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

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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

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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.

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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.

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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).

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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).

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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

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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,

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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

[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.

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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.

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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

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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.

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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

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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	

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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	10/17/1979	0.24
(resample of 1081958)		
1082365	10/18/1979	0.95
1082366	10/18/1979	1007.4

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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

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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

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- 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.

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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.

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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.

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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

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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

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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

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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.

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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).

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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.

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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

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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

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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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Section 10. References

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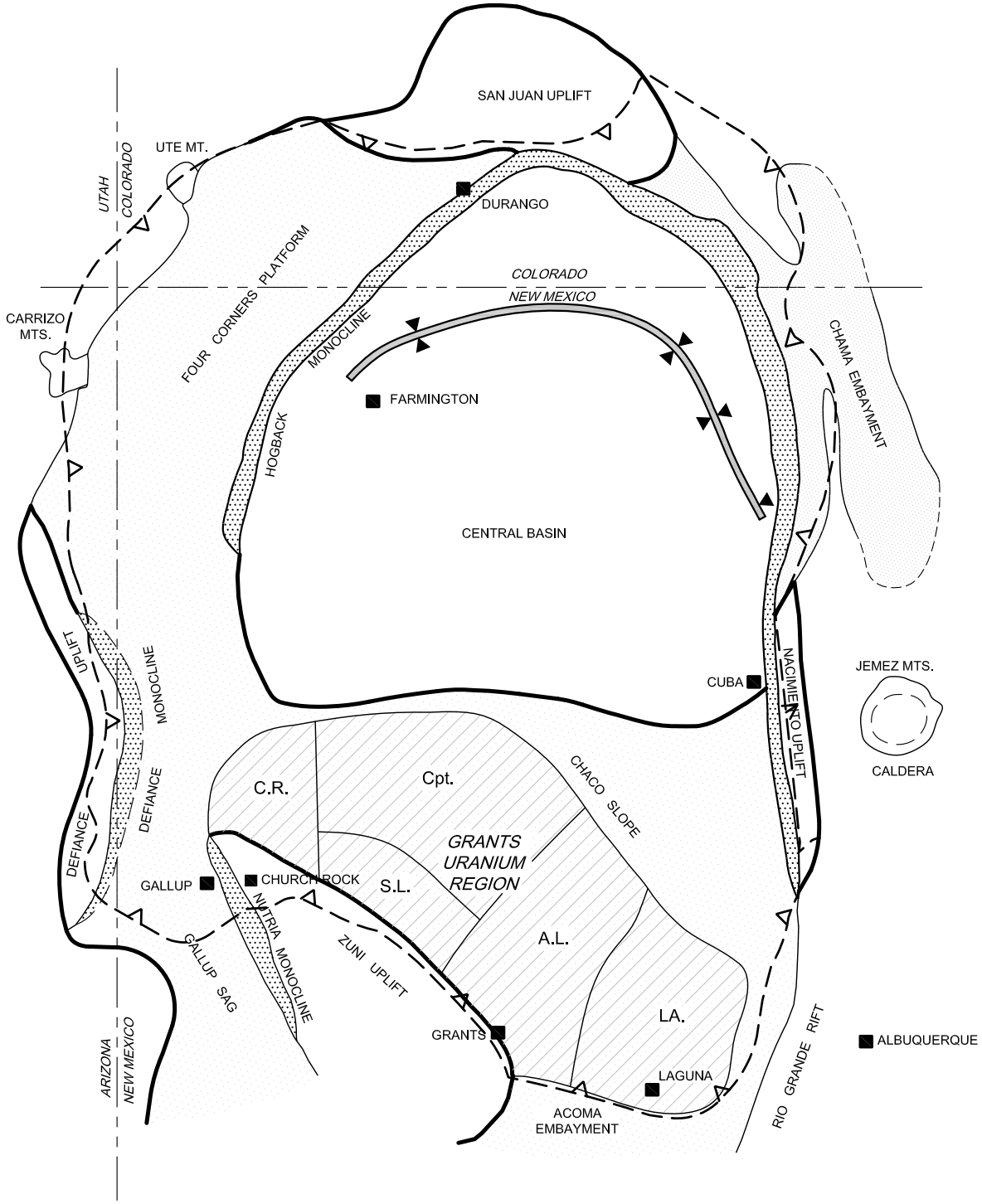
Figures

DRAFT



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

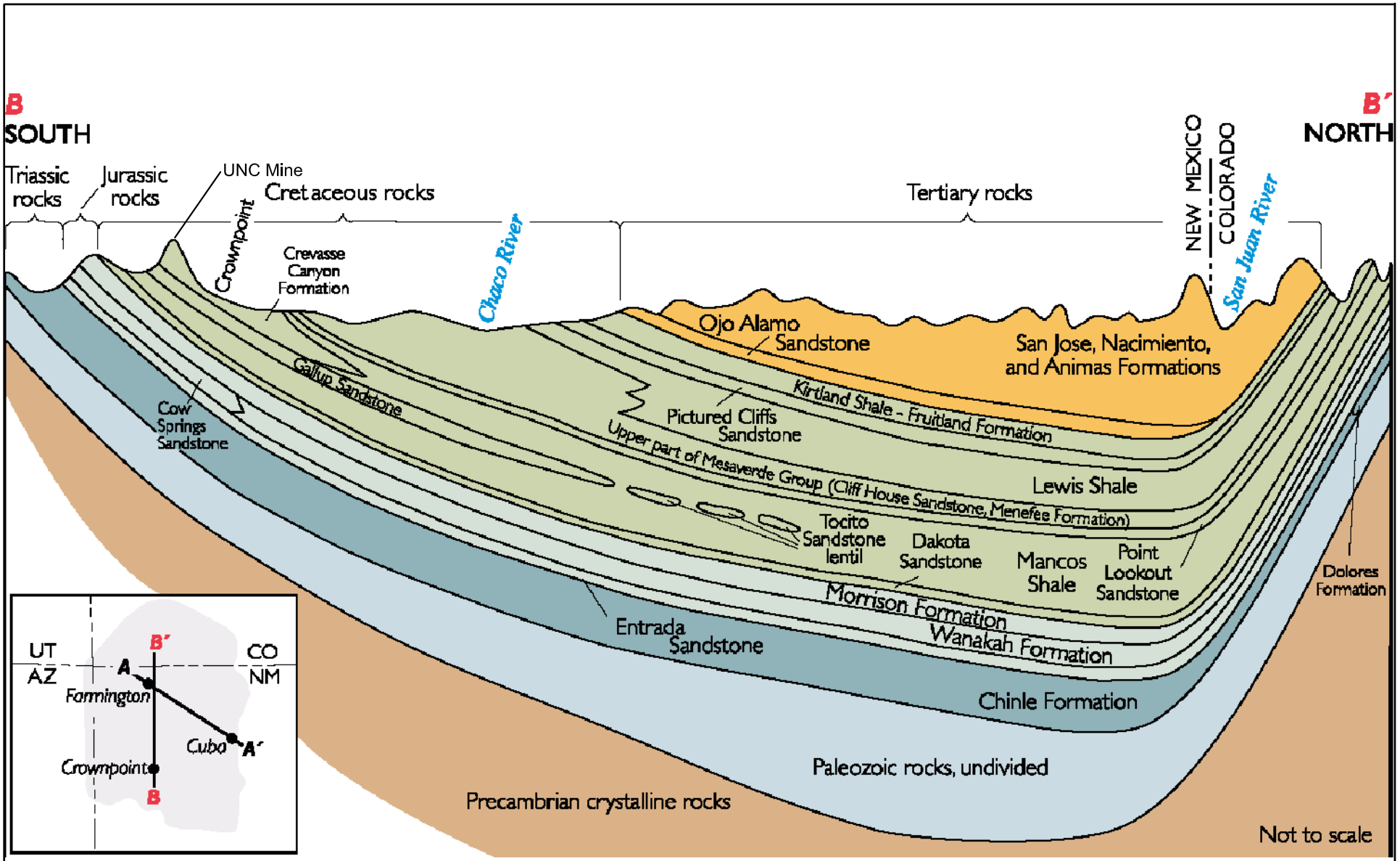
LEGEND:

BOUNDARY OF SAN JUAN STRUCTURAL BASIN

UPLIFT BOUNDARY

Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, California 94104 (415) 395-9974	CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY	GEOLOGIC FEATURES OF THE SAN JUAN BASIN			
	LOCATION: NEW MEXICO NAVAJO NATION	DRAWN BY: SC 08/08/11	CHECKED BY: MF 08/08/11	PROJECT NO. 2010-202	FIG NO. 1

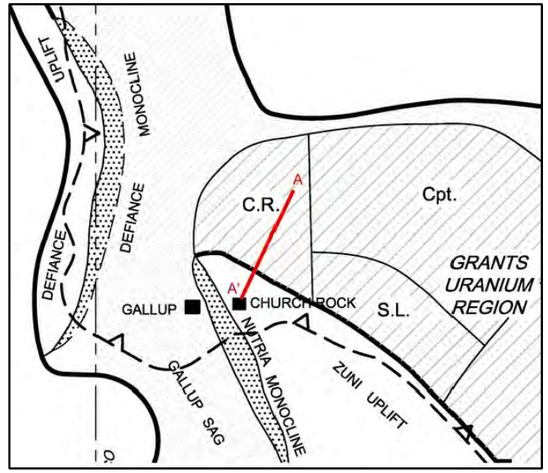
FILE NAME: N:\Graphics\2010\2010-202 US EPA Navajo Nation\Fig1_SanJuan.dwg LAYOUT NAME: 1 PLOTTED: Friday, September 02, 2011 - 5:03pm

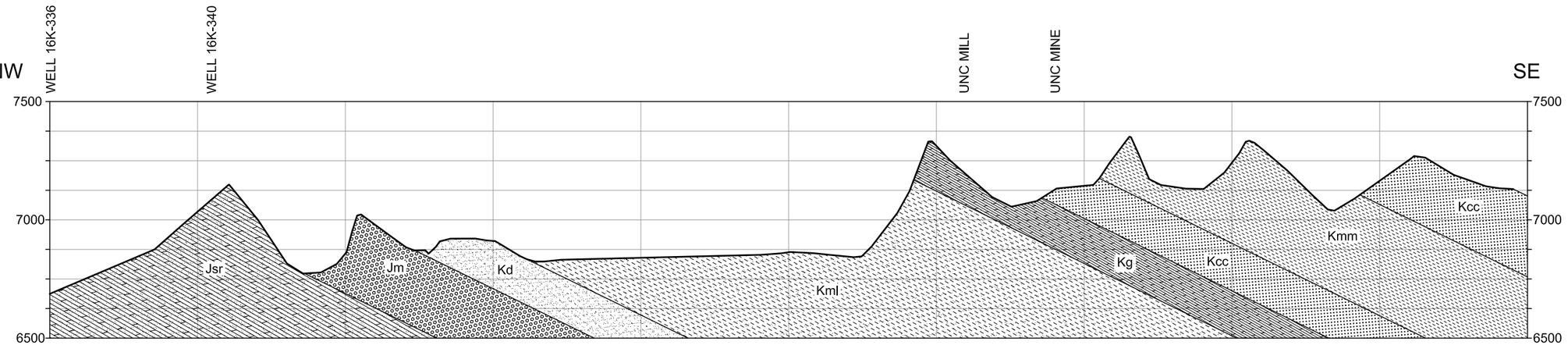


Source:
Brister and Hoffman, 2002. New Mexico's Energy, Present and Future: Policy, Production, Economics, and the Environment. Brian S. Brister and L. Greer Price editors. New Mexico Bureau of Geology and Mineral Resources.

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

ERRG Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, California 94104 (415) 395-9974	CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY	GEOLOGIC CROSS-SECTION OF THE SAN JUAN BASIN			
	LOCATION: CHURCH ROCK AREA NEW MEXICO, NAVAJO AREA	DRAWN BY: SC 08/08/11	CHECKED BY: MHF 08/08/11	PROJECT NO. 2010-202	FIG NO. 2





CROSS SECTION VIEW WITH EXAGGERATED VERTICAL SCALE

0' 1000'

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

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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San Francisco, California 94104
(415) 395-9974

CLIENT:	GEOLOGIC CROSS SECTION CHURCH ROCK AREA			
U.S. ENVIRONMENTAL PROTECTION AGENCY				
LOCATION:	DRAWN BY:	CHECKED BY:	PROJECT NO.	FIG NO.
CHURCH ROCK AREA NEW MEXICO, NAVAJO AREA	SC 09/08/11	MHF 09/08/11	2010-202	3

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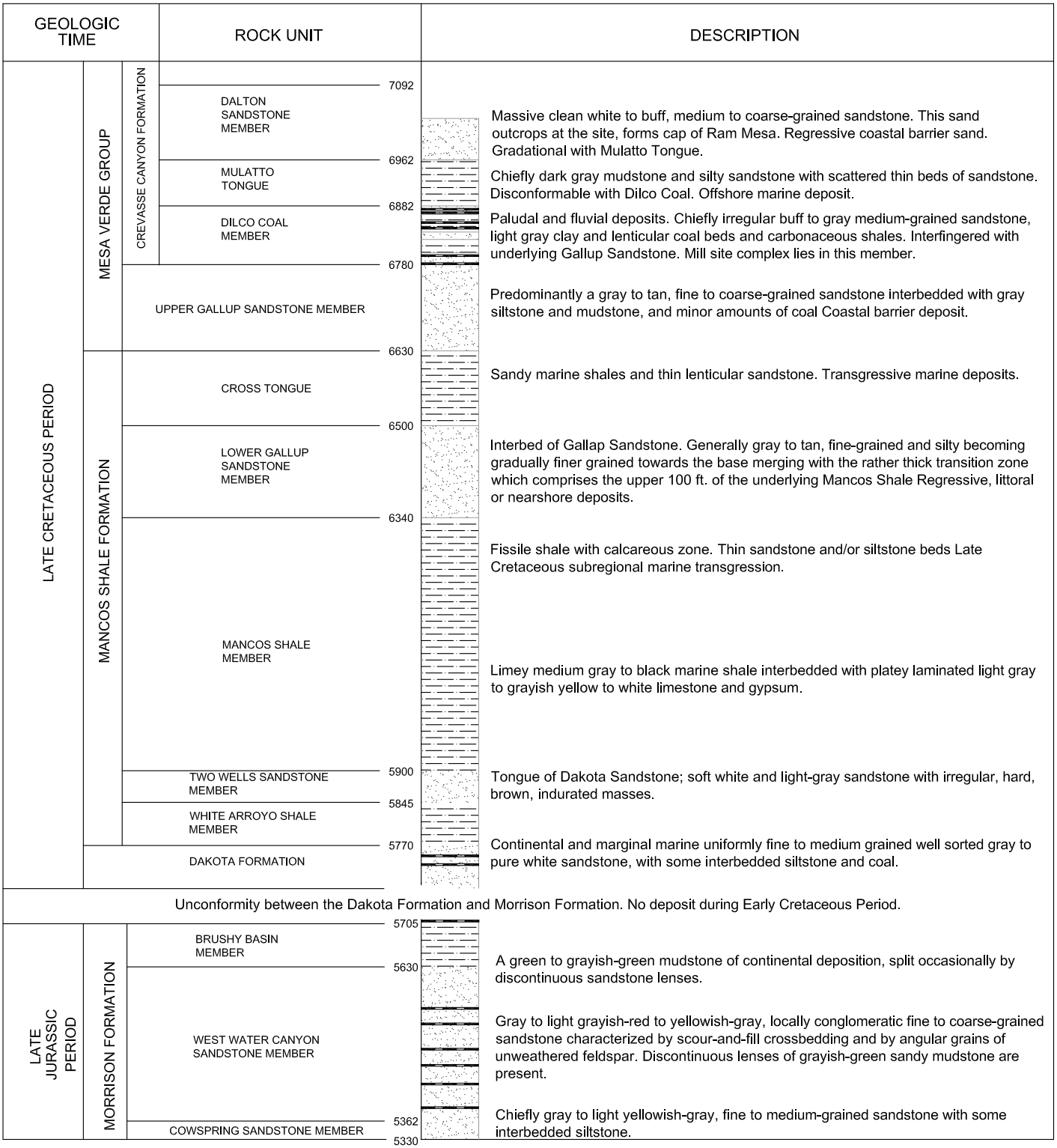

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Source:
Canonie Environmental, 1988. "Transmittal, Pre-Mining/Pre-Milling Water Level Data, United Nuclear Corporation's Church Rock Site, Gallup, New Mexico." July 26.
Specific source for Two Wells SS - Cobban, W.A., and Hook, S.C., 1989, Mid-Cretaceous 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

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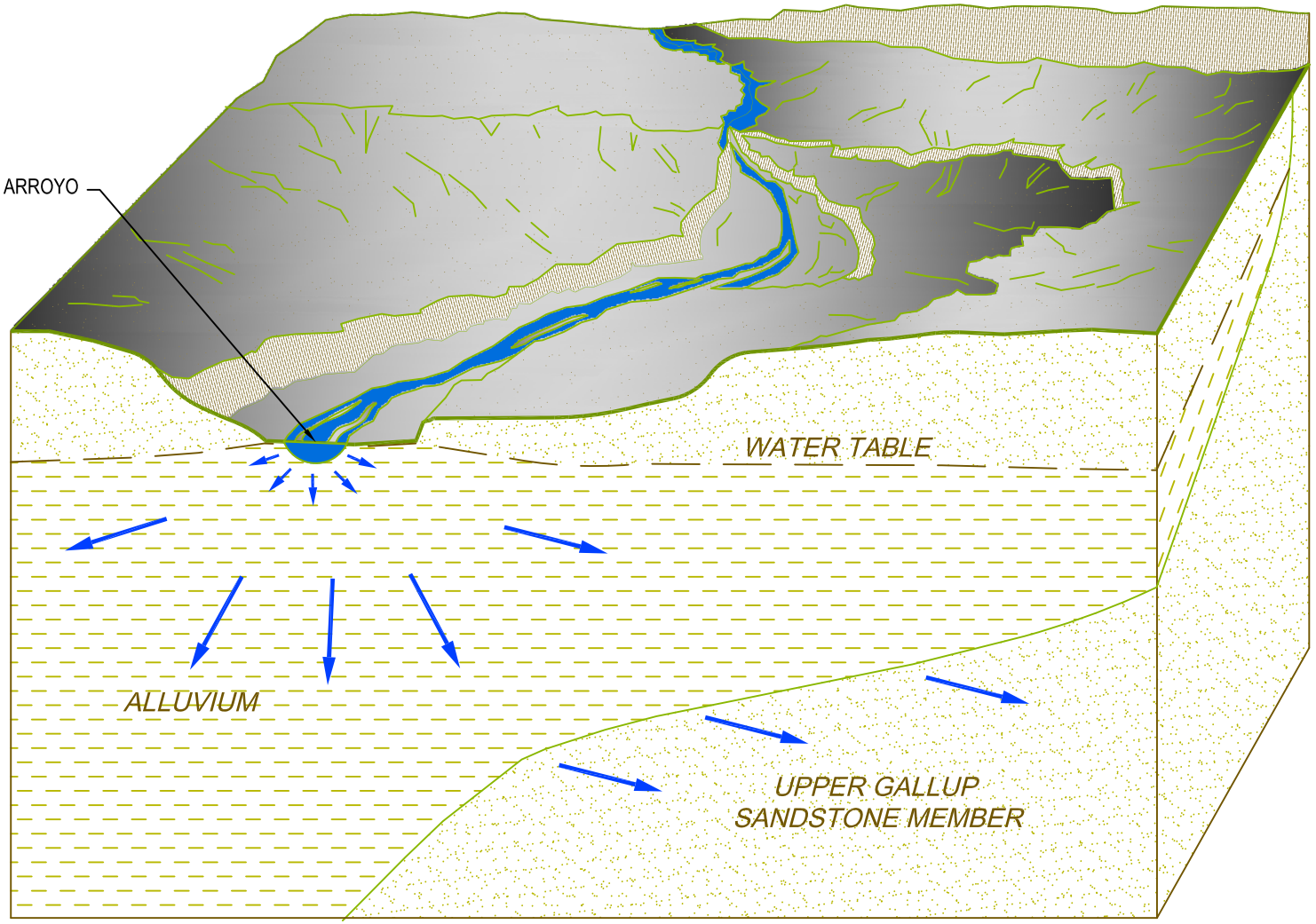
CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY	NORTHEAST CHURCH ROCK MINE SITE STRATIGRAPHIC COLUMN			
LOCATION: CHURCH ROCK AREA NEW MEXICO, NAVAJO NATION	DRAWN BY: SC 08/03/11	CHECKED BY: MHF 08/03/11	PROJECT NO. 2010-202	FIG NO. 4



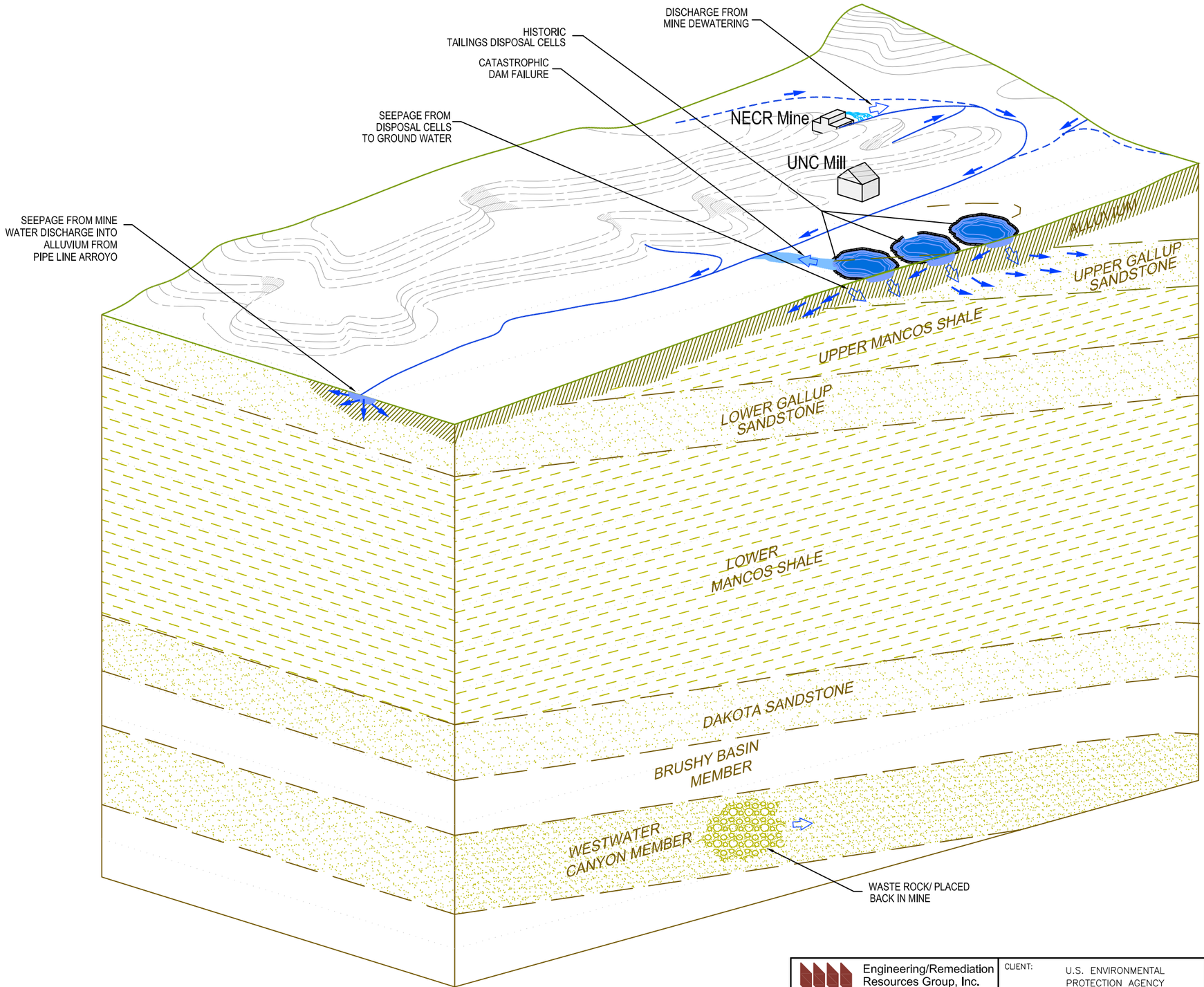
LEGEND:

Ground Water Recharge

NOT TO SCALE

ERRG Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, California 94104 (415) 395-9974	CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY	CONCEPTUAL DRAWINGS OF GROUNDWATER RECHARGE FROM STREAM FLOW			
	LOCATION: CHURCH ROCK AREA NAVAJO NATION	DRAWN BY: SC 09/08/11	CHECKED BY: MF 09/08/11	PROJECT NO. 2010-202	FIG NO. 5

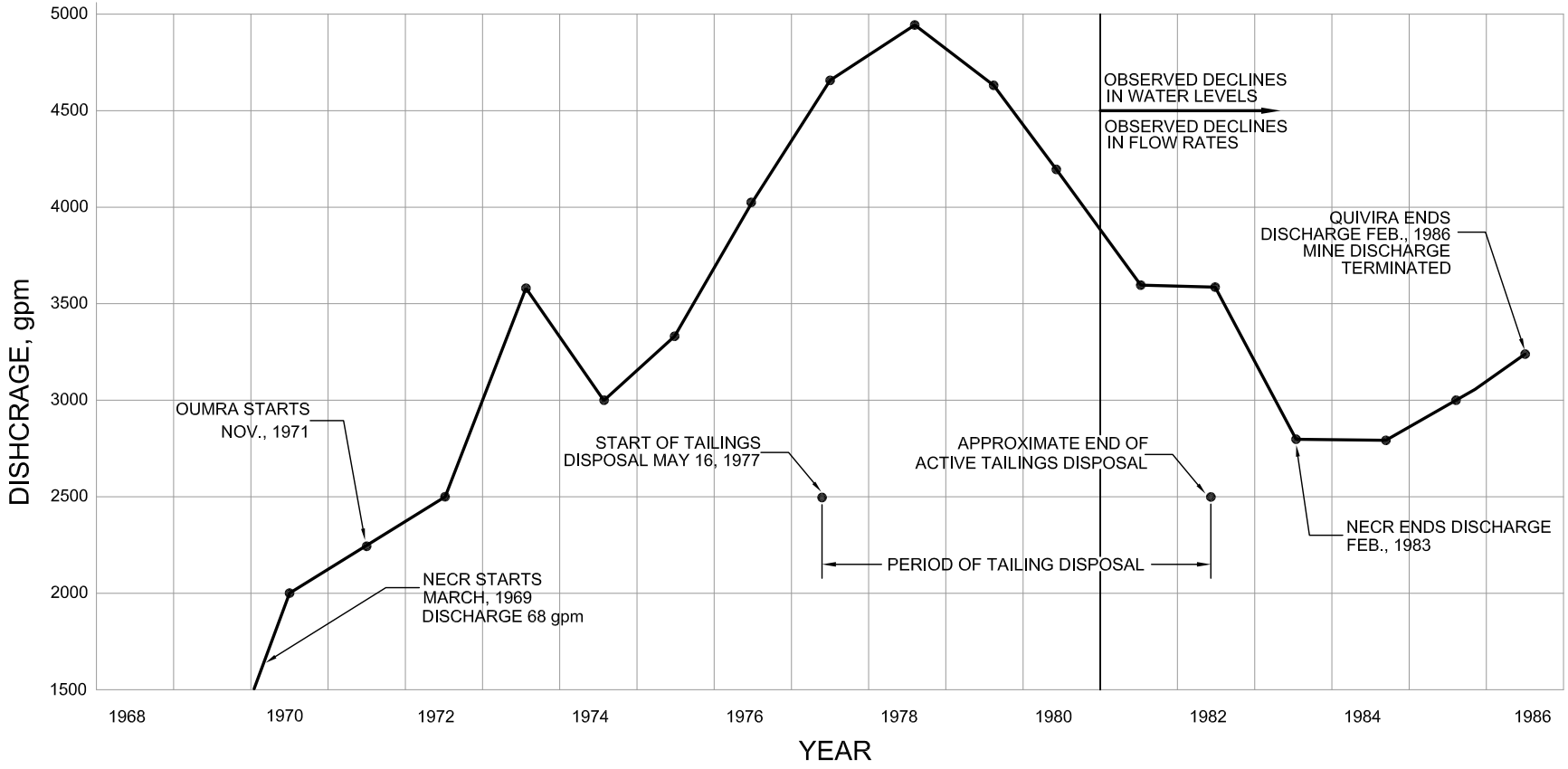
FILE NAME: N:\Graphics\2010\2010-202 US EPA Navajo Nation\Fig5_sectionVIEW.dwg LAYOUT NAME: 5 PLOTTED: Friday, September 09, 2011 - 10:50am



NOT TO SCALE

ERRG Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, California 94104 (415) 395-9974	CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY	CONCEPTUAL DRAWING OF WATER FLOW AND HISTORIC RELEASES			
	LOCATION: CHURCH ROCK AREA NAVAJO NATION	DRAWN BY: SC 09/08/11	CHECKED BY: MF 09/08/11	PROJECT NO. 2010-202	FIG NO. 6

FILE NAME: N:\Graphics\2010\2010-202 US EPA Navajo Nation\Fig6_uranium-release.dwg LAYOUT NAME: 6 PLOTTED: Friday, September 09, 2011 - 12:58pm



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."

NOT TO SCALE

ERRG Engineering/Remediation Resources Group, Inc.
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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

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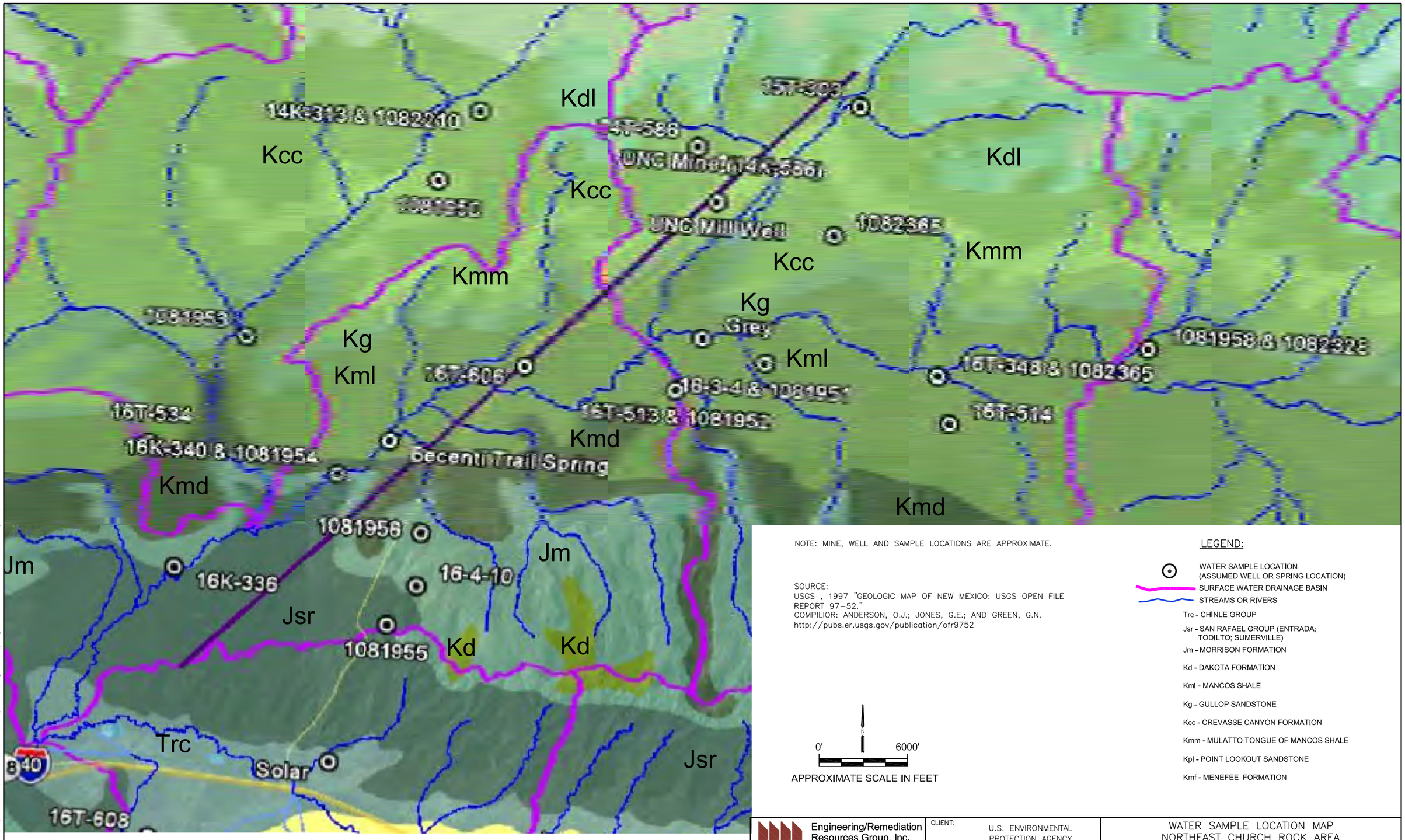

NOTE: MINE, WELL AND SAMPLE LOCATIONS ARE APPROXIMATE.

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

0' 6000'

APPROXIMATE SCALE IN FEET

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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San Francisco, California 94104
(415) 395-9974

CLIENT:	LOCATION:	DRAWN BY:	CHECKED BY:	PROJECT NO.	FIG NO.
U.S. ENVIRONMENTAL PROTECTION AGENCY	CHURCH ROCK AREA NEW MEXICO, NAVAJO AREA	SC 09/08/11	MHF 09/08/11	2010–202	8

WATER SAMPLE LOCATION MAP NORTHEAST CHURCH ROCK AREA

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

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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

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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								
$\delta D\ H_2O$	%		-80.8	-81.2	-73.1	-91.4	-82.6	-107.3
$\delta^{18}O\ H_2O$	%		-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

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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**			

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Table 3. Summary of Groundwater Sampling Results

Geologic Formation	Well ID/ Sample ID	Sample Date**	Radionuclides							General Chemistry						
			Total Uranium (pCi/L)	Uranium (mg/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 (mg/L)	Sulfate (mg/L)	Nitrate (mg/L)
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)	136.41	**13.02**
		29-Oct-03	0.38	0.57	0.83	0.30	1.13	5.9	--	888	--	8.05	--	6	122.0	--
		01-Oct-08	--	0.80	0.40	0.67	1.07	--	--	904	--	--	--	--	158.0	7
		09-Oct-10	0.402		1.20	4.58	**5.78**	0.129		1,000	150		7	**11**	118	2.89
	16K-340 (1081954)	22-Jun-54									1,810				310	**13**
		02-May-72	--	--	--	--	--	--	--	1,423	2,190	--	8.3	--	490	**20**
		26-Mar-74									2,100	8			500	**20**
		06-Oct-76		2.1	0.52			<18			**2,300**				**520**	
		20-Sep-77	--	2.4	--	--	--	--	--	--	2,150	--	7.1	--	--	--
		01-Aug-79		<5.0				<5.4			2,130	7.30		<5	460	
		24-Mar-82		<5.0							1,850	7.40	8.3	26.00	550	
		09-Dec-82		<5.0				4.70			2,020	7.90		12.00	580	
		29-Oct-03	1.96	2.92	0.40	0.40	0.80	nd	--	1,469	--	8.16	--	<5	419	--
		Oct-09[b]	--	2.20	--	0.34	--	--	--	--	--	--	--	--	--	--
		09-Oct-10	1.812		0.464	0.747	1.2	5.46		1200	190		7.6	8.5	368	5.97
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**	1042	0.42
		18-Jul-85	--	--	--	--	--	<2	--	--	--	--	--	--	--	--
		17-Mar-88	--	--	--	--	--		--	--	--	--	--	--	886	--
		05-Aug-03	--	3	2.60	--	--	10.80	--	2,136	--	8.07	--	8	1097	--
		Feb - Mar 2008	--	2	1.19	2	3.44	7.85	7	1,810	2,250	6.98	8	1	--	<0.3
		09-Oct-10	2.474		0.88	3.41		2.62		1,700	2,600		7.1	5.00	1380	0.267
	15T-303* (Pipeline Cyn.)	Jun-55								2,450	3,120				520	0.6
		24-Sep-87	--	--	1.6 ± 0.1	0 ± 1	--	-5.1 ± 3.2	--	2,593	1910	8.00	7.20	<5	1770	0.24
		28-Oct-03	0.46	0.69	0.47	1.50	--	4.0	--	3,043	--	8.13	--	<5	1940	--
		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	4.52	-0.526		2,200	3,500		6.8	7.54	2000	0.100

Table 3. Summary of Groundwater Sampling Results

Geologic Formation	Well ID/ Sample ID	Sample Date**	Radionuclides							General Chemistry						
			Total Uranium (pCi/L)	Uranium (mg/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 (mg/L)	Sulfate (mg/L)	Nitrate (mg/L)
Westwater Canyon Member	Mine Well Mine Wtaer	Nov-73	--	--	--	--	--	--	--	412	663	--	--	--	110	--
		13-Feb-79		1.25	76.7	1				552			8.4	10	77	0.7
		14-Feb-79		0.725	103	1				421			8.4	<10	79	1.2
		16-Feb-79		2.07	0.6	5				415			7.98	<10	81	0.7
		17-Feb-79		2.1	49.3	<1				483			8.2	<10	76	0.5
		21-Feb-79		0.96	82	<1				386			8.19	<10	73	0.4
		27-Feb-79		3.71	155	<1				383			7.42	<10	70	0.5
		14-Mar-79		1.57	67	<1				386			7.2	<10	70	0.5
		27-Mar-79		1.53	89.8	2				404			8	<10	76	0.5
		11-Apr-79		2.29	22	5				380.5			7.59	<10	75.8	**13**
		2-May-79		1.7	11.2	--				370.5			8.45	--	73.3	1.0
		11-Jun-79		3.62	36.1	5.2				449.6			7.94	**11.8**	111.5	<0.1
		30-Apr-80		2.84	490	<1				381.0			8		71	
		16-Jul-80		2.7	86.1	1.3				538			6.7		272	
		2-Jun-81		1.9												
		17-May-04		0.1	2.4	<1		**93**		1,150			**9.9**	<10	450	
	Mill Well I	12-Aug-76	--							335			7.98	1	32	5
		9-Oct-84	--	**65**	1.8	--	--	**43**	--	228	--	--	8.49	1	17.7	--
		23-Apr-92	--	0.576	0.4	2		2		292			**8.83**	4	33.3	0.1
		28-Jul-93	--	2	1.6	1.4	3	1.8	--	2258	--	--	8.5	1.0	1260.0	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	2240	--	--	**8.8**	<1	1270	<0.1
		09-Oct-10	5.604		0.639	1.77		9.79		2,300	360		7.4	5.0	1,460	0.100
MCLs			ne	30	ne	ne	5	15	15	500[b]	ne	6.5 to 8.5	6.5 to 8.5	10	250[b]	10

Notes:

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

b = secondary MCL

Values in **bold** exceed MCLs.

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

DRAFT

WELL

14K-586

WELL

14T-586

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International Specialists in the Environment
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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

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

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

14T-586
15T-303
16K-336
16K-340
Mill Well

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

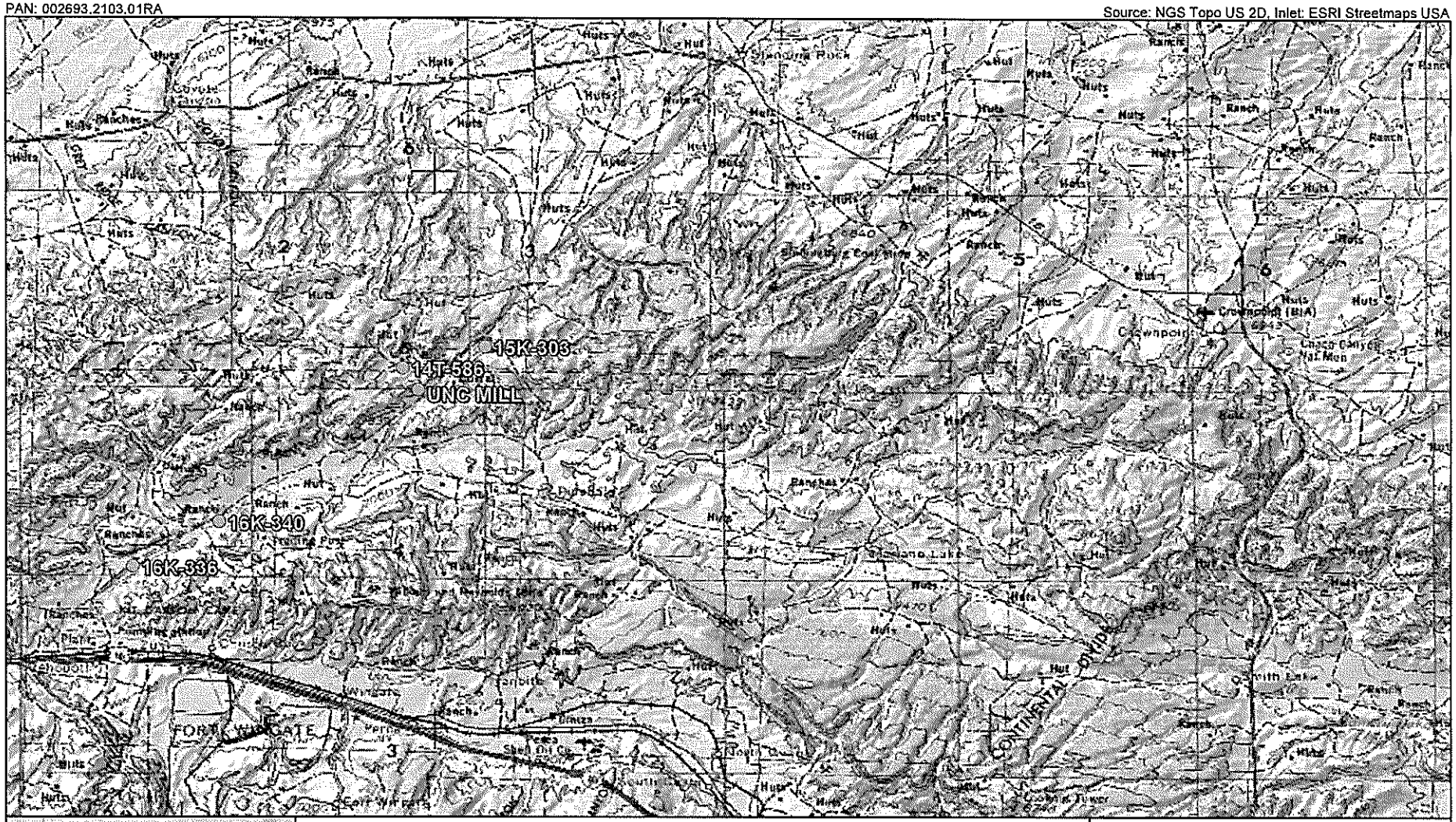
Attachments: A – Homesite Location Map
B –Data Tables
C – Photographic Documentation
D- QASP

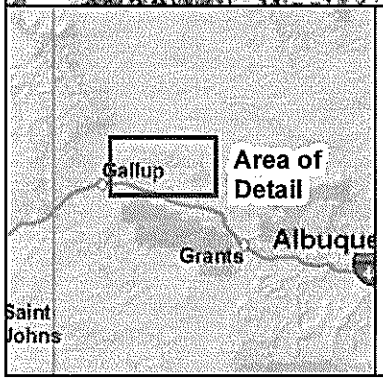
cc: file

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

N

0 2.25 4.5 9 Miles

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
	$\delta D\ H_2O$	-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

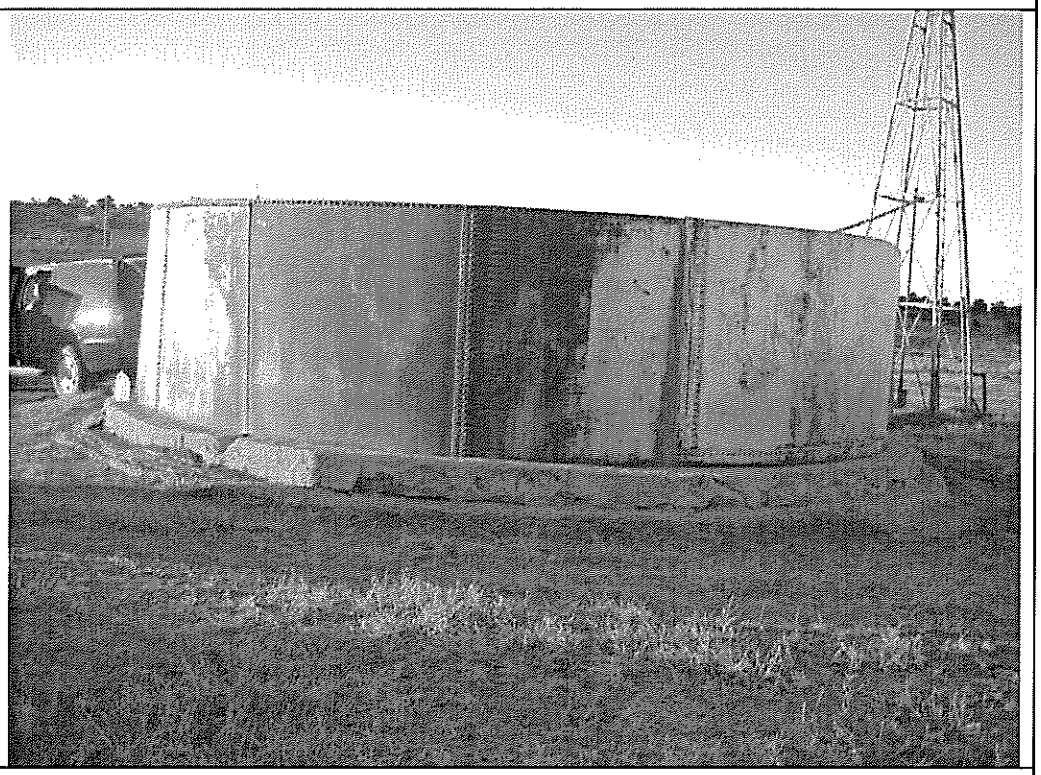
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

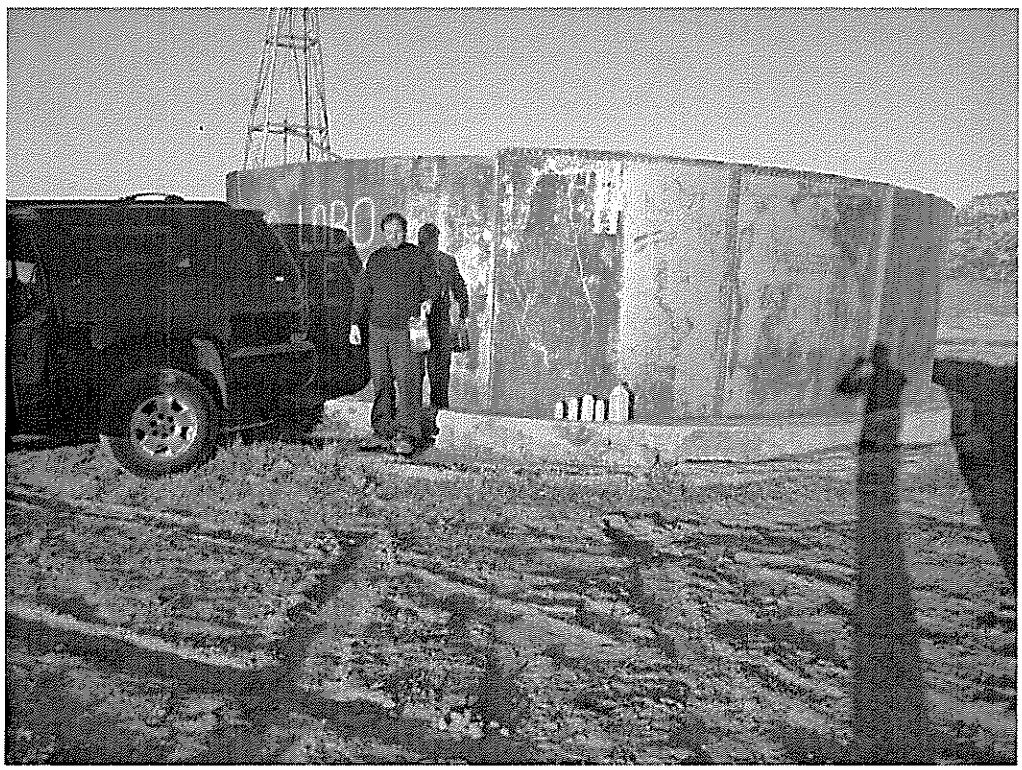
Well 15T-303



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

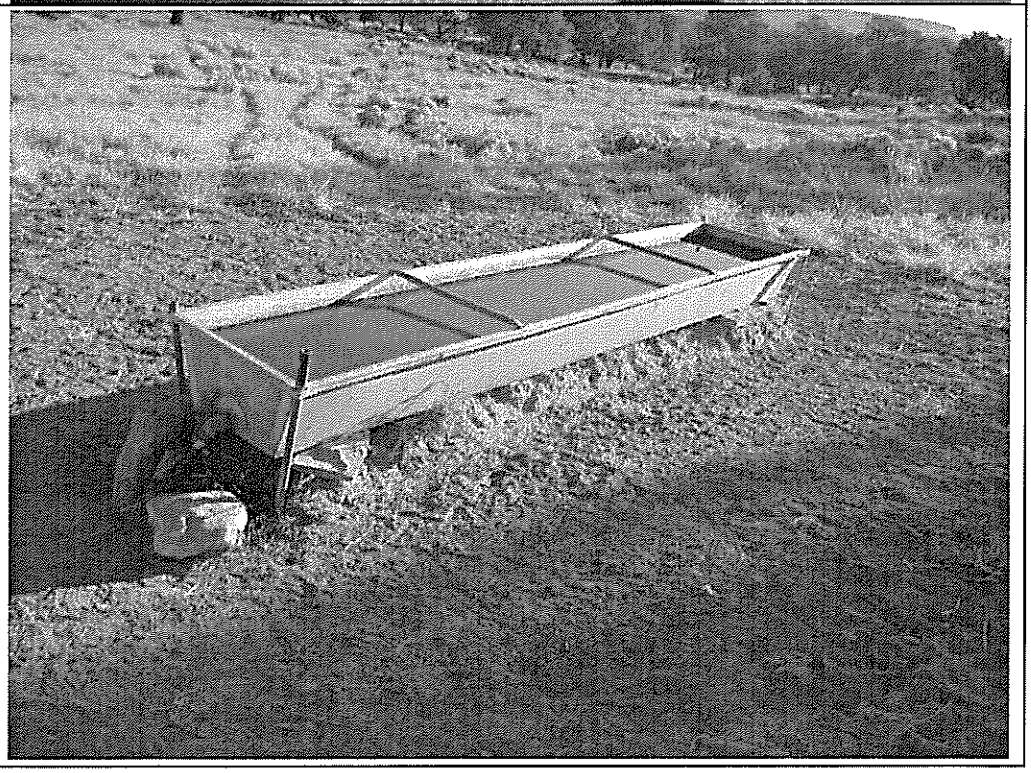
Description:

Well 14T-586

	Date: 10/19/10

Description:

Well 14T-586



PHOTOGRAPHIC LOG

NECR Water Well Sampling

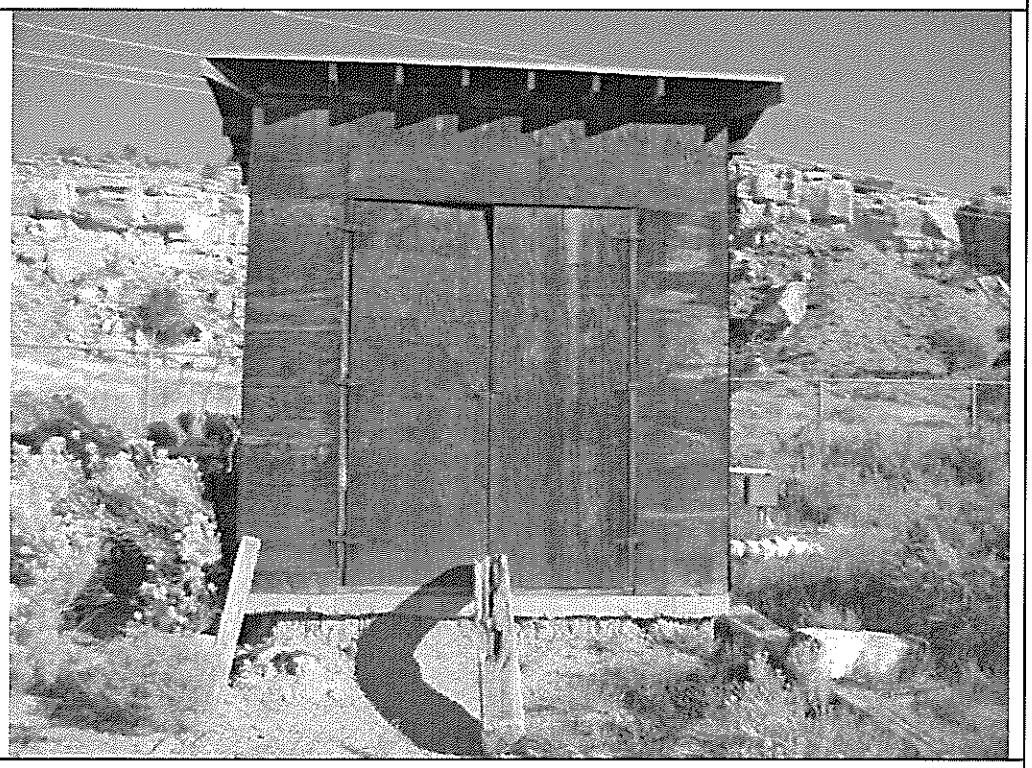
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

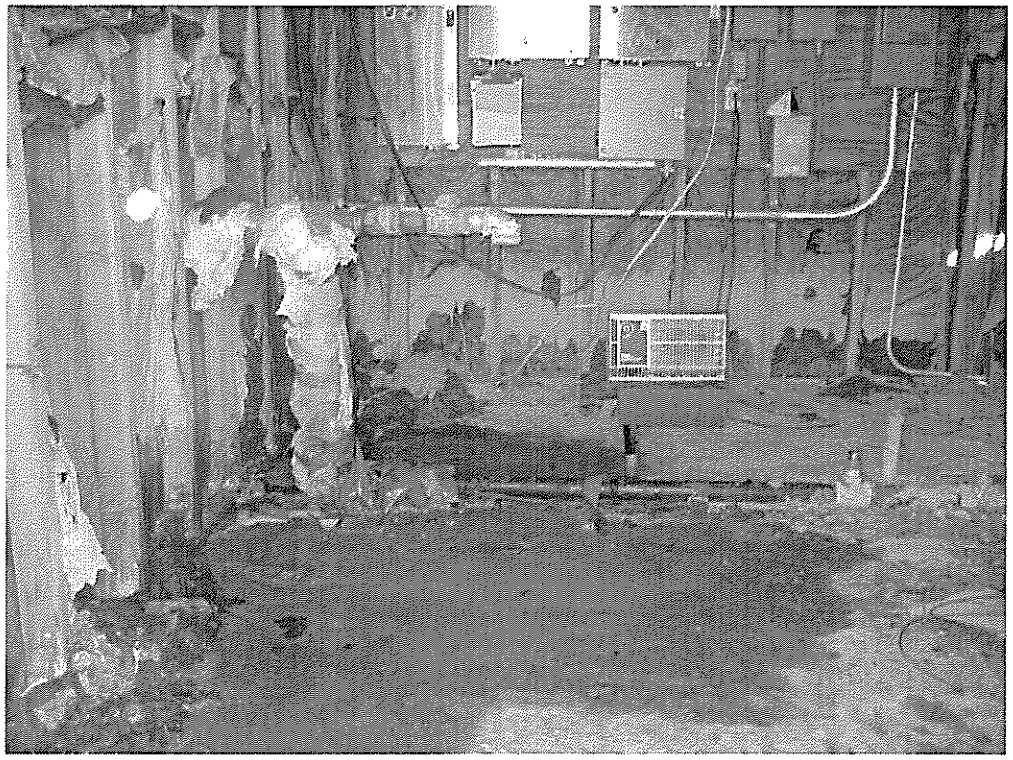
Mill Well



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

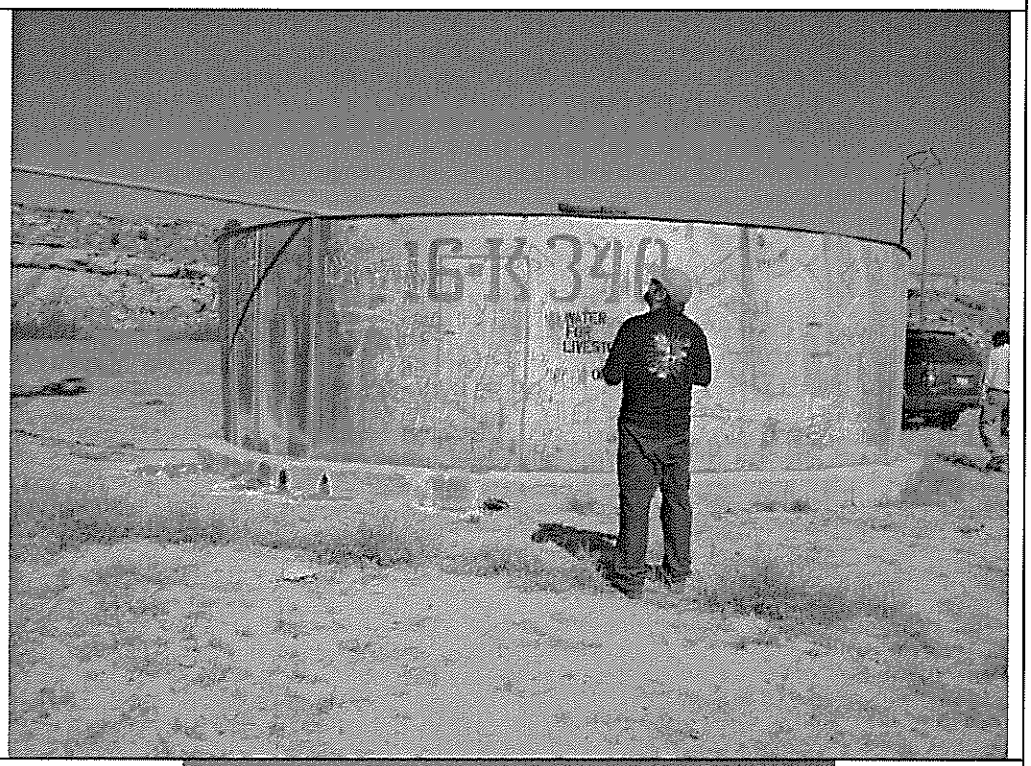
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

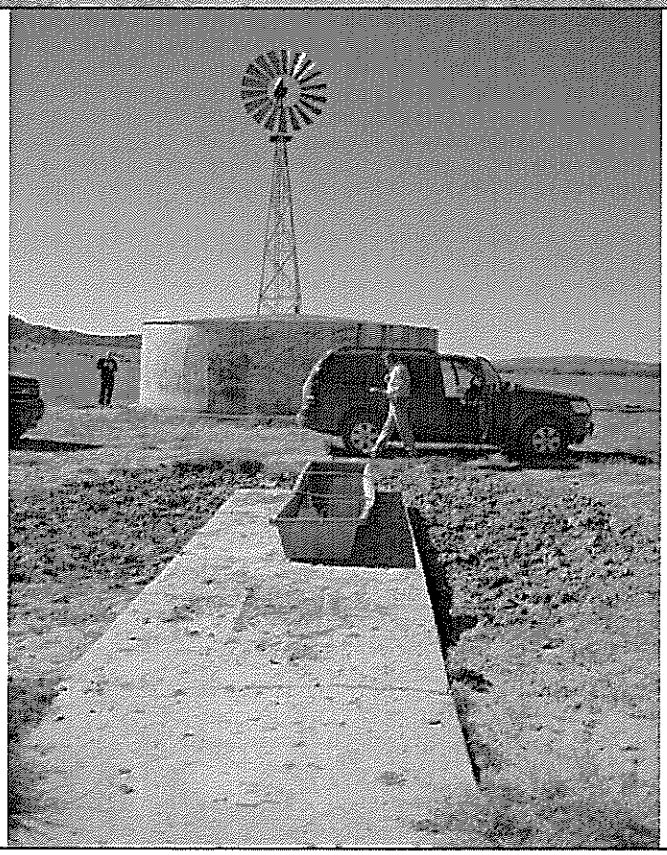
16K-340



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

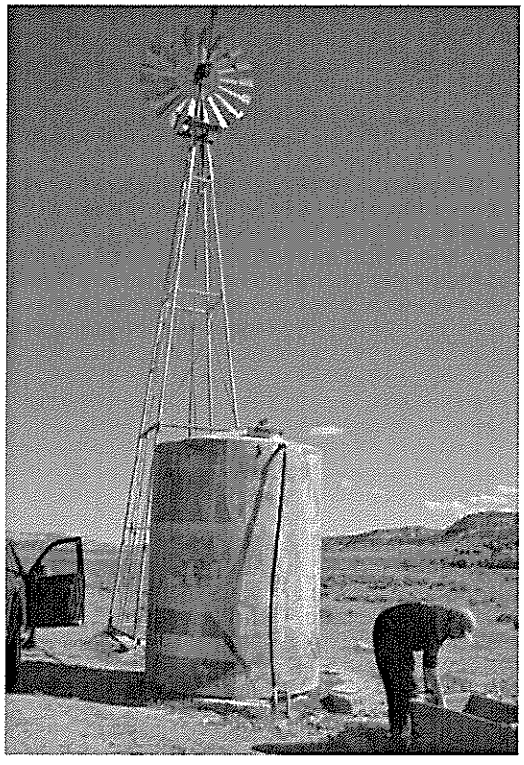


Table J
Reporting Limits, Action Levels, and Quality Control Limits

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

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

MAY 2 0 1976

(14T-586

LAB. NO. 76-NT-894 FIELD NO. _____
COLLECTOR Russ Brangan - Kerr McGee
LOCATION Sec 35 T 17 R 16W
DATE RECEIVED BY LABORATORY April 13,1976
DATE ANALYSIS COMPLETED 4-27-76
DATE COLLECTED April 12,1976
DEPARTMENT Navajo Tribe AGENCY Ft. Defiance BRANCH Water & Sanitation

ANALYZED BY N PD
TRANSCRIBED BY Magdalena
CHECKED BY
REPORTED BY
AUTHORIZED BY George B. Soce
SOURCE OF WATER 14-T-586

		Meq/l	Mg/l
Temperature (°F) ____ (°C)			
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/l			4890
Dissolved Solids Mg/l			1222
Dissolved Solids Tons Per Acre Foot	1.66		
Hardness as Mg/l Ca CO_3 — Calcium, Magnesium			465
Hardness as Mg/l Ca CO_3 — Non Carbonate			130
Alkalinity as Mg/l Ca CO_3 — Bicarbonate Alkalinity			335
Alkalinity as Mg/l Ca CO_3 — Carbonate Alkalinity			—
Alkalinity as Mg/l Ca CO_3 — Hydroxide Alkalinity			—
Alkalinity as Mg/l Ca CO_3 — Total Alkalinity			335
Soluble Sodium Percentage (SSP)	51		
Sodium Absorption Ratio (SAR)	4.45		
Specific Conductance (Micromhos at 25°C)	1690		
Residual Sodium Carbonate (RSC)		—	
PH	8.0		
Class for Irrigation Water	C_3S_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

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

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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

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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 umhos/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

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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~~ Mine 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

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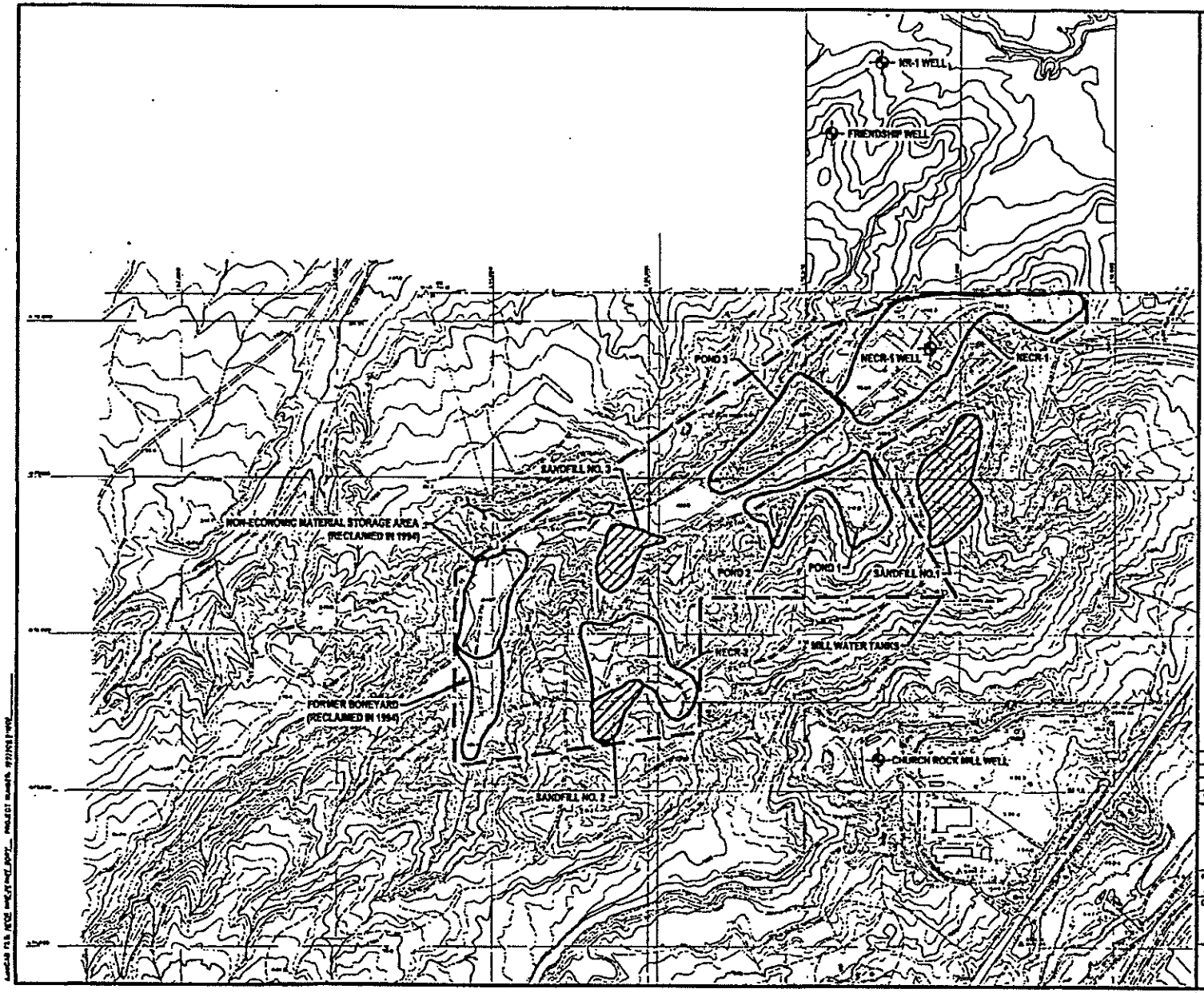

LEGEND

- PERMIT BOUNDARY
- FACILITY BOUNDARY (Approx.)
- SANDFILL (Subsurface Tailings Placement) Reclaimed under NRC Radioactive Material Liscense
- 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

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.

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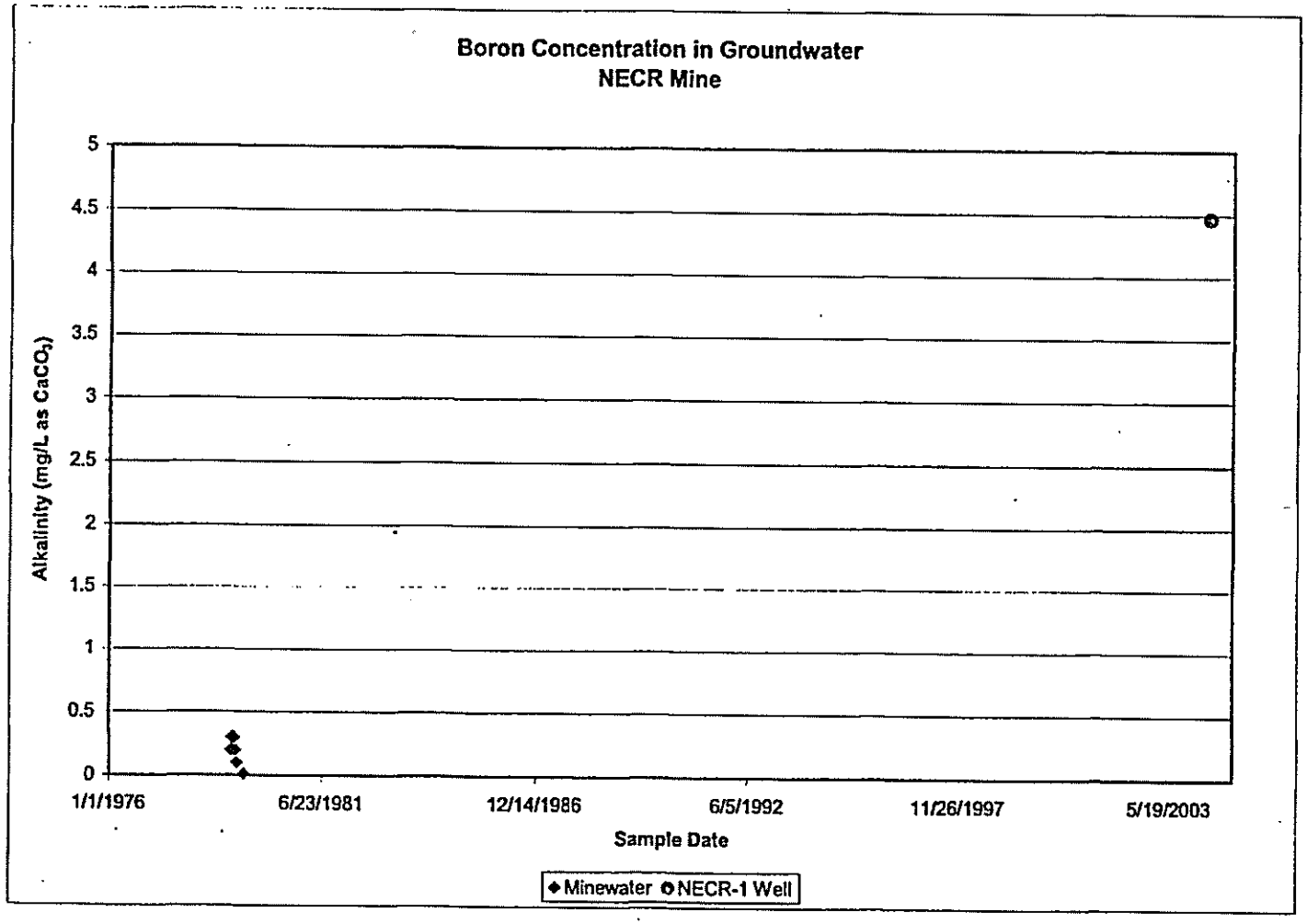

FIGURE 2
ALKALINITY CONCENTRATION IN GROUNDWATER NEAR NECR MINE

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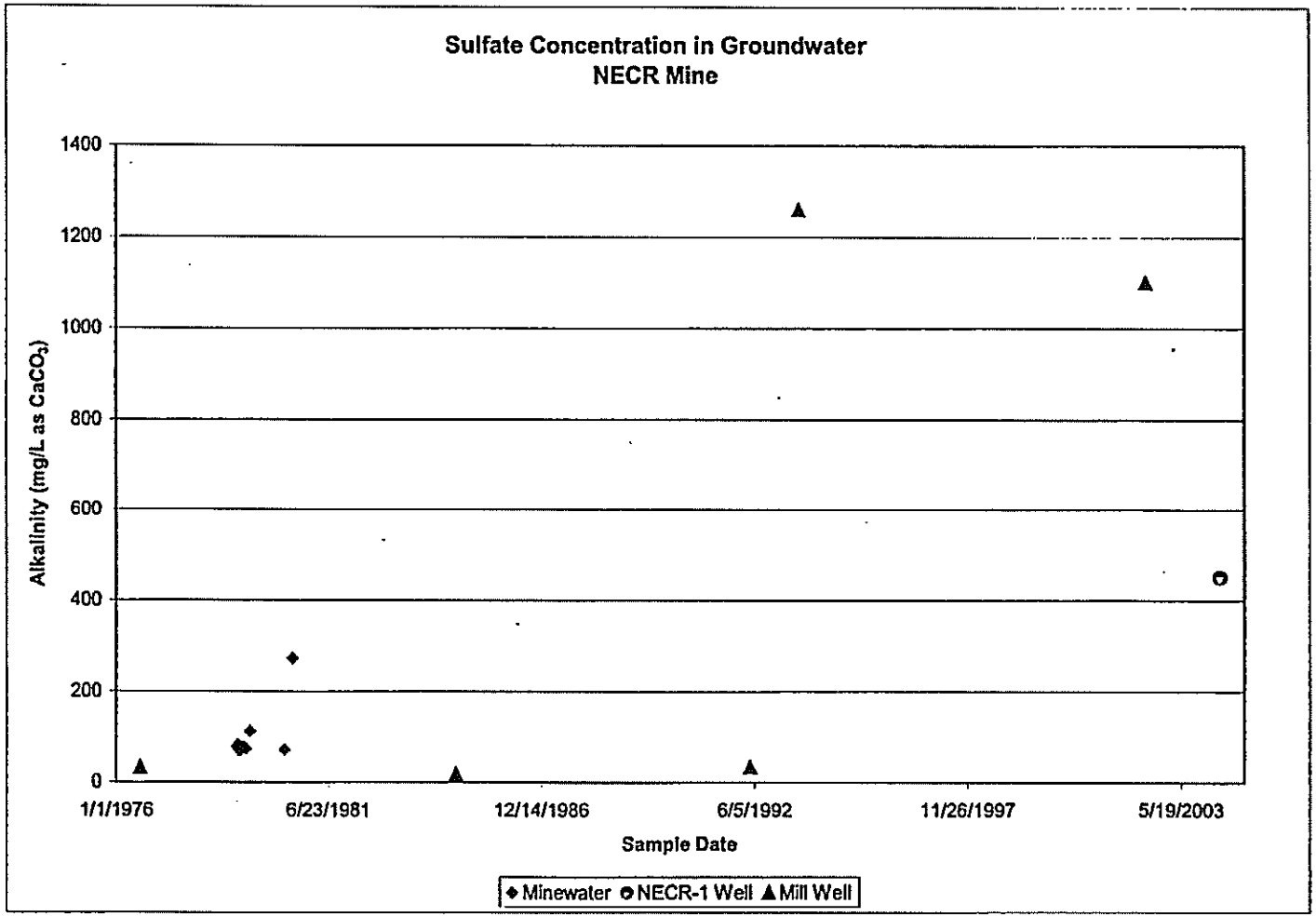

FIGURE 3
SULFATE CONCENTRATION IN GROUNDWATER NEAR NECR MINE

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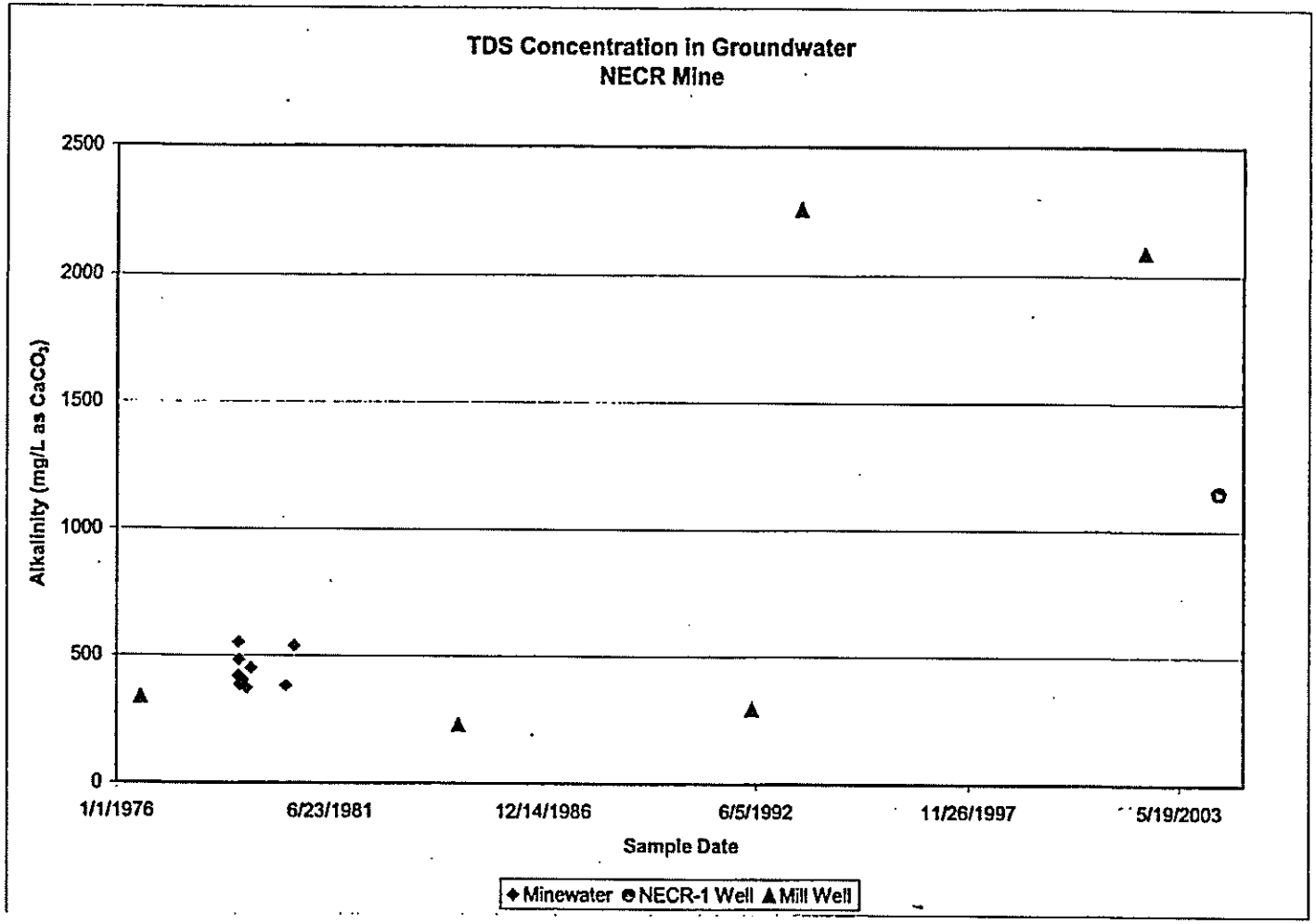

FIGURE 4
TDS CONCENTRATION IN GROUNDWATER NEAR NECR MINE

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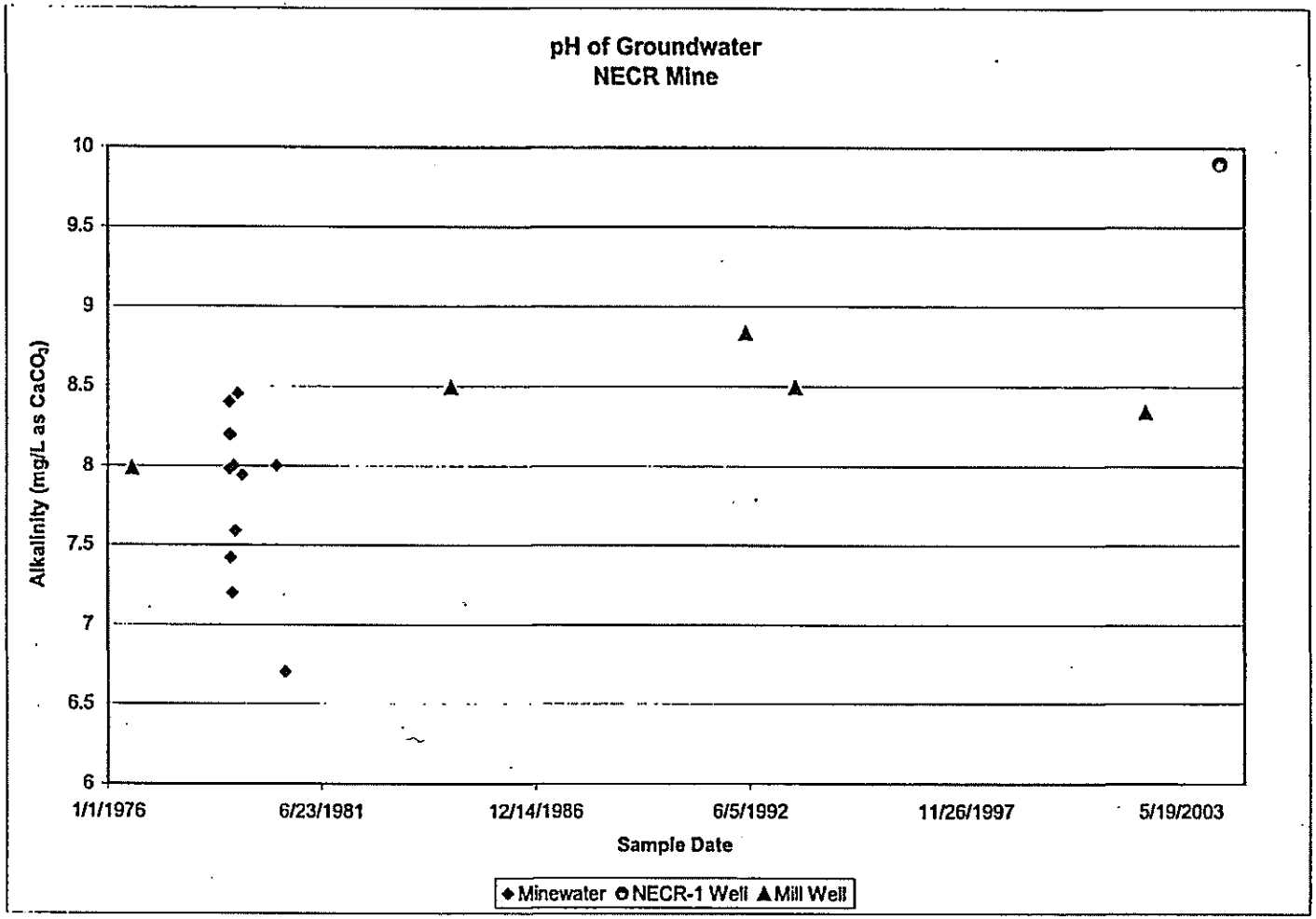

FIGURE 5
pH OF GROUNDWATER NEAR NECR MINE

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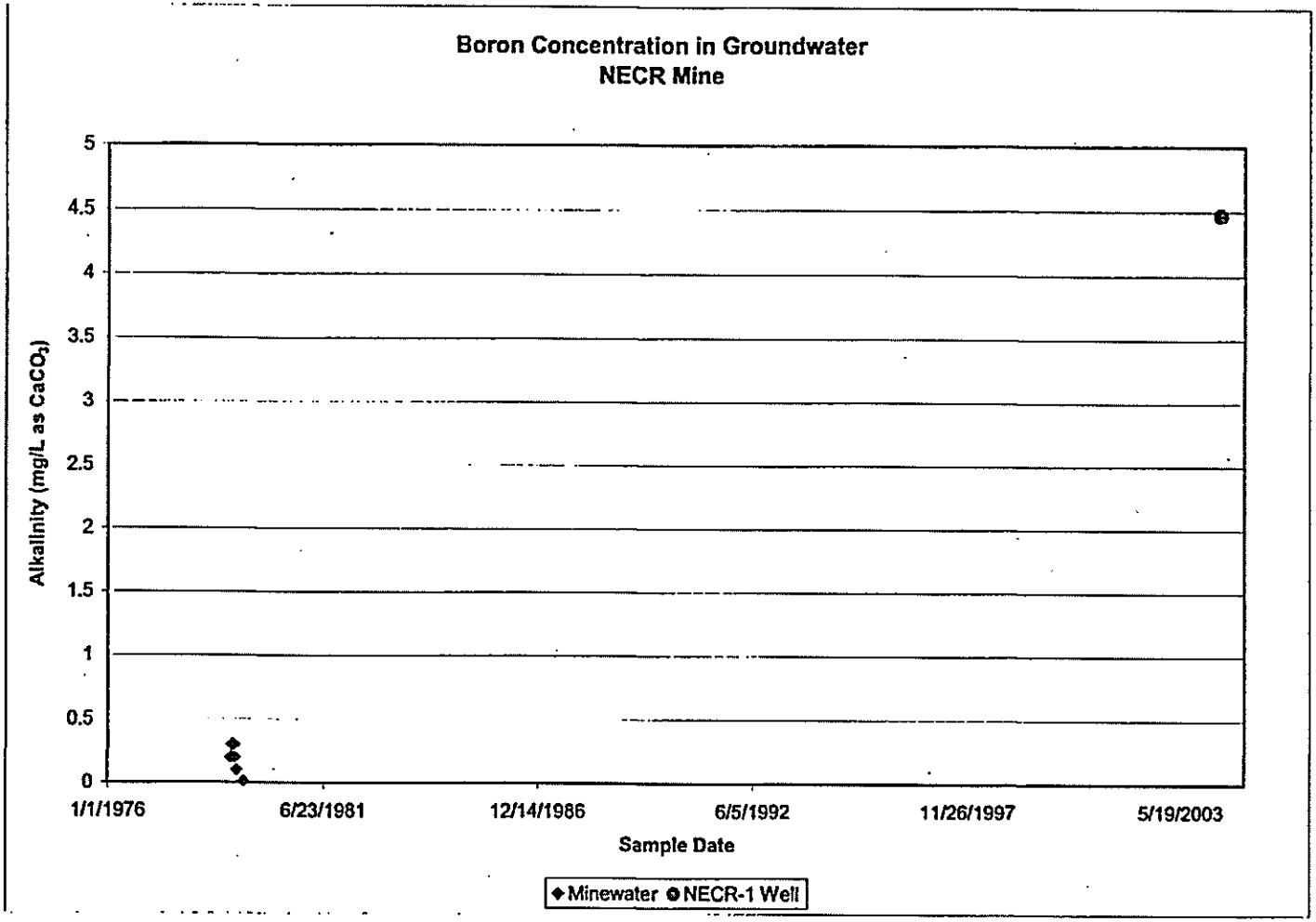

FIGURE 6
BORON CONCENTRATION OF GROUNDWATER NEAR NECR MINE

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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 / stb
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.

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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
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 09:44 / 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.

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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
[illegible]	[illegible]	[illegible]
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	5.67
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	[illegible]
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

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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	

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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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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	

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2393 Salt Creek Highway
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TEL: (307) 235-0515
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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,Uran,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.

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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	mg/l
Boron	Dissolved	EPA 200.7, ICP	0.001	mg/l
Calcium	Dissolved	EPA 200.7, ICP	0.2	mg/l
Iron	Dissolved	EPA 200.7, ICP	0.01	mg/l
Lead	Dissolved	EPA 200.7, ICP	0.04	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	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

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Chain of Custody and Analytical Request Record

Page 1 of 1

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Company Name: UNC	Project Name, PWS #, Permit #, Etc.: UNC CLOSEOUT PLAN
Report 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
Invoice Address: UNC PO BOX 3077 GALLUP, NM 87305-3077	Invoice Contact & Phone #: DOREEN BROWN (505)722-6651 — Purchase Order #: — ELI Quote #: C1212

Report Required For: POTW/WWTP ☐ DW ☐ Other _____

Special Report Formats - ELI must be notified prior to sample submittal for the following:
ELAC ☐ A2LA ☐ Level IV ☐
Other _____
DD/EDT ☐ Format _____

Number of Containers
Sample Type: A W S V B O
Air Water Soils/Solids Vegetation Bioassay Other

ANALYSIS REQUESTED

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	SEE ATTACHED	Normal Turnaround (TAT)	RUSH Turnaround (TAT)	Comments	Lab ID
NECR-WELL1	17MAY04	0940	4-W	X				[illegible]
SECT27-VENT3	17MAY04	1430	4-W	X				

LABORATORY USE ONLY

Custody Record MUST be Signed			
Relinquished by: [signature]	Date/Time: 18 MAY 04/1415	Shipped by: UPS GRND	Received by: [signature] 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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Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

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:

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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.

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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	

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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	<

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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	

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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	

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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	

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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	

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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

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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	

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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	

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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

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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		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/l.

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 — 8-15-88
Donald W. Payne — Date
Senior Sanitarian
Navajo Area Office

Submitted By: Charles C Freeman — 8-15-88
Charles Freeman, R.S. — Date
District Sanitarian
Gallup District

Submitted By: William O. Mace Jr. — 8/16/88
Bill Mace, P.E. — Date
District Engineer
Gallup District

ATTACHMENT A

SURVEY 67
COMMUNITY WATER SUPPLY SYSTEM

Type of Survey (check one)
☐ Follow-up ☒ Annual
☐ Revisit ☐ Other
Date 3/12/88

PWSID #/Well # 147-586 / AM-20323
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/SFDS		
B. PUMPS & MOTORS								
			1. COMPOUND		X	1. BACT. MONITORING	X	
1. PUMP	X	X	2. FOUNDATION		X	2. BACT. CITY.	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: (A-1/C-2) - 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 suction end 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-2/6-7) - 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 mud timbers. 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-4) - 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 - 0 0 3 2 3 _ _

YEAR: 87-88

MICROBIOLOGICAL COMPLIANCE DATA

MON	SAM	RES	DAY	RES	DAY	RES	DAY	RES	DAY	RES	DAY	RES	DAY	RES	DAY	RTN TOT	QTR AVG
								1987									
OCT	RTN	53/0	19/14														>>>>>
	CHK															<<<<<	>>>>>
NOV	RTN	0/0	11/12														>>>>>
	CHK															<<<<<	>>>>>
DEC	RTN	0/0	12/10														
	CHK															<<<<<	>>>>>
								1988									
JAN	RTN	17/0	7/25														>>>>>
	CHK															<<<<<	>>>>>
FEB	RTN	0/0	3/18														>>>>>
	CHK															<<<<<	>>>>>
MAR	RTN	0/0	3/16														
	CHK															<<<<<	>>>>>
								1987									
APR	RTN	0/0	4/15														>>>>>
	CHK															<<<<<	>>>>>
MAY	RTN	0/0	5/14														>>>>>
	CHK															<<<<<	>>>>>
JUN	RTN	31/2	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	1														<<<<<	>>>>>

P.O. BOX 3351 • Santa Fe, New Mexico 87502 OUT OF STATE 800/545-2188

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

1058
SPECIMEN NUMBER

PWSID# NM0323

OWNER COPY

NAME OF CLIENT: Water operation Maint.
ADDRESS: Box 646
CITY: Ft Defy | STATE: AZ. | ZIP:

COLLECTED BY: Billie Hoskie
DATE COLLECTED: 3/10/85 | HOUR:
LOCATION (TOWN): Kerr McGee

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

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

☑ ROUTINE ☑ COMMUNITY
☐ RESAMPLE ☐ NON-COMMUNITY
☐ CHECK SAMPLE ☐ INDIVIDUAL

MAILING ADDRESS OF REPORT
ADDRESS
CITY | STATE | ZIP

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

REMARKS

DATE REPORTED 3/11/85 ANALYST

FORM NO 5462

REV. 9-84

CHEMICAL ANALYSIS

NAVAJO TRIBAL UTILITY AUTHORITY
LABORATORY

SAMPLE NUMBER: 6099
SAMPLE LOCATION: Kerr Mc Gee 14T-586
DATE RECEIVED: 6-5-85
DATE OUT: 10-7-85
TECHNICIAN: A. Becenti / F.S. White

PWSID NUMBER: NM# 0323
DATE COLLECTED: 5-30-85.
COLLECTED BY: C. Mike
ADDRESS: WUS Dept.

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

CHEMICAL ANALYSIS

NAVAJO TRIBAL UTILITY AUTHORITY
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

Speediset Ⓡ Moore Business Forms, Inc. m
MCP Ⓡ Moore Business Forms, Inc. Patents 3,016,308, 3,429,827

WATER CHEMICAL ANALYSIS

NAVAJO TRIBAL UTILITY AUTHORITY
OWNER COPY

SAMPLE NO. 6099
SAMPLE LOCATION Kerr McGee NM# 0323 14T-586
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 W&S Dept.

TEST	PARAMETER	METHOD	RESULTS	mg/l
	ALKALINITY	TITRAMETRIC as $CaCO_3$	362 mg/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. 5468

Kerr McGee Camp Residence - Tom Bonallie

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

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	CAE	75–78
COLOR (15 s.u.)*	13	END CARD 2 - DUPLICATE COLS. 1-8 FOR CARD 3	80
ODOR (3 s.u.)*	15	SPECIFIC CONDUCTANCE (MICROMOHS AT 25°C)	9–12
TOTAL DISSOLVED SOLIDS (500)*	16–20	pH	14–16
CHLORIDE (250)*	21–24	CHROMIUM (TOTAL) CR^{+6} (.05)**	< 17–21 .005
SULFATE (250)*	25–28	SILVER (0.05)**	< 23–27 .03
NITRATE (45)*	29–31 .5	COPPER (1.0)*	28–32 .03
SODIUM	32–35	MANGANESE (0.05)* (SPECT.)	34–38 .64
LITHIUM	36–39	LEAD (0.05)**	40–44 .006
BARIUM (1.0)**	< 40–44 .2	IRON (0.3)* (SPECT.)	46–50 .14
M.B.A.S. (0.5)*	46–49	COBALT	52–56
ARSENIC (0.01)* (0.05)**	< 51–54 .005	CADMIUM (0.01)**	< 58–62 .002
SELENIUM (0.01)**	56–59 .02	ZINC (5.0)*	64–68 .02
CCE	61–64	NICKEL	70–74
FLUORIDE (1.4 TO 2.4)**	66–68	MERCURY	< 75–79 .0005
CYANIDE (0.01)* (0.2)**	70–73	REMARKS	

*RECOMMENDED LIMIT **MANDATORY LIMIT
ALL VALUES ARE MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.
[1]NOT INCLUDED IN 1962 PHS DRINKING WATER STANDARDS

Lab. No. 1258 END CARD 3. 3 (80)
Date Completed 4-13-79
EPA Lab Cincinnati

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

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

DATE OF SAMPLING — DATE COMPOSITE STARTED (MO. DAY): ____ (1–4)

ENDING DATE OF COMPOSITE OR DATE OF GRAB SAMPLE (MO. DAY YR.): 05 28 80 (5–8)

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)	< 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

Kerr McGee Rural Camp

CHEMICAL ANALYSIS

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 (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)	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
H 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.
3/4/80	WC 2829	51.62

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	Water Supply System Code No.	City or Location	County	Check one:
Kerr McGee 14T-586		Kerr McGee Mine,	Mckinley Co.	☐ TREATED WATER ☒ RAW WATER

Collection Date	Collection Time	Collection Point	Collector's remarks	Report to
2/11/80	11:00am	Benallie's Home		Don Payne, OEH

Collected By	Owner	Address
A. Smiley		GIMC, P.O. Box 1337 Gallup, NM 87301

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	mg/l	HEAVY METALS	mg/l	PARAMETER		ORGANIC	mg/l
00930 Sodium (as Na)	236.9	00940 Chloride (as Cl)	10.0	70300 Total Filterable Residue	1714	01000 Arsenic				39390 Endrin	
00935 Potassium (as K)	5.07	00950 Fluoride (as F)	0.48	38260 Foaming Agents (as Las)	1001	01005 Barium				39732 Lindane	
00900 Tot.Hardness (as $CaCO_3$)	795	00620 Nitrate (as N)		00095 Conductance Micromhos 25°C	2134	01025 Cadmium				38270 Methoxychlor	
00915 Calcium (as Ca)	189.0	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)	816.9	00070 Turbidity	0.5	01145 Selenium		11501 Radium-228	pCi/l		
						01075 Silver					

LABORATORY REMARKS:

Reviewed by [signature]
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

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

RECEIVED
U. S. 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/l ± 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. 1	
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 Sta 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 West	
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 Cuska BIA System C	
54684 2/12/80	< 3					NM 268 Naschitti	
54685 2/12/80	< 2					NM 264 Buffalo Springs Systu	
54686 2/12/80	< 2					NM 291 Tohatchi BIA System	
54689 2/11/80	< 4					NM Kerr-McGee	
54771 1/22/80	< 2					CA 5003 Klamath Lake - Blake Alkmer	

M. D. Yee

Environmental Chemist
Nuclear Science Department

Environmental Analysis Laboratories
2039 Wright Avenue
Richmond, California 94804
(415) 235-2633
(TWX) 910-382-8132

RECEIVED
4 REGION I.

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						
54556	< 3						
54553	< 3						
54554	9 ± 2	Incomplete					
54555	< 3						
54557	< 4						
54558	< 3						
54559	< 3						
54560	< 3						
54561	< 4						
54562	< 3						
54801	< 3						
54804	< 2						
54806	< 3						
54811	< 3						
54812	< 4						
54813	< 4						
54814	< 2						

NM265 Black Springs Wash
AZ280 Houck Chapter House
Manuelito Comm. Syst.
AZ280 Houck Community System
AZ282 Lupton Community System
NM278 Tsa Ya Toh Ch. House
NM259 S. Church Rock Comm. Syst
NM260 Church Rock Ch. House
NM275 Pinedale Ch. House
Kerr-McGee Camp
NM229 Ft. Wingate BIA
NM 232 BIA Training Center, Cont. Divic
NM 233 Ojo Encino BIA School
NM 238 Whitehorse Lake Ch. House
NM235 Standing Rock BIA School
NM244 Lake Valley BIA Boarding School
NM248 Lake Valley Chapter Water Syst
NM283 Whiterock Ch. Water Syst.
NM251 Crownpoint BIA Hg. Water Syst.

Mary P. Hunt
Environmental Chemist
Nuclear Science Department

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

COM'L

OCT DRINKING WATER ANALYSIS REPORT

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

Ref: LEB 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 ± 2σ						
	Gross Alpha	^{226}Ra	^{228}Ra	Total Uranium	Gross Beta	^{3}H	^{90}Sr
33853 7/12/79	2 ± 1	Inscription House AZ 283					
33862 7/14/79	< 5	Many Farms NTVA AZ 252					
33867 7/12/79	< 3	Rock Point AZ 3048					
33870 7/13/79	< 3	Chinle – Canyon de Chelly Natl Monument AZ 3022					
34181 7/14/79	6 ± 2	Not Completed Round 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	<1.1E01	<11	PCI/L
19 3040 075 04 09 23	ALPHA	<1.7E01	<17	PCI/L
198970 R9IWS DATE- 79 03 06 7				
SIZE- L				
PINEDALE NM 45865	BETA	<1.1E01	<11	PCI/L
19 3040 075 04 09 23	ALPHA	<1.3E01	<13	PCI/L
200488 R9IWS DATE- 79 03 07				
SIZE- L				
HOUCK ARIZ 45878	ALPHA	<9.2E00		PCI/L
19 3040 075 04 09 23	BETA	<1.1E01	<11	PCI/L
198968 R9IWS DATE- 79 03 09				
SIZE- L				
LUPTON ARIZ 45876	BETA	<1.1E01	<11	PCI/L
19 3040 075 04 09 23	ALPHA	<5.3E00		PCI/L
198969 R9IWS DATE- 79 03 09				
SIZE- L				
DEFIANCE NM 45879	BETA	<1.1E01	<11	PCI/L
19 3040 075 04 09 23	ALPHA	<9.1E00		PCI/L
200489 R9IWS 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 R9IWS 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
198967 R9IWS 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 R9IWS DATE- 79 03 12				
SIZE- L				
CHILCHINBETO ARIZ 42018	BETA	<5.4E00		PCI/L
19 3040 075 04 09 23	ALPHA	<2.6E00		PCI/L
200493 R9IWS 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 R9IWS 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

UPDATED JUL 10 1995

TRIBAL WELL NO 14T-586 update PWSID NM3500323

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

WELL TYPE (MARK ONLY ONE)	WELL STATUS (MARK ONLY ONE)	WELL USE (MARK ONLY ONE)
[X] WW WATER WELL	[X] ACT ACTIVE	[X] DOM DOMESTIC
[ ] WA ARTESIAN WELL	[ ] INA INACTIVE	[ ] AGR AGRICULTURE
[ ] WS SPRING	[ ] ABA ABANDONED	[ ] LIV LIVESTOCK
[ ] NS NATURAL SPRING	[ ] UNK UNKNOWN	[ ] IND INDUSTRIAL MINING
[ ] OW OBSERVATION WELL		[ ] REC RECREATION
[ ] GS GAS WELL		[ ] MUN MUNICIPAL
[ ] OP OIL PRODUCTION		[ ] OTH OTHER
[ ] MW MINERAL WELL		[ ] UNK UNKNOWN
[ ] XX 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~~ O&M TRIBE USGS WATERSHED CODE 15020006000

STATE: [ ] AZ ARIZONA [X] NM NEW MEXICO [ ] UT UTAH [ ] CO COLORADO

COUNTY: [ ] AP APACHE [X] MK MCKINLEY [ ] SJ SAN JUAN [ ] MT MONTEZUMA

[ ] NA NAVAJO [ ] VL VALENCIA [ ] KA KANE [ ] LP LA PLATA

[ ] CO COCONINO [ ] BL BERNALLILLO

[ ] SD SANDOVAL

[ ] SO SOCORRO GRAZING DISTRICT 14

[ ] RA RIO ARRIBA

[ ] SA SAN JUAN

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/doc/Loc-Form.wp

STRUCTURE FILE

UPDATED JUL 19 95

TRIBAL WELL NO 147-586 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. 18.18 IN

1	CASING DIA	12.00	FROM	1-10.	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 DRILLING

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 145-586 USGS AQUIFER CODE 211 mVRD

THICKNESS ___ FT NOMINAL YIELD 110 GPM YIELD MEASURED ___/___/___

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

DRAWDOWN ~~139~~ 10 FT OBSERVATION WELL DATA AVAILABLE ☐ YES ☒ NO

HORIZ CONDUCTIVITY ____.__ FT/DAY SPECIFIC CAPACITY 11.60 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 DEVELOPMENT/WELL FILE

HYDROLOGY FILE COMPLETED BY: L. NOTAH/M.S. JOHNSON DATE 12/18/94

ENTERED JUL 19 1995

STATIC WATER LEVEL FILE

DEPTH TO SWL 381.0 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 ___/___/___

TRIBAL WELL RECORD
GEOHYDROLOGIC UNITS

TRIBAL WELL NO 14T-586

ENTERED JUL 19 1995

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	690	210MMCS	SHLE

LITHOLOGIC MODIFIER

CONTRIBUTING UNIT CODE U

INTERVAL FILE COMPLETED BY: M.S. Johnson

DATE 12/18/94

revised 08 April 93

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

TRIBAL WELL RECORD
GEOHYDROLOGIC UNITS

TRIBAL WELL NO 147-5816

ENTERED JUL 19 1995

SEQ-NO 006
DEPTH TO TOP 690 | DEPTH TO BOTTOM 708 | GEOHYDRO-UNIT 211 TLLS | LITH. SNDS
LITHOLOGIC MODIFIER
CONTRIBUTING UNIT CODE 4

SEQ-NO 007
DEPTH TO TOP 708 | DEPTH TO BOTTOM 718 | GEOHYDRO-UNIT 210MCDK | LITH. SHLE
LITHOLOGIC MODIFIER
CONTRIBUTING UNIT CODE 4

SEQ-NO 008
DEPTH TO TOP 718 | DEPTH TO BOTTOM | GEOHYDRO-UNIT 211DKOT | LITH. SDSL
LITHOLOGIC MODIFIER
CONTRIBUTING UNIT CODE 4

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/doc7int-form.wp

ARIZONA WELL RECORD

COMMENTS FILE

TRIBAL WELL NO 147-6-816

ENTERED JUL 19 1995

PERTINENT COMMENTS: ~~Exact windmill.~~ Tribal well record indicates perforation slotted 40 FT. with ⅛" 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 includes Dilco Coal Member of Crevasse Canyon Formation (211DLCOC).

[X] 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

[X] ELEVATION INTERPOLATED FROM 1:24000 TOPO

THE IMPROVEMENTS AT THIS SITE ARE:

[ ] IN GOOD CONDITION [ ] NEED SOME MAINTENANCE

[X] IN FAIR CONDITION [ ] NEED MAJOR MAINTENANCE

[ ] IN POOR CONDITION

STORAGE TANK IS [X] COVERED [ ] UNCOVERED

COMMENTS BY: L. NOTAH / M.S. Solmen 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	DEPTH 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 D&M ~~>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 .75 miles SW. of MINING OFFICES >KERR MCGEE MINING CAMP

UTM COORD: X(EAST) 724991 ~~>714243~~ Y(NORTH) >3949101 ~~3939221~~ ZONE >13 ~~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

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	DEPTH 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. 61

SALAZAR BROS. DRILLING

DRILLING REPORT

DATE 3/26/76

PROJECT

REPORT NO.

LOCATION AREA Church Rock | COMPANY Kree Magee | STATE OF New Mexico

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

DRILLING AND CORING LOG

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

DRILLERS TIME DISTRIBUTION	MATERIALS USED
R.U. 30 min	
Drilling 5 5/8 Hole 1 hr	

WATER-GALLONS FROM

LOST CIRCULATION—MIX MUD

FROM ' TO '

FROM ' TO '

FROM ' TO '

FROM ' TO '

FROM ' TO '

REMARKS:

SIGNED-DRILLER Leo Dondoval

SERVICE PRINTING CO. GRANTS, N.M.

SALAZAR BROS. DRILLING

DRILLING REPORT

DATE 3/26/26

PROJECT

REPORT NO.

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

SECTION | TWN | RNG | TYPE RIG: C.D 1500 | RIG NO.: 2

DRILLING AND CORING LOG

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

DRILLERS TIME DISTRIBUTION

8 hr Drilling

MATERIALS USED

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	3-26-76
PROJECT	
REPORT NO.	

LOCATION	AREA	COMPANY	STATE OF
	Church Rock	KERRMC GEC	New Mexico

SECTION	TWN	RNG	TYPE RIG	RIG NO.
			B.D. 1500	5

DRILLING AND CORING LOG

HOLE NO.	DEPTH FROM	DEPTH TO	ROCK TYPE	BIT USED NAME	TYPE	SIZE	RUN	SER. NO.	REMARKS OR FEET OF CORE RECOVERED
Water	640	750	MESAVERDE	WM	3	3"		2 of 3	660
Well									
Remedial	0	300	MESAVERDE						

DRILLERS TIME DISTRIBUTION	MATERIALS USED
RTCB 30 mins	18 gal
LD/DP 40 mins Start By Lapping 1 hr	1 sk C mc
Mixed to start reaming	
started [illegible] at 7:30 pm	

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

SIGNED—DRILLER [signature]

SERVICE PRINTING CO. GRANTS, N.M.

SALAZAR BROS. DRILLING

DRILLING REPORT

DATE 3/27/76

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 FROM	DEPTH TO	ROCK TYPE	BIT USED NAME	TYPE	SIZE	RUN	SER. NO.	REMARKS OR FEET OF CORE RECOVERED
	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 Leo Sandoval

SERVICE PRINTING CO. GRANTS, N.M.

SALAZAR BROS. DRILLING

DRILLING REPORT

DATE: 3/27/76

PROJECT:

REPORT NO.:

LOCATION — AREA: Church Rock — COMPANY: Kree McGee — STATE OF: New Mexico

SECTION: TWN: RNG:

TYPE RIG: GD 1500 — RIG NO.: 2

DRILLING AND CORING LOG

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

DRILLERS TIME DISTRIBUTION

mix mud 20 min

LD/DP 55 min

mix set coring from 1130 to 4:00

MATERIALS USED

12 ~~[illegible]~~ Red Devil Gel

WATER-GALLONS FROM

LOST CIRCULATION—MIX MUD

FROM ' TO '

FROM ' TO '

FROM ' TO '

FROM ' TO '

FROM ' TO '

REMARKS:

SIGNED-DRILLER: Camilla Jaramillo

SERVICE PRINTING CO. GRANTS, N.M.

T. Benally, Well

DRILLING REPORT

DATE 3-27-76

PROJECT

REPORT NO.

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

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

DRILLING AND CORING LOG

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

DRILLERS TIME DISTRIBUTION

From 4:00 - 5:00 P.M.
Circulating out mud
5:00 - 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 Tapp

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

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

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

14T-586
15T-303
16K-336
16K-340
Mill Well

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

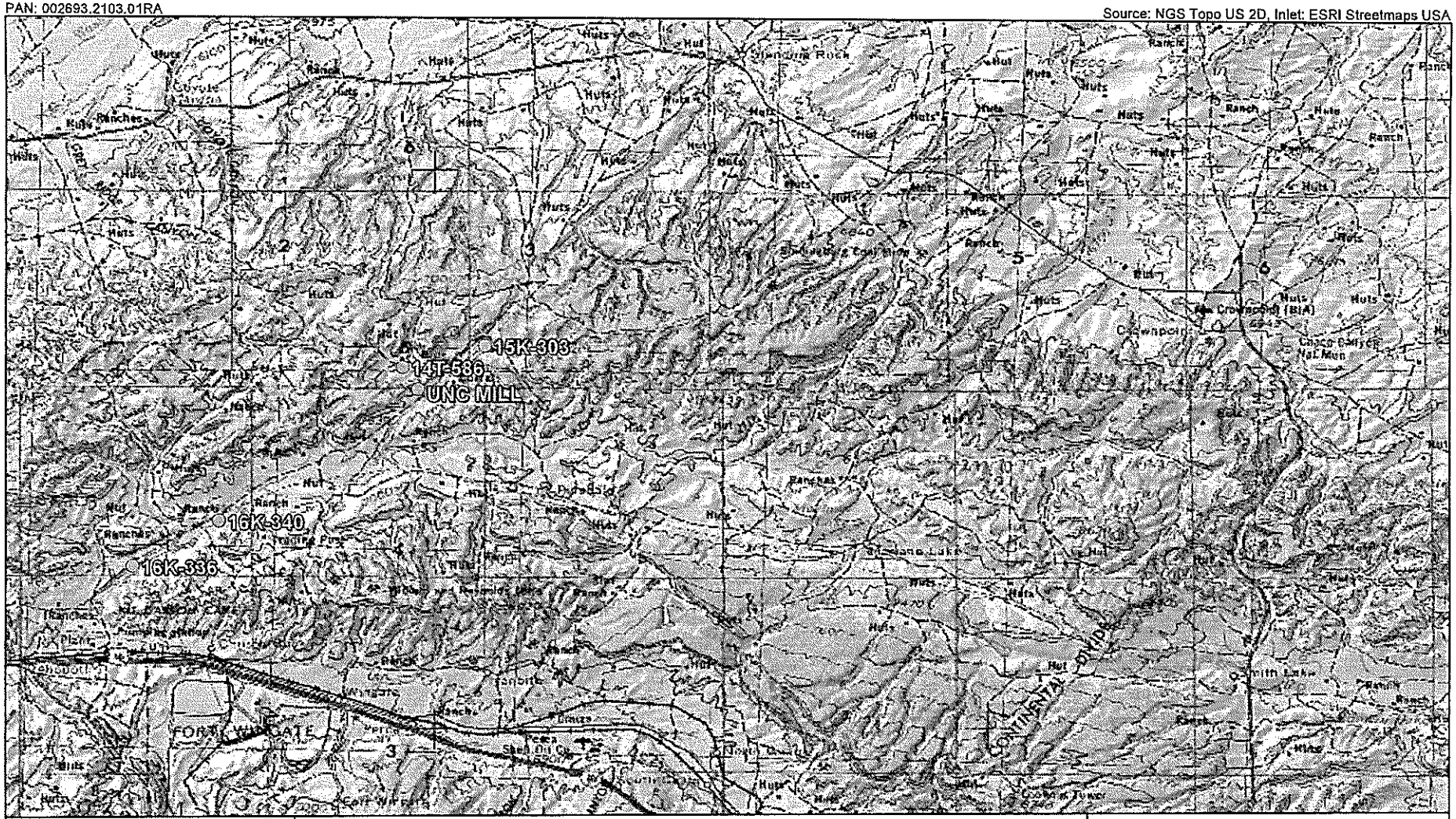
Attachments: A – Homesite Location Map
B –Data Tables
C – Photographic Documentation
D- QASP

cc: file

ATTACHMENT A:
Well Location Map

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

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



LEGEND

Drinking water well

N

0 2.25 4.5 9 Miles

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
	$\delta D\ H_2O$	-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

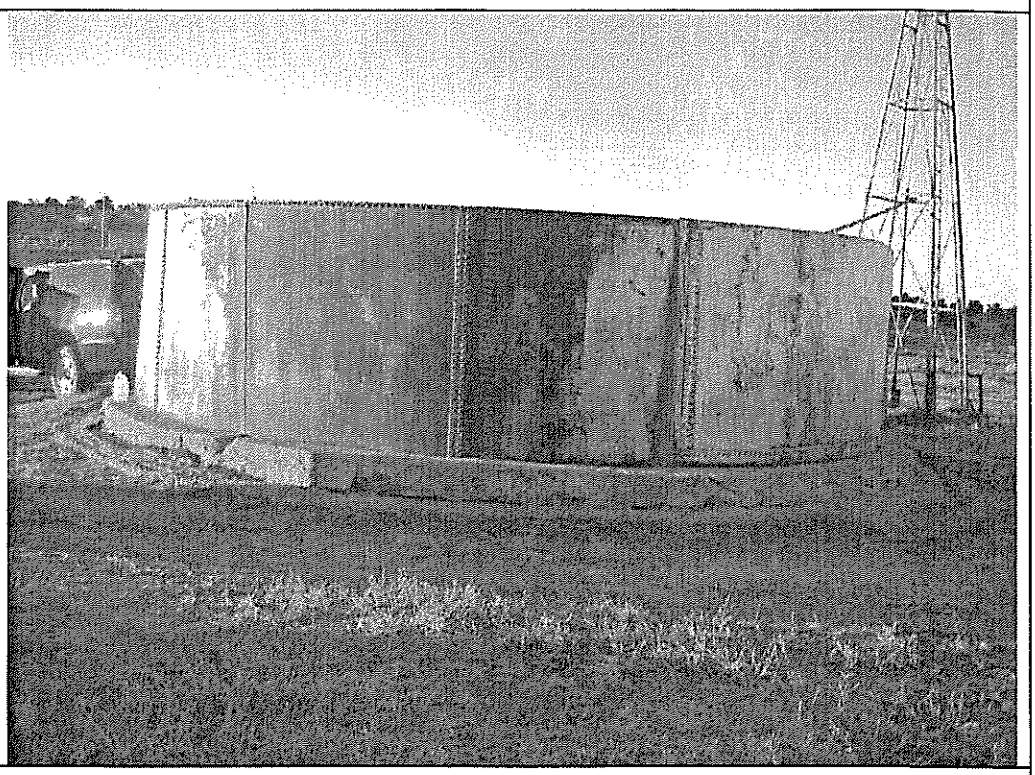
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

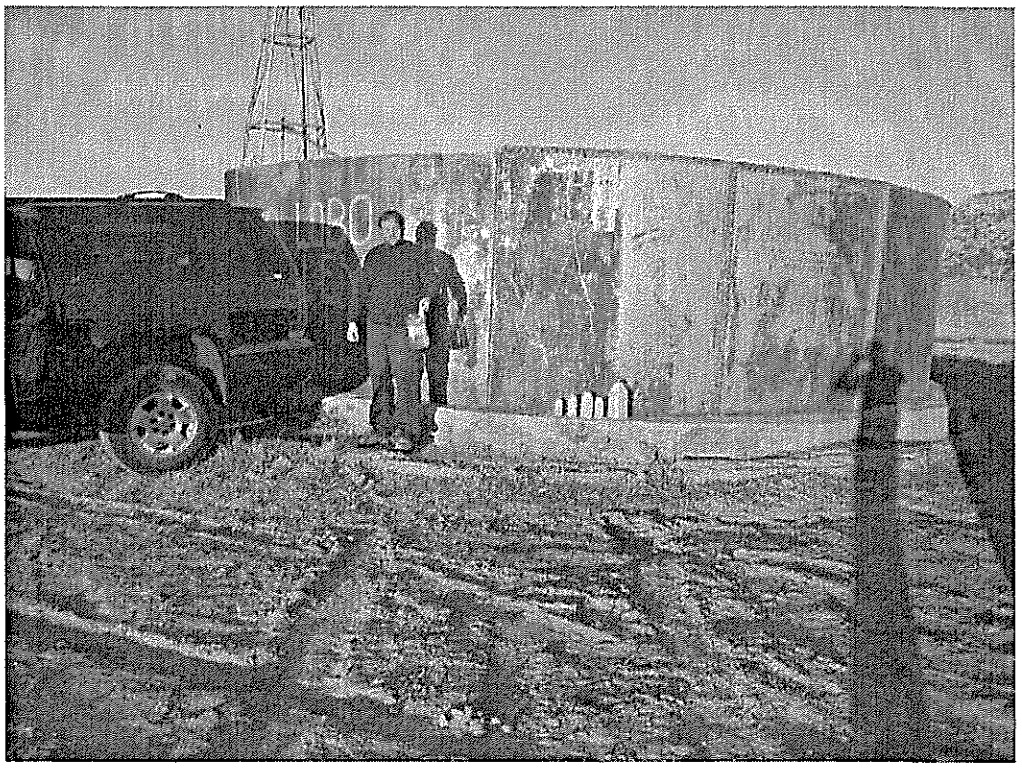
Well 15T-303



Date: 10/19/10

Description:

Well 15T-303



PHOTOGRAPHIC LOG

NECR Water Well Sampling

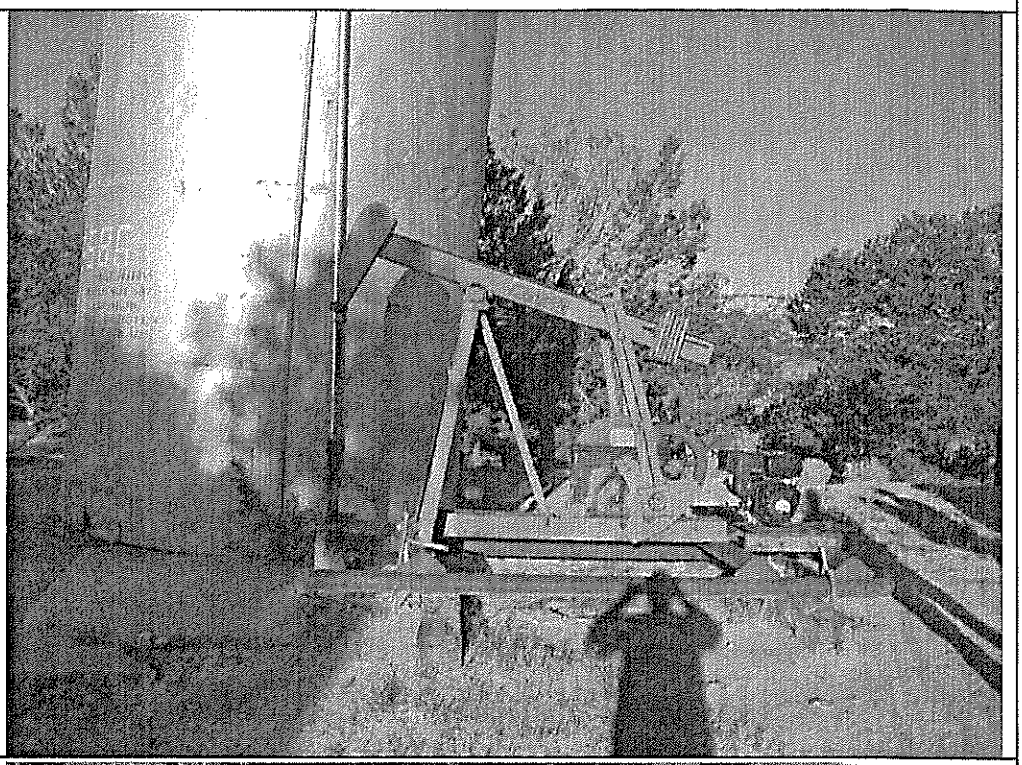
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

	Date: 10/19/10

Description:

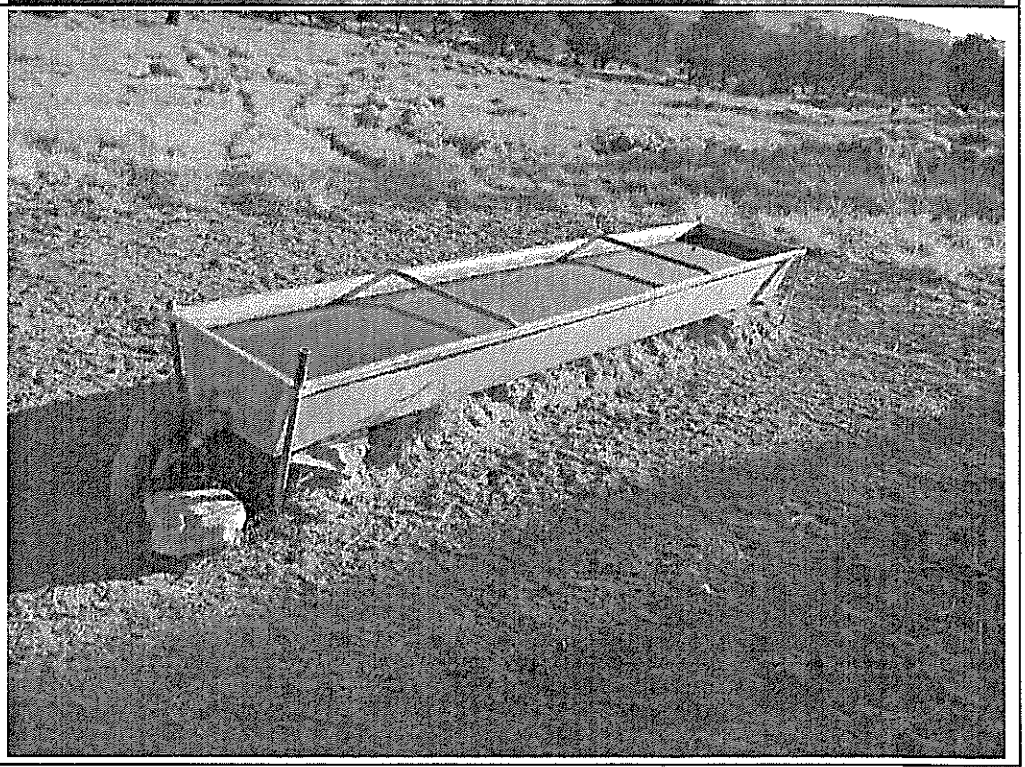
Well 14T-586



	Date: 10/19/10

Description:

Well 14T-586



PHOTOGRAPHIC LOG

NECR Water Well Sampling

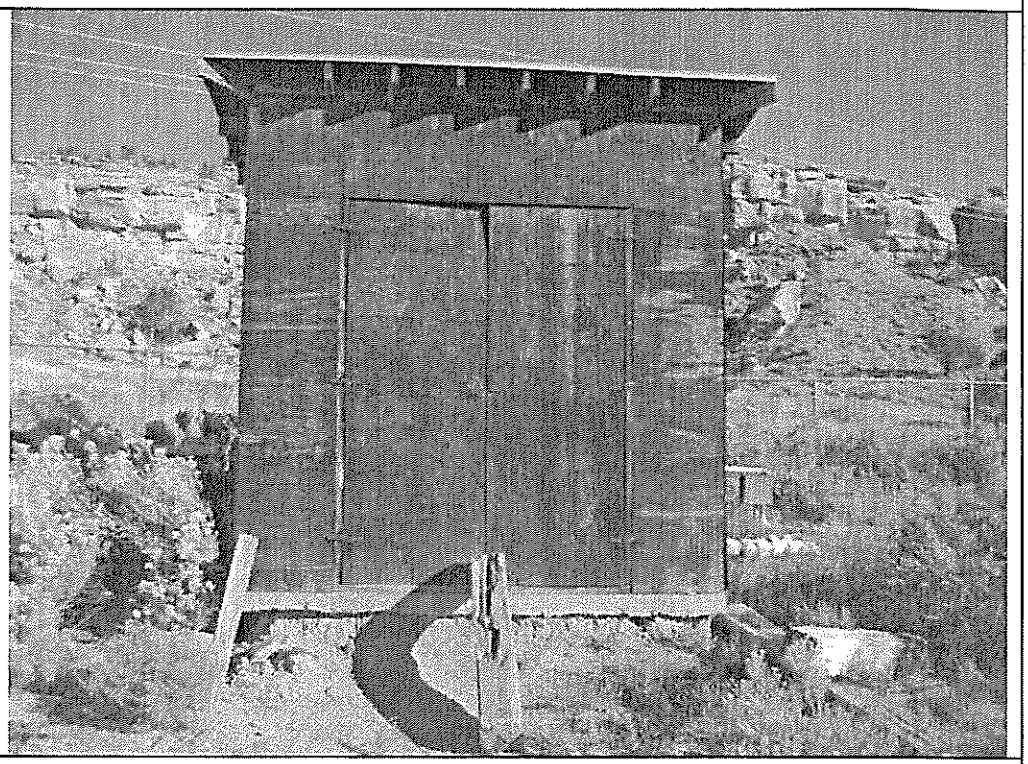
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

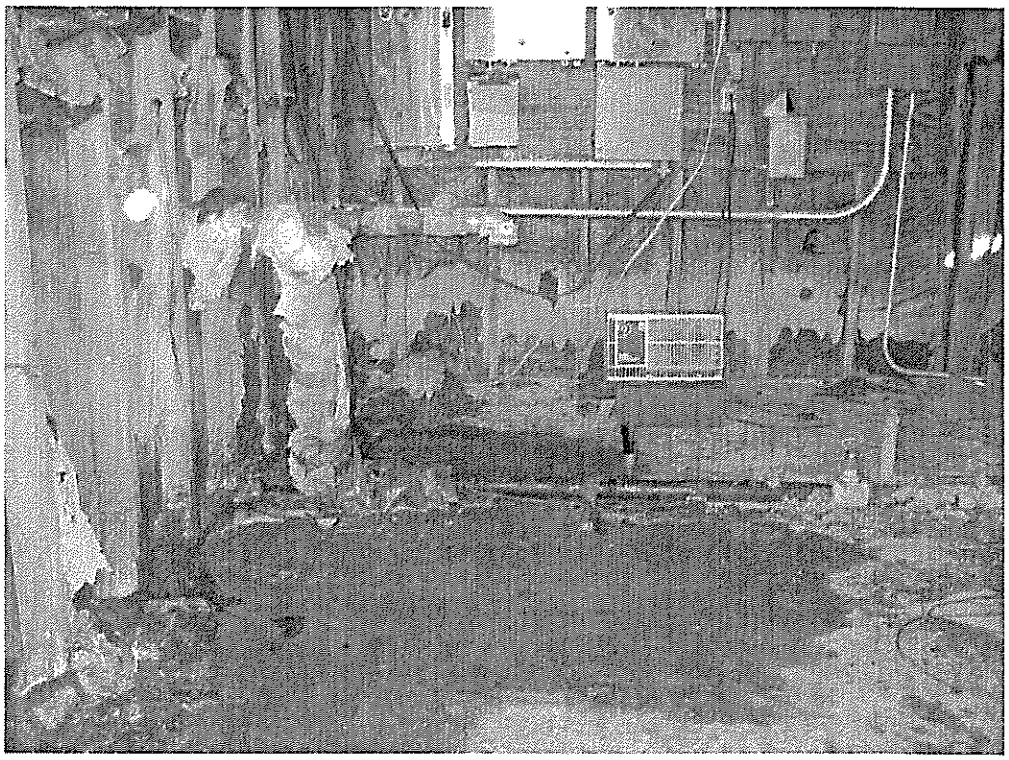
Mill Well



Date: 10/19/10

Description:

Mill Well



PHOTOGRAPHIC LOG

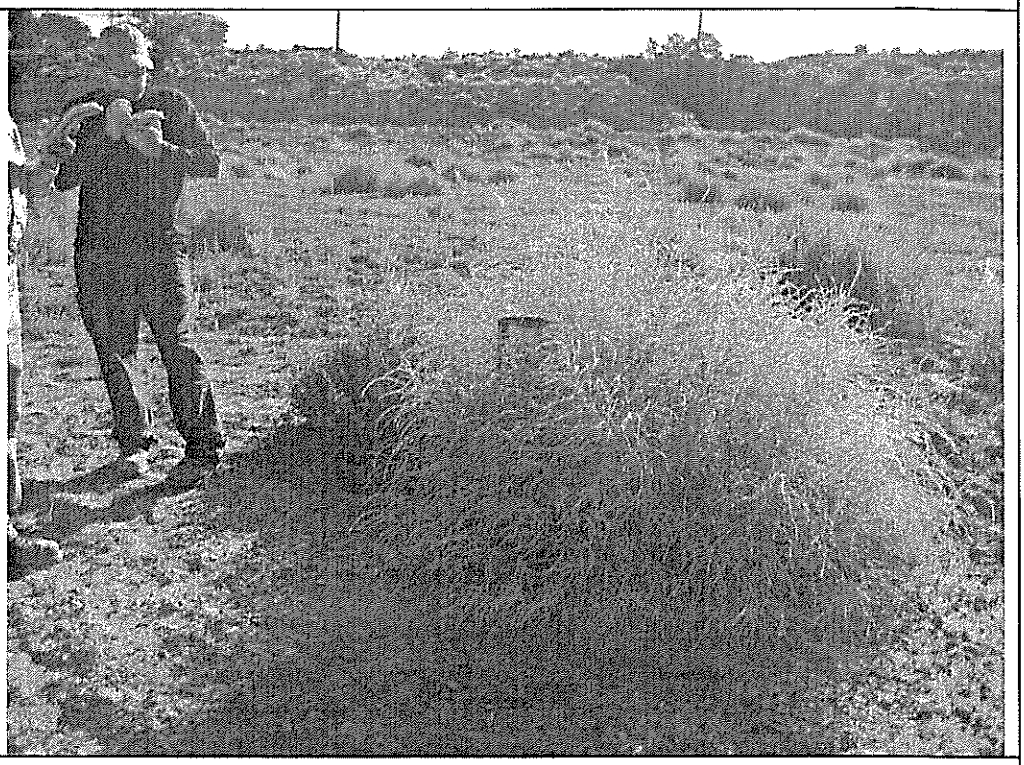
NECR Water Well Sampling

Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

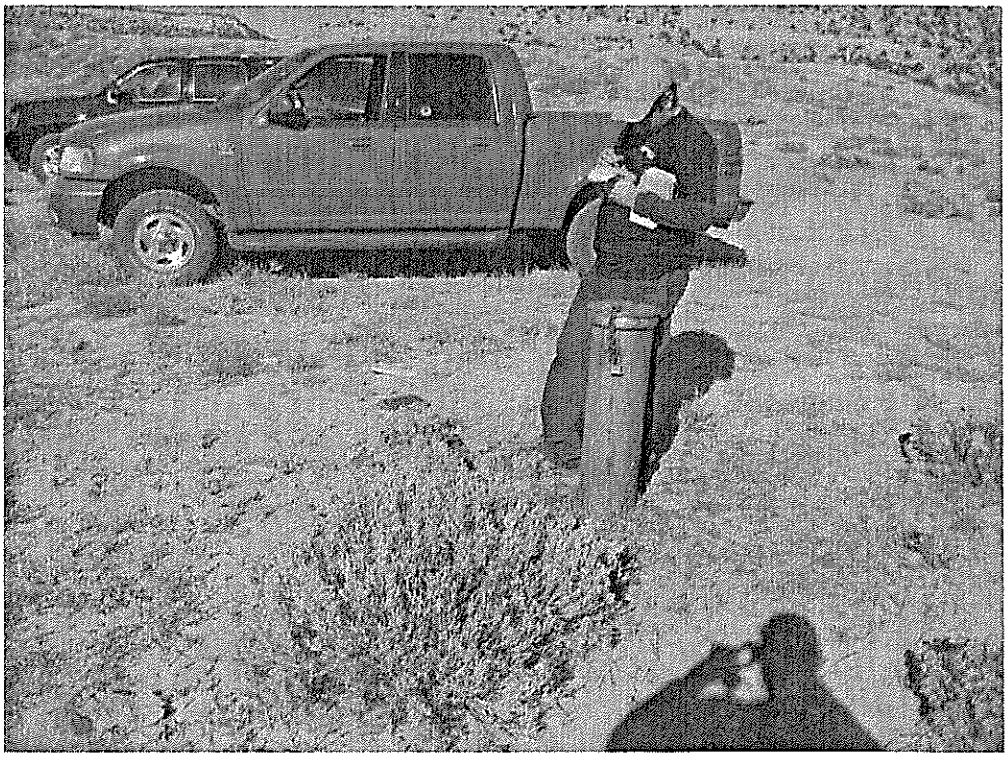
Description:
Mine Well



Date: 10/19/10

Description:

Well NR#1



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

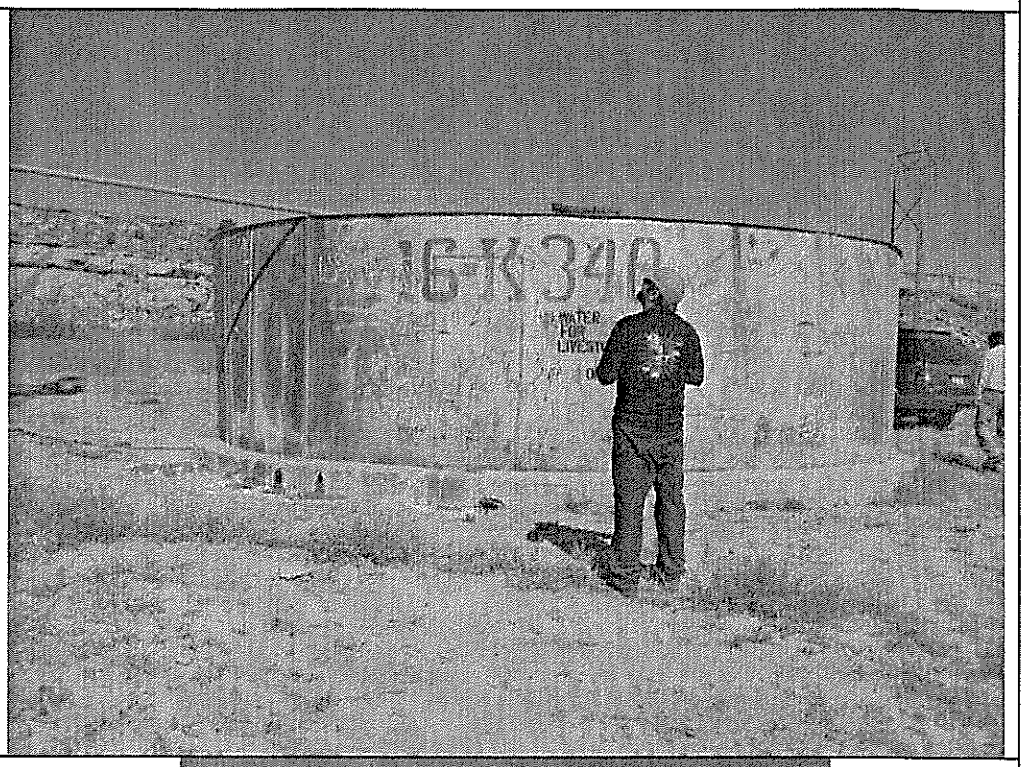
002693.2103.01RA

T02-09-10-08-0005

Date: 10/19/10

Description:

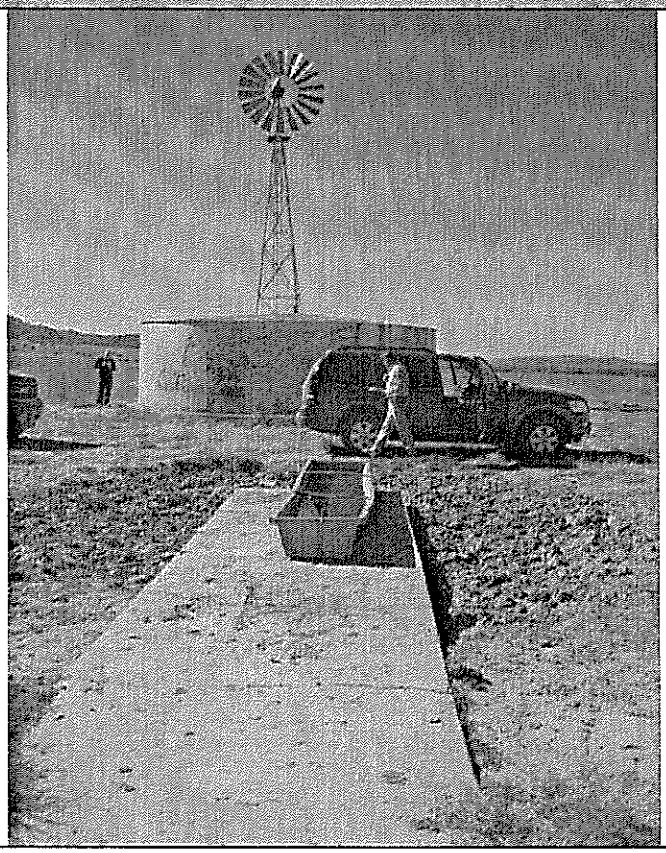
16K-340



Date: 10/19/10

Description:

16K-340



PHOTOGRAPHIC LOG

NECR Water Well Sampling

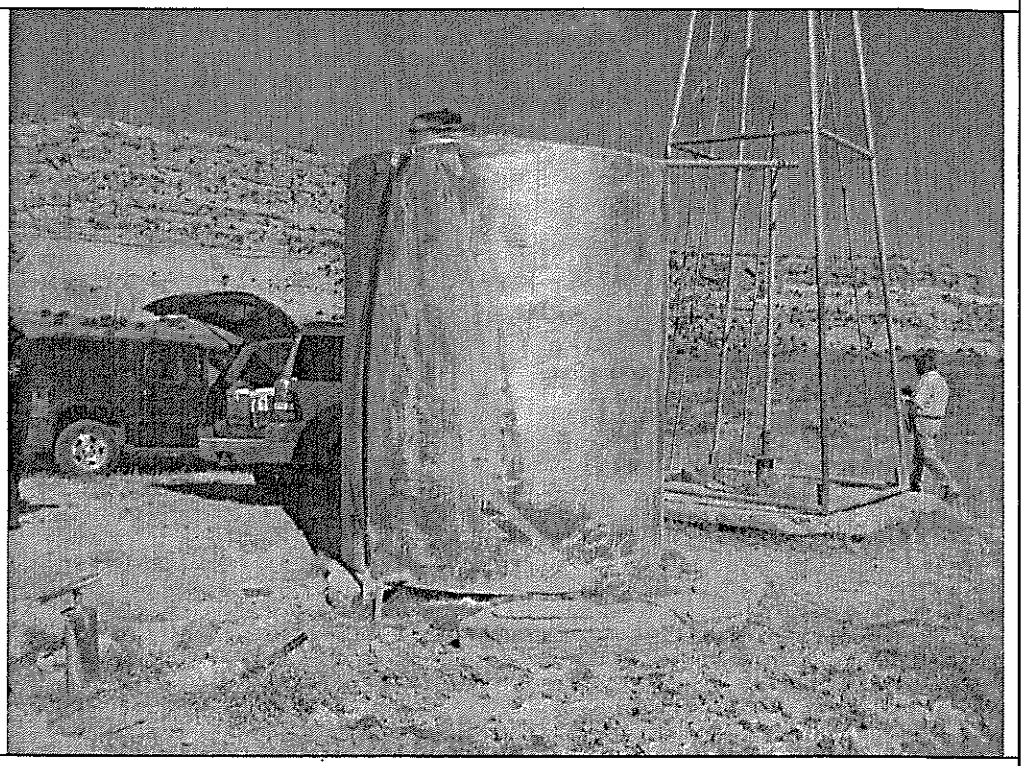
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

16K-336



Date: 10/19/10

Description:

16K-336

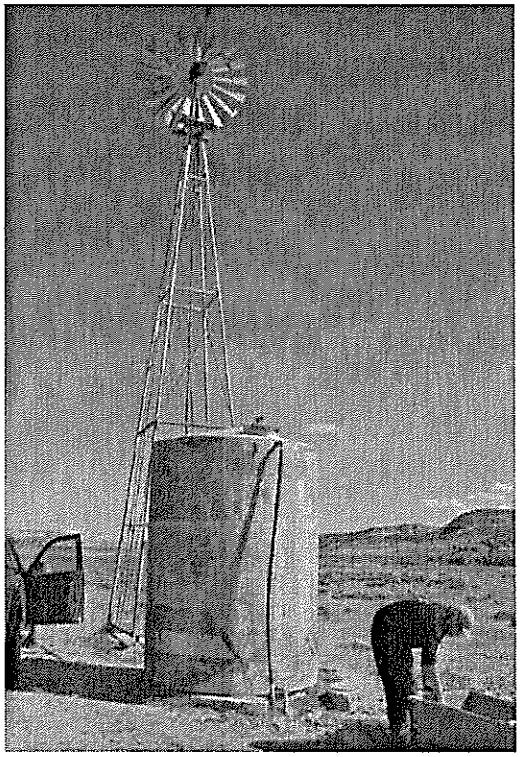


Table J
Reporting Limits, Action Levels, and Quality Control Limits

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

MWH

BUILDING A BETTER WORLD

MEMORANDUM

mill well
9/22/10
Read 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.

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Suite 109
Steamboat Springs, CO 80487

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FAX 970-879-9048
www.mwhglobal.com

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:

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

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).

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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.
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: 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.
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: 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.
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: 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.
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: E200.8										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.
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: 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.
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: 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

C10090864

United Nuclear Corporation

Login completed by: Corinne Wagner
Date Received: 9/22/2010

Reviewed by: BL2000\tedwards
Received by: ha

Reviewed Date: 9/22/2010
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_2SO_4	$Na_2S_2O_3$	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: Mel Chischilly Jr.
Dispatched by:
Carrier: FedEx-Priority Overnight
1 iced cooler
Method of Shipment

Received by Ronald B. Sam
9-21-10 Date
1210 Time

9-20-10 Date
1400 Time
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

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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

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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 umhos/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

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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

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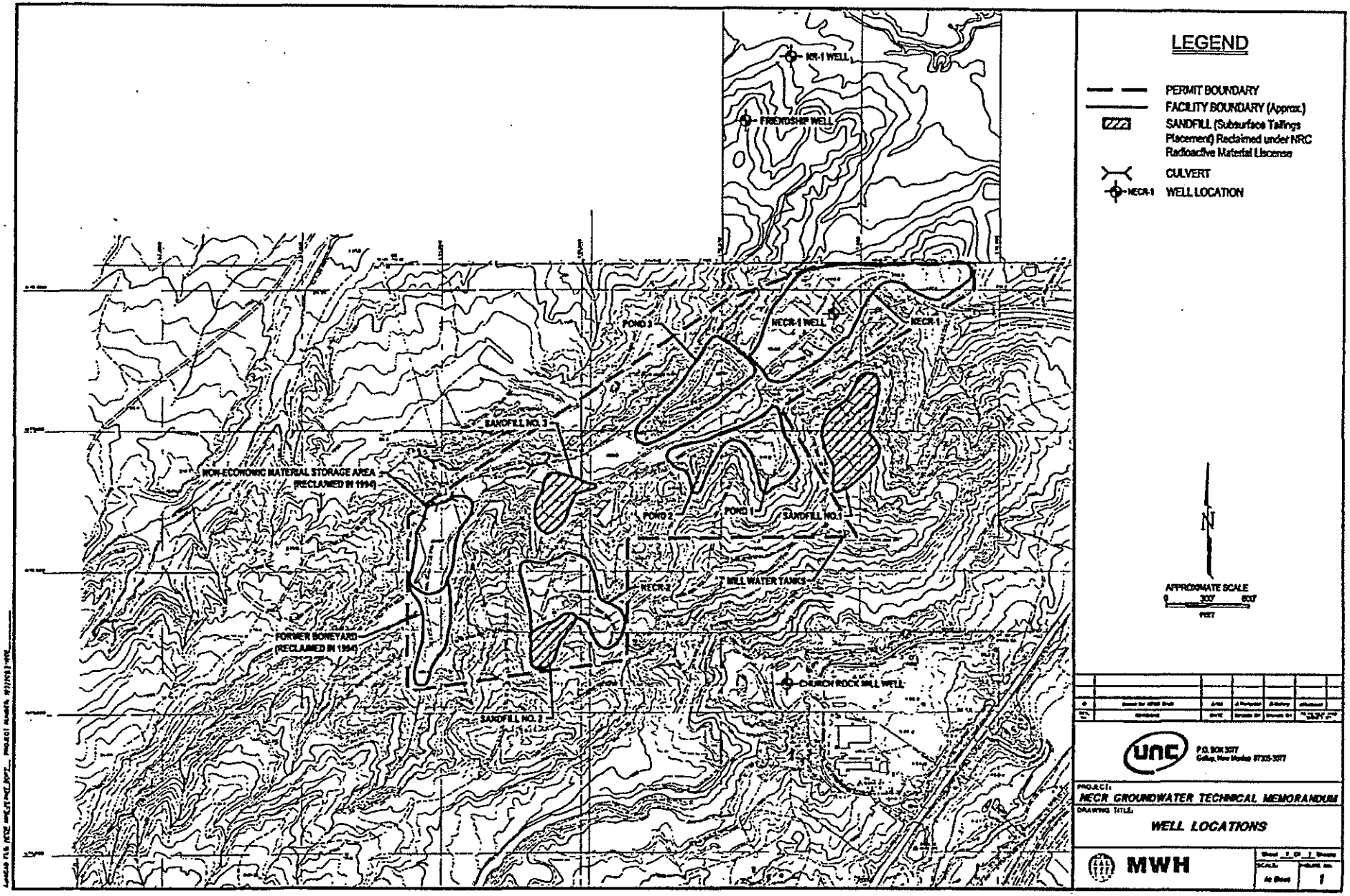

today than during active mining. Uranium is less mobile in reducing environments and iron will react with the sulfide and precipitate as iron sulfide.

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.

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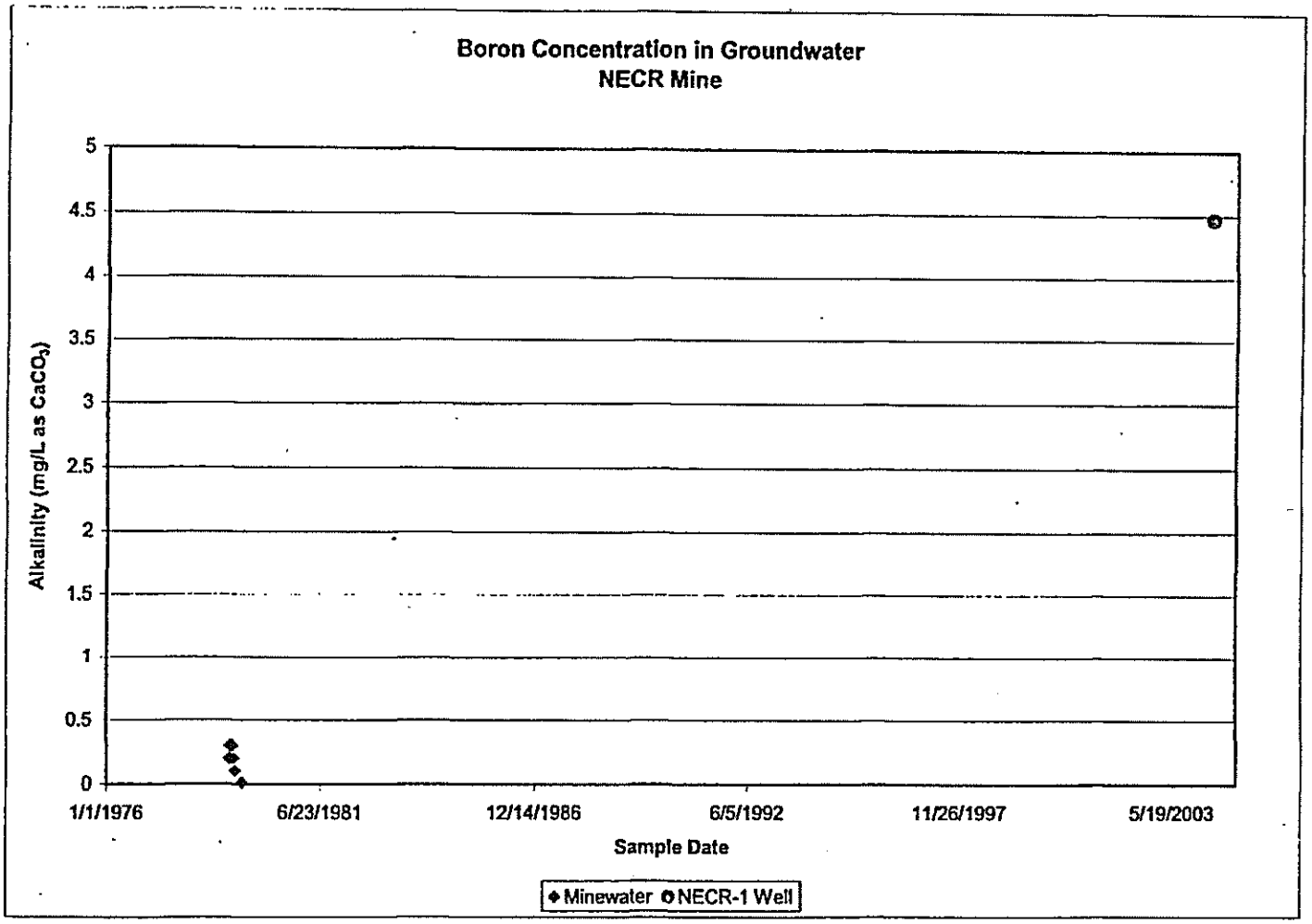

FIGURE 2
ALKALINITY CONCENTRATION IN GROUNDWATER NEAR NECR MINE

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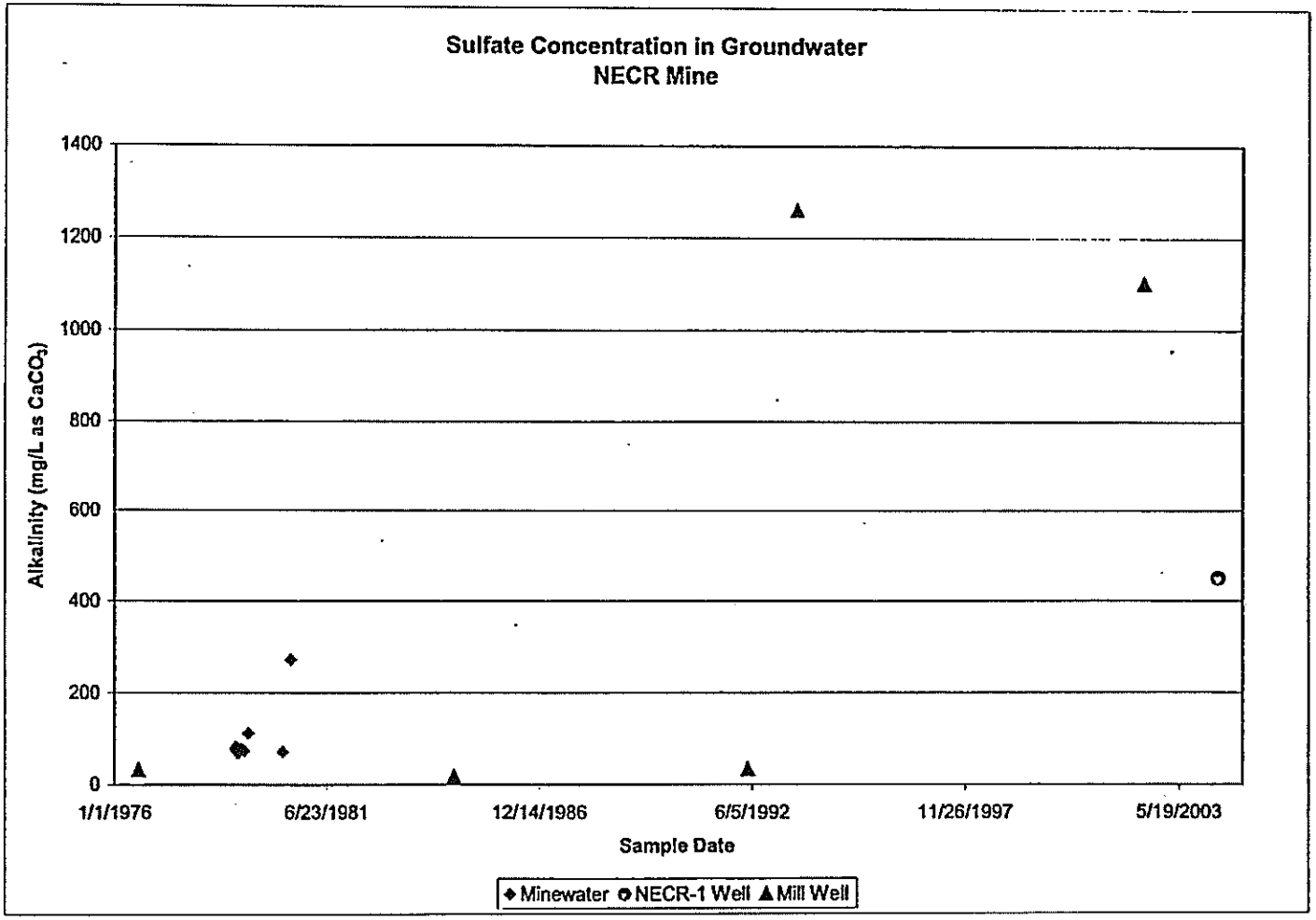

FIGURE 3
SULFATE CONCENTRATION IN GROUNDWATER NEAR NECR MINE

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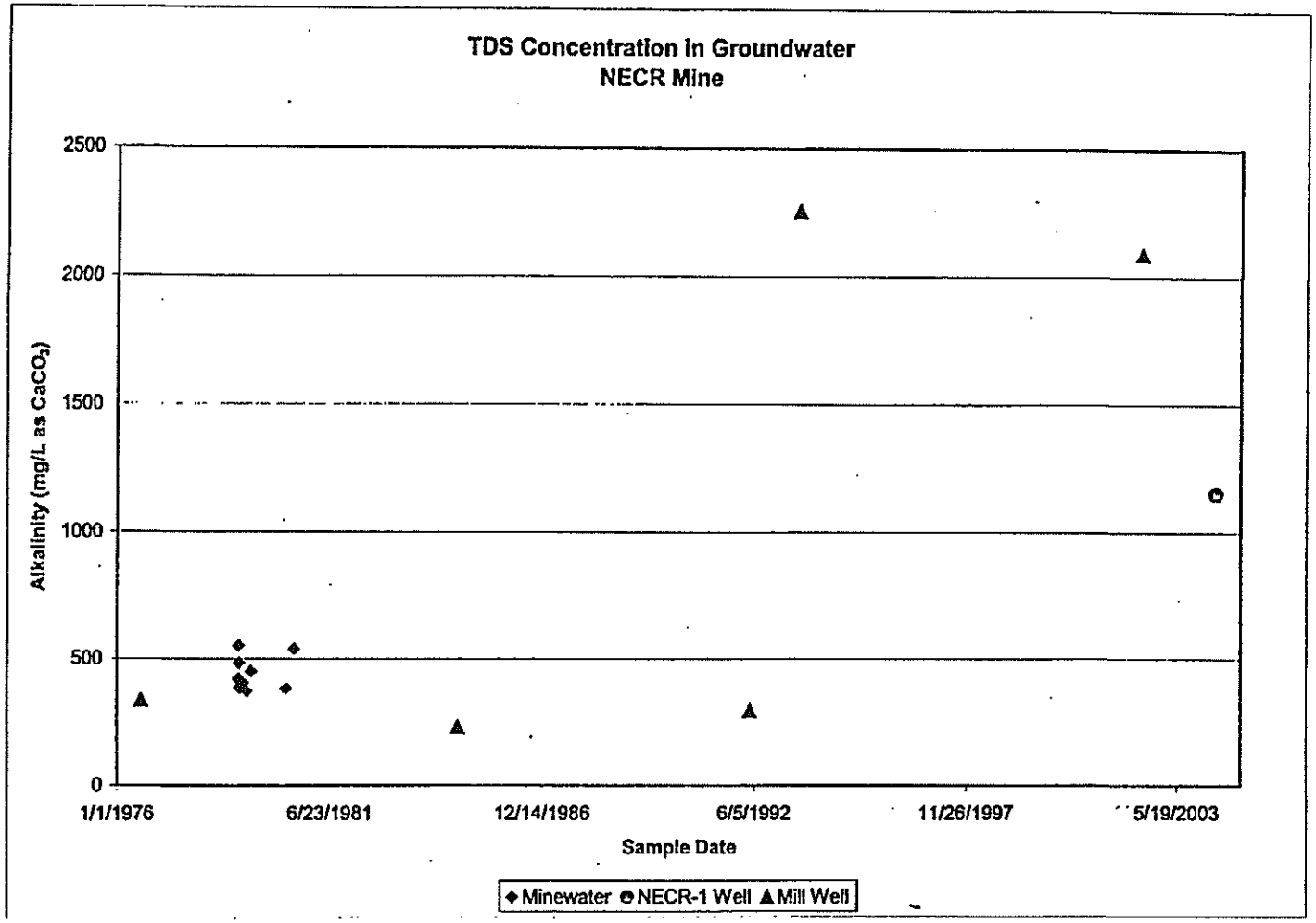

FIGURE 4
TDS CONCENTRATION IN GROUNDWATER NEAR NECR MINE

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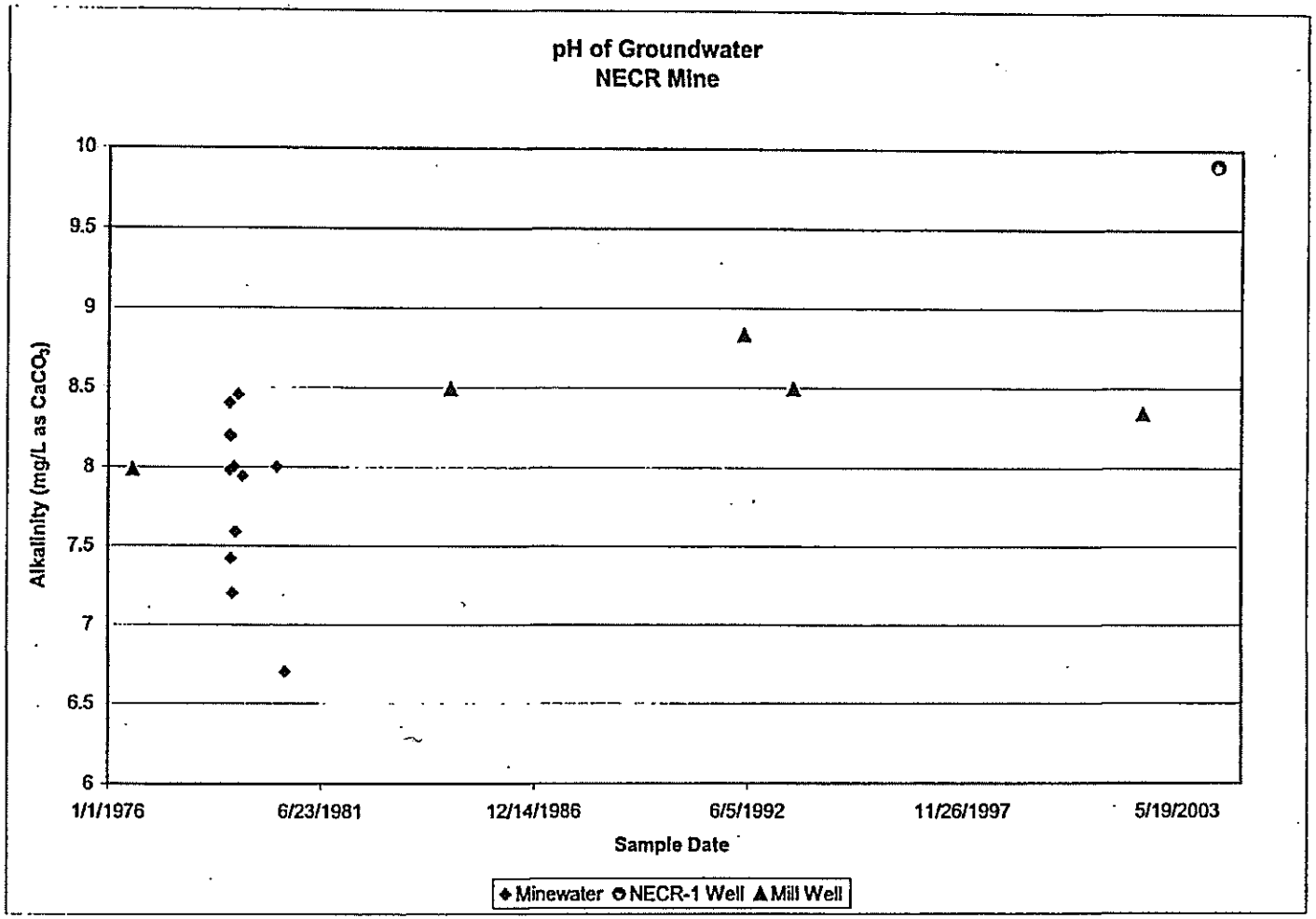

FIGURE 5
pH OF GROUNDWATER NEAR NECR MINE

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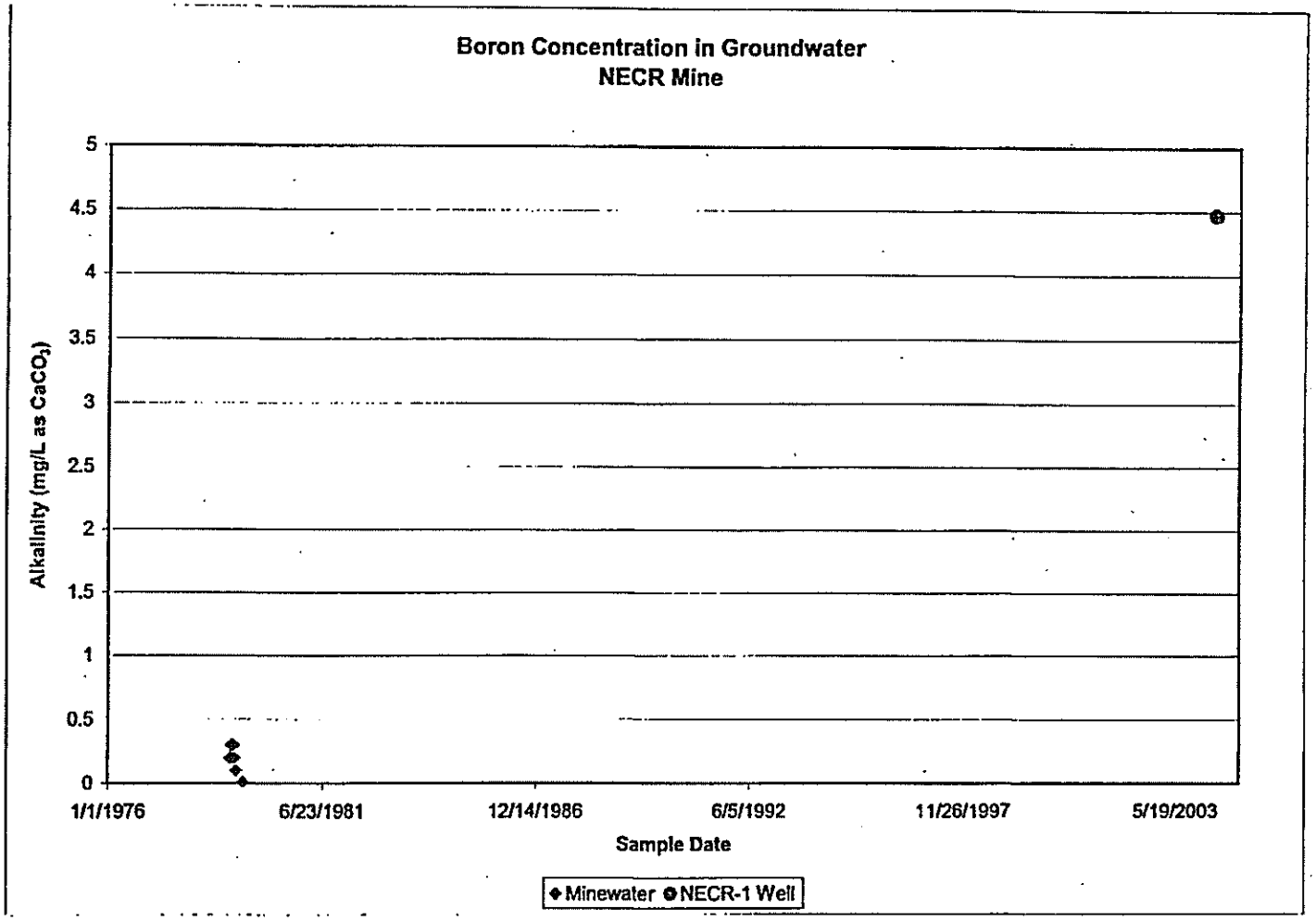

FIGURE 6
BORON CONCENTRATION OF GROUNDWATER NEAR NECR MINE

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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 / slb
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.

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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
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 09:44 / 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.

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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 CrownRock 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	[illegible]0405078[illegible]
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	5.57
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.

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

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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
[illegible]	[illegible]	[illegible]
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

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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 11:29
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	3660	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	6.15	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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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: 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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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: 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.

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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 the service. Any such laboratories will be indicated within the Laboratory Analytical Report.

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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	mg/l
Boron	Dissolved	EPA 200.7, ICP	0.001	mg/l
Calcium	Dissolved	EPA 200.7, ICP	0.2	mg/l
Iron	Dissolved	EPA 200.7, ICP	0.01	mg/l
Lead	Dissolved	EPA 200.7, ICP	0.04	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	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

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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.

Company Name: UNC	Project Name, PWS #, Permit #, Etc.: UNC CLOSEOUT PLAN
Report 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
Invoice Address: UNC PO BOX 3077 GALLUP, NM 87305-3077	Invoice Contact & Phone #: DOREEN BROWN (505)722-6651
	Purchase Order #:
	ELI Quote #: C1212

Report Required For: POTW/WWTP ☐ DW ☐ Other _____

Special Report Formats - ELI must be notified prior to sample submittal for the following:
ELAC ☐ A2LA ☐ Level IV ☐
Other _____
DD/EDT ☐ Format _____

Number of Containers
Sample Type: A W S V B O
Air Water Soils/Solids Vegetation Bioassay Other

ANALYSIS REQUESTED

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

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	SEE ATTACHED	Normal Turnaround (TAT)	RUSH Turnaround (TAT)	Comments:	Lab ID
NECR-WELL1	17MAY04	0940	4-W	X				[illegible]
SECT27-VENT3	17MAY04	1430	4-W	X				

LABORATORY USE ONLY

Custody Record MUST be Signed

Relinquished by: [signature]	Date/Time: 18 MAY 04/1415	Shipped by: VPS GRND	Received by: [signature] 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:

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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.

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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	

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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	<

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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	

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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	

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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	

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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	

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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

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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	

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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	

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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

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MINE WELL

Part - Don't have

STATION NAME: Church Rock Mine - Backfilling 6/02/81

LOCATION: Gallup, N.M

Parameter/Date-Time	decant CR-1	mine H_2O CR-2	comingled H_2O CR-3	mine H_2O CR-4	comingled H_2O CR-5	sump H_2O CR-6	slurry/ H_2O mix CR-7	IX H_2O CR-9
Water Level from MP Ft	DECANT	MINE H2O	COMN H2O	MINE H2O	COM H2O	SUMP H2O	SLR+H2O	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								
ug/ml ~ppm * 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 µmho								
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	Miles from NE-Corner South	Field # or Name	Date Collect	SiO_2	Ca	Mg	Na	HCO_3	CO_3	SO_4	Cl	F	NO_3	Hardness ppm	Dissolved Solids	Conductance	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	8/53	5.1	20	11	262	498	11	210	12	.0	1.9	95	778	1280		Menefee
			16-18																
	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

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

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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

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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 umhos/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

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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

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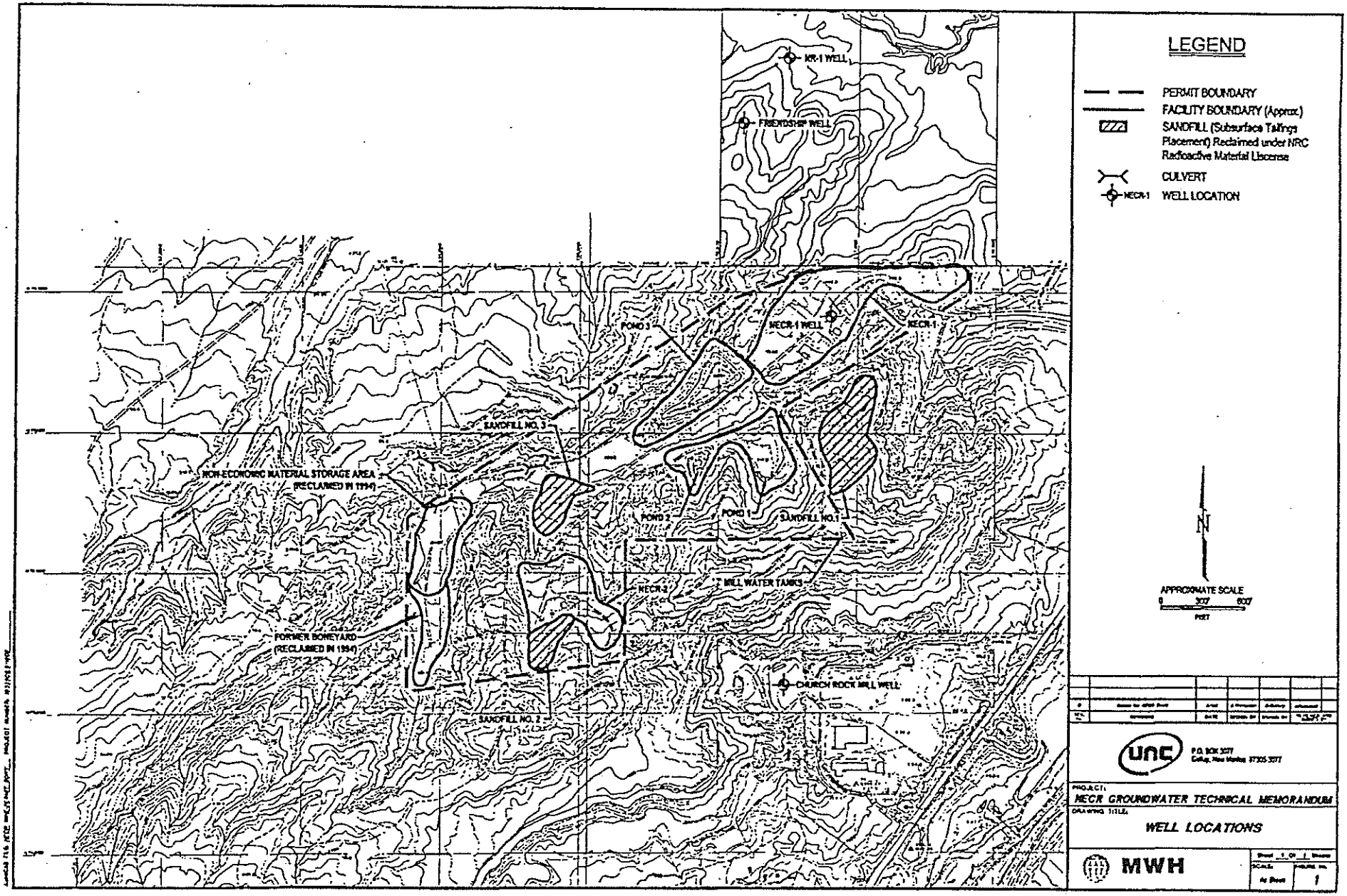

today than during active mining. Uranium is less mobile in reducing environments and iron will react with the sulfide and precipitate as iron sulfide.

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.

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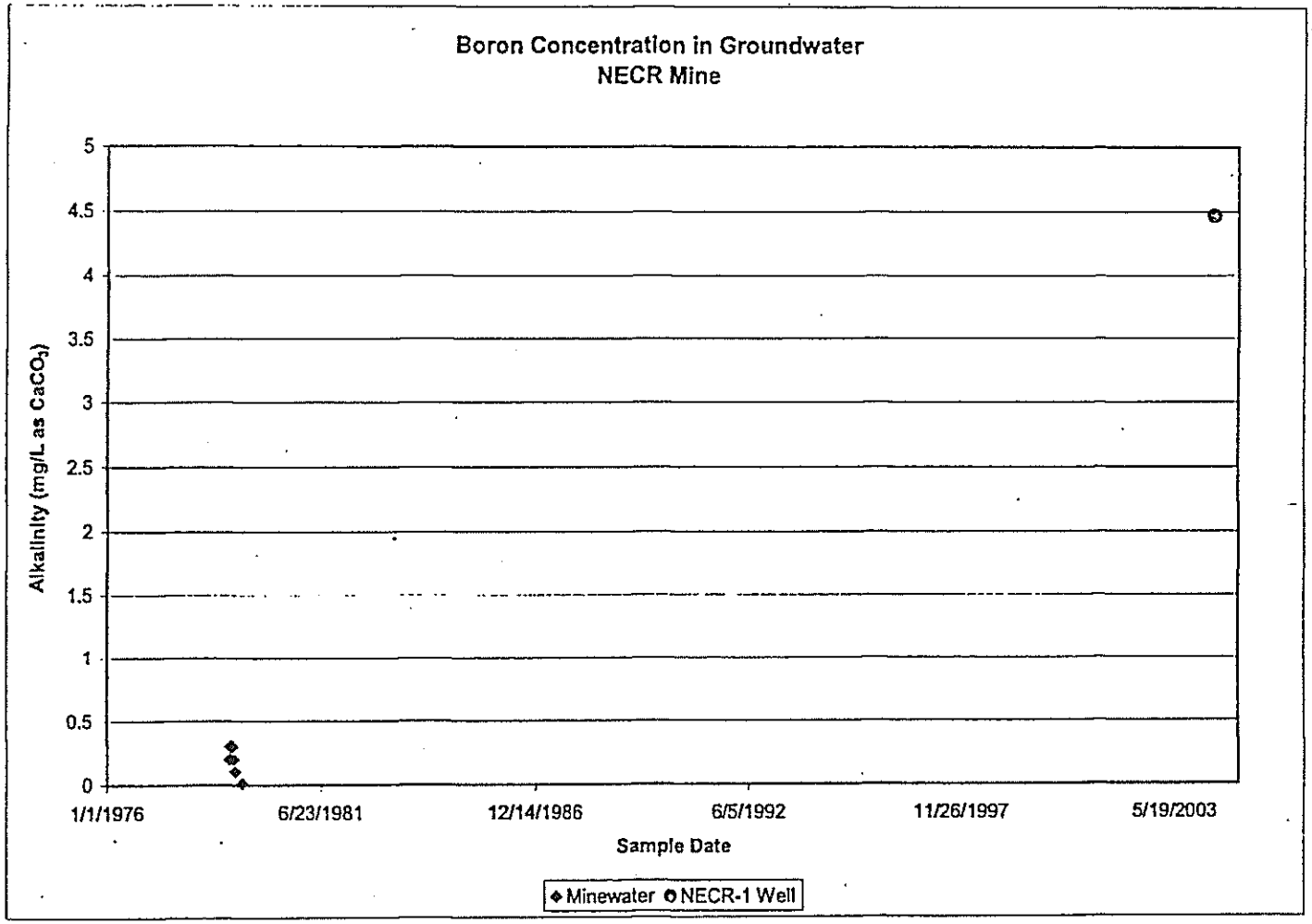

FIGURE 2
ALKALINITY CONCENTRATION IN GROUNDWATER NEAR NECR MINE

Printed with FineDrint

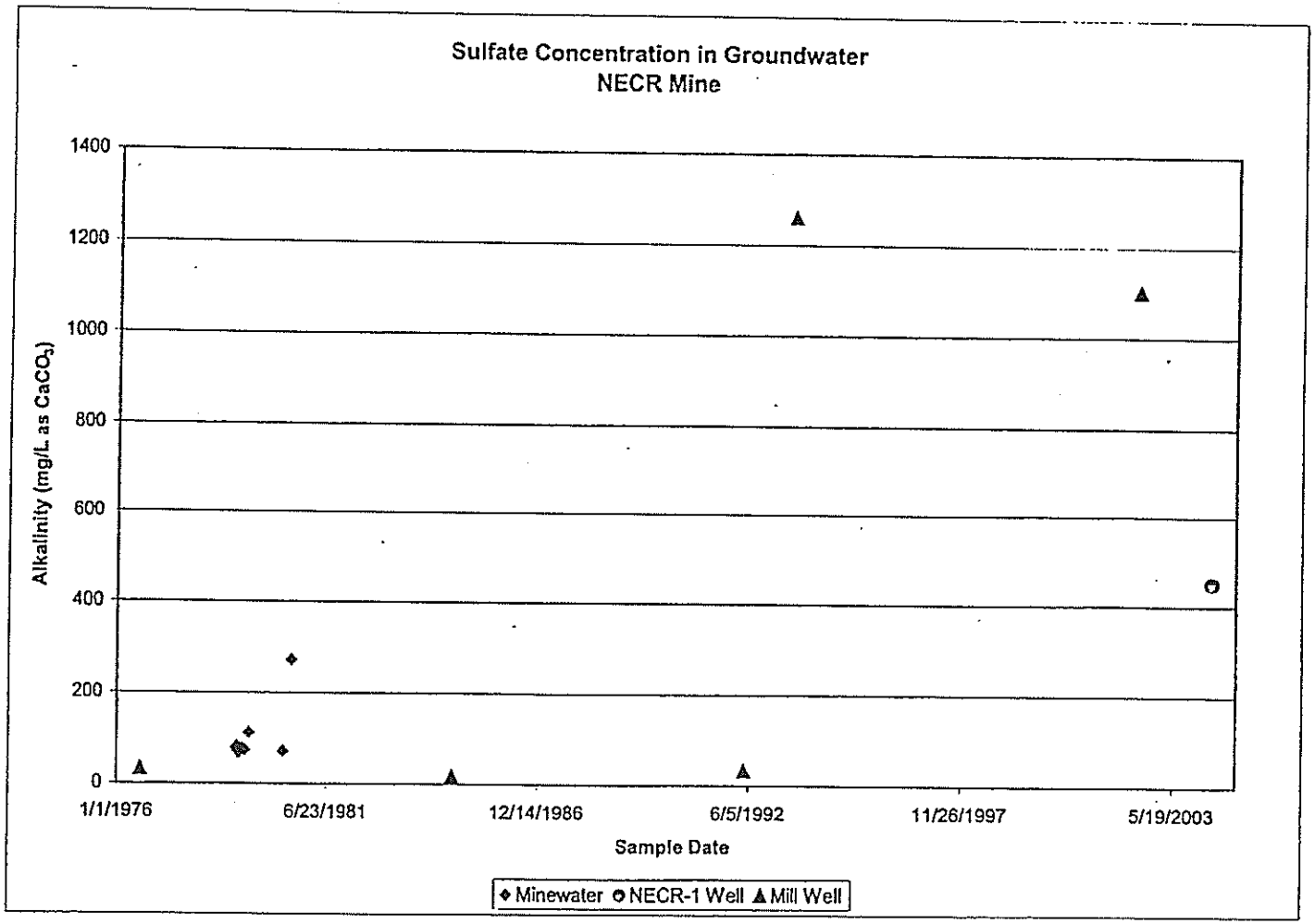

FIGURE 3
SULFATE CONCENTRATION IN GROUNDWATER NEAR NECR MINE

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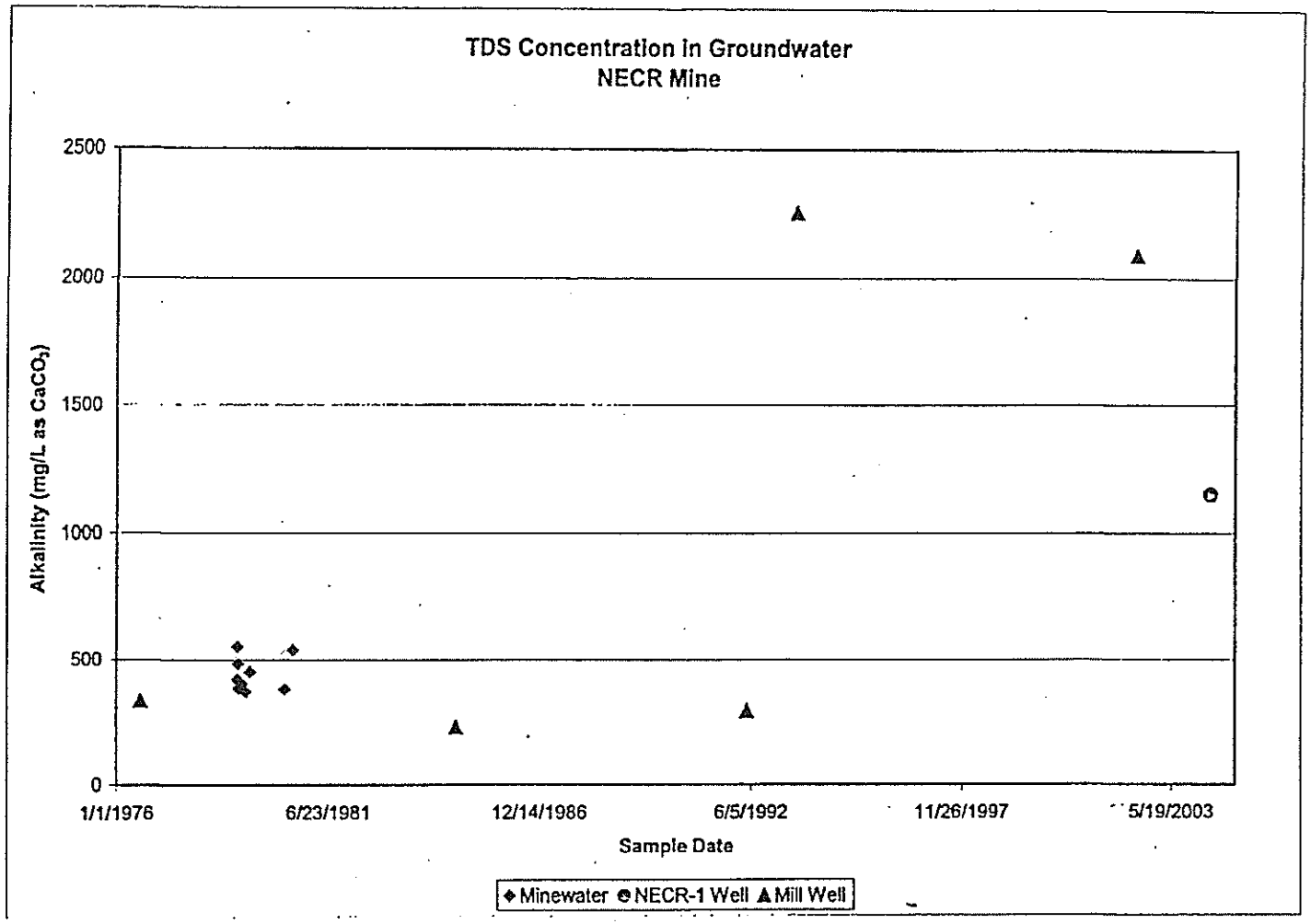

FIGURE 4
TDS CONCENTRATION IN GROUNDWATER NEAR NECR MINE

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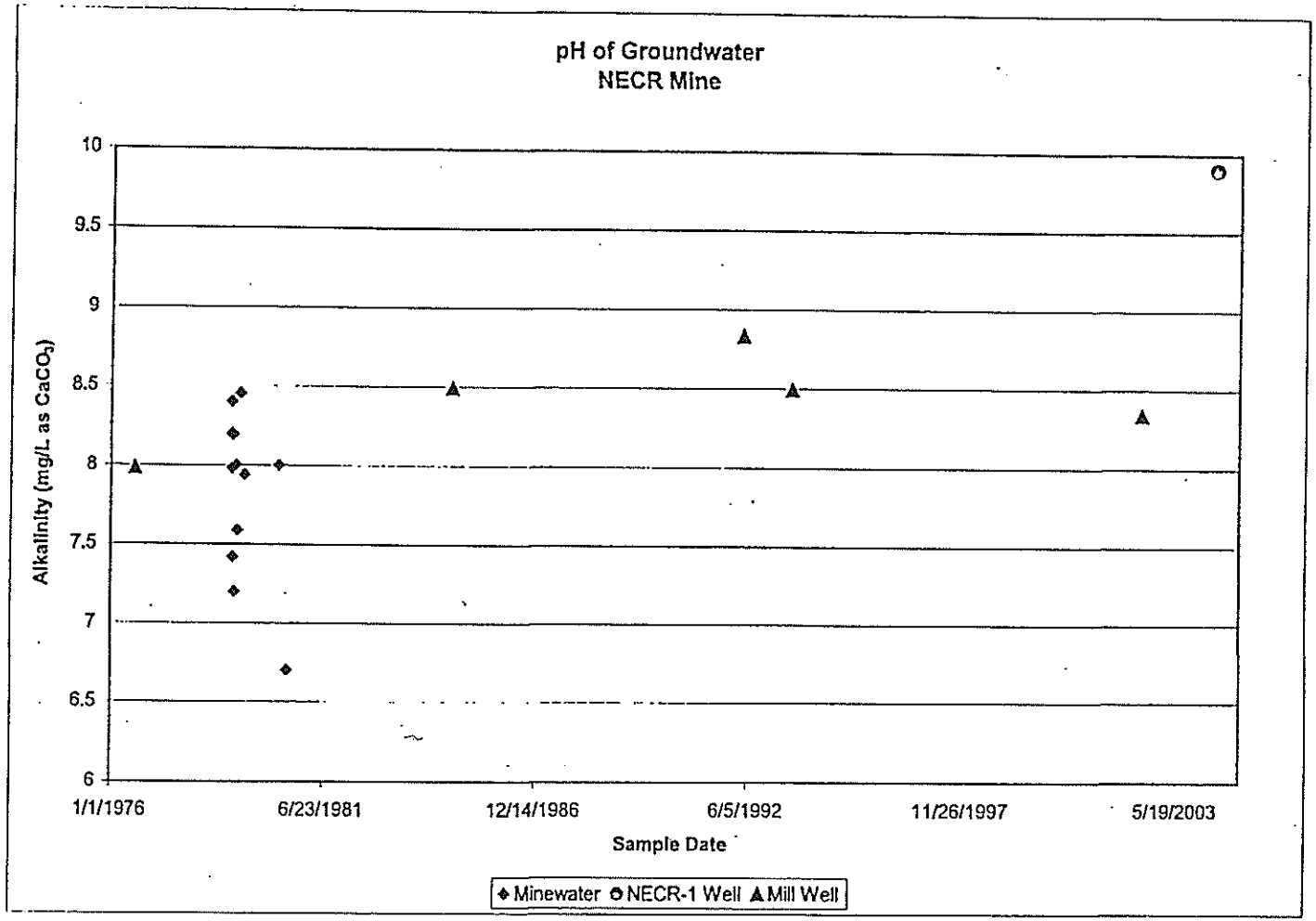

FIGURE 5
pH OF GROUNDWATER NEAR NECR MINE

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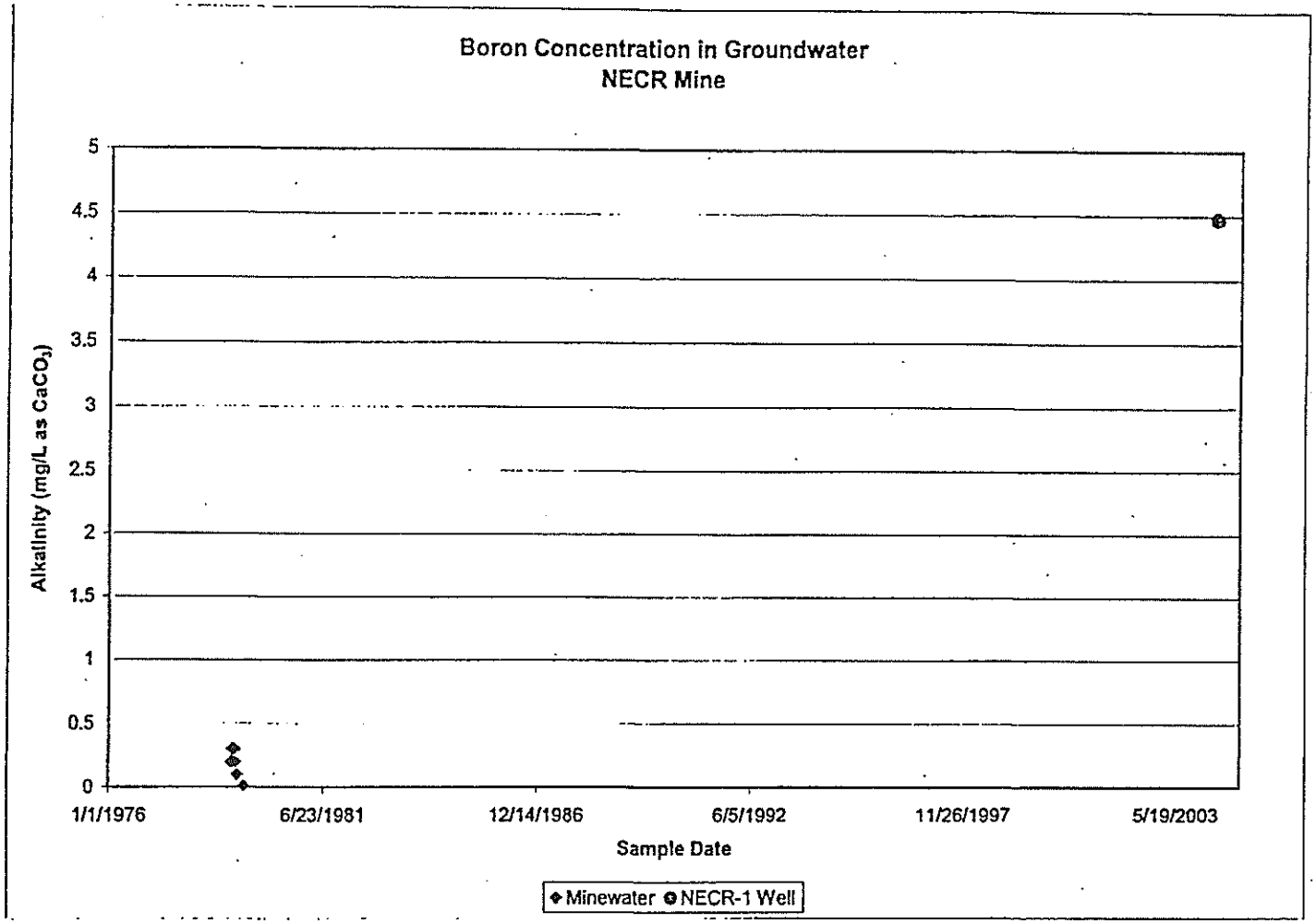

FIGURE 6
BORON CONCENTRATION OF GROUNDWATER NEAR NECR MINE

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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 / slb
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.

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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
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
[illegible]	[illegible]	[illegible]
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	5.67
Sodium	mg/L	368
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	[illegible]
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 11:29
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.

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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	3660	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.

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

Qualifiers:

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ND - Not detected at the reporting limit.

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-04; 8:14AM; 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			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,Uran,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.

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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	mg/l
Boron	Dissolved	EPA 200.7, ICP	0.001	mg/l
Calcium	Dissolved	EPA 200.7, ICP	0.2	mg/l
Iron	Dissolved	EPA 200.7, ICP	0.01	mg/l
Lead	Dissolved	EPA 200.7, ICP	0.04	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	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

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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.

Company Name: UNC

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

Report 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: SAMC

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

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

Purchase Order #:

ELI Quote #: C12/2

Report Required For: POTW/WWTP ☐ DW ☐ Other ____

Special Report Formats - ELI must be notified prior to sample submittal for the following:
ELAC ☐ A2LA ☐ Level IV ☐
Other ____
EDD/EDT ☐ Format ____

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	SEE ATTACHED
NECA-WELL1	17MAY04	0940	4-W	X
SECT27-VENT3	17MAY04	1430	4-W	X

Normal Turnaround (TAT) ☐ RUSH Turnaround (TAT) ☐

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

Comments:

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

LABORATORY USE ONLY

Custody Record MUST be Signed

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

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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.

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

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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	

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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	<

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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	

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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	

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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	

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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	

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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

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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	

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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	

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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

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WELL
15T-303

Well also
marked as
15K-303

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International Specialists in the Environment
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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

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

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

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

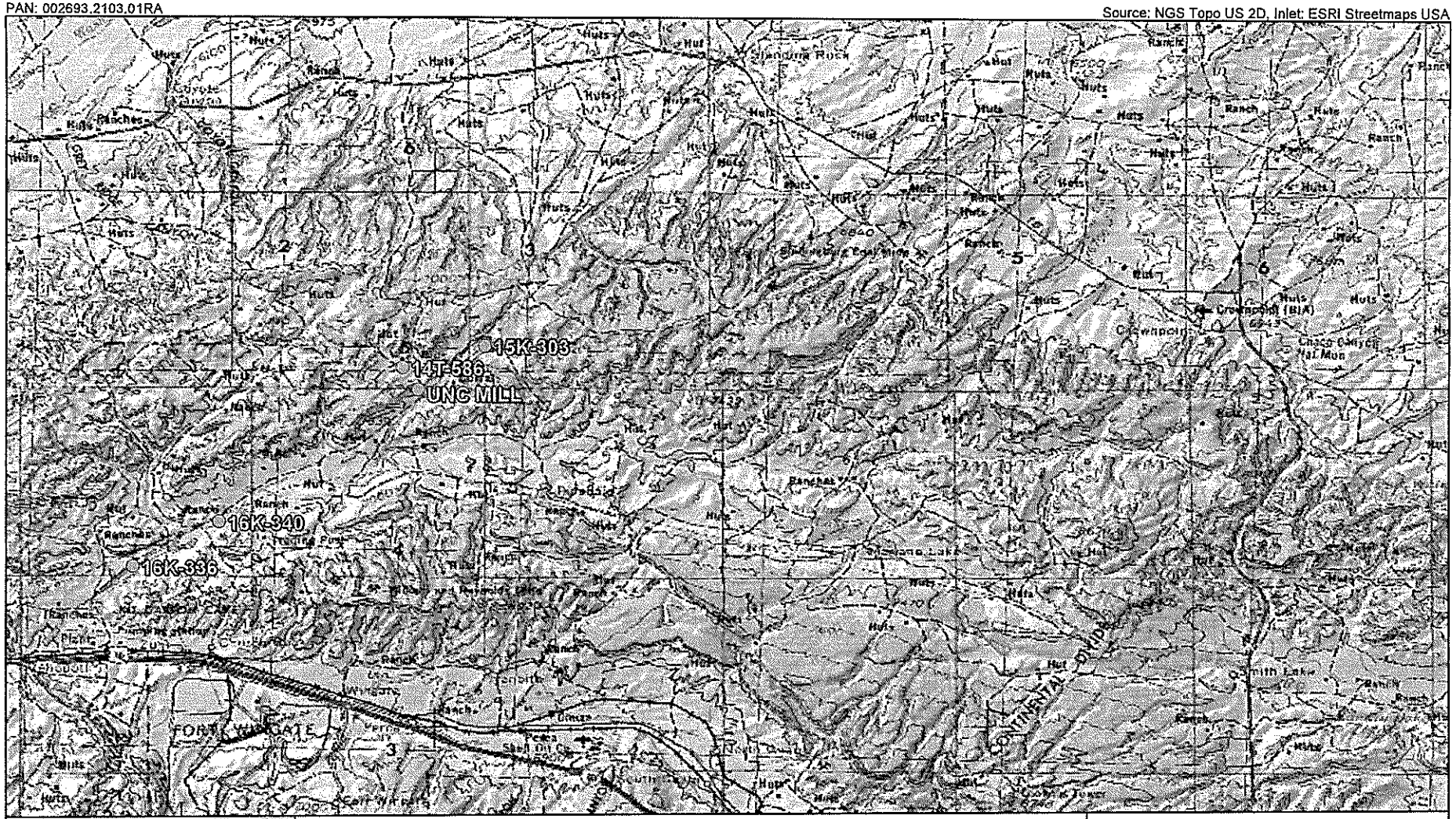
Attachments: A – Homesite Location Map
B –Data Tables
C – Photographic Documentation
D- QASP

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

N

0 2.25 4.5 9 Miles

Figure 1
NECR
Water Well Sampling

Navajo Nation

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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:002693.2104.01 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
	$\delta D\ H_2O$	-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

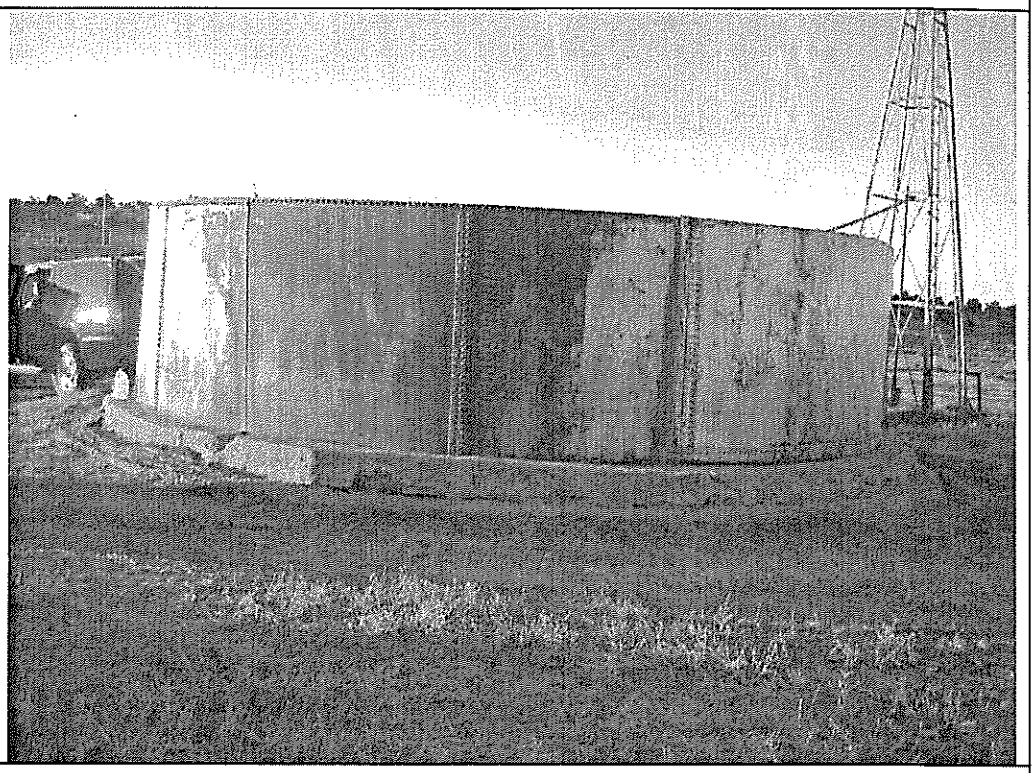
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

	Date: 10/19/10

Description:

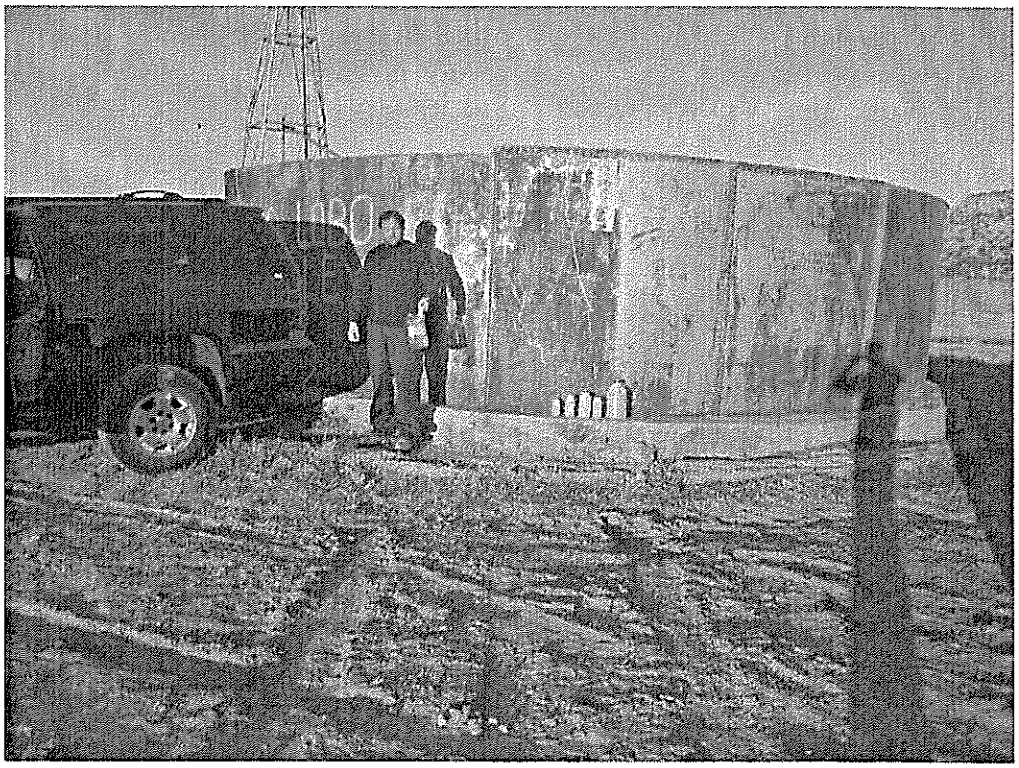
Well 15T-303



	Date: 10/19/10

Description:

Well 15T-303



PHOTOGRAPHIC LOG

NECR Water Well Sampling

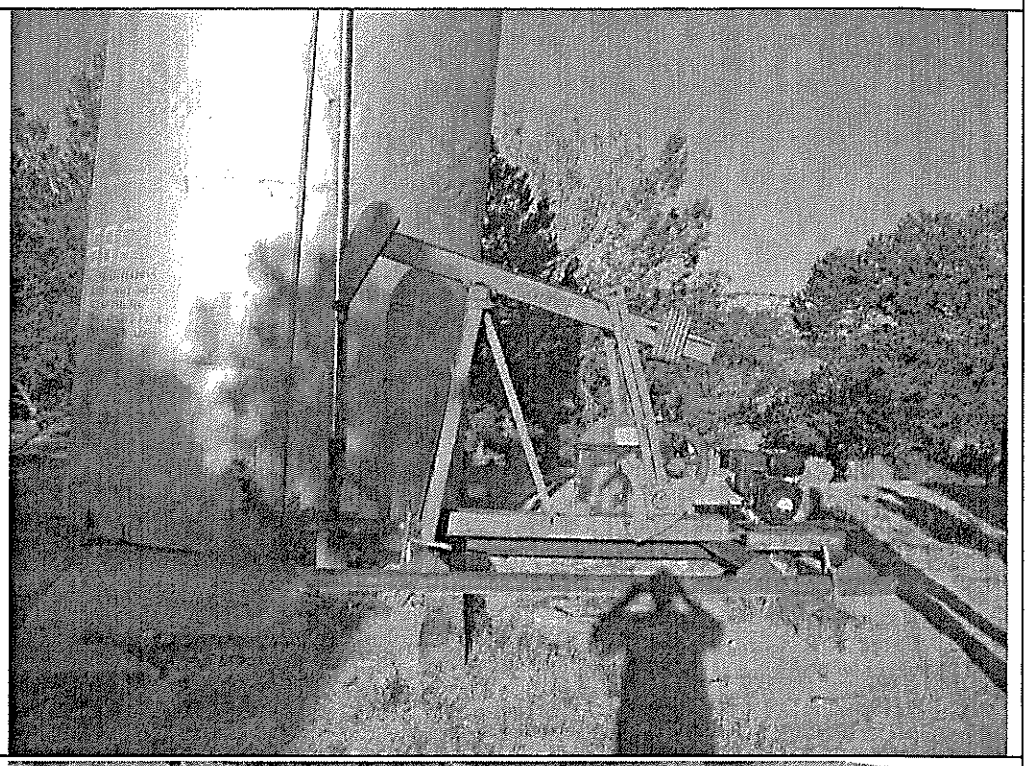
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

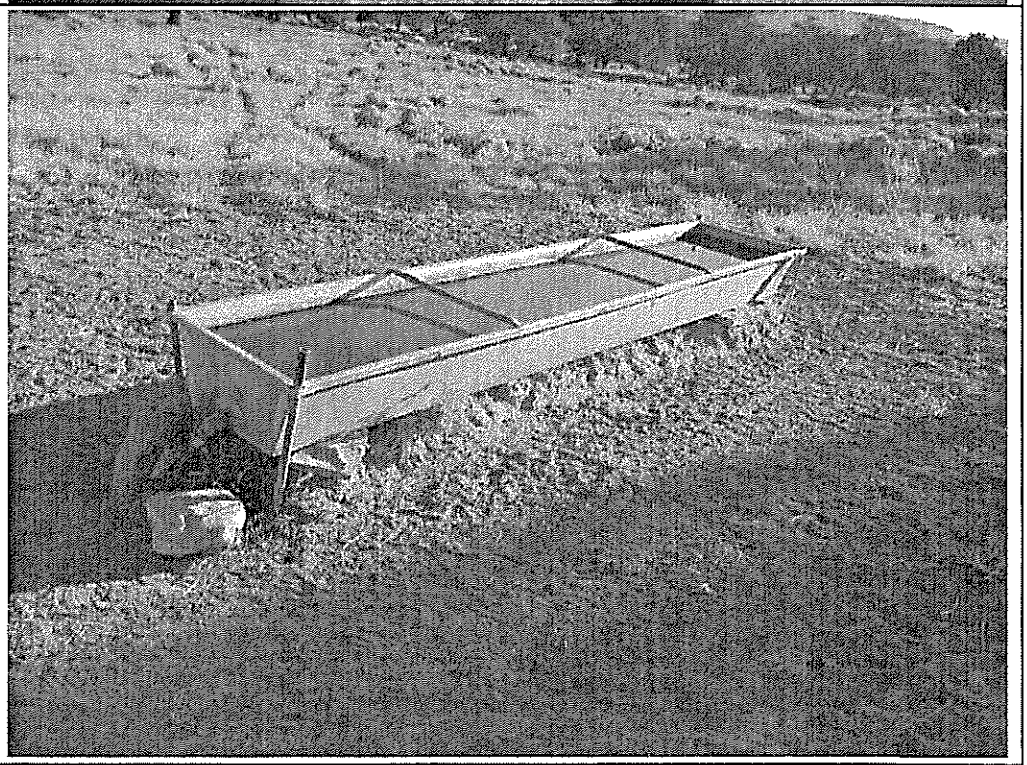
Well 14T-586



Date: 10/19/10

Description:

Well 14T-586



PHOTOGRAPHIC LOG

NECR Water Well Sampling

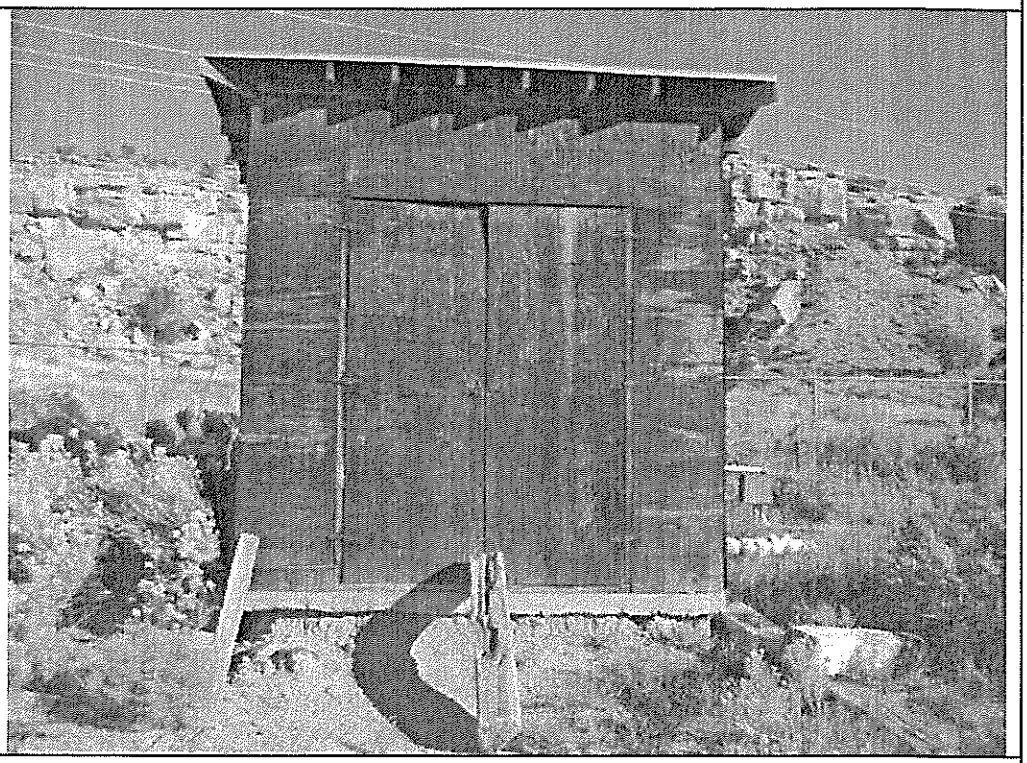
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

	Date: 10/19/10

Description:

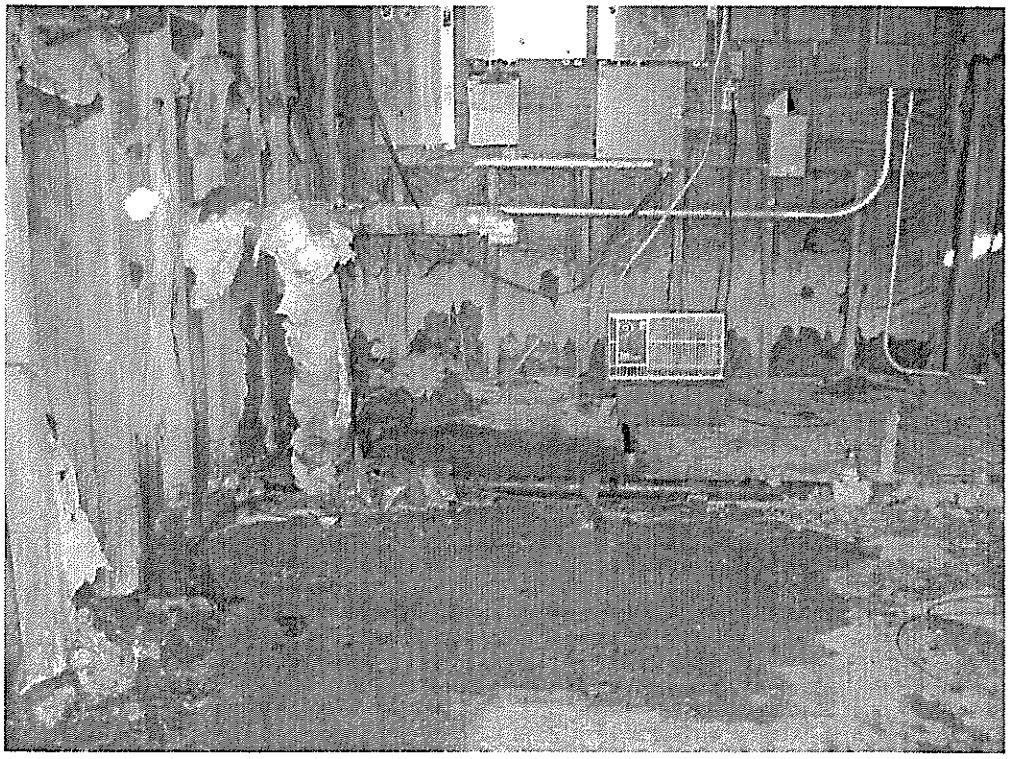
Mill Well



	Date: 10/19/10

Description:

Mill Well



PHOTOGRAPHIC LOG

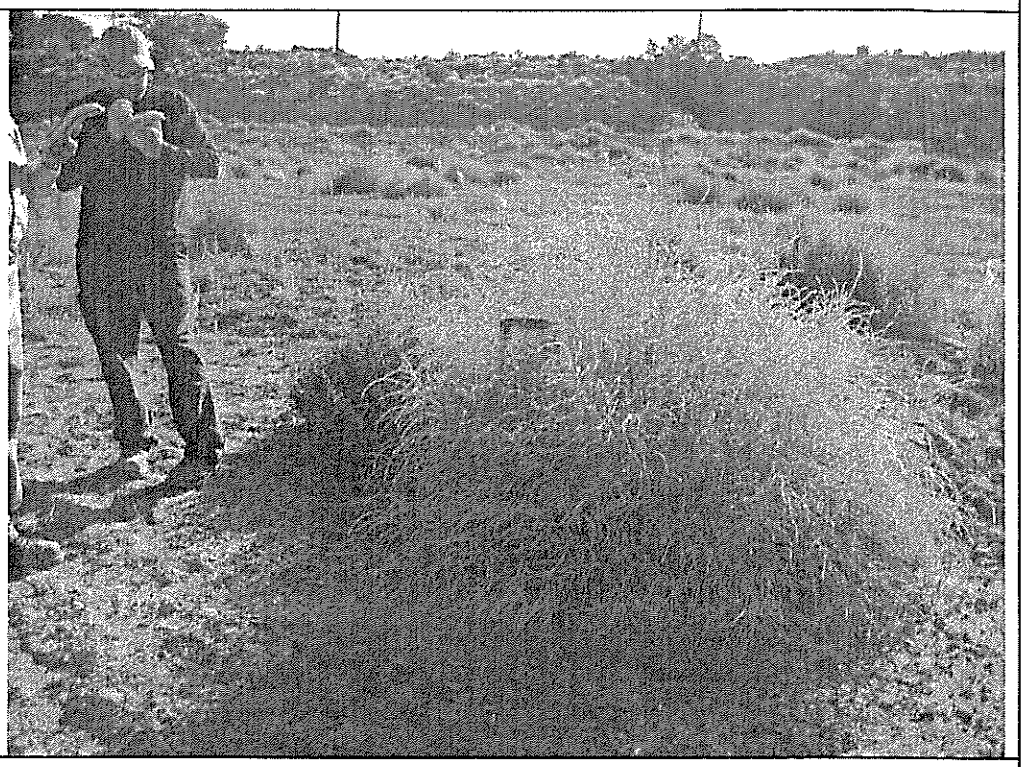
NECR Water Well Sampling

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

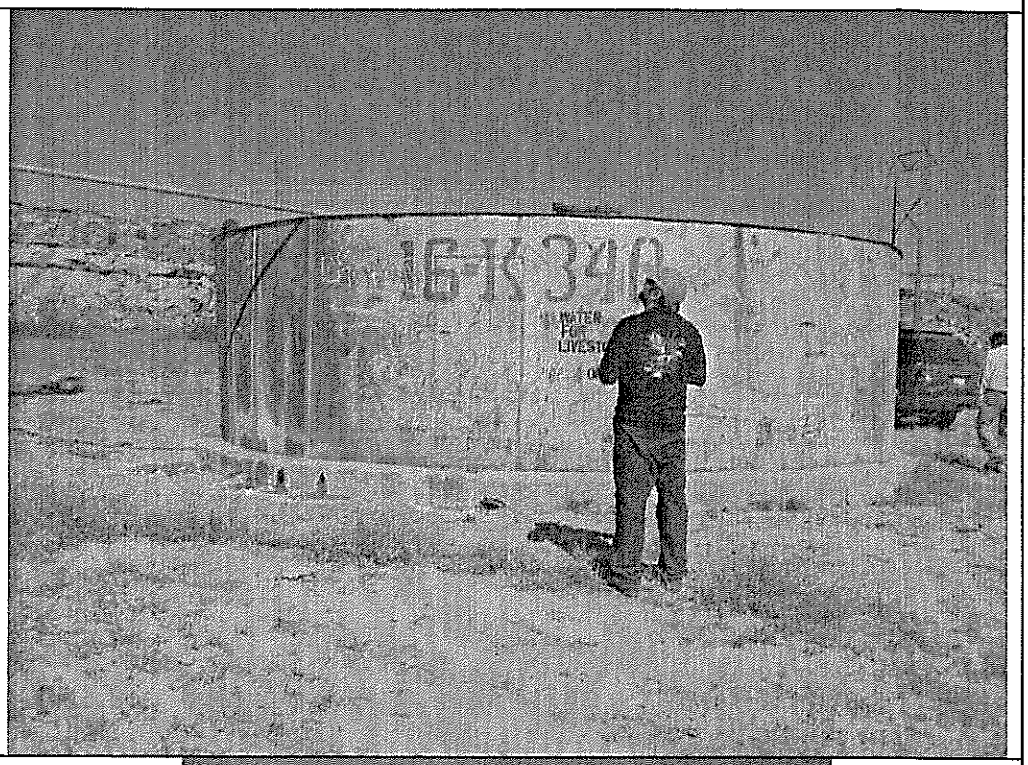
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

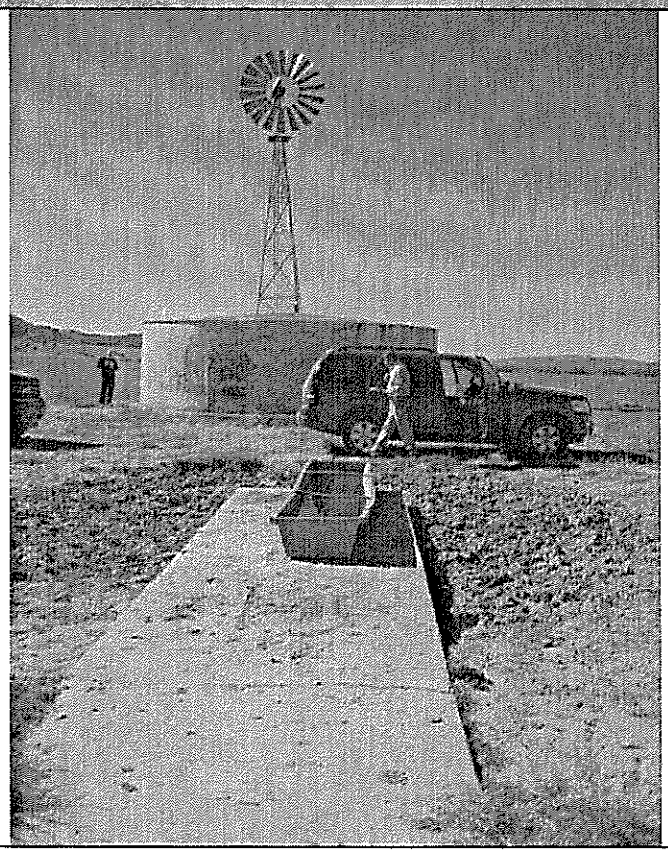
16K-340



Date: 10/19/10

Description:

16K-340



PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

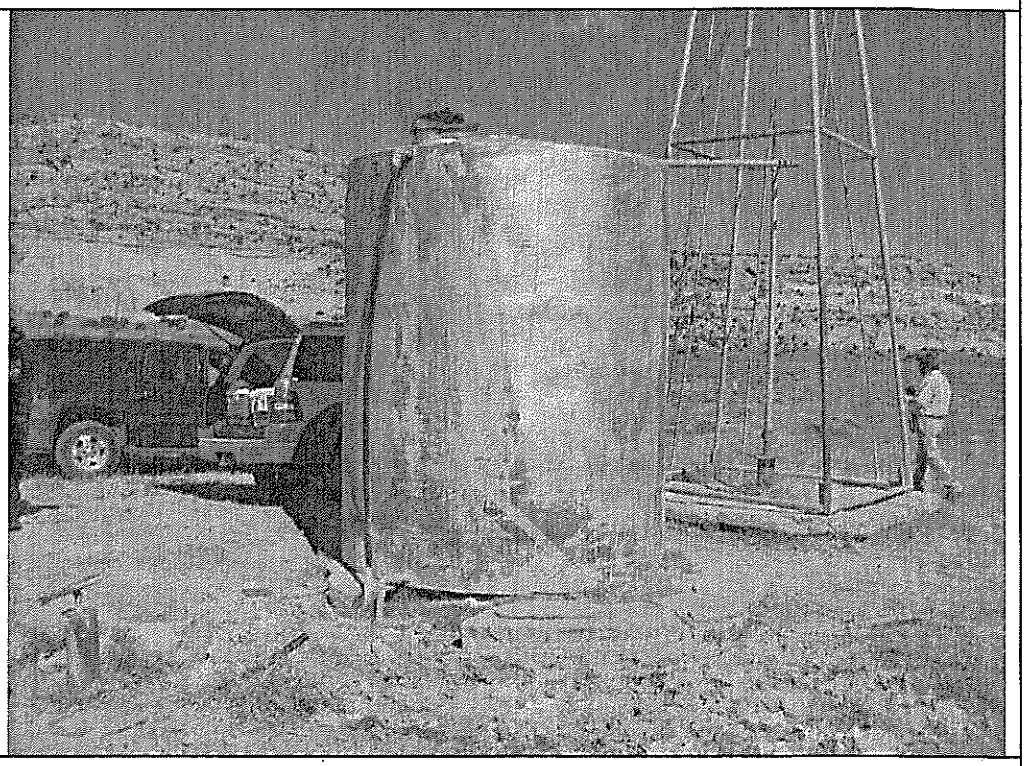
002693.2103.01RA

T02-09-10-08-0005

Date: 10/19/10

Description:

16K-336



Date: 10/19/10

Description:

16K-336

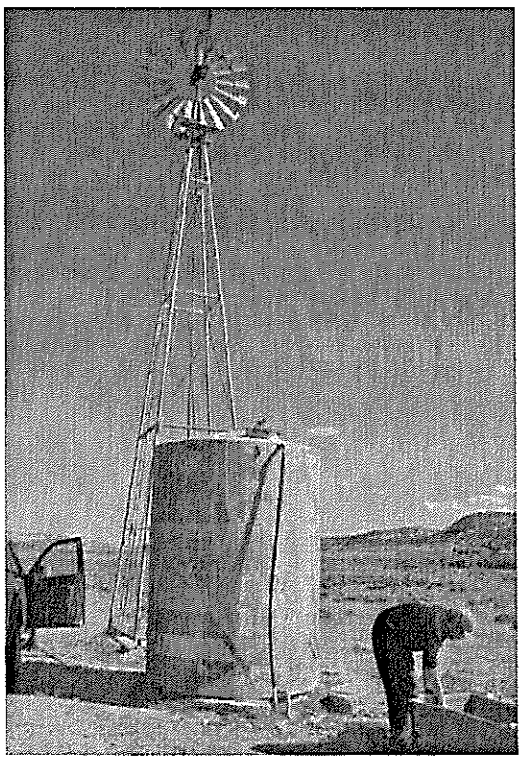


Table J
Reporting Limits, Action Levels, and Quality Control Limits

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

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

1890.00 Conductivity umhos/cm
11.200 Turbidity MCL 1ntu
0.45 Corrosivity
1.70 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

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

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

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
04	1/23/87	1052 1052		✓	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	1/24/87	1030 1030		✓	Well 16F-344 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)
	9/24/87 1800	Federal Express ABH 311 705 3682			
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	

Original 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	1/24/87	1022 1022		✓	~~Well 16F-348~~ Circle Wash	1	X			3297F01 6-009298
						1		X		3297F01 6-009299
						1			X	3297F01 6-009300
02	1/24/87	1131 1131		X	Well 16T 513	1	X			3297F02 6-009349
						1		X		3297F02 6-009350
						1			X	3297F02 6-009351
03	1/24/87	1259 1259		X	Well 16F-606	1	X			3297F03 6-009357
						1		X		3297F03 6-009358
04						1			X	3297F03 6-009359
05										

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
	9/24/87 1800	Federal Express ABH 311 705 3682			
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

CHAIN OF CUSTODY RECORD

First International Bldg., 1201 Elm St.
Dallas, Texas 75270

PROJ. NO.	PROJECT NAME
SMS 3291F	United Nuclear

SAMPLERS: (Signature)

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Metals	Fluoride Chloride Sulfate	TDS	Nitrate			REMARKS
01	9/24/87	1023 1050		X	~~Well 16F-348~~ Circle Wash	5	1	2	1	1			6-009293 to 6-009297
02	9/24/87	1130 1135		X	Well 16F 513	5	1	2	1	1			6-009344 to 6-009348
03													
04													
05	9/24/87	1022 1050		X	Well ~~16F-348~~ Grey	5	1	2	1	1			6-009379 to 6-009383

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
A. Horne	9/24/87 1800	Federal Express AB# 3170536 71			
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

6-13294

Office of Enforcement

CHAIN OF CUSTODY RECORD

First International Bldg., 1201 Elm St.
Dallas, Texas 75270

PROJ. NO.	PROJECT NAME
SMS 3297F	United Nuclear

SAMPLERS: (Signature)

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Metals	Nitrate	TDS	Fluoride Chloride Sulfate			REMARKS
03	9/24/87	1259		X	Well 16F-1006	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)
A. Horne	9/24/87 1800	Federal Express AB# 3170536 71			
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	

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6-13297

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

First International Bldg., 1201 Elm St.
Dallas, Texas 75270

PROJ. NO.	PROJECT NAME
SAS 3247F	United Nuclear

SAMPLERS: (Signature) [signature] [signature]

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Metals	TDS	Nitrate	Chloride Carbonate Sulfate			REMARKS
04	1/24/87	1221 1232		—	WH 15K-303	15	3	3	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)
[signature]	1-24-87 1800	Federal Express 311 7053671			
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	

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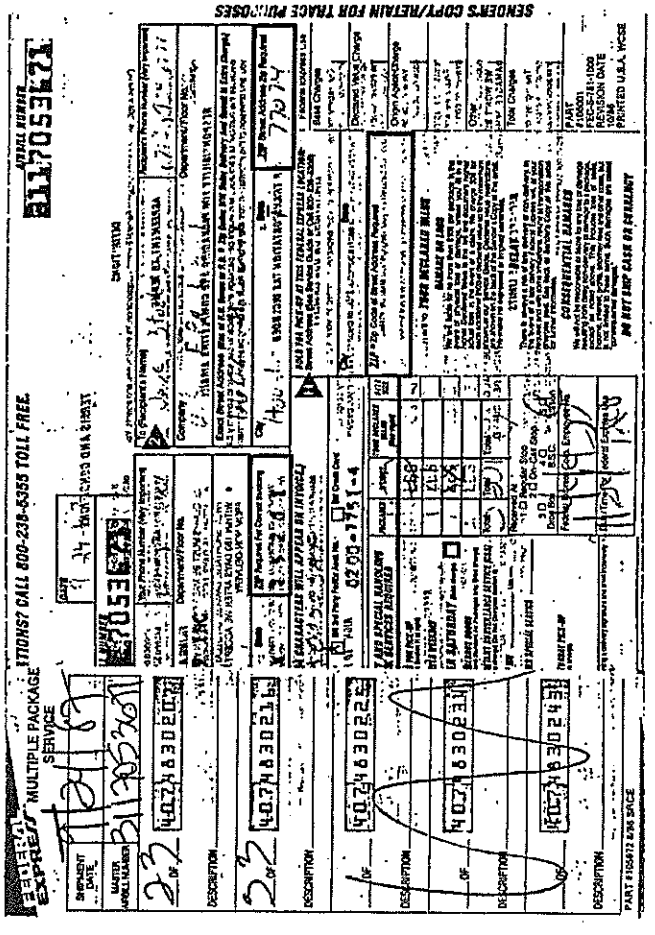
6-13296



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OF 40748302 31

DESCRIPTION

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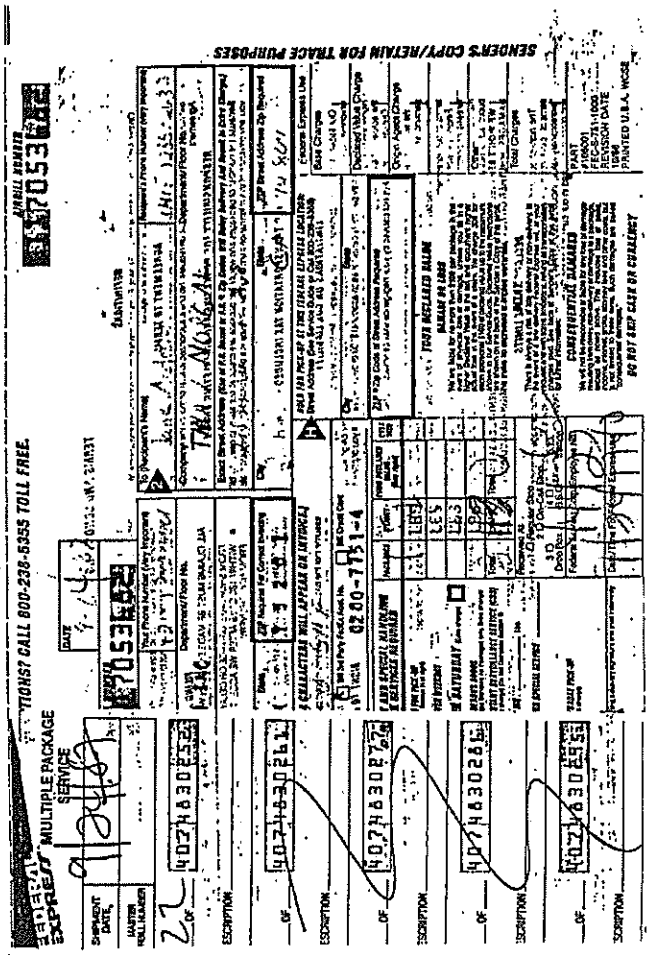
DESCRIPTION

PART #105472 6/86 SACE



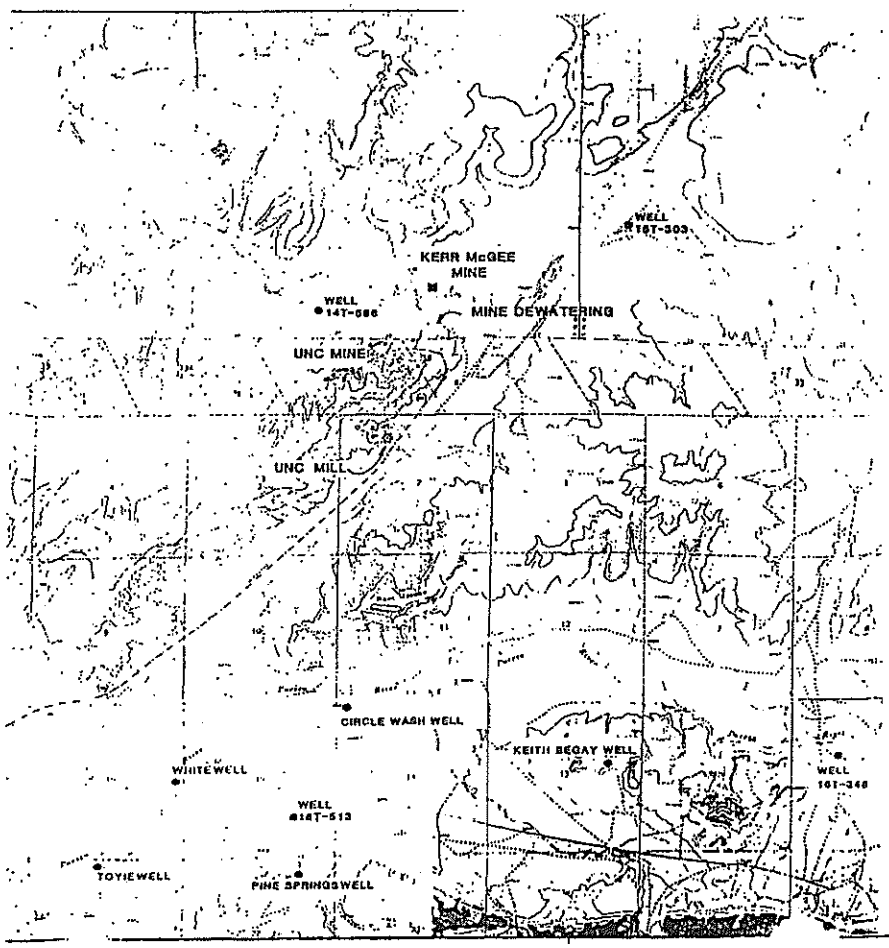


Figure 3

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	16708	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	0.58	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

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 Mark

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-3033 (Update) PWSID NM3534061

WELL NAME/OTHER NO CROWNPOINT POWERHOUSE WELL

WELL TYPE (MARK ONLY ONE)		WELL STATUS (MARK ONLY ONE)		WELL USE (MARK ONLY ONE)	
[X]	WW WATER WELL	[X]	ACT ACTIVE	[X]	DOM DOMESTIC
[ ]	WA ARTESIAN WELL	[ ]	INA INACTIVE	[ ]	AGR AGRICULTURE
[ ]	WS SPRING	[ ]	ABA ABANDONED	[ ]	LIV LIVESTOCK
[ ]	NS NATURAL SPRING	[ ]	UNK UNKNOWN	[ ]	IND INDUSTRIAL MINING
[ ]	OW OBSERVATION WELL			[ ]	REC RECREATION
[ ]	GS GAS WELL			[ ]	MUN MUNICIPAL
[ ]	OP OIL PRODUCTION			[ ]	OTH OTHER
[ ]	MW MINERAL WELL			[ ]	UNK UNKNOWN
[ ]	XX UNKNOWN				

QUAD NO 5561 MILES WEST [ ] MILES SOUTH [ ]

NE SE SW (NW) / NE SE (SW) NW / (NE) SE SW NW — 10 ACRE / 40 ACRE / 160 ACRE

SECT. 30 TOWNSHIP T17.0W RANGE R12.0W

APPROXIMATE LOCATION WSIDE POWERHOUSE BLDG/FACIL/MGMT.

LATITUDE [ ] LONGITUDE [ ]

UTM COORDINATES: X(EAST) 757699 Y(NORTH) 3951606 ZONE 12

OPERATOR B/A USGS WATERSHED CODE 14080106060 10

STATE:							
	[ ] AZ ARIZONA	[X] NM NEW MEXICO	[ ] UT UTAH	[ ] CO COLORADO
COUNTY:	[ ] AP APACHE	[X] 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 10:22:96

FIELD CHECKED BY: L WOTAH DATE 4/11/95

revised 07 April 93

DATE / /

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

STRUCTURE FILE

TRIBAL WELL NO 15K-365 STARTED 7/1/1931 COMPLETED 6/1/1932

ELEVATION 6905 FT DEPTH 2496 update DEPTH MEASURED 6/1/1932

DEPTH IS [X] 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: BIA CONTRACTOR: WM WELLS

SITE IMPROVEMENTS

- [ ] WM WINDMILL
- [ ] WP WATERING POINT
- [ ] TA TANK
- [X] 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
- [X] SU SUBMERSIBLE

ENERGY SOURCE

- [X] 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 221MRSM

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 10/22/96

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 ___/___/___
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
COMMENTS FILE

TRIBAL WELL NO 15R-303

PERTINENT COMMENTS: Well was 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. No pump test data available. ~~Very little~~ Water Quality in well folder. Well is Power House well #3.

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

→ COMPLETION DETAILS UNKNOWN SO AQUIFER UNCERTAIN; PROBABLY 221MRCN.

[X] 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

[X] ELEVATION INTERPOLATED FROM 1:24000 TOPO

THE IMPROVEMENTS AT THIS SITE ARE:

[ ] IN GOOD CONDITION
[X] NEED SOME MAINTENANCE
[X] IN FAIR CONDITION
[ ] NEED MAJOR MAINTENANCE
[ ] IN POOR CONDITION

STORAGE TANK IS [X] COVERED [ ] UNCOVERED

COMMENTS BY: L. NOTAH/M. S. Johnson DATE 10/22/96

revised 07 April 93 /dbase/wells/doc/Com-form.wp

1

TRIBAL WELL NO >15K-303 PWSID > NM 3534001 *******
STATE NUMBER

WELL NAME/OTHER NO >POWER HOUSE WELL
>17N.12W.30.4442

WELL TYPE >WW WELL STATUS ~~>UNK~~ ACT WELL USE ~~>HUN~~ 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~~ 3951606 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~~ 8.62 IN	FROM	-0.9 FT	TO	~~2,300.0~~ 2496.0 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 309000
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 * * LOGS AVAILABLE * (ENTER DL OR EL)
>N< MULTIPLE RATE DRAWDOWN TEST
>N< SINGLE RATE DRAWDOWN TEST >DL< DRILLERS LOG > < ELECTRIC LOG
>N< MULTIPLE RATE/RECOVERY TEST
>N< RECOVERY TEST 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 *

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

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

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

14T-586
15T-305
16K-336
16K-340
Mill well

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, Inset: ESRI Streetmaps USA

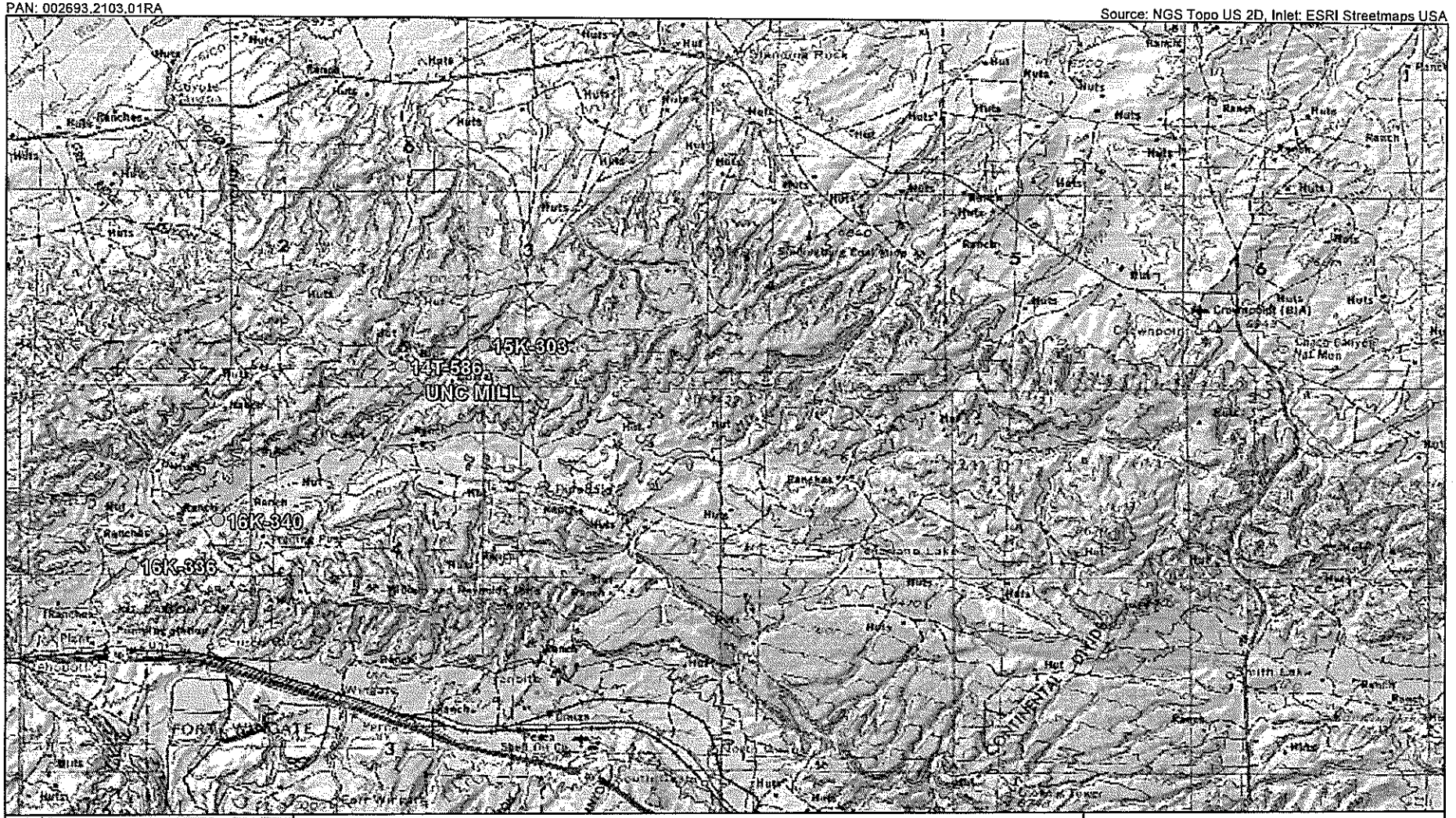


Figure 1
NECR
Water Well Sampling

Navajo Nation

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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
	$\delta D\ H_2O$	-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

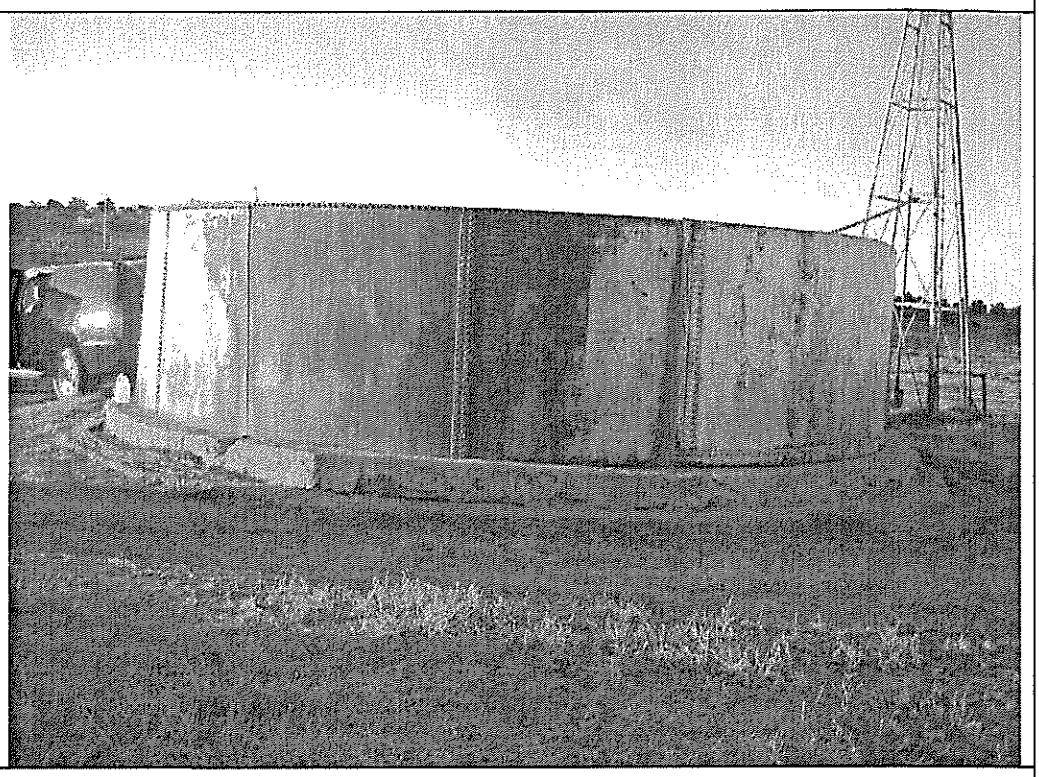
002693.2103.01RA

T02-09-10-08-0005

	Date: 10/19/10

Description:

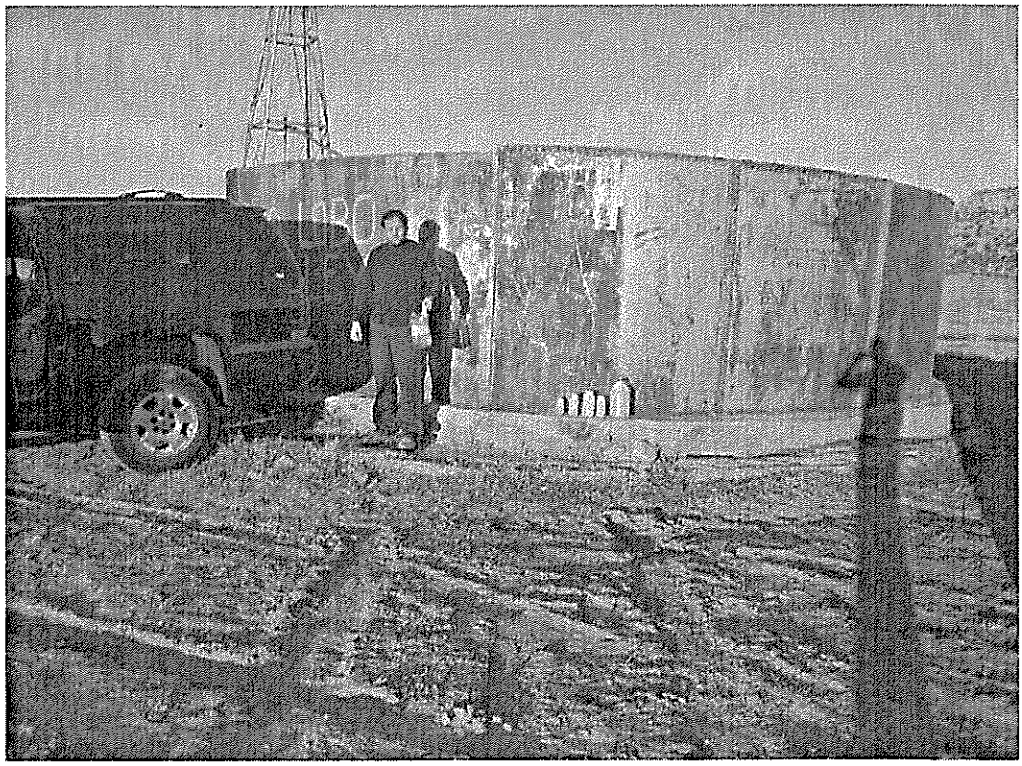
Well 15T-303



	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

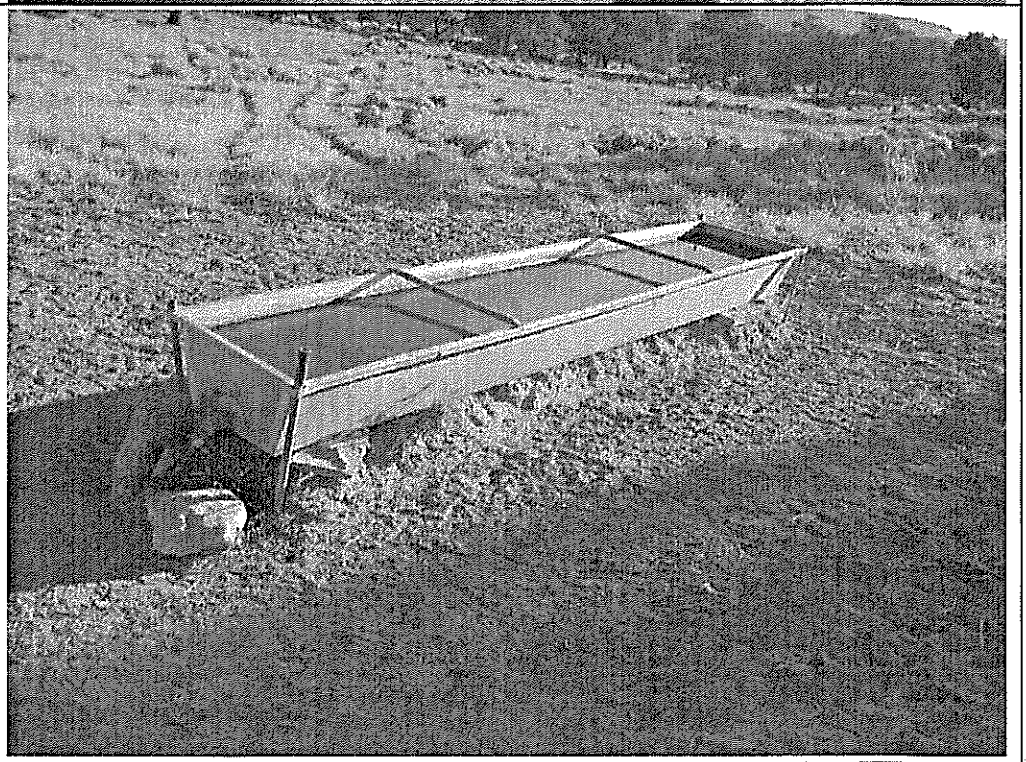
Description:

Well 14T-586

Date: 10/19/10

Description:

Well 14T-586



PHOTOGRAPHIC LOG

NECR Water Well Sampling

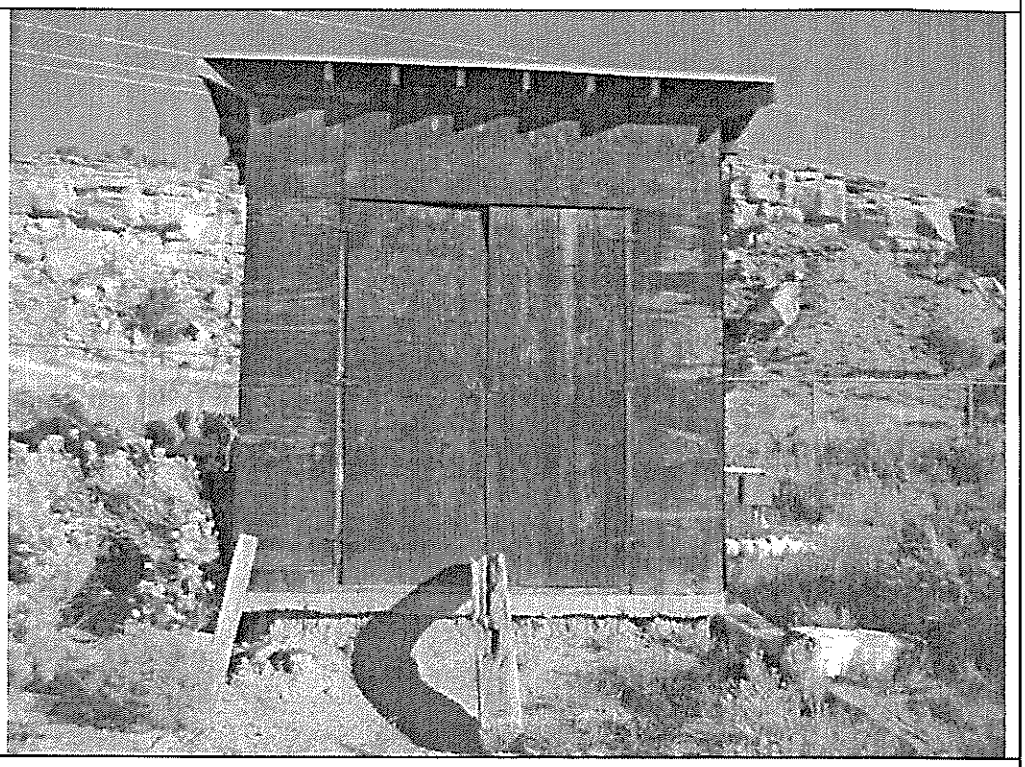
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

	Date: 10/19/10

Description:

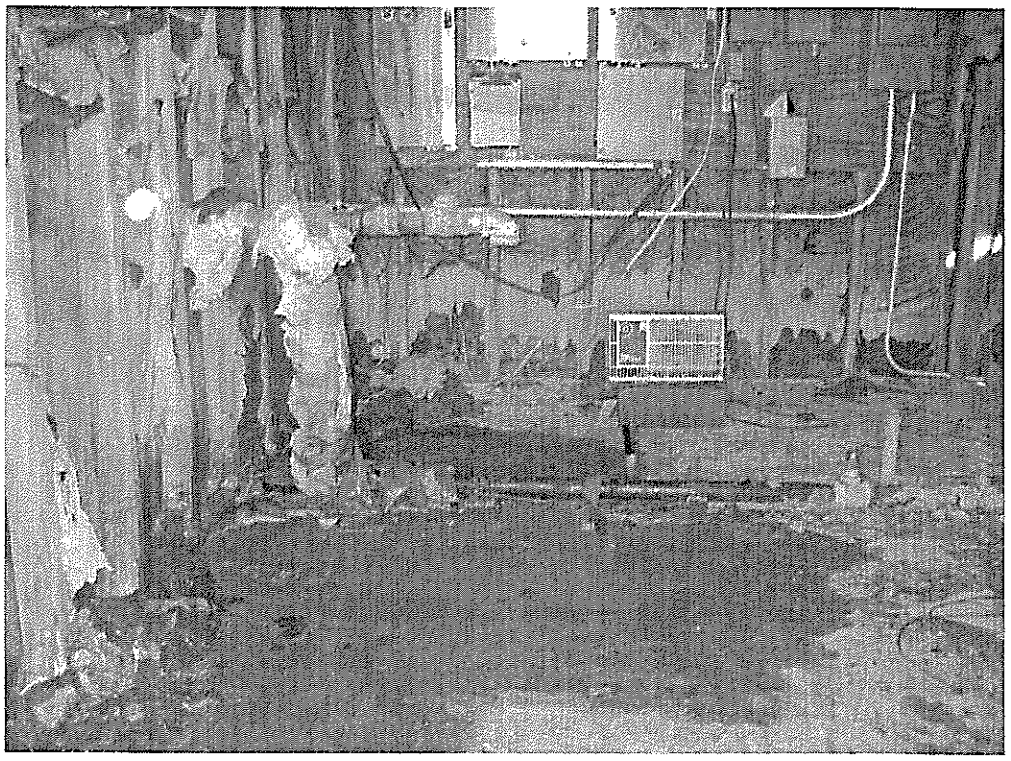
Mill Well



	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

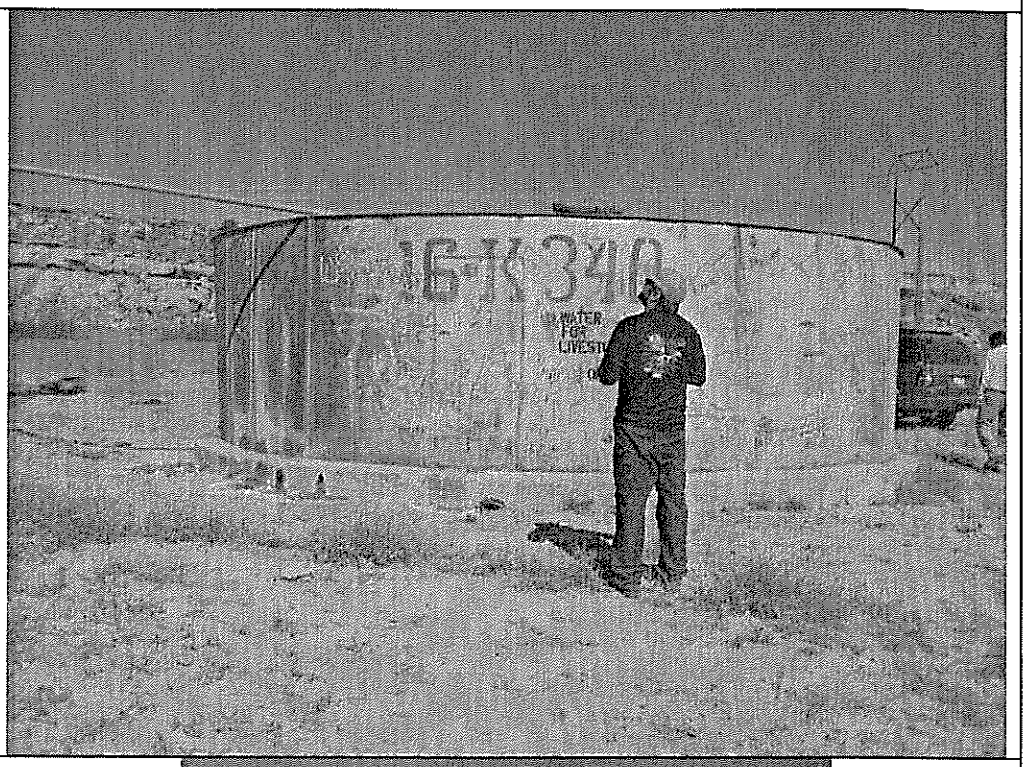
Navajo Nation Reservation

002693.2103.01RA T02-09-10-O8-0005

Date: 10/19/10

Description:

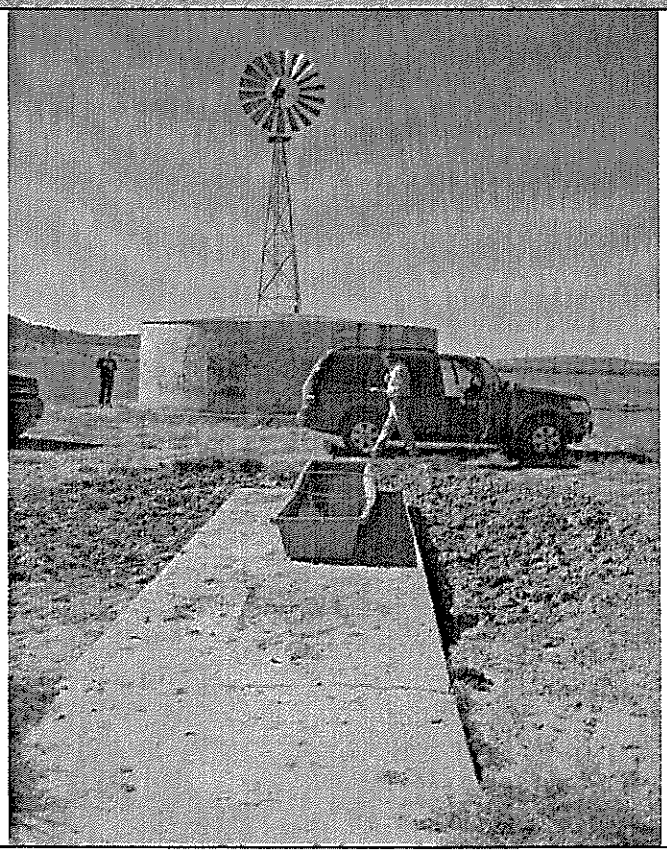
16K-340



Date: 10/19/10

Description:

16K-340



PHOTOGRAPHIC LOG

NECR Water Well Sampling

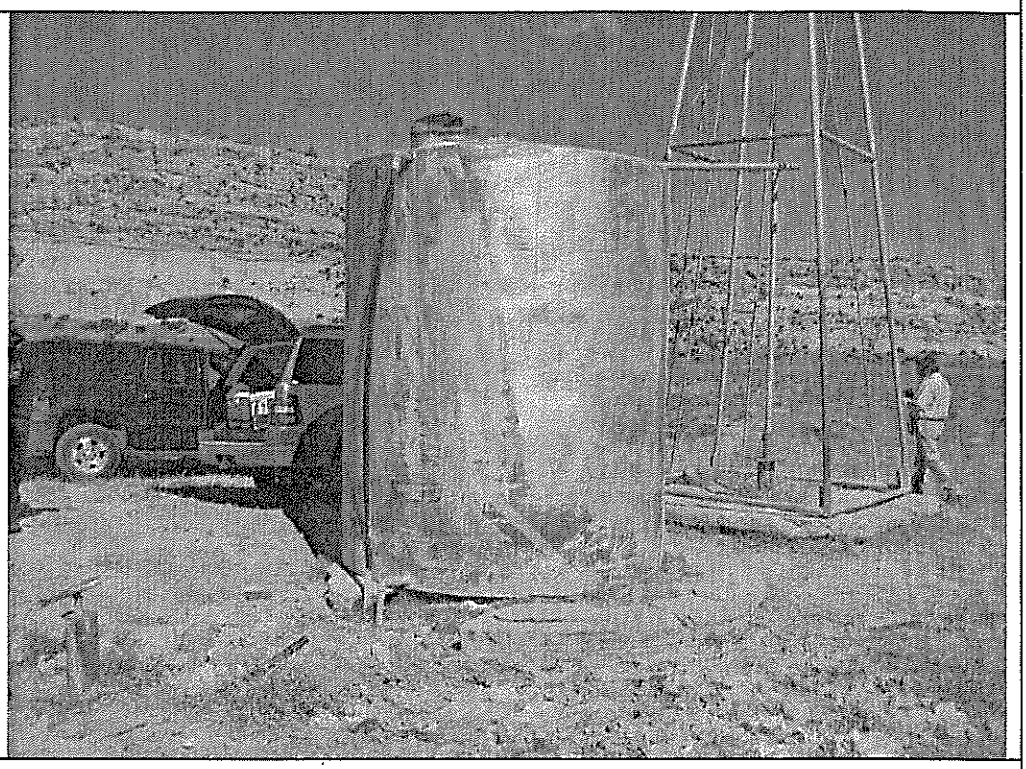
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

16K-336



Date: 10/19/10

Description:

16K-336

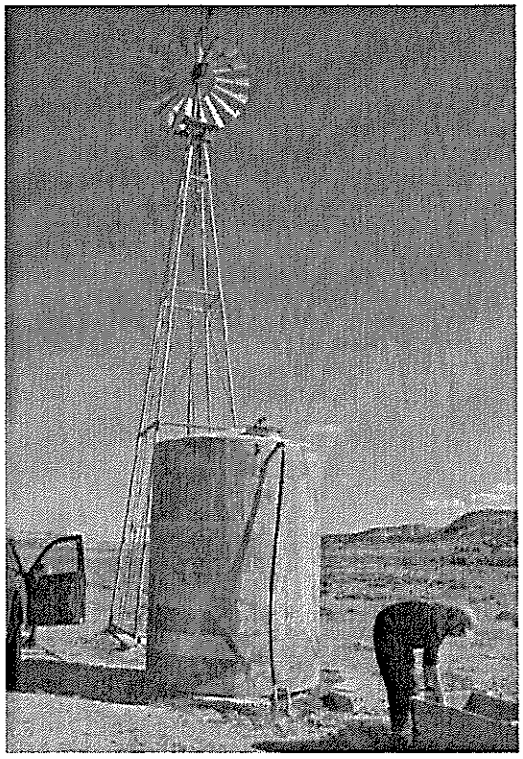


Table J
Reporting Limits, Action Levels, and Quality Control Limits

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		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

UNITED STATES GOVERNMENT

memorandum

DATE: January 30, 1981

REPLY TO ATTN OF: Gallup Service Unit Sanitarian

SUBJECT: Potential Contamination of Aquifers in UNC vicinity

K Dana 3-4-81

Rita, File in well Folder

TO: Gorden Denipah, Chief
EHSB

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

RECEIVED
FEB 09 1981
OFFICE OF ENVIRONMENTAL HEALTH

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.

Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

OPTIONAL FORM NO. 10
(REV. 7-76)
GSA FPMR (41 CFR) 101-11.6
5010-112

Dr. File 16K-336

RECEIVED
OCT 17 1978

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

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
CAMAN

M E M O R A N D U M

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. Packer
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
ıte Collected 3-26-74
ɔcation Church Rock
ɔurce of Water Well No. 16K 336
ɔllector's Name William Weis
uthorized By William Weis
DDRESS: Department: USPHS
Agency: Gallup
Branch: OEH

Analyzed By M
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/l	Mg/l	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/l			892	500
issolved Solids Mg/l			888	
issolved Solids Tons Per Acre Foot	1.21			
ardness as Mg/l Ca CO_3 Calcium, Magnesium			250	500
ardness as Mg/l Ca CO_3 Non Carbonate			—	
lkalinity as Mg/l Ca CO_3 Phenolphthalein			31	N.A.
lkalinity as Mg/l 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_3S_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

16K-340 (?)

WELL_NO = 16K-336 — ?
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	14N-79	14N-16 & 14M-1
14K-318	14T-501	14T-307
14K-316	14A-10	14A-33 & 14T-531
16K-336	16T-544	16T-570
1K-224	1K-204	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
Maintenance Coordinator
Water Works Department

CONCURRED:

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 Fruitland

Location number and name	BIA Number	(a) Aquifer	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 micromho @ 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	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
~~17.15.30.341~~	~~15K-303~~	~~Kg~~	~~6-1955~~	~~15~~	~~157~~	~~89~~	~~504~~	~~297~~	~~0~~	~~2530~~	~~16~~	~~2.0~~	~~0.6~~	~~2450~~	~~3120~~
17.16.32.112 Brown Bell	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 - ½miles 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 perforations Length 82'-120' Mesh

Contractor P. H. Dunning Address

Gravel packed 35' - 123'

LOG

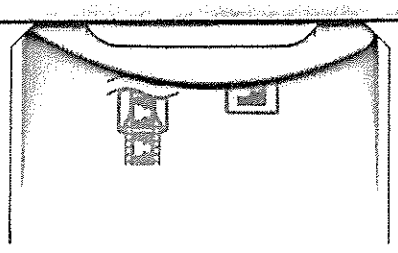
DEPTH From	DEPTH To	Formation	Acquifer	Remarks
0	48	Soil		
48	95	Quick sand - streaks of clay		
95	122	Gravel - sand		

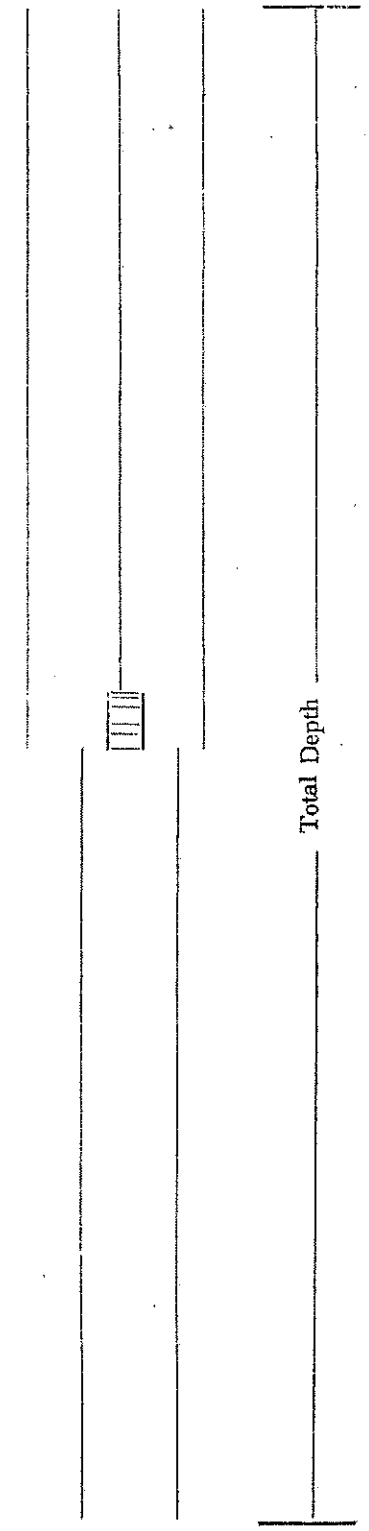
Remarks:

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: 3/4

Liner, if any: _____

Windmill: (make) 8′ Comet

Size: _____

Storage: (kind) _____

Capacity: _____

Troughs: (kind) No. _____

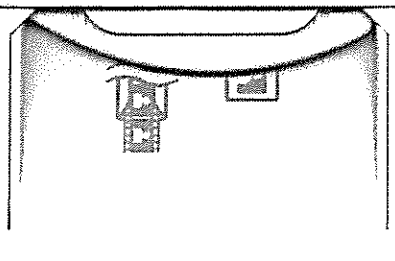
Comments: _____

_____

_____

_____

_____



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.

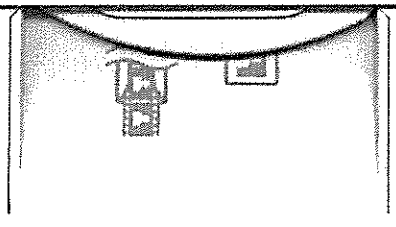
The driller reported that the bottom 40 feet of casing had been perforated. With the bottom of the casing set in gravel at an approximate depth of 112 feet, the perforated zone of casing extended up into the quicksand, which lies between 48 and 95 feet. Thus, the loose sand flowed into the well as it 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:

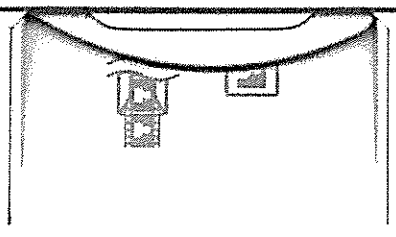
Total depth	118 feet
Static Water level	34 feet
Bailing rate	14.6 gallons per minute
Bailing time	62 minutes
Drawdown	27.5 feet
Recovery	29 feet in 40 minutes
Aquifer	Quarternary gravel from 100 feet to 118 feet

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



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-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

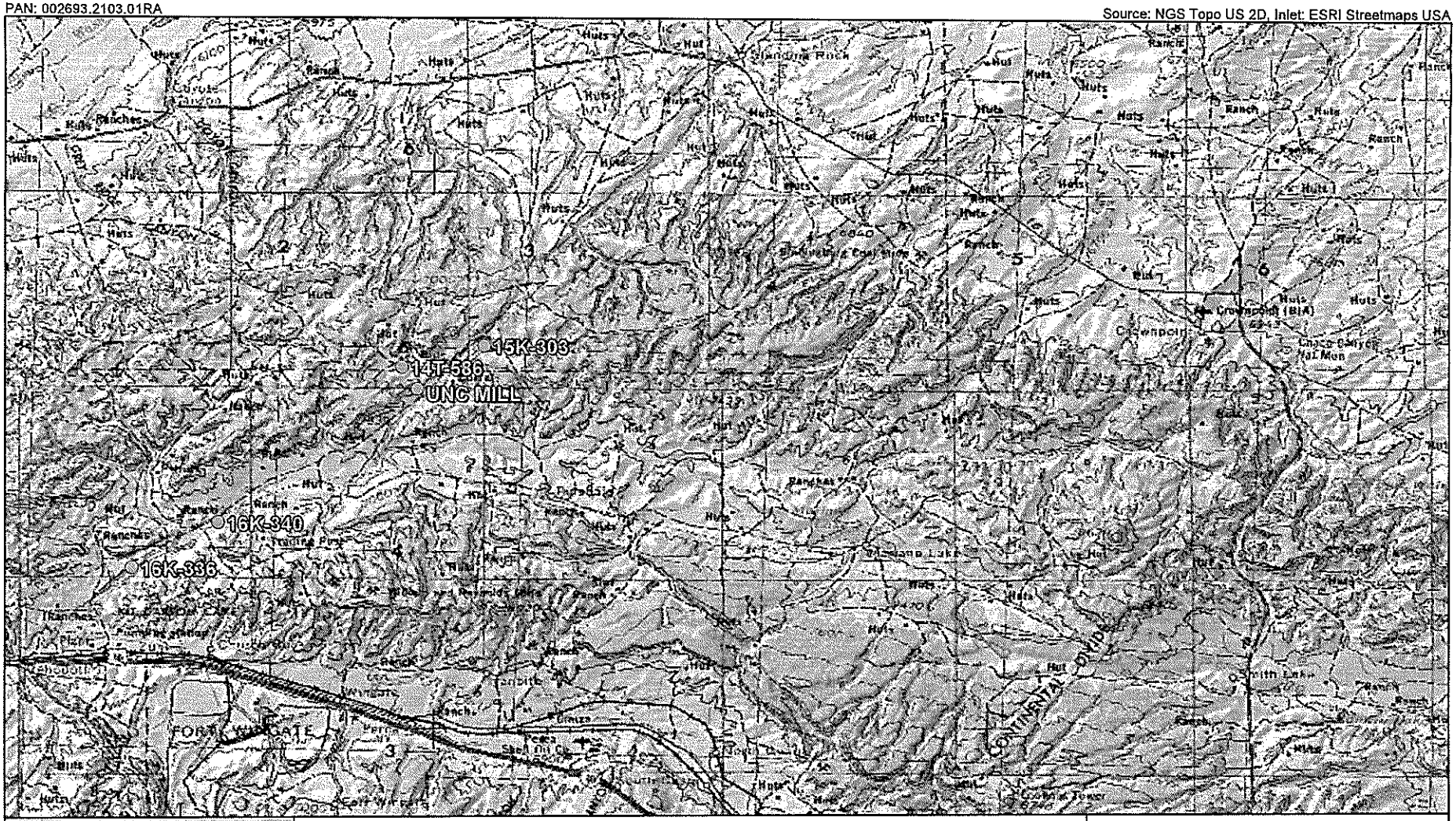


Figure 1
NECR
Water Well Sampling

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
	$\delta D\ H_2O$	-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

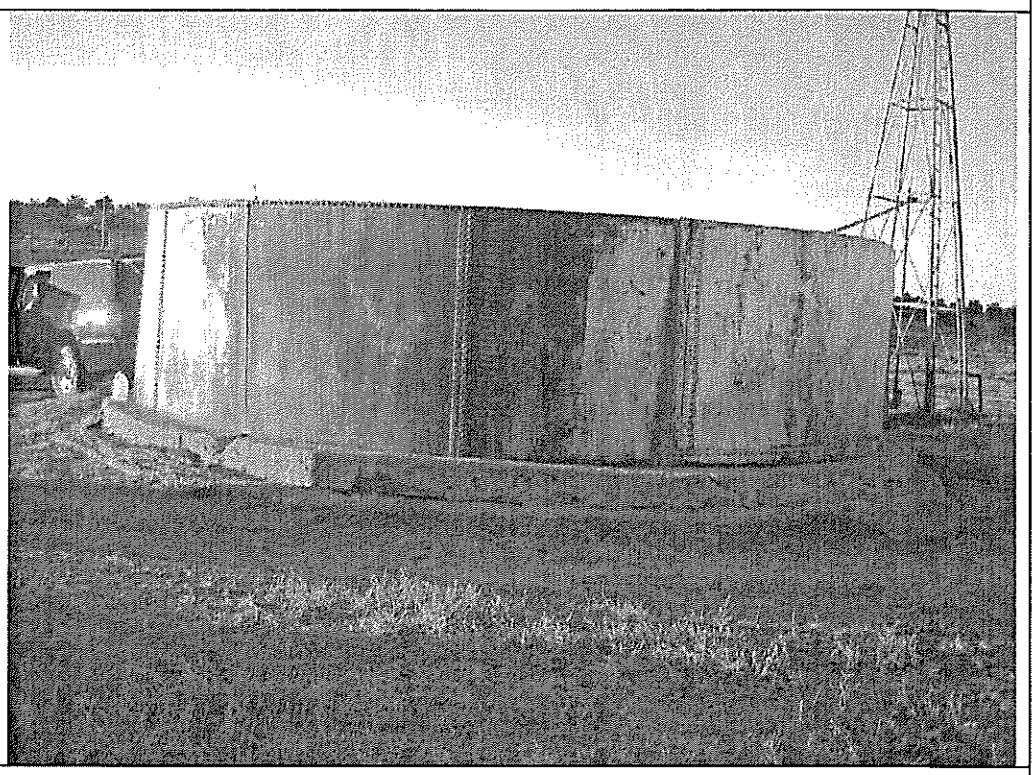
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

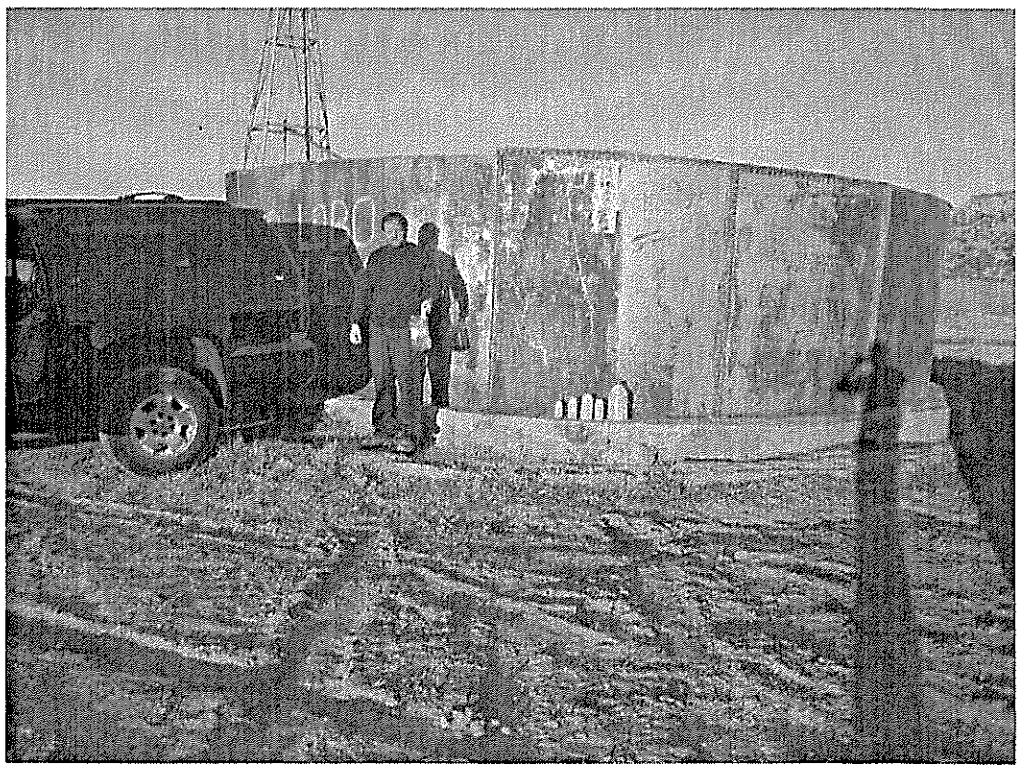
Well 15T-303



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

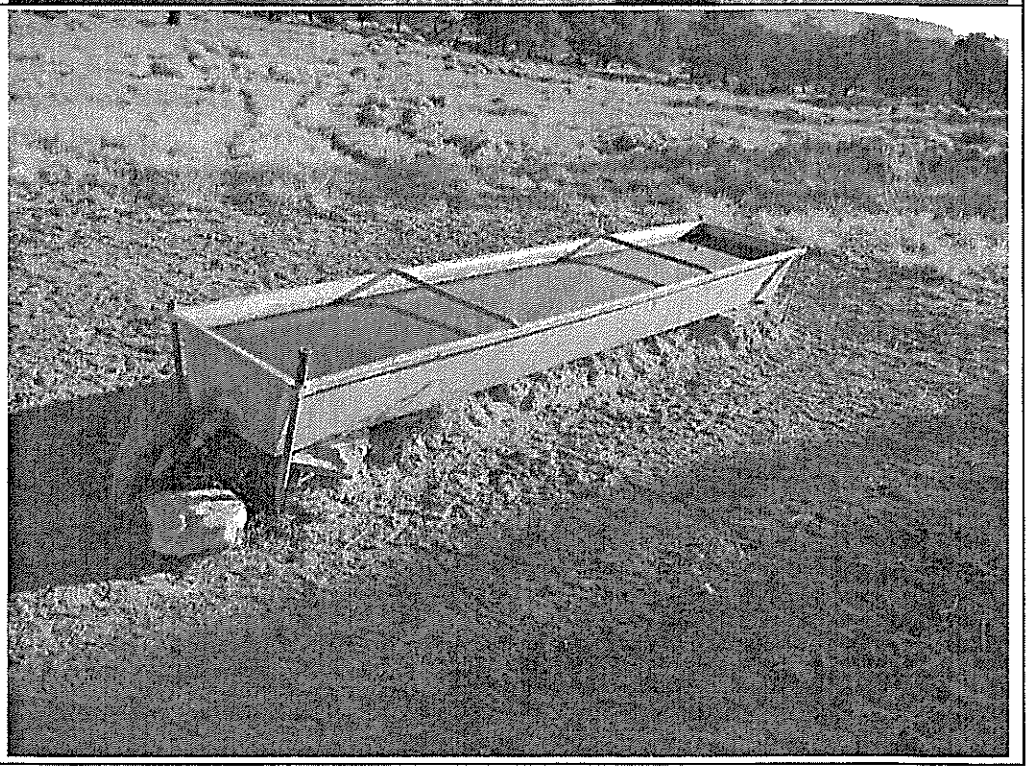
Description:

Well 14T-586

Date: 10/19/10

Description:

Well 14T-586



PHOTOGRAPHIC LOG

NECR Water Well Sampling

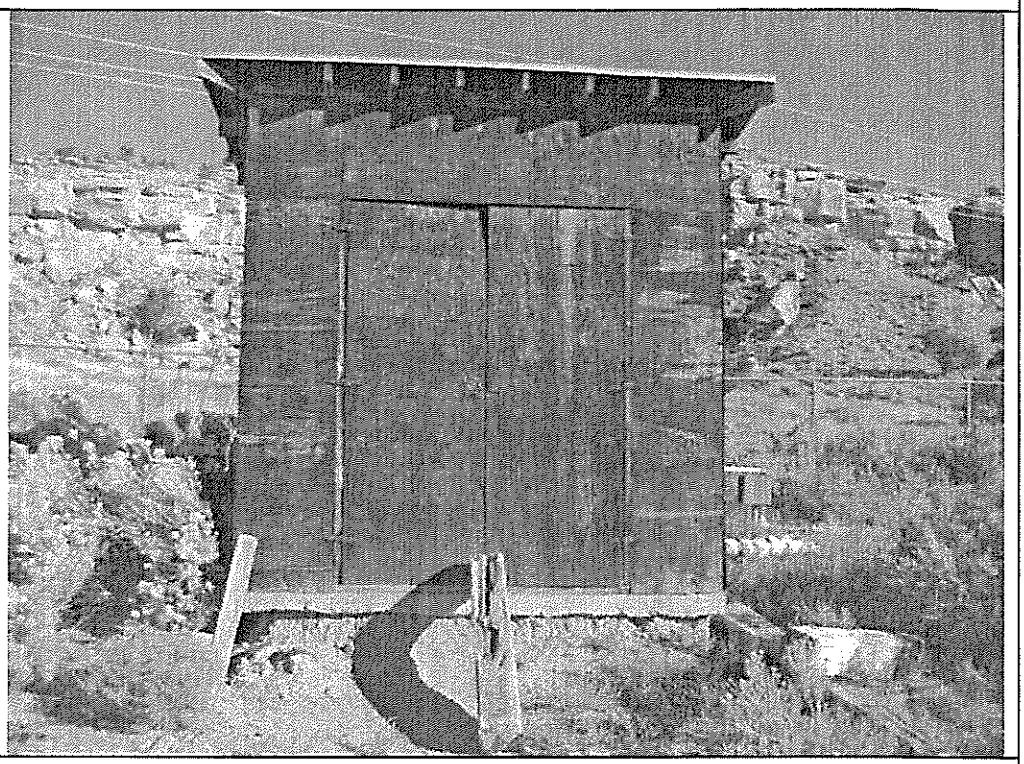
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

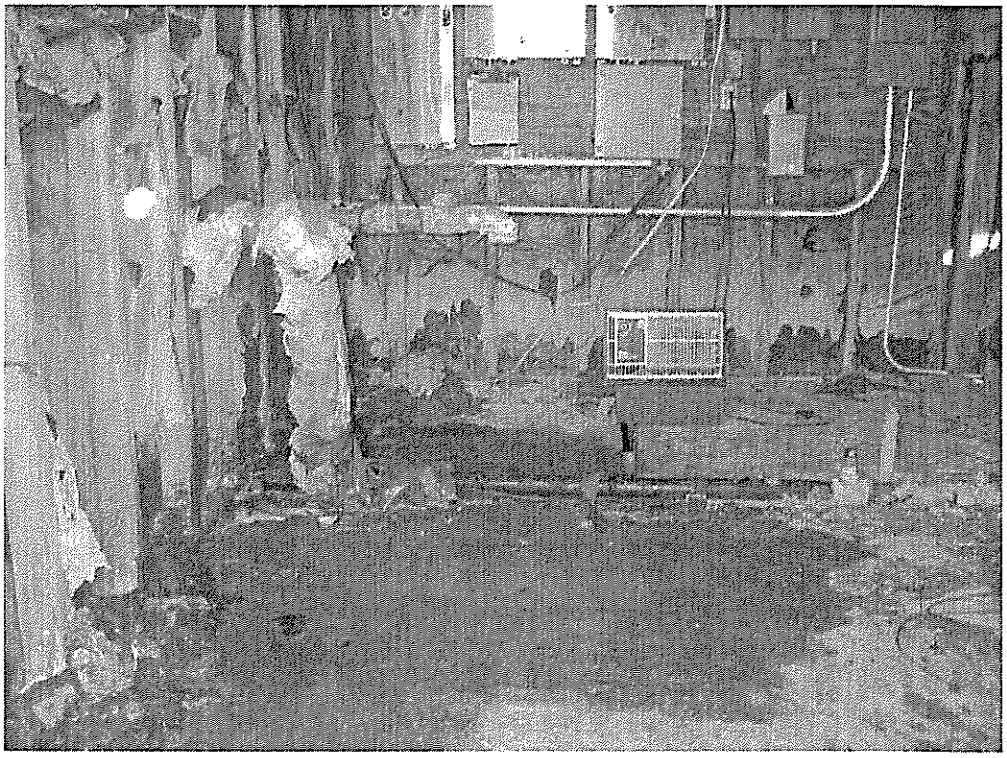
Mill Well



Date: 10/19/10

Description:

Mill Well



PHOTOGRAPHIC LOG

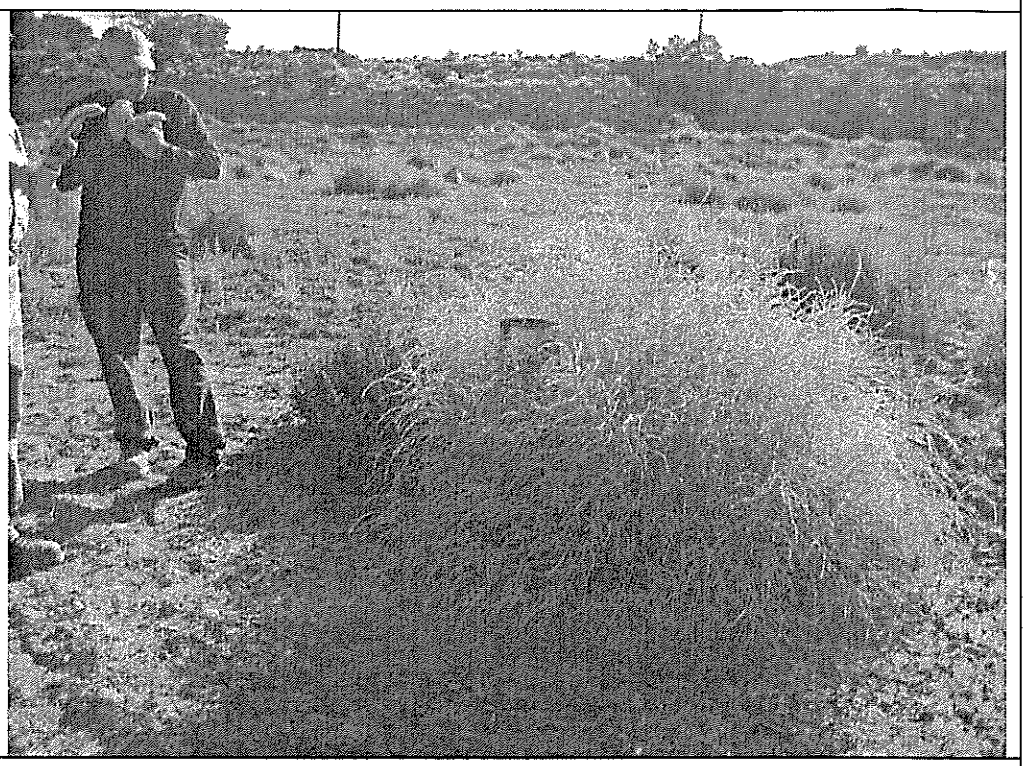
NECR Water Well Sampling

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

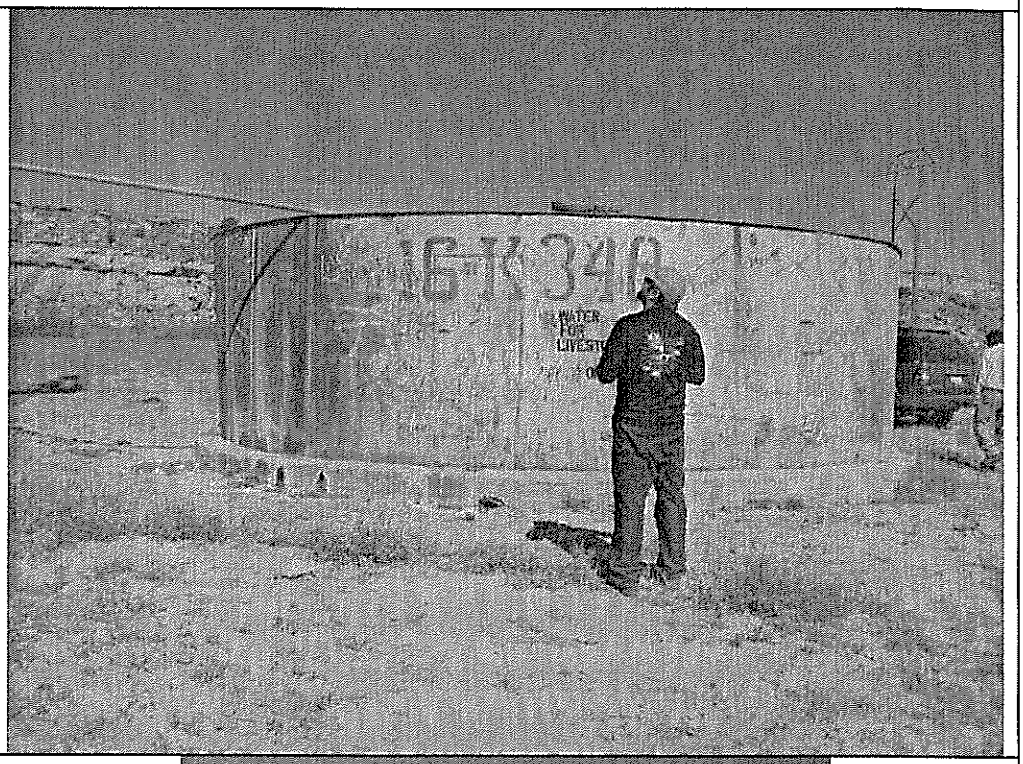
Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10

Description:

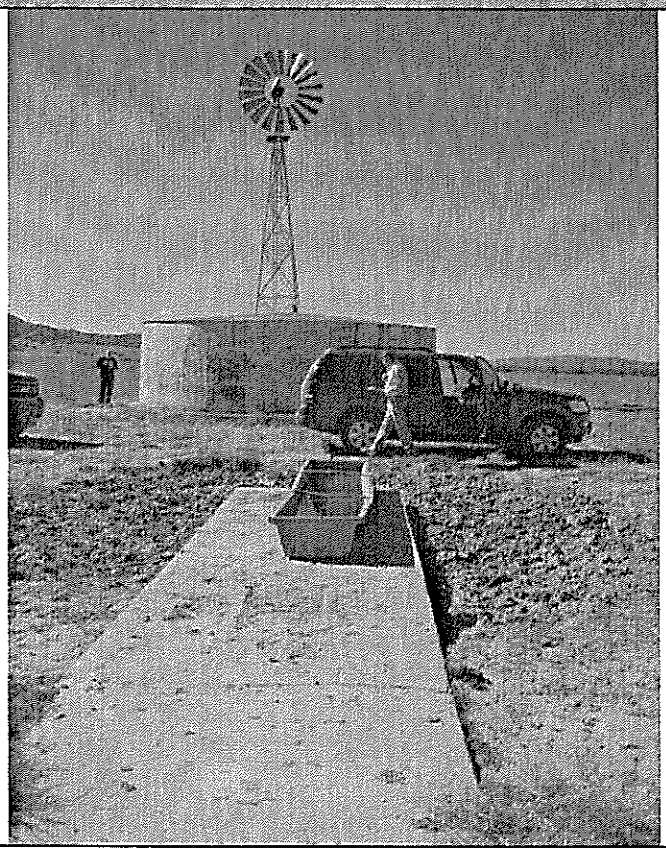
16K-340



Date: 10/19/10

Description:

16K-340

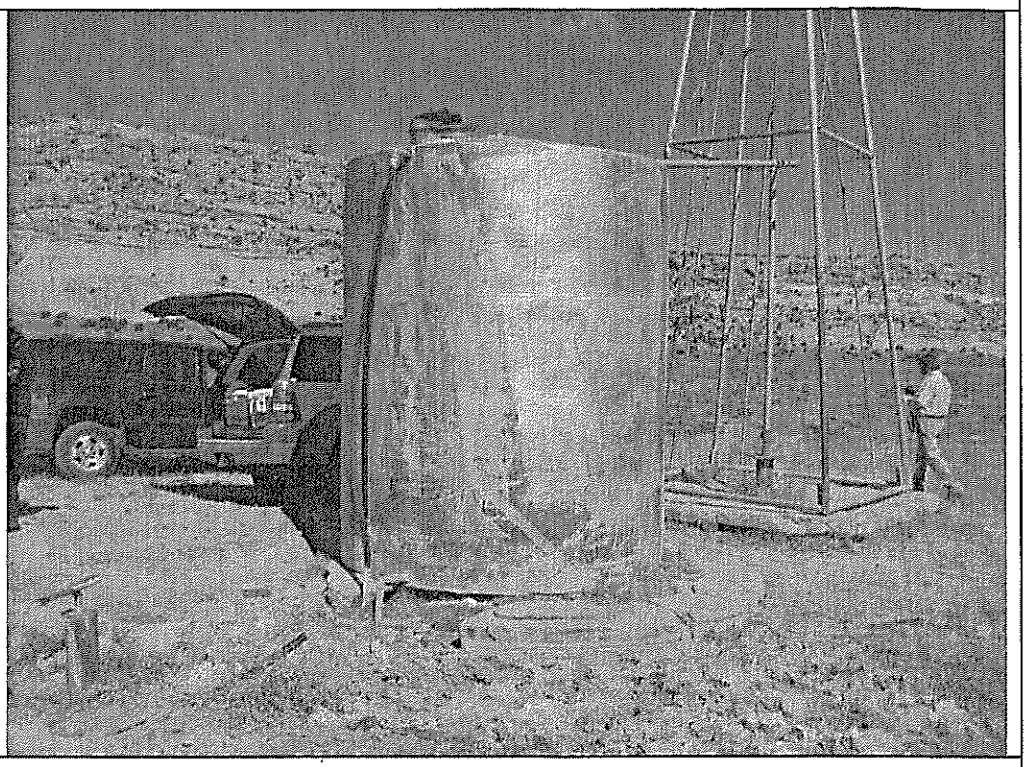


PHOTOGRAPHIC LOG

NECR Water Well Sampling

Navajo Nation Reservation

002693.2103.01RA T02-09-10-08-0005

Date: 10/19/10	
Description: 16K-336	

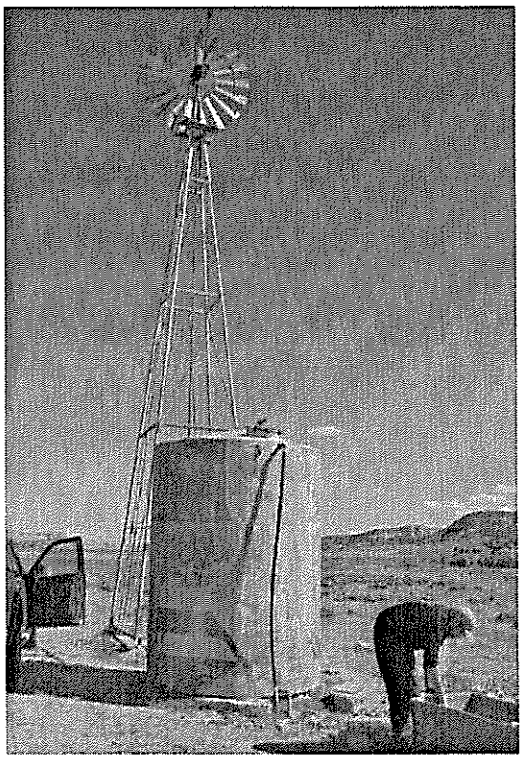
Date: 10/19/10	
Description: 16K-336	

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

Engineering/Remediation
Resources Group, Inc.

EXPENSE REPORT

Signatures:	Traves	1/11/2011
	(Employee)	(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 @ 56¢/mi. Miles	Auto @ 56¢/mi. Amount	Ground Transportation	Allowable Lodging, Meals & Incidentals	Unallowable Lodging, Meals & Incidentals	Business Meals	Ref.	Entertainment & Unallowables	Other	Brief Description	ERRG Credit Card Charges	TOTAL
Date	Project Number: Project	Phase	Task	Billable? (Y) (N)	Air Fare	Auto @ 50¢/mi. Miles	Auto @ 50¢/mi. 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. Supplies		31.63
12/22/2010	2010-034	02	02	N								a			Const. Supplies		39.24
12/16/2010	2010-034	02	02	N								a			Const. Supplies		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 Timesh	Project	Phase	Task	Billable? (Y) (N)	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

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		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	Miles from NE-Corner South	Field # or Name	Date Collect	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	8/53	5.1	20	11	262	498	11	210	12	.0	1.9	95	778	1280		Menefee
			16-18																
	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 Sonsela
120	12.05 x	5.55	16B-39	12/48		1.2	.5	141	244	16	54	19	.4	.9	5	353	576		Petrified Forest, Upper
	7.35 x	4.20	16-5-9	3/53					114	0		4650			373		13400		Wingate (Rock Point)
	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		Glorieta
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	Gallup
123	0.35 x	3.40	16K-321	5/51	10	58	21	287	587	0	314	30	1.6	.8	231	1010	1560		
			16-4-20																

LOCATION FILE

NEW

TRIBAL WELL NO 16K-3901 PWSID

WELL NAME/OTHER NO

WELL TYPE (MARK ONLY ONE)		WELL STATUS (MARK ONLY ONE)		WELL USE (MARK ONLY ONE)	
[X]	WW WATER WELL	[X]	ACT ACTIVE	[ ]	DOM DOMESTIC
[ ]	WA ARTESIAN WELL	[ ]	INA INACTIVE	[ ]	AGR AGRICULTURE
[ ]	WS SPRING	[ ]	ABA ABANDONED	[X]	LIV LIVESTOCK
[ ]	NS NATURAL SPRING	[ ]	UNK UNKNOWN	[ ]	IND INDUSTRIAL MINING
[ ]	OW OBSERVATION WELL			[ ]	REC RECREATION
[ ]	GS GAS WELL			[ ]	MUN MUNICIPAL
[ ]	OP OIL PRODUCTION			[ ]	OTH OTHER
[ ]	MW MINERAL WELL			[ ]	UNK UNKNOWN
[ ]	XX 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. — T TOWNSHIP — R RANGE

APPROXIMATE LOCATION 2 M WW 6 F K; H Church Rock

LATITUDE LONGITUDE

UTM COORDINATES: X(EAST) 7176619 Y(NORTH) 3949125 ZONE 12

OPERATOR Tribal OGM USGS WATERSHED CODE 15020106160100

STATE:	[ ]	AZ ARIZONA	[X]	NM NEW MEXICO	[ ]	UT UTAH	[ ] CO COLORADO
COUNTY:	[ ]	AP APACHE	[X]	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 16

CHAPTER NAME: CHURCH ROCK CHAPTER CODE CHR

LOCATION DATA SOURCE: Well File/Field check 3/95

LOCATION FILE COMPLETED BY: GKinsel / M.S. Johnson DATE 4/18/95

FIELD CHECKED BY: GKinsel / MS Johnson DATE 03/30/95

revised 07 April 93

/dbase/wells/loc/loc-form.wp

TRIBAL WELL NO 16N-13-10 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	18.62	FROM	-10.25	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: P.W.L. Drilling

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/FIELD CHECKED 3/1995

STRUCTURE FILE COMPLETED BY: Skinsel/M.J. Johnson DATE 4/18/95

revised 08 April 93 /dbase/wells/doc/str-form.wp

HYDROLOGY FILE

TRIBAL WELL NO 16R-3/10 USGS AQUIFER CODE 110ALVM

THICKNESS ___ FT NOMINAL YIELD ____ GPM YIELD MEASURED ___/___/___

[X] BAILER [ ] PUMP TEST @ 23.3 GPM FOR ____ HOURS DATE 6/23/1954

DRAWDOWN 68 FT OBSERVATION WELL DATA AVAILABLE [ ] YES [X] 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: [X] DL DRILLER'S [ ] EL ELECTRIC LOG

HYDROLOGY DATA SOURCE: WELL FILE/USGS UTM LOG

HYDROLOGY FILE COMPLETED BY: Grinsel/M.S. Johnson DATE 4/18/95

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 ___/___/___

GEOHYDROLOGIC UNITS

TRIBAL WELL NO 16K-340

SEQ-NO 001

DEPTH TO TOP	DEPTH TO BOTTOM	GEOHYDRO-UNIT	LITH.
0		110ALVM	SAND

LITHOLOGIC MODIFIER: VLW-BRN/LT GRY/FF-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 Drillers log, ~~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 23.3 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.

[X] LOCATION COORDINATES MEASURED WITH GPS DEVICE [8] SATELLITES VISIBLE

[ ] LOCATION COORDINATES PICKED OFF TOPO MAP -SCALE= _____

[X] 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

[X] IN FAIR CONDITION [ ] NEED MAJOR MAINTENANCE

[ ] IN POOR CONDITION

STORAGE TANK IS [X] COVERED [ ] UNCOVERED

COMMENTS BY: GKinsel/MS Johnson DATE 4/18/95

revised 07 April 93 /dbase/wells/doc/Com-Form.wp

RIBAL WELL RECO
FIELD REPORT

TRIBAL WELL NO 16K-340 | 16T-340 | | | "NEW" (NOT IN WELLS DATABASE) PWSID

WELL NAME/OTHER NO

WELL TYPE (MARK ONLY ONE)

- [X] 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)

- [X] ACT ACTIVE
- [ ] INA INACTIVE
- [ ] ABA ABANDONED
- [ ] UNK UNKNOWN

WELL USE (MARK ONLY ONE)

- [ ] DOM DOMESTIC
- [ ] AGR AGRICULTURE
- [X] LIV LIVESTOCK
- [ ] IND INDUSTRIAL MINING
- [ ] REC RECREATION
- [ ] MUN MUNICIPAL
- [ ] OTH OTHER
- [ ] UNK UNKNOWN

APPROXIMATE LOCATION

QUAD NO 5262 QUAD NAME CHURCH ROCK, NM QUAD YEAR 1963 (PR 1979)

UTM COORDINATES: X(EAST) 717664 Y(NORTH) 3941251 ZONE 12

OPERATOR: [X] TRIBE O&M [ ] NTUA [ ] BIA [ ] HOPI OTHER [ ] UNKNOWN

FIELD CHECKED BY: GKI NSELL/NOGNSOW DATE 03/30/95

ELEVATION 6682 FT DEPTH DEPTH MEASURED ___/___/___

DEPTH IS [ ] MEASURED [ ] ESTIMATED [ ] REPORTED CASING WELL DIA. 18.62 IN -0.25 FT

SITE IMPROVEMENTS

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

TYPE OF LIFT

- [ ] AL AIRLIFT
- [X] 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
- [X] 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 ☒ 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

*POSSIBLE COMMENTS:
HOW WAS YIELD, SWL, STORAGE CAPACITY DETERMINE?
ACTUAL DIMENSIONS OF STORAGE DEVICE(S)?

PHOTO OR SKETCH OR COMMENT

/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

Sprinstead Trailer School - 2 miles NW of Kit Carson Cave
Location

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	DEPTH 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 Canyon
Location

Began well _____ Finished well 6 - 6 - 54

Diameter of well 8" Depth of well 141

Static water level _____ Drawdown _____ Recovery _____ at 100'

Quantity of water on test run: bailer: pump: 20 G.P.M. 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	DEPTH 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	(a) Aquifer	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 micromhos @ 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	1060
16.16. 6.112	14N- 70	Kcd	5-1955	18	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~~	~~154~~	~~88~~	~~504~~	~~297~~	~~0~~	~~952~~	~~16~~	~~2.4~~	~~0.6~~	~~2450~~	~~3120~~
17.16.32.112 Brown Bell	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. of 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 AIRS
SOILS LABORATORY
GALLUP, NEW MEXICO
LABORATORY DATA SHEET FOR WATER SAMPLES

16K-340

LAB NO. 72-NT-610 FIELD NO. _____ ANALYZED BY A DR
COLLECTOR _____ TRANSCRIBED BY Reyketewa
LOCATION North of Church Rock CHECKED BY [illegible]
DATE RECEIVED BY LABORATORY 5-2-72 REPORTED BY [illegible]
DATE ANALYSIS COMPLETED 7-5-72 AUTHORIZED BY G. Soce
DATE COLLECTED _____ SOURCE OF WATER 16K340
DEPARTMENT Water Development AGENCY Ft. Defiance BRANCH Window Rock

		Meq/l	Mg/l
Temperature (°F)			
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/l			1423
Dissolved Solids Mg/l			1420
Dissolved Solids Tons Per Acre Foot	1.93		
Hardness as Mg/l Ca CO_3 Calcium, Magnesium			670
Hardness as Mg/l Ca CO_3 Non Carbonate			92
Alkalinity as Mg/l Ca CO_3 Phenolphthalein			88
Alkalinity as Mg/l Ca CO_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