

**REPORT OF THE
CHURCH ROCK URANIUM MONITORING PROJECT
2003-2007**

SPONSORED BY

**CHURCHROCK CHAPTER, NAVAJO NATION
Church Rock, New Mexico**

IN COLLABORATION WITH

**SOUTHWEST RESEARCH AND INFORMATION CENTER
Albuquerque, New Mexico**

AND THE

**NAVAJO EDUCATION AND SCHOLARSHIP FOUNDATION
Window Rock, Navajo Nation (Arizona), USA**

SUPPORTED BY GRANTS FROM

**CITIZENS' MONITORING & TECHNICAL ASSESSMENT FUND
Washington, DC**

May 2007

REPORT OF THE CHURCH ROCK URANIUM MONITORING PROJECT (CRUMP), 2003-2007

PRINCIPAL COLLABORATING ORGANIZATIONS

**CHURCH ROCK CHAPTER,
NAVAJO NATION**

**SOUTHWEST RESEARCH AND
INFORMATION CENTER**

**NAVAJO NATION ENVIRONMENTAL
PROTECTION AGENCY**

**NAVAJO NATION ABANDONED
MINE LANDS DEPARTMENT**

**TRIBAL AIR MONITORING SUPPORT
CENTER, Northern Arizona University**

**U.S. ENVIRONMENTAL
PROTECTION AGENCY**

COMPILED AND WRITTEN BY

CHRIS SHUEY, MPH

Project coordination, water quality assessments, data management, background research, report preparation

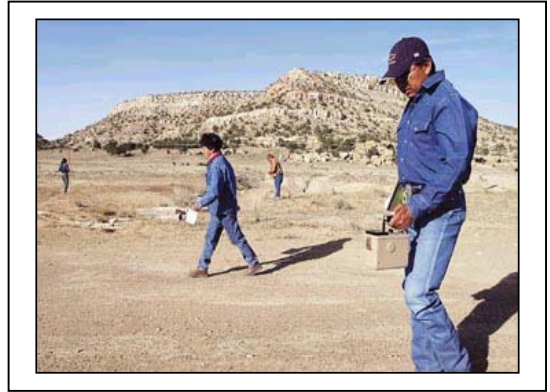
MELINDA RONCA-BATTISTA, MS

Radiation survey coordination, training, data analyses

OTHER MAJOR CONTRIBUTORS

**ANNABELLE ALLISON, JERRY BEGAY,
GERALD BROWN, EDWARD CARLISLE,
LaLORA CHARLES, PERRY CHARLEY,
VIVIAN CRAIG, GEORGE DILBECK,
STANLEY EDISON, EUGENE ESPLAIN,
CHRISTINE GEORGE, CARL HOLIDAY,
LARRY J. KING, JERZY KULIS, LILLIE
LANE, JOHNNYE LEWIS, JOHNNY
LIVINGSTON, ARLENE LUTHER, DIANE
MALONE, BERNICE NORTON, JOHN
PLUMMER, ROGER SHURA**

PREPARED AND SUBMITTED TO RESOLVE, INC.
MAY 2007



EXECUTIVE SUMMARY

The Church Rock Uranium Monitoring Project was initiated by Churchrock Chapter of the Navajo Nation in 2003 for the purposes of assessing environmental conditions in residential areas actually or potentially affected by abandoned uranium mines and building capacity to conduct community-based research and advocate for policies to address the long-term impacts of historic uranium development in the area. Churchrock Chapter requested the assistance of Southwest Research and Information Center (SRIC) to help implement and coordinate the Project's field studies and educational programs and the Navajo Education and Scholarship Foundation (NESF) to manage grants received from private foundations. The Chapter requested and received technical assistance from the Navajo Nation Environmental Protection Agency (NNEPA) as the principal governmental collaborator in the Project. CRUMP also received extensive in-kind support from the U.S. Environmental Protection Agency (USEPA), Navajo Nation Abandoned Mine Lands Reclamation Department (NNAML), and the New Mexico Environment Department (NMED). Several academic institutions also contributed to the Project, including the Uranium Education Program at Diné College in Shiprock, N.M., the University of New Mexico's Community Environmental Health Program, the Stanford University Environmental Engineering program, and Tufts University in Boston. The staff of the Diné Network for Environmental Health (DiNEH) Project, a community-based research program affiliated with the Eastern Navajo Health Board (ENHB) in Crownpoint, N.M., collaborated with CRUMP on work related to documenting individual and community exposures to radiological and chemical toxicants in the environment.

In addition to these in-kind services, which are conservatively valued at \$100,000, the Project received \$90,000 in two grants from the Citizens' Monitoring and Technical Assessment Fund (MTA-Fund) in Washington, D.C., and \$20,000 in a short-term contract with the New Mexico Department of Health in 2004. These grants and contracts were used to pay the salary and benefits for the part-time position of Project coordinator, which was held by two different individuals who reside in the CRUMP study area, cover professional fees for outside technical consultants, purchase supplies and equipment, cover Chapter overhead for office space and services, and provide stipends to community members who served as key informants and participated regularly in Project activities and outreach.

The MTA-Fund grants were made largely because more than half of the 20 abandoned uranium facilities in the Churchrock area were developed by companies that sold uranium ore to the U.S. Atomic Energy Commission for use in the nation's nuclear weapons program in the 1950s and 1960s. The MTA-Fund was established in the late-1990s to give communities affected by contamination from the federal nuclear weapons production complex resources to conduct their own environmental and health studies around facilities now owned or overseen by the U.S. Department of Energy.

The primary work of CRUMP was a multi-media assessment of water quality in unregulated water wells, surface radiation levels, trace metals (including uranium) in soils, indoor radon concentrations, and airborne dust. CRUMP and its collaborators also helped evaluate clean-up needs and plans for two specific abandoned uranium mines, conducted tours of residential areas next to abandoned mining sites for policy makers, regulatory agencies, Chapter officials,

students and media representatives, and engaged in widespread dissemination of Project information and findings at community meetings and in one-on-one talks with community members using the Navajo language as the primary oral communication mechanism. Project activities were conducted in an area that is often referred to as the “Church Rock Mining District” and includes all of Churchrock Chapter and portions of Coyote Canyon, Iyanbito, Nahodishgish, Pinedale and Standing Rock chapters of the Navajo Nation.

With respect to the technical assessment elements of the Project, CRUMP generated the following findings:

- ❑ Water quality in 17 unregulated water sources — drilled wells, dug wells and developed springs that are not regularly tested or treated to comply with federal and tribal safe drinking water standards — ranged from good to poor. *None* of the 17 sources tested were of sufficient quality to warrant recommendations for human drinking water use. Half of the water sources tested were *not* recommended for domestic uses, such as cooking, bathing and irrigating gardens, and most of the other half were recommended only with caution. Most of the water sources were suitable for livestock watering.
- ❑ Two wells were shut down and abandoned because of unsafe water quality during the course of the Project, and a “no human use” advisory was placed on another water source because of uranium levels exceeding the federal drinking water standard by more than two times. One of the abandoned wells may have been contaminated by mining-related activities, but a full hydrologic assessment is needed before a definitive conclusion can be reached.
- ❑ Only 1 of the 17 wells exceeded the federal drinking water standard for uranium, a rate (6%) that is substantially *lower* than recent water quality surveys conducted by federal agencies in the western part of the Navajo Nation that found that 14% to 20% of water sources tested exceeded the uranium standard of 30 micrograms per liter. Uranium, a well-documented kidney toxicant, is the focus of two ongoing health studies aimed at evaluating the role of environmental agents in the high rates of kidney disease in the Navajo population.
- ❑ Mine-water discharges to the Puerco River — the principal intermittent stream in the study area — in the 1960s, ’70s and ’80s were not safe for human or animal consumption, even though observational and anecdotal evidence indicated that residents often used mine water in the river and its tributaries for domestic uses and livestock watering was routine for least 18 years. The long-term effects of those discharges on surface water and shallow groundwater quality remain uncertain.
- ❑ In the northern half of the study area where past uranium mining was concentrated, gamma radiation rates were significantly elevated over background along public highways and roads, on Navajo grazing lands and in certain residential areas in close proximity to three abandoned uranium mines and a closed uranium mill and tailings disposal facility that is a federal Superfund site.
- ❑ Surface gamma radiation rates and uranium concentrations in soils near residences in the Red Water Pond Road area of Study Area A-1 were many times higher than background,

indicating a potential public health emergency for residents of the area. CRUMP's assessment in this area was confirmed in November 2006 by soil sampling conducted by USEPA and contractors to the company that operated the Northeast Church Rock Mine in the area from 1968 through 1982. As a result, radium-contaminated soils are being excavated from around at least five homes in the area as part of a USEPA-led "time-critical removal action" that eventually will lead to reclamation of the mine site and its surroundings.

- ❑ Gamma radiation rates were not significantly different than background in the Springstead Estates tract where the Navajo Nation has proposed building up to 1,000 single-family homes. However, the site of the proposed housing development is located within 1 to 2 miles of three abandoned mines and additional assessments may be needed before the tract is certified safe for human occupancy.
- ❑ Background or "normal" gamma radiation levels were observed in Church Rock Village and around the Churchrock Chapter House.
- ❑ Outside of the Red Water Pond Road area, uranium and trace metal levels in soils at a dozen different monitoring sites were within the range of "background" reported in the literature.
- ❑ Indoor radon levels exceeded the USEPA's 4 picoCurie per liter-air "action level" in 25% of 150 homes tested in 2004, and another 20% of homes tested had indoor radon levels between 2 and 3.99 pCi/l-air. Most of the homes having high radon levels are located in a portion of the community where the principal uranium-bearing rock formation is present at the surface.
- ❑ The average indoor radon level of 2.9 pCi/l-air in the CRUMP study was half of the average concentration for homes located elsewhere in McKinley County and a third lower than the average level of 3.8 pCi/l-air for the entire state of New Mexico.
- ❑ Average indoor radon levels reflective of background were observed in homes in Church Rock Village and in the Sundance Road residential area south of Interstate 40.
- ❑ Monitoring of air particulates, i.e., dust, in the Red Water Pond Road and Pipeline Road areas (Study Area A) between May 2006 and February 2007 revealed maximum levels less than one-sixth of the federal 24-hour average limit. Sampling of particular matter (PM) at two samplers loaned to CRUMP by the TAMS Center will continue for the next year or so.
- ❑ The community's overall goal for reclamation of the Northeast Church Rock Mine — release for unrestricted use — was communicated to federal and tribal agencies in a resolution-petition signed by more than 100 residents in September 2006.
- ❑ Radiological surveys conducted by CRUMP and NNEPA collaborators at the Old Churchrock Mine in August 2006 following flash flooding at the site revealed the presence of mine wastes on Navajo trust land that had not previously been identified.
- ❑ Ten community meetings and a half-dozen tours of the mining-impacted portions of the community were conducted by CRUMP and its collaborating organizations since June 2003.

Results of the Project's work were communicated to Navajo Nation Council standing committees and in ad hoc technical meetings of agencies working on abandoned uranium mines issues. National and international media attention has been focused on the legacy of uranium mining impacts in the Churchrock area as a result of CRUMP activities.

The ensuing narrative of this report summarizes the field investigations, data analyses and policy initiatives of the Church Rock Uranium Monitoring Project between June 2003 and May 2007. Tables, charts and photographs are used extensively to illustrate the Project's findings. Detailed data compilations, Powerpoint presentations, information handouts and other documentation are included in appendixes that accompany the report. Recommendations for future actions are included at the end of the narrative.

IX. Recommendations

Based on the data collected and analyses conducted for CRUMP since 2003, the following recommendations are warranted:

- 1. The Federal Government should fund a clean-up program targeting abandoned uranium mines that produced uranium for the Government's nuclear weapons program.** Like many of the hundreds of AUMs scattered throughout the Navajo Nation and in the Grants Mineral Belt in northwestern New Mexico, most of the abandoned mines in the Churchrock area were developed to sell ore to Atomic Energy Commission buying stations in the region. While safety hazards like open adits, portals and shafts, and high walls at open pits, have been mitigated at many AUMs by programs like the Navajo Abandoned Mine Lands Reclamation Department, complete reclamation of mine wastes, pits and contaminated off-site lands has not been addressed. Difficult access to some AUM sites, jurisdictional impediments, and a lack of funding have delayed or thwarted cleanup. Some AUMs have never been assessed to determine their extent and potential for off-site releases of contaminants. These mines tended to be operated by small companies that stayed in business for only a few years in the 1950s and are no longer viable corporate entities. Congress should fund a program that allows tribes and states to investigate fully the extent of the AUM problem in their jurisdictions, including conducting environmental assessments and public health studies in areas where people still live in close proximity to AUMs. A federal program of this nature should authorize access by tribal and state governments to abandoned sites on private lands, allow for cooperative agreements to overcome jurisdictional barriers, and provide resources for environmental restoration. Reparations for lands destroyed by past uranium mining or lost to permanent disposal of wastes should be included in the program. The Navajo Nation, state of New Mexico, and communities affected by AUMs should begin working with members of Congress from the Four Corners states to develop legislation and advocate for its enactment.
- 2. Comprehensive studies of the health of people who live in uranium mining districts of the Navajo Nation, including the Churchrock area, are needed and should be expedited.** Only one population-based epidemiological study of health effects possibly associated with exposure to uranium mining has ever been conducted on the Navajo Nation despite nearly 60 years of uranium development.¹ No health study has ever been conducted in the Churchrock area despite its lengthy and well-documented history of uranium-related impacts. Little scientific and medical data exist to determine if the health of dependents of uranium workers and residents of mining districts was adversely affected by their environmental exposures to uranium and other radiological and chemical toxicants. Yet anecdotal information and informal surveys suggest that public health has been adversely affected in mining districts. Population-based studies are needed in virtually every uranium-mining district of the Navajo Nation, including Churchrock. Such studies should assess all pathways of exposure, including occupational and environmental, and may require collection and analyses of human blood and urine.

¹ Commonly referred to as the March of Dimes Birth Defects Study, this study is summarized in LM Shields, et al. Navajo Birth Outcomes in the Shiprock Uranium Mining District, *Health Physics*, 63:5, 542-551, November 1992.

Funding for such studies should come from the Federal Government, which bears substantial responsibility for facilitating uranium development on the Navajo Nation. Approval by tribal, federal and academic review boards should be expedited. In the highly impacted Red Water Pond Road and Pipeline Road areas of CRUMP Study Area A, residents are being invited to participate, on a voluntary basis, in a comprehensive health survey administered by trained Navajo staff of the DiNEH Project. While the principal interest of the DiNEH Project is the role of environmental exposures in kidney disease, the 10-page questionnaire addresses an individual's current and past exposures and current healthy status, and is the same survey instrument being used in the Project's routine protocol in 20 chapters of the Eastern Agency. Supplemental support for biomedical elements of the Project is being sought from the Navajo Area Indian Health Service, the Navajo Division of Health, and the University of New Mexico Health Sciences Center. This recommendation addresses Item K of the RWPR-PCR resolution-petition in **Appendix VII.A.**²

3. **The Navajo Nation should enact its own statutory and regulatory authorities to address the unique environmental, land status, and public health conditions at abandoned uranium mines in Navajo Country.** Recent experience has demonstrated that the Navajo Nation needs its own statutory and regulatory authorities to enforce cleanup of AUMs where Federal authorities do not exist or are poorly suited to address the unique conditions of Navajo sites, and where one or more corporate entities that share responsibility for unremediated sites still exist. The lack of such authority has impeded the Navajo Nation's response to reclamation of the Old Churchrock Mine and the Northeast Church Rock Mine, among many others. Navajo authority to develop and enforce clean-up standards and require appropriate financial assurance from past operators would not only accelerate the reclamation process, but also provide local communities with assurance that tribal government is available to fill regulatory gaps in existing Federal programs.
4. **The Lime Ridge Well (16-4-10, also known as the Pinetree Well) should be taken out of service because of unsafe uranium levels, and a replacement water source identified and developed.** In the alternative, a sign should be erected at the well site advising users not to use the water for human consumption. This option recognizes that, except for uranium, the well provides high-quality water and local residents desire that the well remain in service for livestock watering. If it remains in service, the well should be tested annually to observe changes, if any, in water quality.
5. **A new well should be developed to replace 16T-606, a windmill that was shut down and abandoned because of radium concentrations exceeding the federal and tribal drinking water standard.** A replacement well should be sited in the same general location (Study Area B) at a location that is easily accessible for livestock water haulers and in an aquifer that provides good-quality water. The overall quality of the Westwater Canyon Aquifer (WCA) in the area is suitable for human and livestock consumption; care

² The DiNEH Project's Kidney Health Study, which has been approved by the Navajo Human Research Review Board and the UNM Human Research Review Committee and funded by the National Institute of Environmental Health Sciences, can be a model for health studies in other Diné communities affected by uranium mining.

should be taken to avoid screening a well completed in the WCA in a uranium-bearing lens or near one of the abandoned mines in the area.

6. **Wells 16T-513, 16T-514 and 16T-535 in Pinedale Chapter should be tested for radionuclides.** All of these water sources are known to have had human use for drinking water, and 16T-535 is likely to still be used by some people for drinking water because of its generally good water quality and location in a remote area.
7. **A capped water well located in the Red Water Pond Road residential area³ should be accessed by the Navajo Nation and evaluated for public water supply use.** This well, which residents say was drilled by United Nuclear Corporation in the 1970s, is not listed in the Navajo Department of Water Resources database. It could replace Well 14T-586, the so-called Friendship I well that was drilled by Kerr-McGee Corp. in 1976 for water supply to homes in the Red Water Pond Road. Friendship I was closed in 2003 because of poor water quality and the extension of NTUA's water system into the area. This recommendation addresses Item I of the RWPR-PCR resolution-petition.
8. **A comprehensive follow-up investigation of gamma radiation levels and radionuclides and trace metals in soils is needed in the northern end of the State Route 566 corridor.** This area extends roughly from the Puerco River bridge to the terminus of SR 566 at the entrance to the Northeast Church Rock Mine, and includes the Pipeline Road corridor north of the UNC tailings facility. The recommended assessment should expand upon the CRUMP assessments in this area to include soil sampling for laboratory analyses of radionuclides and trace metals. Ore hauling was routine on this route between the Old Churchrock Mine and the UNC mill and from the NECR Mine to the mill in the 1970s and early-'80s. Windblown mill tailings from the tailings impoundment in Section 2 (T16N, R16W) and releases from the Church Rock IE mine site may have contributed to higher-than-background gamma rates observed along Pipeline Road. SR 566 and Pipeline Road are heavily traveled by local residents, livestock routinely graze along the sides of these roads, and an estimated 50 families live in the area. Results of the expanded survey should be evaluated for possible regulatory responses under CERCLA (Superfund), the Atomic Energy Act,⁴ or tribal statutory authorities.
9. **All mine waste should be removed from the NECR Mine site to facilitate cleanup to pre-mining conditions and release of Section 35 for human and livestock use.** Section 35 is Navajo tribal trust land and should not be used for permanent disposal of radioactive waste from mining. The land should be returned to as close to its pre-mining condition as practical, and released for unrestricted use. However, human occupancy of the land should be carefully considered, and if implemented, monitored over time to ensure that people are not living on contaminated ground. This recommendation is

³ The approximate location of this well is 35.66820 north latitude and -108.50980 west longitude, based on using the on-line Microsoft Terraserver locator (<http://terraserver.homeadvisor.msn.com>).

⁴ The AEA, 42 U.S.C. 2011 et seq., as amended by the Uranium Mill Tailings Radiation Control Act of 1978, provides for off-site cleanup of tailings released from licensed facilities such as tailings impoundments.

consistent with the first recommendation (Item A) of the RWPR-PCR resolution-petition, indicating the importance to the local community of the future of Section 35.

10. **USEPA's soil removal around five homes in the Red Water Pond Road community north of the NECR Mine should take into account the CRUMP uranium-in-soil findings.** CRUMP's soil assessment found migration of uranium in concentrations exceeding both background and Preliminary Remediation Goals at depths up to 3 feet below land surface. Ms. DeLemos's uranium solubility and sediment migration studies in support of the DiNEH Project's exposure model also suggest that contaminants are moving downward in the soil column in the RWPR area. USEPA and NNEPA should review these findings to determine if removal of 6 to 12 inches of radium-contaminated soils around five homes is adequate to protect the health of the families affected. Options for mitigating exposures, now and for future generations, should include replacement of existing homes located immediately north of site NECR Mine site at locations elsewhere in the community that have not been impacted by mine waste. This recommendation addresses Item G4 and, in part, Item H of the RWPR-PCR resolution-petition.
11. **All remaining recommendations and requests in the RWPR-PCR resolution-petition should be acted on by the responsible government agencies and named corporations.** As indicated here, several of the recommendations and requests contained in the RWPR-PCR resolution-petition have *not* been addressed. Among those are requests for improvements to access roads to the top of the mesas not disturbed by mining (Item D), dissemination of information of impacts to groundwater resources in around the NECR Mine site and the UNC tailings impoundment (Items G3 and N), cultural resource surveys of the mesa tops around the NECR Mine (Item J), examination of livestock raised in the area by a qualified veterinarian (Item L), review of the integrity of previous reclamation at the Church Rock I and IE mine sites (Item M), and improvement of dirt roads in both residential areas of Study Area A (Items O and P).
12. **The CRUMP indoor radon assessment program requires followup and mitigation strategies for homes exceeding the USEPA radon "action level."** Churchrock and surrounding chapters should work with the NNEPA Radon Program to conduct new testing in homes that exceeded the 4 pCi/l-air action level in 2004 and for which valid retests were not conducted. Mitigation strategies and methods should be communicated to homeowners. Programs that provide grants for home improvements and radon mitigation should be investigated and the information provided to homeowners. Homes that are located on the geological outcrops of uraniumiferous formations and/or close to AUMs should be targeted for new indoor testing.
13. **Sampling of particulate matter at the two CRUMP air samplers should continue at least through the end of 2007.** The sampling is a continuing source of inhalation exposure data and will be especially important as contaminated soils are removed from around homes in the Red Water Pond Road area and during reclamation of the nearby NECR Mine. SRIC is committed to ensuring the sampling is done and the USEPA R&IE laboratory in Las Vegas will continue to analyze the filters.