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United States Government Accountability Office

Report to Congressional Requesters

May 2014

URANIUM CONTAMINATION

Overall Scope, Time Frame, and Cost Information Is Needed for Contamination Cleanup on the Navajo Reservation

GAO-14-323

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GAO Highlights

Highlights of GAO-14-323, a report to congressional requesters

May 2014

URANIUM CONTAMINATION

Overall Scope, Time Frame, and Cost Information Is Needed for Contamination Cleanup on the Navajo Reservation

Why GAO Did This Study

Four million tons of uranium ore were extracted from mines on the Navajo reservation primarily for developing the U.S. nuclear weapons stockpile. For over 30 years, the Navajo people have lived with the environmental and health effects of uranium contamination from this mining. In 2008, five federal agencies adopted a 5-year plan that identified targets for addressing contaminated abandoned mines, structures, water sources, former processing sites, and other sites. Federal agencies also provide funding to Navajo Nation agencies to assist with the cleanup work.

GAO was asked to examine the agencies' cleanup efforts. This report examines (1) the extent to which the agencies achieved the targets set in the 5-year plan and reasons why or why not; (2) what is known about the future scope of work, time frames, and costs; and (3) any key challenges faced by the agencies in completing this work and any opportunities to overcome them. GAO examined agency documents; interviewed agency officials, tribal leaders, and stakeholders; and visited sites on the Navajo and Hopi reservations.

What GAO Recommends

Congress should consider requiring federal agencies to develop an overall estimate of the remaining scope of work, time frames, and costs to fully address uranium contamination. GAO also recommends that BIA address its project management challenges, and agencies incorporate key practices into their coordinated outreach strategy. In commenting on a draft of this report, the agencies generally agreed with GAO's recommendations.

View GAO-14-323. For more information, contact J. Alfredo Gómez at (202) 512-3841 or gomezj@gao.gov.

What GAO Found

Federal agencies implementing the 2008 5-year plan, including the Environmental Protection Agency (EPA), the Department of Energy, the Bureau of Indian Affairs (BIA), and the Indian Health Service, met the targets in six of the plan's eight objectives, working in cooperation with tribal agencies, including the Navajo Nation Environmental Protection Agency. Reasons agencies met the targets were primarily because additional federal and other resources were dedicated to these efforts compared with prior years. For example, from 2008 through 2012, EPA spent $22 million to test and replace contaminated houses, compared with $1.5 million spent in the preceding 5 years. In contrast, targets for two objectives—cleanup of the Northeast Church Rock mine and Tuba City Dump—were not met primarily because EPA's and BIA's estimated schedules were optimistic, and EPA added additional work that extended the time frames. BIA experienced project and contract management challenges in conducting work at Tuba City Dump and did not always follow best practices when estimating the schedule for assessment work at the site. These challenges, if not addressed, could affect BIA's ability to meet future targets for cleanup at the site and successfully plan for project resources.

Federal agencies have not identified the full scope of remaining work, time frames, or costs to fully address uranium contamination on or near the Navajo reservation, although they recognize that significant work remains. In 2008, congressional decision makers requested the agencies provide an overall estimate of the full scope of work needed to address the contamination. The 5-year plan the agencies developed in response to this request does not provide a comprehensive estimate; instead, it focuses on the highest priorities over 5 years. EPA officials said that they typically do not provide cost or schedule estimates until a specific cleanup action is selected and that a number of current uncertainties make developing such an estimate difficult. Even with significant uncertainties, GAO has reported that agencies can create high-level estimates of costs and time frames that can be useful for decision makers and stakeholders. The agencies have collected important information that could provide a starting point for such an estimate. However, absent a statutory requirement to develop such a comprehensive estimate, it appears unlikely that the agencies will undertake such an effort. As a result, decision makers and stakeholders will not have the information they need to assess the overall pace of the cleanup efforts or make resource allocation decisions.

Federal agencies face a variety of challenges in continuing to address uranium contamination on or near the Navajo reservation. For example, according to EPA officials, funding for EPA's efforts at the Navajo abandoned uranium mines is expected to decrease from funding levels available during the 2008 5-year plan because of overall declining federal resources for cleanup. Further, agencies face challenges in effectively engaging tribal communities, in part, because agencies have not always collaborated on their outreach efforts. These agencies identified opportunities to enhance their collaboration by creating a coordinated outreach strategy for the next 5-year plan. Creating such a strategy is consistent with one of the several key practices that GAO has reported can enhance and sustain interagency collaboration and help ensure that agencies make efficient use of limited resources.

United States Government Accountability Office

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Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
AUM	abandoned uranium mine
BIA	Bureau of Indian Affairs
DOE	Department of Energy
CDC	Centers for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	Environmental Protection Agency
IHS	Indian Health Service
NNEPA	Navajo Nation Environmental Protection Agency
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
OMB	Office of Management and Budget
RI/FS	remedial investigation and feasibility study
UMTRA	Navajo Uranium Mill Tailings Remedial Action program
UMTRCA	Uranium Mill Tailings Radiation Control Act of 1978

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U.S. GOVERNMENT ACCOUNTABILITY OFFICE
441 G St. N.W.
Washington, DC 20548

May 5, 2014

Congressional Requesters

Beginning in the 1940s and continuing for approximately 40 years, private companies extracted approximately 4 million tons of uranium ore from mines on the Navajo reservation. Until 1970, the U.S. government purchased most of the ore to meet the demand for developing the nation's first atomic bomb and the subsequent production of weapons for the U.S. nuclear weapons stockpile. Uranium production directly affected the Navajo people who worked in the mines to extract the uranium ore or who lived and raised families in close proximity to the mines. Active uranium mining on the reservation ceased by 1986, and companies often abandoned the mines. Nearly 30 years later, the Navajo people continue to live with the environmental and health effects from mining operations: more than 500 abandoned mines are located across the reservation, some close to homes and communities, and an unknown number of homes and drinking water sources contain radioactive elements. According to the Environmental Protection Agency (EPA) and other federal agencies, health effects—including lung cancer, bone cancer, and impaired kidney function—can result from exposure to elevated levels of uranium and other radionuclides.[1] Uranium contamination at one location also directly affects the Hopi Tribe.[2]

After uranium mining on the Navajo reservation ended, some federal and tribal agencies began to address different aspects of the legacy of uranium contamination. These efforts on the whole have been sporadic, with some exceptions. The largest effort was conducted by the Department of Energy (DOE), which completed remedial actions at four uranium mill sites on the Navajo reservation where uranium ore was processed under the Uranium Mill Tailings Radiation Control Act of 1978,

[1]Uranium is a naturally occurring radioactive element found at elevated levels across the Navajo reservation and the entire Colorado Plateau. We are using the term "contamination" to refer to the presence of uranium in soil and water at the point where it may present a health risk to humans.

[2]Because the uranium mines in the region were located on or near Navajo lands, this report is focused primarily on the Navajo Nation. We discuss effects on the Hopi Tribe from a former landfill known as the Tuba City Dump, located largely on Hopi land.

as amended (UMTRCA).[3] DOE also began monitoring groundwater contamination or implementing plans to address groundwater contamination at three of these sites. Among other efforts, from the 1970s to the mid-2000s, EPA surveyed 65 structures and replaced 2 that had elevated levels of radiation; federal and tribal agencies and others sampled thousands of unregulated water sources to identify contamination; and a Navajo mine reclamation program addressed many of the physical hazards posed by abandoned mines. Even though these efforts represented some progress, Navajo and Hopi tribal officials have repeatedly expressed the tribes' frustrations with the pace of federal efforts to address uranium-related issues.

In October 2007, the House Committee on Oversight and Government Reform held hearings on the health and environmental effects of uranium contamination on the Navajo reservation. Based, in part, on information received in that hearing, in January 2008, the committee requested that five federal agencies create a 5-year plan to address the effects of uranium contamination on Navajo and Hopi tribal lands. All five agencies were either directly involved with uranium mining and processing or with addressing the environmental and health effects of uranium contamination, or both, and included: EPA, DOE, the Department of the Interior's Bureau of Indian Affairs (BIA), the Department of Health and Human Services' Indian Health Service (IHS), and the Nuclear Regulatory Commission (NRC). This plan—referred to in this report as the 2008 5-year plan—was the first collective plan and included actions organized under eight objectives, each of which was to be carried out by one or more of the federal agencies from 2008 through 2012.[4] The plan focused on addressing, over the 5-year period, what the agencies identified as the most urgent uranium-related problems and was not intended to be a long-term plan for fully resolving the entirety of the contamination. The eight objectives were as follows:

1. **Assess abandoned uranium mines for contamination and begin to identify potentially responsible parties**. Assessments are needed to understand the scope of contamination and to identify

[3]Pub. L. No. 95-604, 92 Stat. 3021 (1978).

[4]EPA, et al., *Health and Environmental Impacts of Uranium Contamination in the Navajo Nation: Five-Year Plan as requested by House Committee on Oversight and Government Reform*, June 9, 2008.

necessary cleanup actions, and range from radiation scans to field surveys to more thorough site evaluations. Potentially responsible parties, such as former owners or operators of mines, can be compelled to clean up the contamination or to pay cleanup costs under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).[5]

2. **Clean up the Northeast Church Rock mine**. The Navajo Nation identified this mine, which produced one of the largest volumes of uranium of all the Navajo uranium mines, as its highest priority for cleanup. Located near Church Rock, New Mexico, a former operator of the mine is involved in the cleanup efforts.
3. **Assess and clean up contaminated houses and other structures**. Some Navajo community members used materials from the sites that were contaminated with uranium, such as rocks and pieces of wood or metal, to build homes and other structures.
4. **Test and provide alternatives to contaminated, unregulated drinking water sources**. Federal and tribal agencies have estimated that from 15 to 30 percent of Navajos do not have regulated, piped drinking water in their homes.[6] These residents typically haul water to their homes, and it is not uncommon for them to use unsafe, unregulated water sources, such as livestock wells, for domestic water use.
5. **Continue to remediate groundwater at former uranium processing sites.** DOE is developing or implementing plans to clean up groundwater contamination found at three of the four former processing sites. DOE also conducts long-term surveillance and maintenance at the sites.
6. **Assess the "Highway 160 site."** This site, located across a highway from one of the former uranium processing sites, consists of an area where waste from the processing site was dumped and buried.
7. **Clean up the Tuba City Dump**. A former dump serviced by BIA, Tuba City Dump is located primarily on Hopi land, but it encompasses an area of Navajo land as well, and was used by the nearby

[5]Pub. L. No. 96-510 (1980), *codified as amended at* 42 U.S.C. §§ 9601-9675.

[6]Federal and tribal agencies estimate the number of homes and people without regulated drinking water on the Navajo reservation through different methodologies. As a result, their estimates of these numbers vary.

communities for more than 50 years. BIA, EPA, and the tribes have identified high levels of uranium in the groundwater underneath a portion of the landfill, and BIA has entered into an administrative settlement agreement with EPA to assess contamination and potential cleanup at the site.[7]

8. **Assess and treat health conditions**. IHS is responsible for treating health conditions in eligible Indians, including any health conditions that may result from exposure to uranium.

Under each plan objective, the relevant federal agencies established targets that they expected to meet by the end of the 5-year period, in consultation with the Navajo Nation. Although not identified as a specific objective, Members of Congress also requested that the federal agencies work together to ensure a coordinated federal response. During the course of the 5-year plan period, health research efforts by a sixth agency—the Agency for Toxic Substances and Disease Registry (ATSDR)—was rolled into the health objective.[8] The federal agencies published a summary report in January 2013, outlining their accomplishments under the plan.[9]

Since the 2008 5-year plan period ended in 2012, the federal agencies have continued their work and started the process of developing their next plan, which they intend to publish in 2014. During this transition, you asked us to report on the federal agencies' efforts under the 2008 5-year plan and going forward. This report examines (1) the extent to which federal agencies achieved the targets identified in the 2008 5-year plan, and the reasons why or why not; (2) what is known about the scope of work, time frames, and estimated costs of fully addressing uranium contamination; and (3) the key challenges, if any, faced by federal

[7]In August 2010, EPA and BIA entered into an Administrative Settlement Agreement and Order on Consent for BIA to conduct a remedial investigation and feasibility study at the Tuba City Dump. BIA's work under the settlement agreement is subject to EPA's approval, and EPA will make the decision regarding a cleanup remedy.

[8]ATSDR was established within the Public Health Service of the Department of Health and Human Services. ATSDR is supported by the Centers for Disease Control and Prevention (CDC) and located within CDC's Office of Noncommunicable Disease, Injury and Environmental Health.

[9]EPA, et al., *Federal Actions to Address Impacts of Uranium Contamination in the Navajo Nation: Five-Year Plan Summary Report*, January 2013.

agencies in completing this work and the opportunities, if any, which may be present to help overcome these challenges.

To determine the extent to which federal agencies achieved the targets identified in the 2008 5-year plan, and reasons why they did or did not, we compared the agencies' targets with the actions taken by the agencies and their partners over the 5-year plan period, reviewed key documents, and interviewed federal agency and tribal officials. To identify what is known about the scope of work, time frames, and estimated costs of fully addressing uranium contamination on or near the Navajo reservation, we reviewed available documents and interviewed federal agency and tribal officials. We also assessed the schedule and cost estimates for the Tuba City Dump based on our March 2009 cost estimating and assessment guide, a compilation of cost-estimating best practices drawn from across government and industry, and our May 2012 schedule assessment guide.[10] To ascertain any key challenges faced by federal agencies in completing this work and the opportunities that may be present to help overcome these challenges, we reviewed reports and interviewed federal agency and tribal officials, as well as knowledgeable stakeholders, who included local government officials and community members, university researchers, and representatives of nonprofit organizations. We also visited abandoned uranium mines, a former uranium processing site, and other relevant sites on the Navajo and Hopi reservations; we selected these sites based on the level of activity that federal and tribal agencies conducted there during the 2008 5-year plan or because the agencies identified the sites as needing cleanup in the near future. Appendix I describes our objectives, scope, and methodology in more detail.

We conducted this performance audit from January 2013 to May 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[10]GAO, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, GAO-09-3SP (Washington, D.C.: Mar. 2009); and *GAO Schedule Assessment Guide: Best Practices for Project Schedules*, GAO-12-120G (Washington, D.C.: May 2012).

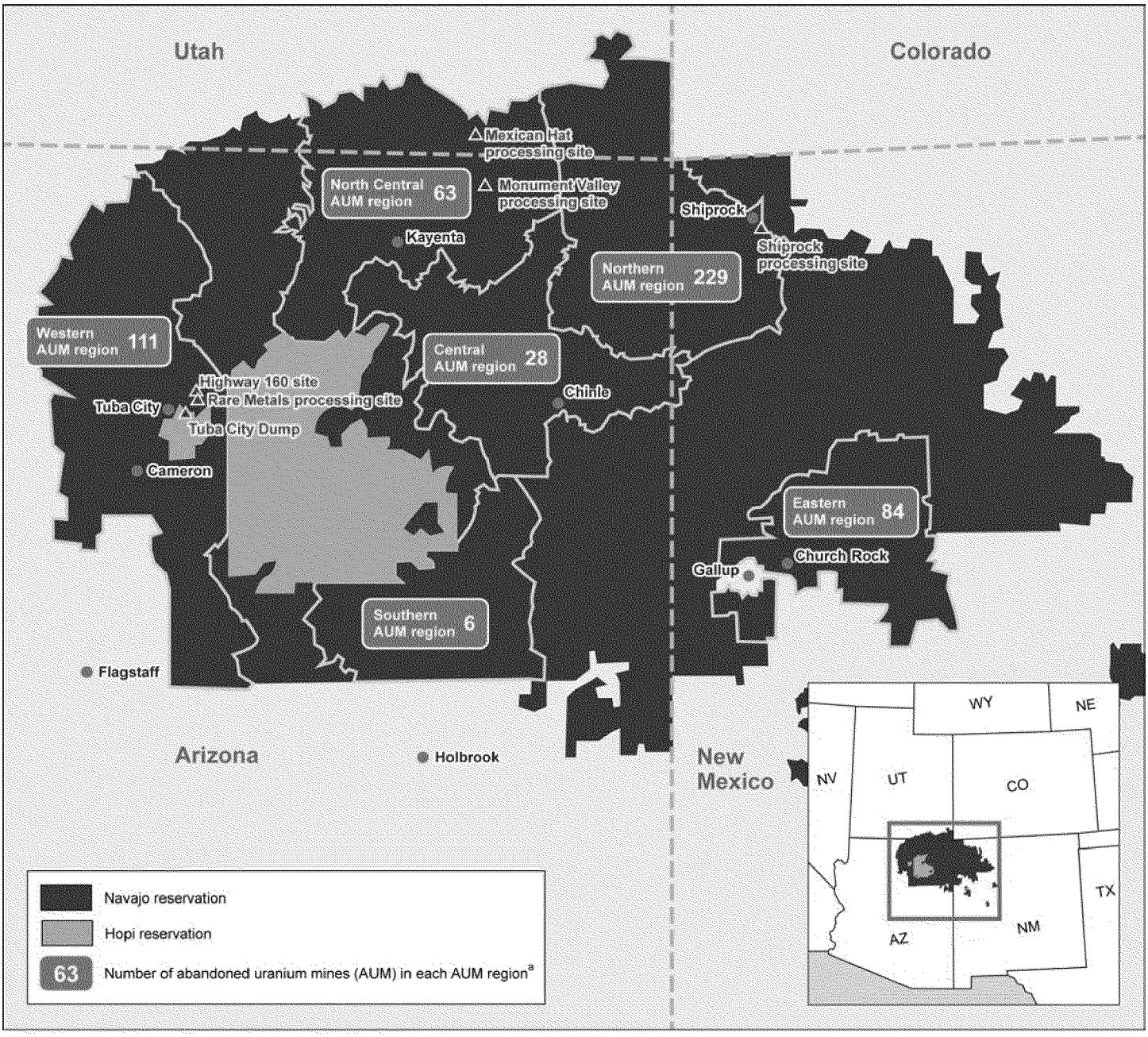
Background

In keeping with its trust responsibility with respect to Indian tribes, the federal government holds title to the Navajo and Hopi tribal land in trust for the benefit of the tribes and their members. In this context, this section provides information on (1) the Navajo Nation and Hopi Tribe; (2) uranium mining and processing on the Navajo reservation and its environmental effects; (3) Navajo people's exposure to uranium contamination and related health effects; (4) key statutes relevant to addressing uranium contamination; and (5) the roles of federal and tribal agencies and selected actions taken to address uranium contamination on the Navajo and Hopi reservations prior to 2008.

Navajo Nation and Hopi Tribe

The Navajo reservation consists of more than 24,000 square miles of land—about the size of the state of West Virginia—in the states of Arizona, New Mexico, and Utah, making it the largest reservation, geographically, in the United States. The Hopi reservation consists of approximately 2,500 square miles of land in northeastern Arizona, entirely surrounded by the Navajo reservation. Figure 1 shows the locations of the Navajo and Hopi reservations, as well as the locations of 521 abandoned uranium mines and other key sites.

Figure 1: Map of the Navajo and Hopi Reservations with 521 Abandoned Uranium Mines, Four Former Uranium Processing Sites, and Other Key Sites



Sources: GAO analysis of EPA and DOE data; Map Resources (map).

Note: The eastern portion of the Navajo reservation, as depicted here, is referred to as the Checkerboard area and consists of land with different ownership and statuses, including tribal trust lands; Indian allotments; Navajo tribal fee lands; and private, state, and federal lands.

[a]The Western, North Central, Northern, and Eastern abandoned uranium mine (AUM) regions extend up to 1 mile beyond the borders of the Navajo reservation.

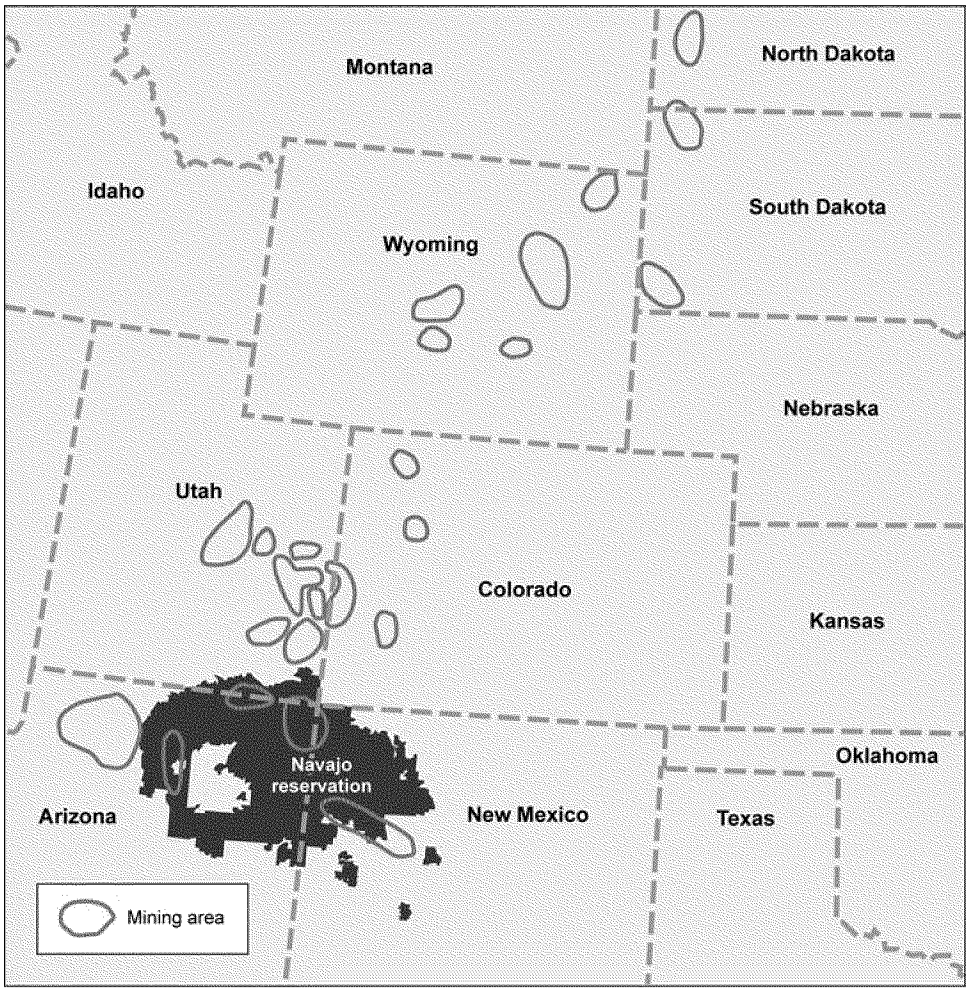
According to the 2010 Census, 174,000 people lived on Navajo land, and, according to Census Bureau estimates, more than 90 percent of the population identified as Navajo. Navajo culture is historically agrarian, and the Navajo people tend to live in small group clusters that are widely dispersed across the reservation. Many Navajo graze sheep and other livestock, which they use for wool and for consumption, among other things. According to Census Bureau estimates, the Navajo reservation's poverty rate is more than twice as high as the poverty rate in the state of Arizona, with 38 percent of people on the reservation—and 44 percent of all children on the reservation—living in poverty. Most homes do not have electricity or telephones; roads are unpaved, and there are no urban centers, although there are large towns generally found near the boundaries of the reservation. Residents living in homes without piped, regulated water sources haul their water from a nearby source, and many of these sources are unregulated, untreated water sources such as livestock wells or natural springs. The Navajo Nation government includes 110 local government subdivisions, known as chapters.

There are more than 5,000 Hopi living on Hopi land, according to the 2010 Census. Poverty rates on the Hopi reservation are similar to those among the Navajo. There were no uranium mines on the Hopi reservation.

Uranium Mining and Processing on the Navajo Reservation and its Environmental Effects

The Navajo reservation is located on the southern end of a stretch of naturally occurring uranium deposits that spans the western United States (see fig. 2). The uranium found on the reservation is primarily located in sandstone formations that range from surface outcrops to deposits more than 4,000 feet deep.

Figure 2: Uranium Mining Areas in the Rocky Mountain and Colorado Plateau Regions of the United States, Including on the Navajo Reservation



Sources: DOE; Map Resources (map).

Notes:

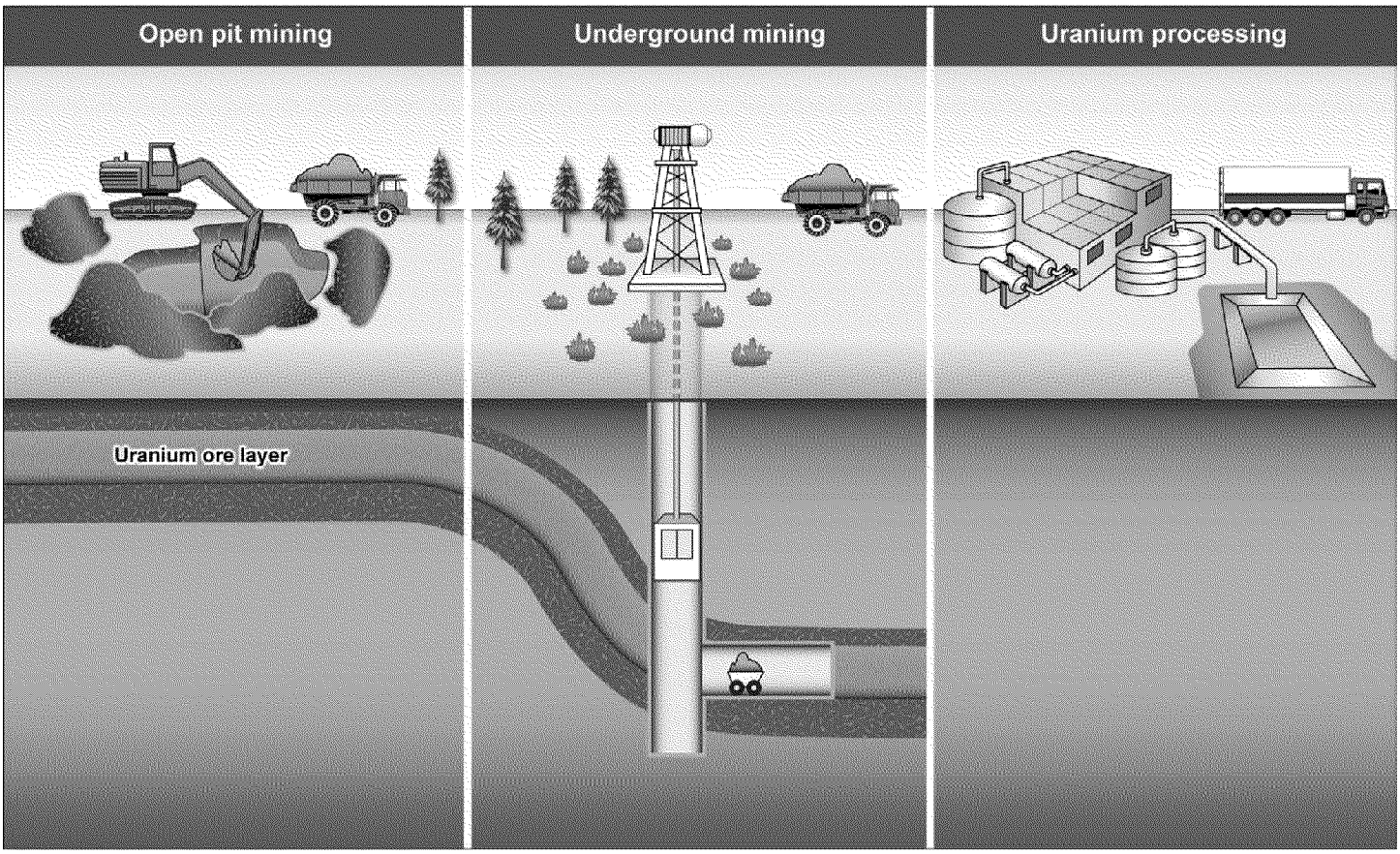
The eastern portion of the Navajo reservation, as depicted here, is referred to as the Checkerboard area and consists of land with different ownership and statuses, including tribal trust lands; Indian allotments; Navajo tribal fee lands; and private, state, and federal lands.

According to DOE, Texas, Idaho, Oregon, and Washington also contain significant uranium mining areas.

On the Navajo reservation, uranium ore was removed from the ground at more than 500 mines, generally through open pit mining for ore deposits located relatively close to the surface, or underground mining for deeper deposits. The mines were often located in mountainous areas and

consisted of multiple features, such as portals and vertical shafts. The material left behind after the ore was removed—known as waste rock—was then disposed, often in nearby piles, and contained dangerous materials, such as radium, radon, and heavy metals. Once mining ceased at a site, companies often abandoned the mines, leaving the waste rock piles in place without conducting any cleanup or posting signs warning about the dangers of contamination or physical hazards. The extracted ore was sent to an off-site processing facility called a mill. At the mill, the mined uranium ore was crushed, ground, and then fed to a leaching system that produced yellow slurry—called yellowcake—that was further processed for use in nuclear weapons or, as of the mid-1960s, for use in nuclear power plants. The leaching system left a waste product known as mill tailings that retained some toxic contaminants. The tailings were of a sandy consistency and mixtures of tailings and water were placed in unlined evaporation ponds at the mill site. DOE estimates that millions of gallons of water contaminated by mill tailings were released into the groundwater over the life of the sites through the unlined ponds. In addition, on July 16, 1979, the largest release of radioactive materials in the United States occurred when a dam on one of the evaporation ponds broke at a processing site near Church Rock, New Mexico, resulting in the release of 94 million gallons of radioactive waste to the Puerco River, which flowed through nearby communities. Figure 3 depicts the uranium mining and processing that occurred on or near the Navajo reservation.

Figure 3: Uranium Mining and Processing That Occurred on or Near the Navajo Reservation



Sources: GAO; Art Explosion (trees and heavy equipment images).

Most of the uranium mining and processing on the Navajo reservation occurred from the late 1940s through the 1960s, and the federal government played a variety of roles during this time. For example, as reported by EPA and the Navajo Nation, beginning in the 1940s, the Secretary of the Interior, along with the Navajo Nation, and later BIA, issued leases and permits to private companies and individuals for uranium mining on the Navajo reservation.[11] In another example, the Atomic Energy Commission (Commission)—a precursor agency to

[11]Early mining on the reservation was for the mineral vanadium, which was used in steel production, and uranium was extracted from the vanadium mill tailings.

DOE—established a series of financial incentives for the discovery and production of domestic uranium, including guaranteed minimum prices for uranium ore and financial bonuses for uranium ore mined from any previously unidentified site, according to a report prepared by the Commission. According to the report, the Commission also provided infrastructure support, such as roads needed to survey mine sites and transport ore. Finally, the federal government was the sole customer of the processed uranium from 1947 to 1965.

Beginning in 1970, uranium from the Navajo reservation was sold exclusively to the commercial sector for use in nuclear power plants, but prices fell in the 1980s, and uranium mining operations on the reservation ended in 1986. Because of lingering contamination and its effects, in 2005 the Navajo Nation enacted a law placing a moratorium on uranium mining and processing on any site within the tribe's territorial jurisdiction. In 2012, the Navajo Nation enacted a law prohibiting transportation of uranium ore or radioactive waste through lands under the tribe's territorial jurisdiction unless fees, bonding, and other requirements were met. The 2012 law also stated that the Navajo Nation generally opposed transportation of uranium ore or radioactive materials, except for the purpose of disposing of materials from past mining or milling in a long-term facility outside of the tribe's territorial jurisdiction or a temporary facility within the jurisdiction. Even with these laws, however, increases in the price of uranium during the past 10 years have sparked renewed interest in uranium mining and processing on and near the Navajo reservation, and opinions over new mining appear split, especially given the potential for job creation offered by the industry in economically depressed areas.[12] For example, a committee of the Navajo Nation Council approved a resolution in December 2013 acknowledging a private

[12]The more recent technique for extracting uranium in the United States is called in situ recovery, which aims to extract uranium with less surface disturbance. According to NRC, this technique involves extracting uranium from aquifers that naturally contain uranium and other hazardous constituents by injecting oxygenated water and carbon dioxide or sodium bicarbonate hundreds of feet underground to dissolve uranium located in a subsurface ore body. Once dissolved, the water and uranium mixture is pumped to the surface. The primary risk associated with in situ recovery is the potential for contamination of nearby groundwater outside of the ore zone. When operations cease, companies remove and stabilize hazardous constituents found in the groundwater that may have been disturbed from the ore body by the operations. How long it will take to restore an in situ recovery site after production ceases is variable, and restoration to background levels may not be achievable for every constituent, according to NRC officials with whom we spoke.

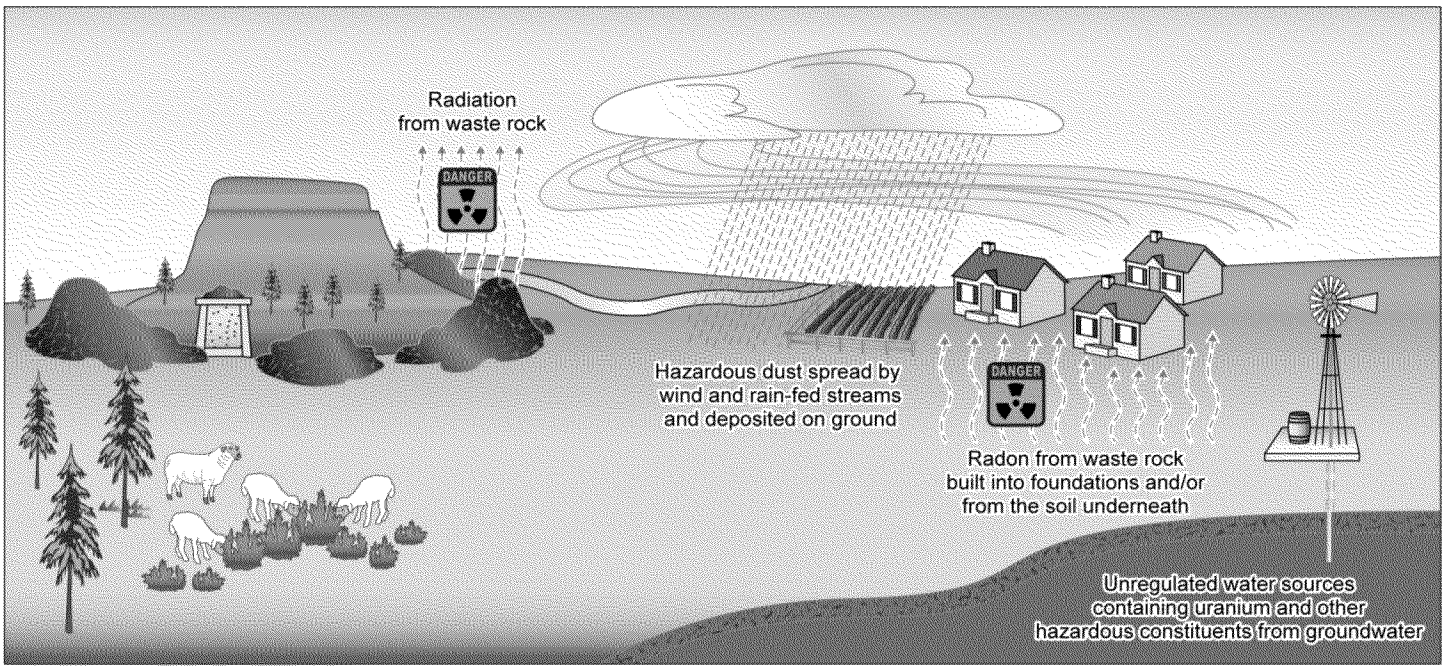
company's right-of-way across tribal land near Church Rock, New Mexico, and authorizing its use for a demonstration project that extracts uranium from beneath the surface. The Navajo Nation Department of Justice has concluded that the resolution conflicts with the 2005 and 2012 laws.

Exposure to Uranium and Its Health Effects

Uranium is present naturally in virtually all soil, rock, and water, and is spread throughout the environment by geological processes, as well as by wind and rain. On the Navajo reservation, winds blow during most of the year, exceeding 50 miles per hour at times, and localized, heavy rainstorms occur throughout the summer. When uranium is present in the environment, people may be exposed to it, as well as the radioactive by-products that are created as uranium decays—including radium and radon (a gas)—through a variety of exposure pathways. For example, Navajo people have been exposed to naturally occurring uranium and its by-products by drinking water from unregulated wells that tap into groundwater that comes into contact with underground uranium deposits. People are also exposed to naturally occurring radon when it migrates into their homes from the uranium-bearing soil underneath.

Mining and milling processes on the Navajo reservation created new pathways for exposure to uranium, increasing the amount of potential exposure at the surface. When the uranium mines were in operation, uranium miners inhaled radioactive dust and radon in and near the mines where they worked. Miners tracked the dust into their homes, exposing their families. Community members occasionally used materials from the mines and mill sites to build their houses and ceremonial structures, leading to increased radon inside these structures. When waste rock piles were left next to abandoned mines, wind and rain at times spread—and could continue to spread—the hazardous materials, sometimes through intermittent streams, where these materials could come into contact with residents of nearby communities, who could then be exposed by inhalation or ingestion. Residents of some communities located near the mines reported playing as children in and around the open mines. Many of the exposure pathways that existed when the mines and processing sites were in operation have been eliminated, and the Navajo Nation has stated that the most significant safety hazards that were present at the abandoned mines have been addressed. However, there are pathways of exposure that remain for Navajo residents today (see fig. 4).

Figure 4: Current Pathways for Exposure to Uranium and Other Radiation Hazards



Sources: GAO; Art Explosion (trees and sheep).

Although historic, occupational exposure to uranium has been shown by the Centers for Disease Control and Prevention (CDC) and others to have affected human health, the extent to which the Navajo people have experienced health effects resulting from uranium exposures in other ways has not been thoroughly examined and remains uncertain. For nonoccupational exposures, comprehensive health studies have not been conducted to assess the health effects of uranium contamination on Navajo communities or other communities located near active or abandoned uranium mines and processing sites, but Navajo community members who have lived near these sites have reported a variety of serious health effects, including cancers, according to CDC.[13] EPA reports that exposure to gamma radiation—such as from waste rock located near abandoned mines—can cause a variety of cancers, including lung cancer and leukemia, and that exposure to radon can

[13]House Committee on Oversight and Government Reform, *The Health and Environmental Impacts of Uranium Contamination In the Navajo Nation*, 110th Cong., 1st sess., 2007.

cause lung cancer. Because of these potential dangers, EPA recommends that people stay away from areas on the Navajo reservation with especially high levels of radiation—more than 10-times above the naturally-occurring, background radiation—in order to avoid potential health effects.[14] ATSDR and EPA have noted that the abandoned mines pose a risk especially to children, since children tend to put dirt in their mouths, and the dirt at the mines could be contaminated. EPA noted in the 2008 5-year plan that inhabitants of structures constructed with uranium mining waste are at risk of developing lung cancer because of the increased presence of radon in indoor air. In addition, given the consumption by Navajo residents of livestock that have grazed on plants located on or near abandoned mine sites, residents and researchers have identified the need to study the potential for exposure to radiation through consuming these animals.

Key Statutes Relevant to Addressing Uranium Contamination

Two key statutes involved with addressing uranium contamination are (1) CERCLA,[15] also known as Superfund, and (2) UMTRCA.[16]

CERCLA

CERCLA established the Superfund program in 1980 to protect human health and the environment from the effects of hazardous substances, including uranium. Under CERCLA, potentially responsible parties—such as current or former owners or operators of a mine site containing hazardous substances—are liable for conducting or paying for cleanup of

[14]Background radiation is the radiation that is emitted from naturally occurring materials, such as from radium that is present in nearly all soils and rocks, or from other elements found in the earth's crust, including thorium and potassium. Background radiation varies all over the world, depending on the makeup of soils and rocks in the local area and on the elevation of the local area, which affects the amount of exposure to cosmic radiation. EPA considers radiation levels of more than 2-times background levels as evidence of an observed hazardous release that may require further investigation under CERCLA.

[15]Pub. L. No. 96-510 (1980), *codified as amended at* 42 U.S.C. §§ 9601-9675.

[16]Pub. L. No. 95-604, 92 Stat. 3021 (1978).

hazardous substances at contaminated sites.[17] If the federal government is a potentially responsible party at a site, it is liable for cleanup costs even if there are nonfederal potentially responsible parties. For example, one court has held that the federal government was liable as an owner under CERCLA for the cleanup costs at a mine located within an Indian reservation.[18]

Under CERCLA, EPA has the authority to compel potentially responsible parties to clean up contaminated sites, or to conduct cleanups itself and then seek reimbursement from the potentially responsible parties. EPA may compel cleanup by bringing an enforcement action against a potentially responsible party or by attempting to reach an administrative agreement—known as an administrative order on consent, or a settlement agreement—requiring the responsible party to perform and pay for site cleanup. Sometimes, however, potentially responsible parties cannot be identified or may be financially unable to perform the cleanup.

[17]Courts have held responsible party liability under CERCLA to be strict, joint and several, and retroactive. Under strict liability, a party may be liable for cleanup even though its actions were not considered negligent. Because liability is joint and several, when the harm done is indivisible, one party can be held responsible for the full cost of the remedy even though other parties may have contributed to the release of hazardous substances at the site. Retroactive liability means that liability applies to actions that took place before CERCLA was enacted.

[18]Specifically, a federal district court has ruled that the federal government, as holder of title to the land on the Spokane Indian Reservation and entity responsible for approving and enforcing the uranium mine lease, is liable under CERCLA for the restoration of land damaged by uranium mining. *See United States v. Newmont USA Ltd*, 504 F.Supp.2d 1050, 1075 (E.D. Wash. 2007) ("[T]he drafters of CERCLA intended that land held by the United States in trust for Indians be treated the same as land owned in fee simple by the United States").

Under the Superfund program, EPA and potentially responsible parties can undertake two types of cleanups: (1) removal actions and (2) remedial actions.[19]

Removal actions are generally shorter-term or emergency cleanups to mitigate immediate threats. These include time-critical removals for threats requiring action within 6 months, and non-time-critical removals for threats where action can be delayed to account for a 6-month or longer planning period, which includes a site evaluation to characterize the site and identify and analyze removal alternatives.[20] Removal actions can include, for example, installing a fence around a contaminated site and excavating contaminated soils for disposal, and can be quite complex. Removal actions can be financed by the Hazardous Substance Superfund Trust Fund (Superfund Trust Fund).[21]

Remedial actions typically are longer-term actions that involve a more elaborate process to permanently and significantly reduce contamination. Remedial actions are taken instead of, or in addition to, a removal action. Before undertaking a remedial action, a remedial investigation and feasibility study (RI/FS) is conducted in accordance with an approved work plan to (1) characterize site conditions and assess the risks to

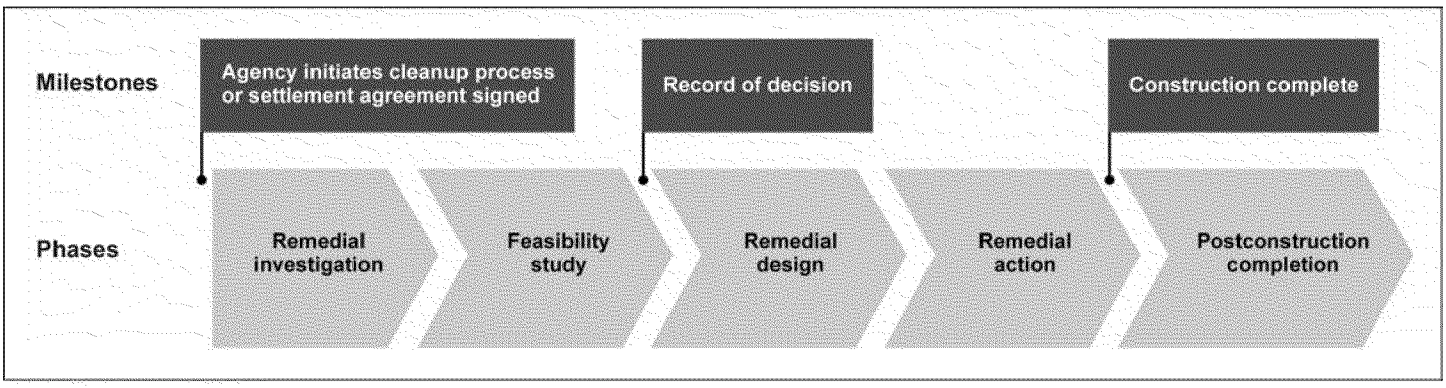
[19]Under CERCLA, federal agencies are generally not authorized to respond to a release of "a naturally occurring substance in its unaltered form, or altered solely through naturally occurring processes or phenomena, from a location where it is naturally found." 42 U.S.C. § 9604(a)(3). The burden is on the responsible party to prove that the government lacks the authority to respond to any particular release for this reason. E.g., *United States v. W.R. Grace - Conn.*, 280 F.Supp.2d 1149, 1175 (D. Mont. 2003). Releases resulting from mining activity that relocates the naturally occurring substances are not subject to the statutory limitation. E.g., *Monarch Greenback v. Monticello Insurance*, 118 F.Supp.2d 1068, 1080 (D. Idaho 1999). In this report, we use the term "contamination" to refer to releases of hazardous substances other than those covered by the statutory exemption. We make no findings herein as to whether any particular release is subject to the limitation.

[20]A site evaluation includes a site investigation and an engineering evaluation/cost analysis.

[21]CERCLA established the Superfund Trust Fund to support Superfund program activities. Historically, the Superfund Trust Fund received revenue from four major sources: taxes on crude oil and certain chemicals, as well as an environmental tax assessed on corporations based on their taxable income; transfers via appropriations from the general fund of the Treasury; fines, penalties, and recoveries from potentially responsible parties; and interest earned on the balance of the Superfund Trust Fund. As of 2011, the Superfund Trust Fund's primary source of revenue is the transfer from the general fund of the Treasury. EPA's Superfund program receives annual appropriations from the Superfund Trust Fund.

human health and the environment, among other things, and (2) evaluate various options to address the problems identified. A remedy is selected for addressing the site's contamination in a record of decision, and the design of the selected remedy is then developed and implemented (see fig. 5). Only sites on the National Priorities List (NPL)—EPA's list of the nation's most contaminated sites—are eligible to have remedial actions financed by the Superfund Trust Fund.[22] None of the mine sites on the Navajo reservation are currently listed on the NPL.

Figure 5: Superfund Remedial Action Process



Source: GAO analysis of EPA data.

UMTRCA

UMTRCA required DOE to take remedial actions at certain uranium mill sites across the country—and properties in the vicinity that were contaminated with radioactive materials from the mill sites—to stabilize and control the mill tailings in a safe and environmentally sound manner and to minimize or eliminate health hazards, among other things.

[22]40 C.F.R. § 300.425(b)(1). In placing sites on the NPL, EPA uses a hazard ranking system to determine a site's relative threat to human health and the environment based on potential pathways of contamination and the availability of alternative state or federal programs that could clean up the site, among other things. EPA considers risks to human health and the environment, the urgency of the need for response, and program management factors, such as projected costs to the Superfund program and the timing of funding needs.

UMTRCA included four sites on the Navajo reservation:[23] Mexican Hat, Monument Valley, Shiprock, and Tuba City, which we refer to as the Rare Metals site in this report.[24] Under the act, DOE is also responsible for ensuring that any residual radioactive minerals entering the groundwater do not exceed specified limits; therefore, DOE maintains groundwater remediation systems at sites where groundwater contamination has persisted. In accordance with the act, the Secretary of Energy has entered into cooperative agreements with the Navajo Nation to perform the remedial actions at the sites located on the tribe's land; the current agreement lasts until 2017.[25] The act also required DOE to complete the remedial actions at the processing sites and vicinity properties before DOE's authority under the act, as amended, to perform these actions expired in 1998; DOE's authority to perform groundwater restoration activities has not expired. UMTRCA did not include provisions for DOE to remediate abandoned uranium mines.[26]

[23]There is a fifth former uranium mill site that is not located on the Navajo reservation but is located on private land, surrounded by Navajo land, directly across from the Northeast Church Rock mine. In contrast to the four mill sites on the reservation that are UMTRCA Title I sites, and which DOE was required to remediate, this mill site is an UMTRCA Title II site, which the private licensee, not DOE, is required to remediate. NRC licenses the site, subjecting it to NRC's decontamination, decommissioning, and reclamation standards, and the site is listed on the NPL. EPA issued an administrative order to the site's former operator to undertake a CERCLA remedial action. When this mill site is remediated to NRC standards the site will be transferred to DOE, which will perform long-term surveillance and maintenance.

[24]The Rare Metals Corporation and its successor, the El Paso Natural Gas Company, operated the Tuba City uranium processing site from 1956 to 1966. DOE refers to this former processing site as the Tuba City site, but in order to distinguish it from the other contaminated sites in the Tuba City area discussed in this report, we refer to the Tuba City former uranium processing site as the Rare Metals site.

[25]DOE and the Navajo Nation entered into a cooperative agreement in 1983 to facilitate the surface remedial actions at the sites on the reservation. This agreement expired in 1998, and a new cooperative agreement was initiated for groundwater cleanup that remains in effect.

[26]According to DOE officials, no uranium mines met the statutory definition of a vicinity property.

Federal and Tribal Agencies' Roles and Selected Actions Taken to Address Uranium Contamination on or Near the Navajo Reservation Prior to 2008

A variety of federal agencies have specific roles in addressing uranium contamination on or near the Navajo reservation. Table 1 outlines the agencies, their roles, and selected actions they took to begin addressing the contamination prior to 2008.

Table 1: Federal Agencies, Their Roles, and Selected Actions Taken to Address Uranium Contamination on or Near the Navajo Reservation Prior to 2008

Agency	Role addressing uranium contamination	Selected actions taken prior to 2008
Environmental Protection Agency (EPA)	EPA Region 9 addresses issues related to contaminated abandoned uranium mines and contaminated homes and other structures. EPA conducts this work under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).[a] EPA also approves BIA's work at the Tuba City Dump under a settlement agreement entered into pursuant to CERCLA and will select the remedy at this site. In addition, EPA funds construction of drinking water infrastructure projects under the Safe Drinking Water Act.[b]	From the 1970s to the 1990s, EPA and the Navajo Nation assessed 65 structures for uranium contamination and replaced 2 contaminated structures. In addition, from 2000 to 2007, EPA worked with Navajo tribal agencies to collect and map information about the abandoned uranium mines on the reservation.[c] Further, in 2007, EPA conducted its first interim removal action at the Northeast Church Rock mine, removing approximately 6,500 cubic yards of contaminated soils from a residential area located adjacent to the mine.
Bureau of Indian Affairs (BIA)	BIA serviced the Tuba City Dump, located near the Navajo town of Tuba City and the Hopi Villages of Moenkopi, which was used by the surrounding communities for 50 years until its administrative closure in 1997. BIA is a potentially responsible party at the site.	In 1998, BIA began assessment activities, including analyses of groundwater and pathways of contaminant migration that were conducted by various consultants and other federal agencies, including the U.S. Geological Survey and EPA. In 2006, BIA initiated the CERCLA remedial action process so that a final remedy could be evaluated, selected, and ultimately implemented at the site.
Department of Energy (DOE)	DOE is responsible, under the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), for long-term surveillance and maintenance at the four former uranium processing sites located on the Navajo reservation.[d] DOE maintains groundwater remediation systems at three sites. DOE is also the lead federal agency at the Highway 160 site.	DOE completed surface remedial actions at the four former sites from 1986 to 1995, and constructed disposal cells at the Mexican Hat, Shiprock, and the Rare Metals sites (waste from Monument Valley was disposed at Mexican Hat). DOE adopted groundwater compliance action plans for the Shiprock and Rare Metals sites and began evaluating options at the Monument Valley site to address the continued presence of groundwater contamination. DOE also remediated 31 contaminated properties in the vicinity of former processing sites that were contaminated with radioactive materials from the mill sites.

Agency	Role addressing uranium contamination	Selected actions taken prior to 2008
Nuclear Regulatory Commission (NRC)	NRC regulates and licenses DOE's activities under UMTRCA at the three former uranium processing sites on the Navajo reservation that contain disposal cells and conducts oversight of DOE's monitoring and maintenance activities at all four of the former processing sites.	As required by UMTRCA, NRC evaluated and concurred on DOE's remedial action plans at Mexican Hat, Shiprock, and Rare Metals and then issued licenses to DOE for the custody and long-term care of radioactive disposal cells at these sites in the 1990s.
Indian Health Service (IHS)	IHS's Navajo Area Indian Health Service provides health care to eligible American Indians through a network of hospitals and health centers. IHS also funds and develops water infrastructure projects to serve Navajo homes.	IHS provided uranium-related health services to a specific set of Navajos, including former uranium miners, former uranium millers, and community members who may have been exposed to fallout from the detonation of nuclear devices.[e]
Centers for Disease Control and Prevention (CDC)/ Agency for Toxic Substances and Disease Registry (ATSDR)	CDC, among other things, conducts scientific research and provides health information to communities. ATSDR was established under CERCLA to carry out that law's health-related activities, which included survey and screening programs to determine the relationships between toxic exposures and illness.[f] ATSDR is located within CDC's Office of Noncommunicable Disease, Injury, and Environmental Health.	CDC was involved in efforts in 2006 and 2007 to sample unregulated drinking water sources and educate Navajo communities about the results. ATSDR did not conduct work related to uranium contamination on the Navajo reservation before 2008.

Sources: GAO analysis of agencies' information.

[a]Pub. L. No. 96-510 (1980), *codified as amended at* 42 U.S.C. §§ 9601-9675.

[b]Pub. L. No. 93-523 (1974), *codified as amended at* 42 U.S.C. §§ 300f to 300j-26.

[c]EPA, et al., *Abandoned Uranium Mines and the Navajo Nation: Navajo Nation AUM Screening Assessment Report and Atlas with Geospatial Data* (August 2007).

[d]Pub. L. No. 95-604, 92 Stat. 3021 (1978).

[e]IHS provided these services to eligible Navajos through the Radiation Exposure Screening and Education Program, which was created in response to the Radiation Exposure Compensation Act Amendments of 2000, which recognized the federal government's responsibility to initiate and support programs designed for the early detection, prevention and education on diseases to aid the thousands of individuals adversely affected by the mining of uranium and testing of the country's nuclear weapons.

[f]Pub. L. No. 96-510, § 104(i), 94 Stat. 2767, 2778-2779 (1980).

In addition to the federal agencies, tribal agencies play key roles and have been actively addressing the impacts of historical uranium mining and processing on or near the Navajo reservation.

- *Navajo Nation Environmental Protection Agency (NNEPA)*. NNEPA is the lead Navajo agency for regulating radiological contamination at abandoned uranium mines. NNEPA addresses uranium contamination on the Navajo reservation through a variety of programs, including the Navajo Superfund program, which is responsible for assessing hazardous waste sites on the reservation, including abandoned uranium mines. NNEPA partners with EPA in

working under the structures, abandoned mines, and unregulated drinking water objectives of the 2008 5-year plan, and provides input on the other objectives as well.

- *Navajo Abandoned Mine Lands Reclamation/ Uranium Mill Tailings Remedial Action (UMTRA) Department*. This Navajo department consists of two programs, the Abandoned Mine Lands Reclamation Program and the UMTRA program. The Abandoned Mine Lands Reclamation Program reclaims abandoned mines on the Navajo reservation.[27] From the 1990s through 2005, the Abandoned Mine Lands Reclamation Program reclaimed more than 900 abandoned uranium mine features found at the 521 mines located on or near the reservation, primarily addressing surface hazards, including stabilizing steep areas and burying uranium-contaminated soils.[28] According to Navajo Nation officials, this work did not address all associated radiological hazards, and the program continues to conduct maintenance on past reclamation work. The department's UMTRA program provides assistance to DOE under an UMTRCA cooperative agreement at the four former uranium processing sites on the reservation.[29] Under the 2008 5-year plan, the Navajo Nation chose not to have the Abandoned Mine Lands Reclamation Program coordinate its reclamation work with EPA and NNEPA's abandoned mine work. The UMTRA program, however, supported DOE's efforts at the former processing sites under the 5-year plan.

[27]The Navajo Abandoned Mine Lands Reclamation Program conducts reclamation work on uranium mines using Abandoned Mine Reclamation Fund money. Under the Surface Mining Control Reclamation Act, the Navajo Nation applies for grants from the Abandoned Mine Reclamation Fund to reclaim non-coal lands and waters and develop infrastructure in communities affected by mining activities. *See* 30 U.S.C. §§ 1235(k), 1240a(b); 53 Fed. Reg. 17186 (May 16, 1988); 59 Fed. Reg. 49178 (Sept. 27, 1994).

[28]We have reported that federal agencies do not have a consistent definition of an abandoned hardrock mine, including uranium mines. For example, some agencies count each mine feature as a separate mine where others group all features associated with one mine claim as a mine. EPA and NNEPA organize the abandoned uranium mines on the Navajo reservation by discrete mine claim. In this report, we are using this definition of an abandoned mine and therefore are reporting on the number of claims. For readability, we refer to these mine claims as mines. See GAO, *Uranium Mining: Opportunities Exist to Improve Oversight of Financial Assurances*, GAO-12-544 (Washington, D.C.: May 17, 2012); and *Hardrock Mining: Information on Abandoned Mines and Value and Coverage of Financial Assurances on BLM Land*, GAO-08-574T (Washington, D.C.: Mar. 12, 2008).

[29]The UMTRCA cooperative agreement is authorized by 42 U.S.C. § 7915(a).

Agencies Met the Targets in Six Out of Eight Plan Objectives Primarily Because of Additional Federal Resources

Federal agencies met the targets in six of the eight objectives they established in the 2008 5-year plan, but they did not meet the targets in two of the eight objectives. Reasons the agencies met the targets in five objectives were primarily because additional federal resources, including funding and staff time, were dedicated to their efforts. DOE met the targets in a sixth objective because the agency set targets that represented a continuation of previously required activities. By contrast, the reasons federal agencies did not meet the targets in two objectives were, in part, because of decisions to conduct additional assessment and outreach activities before identifying final cleanup actions. Remaining actions are necessary to meet the targets in these two objectives.

Agencies Met the Targets in Six Out of Eight Plan Objectives

In the 2008 5-year plan, federal agencies identified targets under each of the eight objectives that they intended to meet, in cooperation with tribal agency partners, by the end of the plan period in 2012. We found that the agencies met the targets in six of the eight objectives. According to the agencies' January 2013 summary report, the 2008 5-year plan outlined a strategy for gaining a better understanding of the scope of the problem and addressing the greatest risks first. The scope of work required to meet most of the targets did not represent the entirety of work necessary to fully address the issues encompassed by each objective. Table 2 explains the actions taken by the federal agencies—and the tribal agencies with whom they worked—during the period of 2008 through 2012, and our assessment of whether these actions met the targets in the 2008 5-year plan.[30]

[30]In addition to establishing targets under eight objectives, the 2008 5-year plan included a more detailed discussion of each objective which, in some cases, identified specific actions the federal agencies planned to take and interim milestones the agencies planned to meet. This table shows the targets established in the 5-year plan but does not identify all actions contained in the plan.

Table 2: Assessment of Actions Taken by Federal Agencies and Their Partners to Address Navajo Uranium Contamination Targets in the 2008 5-year Plan

2008 5-year plan objective	Targets established by federal agencies in 2008	Key actions taken by federal agencies from 2008 through 2012	Lead federal agency (federal and tribal agency partners)	GAO assessment
Abandoned uranium mines—assessment and enforcement	• Conduct initial assessments of up to 250 mines and detailed assessments of approximately 35 mines.[a] • Search for potentially responsible parties.	• The Environmental Protection Agency (EPA) completed initial assessments, which included radiation scans, of 521 mines and more detailed assessments of 45 mines to determine whether the mines could potentially be eligible for listing on the National Priorities List and/or if they should be referred to the agency's emergency response program for immediate action. • EPA continued to search for potentially responsible parties and, by the end of 2012, had signed agreements with potentially responsible parties for 3 mines, and identified potentially responsible parties at 24 additional mines.	EPA (Navajo Nation Environmental Protection Agency (NNEPA))	Met
Northeast Church Rock mine	• Complete cleanup of the former Northeast Church Rock uranium mine.	• EPA and the potentially responsible party conducted two interim removal actions to remove 130,000 cubic yards of contaminated soil found in the surrounding community but did not begin a final cleanup action at the mine. • EPA selected the cleanup remedy for the site and organized an interagency work group to provide technical design assistance, comprised of other federal agencies and others.	EPA (NNEPA, Nuclear Regulatory Commission (NRC), Department of Energy (DOE))	Not met
Contaminated houses and other structures	• In coordination with the Navajo Nation, assess up to 500 structures. • Where contaminated structures are found that pose a health risk, take appropriate response actions using EPA's Superfund authority.	• EPA and NNEPA assessed 878 structures for contamination; EPA then conducted more thorough assessments using more sensitive equipment for 527 structures that posed potential health risks. • EPA identified 43 structures and 18 yards that posed health risks. Of these, EPA demolished and rebuilt or provided financial settlements for 31 structures, excavated 18 yards, and awarded a grant to a Navajo housing agency to rebuild 9 structures.[b]	EPA (NNEPA)	Met

2008 5-year plan objective	Targets established by federal agencies in 2008	Key actions taken by federal agencies from 2008 through 2012	Lead federal agency (federal and tribal agency partners)	GAO assessment
Unregulated drinking water sources	• Test up to 70 unregulated water sources located near abandoned uranium mines to determine if they contain safe levels of radiation or radionuclides and provide results to affected communities. • Provide alternative water supplies where feasible.	• EPA tested 97 unregulated water sources; through this and work completed prior to the 5-year plan, EPA, NNEPA, the Centers for Disease Control and Prevention (CDC), and other partners identified 29 sources with unsafe uranium levels, and worked to communicate the results to communities. • EPA and the Indian Health Service (IHS) funded 13 water infrastructure projects to provide alternative water supplies to communities near more than half of the 29 contaminated sources; EPA funded a pilot project for the Navajo Nation to haul water to remote communities.[c]	EPA (CDC, IHS, NNEPA, Navajo Dept. of Water Resources)	Met
Former uranium processing sites	• Continue existing groundwater treatment strategies at three former uranium processing sites with contaminated groundwater. • Continue long-term surveillance and maintenance at the four former processing sites.	• DOE continued its active groundwater treatment at two sites under treatment plans that were adopted prior to the initiation of the 2008 5-year plan and continued examining passive treatment options at a third site. DOE also conducted technical studies of groundwater conditions at the sites. • DOE continued long-term surveillance and maintenance at the four sites.	DOE (NRC, Navajo Uranium Mill Tailings Remedial Action program, NNEPA)	Met
Highway 160 site	• Understand the best approach for characterization of the site and any required cleanup based on that characterization.	• DOE and NNEPA completed characterization and cleanup at the site, which included disposing of 5,700 cubic yards of waste at DOE's disposal cell in Grand Junction, Colorado. NNEPA also began addressing contaminated structures located near the site.	DOE (NNEPA)	Met

2008 5-year plan objective	Targets established by federal agencies in 2008	Key actions taken by federal agencies from 2008 through 2012	Lead federal agency (federal and tribal agency partners)	GAO assessment
Tuba City Dump	• Work together with the Navajo Nation and Hopi Tribe to assess whether interim actions are needed to address urgent threats; complete a remedial investigation and feasibility study (RI/FS) and select a remedial action; complete cleanup at the site by December 2012.	• The Bureau of Indian Affairs (BIA), in consultation with the tribes, found no imminent threat to drinking water wells; BIA installed a fence around the site, implemented quarterly groundwater monitoring, and conducted additional studies. BIA and its contractor implemented the agency's settlement agreement with EPA by conducting various assessments of contamination at the site but did not complete the RI/FS. Also, DOE funded a study to characterize the groundwater between the Rare Metals processing site and the landfill. EPA did not select a remedial action for the site, and BIA did not complete cleanup at the site.	BIA (EPA, NNEPA, Hopi Water Resources Program, DOE)	Not met
Health conditions	• Continue to diagnose and treat known health conditions in eligible Indians. • Support a university-led Navajo uranium assessment and kidney health project. • Develop plans for future health studies, and assessment and surveillance of health conditions.	• IHS continued to diagnose and treat health conditions. IHS also initiated a program that holds community forums to enhance education about uranium-related health impacts; provides health screenings in communities; updates patients' health records to include information about exposures to uranium; and provides uranium-specific training to health care workers. • IHS staff completed medical evaluations on kidney health project participants living in one region of the Navajo reservation. • An epidemiologist on detail to IHS from CDC helped evaluate options for future health studies and developed plans for assessment and surveillance of health conditions.	IHS (CDC)	Met

Sources: GAO analysis of information provided by BIA, DOE, EPA, IHS, and NRC.

Note: In addition to establishing targets under eight objectives, the 2008 5-year plan included a more detailed discussion of each objective which, in some cases, identified specific actions the federal agencies planned to take and interim milestones the agencies planned to meet. This table shows the targets established in the 5-year plan but does not identify all actions contained in the plan.

[a]Initial assessments involve field surveys of each mine, including on-the-ground radiation scans at all accessible mines. As described here, detailed assessments evaluate the extent to which people are likely to be exposed to radiation at each mine in order to determine whether mines are eligible for listing on the National Priorities List.

[b]EPA also identified three contaminated structures for which the agency did not provide financial compensation or rebuild because they were rebuilt by the owner or had been abandoned. In July 2012, EPA awarded a $3 million grant to Navajo Community Housing and Infrastructure Department to rebuild nine houses in Haystack, New Mexico. The Navajo agency accepted the grant in February 2013, and work on rebuilding the houses was under way during our site visit in July 2013.

[c]Department of Housing and Urban Development's Community Development Block Grants were also used to fund these projects.

We also found that federal agencies completed additional actions and produced results beyond the targets in the 2008 5-year plan during the plan period and in 2013. Among other things, EPA, working with the Navajo Nation, conducted a time-critical removal action at the Skyline mine, located within the Oljato Chapter in southern Utah. The action involved moving 25,000 cubic yards of radioactive mine waste—most of which was located at the bottom of a 700-foot high mesa—to a repository constructed on-site at the top of the mesa. According to EPA officials, the agency built the repository to be permanent, but the waste could ultimately be removed from the site given the Navajo Nation's preference that all contamination be removed from the reservation. EPA undertook smaller, interim removal actions at three other sites, including the Quivira mine, which is located near the Northeast Church Rock mine.[31] At two of the sites, EPA built temporary storage repositories to hold the waste on-site until a final disposal option is selected.

In addition, EPA and NNEPA identified 43 of the 521 abandoned mines as the highest priority for additional assessment work and cleanup actions; EPA officials said these mines are the highest priority because they pose the greatest exposure risks to the Navajo people since elevated radiation levels are present at the mines and they are located near houses or other potentially inhabited structures.[32] EPA recommends that people stay away from areas on the Navajo reservation with such elevated levels of radiation in order to avoid potential health effects. The 43 highest priority mines include 37 mines where radiation levels measured at or above 10-times the background radiation at the mine and where a potentially inhabited house or structure is within one-quarter mile of the mine. Of these mines, 8 mines measured at or above 50-times the background radiation, and 3 mines measured above 95-times the background radiation. EPA and NNEPA identified 6 additional mines as part of the 43 highest priority mines where radiation levels were lower—from 2-times to 10-times background—but that posed especially high

[31]EPA undertook other interim removal actions, such as constructing fences, at two additional sites.

[32]EPA officials said this prioritization is based on the best information available and that they plan to add more mines to the list as necessary as they gain additional information about how the land surrounding the mines may be used by local residents.

risks because, for example, a potentially inhabited house or structure is within 200 feet. EPA Region 9 officials we spoke with said prioritizing the mines benefits both federal and tribal agencies by providing a common road map for their efforts. Figure 6 shows how the 43 highest priority mines relate to the rest of the 521 abandoned uranium mines in terms of radiation levels and distance to homes or structures.

Figure 6: 521 Abandoned Uranium Mines on or Near the Navajo Reservation, Radiation Levels, Distance From Homes or Structures, and the 43 Highest Priority Mines

	Radiation levels measured at mines				
Distance from potentially inhabited home or structure	**At or above 10x background**	**Between 2x and 10x background**	**Below 2x background**	**Unknown[a]**	**Total[b]**
Within 1/4 mile	37	6[d]	10	-	**82**
	2[c]	27			
Farther than 1/4 mile	188	154	61	-	**403**
Total	**227**	**187**	**71**	**36**	**521**

Highest priority mines

Source: GAO analysis of EPA data.

Note: Background radiation is the radiation that is emitted from naturally occurring materials, such as from radium that is present in nearly all soils and rocks, or from other elements found in the earth's crust, including thorium and potassium. The Environmental Protection Agency (EPA) considered radiation levels of more than 2-times background levels as evidence of an observed hazardous release that may require further investigation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

[a]EPA officials said that radiation levels are unknown at these mines because they could not access the mines to gather radiation data, either because of locked gates or fences or remote, mountainous locations.

[b]Figures in this column do not add to 521 since the mines with unknown radiation levels are not included in the Total column.

[c]There are 2 mines with radiation levels at or above 10-times background and within one-quarter mile of a potentially inhabited structure that are not included on the list of 43 highest priority mines. According to an EPA Region 9 official familiar with the mines, these mines are not included on the list because EPA did not have radiation data for them at the time EPA and the Navajo Nation Environmental Protection Agency created the list, and the agencies may add these mines to the list when they update it in the future.

[d]Of these 6 mines, 5 are within 200 feet of a potentially inhabited structure and 1 is located near the Northeast Church Rock mine, which is among the 43 highest priority mines.

Further, ATSDR worked with the Navajo Nation, the University of New Mexico, and IHS to develop and begin the Navajo Birth Cohort Study, a

health study that is intended to improve the understanding of the relationship between uranium exposures and human health—specifically that of mothers and babies—on the Navajo reservation. According to the study proposal, for the Navajo Nation, congenital anomalies remain the leading cause of infant deaths, and the infant mortality rate among the Navajo people is 8.5 deaths per 1,000 live births, compared with 6.9 deaths per 1,000 live births overall in the United States. ATSDR awarded a research cooperative agreement to the university in August 2010, and ATSDR and the university received approval to begin recruiting participants in February 2013; this approval occurred after a lengthy review process that included obtaining multiple, separate approvals, including from the university, the Navajo Nation, and the Office of Management and Budget (OMB).[33] The Navajo Nation and others expressed frustration about the length of time spent developing and approving the study, which took longer than anticipated for a variety of reasons. For example, one reason for the overall amount of time is that OMB did not approve the information collection necessary for the study, or take other actions, within the 60-day regulatory deadline, but rather approved it after more than 300 days.[34] Now that the study is under way, however, ATSDR officials told us that it has already had positive outcomes in Navajo communities. For example, according to ATSDR officials, recent observations of increased levels of prenatal care across the reservation may be a result of the outreach and community education that has occurred as part of the study. Moreover, according to ATSDR's study proposal, the results of the study will answer long-standing questions on whether or not exposures to uranium wastes and other

[33]In 2013, ATSDR extended its agreement with the University of New Mexico and the Navajo Nation for the Birth Cohort Study by 5 years, until 2018.

[34]5 C.F.R. § 1320.10(b). Under the Paperwork Reduction Act, the Director of OMB must review and approve agencies' proposed collections of information. OMB had 60 days from March 30, 2012—the date ATSDR submitted the proposed information collection for the study—to approve, disapprove, or request changes to the information collection. However, OMB did not request supplemental information from ATSDR until July 30, 2012, and did not approve the collection until February 14, 2013. Because OMB missed the 60-day regulatory deadline, ATSDR was allowed to request an OMB control number to validly collect the information for a year. 5 C.F.R. § 1320.10(c). However, the agency did not make such a request since the study would take more than a year to collect the information. OMB staff identified a number of factors influencing the length of the review process, including the complexity of the information included in the review and the large number of study partners participating in discussions related to the review. They also noted that ATSDR may have reduced the review time by submitting its documents for approval earlier in the process.

environmental contaminants are associated with adverse birth outcomes or developmental delays on the Navajo reservation. Navajo Nation officials, however, stated that the Navajo Birth Cohort Study is just a small step and that more comprehensive studies are needed to better assess the health effects of uranium contamination on the Navajo people.

We found that some of the agencies' actions during the 2008 5-year plan period yielded additional benefits. For example, outreach to affected communities was an important component of some of the objectives under the 2008 5-year plan, although the plan did not include a strategy for coordinating agencies' outreach. Regardless, federal agencies began to coordinate these efforts, and, for example, held five joint workshops for stakeholders, including members of Navajo communities affected by uranium contamination, during which the agencies presented information about their efforts and solicited feedback. Federal agencies also partnered with Navajo agencies on some outreach efforts, which was important for their success in some cases. For example, EPA and NNEPA officials told us EPA relied heavily on NNEPA's outreach staff to communicate with affected community members in identifying and addressing contaminated structures. NNEPA outreach staff's ability to speak Navajo and their familiarity with Navajo cultural practices allowed them to work more effectively with community members than if EPA had conducted outreach on its own. Other benefits from the agencies' actions included tribal capacity building and career development and education opportunities for Navajos. For example, EPA helped enhance capacity building within NNEPA by training some of its staff to assess potentially contaminated structures, and it also provided job training to 20 Navajo hazardous waste workers through EPA's Superfund Job Training Initiative program. In another example, DOE continued to sponsor a summer internship program to give assistance to American Indian college students—including Navajo students—who are pursuing degrees in science, engineering, and technology.

Agencies Met the Targets in Six Objectives Primarily Because of Additional Federal Resources or Because Targets Continued Previously-Established Efforts

We found that a key reason why agencies met the targets for five objectives in the 2008 5-year plan was because additional resources, mostly federal but also private, were dedicated to their efforts. For their work on the objectives addressing contaminated houses, abandoned mines, unregulated drinking water sources, the Highway 160 site, and treatment of health conditions, the agencies either dedicated more funds and staff resources than during the previous 5-year period or received additional appropriations for work related to Navajo uranium contamination. DOE was able to meet the targets for a sixth objective,

regarding former uranium processing sites, primarily because its targets largely represented a continuation of previously required activities.

Additional Resources

In accomplishing the targets under five of the objectives outlined in the 2008 5-year plan, according to agency officials, agencies benefited from dedicating additional resources from their existing budgets, receiving additional appropriations to conduct the work, or leveraging funds from private parties. Examples are as follows:

- *Additional funding and staff time from agencies' existing budgets.* EPA prioritized its work under three objectives of the 2008 5-year plan by dedicating additional resources from its existing budget for addressing contaminated houses, assessing abandoned uranium mines, and addressing unregulated drinking water sources. EPA provided from $1.8 million to $7.8 million annually to the Region 9 Superfund Removal program to fund the program's Navajo uranium work during the 5-year plan period—a significant increase over the previous 5-year period. For example, from fiscal years 2008 through 2012, EPA reported that it expended $22 million on efforts to identify and address contaminated houses and other structures, compared with the $1.5 million it expended on similar efforts in the preceding 5 years. Throughout the 2008 5-year plan period, the additional Superfund Removal program funds allowed EPA Region 9 to increase the amount of money it spent on the Navajo work even as the national Superfund budget decreased, according to a senior EPA Region 9 official. Further, EPA officials told us that they conducted work that went beyond the 5-year plan targets because of the increased funding the agency dedicated to Navajo uranium work. Specifically, these officials said they could not have completed the removal action at the Skyline mine without the increased funding since the Region 9 Superfund removal program's prior budget would have been insufficient, and there was no potentially responsible party to contribute funds. In addition to increased funding, EPA Region 9 also increased the number of full-time equivalent employees that it dedicated to its Navajo uranium work from approximately 3.68 in 2008 to 6.95 in 2012. Similarly, IHS reported that its Navajo Area identified nearly $1 million from within its existing budget that it used to support the creation of a uranium-related health screening program, which was established in 2010.

- *Additional funding from the American Recovery and Reinvestment Act of 2009 (Recovery Act).*[35] EPA and IHS used Recovery Act funds for some of the water infrastructure projects that were selected to serve Navajo communities in which contaminated, unregulated water sources had been identified. For example, in fiscal year 2009, EPA contributed $3 million in Drinking Water Infrastructure Grants Tribal Set Aside funds, and IHS contributed about $2 million from the IHS Recovery Act Sanitation Facilities Construction Fund toward a nearly $10 million, 50-mile extension of a water main to the communities around Sweetwater, Arizona. An EPA official familiar with the project told us that it will supply water to homes within the vicinity of four contaminated, unregulated wells, including a well that had the highest uranium levels of all unregulated water sources tested during the 5-year plan period.
- *Additional appropriations.* In fiscal year 2009, DOE received a $5 million appropriation to carry out a remedial action of the Highway 160 site.[36] The 2008 5-year plan included a target for assessing the site and identifying the best path forward, but not for completing cleanup at the site. According to DOE and NNEPA officials involved with the project, having the resources available to fund assessment and cleanup work allowed the agencies to move forward and complete the cleanup more quickly than they had anticipated. Moreover, NNEPA and DOE also used the appropriated funds to begin to address recently discovered, contaminated structures in the area of the Highway 160 site and the nearby Rare Metals processing site.[37] In addition, ATSDR officials we spoke with said they would not have been able to fund the Navajo Birth Cohort Study without additional appropriations for such research. These officials said ATSDR received an increase of $2 million in funding for fiscal year

[35]Pub. L. No. 111-5, 123 Stat. 115 (2009).

[36]Pub. L. No. 111-8, Div. C, Tit. III, 123 Stat. 524, 617-18 (2009). DOE used the existing UMTRCA cooperative agreement with the Navajo Nation to provide most of the funding to NNEPA, which led the cleanup efforts.

[37]According to NNEPA officials, they scanned 14 structures for radiation and identified 2 that were contaminated and needed remediation. Remediation of the 2 structures was completed in March 2014, and, as of April 2014, NNEPA had identified one additional structure that required scanning.

2010 to begin the study, and that the agency has subsequently put that amount toward the study.[38]

- *Leveraging funding from private, potentially responsible parties and other federal agencies.* According to EPA officials, the agency was able to complete some of the work that went beyond the targets in the 2008 5-year plan, including conducting the interim time-critical removal actions at the Quivira mine and others, because of funding that came from private, potentially responsible parties. Specifically, EPA issued an administrative order to one of the former operators of the Quivira mine to conduct and pay for the interim removal action. In addition, EPA and NNEPA used funds from a bankruptcy settlement with another potentially responsible party to pay for the interim actions at three other mines or mine-related sites.[39] Without funds from the private, potentially responsible parties, EPA officials said they would not have been able to conduct these actions during the 5-year plan period. Further, EPA officials said that funds from the bankruptcy settlement were instrumental in providing the initial funding for the agency's efforts to pursue potentially responsible parties at other abandoned uranium mines on the Navajo reservation.

  Federal agencies' ability to share resources was also an important factor in meeting the targets in at least one objective. Specifically, IHS officials told us the agency would not have been able to contribute funding to all 13 drinking water infrastructure projects funded during the 5-year plan period without combining its funds with funds from EPA and the Department of Housing and Urban Development. IHS officials said the agency's ability to fund these drinking water projects would have been limited because IHS's share of some of the projects' costs would have exceeded the agency's limit for economic feasibility. For example, if the agency had to solely fund a $4.75 million project in

[38]Committee reports accompanying the fiscal year 2012 and 2013 appropriation acts directed that $2 million of funds appropriated to ATSDR be used to continue epidemiological studies of the health conditions caused by exposures to uranium released from mining and milling operations on the reservation.

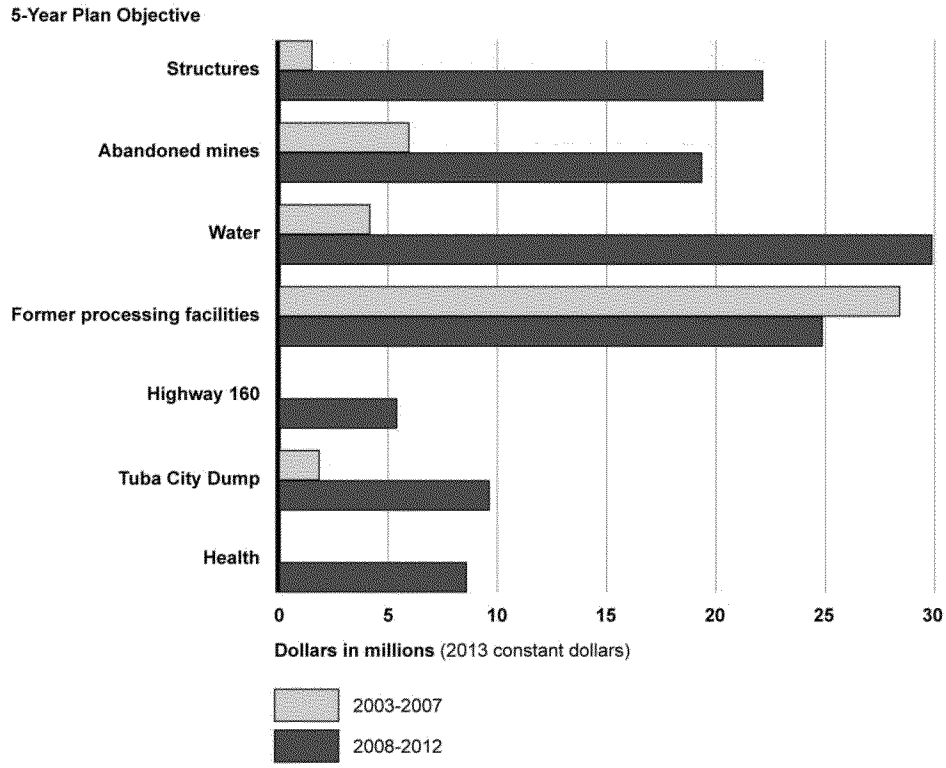
[39]In 2011, EPA received $13.3 million from the bankruptcy of Tronox, Inc., a potentially responsible party as the successor to the Kerr-McGee Corporation, which operated contaminated sites on the reservation. Of the settlement funds, EPA received $12 million to conduct or finance response actions at 49 sites on or near the Navajo reservation, including mines. EPA received $1.3 million to conduct or finance response actions at Quivira mine. EPA reported that they did not spend the Tronox bankruptcy funds on the interim time-critical removal action at the Quivira mine since the other former operator conducted and financed the action under an administrative order.

Dennehotso, in the northern part of the reservation, it would have cost the agency about $44,000 per home, an amount that would have been considered economically infeasible for IHS in fiscal year 2009, the year the project was funded. However, contributions of $2 million from EPA and $1 million from the Department of Housing and Urban Development reduced IHS's per-home cost so that the agency was able to participate in funding the project that provided piped drinking water to 107 homes that did not previously have piped water.

Overall, the federal agencies reported spending $121 million on work performed under the 2008 5-year plan.[40] These amounts do not include the approximately $17 million in private funds spent during the 5-year plan period, including by potentially responsible parties at the Northeast Church Rock mine, the Quivira mine, and from the bankruptcy settlement, according to the federal agencies' January 2013 summary report. In contrast, agencies reported spending approximately $42 million during the prior 5 years, and more than half of that amount was spent by DOE at the four processing sites. Figure 7 compares the amount of funds spent by the federal agencies under each objective in the 5-year plan period with the previous 5 years. Because the 2008 5-year plan did not include an overall cost estimate for conducting the work, we cannot determine whether the total amount spent by the agencies was in keeping with their expected costs. The 5-year plan included estimated costs of varying specificity for the first 2 years of the plan—2008 and 2009—since agency budgets for the first 2 years were already in place at the time of the plan's development but not for the final 3 years of the plan.

[40]The federal agencies' January 2013 summary report of work accomplished under the 2008 5-year plan reported that the agencies had spent $110 million during the 5-year plan period; we are reporting a different amount because agencies provided us with updated data, and we are reporting it in 2013 constant dollars. According to agency officials, these figures represent the agencies' direct costs and do not include funds for salaries or benefits.

Figure 7: Federal Agency Expenditures on Actions Taken to Address Uranium Contamination on or Near the Navajo Reservation, 2003-2007 and 2008-2012



Source: GAO analysis of agencies' data.

Notes:

The Agency for Toxic Substances and Disease Registry, Bureau of Indian Affairs (BIA), Environmental Protection Agency (EPA), and Indian Health Service reported obligations, and the Centers for Disease Control and Prevention and Department of Energy reported direct outlays. The figure includes only the agencies' direct costs and does not include staff time. The Nuclear Regulatory Commission (NRC) is not included in the figure because it did not report any direct costs, although NRC staff reported working on activities related to Navajo uranium-related sites, including the former processing facilities and the Northeast Church Rock mine.

According to EPA officials, EPA's Northeast Church Rock mine expenditures are included in the Abandoned mines totals for 2003-2007, but most of these expenditures have been reimbursed by the private, potentially responsible party.

BIA reported obligations of its 2-year appropriations but did not report the year the obligation was made. With input from BIA officials, we assigned the obligations to one fiscal year to create a data set that is comparable to the other agencies'.

Dollars do not include $1.35 million in General Assistance Program grants provided to the Navajo Nation by EPA's Office of Water from 2008 to 2012 for uranium-related work.

Targets That Continued Previously Required Efforts

For one objective of the 2008 5-year plan—addressing contamination at former uranium processing sites—DOE set targets that largely continued previously authorized activities that the agency was already undertaking, which according to DOE officials, helped the agency accomplish the targets. DOE set targets to continue to address groundwater contamination at three of the sites and to continue long-term surveillance and maintenance at all four sites—actions the agency was required to undertake under UMTRCA. DOE officials told us that continuing to carry out the already approved groundwater remediation strategies at the sites was the most appropriate action for the agency during the 2008 5-year plan period since those were the actions they were explicitly authorized to conduct. Navajo Nation officials told us that they were disappointed that DOE did not increase its level of effort at the sites. They also told us they were concerned that the remediation efforts that DOE is implementing are not achieving sufficient results, and that it appears that the agency is not expected to complete its efforts to treat contaminated groundwater in the foreseeable future.

Agencies Did Not Meet the Targets in Two Objectives for a Variety of Reasons, Including Optimistic Schedules and Decisions to Perform Additional Work That Extended Time Frames

Federal agencies did not meet the targets for two of the eight objectives in the 2008 5-year plan—cleanup of the Northeast Church Rock mine and the Tuba City Dump—for a variety of reasons, including that the schedules were optimistic and ambitious, and EPA decided to increase outreach work at the Northeast Church Rock mine and assessment work at the Tuba City Dump before identifying final cleanup actions for the sites. EPA and BIA officials told us they estimated the schedules based on the information they had at the time, but neither agency anticipated the need for additional steps in the assessment process and therefore did not include these steps in their schedules. Officials from both agencies said they deliberately created ambitious schedules for these sites, in part, to acknowledge the threats they posed and to make it clear that the agencies were committed to cleaning them up. Work remains for both agencies to complete the cleanups at the two sites, and the agencies expect that time frames will likely extend beyond the agencies' 2014 5-year plan and that federal costs will be in the tens of millions of dollars at each site.

Northeast Church Rock Mine

EPA did not meet its target to complete cleanup of the Northeast Church Rock mine in part because its schedule was optimistic and ambitious. According to the 2008 5-year plan, EPA expected to select the removal action for the site in December 2008; however, this selection did not occur until September 2011. According to EPA officials familiar with the project, selecting the removal action took longer than anticipated for a

number of reasons. First, completing the cleanup assessment for the site took 8 months longer than planned. Second, after EPA issued the cleanup assessment, the agency postponed selecting the removal action by 2 years so that agency officials could better understand and attempt to address community concerns. Over this 2-year period, EPA conducted 10 public meetings and brought in a Navajo peacemaker to facilitate discussions and improve communication between the agency and the community. According to EPA officials we spoke with, in order to further respond to community concerns, EPA also began work on some predesign analyses that are normally conducted at a later stage in the cleanup process. EPA officials told us they felt the meetings were valuable and that they have conducted more outreach at this site than at most other sites, but community members we spoke with said they remain frustrated with the decision process and disappointed with the outcome.

Third, when estimating the schedule under the 2008 5-year plan, EPA Region 9 officials did not anticipate that additional approval processes would be necessary to implement the removal action for the site that EPA ultimately selected. EPA's selected action involves disposing of approximately 1 million cubic yards of mine waste within an existing disposal cell for mill tailings at a former uranium processing site. The site is located less than 1 mile from the Northeast Church Rock mine and is regulated and managed by NRC and EPA Region 6, respectively. The former operator of the processing site—which is also the former operator and a potentially responsible party for the mine—currently holds a license from NRC for the existing disposal cell at the former processing site. According to EPA Region 9 officials, for EPA to transfer waste from the mine to the disposal cell, EPA headquarters officials determined that EPA Region 6 would need to approve a Record of Decision, which took 18 months to complete.

A number of steps remain for EPA to fully meet the target of cleaning up the mine. As of February 2014, EPA was in the removal predesign phase of the cleanup process. NRC and DOE are both participating in an EPA-led design work group since NRC will transfer responsibility for the site to DOE once the processing site is closed for long-term surveillance and maintenance pursuant to UMTRCA. Once the design phase is complete, the former operator of the processing site must submit a license amendment request and receive an amended license from NRC before disposing of the mine waste at the former processing site. This former operator and potentially responsible party for the mine is expected to implement the removal action if and when NRC issues the amended

license. In addition, NNEPA officials told us they have concerns regarding groundwater contamination at the site that have yet to be examined.

EPA's current schedule estimate is to complete the removal action in 2020. EPA officials, however, acknowledged that this schedule is also optimistic since it assumes that NRC's approval process for the license amendment will take 1 year, and that the cleanup itself will take 4 years. NRC officials also said they felt the schedule was too optimistic, and they told us that NRC's safety and environmental reviews will take approximately 2 years but, if a public hearing on the license amendment is requested, the approval process could take up to 5 years.[41] An EPA project manager for the mine told us EPA is working with NRC to revise the schedule to provide 2 years for the license amendment approval process in order to better account for NRC's process. Moreover, although the former operator and potentially responsible party at Northeast Church Rock mine is taking the lead for the cleanup, the government will pay up to 33 percent of future cleanup costs; in 2009, EPA estimated that these total future costs could be $44 million.[42]

Tuba City Dump

BIA also did not meet its targets in the 2008 5-year plan for the Tuba City Dump, in part, because the schedules were optimistic and ambitious. Under the plan, BIA was to (1) complete a set of studies to assess whether interim actions were warranted to protect Hopi water supplies, including drinking water wells, by mid-2008; (2) create a work plan for, then conduct and complete a RI/FS by late 2009; and (3) complete a remedial action by the end of 2012. Partway through BIA's implementation of the 5-year plan, in August 2010, BIA entered into a settlement agreement with EPA to conduct the RI/FS. Under the settlement agreement, BIA's work is subject to EPA's approval, and EPA will select the remedial action. As of the end of the 5-year plan period in 2012, BIA had completed the interim action studies, which found the dump did not pose an immediate threat to the wells, and it had implemented certain actions recommended by the studies, including installing a fence around the perimeter and conducting a detailed analysis

[41]NRC officials said that, given the high level of interest in the site, they believe it is likely that a petition for a hearing on the proposed action for the license amendment request will be filed, and that the hearing process may take several years.

[42]According to EPA's assessment of removal options, this is an order of magnitude estimate rather than a specific, point estimate. Due to uncertainties, total cleanup costs could fall within a range from minus 30 percent to plus 50 percent of the $44 million.

of one location with high levels of uranium. BIA developed the RI/FS work plan but had not completed the plan's required work. EPA had not selected a remedial action and, therefore, BIA had not begun or completed a remedial action.

Further, BIA's actions under the 5-year plan took longer than expected, for various reasons, which also contributed to the agency not meeting the targets. First, BIA spent nearly 1 year longer than expected conducting the interim action studies, and implementing the recommended actions took an additional year that had not been accounted for in the 5-year plan. BIA officials said they underestimated the amount of time needed to complete these efforts. Second, BIA spent more time developing the work plan for the RI/FS than had been anticipated, in part because EPA directed it to significantly revise the work plan. Under the settlement agreement, BIA was responsible for submitting a work plan for EPA approval that specified the activities and deliverables, as well as deadlines, for BIA in the development of the RI/FS.[43] The work plan and its deadlines are legally enforceable once EPA approves the work plan. EPA approved the initial work plan developed by BIA in January 2011, and BIA issued a $2 million task award for its implementation in June 2011.[44] However, in July 2011, 1 month later, EPA notified BIA that it would need to revise the RI/FS work plan, which significantly increased the amount of work to be performed. BIA then spent an additional year working with EPA revising the work plan, which EPA ultimately approved in July 2012. According to EPA correspondence to BIA, although it would delay completion of the RI/FS, the additional investigative work was necessary to resolve conflicting interpretations of data collected over the previous years of assessments and to support a defensible selection of a remedial action for the site. EPA officials said the additional work has yielded valuable information, including determining whether groundwater

[43]BIA is also responsible for implementing the approved work plan by awarding a contract that incorporates the requirements addressed in the work plan, and ensuring that its contractors properly perform the contract. Under the settlement agreement, BIA is responsible for ensuring its contractors comply with the agreement.

[44]On June 1, 2011, BIA issued a task order for the RI/FS in the amount of $1,994,577, under an indefinite delivery indefinite quantity contract.

contamination at the site can reach nearby Hopi drinking water wells.[45] Hopi tribal leaders, however, told us that although they appreciate the additional understanding that has been gained through the RI/FS, they are frustrated that the federal agencies have continued to dedicate resources to conducting additional assessments instead of cleanup actions,[46] especially in light of the fact that, as of 2013, BIA had overseen assessment work at the site for more than 10 years.

Third, implementing the RI/FS has taken longer than expected by BIA under the 2008 5-year plan, in part because BIA conducted additional work under the work plan at EPA's direction. In addition to the work EPA directed BIA to add in 2011, EPA subsequently required BIA to conduct additional field investigations. EPA officials explained that the scope of an RI/FS is often changed in response to conditions found on the ground, and that the Tuba City RI/FS has been typical in that respect. According to EPA and BIA documents, conducting this additional fieldwork contributed to BIA missing some of the work plan deadlines.

Moreover, project and contract management challenges faced by BIA have also contributed to the length of time spent on the RI/FS. BIA officials told us they had communication problems with the agency's

[45]DOE has funded work that has contributed to the understanding of conditions at the site as well. Specifically, DOE provided funding to NNEPA to drill seven groundwater characterization wells between the Rare Metals site, located about 4 miles away, and the Tuba City Dump. According to DOE, sampling from the wells demonstrated that no groundwater contaminants were migrating from the Rare Metals site toward the dump.

[46]Both tribes have sued the federal government over the Tuba City Dump and Highway 160 site. Specifically, in 2010, the Navajo Nation intervened in an appeal a potentially responsible party for the Rare Metals site filed challenging a federal district court's dismissal of its lawsuit over the sites. The United States Court of Appeals for the District of Columbia affirmed the dismissal. *See El Paso Natural Gas Co. v. United States*, 632 F.3d 1272 (D.C. Cir. 2011). The tribe then intervened in a subsequent lawsuit the potentially responsible party brought, which the district court also dismissed. *El Paso Natural Gas Comp. v. United States*, 774 F.Supp.2d 40 (D.D.C. 2011). The tribe and potentially responsible party subsequently brought additional legal claims against the government, which the district court also dismissed. *El Paso Natural Gas Co. v. United States*, 847 F.Supp.2d 111 (D.D.C. 2012). The tribe and potentially responsible party appealed this decision, and the United States Court of Appeals for the District of Columbia affirmed the dismissal of the claims concerning the dump but allowed one of the claims concerning groundwater remediation at the Highway 160 site to be heard by the district court. *El Paso Natural Gas Company v. United States*, No. 12-5156, 12-5157, _ F.3d _ (D.C. Cir. 2014). The Hopi Tribe filed a complaint against BIA in Hopi Tribal Court. *See Hopi Tribe v. Bureau of Indian Affairs*, No. 2011-cv-0107 (Hopi Tribal Court).

contractor for the RI/FS and performance problems regarding the quality and timeliness of the contractor's deliverables. For example, in correspondence with the contractor, BIA noted multiple instances when the contractor was late in providing draft deliverables to BIA, which did not provide sufficient time for BIA to review the deliverables before they were due to EPA. In addition, when BIA completed its review of the deliverables, it found they did not all meet the terms and conditions of the contract. BIA also noted in its correspondence with the contractor that the contractor's performance problems began soon after the contract was signed. After the problems continued to mount, according to BIA officials, they worked informally through phone calls and e-mails to correct the performance problems; however, BIA did not formally notify the contractor of the problems and require corrective action until about 16 months after the problems began.[47] During that time period, BIA modified the contract four times, each time increasing the work to be performed in accordance with direction from EPA; these modifications totaled nearly $1.6 million, about an 80 percent increase above the value of the original contract. By adding work to the contract without correcting the contractor's poor performance and adding stronger performance provisions, BIA was effectively rewarding the contractor for its poor performance. In hindsight, BIA officials responsible for managing the contract told us, had they known the problems would not improve, they would have initiated formal action against the contractor sooner; however, they were reluctant to further delay the project. Had they terminated the contractor for default, BIA would have had to award a new contract, taking a minimum of 90 days, plus the additional time it would take to bring a new contractor up to speed to perform the contract. The BIA officials said, instead, they prioritized meeting the deadlines in the work plan and avoiding the delay of awarding a new contract. These officials told us that the RI/FS contract, initially valued at approximately $2 million, is not typical for their region and is much larger than any other contract they manage. For example, the next largest environmental contract in BIA's Western region is worth $300,000. Learning from its challenges in managing the RI/FS contract will become even more important to BIA in the next few years as the agency moves from assessment to cleanup work after a remedial action is selected. At that time, BIA officials said their agency will award and

[47]Under the terms and conditions of the contract, BIA issued a cure notice to its contractor on November 9, 2012. The cure notice stated that BIA would terminate the contract within 10 days if the contractor did not cure the conditions stated in the notice that were endangering performance of the contract.

manage a new contract, one that is even larger and more complicated that will increase costs significantly. In August 2011, we reported that incorporating lessons learned from past contracts is an important element of successful acquisition planning when preparing to award a new contract.[48] Through this process, agencies ensure that knowledge gained from prior acquisitions is used to refine requirements and acquisition strategies. Without examining lessons learned from managing the RI/FS contract and considering these lessons as part of the acquisition planning process for the remedial action contract, BIA could face contract management challenges on a larger scale.

Further, according to EPA and BIA officials, BIA's management of the project also contributed to BIA's missing some legally enforceable deadlines in the work plan within months of EPA approving it in July 2012. Specifically, BIA did not comply with the settlement agreement's terms for requesting an extension to these deadlines in the work plan.[49] As a result, BIA was subject to stipulated penalties under the settlement agreement for the deadlines it missed.[50] EPA officials told us the agency held the penalties in abeyance; as a result, EPA did not calculate the total amount of the penalties.[51] As EPA noted in correspondence to BIA, the missed deadlines only led to a few weeks of direct delays to the work plan schedule, but the missed deadlines used much of the contingency, or

[48]GAO, *Acquisition Planning: Opportunities to Build Strong Foundations for Better Services Contracts*, GAO-11-672 (Washington, D.C.: Aug. 9, 2011).

[49]The settlement agreement allows BIA to request an extension to deadlines in the work plan schedule from EPA in advance of a deadline and requires EPA to approve a timely extension request when good cause exists for the extension.

[50]Under the settlement agreement, BIA is liable for specified stipulated penalties per violation per day for failure to comply with any of the agreement's requirements, including failure to perform work as required in the approved work plan and failure to submit timely or adequate reports or documents specified by EPA. EPA reviewed the reasons BIA gave for missing deadlines and considered BIA's past work, as well as its proposal for future work, to determine which missed deadlines were justifiable. According to EPA documents, at least 966 days of missed deadlines in 2012 were unjustifiable, including 54 days due to BIA coordination and contractor performance. EPA held the stipulated penalties in abeyance for the missed deadlines it determined to be unjustifiable.

[51]According to EPA, the issuance of penalties was held in abeyance because of (1) BIA's efforts to correct deficiencies in its management that had led to delays, reattain schedule progress, and comply with an optimized schedule to make up for some delays and (2) project delays that can result from the process of issuing penalties. EPA has reserved the right to issue penalties for the deadlines BIA missed in 2012. Based on EPA documents, the penalties appear at a minimum to be between $443,000 and $887,500.

slack, in the schedule, meaning any future delays could not be absorbed without directly lengthening the project.[52] In 2013, according to EPA officials, BIA notified EPA that it was going to miss another work plan deadline, however, BIA again did not submit the extension request before the deadline passed, potentially subjecting it to additional stipulated penalties.[53]

Further complicating its management of the project, we found that the schedule BIA used to manage its responsibilities under the RI/FS was not created based on best practices for effective scheduling. We have reported that a sound schedule is comprehensive, well-constructed, credible, and controlled.[54] The RI/FS schedule generated by BIA's contractor and approved by EPA minimally met these criteria. For example, we could not verify that the schedule included all the actions needed to complete the RI/FS, which is an essential practice in ensuring that the schedule is comprehensive. If a project schedule does not fully reflect the scope of the project, it can result in unreliable estimated completion dates and delays. In another example, neither BIA nor EPA regularly updated the schedule based on actual progress, an important aspect of a controlled schedule. BIA officials explained that they do not keep a copy of the schedule file that they can update; BIA relies on its contractor to update the schedule, and EPA maintains control of the master schedule file for the RI/FS. Without an updatable version of the schedule, BIA cannot effectively monitor its contractor's progress and cannot evaluate the quality of changes to the schedule proposed by the contractor, which BIA then proposes to EPA for approval. According to BIA officials, not having information about the basis for the proposed schedule changes contributed to the agency proposing a new RI/FS

[52]According to EPA documents, the 966 days of missed deadlines translated into a few weeks' delay because the deadlines were for interim products or actions, and there were multiple concurrent violations.

[53]The work plan deadline for submittal of the draft Remedial Investigation report was on August 23, 2013. BIA requested an extension of this deadline on September 3, 2013, and submitted the draft report on the new deadline of November 15, 2013.

[54]A schedule is comprehensive if it includes all activities for both the government and its contractors necessary to accomplish a project's objectives and realistically reflects how long each activity will take; is well-constructed if all its activities are logically sequenced; is credible if it reflects the order of events necessary to achieve a final outcome and data about risks are used to predict a level of confidence in meeting the project's completion date; and is controlled if it is updated by trained schedulers using actual progress to realistically forecast dates. See GAO-09-3SP and GAO-12-120G.

schedule to EPA in 2012 that contained errors and was not achievable. Appendix II contains additional details about our analysis.

A number of steps remain for BIA to meet the target of completing cleanup at the Tuba City Dump. As of February 2014, the full scope of remaining cleanup work—and an estimate of when it may be completed—had not been determined since the RI/FS was ongoing. BIA requested two extensions to the deadlines in the work plan in 2013;[55] as a result, the current deadline for completion of the RI/FS is May 2014, more than 4 years after the completion date in the 2008 5-year plan. According to BIA officials, the May 2014 deadline may not be achieved. For example, BIA officials said they are expecting the schedule to change to allow for additional time for stakeholders' review of a key draft document and for additional analysis requested by EPA in December 2013. In another example, BIA has continued to experience performance problems with its contractor related to timeliness and product quality. These performance problems prompted BIA to send a second formal notification to take corrective action to its contractor in January 2014. Nevertheless, in the short-term, EPA officials said they plan to conduct extensive outreach with local communities as they evaluate the remedial options for the site. Hopi officials we spoke with stressed the tribe's concern over protecting their water sources in the area and told us that having a contaminated dump located on their land is affecting their ability to expand economic development. Because of these concerns, Hopi officials stated that the only acceptable solution is to remove the contamination from the site. DOE and EPA officials involved at the site told us, however, that the data collected thus far indicate the Hopi drinking water wells will not be affected by the dump, and there are other factors limiting development in the area, including the region's scarcity of water.

Based on two potential remedial actions for the site identified by BIA, the agency has estimated that the range of probable future cleanup costs is

[55]BIA submitted an extension request in September 2013 and another in October 2013. EPA did not initially approve the September 2013 request because it found that BIA had not demonstrated good cause for the extension as required by the settlement agreement. However, EPA did not respond to the September request within the time period required by the settlement agreement so EPA was deemed to have concurred with the extension. EPA did not find the October 2013 request to be justified but did find the October 2013 government shutdown to constitute good cause to adjust the schedule.

from $22 million to $72 million.[56] BIA created this estimate range in order to contribute to the Department of the Interior's (Interior) environmental and disposal liability estimate, which is included in Interior's annual financial statement, but we found the estimate was not generated according to the government and industry cost-estimating best practices identified in our 2009 cost estimating and assessment guide.[57] According to BIA officials, the estimate was created according to Interior's guidance. Nevertheless, according to best practices, cost estimates should be comprehensive, well-documented, accurate, and credible, which are the four characteristics of a high-quality cost estimate of any type, and BIA's estimate does not fully reflect these characteristics. For example, the estimate did not completely define the program, an important aspect of a comprehensive schedule. In response to our questions about some aspects of the work scope that were included in the estimate, including whether future groundwater treatment was included, BIA officials stated that such treatment should be included in the estimate. However, after checking with the contractor that created the estimate, one BIA official involved with managing the project discovered that costs for groundwater treatment were not included in the estimate. Without fully accounting for all future costs, management will have difficulty successfully planning program resource requirements. In response, BIA officials said that they directed the contractor to include these costs in a revised estimate. These officials also said they did not apply all of the best practices when developing the estimate, in part, because it would not have been appropriate for BIA to expend significant resources developing a detailed cost estimate since they have not completed the RI/FS, and that once EPA selects a final remedial action, BIA will work to apply cost estimating protocols when it develops a more detailed cost estimate for the site. Appendix III provides additional details of the results of our analysis of the cost estimate.

[56]BIA and its contractor have estimated the costs for two remedial actions: (1) a low-cost option that involves closing the landfill in place and installing a cap and cover system and (2) a high-cost option that entails excavating the waste and contaminated material and disposing of it offsite.

[57]GAO-09-3SP.

Agencies Have Not Estimated the Full Scope of Work, Time Frames, or Costs Needed to Address Uranium Contamination but Recognize That Significant Work Remains

The agencies that implemented the 2008 5-year plan have not identified the full scope of remaining work, time frames, or costs of fully addressing uranium contamination on or near the Navajo reservation, especially at abandoned uranium mines, but have recognized that significant work remains for addressing such contamination beyond the targets in the plan. As a result, decision makers and stakeholders do not have sufficient information about the overall remaining work, time frames, and costs to assess the overall pace of the cleanup efforts. Given that significant work remains to address contamination on or near the Navajo reservation, it is likely that it will take many decades and cost at least hundreds of millions of dollars in additional funding to make significant progress in this area.

Agencies Have Not Identified the Full Scope of Remaining Work, Time Frames, or Costs Needed to Fully Address Uranium Contamination, Especially at Abandoned Mines

Federal agencies that implemented the 2008 5-year plan have not identified the full scope of work needed to fully address uranium contamination on or near the Navajo reservation, especially regarding the abandoned uranium mines and, as a result, they have not estimated total time frames or costs. Prior to the development of the 2008 5-year plan, the House Committee on Oversight and Government Reform reviewed short-term draft action plans that the agencies had prepared. In a January 2008 letter from the House Committee on Oversight and Government Reform to EPA requesting the development of a 5-year plan, the committee wrote the following:

> The draft action plans do not clearly delineate a course of action for fully resolving the problem. Given the extent of the contamination that is already known, it is obvious that the contamination cannot and will not be cleaned up in the 3- to 9-month timeframes covered by the draft plans. We need a 5-year plan from each agency that sets out specific cleanup objectives, specific timeframes for achieving those objectives, and the new authorities and funding, if any, necessary to achieve those objectives. These plans will provide the Congress, the Navajo Nation, and the public with concrete benchmarks against which to measure the progress of the federal agencies in cleaning up the contamination.

In its critique of the short-term action plans, the committee requested of the agencies additional information to understand the full scope of the cleanup effort. The same critique is also generally applicable to the 2008 5-year plan because it too did not contain information on the full scope of the cleanup and instead provided targets for achieving incremental progress under the plan. For example, it is still unclear what percentage

of the overall cleanup effort was expected to be achieved in the 2008 5-year plan or how many additional 5-year plans may be necessary to fully address the contamination. As we discussed above, the agencies stated that the 2008 5-year plan focused on addressing over the 5-year period what they identified as the most urgent uranium-related problems and was not intended to be a long-term plan for dealing with the entirety of the contamination. EPA officials involved with coordinating the development of the agencies' 2014 5-year plan told us this plan also will not include the full scope of the cleanup work.

EPA officials cited a variety of reasons for not having identified estimates of the full scope, time frames, or costs of cleanup, including at the abandoned mines. These officials explained that providing such high-level, general estimates of required work, time frames, or costs is not consistent with how EPA cleans up contaminated sites under CERCLA. The agency typically develops detailed, site-specific information on a site-by-site basis, and then estimates costs and schedules based on that specific information. They said the agency generally does not create even rough estimates if cleanup actions have not been selected or if they do not know the total number of mines that will need cleanup. These officials also said that a number of other uncertainties remain. More specifically,

- *Incomplete information about the extent of contamination.* According to the January 2013 report summarizing the agencies' accomplishments under the 2008 5-year plan, EPA and NNEPA's actions resulted in an improved understanding of the scope of uranium contamination at the mines on the reservation, and the agencies identified and prioritized 43 mines that pose the highest risk to surrounding communities. EPA, however, does not know the full scope of cleanup actions that will be necessary to address these highest priority mines (see app. IV for more information about the status of each of the 43 mines), and EPA officials said they expect that some number of the rest of the 521 abandoned mines will also need cleanup, but they do not know what that number will be. EPA officials said that they need additional information about, for example, the location and volume of waste present at each site before they can

identify the scope of cleanup actions.[58] However, EPA officials told us they have begun making assumptions about what work may be needed at the highest priority mines based on the site-specific information they have already collected. These officials stated that they expect that most of the highest priority mines will need removal actions, involving excavating and disposing from a few thousand to hundreds of thousands of cubic yards of mine waste at each mine, and a few of these mines may warrant longer-term remedial actions where surface water and/or groundwater may be contaminated.

- *Uncertainty about potentially responsible parties.* According to EPA officials, the total number of abandoned mines that will have a potentially responsible party to lead or contribute funding for assessment and cleanup work is unknown, and this number will affect the scope of work, time frames, and costs necessary to clean up abandoned mines using federal funds. As of February 2014, EPA had signed agreements with potentially responsible parties regarding 24 mines and received money from a bankruptcy settlement for use at another 49 mines—these actions covered 9 of the 43 highest priority mines. EPA Region 9 officials said they are continuing to pursue potentially responsible parties, but the total number of mines that could ultimately be subject to agreements with such parties may be limited, in part, because of difficulties associated with identifying parties more than 50 years after mines were abandoned. Further, there are other reasons why the government's ultimate share of the cleanup costs is unknown. If the federal government is a potentially responsible party at a site, it is liable for the cleanup costs even if a viable nonfederal potentially responsible party is also identified. Also, in November 2013, the Navajo Nation formally stated its intent to file a claim against the United States, and DOE in particular, for reimbursement of its cleanup costs at the abandoned mines on the reservation if a cooperative approach is not successful, which could further affect the government's share of those costs.

[58]EPA has already selected cleanup actions at 2 of the 43 highest priority mines: Skyline mine, where the cleanup action was selected and has been conducted, and Northeast Church Rock mine, where EPA has selected the removal action but it has not been completed. According to EPA officials, since they conducted the cleanup at Skyline mine to be protective of human health and the environment in the long term, they consider the cleanup action to be complete. The Navajo Nation, however, considers the cleanup to be temporary given its current position regarding removing all mine waste from the reservation.

- *Uncertainty about disposal options.* Another uncertainty that affects the scope, time frames, and costs of the remaining abandoned mine work is where the mine waste will ultimately be disposed. Currently, the Navajo Nation's position is that all remaining contaminated materials from uranium mines and at processing sites should be excavated and disposed off of Navajo lands. As a result, it is unclear where the volumes of mine waste will be disposed. As of January 2014, the Navajo Nation was working on drafting legislation to create a Uranium Commission under Navajo law that is expected to recommend options for mine waste disposal. However, according to a Navajo Nation official involved with the process, this commission is not expected to make any disposal recommendations until sometime in the next few years.

Even when significant uncertainties regarding the scope of work and available funding remain, however, we have reported that agencies can create high-level estimates of costs and time frames that can be useful for decision makers and stakeholders.[59] For example, EPA can base these estimates on the information it currently has regarding the removal actions that may be necessary at most of the highest priority mines. Specifically, according to our 2009 cost estimating and assessment guide of government and industry cost-estimating best practices, agencies can create high-level cost estimates—for example, rough order of magnitude estimates—for efforts, even with significant uncertainties, that can inform decision makers as they evaluate resource requirements. These cost estimates are often in the form of a range to correspond with the level of uncertainty associated with the estimate and can be developed in short time frames of weeks or months. Although not budget-quality estimates, these types of estimates can be used in planning and can be created before detailed requirements are known. Typically, according to our 2009 cost estimating and assessment guide, an estimate should be revised and contain more detail as the agency obtains more site-specific information and the effort becomes better defined, and the estimate should become more certain as actual costs begin to replace earlier estimates. For example, as EPA obtains more detailed information about the site-specific characteristics at each of the highest priority mines, it would be able to update the scope of its estimate, bringing more certainty. According to our 2009 cost estimating and assessment guide and our

[59]GAO-09-3SP.

2012 schedule assessment guide,[60] agencies can also create high-level schedules that are linked to cost estimates, based on stated assumptions, and that incorporate uncertainties regarding future activities through a schedule risk analysis. The risk analysis provides agencies with a range of dates that correspond with levels of confidence in the ability to meet those dates.

As further evidence that it is possible to develop these types of high-level estimates, the National Defense Authorization Act for Fiscal Year 2013 requires the Secretary of Energy, in consultation with the EPA Administrator and the Secretary of the Interior, to undertake a review of and prepare a report on abandoned uranium mines across the United States that previously provided uranium ore for the nation's nuclear defense activities.[61] According to DOE documents, the agency plans to issue a report in July 2014 that will include information about the potential costs and feasibility of reclaiming or remediating abandoned uranium mines, including the mines on or near Navajo lands. According to a DOE presentation on the draft report, the report is expected to contain cost estimate ranges based on the amount of uranium ore produced at the mines, among other assumptions. A DOE official involved with developing the draft report told us that the cost estimate ranges are not specific to mines on the Navajo reservation but are based on production size categories of mines across the United States that provided ore to the Atomic Energy Commission. This work by DOE could be a good starting point for a high-level cost estimate to clean up the uranium mines on or near the Navajo reservation; however, based on the statutory requirements for the study, we neither anticipate that it will provide information on the full scope or costs of any other activities covered in the 2008 5-year plan nor any time frames.

[60]GAO-12-120G.

[61]Specifically, this report is required to identify the locations of abandoned uranium mines across the country, including on the Navajo reservation; describe the risks associated with the mines; prioritize the remediation and reclamation of the mines; analyze the cost of remediating and reclaiming each mine; and describe the status of any efforts to remediate and reclaim the mines. Pub. L. No. 112-239, § 3151 (2013). The statutory reporting deadline is July 2, 2014. According to DOE, the agency met with EPA and Navajo agencies, as required, to ensure that all mines on Navajo lands are incorporated in the report.

Although EPA, DOE, BIA, IHS, and NRC provided some information on high-priority cleanup issues in their 2008 5-year plan, the agencies did not provide the House Committee on Oversight and Government Reform with overall estimates of the remaining scope of work, time frames, and costs of fully addressing uranium contamination on or near the Navajo reservation as requested. Without an estimate of the remaining scope of work, time frames, and costs to fully address uranium contamination, especially at the abandoned mines, decision makers and stakeholders neither have the information they need to assess the overall pace of the cleanup efforts, nor do they have a basis to put the agencies' accomplishments under the 2008 5-year plan into perspective. Navajo Nation officials and other stakeholders told us that they want the federal agencies to describe the full scope of work that remains to fully address the contamination.

Agencies Recognize That Significant Work Remains to Address Uranium Contamination

Although the agencies have not identified the full scope of work that remains to address uranium contamination on or near the Navajo reservation, through implementing the 2008 5-year plan, federal and tribal agencies have compiled information that shows that significant work is needed. For some plan objectives, the agencies have developed a significant long-term scope of work, including the objectives of providing regulated, piped drinking water to Navajo residents in uranium-affected areas, treating groundwater contamination at the former processing sites, and at the abandoned mines. For example, to help lower the number of Navajo residents without access to regulated, piped drinking water in their homes and to continue reducing the use of unregulated and potentially contaminated water sources, IHS developed a list of 145 potential water infrastructure projects that would serve approximately 3,300 homes that do not have piped water.[62] IHS, however, considers just 36 of the 145 projects—serving about 1,000 homes—as economically feasible to fund, according to IHS documents, so it is unclear how many of the 145 projects will ultimately be undertaken by IHS. In another example, according to DOE officials, the agency will continue its active groundwater remediation work at the Rare Metals and Shiprock processing sites, but the future scope of work at the sites is unclear. This is, in part, because the remediation systems that were designed to address contamination

[62]In 2012, IHS estimated that there were approximately 5,500 homes on the entire Navajo reservation without piped water.

from millions of gallons of water contaminated by mill tailings that entered the ground at these sites are not performing as anticipated.[63] As a result, DOE has not made as much progress toward meeting water quality standards as it originally projected. According to DOE officials, they plan to revise the two sites' groundwater compliance action plans beginning in 2014 and 2015, and these revised plans will dictate the future scope of work at these sites.

For EPA's work at the abandoned uranium mines, although many uncertainties remain about the full scope of work needed to clean up the mines, EPA and Navajo Nation officials said that they recognize that the amount of work will be significant. During the 2014 5-year plan period, EPA officials said, in order to obtain additional information needed to select removal or remedial actions at the highest priority mines, the agency plans to conduct additional assessments at 41 of the 43 highest priority mines, beyond the initial screening information gathered during the 2008 5-year plan period, in cooperation with potentially responsible parties where applicable. EPA and NNEPA officials said these additional assessments range from, at a minimum, scanning the entire site to identify the likely boundaries of contamination and conducting tests to estimate the volume of waste present, to conducting more thorough assessments.[64] These officials told us they do not anticipate conducting cleanups at any mines without potentially responsible parties that would require full funding from EPA during this time period. Appendix V contains additional information about the future work associated with the other 2008 5-year plan objectives not discussed here.

[63]Specifically, according to DOE officials, lower volumes of groundwater present underneath the Rare Metals site have resulted in reduced efficacy of the pump-and-treat system. DOE has operated the system since 2002, and it has not observed significant or widespread decreases in the concentration of contaminants under the site. DOE officials estimate it could take 400 years to achieve water quality standards with the current system. Similarly, at Shiprock, DOE has run a pumping system for the past 10 years, but it has not decreased overall contamination levels, although the extent of one plume has decreased, and many previously existing contaminant seeps have gone dry. DOE estimated in 2002 that it would need to operate portions of the pumping system for up to 60 years; however, DOE officials said that they have not recalculated that number in light of actual performance of the system.

[64]The more thorough assessments, as we refer to them here, include (1) a site evaluation, including an engineering evaluation/cost analysis, to support a non-time critical removal action or (2) an RI/FS to support a remedial action.

Full Scope of Additional Work Will Likely Take Many Decades to Complete

Given what is known about the significant scope of work that agencies have recognized as remaining to address uranium contamination on or near the Navajo reservation, it is clear that, at current funding levels, it could take at least many decades to complete.

For example, at the abandoned uranium mines, EPA officials said that they are assuming that most of the remaining 42 of the 43 highest priority abandoned mines will need additional removal actions. For one of the highest priority mines—the Skyline mine—EPA has conducted a removal action to clean it up, but the waste remains on the reservation. In the absence of an EPA-estimated time frame, we roughly estimated time frames using information from EPA officials about the number of removal actions that they said they assumed EPA will need to fund and the costs of the agency's removal action for the Skyline mine.[65] Specifically, assuming viable nonfederal potentially responsible parties can be identified for about half of these highest priority mines, which EPA officials said is a reasonable early assumption, federal funds would be necessary to cover the full cost of removal actions at the other half of these mines, or 21 mines.[66] Over the 2008 5-year plan period (i.e., 2008 through 2012), EPA funded the removal action at the Skyline mine from Region 9's Superfund removal budget, spending about $7 million. Assuming Region 9's Superfund removal budget funding levels from the 2008 5-year plan period continued, it would take EPA 105 years to fund the removal actions at 21 of the highest priority mines. According to our rough estimate, it would take even longer to also address the unknown number of mines without potentially responsible parties that will also need cleanup, but which have not been identified.

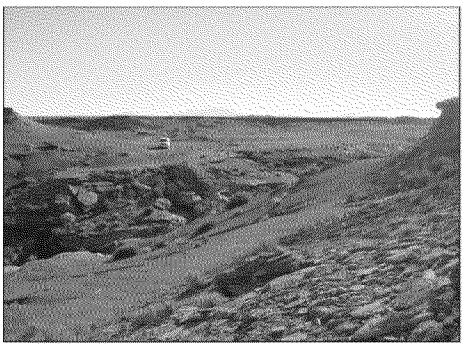
Moreover, during the decades-long time frames for conducting cleanup at the highest priority abandoned mines, the Navajo people living near these mines could continue to be exposed to elevated radiation levels that pose

[65]We created this rough estimate based on the following assumptions: (1) EPA would need to fully fund removal actions at 21 of the highest priority mines that most likely will not have a potentially responsible party available to contribute to the costs; (2) the costs for these removal actions would average, at a minimum, what EPA spent on the removal action conducted at Skyline mine, or about $7 million; and (3) EPA Region 9's Superfund removal budget funding levels from the 2008 5-year plan period continue into the future.

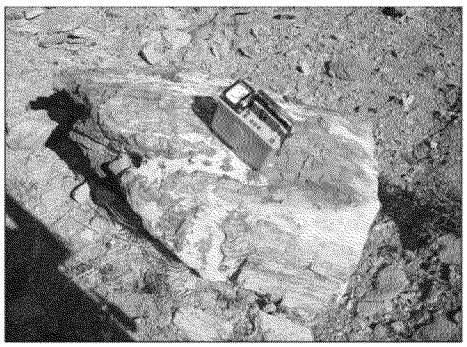
[66]In addition, if the federal government is a potentially responsible party at any of these highest priority sites, it is also liable for cleanup costs, thereby increasing the amount of federal funds necessary for cleanup.

a high risk, either by visiting the abandoned mines or by inhaling or ingesting contaminated dust that migrates from the mines into communities. For example, as of February 2014, 38 of the 43 highest priority mines remained physically accessible and/or there were no signs communicating the radiation dangers present at the sites. We visited one such mine—the A&B #3 mine near Cameron, Arizona—in July 2013, where EPA measured radiation levels that were 37-times above background (see fig. 8). The mine is not signed or fenced and is located within one-quarter mile of nearby homes. According to a local government official and a Navajo agency official, they have seen evidence that people visit the mine site; they told us they have found children's toys at the site and pointed out vehicle tracks.

Figure 8: Photographs of A&B #3 Mine, Uranium-Bearing Rock Located On-site, and Nearby Homes and Structures

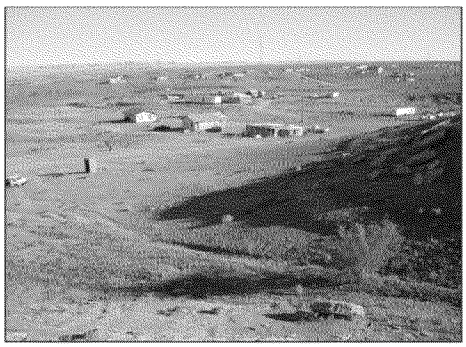


View of the A&B #3 mine.



Source: EPA.

EPA measuring elevated gamma radiation on a rock at the A&B #3 mine.



Looking at nearby homes and structures from the A&B #3 mine.

In addition, the time frames associated with addressing contamination under other plan objectives are lengthy as well. For example, IHS officials estimated that it would take approximately 38 years to complete 36 of the 145 projects it identified as necessary to provide regulated, piped drinking water to residents of areas affected by historic uranium mining, assuming IHS were the sole contributor of funds and based on IHS's Navajo Area water program budget for fiscal year 2013. During this time frame, residents may continue to be exposed to harmful constituents potentially found in unregulated drinking water sources. EPA and NNEPA officials told us that although the official position of the Navajo Nation is that unregulated water sources are not fit for human consumption, they continue to receive reports that Navajo residents use these sources, in part if there is no alternative, but for other reasons as well. In addition to health dangers posed by drinking uranium-contaminated water, which

ATSDR and others have linked to kidney disease, IHS and EPA consider the general lack of regulated drinking water to be a health risk because contaminants often found in unregulated sources, such as *E. coli* bacteria, can pose an immediate health danger to people that consume them.[67] Appendix V contains additional information about the potential future time frames associated with the other 2008 5-year plan objectives not discussed here.

The Scope of Additional Work Will Most Likely Cost Hundreds of Millions of Dollars

For the significant amount of remaining work to address uranium contamination that federal agencies recognize is needed, it appears that associated costs could exceed hundreds of millions of dollars. For example, in the absence of a cost estimate from EPA for work at the abandoned mines, our rough estimate based on previously incurred costs by EPA at the Skyline mine indicates that EPA's costs to fund removal actions at just half of the highest priority mines, or 21 mines, could be a minimum of about $150 million.[68] This is a conservative, low-end estimate for a number of reasons but, most importantly, because it does not include costs to transport and dispose of waste off-site.[69] According to EPA officials, this is one of the most significant factors influencing cleanup costs; disposing of waste offsite is consistent with the Navajo Nation position that such waste be removed from Navajo lands.

Other federal agencies have developed cost estimates for addressing contamination under other plan objectives, and the costs for these efforts appear to reach into the hundreds of millions of dollars as well. For example, IHS officials estimated that the 36 economically feasible drinking water projects would cost about $35 million, and that all

[67]Further, a NNEPA water program official explained in a presentation that, even if the residents choose to haul water from a regulated source, CDC found that the cisterns used by many residents to store their water at their homes contained bacteria, which could contaminate clean water hauled and then stored in the cistern.

[68]This estimate is based on the same assumptions as our time frame estimate.

[69]According to EPA officials, Skyline mine was a small-sized mine, and these officials said they believe it represents the low end of costs for these mines. In addition, EPA did not incur transportation costs at Skyline mine because the agency disposed of the waste in a newly constructed cell located on-site.

145 projects would cost about $195 million to complete.[70] In another example, DOE has estimated that its various actions at the former processing sites will cost about $193 million over the next 75 years, but DOE officials said that this estimate will need revision based on new groundwater remediation plans at the Rare Metals and Shiprock sites.[71] Appendix V contains additional information about the potential future costs associated with the other 2008 5-year plan objectives not discussed here.

Agencies Face Challenges Meeting Funding Needs and Engaging Affected Communities, Though Opportunities Exist for Improving Relationships with the Navajo and Hopi People

Federal agencies face a variety of challenges in continuing to address uranium contamination on and near the Navajo reservation, including securing adequate funding and effectively engaging tribal communities. However, federal and Navajo agency officials and community members we spoke with identified opportunities for improving relationships with the Navajo and Hopi people, which could help the federal agencies more effectively engage these communities. In addition, other opportunities exist to enhance collaboration with federal agencies and with Navajo agencies.

[70]A senior Navajo Area IHS official told us that the agency funded 7 of the 36 projects in fiscal year 2013, after the 2008 5-year plan was complete. Therefore, the remaining 28 economically feasible projects are estimated to cost about $29 million.

[71]DOE created its estimate to contribute to the agency's environmental liability estimate and includes anticipated work associated with the four former processing sites on the Navajo reservation, DOE's cooperative agreements with the Navajo Nation and Hopi Tribe, and the expected disposal of waste from Northeast Church Rock mine at a former processing site just off the reservation.

Adequate Funding for Continued Efforts to Address Uranium Contamination Is a Key Challenge

One key challenge that federal agencies face is difficulty meeting funding needs with available federal resources. Specifically, according to EPA Region 9 officials, funding for EPA's efforts to assess and clean up abandoned uranium mines under its Superfund removal program, especially those without viable private, potentially responsible parties, and to provide clean and safe drinking water is expected to decrease from funding levels that have been available from 2008 through 2012. EPA officials told us that reducing the human health risks associated with abandoned uranium mines on the Navajo reservation is a priority and that the agency intends to continue providing funding as resources allow. However, these officials stated that declining Superfund removal program resources nationally will likely result in a reduction in funding available to conduct removal actions at Navajo abandoned mines from the level available in previous years. An EPA Region 9 official familiar with funding tribal drinking water projects on the Navajo reservation also told us that federal resources available for drinking water infrastructure projects are expected to continue to decrease.[72] In addition, as federal funding resources for abandoned mines and water projects become more constrained, such projects on the Navajo reservation may be less likely to receive federal funds because the programs by which they are funded prioritize projects based on risk. For example, under the EPA Superfund removal program, which EPA has used to pay for assessment and cleanup at the Navajo abandoned mines, projects that address emergency situations, such as toxic waste spills, are prioritized for funding over projects that generally are not considered emergencies, like the abandoned mine projects. EPA officials have prioritized the Navajo abandoned mine projects, but these officials told us that there is already a high demand for Region 9's Superfund removal program funds with more projects that warrant selection than available funding.

Moreover, with few exceptions, federal agencies currently have limited options for other sources of federal funding for uranium-related work on the Navajo reservation. For example, according to EPA Region 9 officials, one possible source of funding for the typically longer-term remedial

[72]The Safe Drinking Water Act Amendments of 1996 established the Drinking Water State Revolving Fund, which provides annual funding to states to finance projects for publicly and privately owned drinking water treatment systems. Specifically, states use the funding to provide low- or no-interest loans to communities or utilities, which, when repaid, allows the funding of future loans for additional projects. Tribes receive funding through a set-aside account that represents a percentage of the total appropriation for the fund.

actions that may be warranted at a few of the highest priority mines without potentially responsible parties is the Superfund Trust Fund. Although the Superfund Trust Fund can be used for removal actions at all sites, it can only be used for remedial actions at sites that are included on the NPL.[73] None of the Navajo abandoned mines are currently listed on the NPL, and, according to EPA Region 9 officials, only a few of the highest priority mines on the reservation may qualify for listing. In general, according to these officials, to score high enough in the Hazard Ranking System to be included on the NPL, an abandoned uranium mine would need to impact a sufficient number of people using a drinking water supply contaminated by the mine, expose a sufficient population to uranium through air or soil contamination, or impact a sensitive environment such as a wetland. However, given the locations and characteristics of the mines on the reservation and the population or environment affected, these officials said they believe most mines do not meet these criteria. For example, EPA officials told us that even the Navajo mines located near communities affect relatively small populations given the dispersed nature of the Navajo population, and the surrounding desert conditions mean that most of the mines do not appear to impact surface water. EPA officials said that community members in rural communities, including Navajo communities, have expressed a deep frustration with the ranking system used to determine sites' inclusion on the NPL because they feel that the system unfairly discriminates against small communities. Nevertheless, EPA officials said they will continue to pursue including some of the mines on the NPL in order to use the Superfund Trust Fund to pay for remedial actions.

Another potential source of federal funding is Interior's Central Hazardous Materials Fund (Fund), an appropriation available to pay for Interior's CERCLA response actions. BIA received $162,000 from the Fund for the Tuba City Dump site, in 2008 and 2009. According to BIA officials, this money was used, in part, to search for another potentially responsible party at the site, pay for project oversight, and hire a technical consultant. In 2011, Interior issued a memorandum stating that CERCLA response actions on Indian trust lands were no longer eligible to receive money from the Fund. BIA officials told us, based on this memorandum, they believed that they were no longer eligible to obtain money for assessment

[73]According to EPA officials, EPA Region 9 has used the Superfund Trust Fund to pay for removal actions through its removal program.

or cleanup work at the Tuba City Dump. These officials said that they have not requested funding from the Fund to pay for assessment work and do not plan to request funding for the eventual remedial action at the site. However, Interior's memorandum also stated that the Fund would continue to fund cleanup-related activities on Indian trust lands if BIA had received funding for cleanup-related activities, including those undergoing CERCLA assessments, in the past. According to a senior Fund official, because the Tuba City Dump site received Fund money prior to 2011, it is eligible to receive additional funds, including funding for the remedial action work. Pursuing this funding is important for two reasons: (1) once the remedial action has been selected, BIA's funding requirements are likely to increase substantially (BIA estimated the remedial action could cost about 3- to 10-times as much as the RI/FS), and (2) federal standards for internal control encourage agencies to strive for efficiency in their use of resources.[74] Since the Tuba City Dump is located in BIA's Western region, the agency has paid for its work at the site out of that region's budget. According to BIA officials, BIA has prioritized the Tuba City Dump project over other projects in the region that also need funding, which has resulted in some projects not receiving funding when BIA's costs at the Tuba City site were especially high.

In addition, EPA is pursuing two other funding sources to contribute to the work at the abandoned mines. First, EPA and a potentially responsible party have reached an agreement to settle a pending lawsuit which, if approved by the judge presiding over the lawsuit, could result in approximately $1 billion for the agency's and the Navajo Nation's cleanup efforts at 50 mines and other contaminated sites.[75] Second, EPA has sought to involve DOE in assessments and potentially cleanups at mines that do not have potentially responsible parties. In June 2013, EPA Region 9 corresponded with DOE, stating that DOE's financial assistance with developing and implementing an approach to conducting assessments, interim actions, and cleanups at highest priority mines on the Navajo reservation is essential. Senior DOE officials told us they interpreted the letter as encouraging DOE to play a larger role in addressing the contamination from the mines on the reservation by

[74]GAO, *Standards for Internal Control in the Federal Government*, GAO/AIMD-00-21.3.1 (Washington, D.C.: November 1999).

[75]79 Fed. Reg. 20910 (Apr. 14, 2014); *In re: Tronox, Incorp., et al*, Case No. 09-10165 (Bankr. S.D. N.Y.).

funding assessment and cleanup at some of the mines. In January 2014, DOE responded to EPA that, although the National Defense Authorization Act for Fiscal Year 2013 required a DOE report on abandoned uranium mines, DOE was not given budget authority in fiscal year 2013 to remediate uranium mines, and its authority to take remedial actions under UMTRCA, which was limited to the former uranium processing sites and vicinity properties, has expired.

Engaging Tribal Communities Continues to Be a Key Challenge

Another key challenge faced by federal agencies is identifying ways of more effectively engaging with tribal communities. According to outreach plans prepared by DOE and EPA, and other documents prepared by various federal agencies, engaging with communities is important for a number of reasons, including soliciting feedback on the decision-making process, obtaining meaningful input into cleanup decisions, and working with community members to determine how best to limit exposures to uranium contamination. During the 2008 5-year plan period, federal agency officials increasingly recognized the importance of community engagement and began building bridges in the communities where they conducted work, both by developing relationships themselves, and by funding Navajo agency officials' outreach work. Even with the federal agencies' increased attention to outreach activities, agency officials and community members we spoke with said that the need for increased and improved outreach is great. Nevertheless, federal agencies face challenges in their ongoing efforts to effectively engage Navajo communities for at least four reasons: (1) building trust may require significant time and effort on the Navajo reservation, (2) the number of outreach staff is small compared with the size of the reservation, (3) commonly used tools for engaging communities may not be effective in Navajo communities, and (4) federal agencies have not coordinated their outreach efforts.

Building Trust

Agency officials and community members we spoke with said that although building trust among the Navajo people is necessary to effectively engage local communities, it will take significant time and effort. One reason for this is that many members of the Navajo community distrust outsiders—especially those representing the federal government—because of historical events, related to both uranium mining and the government's treatment of Native people. The federal government's inconsistent attention to uranium-related issues on Navajo lands in recent decades may also have contributed to a lack of trust among community members. For example, according to EPA Region 9 officials, EPA compiled a list of potentially contaminated houses on the

Navajo reservation in the 1970s, but it did not take steps to ensure that all houses on the list were assessed for contamination until it began work under the 2008 5-year plan.[76] Distrust of the federal government is also exacerbated by concerns about ongoing issues, such as fears that federal agencies will issue permits for new uranium mining near the Navajo reservation before contamination from previous mining is fully addressed.[77]

Another reason why building trust will be a challenge is because Navajo community members are concerned that the federal agencies that worked on the 2008 5-year plan may not have a long-term commitment to addressing uranium contamination, according to Navajo Nation officials and some stakeholders. For example, Navajo community members have expressed disappointment that the 2008 plan encompassed just 5 years' worth of work when, in their view, fully addressing the effects of contamination will take decades of commitment. A long-term commitment—along with completing cleanup work—could help build trust with Navajo communities. One challenge the federal agencies will continue to face in addressing these concerns, however, is that, in some cases, the agencies are limited in the types of long-term commitments that they can make. For example, EPA officials explained that the agency cannot commit to cleaning up even the 43 highest priority mines at this time because they do not have dedicated funding for addressing the highest priority mines that do not have potentially responsible parties and are not listed on the NPL. This is in contrast to the situation at the former

[76]EPA Region 9's Office of Air and Radiation developed the list of potentially contaminated structures, and officials from the region's Superfund program told us they were not aware of the list until the Navajo Nation presented it at a 2007 congressional hearing on Navajo uranium contamination. A NNEPA program official told us that, subsequently, in assessing homes on the list for contamination, one homeowner asked her if she had come to retrieve an old radon testing canister. The home owner presented the official with the canister—stamped with EPA's name and logo—and told her that EPA had placed the canister in her home in the 1970s or early 1980s but had never returned to communicate the results.

[77]In recent years, some mining companies have expressed a renewed interest in uranium mining on or near the Navajo reservation. For example, since 2005, one company has pursued NRC approval to renew its license for uranium mining on four sites in New Mexico that are near the reservation, according to NRC officials we spoke with. In 2012, the company also signed an agreement with the Navajo Nation allowing it to cross tribal trust land in order to access a site where it has been conducting exploration; however, the agreement specifically states that the company cannot begin mining uranium on that site until legacy waste at that site and an adjacent site has been cleaned up.

uranium processing sites, where DOE must prepare and implement a long-term surveillance plan for disposal sites, in accordance with NRC regulations implementing UMTRCA.[78]

In addition, building trust is a challenge because Navajo Nation officials and some stakeholders told us they are frustrated by what they see as examples of environmental injustice.[79] These are instances when uranium contamination on the Navajo reservation appears to be treated differently than contamination on non-Indian lands, such as the community in Moab, Utah, where DOE is excavating a large mill tailings pile and disposing of it elsewhere.[80] In another example of environmental injustice on the Navajo reservation, high-level Navajo officials and others have said that the release of radioactive materials from the uranium processing site near Church Rock, New Mexico, has received far less attention nationally than the radioactive release at Three Mile Island—which occurred 4 months earlier—although the amount of radioactive materials released in the later incident was significantly greater.

Finally, some tribal agency officials we spoke with told us they believe the federal agencies had fostered mistrust by sometimes overstating their progress in addressing uranium contamination on the Navajo reservation. Specifically, some high-level Navajo Nation officials have stated that they believe the federal agencies have understated the scope of the uranium contamination problem on the Navajo reservation and have overstated the federal agencies' efforts in addressing the problem. For example, Navajo Nation officials said they were frustrated that the federal agencies' January 2013 summary report, published at the end of the 2008 5-year plan period, highlighted the agencies' accomplishments but did not

[78]42 U.S.C. § 7914(f)(2);10 C.F.R. § 40.27(b), (c).

[79]In October 2011, we reported on EPA's efforts for promoting environmental justice, that is, the fair treatment and meaningful involvement of all people in developing, implementing, and enforcing environmental laws, regulations, and policies. The concept of environmental justice is based on the belief that communities with large numbers of minority or low-income residents frequently shoulder a disproportionate share of environmental and health risks. Many of these communities are located in areas within close proximity to sources of pollutants that can adversely affect both the environment and human health. See GAO, *Environmental Justice: EPA Needs to Take Additional Actions to Help Ensure Effective Implementation,* GAO-12-77 (Washington, D.C.: Oct. 6, 2011).

[80]The project involves relocating 16 million tons of tailings and tailings contaminated soil. DOE estimates that the project will be completed in 2025, at a total project cost of about $1 billion.

identify or communicate the larger context: that, overall, significant progress has not been made in addressing uranium contamination on the reservation.

Limited Number of Outreach Staff

Federal and tribal agency officials we spoke with said that the number of federal and tribal agency outreach staff working on engaging Navajo communities about uranium-related issues is very small compared with the size of and conditions on the reservation. Outreach staff are responsible for engaging communities that are spread out over three states across the 24,000 square-mile reservation. Many of these communities are not only remote, but they are also difficult to access because of harsh terrain and rough roads.

- *Dedicated outreach staff.* As of November 2013, EPA Region 9 had the full-time equivalent of 1.5 outreach staff working on Navajo uranium issues, including only one staff member who speaks Navajo. EPA outreach staff are not based on the Navajo reservation, and travel time between the reservation and Region 9 headquarters in San Francisco limits the amount of time that staff are able to spend engaging communities. In addition to EPA outreach staff, NNEPA has one outreach staff member dedicated to uranium issues, and one additional staff member who incorporates outreach in her work. NNEPA's dedicated staff person, however, is responsible for activities in addition to community outreach, such as interfacing with the media on uranium-related issues, and this staff person told us that she cannot meet all the outreach needs put before her. For example, she said that coordinating with IHS on outreach events could be a full-time position, but that she is limited by other demands on her time.
- *Other staff conducting outreach.* Other federal and tribal agencies that worked on the 2008 5-year plan conduct outreach as part of their activities, but they do not have dedicated staff working full-time on uranium-related outreach to Navajo communities. For example, IHS has two staff members who engage with communities on uranium issues, in addition to their other responsibilities, and DOE has one staff member who performs outreach activities in addition to her site management responsibilities. The Navajo Abandoned Mine Lands Reclamation/UMTRA department's public affairs staff, under the UMTRA program's cooperative agreement with DOE, has engaged Navajo communities to discuss concerns about former processing sites located on the reservation. In addition, the Navajo Nation Division of Health has used ATSDR funding to hire staff who conduct outreach activities as part of their responsibilities related to implementing the Navajo Birth Cohort Study.

Limitations of Common Outreach Tools

For a variety of reasons, commonly used tools for communicating with communities—such as disseminating written materials, including brochures or e-mails, and putting up signs and fencing off contaminated areas—may generally be less effective on the Navajo reservation. For example, written materials may be less effective because Navajo and Hopi are traditionally spoken languages—not written languages—and many community members learned English as a second language. Also, many residents are not connected by Internet or telephone in their homes. According to EPA and NNEPA officials, the most effective way to communicate with many members of Navajo communities is through face-to-face interactions, which requires trusted native speakers and is more time-consuming than written communications. Furthermore, although signs and fences may be used to communicate information about risks from contamination, they may be less effective on the Navajo reservation. In part because of differences in how Navajo people traditionally view the land, it is generally not acceptable to restrict the use of reservation lands, although there are some exceptions, such as those related to grazing uses and home sites. As a result, knowledgeable EPA officials told us they did not believe that signs and fences would be sufficient to limit access to contaminated areas because they felt signs and fences would be disregarded. As an example, these officials told us that a mining company had erected a fence to restrict access to an area contaminated by uranium, but, rather than staying out of the area, a community member had instead used the fence to contain his livestock, confining them in the very area to which the agency was trying to restrict access. Furthermore, according to these officials, physical structures such as signs and fences are difficult to maintain in remote areas of the reservation, where vandalism and theft pose challenges.

Moreover, providing information, regardless of delivery method, may itself be a limited tool for changing behavior because, in many cases, no acceptable alternatives are available. For example, according to Navajo agency officials and community members with whom we spoke, some community members—because they do not have a better alternative—continue to get their drinking water from unregulated livestock wells that may be contaminated with uranium and other toxins, even though some of these community members understand that doing so is unsafe. Some community members we spoke with said that they used unregulated water sources for domestic purposes, such as cooking and drinking, and that more education would not be effective in changing this behavior until better alternatives were made available.

Limited Federal Agency Collaboration on Outreach Efforts

Federal agencies that worked on the 2008 5-year plan have not generally coordinated their outreach efforts. Although the agencies began hosting joint workshops for stakeholders in 2008, according to agency officials, the agencies generally have conducted their own public meetings in communities without inviting other agencies to participate. Agency officials told us that not coordinating outreach poses a challenge to effectively engaging communities because community members often expect these meetings to cover a variety of uranium-related issues, regardless of whether those issues fell within the jurisdiction of the agency present. For example, according to an EPA official we spoke with, when EPA conducted outreach related to abandoned uranium mines, community members often had questions about other uranium-related topics, such as health effects. In some cases, the limited scope of issues covered in community meetings has caused significant frustration among community members, according to EPA and IHS officials. An EPA official told us that this may hamper the efforts of outreach staff to build relationships in tribal communities. Because the costs of attending community meetings can be high for both federal agencies and community members—many of whom travel significant distances to attend the meetings—EPA officials said they realized it is important to maximize each contact that they have with affected communities. Officials from multiple agencies told us they recognize the value in coordinating on outreach and have begun to coordinate their efforts by, for example, holding joint community meetings. For example, in March 2012, IHS and DOE met jointly with community members to discuss the Shiprock former uranium processing site, including concerns about health impacts. In another example, in 2013, EPA and IHS jointly hosted a health screening in one Navajo community for residents who had been living in contaminated homes that were being demolished through EPA's actions to address and replace contaminated structures.

Opportunities Exist to Improve Federal Agencies' Relationships with the Navajo and Hopi People

Federal and Navajo agency officials and community members we spoke with identified a number of opportunities that federal agencies could pursue to improve relationships with the Navajo people, as well as with the Hopi people affected by the Tuba City Dump. Opportunities identified for improving relationships with tribal communities include the following:

- *Provide information on long-term scope of work.* Federal officials and community members identified opportunities for federal agencies to provide a more complete picture of the scope of the uranium contamination problem and their progress toward addressing the problem. For example, some community members, including

participants at one of the agencies' stakeholder workshops, told the agencies they would like to see the next interagency plan cover a period longer than just another 5 years because they believe it is clear that the amount of work remaining will take significantly longer than 5 years. Stakeholders said that including information about the long-term scope of work in the next plan would increase their ability to hold the agencies accountable and provide a benchmark against which they can measure the agencies' progress.

- *Conduct in-person outreach.* Federal officials and community members identified opportunities for federal agencies to improve their relationships with Navajo communities—and the Hopi people affected by the Tuba City Dump—by conducting in-person outreach where possible, although such methods are resource intensive. For example, in a community involvement plan created to guide its outreach related to the Tuba City Dump, EPA noted that distributing information in small group or door-to-door settings assists in developing trust and keeping misunderstandings of new materials and information to a minimum. According to the plan, the Hopi people have regularly requested that federal agencies rely on in-person outreach methods when feasible. The plan stated that although it is not feasible to distribute all information in person, doing so conveys to community members that they are important and are part of the process.
- *Establish agency offices on or near the reservation.* One way agency officials identified to establish a more constant presence on the reservation would be for federal agencies that do not already have offices nearby, including EPA and DOE, to set up and assign technical and outreach staff to offices in the area. This would increase the amount of time that staff can interact with communities, since typically EPA and DOE staff travel to the reservation from California or Colorado. According to a Navajo Nation official we spoke with, having staff on or near the reservation would increase the federal agencies' ability to connect with communities, especially since it would help increase their cultural awareness and sensitivity. One EPA staff member who spent 2 months working on-site during a mine cleanup said that his consistent presence during that time—as well as the extensive outreach he conducted over a longer period—allowed him to build strong relationships with community members, which in turn increased that community's acceptance of the cleanup remedy.
- *Partner with community organizations.* Some stakeholders we spoke with said that opportunities may exist for federal agencies to more effectively engage Navajo communities by partnering with trusted community organizations. For example, the president of a nonprofit

community organization that works to ensure that the Navajo people—especially those affected by uranium contamination in a remote region of the reservation—have access to safe drinking water and economic development, among other things, told us that he would welcome a partnership with federal agencies to conduct outreach on uranium-related issues. Such a partnership would take full advantage of the organization's existing connection with Navajo communities. Representatives from this organization and others told us that community organizations are often a trusted source of information, and their involvement would lend credibility to federal and tribal agencies' engagement efforts.

- *Promote job creation and training.* Navajo officials we spoke with also told us that the federal agencies could help improve relationships by identifying opportunities to promote job creation and training on the Navajo reservation as part of the efforts to address uranium contamination. Officials we spoke with said the federal government should provide more funding for new positions within the tribal agencies to address uranium contamination. They said that, in 2007, the Navajo Nation had identified the need for 20 new full-time employees within NNEPA to address uranium contamination, but that federal agencies awarded funding for just 2 additional employees from 2008 to 2012. Tribal officials also said that they would like to see the federal agencies provide job training programs similar to the one that EPA offered during the 5-year plan period.
- *Issue a formal apology.* Some stakeholders, including Navajo community members, told us they felt that receiving an official apology from the federal government for failing to ensure that the companies conducting uranium mining to support U.S. nuclear weapons development were protective of the environment and public health would go a long way toward improving relationships.[81]

[81]The U.S. government has issued formal apologies for past events. For example, in Pub. L. No. 103-150, 107 Stat. 1510 (1993), Congress apologized to Native Hawaiians on behalf of the people of the United States for the overthrow of the Kingdom of Hawaii with the participation of agents and citizens of the United States. In addition, in the Radiation Exposure Compensation Act, Congress apologized on behalf of the nation to underground uranium miners and their families, among others, for the hardships they endured. Pub. L. No. 101-426, 104 Stat. 920 (1990).

Additional Opportunities Exist for Federal Agencies to Enhance Interagency Collaboration and Collaboration with Navajo Agencies

Agency officials we spoke with said that additional opportunities exist for the federal agencies to enhance both interagency collaboration at the federal level and collaboration with Navajo agencies. Specifically, EPA, IHS, and DOE officials identified a number of opportunities for increased interagency collaboration on efforts to engage tribal communities. For example, an IHS official involved with conducting uranium-related health screenings told us that the joint health screening event conducted with EPA in 2013 was a success and that, in addition to duplicating such efforts in other affected communities, there may be additional opportunities for enhanced interagency collaboration to help ensure that the Navajo people receive health screenings as well as information on how they can most effectively protect themselves from uranium contamination. More specifically, the IHS official told us that there may be opportunities to work with partners, including CDC and EPA, to develop informational videos on the health effects of uranium exposure that could be screened in IHS clinics. In addition, EPA officials told us that they have initiated a pilot effort to provide more coordinated outreach in the Cameron region of the reservation. In that region—where potentially responsible parties will be conducting extensive assessment and some cleanup of abandoned mines in the coming years—EPA and NNEPA plan to work with other partners, including other federal agencies, to provide a more coordinated approach to engaging the communities in discussions about, among other things, steps the federal agencies and community members can take to mitigate exposures to hazardous uranium contamination. Further, EPA officials involved in coordinating the 2014 5-year plan told us that they plan to engage the other federal agencies in developing and including a coordinated outreach strategy in the plan to better ensure that the agencies maximize each contact that they have with affected communities by, for example, providing the communities with information on a variety of uranium-related issues. Officials from the other agencies agreed that they would engage with EPA to develop or support such a strategy. This is consistent with one of the key practices that, in October 2005, we reported can help enhance and sustain collaboration among federal agencies—establishing mutually reinforcing or joint strategies—which can assist partner agencies in aligning their activities and resources, among other things.[82] We have reported on other key practices to enhance and sustain interagency collaboration, including,

[82]GAO, *Results-Oriented Government: Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies*, GAO-06-15 (Washington, D.C.: Oct. 21, 2005).

for example, for collaborating agencies to define and agree on their respective roles and responsibilities.[83] In doing so, collaborating agencies can identify how their collaborative efforts will be led, clarify who will do what, organize their joint and individual efforts, and facilitate decision making.

Federal and Navajo agency officials also identified opportunities for the federal agencies to enhance collaboration with Navajo agencies, some of which also present opportunities to enhance capacity building. For example, an EPA official we spoke with said that the agency could potentially train NNEPA staff to perform the more detailed assessments that EPA has been conducting to determine whether houses are contaminated and warrant replacement. In addition, Navajo Nation officials told us that they would like the federal agencies to work with them to identify as many opportunities as possible for the federal agencies to partner with the Navajo agencies on uranium-related work. These officials pointed to the partnership between DOE and NNEPA at the Highway 160 site—where NNEPA led the implementation of the cleanup work—as a particular success that they would like to see replicated in other areas. EPA Region 9 officials also pointed to the partnership between EPA and the Navajo Community Housing and Infrastructure Department, a Navajo agency that is helping to replace some of the contaminated houses on the reservation.

According to both federal and tribal agency officials, federal agencies could also enhance their collaboration with Navajo agencies by including additional tribal agencies in future efforts. For example, EPA and DOE identified potential opportunities for enhanced collaboration with the Navajo Abandoned Mine Lands Reclamation Program, which was not involved in the abandoned mine work conducted under the 2008 5-year plan, although the UMTRA program under the same department has been working with DOE at the former uranium processing sites. The Navajo Abandoned Mine Lands Reclamation Program was active in abandoned uranium mine-related efforts during the plan period by, among

[83]Other key practices we identified in GAO-06-15 that can enhance and sustain interagency collaboration are: define and articulate a common outcome; identify and address needs by leveraging resources; establish compatible policies, procedures, and other means to operate across agency boundaries; develop mechanisms to monitor, evaluate, and report on the results; reinforce agency accountability for collaborative efforts; and reinforce individual accountability for collaborative efforts.

other things, maintaining reclamation work previously conducted to mitigate physical hazards at the mines. According to Navajo Abandoned Mine Lands Reclamation Program officials, they plan to continue this maintenance work at reclaimed mine sites in the future. According to both federal and tribal agency officials we spoke with, EPA could potentially collaborate with that program and NNEPA to help ensure that, where feasible, any additional maintenance work on reclaimed uranium mines is done in coordination with NNEPA and EPA to help further reduce radiological hazards.[84] EPA officials told us that they have begun talking with Navajo Abandoned Mine Lands Reclamation Program staff to identify ways to work together, whereas in the period of the 2008 5-year plan, the program and NNEPA each generally operated independently from one another. According to DOE, EPA and DOE have agreed to invite officials from NNEPA and both programs within the Navajo Abandoned Mine Lands Reclamation/UMTRA Department to participate in activities of either federal agency. In another example, a CDC official told us there may be opportunities for CDC to increase its collaboration with the Navajo Division of Health to improve available data on how cancers impact the Navajo people.

Conclusions

From 2008 through 2012, six federal agencies increased their overall efforts to address the legacy of uranium contamination that remained on the Navajo reservation after uranium mining and processing ceased, spending more than $120 million on various actions, including assessments of abandoned mines and cleanups of contaminated homes and other sites. However, nearly 30 years since the last active uranium mine on the Navajo reservation ceased production, federal agencies do not have comprehensive information about the extent of the contamination or the total scope of work—and associated time frames and costs—required to fully address it, especially the contamination found at the abandoned mines. When requesting the 2008 5-year plan, policymakers were looking for a comprehensive course of action for fully resolving the problem of uranium contamination on or near the Navajo

[84]In an April 2013 letter to the Executive Directors of NNEPA and the Navajo Nation Division of Natural Resources, which houses the Abandoned Mine Lands Reclamation program, the Navajo Nation Department of Justice encouraged the two agencies to continue to work cooperatively at sites contaminated by past uranium mining or processing while stating its position that NNEPA exercises regulatory authority over all actions taken by any other Navajo Nation agency at these sites.

reservation. Given that the scope of the 2008 5-year plan focused on addressing the most urgent problems, and the agencies' next 5-year plan is not expected to identify the full scope of work that remains, it is unclear how many 5-year plans at this rate would be needed to estimate the remaining scope of work, time frames, and costs for fully addressing the contamination. While many uncertainties exist, it is possible to generate useful, high-level estimates of the work, time frames, and costs in a short period of time based on the information the federal agencies currently possess. However, absent a statutory requirement to develop such a comprehensive estimate, it appears unlikely that the agencies will undertake such an effort. Without more comprehensive information about the overall remaining scope of work, time frames, and costs needed to address contamination across the reservation, including at the abandoned mines, stakeholders and decision makers do not have a basis on which to assess the overall pace of the cleanup efforts; and without this information cannot put the accomplishments of the 2008 5-year plan—or any future plans—into perspective, and cannot make effective resource allocation decisions.

Effectively engaging with tribal communities is a key challenge facing federal agencies in the efforts to address contamination on Navajo and Hopi lands. The 2008 5-year plan did not contain information about how the federal agencies would coordinate their outreach efforts to these communities. While the agencies began to integrate their outreach activities over the course of the 5-year plan period, community members continued to express frustration with the agencies' efforts. Creating a coordinated outreach strategy is consistent with the key practice of establishing mutually reinforcing or joint strategies that we have reported can help enhance and sustain interagency collaboration and help agencies better align their activities and resources. Such an effort should also identify how the collaborative effort will be led, clarify who will do what, organize their joint and individual efforts, and facilitate decision making.

In addition, assessment work conducted by BIA at the Tuba City Dump has yielded information about the contamination at the site that has provided significant value to decision makers. In doing so, however, BIA has experienced a number of challenges, some concerning contract management. BIA has missed enforceable deadlines, subjecting BIA to stipulated penalties under its settlement agreement with EPA. Moreover, BIA continued to increase the value of the contract while the contractor was not performing according to the contract's terms and conditions. BIA is nearing the end of its management of the current RI/FS contract; these

contract management challenges, however, if left unaddressed, will become even more pertinent in the next few years as BIA moves into the cleanup phase after a remedial action is selected. At that point, the agency will award and manage an even larger and more complicated contract that will increase costs significantly. Without examining lessons learned from managing the RI/FS contract and considering these lessons as part of the acquisition planning process for the remedial action contract, BIA could face contract management challenges on a larger scale. Further, BIA did not fully follow best practices in estimating the schedule for the RI/FS, which was not fully comprehensive or controlled. Without control over the schedule, BIA cannot effectively monitor its contractor's progress and cannot evaluate the quality of changes proposed by the contractor. BIA's estimate of probable future costs for the cleanup at the Tuba City Dump also did not always reflect the characteristics of a comprehensive high-quality cost estimate. Without fully accounting for all future costs, management will have difficulty successfully planning program resource requirements. Further, significantly more funds will likely be needed to implement the remedial action that will be selected for the Tuba City Dump site. Given this increased need and other competing interests for BIA's limited resources, other funding sources for remedial actions, such as Interior's Central Hazardous Materials Fund, become more important. The Tuba City Dump site is eligible to receive funds from the Fund for the RI/FS, as well as the selected remedial action, although BIA officials have not applied for such funding and do not plan to do so. Without leveraging the Fund, BIA will have difficulty meeting the funding needs for the remedial action cleanup phase of the project.

Matter for Congressional Consideration

To develop an estimate of the scope of work remaining to address uranium contamination on or near the Navajo reservation, Congress should consider requiring that the Environmental Protection Agency take the lead and work with the other federal agencies to develop an overall estimate of the remaining scope of the work, time frames, and costs.

Recommendations for Executive Action

We are making the following four recommendations in this report:

To ensure that agencies working on the 2014 5-year plan better align their activities and resources, we recommend that the Administrator of EPA; the Secretaries of Energy, the Interior, and Health and Human Services; and the Chairman of the Nuclear Regulatory Commission, as they develop a coordinated outreach strategy to include in the 2014 5-year plan, take action to incorporate key practices in their collaborative effort, such as defining and agreeing on the agencies' respective roles and responsibilities.

In light of the problems BIA has encountered in managing the cleanup at the Tuba City Dump site, we recommend that the Secretary of the Interior direct the Assistant Secretary for Indian Affairs to take the following three actions:

- identify and examine any lessons learned from managing the RI/FS contract and consider these lessons as part of the acquisition planning process for the remedial action contract,
- employ best practices in creating the schedule and cost estimates for the remedial action cleanup phase, and
- apply for funding from Interior's Central Hazardous Materials Fund in order to help meet the funding needs for the remedial action cleanup phase of the project.

Agency and Third Party Comments and Our Evaluation

We provided a draft of this report for review and comment to the Environmental Protection Agency; the Departments of Energy, the Interior, and Health and Human Services; the Nuclear Regulatory Commission; the Office of Management and Budget; and the Navajo Nation and Hopi Tribe. EPA, DOE, BIA (responding on behalf of Interior), the Department of Health and Human Services, and NRC generally agreed with our recommendations, and their written comments are reproduced in appendixes VI, VII, VIII, IX, and X, respectively. Each of these agencies also provided technical comments, which we incorporated as appropriate. The Navajo Nation also provided written comments (reproduced in app. XI) and technical comments, which we incorporated as appropriate. The Office of Management and Budget and the Hopi Tribe did not comment on our report.

DOE was the only agency that commented on our Matter for Congressional Consideration. Specifically, DOE acknowledged the need

to identify the remaining scope of work, time frames, and costs of fully addressing uranium contamination on the Navajo reservation. However, the agency expressed concern about the difficulty of quantifying the full scope of work at this time, given the number of uncertainties that remain. We agree that attempting to quantify, in a detailed manner, the full scope of remaining work is not possible at this time because of the uncertainties we describe in this report, as well as those identified by DOE in its comments. However, we believe that the agencies' estimates can be improved and, for the reasons detailed in our report, consider it essential for Congress to have more comprehensive information about the remaining scope of work in order to assess the overall pace of the cleanup and to make informed resource allocation decisions. In addition, DOE commented on (1) our use of the term "Rare Metals" site instead of the "Tuba City Mill Site" or the "Tuba City Former Processing Site" and (2) an observation in the report about the cleanup of the former processing sites on the Navajo reservation versus another site near Moab, Utah. Regarding the comparison of the former processing sites on the Navajo reservation to the Moab site, DOE provided comments on the unique nature of each site. Regarding the Rare Metals site, we clarified our report to indicate that our use of the term "Rare Metals site" was solely to prevent it from being confused with other contaminated sites in the Tuba City area, including BIA's Tuba City Dump site.

In agreeing with our recommendation that the federal agencies incorporate key practices for enhancing and sustaining interagency collaborative efforts into their coordinated outreach strategy, EPA, DOE, and the Department of Health and Human Services provided additional details about the contents of the draft outreach strategy that they intend to include in their 2014 5-year plan. We are encouraged by elements of the draft strategy, which appear to include some of the key practices for enhancing and sustaining interagency collaboration. For example, the agencies plan to leverage resources to fund a shared coordinator who will direct a community outreach network composed of representatives from the federal and tribal agencies.

In its written comments, BIA asserted that our report disproportionately focuses on the agency's management of the Tuba City Dump site, a site that BIA described as comprising a very small part of the overall problem of uranium contamination across the Navajo reservation. Although we agree that cleaning up the Tuba City Dump is but one part of the agencies' broader efforts to address uranium contamination on the Navajo reservation, we believe that our detailed examination of BIA's and EPA's management of the assessment work at the site was appropriate.

As explained in our report, the Tuba City Dump site was one of the two objectives where the federal agencies did not meet the targets in the 2008 5-year plan. In order to identify reasons why BIA did not meet those targets, we analyzed the agency's management of the Tuba City Dump site, including its project and contract management approaches. In addition, BIA commented that it believes the management of the cleanup has been handled responsibly but that circumstances beyond its control have contributed to delays. We acknowledge in this report that circumstances beyond BIA's control contributed to delays in the Tuba City Dump cleanup; however, BIA's own actions also contributed to these delays. For example, BIA had communication problems with its RI/FS contractor and performance problems regarding the quality and timeliness of the contractor's deliverables. These problems and others led BIA to miss several legally enforceable deadlines in the RI/FS work plan and resulted in BIA failing to complete the RI/FS for the site, an objective of the 2008 5-year plan and a work plan requirement. In its comments, BIA appears to fault EPA and the contractor for the delays and associated stipulated penalties, but BIA did not explain how, if at all, EPA's and the contractor's actions would relieve BIA of its legal obligation to meet the work plan deadlines, or of the consequences of failing to do so.

While agreeing with our recommendations, BIA disagreed with our findings regarding the agency's cost and schedule estimating at the Tuba City Dump. These findings were the basis for our recommendation that BIA employ best practices in creating the schedule and cost estimates for the forthcoming CERCLA remedial action at the Tuba City Dump. BIA asserted that its approach to developing the cost and schedule estimates was reasonable, and did not believe that the best practices found in our cost estimating and assessment guide were applicable, at least in part, because the details of the remedial action to be conducted at the site have not been identified. As explained in this report, the best practices in our cost estimating and assessment guide can be used for projects with significant unknowns, such as the Tuba City Dump, and include specific steps for properly taking those unknowns into account. For example, the guide discusses how every cost estimate is uncertain because of the assumptions that must be made about future projections. It also states that because many of the assumptions made at the start of a project turn out to be inaccurate, it is important to assess the risk associated with changes in assumptions. As described in our report, we found that BIA did not assess such risks when creating its cost estimate. In addition, although BIA concurred with our recommendation to use best practices when creating cost and schedule estimates for the forthcoming remedial action, BIA stated that it does not intend to use these best practices when

developing future estimates at the site because it does not believe that they are applicable to environmental cleanup projects. To the contrary, these guides offer best practices that are directly relevant to a wide range of government projects, including environmental cleanups, and we have previously assessed such projects using the criteria in the guides.[85] BIA's refusal to apply cost and schedule estimating best practices is troublesome, especially since, as we note in the report, the remedial action at the site will represent a more significant undertaking than the RI/FS. As such, it is important that BIA have reliable cost and schedule estimates in order to effectively manage the project.

In written comments, the Navajo Nation stated that, overall, our report represented a good start toward illuminating the nature and extent of the damage uranium mining and processing has caused to Navajo lands and people. However, the Navajo Nation also noted some instances where it felt the report fell short. For example, the tribe noted that our projection of the need for hundreds of millions of dollars to address the remaining scope of work that has been identified by the agencies was a significant underestimation of the total projected costs for future remediation at all uranium-related sites on Navajo lands. The tribe stated that it believes that these total costs will be in the billions of dollars rather than hundreds of millions of dollars. As noted in our report and recognized by the Navajo Nation in its comments, our estimate related to the cleanup of highest priority abandoned mines represents a conservative, low-end estimate. While we cannot comment on the accuracy of the tribe's characterization of total future costs, the tribe's estimate further illuminates the need for the federal agencies involved to generate a high-level estimate, as discussed in our report, based on their most current information regarding the remaining scope of work. In addition, the Navajo Nation noted the absence of any discussion of potential groundwater contamination in the draft report, especially at the Northeast Church Rock mine. In response,

[85]We have assessed environmental cleanup projects against the criteria found in our cost estimating and assessment guide and our schedule assessment guide and have reported on the results of these assessments. See, for example, GAO, *Nuclear Weapons: Factors Leading to Cost Increases with the Uranium Processing Facility*, GAO-13-686R (Washington, D.C.: July 12, 2013); *Nuclear Waste: Actions Needed to Address Persistent Concerns with Efforts to Close Underground Radioactive Waste Tanks at DOE's Savannah River Site*, GAO-10-816 (Washington, D.C.: Sep. 14, 2010); and *Department of Energy: Actions Needed to Develop High-Quality Cost Estimates for Construction and Environmental Cleanup Projects*, GAO-10-199 (Washington, D.C.: Jan. 14, 2010).

we have made changes to include information about the status of federal agencies' groundwater assessment efforts.

We are sending copies of this report to the Administrator of the Environmental Protection Agency; the Secretaries of Energy, the Interior, and Health and Human Services; the Chairman of the Nuclear Regulatory Commission; the Director of the Office of Management and Budget; the President of the Navajo Nation; the Chairman of the Hopi Tribe; the appropriate congressional committees; and other interested parties. In addition, this report is available at no charge on the GAO website at http://www.gao.gov.

If you or your staff members have any questions about this report, please contact me at (202) 512-3841 or gomezj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to the report are listed in appendix XII.

J. Alfredo Gómez
Director, Natural Resources and Environment

List of Requesters

The Honorable Henry A. Waxman
Ranking Member
Committee on Energy and Commerce
House of Representatives

The Honorable Peter DeFazio
Ranking Member
Committee on Natural Resources
House of Representatives

The Honorable Frank Pallone, Jr.
Ranking Member
Subcommittee on Health
Committee on Energy and Commerce
House of Representatives

The Honorable Colleen Hanabusa
Ranking Member
Subcommittee on Indian and Alaska Native Affairs
Committee on Natural Resources
House of Representatives

The Honorable Raúl M. Grijalva
Ranking Member
Subcommittee on Public Lands and Environmental Regulation
Committee on Natural Resources
House of Representatives

The Honorable Martin Heinrich
United States Senate

The Honorable Edward J. Markey
United States Senate

The Honorable Ben Ray Luján
House of Representatives

Appendix I: Objectives, Scope, and Methodology

In this report, we examined: (1) the extent to which federal agencies, including the Environmental Protection Agency (EPA), Department of Energy (DOE), the Department of the Interior's Bureau of Indian Affairs (BIA), the Department of Health and Human Services' Indian Health Service (IHS), and the Nuclear Regulatory Commission (NRC) achieved the targets identified in the 2008 5-year plan, and the reasons why or why not; (2) what is known about the scope of work, time frames, and estimated costs of fully addressing uranium contamination on the Navajo reservation; and (3) the key challenges, if any, faced by federal agencies in completing this work and the opportunities, if any, which may be present to help overcome these challenges.

To determine the extent to which federal agencies achieved the targets identified in the 2008 5-year plan, we compared the agencies' targets as laid out in the 5-year plan with the actions taken by the agencies and their partners over the 5-year plan period from 2008 through 2012. We identified these actions by reviewing key documents, including the summary report issued by the federal agencies in January 2013. We corroborated information in the documents by interviewing relevant federal agency officials and Navajo and Hopi tribal officials from relevant tribal government agencies—the Navajo Nation Department of Justice, Navajo Nation Environmental Protection Agency, the Navajo Nation Division of Natural Resources' Navajo Abandoned Mine Lands Reclamation/Uranium Mill Tailings Remedial Action Department, and the Hopi Tribe Department of Natural Resources' Water Resources Program—and by obtaining additional documentation and visiting relevant sites across the Navajo and Hopi reservations where federal and tribal agencies have been conducting their work. In addition to the five federal agencies listed above, other relevant federal agencies we spoke with included the Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry (ATSDR), the Office of Management and Budget, and the Department of the Interior's Office of Environmental Policy and Compliance, which manages the Central Hazardous Materials Fund, and the Office of Surface Mining Reclamation and Enforcement, which provides funding to the Navajo Abandoned Mine Lands Reclamation Program. In April 2013 and July 2013, we visited key sites, including the Northeast Church Rock, Quivira, and Skyline mines, as well as abandoned uranium mines and mine-related sites near the communities of Cameron, Cove, and Teec Nos Pos, Arizona; and Haystack, and Casamero Lake, New Mexico; the former uranium processing site in Shiprock, New Mexico; the Highway 160 site near Tuba City, Arizona; and the Tuba City Dump, located on both the Hopi and Navajo reservations and near the Hopi Villages of Moenkopi and the

Navajo town of Tuba City, Arizona. We selected these sites based on the level of activity that federal and tribal agencies conducted there during the 5-year plan, and in order to see some of the sites that the agencies have identified as needing cleanup work in the near future.

To identify the reasons why the agencies met or did not meet the targets in the 5-year plan, we reviewed agency documents and interviewed federal and tribal agency officials. We also reviewed federal agency expenditure data for the 2008 5-year plan period (fiscal years 2008 through 2012) and compared it with expenditure data from the previous 5 years (fiscal years 2003 through 2007). These data represent obligations or direct outlays by the agencies and represent the agencies' direct costs and did not include intramural costs, such as staff salaries. We received data from ATSDR, BIA, CDC, DOE, EPA, and IHS; NRC did not provide expenditure data because NRC did not incur any direct obligations during the time period, although it did expend resources for staff time. In order to determine costs in constant 2013 dollars, we adjusted the amounts reported to us for inflation by applying the fiscal year chain-weighted gross domestic product price index, with fiscal year 2013 as the base year. To evaluate the reliability of these data and determine their limitations, we reviewed the data obtained from each agency. For each data source, we analyzed related documentation, examined the data to identify obvious errors or inconsistencies, and compared the data we received with other published data sources, where possible. We also interviewed officials from each agency to obtain information on the internal controls of their data systems. On the basis of our evaluation of these sources, we concluded that the expenditure data we collected and analyzed were sufficiently reliable for our purposes.

To identify what is known about the scope of work remaining to fully address uranium contamination on or near the Navajo reservation, we reviewed available documents and interviewed knowledgeable federal agency and tribal officials. To identify what is known about time frames and costs, we reviewed documentation containing schedule and/or cost estimates or general information about time frames or costs, where available. To create estimates of time frames and costs to clean up the highest priority abandoned mines, we gathered information about the costs associated with the Skyline mine cleanup, which was the one cleanup EPA conducted during the 5-year plan period with the agency's funds, the pace of work conducted under the 5-year plan, and the number of mines that would need full funding from EPA. In addition, we analyzed the extent to which the schedule generated by BIA for the remedial investigation and feasibility study at the Tuba City Dump reflected the four

general characteristics for sound schedule estimating, as outlined in our schedule assessment guide: comprehensive, well-constructed, credible, and controlled.[1] We selected this schedule to review because it was the most robust of the available schedules, and it represented an entirely federal effort. We also examined the extent to which BIA's estimate of probable future costs for Tuba City Dump reflected the four characteristics of high-quality cost estimates, as outlined in our cost estimating and assessment guide: comprehensive, well-documented, accurate, and credible.[2] We selected this cost estimate to review since the cleanup will be paid for entirely with federal funds, and it represented a distinct cleanup project rather than an ongoing level of effort. In reviewing BIA's schedule and cost estimates, we analyzed supporting documentation submitted by BIA and conducted interviews with BIA and EPA project managers and staff. We shared our cost and schedule guides and the criteria against which we would be evaluating the estimates with BIA staff. We then compared BIA's methods and approaches for preparing the estimates with the best practices contained in the guides.

To ascertain the key challenges faced by federal agencies in completing this work and the opportunities that may be present to help overcome these challenges, we reviewed key documents, including the January 2013 summary report, written materials from the federal agencies' Navajo uranium stakeholder workshops, agency reports, and Navajo Nation laws and position papers. We corroborated and supplemented information in the documents by interviewing relevant federal agency officials and Navajo and Hopi tribal officials. We also interviewed knowledgeable stakeholders, including community members living in areas affected by uranium mining or contamination. For example, we worked with the federal and tribal agencies and others to hold meetings in seven affected communities, which were attended by 50 local government officials and community members. We also spoke with other knowledgeable stakeholders, such as university researchers and representatives of nonprofit and community organizations active on Navajo uranium issues. We met with most of these stakeholders during our July 2013 site visits and at the April 2013 Navajo Uranium Stakeholder Workshop held in Gallup, New Mexico, and spoke with other stakeholders by telephone. We

[1]GAO-12-120G.

[2]GAO-09-3SP.

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identified stakeholders by performing an Internet and literature search for individuals and organizations involved in relevant issues, attending the stakeholder workshop and identifying participating stakeholders, and requesting referrals from agency officials and stakeholders with whom we spoke. The views of the stakeholders we spoke with are not representative of and cannot be generalized to all stakeholders.

We conducted this performance audit from January 2013 to May 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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Appendix II: Detailed Results of GAO Assessment of the Schedule for the Tuba City Dump Remedial Investigation and Feasibility Study Work Plan

Our prior work has identified 10 best practices associated with effective scheduling.[1] These are (1) capturing all activities; (2) sequencing all activities; (3) assigning resources to all activities; (4) establishing the duration of all activities; (5) verifying that the schedule is traceable horizontally and vertically; (6) confirming that the critical path is valid; (7) ensuring reasonable total float; (8) conducting a schedule risk analysis; (9) updating the schedule with actual progress and logic; and (10) maintaining a baseline schedule. These practices are summarized into four characteristics of a reliable schedule—comprehensive, well-constructed, credible, and controlled. We assessed the extent to which the Bureau of Indian Affairs' (BIA) January 2013 schedule for the remedial investigation and feasibility study (RI/FS) at the Tuba City Dump met each of the 10 best practices,[2] and characterized whether the schedule met each of the four characteristics of a reliable schedule. We found that the schedule minimally met each of the four characteristics of a reliable schedule. As a result, we are concerned about the validity of the dates that were forecasted by the schedule, as well as the identification of the critical path. Without an accurate critical path, management cannot focus on the activities that will be most detrimental to the project's key milestones and finish date if they slip. Table 3 provides the detailed results of our analysis.

[1]GAO-12-120G.

[2]We determined the overall assessment rating by assigning each individual rating a number: Not Met = 1, Minimally Met = 2, Partially Met = 3, Substantially Met = 4, and Met = 5. Then, we took the average of the individual assessment ratings to determine the overall rating for each of the four characteristics. The resulting average becomes the Overall Assessment as follows: Not Met = 1.0 to 1.4, Minimally Met = 1.5 to 2.4, Partially Met = 2.5 to 3.4, Substantially Met = 3.5 to 4.4, and Met = 4.5 to 5.0.

Table 3: Assessment of the January 2013 Tuba City Dump RI/FS Work Plan Schedule

Schedule characteristic	Explanation	Criterion met[a]	GAO analysis
Comprehensive	Capturing all activities, assigning resources to all activities, and establishing the durations of all activities. • All activities as defined in the project's work breakdown structure are included; • the labor, materials, and overhead needed to do the work and whether those resources will be available when needed; and • how long each activity will take, allowing for discrete progress measurement with specific start and finish dates.	Minimally	While our analysis found a good ratio of detail to milestone activities, we could not determine if the schedule reflected the work necessary to conduct the remedial investigation and feasibility study (RI/FS) work plan. Specifically, there was no work breakdown structure documentation submitted, and only 50 percent of the schedule activities had work breakdown structure elements assigned to them. As a result, we could not validate if all work necessary to complete the project is included in the schedule. In addition, there were only two resources used for the project, and they were both overallocated, one by over 5,000 percent. Consequently, it appears that those resources will not be available when needed. Further, our analysis found that the use of multiple duration units caused duration conversion issues, which made the schedule's activity durations unreliable.
Well-constructed	Sequencing all activities, confirming that the critical path is valid and ensuring reasonable total float. The schedule should be constructed so that • all activities are logically sequenced with predecessor and successor logic; • limited amounts of unusual or complicated logic techniques are justified in the schedule documentation; • a critical path that determines which activities drive the project's earliest completion date can be identified; and • total float that accurately determines the schedule's flexibility.	Minimally	We found that 17 of the remaining schedule activities (29.3 percent) were missing logic, 4 had hard constraints without justification (about 7 percent), and there were lags and leads used that cause the sequencing to be questionable. Although hard constraints are useful for calculating the amount of float available in the schedule and, therefore, the realism of the required project finish date and available resources during schedule development, they may be abused if they force activities to occur on specific dates that are determined off-line without much regard for the realism of the assumptions necessary to achieve them. Because of these logic issues, the critical path as calculated by the scheduling software was deemed unreliable. Our analysis found that the critical path contained lags, leads, long-duration activities, and activities with hard constraints, which by definition will always appear as critical. We also found that the driving path could not be traced, and from what few driving activities could be found, they differed from the default critical path. Finally, we encountered task inspector errors that suggested rescheduling a task to its resource's next available time. There were differing amounts of total float, on the critical path in particular, that led to questionable schedule flexibility. A possible contributing factor may be the duration units assigned in the schedule that caused conversion issues, as discussed above.

Schedule characteristic	Explanation	Criterion met[a]	GAO analysis
Credible	Verifying that the schedule is traceable horizontally and vertically, conducting a schedule risk analysis. The schedule should identify • the order of events necessary to achieve aggregated products or outcomes; • varying levels of activities, supporting activities, and subtasks; • key dates that can be used to present status updates to management; • a level of confidence in meeting a project's completion date based on data about risks and opportunities for the project; and • necessary schedule contingency and high-priority risks based on conducting a robust schedule risk analysis.	Minimally	We found the schedule to be vertically traceable, with dates in the detailed schedule mapping to higher-level management correspondence. We also identified schedule documentation that matched the project start and completion dates in the schedule. In contrast, we found the schedule could not be traced horizontally. For example, the schedule did not respond appropriately when significant delays were introduced into the network due to the logic issues discussed above. Furthermore, we received no documentation to substantiate that a schedule risk analysis was performed, so the credibility of the dates in the schedule were also in question.
Controlled	Updating the schedule with actual progress and logic, maintaining a baseline schedule. The schedule should be • updated periodically by schedulers trained in critical path method scheduling; • statused using actual progress and logic to realistically forecast dates for program activities; • compared against a documented baseline schedule to determine variances from the plan; • accompanied by a corresponding baseline document that explains the overall approach to the project, defines assumptions, and describes unique features of the schedule; and • subject to a configuration management control process.	Minimally	It is unclear if schedule progress is updated monthly because the schedule's status date was outdated. Furthermore, there was no evidence that a formal schedule narrative accompanied the schedule delivery to the government. While it appeared that the Bureau of Indian Affairs (BIA), BIA's contractor, and Environmental Protection Agency (EPA) officials meet to discuss the schedule, it does not appear that the schedule is used to manage the project because EPA did not want to put additional information about BIA and the contractor's effort in the schedule. Our analysis also found that, relative to the assumed status date, 5 activities had start dates in the past. Although we cannot determine when the baseline was set, all 126 activities have baseline start dates. Project documentation also stated that the schedule was baselined, but the baseline date cannot be found in MS Project. Nevertheless, it is commendable that the schedule is baselined, which allows for analysis and monitoring of date variances. On the other hand, there is no evidence that a schedule baseline document was created for this schedule baseline.

Source: GAO analysis of BIA data.

[a]"Met" means the program provided complete evidence that satisfies the entire criterion. "Substantially" means the program provided evidence that satisfies a large portion of the criterion. "Partially" means the program provided evidence that satisfies about half of the criterion. "Minimally" means the program provided evidence that satisfies a small portion the criterion. "Not met" means the program provided no evidence that satisfies any of the criterion.

Appendix III: Detailed Results of GAO Assessment of the Tuba City Dump 5-Year Cost Estimate

To analyze the Bureau of Indian Affairs' (BIA) 5-year cost estimate, dated April 2013, for the Tuba City Dump, we determined the extent to which BIA followed the best practices outlined in the GAO Cost Estimating and Assessment Guide.[1] The guide identifies 12 practices that are the basis for effective cost estimation, including cost estimation for annual budget requests. The guide associates these practices with four characteristics: accurate, well-documented, comprehensive, and credible. The Office of Management and Budget endorsed this guidance as being sufficient for meeting most cost-estimating requirements, including for budget formulation. If followed correctly, these practices should result in reliable and valid budgets that (1) can be easily and clearly traced, replicated, and updated; and (2) enable managers to make informed decisions. BIA created this cost estimate to contribute to the Department of the Interior's (Interior) environmental and disposal liability estimate as part of Interior's annual financial statement. Since a remedial action has not been selected for the site, BIA estimated two options, a low-cost option and a high-cost option. In accordance with Interior's guidance, BIA submitted the low-cost option as part of the liability estimate. We assessed the extent to which the Tuba City Dump 5-year cost estimate from April 2013 met each of the four characteristics associated with cost-estimating best practices.[2] As table 4 illustrates, we found that the Tuba City Dump April 2013 cost estimate minimally met each of these four characteristics.

[1]GAO-09-3SP.

[2]We determined the overall assessment rating by assigning each individual rating a number: Not Met = 1, Minimally Met = 2, Partially Met = 3, Substantially Met = 4, and Met = 5. Then, we took the average of the individual assessment ratings to determine the overall rating for each of the four characteristics. The resulting average becomes the Overall Assessment as follows: Not Met = 1.0 to 1.4, Minimally Met = 1.5 to 2.4, Partially Met = 2.5 to 3.4, Substantially Met = 3.5 to 4.4, and Met = 4.5 to 5.0.

Table 4: Assessment of the Tuba City Dump 5-Year Cost Estimate

Cost characteristic	Explanation	Criterion met[a]	GAO analysis
Comprehensive	The cost estimate includes all life-cycle costs; the cost estimate completely defines the program, reflects the current schedule, and is technically reasonable; the cost estimate work breakdown structure is product-oriented, traceable to the statement of work, and at an appropriate level of detail to ensure that cost elements are neither omitted nor double-counted; and the estimate documents all cost-influencing ground rules and assumptions.	Minimally	The estimate does not include all life-cycle costs, including both government and contractor costs, to clean up, operate, and maintain the Tuba City Dump. This is because a remedial action has not been selected for the site and because the Department of the Interior's (Interior) guidance suggests that agencies only include future costs, rather than life-cycle costs, in the liability estimates.
Well-documented	The documentation should capture in writing the source data used, the reliability of the data, and how the data were normalized; the documentation describes in detail the calculations performed and the estimating methodology used to derive each work breakdown structure element's cost; the documentation describes step by step how the estimate was developed so that a cost analyst unfamiliar with the program could understand what was done and replicate it; the documentation discusses the technical baseline description and the data in the technical baseline are consistent with the cost estimate; and the documentation provides evidence that the cost estimate was reviewed and accepted by management.	Minimally	According to project officials, the estimate was developed in accordance with Interior's *Environmental and Disposal Liabilities Identification, Documentation and Reporting Handbook*. Though the handbook clearly states what should be included in the source data, we found that the Tuba City Dump estimate did not meet all of the criteria. In addition, the documentation supporting the cost estimate is limited. Neither the cost model nor the supporting documentation details the calculations or the estimating methodology by element. The documentation neither captures how the scope of the project was determined, nor does it capture at a detailed level how quantities of materials or labor rates were determined. As a result, a cost analyst unfamiliar with the Tuba City Dump and the estimating process would not be able to recreate the estimate based on the documentation package received.

Cost characteristic	Explanation	Criterion met[a]	GAO analysis
Accurate	The cost estimate results are unbiased, not overly conservative or optimistic, and based on an assessment of most likely costs; the estimate has been adjusted properly for inflation; the estimate contains few, if any, minor mistakes; the cost estimate is regularly updated to reflect significant changes in the program, such as when schedules or other assumptions change, and actual costs so that it is always reflecting current status; variances between planned and actual costs are documented, explained, and reviewed; the estimate is based on a historical record of cost estimating and actual experiences from other comparable programs; and the estimating technique for each cost element was used appropriately.	Minimally	The cost estimate does not include a risk and uncertainty analysis. While the estimate included contingency costs, it is unclear what statistical analysis was performed to derive these numbers. The escalation method was not documented in the cost estimate, and the estimate did not cite the source of the inflation rate. An inflation factor of 5 percent was used in the estimate. Mathematically, the calculations are accurate, and no mistakes are apparent. We credit the agency with keeping a documented log of changes to the estimate, although none of these changes are evident in the estimate itself. No costs were labeled as actuals in the documentation provided, and there is no mention of whether variances between the estimate and actual costs were reviewed. It is unclear from the evidence which estimating technique was used for each element and if that method was appropriate.
Credible	The cost estimate included a sensitivity analysis that identified a range of possible costs based on varying major assumptions, parameters, and data inputs; a risk and uncertainty analysis was conducted that quantified the imperfectly understood risks and identified the effects of changing key cost driver assumptions and factors; major cost elements were cross-checked to see if results are similar; and an independent cost estimate was conducted by a group outside the acquiring organization to determine whether other estimating methods produce similar results.	Minimally	The cost estimate does not include a sensitivity analysis. The documentation says there are many unknowns associated with this project that may impact the probable costs. To account for these unknowns, a minus 30 percent/plus 50 percent range was provided in addition to the most probable cost. Without documentation that shows how they arrived at the minus 30 percent/plus 50 percent contingency range, we have no evidence that statistical analysis was performed. In addition, there is no evidence a risk and uncertainty analysis was conducted that quantified the imperfectly understood risks and identified the effects of changing key cost driver assumptions and factors. The documentation provides contingency factors, however, there is no documentation supporting how these numbers were derived. In addition, the documentation does not include the likelihood and severity of consequence for each risk, which work breakdown structure elements are affected by each risk, cost risk ranges by work breakdown structure elements, or a risk correlation matrix by work breakdown structure element.

Source: GAO analysis of BIA data.

[a]"Met" means the program provided complete evidence that satisfies the entire criterion. "Substantially" means the program provided evidence that satisfies a large portion of the criterion. "Partially" means the program provided evidence that satisfies about half of the criterion. "Minimally" means the program provided evidence that satisfies a small portion the criterion. "Not met" means the program provided no evidence that satisfies any of the criterion.

Appendix IV: The 43 Highest Priority Mines, Their Locations, and the Status of Assessment and Cleanup Efforts

Mine name	Region	Potentially responsible party identified	Fence, sign, or other barricade	Initial assessment (radiation scan)	Interim removal action[a]	Detailed assessment initiated[b]	Final removal action selected
Occurrence B	Central			☐			
Black Jack No. 2	Eastern			☐			
Eunice Becenti	Eastern			☐			
Haystack No. 1	Eastern			☐			
Mac No. 1	Eastern			☐			
Mariano Lake	Eastern	☐	☐	☐		☐	
Northeast Church Rock	Eastern	☐	☐	☐	☐	☐	☐
Quivira (NE Church Rock No. 1)	Eastern	☐	☐	☐	☐	☐	
Ruby No. 3	Eastern	☐	☐	☐			
Section 23	Eastern			☐			
Section 24 (Nanabah Vandever)	Eastern			☐			
Section 25	Eastern			☐			
Section 26 (Desidero Group)	Eastern	☐		☐			
Standing Rock	Eastern			☐			
Charles Keith	North Central			☐			
Firelight No. 6	North Central			☐			
Harvey Blackwater No. 3	North Central			☐			
Mitten No. 3	North Central			☐			
Rock Door No. 1	North Central			☐			
Skyline	North Central		☐	☐	☐[c]	n/a	n/a
Alongo Mines	Northern			☐		☐	
Barton 3	Northern			☐			
Black Rock Point Mines	Northern			☐			
Climax Transfer Station	Northern			☐			
Hoskie Henry	Northern			☐			
King Tutt Point	Northern			☐		☐	
Mesa II ½, Mine 4	Northern	☐		☐			
Mesa III Mine	Northern	☐		☐			
Mesa III, Northwest Mine	Northern			☐			
NA-0904	Northern			☐			
NA-0928	Northern			☐			

Mine name	Region	Potentially responsible party identified	Fence, sign, or other barricade	Initial assessment (radiation scan)	Interim removal action[a]	Detailed assessment initiated[b]	Final removal action selected
North Martin	Northern			☐			
Oak 124, Oak 125	Northern			☐			
Plot 3	Northern			☐		☐	
Plot 6	Northern			☐		☐	
Tsosie 1	Northern			☐			
Hoskie Tso No. 1	Southern			☐			
A & B No. 2	Western			☐			
A & B No. 3	Western			☐			
Boyd Tisi No. 2	Western			☐			
Charles Huskon No. 12	Western	☐		☐			
Charles Huskon No. 14	Western	☐		☐			
Juan Horse No. 3	Western			☐			

Source: GAO analysis of Environmental Protection Agency (EPA) data.

[a]Removal actions conducted at these sites were done as time-critical removal actions and are listed as interim because they did not constitute the final cleanup actions at the mines.

[b]Detailed assessments listed here include remedial action assessments (preliminary assessment and/or site investigation) and removal action assessments (engineering evaluation/cost analysis).

[c]The Skyline mine cleanup is included here because the Navajo Nation considers it to be temporary, given its current position regarding removing all mine waste from the reservation. EPA considers the cleanup complete.

Appendix V: Additional Information about the Remaining Scope of Work, Time Frames, and Costs to Address Uranium Contamination on or Near the Navajo Reservation

The following is a discussion of what is known about the remaining scope of work, time frames, and costs to assess and clean up contaminated structures and to assess and treat health conditions and conduct health research.

Assess and Clean Up Contaminated Houses and Other Structures

The Environmental Protection Agency (EPA) and the Navajo Nation Environmental Protection Agency (NNEPA) have not identified a full scope of work because there is no comprehensive source of information regarding the number of houses that may be contaminated; the agencies do not have an end date for this work nor an overall cost estimate.

Scope of work: EPA Region 9 officials told us they believe living in contaminated homes continues to be the greatest uranium-related health risk to people on the Navajo reservation today. To continue mitigating this risk, EPA and NNEPA officials told us they plan to continue the work they conducted under the 2008 5-year plan, but they do not know how many homes they will ultimately need to assess and replace since there is no comprehensive source for this information. According to NNEPA officials, the agency has a backlog of more than 100 homes where residents have requested testing. A NNEPA official familiar with the work told us the agency expects to address this backlog in the 2014 5-year plan period. The official also told us that the number of requests continues to increase significantly as more people become aware of the agencies' efforts to assess houses and structures, in part, through outreach conducted by NNEPA. NNEPA is also responsible for communicating the results of completed assessments to residents when those results indicated homes were safe. A NNEPA official told us that, as of February 2014, the agency had communicated the results of fewer than half of the completed assessments, in some cases, because the agency was waiting for EPA to provide the results, and that the agency will continue to address this backlog moving forward. Overall, EPA officials said that they expect the total number of homes needing replacement will decrease in the 2014 5-year plan period since they believe the homes most likely to be contaminated have been addressed through earlier efforts.

Time frame: According to EPA officials involved, there is no end date for this work. They expect that the work assessing and potentially cleaning up contaminated houses to continue into the future as long as NNEPA continues to receive requests.

Cost: Given the unknown number of homes needing assessment and cleanup, EPA has not developed an overall cost estimate. However, EPA

officials told us they typically spend $6,000 on a detailed assessment and from $80,000 to $300,000 to demolish a home and either provide financial compensation or a replacement home.

Assess and Treat Health Conditions and Conduct Health Research

Federal agencies do not have concrete plans or available funds to begin additional health studies on the Navajo reservation, but the Indian Health Service (IHS) will continue its work and the Agency for Toxic Substances and Disease Registry (ATSDR) and its partners will continue the Navajo Birth Cohort Study, spending up to $10 million from 2013 to 2018.

Scope of work: IHS and ATSDR officials told us they intend to include short-term health treatment and assessment efforts in the 2014 5-year plan, and they are developing overall goals for health research related to exposure to uranium on the Navajo reservation as well. In the short-term, beyond health care delivery to patients, IHS plans to continue its efforts under the uranium health-screening program that it established under the 2008 5-year plan. With 3.5 staff members, however, this is a small-scale effort. In addition, the Navajo Birth Cohort Study is expected to continue. Regarding other long-term research studies, ATSDR officials told us they do not have specific plans or funding to initiate additional uranium-related health research studies at this time. Members of the Navajo Nation, researchers, and other stakeholders have repeatedly called for a long-term epidemiological study of the effects of nonoccupational exposures to uranium in the communities that have lived closest to former mines and processing sites in order to gain a better understanding of how these communities have been and continue to be affected.[1] IHS officials told us they have been limited in their ability to identify or plan potential studies because conducting research studies is not a part of IHS's mission, and dedicated funding is not available for such efforts. ATSDR officials told us that their agency infrequently funds such studies; for example, it is currently conducting two long-term epidemiological studies across the country in addition to the Navajo study.

[1]In April 2013, Radiation Exposure Compensation Act Amendments of 2013 were introduced in the House and Senate. The bills, if enacted into law, would require the Secretary of Health and Human Services to establish and administer a grant program through the National Institutes of Health for the study of the epidemiological impact of uranium mining and milling among nonoccupationally exposed individuals, including family members of miners and millers. As of February 2014, the bills had not been enacted into law. H.R. 1645, 113th Cong. (2013); S. 773, 113th Cong. (2013).

Time frame: IHS officials said they expect to extend the uranium health screening program into the future, at least through the 2014 5-year plan period. In 2013, ATSDR extended its agreement with the University of New Mexico and the Navajo Nation for the Navajo Birth Cohort Study by 5 years, until 2018.

Cost: ATSDR has committed to spending up to $10 million on the Navajo Birth Cohort Study from 2013 to 2018, but overall costs for potential future studies are unknown.

Appendix VI: Comments from the Environmental Protection Agency

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

APR 15 2014

Mr. Alfredo Gomez
Director
Natural Resources and Environment
U.S. Government Accountability Office
Washington, DC 20548

Dear Mr. Gomez,

Thank you for the opportunity to review and comment on GAO's draft report, "Uranium Contamination, Overall Scope, Time Frame and Cost Information is Needed for Contamination Cleanup on the Navajo Reservation", GAO-14-323. The purpose of this letter is to provide the EPA's response to your recommendation.

GAO was asked to examine the agencies' cleanup efforts under the 2008 5-year plan, "Health and Environmental Impacts of Uranium Contamination in the Navajo Nation". The GAO report examines the extent to which the agencies achieved the targets set in the 5-year plan and reasons why or why not; what is known about the future scope of work, time frames and costs; and any key challenges faced by the agencies in completing this work and any opportunities to overcome them.

In summary, the GAO found that the five federal agencies involved in implementing the plan met six of the plan's eight objectives. The agencies have not yet identified the scope of remaining work, time frames, or cost to fully address uranium contamination on and near the Navajo Reservation. GAO concluded that while agencies face challenges meeting funding needs and engaging affected communities, opportunities exist to improve relationships with Navajo and Hopi people by creating and implementing a coordinated outreach strategy.

The EPA agrees with GAO's findings and conclusions. The EPA and partner federal agencies are currently developing a second 5-Year plan to continue the work addressing uranium contamination on the Navajo Nation. The plan includes a coordinated outreach strategy as recommended by the GAO report. We expect this plan to be issued in May 2014. The plan will be used as a working draft while we conduct formal consultation with the Navajo Nation. EPA recognizes that the scope of the remaining work is large and that collaboration and cooperation with federal and Navajo partners will be essential to fully address uranium contamination on the Navajo Nation. EPA will continue to search for and work with responsible parties to pay for investigation and cleanup of mines.

The GAO report makes one recommendation for EPA:

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"To ensure that agencies working on the 2014 5-year plan better align their activities and resources, we recommend that the Administrator of the EPA; the Secretaries of Energy, the Interior and the Health and Human Services; and the Chairman of the Nuclear Regulatory Commission, as they develop a coordinated outreach strategy to include in the 2014 5-year plan, take action to incorporate key practices in their collaborative effort, such as defining and agreeing on the agencies' respective roles and responsibilities."

EPA agrees with GAO's recommendation. The draft 5-year plan addresses federal agency collaboration with the Navajo Nation by forming a community outreach network consisting of representatives from relevant federal and Navajo agencies. The network will be led by a coordinator working on the Navajo Nation in a location that serves as an office and visitors' center where people can obtain information about uranium-related issues from all of the agencies. Key functions of this network include the following:

- Maintain a master outreach calendar that tracks outreach events planned by each agency.
- Develop an easily accessible website with relevant information regarding uranium issues with links to resources provided by all agencies.
- Plan and organize two stakeholder workshops per year. Workshops will be located in different geographic locations on the Nation and will cover topics relevant to the interest in the area. Workshops will be planned with assistance from local grassroots organizations.
- Conduct a face-to-face community information effort by communicating with Navajo and Hopi residents in their homes and in small groups.
- Conduct a pro-active media relations effort that educates reporters about uranium-related issues so they can disseminate that information to local residents through the news media.
- Conduct a community involvement needs assessment for each chapter impacted by uranium mines.

EPA thanks GAO for the opportunity to review the draft report. Enclosed are comments clarifying statements in the report regarding work completed at the Northeast Church Rock Mine. Please contact Clancy Tenley at (415) 972-3785 if you have questions or would like further information.

Sincerely,

Enrique Manzanilla
Director
Superfund Division

Enclosure: Comments on NECR Mine Site

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Appendix VII: Comments from the Department of Energy

Department of Energy
Washington, DC 20585

April 18, 2014

J. Alfredo Gómez
Director
Natural Resources and Environment
Government Accountability Office
441 G Street, NW
Washington, DC 20458

Dear Mr. Gómez:

Thank you for the opportunity to review the Government Accountability Office's (GAO) draft report entitled *Uranium Contamination: Overall Scope, Time Frame, and Cost Information is Needed for Contamination Cleanup on the Navajo Reservation* (GAO-14-323). The Department of Energy (DOE) concurs with GAO's recommendation to coordinate outreach strategy and incorporate key practices in a collaborative effort with other federal agencies and has included this strategy in the 2014 Five-Year Plan (currently under development).

We are providing comments as requested before the final report is issued in the enclosure to this letter. In addition, general comments are summarized below.

1) To improve clarity we recommend that you refer to sites using a geographic reference. We suggest using the name "Tuba City Mill Site" or "Tuba City Former Processing Site" rather than "Rare Metals". The "Rare Metals" site refers to a specific owner/operator's name, which is not consistent with nomenclature for Uranium Mill Tailings Radiation Control Act (UMTRCA) sites. DOE has established guidelines for naming or identifying sites, and has eliminated the use of company names or property owners. DOE uses geographical proximity to cities or towns, or where multiple sites exist within a city or town, a direction name after each site (e.g. Ambrosia Lake West).

2) We appreciate the need to quantify the scope of remaining work (including cost and schedule) necessary to fully address uranium contamination on, or near, the Navajo Nation. However, it is not possible, at this time, to accurately determine the full scope of the remaining work much less provide reasonable estimates of schedule and cost. Factors that will influence the schedule and cost include: the applicability of environmental regulations and standards to mine remediation; the number and financial status of potentially responsible parties; the performance of existing and proposed environmental remedies; the results of ongoing health studies; the pervasive presence of naturally occurring uranium; the viability of institutional controls; and, the impacts of a recent court settlement (Kerr-McGee) as well as ongoing and potential litigation. Given the potential impact of these factors it would be misleading to present a scope of work, with associated cost and schedule information, necessary to address the remaining uranium contamination on the Navajo Nation.

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3) With respect to the observation: "There… are instances when uranium contamination on the Navajo reservation appears to be treated differently than contamination on non-Indian lands, such as the community in Moab, UT, where DOE is excavating a large mill tailings pile and disposing of it elsewhere."

Each former uranium milling site presents a different set of technical challenges, stakeholder concerns, and site history. The former milling sites on the Navajo Nation were a priority for DOE in the 1980s and 1990s. Surface cleanup at these sites was completed over twenty years ago. Disposal cell design and decisions regarding groundwater cleanup will continue to evolve over time. The cleanup of the four, former milling sites on the Navajo Nation were evaluated as required under the National Environmental Policy Act. Today, the disposal cells are protective of human health and the environment and the impact to groundwater has been carefully studied and is relatively minor. It is worth noting that because the groundwater at UMTRCA sites was contaminated by past milling operations, moving the contents of a disposal cell would do little, if anything, to improve site water quality.

Sincerely,

David W. Geiser
Director
Office of Legacy Management

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Response to Report Recommendations

Recommendation 1: To ensure that agencies working on the 2014 5-year plan better align their activities and resources, we recommend that the Administrator of EPA; the Secretaries of Energy, Interior, and Health and Human Services; and the Chairman of the Nuclear Regulatory Commission, as they develop a coordinated outreach strategy to include the 2014 5-year plan, take action to incorporate key practices in their collaborative effort, such as defining and agreeing on the agencies' respective roles and responsibilities.

Management Response:

Concur – The need to improve community outreach was identified by the agencies during preparation of the second 5-year plan. As a result, a combined master calendar of outreach activities was prepared in consultation with DOE, Health and Human Services, and Nuclear Regulatory Commission staff and is included in the current draft of the second 5-year plan. The calendar represents a coordinated, integrated approach to schedule community outreach activities by the agencies. In addition, the agencies have agreed to support the creation of a Community Outreach Network to better coordinate outreach and communication with communities. A Community Outreach Coordinator will lead the network, will be located on Navajo Nation, and will staff an office/visitors' center where information about uranium and each agencies' activities will be available. These actions will be implemented upon completion of the second 5-year plan and are expected to continue into the foreseeable future.

3

Appendix VIII: Comments from the Department of the Interior

United States Department of the Interior

BUREAU OF INDIAN AFFAIRS
Washington, DC 20240

IN REPLY REFER TO:

APR 17 2014

Mr. J. Alfredo Gomez
Director, Natural Resources and Environment
Government Accountability Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Gomez:

Thank you for the opportunity to review and comment on the Government Accountability Office (GAO) draft report entitled, *URANIUM CONTAMINATION: Overall Scope, Time Frame, and Cost Information is Needed for Contamination Cleanup on the Navajo Reservation* (GAO-14-323). We appreciate GAO's efforts to focus attention on ways to improve the response to uranium contamination on the Navajo reservation.

The Department of the Interior concurs with the recommendations but does not agree with the findings associated with scheduling and cost estimating.

The report's title suggests it is aimed at looking at the "overall" scope, time frame, and cost information needed for uranium contamination cleanup involving more than 500 unremediated uranium mines on the Navajo reservation—but the report aims its final three recommendations at criticizing Bureau of Indian Affairs' (BIA) management of the Tuba City Dump cleanup, a very small part of the overall cleanup problem. The Department does take its responsibilities related to this site seriously. The Department believes the management of the cleanup has been handled responsibly, but as explained in the enclosure, circumstances beyond BIA's control contributed to delays.

The Department believes the United States' trust relationship with the Navajo Nation, coupled with the actions the United States has taken with respect to uranium production over the decades, demands more be done in response to this problem. The United States has extensive experience over the last few decades in addressing massive environmental contamination, including that originating from war material and weapons production activities. That expertise should be brought to bear on the entire current problem, rather than focusing on discrete and shorter term issues.

The announcement on April 5, 2014 of the $5.1 billion Anadarko settlement, pursuant to which the Navajo Nation is reportedly to receive about $1 billion to address uranium contamination, may provide an opportunity for high level, comprehensive discussions about better addressing the totality of the Navajo uranium contamination problem. The Department will be reaching out to the other governmental entities referenced in the report in an effort to jump-start those discussions.

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The enclosure provides additional comments to capture more accurately the progress made by the BIA. If you have any questions about this response, please contact Marvin Keller, Acting Chief, Division of Environmental and Cultural Resources at (703)390-6470.

Sincerely,

Michael S. Black
Director, Bureau of Indian Affairs

Enclosure

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Department of the Interior
Comments on Draft GAO Report
***URANIUM CONTAMINATION: Overall Scope, Time Frame, and Cost Information is Needed for Contamination Cleanup on the Navajo Reservation* (GAO-14-323)**

Comments and Clarifications on Recommendations for the Tuba City Dump (TCD) Site:

Recommendation 1: To ensure that agencies working on the 2014 5-year plan better align their activities and resources, the Executive Branch entities involved in addressing the uranium contamination on the Navajo reservation as they develop a coordinated outreach strategy to include in the 2014 5-year plan, should take action to incorporate key practices in their collaborative effort, such as defining and agreeing on the agencies' respective roles and responsibilities.

Response: Indian Affairs (IA) concurs. To this end, the Department has already reached out to the counterparts at the Department of Energy, the Environmental Protection Agency, the Department of Health and Human Services and the Nuclear Regulatory Commission and suggested that this topic be addressed by the White House Council on Native American Affairs. That will raise the visibility of, and attention paid, to these important issues.

Recommendation 2: Identify and examine lessons learned from managing the RI/FS contract and consider these lessons as part of the acquisition planning process for the remedial action contract.

Response: IA concurs. We regularly review lessons learned. We plan to implement lessons learned with the RI/FS implementation contract in the next phases of the remediation process.

Recommendation 3: Employ best practices in creating the schedule and cost estimates for the remedial action contract.

Response: IA concurs. We will continue to prepare schedules and estimates in accordance with Interior's "Environmental and Disposal Liabilities Identification, Documentation and Reporting Handbook", dated December 2011, and other standards of the environmental industry. We do not believe the guides used by GAO are applicable to environmental actions.

Recommendation 4: Apply for funding from Interior's Central Hazardous Materials Fund in order to help meet the funding needs for remedial action cleanup phase of the project.

Response: IA concurs with the need to seek resources through multiple avenues. The Central Hazardous Materials Fund is allocated to fund highest priorities among a very long list of property needs. Thus, as appropriate, we will pursue funding through the Indian Affairs budget and other possible means as well.

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Appendix IX: Comments from the Department of Health and Human Services

DEPARTMENT OF HEALTH & HUMAN SERVICES — OFFICE OF THE SECRETARY

Assistant Secretary for Legislation
Washington, DC 20201

APR 18 2014

J. Alfredo Gomez
Director, Natural Resources
and Environment
U.S. Government Accountability Office
441 G Street NW
Washington, DC 20548

Dear Mr. Gomez:

Attached are comments on the U.S. Government Accountability Office's (GAO) report entitled, "*Uranium Contamination: Overall Scope, Time Frame, and Cost Information is Needed for Contamination Cleanup on the Navajo Reservation*" (GAO-14-323).

The Department appreciates the opportunity to review this report prior to publication.

Sincerely,

Jim R. Esquea
Assistant Secretary for Legislation

Attachment

EPA-R9-2015-010125 Production VOL001

GENERAL COMMENTS OF THE DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS) ON THE GOVERNMENT ACCOUNTABILITY OFFICE'S (GAO) DRAFT REPORT ENTITLED, "URANIUM CONTAMINATION: OVERALL SCOPE, TIME FRAME, AND COST INFORMATION IS NEEDED FOR CONTAMINATION CLEANUP ON THE NAVAJO RESERVATION" (GAO-14-323)

The Department appreciates the opportunity to review and comment on this draft report.

Recommendations for Executive Action:

To ensure that agencies working on the 2014 5-year plan better align their activities and resources, recommend that the Administrator of EPA; the Secretaries of Energy, the Interior, and Health and Human Services; and the Chairman of the Nuclear Regulatory commission, as they develop a coordinated outreach strategy to include the 2014 5-year plan, take action to incorporate key practices in their collaborative effort, such as defining and agreeing on the agencies' respective roles and responsibilities.

HHS Response:

HHS concurs with GAO's recommendation. The Navajo Area IHS (NAIHS) will continue to conduct outreach events in Navajo communities alerting other agencies using a planned EPA SharePoint site to facilitate their scheduling and participation. The NAIHS staff will also attend other agency outreach events and coordinate presentations with those agencies.

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Appendix X: Comments from the Nuclear Regulatory Commission

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 17, 2014

Mr. J. Alfredo Gómez, Director
Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Gómez:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to your letter dated March 25, 2014, requesting comments on the U.S. Government Accountability Office (GAO) draft report GAO-14-323, "Overall Scope, Time Frame, and Cost Information is Needed for Contamination Cleanup on the Navajo Reservation." We appreciate the opportunity to review the draft report and provide our comments for your consideration.

As requested, the NRC has reviewed the draft report and, in general, is in agreement. Our comments are enclosed.

Sincerely,

Mark A. Satorius
Executive Director
for Operations

Enclosure:
NRC comments on draft GAO report

Appendix XI: Comments from the Navajo Nation

NAVAJO NATION DEPARTMENT OF JUSTICE
OFFICE OF THE ATTORNEY GENERAL

HARRISON TSOSIE
ATTORNEY GENERAL

DANA BOBROFF
DEPUTY ATTORNEY GENERAL

Via Electronic Mail and U.S. Regular Mail

April 15, 2014

Mr. J. Alfredo Gomez, Director
Natural Resources and Environment
United States Government Accountability Office
441 G. St. NW
Washington, D.C. 20548

RE: GAO Draft Report on Uranium Contamination in the Navajo Nation

Dear Mr. Gomez:

First I want to take this opportunity to personally thank the representatives of your office who spent many hours on the Navajo Nation visiting abandoned uranium mine sites and former uranium processing sites. These representatives include Jeffrey Malcom of the U.S. GAO Washington D.C. Office, Leslie Pollock of the U.S. GAO Denver Office and Emily Hanawalt of the U.S. GAO San Francisco Office. They traveled across the Navajo Nation visiting perhaps twenty of our 521 abandoned uranium mine sites and three of our five former uranium processing sites. Their effort at gathering first-hand information was commendable and much appreciated.

Still, however, as I am sure all understand and agree, it is an impossible task to fully comprehend the nature and extent of the devastation to Navajo lands and people caused by past uranium mining and processing without living here and experiencing the impacts on a daily basis.

With that in mind, here is our overall reaction to the GAO Draft Report. While, like the recent widely reported Tronox settlement, it represents a good start, the GAO Draft Report falls short in a number of areas, especially in its admittedly vague projections of additional funds necessary to address the remaining problems, in its assessment of certain agencies successes, and in its failure to emphasize the lack of groundwater characterization that has taken place concerning abandoned uranium mine sites.

We illustrate the funding issue by using the recent Tronox settlement as a focal point. Assuming that the settlement is approved by the Court and assuming that all public comments can be adequately addressed and assuming that there are no appeals filed, the Navajo Nation stands to have approximately 1 billion dollars available for remediating 50 former Kerr-McGee operated abandoned uranium mines and one former mill site. It is important to note that the evidence presented at trial and the evidence considered in the settlement related only to those 50 out of 521 abandoned mine

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sites and one mill site. The amount allocated to the former mill site is 43 million. Given the fact that many of the former Kerr-McGee mines are located in rugged, remote mountainous regions, as noted in the Draft GAO Report, we are not at all sure that the approximate 985 million allotted to the mines will be sufficient to complete their remediation. We are hopeful.

On the other hand we are quite sure that the 43 million allocated to the former Shiprock Mill site will fall far short of the money needed to achieve our desired result for that site, relocation of the unlined tailings pile to a different, safer place, as is occurring with the Moab tailings pile. Our projected cost of that task is close to a billion dollars by itself.

Thus, it is clear to us that the best current guess as to projected costs for future remediation on the Navajo Nation should be expressed in the billions as opposed to the hundreds of millions of dollars.

Next, we take issue with the discussion regarding the Department of Energy meeting its Five-Year Plan goal of continuing the funding for remediation of former mill sites on the Navajo Nation. Strictly speaking we recognize the accuracy of that statement, but, as we believe the writers of the Draft Report realize, the goal was achieved only because it was incredibly modest to begin with and contained no commitment for additional funds. For us it is imperative for people to realize that there is no substantial evidence available to indicate that the treatment operations at those mill sites are successfully remediating the groundwater contamination. They are failing and we challenge anyone at DOE to say otherwise. This should have been plainly stated in the Draft Report.

Furthermore we believe the Draft Report understates the lack of progress in characterizing the potential groundwater contamination caused by past uranium mining. We illustrate this point by noting that we are just now getting firm commitments from U.S. EPA to fully characterize the groundwater beneath the Northeast Church Rock site. To our knowledge there has been no full groundwater characterization at any of the 521 abandoned uranium mine sites.

Additionally, we believe there is a substantial omission in the Draft Report regarding what is needed in moving forward. Both the Congress and the Executive Branch agencies need to commit the United States to full and long term clean-up of the uranium contamination that continues to devastate Navajo people and lands.

Finally, we would greatly appreciate you adding New Mexico Senator Tom Udall to the list of Congressional Representatives who will receive this Report. Senator Udall participated in the 2007 Congressional Hearing when he was a member of the U.S. House of Representatives and he continues to stay focused on the needs of the Navajo Nation concerning uranium related matters.

Attached to this letter you will find additional more specific comments prepared by Navajo Nation EPA Executive Director Steve Etsitty, Navajo EPA long time employee Cassandra Bloedel and Navajo Nation outside attorney Paul Frye. We ask you to also take these comments into consideration.

P.O. Box 2010 • Window Rock, Navajo Nation (AZ) 86515 • 928-871-6347 • Fax No. 928-871-6177

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Mr. J. Alfredo Gomez, Director
RE: GAO Draft Report on Uranium Contamination in the Navajo Nation
April 15, 2014
Page 2

Thank you again for your efforts and your help in giving us a good start at addressing these overwhelming issues.

Sincerely,

THE NAVAJO NATION

Harrison Tsosie, Attorney General

Attachments

P.O. Box 2010 • Window Rock, Navajo Nation (AZ) 86515 • 928-871-6347 • Fax No. 928-871-6177

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Appendix XII: GAO Contact and Staff Acknowledgments

GAO Contact

J. Alfredo Gómez, (202) 512-3841 or gomezj@gao.gov

Staff Acknowledgments

In addition to the individual named above, Jeffery D. Malcolm (Assistant Director), Juaná Collymore, John Delicath, Tisha Derricotte, Emily Hanawalt, John Krump, Leslie Kaas Pollock, Karen Richey, Dan Royer, Kelly Rubin, Jeanette Soares, Kiki Theodoropoulos, and Sarah Veale made significant contributions to this report.

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