Addressing Navajo Uranium Contamination

November 2011

5-Year Plan to Address Uranium Legacy

- Centers for Disease Control and Indian Health Service – Health Assessment
- Nuclear Regulatory Commission – Regulated Facilities
- Department of Energy – Mill Sites
- Bureau of Indian Affairs – Tuba City Dump
- EPA – Structures, Water Supplies, and Mines

A Prospective Birth Cohort Study Involving Environmental Uranium Exposure in the Navajo Nation

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Farmington, NM
November 8, 2011

Why a Prospective Birth Cohort Study?

- Increased exposure potential due to both elevated naturally occurring uranium levels as well as historical mining and milling activities
- Existing health burden
  - Congenital anomalies are the leading cause of Navajo infant deaths
  - Infant mortality rate among Navajos is 8.5 deaths per 1000 live births, compared to 6.9 deaths per 1000 live births among all races in the US
  - Postnatal mortality rates for Navajo infants are 2.1 times higher than for all races in the US
- Limited information on the association between uranium exposure and adverse birth outcomes and developmental delays
- Ability to use biomonitoring to assess exposure and evaluate impacts at different developmental stages

A Prospective Birth Cohort Study Involving Environmental Uranium Exposure in the Navajo Nation

Research Goals

- Evaluate potential associations between uranium exposure during pregnancy and birth defects/developmental delays
- Assess potential interactions with other heavy metals in the environment
- Determine activities and source contributions that lead to increased maternal/fetal uranium exposure

Applied Public Health Goals

- Increase the use of prenatal care among Navajo mothers through community outreach and education
- Ensure early intervention to reduce the impact of birth defects and developmental delays
- Strengthen the environmental health capacity of Navajo area agencies

Outline for tomorrow morning's presentations during the —Health Research and Outreach" session

Birth cohort study components

- Background, goals, structure (Steve Dearwent, ATSDR)
- Research design (Johnnye Lewis, UNM)
- IHS participation (Doug Peter, IHS)
- NNDOH role (Mae-Gilene Begay, NNDOH)

Cultural Relevance and Community Benefits

- Respecting traditional knowledge (David Begay & Perry Charley)
- Symbolism of the cohort study logo (Sandy Ramone)
- Early Intervention and improving developmental outcomes (Chris Vining)

INDIAN HEALTH SERVICE

FIVE YEAR Action Plan Progress Report

As of October, 2011

Medical Screening program implementation

1. Funded by Navajo Area from 2010-2011 IHS appropriations. The first staff member was hired in January, 2010 who assisted the University of New Mexico research staff with medical exams and lab testing in support of a NIH study on the impact of uranium on kidney disease.
2. As of October, 2011 staff was increased to 2.5 FTEs including a physician with plans to add two more staff in CY 2012.

3. Objectives of the program include:

a. Community discussions to see what residents want from the program.
b. Use of mobile unit / field clinics close to beneficiaries with a history of non-occupational uranium exposures.
c. Health Education
d. Patient registries and database of those screened in the NAIHS health records system.
e. Case management services in coordination with medical home providers across the reservation.
f. Health care provider education.
g. Collaboration with traditional Navajo medicine people.

4. Community conversations which were scheduled once per month in 2010.
5. Health screening events which were held in 16 locations over the past 12 months with 600 screened to date of which 62% self-reported exposure by water source, 26% by a contaminated building, and 35% by living in proximity to an abandoned mine/mill site.

6. Health concerns identified (note: some were previously known by IHS providers) included 56% - eye problems, 40% - diabetes, 50% - elevated blood pressure, 30% - depression, 25% - respiratory concerns, 20% - skin problems, 15% - kidney problems, 44% - headaches, 13% - miscarriages, 12% - speech delay, 14% - learning problems, and others.
7. The number one concern identified by those interviewed was the need for improved access to clean, uncontaminated water nearby or in their homes.

Continuation of Navajo Area IHS Radiation Exposure Screening and Education Program – for Radiation Exposure Compensation Act purposes…

HRSA grant awarded for patient screening to IHS in Shiprock, New Mexico for 2011-2014 at $200K/year. Screening results shared with staff in the Office of Navajo Uranium Workers.

Interagency Work with ATSDR

Work with ATSDR on a prospective birth cohort study which will include Navajo Area IHS and PL 93-638 contracted program staff involvement with the University of New Mexico in conducting the research. Study sites will include Kayenta, Tuba City, Fort Defiance, and Chinle, Arizona as well as Gallup and Shiprock, New Mexico. Funds have been distributed for equipment purchase and staff hiring.

U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Status of USNRC Activities Navajo Nation 5-Year Plan

Dominick Orlando

Special Projects Branch
Decommissioning and Uranium Recovery Licensing Directorate
Division of Waste Management and Environmental Protection
U.S. Nuclear Regulatory Commission

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Protecting People and the Environment

Current Status

- NRC and EPA-Region 6 have joint jurisdiction over groundwater contamination
- Three (3) tailings disposal Cells reclaimed 1989-1995
- Radon cover in-place since 1996
- Two Borrow Pits reclaimed and backfilled
- Mill Building area released for unrestricted use in 1995
- Estimated License Termination - 2020

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2011 Activities

Semi-annual groundwater monitoring program in progress in all 3 zones

- **Groundwater extraction system operates only in Zone 3**

April 2011 – Technical discussions on disposal approach

May 2011 - NRC peer review of the Revised Site Wide Supplemental Feasibility Study and Human Health Risk Assessment

August 2011 - biennial inspection by NRC staff – no violations

- **Last inspection - May 2009 – no violations**

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Northeast Church Rock Mine

September 29, 2011 - UNC Church Rock Mill Site selected by the EPA as the disposal site for mine waste from the North East Church Rock Mine

Non-11e.2 material to be placed over existing tailings cells containing 11e.2 byproduct material

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Protecting People and the Environment

Path forward

Early 2012 - EPA and GE/UNC sign Administrative Order

- Design Steering Committee meet frequently over the next 3 years
- Work closely with DOE, EPA, NNEPA & State
- Resolve technical and regulatory requirements and policy issues for enhancing tailings design

GE/UNC submits license amendment to:

- Accept non-11e.(2) waste
- Enhance cover design of the existing tailings cover

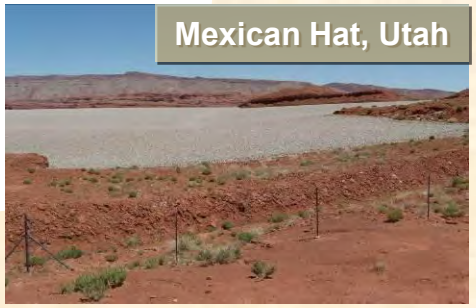
NRC reviews request, if acceptable, amends License

- Estimated 1 year process
- Includes safety & environmental reviews
- Public outreach activities – EA/EIS Comments and Consultation, Opportunity for hearing, Public meetings

U.S. Department of Energy (DOE) Navajo Nation *Five-Year Plan*

Update on Activities

November 8, 2011



DOE is implementing the actions outlined in the Navajo Nation *Five-Year Plan*

- DOE continues to monitor and maintain the disposal cells (Mexican Hat, Utah; Shiprock, New Mexico; and Tuba City, Arizona) and operate groundwater treatment systems to ensure they remain protective.
- DOE continues to fund the Navajo Nation to support the Nation's participation in all site activities under our Cooperative Agreement
- DOE continues to provide technical expertise to the Indian Health Service and Bureau of Indian Affairs, as requested

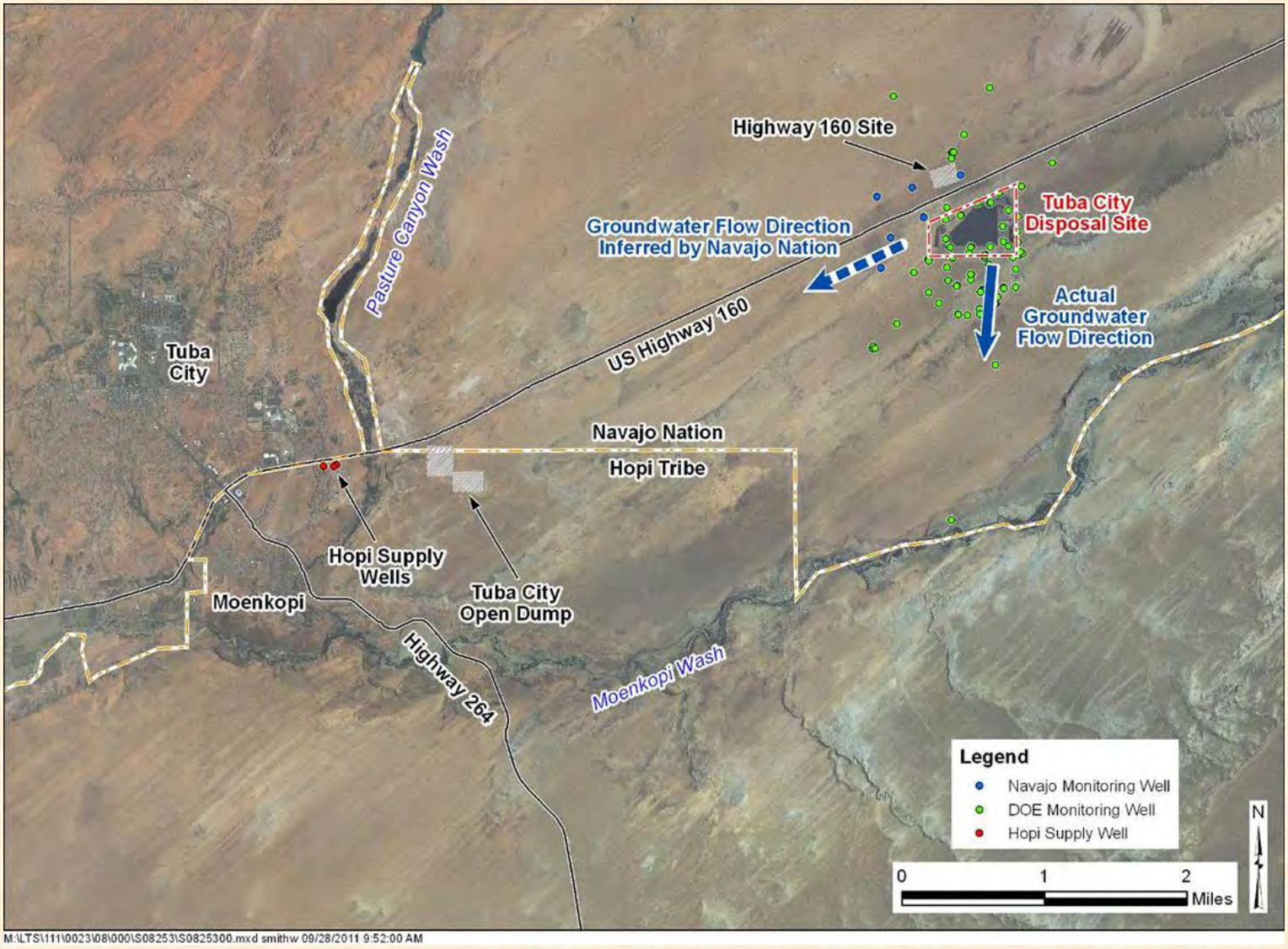
DOE continues its technical coordination with the Navajo Nation

- DOE coordinates with the Navajo Nation through several avenues
  - Holding regular quarterly meetings since 1998 with Navajo Uranium Mill Tailings Remedial Action (UMTRA) project and Navajo Nation Environmental Protection Agency (NNEPA) staff to discuss groundwater remedies
  - Providing groundwater monitoring data, annual treatment system performance reports, and annual site inspection reports, along with a number of special study reports to evaluate alternative treatment technologies
  - Maintaining continuous involvement of Navajo UMTRA staff in site management and surveillance and maintenance through the Cooperative Agreement
  - Sponsoring a Navajo Nation (and Hopi Tribe) federal intern at an LM office
  - Holding a public meeting and quarterly meeting in Shiprock in September 2011
  - Working closely with the NNEPA in supporting the remediation of the Highway 160 Site by operating the Grand Junction Disposal Site to receive 412 truckloads of contaminated material over a 12-week period

DOE continues its technical coordination with the Navajo Nation (continued)

- DOE provided funding through the Cooperative Agreement with NNEPA to install and sample new monitoring wells near the Tuba City UMTRCA site (former Rare Metals mill site) to address concerns about groundwater contamination flowing west toward Tuba City
  - Monitoring wells were installed in fall 2010 and sampled over the winter
  - Study concludes that the UMTRCA site groundwater flows south/southwest and does not flow to the west toward Tuba City or other properties west of the site
- Radiation awareness training for local residents and public workers was conducted in Tuba City on June 15 and 16, 2011, prior to start of Highway 160 cleanup

Groundwater Flow at DOE Uranium Mill Tailings Radiation Control Act (UMTRCA) Site in Relation to Tuba City Open Dump and Highway 160 Site



DOE continues its technical coordination with the Navajo Nation (continued)

- Monument Valley
  - Performing long-term surveillance and maintenance (LTS&M) inspection and reporting activities
  - Phytoremediation pilot studies have been successful in removing ammonium and nitrate from subpile soils, hydraulically controlling spread of the groundwater plume, improving rangeland condition, and producing native seed for reclamation
  - Finalizing path forward for treatment of ammonium and nitrate plume
- Shiprock
  - Performing LTS&M inspection and reporting activities
  - Continuing to pump contaminated groundwater into evaporation pond
  - Responding to Navajo Nation comments on groundwater compliance action plan
  - Investigating source of high levels of uranium and selenium in seeps in Many Devils Wash (naturally occurring or disposal cell–related)
- Tuba City
  - Performing LTS&M inspection and reporting activities
  - Upgraded groundwater treatment plant; recently restarted operations

Navajo Nation and DOE completed remediation of the Highway 160 Site

- The 2009 Omnibus Bill gave DOE $5 million to perform surface remediation of the Highway 160 Site; DOE transferred $4.4 million to the Navajo Nation through a new cooperative agreement
- Navajo Nation managed the characterization, design, and remediation
- DOE provided oversight and independent verification of the remediation (used $.5 million of the funding); DOE operated the Grand Junction Disposal Cell for disposal and placement of contaminated materials
- Excavation and transportation of contaminated materials was completed on August 29; backfill of the site was completed in early October

Bulk and bagged waste from the Highway 160 Site at the Grand Junction Disposal Cell—August 2011

Navajo Nation and DOE completed remediation of the Highway 160 Site (continued)

- Characterization included the Highway 160 Site and nearby residences; waiting for radon tests to conclude structures do not exceed DOE and U.S. Environmental Protection Agency cleanup criteria
- Completion Report and Independent Verification Report will be completed in November 2011 after all laboratory data is received
- Waiting for final project costs from Navajo Nation to determine how much money remains from original funding

Tuba City Dump Site
Project Update

November 8, 2011

Completed Activities

- IA funded EPA IAA investigation and source removal at MW-07 Final Report received August 9, 2010
- EPA and IA signed AOC September 10, 2010
- IA funded RI/FS Work plan completed Dec 20, 2010
- IA and EPA executed an Interagency Agreement for EPA oversight

Completed Activities cont'd.

- IA contracted RI/FS work - AMEC
- IA funded Hopi Water Supply Well Studies Report received August 5, 2011
- Indian Affairs funded Hopi quarterly ground water monitoring – June report received August 26, 2011
- IA Contractor began RI/FS June 2011

Scope of RI/FS

- Area-wide surface radiological survey
- Surface sediment sampling
- Well installation (shallow and deep)
- Ecological sampling and analysis (plants and small mammals)
- Landfill gas survey and monitoring
- Baseline human health and ecological risk assessment

Indian Affairs Funding

- FY 1997-2009 ~$5.6 million for assessment, monitoring, and oversight
- FY 2010-2011 ~ $2.7 million for RI/FS
  - $300K for EPA IAG for RI/FS oversight
  - $445K GW monitoring & assistance (Hopi Tribe)
  - $2M for RI/FS Contractor (AMEC)
- FY 2012
  - RI/FS Studies $214,000
  - EPA IAG for RI/FS oversight $254,000
  - Hopi technical assistance $233,672
  - Groundwater monitoring $246,820
  - Tech support / meetings $46,100

RI/FS Timeline

- June 2011
  - Started RI/FS 2-yr implementation
- February 2012
  - Treatability/Pilot studies complete
- March 2012
  - Finish field investigations
- June 2012
  - Sample Analysis and Validation Report due
- August 2012
  - Draft Sampling & Analysis Report due
  - Geochemical Fate and Transport Model

RI/FS Projected Time Line

- December 2012
  - Complete RI
- May 2013
  - FS due to EPA
- August 2013
  - Complete FS
- October 2013
  - EPA Signs Record of Decision
- 2013 through 2014
  - Select and Design Remedy
- 2015 through 2017
  - Implement Remedy

Looking Forward

- Completing RI/FS – anticipated fall 2013
- EPA Selects final remedy with input from IA, Tribes and public
- Remedial action/Remedial design – anticipated to begin 2014
- Remedial implementation (dependent on timeline and outcomes of RI/FS

Summary

- IA has implemented interim actions to address potential risks from the TCD.
- IA has completed the RI/FS work plan.
- The RI/FS work is being implemented under an AOC between IA and EPA to be completed in 2013.
- The RI/FS has an established scope and time frame
- The RI/FS work requires Tribal consultation Tribal/Stakeholder comment periods, comment response time and EPA approvals

Environmental Protection Agency

- Contaminated Structures
- Water Supplies
- Abandoned Mines

Structures - Background

- Waste rock used for building homes
- 2007 – EPA mapped and identified ~500 structures near mines
- Plan: Assess 100 structures per year, clean up or replace contaminated homes

Contaminated Structure Removal

Structures - Update

- Navajo EPA and US EPA have assessed a total of 683 structures for possible contamination
- Remediated 34 contaminated structures and 10 residential yards
- Working on Partnership with Navajo Housing Authority

New Replacement Home

Water Sources - Background

- 30% of Navajo families haul drinking water
  (<1% nationwide)
- Unregulated water sources can exceed uranium, arsenic, and other standards
- Plan: Outreach, pilot hauling program, new waterlines, and new regulated water hauling points

Water Haulers from an approved point

Water - Update

- Tested 240 unregulated water sources between 2006-2010.
- 29 sources exceeded drinking water standard for uranium or radionuclides
- Wells posted, residents notified
- 3 contaminated wells shut down

Water – Infrastructure and Water Hauling

- In 2009-2011 EPA, IHS & HUD committed over $24.5 million for water infrastructure, including:
  - Piped water serving over 400 homes
  - Water hauling program serving up to 3,000 homes
  - New regulated water hauling points

Sweetwater 500,000 gallon water tank

Water Hauling

- Navajo Department of Water Resources purchased 5 water hauling trucks and is implementing a water hauling program with a $2,640,000 USEPA grant

- NNEPA developed water hauling guidelines

Baca Watering Point Construction

Abandoned Uranium Mines - Background

- 2007: EPA completed multi-year effort to assess uranium contamination – 520 mines identified

- Plan: On-site screening of all 520 mines by end of 2011; clean up the highest risk mines

Ruby No. 3 Mine

Abandoned Uranium Mines- Update

- Completed on-site screening of 452 mines
- Started assessment/cleanup at 4 mines: Northeast Church Rock, Quivira, Skyline, and Mariano Lake
- Selected additional mines for detailed assessment in 2012
- Identifying Potentially Responsible Parties for cleanup

Mariano Lake Mine

Skyline Mine

- Removal Assessment May 2009
- Community Workshops Spring/Summer 2010
- Removal Action complete October 21, 2011

Northeast Church Rock Mine

- Largest underground uranium mine in country and highest priority mine for Navajo Nation
- Signed cleanup plan in September 2011, requiring:
  - Most stringent cleanup standard in the country
  - One disposal location with cap and liner
  - Voluntary housing options during cleanup
  - Job training and employment during cleanup
  - Navajo Nation, DOE, NRC, New Mexico participation in design
  - Independent technical advisor for community

Summary

- EPA Investment
  - Approximately $12M per year in appropriated funds
  - Responsible parties have spent $12M to date
  - Additional $13.2M from Tronox settlement
  - Grant funding to support partnership with Navajo EPA
- Results
  - Assessed 683 structures; remediated 34 contaminated structures and 10 residential yards
  - Assessed 452 mines; started removal actions on 4 highest priority mines; beginning detailed assessments on at least 3 more mines in 2012
  - 240 wells tested; $24.5M in new water lines serving 400 homes; water hauling program serves up to 3000 homes