Radium 226		14.9	pCi/L	0.20	98.1	70	130			
Method: E904.0										Batch: 04228-602A
Sample ID: C04050891-001A	Matrix Spike									05/28/04 09:24
Radium 228		25	pCi/L	1.0	107	70	130			
Sample ID: C04050891-001A	Matrix Spike Duplicate									05/28/04 09:24
Radium 228		22	pCi/L	1.0	96.8	70	130	9.8	30	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

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Energy Laboratories Inc.
2393 Salt Creek Highway
PO Box 3258
Casper, WY 82602-

TEL: (307) 235-0515
FAX: (307) 234-1639

Quotation Date: 29-Apr-04
Submitted By: Tracy DeWitt

Quotation for Analytical Services # C1212

Company: Montgomery Watson Harza
Contact: Jed Thompson
Address: 1475 Pine Grove Road
Ste 109
PO Box 774018
Steamboat Springs, CO 80477
Phone: (970) 879-6260 Fax: (970) 879-9048

Quote ID: C 1212
Project: Groundwater Sampling
TAT: 15 Working Days
QC Level: STD
Expires: 21-Apr-05

Matrix	Test Name	Test	Remarks	# Samp	Unit Price	Test Total
Aqueous	Alkalinity	A2320 B		1	$10.00	$10.00
Aqueous	Chloride	A4500-Cl B		1	$10.00	$10.00
Aqueous	Conductivity	A2510 B		1	$10.00	$10.00
Aqueous	Fluoride	A4500-F C		1	$10.00	$10.00
Aqueous	Gross Alpha	E900.0		1	$50.00	$50.00
Aqueous	Metals by ICP, Dissolved	E200.7	Ca,Fe,Mg,K,Na	1	$50.00	$50.00
Aqueous	Metals by ICP/ICPMS, Total	E200.7_8	Boron only (analyzed in ELI-Billings)	1	$10.00	$10.00
Aqueous	Metals by ICP-MS, Dissolved	E200.8	Ba,V,Unat,Pb	1	$40.00	$40.00
Aqueous	Nitrogen, Nitrate + Nitrite	E353.2		1	$15.00	$15.00
Aqueous	pH	A4500-H B		1	$10.00	$10.00
Aqueous	Radium 226, Dissolved	E903.0		1	$75.00	$75.00
Aqueous	Radium 228, Dissolved	E904.0		1	$75.00	$75.00
Aqueous	Solids, Total Dissolved	A2540 C		1	$10.00	$10.00
Aqueous	Solids, Total Suspended	E160.2		1	$10.00	$10.00
Aqueous	Sulfate	A4500-SO4 E		1	$10.00	$10.00

To assure that the quoted analysis and pricing specifications are provided, please include the Quote ID number referenced above on the Chain of Custody or sample submittal documents.

Subcontracting of sample analyses to an outside laboratory may be required. If so, Energy Laboratories will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report.

the Project Manager and the laboratory's project manager, will decide whether or not to analyze the samples.

3.4 FIELD DOCUMENTATION

All aspects of sample collection and handling as well as visual observations will be documented in the field logbooks. Field logbooks will note the following information:

- Site location
- Sampler name(s)
- Date and time of sample collection
- Sample identification number(s)
- Field water quality measurements (pH, conductivity, temperature)
- Sample handling (including preservation, as appropriate)
- How sample collected (e.g. grab, composite, bailer)
- Number and type of any QA/QC or split samples collected
- Field observations, including any unusual conditions or activities in the area

4.0 WATER QUALITY PARAMETERS

Water quality parameters to be analyzed for the collected sample are presented in Table 4.1 below.

TABLE 4.1
WATER QUALITY MONITORING PARAMETERS

Parameter	Fraction	Method	Detection Limit	UNITS
GENERAL CHEMISTRY AND ANIONS				
pH		EPA 150.1	0.1	mg/l
Electrical Conductivity		EPA 120.1	1	umhos/cm
Total Dissolved Solids		EPA 160.1	10	mg/l
Total Suspended Solids		EPA 160.2	5	mg/l
Alkalinity		EPA 310.1	2.0	mg/l (as $CaCO_3$)
Chloride		EPA 325.2	1.0	mg/l
Fluoride		EPA 340.2	0.1	mg/l
Nitrate (NO3+NO2 as N)		EPA 353.2	0.02	mg/l
Sulfate		EPA 375.3	10.0	mg/l
CATIONS AND TRACE METALS				
Barium	Dissolved	EPA 200.7, ICP	0.003 0.1	mg/l
Boron	Dissolved	EPA 200.7, ICP	0.001 0.1	mg/l
Calcium	Dissolved	EPA 200.7, ICP	0.2 ✓	mg/l
Iron	Dissolved	EPA 200.7, ICP	0.01 0.1	mg/l
Lead	Dissolved	EPA 200.7, ICP	0.04 0.1	mg/l
Magnesium	Dissolved	EPA 200.7, ICP	0.2 ✓	mg/l
Potassium	Dissolved	EPA 200.7, ICP	0.30 ✓	mg/l
Sodium	Dissolved	EPA 200.7, ICP	0.30 ✓	mg/l
Uranium	Dissolved	EPA 200.8, ICP-MS	0.0001	mg/l
Vanadium	Dissolved	EPA 200.7, ICP	0.005 0.1	mg/l
RADIONUCLIDES				
Radium 226	Dissolved	EPA 903.0	1	pCi/l
Radium 228	Dissolved	EPA 904.0	1	pCi/l
Gross Alpha	Dissolved	EPA 900.0	1	pCi/l

LABORATORIES

Chain of Custody and Analytical Request Record

Page 1 of 1

PLEASE PRINT, provide as much information as possible. Refer to corresponding notes on reverse side.

ompany Name: UNC

Project Name, PWS #, Permit #, Etc.: UNC CLOSEOUT PLAN

eport Mail Address: MWH
ATTN: JED THOMPSON
PO BOX 774018
1475 PINEGROVE RD, STE 109
STEAMBOAT SPRINGS, CO 80477

Contact Name, Phone, Fax, E-mail:
JED THOMPSON
(970) 879-6260
JAMES.THOMPSON@MWHGLOBAL.COM

Sampler Name if other than Contact: SAME

nvoice Address:
UNC
PO BOX 3077
GALLUP, NM 87305-3077

Invoice Contact & Phone #:
DOREEN BROWN
(505)722-6651

Purchase Order #:

ELI Quote #: C1212

eport Required For: POTW/WWTP ☐ DW ☐ Other

pecial Report Formats - ELI must be notified prior to ample submittal for the following:
ELAC ☐ A2LA ☐ Level IV ☐
ther
DD/EDT ☐ Format

Notify ELI prior to RUSH sample submittal for additional charges and scheduling

Comments:

Receipt Temp 18 °C
Cooler ID(s) Client
Custody Seal [✓ Y] N
Intact [✓ Y] N
Signature Match [✓ Y] N

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX (Number of Containers; Sample Type: A W S V B O; Air Water Solids/Solids Vegetation Bioassay Other)	ANALYSIS REQUESTED	SEE ATTACHED	Normal Turnaround (TAT)	RUSH Turnaround (TAT)	Comments	LABORATORY USE ONLY Lab ID
NECR-WELL1	17MAY04	0940	4-W		X				[illegible]
SECT27-VENT3	17MAY04	1430	4-W		X				

Custody Record MUST be Signed

Relinquished by: Date/Time: 18 MAY 04/1415 Shipped by: UPS GRND Received by: Date/Time: [illegible]

Relinquished by: Date/Time: Shipped by: Received by: Date/Time:

Sample Disposal: Return to client: ______ Lab Disposal: X

LABORATORY USE ONLY
Sample Type: ______ # of fractions ______

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.

Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, & links.

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Energy Laboratories Inc.

Sample Receipt Checklist

Client Name: United Nuclear Corporation

Date and Time Received: 5/20/2004 10:00:00

Work Order Number C04050789

Received by: sp

Checklist completed by: Shana Peavy 5/20/04
Signature | Date

Reviewed by ______
Initials | Date

Carrier name: UPS

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☐	No ☑	18 °C
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Adjusted? ______ Checked by ______

Any No and/or NA (not applicable) response must be detailed in the comments section below.

Client contacted: ______ Date contacted: ______ Person contacted ______

Contacted by: ______ Regarding: ______

Comments:

Split and preserved for total metals.

Corrective Action ______

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ANALYTICAL SUMMARY REPORT

June 24, 2004

Max Chischilly
United Nuclear Corporation
1475 Pine Grove Road
Ste 109
PO Box 774018
Gallup, NM 87305

Workorder No.: C04050789 Quote ID: C1247 - Groundwater Sampling

Energy Laboratories Inc. received the following 2 samples from United Nuclear Corporation on 5/20/2004 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C04050789-001	NECR-Well 1	05/17/04 9:40	05/20/04	Aqueous	Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Total Alkalinity QA Calculations Chloride Conductivity Fluoride Metals by ICP, Dissolved Metals by ICP-MS, Dissolved Nitrogen, Nitrate + Nitrite pH Gross Alpha Radium 226, Dissolved Radium 228, Dissolved Solids, Total Dissolved Solids, Total Suspended Sulfate
C04050789-002	SECT27-Vent 3	05/17/04 14:30	05/20/04	Aqueous	Same As Above

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative or Report.

If you have any questions regarding these tests results, please call.

Report Approved By:

R.A. [illegible]
[illegible]
LABORATORY SUPERVISOR

ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
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Date: *24-Jun-04*

CLIENT: United Nuclear Corporation
Project: UNC Closeout Plan
Sample Delivery Group: C04050789

CASE NARRATIVE

THIS IS THE FINAL PAGE OF THE LABORATORY ANALYTICAL REPORT

COMMENTS
Additional metals added per client's request 6/23/04.

BRANCH LABORATORY LOCATIONS
eli-b - Energy Laboratories, Inc. - Billings, MT
eli-cs - Energy Laboratories, Inc. - College Station, TX
eli-g - Energy Laboratories, Inc. - Gillette, WY
eli-h - Energy Laboratories, Inc. - Helena, MT
eli-r - Energy Laboratories, Inc. - Rapid City, SD

ORIGINAL SAMPLE SUBMITTAL(S)
All original sample submittals have been returned with the data package. A copy of the submittal(s) has been included and tracked in the data package.

SUBCONTRACTING ANALYSIS
Subcontracting of sample analyses to an outside laboratory may be required. If so, ENERGY LABORATORIES will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report.

SAMPLE TEMPERATURE COMPLIANCE: 4°C (±2°C)
Temperature of samples received may not be considered properly preserved by accepted standards. Samples that are hand delivered immediately after collection shall be considered acceptable if there is evidence that the chilling process has begun.

ENERGY LABORATORIES, INC. - CASPER,WY certifies that certain method selections contained in this report meet requirements as set forth by NELAC. Some client specific reporting requirements may not require NELAC reporting protocol. NELAC Certification Number E87641.

ELI appreciates the opportunity to provide you with this analytical service. For additional information and services visit our web page www.energylab.com.

The total number of pages of this report are indicated by the page number located in the lower right corner.

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
8/12/1976		Mill Well	Alkalinity (CaCO3)	mg/L	100	
8/12/1976		Mill Well	Arsenic	mg/L	0.001	
8/12/1976		Mill Well	Bicarbonate	mg/L	121.7	
8/12/1976		Mill Well	Cadmium	mg/L	0.01	
8/12/1976		Mill Well	Calcium	mg/L	5.5	
8/12/1976		Mill Well	Chloride	mg/L	17	
8/12/1976		Mill Well	Magnesium	mg/L	0.8	
8/12/1976		Mill Well	Manganese	mg/L	0.08	
8/12/1976		Mill Well	Nitrate + Nitrate as N	mg/L	5.3	
8/12/1976		Mill Well	pH	s.u.	7.98	
8/12/1976		Mill Well	Potassium	mg/L	6.6	
8/12/1976		Mill Well	Selenium	mg/L	0.01	
8/12/1976		Mill Well	Sodium	mg/L	60	
8/12/1976		Mill Well	Sulfate	mg/L	32	
8/12/1976		Mill Well	TDS	mg/L	335	
2/13/1979	TS-24A	Minewater	Aluminum	mg/l	0.2	
2/13/1979	TS-24A	Minewater	Arsenic	mg/l	0.01	
2/13/1979	TS-24A	Minewater	Barium	mg/l	0.1	<
2/13/1979	TS-24A	Minewater	Boron	mg/l	0.2	
2/13/1979	TS-24A	Minewater	Cadmium	mg/l	0.001	<
2/13/1979	TS-24A	Minewater	Chloride	mg/l	5.8	
2/13/1979	TS-24A	Minewater	Chromium	mg/l	0.001	<
2/13/1979	TS-24A	Minewater	Cobalt	mg/l	0.01	<
2/13/1979	TS-24A	Minewater	Copper	mg/l	0.001	
2/13/1979	TS-24A	Minewater	Cyanide	mg/l	0.1	<
2/13/1979	TS-24A	Minewater	Fluoride	mg/l	0.5	
2/13/1979	TS-24A	Minewater	Iron	mg/l	0.05	
2/13/1979	TS-24A	Minewater	Lead	mg/l	0.001	<
2/13/1979	TS-24A	Minewater	Manganese	mg/l	0.006	
2/13/1979	TS-24A	Minewater	Mercury	mg/l	0.0004	<
2/13/1979	TS-24A	Minewater	Molybdenum	mg/l	0.003	
2/13/1979	TS-24A	Minewater	Nickel	mg/l	0.01	<
2/13/1979	TS-24A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.7	
2/13/1979	TS-24A	Minewater	pH, lab	SU	8.4	
2/13/1979	TS-24A	Minewater	Phenols	mg/l	0.003	
2/13/1979	TS-24A	Minewater	Radium-226	pCi/l	76.7	± 2.8
2/13/1979	TS-24A	Minewater	Radium-228	pCi/l	1	± 1
2/13/1979	TS-24A	Minewater	Selenium	mg/l	0.04	
2/13/1979	TS-24A	Minewater	Silica	mg/l	0.01	<
2/13/1979	TS-24A	Minewater	Sulfate	mg/l	77	
2/13/1979	TS-24A	Minewater	TDS	mg/l	552	
2/13/1979	TS-24A	Minewater	Uranium	mg/l	1.25	
2/13/1979	TS-24A	Minewater	Zinc	mg/l	0.02	
2/14/1979	TS-28A	Minewater	Aluminum	mg/l	0.3	
2/14/1979	TS-28A	Minewater	Arsenic	mg/l	0.01	<
2/14/1979	TS-28A	Minewater	Barium	mg/l	0.1	<
2/14/1979	TS-28A	Minewater	Boron	mg/l	0.2	
2/14/1979	TS-28A	Minewater	Cadmium	mg/l	0.001	<
2/14/1979	TS-28A	Minewater	Chloride	mg/l	6.1	
2/14/1979	TS-28A	Minewater	Chromium	mg/l	0.001	<
2/14/1979	TS-28A	Minewater	Cobalt	mg/l	0.01	<
2/14/1979	TS-28A	Minewater	Copper	mg/l	0.002	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
2/14/1979	TS-28A	Minewater	Cyanide	mg/l	0.1	<
2/14/1979	TS-28A	Minewater	Fluoride	mg/l	0.5	
2/14/1979	TS-28A	Minewater	Iron	mg/l	0.01	
2/14/1979	TS-28A	Minewater	Lead	mg/l	0.001	<
2/14/1979	TS-28A	Minewater	Manganese	mg/l	0.002	
2/14/1979	TS-28A	Minewater	Mercury	mg/l	0.0004	<
2/14/1979	TS-28A	Minewater	Molybdenum	mg/l	0.001	
2/14/1979	TS-28A	Minewater	Nickel	mg/l	0.01	
2/14/1979	TS-28A	Minewater	Nitrogen, Nitrate (as N)	mg/l	1.2	
2/14/1979	TS-28A	Minewater	pH, lab	SU	8.4	
2/14/1979	TS-28A	Minewater	Phenols	mg/l	0.003	
2/14/1979	TS-28A	Minewater	Radium-226	pCi/l	103	± 3
2/14/1979	TS-28A	Minewater	Radium-228	pCi/l	1	± 2
2/14/1979	TS-28A	Minewater	Selenium	mg/l	0.04	
2/14/1979	TS-28A	Minewater	Silver	mg/l	0.01	<
2/14/1979	TS-28A	Minewater	Sulfate	mg/l	79	
2/14/1979	TS-28A	Minewater	TDS	mg/l	421	
2/14/1979	TS-28A	Minewater	Uranium	mg/l	0.725	
2/14/1979	TS-28A	Minewater	Zinc	mg/l	0.01	
2/16/1979	TS-33A	Minewater	Aluminum	mg/l	1.2	
2/16/1979	TS-33A	Minewater	Arsenic	mg/l	0.01	<
2/16/1979	TS-33A	Minewater	Barium	mg/l	0.3	
2/16/1979	TS-33A	Minewater	Boron	mg/l	0.2	
2/16/1979	TS-33A	Minewater	Cadmium	mg/l	0.001	<
2/16/1979	TS-33A	Minewater	Chloride	mg/l	7.7	
2/16/1979	TS-33A	Minewater	Chromium	mg/l	0.002	
2/16/1979	TS-33A	Minewater	Cobalt	mg/l	0.01	<
2/16/1979	TS-33A	Minewater	Copper	mg/l	0.004	
2/16/1979	TS-33A	Minewater	Cyanide	mg/l	0.1	<
2/16/1979	TS-33A	Minewater	Fluoride	mg/l	0.48	
2/16/1979	TS-33A	Minewater	Iron	mg/l	4.9	
2/16/1979	TS-33A	Minewater	Lead	mg/l	0.001	<
2/16/1979	TS-33A	Minewater	Manganese	mg/l	0.011	
2/16/1979	TS-33A	Minewater	Mercury	mg/l	0.0004	<
2/16/1979	TS-33A	Minewater	Molybdenum	mg/l	0.003	
2/16/1979	TS-33A	Minewater	Nickel	mg/l	0.01	<
2/16/1979	TS-33A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.7	
2/16/1979	TS-33A	Minewater	pH, lab	SU	7.98	
2/16/1979	TS-33A	Minewater	Phenols	mg/l	0.004	
2/16/1979	TS-33A	Minewater	Radium-226	pCi/l	0.6	± 0.4
2/16/1979	TS-33A	Minewater	Radium-228	pCi/l	5	± 2
2/16/1979	TS-33A	Minewater	Selenium	mg/l	0.04	
2/16/1979	TS-33A	Minewater	Silver	mg/l	0.01	<
2/16/1979	TS-33A	Minewater	Sulfate	mg/l	81	
2/16/1979	TS-33A	Minewater	TDS	mg/l	415	
2/16/1979	TS-33A	Minewater	Uranium	mg/l	2.07	
2/16/1979	TS-33A	Minewater	Zinc	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Aluminum	mg/l	0.3	
2/17/1979	TS-38A	Minewater	Arsenic	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Barium	mg/l	0.7	
2/17/1979	TS-38A	Minewater	Boron	mg/l	0.2	
2/17/1979	TS-38A	Minewater	Cadmium	mg/l	0.001	<

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
2/17/1979	TS-38A	Minewater	Chloride	mg/l	6.2	
2/17/1979	TS-38A	Minewater	Chromium	mg/l	0.001	<
2/17/1979	TS-38A	Minewater	Cobalt	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Copper	mg/l	0.001	<
2/17/1979	TS-38A	Minewater	Cyanide	mg/l	0.1	<
2/17/1979	TS-38A	Minewater	Fluoride	mg/l	0.48	
2/17/1979	TS-38A	Minewater	Iron	mg/l	2.5	
2/17/1979	TS-38A	Minewater	Lead	mg/l	0.001	<
2/17/1979	TS-38A	Minewater	Manganese	mg/l	0.003	
2/17/1979	TS-38A	Minewater	Mercury	mg/l	0.0004	<
2/17/1979	TS-38A	Minewater	Molybdenum	mg/l	0.002	
2/17/1979	TS-38A	Minewater	Nickel	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.5	
2/17/1979	TS-38A	Minewater	pH, lab	SU	8.2	
2/17/1979	TS-38A	Minewater	Phenols	mg/l	0.005	
2/17/1979	TS-38A	Minewater	Radium-226	pCi/l	49.3	± 2.1
2/17/1979	TS-38A	Minewater	Radium-228	pCi/l	1	<
2/17/1979	TS-38A	Minewater	Selenium	mg/l	0.03	
2/17/1979	TS-38A	Minewater	Silver	mg/l	0.01	<
2/17/1979	TS-38A	Minewater	Sulfate	mg/l	76	
2/17/1979	TS-38A	Minewater	TDS	mg/l	483	
2/17/1979	TS-38A	Minewater	Uranium	mg/l	2.1	
2/17/1979	TS-38A	Minewater	Zinc	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Aluminum	mg/l	0.3	
2/21/1979	TS-43A	Minewater	Arsenic	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Barium	mg/l	0.4	
2/21/1979	TS-43A	Minewater	Boron	mg/l	0.3	
2/21/1979	TS-43A	Minewater	Cadmium	mg/l	0.001	<
2/21/1979	TS-43A	Minewater	Chloride	mg/l	7	
2/21/1979	TS-43A	Minewater	Chromium	mg/l	0.001	<
2/21/1979	TS-43A	Minewater	Cobalt	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Copper	mg/l	0.003	
2/21/1979	TS-43A	Minewater	Cyanide	mg/l	0.1	<
2/21/1979	TS-43A	Minewater	Fluoride	mg/l	0.46	
2/21/1979	TS-43A	Minewater	Iron	mg/l	0.07	
2/21/1979	TS-43A	Minewater	Lead	mg/l	0.001	<
2/21/1979	TS-43A	Minewater	Manganese	mg/l	0.01	
2/21/1979	TS-43A	Minewater	Mercury	mg/l	0.0004	<
2/21/1979	TS-43A	Minewater	Molybdenum	mg/l	0.002	
2/21/1979	TS-43A	Minewater	Nickel	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.4	
2/21/1979	TS-43A	Minewater	pH, lab	mg/l	8.19	
2/21/1979	TS-43A	Minewater	Phenols	mg/l	0.003	
2/21/1979	TS-43A	Minewater	Radium-226	pCi/l	82	± 1.7
2/21/1979	TS-43A	Minewater	Radium-228	pCi/l	1	<
2/21/1979	TS-43A	Minewater	Selenium	mg/l	0.03	
2/21/1979	TS-43A	Minewater	Silver	mg/l	0.01	<
2/21/1979	TS-43A	Minewater	Sulfate	mg/l	73	
2/21/1979	TS-43A	Minewater	TDS	mg/l	386	
2/21/1979	TS-43A	Minewater	Uranium	mg/l	0.96	
2/21/1979	TS-43A	Minewater	Zinc	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Aluminum	mg/l	0.3	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
2/27/1979	TS-47A	Minewater	Arsenic	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Barium	mg/l	0.1	
2/27/1979	TS-47A	Minewater	Boron	mg/l	0.3	
2/27/1979	TS-47A	Minewater	Cadmium	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Chloride	mg/l	7	
2/27/1979	TS-47A	Minewater	Chromium	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Cobalt	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Copper	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Cyanide	mg/l	0.2	
2/27/1979	TS-47A	Minewater	Fluoride	mg/l	0.48	
2/27/1979	TS-47A	Minewater	Iron	mg/l	0.61	
2/27/1979	TS-47A	Minewater	Lead	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Manganese	mg/l	0.02	
2/27/1979	TS-47A	Minewater	Mercury	mg/l	0.0004	
2/27/1979	TS-47A	Minewater	Molybdenum	mg/l	0.001	<
2/27/1979	TS-47A	Minewater	Nickel	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.5	
2/27/1979	TS-47A	Minewater	pH, lab	mg/l	7.42	
2/27/1979	TS-47A	Minewater	Phenols	mg/l	0.002	
2/27/1979	TS-47A	Minewater	Radium-226	pCi/l	155	± 3
2/27/1979	TS-47A	Minewater	Radium-228	pCi/l	1	<
2/27/1979	TS-47A	Minewater	Selenium	mg/l	0.04	
2/27/1979	TS-47A	Minewater	Silver	mg/l	0.01	<
2/27/1979	TS-47A	Minewater	Sulfate	mg/l	70	
2/27/1979	TS-47A	Minewater	TDS	mg/l	383	
2/27/1979	TS-47A	Minewater	Uranium	mg/l	3.71	
2/27/1979	TS-47A	Minewater	Zinc	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Aluminum	mg/l	0.3	
3/14/1979	TS-52A	Minewater	Arsenic	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Barium	mg/l	0.2	
3/14/1979	TS-52A	Minewater	Boron	mg/l	0.3	
3/14/1979	TS-52A	Minewater	Cadmium	mg/l	0.001	<
3/14/1979	TS-52A	Minewater	Chloride	mg/l	6.5	
3/14/1979	TS-52A	Minewater	Chromium	mg/l	0.041	
3/14/1979	TS-52A	Minewater	Cobalt	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Copper	mg/l	0.016	
3/14/1979	TS-52A	Minewater	Cyanide	mg/l	0.1	
3/14/1979	TS-52A	Minewater	Fluoride	mg/l	0.52	
3/14/1979	TS-52A	Minewater	Iron	mg/l	0.62	
3/14/1979	TS-52A	Minewater	Lead	mg/l	0.001	<
3/14/1979	TS-52A	Minewater	Manganese	mg/l	0.081	
3/14/1979	TS-52A	Minewater	Mercury	mg/l	0.0004	<
3/14/1979	TS-52A	Minewater	Molybdenum	mg/l	0.003	
3/14/1979	TS-52A	Minewater	Nickel	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.5	
3/14/1979	TS-52A	Minewater	pH, lab	mg/l	7.2	
3/14/1979	TS-52A	Minewater	Phenols	mg/l	0.006	
3/14/1979	TS-52A	Minewater	Radium-226	pCi/l	67	± 2.7
3/14/1979	TS-52A	Minewater	Radium-228	pCi/l	1	<
3/14/1979	TS-52A	Minewater	Selenium	mg/l	0.03	
3/14/1979	TS-52A	Minewater	Silver	mg/l	0.01	<
3/14/1979	TS-52A	Minewater	Sulfate	mg/l	70	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
3/14/1979	TS-52A	Minewater	TDS	mg/l	386	
3/14/1979	TS-52A	Minewater	Uranium	mg/l	1.57	
3/14/1979	TS-52A	Minewater	Zinc	mg/l	0.02	
3/27/1979	TS-56A	Minewater	Aluminum	mg/l	0.1	<
3/27/1979	TS-56A	Minewater	Arsenic	mg/l	0.01	<
3/27/1979	TS-56A	Minewater	Barium	mg/l	0.2	
3/27/1979	TS-56A	Minewater	Boron	mg/l	0.2	
3/27/1979	TS-56A	Minewater	Cadmium	mg/l	0.001	<
3/27/1979	TS-56A	Minewater	Chloride	mg/l	7	
3/27/1979	TS-56A	Minewater	Chromium	mg/l	0.002	
3/27/1979	TS-56A	Minewater	Cobalt	mg/l	0.01	<
3/27/1979	TS-56A	Minewater	Copper	mg/l	0.001	
3/27/1979	TS-56A	Minewater	Cyanide	mg/l	0.1	<
3/27/1979	TS-56A	Minewater	Fluoride	mg/l	0.48	
3/27/1979	TS-56A	Minewater	Iron	mg/l	0.02	
3/27/1979	TS-56A	Minewater	Lead	mg/l	0.001	<
3/27/1979	TS-56A	Minewater	Manganese	mg/l	0.002	
3/27/1979	TS-56A	Minewater	Mercury	mg/l	0.0004	<
3/27/1979	TS-56A	Minewater	Molybdenum	mg/l	0.001	
3/27/1979	TS-56A	Minewater	Nickel	mg/l	0.01	<
3/27/1979	TS-56A	Minewater	Nitrogen, Nitrate (as N)	mg/l	0.5	
3/27/1979	TS-56A	Minewater	pH, lab	mg/l	8	
3/27/1979	TS-56A	Minewater	Phenols	mg/l	0.001	<
3/27/1979	TS-56A	Minewater	Radium-226	pCi/l	89.8	± 2.3
3/27/1979	TS-56A	Minewater	Radium-228	pCi/l	2	± 1
3/27/1979	TS-56A	Minewater	Selenium	mg/l	0.03	
3/27/1979	TS-56A	Minewater	Silver	mg/l	0.01	<
3/27/1979	TS-56A	Minewater	Sulfate	mg/l	76	
3/27/1979	TS-56A	Minewater	TDS	mg/l	404	
3/27/1979	TS-56A	Minewater	Uranium	mg/l	1.53	
3/27/1979	TS-56A	Minewater	Zinc	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Aluminum	mg/l	0.2	<
4/11/1979	TS-63	Minewater	Arsenic	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Barium	mg/l	0.2	
4/11/1979	TS-63	Minewater	Boron	mg/l	0.1	<
4/11/1979	TS-63	Minewater	Cadmium	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Chloride	mg/l	5	
4/11/1979	TS-63	Minewater	Chromium	mg/l	0.02	<
4/11/1979	TS-63	Minewater	Cobalt	mg/l	0.03	<
4/11/1979	TS-63	Minewater	Copper	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Cyanide	mg/l	0.1	<
4/11/1979	TS-63	Minewater	Fluoride	mg/l	0.51	
4/11/1979	TS-63	Minewater	Iron	mg/l	0.05	<
4/11/1979	TS-63	Minewater	Lead	mg/l	0.05	<
4/11/1979	TS-63	Minewater	Manganese	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Mercury	mg/l	0.0004	<
4/11/1979	TS-63	Minewater	Molybdenum	mg/l	0.04	<
4/11/1979	TS-63	Minewater	Nickel	mg/l	0.02	
4/11/1979	TS-63	Minewater	Nitrogen, Nitrate (as N)	mg/l	13	
4/11/1979	TS-63	Minewater	pH, lab	mg/l	7.59	
4/11/1979	TS-63	Minewater	Phenols	mg/l	0.001	<
4/11/1979	TS-63	Minewater	Radium-226	pCi/l	22	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
4/11/1979	TS-63	Minewater	Radium-228	pCi/l	5	
4/11/1979	TS-63	Minewater	Sc	umhos/cm	600	
4/11/1979	TS-63	Minewater	Selenium	mg/l	0.02	
4/11/1979	TS-63	Minewater	Silver	mg/l	0.01	<
4/11/1979	TS-63	Minewater	Sodium	mg/l	85.3	
4/11/1979	TS-63	Minewater	Sulfate	mg/l	75.8	
4/11/1979	TS-63	Minewater	TDS	mg/l	380.5	
4/11/1979	TS-63	Minewater	Thorium-230	pCi/l	0.6	<
4/11/1979	TS-63	Minewater	Uranium	mg/l	2.29	
4/11/1979	TS-63	Minewater	Vanadium	mg/l	0.1	<
4/11/1979	TS-63	Minewater	Zinc	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Aluminum	mg/l	0.2	<
5/2/1979	TS-69	Minewater	Barium	mg/l	0.1	<
5/2/1979	TS-69	Minewater	Cadmium	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Chloride	mg/l	5	
5/2/1979	TS-69	Minewater	Chromium	mg/l	0.02	<
5/2/1979	TS-69	Minewater	Cobalt	mg/l	0.05	<
5/2/1979	TS-69	Minewater	Copper	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Fluoride	mg/l	0.42	
5/2/1979	TS-69	Minewater	Iron	mg/l	0.04	<
5/2/1979	TS-69	Minewater	Lead	mg/l	0.05	<
5/2/1979	TS-69	Minewater	Manganese	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Mercury	mg/l	0.0004	<
5/2/1979	TS-69	Minewater	Molybdenum	mg/l	0.04	<
5/2/1979	TS-69	Minewater	Nickel	mg/l	0.04	<
5/2/1979	TS-69	Minewater	Nitrogen, Nitrate (as N)	mg/l	1	
5/2/1979	TS-69	Minewater	pH, lab	mg/l	8.45	
5/2/1979	TS-69	Minewater	Phenols	mg/l	0.001	<
5/2/1979	TS-69	Minewater	Radium-226	pCi/l	11.2	
5/2/1979	TS-69	Minewater	Sc	umhos/cm	485	
5/2/1979	TS-69	Minewater	Silver	mg/l	0.01	<
5/2/1979	TS-69	Minewater	Sodium	mg/l	1009.1	
5/2/1979	TS-69	Minewater	Sulfate	mg/l	73.3	
5/2/1979	TS-69	Minewater	TDS	mg/l	370.5	
5/2/1979	TS-69	Minewater	Thorium-230	pCi/l	5.8	
5/2/1979	TS-69	Minewater	Uranium	mg/l	1.7	
5/2/1979	TS-69	Minewater	Vanadium	mg/l	0.1	<
5/2/1979	TS-69	Minewater	Zinc	mg/l	0.01	<
6/11/1979		Minewater	Aluminum	mg/l	0.339	
6/11/1979		Minewater	Arsenic	mg/l	0.0118	
6/11/1979		Minewater	Barium	mg/l	0.043	
6/11/1979		Minewater	Boron	mg/l	0.01	
6/11/1979		Minewater	Cadmium	mg/l	0.0038	
6/11/1979		Minewater	Chloride	mg/l	13.4	
6/11/1979		Minewater	Chromium	mg/l	0.0356	
6/11/1979		Minewater	Cobalt	mg/l	0.0001	<
6/11/1979		Minewater	Copper	mg/l	0.0235	
6/11/1979		Minewater	Fluoride	mg/l	0.55	
6/11/1979		Minewater	Iron	mg/l	0.059	
6/11/1979		Minewater	Lead	mg/l	0.0138	
6/11/1979		Minewater	Manganese	mg/l	0.0026	
6/11/1979		Minewater	Mercury	mg/l	0.001	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
6/11/1979		Minewater	Molybdenum	mg/l	0.0373	
6/11/1979		Minewater	Nickel	mg/l	0.1349	
6/11/1979		Minewater	Nitrogen, Nitrate (as N)	mg/l	0.1	<
6/11/1979		Minewater	pH, lab	SU	7.94	
6/11/1979		Minewater	Radium-226	pCi/l	36.1	
6/11/1979		Minewater	Radium-228	pCi/l	5.2	
6/11/1979		Minewater	Sc	umhos/cm	690	
6/11/1979		Minewater	Selenium	mg/l	0.0149	
6/11/1979		Minewater	Silver	mg/l	0.0054	
6/11/1979		Minewater	Sodium	mg/l	10	
6/11/1979		Minewater	Sulfate	mg/l	111.5	
6/11/1979		Minewater	TDS	mg/l	449.6	
6/11/1979		Minewater	Thorium-230	pCi/l	120.5	
6/11/1979		Minewater	Uranium	mg/l	3.62	
6/11/1979		Minewater	Vanadium	mg/l	0.1	
6/11/1979		Minewater	Zinc	mg/l	0.0022	
4/30/1980		Minewater	Alkalinity (CaCO3)	mg/l	232	
4/30/1980		Minewater	Aluminum	mg/l	2.8	
4/30/1980		Minewater	Barium	mg/l	0.1	
4/30/1980		Minewater	Calcium	mg/l	10.1	
4/30/1980		Minewater	Chloride	mg/l	6.5	
4/30/1980		Minewater	Iron	mg/l	1.99	
4/30/1980		Minewater	Lead-210	pCi/l	240	± 7.0
4/30/1980		Minewater	Magnesium	mg/l	1	<
4/30/1980		Minewater	Manganese	mg/l	0.003	
4/30/1980		Minewater	pH, lab	SU	8	
4/30/1980		Minewater	Potassium	mg/l	2.2	
4/30/1980		Minewater	Radium-226	pCi/l	490	± 12
4/30/1980		Minewater	Radium-228	pCi/l	1	<
4/30/1980		Minewater	Sc	umhos/cm	691	
4/30/1980		Minewater	Selenium	mg/l	0.004	
4/30/1980		Minewater	Silica	mg/l	21	
4/30/1980		Minewater	Sodium	mg/l	170	
4/30/1980		Minewater	Sulfate	mg/l	71	
4/30/1980		Minewater	TDS	mg/l	381	
4/30/1980		Minewater	Thorium-230	pCi/l	0.6	<
4/30/1980		Minewater	Uranium	mg/l	2.84	
4/30/1980		Minewater	Zinc	mg/l	0.02	
7/16/1980		Minewater	Alkalinity (CaCO3)	mg/l	127	
7/16/1980		Minewater	Aluminum	mg/l	0.1	<
7/16/1980		Minewater	Barium	mg/l	0.01	<
7/16/1980		Minewater	Bicarbonate	mg/l	155	
7/16/1980		Minewater	Calcium	mg/l	31	
7/16/1980		Minewater	Carbonate	mg/l	0.1	<
7/16/1980		Minewater	Chloride	mg/l	14.9	
7/16/1980		Minewater	Iron	mg/l	0.1	<
7/16/1980		Minewater	Lead-210	pCi/l	0	± 3.42
7/16/1980		Minewater	Magnesium	mg/l	4.2	
7/16/1980		Minewater	Manganese	mg/l	1.3	
7/16/1980		Minewater	pH, lab	SU	6.7	
7/16/1980		Minewater	Potassium	mg/l	1.9	
7/16/1980		Minewater	Radium-226	pCi/l	86.1	± 1.7

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
7/16/1980		Minewater	Radium-228	pCi/l	1.3	± 5.0
7/16/1980		Minewater	Sc	umhos/cm	950	
7/16/1980		Minewater	Selenium	mg/l	0.05	
7/16/1980		Minewater	Silicon	mg/l	6.9	
7/16/1980		Minewater	Sodium	mg/l	140	
7/16/1980		Minewater	Sulfate	mg/l	272	
7/16/1980		Minewater	TDS	mg/l	538	
7/16/1980		Minewater	Thorium-230	pCi/l	5.3	± 2.6
7/16/1980		Minewater	Uranium	mg/l	2.7	
7/16/1980		Minewater	Zinc	mg/l	0.01	
10/9/1984		Mill Well	Alkalinity (CaCO3)	mg/L	197	
10/9/1984		Mill Well	Aluminum	mg/L	0.05	
10/9/1984		Mill Well	Ammonium as N	mg/L	0.05	
10/9/1984		Mill Well	Arsenic	mg/L	0.001	
10/9/1984		Mill Well	Bicarbonate	mg/L	239.7	
10/9/1984		Mill Well	Cadmium	mg/L	0.01	
10/9/1984		Mill Well	Calcium	mg/L	4.7	
10/9/1984		Mill Well	Chloride	mg/L	4.1	
10/9/1984		Mill Well	Cobalt	mg/L	0.05	
10/9/1984		Mill Well	Gross Alpha	pCi/L	43	
10/9/1984		Mill Well	Lead	mg/L	0.05	
10/9/1984		Mill Well	Lead 210	pCi/L	9.3	
10/9/1984		Mill Well	Magnesium	mg/L	3.24	
10/9/1984		Mill Well	Manganese	mg/L	0.01	
10/9/1984		Mill Well	Molybdenum	mg/L	0.01	
10/9/1984		Mill Well	Nickel	mg/L	0.05	
10/9/1984		Mill Well	pH	s.u.	8.49	
10/9/1984		Mill Well	Potassium	mg/L	1.6	
10/9/1984		Mill Well	Radium 226	pCi/L	1.8	
10/9/1984		Mill Well	Selenium	mg/L	0.001	
10/9/1984		Mill Well	Sodium	mg/L	103.2	
10/9/1984		Mill Well	Sulfate	mg/L	17.7	
10/9/1984		Mill Well	TDS	mg/L	228	
10/9/1984		Mill Well	Thorium 230	pCi/L	61.3	
10/9/1984		Mill Well	Uranium	mg/L	0.065	
10/9/1984		Mill Well	Vanadium	mg/L	0.01	
4/23/1992		Mill Well	Alkalinity (CaCO3)	mg/L	201	
4/23/1992		Mill Well	Aluminum	mg/L	0.1	
4/23/1992		Mill Well	Ammonium as N	mg/L	0.1	
4/23/1992		Mill Well	Arsenic	mg/L	0.004	
4/23/1992		Mill Well	Beryllium	mg/L	0.1	
4/23/1992		Mill Well	Bicarbonate	mg/L	245	
4/23/1992		Mill Well	Cadmium	mg/L	0.01	
4/23/1992		Mill Well	Calcium	mg/L	3.2	
4/23/1992		Mill Well	Chloride	mg/L	6.3	
4/23/1992		Mill Well	Cobalt	mg/L	0.01	
4/23/1992		Mill Well	Gross Alpha	pCi/L	2.3	
4/23/1992		Mill Well	Lead	mg/L	0.05	
4/23/1992		Mill Well	Lead 210	pCi/L	1	
4/23/1992		Mill Well	Magnesium	mg/L	0.4	
4/23/1992		Mill Well	Manganese	mg/L	0.01	
4/23/1992		Mill Well	Molybdenum	mg/L	0.1	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
4/23/1992		Mill Well	Nickel	mg/L	0.05	
4/23/1992		Mill Well	Nitrate + Nitrate as N	mg/L	0.1	
4/23/1992		Mill Well	pH	s.u.	8.83	
4/23/1992		Mill Well	Potassium	mg/L	1	
4/23/1992		Mill Well	Radium 226	pCi/L	0.4	
4/23/1992		Mill Well	Radium 228	pCi/L	2.1	
4/23/1992		Mill Well	Selenium	mg/L	0.218	
4/23/1992		Mill Well	Sodium	mg/L	123	
4/23/1992		Mill Well	Sulfate	mg/L	33.3	
4/23/1992		Mill Well	TDS	mg/L	292	
4/23/1992		Mill Well	Thorium 230	pCi/L	0.2	
4/23/1992		Mill Well	Uranium	mg/L	0.576	
4/23/1992		Mill Well	Vanadium	mg/L	0.1	
7/28/1993		Mill Well	Alkalinity (CaCO3)	mg/L	188	
7/28/1993		Mill Well	Aluminum	mg/L	0.16	
7/28/1993		Mill Well	Ammonium as N	mg/L	0.05	
7/28/1993		Mill Well	Arsenic	mg/L	0.001	
7/28/1993		Mill Well	Beryllium	mg/L	0.005	
7/28/1993		Mill Well	Bicarbonate	mg/L	229	
7/28/1993		Mill Well	Cadmium	mg/L	0.01	
7/28/1993		Mill Well	Calcium	mg/L	15	
7/28/1993		Mill Well	Chloride	mg/L	182	
7/28/1993		Mill Well	Cobalt	mg/L	0.01	
7/28/1993		Mill Well	Gross Alpha	pCi/L	1.8	
7/28/1993		Mill Well	Lead	mg/L	0.05	
7/28/1993		Mill Well	Magnesium	mg/L	4.9	
7/28/1993		Mill Well	Manganese	mg/L	0.24	
7/28/1993		Mill Well	Molybdenum	mg/L	0.1	
7/28/1993		Mill Well	Nickel	mg/L	0.05	
7/28/1993		Mill Well	Nitrate + Nitrate as N	mg/L	0.1	
7/28/1993		Mill Well	pH	s.u.	8.49	
7/28/1993		Mill Well	Potassium	mg/L	3	
7/28/1993		Mill Well	Radium 226	pCi/L	1.6	
7/28/1993		Mill Well	Radium 228	pCi/L	1.4	
7/28/1993		Mill Well	Selenium	mg/L	0.003	
7/28/1993		Mill Well	Sodium	mg/L	708	
7/28/1993		Mill Well	Sulfate	mg/L	1260	
7/28/1993		Mill Well	TDS	mg/L	2258	
7/28/1993		Mill Well	Thorium 230	pCi/L	0.2	
7/28/1993		Mill Well	Uranium	mg/L	0.002	
7/28/1993		Mill Well	Vanadium	mg/L	0.1	
6/18/2002		Mill Well	Alkalinity (CaCO3)	mg/L	185	
6/18/2002		Mill Well	Aluminum	mg/L	0.1	
6/18/2002		Mill Well	Ammonium as N	mg/L	0.5	
6/18/2002		Mill Well	Arsenic	mg/L	0.001	
6/18/2002		Mill Well	Beryllium	mg/L	0.01	
6/18/2002		Mill Well	Bicarbonate	mg/L	225	
6/18/2002		Mill Well	Cadmium	mg/L	0.005	
6/18/2002		Mill Well	Calcium	mg/L	16	
6/18/2002		Mill Well	Chloride	mg/L	160	
6/18/2002		Mill Well	Cobalt	mg/L	0.01	
6/18/2002		Mill Well	Gross Alpha	pCi/L	1	

ATTACHMENT 1
WESTWATER CANYON MEMBER WATER QUALITY DATA

Date	Sample ID	Location	Analyte	Units	Value	Qualifier
6/18/2002		Mill Well	Lead	mg/L	0.05	
6/18/2002		Mill Well	Lead 210	pCi/L	1	
6/18/2002		Mill Well	Magnesium	mg/L	4.2	
6/18/2002		Mill Well	Manganese	mg/L	0.05	
6/18/2002		Mill Well	Molybdenum	mg/L	0.1	
6/18/2002		Mill Well	Nickel	mg/L	0.05	
6/18/2002		Mill Well	Nitrate + Nitrate as N	mg/L	0.1	
6/18/2002		Mill Well	pH	s.u.	8.34	
6/18/2002		Mill Well	Potassium	mg/L	3.5	
6/18/2002		Mill Well	Radium 226	pCi/L	0.7	
6/18/2002		Mill Well	Radium 228	pCi/L	2.7	
6/18/2002		Mill Well	Selenium	mg/L	0.001	
6/18/2002		Mill Well	Sodium	mg/L	644	
6/18/2002		Mill Well	Sulfate	mg/L	1100	
6/18/2002		Mill Well	TDS	mg/L	2090	
6/18/2002		Mill Well	Thorium 230	pCi/L	0.02	
6/18/2002		Mill Well	Uranium	mg/L	0.07	
6/18/2002		Mill Well	Vanadium	mg/L	0.1	

Notes:

Qualifier of < signifies that concentration was less than detection limit shown

Qualifier of ± represents precision of radionuclides analysis

Ok

WELL

15T-303

Well also
marked as
15K-303

ecology and environment, inc.
International Specialists in the Environment
1940 Webster Street, Suite 100
Oakland, California 94612
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January 24, 2011

U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, CA 94105

TDD No: T02-09-10-08-0005
Project No: 002693.2103.01RA

14T-586
15T-305
16K-336
16K-340
mill well

Attention: Harry Allen, USEPA On-Scene Coordinator
Andrew Bain, USEPA

Subject: **NECR Water Well Sampling**
Church Rock Chapter
Navajo Nation

INTRODUCTION

In October 2010 the U.S. Environmental Protection Agency (USEPA) tasked the Ecology and Environment Inc. Superfund Technical Assessment and Response Team (START) with technical assistance relating to residential water well sampling in the vicinity of the former Northeast Church Rock Mine located in the Church Rock Chapter of the Navajo Nation. (Figure 1, Attachment A).

The purpose of this sampling event was to generate additional data to measure the impact of the former Northeast Church Rock Mine uranium mine on wells within the adjacent areas.

SAMPLING ACTIVITIES

Well sampling was conducted on October 19, 2010. A total of five wells were sampled. Four of the wells were residential wells and one (Mill Well) well was part of the former United Nuclear Corporation (UNC) facility in the area. Every effort was made to collect water samples in a manner consistent with resident collection and use (i.e. taps, pumps or bucket collect).

A Time Critical Quality Assurance and Sampling (QASP) Plan (Appendix D) was developed prior to sampling and followed with the following exceptions:

- Well NR#1 is no longer in use and was not sampled as the casing has been filled with concrete.
- The Mine Well is no longer in use and was not sampled as the casing has been filled with concrete.

Water quality parameters were measured in the field using a Horiba, Ltd. multi-parameter water quality meter. The meter was calibrated daily using a buffer solution. Samples were collected and analyzed for metals, radionuclides and anions by GEL Laboratories Inc. (Charleston, SC). Samples were collected and analyzed for oxygen and hydrogen isotopic ratio by Isotech Laboratories, Inc (Champaign, Il). The QASP (Appendix D) contains all methods and volumes used in sample analysis.

WELL DESCRIPTIONS

Well 15T-303

Well 15T-303 is a windmill powered well that feeds into an approximately 40,000 gallon uncovered metal tank. The well is currently in use and there is a trough and locked tap in the vicinity of the tank that are used to water livestock. Samples were collected from the top of the tank using a bucket.

14T-586

14T-586 is a diesel engine powered well that feeds into an approximately 10,000 gallon covered metal tank. The well is currently in use and there is a trough and tap in the vicinity of the tank that are used to water livestock. Samples were collected from the tap in manner consistent with residential use.

Mill Well

The Mill Well is located on the former UNC facility property. The well is electric powered well, housed in a wooden pump house, north of the former UNC offices and equipment yard. There is no storage tank affiliated with the well and the well is not currently in use. Samples were collected from a tap inside the pump house with pump turned on.

Mine Well

The mine well is located within the boundary of the former Northeast Church Mine. The well is currently not in use and has been non-operational for at least 15 years. The well opening is currently plugged with concrete.

NR#1

The NR#1 well is located within the boundary of the former Northeast Church Mine. The well is currently not in use and has been non-operational for at least 15 years. The well opening is currently plugged with concrete.

16K-340

Well 16K-340 is a windmill powered well that feeds into an approximately 40,000 gallon covered metal tank. The well is currently in use and there is a trough and tap in the vicinity of the tank that are used to water livestock. Samples were collected from the tap in manner consistent with residential use.

RESULTS

Table 1 (Appendix B) gives a well specific summary of all applicable data. All laboratory data was validated by a START chemist using the *Region 9 Draft Superfund Data Evaluation/Validation Guidance*. Data validation indicated the laboratory data was acceptable with qualification as definitive data. A separate data validation report was generated under this project and is included in the project file.

This letter summarizes all activities conducted on the Tuba City Removal project. If you have any questions regarding START's activities associated with this project, please do not hesitate to contact me.

Respectfully,

Mike Folan

START Member

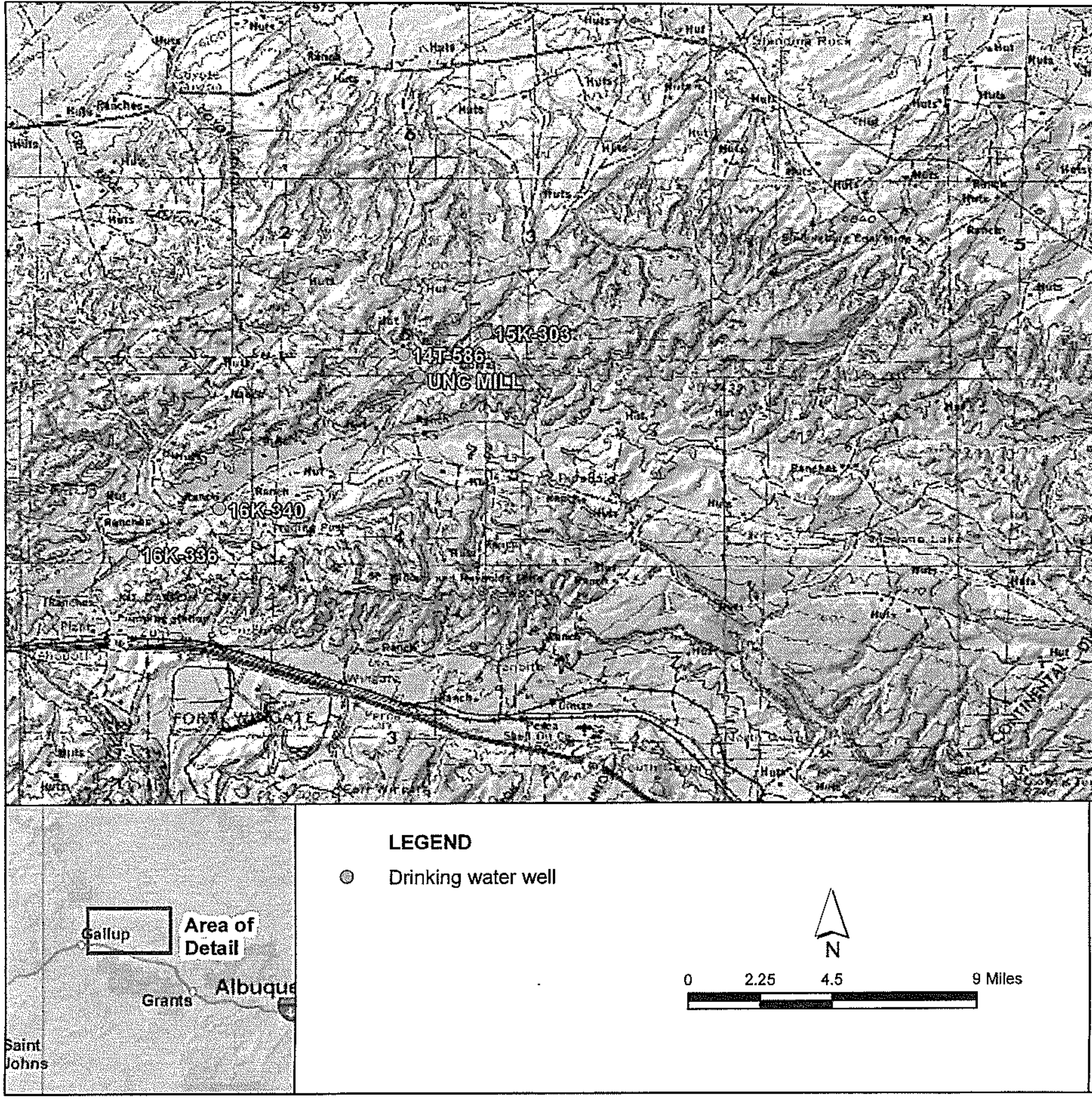
Attachments: A – Homesite Location Map
B –Data Tables
C – Photographic Documentation
D- QASP

cc: file

ATTACHMENT A:
Well Location Map

TDD: 09-10-08-0004
PAN: 002693.2103.01RA

Source: NGS Topo US 2D, Inlet: ESRI Streetmaps USA



LEGEND

● Drinking water well

Figure 1
NECR
Water Well Sampling

Navajo Nation

ecology and environment, inc.
International Specialists in the Environment

ATTACHMENT B:
Data Tables

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005

PAN:002693.2104.01RA

	14T-586			14T-586100 (duplicate)			15T-303		
		Result	Units		Result	Units		Result	Units
Water Quality	pH	7.1		pH	7.1		pH	6.8	
	Conductivity	0.26	S/m	Conductivity	0.26	S/m	Conductivity	0.35	S/m
	Turbidity	10.1	NTU	Turbidity	10.1	NTU	Turbidity	10.1	NTU
	Dissolved Oxygen	6.30	mg/L	Dissolved Oxygen	6.30	mg/L	Dissolved Oxygen	7.99	mg/L
	Temperature	7.6	°C	Temperature	7.6	°C	Temperature	12.1	°C
	Salinity	0.1	%	Salinity	0.1	%	Salinity	0.2	%
	Total Dissolved Solids	1.7	g/L	Total Dissolved Solids	1.7	g/L	Total Dissolved Solids	2.2	g/L
	Oxidation Reduction Potential	100	mV	Oxidation Reduction Potential	100	mV	Oxidation Reduction Potential	129	mV
Metals	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Aluminum	220	ug/L	Aluminum	82	ug/L	Aluminum	68.0	ug/L
	Antimony	3.00	ug/L	Antimony	7.34	ug/L	Antimony	6.83	ug/L
	Arsenic	5.00	ug/L	Arsenic	5.00	ug/L	Arsenic	7.54	ug/L
	Barium	13.1	ug/L	Barium	13.4	ug/L	Barium	8.24	ug/L
	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L
	Bromide	0.200	ug/L	Bromide	0.200	ug/L	Bromide	0.200	ug/L
	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L	Cadmium	1.17	ug/L
	Calcium	270000	ug/L	Calcium	281000	ug/L	Calcium	373000	ug/L
	Chromium	13.9	ug/L	Chromium	1.00	ug/L	Chromium	1.16	ug/L
	Cobalt	1.13	ug/L	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L
	Copper	3.00	ug/L	Copper	3.00	ug/L	Copper	3.00	ug/L
	Iron	482	ug/L	Iron	468	ug/L	Iron	685	ug/L
	Lead	3.30	ug/L	Lead	3.30	ug/L	Lead	3.30	ug/L
	Magnesium	119000	ug/L	Magnesium	122000	ug/L	Magnesium	144000	ug/L
	Manganese	320	ug/L	Manganese	319	ug/L	Manganese	162	ug/L
	Mercury	0.066	ug/L	Mercury	0.066	ug/L	Mercury	0.066	ug/L
	Nickel	71.3	ug/L	Nickel	1.51	ug/L	Nickel	1.50	ug/L
	Potassium	7430	ug/L	Potassium	7690	ug/L	Potassium	5650	ug/L
	Selenium	7.7	ug/L	Selenium	37.7	ug/L	Selenium	43.8	ug/L
	Silver	1.00	ug/L	Silver	1.00	ug/L	Silver	1.00	ug/L
	Sodium	135000	ug/L	Sodium	140000	ug/L	Sodium	188000	ug/L
	Thallium	5.00	ug/L	Thallium	5.00	ug/L	Thallium	8.9	ug/L
	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L
	Zinc	338	ug/L	Zinc	355	ug/L	Zinc	839	ug/L
Radionuclide's	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	ALPHA	2.62	pCi/L	ALPHA	5.80	pCi/L	ALPHA	-0.526	pCi/L
	BETA	6.58	pCi/L	BETA	6.02	pCi/L	BETA	2.62	pCi/L
	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent
	Radium-226	0.880	pCi/L	Radium-226	0.540	pCi/L	Radium-226	1.18	pCi/L
	Radium-228	3.41	pCi/L	Radium-228	3.71	pCi/L	Radium-228	3.34	pCi/L
	Thorium-228	-0.0147	pCi/L	Thorium-228	0.155	pCi/L	Thorium-228	-0.139	pCi/L
	Thorium-230	-0.185	pCi/L	Thorium-230	0.818	pCi/L	Thorium-230	-0.158	pCi/L
	Thorium-232	-0.133	pCi/L	Thorium-232	-0.0195	pCi/L	Thorium-232	-0.0195	pCi/L
	Uranium-233/234	1.16	pCi/L	Uranium-233/234	1.73	pCi/L	Uranium-233/234	0.317	pCi/L
	Uranium-235/236	0.114	pCi/L	Uranium-235/236	0.0569	pCi/L	Uranium-235/236	0.219	pCi/L
	Uranium-238	1.20	pCi/L	Uranium-238	0.790	pCi/L	Uranium-238	0.442	pCi/L

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005

PAN:002693.2104.01RA

	14T-586			14T-586100 (duplicate)			15T-303		
Anions	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Chloride	14.0	mg/L	Chloride	14.1	mg/L	Chloride	10.5	mg/L
	Nitrate	0.267	mg/L	Nitrate	0.266	mg/L	Nitrate	0.100	mg/L
	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L
	Ortho-phosphate	0.200	mg/L	Ortho-phosphate	0.200	mg/L	Ortho-phosphate	2.00	mg/L
	Sulfate	1380	mg/L	Sulfate	1310	mg/L	Sulfate	2000	mg/L
	Fluoride	1.19	mg/L	Fluoride	1.24	mg/L	Fluoride	1.52	mg/L
	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	δD H_2O	-80.8	%	δD H_2O	-81.2	%	δD H_2O	-73.1	%
	$\delta^{18}O$ H_2O	-10.44	%	$\delta^{18}O$ H_2O	-10.53	%	$\delta^{18}O$ H_2O	-8.56	%

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005

PAN:002693.2104.01 RA

	16K-336			16K-340			MILLWELL		
		Result	Units		Result	Units		Result	Units
Water Quality	pH	7.4		pH	7.6		pH	7.4	
	Conductivity	0.15	S/m	Conductivity	0.19	S/m	Conductivity	0.36	S/m
	Turbidity	29.9	NTU	Turbidity	5.5	NTU	Turbidity	14.7	NTU
	Dissolved Oxygen	3.05	mg/L	Dissolved Oxygen	5.26	mg/L	Dissolved Oxygen	6.39	mg/L
	Temperature	15.5	°C	Temperature	16.8	°C	Temperature	15.2	°C
	Salinity	0.1	%	Salinity	0.1	%	Salinity	0.2	%
	Total Dissolved Solids	1	g/L	Total Dissolved Solids	1.2	g/L	Total Dissolved Solids	2.3	g/L
	Oxidation Reduction Potential	86	mV	Oxidation Reduction Potential	76	mV	Oxidation Reduction Potential	-127	mV
Metals	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Aluminum	229	ug/L	Aluminum	126	ug/L	Aluminum	68.0	ug/L
	Antimony	3.00	ug/L	Antimony	3.00	ug/L	Antimony	3.00	ug/L
	Arsenic	11	ug/L	Arsenic	8.53	ug/L	Arsenic	5.00	ug/L
	Barium	450	ug/L	Barium	140	ug/L	Barium	1.64	ug/L
	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L
	Bromide	0.234	ug/L	Bromide	0.295	ug/L	Bromide	0.361	ug/L
	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L
	Calcium	76800	ug/L	Calcium	99800	ug/L	Calcium	2420	ug/L
	Chromium	1.00	ug/L	Chromium	1.03	ug/L	Chromium	1.43	ug/L
	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L
	Copper	29.7	ug/L	Copper	3.00	ug/L	Copper	20.4	ug/L
	Iron	2720	ug/L	Iron	181	ug/L	Iron	9870	ug/L
	Lead	3.58	ug/L	Lead	3.30	ug/L	Lead	3.74	ug/L
	Magnesium	20600	ug/L	Magnesium	43500	ug/L	Magnesium	470	ug/L
	Manganese	95.9	ug/L	Manganese	122	ug/L	Manganese	51	ug/L
	Mercury	0.066	ug/L	Mercury	0.066	ug/L	Mercury	0.066	ug/L
	Nickel	1.50	ug/L	Nickel	1.50	ug/L	Nickel	2.38	ug/L
	Potassium	2540	ug/L	Potassium	3940	ug/L	Potassium	3200	ug/L
	Selenium	10.2	ug/L	Selenium	5.00	ug/L	Selenium	26.7	ug/L
	Silver	1.00	ug/L	Silver	1.00	ug/L	Silver	1.00	ug/L
	Sodium	202000	ug/L	Sodium	233000	ug/L	Sodium	694000	ug/L
	Thallium	5.00	ug/L	Thallium	5.00	ug/L	Thallium	6.45	ug/L
	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L
	Zinc	153	ug/L	Zinc	148	ug/L	Zinc	659	ug/L
Radionuclide's	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	ALPHA	0.129	pCi/L	ALPHA	5.46	pCi/L	ALPHA	9.79	pCi/L
	BETA	4.99	pCi/L	BETA	2.37	pCi/L	BETA	2.72	pCi/L
	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent
	Radium-226	1.20	pCi/L	Radium-226	0.464	pCi/L	Radium-226	0.639	pCi/L
	Radium-228	4.58	pCi/L	Radium-228	0.747	pCi/L	Radium-228	1.77	pCi/L
	Thorium-228	0.298	pCi/L	Thorium-228	-0.0682	pCi/L	Thorium-228	0.139	pCi/L
	Thorium-230	-0.524	pCi/L	Thorium-230	0.0264	pCi/L	Thorium-230	0.480	pCi/L
	Thorium-232	-0.0195	pCi/L	Thorium-232	-0.0722	pCi/L	Thorium-232	-0.0195	pCi/L
	Uranium-233/234	-0.171	pCi/L	Uranium-233/234	0.297	pCi/L	Uranium-233/234	2.61	pCi/L
	Uranium-235/236	0.181	pCi/L	Uranium-235/236	0.115	pCi/L	Uranium-235/236	0.174	pCi/L
	Uranium-238	0.392	pCi/L	Uranium-238	1.40	pCi/L	Uranium-238	2.82	pCi/L

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005

PAN:002693.2104.01RA

	16K-336			16K-340			MILLWELL		
Anions	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Chloride	18.8	mg/L	Chloride	22.1	mg/L	Chloride	154	mg/L
	Nitrate	2.89	mg/L	Nitrate	5.97	mg/L	Nitrate	0.100	mg/L
	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L
	Ortho-phosphate	0.291	mg/L	Ortho-phosphate	0.163	mg/L	Ortho-phosphate	2.00	mg/L
	Sulfate	118	mg/L	Sulfate	368	mg/L	Sulfate	1460	mg/L
	Fluoride	0.861	mg/L	Fluoride	0.483	mg/L	Fluoride	1.73	mg/L
	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	δD H_2O	-91.4	%	δD H_2O	-82.6	%	δD H_2O	-107.3	%
	$\delta^{18}O$ H_2O	-12.04	%	$\delta^{18}O$ H_2O	-11.01	%	$\delta^{18}O$ H_2O	-14.14	%

ATTACHMENT C:
Photographic Documentation

PHOTOGRAPHIC LOG

NECR Water Well Sampling

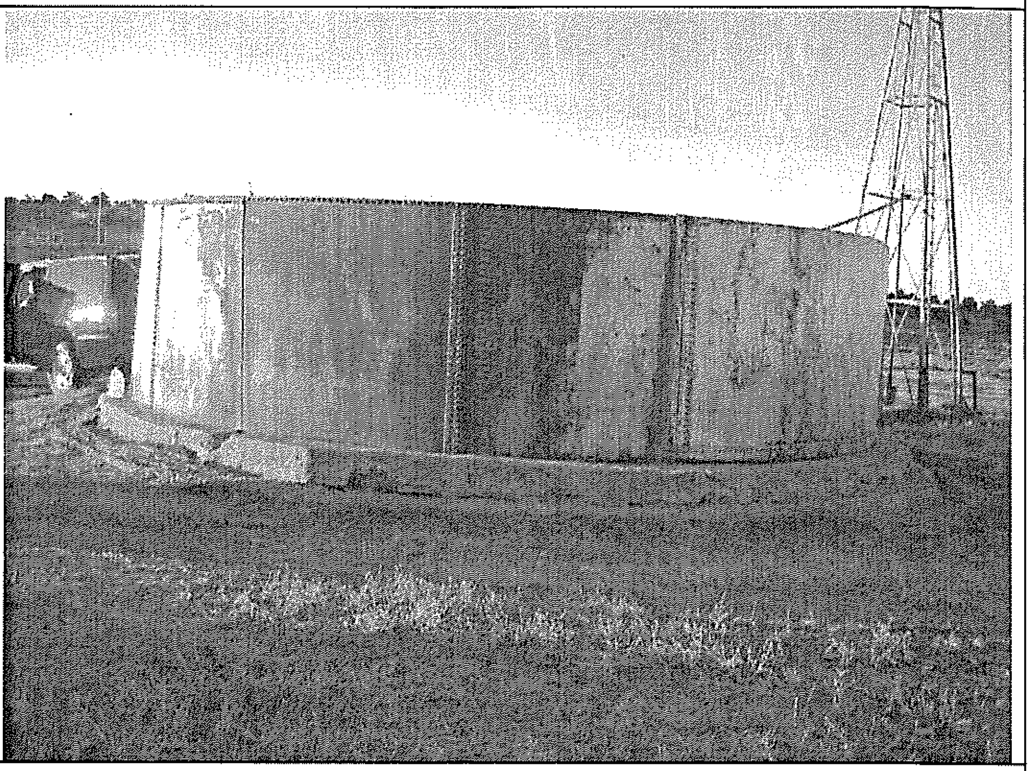
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

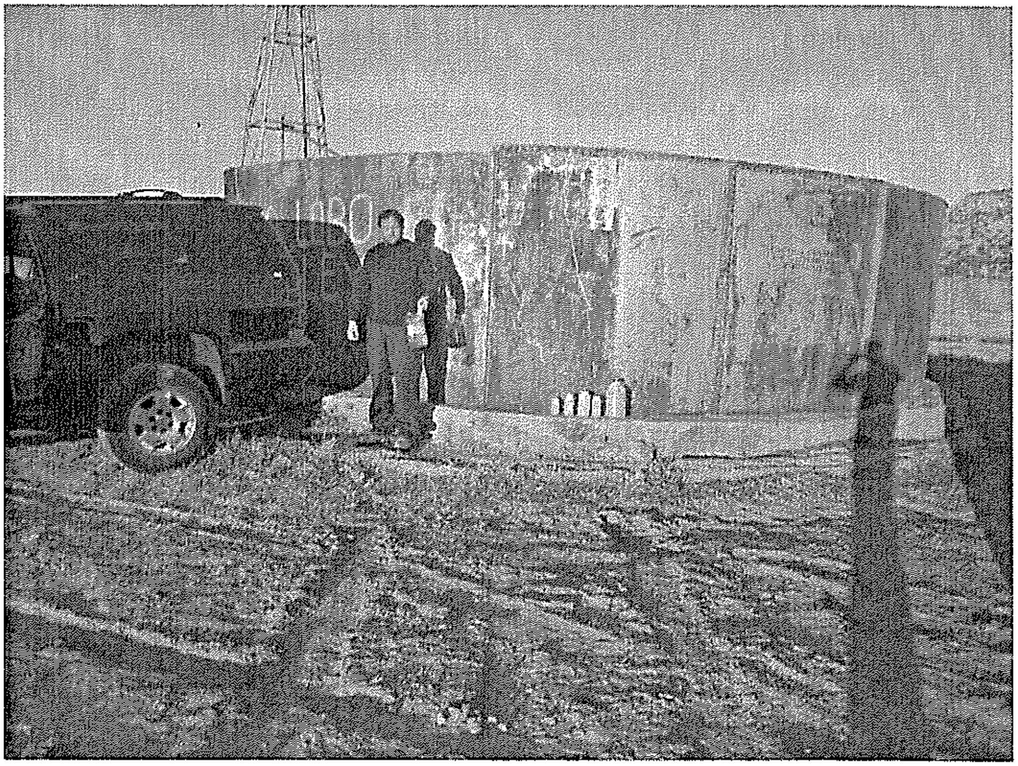
Well 15T-303



Date: 10/19/10

Description:

Well 15T-303



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

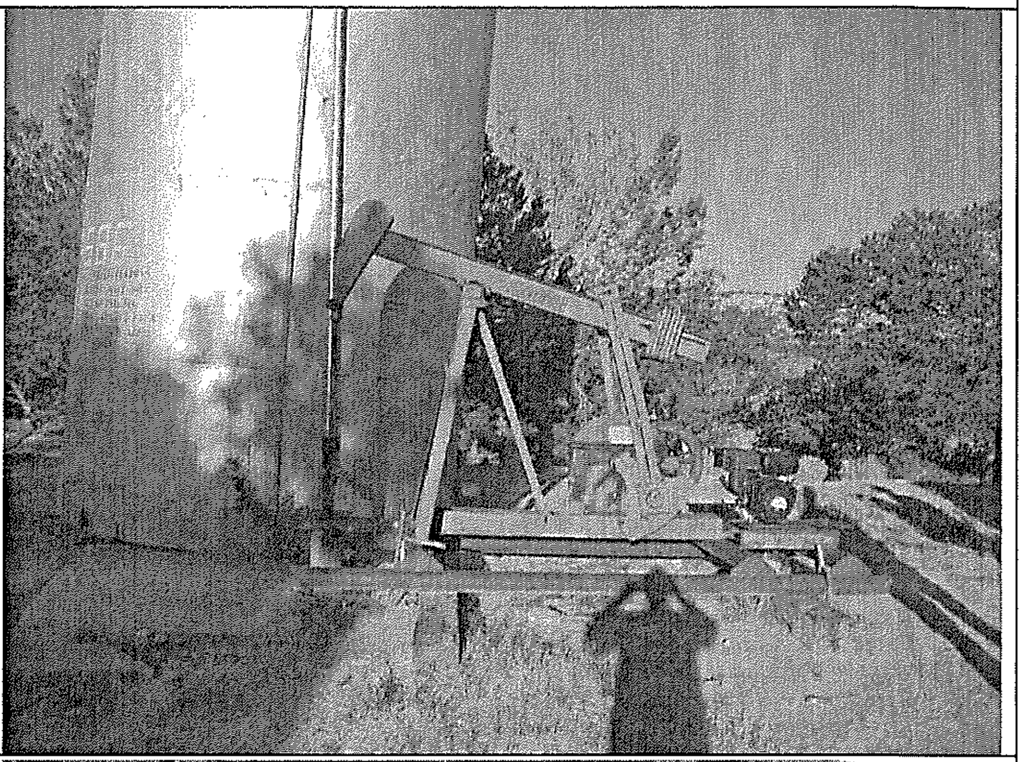
002693.2103.01RA

T02-09-10-08-0005

Date: 10/19/10

Description:

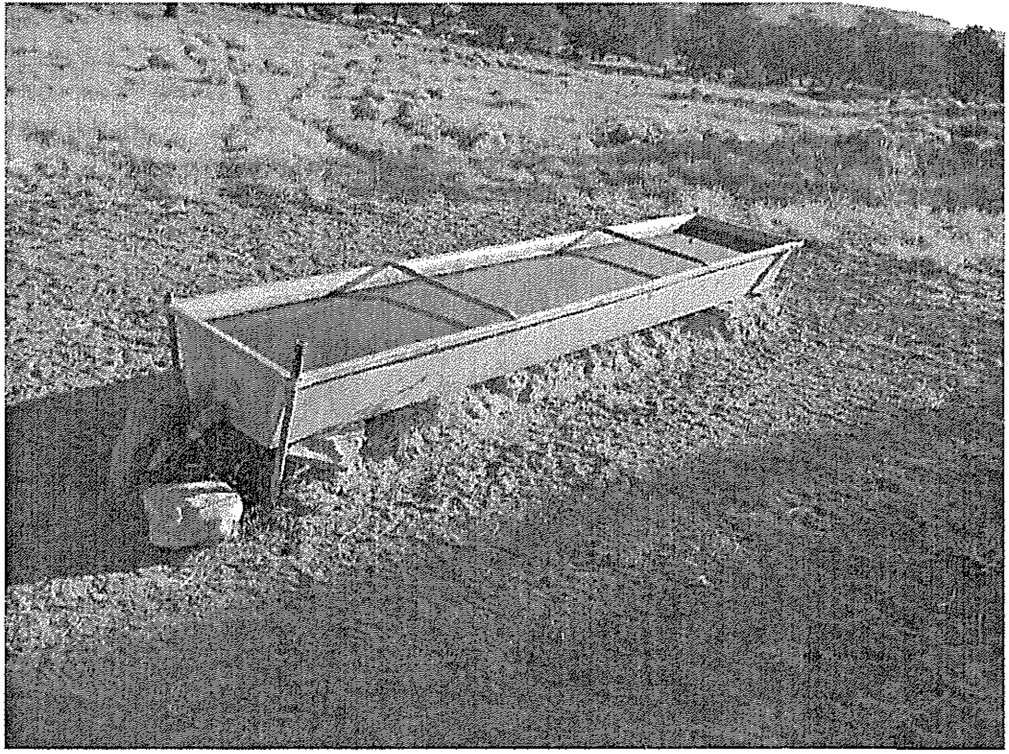
Well 14T-586



Date: 10/19/10

Description:

Well 14T-586



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

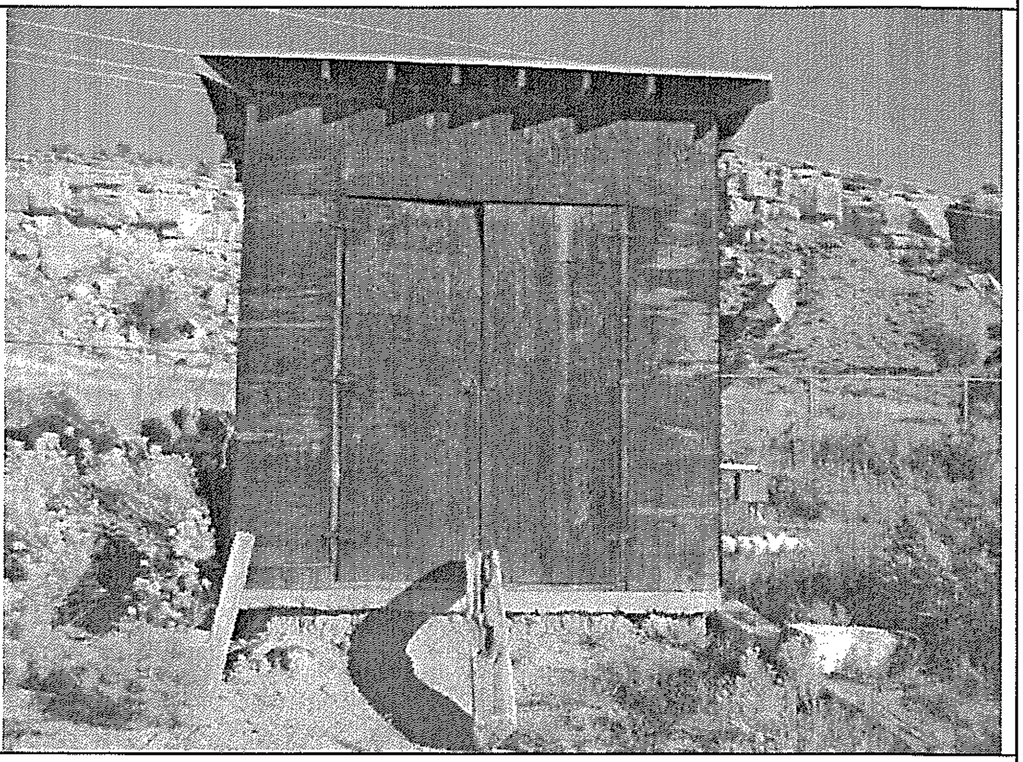
002693.2103.01RA

T02-09-10-08-0005

Date: 10/19/10

Description:

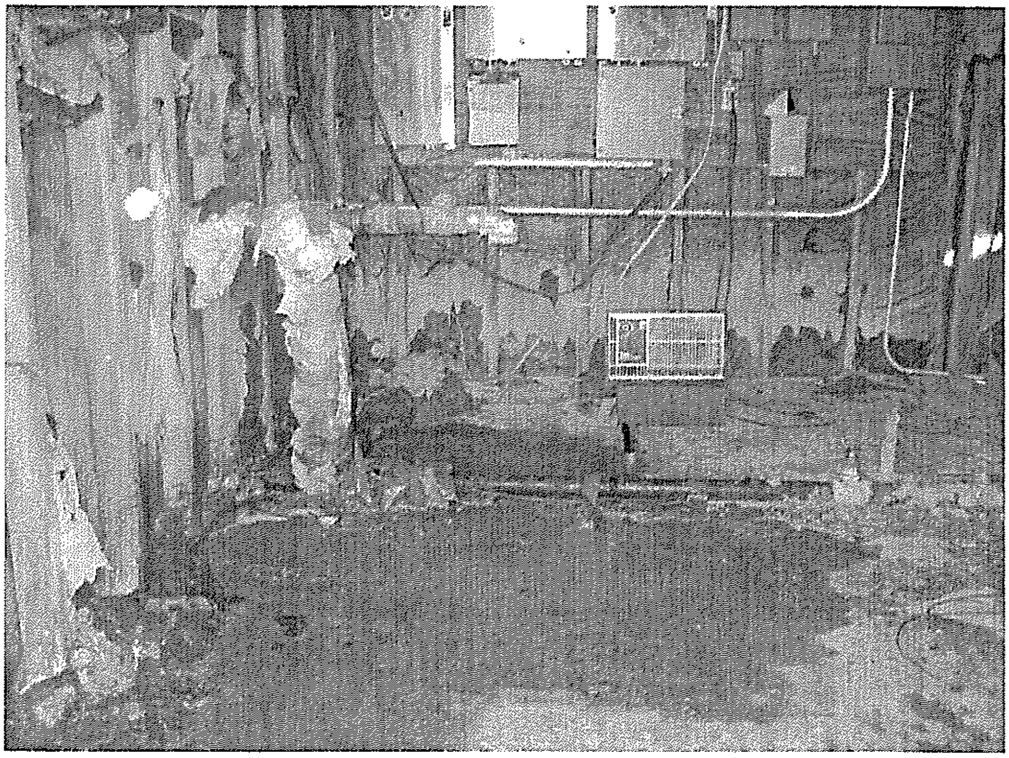
Mill Well



Date: 10/19/10

Description:

Mill Well



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date:
10/19/10

Description:
Mine Well

Date:
10/19/10

Description:

Well NR#1

PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

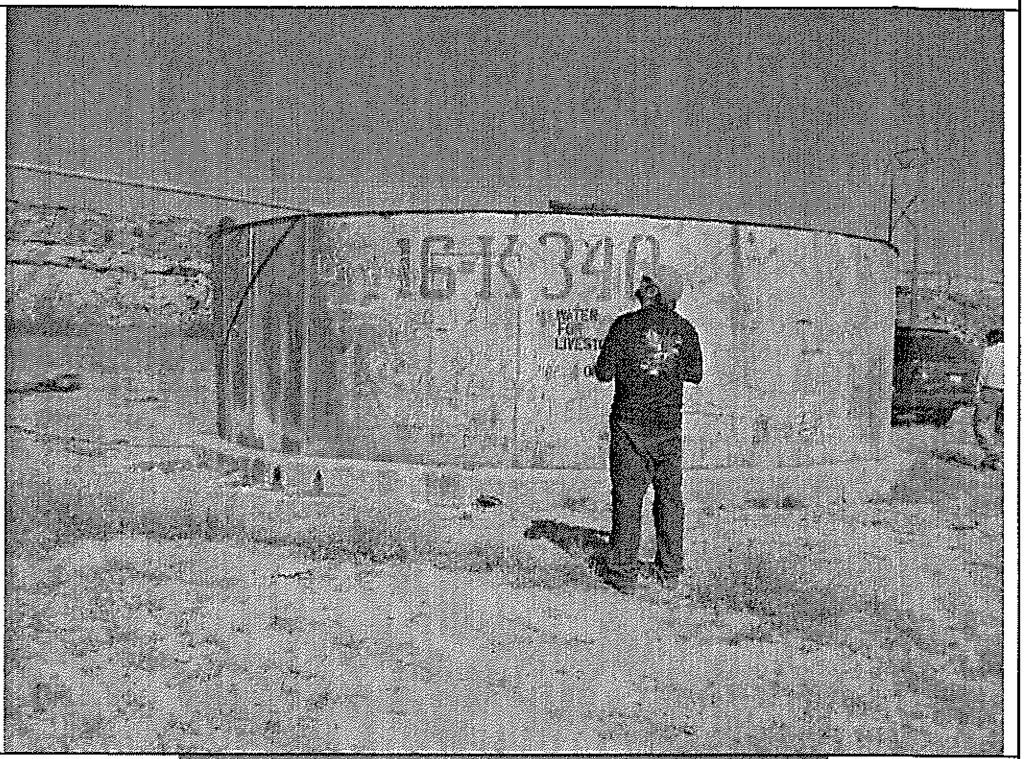
002693.2103.01RA

T02-09-10-08-0005

Date:
10/19/10

Description:

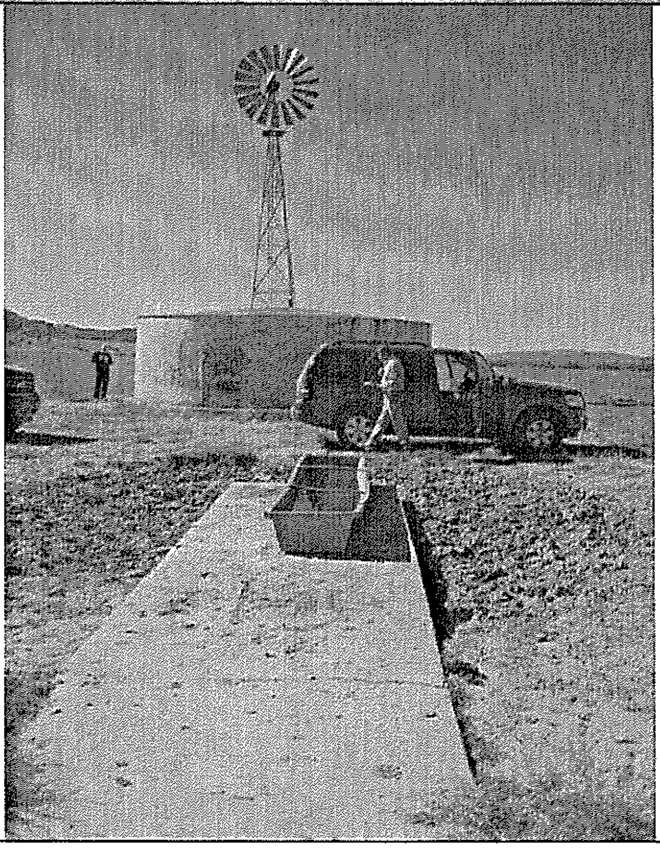
16K-340



Date:
10/19/10

Description:

16K-340



PHOTOGRAPHIC LOG

NECR Water Well Sampling

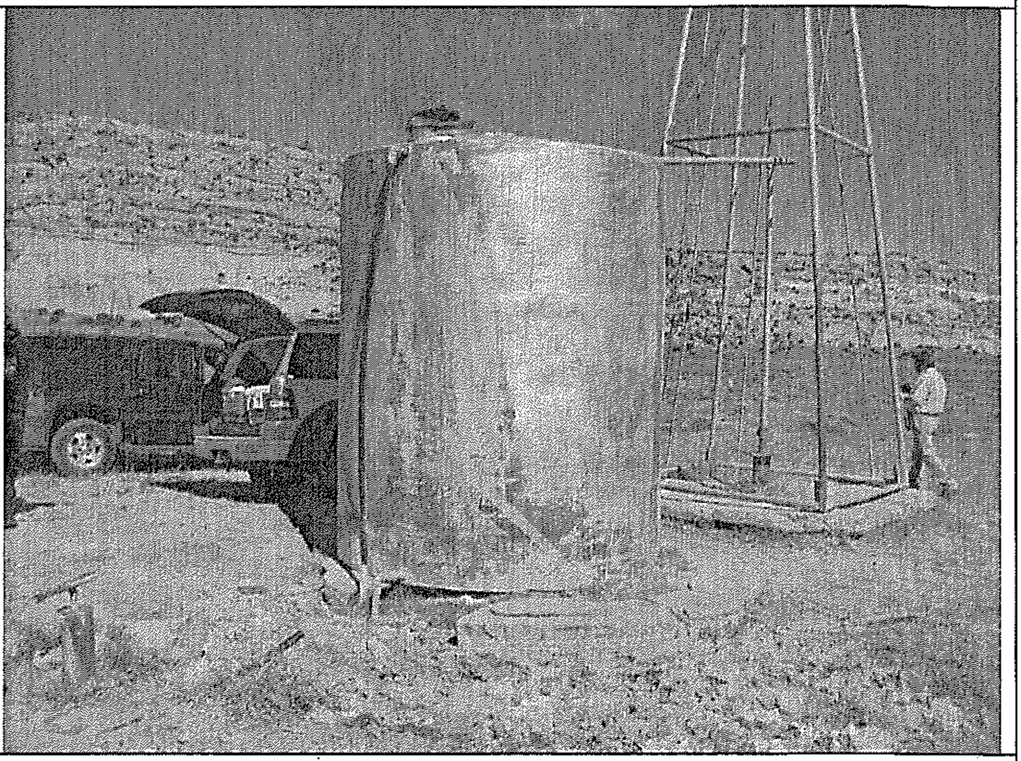
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

	Date: 10/19/10

Description:

16K-336



	Date: 10/19/10

Description:

16K-336

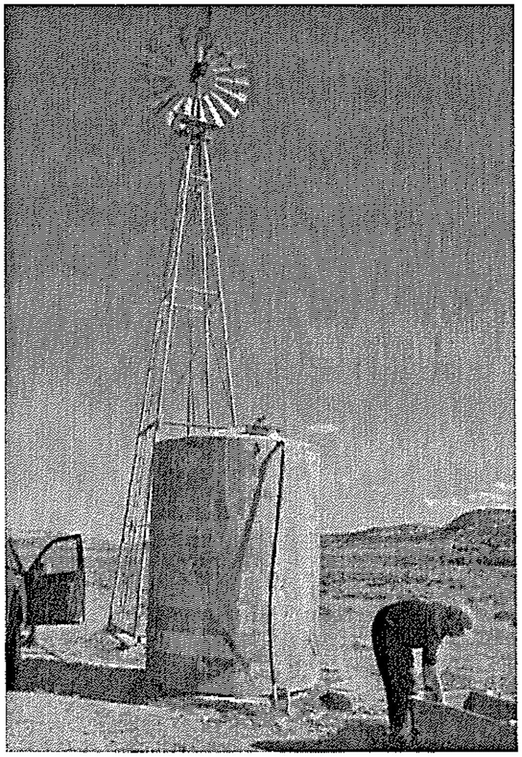


Table J
Reporting Limits, Action Levels, and Quality Control Limits

Analysis	Analyte	Action Level (mg/L)	Quantitation Limit (µg/L)	Duplicate RPD	Matrix Spike	Matrix Spike RPD
Anions by 300.0	Fluoride	4	0.10	25	75-125	20
Anions by 300.0	Chloride	250	1.0	25	75-125	20
Anions by 300.0	Nitrite as N	1	0.10	25	75-125	20
Anions by 300.0	Nitrate as N	10	0.10	25	75-125	20
Anions by 300.0	o-Phosphate, as P	Not Available	1.0	25	75-125	20
Anions by 300.0	Sulfate	250 (s)	0.50	25	75-125	20
Metals by 6010B	Aluminum	0.1	100	25	75-125	20
Metals by 6010B	Antimony	0.1	100	25	75-125	20
Metals by 6010B	Arsenic	0.01	10	25	75-125	20
Metals by 6010B	Barium	2	20	25	75-125	20
Metals by 6010B	Beryllium	0.005	5	25	75-125	20
Metals by 6010B	Cadmium	0.01	10	25	75-125	20
Metals by 6010B	Calcium	Not Available	1000	25	75-125	20
Metals by 6010B	Chromium	0.10	10	25	75-125	20
Metals by 6010B	Cobalt	Not Available	20	25	75-125	20
Metals by 6010B	Copper	1.3 (s)	20	25	75-125	20
Metals by 6010B	Iron	Not Available	50	25	75-125	20
Metals by 6010B	Lead	0.015	5	25	75-125	20
Metals by 6010B	Magnesium	Not Available	600	25	75-125	20
Metals by 6010B	Manganese	0.05 (s)	15	25	75-125	20
Metals by 6010B	Mercury	0.002	0.5	25	75-125	20
Metals by 6010B	Nickel	Not Available	20	25	75-125	20
Metals by 6010B	Potassium	Not Available	5000	25	75-125	20
Metals by 6010B	Selenium	0.05	10	25	75-125	20
Metals by 6010B	Silver	0.10 (s)	10	25	75-125	20
Metals by 6010B	Thallium	0.002	10	25	75-125	20
Metals by 6010B	Vanadium	Not Available	20	25	75-125	20
Metals by 6010B	Zinc	5 (s)	10	25	75-125	20
Gross alpha by 900.0	alpha	See table A-1	1.0 piC/L	25	75-125	20
Gross beta by 900.0	beta	See table A-1	1.0 piC/L	25	75-125	20
903.1	Ra-226	See table A-1	1.0 piC/L	25	75-125	20
904.0	Ra-228	See table A-1	1.0 piC/L	25	75-125	20
Isotopic Th by HASL 300 Th-01-RCmod	Th-238, 230, 232	See table A-1	1.0 piC/L	25	75-125	20
Isotopic U by HASL 300 U-02-RC mod	U-233/234, U-235/236, U-238	See table A-1	1.0 piC/L	25	75-125	20

Key: RPD = relative percent difference; mg/L = milligrams per liter; µ/L = micrograms per Liter NA = Not Applicable

(s) = National Secondary Drinking Water Regulation not enforceable and not an action limit for this assessment

14T-586 Friendship-1 PWSID NN3500323

d/s of mill

2008

EPA sample
0.970 Arsenic MCL 10 ug/L
1.500 Uranium MCL 30 ug/L
1.190 Ra226 pCi/L
2.250 Ra228 pCi/L
3.440 RaTotal MCL 5 pCi/L
7.850 Gross Alpha pCi/L
6.845 Gr. Alpha (excluding U) MCL 15 pCi/L
4.450 Beta
7.80 pH Secondary MCL 6.5 - 8.5
6.98 Field pH
2250.00 Conductivity umhos/cm
14.900 Turbidity MCL 1ntu
-0.37 Corrosivity
3.78 Collection temperature celsius
325.0 T. Alkalinity (CaCO3) mg/L
830.0 Total Hardness NTUA desired maximum 500 mg/L
150.4 Calcium NTUA desired range 75-200 mg/L
376.0 Calcium (CaCO3) NTUA desired range 75-200 mg/L
110.40 Magnesium mg/L
454.0 Magnesium (CaCO3) mg/L
1810.0 Dissolved Solids Secondary MCL 500 mg/L
16.40 Chloride Secondary MCL 250 mg/L
0.388 Fluoride Primary MCL 4.0; Secondary MCL 2.0 mg/L
<0.3 Phosphate mg/L
Sulfate Secondary MCL 250 mg/L
<0.3 Nitrate Primary MCL 10
<0.3 Nitrite Primary MCL 1 mg/L
ND Mercury Primary MCL .002 ug/L
100 Boron ug/L
240000 Calcium ug/L
2.100 Iron Secondary MCL .3 mg/L
120000 Magnesium ug/L
8000 Potassium ug/L
160000 Sodium ug/L
1100.0 Hardness as CaCO3 (calculated) mg/L
ND AluminumSecondary MCL .05-.2 mg/L
ND Antimony Primary MCL .006 mg/L
0.0200 Barium Primary MCL 2 mg/L
ND Beryllium Primary MCL .004 mg/L
ND Cadmium Primary MCL .005 mg/L
ND ChromiumPrimary MCL .1mg/L
1.30 Cobalt ug/L
0.0029 Copper Primary MCL action level 1.3 mg/L
ND Lead Primary MCL action level .015 mg/L
2.0000 Manganese Secondary MCL .05 mg/L
13.00 Molybdenum ug/L
13.000 NickelB ug/L
0.00110 SeleniumPrimary MCL .05 mg/L
ND Silver Secondary MCL .10 mg/L
ND ThalliumPrimary MCL .002 mg/L
ND Vanadiumug/L
2.0000 Zinc Secondary MCL 5 mg/L

15K-303 Pipeline Canyon Well

d/s of mine

EPA
2008?

EPA sample
0.710 Arsenic MCL 10 ug/L
0.380 Uranium MCL 30 ug/L
1.190 Ra226 pCi/L
3.730 Ra228 pCi/L
4.920 RaTotal MCL 5 pCi/L
0.895 Gross Alpha pCi/L
0.640 Gr. Alpha (excluding U) MCL 15 pCi/L
13.800 Beta
6.54 pH Secondary MCL 6.5 - 8.5
7.20 Field pH

890.00 Conductivity umhos/cm
1.200 Turbidity MCL 1ntu
0.45 Corrosivity
.70 Collection temperature celsius
95.0 T. Alkalinity (CaCO3) mg/L
040.0 Total Hardness NTUA desired maximum 500 mg/L
29.6 Calcium NTUA desired range 75-200 mg/L
24.0 Calcium (CaCO3) NTUA desired range 75-200 mg/L
74.10 Magnesium mg/L
16.0 Magnesium (CaCO3) mg/L
2528.0 Dissolved Solids Secondary MCL 500 mg/L
0.50 Chloride Secondary MCL 250 mg/L
0.738 Fluoride Primary MCL 4.0; Secondary MCL 2.0 mg/L
<0.3 Phosphate mg/L
Sulfate Secondary MCL 250 mg/L
<0.3 Nitrate Primary MCL 10
<0.3 Nitrite Primary MCL 1 mg/L
ND Mercury Primary MCL .002 ug/L
110 Boron ug/L
370000 Calcium ug/L
1.000 Iron Secondary MCL .3 mg/L
140000 Magnesium ug/L
5300 Potassium ug/L
140000 Sodium ug/L
1500.0 Hardness as CaCO3 (calculated) mg/L
ND AluminumSecondary MCL .05-.2 mg/L
ND Antimony Primary MCL .006 mg/L
0.0067 Barium Primary MCL 2 mg/L
ND Beryllium Primary MCL .004 mg/L
ND Cadmium Primary MCL .005 mg/L
ND ChromiumPrimary MCL .1mg/L
0.77 Cobalt ug/L
0.0024 Copper Primary MCL action level 1.3 mg/L
ND Lead Primary MCL action level .015 mg/L
0.3100 Manganese Secondary MCL .05 mg/L
0.84 Molybdenum ug/L
16.000 NickelB ug/L
0.00083 SeleniumPrimary MCL .05 mg/L
ND Silver Secondary MCL .10 mg/L
ND ThalliumPrimary MCL .002 mg/L
ND Vanadiumug/L
0.0400 Zinc Secondary MCL 5 mg/L

Annie Grey HP

EPA sample
2.400 Arsenic MCL 10 ug/L
5.200 Uranium MCL 30 ug/L
0.948 Ra226 pCi/L
0.566 Ra228 pCi/L
1.514 RaTotal MCL 5 pCi/L
12.200 Gross Alpha pCi/L
8.716 Gr. Alpha (excluding U) MCL 15 pCi/L
35.400 Beta
8.57 pH Secondary MCL 6.5 - 8.5
6.90 Field pH
332.00 Conductivity umhos/cm
22.400 Turbidity MCL 1ntu
-1.54 Corrosivity
6.82 Collection temperature celsius
143.0 T. Alkalinity (CaCO3) mg/L
55.2 Total Hardness NTUA desired maximum 500 mg/L
17.6 Calcium NTUA desired range 75-200 mg/L
44.0 Calcium (CaCO3) NTUA desired range 75-200 mg/L

SFUND RECORDS CTR
2097103

Water Sources in Church Rock Area Sampled in 2003 by CRUMP Water Assessment Team

Well #	Well Name	Chapter	Latitude	Longitude	TRS Coordinates	Formation	Well Type	TD (ft)	Use(s)
Grey	Annie Grey	Pinedale	35,37 457	108,30 670	16 16 14 1111	Qal	dug, HP	8	LS, DOM
Solar	Solar St	Church Rock	35,32 158	108,35 753	15 17 13 1	Qal?	drilled, HP	unk	LS
14K-313	Brown Bull	Coyote Cyn	35,39 982	108,34 113	17 16 32 or 29	Kg	drilled, WM	622	LS, DOM
A 14K-586	Friendship I	Coyote Cyn	35,39 432	108,30 557	17 16 35	Kmv or Kg	drilled, PWS	750	abd-CWS
A 15K-303	Pipeline Cyn	Standing Rk	35,40 277	108,28 698	17 15 29 421	Kg	drilled, WM	614	LS
16-4-10	Lime Ridge	Church Rock	35,34 315	108,34 633	16 16 31 33	Jmw?	dug, HP	<1	LS, DOM
16K-336	Puerco No Fork	Church Rock	35,34 362	108,38 202	16 17 33 4223	Qal	drilled, WM	122	LS
A 16K-340	Windmill Cluster	Church Rock	35,35 582	108,35 890	16 17 25 1132	Qal	drilled, WM	141	LS
16T-348	Lobo Valley	Pinedale	35,37 178	108,27 195	16 15 17 1431	Kd	drilled, WM	410	LS
16T-534	Superman Cyn	Church Rock	35,35 818	108,38 675	16 17 21 344	Jmw	drilled, WM	410	DOM, LS
16T-559	Coal Mine/ Henry's	Church Rock	35,27 560	108,39 207	15 17 33 43	unk	drilled, WM	unk	LS
16T-606	King Ranch	Church Rock	35,36 998	108,33 237	16 16 17 411	Kd	drilled, WM	417	LS
16T-608	Yazzie Family	Church Rock	35,31 123	108,38 332	15 17 21 4	unk	drilled, WM	unk	DOM, LS

Following Pages

- Summary of General Chemistry
- Summary of Heavy Metals
- Summary of Radionuclides
- Complete field chemistry reported by NMED
- Complete radionuclide analyses reported by NMED
- Complete uranium analyses reported by USEPA

Abbreviations and Symbols

TRS = Township, Range, Section
TD = Total Depth of well, in feet, unk = unknown depth
Uses abd-CWS = abandoned community water system, DOM = domestic, LS = livestock,
Type HP = hand pump, WM = windmill
Formation Qal = alluvium, Kd = Dakota SS, Kg = Gallup SS, Kmv = Mesa Verde, Jmw = Morrison/Westwater
NNEPA = Navajo Nation Environmental Protection Agency
USEPA = U S Environmental Protection Agency

Summary of General Chemistry

Well #	Sampling Date	Dissolved Solids (mg/L)	Calcium ($CaCO_3$) (mg/L)	Magnesium (mg/L)	Potassium (mg/l)	Sodium (mg/L)	Total Hardness (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	pH (Units)
USEPA or NNEPA MCL		500	75-200	none	none	none	500	250	250	6 5-8 5
Lab		NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	field
Grey	10/28/2003	**553 5**	**376 0**	(???) -36	6 69	24 1	240 0	4 5	**305 0**	7 72
Solar	10/29/2003	**561 8**	38 0	120 0	4 00	27 9	148 0	4 64	**352 0**	**8 61**
14K-313	10/29/2003	**1,095 0**	**640 0**	440 0	4 36	105 0	**1,080 0**	10 7	**1,070 0**	8 31
14K-586	8/5/2003	**2,136 0**	**251 8**	125 1	7 10	143 1	**1,143 9**	19 1	**1,097 2**	8 07
15K-303	10/28/2003	**3,043 0**	**980 0**	(???) -940	5 97	191 0	40 0	12 1	**1,940 0**	8 13
16-4-10	10/29/2003	237 5	152 0	32 0	1 61	8 37	184 0	14 3	27 1	7 45
16K-336	10/29/2003	**887 6**	200 0	88 0	2 84	207 0	288 0	20 9	122 0	8 05
16K-340	10/29/2003	**1,469 0**	**420 0**	180 0	3 65	256 0	**600 0**	25 5	**419 0**	8 16
16T-348	10/29/2003	**660 9**	4 0	8 0	0 86	222 0	12 0	3 48	155 0	**9 63**
16T-534	10/29/2003	**811 8**	132 0	76 0	3 00	179 0	208 0	8 0	**314 0**	**8 67**
16T-559	10/28/2003	498 4	12 0	15 0	1 71	162 0	27 0	4 59	148 0	**8 87**
16T-606	10/28/2003	**3,500 0**	196 0	1,740 0	6 91	245 0	**1,940 0**	23 3	**1,130 0**	7 45
16T-608	10/28/2003	**1,015 0**	24 0	36 0	0 86	390 0	60 0	**251 0**	134 0	**8 82**

Boldface numbers indicate values exceeding standards

Abbreviations MCL = maximum contaminant level, mg/L = milligrams per liter, NMSLD = New Mexico Scientific Laboratory Division, NTUA = Navajo Tribal Utility Authority, ??? = data are questionable

Summary of Heavy Metals and Aesthetic Parameters

Well #	Sampling Date	Arsenic (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Fluoride (mg/L)	Iron (mg/L)
USEPA or NNEPA MCL		0 010	0 005	0 05	1 3	0 02	0 1	0 05	1 6 (WQCC)	0 3
Lab		NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	field*	field*
Grey	10/28/2003	<0 005	<0 0002	<0 001	<0 02	0 001	<0 04	<0 005	0 92	0 01
Solar	10/29/2003	<0 005	<0 0002	<0 001	0 062	<0 001	<0 04	<0 005	0 32	4 10
14K 313	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	1 34	**0 54**
14K 586	8/5/2003	0 008**	<0 001**	<0 001**	<0 1**	<0 001**	<0 1**	<0 005**	not tested	**5 10****
15K 303	10/28/2003	<0 005	<0 0002	<0 001	0 026	<0 001	<0 04	<0 005	**1 60**	**0 68**
16 4 10	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	0 043	0 58	0 10
16K 336	10/29/2003	0 006	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	1 03	**2 00**
16K 340	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 71	**0 40**
16T 348	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 47	0 02
16T 534	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 44	**0 49**
16T 559	10/28/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 64	0 07
16T 606	10/28/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	1 16	**3 28**
16T 608	10/28/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	0 006	**1 96**	0 12

*field tests by New Mexico Environment Department

**lab results reported by NMSLD

Boldface numbers indicate values exceeding standards

Abbreviations MCL = maximum contaminant level mg/L = milligrams per liter NMSLD = New Mexico Scientific Laboratory Division
NTUA = Navajo Tribal Utility Authority WQCC = N M Water Quality Control Commission groundwater standard ??? = data are questionable

Summary of Selected Radionuclides*

Well #	Sampling Date	Gr Alpha (U Nat Ref) (pCi/L)	Gr Beta (Sr/Y 90 Ref) (pCi/L)	Radium 226 (pCi/L)	Radium 228 (pCi/L)	Total Uranium (pCi/L)	Uranium mass (ug/L)
USEPA or NNEPA MCL		15	none	combined 5 0		none	30
Grey	10/28/2003	7 20	9 40	0 10	0 40	9 94	14 84
Solar	10/29/2003	nd	4 40	0 08	0 20	0 16	0 24
14K 313	10/29/2003	nd	4 40	0 04	0 50	0 04	0 05
14K 586	8/5/2003	10 80	14 90	2 60	not tested	not tested	3 00
15K 303	10/28/2003	4 00	9 00	0 47	1 50	0 46	0 69
16 4 10	10/29/2003	**44 10**	26 00	0 33	0 70	46 48	**69 37**
16K 336	10/29/2003	5 90	4 40	0 83	0 30	0 38	0 57
16K 340	10/29/2003	nd	4 90	0 40	0 40	1 96	2 92
16T 348	10/29/2003	nd	1 60	nd	0 60	0 20	0 29
16T 534	10/29/2003	nd	2 70	0 20	0 50	0 10	0 15
16T 559	10/28/2003	nd	1 50	0 05	nd	0 06	0 09
16T 606	10/28/2003	**40 00**	20 40	**8 34**	**0 80**	4 68	6 99
16T 608	10/28/2003	5 40	nd	0 04	1 40	3 86	5 76

*All samples except for 14T 586 analyzed at USEPA lab in Las Vegas NV 14T 586 analysis at N M State Laboratory

Boldface numbers indicate values exceeding standards

Abbreviations MCL = maximum contaminant level pCi/L = picoCuries per liter

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

First International Bldg., 1201 Elm St.
Dallas, Texas 75270

PROJ. NO.: SAS 3297 F

PROJECT NAME:

SAMPLERS: (Signature)

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Gross Alpha	Gross Beta	Radium 226,228				REMARKS
04	7/23/87	[illegible]		✓	Well 15K-303	3	X						3297F04 6-009370 to 6-009372
					Additional Volume for QA/QC	3		X					3297F04 6-009373 to 6-009375
						3			X				3297F04 6-009376 to 6-009378
05	7/24/87	1032 1050		✓	~~Well 16F-348~~ Grey	1	X						3297F05 6-009384
						1		X					3297F05 6-009385
						1			X				3297F05 6-009386

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
	7/24/87 1800	Federal Express AB# 311 7053682			

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)

Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks

riginal Accompanies Shipment; Copy to Coordinator Field Files

6-13292

15T-303

CHAIN OF CUSTODY RECORD

First International Bldg., 1201 Elm St.
Dallas, Texas 75270

PROJ. NO.: SAS 3297F

PROJECT NAME:

SAMPLERS: (Signature)

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Gross alpha	Gross beta	Radium 226+228				REMARKS
01	7/24/87	1033 1050		✓	~~Well 16F-348~~ Circle Wash	1	X						3297F01 6-009298
						1		X					3297F01 6-009299
						1			X				3297F01 6-009300
02	7/24/87	1131 1151		X	Well 16T 513	1	X						3297F02 6-009349
						1		X					3297F02 6-009350
						1			X				3297F02 6-009351
03	7/24/87	1259 1307		X	Well 16F-606	1	X						3297F03 6-009357
						1		X					3297F03 6-009358
						1			X				3297F03 6-009359
~~04~~													
~~05~~													

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
	7/24/87 1800	Federal Express AB# 311 7053682			

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)

Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

6-13295

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

First International Bldg., 1201 Elm St.
Dallas, Texas 75270

CHAIN OF CUSTODY RECORD

PROJ. NO. SAS 3297F
PROJECT NAME United Nuclear
SAMPLERS: *(Signature)*

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Metals	Fluoride Corrosivity Chloride Sulfate	TDS	Nitrate			REMARKS
01	9/24/87	1022 1050		X	~~Well 16T-348~~	5	1	2	1	1			6-009293 to 6-009297
					Circle Wash								
02	9/24/87	1130 1135		X	Well 16T 513	5	1	2	1	1			6-009344 to 6-009348
03													
04													
05	9/24/87	1022 1050		X	~~Well 16T-348~~ Grey	5	1	2	1	1			6-009379 to 6-009383
					Grey								

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
	9/24/87 800	Federal Express AB# 3117053671			
Relinquished by: *(Signature)*	**Date / Time**	**Received by:** *(Signature)*	**Relinquished by:** *(Signature)*	**Date / Time**	**Received by:** *(Signature)*
Relinquished by: *(Signature)*	**Date / Time**	**Received for Laboratory by:** *(Signature)*	**Date / Time**	**Remarks**	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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Office of Enforcement

First International Bldg., 1201 Elm St.
Dallas, Texas 75270

CHAIN OF CUSTODY RECORD

PROJ. NO. SAS 3297F
PROJECT NAME United Nuclear
SAMPLERS: *(Signature)*

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Metals	Nitrate	TDS	Fluoride Chloride Sulfate Corrosivity			REMARKS
03	9/24/87	1254		X	Well 16F-606	5	1	1	1	2			Tag 6-009352 to 6-009356

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
	9/24/87 1500	Federal Express AB# 3117053671			
Relinquished by: *(Signature)*	**Date / Time**	**Received by:** *(Signature)*	**Relinquished by:** *(Signature)*	**Date / Time**	**Received by:** *(Signature)*
Relinquished by: *(Signature)*	**Date / Time**	**Received for Laboratory by:** *(Signature)*	**Date / Time**	**Remarks**	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

Office of Enforcement

First International Bldg., 1201 Elm St.
Dallas, Texas 75270

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
SAS 3247F	United Medical

SAMPLERS: *(Signature)* KWinnett R Horne

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CON-TAINERS	[illegible]	TDS	Nitrate	Chloride Calcium Custody Seal			REMARKS
04	7/24/87	1221 1232		✓	WH 15K-303	15	3	B	3	6			6-009360 thru 6-009369
					Addition volume for QA/QC								6-009395 thru 6-009399

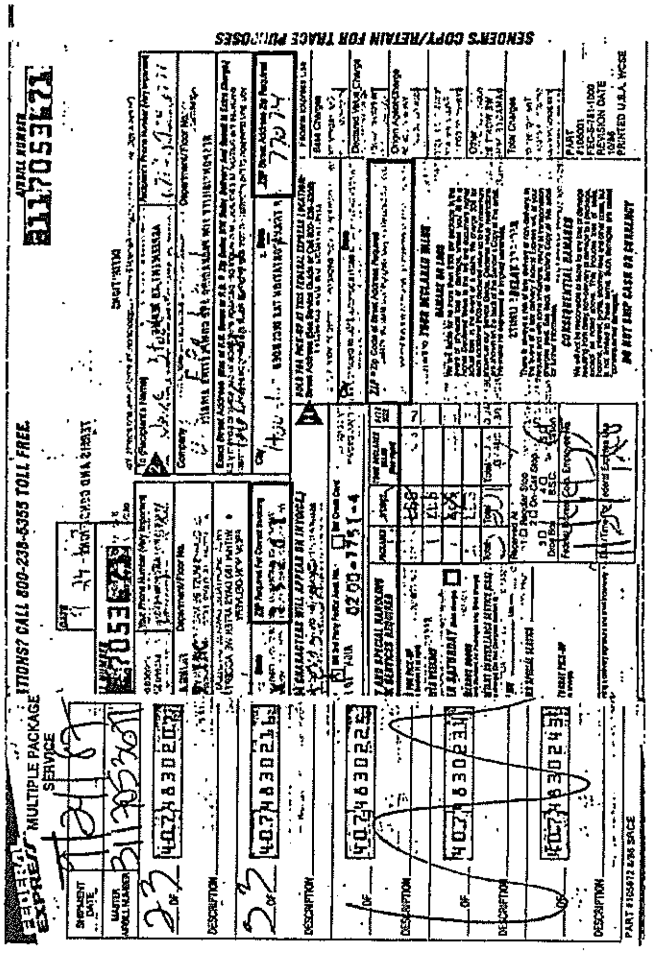
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
KWinnett	7-24-87 1800	Federal Express 3117053671			

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*

Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

6-13296



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OF 4074830243

DESCRIPTION

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DATE 7-24-87

To (Recipient's Name)

Company

Exact Street Address

City Houston

ZIP 77074

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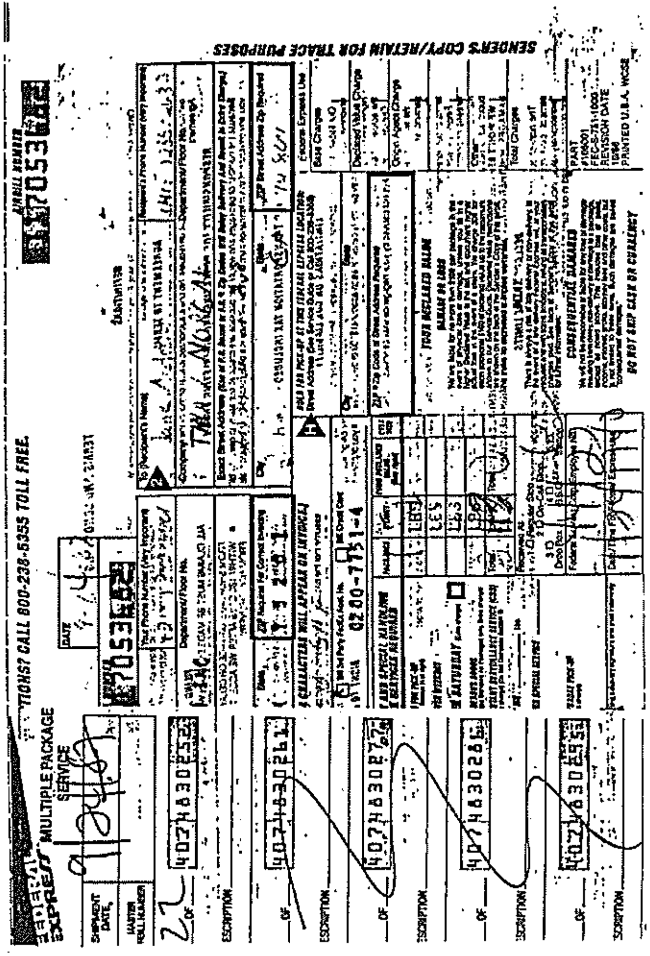

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DESCRIPTION

OF 4074630272

DESCRIPTION

OF 4074630285

DESCRIPTION

OF 4074630293

DESCRIPTION

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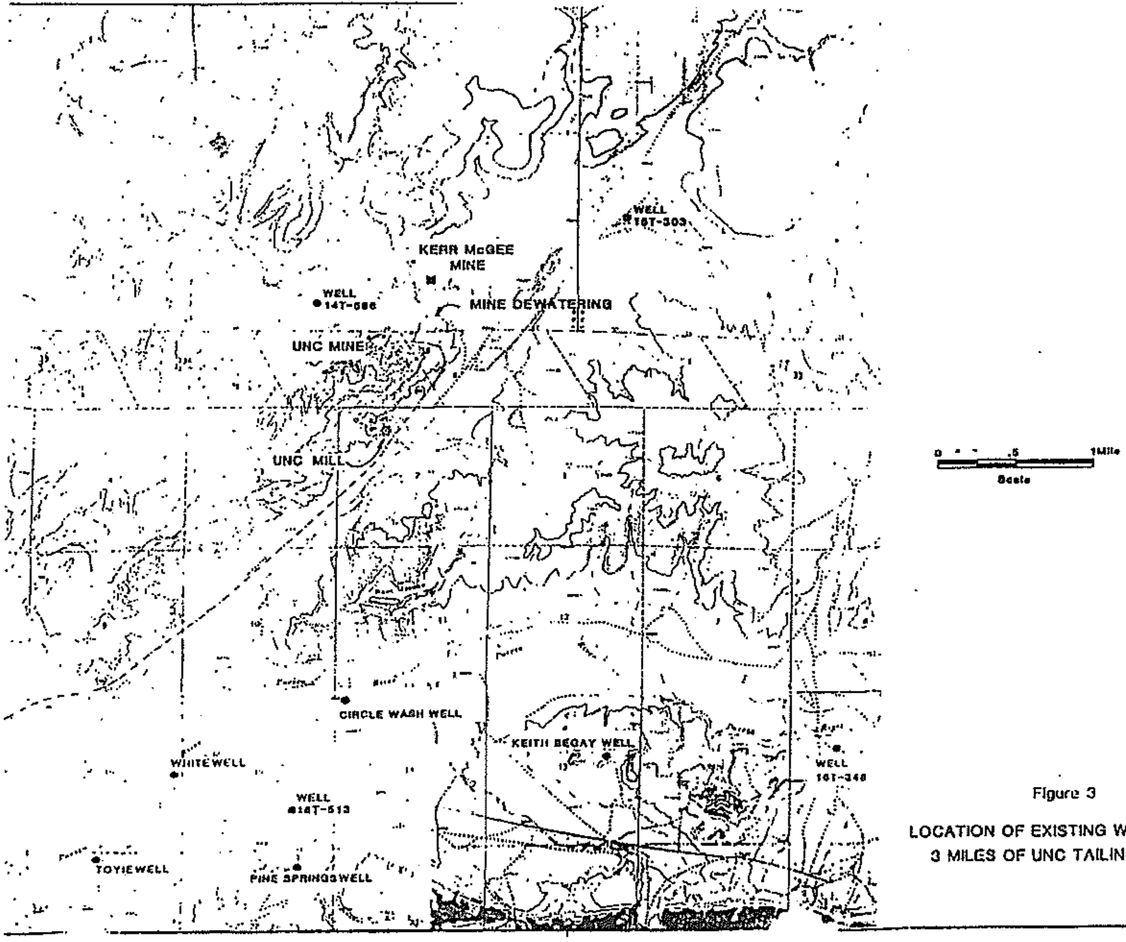

Figure 3

LOCATION OF EXISTING WELLS WITHIN 3 MILES OF UNC TAILINGS PONDS

INORGANIC ANALYSIS SUMMARY FOR WATER

SITE NAME AND NUMBER: UNITED NUCLEAR, CHURCHROCK
CASE NUMBER: SAS 3297F PAGE 1 OF 1
CONCENTRATIONS IN PARTS PER BILLION (PPB)

TRAFFIC REPORT NUMBER AND STATION LOCATION.

		DRINKING WATER CRITERIA P - PRIMARY S - SECONDARY	3297F02 STA. 02 WELL 16T 513	3297F03 STA. 03 WELL 16F 606	3297F04 STA. 04 WELL 15K 303	3297F05 STA. 05 GRAY WELL	3297F01 STA. 01 CIRCLE WASH WELL DUPLICATE OF STA. 05
	MATRIX		WATER	WATER	WATER	WATER	WATER
	% MOISTURE		0	0	0	0	0
	CAS NO.						
ALUMINUM	7429-90-5		ONA	100U	100U	100U	100U
ANTIMONY	7440-36-0		ONA	60U	60U	60U	60U
ARSENIC	7440-38-2	50P	ONA	5U	5U	5U	5U
BARIUM	7440-39-3	1000P	ONA	247	10U	26	25
BERYLLIUM	7440-41-7		ONA	5U	5U	5U	5U
CADMIUM	7440-43-9	10P	ONA	5U	5U	5U	5U
CALCIUM	7440-70-2		ONA	184839	342839U	134839	129839
CHROMIUM	7440-47-3	50P	ONA	10U	10U	10U	10U
COBALT	7440-48-4		ONA	20U	20U	20U	20U
COPPER	7440-50-8	1000S	ONA	20U	20U	20U	20U
IRON	7439-89-6	300S	ONA	6875	1570	29	25U
LEAD	7439-92-1	50P	ONA	30U	30U	30U	30U
MAGNESIUM	7439-95-4		ONA	70600	132000	28750	27800
MANGANESE	7439-96-5	50S	ONA	105	476	5U	7
MERCURY	7439-97-6	2P	ONA	0.200U	0.200U	0.200U	0.200U
NICKEL	7440-02-0		ONA	20U	20U	20U	20U
POTASSIUM	7440-09-7		ONA	5700	4471	2980	2700
SELENIUM	7782-49-2	10P	ONA	10U	10U	10U	10U
SILVER	7440-22-4	50P	ONA	10U	10U	10U	10U
SODIUM	7440-23-5		ONA	18708	134808	29908	28808
THALLIUM	7440-28-0		ONA	5U	5U	50U	5U
TIN	7440-31-5		ONA	40U	40U	40U	40U
VANADIUM	7440-62-2		ONA	30U	30U	30U	30U
ZINC	7440-66-6	5000S	ONA	480	74	242	251
CYANIDE			ONA	ONA	ONA	ONA	ONA
HARDNESS			ONA	ONA	ONA	ONA	ONA
ALKALINITY			ONA	ONA	ONA	ONA	ONA

R - DATA IS UNUSABLE DUE TO QA/QC OUT OF CONTROL LIMITS.
J - REPORTED CONCENTRATIONS ARE ESTIMATES DUE TO QA/QC OUT OF CONTROL LIMITS.
B - CONCENTRATION IN SAMPLE ATTRIBUTABLE TO BLANK CONTAMINATION.
U - NOT DETECTED; VALUE REPORTED IS THE DETECTION LIMIT.
NA NOT ANALYZED FOR

UNITED NUCLEAR, CHURCHROCK
CASE NUMBER: 3297F PAGE 1 OF 1

		DRINKING WATER CRITERIA	3297F02 STA. 02 WELL 16T 513	3297F03 STA. 03 WELL 16F 606	3297F04 STA. 04 WELL 15K 303	3297F05 STA. 05 GRAY WELL	3297F01 STA. 01 CIRCLE WASH WELL DUPLICATE OF STA. 05
	MATRIX		WATER	WATER	WATER	WATER	WATER
	UNITS						
TOTAL DISSOLVED SOLIDS	MG/L	500	671.00	1440.00	2593.00	639.00	638.00
NITRATE	MG/L	10	0.11	1.82	0.24	1.05	0.94
CHLORIDE	MG/L	250	42.00	17.00	8.00	3.80	4.00
FLUORIDE	MG/L	1.4-2.4	2.23	0.57	0.59	0.62	0.56
SULFATE	MG/L	250	408.00	324.00	1770.00	328.00	344.00
pH (LAB)		6.5-8.5	7.35	7.00	7.20	7.35	7.10
pH (FIELD)			7.56	7.55	8.00	7.26	7.26
CONDUCTIVITY (FIELD)	uMHOS		1050.00	2400.00	1910.00	900.00	900.00
TEMPERATURE (FIELD)	C		16.00	18.00	18.30	14.00	14.00
GROSS ALPHA	pCi/L	15	-1.6 ± 1.6	-0.1 ± 2.0	-5.1 ± 3.2	2.5 ± 3.0	0.2 ± 3.3
GROSS BETA	pCi/L	4 millirem/year	0.3 ± 1.9	0.3 ± 1.9	12.0 ± 2.7	5.6 ± 3.6	5.3 ± 1.9
RADIUM 226	pCi/L	5*	0.3 ± 1.9	0.9 ± 0.1	1.6 ± 0.1	0.5 ± 0.1	0 ± 0.1
RADIUM 228	pCi/L	5*	0 ± 1	0 ± 1	0 ± 1	0 ± 1	0 ± 1

* COMBINED RADIUM 226 AND 228

ECOLOGY AND ENVIRONMENT, INC.

DALLAS, TEXAS

MEMORANDUM

87 DEC -9 PM 12:30
SUPERFUND BRANCH

To: Dave Wineman, Region VI, RPO

Thru: K. H. Malone, Jr., FITOM

From: David Anderson, FIT Chemist

Date: December 4, 1987

Subj: Results of Well Sampling in the Vicinity of UNC, Churchrock Site, McKinley County, New Mexico (NMD030443303)
TDD F06-8708-17

FIT members David Anderson, Rick Horne, Lyle Winnette and Lee Wilkening collected samples from four domestic water wells within three miles of the UNC-Churchrock site on September 24, 1987. The wells sampled were selected by Bureau of Indian Affairs and EPA personnel present during the sampling. Wells sampled were well 16T 513, well 16F 606, well 15K 303, and the Grey (Circle Wash) well (see attached photos). A duplicate sample was collected from the Grey Well. The samples were analyzed for metals, total dissolved solids (TDS), nitrates, chlorides, fluorides, sulfates, gross alpha, gross beta, radium 226 and radium 228. Analytical results for the samples are attached.

QA/QC SUMMARY:

The duplicate samples (station 01 3297F01 and station 05 3297F05) were in close agreement with differences in the analytical results, generally less than 10%. Matrix spike recoveries and laboratory duplicate analysis for the radiological analysis were also within the control limits specified. The radiological analysis is corrected for the counter background, which results in negative activities for three of the alpha analyses. All data generated is acceptable for use. Metals data was not available from well 16T 513, due to breakage of the sample container in shipment.

DATA EVALUATION:

Complete summaries of the analytical results are shown on the attached tables.

Primary drinking water standards were not exceeded in any of the samples. Well 15K 303 and the Gray Well were the only samples containing radiological activity above 1 pico curie per liter (pCi/L), with 15K 303 containing 12.0 ± 2.7 pCi/L beta and 1.6 ±0.1 pCi/L radium 226, and the Gray well containing 2.5 ± 3.0 pCi/L alpha and 5.6 ± 3.6 pCi/L beta. These activities are below the drinking water standards.

Secondary drinking water standards for TDS(500 mg/L) and sulfate (250 mg/L) were exceeded in the samples for all four wells. Iron (0.3 mg/L) and manganese (0.05 mg/L) secondary standards were exceeded in wells 16T 513 and 16F 606.

Data already
in table
need to
send to Michael

Navajo Nation Water Management Branch
Well Log and Drilling Report

*PO Box 678 Fort Defiance, Arizona * PH: 928.729.4004 * FAX: 928.729.4126*

WELL NO: **15T-303** *PWSID:*
WELL NAME/OTHER NO: **NR105 1286X0547**
WELL TYPE: **WW** *WELL STATUS:* **ACT** *WELL USE:* **LIV**
LOCATION: **QUADNAME IS OAK SPRINGS NM 123 NW**
UTM : X(EAST) **728291** *Y (NORTH)* **3950171** *ZONE:* **12** *OPERATOR:* **TRIBE O&M**
WATERSHED CODE: **14080106000** *STATE:* **NM** *COUNTY:* **MK** *CHAPTER CODE:* **NAHO**
GRAZING DISTRICT: **15** *LOCATION DATA SOURCE:* **M.S. JOHNSON**

WELLNO: **15T-303** *STARTED:* *COMPLETED:* **1/11/1952**
ELEVATION: **7038** **FT.** *DEPTH:* **614** **FT.** *DEPTH MEASURED:*
DIAMETER: **0** **IN.** *DEPTH IS:* **R** *Measured, Estimated, Reported*
CASING_DIAMETER: **7** **IN.** *FROM:* **0** **FT.** *TO:* **537** **FT.** *MATL:*
CASING_DIAMETER: **0** **IN.** *FROM:* **0** **FT.** *TO:* **0** **FT.** *MATL:*
CASING_DIAMETER: **0** **IN.** *FROM:* **0** **FT.** *TO:* **0** **FT.** *MATL:*
CASING_DIAMETER: **0** **IN.** *FROM:* **0** **FT.** *TO:* **0** **FT.** *MATL:*

CASING PERFORATED FROM: **537** **FT.** *TO:* **614** **FT.** *OPENING TYPE:* **X**
CASING PERFORATED FROM: **0** **FT.** *TO:* **0** **FT.** *OPENING TYPE:*
CASING PERFORATED FROM: **0** **FT.** *TO:* **0** **FT.** *OPENING TYPE:*
CASING PERFORATED FROM: **0** **FT.** *TO:* **0** **FT.** *OPENING TYPE:*
CASING PERFORATED FROM: **0** **FT.** *TO:* **0** **FT.** *OPENING TYPE:*

DATE WELL TURNED OVER TO TRIBE:
FUNDED BY: *CONTRACTOR:* **FOSTER-WEST**
SITE IMPROVEMENTS: **WM TA** *TYPE OF LIFT:* **PS** *ENERGY:* **WM**

HORSEPOWER RATING OF PUMP: **0** *ON SITE STORAGE CAPACITY:* **0** **GAL.**
STRUCTURE DATA SOURCE: **M.S. JOHNSON 2/94**

WELLNO: **15T-303** *USGS PRINCIPLE AQUIFER CODE:* **211GLLP**
THICKNESS: **0** **FT.** *NOMINAL YIELD:* **0** **GPM** *DATE YEILD MEASURED:*
BAILER/PUMP TEST: **BT** *RATE:* **23** **GPM** *TEST PERIOD:* **1** **HR.** *TEST DATE:* **1/11/1952**
DRAWDOWN: **50** **FT.** *OBSERVATION WELL DATA AVAILABLE:* **N**
HORIZONTAL CONDUCTIVITY: **0** **FT/DAY** *SPECIFIC CAPACITY:* **0.46** **GAL./MIN./FT.**
VERTICAL CONDUCTIVITY: **0** **FT/DAY** *STORAGE COEFFICIENT:* **0**
COEFFICIENT OF TRANSMISSIVITY: **0** **FT2/DAY**
AVAILABITY OF TEST DATA: **NNNN** *DRILLERS/ELECTRIC LOGS:* **DL**
HYDROLOGY DATA SOURCE: **WELL FILE**

WELL NO: **15T-303**

STATIC WATER LEVEL(S):

327.4	FT.	8/14/1985
	FT.	5/9/1985
328.6	FT.	8/17/1984
328.7	FT.	11/9/1983
331.6	FT.	3/29/1983
328.4	FT.	8/4/1982
337.6	FT.	7/21/1982
328.5	FT.	1/13/1982
329.3	FT.	9/23/1981
326.6	FT.	1/16/1981
324	FT.	2/13/1979
313.6	FT.	2/24/1978
312.5	FT.	6/23/1977
311	FT.	2/14/1957
302.4	FT.	1/11/1952

GEOLOGIC INTERVAL(S):

TOP	*BOTTOM*	*UNIT*	*LITHOLOGY*	
135	480	211MVRD	SLSN	TLY SLSN SOME SHLE CO.
480	0	211GLLP	SNDS	SILTY SNDS MDSN COAL

COMMENT(S):

15K-303 PAINTED ON TANK << USGS COMMENT

WELL CONFIRMED-UPDATED PER * O&M SURVEY OF FALL 91 *

WATER QUALITY DATA AVAILABLE IN WELL FILE. GEOHYDROLOGIC

UNITS FROM USGS LITHOLOGIC LOG IN WELL FILE.

M.S. JOHNSON 02/1994

LOCATION FILE

TRIBAL WELL NO 15K-303 [✓ Update] **PWSID** NM3534061

WELL NAME/OTHER NO CROWNPOINT POWERHOUSE WELL

WELL TYPE
(MARK ONLY ONE)

☒ WW WATER WELL
☐ WA ARTESIAN WELL
☐ WS SPRING
☐ NS NATURAL SPRING
☐ OW OBSERVATION WELL
☐ GS GAS WELL
☐ OP OIL PRODUCTION
☐ MW MINERAL WELL
☐ XX UNKNOWN

WELL STATUS
(MARK ONLY ONE)

☒ ACT ACTIVE
☐ INA INACTIVE
☐ ABA ABANDONED
☐ UNK UNKNOWN

WELL USE
(MARK ONLY ONE)

☒ DOM DOMESTIC
☐ AGR AGRICULTURE
☐ LIV LIVESTOCK
☐ IND INDUSTRIAL MINING
☐ REC RECREATION
☐ MUN MUNICIPAL
☐ OTH OTHER
☐ UNK UNKNOWN

QUAD NO 5561 **MILES WEST** . **MILES SOUTH** .

NE SE SW [✓ NW] / NE SE [✓ SW] NW / [✓ NE] SE SW NW — 30 — T 17.0W — R 12.0W
10 ACRE — 40 ACRE — 160 ACRE — SECT. — TOWNSHIP — RANGE

APPROXIMATE LOCATION W SIDE POWERHOUSE BLDG/FACIL/MGMT.

LATITUDE **LONGITUDE**

UTM COORDINATES: X(EAST) 757699 **Y(NORTH)** 3951606 **ZONE** 12

OPERATOR B/A **USGS WATERSHED CODE** 14080106000

STATE: ☐ AZ ARIZONA ☒ NM NEW MEXICO ☐ UT UTAH ☐ CO COLORADO

COUNTY: ☐ AP APACHE ☒ MK MCKINLEY ☐ SJ SAN JUAN ☐ MT MONTEZUMA
☐ NA NAVAJO ☐ VL VALENCIA ☐ KA KANE ☐ LP LA PLATA
☐ CO COCONINO ☐ BL BERNALLILLO
☐ SD SANDOVAL
☐ SO SOCORRO
☐ RA RIO ARRIBA
☐ SA SAN JUAN

GRAZING DISTRICT 15

CHAPTER NAME: CROWNPOINT **CHAPTER CODE** CROW

LOCATION DATA SOURCE: FIELD CHECKED 4/11/95

LOCATION FILE COMPLETED BY: L. NOTAH / M. S. Johnson **DATE** 10/22/1996

FIELD CHECKED BY: L NOTAH 4/95 **DATE** / /

revised 07 April 93

/dbase/wells/loc/loc-form.wp

V

STRUCTURE FILE

TRIBAL WELL NO 15K-363 STARTED 7 / / 1931 COMPLETED 6 / / 1932

ELEVATION 16985 FT DEPTH 2496 update DEPTH MEASURED 6 / / 1932

DEPTH IS ☒ MEASURED ☐ ESTIMATED ☐ REPORTED WELL DIA. . IN

1 CASING DIA 8.62 FROM -.90 FT TO 2496 FT MATL STL

2 CASING DIA . FROM FT TO FT MATL

3 CASING DIA . FROM FT TO FT MATL

4 CASING DIA . FROM FT TO FT MATL

CASING MATL CODES: brs=brass cop=copper evd=everdur irn=iron mon=monel
pls=plastic stl=steel sst=stainless steel

1 CASING PERFORATED FROM FT TO FT OPENING TYPE ☐

2 CASING PERFORATED FROM FT TO FT OPENING TYPE ☐

3 CASING PERFORATED FROM FT TO FT OPENING TYPE ☐

4 CASING PERFORATED FROM FT TO FT OPENING TYPE ☐

5 CASING PERFORATED FROM FT TO FT OPENING TYPE ☐

OPENING CODES: f=fractured rock l=louvered/shutter-type screen m=mesh screen
p=perforated/porous/slotted casing r=wire-wound screen
s=screen/type unknown t=sand point w=walled/shored x=open hole
z=other

DATE WELL TURNED OVER TO TRIBE: ____/____/____

FUNDED BY: B/A CONTRACTOR: WM WELLS

SITE IMPROVEMENTS

- ☐ WM WINDMILL
- ☐ WP WATERING POINT
- ☐ TA TANK
- ☒ WL WATER LINE
- ☐ TR TROUGH
- ☐ CS CISTERN
- ☐ HP HAND PUMP
- ☐ NO NONE

TYPE OF LIFT

- ☐ AL AIRLIFT
- ☐ PS PISTON
- ☐ TU TURBINE
- ☐ MT MULTIPLE TURBINE
- ☐ CN CENTRIFUGAL
- ☐ MC MULTIPLE CENTRIFUGAL
- ☐ BU BUCKET
- ☒ SU SUBMERSIBLE

ENERGY SOURCE

- ☒ EM ELECTRIC MOTOR
- ☐ DE DIESEL ENGINE
- ☐ HA HAND
- ☐ GS GAS ENGINE
- ☐ LP LP GAS ENGINE
- ☐ NG NATURAL GAS ENGINE
- ☐ WM WINDMILL
- ☐ SO SOLAR

PUMP HP 25 ON SITE STORAGE CAPACITY 300000 GAL

STRUCTURE DATA SOURCE: BIA WELL FILE

STRUCTURE FILE COMPLETED BY: L. NOTAH / M.S. Johnson DATE 10 / 22 / 96

revised 08 April 93

/dbase/wells/doc/str-form.wp

HYDROLOGY FILE

TRIBAL WELL NO 15K-3d1 USGS AQUIFER CODE 221MRSN

THICKNESS ☐☐☐ FT NOMINAL YIELD 86 GPM YIELD MEASURED 2/1/1995

☐ BAILER ☐ PUMP TEST @ ____ GPM FOR ___.__ HOURS DATE ___/___/___

DRAWDOWN _____ FT OBSERVATION WELL DATA AVAILABLE ☐ YES ☒ NO

HORIZ CONDUCTIVITY ____.___ FT/DAY SPECIFIC CAPACITY _.__ GPM/FT

VERT. CONDUCTIVITY ____.___ FT/DAY STORAGE COEF .______

COEF OF TRANSMISSIVITY _______ FT2/DAY

update

INDICATE ADDITIONAL PUMPING TEST DATA AVAILABLE AS HARD COPY:

☐ YES ☒ NO MULTIPLE RATE DRAWDOWN PUMPING TEST
☐ YES ☒ NO SINGLE RATE DRAWDOWN PUMPING TEST
☐ YES ☒ NO MULTIPLE RATE DRAWDOWN/RECOVERY TEST
☐ YES ☒ NO RECOVERY TEST

LOG AVAILABLE: ☒ DL DRILLER'S ☐ EL ELECTRIC LOG

HYDROLOGY DATA SOURCE: BIA FILE

HYDROLOGY FILE COMPLETED BY: L NOTAH/M.S. Johnson DATE [illegible]/22/96

STATIC WATER LEVEL FILE

DEPTH TO SWL ______FT DATE ___/___/___ DEPTH TO SWL ______FT DATE ___/___/___
DEPTH TO SWL ______FT DATE ___/___/___ DEPTH TO SWL ______FT DATE ___/___/___
DEPTH TO SWL ______FT DATE ___/___/___ DEPTH TO SWL ______FT DATE ___/___/___
DEPTH TO SWL ______FT DATE ___/___/___ DEPTH TO SWL ______FT DATE ___/___/___
DEPTH TO SWL ______FT DATE ___/___/___ DEPTH TO SWL ______FT DATE ___/___/___
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DEPTH TO SWL ______FT DATE ___/___/___ DEPTH TO SWL ______FT DATE ___/___/___
DEPTH TO SWL ______FT DATE ___/___/___ DEPTH TO SWL ______FT DATE ___/___/___
DEPTH TO SWL ______FT DATE ___/___/___ DEPTH TO SWL ______FT DATE ___/___/___

TRIBAL WELL RECORD
COMMENTS FILE

TRIBAL WELL NO 15K-303

PERTINENT COMMENTS: Well was ~~drilled~~ Completed in early 1930's with 10" (0 - 1200 FT) and 8" (0-2300 FT) casing. IN 1969-1970 pump Jack was replaced with submersible Pump.

Well was reworked and 10" casing removed. Well cased with 8" casing.

Perforation zones unknown. → ORIGINAL PERFORATIONS:
1635 FT TO 1670 FT
1678 FT TO 1712 FT
1720 FT TO 1755 FT
1760 FT TO 1770 FT
1875 FT TO 1896 FT
1905 FT TO 1940 FT
1955 FT TO 1965 FT
1972 FT TO 2029 FT
2050 FT TO 2115 FT
2148 FT TO 2158 FT
2169 FT TO 2175 FT
2240 FT TO 2248 FT

No pump test data available.

~~Very little~~ Water Quality in well folder.

Well is Power House Well #3.

COMPLETION DETAILS UNKNOWN SO AQUIFER UNCERTAIN; PROBABLY 221MRSN.

☒ LOCATION COORDINATES MEASURED WITH GPS DEVICE 6 SATELLITES VISIBLE

☐ LOCATION COORDINATES PICKED OFF TOPO MAP -SCALE=

☐ ELEVATION PRINTED ON TOPO MAP -SCALE=

☐ ELEVATION MEASURED WITH GPS UNIT -4 SATELLITES VISIBLE

☒ ELEVATION INTERPOLATED FROM 1:24000 TOPO

THE IMPROVEMENTS AT THIS SITE ARE:

☐ IN GOOD CONDITION
☒ IN FAIR CONDITION
☐ IN POOR CONDITION

☒ NEED SOME MAINTENANCE
☐ NEED MAJOR MAINTENANCE

STORAGE TANK IS ☒ COVERED ☐ UNCOVERED

COMMENTS BY: L. NOTAH / M. S. Johnson

DATE 10/22/96

revised 07 April 93

/dbase/wells/doc/Com-Form.wp

TRIBAL WELL NO >15K-303 PWSID > NM 3534061 *******
STATE NUMBER

WELL NAME/OTHER NO >17N.12W.30.4442 POWER HOUSE WELL

WELL TYPE >WW WELL STATUS ~~UNK~~ ACT WELL USE >~~MUN~~ DOM

QUAD NO >5561 MILES WEST > 0.00 MILES SOUTH > 0.00

10 ACRE >SW 40 ACRE >SW 160 ACRE >SW SECT >30 TWNSHP >T17.0N RANGE >R12.0W

APPROXIMATE LOCATION >~~QUADNAME IS CROWNPOINT,NM 124NW~~ INSIDE POWER HOUSE BUILDING/FACILITY MANAGEMENT.

UTM COORD: X(EAST) >~~757565~~ 757649 Y(NORTH) >~~3951835~~ 3951666 ZONE >12 OPERATOR >US BIA

WATERSHED CODE >14080106000 STATE >NM COUNTY >MK CHAPTER CODE >CROW

GRAZING DISTRICT >15 LOCATION DATA SOURCE >USGS ALB 04/08/86

FIELD CHECKED BY >~~S. WEST 1956~~
L. NOTAH 4-11-95

WELLNO 15K-303 STARTED **/**/**** 7-?-1931 COMPLETED 6/ 1/1932

ELEVATION ~~6,992.0~~ 6985.0 FT DEPTH 2,496.0 FT DEPTH MEASURED 6 / 1 / 1932

DEPTH IS RM WELL DIA 0.00 IN

1 CASING DIA 8.~~25~~ 62 IN FROM -0.9 FT TO ~~2,300.0~~ 2,496.0 FT MATL STL

2 CASING DIA 0.00 IN FROM 0.0 FT TO 0.0 FT MATL

3 CASING DIA 0.00 IN FROM 0.0 FT TO 0.0 FT MATL

4 CASING DIA 0.00 IN FROM 0.0 FT TO 0.0 FT MATL

WELL NO= 15K-303

1 CASING PERFORATED FROM 1,635.0 FT TO 1,670.0 FT OPENING TYPE P

2 CASING PERFORATED FROM 1,678.0 FT TO 1,712.0 FT OPENING TYPE P

3 CASING PERFORATED FROM 1,720.0 FT TO 1,755.0 FT OPENING TYPE P

4 CASING PERFORATED FROM 1,760.0 FT TO 1,770.0 FT OPENING TYPE P

5 CASING PERFORATED FROM 1,875.0 FT TO 1,896.0 FT OPENING TYPE P

DATE WELL TURNED OVER TO TRIBE / /

FUNDED BY BIA CONTRACTOR WM. WELLS

SITE IMPROVEMENTS WL TYPE OF LIFT SU ENERGY SOURCE EM

PUMP HP 25 ~~0~~ ON SITE STORAGE CAPACITY 300000
STRUCTURE DATA SOURCE USGS ALB 04/08/86

TRIBAL WELL NO >15K-303 < USGS AQUIFER CODE >221MRSN <

THICKNESS > 0.0< NOMINAL YIELD > 86.0 ~~0.0~~< DATE YIELD MEASURED > 2/1/1995

ENTER BT OR PT > < GPM > 100.0< HOURS > 0.0< TEST DATE > 6/ 1/1932

DRAWDOWN > 0.0< OBSERVATION WELL DATA AVAILABLE (ENTER Y OR N) >N<

HORIZONTAL CONDUCTIVITY > 0.000< SPECIFIC CAPACITY >0.00<

VERTICAL CONDUCTIVITY > 0.000< STORAGE COEFFICIENT >.0000000

COEFFICIENT OF TRANSMISSIVITY > 0.0<

* AVAILABILITY OF TEST DATA *
>N< MULTIPLE RATE DRAWDOWN TEST
>N< SINGLE RATE DRAWDOWN TEST
>N< MULTIPLE RATE/RECOVERY TEST
>N< RECOVERY TEST

* LOGS AVAILABLE * (ENTER DL OR EL)
>DL< DRILLERS LOG > < ELECTRIC LOG
DATA SOURCE > <

$RECNO	WELLNO	SWL	DATE
15080	15K-303	530.0	6/26/1985
15081	15K-303	465.0	4/19/1979
15082	15K-303	410.0	1/ 1/1974
15083	15K-303	260.0	4/13/1949
15084	15K-303	318.0	12/ 5/1947
15085	15K-303	225.0	6/ 1/1932

5698
WELLNO =15K-303
GEOHYDRO-SEQ-NO = 1
GEOHYDRO-TOP = 0.00
GEOHYDRO-BOTTOM = 0.00
GEOHYDRO-UNIT =211DKOT
LITHOLOGY =SNDS
LITH-MODIFIER =
GEOHYDRO-C-UNIT =S

5699
WELLNO =15K-303
GEOHYDRO-SEQ-NO = 2
GEOHYDRO-TOP = 0.00
GEOHYDRO-BOTTOM = 0.00
GEOHYDRO-UNIT =221MRSN
LITHOLOGY =
LITH-MODIFIER =
GEOHYDRO-C-UNIT =P

$RECNO	WELLNO	FWQ-SAMPLE-DATE	FWQ-GEO-UNIT	FWQ-MEASUREMENT	FWQ-PARAM-DE
3136	15K-303	10/13/64	221MRSN	586.0	specific cor

MONTHLY WATER QUALITY BY USPHS << USGS COMMENT
6/85 WL TAKEN AFTER 9HRS PUMP STOP << USGS COMMENT
DELETE FROM D. BASE
WELL CONFIRMED-UPDATED PER * O&M SURVEY OF FALL 91 *

ok

WELL 16K-336

ecology and environment, inc.
International Specialists in the Environment
1940 Webster Street, Suite 100
Oakland, California 94612
Tel: (510) 893-6700, Fax: (510) 550-2760

January 24, 2011

U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, CA 94105

TDD No: T02-09-10-08-0005
Project No: 002693.2103.01RA

14T-586
15T-305
16K-336
16K-340
mill well

Attention: Harry Allen, USEPA On-Scene Coordinator
Andrew Bain, USEPA

Subject: **NECR Water Well Sampling**
Church Rock Chapter
Navajo Nation

INTRODUCTION

In October 2010 the U.S. Environmental Protection Agency (USEPA) tasked the Ecology and Environment Inc. Superfund Technical Assessment and Response Team (START) with technical assistance relating to residential water well sampling in the vicinity of the former Northeast Church Rock Mine located in the Church Rock Chapter of the Navajo Nation. (Figure 1, Attachment A).

The purpose of this sampling event was to generate additional data to measure the impact of the former Northeast Church Rock Mine uranium mine on wells within the adjacent areas.

SAMPLING ACTIVITIES

Well sampling was conducted on October 19, 2010. A total of five wells were sampled. Four of the wells were residential wells and one (Mill Well) well was part of the former United Nuclear Corporation (UNC) facility in the area. Every effort was made to collect water samples in a manner consistent with resident collection and use (i.e. taps, pumps or bucket collect).

A Time Critical Quality Assurance and Sampling (QASP) Plan (Appendix D) was developed prior to sampling and followed with the following exceptions:

- Well NR#1 is no longer in use and was not sampled as the casing has been filled with concrete.
- The Mine Well is no longer in use and was not sampled as the casing has been filled with concrete.

Water quality parameters were measured in the field using a Horiba, Ltd. multi-parameter water quality meter. The meter was calibrated daily using a buffer solution. Samples were collected and analyzed for metals, radionuclides and anions by GEL Laboratories Inc. (Charleston, SC). Samples were collected and analyzed for oxygen and hydrogen isotopic ratio by Isotech Laboratories, Inc (Champaign, Il). The QASP (Appendix D) contains all methods and volumes used in sample analysis.

WELL DESCRIPTIONS

Well 15T-303

Well 15T-303 is a windmill powered well that feeds into an approximately 40,000 gallon uncovered metal tank. The well is currently in use and there is a trough and locked tap in the vicinity of the tank that are used to water livestock. Samples were collected from the top of the tank using a bucket.

14T-586

14T-586 is a diesel engine powered well that feeds into an approximately 10,000 gallon covered metal tank. The well is currently in use and there is a trough and tap in the vicinity of the tank that are used to water livestock. Samples were collected from the tap in manner consistent with residential use.

Mill Well

The Mill Well is located on the former UNC facility property. The well is electric powered well, housed in a wooden pump house, north of the former UNC offices and equipment yard. There is no storage tank affiliated with the well and the well is not currently in use. Samples were collected from a tap inside the pump house with pump turned on.

Mine Well

The mine well is located within the boundary of the former Northeast Church Mine. The well is currently not in use and has been non-operational for at least 15 years. The well opening is currently plugged with concrete.

NR#1

The NR#1 well is located within the boundary of the former Northeast Church Mine. The well is currently not in use and has been non-operational for at least 15 years. The well opening is currently plugged with concrete.

16K-340

Well 16K-340 is a windmill powered well that feeds into an approximately 40,000 gallon covered metal tank. The well is currently in use and there is a trough and tap in the vicinity of the tank that are used to water livestock. Samples were collected from the tap in manner consistent with residential use.

RESULTS

Table 1 (Appendix B) gives a well specific summary of all applicable data. All laboratory data was validated by a START chemist using the *Region 9 Draft Superfund Data Evaluation/Validation Guidance*. Data validation indicated the laboratory data was acceptable with qualification as definitive data. A separate data validation report was generated under this project and is included in the project file.

This letter summarizes all activities conducted on the Tuba City Removal project. If you have any questions regarding START's activities associated with this project, please do not hesitate to contact me.

Respectfully,

Mike Folan

START Member

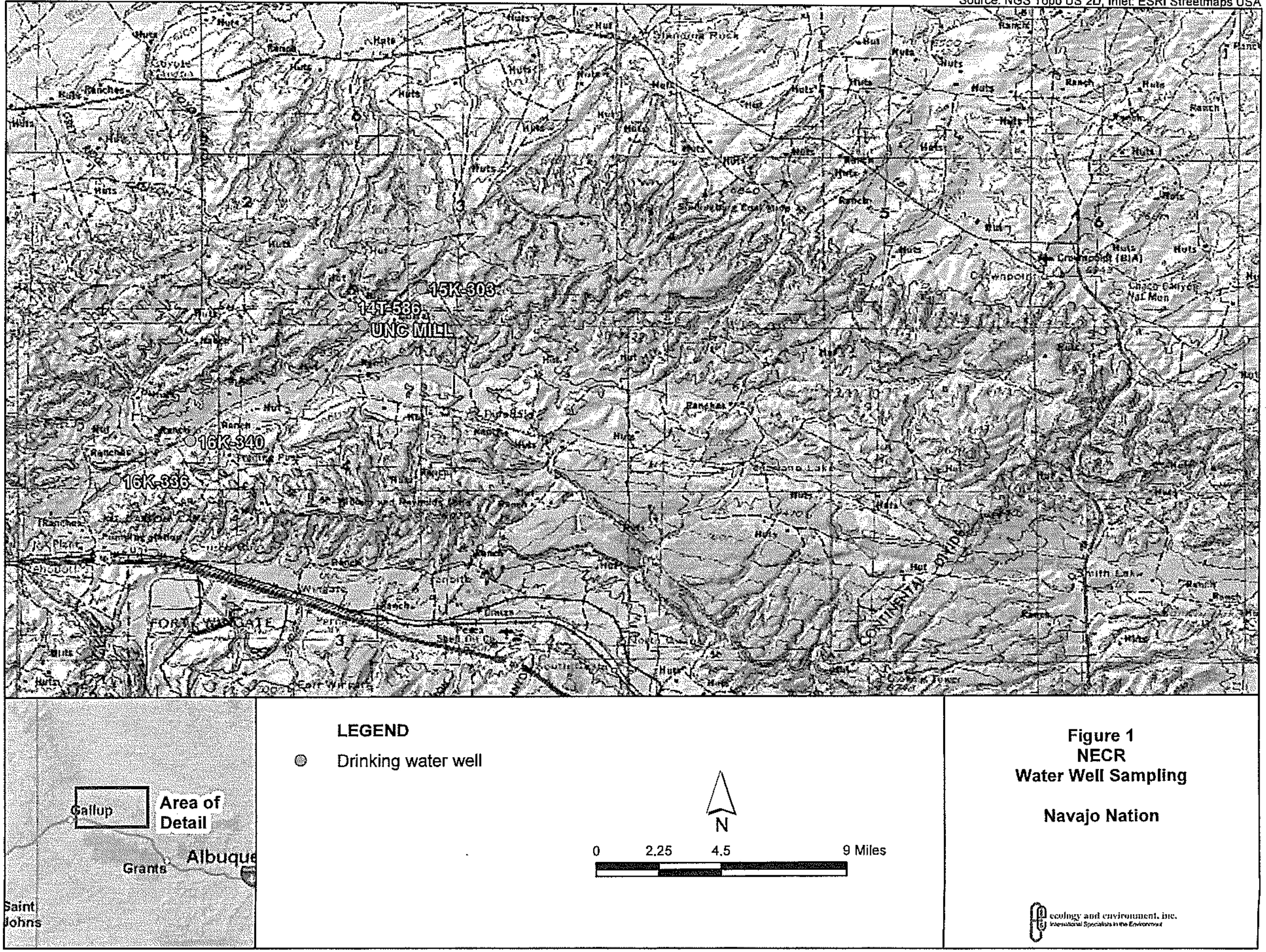
Attachments: A – Homesite Location Map
B –Data Tables
C – Photographic Documentation
D- QASP

cc: file

ATTACHMENT A:
Well Location Map

TDD: 09-10-08-0004
PAN: 002693.2103.01RA

Source: NGS Topo US 2D, Inlet: ESRI Streetmaps USA



LEGEND

● Drinking water well

Figure 1
NECR
Water Well Sampling

Navajo Nation

ecology and environment, inc.
International Specialists in the Environment

ATTACHMENT B:
Data Tables

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005 PAN:002693.2104.01RA

	14T-586			14T-586100 (duplicate)			15T-303		
		Result	Units		Result	Units		Result	Units
Water Quality	pH	7.1		pH	7.1		pH	6.8	
	Conductivity	0.26	S/m	Conductivity	0.26	S/m	Conductivity	0.35	S/m
	Turbidity	10.1	NTU	Turbidity	10.1	NTU	Turbidity	10.1	NTU
	Dissolved Oxygen	6.30	mg/L	Dissolved Oxygen	6.30	mg/L	Dissolved Oxygen	7.99	mg/L
	Temperature	7.6	°C	Temperature	7.6	°C	Temperature	12.1	°C
	Salinity	0.1	%	Salinity	0.1	%	Salinity	0.2	%
	Total Dissolved Solids	1.7	g/L	Total Dissolved Solids	1.7	g/L	Total Dissolved Solids	2.2	g/L
	Oxidation Reduction Potential	100	mV	Oxidation Reduction Potential	100	mV	Oxidation Reduction Potential	129	mV
Metals	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Aluminum	220	ug/L	Aluminum	82	ug/L	Aluminum	68.0	ug/L
	Antimony	3.00	ug/L	Antimony	7.34	ug/L	Antimony	6.83	ug/L
	Arsenic	5.00	ug/L	Arsenic	5.00	ug/L	Arsenic	7.54	ug/L
	Barium	13.1	ug/L	Barium	13.4	ug/L	Barium	8.24	ug/L
	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L
	Bromide	0.200	ug/L	Bromide	0.200	ug/L	Bromide	0.200	ug/L
	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L	Cadmium	1.17	ug/L
	Calcium	270000	ug/L	Calcium	281000	ug/L	Calcium	373000	ug/L
	Chromium	13.9	ug/L	Chromium	1.00	ug/L	Chromium	1.16	ug/L
	Cobalt	1.13	ug/L	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L
	Copper	3.00	ug/L	Copper	3.00	ug/L	Copper	3.00	ug/L
	Iron	482	ug/L	Iron	468	ug/L	Iron	685	ug/L
	Lead	3.30	ug/L	Lead	3.30	ug/L	Lead	3.30	ug/L
	Magnesium	119000	ug/L	Magnesium	122000	ug/L	Magnesium	144000	ug/L
	Manganese	320	ug/L	Manganese	319	ug/L	Manganese	162	ug/L
	Mercury	0.066	ug/L	Mercury	0.066	ug/L	Mercury	0.066	ug/L
	Nickel	71.3	ug/L	Nickel	1.51	ug/L	Nickel	1.50	ug/L
	Potassium	7430	ug/L	Potassium	7690	ug/L	Potassium	5650	ug/L
	Selenium	7.7	ug/L	Selenium	37.7	ug/L	Selenium	43.8	ug/L
	Silver	1.00	ug/L	Silver	1.00	ug/L	Silver	1.00	ug/L
	Sodium	135000	ug/L	Sodium	140000	ug/L	Sodium	188000	ug/L
	Thallium	5.00	ug/L	Thallium	5.00	ug/L	Thallium	8.9	ug/L
	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L
	Zinc	338	ug/L	Zinc	355	ug/L	Zinc	839	ug/L
Radionuclide's	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	ALPHA	2.62	pCi/L	ALPHA	5.80	pCi/L	ALPHA	-0.526	pCi/L
	BETA	6.58	pCi/L	BETA	6.02	pCi/L	BETA	2.62	pCi/L
	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent
	Radium-226	0.880	pCi/L	Radium-226	0.540	pCi/L	Radium-226	1.18	pCi/L
	Radium-228	3.41	pCi/L	Radium-228	3.71	pCi/L	Radium-228	3.34	pCi/L
	Thorium-228	-0.0147	pCi/L	Thorium-228	0.155	pCi/L	Thorium-228	-0.139	pCi/L
	Thorium-230	-0.185	pCi/L	Thorium-230	0.818	pCi/L	Thorium-230	-0.158	pCi/L
	Thorium-232	-0.133	pCi/L	Thorium-232	-0.0195	pCi/L	Thorium-232	-0.0195	pCi/L
	Uranium-233/234	1.16	pCi/L	Uranium-233/234	1.73	pCi/L	Uranium-233/234	0.317	pCi/L
	Uranium-235/236	0.114	pCi/L	Uranium-235/236	0.0569	pCi/L	Uranium-235/236	0.219	pCi/L
	Uranium-238	1.20	pCi/L	Uranium-238	0.790	pCi/L	Uranium-238	0.442	pCi/L

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005

PAN:002693.2104.01RA

	14T-586			14T-586100 (duplicate)			15T-303		
Anions	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Chloride	14.0	mg/L	Chloride	14.1	mg/L	Chloride	10.5	mg/L
	Nitrate	0.267	mg/L	Nitrate	0.266	mg/L	Nitrate	0.100	mg/L
	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L
	Ortho-phosphate	0.200	mg/L	Ortho-phosphate	0.200	mg/L	Ortho-phosphate	2.00	mg/L
	Sulfate	1380	mg/L	Sulfate	1310	mg/L	Sulfate	2000	mg/L
	Fluoride	1.19	mg/L	Fluoride	1.24	mg/L	Fluoride	1.52	mg/L
	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	δD H_2O	-80.8	%	δD H_2O	-81.2	%	δD H_2O	-73.1	%
	$\delta^{18}O$ H_2O	-10.44	%	$\delta^{18}O$ H_2O	-10.53	%	$\delta^{18}O$ H_2O	-8.56	%

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005 PAN:002693.2104.01RA

	16K-336			16K-340			MILLWELL		
		Result	Units		Result	Units		Result	Units
Water Quality	pH	7.4		pH	7.6		pH	7.4	
	Conductivity	0.15	S/m	Conductivity	0.19	S/m	Conductivity	0.36	S/m
	Turbidity	29.9	NTU	Turbidity	5.5	NTU	Turbidity	14.7	NTU
	Dissolved Oxygen	3.05	mg/L	Dissolved Oxygen	5.26	mg/L	Dissolved Oxygen	6.39	mg/L
	Temperature	15.5	°C	Temperature	16.8	°C	Temperature	15.2	°C
	Salinity	0.1	%	Salinity	0.1	%	Salinity	0.2	%
	Total Dissolved Solids	1	g/L	Total Dissolved Solids	1.2	g/L	Total Dissolved Solids	2.3	g/L
	Oxidation Reduction Potential	86	mV	Oxidation Reduction Potential	76	mV	Oxidation Reduction Potential	-127	mV
Metals	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Aluminum	229	ug/L	Aluminum	126	ug/L	Aluminum	68.0	ug/L
	Antimony	3.00	ug/L	Antimony	3.00	ug/L	Antimony	3.00	ug/L
	Arsenic	11	ug/L	Arsenic	8.53	ug/L	Arsenic	5.00	ug/L
	Barium	450	ug/L	Barium	140	ug/L	Barium	1.64	ug/L
	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L
	Bromide	0.234	ug/L	Bromide	0.295	ug/L	Bromide	0.361	ug/L
	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L
	Calcium	76800	ug/L	Calcium	99800	ug/L	Calcium	2420	ug/L
	Chromium	1.00	ug/L	Chromium	1.03	ug/L	Chromium	1.43	ug/L
	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L
	Copper	29.7	ug/L	Copper	3.00	ug/L	Copper	20.4	ug/L
	Iron	2720	ug/L	Iron	181	ug/L	Iron	9870	ug/L
	Lead	3.58	ug/L	Lead	3.30	ug/L	Lead	3.74	ug/L
	Magnesium	20600	ug/L	Magnesium	43500	ug/L	Magnesium	470	ug/L
	Manganese	95.9	ug/L	Manganese	122	ug/L	Manganese	51	ug/L
	Mercury	0.066	ug/L	Mercury	0.066	ug/L	Mercury	0.066	ug/L
	Nickel	1.50	ug/L	Nickel	1.50	ug/L	Nickel	2.38	ug/L
	Potassium	2540	ug/L	Potassium	3940	ug/L	Potassium	3200	ug/L
	Selenium	10.2	ug/L	Selenium	5.00	ug/L	Selenium	26.7	ug/L
	Silver	1.00	ug/L	Silver	1.00	ug/L	Silver	1.00	ug/L
	Sodium	202000	ug/L	Sodium	233000	ug/L	Sodium	694000	ug/L
	Thallium	5.00	ug/L	Thallium	5.00	ug/L	Thallium	6.45	ug/L
	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L
	Zinc	153	ug/L	Zinc	148	ug/L	Zinc	659	ug/L
Radionuclide's	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	ALPHA	0.129	pCi/L	ALPHA	5.46	pCi/L	ALPHA	9.79	pCi/L
	BETA	4.99	pCi/L	BETA	2.37	pCi/L	BETA	2.72	pCi/L
	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent
	Radium-226	1.20	pCi/L	Radium-226	0.464	pCi/L	Radium-226	0.639	pCi/L
	Radium-228	4.58	pCi/L	Radium-228	0.747	pCi/L	Radium-228	1.77	pCi/L
	Thorium-228	0.298	pCi/L	Thorium-228	-0.0682	pCi/L	Thorium-228	0.139	pCi/L
	Thorium-230	-0.524	pCi/L	Thorium-230	0.0264	pCi/L	Thorium-230	0.480	pCi/L
	Thorium-232	-0.0195	pCi/L	Thorium-232	-0.0722	pCi/L	Thorium-232	-0.0195	pCi/L
	Uranium-233/234	-0.171	pCi/L	Uranium-233/234	0.297	pCi/L	Uranium-233/234	2.61	pCi/L
	Uranium-235/236	0.181	pCi/L	Uranium-235/236	0.115	pCi/L	Uranium-235/236	0.174	pCi/L
	Uranium-238	0.392	pCi/L	Uranium-238	1.40	pCi/L	Uranium-238	2.82	pCi/L

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005

PAN:002693.2104.01RA

	16K-336			16K-340			MILLWELL		
Anions	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Chloride	18.8	mg/L	Chloride	22.1	mg/L	Chloride	154	mg/L
	Nitrate	2.89	mg/L	Nitrate	5.97	mg/L	Nitrate	0.100	mg/L
	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L
	Ortho-phosphate	0.291	mg/L	Ortho-phosphate	0.163	mg/L	Ortho-phosphate	2.00	mg/L
	Sulfate	118	mg/L	Sulfate	368	mg/L	Sulfate	1460	mg/L
	Fluoride	0.861	mg/L	Fluoride	0.483	mg/L	Fluoride	1.73	mg/L
	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	$\delta D\ H_2O$	-91.4	%	$\delta D\ H_2O$	-82.6	%	$\delta D\ H_2O$	-107.3	%
	$\delta^{18}O\ H_2O$	-12.04	%	$\delta^{18}O\ H_2O$	-11.01	%	$\delta^{18}O\ H_2O$	-14.14	%

ATTACHMENT C:
Photographic Documentation

PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

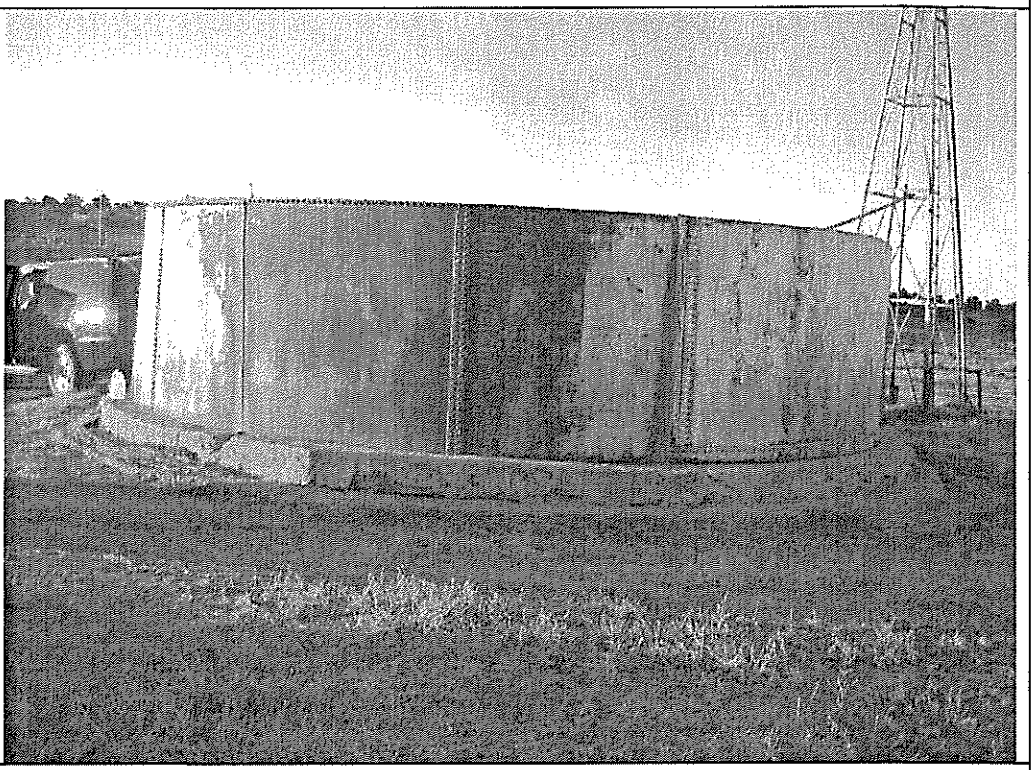
002693.2103.01RA

T02-09-10-08-0005

Date:
10/19/10

Description:

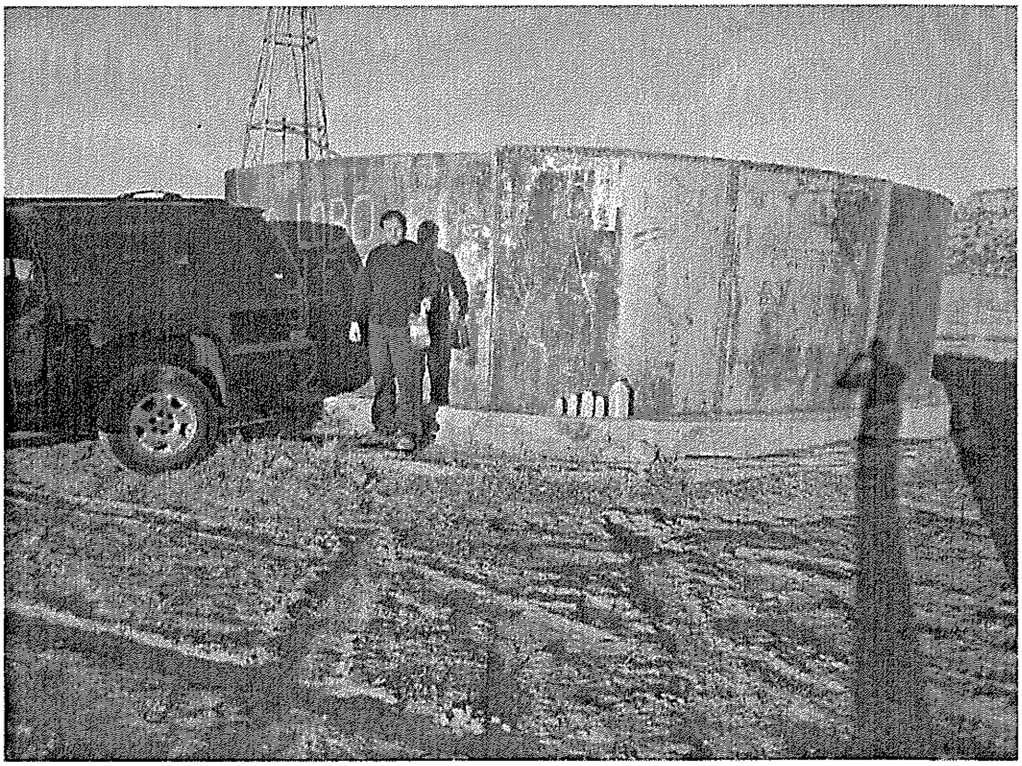
Well 15T-303



Date:
10/19/10

Description:

Well 15T-303



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

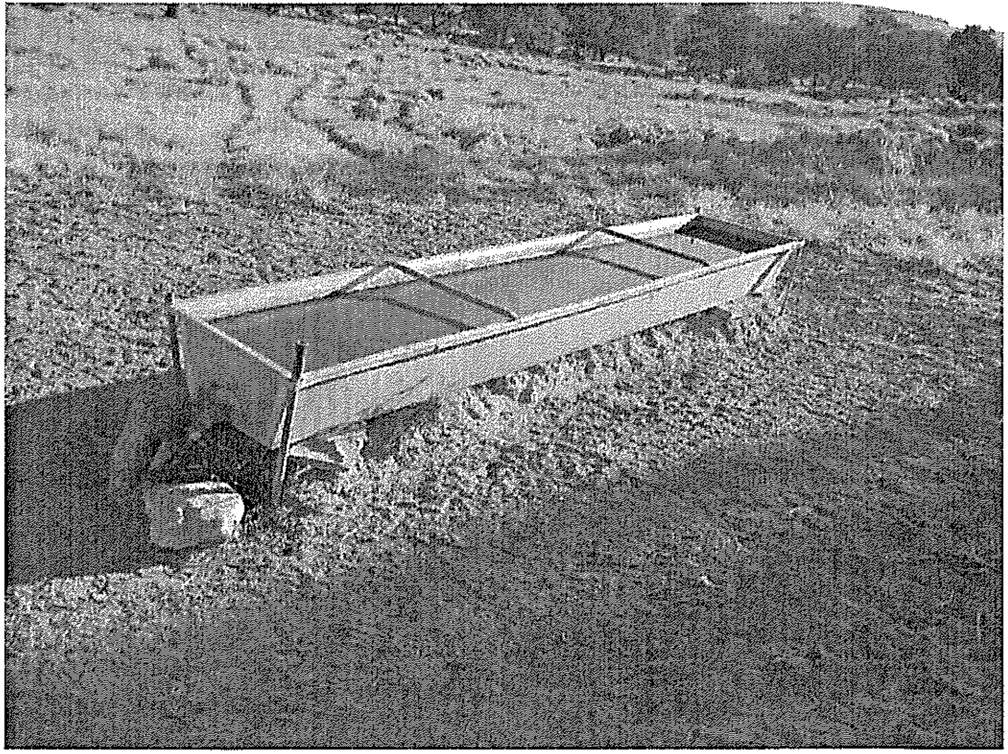
Description:

Well 14T-586

Date: 10/19/10

Description:

Well 14T-586



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

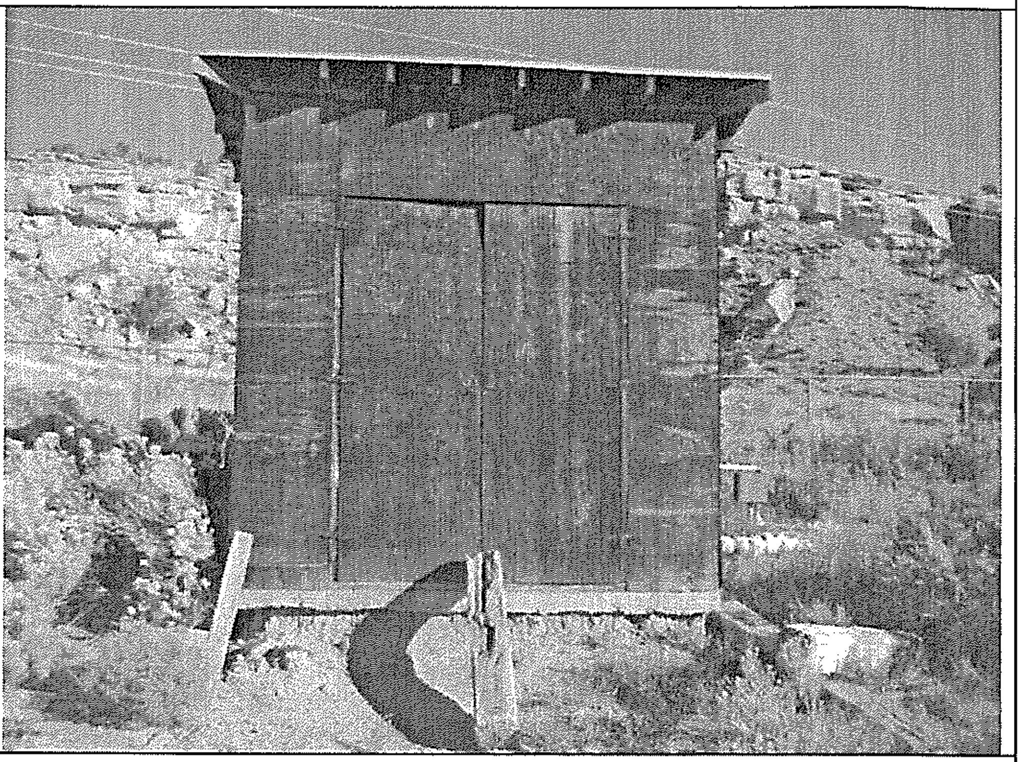
002693.2103.01RA

T02-09-10-08-0005

Date:
10/19/10

Description:

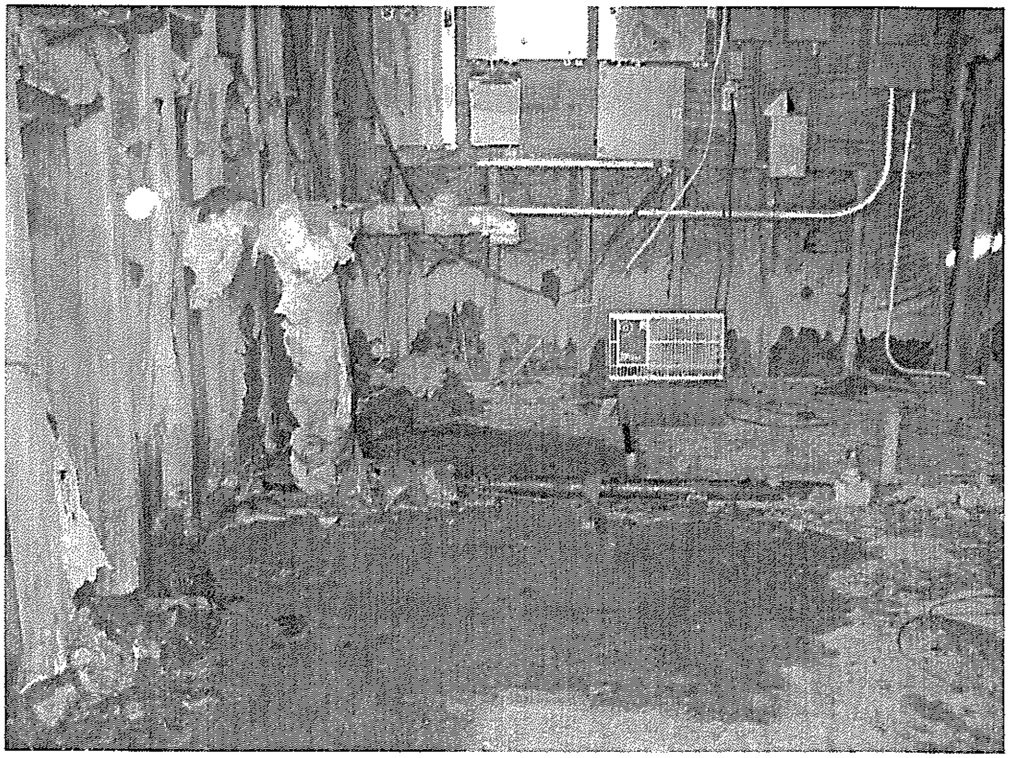
Mill Well



Date:
10/19/10

Description:

Mill Well



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

002693.2103.01RA

T02-09-10-08-0005

Date:
10/19/10

Description:
Mine Well

Date:
10/19/10

Description:

Well NR#1

PHOTOGRAPHIC LOG

NECR Water Well Sampling

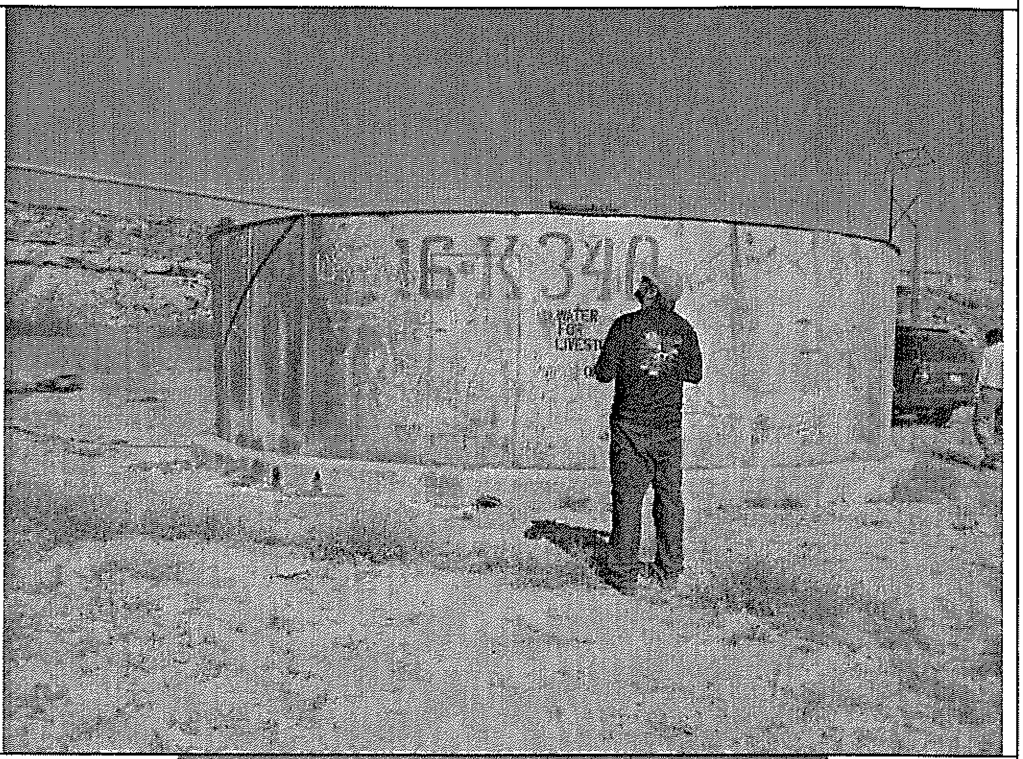
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

	Date: 10/19/10

Description:

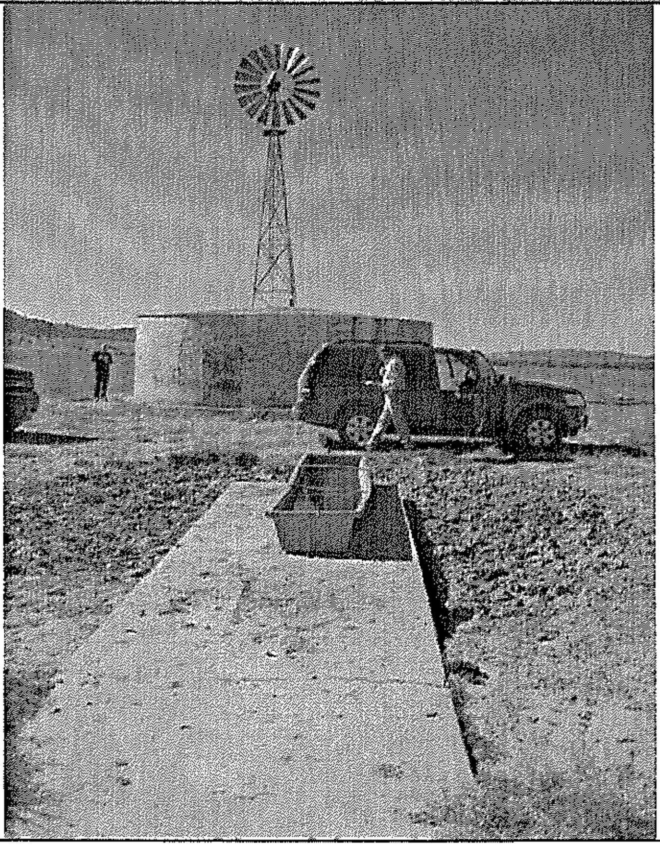
16K-340



	Date: 10/19/10

Description:

16K-340



PHOTOGRAPHIC LOG

NECR Water Well Sampling

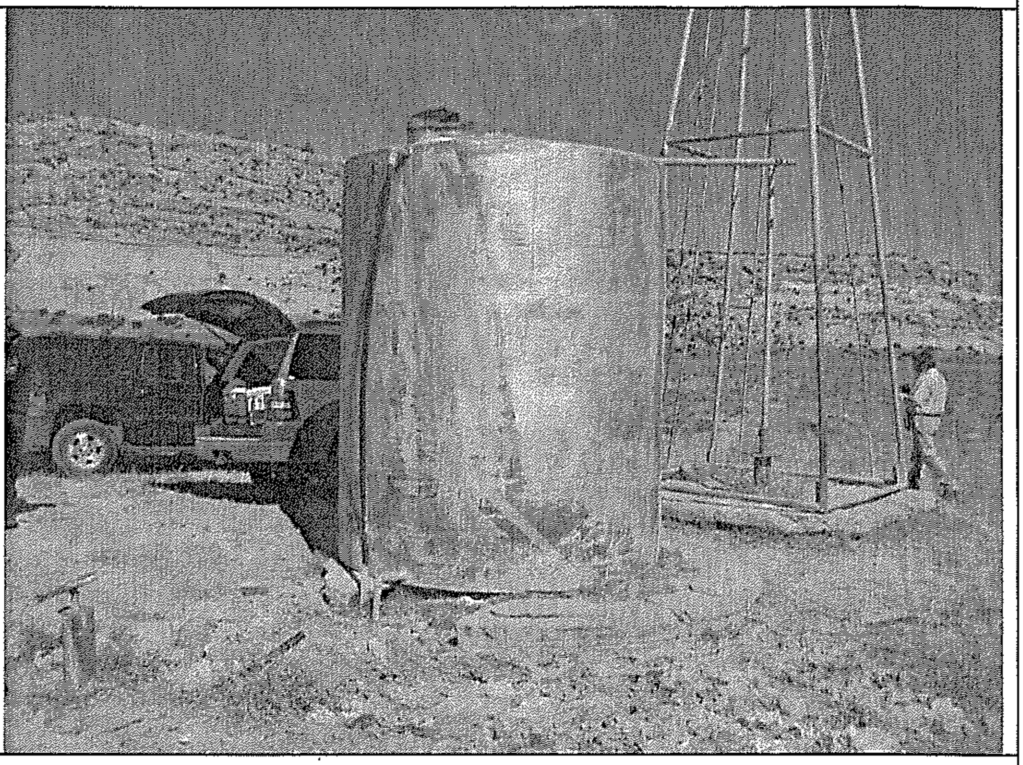
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

16K-336



Date: 10/19/10

Description:

16K-336

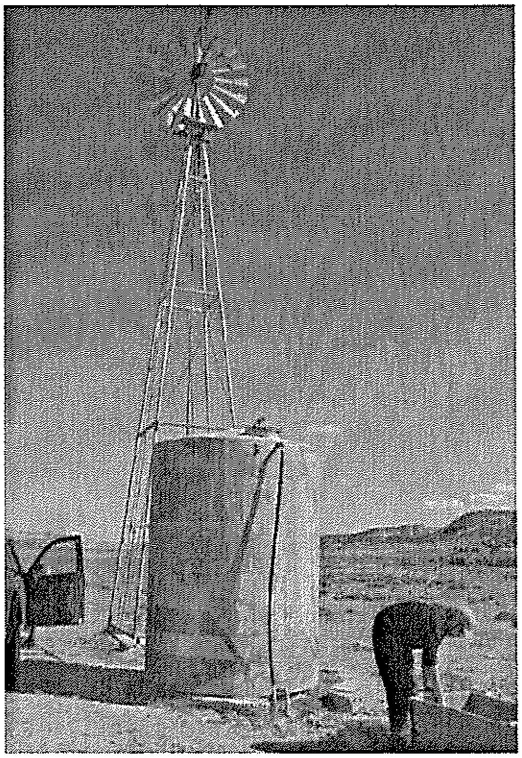


Table J
Reporting Limits, Action Levels, and Quality Control Limits

Analysis	Analyte	Action Level (mg/L)	Quantitation Limit (µg/L)	Duplicate RPD	Matrix Spike	Matrix Spike RPD
Anions by 300.0	Fluoride	4	0.10	25	75-125	20
Anions by 300.0	Chloride	250	1.0	25	75-125	20
Anions by 300.0	Nitrite as N	1	0.10	25	75-125	20
Anions by 300.0	Nitrate as N	10	0.10	25	75-125	20
Anions by 300.0	o-Phosphate, as P	Not Available	1.0	25	75-125	20
Anions by 300.0	Sulfate	250 (s)	0.50	25	75-125	20
Metals by 6010B	Aluminum	0.1	100	25	75-125	20
Metals by 6010B	Antimony	0.1	100	25	75-125	20
Metals by 6010B	Arsenic	0.01	10	25	75-125	20
Metals by 6010B	Barium	2	20	25	75-125	20
Metals by 6010B	Beryllium	0.005	5	25	75-125	20
Metals by 6010B	Cadmium	0.01	10	25	75-125	20
Metals by 6010B	Calcium	Not Available	1000	25	75-125	20
Metals by 6010B	Chromium	0.10	10	25	75-125	20
Metals by 6010B	Cobalt	Not Available	20	25	75-125	20
Metals by 6010B	Copper	1.3 (s)	20	25	75-125	20
Metals by 6010B	Iron	Not Available	50	25	75-125	20
Metals by 6010B	Lead	0.015	5	25	75-125	20
Metals by 6010B	Magnesium	Not Available	600	25	75-125	20
Metals by 6010B	Manganese	0.05 (s)	15	25	75-125	20
Metals by 6010B	Mercury	0.002	0.5	25	75-125	20
Metals by 6010B	Nickel	Not Available	20	25	75-125	20
Metals by 6010B	Potassium	Not Available	5000	25	75-125	20
Metals by 6010B	Selenium	0.05	10	25	75-125	20
Metals by 6010B	Silver	0.10 (s)	10	25	75-125	20
Metals by 6010B	Thallium	0.002	10	25	75-125	20
Metals by 6010B	Vanadium	Not Available	20	25	75-125	20
Metals by 6010B	Zinc	5 (s)	10	25	75-125	20
Gross alpha by 900.0	alpha	See table A-1	1.0 piC/L	25	75-125	20
Gross beta by 900.0	beta	See table A-1	1.0 piC/L	25	75-125	20
903.1	Ra-226	See table A-1	1.0 piC/L	25	75-125	20
904.0	Ra-228	See table A-1	1.0 piC/L	25	75-125	20
Isotopic Th by HASL 300 Th-01-RCmod	Th-238, 230, 232	See table A-1	1.0 piC/L	25	75-125	20
Isotopic U by HASL 300 U-02-RC mod	U-233/234, U-235/236, U-238	See table A-1	1.0 piC/L	25	75-125	20

Key: RPD = relative percent difference; mg/L = milligrams per liter; µ/L = micrograms per Liter NA = Not Applicable

(s) = National Secondary Drinking Water Regulation not enforceable and not an action limit for this assessment

10/29/03

SFUND RECORDS CTR
2097103

Water Sources in Church Rock Area Sampled in 2003 by CRUMP Water Assessment Team

Well #	Well Name	Chapter	Latitude	Longitude	TRS Coordinates	Formation	Well Type	TD (ft)	Use(s)
Grey	Annie Grey	Pinedale	35,37 457	108,30 670	16 16 14 1111	Qal	dug, HP	8	LS, DOM
Solar	Solar St	Church Rock	35,32 158	108,35 753	15 17 13 1	Qal?	drilled, HP	unk	LS
14K-313	Brown Bull	Coyote Cyn	35,39 982	108,34 113	17 16 32 or 29	Kg	drilled, WM	622	LS, DOM
14K-586	Friendship I	Coyote Cyn	35,39 432	108,30 557	17 16 35	Kmv or Kg	drilled, PWS	750	abd-CWS
15K-303	Pipeline Cyn	Standing Rk	35,40 277	108,28 698	17 15 29 421	Kg	drilled, WM	614	LS
16-4-10	Lime Ridge	Church Rock	35,34 315	108,34 633	16 16 31 33	Jmw?	dug, HP	<1	LS, DOM
16K-336	Puerco No Fork	Church Rock	35,34 362	108,38 202	16 17 33 4223	Qal	drilled, WM	122	LS
16K-340	Windmill Cluster	Church Rock	35,35 582	108,35 890	16 17 25 1132	Qal	drilled, WM	141	LS
16T-348	Lobo Valley	Pinedale	35,37 178	108,27 195	16 15 17 1431	Kd	drilled, WM	410	LS
16T-534	Superman Cyn	Church Rock	35,35 818	108,38 675	16 17 21 344	Jmw	drilled, WM	410	DOM, LS
16T-559	Coal Mine/ Henry's	Church Rock	35,27 560	108,39 207	15 17 33 43	unk	drilled, WM	unk	LS
16T-606	King Ranch	Church Rock	35,36 998	108,33 237	16 16 17 411	Kd	drilled, WM	417	LS
16T-608	Yazzie Family	Church Rock	35,31 123	108,38 332	15 17 21 4	unk	drilled, WM	unk	DOM, LS

Following Pages

Summary of General Chemistry
Summary of Heavy Metals
Summary of Radionuclides
Complete field chemistry reported by NMED
Complete radionuclide analyses reported by NMED
Complete uranium analyses reported by USEPA

Abbreviations and Symbols

TRS = Township, Range, Section
TD = Total Depth of well, in feet, unk = unknown depth
Uses abd-CWS = abandoned community water system, DOM = domestic, LS = livestock,
Type HP = hand pump, WM = windmill
Formation Qal = alluvium, Kd = Dakota SS, Kg = Gallup SS, Kmv = Mesa (?) Verde, Jmw = Morrison/Westwater
NNEPA = Navajo Nation Environmental Protection Agency
USEPA = U S Environmental Protection Agency

Summary of General Chemistry

Well #	Sampling Date	Dissolved Solids (mg/L)	Calcium ($CaCO_3$) (mg/L)	Magnesium (mg/L)	Potassium (mg/l)	Sodium (mg/L)	Total Hardness (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	pH (Units)
USEPA or NNEPA MCL Lab		500 NTUA	75-200 NTUA	none NTUA	none NTUA	none NTUA	500 NTUA	250 NTUA	250 NTUA	6 5-8 5 field
Grey	10/28/2003	**553 5**	**376 0**	(???) -36	6 69	24 1	240 0	4 5	**305 0**	7 72
Solar	10/29/2003	**561 8**	38 0	120 0	4 00	27 9	148 0	4 64	**352 0**	**8 61**
14K-313	10/29/2003	**1,095 0**	**640 0**	440 0	4 36	105 0	**1,080 0**	10 7	**1,070 0**	8 31
14K-586	8/5/2003	**2,136 0**	**251 8**	125 1	7 10	143 1	**1,143 9**	19 1	**1,097 2**	8 07
15K-303	10/28/2003	**3,043 0**	**980 0**	(???) -940	5.97	191 0	40 0	12 1	**1,940 0**	8 13
16-4-10	10/29/2003	237 5	152 0	32 0	1 61	8 37	184 0	14 3	27 1	7 45
16K-336	10/29/2003	**887 6**	200 0	88 0	2 84	207 0	288 0	20 9	122 0	8 05
16K-340	10/29/2003	**1,469 0**	**420 0**	180 0	3 65	256 0	**600 0**	25 5	**419 0**	8 16
16T-348	10/29/2003	**660 9**	4 0	8 0	0 86	222 0	12 0	3 48	155 0	**9 63**
16T-534	10/29/2003	**811 8**	132 0	76 0	3 00	179 0	208 0	8 0	**314 0**	**8 67**
16T-559	10/28/2003	498 4	12 0	15 0	1 71	162 0	27 0	4 59	148 0	**8 87**
16T-606	10/28/2003	**3,500 0**	196 0	1,740 0	6 91	245 0	**1,940 0**	23 3	**1,130 0**	7 45
16T-608	10/28/2003	**1,015 0**	24 0	36 0	0 86	390 0	60 0	**251 0**	134 0	**8 82**

Boldface numbers indicate values exceeding standards

Abbreviations MCL = maximum contaminant level, mg/L = milligrams per liter, NMSLD = New Mexico Scientific Laboratory Division, NTUA = Navajo Tribal Utility Authority, ??? = data are questionable

Summary of Heavy Metals and Aesthetic Parameters

Well #	Sampling Date	Arsenic (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Fluoride (mg/L)	Iron (mg/L)
USEPA or NNEPA MCL		0 010	0 005	0 05	1 3	0 02	0 1	0 05	1 6 (WQCC)	0 3
Lab		NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	field*	field*
Grey	10/28/2003	<0 005	<0 0002	<0 001	<0 02	0 001	<0 04	<0 005	0 92	0 01
Solar	10/29/2003	<0 005	<0 0002	<0 001	0 062	<0 001	<0 04	<0 005	0 32	4 10
14K 313	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	1 34	**0 54**
14K 586	8/5/2003	0 008**	<0 001**	<0 001**	<0 1**	<0 001**	<0 1**	<0 005**	not tested	**5 10****
15K 303	10/28/2003	<0 005	<0 0002	<0 001	0 026	<0 001	<0 04	<0 005	**1 60**	**0 68**
16 4 10	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	0 043	0 58	0 10
16K 336	10/29/2003	0 006	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	1 03	**2 00**
16K 340	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 71	**0 40**
16T 348	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 47	0 02
16T 534	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 44	**0 49**
16T 559	10/28/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 64	0 07
16T 606	10/28/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	1 16	**3 28**
16T 608	10/28/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	0 006	**1 96**	0 12

*field tests by New Mexico Environment Department

**lab results reported by NMSLD

Boldface numbers indicate values exceeding standards

Abbreviations MCL = maximum contaminant level mg/L = milligrams per liter NMSLD = New Mexico Scientific Laboratory Division
NTUA = Navajo Tribal Utility Authority WQCC = N M Water Quality Control Commission groundwater standard ??? = data are questionable

Summary of Selected Radionuclides*

Well #	Sampling Date	Gr Alpha (U Nat Ref) (pCi/L)	Gr Beta (Sr/Y 90 Ref) (pCi/L)	Radium 226 (pCi/L)	Radium 228 (pCi/L)	Total Uranium (pCi/L)	Uranium mass (ug/L)
USEPA or NNEPA MCL		15	none	combined 5 0		none	30
Grey	10/28/2003	7 20	9 40	0 10	0 40	9 94	14 84
Solar	10/29/2003	nd	4 40	0 08	0 20	0 16	0 24
14K 313	10/29/2003	nd	4 40	0 04	0 50	0 04	0 05
14K 586	8/5/2003	10 80	14 90	2 60	not tested	not tested	3 00
15K 303	10/28/2003	4 00	9 00	0 47	1 50	0 46	0 69
16 4 10	10/29/2003	**44 10**	26 00	0 33	0 70	46 48	**69 37**
16K 336	10/29/2003	5 90	4 40	0 83	0 30	0 38	0 57
16K 340	10/29/2003	nd	4 90	0 40	0 40	1 96	2 92
16T 348	10/29/2003	nd	1 60	nd	0 60	0 20	0 29
16T 534	10/29/2003	nd	2 70	0 20	0 50	0 10	0 15
16T 559	10/28/2003	nd	1 50	0 05	nd	0 06	0 09
16T 606	10/28/2003	**40 00**	20 40	**8 34**	**0 80**	4 68	6 99
16T 608	10/28/2003	5 40	nd	0 04	1 40	3 86	5 76

*All samples except for 14T 586 analyzed at USEPA lab in Las Vegas NV 14T 586 analysis at N M State Laboratory

Boldface numbers indicate values exceeding standards

Abbreviations MCL = maximum contaminant level pCi/L = picoCuries per liter

UNITED STATES GOVERNMENT

memorandum

3-4-81

Rita, File in well Folder

DATE: January 30, 1981

REPLY TO ATTN OF: Gallup Service Unit Sanitarian

SUBJECT: Potential Contamination of Aquifers in UNC vicinity

TO: Gorden Denipah, Chief
EHSB

RECEIVED
FEB 09 1981
OFFICE OF ENVIRONMENTAL HEALTH

Mike Brown, NMEID, called on January 16, 1981 to enlist our help in obtaining information concerning drilled wells in the area. Mark Mattson looked at our well location map here in the Office and pulled out the following information.

0-1 mile radius of UNC
16K-319

1-5 mile radius of UNC
14T-584
15T-303
16T-348
16T-514
16T-532
16T-535

6-10 mile radius of UNC
14A-81
14T-321
14T-524
14T-538
14T-540
14T-545
14T-546
14T-549
14T-550
14T-551
14T-552
14T-553
14T-554
14T-564
14T-565
14T-566
14T-571
14T-572
14T-573
14T-579
15T-535
16B-12
16B-40
16B-40A
16I-500A
16I-537
16K-318
16K-330
16K-336
16K-340
16T-351
16T-509
16T-510
16T-520
16T-554
16T-555
16T-560
16T-581

I gave the above information to Mike, along with a set of well location maps. The State will assume responsibility for collecting water samples for chemical analysis. I have agreed to have Bobbie or Smiley help them locate the wells.

OPTIONAL FORM NO. 10
(REV. 7-76)
GSA FPMR (41 CFR) 101-11.6
5010-112

M. FILE 16K-336

THE NAVAJO TRIBE
WATER & SANITATION DEPARTMENT
POST OFFICE BOX 678
FORT DEFIANCE, NAVAJO NATION (ARIZONA) 86504
(602) 729-2390,2391,2394

PETER MACDONALD
CHAIRMAN, NAVAJO TRIBAL COUNCIL
WILSON C. SKEET
VICE CHAIRMAN, NAVAJO TRIBAL COUNCIL

RECEIVED
OCT 17 1978

16 OCTOBER 1978

CALVIN –
WE NEED TO HAVE THE FOLLOWING INFORMATION.
*1 – STATIC WATER LEVEL AT THE TIME OF BAILING
2. DRAWDOWN AT THE END OF BAILING.
3. TOTAL DEPTH OF WELL AT THE END OF BAILING

KHAN

MEMORANDUM

TO : Akhtar Zaman, Director
Technical Services Branch

THRU : Calvin Arnold, Supervisor
Operations Branch

FROM : Billie Holtso, Field Foreman
Fort Defiance Agency

SUBJECT: Well #16K-336

Well #16K-336 is going dry. It is located 2½ miles northeast of El Paso Station and 4 miles north of Rehoboth, New Mexico. The list below is what information we could gather on this well.

1. The well was built in October, 1953.
2. Depth of well - 122 feet.
3. Static water level - 35 feet.
4. Draw down - 30 feet.
5. Torch cut perferation - 82-120 feet
6. Gravel Packed - 35-123 feet.

* We used a 4 inch bailer to get the water out, it took about 30 minutes to pump the well dry.

Your concern and neccessary action to this matter will be appreciated.

Allen M. Parker
for Billie Holtso

CONCURRED BY:

Calvin Arnold, Supervisor
Operations Branch/WSD

cc to CALVIN ARNOLD

Soil, Water & Materials Testing Laboratory
P. O. Box 1060, Gallup, New Mexico 87301

ıb. No. 74-PH-433 Field No. ______
ıte Received by Lab. 3-26-74
ate Collected 3-26-74
ocation Church Rock
ource of Water Well No. 16K 336
ollector's Name William Weis
uthorized By William Weis
DDRESS: Department: USPHS
Agency: Gallup
Branch: OEH

Analyzed By N
Transcribed By
Checked By
Date Analysis Completed 5-13-74
Reported By
Date Reported ______

SEND REPORT TO: William Weis
PHS Environmental Health
P.O. Box 1337
Gallup, New Mexico 87301

X) Test Requested		Meq/1	Mg/1	Recommended Standards
oron (B)			0.67	1.0
ron (Fe)		Trace	Trace	0.3
alcium (Ca)		3.10	62.12	75 - 200
agnesium (Mg)		1.90	23.10	50 - 150
odium (Na)		11.12	255.65	115 **
otassium (K)		0.03	1.17	1000 to 2000
CATIONS		16.15		
hosphorus (P)			0.03	50.0 **
icarbonate (HCO_3)		10.54	643.15	150
arbonate (CO_3)		0.62	18.61	
ulfate (SO_4)		2.84	136.41	250
hloride (Cl)		1.25	44.33	250
luoride (F)		0.08	1.55	50°to 58.3° 1.8 58.7°to70.6° 1.5 70.7°to90.5° 1.2
itrate (NO_3)		0.21	13.02	45
ANIONS		15.54		
otal Solids Mg/1			892	500
issolved Solids Mg/1			888	
issolved Solids Tons Per Acre Foot	1.21			
ardness as Mg/1 Ca CO_3 Calcium, Magnesium			250	500
ardness as Mg/1 Ca CO_3 Non Carbonate			—	
lkalinity as Mg/1 Ca CO_3 Phenolphthalein			31	N.A.
lkalinity as Mg/1 Ca CO_3 Total Alkalinity (Methyl Orange)			527	
oluble Sodium Percentage (SSP)	69			
odium Absorption Ratio (SAR)	7.03			
pecific Conductance (Micromhos at 25°C)	1380			
esidual Sodium Carbonate (RSC)		5.54		
H	8.2			4 to 10
lass for Irrigation Water	$C_3 S_2$			
rsenic (As)			Trace	0.01 *
arium (Ba)			0.20	1.0 *
admium (Cd)			Trace	0.01 *
opper (Cu)			Trace	1.0
yanide (Cn)			Trace	0.2
hromium (Cr.)			Trace	0.05 *
ead (Pb)			Trace	0.05 *
anganese (Mn)			0.076	0.05
ercury (Hg)			Trace	0.005 **
elenium (Se)			Trace	0.01 *
ilica (SiO_2)			9.63	
ilver (Ag)			Trace	0.05
inc (Zn)			0.030	5.0
lkyl Benzene Sulfonates (ABS)			trace	0.5
henols			Trace	0.001

ause for Rejection of the Supply
nofficial Standards Total Iron - 1.76 ppm

16K-336

WELL_NO = 16K-336 — ? 16K-340 (?)
WELL_NAME = Puerco No. Fork
CHAPTER = Church Rock
LAT_DM = 35,34.362
LONG_DM = 108,38.202
LATITUDE = 35.5727
LONGITUDE = -108.637
TRS_COORD = 16.17.33.4223
FORMATION = Qal
WELL_TYPE = drilled; WM
TD_FT = 122
USES = LS
SAMP_DATE = 20031029
GROSSALPHA = 5.9
GA_UNITS = U-Nat Ref., pCi/L
GROSSBETA = 4.4
GB_UNITS = Sr/Y-90 Ref., pCi/L
RADIUM_226 = 0.83
RA226_UNIT = pCi/L
RADIUM_228 = 0.3
RA228_UNIT = pCi/L
T_URANIUM = 0.38
TU_UNITS = pCi/L
M_URANIUM = 0.57
MU_UNITS = ug/L

Mr. Johnnie Willeto
Mechanical Supervisor
Water Works Department

Earth Tanks

18 February 1972

Fred E. Zschach

5552

552-741

The following earth tanks are filled with dirt and need to be made bigger where possible:

14A-33
14K-318
14K-316
16K-336
1K-224
14N-79
14T-501
14A-10
16T-544
1K-204
14N-16 & 14M-1
14T-307
14A-33 & 14T-531
16T-570
3K-324

9Y-25 needs blow sand pushed away from well; 9T-220 needs sand pushed away from well and diversion made.

I request this cat work be put on your schedule. I can have a representative from each district to accompany your cat skinner and show him the locations and work which need to be done.

Fred E Zschach
Fred E. Zschach
Maintenance Coordinator
Water Works Department

CONCURRED:

Jack Martin
Jack Martin
Acting Superintendent
Water Works Department

cc: Mr. Arthur Hubbard, Jr., Superintendent
Mr. Jack Martin, Assistant Superintendent
Mr. George Soce, Administrative Assistant
File: Wells and Windmills
Well Folder
Chrono

FEZ/rb

TABLE 2.6-2

SELECTED CHEMICAL ANALYSES OF GROUND WATER IN THE VICINITY OF PROPOSED MILL SITE

(constituents in parts per million unless otherwise noted)

14 T. 586 Friendship

Location number and name	BIA Number	Aquifer (a)	Date Sampled	Silica SiO_2	Calcium Ca	Magnesium Mg	Sodium plus potassium Na + K	Bicarbonate HCO_3	Carbonate CO_3	Sulfate SO_4	Chloride Cl	Fluoride F	Nitrate NO_3	Total dissolved solids	Conductance μmhos @ 25° C
16.15.20.		Qal	8-1949	12	72	14	13	258	0	43	4	0.6	2.2	288	480
20.		Qal	5-1950	15	42	13	8	160	0	40	2	0.2	0.1	199	331
20.234 Pinedale TP		Km?	8-1949	12	170	55	161	359	0	590	50	0.4	24.0	1240	1720
16.16. 1.112	16K-319	Kd	6-1955	14	1.6	1.9	262	518	39	74	8	1.4	1.5	658	1060
16.16. 6.112	14N- 70	Kcd	5-1955	10	57	20	0.9	130	0	102	9	0.4	0.0	271	436
16.17.25.113	16K-340	Qal	6-1954	12	139	44	264	890	0	314	24	0.6	13.0	1250	1810
16.17.33.422 or 14K303	16K-336	Qal	9-1953	5.8	80	19	227	776	0	91	26	1.4	0.3	832	1330
~~[illegible]~~	~~16T-303~~	~~Kg~~	~~6-1955~~	~~15~~	~~[illegible]~~	~~89~~	~~504~~	~~297~~	~~0~~	~~2520~~	~~16~~	~~[illegible]~~	~~0.6~~	~~2450~~	~~3120~~
17.16.32.112 Brown Bull	14K-313	Kg	5-1955	17	218	99	72	271	0	835	11	0.8	0.0	1390	1760
17.16.35. **Kerr McGee Mine**		Jmw	11-1973	17	11	8.4	131.6	220	21	110	3.6	0.3	---	412	663
17.17. 7.233	14A- 79	Kcd	6-1949	--	3	0.9	105	237	0	38	4	0.2	0.5	268	455
17.17.16	14A- 14	Qal	5-1955	--	--	--	---	409	0	---	32	1.2	0.3	530	3370
Applicant's Mine		Jmw	11-1973	17	2.2	0.3	121.4	215	31	45	5.2	0.2	---	329	550

(a) Aquifers: Qal, alluvium; Kcc, Crevasse Canyon Formation; Kcd, Dalton Sandstone Mbr. , Crevasse Canyon Formation; Kmf, Menefee Formation; Kpl, Point Lookout Sandstone; Kg, Gallup Sandstone; Km, Mancos Shale; Kd, Dakota Sandstone; Jmw, Westwater Canyon Sandstone Mbr. of Morrison Formation; Jcs, Cow Springs Sandstone

14K303 should be 15T. 503

WELL RECORD

Water Well Development
Navajo Tribe
Window Rock, Arizona

WELL NO. 16K-336

Quad. No. 106 (¼ SW) Miles west 7.2 Miles south 12.25

2½ miles NE El Paso Station - 4miles N of Rehobeth
Location

Began well October 1953 Finished well October 1953

Diameter of well 12" Depth of well 122'

Static water level 35' Drawdown 30' Recovery

Quantity of water on test run: bailer: pump: 20 G.P.M. Tested for hours

Kind of casing: 6 5/8" od - 8 thd - 19 lbs. Sizes and length

Screen kind Torch cut perferations Length 82'-120' Mesh

Contractor P. H. Dunning Address

Gravel packed 35' - 123'

LOG

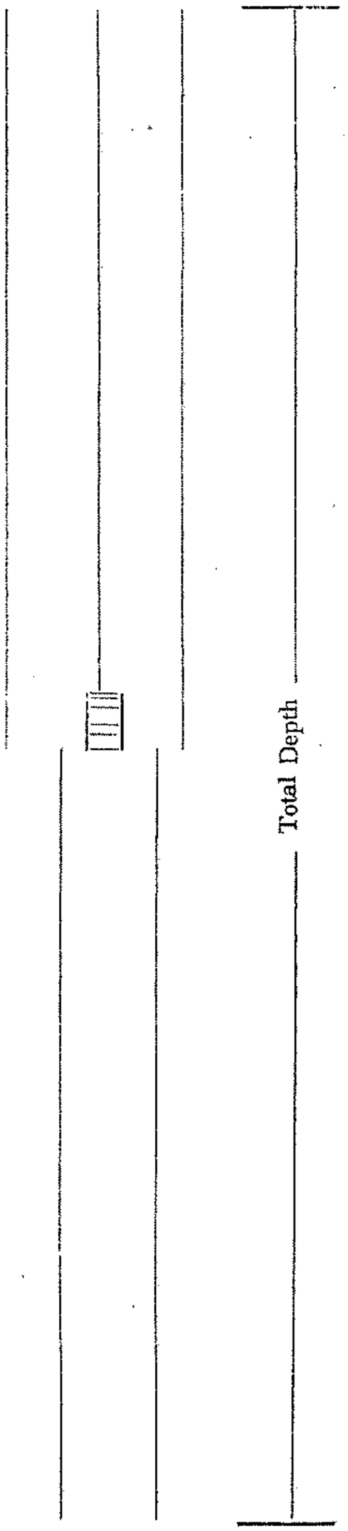
DEPTH		Formation	Acquifer	Remarks
From	To			
0	48	Soil		
48	95	Quick sand - streaks of clay		
95	122	Gravel - sand		

Remarks:

S.P.

Teta Salts	Calcium Ca.	Magnesium Mg.	Sodium Na.	Chlorides Cl.	Sulfates SO_4	Carbonates HCO_3	P.H.	CO_3

Excellent Good Fair Poor Doubtful Not suitable for domestic, livestock use



Cylinder size: 2 1/2

Tubing, cylinder and suction pipe length in feet: 100'

Kind of pump rod: 3/4

Size of box and pin: 7/8

Liner, if any:

Windmill: (make) 8' Gas motor

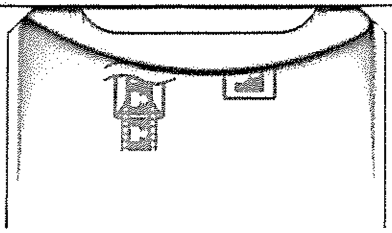
Size:

Storage: (kind)

Capacity:

Troughs: (kind) No.

Comments:



COPY

Memorandum September 28, 1953

To: John J. Schwarz, Window Rock, Arizona

From: Joseph T. Callahan, Holbrook, Arizona

Subject: Preliminary bail test, well 16K-336

A preliminary bail test was conducted on September 24, 1953, at the time of development of this well.

The well was bailed at the rate of 8.5 gallons per minute for 2:01. The water level drew down 19 feet from a level of 34.5 feet. Although this is sufficient water to meet the pumping requirements of a windmill, much more water will be available when the influx of sand to the well is stopped.

The driller reported that the bottom 40 feet of casing had been perforated. With the bottom of the casing set in gravel at an approximate depth of 112 feet, the perforated zone of casing extended up into the quicksand, which lies between 48 and 95 feet. Thus, the loose sand flowed into the well as it was bailed, and cut off the water in the gravel which lies below 100 feet. The well was being bailed off bottom, from a depth of between 96 and 101 feet, depending on the amount of sand in the well.

A more successful well could be developed if only that part of the casing adjacent to the gravel were perforated.

s/ Joseph T. Callahan
Joseph T. Callahan
Geologist

JTC/cj

cc: Howard Gorman

COPY

Memorandum October 1, 1953

To: John J. Schwarz, Window Rock, Arizona

From: J. T. Callahan, Holbrook, Arizona

Subject: Completion and bail test of well 16K-336; located about 2½ miles north of El Paso Wingate Pumping Station, in the S.W. ¼, sec. 33, T 16 N, R 17W.

This well was completed and bail tested on September 30, 1953. The following information was obtained from the bail test:

Total depth	118 feet
Static Water level	34 feet
Bailing rate	14.6 gallons per minute
Bailing time	62 minutes
Drawdown	27.5 feet
Recovery	29 feet in 40 minutes
Aquifer	Quarternary gravel from 100 feet to 118 feet

The static water level was higher following bail testing than it was prior to testing.

The Quality of Water Laboratory in Albuquerque reported that this water is satisfactory for domestic use.

s/ Joseph T. Callahan
Joseph T. Callahan
Geologist

JTC/cj

Ok

WELL

16K-340

ecology and environment, inc.
International Specialists in the Environment
1940 Webster Street, Suite 100
Oakland, California 94612
Tel: (510) 893-6700, Fax: (510) 550-2760

January 24, 2011

U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, CA 94105

TDD No: T02-09-10-08-0005
Project No: 002693.2103.01RA

14T-586
15T-303
16K-336
16K-340
mill well

Attention: Harry Allen, USEPA On-Scene Coordinator
Andrew Bain, USEPA

Subject: **NECR Water Well Sampling**
Church Rock Chapter
Navajo Nation

INTRODUCTION

In October 2010 the U.S. Environmental Protection Agency (USEPA) tasked the Ecology and Environment Inc. Superfund Technical Assessment and Response Team (START) with technical assistance relating to residential water well sampling in the vicinity of the former Northeast Church Rock Mine located in the Church Rock Chapter of the Navajo Nation. (Figure 1, Attachment A).

The purpose of this sampling event was to generate additional data to measure the impact of the former Northeast Church Rock Mine uranium mine on wells within the adjacent areas.

SAMPLING ACTIVITIES

Well sampling was conducted on October 19, 2010. A total of five wells were sampled. Four of the wells were residential wells and one (Mill Well) well was part of the former United Nuclear Corporation (UNC) facility in the area. Every effort was made to collect water samples in a manner consistent with resident collection and use (i.e. taps, pumps or bucket collect).

A Time Critical Quality Assurance and Sampling (QASP) Plan (Appendix D) was developed prior to sampling and followed with the following exceptions:

- Well NR#1 is no longer in use and was not sampled as the casing has been filled with concrete.
- The Mine Well is no longer in use and was not sampled as the casing has been filled with concrete.

Water quality parameters were measured in the field using a Horiba, Ltd. multi-parameter water quality meter. The meter was calibrated daily using a buffer solution. Samples were collected and analyzed for metals, radionuclides and anions by GEL Laboratories Inc. (Charleston, SC). Samples were collected and analyzed for oxygen and hydrogen isotopic ratio by Isotech Laboratories, Inc (Champaign, Il). The QASP (Appendix D) contains all methods and volumes used in sample analysis.

WELL DESCRIPTIONS

Well 15T-303

Well 15T-303 is a windmill powered well that feeds into an approximately 40,000 gallon uncovered metal tank. The well is currently in use and there is a trough and locked tap in the vicinity of the tank that are used to water livestock. Samples were collected from the top of the tank using a bucket.

14T-586

14T-586 is a diesel engine powered well that feeds into an approximately 10,000 gallon covered metal tank. The well is currently in use and there is a trough and tap in the vicinity of the tank that are used to water livestock. Samples were collected from the tap in manner consistent with residential use.

Mill Well

The Mill Well is located on the former UNC facility property. The well is electric powered well, housed in a wooden pump house, north of the former UNC offices and equipment yard. There is no storage tank affiliated with the well and the well is not currently in use. Samples were collected from a tap inside the pump house with pump turned on.

Mine Well

The mine well is located within the boundary of the former Northeast Church Mine. The well is currently not in use and has been non-operational for at least 15 years. The well opening is currently plugged with concrete.

NR#1

The NR#1 well is located within the boundary of the former Northeast Church Mine. The well is currently not in use and has been non-operational for at least 15 years. The well opening is currently plugged with concrete.

16K-340

Well 16K-340 is a windmill powered well that feeds into an approximately 40,000 gallon covered metal tank. The well is currently in use and there is a trough and tap in the vicinity of the tank that are used to water livestock. Samples were collected from the tap in manner consistent with residential use.

RESULTS

Table 1 (Appendix B) gives a well specific summary of all applicable data. All laboratory data was validated by a START chemist using the *Region 9 Draft Superfund Data Evaluation/Validation Guidance.* Data validation indicated the laboratory data was acceptable with qualification as definitive data. A separate data validation report was generated under this project and is included in the project file.

This letter summarizes all activities conducted on the Tuba City Removal project. If you have any questions regarding START's activities associated with this project, please do not hesitate to contact me.

Respectfully,

Mike Folan

START Member

Attachments: A – Homesite Location Map
B –Data Tables
C – Photographic Documentation
D- QASP

cc: file

ATTACHMENT A:
Well Location Map

TDD: 09-10-08-0004
PAN: 002693.2103.01RA

Source: NGS Topo US 2D, Inlet: ESRI Streetmaps USA

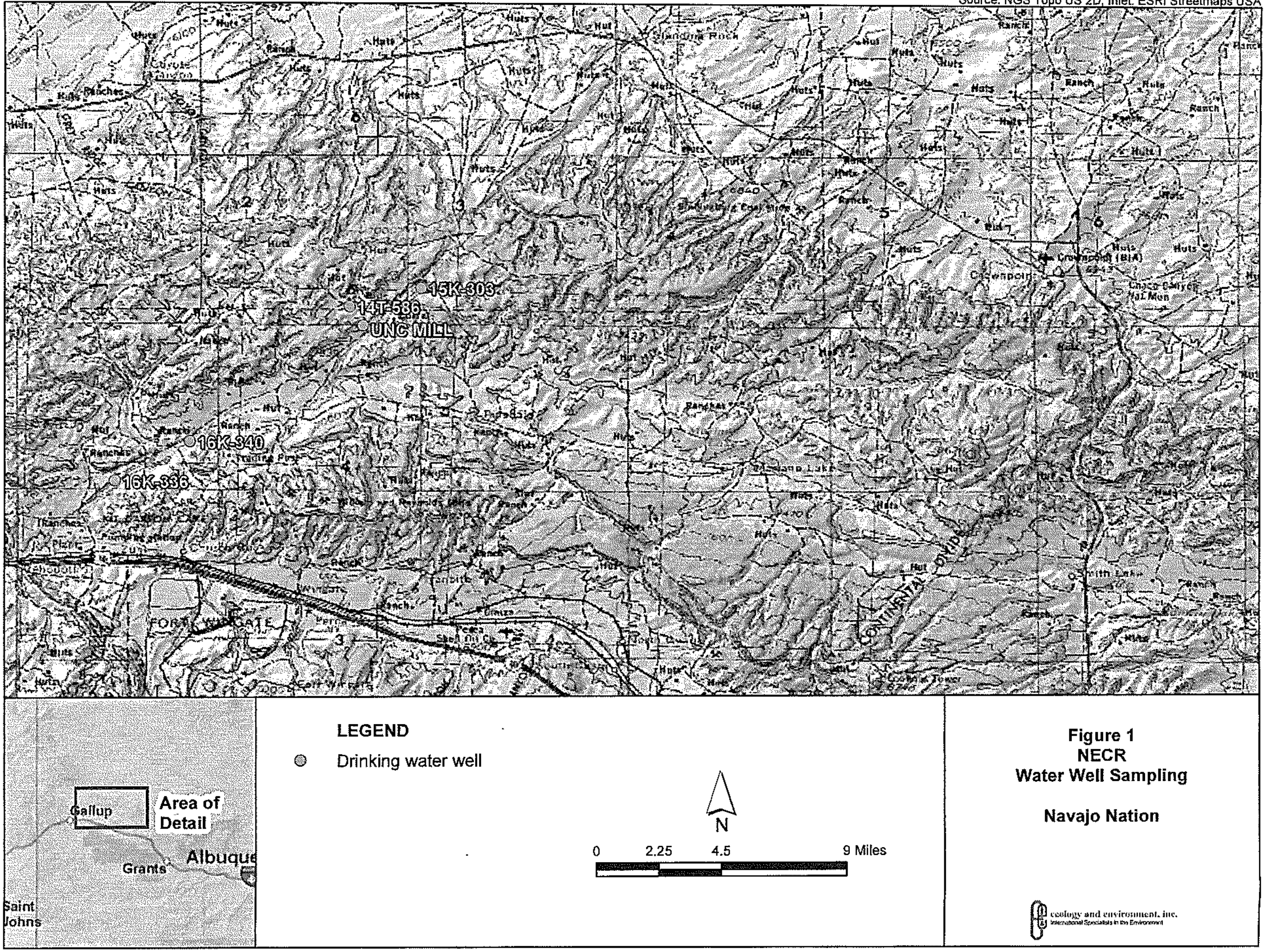


Figure 1
NECR
Water Well Sampling

Navajo Nation

ecology and environment, inc.
International Specialists in the Environment

ATTACHMENT B:
Data Tables

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005 PAN:002693.2104.01RA

	14T-586			14T-586100 (duplicate)			15T-303		
		Result	Units		Result	Units		Result	Units
Water Quality	pH	7.1		pH	7.1		pH	6.8	
	Conductivity	0.26	S/m	Conductivity	0.26	S/m	Conductivity	0.35	S/m
	Turbidity	10.1	NTU	Turbidity	10.1	NTU	Turbidity	10.1	NTU
	Dissolved Oxygen	6.30	mg/L	Dissolved Oxygen	6.30	mg/L	Dissolved Oxygen	7.99	mg/L
	Temperature	7.6	°C	Temperature	7.6	°C	Temperature	12.1	°C
	Salinity	0.1	%	Salinity	0.1	%	Salinity	0.2	%
	Total Dissolved Solids	1.7	g/L	Total Dissolved Solids	1.7	g/L	Total Dissolved Solids	2.2	g/L
	Oxidation Reduction Potential	100	mV	Oxidation Reduction Potential	100	mV	Oxidation Reduction Potential	129	mV
Metals	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Aluminum	220	ug/L	Aluminum	82	ug/L	Aluminum	68.0	ug/L
	Antimony	3.00	ug/L	Antimony	7.34	ug/L	Antimony	6.83	ug/L
	Arsenic	5.00	ug/L	Arsenic	5.00	ug/L	Arsenic	7.54	ug/L
	Barium	13.1	ug/L	Barium	13.4	ug/L	Barium	8.24	ug/L
	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L
	Bromide	0.200	ug/L	Bromide	0.200	ug/L	Bromide	0.200	ug/L
	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L	Cadmium	1.17	ug/L
	Calcium	270000	ug/L	Calcium	281000	ug/L	Calcium	373000	ug/L
	Chromium	13.9	ug/L	Chromium	1.00	ug/L	Chromium	1.16	ug/L
	Cobalt	1.13	ug/L	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L
	Copper	3.00	ug/L	Copper	3.00	ug/L	Copper	3.00	ug/L
	Iron	482	ug/L	Iron	468	ug/L	Iron	685	ug/L
	Lead	3.30	ug/L	Lead	3.30	ug/L	Lead	3.30	ug/L
	Magnesium	119000	ug/L	Magnesium	122000	ug/L	Magnesium	144000	ug/L
	Manganese	320	ug/L	Manganese	319	ug/L	Manganese	162	ug/L
	Mercury	0.066	ug/L	Mercury	0.066	ug/L	Mercury	0.066	ug/L
	Nickel	71.3	ug/L	Nickel	1.51	ug/L	Nickel	1.50	ug/L
	Potassium	7430	ug/L	Potassium	7690	ug/L	Potassium	5650	ug/L
	Selenium	7.7	ug/L	Selenium	37.7	ug/L	Selenium	43.8	ug/L
	Silver	1.00	ug/L	Silver	1.00	ug/L	Silver	1.00	ug/L
	Sodium	135000	ug/L	Sodium	140000	ug/L	Sodium	188000	ug/L
	Thallium	5.00	ug/L	Thallium	5.00	ug/L	Thallium	8.9	ug/L
	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L
	Zinc	338	ug/L	Zinc	355	ug/L	Zinc	839	ug/L
Radionuclide's	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	ALPHA	2.62	pCi/L	ALPHA	5.80	pCi/L	ALPHA	-0.526	pCi/L
	BETA	6.58	pCi/L	BETA	6.02	pCi/L	BETA	2.62	pCi/L
	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent
	Radium-226	0.880	pCi/L	Radium-226	0.540	pCi/L	Radium-226	1.18	pCi/L
	Radium-228	3.41	pCi/L	Radium-228	3.71	pCi/L	Radium-228	3.34	pCi/L
	Thorium-228	-0.0147	pCi/L	Thorium-228	0.155	pCi/L	Thorium-228	-0.139	pCi/L
	Thorium-230	-0.185	pCi/L	Thorium-230	0.818	pCi/L	Thorium-230	-0.158	pCi/L
	Thorium-232	-0.133	pCi/L	Thorium-232	-0.0195	pCi/L	Thorium-232	-0.0195	pCi/L
	Uranium-233/234	1.16	pCi/L	Uranium-233/234	1.73	pCi/L	Uranium-233/234	0.317	pCi/L
	Uranium-235/236	0.114	pCi/L	Uranium-235/236	0.0569	pCi/L	Uranium-235/236	0.219	pCi/L
	Uranium-238	1.20	pCi/L	Uranium-238	0.790	pCi/L	Uranium-238	0.442	pCi/L

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005 PAN:002693.2104.01RA

	14T-586			14T-586100 (duplicate)			15T-303		
Anions	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Chloride	14.0	mg/L	Chloride	14.1	mg/L	Chloride	10.5	mg/L
	Nitrate	0.267	mg/L	Nitrate	0.266	mg/L	Nitrate	0.100	mg/L
	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L
	Ortho-phosphate	0.200	mg/L	Ortho-phosphate	0.200	mg/L	Ortho-phosphate	2.00	mg/L
	Sulfate	1380	mg/L	Sulfate	1310	mg/L	Sulfate	2000	mg/L
	Fluoride	1.19	mg/L	Fluoride	1.24	mg/L	Fluoride	1.52	mg/L
	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	$\delta D\ H_2O$	-80.8	%	$\delta D\ H_2O$	-81.2	%	$\delta D\ H_2O$	-73.1	%
	$\delta^{18}O\ H_2O$	-10.44	%	$\delta^{18}O\ H_2O$	-10.53	%	$\delta^{18}O\ H_2O$	-8.56	%

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005 PAN:002693.2104.01RA

	16K-336			16K-340			MILLWELL		
		Result	Units		Result	Units		Result	Units
Water Quality	pH	7.4		pH	7.6		pH	7.4	
	Conductivity	0.15	S/m	Conductivity	0.19	S/m	Conductivity	0.36	S/m
	Turbidity	29.9	NTU	Turbidity	5.5	NTU	Turbidity	14.7	NTU
	Dissolved Oxygen	3.05	mg/L	Dissolved Oxygen	5.26	mg/L	Dissolved Oxygen	6.39	mg/L
	Temperature	15.5	°C	Temperature	16.8	°C	Temperature	15.2	°C
	Salinity	0.1	%	Salinity	0.1	%	Salinity	0.2	%
	Total Dissolved Solids	1	g/L	Total Dissolved Solids	1.2	g/L	Total Dissolved Solids	2.3	g/L
	Oxidation Reduction Potential	86	mV	Oxidation Reduction Potential	76	mV	Oxidation Reduction Potential	-127	mV
Metals	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Aluminum	229	ug/L	Aluminum	126	ug/L	Aluminum	68.0	ug/L
	Antimony	3.00	ug/L	Antimony	3.00	ug/L	Antimony	3.00	ug/L
	Arsenic	11	ug/L	Arsenic	8.53	ug/L	Arsenic	5.00	ug/L
	Barium	450	ug/L	Barium	140	ug/L	Barium	1.64	ug/L
	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L	Beryllium	1.00	ug/L
	Bromide	0.234	ug/L	Bromide	0.295	ug/L	Bromide	0.361	ug/L
	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L	Cadmium	1.00	ug/L
	Calcium	76800	ug/L	Calcium	99800	ug/L	Calcium	2420	ug/L
	Chromium	1.00	ug/L	Chromium	1.03	ug/L	Chromium	1.43	ug/L
	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L	Cobalt	1.00	ug/L
	Copper	29.7	ug/L	Copper	3.00	ug/L	Copper	20.4	ug/L
	Iron	2720	ug/L	Iron	181	ug/L	Iron	9870	ug/L
	Lead	3.58	ug/L	Lead	3.30	ug/L	Lead	3.74	ug/L
	Magnesium	20600	ug/L	Magnesium	43500	ug/L	Magnesium	470	ug/L
	Manganese	95.9	ug/L	Manganese	122	ug/L	Manganese	51	ug/L
	Mercury	0.066	ug/L	Mercury	0.066	ug/L	Mercury	0.066	ug/L
	Nickel	1.50	ug/L	Nickel	1.50	ug/L	Nickel	2.38	ug/L
	Potassium	2540	ug/L	Potassium	3940	ug/L	Potassium	3200	ug/L
	Selenium	10.2	ug/L	Selenium	5.00	ug/L	Selenium	26.7	ug/L
	Silver	1.00	ug/L	Silver	1.00	ug/L	Silver	1.00	ug/L
	Sodium	202000	ug/L	Sodium	233000	ug/L	Sodium	694000	ug/L
	Thallium	5.00	ug/L	Thallium	5.00	ug/L	Thallium	6.45	ug/L
	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L	Vanadium	1.00	ug/L
	Zinc	153	ug/L	Zinc	148	ug/L	Zinc	659	ug/L
Radionuclide's	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	ALPHA	0.129	pCi/L	ALPHA	5.46	pCi/L	ALPHA	9.79	pCi/L
	BETA	4.99	pCi/L	BETA	2.37	pCi/L	BETA	2.72	pCi/L
	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent	Pct Uranium-235	0.00	percent
	Radium-226	1.20	pCi/L	Radium-226	0.464	pCi/L	Radium-226	0.639	pCi/L
	Radium-228	4.58	pCi/L	Radium-228	0.747	pCi/L	Radium-228	1.77	pCi/L
	Thorium-228	0.298	pCi/L	Thorium-228	-0.0682	pCi/L	Thorium-228	0.139	pCi/L
	Thorium-230	-0.524	pCi/L	Thorium-230	0.0264	pCi/L	Thorium-230	0.480	pCi/L
	Thorium-232	-0.0195	pCi/L	Thorium-232	-0.0722	pCi/L	Thorium-232	-0.0195	pCi/L
	Uranium-233/234	-0.171	pCi/L	Uranium-233/234	0.297	pCi/L	Uranium-233/234	2.61	pCi/L
	Uranium-235/236	0.181	pCi/L	Uranium-235/236	0.115	pCi/L	Uranium-235/236	0.174	pCi/L
	Uranium-238	0.392	pCi/L	Uranium-238	1.40	pCi/L	Uranium-238	2.82	pCi/L

Table 1: NECR Water Well Sampling Data

TDD:09-10-08-0005

PAN:002693.2104.01RA

	16K-336			16K-340			MILLWELL		
Anions	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	Chloride	18.8	mg/L	Chloride	22.1	mg/L	Chloride	154	mg/L
	Nitrate	2.89	mg/L	Nitrate	5.97	mg/L	Nitrate	0.100	mg/L
	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L	Nitrite	0.100	mg/L
	Ortho-phosphate	0.291	mg/L	Ortho-phosphate	0.163	mg/L	Ortho-phosphate	2.00	mg/L
	Sulfate	118	mg/L	Sulfate	368	mg/L	Sulfate	1460	mg/L
	Fluoride	0.861	mg/L	Fluoride	0.483	mg/L	Fluoride	1.73	mg/L
	Analyte	Result	Units	Analyte	Result	Units	Analyte	Result	Units
	δD H_2O	-91.4	%	δD H_2O	-82.6	%	δD H_2O	-107.3	%
	$\delta^{18}O$ H_2O	-12.04	%	$\delta^{18}O$ H_2O	-11.01	%	$\delta^{18}O$ H_2O	-14.14	%

ATTACHMENT C:
Photographic Documentation

PHOTOGRAPHIC LOG

NECR Water Well Sampling

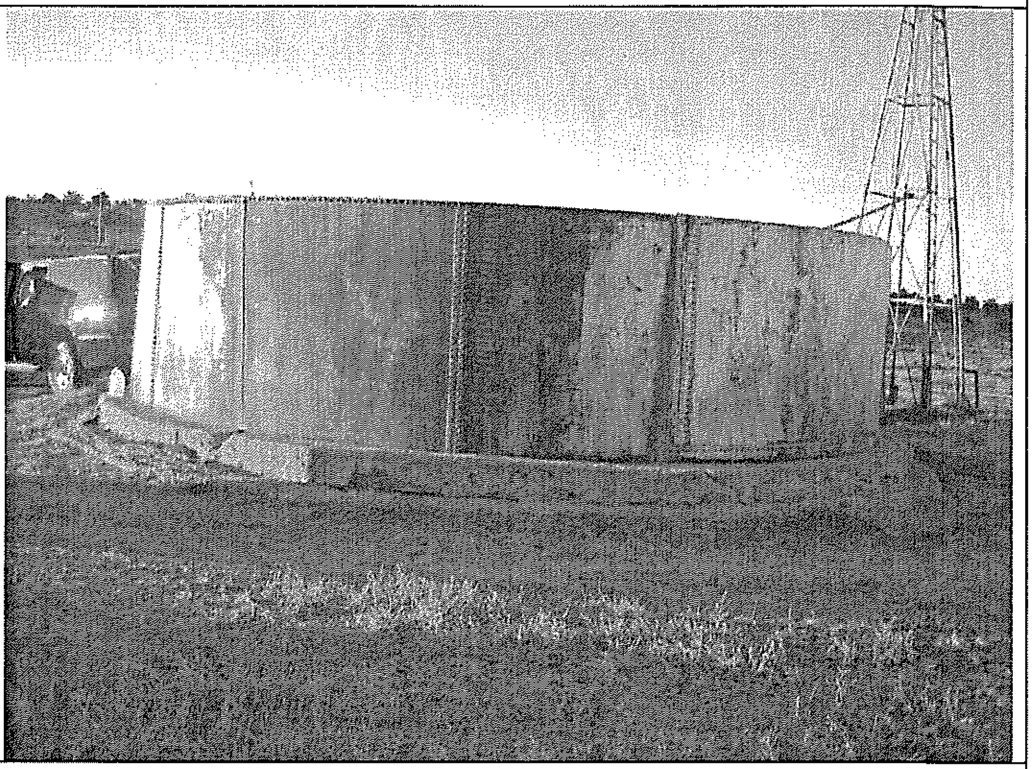
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

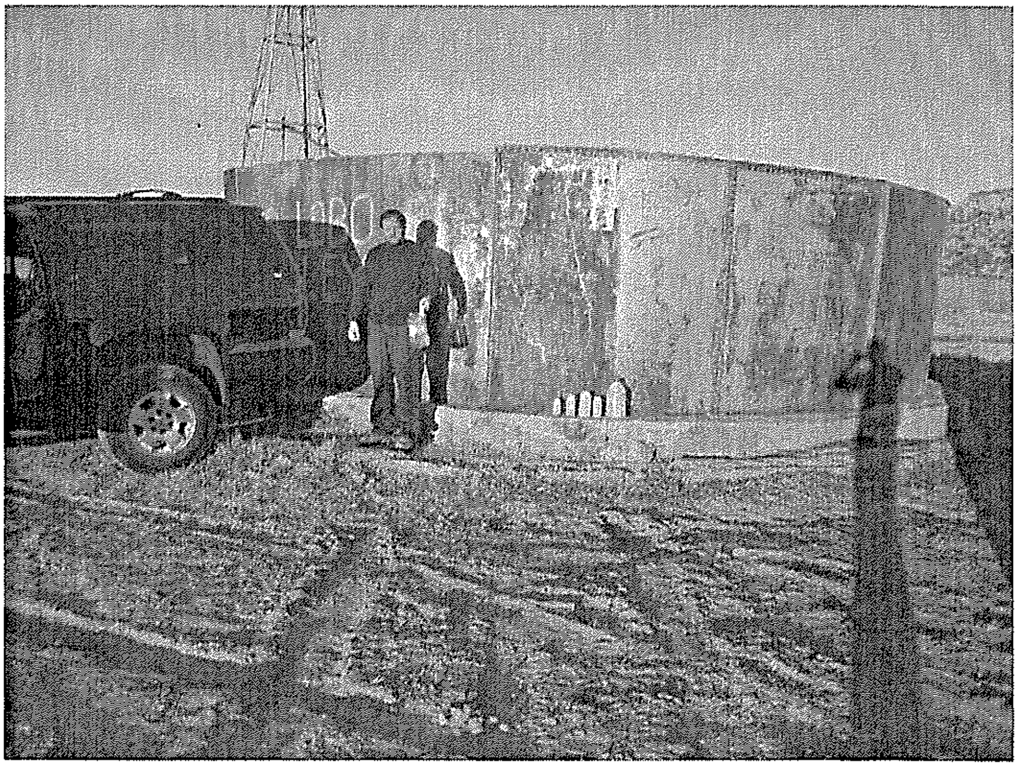
Well 15T-303



Date: 10/19/10

Description:

Well 15T-303



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

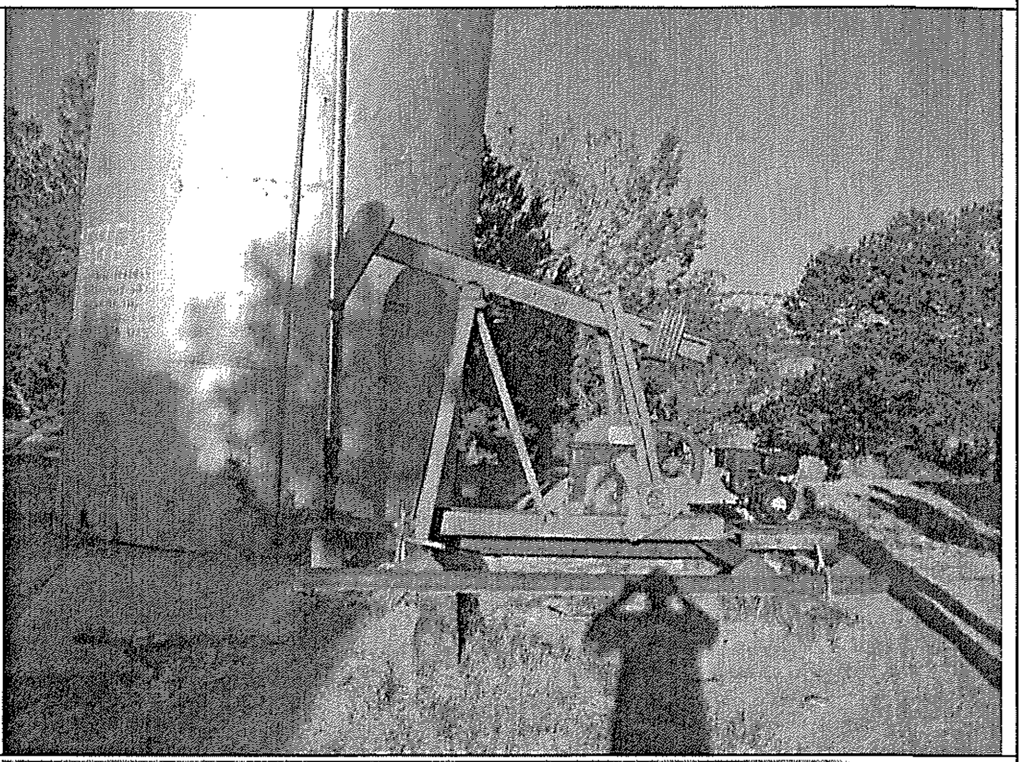
002693.2103.01RA

T02-09-10-O8-0005

Date: 10/19/10

Description:

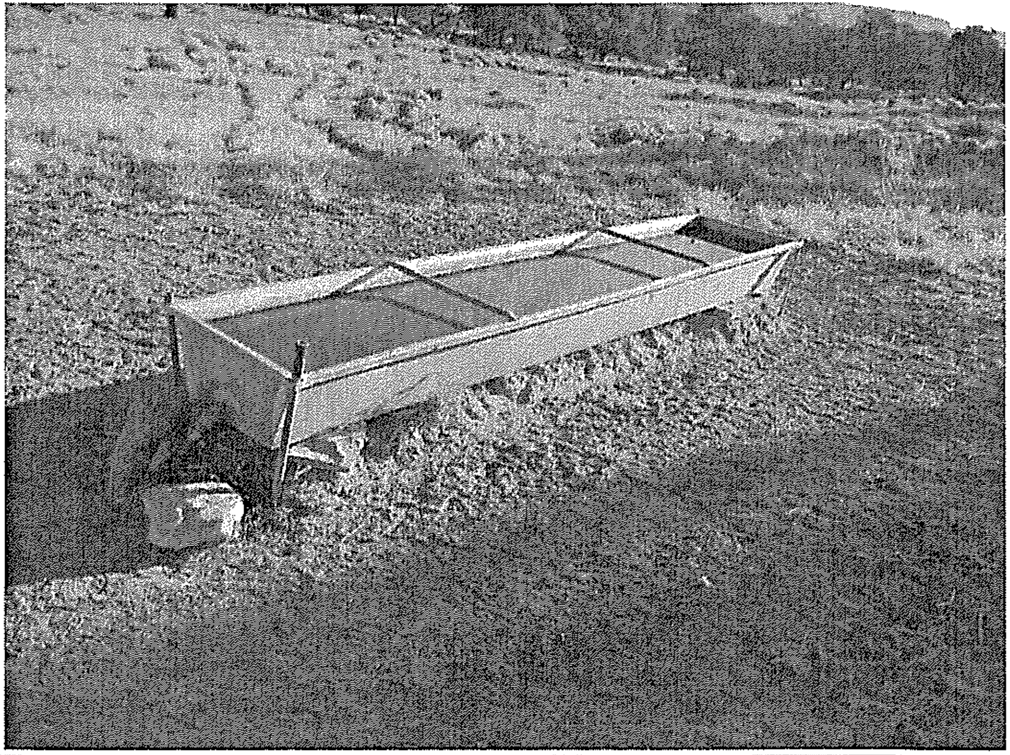
Well 14T-586



Date: 10/19/10

Description:

Well 14T-586



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

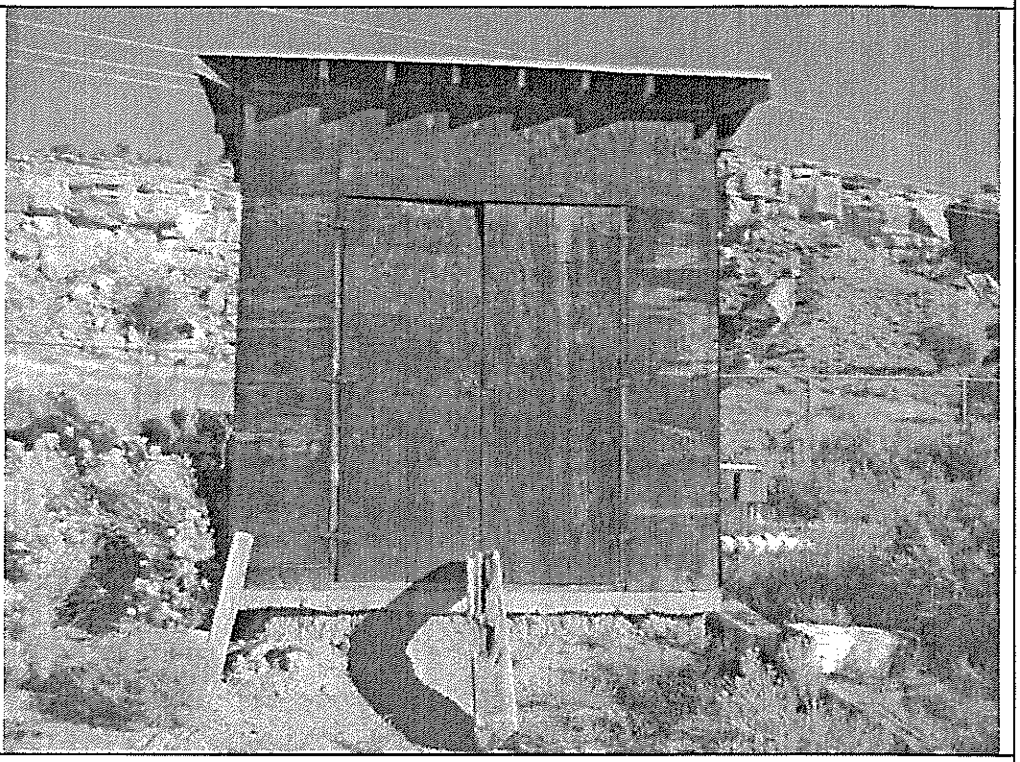
002693.2103.01RA

T02-09-10-08-0005

Date: 10/19/10

Description:

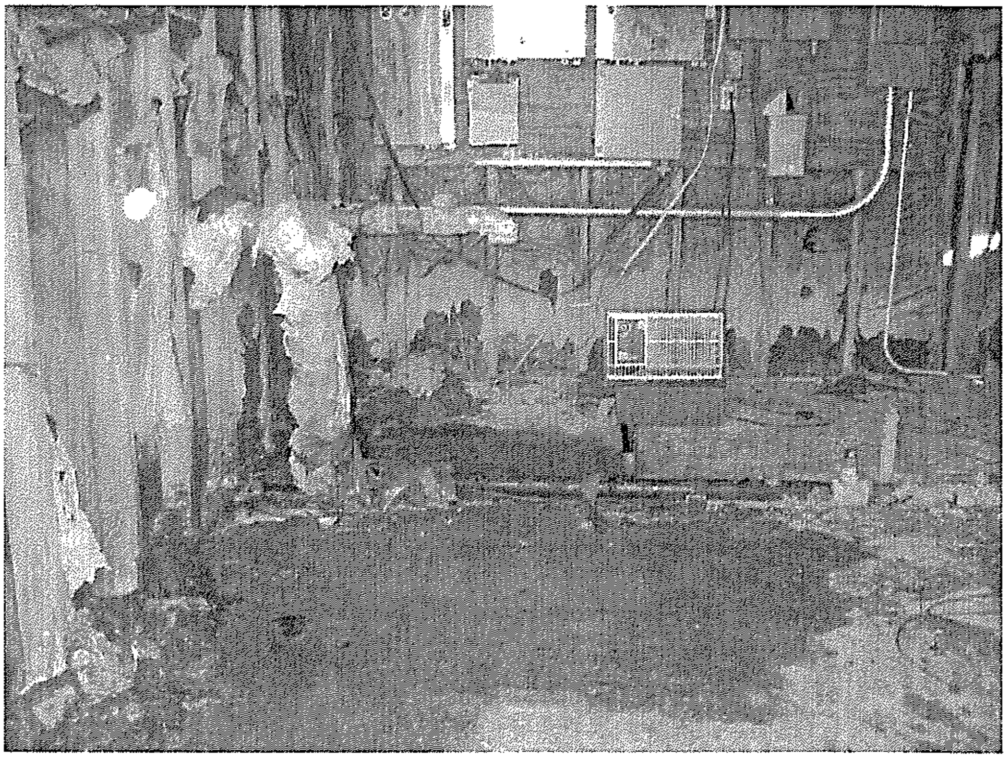
Mill Well



Date: 10/19/10

Description:

Mill Well



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

002693.2103.01RA

T02-09-10-08-0005

Date:
10/19/10

Description:
Mine Well

Date:
10/19/10

Description:

Well NR#1

PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

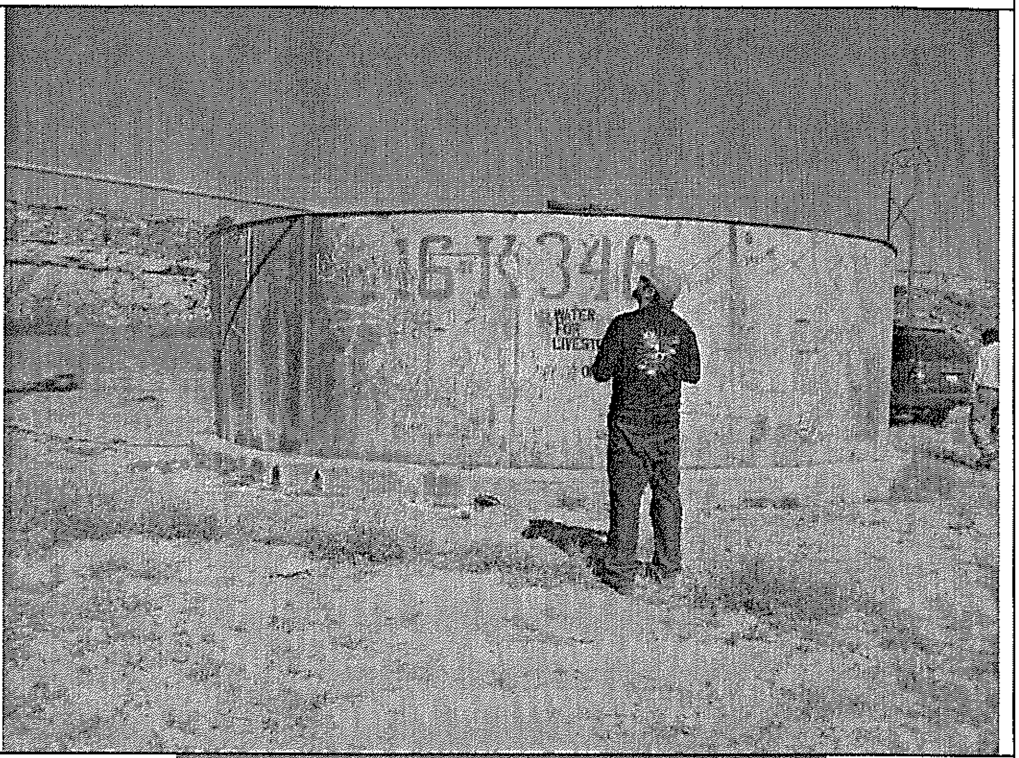
002693.2103.01RA

T02-09-10-08-0005

Date: 10/19/10

Description:

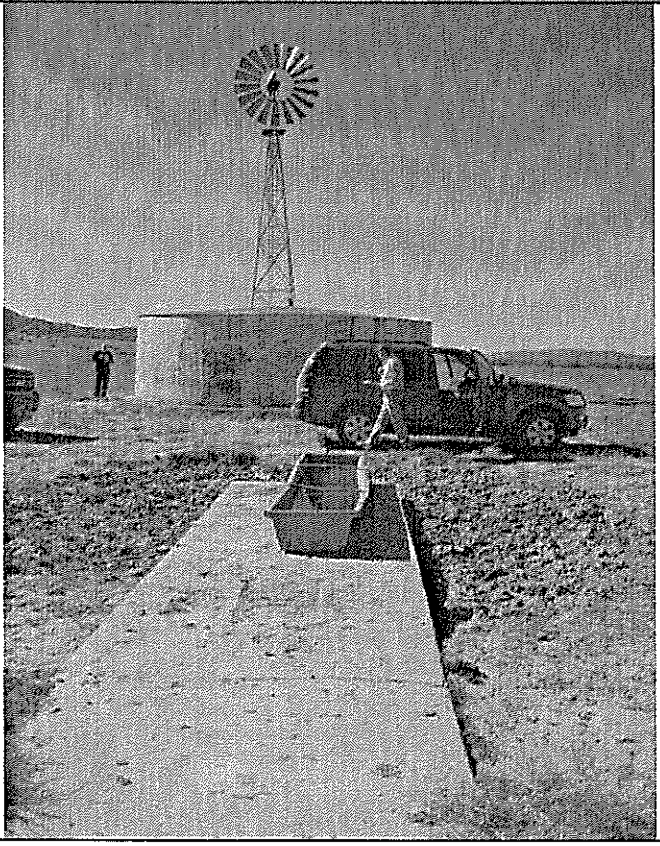
16K-340



Date: 10/19/10

Description:

16K-340



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

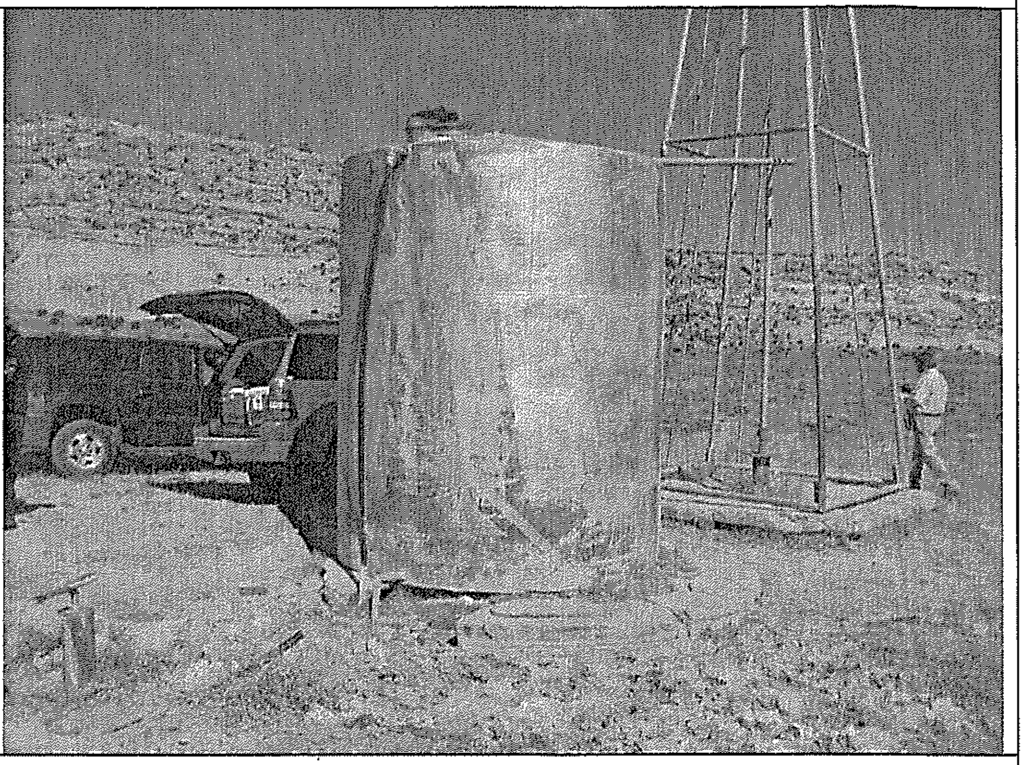
002693.2103.01RA

T02-09-10-O8-0005

Date: 10/19/10

Description:

16K-336



Date: 10/19/10

Description:

16K-336

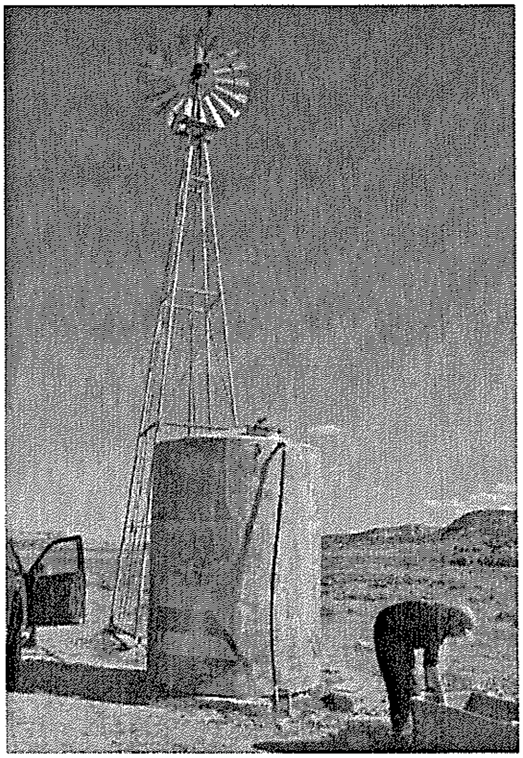


Table J
Reporting Limits, Action Levels, and Quality Control Limits

Analysis	Analyte	Action Level (mg/L)	Quantitation Limit (μg/L)	Duplicate RPD	Matrix Spike	Matrix Spike RPD
Anions by 300.0	Fluoride	4	0.10	25	75-125	20
Anions by 300.0	Chloride	250	1.0	25	75-125	20
Anions by 300.0	Nitrite as N	1	0.10	25	75-125	20
Anions by 300.0	Nitrate as N	10	0.10	25	75-125	20
Anions by 300.0	o-Phosphate, as P	Not Available	1.0	25	75-125	20
Anions by 300.0	Sulfate	250 (s)	0.50	25	75-125	20
Metals by 6010B	Aluminum	0.1	100	25	75-125	20
Metals by 6010B	Antimony	0.1	100	25	75-125	20
Metals by 6010B	Arsenic	0.01	10	25	75-125	20
Metals by 6010B	Barium	2	20	25	75-125	20
Metals by 6010B	Beryllium	0.005	5	25	75-125	20
Metals by 6010B	Cadmium	0.01	10	25	75-125	20
Metals by 6010B	Calcium	Not Available	1000	25	75-125	20
Metals by 6010B	Chromium	0.10	10	25	75-125	20
Metals by 6010B	Cobalt	Not Available	20	25	75-125	20
Metals by 6010B	Copper	1.3 (s)	20	25	75-125	20
Metals by 6010B	Iron	Not Available	50	25	75-125	20
Metals by 6010B	Lead	0.015	5	25	75-125	20
Metals by 6010B	Magnesium	Not Available	600	25	75-125	20
Metals by 6010B	Manganese	0.05 (s)	15	25	75-125	20
Metals by 6010B	Mercury	0.002	0.5	25	75-125	20
Metals by 6010B	Nickel	Not Available	20	25	75-125	20
Metals by 6010B	Potassium	Not Available	5000	25	75-125	20
Metals by 6010B	Selenium	0.05	10	25	75-125	20
Metals by 6010B	Silver	0.10 (s)	10	25	75-125	20
Metals by 6010B	Thallium	0.002	10	25	75-125	20
Metals by 6010B	Vanadium	Not Available	20	25	75-125	20
Metals by 6010B	Zinc	5 (s)	10	25	75-125	20
Gross alpha by 900.0	alpha	See table A-1	1.0 piC/L	25	75-125	20
Gross beta by 900.0	beta	See table A-1	1.0 piC/L	25	75-125	20
903.1	Ra-226	See table A-1	1.0 piC/L	25	75-125	20
904.0	Ra-228	See table A-1	1.0 piC/L	25	75-125	20
Isotopic Th by HASL 300 Th-01-RCmod	Th-238, 230, 232	See table A-1	1.0 piC/L	25	75-125	20
Isotopic U by HASL 300 U-02-RC mod	U-233/234, U-235/236, U-238	See table A-1	1.0 piC/L	25	75-125	20

Key: RPD = relative percent difference; mg/L = milligrams per liter; μ/L = micrograms per Liter NA = Not Applicable

(s) = National Secondary Drinking Water Regulation not enforceable and not an action limit for this assessment

Engineering/Remediation
Resources Group, Inc.

EXPENSE REPORT

Signatures:	(Employee)	1/11/2011 (Date)
	(Approved by)	(Date)

Employee Name: Traves Young
Vendor No.:

Week Ending: January 11, 2011
Location: Martinez

Date	Project Number: Project	Phase	Task	Billable? (Y) (N)	Air Fare	Auto @ 50¢/mi.: Miles	Amount	Ground Transportation	Allowable Lodging, Meals & Incidentals	Unallowable Lodging, Meals & Incidentals	Business Meals	Ref.	Entertainment & Unallowables	Other	Brief Description	ERRG Credit Card Charges	TOTAL
12/13/2010	2010-034	02	02	N								a			Lube		4.91
11/30/2010	2010-034	02	02	N								b			H & S Water		31.14
12/1/2010	2010-034	02	02	N								a			Rope		9.56
12/6/2010	2010-034	02	02	N								b			Sampling Supplies		13.03
12/8/2010	2010-034	02	02	N								a			Hilti Chisl bit		59.59
12/9/2010	2010-034	02	02	N								a			Const. Suppies		31.63
12/22/2010	2010-034	02	02	N								a			Const. Suppies		39.24
12/16/2010	2010-034	02	02	N								a			Const. Suppies		56.51
12/8/2010	2010-034	02	02	N								a			TrucksStraps		30.50
1/4/2011	2010-034	02	02	N								f			(2) Toll		10.00
12/6/2010	2010-034	02	02	N								d			Fuel		75.00
12/1/2010	2010-034	02	02	N								a			Tri-Wall Pallets		60.09
12/21/2010	2010-033	03	04	N								e			Formwork Waste Dissposal		39.25
12/21/2010	29-209	02	04	Y								e			CMP Dissposal		30.00
Totals															Subtotals		490.45

Date(s) and/or Time(s)					Reference	Business Purpose, Guest, Company, etc.
12/13/2010	2010-034	02	02	N	a	Construction Supplies needed for excavating soil
12/1/2010	2010-034	02	02	N	b	Health and Safety Supplies
12/6/2010	2010-034	02	02	N	c	Sampling Supplies
12/8/2010	2010-034	02	02	N	a	Construction Supplies needed for excavating soil
12/9/2010	2010-034	02	02	N	a	Construction Supplies needed for excavating soil
12/22/2010	2010-034	02	02	N	a	Construction Supplies needed for excavating soil
12/16/2010	2010-034	02	02	N	a	Construction Supplies needed for excavating soil
12/8/2010	2010-034	02	02	N	a	Construction Supplies needed for excavating soil
1/4/2011	2010-034	02	02	N	f	Toll Fee
12/6/2010	2010-034	02	02	N	d	Fuel for ERRG Pickup
12/1/2010	2010-034	02	02	N	a	Construction Supplies needed for excavating soil
12/21/2010	2010-033	03	04	N	e	Recycling Center fee
12/21/2010	29-209	02	04	Y	e	Recycling Center fee

LESS: COMPANY PAID EXPENSE (Credit Card Chgs)	
LESS: ADVANCE or OTHER OFFSET(S)	
AMOUNT DUE ASSOCIATE	490.45
AMOUNT DUE COMPANY	

LMI - LODGING, MEALS/PER DIEM AND INCIDENTALS DAILY ACTIVITY

Date	Project Charge Number: Project	Phase	Task		Lodging	Meals or Partial Per Diem Detail: Breakfast	Lunch	Dinner	Daily Per Diem	Incidentals	Total LMI
		TOTALS									
		TOTALS									

UNALLOWABLE LMI COMPUTATION

Total LMI	(Less: Unallow. Meals	Adj. LMI	FTR Daily Limit	Allow. LMI	Unallow. LMI

10/29/03

Water Sources in Church Rock Area Sampled in 2003 by CRUMP Water Assessment Team

Well #	Well Name	Chapter	Latitude	Longitude	TRS Coordinates	Formation	Well Type	TD (ft)	Use(s)
Grey	Annie Grey	Pinedale	35,37 457	108,30 670	16 16 14 1111	Qal	dug, HP	8	LS, DOM
Solar	Solar St	Church Rock	35,32 158	108,35 753	15 17 13 1	Qal?	drilled, HP	unk	LS
14K-313	Brown Bull	Coyote Cyn	35,39 982	108,34 113	17 16 32 or 29	Kg	drilled, WM	622	LS, DOM
14K-586	Friendship I	Coyote Cyn	35,39 432	108,30 557	17 16 35	Kmv or Kg	drilled, PWS	750	abd-CWS
15K-303	Pipeline Cyn	Standing Rk	35,40 277	108,28 698	17 15 29 421	Kg	drilled, WM	614	LS
16-4-10	Lime Ridge	Church Rock	35,34 315	108,34 633	16 16 31 33	Jmw?	dug, HP	<1	LS, DOM
16K-336	Puerco No Fork	Church Rock	35,34 362	108,38 202	16 17 33 4223	Qal	drilled, WM	122	LS
16K-340	Windmill Cluster	Church Rock	35,35 582	108,35 890	16 17 25 1132	Qal	drilled, WM	141	LS
16T-348	Lobo Valley	Pinedale	35,37 178	108,27 195	16 15 17 1431	Kd	drilled, WM	410	LS
16T-534	Superman Cyn	Church Rock	35,35 818	108,38 675	16 17 21 344	Jmw	drilled, WM	410	DOM, LS
16T-559	Coal Mine/ Henry's	Church Rock	35,27 560	108,39 207	15 17 33 43	unk	drilled, WM	unk	LS
16T-606	King Ranch	Church Rock	35,36 998	108,33 237	16 16 17 411	Kd	drilled, WM	417	LS
16T-608	Yazzie Family	Church Rock	35,31 123	108,38 332	15 17 21 4	unk	drilled, WM	unk	DOM, LS

Following Pages

Summary of General Chemistry
Summary of Heavy Metals
Summary of Radionuclides
Complete field chemistry reported by NMED
Complete radionuclide analyses reported by NMED
Complete uranium analyses reported by USEPA

Abbreviations and Symbols

TRS = Township, Range, Section
TD = Total Depth of well, in feet, unk = unknown depth
Uses abd-CWS = abandoned community water system, DOM = domestic, LS = livestock,
Type HP = hand pump, WM = windmill
Formation Qal = alluvium, Kd = Dakota SS, Kg = Gallup SS, Kmv = Mesa Verde, Jmw = Morrison/Westwater (?)
NNEPA = Navajo Nation Environmental Protection Agency
USEPA = U S Environmental Protection Agency

Summary of General Chemistry

Well #	Sampling Date	Dissolved Solids (mg/L)	Calcium ($CaCO_3$) (mg/L)	Magnesium (mg/L)	Potassium (mg/l)	Sodium (mg/L)	Total Hardness (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	pH (Units)
USEPA or NNEPA MCL		500	75-200	none	none	none	500	250	250	6 5-8 5
Lab		NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	field
Grey	10/28/2003	**553 5**	**376 0**	(???) -36	6 69	24 1	240 0	4 5	**305 0**	7 72
Solar	10/29/2003	**561 8**	38 0	120 0	4 00	27 9	148 0	4 64	**352 0**	**8 61**
14K-313	10/29/2003	**1,095 0**	**640 0**	440 0	4 36	105 0	**1,080 0**	10 7	**1,070 0**	8 31
14K-586	8/5/2003	**2,136 0**	**251 8**	125 1	7 10	143 1	**1,143 9**	19 1	**1,097 2**	8 07
15K-303	10/28/2003	**3,043 0**	**980 0**	(???) -940	5 97	191 0	40 0	12 1	**1,940 0**	8 13
16-4-10	10/29/2003	237 5	152 0	32 0	1 61	8 37	184 0	14 3	27 1	7 45
16K-336	10/29/2003	**887 6**	200 0	88 0	2 84	207 0	288 0	20 9	122 0	8 05
16K-340	10/29/2003	**1,469 0**	**420 0**	180 0	3 65	256 0	**600 0**	25 5	**419 0**	8 16
16T-348	10/29/2003	**660 9**	4 0	8 0	0 86	222 0	12 0	3 48	155 0	**9 63**
16T-534	10/29/2003	**811 8**	132 0	76 0	3 00	179 0	208 0	8 0	**314 0**	**8 67**
16T-559	10/28/2003	498 4	12 0	15 0	1 71	162 0	27 0	4 59	148 0	**8 87**
16T-606	10/28/2003	**3,500 0**	196 0	1,740 0	6 91	245 0	**1,940 0**	23 3	**1,130 0**	7 45
16T-608	10/28/2003	**1,015 0**	24 0	36 0	0 86	390 0	60 0	**251 0**	134 0	**8 82**

Boldface numbers indicate values exceeding standards

Abbreviations MCL = maximum contaminant level, mg/L = milligrams per liter, NMSLD = New Mexico Scientific Laboratory Division, NTUA = Navajo Tribal Utility Authority, ??? = data are questionable

Summary of Heavy Metals and Aesthetic Parameters

Well #	Sampling Date	Arsenic (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Fluoride (mg/L)	Iron (mg/L)
USEPA or NNEPA MCL		0 010	0 005	0 05	1 3	0 02	0 1	0 05	1 6 (WQCC)	0 3
Lab		NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	NTUA	field*	field*
Grey	10/28/2003	<0 005	<0 0002	<0 001	<0 02	0 001	<0 04	<0 005	0 92	0 01
Solar	10/29/2003	<0 005	<0 0002	<0 001	0 062	<0 001	<0 04	<0 005	0 32	4 10
14K 313	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	1 34	**0 54**
14K 586	8/5/2003	0 008**	<0 001**	<0 001**	<0 1**	<0 001**	<0 1**	<0 005**	not tested	**5 10****
15K 303	10/28/2003	<0 005	<0 0002	<0 001	0 026	<0 001	<0 04	<0 005	**1 60**	**0 68**
16 4 10	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	0 043	0 58	0 10
16K 336	10/29/2003	0 006	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	1 03	**2 00**
16K 340	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 71	**0 40**
16T 348	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 47	0 02
16T 534	10/29/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 44	**0 49**
16T 559	10/28/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	0 64	0 07
16T 606	10/28/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	<0 005	1 16	**3 28**
16T 608	10/28/2003	<0 005	<0 0002	<0 001	<0 02	<0 001	<0 04	0 006	**1 96**	0 12

*field tests by New Mexico Environment Department

**lab results reported by NMSLD

Boldface numbers indicate values exceeding standards

Abbreviations MCL = maximum contaminant level mg/L = milligrams per liter NMSLD = New Mexico Scientific Laboratory Division
NTUA = Navajo Tribal Utility Authority WQCC = N M Water Quality Control Commission groundwater standard ??? = data are questionable

Summary of Selected Radionuclides*

Well #	Sampling Date	Gr Alpha (U Nat Ref) (pCi/L)	Gr Beta (Sr/Y 90 Ref) (pCi/L)	Radium 226 (pCi/L)	Radium 228 (pCi/L)	Total Uranium (pCi/L)	Uranium mass (ug/L)
USEPA or NNEPA MCL		15	none	combined 5 0		none	30
Grey	10/28/2003	7 20	9 40	0 10	0 40	9 94	14 84
Solar	10/29/2003	nd	4 40	0 08	0 20	0 16	0 24
14K 313	10/29/2003	nd	4 40	0 04	0 50	0 04	0 05
14K 586	8/5/2003	10 80	14 90✓	2 60	not tested	not tested	3 00
15K 303	10/28/2003	4 00	9 00	0 47	1 50	0 46	0 69
16 4 10	10/29/2003	**44 10**	26 00	0 33	0 70	46 48	**69 37**
16K 336	10/29/2003	5 90	4 40	0 83	0 30	0 38	0 57
16K 340	10/29/2003	nd	4 90	0 40	0 40	1 96	2 92
16T 348	10/29/2003	nd	1 60	nd	0 60	0 20	0 29
16T 534	10/29/2003	nd	2 70	0 20	0 50	0 10	0 15
16T 559	10/28/2003	nd	1 50	0 05	nd	0 06	0 09
16T 606	10/28/2003	**40 00**	20 40	**8 34**	**0 80**	4 68	6 99
16T 608	10/28/2003	5 40	nd	0 04	1 40	3 86	5 76

*All samples except for 14T 586 analyzed at USEPA lab in Las Vegas NV 14T 586 analysis at N M State Laboratory

Boldface numbers indicate values exceeding standards

Abbreviations MCL = maximum contaminant level pCi/L = picoCuries per liter

TABLE C

CHEMICAL GROUND-WATER ANALYSES OF TRIBAL WELLS AND SPRINGS OPERATED BY THE GROUND-WATER DEVELOPMENT AND SHALLOW WELL AND SPRING DEVELOPMENT DEPARTMENTS (continued)

Quad. #	Miles from NE-Corner West South	Field # or Name	Date Col-lect	SiO_2	Ca	Mg	Na	HCO_3	CO_3	SO4	Cl	F	NO_3	Hard-ness ppm	Dis-solved Solids	Conduc-tance	pH	Geological Formation
				Parts Per Million (ppm)														
								District 16 (continued)										
106	0.55 x 16.15	16B-12	5/50	11	169	87	24	247	0	596	5	.2	..3	779	1010	1350		Glorieta
	5.35 x 14.70	16B-40A	2/64		356	236		220	0	385	20			592	1125	1500	8.1	Glorieta
	7.60 x 12.10	16K-336	9/53	58	80	19	227	776	0	91	26	1.4	.3	278	832	1330		Alluvium
	5.45 x 10.80	16K-340	6/54	12	139	44	264	890	0	314	24	.6	13	528	1250	1810		Alluvium
	12.92 x 10.30	16T-525	12/53					458	52		10					1080	8.6	Crevasse Canyon
	4.65 x 12.80	16-3-7	8/49					153	0		8					268		Westwater Canyon
107	4.60 x 10.00	16K-328 16-18	8/53	5.1	20	11	262	498	11	210	12	.0	1.9	95	778	1280		Menefee
	8.55 x 16.70	16T-339	8/54	14	48	13	157	364	0	138	13	.5	.2	174	613	937		Gallup
	4.75 x 7.20	16T-524	11/53					310	67		8			14		842	8.8	Menefee
	0.25 x 8.55	16T-526	12/53					548	55		9			50		1260	8.4	Menefee+ Crevasse Canyon
108	2.15 x 6.35	16-2-8	3/50					590	0	2430						4320		Landslide
119	10.50 x 10.00	16T-521	11/63	10	19	1.5	204	416	0	124	15	2.0	.7	54	581	912	7.9	Entrada
120	12.05 x 5.55	16B-39	12/48		1.2	.5	141	244	16	54	19	.4	.9	5	353	576		Sonsela
	7.35 x 4.20	16-5-9	3/53					114	0		4650			373		13400		Petrified Forest, Upper
	7.75 x 4.50	San Antone Spr.	11/48		2.0	3.3	219	436	0	77	33	1.2	8.6	18	559	881		Wingate (Rock Point)
121	0.50 x 4.55	16T-529	3/64	7.1	10	2.4	147	236	0	92	44	.8	.0	35	419	687	8.2	Glorieta
123	0.35 x 3.40	16K-321 16-4-20	5/51	10	58	21	287	587	0	314	30	1.6	.8	231	1010	1560		Gallup

LOCATION FILE

NEW

TRIBAL WELL NO 16K-340

PWSID

WELL NAME/OTHER NO

WELL TYPE
(MARK ONLY ONE)

☒ WW WATER WELL
☐ WA ARTESIAN WELL
☐ WS SPRING
☐ NS NATURAL SPRING
☐ OW OBSERVATION WELL
☐ GS GAS WELL
☐ OP OIL PRODUCTION
☐ MW MINERAL WELL
☐ XX UNKNOWN

WELL STATUS
(MARK ONLY ONE)

☒ ACT ACTIVE
☐ INA INACTIVE
☐ ABA ABANDONED
☐ UNK UNKNOWN

WELL USE
(MARK ONLY ONE)

☐ DOM DOMESTIC
☐ AGR AGRICULTURE
☒ LIV LIVESTOCK
☐ IND INDUSTRIAL MINING
☐ REC RECREATION
☐ MUN MUNICIPAL
☐ OTH OTHER
☐ UNK UNKNOWN

QUAD NO 5262

MILES WEST .

MILES SOUTH .

NE SE SW NW / NE SE SW NW / NE SE SW NW
10 ACRE 40 ACRE 160 ACRE

SECT.

TOWNSHIP T .

RANGE W .

APPROXIMATE LOCATION 2 M NW of Kit Carson Cave

LATITUDE

LONGITUDE

UTM COORDINATES: X(EAST) 717669

Y(NORTH) 3941251

ZONE 12

OPERATOR Tribe OHM

USGS WATERSHED CODE 15020066000

STATE:
☐ AZ ARIZONA
☒ NM NEW MEXICO
☐ UT UTAH
☐ CO COLORADO

COUNTY:
☐ AP APACHE
☐ NA NAVAJO
☐ CO COCONINO
☒ MK MCKINLEY
☐ VL VALENCIA
☐ BL BERNALLILLO
☐ SD SANDOVAL
☐ SO SOCORRO
☐ RA RIO ARRIBA
☐ SA SAN JUAN
☐ SJ SAN JUAN
☐ KA KANE
☐ MT MONTEZUMA
☐ LP LA PLATA

GRAZING DISTRICT 16

CHAPTER NAME: CHURCH ROCK

CHAPTER CODE Chur

LOCATION DATA SOURCE: Well FILE/FLD CHKD 3/95

LOCATION FILE COMPLETED BY: GKinsel/M.S. Johnson

DATE 4/18/95

FIELD CHECKED BY: GKinsel/Johnson

DATE 03/30/95

revised 07 April 93

/dbase/wells/doc/Loc-Form.wp

TRIBAL WELL NO 16T-3-10 STARTED 6 / __ / 1954 COMPLETED 6 / 23 / 1954

ELEVATION 6682 FT DEPTH 141 DEPTH MEASURED ___/___/___

DEPTH IS ☐ MEASURED ☐ ESTIMATED ☒ REPORTED WELL DIA. 10.00 IN

1 CASING DIA 8.62 FROM -0.25 FT TO 141 FT MATL STL

2 CASING DIA ☐ FROM ☐ FT TO ☐ FT MATL ☐

3 CASING DIA ☐ FROM ☐ FT TO ☐ FT MATL ☐

4 CASING DIA ☐ FROM ☐ FT TO ☐ FT MATL ☐

CASING MATL CODES: brs=brass cop=copper evd=everdur irn=iron mon=monel
pls=plastic stl=steel sst=stainless steel

1 CASING PERFORATED FROM 101 FT TO 141 FT OPENING TYPE P

2 CASING PERFORATED FROM ☐ FT TO ☐ FT OPENING TYPE ☐

3 CASING PERFORATED FROM ☐ FT TO ☐ FT OPENING TYPE ☐

4 CASING PERFORATED FROM ☐ FT TO ☐ FT OPENING TYPE ☐

5 CASING PERFORATED FROM ☐ FT TO ☐ FT OPENING TYPE ☐

OPENING CODES: f=fractured rock l=louvered/shutter-type screen m=mesh screen
p=perforated/porous/slotted casing r=wire-wound screen
s=screen/type unknown t=sand point w=walled/shored x=open hole
z=other

DATE WELL TURNED OVER TO TRIBE: ___/___/___

FUNDED BY: ☐ CONTRACTOR: R. H. Dunning

SITE IMPROVEMENTS	TYPE OF LIFT	ENERGY SOURCE
☒ WM WINDMILL	☐ AL AIRLIFT	☐ EM ELECTRIC MOTOR
☒ WP WATERING POINT	☒ PS PISTON	☐ DE DIESEL ENGINE
☒ TA TANK	☐ TU TURBINE	☐ HA HAND
☒ WL WATER LINE	☐ MT MULTIPLE TURBINE	☐ GS GAS ENGINE
☐ TR TROUGH	☐ CN CENTRIFUGAL	☐ LP LP GAS ENGINE
☐ CS CISTERN	☐ MC MULTIPLE CENTRIFUGAL	☐ NG NATURAL GAS ENGINE
☐ HP HAND PUMP	☐ BU BUCKET	☒ WM WINDMILL
☐ NO NONE	☐ SU SUBMERSIBLE	☐ SO SOLAR

PUMP HP ☐ ON SITE STORAGE CAPACITY 27,900 GAL

STRUCTURE DATA SOURCE: WELL FILE/FLD CHECKED 3/95

STRUCTURE FILE COMPLETED BY: GKinsel/M.J. Johnson DATE 4/18/95

revised 08 April 93 /dbase/wells/doc/str-form.wp

HYDROLOGY FILE

TRIBAL WELL NO 16R-340 USGS AQUIFER CODE 110ALVM

THICKNESS ☐ FT NOMINAL YIELD ☐ GPM YIELD MEASURED ___/___/___

☒ BAILER ☐ PUMP TEST @ 23.3 GPM FOR ☐ HOURS DATE 6/23/1954

DRAWDOWN 68 FT OBSERVATION WELL DATA AVAILABLE ☐ YES ☒ NO

HORIZ CONDUCTIVITY ☐ FT/DAY SPECIFIC CAPACITY ☐ GPM/FT

VERT. CONDUCTIVITY ☐ FT/DAY STORAGE COEF ☐

COEF OF TRANSMISSIVITY ☐ FT2/DAY

INDICATE ADDITIONAL PUMPING TEST DATA AVAILABLE AS HARD COPY:

☐ YES ☐ NO MULTIPLE RATE DRAWDOWN PUMPING TEST

☐ YES ☐ NO SINGLE RATE DRAWDOWN PUMPING TEST

☐ YES ☐ NO MULTIPLE RATE DRAWDOWN/RECOVERY TEST

☐ YES ☐ NO RECOVERY TEST

LOG AVAILABLE: ☒ DL DRILLER'S ☐ EL ELECTRIC LOG

HYDROLOGY DATA SOURCE: WELL FILE/USGS LITH LOG

HYDROLOGY FILE COMPLETED BY: G.Kinsel/M.S. Johnson DATE 4/8/95

STATIC WATER LEVEL FILE

DEPTH TO SWL 30.5 FT DATE 6/6/1954 DEPTH TO SWL ___ FT DATE ___/___/___

DEPTH TO SWL 37.5 FT DATE 6/23/1954 DEPTH TO SWL ___ FT DATE ___/___/___

DEPTH TO SWL ___ FT DATE ___/___/___ DEPTH TO SWL ___ FT DATE ___/___/___

DEPTH TO SWL ___ FT DATE ___/___/___ DEPTH TO SWL ___ FT DATE ___/___/___

DEPTH TO SWL ___ FT DATE ___/___/___ DEPTH TO SWL ___ FT DATE ___/___/___

DEPTH TO SWL ___ FT DATE ___/___/___ DEPTH TO SWL ___ FT DATE ___/___/___

DEPTH TO SWL ___ FT DATE ___/___/___ DEPTH TO SWL ___ FT DATE ___/___/___

DEPTH TO SWL ___ FT DATE ___/___/___ DEPTH TO SWL ___ FT DATE ___/___/___

DEPTH TO SWL ___ FT DATE ___/___/___ DEPTH TO SWL ___ FT DATE ___/___/___

DEPTH TO SWL ___ FT DATE ___/___/___ DEPTH TO SWL ___ FT DATE ___/___/___

DEPTH TO SWL ___ FT DATE ___/___/___ DEPTH TO SWL ___ FT DATE ___/___/___

GEOHYDROLOGIC UNITS

TRIBAL WELL NO 16K-340

SEQ-NO 001

DEPTH TO TOP 0

DEPTH TO BOTTOM

GEOHYDRO-UNIT 110ALVM

LITH. SAND

LITHOLOGIC MODIFIER YLW-BRN/LT GRY/VF-C GR/PR SORT

CONTRIBUTING UNIT CODE P

SEQ-NO

DEPTH TO TOP

DEPTH TO BOTTOM

GEOHYDRO-UNIT

LITH.

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE

SEQ-NO

DEPTH TO TOP

DEPTH TO BOTTOM

GEOHYDRO-UNIT

LITH.

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE

SEQ-NO

DEPTH TO TOP

DEPTH TO BOTTOM

GEOHYDRO-UNIT

LITH.

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE

SEQ-NO

DEPTH TO TOP

DEPTH TO BOTTOM

GEOHYDRO-UNIT

LITH.

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE

INTERVAL FILE COMPLETED BY: M. S. Johnson

DATE 4/18/95

revised 08 April 93

/dbase/wells/doc/Int-Form.wp

COMMENTS FILE

TRIBAL WELL NO 16T-340

PERTINENT COMMENTS: available Drillerslog, ~~Laboratory~~ WATER QUALITY / Data ~~sheet / Report~~

USGS Lithologic log + Inspection Report, ALL IN WELL FILE.

REPORTED Perforations: "2 bottom joints" (ASSUMED 20 FT JOINTS). ~~the GPM 20 or 27,3 at 100'?~~ 27,900-gallon covered tank on Concrete Base.

Tank Labelled with well Number (16T-340). Under Ground waterline From tank to hand Valve WP, Concrete Pad for Troughs, But Trough Removed, WP ~ 75' North of well

Another Concrete Trough Pad Located immediately south of well, ~~Unknown Electric Log~~ GEOHYDROLOGIC UNITS FROM DRILLER'S LOG.

☒ LOCATION COORDINATES MEASURED WITH GPS DEVICE 8 SATELLITES VISIBLE

☐ LOCATION COORDINATES PICKED OFF TOPO MAP -SCALE=

☒ ELEVATION PRINTED ON TOPO MAP -SCALE= 1:24,000

☐ ELEVATION MEASURED WITH GPS UNIT -4 SATELLITES VISIBLE

☐ ELEVATION INTERPOLATED FROM 1:24000 TOPO

THE IMPROVEMENTS AT THIS SITE ARE:

☐ IN GOOD CONDITION

☒ IN FAIR CONDITION

☐ IN POOR CONDITION

☐ NEED SOME MAINTENANCE

☐ NEED MAJOR MAINTENANCE

STORAGE TANK IS ☒ COVERED ☐ UNCOVERED

COMMENTS BY: GKihsel/MS.Johnson

DATE 4/18/95

revised 07 April 93

/dbase/wells/doc/Com-Form.wp

RIBAL WELL RECO
FIELD REPORT

16K-340

"NEW"
(NOT IN WELLS DATABASE)

TRIBAL WELL NO 16T-340

PWSID

WELL NAME/OTHER NO

WELL TYPE
(MARK ONLY ONE)

☒ WW WATER WELL
☐ WA ARTESIAN WELL
☐ WS SPRING
☐ NS NATURAL SPRING
☐ OW OBSERVATION WELL
☐ GS GAS WELL
☐ OP OIL PRODUCTION
☐ MW MINERAL WELL
☐ XX UNKNOWN

WELL STATUS
(MARK ONLY ONE)

☒ ACT ACTIVE
☐ INA INACTIVE
☐ ABA ABANDONED
☐ UNK UNKNOWN

WELL USE
(MARK ONLY ONE)

☐ DOM DOMESTIC
☐ AGR AGRICULTURE
☒ LIV LIVESTOCK
☐ IND INDUSTRIAL MINING
☐ REC RECREATION
☐ MUN MUNICIPAL
☐ OTH OTHER
☐ UNK UNKNOWN

APPROXIMATE LOCATION

QUAD NO 52662   QUAD NAME CHURCH ROCK, NM   QUAD YEAR 1963 (PR 1979)

UTM COORDINATES: X(EAST) 717664   Y(NORTH) 3941251   ZONE 12

OPERATOR: ☒ TRIBE O&M ☐ NTUA ☐ BIA ☐ HOPI OTHER ☐ UNKNOWN

FIELD CHECKED BY: GKINSEL/JOHNSON   DATE 03/30/95

ELEVATION 6682   FT DEPTH   DEPTH MEASURED ___/___/___

DEPTH IS ☐ MEASURED ☐ ESTIMATED ☐ REPORTED   CASING ~~WELL~~ DIA. 8.62 IN
-0.25 FT

SITE IMPROVEMENTS

☒ WM WINDMILL
☒ WP WATERING POINT
☒ TA TANK
☒ WL WATER LINE
☐ TR TROUGH
☐ CS CISTERN
☐ HP HAND PUMP
☐ NO NONE

TYPE OF LIFT

☐ AL AIRLIFT
☒ PS PISTON
☐ TU TURBINE
☐ MT MULTIPLE TURBINE
☐ CN CENTRIFUGAL
☐ MC MULTIPLE CENTRIFUGAL
☐ BU BUCKET
☐ SU SUBMERSIBLE

ENERGY SOURCE

☐ EM ELECTRIC MOTOR
☐ DE DIESEL ENGINE
☐ HA HAND
☐ GS GAS ENGINE
☐ LP LP GAS ENGINE
☐ NG NATURAL GAS ENGINE
☒ WM WINDMILL
☐ SO SOLAR

PUMP HP   ON SITE STORAGE CAPACITY 27900 GAL

(OVER)

NOMINAL YIELD ☐☐☐☐ GPM LD MEASURED ____/____/____

☐ BAILER ☐ PUMP TEST @ ☐☐☐☐ GPM FOR ☐☐☐.☐ HOURS DATE ____/____/____

DRAWDOWN ☐☐☐☐☐ FT OBSERVATION WELL DATA AVAILABLE ☐ YES ☐ NO

DEPTH TO SWL ______FT DATE ____/____/____ DEPTH TO SWL ______FT DATE ____/____/____

PERTINENT COMMENTS:

27,900-gallon COVERED TANK ON CONCRETE BASE. TANK LABELLED WITH WELL NUMBER.

UNDERGROUND WATERLINE FROM TANK TO HAND VALVE WP. CONCRETE PAD FOR TROUGHS, BUT TROUGHS REMOVED.

WP ~75' NORTH OF WELL

ANOTHER CONCRETE TROUGH PAD LOCATED IMMEDIATELY SOUTH OF WELL.

☒ LOCATION COORDINATES MEASURED WITH GPS DEVICE 8 SATELLITES VISIBLE

☐ LOCATION COORDINATES PICKED OFF TOPO MAP ~SCALE= ________

☒ ELEVATION PRINTED ON TOPO MAP ~SCALE= 1:24,000

☐ ELEVATION MEASURED WITH GPS UNIT -4 SATELLITES VISIBLE

☐ ELEVATION INTERPOLATED FROM 1:24000 TOPO

THE IMPROVEMENTS AT THIS SITE ARE:

☐ IN GOOD CONDITION ☐ NEED SOME MAINTENANCE

☒ IN FAIR CONDITION ☐ NEED MAJOR MAINTENANCE

☐ IN POOR CONDITION

STORAGE TANK IS ☒ COVERED ☐ UNCOVERED

PHOTO OR SKETCH OR COMMENT

*POSSIBLE COMMENTS:
HOW WAS YIELD, SWL, STORAGE CAPACITY DETERMINE?
ACTUAL DIMENSIONS OF STORAGE DEVICE(S)?

/dbase/wells/doc/Field-Form.wp
revised 07 April 93

WELL RECORD

Water Well Development
Navajo Tribe
Window Rock, Arizona

WELL NO. 16K-340

Quad. No. 106 Miles west 5.45 Miles south 10.80

Location Sprinstead Trailer School - 2 miles NW of Kit Carson Cave

Began well Finished well June 6, 1954

Diameter of well 10" Depth of well 141

Static water level 30.5' Drawdown 68' Recovery

Quantity of water on test run: bailer: pump: 20 or 23.3 G. P. M. at 100' Tested for hours

Kind of casing: 8-5/8" x 141' Sizes and length

Screen kind Torch Cut Perforations Length 2 bottom joints Mesh

Contractor P.H. Dunning Address

LOG

DEPTH				
From	To	Formation	Acquifer	Remarks
0	15	Surface soil		
15	41	Soft sandy soil		
41	55	Buff clay		
55	70	Blue clay		
70	85	Blue snayd clay	Allubium	
85	140	Sand - streaks of clay - water		
140	141	Blue clay		

Remarks: Drawdown 68' from W.L. 37.5

S.P.

Tota Salts	Calcium Ca.	Magnesium Mg.	Sodium Na.	Chlorides Cl.	Sulfates SO_4	Carbonates HCO_3	P.H.	CO_3

Excellent Good Fair Poor Doubtful Not suitable for domestic, livestock use

NTRD-61

WELL RECORD

Water Well Development
Navajo Tribe
Window Rock, Arizona

WELL NO. 16K-340

Quad. No. 106 (¼ SE) Miles west 5.5 Miles south 11.05

Springstead Trailer School - 2 miles NW Kit Carson Cave
Location

Began well ____ Finished well 6 - 6 - 54

Diameter of well 8" Depth of well 141

Static water level ____ Drawdown ____ Recovery ____

Quantity of water on test run: bailer: pump: 20 G.P.M. Tested for at 100' ____ hours

Kind of casing: 8 5/8" x 141' Sizes and length ____

Screen kind Torch cut perforations Length 2 bottom joints Mesh ____

Contractor P. H. Dunning Address ____

LOG

DEPTH				
From	To	Formation	Acquifer	Remarks
0	15	Surface soil		
15	41	Soft sandy soil		
41	55	Buff Clay		
55	70	Blue clay		
70	85	Blue sandy clay		
85	140	Sand - streaks of clay - water		
140	141	Blue clay		

Remarks:

S.P.

Teta Salts	Calcium Ca.	Magnesium Mg.	Sodium Na.	Chlorides Cl.	Sulfates SO_4	Carbonates HCO_3	P.H.	CO_3

Excellent Good Fair Poor Doubtful Not suitable for domestic, livestock use

TABLE 2.6-2

SELECTED CHEMICAL ANALYSES OF GROUND WATER IN THE VICINITY OF PROPOSED MILL SITE

(constituents in parts per million unless otherwise noted)

Friendship

Location number and name	BIA Number	Aquifer (a)	Date Sampled	Silica SiO_2	Calcium Ca	Magnesium Mg	Sodium plus potassium Na + K	Bicarbonate HCO_3	Carbonate CO_3	Sulfate SO_4	Chloride Cl	Fluoride F	Nitrate NO_3	Total dissolved solids	Conductance μmhos @ 25° C
16.15.20.		Qal	8-1949	12	72	14	13	258	0	43	4	0.6	2.2	288	480
20.		Qal	5-1950	15	42	13	8	160	0	40	2	0.2	0.1	199	331
20.234 Pinedale TP		Km?	8-1949	12	170	55	161	359	0	590	50	0.4	24.0	1240	1710
16.16. 1.112	16K-319	Kd	6-1955	14	1.6	1.9	262	518	39	74	8	1.4	1.5	658	1050
16.16. 6.112	14N- 70	Kcd	5-1955	10	57	20	0.9	130	0	102	9	0.4	0.0	271	436
16.17.25.113	16K-340	Qal	6-1954	12	139	44	264	890	0	314	24	0.6	13.0	1250	1810
16.17.33.422 or 14K303	16K-336	Qal	9-1953	5.8	80	19	227	776	0	91	26	1.4	0.3	832	1330
~~17.15.30.341~~	~~15T-303~~	~~Kg~~	~~6-1955~~	~~15~~	~~151~~	~~89~~	~~504~~	~~297~~	~~0~~	~~2520~~	~~16~~	~~2.4~~	~~0.6~~	~~2450~~	~~3120~~
17.16.32.112 Brown Bull	14K-313	Kg	5-1955	17	218	99	72	271	0	835	11	0.8	0.0	1390	1760
17.16.35. Kerr McGee Mine		Jmw	11-1973	17	11	8.4	131.6	220	21	110	3.6	0.3	---	412	663
17.17. 7.233	14A- 79	Kcd	6-1949	--	3	0.9	105	237	0	38	4	0.2	0.5	268	455
17.17.16	14A- 14	Qal	5-1955	--	--	--	---	409	0	---	32	1.2	0.3	530	3370
Applicant's Mine		Jmw	11-1973	17	2.2	0.3	121.4	215	31	45	5.2	0.2	---	329	550

(a) Aquifers: Qal, alluvium; Kcc, Crevasse Canyon Formation; Kcd, Dalton Sandstone Mbr. , Crevasse Canyon Formation; Kmf, Menefee Formation; Kpl, Point Lookout Sandstone; Kg, Gallup Sandstone; Km, Mancos Shale; Kd, Dakota Sandstone; Jmw, Westwater Canyon Sandstone Mbr. of Morrison Formation; Jcs, Cow Springs Sandstone

14K303 should be 15T 503

JUL 6 1972

BUREAU OF INDIAN AFFAIRS
SOILS LABORATORY
GALLUP, NEW MEXICO
LABORATORY DATA SHEET FOR WATER SAMPLES

16K-340

LAB NO. 72-NT-610 FIELD NO.
COLLECTOR
LOCATION North of Church Rock
DATE RECEIVED BY LABORATORY 5-2-72
DATE ANALYSIS COMPLETED 7-5-72
DATE COLLECTED
DEPARTMENT Water Development AGENCY Ft. Defiance BRANCH Window Rock

ANALYZED BY A DR
TRANSCRIBED BY
CHECKED BY
REPORTED BY Dan Cooke
AUTHORIZED BY G. Soce
SOURCE OF WATER 16K340

		Meq/1	Mg/1
Temperature (^oF)			
Silica (SiO_2)			
Boron (B)			0.08
Iron (Fe)		0.001	0.01
Calcium (Ca)		8.80	176.35
Magnesium (Mg)		4.60	55.94
Sodium (Na)		12.45	286.23
Potassium (K)		0.06	2.35
Cations		25.91	
Phosphorus (P)			0.11
Bicarbonate (HCO_3)		11.56	705.39
Carbonate (CO_3)		1.76	52.82
Sulphate (SO_4)		10.21	490.39
Chloride (Cl)		0.70	24.82
Fluoride (F)		0.03	0.52
Nitrate (NO_3)		0.33	20.46
Anions		24.59	
Total Solids Mg/1			1423
Dissolved Solids Mg/1			1420
Dissolved Solids Tons Per Acre Foot	1.93		
Hardness as Mg/1 $CaCO_3$ Calcium, Magnesium			670
Hardness as Mg/1 $CaCO_3$ Non Carbonate			92
Alkalinity as Mg/1 $CaCO_3$ Phenolphthalein			88
Alkalinity as Mg/1 $CaCO_3$ Total Alkalinity (Methyl Orange)			578
Soluble Sodium Percentage (SSP)	48		
Sodium Absorption Ratio (SAR)	4.81		
Specific Conductance (Micromhos at 25°C)	2190		
Residual Sodium Carbonate (RSC)		—	
PH	8.3		
Class for Irrigation Water	C_3S_2		

RECEIVED
JUL 07 1972
WATER DEVELOPMENT
THE NAVAJO TRIBE

Remarks:

Navajo Nation Water Management Branch
Well Log and Drilling Report

*PO Box 678 Fort Defiance, Arizona * PH: 928.729.4004 * FAX: 928.729.4126*

WELL NO: **16K-340** *PWSID:*

WELL NAME/OTHER NO:

WELL TYPE: **WW** *WELL STATUS:* **ACT** *WELL USE:* **LIV**

LOCATION: **2 M. NW OF KIT CARSON CAVE**

UTM : X(EAST) **717664** *Y (NORTH)* **3941251** *ZONE:* **12** *OPERATOR:* **TRIBE O&M**

WATERSHED CODE: **15020006000** *STATE:* **NM** *COUNTY:* **MK** *CHAPTER CODE:* **CHUR**

GRAZING DISTRICT: **16** *LOCATION DATA SOURCE:* **WELL FILE/FLD CHKD 3/95**

WELLNO: **16K-340** *STARTED:* **5/31/1954** *COMPLETED:* **6/23/1954**

ELEVATION: **6682** **FT.** *DEPTH:* **141** **FT.** *DEPTH MEASURED:*

DIAMETER: **10** **IN.** *DEPTH IS:* **R** *Measured, Estimated, Reported*

CASING_DIAMETER: **8.62** **IN.** *FROM:* **-0.3** **FT.** *TO:* **141** **FT.** *MATL:* **STL**

CASING_DIAMETER: **0** **IN.** *FROM:* **0** **FT.** *TO:* **0** **FT.** *MATL:*

CASING_DIAMETER: **0** **IN.** *FROM:* **0** **FT.** *TO:* **0** **FT.** *MATL:*

CASING_DIAMETER: **0** **IN.** *FROM:* **0** **FT.** *TO:* **0** **FT.** *MATL:*

CASING PERFORATED FROM: **101** **FT.** *TO:* **141** **FT.** *OPENING TYPE:* **P**

CASING PERFORATED FROM: **0** **FT.** *TO:* **0** **FT.** *OPENING TYPE:*

CASING PERFORATED FROM: **0** **FT.** *TO:* **0** **FT.** *OPENING TYPE:*

CASING PERFORATED FROM: **0** **FT.** *TO:* **0** **FT.** *OPENING TYPE:*

CASING PERFORATED FROM: **0** **FT.** *TO:* **0** **FT.** *OPENING TYPE:*

DATE WELL TURNED OVER TO TRIBE:

FUNDED BY: *CONTRACTOR:* **P.H. DUNNING**

SITE IMPROVEMENTS: **WM-WP-TA-WL** *TYPE OF LIFT:* **PS** *ENERGY:* **WM**

HORSEPOWER RATING OF PUMP: **0** *ON SITE STORAGE CAPACITY:* **27900** **GAL.**

STRUCTURE DATA SOURCE: **WELL FLE/FLD CHKD 03/95**

WELLNO: **16K-340** *USGS PRINCIPLE AQUIFER CODE:* **110ALVM**

THICKNESS: **0** **FT.** *NOMINAL YIELD:* **0** **GPM** *DATE YEILD MEASURED:*

BAILER/PUMP TEST: **BT** *RATE:* **23.3** **GPM** *TEST PERIOD:* **0** **HR.** *TEST DATE:* **6/23/1954**

DRAWDOWN: **68** **FT.** *OBSERVATION WELL DATA AVAILABLE:* **N**

HORIZONTAL CONDUCTIVITY: **0** **FT/DAY** *SPECIFIC CAPACITY:* **0** **GAL./MIN./FT.**

VERTICAL CONDUCTIVITY: **0** **FT/DAY** *STORAGE COEFFICIENT:* **0**

COEFFICIENT OF TRANSMISSIVITY: **0** **FT2/DAY**

AVAILABITY OF TEST DATA: *DRILLERS/ELECTRIC LOGS:* **DL**

HYDROLOGY DATA SOURCE: **WELL FILE/USGS LITH. LOG**

WELL NO: **16K-340**

STATIC WATER LEVEL(S):

37.5	FT.	6/23/1954
30.5	FT.	6/6/1954

GEOLOGIC INTERVAL(S):

TOP	*BOTTOM*	*UNIT*	*LITHOLOGY*	
0	0	110ALVM	SAND	-BRN/LT GRY/VF-C GR/PR S

COMMENT(S):

AVAILABLE - DRILLER'S LOG/WATER QUALITY DATA/USGS LITHOLOGIC LOG/INSPECTION REPORT - ALL IN WELL FILE. REPORTED PERFORATIONS: "2 BOTTOM JOINTS" (ASSUMED 20 FT JOINTS). 27900 GALLON COVERED TANK ON CONCRETE BASE. TANK LABELED WITH WELL NUMBER (16T-340) UNDERGROUND WATERLINE FROM TANK TO HAND VALVE WP. CONCRETE PAD FOR TROUGHS BUT TROUGHS REMOVED. WP~75' NORTH OF WELL. ANOTHER CONCRETE TROUGH PAD LOCATED IMMEDIATELY SOUTH OF WELL. GEOHYDROLOGIC UNITS FROM DRILLER'S LOG. LOCATION COORDINATES MEASURED WITH GPS DEVICE 8 SATELLITES VISIBLE. ELEVATION PRINTED ON TOPO MAP ~SCALE= 1:24000. THE IMPROVEMENTS AT THIS SITE ARE IN FAIR CONDITION. STORAGE TANK IS COVERED.
G. KINSEL/M.S. JOHNSON 04/18/1995

ATTACHMENT D:

Summer 2022 Data

Wells:

16K-336

16K-340

14K-586

15T-303

Mill Well I

Well ID	Latitude	Longitude
14T-586	35.661717	-108.515296
16K-340	35.592875	-108.598006
16K-336	35.57262	-108.636751
15T-303	35.671296	-108.478138
NECR Mine Well	35.658635	-108.508977
UNC Mill Well	35.652018	-108.508323

Legend

- ⊕ Existing Wells
- ▭ Kerr-McGee Pond Fenceline
- ▭ Kerr McGee Ponds Investigation Boundary
- ▭ Former Pond Area
- ▨ Former Stockpile Area
- ▭ NECR Mine Boundary
- ▨ Potential Soil Borrow Areas
- ▭ Lease Boundary
- ▭ 100-foot Step Out Boundary
- ▭ UNC Mill Boundary

Notes:
NECR North East Church Rock
XRF Xray fluorescence

Feet
0 5,000 10,000

Prepared for: U.S. EPA Region 9

NECR EXISTING WELL LOCATIONS

Prepared By:
TETRA TECH

Task Order No.: 0003

Contract No.: EP-S9-17-03

Figure No: X

Location: QUIVIRA

Date: 09/10/2020

Pace Analytical

1673 Terra Avenue Sheridan, WY 82801 ph: (307) 672-8945

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported 8/11/2022
Report ID: S2206451001

ProjectName: RAES-TO003-Quivira
Lab ID: S2206451-001
ClientSample ID: 16K-336-GWQ1-01
COC: RAES3-001
PWS ID:
Comments

WorkOrder: S2206451
CollectionDate: 6/21/2022 2:26:00 PM
DateReceived: 6/24/2022
FieldSampler:
Matrix: Water

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Anions/Cations							
Alkalinity, Total (As CaCO3)	644	mg/L		5	SM 2320B	06/30/2022 2246	KAT
Chloride	19	mg/L		1	EPA 300.0	06/24/2022 1751	AB
Nitrogen, Nitrate+Nitrite (as N)	1.0	mg/L		0.1	EPA 353.2	07/18/2022 1236	AMB
Sulfate	122	mg/L		1	EPA 300.0	06/24/2022 1751	AB
Calcium	79	mg/L		1	EPA 200.7	06/29/2022 1506	DG
Magnesium	20	mg/L		1	EPA 200.7	06/29/2022 1506	DG
Potassium	3	mg/L		1	EPA 200.7	06/29/2022 1506	DG
Nitrogen, Ammonia (As N)	3.6	mg/L		0.1	EPA 350.1	07/08/2022 1305	AMB
Phosphorus, Orthophosphate as P	0.247	mg/L	H	0.1	EPA 300.0	06/24/2022 1751	AB
General Parameters							
Hardness, Calcium/Magnesium (As CaCO3)	280	mg/L		1	SM 2340B	08/08/2022 1528	WN
Nitrogen, Total Kjeldahl (TKN)	4	mg/L		1	EPA 351.2	06/28/2022 1127	AMB
Total Dissolved Solids (180)	970	mg/L		10	SM 2540	06/24/2022 1125	JMS
Total Organic Carbon	6	mg/L		1	SM 5310B	07/06/2022 1802	AB
Total Suspended Solids	4	mg/L	J	5	SM 2540	06/27/2022 1327	KAT
Metals - Dissolved							
Aluminum	ND	mg/L	U	0.1	6010C	06/29/2022 1506	DG
Antimony	0.000135	mg/L	J	0.005	6020A	06/27/2022 1632	MS
Arsenic	0.00407	mg/L	J	0.005	6020A	06/27/2022 1632	MS
Barium	0.4	mg/L		0.1	6020A	06/27/2022 1632	MS
Beryllium	ND	mg/L	U	0.001	6010C	06/29/2022 1506	DG
Cadmium	ND	mg/L	U	0.002	6020A	06/27/2022 1632	MS
Chromium	ND	mg/L	U	0.01	6010C	06/29/2022 1506	DG
Cobalt	ND	mg/L	U	0.01	6010C	06/29/2022 1506	DG
Copper	0.00227	mg/L	J	0.01	6020A	06/27/2022 1632	MS
Iron	ND	mg/L	U	0.05	6010C	06/29/2022 1506	DG
Lead	ND	mg/L	U	0.001	6020A	06/27/2022 1632	MS
Manganese	0.10	mg/L		0.01	6010C	06/29/2022 1506	DG
Molybdenum	ND	mg/L	U	0.02	6020A	06/27/2022 1632	MS
Nickel	ND	mg/L	U	0.01	6010C	06/29/2022 1506	DG
Selenium	ND	mg/L	U	0.005	6020A	06/27/2022 1632	MS
Silver	ND	mg/L	U	0.003	6020A	06/27/2022 1632	MS
Thallium	ND	mg/L	U	0.001	6020A	06/27/2022 1632	MS
Thorium	ND	mg/L	U	0.1	6010C	06/29/2022 1506	DG
Uranium	0.000422	mg/L	J	0.001	6020A	06/27/2022 1632	MS
Vanadium	ND	mg/L	U	0.02	6020A	06/27/2022 1632	MS
Zinc	0.0169	mg/L	J	0.05	6010C	06/29/2022 1506	DG

ANALYTICAL SUMMARY REPORT

August 17, 2022

United Nuclear Corporation
PO Box 1088
Gallup, NM 87305-1088

Work Order: C22070748   Quote ID: C6117

Project Name: UNC-MILL

Energy Laboratories, Inc. Casper WY received the following 1 sample for United Nuclear Corporation on 7/20/2022 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C22070748-001	Domestic Water Well	07/19/22 9:54	07/20/22	Aqueous	Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Total Alkalinity to pH 4.5 Anion - Cation Balance Mercury, Total Anions by Ion Chromatography Nitrogen, Ammonia Nitrogen, Nitrate + Nitrite pH Metals Preparation by EPA 200.2 Digestion, Mercury by CVAA Gross Alpha, Gross Beta, Total Gross Alpha minus Radon and Uranium, Total Lead 210, Total Radium 226 + Radium 228, Total Radium 226, Total Radium 228, Total Thorium, Isotopic, Total Solids, Total Dissolved Solids, Total Dissolved - Calculated TRACKER SHEET 624-Purgeable Organics 624-Purgeable Organics

The analyses presented in this report were performed by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager .

Report Approved By:

CLIENT: United Nuclear Corporation
Project: UNC-MILL
Work Order: C22070748

Report Date: 08/17/22

CASE NARRATIVE

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

Work Order Sample Summary

CLIENT: United Nuclear Corporation
Project: UNC-MILL
Work Order: C22070748 **Report Date:** 08/17/22

Lab ID	Client Sample ID	Collection Date	Date Received
C22070748-001	Domestic Water Well	7/19/2022 9:54:00 AM	7/20/2022

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client:	United Nuclear Corporation	**Report Date:**	08/17/22
Project:	UNC-MILL	**Collection Date:**	07/19/22 09:54
Lab ID:	C22070748-001	**DateReceived:**	07/20/22
Client Sample ID:	Domestic Water Well	**Matrix:**	Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
Bicarbonate as HCO3	258	mg/L		6		A2320 B	07/23/22 01:27 / dmb
Chloride	47	mg/L		1		E300.0	07/23/22 05:17 / dmb
Sulfate	469	mg/L	D	2		E300.0	07/23/22 05:17 / dmb
Calcium	8	mg/L		1		E200.7	07/25/22 19:08 / eli-b
Magnesium	5	mg/L		1		E200.7	07/25/22 19:08 / eli-b
Potassium	2	mg/L		1		E200.7	07/25/22 19:08 / eli-b
Sodium	333	mg/L		1		E200.7	07/25/22 19:08 / eli-b
PHYSICAL PROPERTIES							
pH	8.3	s.u.	H	0.1		A4500-H B	07/21/22 12:24 / mnm
pH Measurement Temp	17.6	°C				A4500-H B	07/21/22 12:24 / mnm
Solids, Total Dissolved TDS @ 180 C	1020	mg/L		20		A2540 C	07/21/22 12:25 / mnm
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	0.17	mg/L		0.05		E353.2	07/21/22 16:01 / erc
Nitrogen, Ammonia as N	0.16	mg/L		0.05		E350.1	07/21/22 12:24 / dmb
METALS, TOTAL							
Aluminum	ND	mg/L		0.03		E200.8	07/29/22 01:24 / eli-b
Arsenic	0.002	mg/L		0.001		E200.8	07/29/22 01:24 / eli-b
Beryllium	ND	mg/L		0.001		E200.8	07/30/22 07:01 / eli-b
Cadmium	ND	mg/L		0.001		E200.8	07/29/22 01:24 / eli-b
Cobalt	ND	mg/L		0.005		E200.8	07/29/22 01:24 / eli-b
Lead	ND	mg/L		0.001		E200.8	07/29/22 01:24 / eli-b
Manganese	0.044	mg/L		0.001		E200.8	07/29/22 01:24 / eli-b
Mercury	ND	mg/L		0.0001		E245.1	08/02/22 17:48 / eli-b
Molybdenum	0.006	mg/L		0.001		E200.8	07/29/22 01:24 / eli-b
Nickel	ND	mg/L		0.005		E200.8	07/29/22 01:24 / eli-b
Selenium	0.070	mg/L		0.001		E200.8	07/29/22 01:24 / eli-b
Uranium	0.300	mg/L		0.0003		E200.8	07/29/22 01:24 / eli-b
Vanadium	ND	mg/L		0.01		E200.8	07/29/22 01:24 / eli-b
DATA QUALITY							
Solids, Total Dissolved - Calculated	994	mg/L		1.00		A1030 E	08/06/22 10:22 / tlf
A/C Balance	-0.36	%				A1030 E	08/06/22 10:22 / tlf
Anions	15.4	meq/L				A1030 E	08/06/22 10:22 / tlf
Cations	15.3	meq/L				A1030 E	08/06/22 10:22 / tlf
TDS Ratio	1.03	unitless				A1030 E	08/06/22 10:22 / tlf
RADIONUCLIDES, TOTAL							
Gross Alpha minus Rn & U	0.5	pCi/L	U			E900.1	08/01/22 15:01 / trs
Gross Alpha minus Rn & U Precision (±)	0.7	pCi/L				E900.1	08/01/22 15:01 / trs
Gross Alpha minus Rn & U MDC	1.1	pCi/L				E900.1	08/01/22 15:01 / trs
Gross Beta	61.6	pCi/L				E900.0	08/09/22 09:37 / hat

Report Definitions:

RL - Analyte Reporting Limit
QCL - Quality Control Limit
D - Reporting Limit (RL) increased due to sample matrix
U - Not detected at Minimum Detectable Concentration (MDC)
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)
H - Analysis performed past the method holding time

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client:	United Nuclear Corporation	**Report Date:**	08/17/22
Project:	UNC-MILL	**Collection Date:**	07/19/22 09:54
Lab ID:	C22070748-001	**DateReceived:**	07/20/22
Client Sample ID:	Domestic Water Well	**Matrix:**	Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
RADIONUCLIDES, TOTAL							
Gross Beta precision (±)	6.8	pCi/L				E900.0	08/09/22 09:37 / hat
Gross Beta MDC	4.8	pCi/L				E900.0	08/09/22 09:37 / hat
Lead 210	3.7	pCi/L				E909.0	08/04/22 15:53 / hat
Lead 210 precision (±)	1.3	pCi/L				E909.0	08/04/22 15:53 / hat
Lead 210 MDC	1.3	pCi/L				E909.0	08/04/22 15:53 / hat
Radium 226	0.4	pCi/L				E903.0	08/09/22 15:08 / trs
Radium 226 precision (±)	0.2	pCi/L				E903.0	08/09/22 15:08 / trs
Radium 226 MDC	0.2	pCi/L				E903.0	08/09/22 15:08 / trs
Radium 228	-0.2	pCi/L	U			RA-05	08/03/22 16:31 / trs
Radium 228 precision (±)	0.8	pCi/L				RA-05	08/03/22 16:31 / trs
Radium 228 MDC	1.3	pCi/L				RA-05	08/03/22 16:31 / trs
Radium 226 + Radium 228	0.2	pCi/L	U			A7500-RA	08/10/22 12:00 / dmf
Radium 226 + Radium 228 precision (±)	0.8	pCi/L				A7500-RA	08/10/22 12:00 / dmf
Radium 226 + Radium 228 MDC	1.3	pCi/L				A7500-RA	08/10/22 12:00 / dmf
Thorium 230	0.1	pCi/L				A7500-U C	08/02/22 14:41 / sec
Thorium 230 precision (±)	0.05	pCi/L				A7500-U C	08/02/22 14:41 / sec
Thorium 230 MDC	0.06	pCi/L				A7500-U C	08/02/22 14:41 / sec
VOLATILE ORGANIC COMPOUNDS							
Bromodichloromethane	ND	ug/L		0.50		E624.1	07/28/22 07:49 / eli-b
Bromoform	ND	ug/L		0.50		E624.1	07/28/22 07:49 / eli-b
Chlorodibromomethane	ND	ug/L		0.50		E624.1	07/28/22 07:49 / eli-b
Chloroform	ND	ug/L		0.50		E624.1	07/28/22 07:49 / eli-b
Trihalomethanes, Total	ND	ug/L		0.50		E624.1	08/10/22 13:28 / jlw
Surr: 1,2-Dichloroethane-d4	103	%REC		71-139		E624.1	07/28/22 07:49 / eli-b
Surr: p-Bromofluorobenzene	92.0	%REC		80-127		E624.1	07/28/22 07:49 / eli-b
Surr: Toluene-d8	105	%REC		80-123		E624.1	07/28/22 07:49 / eli-b

Report Definitions:

RL - Analyte Reporting Limit
QCL - Quality Control Limit
U - Not detected at Minimum Detectable Concentration (MDC)
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

Guideline 8: Sweetwater

Well ID:		Domestic Water Well	Domestic Water Well	Domestic Water Well
Collection Date:		7/19/2022	9/20/2010	6/18/2002
Receive Date:		7/20/2022	9/22/2010	6/24/2002
Report Date:		8/17/2022	10/11/2010	7/16/2002
Analyte	**Units**	**C22070748-001**	**C10090864-001**	**C02060775-001**
Bicarbonate as HCO3	mg/L	258	246	225
Calcium	mg/L	8	13	16.0
Chloride	mg/L	47	151	
Magnesium	mg/L	5	3	4.2
Potassium	mg/L	2	3	3.5
Sodium	mg/L	333	806	644
Sulfate	mg/L	469	1270	
pH	s.u.	8.3	8.80	8.34
pH Measurement Temp	°C	17.6	0	
Solids, Total Dissolved TDS @ 180 C	mg/L	1020	2240	2090
Solids, Total Dissolved - Calculated	mg/L	994		
Nitrogen, Ammonia as N	mg/L	0.16	0.49	0.50
Nitrogen, Nitrate+Nitrite as N	mg/L	0.17	ND(0.1)	ND(0.10)
Aluminum	mg/L	ND(0.03)	ND(0.1)	ND(0.1)
Arsenic	mg/L	0.002		
Beryllium	mg/L	ND(0.001)	ND(0.01)	ND(0.01)
Cadmium	mg/L	ND(0.001)	ND(0.005)	ND(0.005)
Cobalt	mg/L	ND(0.005)	ND(0.01)	ND(0.01)
Lead	mg/L	ND(0.001)	ND(0.05)	ND(0.05)
Manganese	mg/L	0.044	0.07	0.05
Molybdenum	mg/L	0.006	ND(0.1)	ND(0.1)
Nickel	mg/L	ND(0.005)	ND(0.05)	ND(0.05)
Selenium	mg/L	0.070		
Uranium	mg/L	0.300	0.0030	0.0700
Vanadium	mg/L	ND(0.01)	ND(0.1)	ND(0.1)
A/C Balance	%	-0.36		0
Anions	meq/L	15.4	35.0	0
Cations	meq/L	15.3	36.1	0
TDS Ratio	unitless	1.03		
Gross Alpha minus Rn & U	pCi/L	0.5	1.7	0(1.0)
Gross Alpha minus Rn & U MDC		1.1	0.5	0
Gross Alpha minus Rn & U Precision (±)		0.7	0.5	0
Lead 210	pCi/L	3.7	2.7	0(1.0)
Lead 210 MDC		1.3	1.9	0
Lead 210 precision (±)		1.3	1.2	0
Radium 226	pCi/L	0.4	0.92	0.7
Radium 226 MDC		0.2	0.21	0
Radium 226 precision (±)	±	0.2	0.25	0.2
Radium 228	pCi/L	-0.2	1.7	2.7
Radium 228 MDC		1.3	0.84	0
Radium 228 precision (±)	±	0.8	0.58	1.3
Thorium 230	pCi/L	0.1	0.06	0(0.2)
Thorium 230 precision (±)		0.05	0.07	0
Thorium 230 MDC	pCi/L	0.06	0.1	
Bromodichloromethane	ug/L	ND(0.50)	ND(1.0)	
Bromoform	ug/L	ND(0.50)	ND(1.0)	
Chlorodibromomethane	ug/L	ND(0.50)	ND(1.0)	
Chloroform	ug/L	ND(0.50)	ND(1.0)	ND(1.0)
Trihalomethanes, Total	ug/L	ND(0.50)		

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 07/29/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2320 B							Analytical Run: MANTECH_220722A			
Lab ID: ICV		Initial Calibration Verification Standard							07/22/22 14:57	
pH		8.03	s.u.	0.010	100	98	102			
Method: A2320 B									Batch: R285108	
Lab ID: MBLK		Method Blank				Run: MANTECH_220722A			07/23/22 01:11	
Alkalinity, Total as CaCO3		ND	mg/L	2						
Lab ID: C22070748-001ADUP		Sample Duplicate				Run: MANTECH_220722A			07/23/22 01:35	
Alkalinity, Total as CaCO3		218	mg/L	5.0				0.1	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 07/29/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2540 C									Batch: TDS220721A	
Lab ID: MB-25_220721A	Method Blank					Run: BAL-111_220721A			07/21/22 12:23	
Solids, Total Dissolved TDS @ 180 C		ND	mg/L	10						
Lab ID: LCS-26_220721A	Laboratory Control Sample					Run: BAL-111_220721A			07/21/22 12:23	
Solids, Total Dissolved TDS @ 180 C		1020	mg/L	20	102	90	110			
Lab ID: C22070746-013A DUP	Sample Duplicate					Run: BAL-111_220721A			07/21/22 12:24	
Solids, Total Dissolved TDS @ 180 C		5050	mg/L	38				0.1	5	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 07/29/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A4500-H B										Analytical Run: PHSC_101-C_220721A
Lab ID: 8.0	2	Initial Calibration Verification Standard								07/21/22 09:33
pH		8.0	s.u.	0.1	100	98	102			
pH Measurement Temp		21.3	°C			0	0			
Lab ID: CCV - pH 7	2	Continuing Calibration Verification Standard								07/21/22 11:59
pH		7.0	s.u.	0.1	100	98	102			
pH Measurement Temp		20.4	°C			0	0			
Method: A4500-H B										Batch: R285015
Lab ID: C22070746-015ADUP	2	Sample Duplicate				Run: PHSC_101-C_220721A				07/21/22 12:12
pH		7.1	s.u.	0.1				0.0	1.5	
pH Measurement Temp		17.7	°C							

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 07/29/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E300.0**										Analytical Run: IC3-C_220722A
Lab ID: **ICV**	2	Initial Calibration Verification Standard								07/22/22 12:02
Chloride		9.64	mg/L	1.0	96	90	110			
Sulfate		39.2	mg/L	1.0	98	90	110			
Lab ID: **CCV**	2	Continuing Calibration Verification Standard								07/23/22 02:25
Chloride		19.9	mg/L	1.0	100	90	110			
Sulfate		81.1	mg/L	1.0	101	90	110			
Method: **E300.0**										Batch: R285124
Lab ID: **ICB**	2	Method Blank				Run: IC3-C_220722A				07/22/22 12:22
Chloride		ND	mg/L	0.01						
Sulfate		ND	mg/L	0.2						
Lab ID: **LFB**	2	Laboratory Fortified Blank				Run: IC3-C_220722A				07/22/22 12:41
Chloride		9.36	mg/L	1.0	97	90	110			
Sulfate		38.4	mg/L	1.0	100	90	110			
Lab ID: **C22070746-012AMS**	2	Sample Matrix Spike				Run: IC3-C_220722A				07/23/22 03:03
Chloride		283	mg/L	2.1	95	80	120			
Sulfate		3860	mg/L	8.3	88	80	120			
Lab ID: **C22070746-012AMSD**	2	Sample Matrix Spike Duplicate				Run: IC3-C_220722A				07/23/22 03:22
Chloride		281	mg/L	2.1	94	80	120	0.8	20	
Sulfate		3790	mg/L	8.3	79	80	120	1.9	20	S

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

S - Spike recovery outside of advisory limits

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 07/29/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E350.1**						Analytical Run: FIA201-C_220721A				
Lab ID: **ICV**		Initial Calibration Verification Standard								07/21/22 11:34
Nitrogen, Ammonia as N		1.00	mg/L	0.050	100	90	110			
Lab ID: **CCV**		Continuing Calibration Verification Standard								07/21/22 12:09
Nitrogen, Ammonia as N		0.947	mg/L	0.050	95	90	110			
Method: **E350.1**									Batch: R285062	
Lab ID: **MBLK**		Method Blank				Run: FIA201-C_220721A				07/21/22 11:33
Nitrogen, Ammonia as N		ND	mg/L	0.03						
Lab ID: **LFB**		Laboratory Fortified Blank				Run: FIA201-C_220721A				07/21/22 11:35
Nitrogen, Ammonia as N		0.965	mg/L	0.050	97	90	110			
Lab ID: **C22070746-009DMS**		Sample Matrix Spike				Run: FIA201-C_220721A				07/21/22 12:13
Nitrogen, Ammonia as N		0.507	mg/L	0.050	51	90	110			S
Lab ID: **C22070746-009DMSD**		Sample Matrix Spike Duplicate				Run: FIA201-C_220721A				07/21/22 12:14
Nitrogen, Ammonia as N		0.544	mg/L	0.050	54	90	110	7.1	10	S

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

S - Spike recovery outside of advisory limits

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 07/29/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E353.2										Analytical Run: FIA201-C_220721B
Lab ID: ICV		Initial Calibration Verification Standard								07/21/22 14:57
Nitrogen, Nitrate+Nitrite as N		1.02	mg/L	0.050	102	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard								07/21/22 15:48
Nitrogen, Nitrate+Nitrite as N		0.938	mg/L	0.050	94	90	110			
Method: E353.2										Batch: R285051
Lab ID: MBLK		Method Blank				Run: FIA201-C_220721B				07/21/22 14:58
Nitrogen, Nitrate+Nitrite as N		ND	mg/L	0.01						
Lab ID: LFB		Laboratory Fortified Blank				Run: FIA201-C_220721B				07/21/22 14:59
Nitrogen, Nitrate+Nitrite as N		1.01	mg/L	0.050	102	90	110			
Lab ID: C22070746-011DMS		Sample Matrix Spike				Run: FIA201-C_220721B				07/21/22 15:52
Nitrogen, Nitrate+Nitrite as N		1.12	mg/L	0.050	93	90	110			
Lab ID: C22070746-011DMSD		Sample Matrix Spike Duplicate				Run: FIA201-C_220721B				07/21/22 15:53
Nitrogen, Nitrate+Nitrite as N		1.14	mg/L	0.050	95	90	110	1.8	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 08/04/22

Analyte		Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method:	**E200.7**										Analytical Run: ICP203-B_220725A
Lab ID:	**ICV**	4	Continuing Calibration Verification Standard								07/25/22 15:00
Calcium			25.5	mg/L	1.0	102	95	105			
Magnesium			25.7	mg/L	1.0	103	95	105			
Potassium			25.5	mg/L	1.0	102	95	105			
Sodium			25.2	mg/L	1.0	101	95	105			
Lab ID:	**CCV**	4	Continuing Calibration Verification Standard								07/25/22 18:33
Calcium			25.4	mg/L	1.0	102	90	110			
Magnesium			25.9	mg/L	1.0	103	90	110			
Potassium			25.6	mg/L	1.0	102	90	110			
Sodium			25.2	mg/L	1.0	101	90	110			
Method:	**E200.7**										Batch: R385207
Lab ID:	**MB-7500DIS220725A**	4	Method Blank				Run: ICP203-B_220725A				07/25/22 15:09
Calcium			ND	mg/L	0.1						
Magnesium			ND	mg/L	0.02						
Potassium			ND	mg/L	0.1						
Sodium			ND	mg/L	0.2						
Lab ID:	**LFB-7500DIS220725A**	4	Laboratory Fortified Blank				Run: ICP203-B_220725A				07/25/22 15:18
Calcium			50.8	mg/L	1.0	102	85	115			
Magnesium			50.8	mg/L	1.0	102	85	115			
Potassium			50.7	mg/L	1.0	101	85	115			
Sodium			50.7	mg/L	1.0	101	85	115			
Lab ID:	**B22071852-005BMS2**	4	Sample Matrix Spike				Run: ICP203-B_220725A				07/25/22 18:29
Calcium			268	mg/L	1.5	102	70	130			
Magnesium			278	mg/L	2.6	104	70	130			
Potassium			288	mg/L	2.6	105	70	130			
Sodium			801	mg/L	2.6	103	70	130			
Lab ID:	**B22071852-005BMSD**	4	Sample Matrix Spike Duplicate				Run: ICP203-B_220725A				07/25/22 18:42
Calcium			268	mg/L	1.5	102	70	130	0.2	20	
Magnesium			276	mg/L	2.6	103	70	130	0.5	20	
Potassium			284	mg/L	2.6	103	70	130	1.2	20	
Sodium			794	mg/L	2.6	100	70	130	0.9	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 08/04/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8							Analytical Run: ICPMS206-B_220728A			
Lab ID: QCS	11	Initial Calibration Verification Standard							07/28/22 19:47	
Aluminum		0.261	mg/L	0.10	104	90	110			
Arsenic		0.0522	mg/L	0.0050	104	90	110			
Cadmium		0.0256	mg/L	0.0010	102	90	110			
Cobalt		0.0508	mg/L	0.010	102	90	110			
Lead		0.0520	mg/L	0.010	104	90	110			
Manganese		0.251	mg/L	0.010	100	90	110			
Molybdenum		0.0504	mg/L	0.0050	101	90	110			
Nickel		0.0524	mg/L	0.010	105	90	110			
Selenium		0.0497	mg/L	0.0050	99	90	110			
Uranium		0.0519	mg/L	0.00030	104	90	110			
Vanadium		0.0498	mg/L	0.10	100	90	110			
Lab ID: CCV	11	Continuing Calibration Verification Standard							07/29/22 01:02	
Aluminum		0.0527	mg/L	0.10	105	90	110			
Arsenic		0.0496	mg/L	0.0050	99	90	110			
Cadmium		0.0529	mg/L	0.0010	106	90	110			
Cobalt		0.0513	mg/L	0.010	103	90	110			
Lead		0.0519	mg/L	0.010	104	90	110			
Manganese		0.0509	mg/L	0.010	102	90	110			
Molybdenum		0.0498	mg/L	0.0050	100	90	110			
Nickel		0.0510	mg/L	0.010	102	90	110			
Selenium		0.0516	mg/L	0.0050	103	90	110			
Uranium		0.0526	mg/L	0.00030	105	90	110			
Vanadium		0.0504	mg/L	0.10	101	90	110			
Method: E200.8									Batch: 168747	
Lab ID: MB-168747	12	Method Blank				Run: ICPMS206-B_220728A			07/29/22 00:34	
Aluminum		ND	mg/L	0.001						
Arsenic		ND	mg/L	0.0001						
Beryllium		ND	mg/L	0.0001						
Cadmium		ND	mg/L	0.00003						
Cobalt		ND	mg/L	0.00004						
Lead		ND	mg/L	0.00008						
Manganese		ND	mg/L	0.0001						
Molybdenum		0.0001	mg/L	0.00006						
Nickel		ND	mg/L	0.0008						
Selenium		ND	mg/L	0.0002						
Uranium		ND	mg/L	0.00005						
Vanadium		ND	mg/L	0.0006						
Lab ID: LCS4-168747	12	Laboratory Control Sample				Run: ICPMS206-B_220728A			07/29/22 00:39	
Aluminum		0.546	mg/L	0.030	109	85	115			
Arsenic		0.105	mg/L	0.0010	105	85	115			
Beryllium		0.0494	mg/L	0.0010	99	85	115			
Cadmium		0.0542	mg/L	0.0010	108	85	115			
Cobalt		0.106	mg/L	0.0050	106	85	115			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 08/04/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E200.8**										Batch: 168747
Lab ID: **LCS4-168747**	12	Laboratory Control Sample				Run: ICPMS206-B_220728A				07/29/22 00:39
Lead		0.108	mg/L	0.0010	108	85	115			
Manganese		0.513	mg/L	0.0010	103	85	115			
Molybdenum		0.102	mg/L	0.0010	102	85	115			
Nickel		0.106	mg/L	0.020	106	85	115			
Selenium		0.106	mg/L	0.0010	106	85	115			
Uranium		0.107	mg/L	0.00030	107	85	115			
Vanadium		0.101	mg/L	0.010	101	85	115			
Lab ID: **B22071866-001CMS4**	12	Sample Matrix Spike				Run: ICPMS206-B_220728A				07/29/22 00:56
Aluminum		1.98	mg/L	0.030	91	70	130			
Arsenic		0.105	mg/L	0.0010	105	70	130			
Beryllium		0.0478	mg/L	0.0010	95	70	130			
Cadmium		0.0549	mg/L	0.0010	110	70	130			
Cobalt		0.105	mg/L	0.0050	105	70	130			
Lead		0.106	mg/L	0.0010	106	70	130			
Manganese		0.516	mg/L	0.0010	102	70	130			
Molybdenum		0.102	mg/L	0.0010	101	70	130			
Nickel		0.104	mg/L	0.020	104	70	130			
Selenium		0.105	mg/L	0.0010	105	70	130			
Uranium		0.106	mg/L	0.00030	106	70	130			
Vanadium		0.102	mg/L	0.010	101	70	130			
Lab ID: **B22071866-001CMSD**	12	Sample Matrix Spike Duplicate				Run: ICPMS206-B_220728A				07/29/22 01:13
Aluminum		2.04	mg/L	0.030	104	70	130	3.2	20	
Arsenic		0.107	mg/L	0.0010	107	70	130	1.5	20	
Beryllium		0.0485	mg/L	0.0010	97	70	130	1.5	20	
Cadmium		0.0536	mg/L	0.0010	107	70	130	2.5	20	
Cobalt		0.108	mg/L	0.0050	108	70	130	3.4	20	
Lead		0.108	mg/L	0.0010	108	70	130	2.1	20	
Manganese		0.526	mg/L	0.0010	104	70	130	1.8	20	
Molybdenum		0.102	mg/L	0.0010	101	70	130	0.3	20	
Nickel		0.106	mg/L	0.020	106	70	130	1.7	20	
Selenium		0.107	mg/L	0.0010	107	70	130	1.7	20	
Uranium		0.110	mg/L	0.00030	110	70	130	3.3	20	
Vanadium		0.103	mg/L	0.010	103	70	130	1.9	20	
Method: **E200.8**										Analytical Run: ICPMS206-B_220729A
Lab ID: **QCS**		Initial Calibration Verification Standard								07/30/22 06:16
Beryllium		0.0241	mg/L	0.0010	96	90	110			
Lab ID: **CCV**		Continuing Calibration Verification Standard								07/30/22 06:38
Beryllium		0.0462	mg/L	0.0010	92	90	110			
Method: **E200.8**										Batch: 168747
Lab ID: **MB-168747**		Method Blank				Run: ICPMS206-B_220729A				07/30/22 06:49
Beryllium		ND	mg/L	0.0001						

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 08/04/22

Analyte		Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method:	**E245.1**							Analytical Run: HGCV202-B_220802A			
Lab ID:	**ICV-168816**		Initial Calibration Verification Standard							08/02/22 15:16	
Mercury			0.00196	mg/L	0.00010	98	90	110			
Lab ID:	**ICV-168816**		Initial Calibration Verification Standard							08/03/22 09:23	
Mercury			0.00188	mg/L	0.00010	94	90	110			
Method:	**E245.1**							Batch: 168817			
Lab ID:	**MB-168817**		Method Blank				Run: HGCV202-B_220802A			08/02/22 15:31	
Mercury			ND	mg/L	0.00005						
Lab ID:	**LCS-168817**		Laboratory Control Sample				Run: HGCV202-B_220802A			08/02/22 15:33	
Mercury			0.00215	mg/L	0.00010	107	85	115			
Lab ID:	**B22071851-002CMS**		Sample Matrix Spike				Run: HGCV202-B_220802A			08/02/22 17:41	
Mercury			0.00161	mg/L	0.00010	81	70	130			
Lab ID:	**B22071851-002CMSD**		Sample Matrix Spike Duplicate				Run: HGCV202-B_220802A			08/02/22 17:43	
Mercury			0.00168	mg/L	0.00010	84	70	130	4.1	30	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 08/12/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A7500-U C									Batch: RA-TH-ISO-3459	
Lab ID: MB-RA-TH-ISO-3459	3	Method Blank				Run: EGG-ORTEC_ALL_220725C			08/02/22 14:41	
Thorium 230		0.1	pCi/L							
Thorium 230 precision (±)		0.04	pCi/L							
Thorium 230 MDC		0.05	pCi/L							
Lab ID: LCS-RA-TH-ISO-3459	3	Laboratory Control Sample				Run: EGG-ORTEC_ALL_220725C			08/02/22 14:41	
Thorium 230		11	pCi/L		89	70	130			
Thorium 230 precision (±)		2.1	pCi/L							
Thorium 230 MDC		0.055	pCi/L							
Lab ID: C22070746-012EDUP	3	Sample Duplicate				Run: EGG-ORTEC_ALL_220725C			08/02/22 14:41	
Thorium 230		0.20	pCi/L					2.8	30	
Thorium 230 precision (±)		0.099	pCi/L							
Thorium 230 MDC		0.13	pCi/L							

- The RER result is 0.04.

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 08/12/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E900.0										Batch: GrAB-3070
Lab ID: Sr90-GrAB-3070	3	Laboratory Control Sample				Run: G5000W_220802A				08/06/22 09:33
Gross Beta		430	pCi/L		117	70	130			
Gross Beta precision (±)		44	pCi/L							
Gross Beta MDC		2.9	pCi/L							
Lab ID: MB-GrAB-3070	3	Method Blank				Run: G5000W_220802A				08/06/22 09:33
Gross Beta		-0.9	pCi/L							U
Gross Beta precision (±)		2	pCi/L							
Gross Beta MDC		3	pCi/L							
Lab ID: C22070907-003GMS1	3	Sample Matrix Spike				Run: G5000W_220802A				08/06/22 09:33
Gross Beta		490	pCi/L		132	70	130			S
Gross Beta precision (±)		50	pCi/L							
Gross Beta MDC		3.0	pCi/L							
Lab ID: C22070907-003GMSD	3	Sample Matrix Spike Duplicate				Run: G5000W_220802A				08/06/22 09:33
Gross Beta		470	pCi/L		129	70	130	2.8	30	
Gross Beta precision (±)		48	pCi/L							
Gross Beta MDC		2.8	pCi/L							

- The RER result is 0.20.

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

S - Spike recovery outside of advisory limits

U - Not detected at Minimum Detectable Concentration (MDC)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 08/12/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E900.1										Batch: GA-1374
Lab ID: LCS-GA-1374	3	Laboratory Control Sample				Run: G542M-2_220728A				08/01/22 15:01
Gross Alpha minus Rn & U		34	pCi/L		99	70	130			
Gross Alpha minus Rn & U Precision (±)		6.8	pCi/L							
Gross Alpha minus Rn & U MDC		1.1	pCi/L							
Lab ID: MB-GA-1374	3	Method Blank				Run: G542M-2_220728A				08/01/22 15:01
Gross Alpha minus Rn & U		-0.6	pCi/L							U
Gross Alpha minus Rn & U Precision (±)		0.6	pCi/L							
Gross Alpha minus Rn & U MDC		1	pCi/L							
Lab ID: C22070759-001DDUP	3	Sample Duplicate				Run: G542M-2_220728A				08/01/22 16:49
Gross Alpha minus Rn & U		1.3	pCi/L					58	30	R
Gross Alpha minus Rn & U Precision (±)		0.83	pCi/L							
Gross Alpha minus Rn & U MDC		1.1	pCi/L							

- Duplicate RPD is outside of the acceptance range for this analysis. However, the RER is less than the limit of 3, the RER result is 0.54.

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

R - Relative Percent Difference (RPD) exceeds advisory limit

U - Not detected at Minimum Detectable Concentration (MDC)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 08/12/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E903.0										Batch: RA226-10561R
Lab ID: LCS-RA226-10561	3	Laboratory Control Sample				Run: G5000W_220727A				08/09/22 12:58
Radium 226		12	pCi/L		116	70	130			
Radium 226 precision (±)		2.3	pCi/L							
Radium 226 MDC		0.20	pCi/L							
Lab ID: MB-RA226-10561	3	Method Blank				Run: G5000W_220727A				08/09/22 12:58
Radium 226		0.04	pCi/L							U
Radium 226 precision (±)		0.1	pCi/L							
Radium 226 MDC		0.2	pCi/L							
Lab ID: C22070746-002EDUP	3	Sample Duplicate				Run: G5000W_220727A				08/09/22 12:58
Radium 226		0.13	pCi/L					17	30	U
Radium 226 precision (±)		0.14	pCi/L							
Radium 226 MDC		0.18	pCi/L							

- The RER result is 0.13.

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

U - Not detected at Minimum Detectable Concentration (MDC)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 08/12/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E909.0										Batch: PB-210-1423
Lab ID: LCS-PB-210-1423	3	Laboratory Control Sample				Run: HIDEX 300SL_220802A				08/04/22 15:53
Lead 210		18	pCi/L		109	70	130			
Lead 210 precision (±)		5.5	pCi/L							
Lead 210 MDC		1.4	pCi/L							
Lab ID: MB-PB-210-1423	3	Method Blank				Run: HIDEX 300SL_220802A				08/04/22 15:53
Lead 210		-1	pCi/L							U
Lead 210 precision (±)		0.7	pCi/L							
Lead 210 MDC		1	pCi/L							
Lab ID: C22070827-001GDUP	3	Sample Duplicate				Run: HIDEX 300SL_220802A				08/04/22 15:53
Lead 210		0.043	pCi/L					250	30	UR
Lead 210 precision (±)		0.76	pCi/L							
Lead 210 MDC		1.3	pCi/L							

- Duplicate RPD is outside of the acceptance range for this analysis. However, the RER is less than the limit of 3, the RER result is 0.42.

Qualifiers:

RL - Analyte Reporting Limit

R - Relative Percent Difference (RPD) exceeds advisory limit

ND - Not detected at the Reporting Limit (RL)

U - Not detected at Minimum Detectable Concentration (MDC)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 08/12/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: RA-05										Batch: RA228-6874
Lab ID: LCS-228-RA226-10561	3	Laboratory Control Sample				Run: TENNELEC-4_220727C			08/03/22 14:45	
Radium 228		6.5	pCi/L		85	70	130			
Radium 228 precision (±)		1.5	pCi/L							
Radium 228 MDC		1.2	pCi/L							
Lab ID: MB-RA226-10561	3	Method Blank				Run: TENNELEC-4_220727C			08/03/22 14:45	
Radium 228		-0.8	pCi/L							U
Radium 228 precision (±)		0.6	pCi/L							
Radium 228 MDC		1	pCi/L							
Lab ID: C22070746-002EDUP	3	Sample Duplicate				Run: TENNELEC-4_220727C			08/03/22 14:45	
Radium 228		0.10	pCi/L					370	30	UR
Radium 228 precision (±)		0.59	pCi/L							
Radium 228 MDC		0.98	pCi/L							

- Duplicate RPD is outside of the acceptance range for this analysis. However, the RER is less than the limit of 3, the RER result is 0.56.

Qualifiers:

RL - Analyte Reporting Limit

R - Relative Percent Difference (RPD) exceeds advisory limit

ND - Not detected at the Reporting Limit (RL)

U - Not detected at Minimum Detectable Concentration (MDC)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: United Nuclear Corporation **Work Order:** C22070748 **Report Date:** 08/06/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E624.1										Batch: R385804
Lab ID: LCS072722a	7	Laboratory Control Sample				Run: VOA5975C.I_220727C				07/28/22 01:51
Bromodichloromethane		5.28	ug/L	0.50	106	74	128			
Bromoform		5.42	ug/L	0.50	108	70	130			
Chlorodibromomethane		5.68	ug/L	0.50	114	74	125			
Chloroform		4.77	ug/L	0.50	95	70	135			
Surr: 1,2-Dichloroethane-d4				0.50	91	71	139			
Surr: p-Bromofluorobenzene				0.50	90	80	127			
Surr: Toluene-d8				0.50	113	80	123			
Lab ID: MBLK072722a	7	Method Blank				Run: VOA5975C.I_220727C				07/28/22 03:14
Bromodichloromethane		ND	ug/L	0.50						
Bromoform		ND	ug/L	0.50						
Chlorodibromomethane		ND	ug/L	0.50						
Chloroform		ND	ug/L	0.50						
Surr: 1,2-Dichloroethane-d4				0.50	97	71	139			
Surr: p-Bromofluorobenzene				0.50	91	80	127			
Surr: Toluene-d8				0.50	104	80	123			
Lab ID: B22071983-001AMS	7	Sample Matrix Spike				Run: VOA5975C.I_220727C				07/28/22 11:40
Bromodichloromethane		99.4	ug/L	10	99	74	128			
Bromoform		111	ug/L	10	111	66	128			
Chlorodibromomethane		117	ug/L	10	117	74	125			
Chloroform		92.7	ug/L	10	87	68	124			
Surr: 1,2-Dichloroethane-d4				10	94	71	139			
Surr: p-Bromofluorobenzene				10	87	80	127			
Surr: Toluene-d8				10	107	80	123			
Lab ID: B22071983-001AMSD	7	Sample Matrix Spike Duplicate				Run: VOA5975C.I_220727C				07/28/22 12:07
Bromodichloromethane		105	ug/L	10	105	74	128	5.5	20	
Bromoform		121	ug/L	10	121	66	128	8.9	20	
Chlorodibromomethane		123	ug/L	10	123	74	125	4.7	20	
Chloroform		99.5	ug/L	10	94	68	124	7.1	20	
Surr: 1,2-Dichloroethane-d4				10	95	71	139			
Surr: p-Bromofluorobenzene				10	88	80	127			
Surr: Toluene-d8				10	108	80	123			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

Work Order Receipt Checklist

United Nuclear Corporation

C22070748

Login completed by: Ciara M. Leis
Reviewed by: Chantel S. Johnson
Reviewed Date: 7/22/2022

Date Received: 7/20/2022
Received by: pml
Carrier name: FedEx

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Applicable ☐
Container/Temp Blank temperature:	°C On Ice		
Containers requiring zero headspace have no headspace or bubble that is <6mm (1/4").	Yes ☑	No ☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

The reference date for Radon analysis is the sample collection date. The reference date for all other Radiochemical analyses is the analysis date. Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

Contact and Corrective Action Comments:

Cooler 1- 2.4 ° C
Cooler 2- 2.3 ° C
Cooler 3 - 2.6 ° C
Cooler 4 - 2.3 ° C
Cooler 5- 2.4 ° C
Cooler 6- 3.4 ° C
Shared trip blank C22070746-023A
No before shipping pictures assosiated with WO 7/21/2022 CL

C2207074

ENERGY LABORATORIES
Trust our People. Trust our Data.

Chain of Custody & Analytical Request Record

www.energylab.com

Page 1 of 1

Account Information (Billing information)

Company/Name	Wood PLC
Contact	Dorina Young
Phone	505-905-6651
Mailing Address	P.O. Box 1088
City, State, Zip	Gallup, NM 87305
Email	dorina.young@woodplc.com
Receive Invoice	☐Hard Copy ☒Email
Receive Report	☐Hard Copy ☒Email
Purchase Order	C014000055
Quote	6117
Bottle Order	70581 and/or 69379

Report Information (if different than Account Information)

Company/Name	United Nuclear Corp.
Contact	Max Chischilly JR.
Phone	505-905-6651
Mailing Address	P.O. Box 1088
City, State, Zip	Gallup, NM 87305
Email	max.chischilly@woodplc.com
Receive Report	☐Hard Copy ☒Email
Special Report/Formats:	☐ LEVEL IV ☐NELAC ☐ EDD/EDT (contact laboratory) ☐ Other_____

Comments

Wood PLC
Acct. No. is C16610
United Nuclear Corporation is no longer mining and milling.

These water samples were not considered Radioactive under US DOT-HMR gudelines for shipping on recent/previous quarterly sampling.

Project Information

Project Name, PWSID, Permit, etc. UNC- MILL

Sampler Name Max Chischilly JR.

Sampler Phone 505-905-6651

Sample Origin State NM

EPA/State Compliance ☒ Yes ☐ No

URANIUM MINING CLIENTS MUST indicate sample type

☒ Unprocessed Ore

☐ Processed Ore (Ground or Refined) **CALL BEFORE SENDING

☐ 11(e)2 Byproduct Material (Can ONLY be Submitted to ELI Casper Location)

Matrix Codes

A - Air
W- Water
S - Soils/ Solids
V - Vegetation
B - Bioassay
O - Oil
DW - Drinking Water

All turnaround times are standard unless marked as RUSH.

Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	As (Total)	Se (Total)	Be, Ca, Cd, Cl, HC03 K. Mg. Mn. Na	NH4, Ni, NO3, Pb, Mo Pb-210. pH. S04	TDS, Th-230, U, V Chloroform	Gross Alpha (-) U & Rn, Al	Co, Combined Ra-226 & Ra-228.	TTHM'S	Hg, (Total) Gross Beta (Total)	See Attached	RUSH TAT	ELI LAB ID Laboratory Use Only
1	DOMESTIC WATER WELL	7-19-22	0954	10	W	✓	✓	✓	✓	✓	✓	✓	✓	✓			
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	

ELI is REQUIRED to provide preservative traceability. If the preservatives supplied with the bottle order were **NOT** used, please attach your preservative information with this COC.

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Max Chischilly Jr.	7-19-22/1030	Max Chischilly J.	Franchesca Gillreath	7-19-22/1100	
	Relinquished by (print)	**Date/Time**	**Signature**	**Received by Laboratory (print)**	**Date/Time**	**Signature**
	Ricky E. Spitz	7-19-22/1300		Patience Leis	7/20/22 1:30	

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals	Intact	Receipt Temp	Temp Blank	On Ice	Payment Type	Amount	Receipt Number (cash/check only)
		Y N C B	Y N	°C	Y N	Y N	CC Cash Check_____	$	

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

Sample Analysis Report

Company:	Tetra Tech 1999 Harrison St Suite 500 Oakland, CA 94612	**Date Reported**	8/11/2022
		Report ID:	S2206451001
ProjectName:	RAES-TO003-Quivira	**WorkOrder:**	S2206451
Lab ID:	S2206451-001	**CollectionDate:**	6/21/2022 2:26:00 PM
ClientSample ID:	16K-336-GWQ1-01	**DateReceived:**	6/24/2022
COC:	RAES3-001	**FieldSampler:**	
PWS ID:		**Matrix:**	Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Radionuclides - Dissolved							
Radium 226	0.6	pCi/L		0.2	SM 7500 Ra-B	08/01/2022 1345	WN
Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	08/01/2022 1345	WN
Radium 228	0.4	pCi/L	U	1	Ga-Tech	08/06/2022 258	WN
Radium 228 Precision (±)	3.7	pCi/L	U		Ga-Tech	08/06/2022 258	WN

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported 8/11/2022
Report ID: S2206451001

ProjectName: RAES-TO003-Quivira
Lab ID: S2206451-002
ClientSample ID: 16K-340-GWQ1-01
COC: RAES3-001
PWS ID:
Comments

WorkOrder: S2206451
CollectionDate: 6/22/2022 11:48:00 AM
DateReceived: 6/24/2022
FieldSampler:
Matrix: Water

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Anions/Cations							
Alkalinity, Total (As CaCO3)	564	mg/L		5	SM 2320B	06/30/2022 2256	KAT
Chloride	23	mg/L		1	EPA 300.0	06/24/2022 1801	AB
Nitrogen, Nitrate+Nitrite (as N)	6.7	mg/L		0.1	EPA 353.2	07/18/2022 1627	AMB
Sulfate	334	mg/L		1	EPA 300.0	06/27/2022 1409	AB
Calcium	82	mg/L		1	EPA 200.7	06/29/2022 1508	DG
Magnesium	46	mg/L		1	EPA 200.7	06/29/2022 1508	DG
Potassium	5	mg/L		1	EPA 200.7	06/29/2022 1508	DG
Nitrogen, Ammonia (As N)	ND	mg/L	U	0.1	EPA 350.1	07/08/2022 1309	AMB
Phosphorus, Orthophosphate as P	0.106	mg/L	H	0.1	EPA 300.0	06/24/2022 1801	AB
General Parameters							
Hardness, Calcium/Magnesium (As CaCO3)	394	mg/L		1	SM 2340B	08/08/2022 1528	WN
Nitrogen, Total Kjeldahl (TKN)	0.382	mg/L	J	1	EPA 351.2	06/28/2022 1134	AMB
Total Dissolved Solids (180)	1170	mg/L		10	SM 2540	06/24/2022 1126	JMS
Total Organic Carbon	5	mg/L		1	SM 5310B	07/06/2022 1938	AB
Total Suspended Solids	ND	mg/L	U	5	SM 2540	06/27/2022 1328	KAT
Metals - Dissolved							
Aluminum	ND	mg/L	U	0.1	6010C	06/29/2022 1508	DG
Antimony	ND	mg/L	U	0.005	6020A	06/27/2022 1644	MS
Arsenic	ND	mg/L	U	0.005	6020A	06/27/2022 1644	MS
Barium	0.1	mg/L		0.1	6020A	06/27/2022 1644	MS
Beryllium	ND	mg/L	U	0.001	6010C	06/29/2022 1508	DG
Cadmium	ND	mg/L	U	0.002	6020A	06/27/2022 1644	MS
Chromium	ND	mg/L	U	0.01	6010C	06/29/2022 1508	DG
Cobalt	ND	mg/L	U	0.01	6010C	06/29/2022 1508	DG
Copper	0.00419	mg/L	J	0.01	6020A	06/27/2022 1644	MS
Iron	ND	mg/L	U	0.05	6010C	06/29/2022 1508	DG
Lead	ND	mg/L	U	0.001	6020A	06/27/2022 1644	MS
Manganese	0.02	mg/L		0.01	6010C	06/29/2022 1508	DG
Molybdenum	ND	mg/L	U	0.02	6020A	06/27/2022 1644	MS
Nickel	ND	mg/L	U	0.01	6010C	06/29/2022 1508	DG
Selenium	ND	mg/L	U	0.005	6020A	06/27/2022 1644	MS
Silver	ND	mg/L	U	0.003	6020A	06/27/2022 1644	MS
Thallium	ND	mg/L	U	0.001	6020A	06/27/2022 1644	MS
Thorium	ND	mg/L	U	0.1	6010C	06/29/2022 1508	DG
Uranium	0.002	mg/L		0.001	6020A	06/27/2022 1644	MS
Vanadium	ND	mg/L	U	0.02	6020A	06/27/2022 1644	MS
Zinc	0.0254	mg/L	J	0.05	6010C	06/29/2022 1508	DG

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported 8/11/2022
Report ID: S2206451001

ProjectName: RAES-TO003-Quivira
Lab ID: S2206451-002
ClientSample ID: 16K-340-GWQ1-01
COC: RAES3-001
PWS ID:
Comments

WorkOrder: S2206451
CollectionDate: 6/22/2022 11:48:00 AM
DateReceived: 6/24/2022
FieldSampler:
Matrix: Water

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Radionuclides - Dissolved							
Radium 226	0.3	pCi/L		0.2	SM 7500 Ra-B	08/01/2022 1345	WN
Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	08/01/2022 1345	WN
Radium 228	0.2	pCi/L	U	1	Ga-Tech	08/06/2022 601	WN
Radium 228 Precision (±)	3.3	pCi/L	U		Ga-Tech	08/06/2022 601	WN

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported 8/11/2022
Report ID: S2206451001

ProjectName: RAES-TO003-Quivira
Lab ID: S2206451-003
ClientSample ID: 15T-303-GWQ1-01
COC: RAES3-001
PWS ID:
Comments

WorkOrder: S2206451
CollectionDate: 6/21/2022 3:50:00 PM
DateReceived: 6/24/2022
FieldSampler:
Matrix: Water

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Anions/Cations							
Alkalinity, Total (As CaCO3)	230	mg/L		5	SM 2320B	06/30/2022 2305	KAT
Chloride	9	mg/L		1	EPA 300.0	06/24/2022 1810	AB
Nitrogen, Nitrate+Nitrite (as N)	ND	mg/L	U	0.1	EPA 353.2	07/18/2022 1222	AMB
Sulfate	1490	mg/L	D	2.55	EPA 300.0	06/27/2022 1421	AB
Calcium	390	mg/L		1	EPA 200.7	06/29/2022 1512	DG
Magnesium	141	mg/L		1	EPA 200.7	06/29/2022 1512	DG
Potassium	7	mg/L		1	EPA 200.7	06/29/2022 1512	DG
Nitrogen, Ammonia (As N)	0.2	mg/L		0.1	EPA 350.1	07/08/2022 1313	AMB
Phosphorus, Orthophosphate as P	0.464	mg/L	DH	0.216	EPA 300.0	06/24/2022 1810	AB
General Parameters							
Hardness, Calcium/Magnesium (As CaCO3)	1550	mg/L		1	SM 2340B	08/08/2022 1528	WN
Nitrogen, Total Kjeldahl (TKN)	0.157	mg/L	J	1	EPA 351.2	06/28/2022 1128	AMB
Total Dissolved Solids (180)	2490	mg/L		10	SM 2540	06/24/2022 1127	JMS
Total Organic Carbon	2	mg/L		1	SM 5310B	07/06/2022 1822	AB
Total Suspended Solids	17	mg/L		5	SM 2540	06/27/2022 1329	KAT
Metals - Dissolved							
Aluminum	ND	mg/L	U	0.1	6010C	06/29/2022 1512	DG
Antimony	ND	mg/L	U	0.005	6020A	06/27/2022 1650	MS
Arsenic	0.00102	mg/L	J	0.005	6020A	06/27/2022 1650	MS
Barium	0.00782	mg/L	J	0.1	6020A	06/27/2022 1650	MS
Beryllium	ND	mg/L	U	0.001	6010C	06/29/2022 1512	DG
Cadmium	ND	mg/L	U	0.002	6020A	06/27/2022 1650	MS
Chromium	ND	mg/L	U	0.01	6010C	06/29/2022 1512	DG
Cobalt	ND	mg/L	U	0.01	6010C	06/29/2022 1512	DG
Copper	0.00902	mg/L	J	0.01	6020A	06/27/2022 1650	MS
Iron	6.75	mg/L		0.05	6010C	06/29/2022 1512	DG
Lead	ND	mg/L	U	0.001	6020A	06/27/2022 1650	MS
Manganese	0.51	mg/L		0.01	6010C	06/29/2022 1512	DG
Molybdenum	0.02	mg/L		0.02	6020A	06/27/2022 1650	MS
Nickel	0.00273	mg/L	J	0.01	6010C	06/29/2022 1512	DG
Selenium	ND	mg/L	U	0.005	6020A	06/27/2022 1650	MS
Silver	ND	mg/L	U	0.003	6020A	06/27/2022 1650	MS
Thallium	ND	mg/L	U	0.001	6020A	06/27/2022 1650	MS
Thorium	ND	mg/L	U	0.1	6010C	06/29/2022 1512	DG
Uranium	0.000374	mg/L	J	0.001	6020A	06/27/2022 1650	MS
Vanadium	ND	mg/L	U	0.02	6020A	06/27/2022 1650	MS
Zinc	0.49	mg/L		0.05	6010C	06/29/2022 1512	DG

Sample Analysis Report

Company:	Tetra Tech 1999 Harrison St Suite 500 Oakland, CA 94612	**Date Reported**	8/11/2022
		Report ID:	S2206451001
ProjectName:	RAES-TO003-Quivira	**WorkOrder:**	S2206451
Lab ID:	S2206451-003	**CollectionDate:**	6/21/2022 3:50:00 PM
ClientSample ID:	15T-303-GWQ1-01	**DateReceived:**	6/24/2022
COC:	RAES3-001	**FieldSampler:**	
PWS ID:		**Matrix:**	Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Radionuclides - Dissolved							
Radium 226	2.5	pCi/L		0.2	SM 7500 Ra-B	08/01/2022 1345	WN
Radium 226 Precision (±)	0.2	pCi/L			SM 7500 Ra-B	08/01/2022 1345	WN
Radium 228	0.9	pCi/L	J	1	Ga-Tech	08/06/2022 905	WN
Radium 228 Precision (±)	3.4	pCi/L	J		Ga-Tech	08/06/2022 905	WN

Sample Analysis Report

Company:	Tetra Tech 1999 Harrison St Suite 500 Oakland, CA 94612	**Date Reported**	8/11/2022
		Report ID:	S2206451001
ProjectName:	RAES-TO003-Quivira	**WorkOrder:**	S2206451
Lab ID:	S2206451-004	**CollectionDate:**	6/22/2022 2:05:00 PM
ClientSample ID:	14T-586-GWQ1-01	**DateReceived:**	6/24/2022
COC:	RAES3-001	**FieldSampler:**	
PWS ID:		**Matrix:**	Water
Comments			

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Anions/Cations							
Alkalinity, Total (As CaCO3)	388	mg/L		5	SM 2320B	06/30/2022 2324	KAT
Chloride	12	mg/L		1	EPA 300.0	06/24/2022 1849	AB
Nitrogen, Nitrate+Nitrite (as N)	0.3	mg/L		0.1	EPA 353.2	07/18/2022 1239	AMB
Sulfate	955	mg/L	D	2.55	EPA 300.0	06/27/2022 1508	AB
Calcium	290	mg/L		1	EPA 200.7	06/29/2022 1519	DG
Magnesium	113	mg/L		1	EPA 200.7	06/29/2022 1519	DG
Potassium	9	mg/L		1	EPA 200.7	06/29/2022 1519	DG
Nitrogen, Ammonia (As N)	0.0520	mg/L	J	0.1	EPA 350.1	07/08/2022 1312	AMB
Phosphorus, Orthophosphate as P	0.090	mg/L	JH	0.1	EPA 300.0	06/24/2022 1849	AB
General Parameters							
Hardness, Calcium/Magnesium (As CaCO3)	1190	mg/L		1	SM 2340B	08/08/2022 1528	WN
Nitrogen, Total Kjeldahl (TKN)	0.0896	mg/L	J	1	EPA 351.2	06/28/2022 1135	AMB
Total Dissolved Solids (180)	2100	mg/L		10	SM 2540	06/24/2022 1129	JMS
Total Organic Carbon	2	mg/L		1	SM 5310B	07/06/2022 1958	AB
Total Suspended Solids	7	mg/L		5	SM 2540	06/27/2022 1331	KAT
Metals - Dissolved							
Aluminum	ND	mg/L	U	0.1	6010C	06/29/2022 1519	DG
Antimony	0.000192	mg/L	J	0.005	6020A	06/27/2022 1724	MS
Arsenic	ND	mg/L	U	0.005	6020A	06/27/2022 1724	MS
Barium	0.0143	mg/L	J	0.1	6020A	06/27/2022 1724	MS
Beryllium	ND	mg/L	U	0.001	6010C	06/29/2022 1519	DG
Cadmium	ND	mg/L	U	0.002	6020A	06/27/2022 1724	MS
Chromium	ND	mg/L	U	0.01	6010C	06/29/2022 1519	DG
Cobalt	ND	mg/L	U	0.01	6010C	06/29/2022 1519	DG
Copper	ND	mg/L	U	0.01	6020A	06/27/2022 1724	MS
Iron	ND	mg/L	U	0.05	6010C	06/29/2022 1519	DG
Lead	ND	mg/L	U	0.001	6020A	06/27/2022 1724	MS
Manganese	1.17	mg/L		0.01	6010C	06/29/2022 1519	DG
Molybdenum	0.03	mg/L		0.02	6020A	06/27/2022 1724	MS
Nickel	0.00143	mg/L	J	0.01	6010C	06/29/2022 1519	DG
Selenium	ND	mg/L	U	0.005	6020A	06/27/2022 1724	MS
Silver	ND	mg/L	U	0.003	6020A	06/27/2022 1724	MS
Thallium	ND	mg/L	U	0.001	6020A	06/27/2022 1724	MS
Thorium	ND	mg/L	U	0.1	6010C	06/29/2022 1519	DG
Uranium	0.002	mg/L		0.001	6020A	06/27/2022 1724	MS
Vanadium	ND	mg/L	U	0.02	6020A	06/27/2022 1724	MS
Zinc	0.34	mg/L		0.05	6010C	06/29/2022 1519	DG

Sample Analysis Report

Company:	Tetra Tech 1999 Harrison St Suite 500 Oakland, CA 94612	**Date Reported**	8/11/2022
		Report ID:	S2206451001
ProjectName:	RAES-TO003-Quivira	**WorkOrder:**	S2206451
Lab ID:	S2206451-004	**CollectionDate:**	6/22/2022 2:05:00 PM
ClientSample ID:	14T-586-GWQ1-01	**DateReceived:**	6/24/2022
COC:	RAES3-001	**FieldSampler:**	
PWS ID:		**Matrix:**	Water

Comments

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Radionuclides - Dissolved							
Radium 226	1.5	pCi/L		0.2	SM 7500 Ra-B	08/01/2022 1345	WN
Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	08/01/2022 1345	WN
Radium 228	-2.1	pCi/L	U	1	Ga-Tech	08/06/2022 1815	WN
Radium 228 Precision (±)	2.7	pCi/L	U		Ga-Tech	08/06/2022 1815	WN

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported 8/11/2022
Report ID: S2206451001

ProjectName: RAES-TO003-Quivira
Lab ID: S2206451-005
ClientSample ID: 14T-586-GWQ1-02
COC: RAES3-001
PWS ID:
Comments

WorkOrder: S2206451
CollectionDate: 6/22/2022 2:05:00 PM
DateReceived: 6/24/2022
FieldSampler:
Matrix: Water

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Metals - Dissolved							
Aluminum	ND	mg/L	U	0.1	6010C	06/29/2022 1521	DG
Antimony	ND	mg/L	U	0.005	6020A	06/27/2022 1730	MS
Arsenic	ND	mg/L	U	0.005	6020A	06/27/2022 1730	MS
Barium	0.0145	mg/L	J	0.1	6020A	06/27/2022 1730	MS
Beryllium	ND	mg/L	U	0.001	6010C	06/29/2022 1521	DG
Cadmium	ND	mg/L	U	0.002	6020A	06/27/2022 1730	MS
Calcium	291	mg/L		0.5	6010C	06/29/2022 1521	DG
Chromium	ND	mg/L	U	0.01	6010C	06/29/2022 1521	DG
Cobalt	ND	mg/L	U	0.01	6010C	06/29/2022 1521	DG
Copper	0.00588	mg/L	J	0.01	6020A	06/27/2022 1730	MS
Iron	ND	mg/L	U	0.05	6010C	06/29/2022 1521	DG
Lead	ND	mg/L	U	0.001	6020A	06/27/2022 1730	MS
Magnesium	113	mg/L		0.5	6010C	06/29/2022 1521	DG
Manganese	1.16	mg/L		0.01	6010C	06/29/2022 1521	DG
Molybdenum	0.03	mg/L		0.02	6020A	06/27/2022 1730	MS
Nickel	0.00191	mg/L	J	0.01	6010C	06/29/2022 1521	DG
Selenium	ND	mg/L	U	0.005	6020A	06/27/2022 1730	MS
Silver	ND	mg/L	U	0.003	6020A	06/27/2022 1730	MS
Sodium	140	mg/L		1	6010C	06/29/2022 1521	DG
Thallium	ND	mg/L	U	0.001	6020A	06/27/2022 1730	MS
Thorium	ND	mg/L	U	0.1	6010C	06/29/2022 1521	DG
Uranium	0.002	mg/L		0.001	6020A	06/27/2022 1730	MS
Vanadium	ND	mg/L	U	0.02	6020A	06/27/2022 1730	MS
Zinc	0.34	mg/L		0.05	6010C	06/29/2022 1521	DG
Radionuclides - Dissolved							
Radium 226	1.5	pCi/L		0.2	SM 7500 Ra-B	08/01/2022 1345	WN
Radium 226 Precision (±)	0.1	pCi/L			SM 7500 Ra-B	08/01/2022 1345	WN
Radium 228	1.4	pCi/L		1	Ga-Tech	08/06/2022 2118	WN
Radium 228 Precision (±)	3.3	pCi/L			Ga-Tech	08/06/2022 2118	WN

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported 8/11/2022
Report ID: S2206451001

ProjectName: RAES-TO003-Quivira
Lab ID: S2206451-006
ClientSample ID: QV-FB-01-6/22/22
COC: RAES3-001
PWS ID:
Comments

WorkOrder: S2206451
CollectionDate: 6/22/2022 6:50:00 PM
DateReceived: 6/24/2022
FieldSampler:
Matrix: Water

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Metals - Dissolved							
Aluminum	ND	mg/L	U	0.1	6010C	06/29/2022 1523	DG
Antimony	ND	mg/L	U	0.005	6020A	06/27/2022 1736	MS
Arsenic	ND	mg/L	U	0.005	6020A	06/27/2022 1736	MS
Barium	ND	mg/L	U	0.1	6020A	06/27/2022 1736	MS
Beryllium	ND	mg/L	U	0.001	6010C	06/29/2022 1523	DG
Cadmium	ND	mg/L	U	0.002	6020A	06/27/2022 1736	MS
Calcium	ND	mg/L	U	0.5	6010C	06/29/2022 1523	DG
Chromium	ND	mg/L	U	0.01	6010C	06/29/2022 1523	DG
Cobalt	ND	mg/L	U	0.01	6010C	06/29/2022 1523	DG
Copper	ND	mg/L	U	0.01	6020A	06/27/2022 1736	MS
Iron	ND	mg/L	U	0.05	6010C	06/29/2022 1523	DG
Lead	ND	mg/L	U	0.001	6020A	06/27/2022 1736	MS
Magnesium	ND	mg/L	U	0.5	6010C	06/29/2022 1523	DG
Manganese	ND	mg/L	U	0.01	6010C	06/29/2022 1523	DG
Molybdenum	ND	mg/L	U	0.02	6020A	06/27/2022 1736	MS
Nickel	ND	mg/L	U	0.01	6010C	06/29/2022 1523	DG
Selenium	ND	mg/L	U	0.005	6020A	06/27/2022 1736	MS
Silver	ND	mg/L	U	0.003	6020A	06/27/2022 1736	MS
Sodium	ND	mg/L	U	1	6010C	06/29/2022 1523	DG
Thallium	ND	mg/L	U	0.001	6020A	06/27/2022 1736	MS
Thorium	ND	mg/L	U	0.1	6010C	06/29/2022 1523	DG
Uranium	ND	mg/L	U	0.001	6020A	06/27/2022 1736	MS
Vanadium	ND	mg/L	U	0.02	6020A	06/27/2022 1736	MS
Zinc	ND	mg/L	U	0.05	6010C	06/29/2022 1523	DG
Radionuclides - Dissolved							
Radium 226	0.09	pCi/L	U	0.2	SM 7500 Ra-B	08/01/2022 1345	WN
Radium 226 Precision (±)	0.04	pCi/L	U		SM 7500 Ra-B	08/01/2022 1345	WN
Radium 228	-2.3	pCi/L	U	1	Ga-Tech	08/07/2022 022	WN
Radium 228 Precision (±)	4.8	pCi/L	U		Ga-Tech	08/07/2022 022	WN

Sample Analysis Report

Company: Tetra Tech
1999 Harrison St Suite 500
Oakland, CA 94612

Date Reported 8/11/2022
Report ID: S2206451001

ProjectName: RAES-TO003-Quivira
Lab ID: S2206451-007
ClientSample ID: QV-EB-01-6/22/22
COC: RAES3-001
PWS ID:
Comments

WorkOrder: S2206451
CollectionDate: 6/22/2022 7:06:00 PM
DateReceived: 6/24/2022
FieldSampler:
Matrix: Water

Analyses	Result	Units	Qual	RL	Method	Date Analyzed/Init	
Metals - Dissolved							
Aluminum	ND	mg/L	U	0.1	6010C	06/29/2022 1530	DG
Antimony	ND	mg/L	U	0.005	6020A	06/27/2022 1742	MS
Arsenic	ND	mg/L	U	0.005	6020A	06/27/2022 1742	MS
Barium	ND	mg/L	U	0.1	6020A	06/27/2022 1742	MS
Beryllium	ND	mg/L	U	0.001	6010C	06/29/2022 1530	DG
Cadmium	ND	mg/L	U	0.002	6020A	06/27/2022 1742	MS
Calcium	ND	mg/L	U	0.5	6010C	06/29/2022 1530	DG
Chromium	ND	mg/L	U	0.01	6010C	06/29/2022 1530	DG
Cobalt	ND	mg/L	U	0.01	6010C	06/29/2022 1530	DG
Copper	ND	mg/L	U	0.01	6020A	06/27/2022 1742	MS
Iron	ND	mg/L	U	0.05	6010C	06/29/2022 1530	DG
Lead	ND	mg/L	U	0.001	6020A	06/27/2022 1742	MS
Magnesium	ND	mg/L	U	0.5	6010C	06/29/2022 1530	DG
Manganese	ND	mg/L	U	0.01	6010C	06/29/2022 1530	DG
Molybdenum	ND	mg/L	U	0.02	6020A	06/27/2022 1742	MS
Nickel	ND	mg/L	U	0.01	6010C	06/29/2022 1530	DG
Selenium	ND	mg/L	U	0.005	6020A	06/27/2022 1742	MS
Silver	ND	mg/L	U	0.003	6020A	06/27/2022 1742	MS
Sodium	ND	mg/L	U	1	6010C	06/29/2022 1530	DG
Thallium	ND	mg/L	U	0.001	6020A	06/27/2022 1742	MS
Thorium	ND	mg/L	U	0.1	6010C	06/29/2022 1530	DG
Uranium	ND	mg/L	U	0.001	6020A	06/27/2022 1742	MS
Vanadium	ND	mg/L	U	0.02	6020A	06/27/2022 1742	MS
Zinc	ND	mg/L	U	0.05	6010C	06/29/2022 1530	DG
Radionuclides - Dissolved							
Radium 226	0.02	pCi/L	U	0.2	SM 7500 Ra-B	08/01/2022 1345	WN
Radium 226 Precision (±)	0.04	pCi/L	U		SM 7500 Ra-B	08/01/2022 1345	WN
Radium 228	-1.4	pCi/L	U	1	Ga-Tech	08/07/2022 326	WN
Radium 228 Precision (±)	3.0	pCi/L	U		Ga-Tech	08/07/2022 326	WN