

HOW NONPROFIT ORGANIZATIONS FILL THE 'WATER GAP' IN PARTS OF THE NAVAJO NATION

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GSA Connects 2022

T71. Challenges to Tribal Water Resources and the Health of
Indigenous Communities in North America

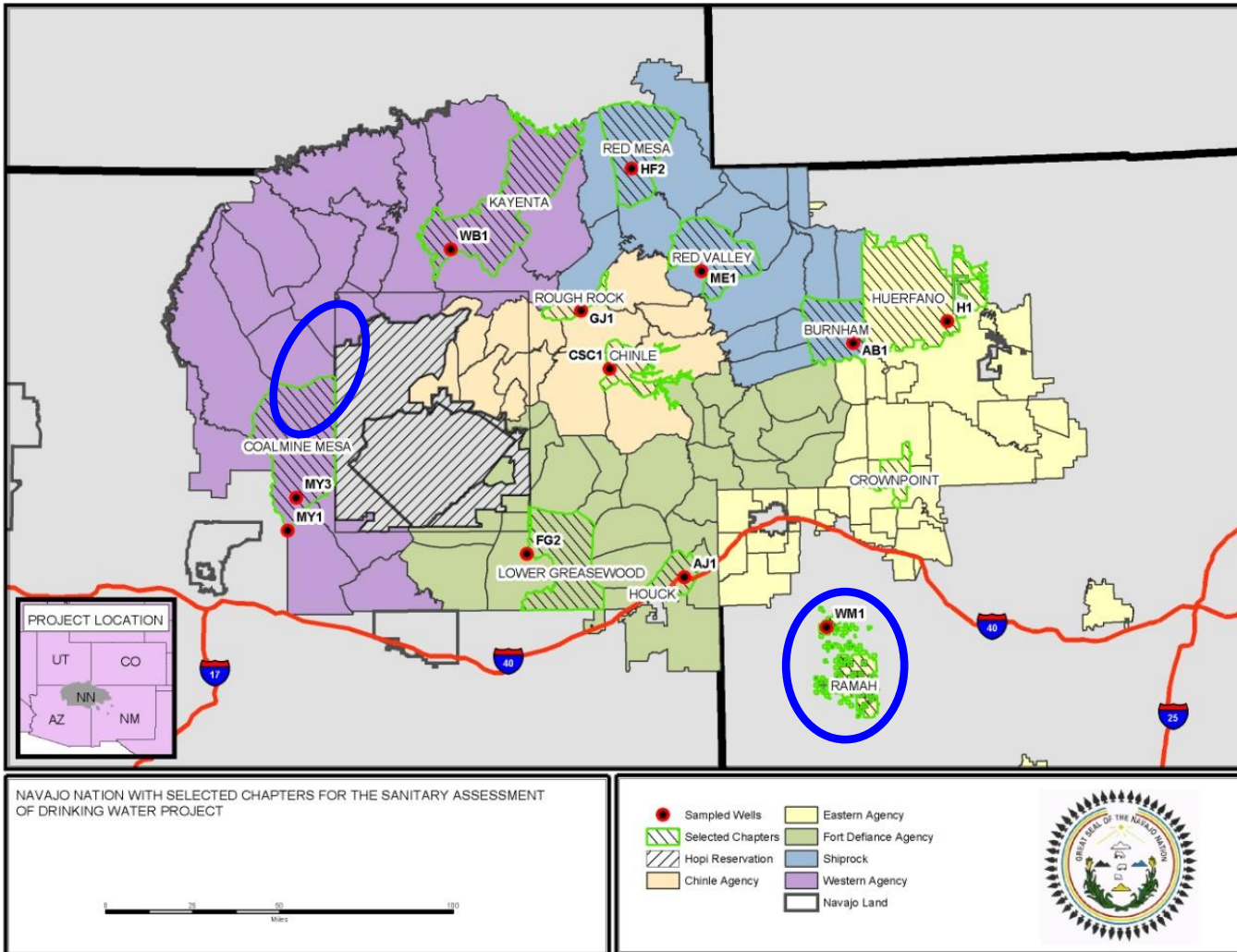
October 9, 2022

Outline

- Review of some environmental health issues on Navajo Reservation.
- Examples of projects by non-profit organizations
 - Ramah Navajo Reservation
 - Engineers without Borders (EWB) (2005-2011)
 - Water testing for stock wells and public education
 - Bennett Freeze area (2012-2022)
 - Water Resources Action Project, GA2030 and Forgotten People
 - Handwash stations for COVID-19 relief
 - Water filtration for water haulers
 - Rainwater harvesting for drinking water during monsoons
 - Sampling and treatment of isolated wells with low-tech materials

Navajo Nation

- Population
 - 180K/300K
- Area
 - 26K – 27K mi²
 - ~ W. VA
- Government
 - Current tribal government established and recognized by US in 1923



Potential Contaminants in Drinking Water

- Southwestern United States is characterized by high and variable background levels for arsenic.
- Uranium and its radioactive daughters (radium and radon) are also high and variable in Southwest drinking water
- Health effects of concern:
 - Arsenic: bladder and lung cancer
 - Radium: bone sarcoma and head carcinoma
 - Uranium: nephrotoxin, synergistic with diabetes
- Other COCs
 - Nitrate – blue baby syndrome
 - Sulfate – laxative effect
 - Microbial contaminants – GI effects, stomach cancer
 - Pesticides (sheep/cattle dip) – kidney, liver, thyroid, developmental, reproductive effects
 - Spread of infectious diseases (COVID-19)

Navajo Water Haulers

- Nationwide, more than 36,000 tribal homes lack access to safe drinking water.
 - Over 30% of Navajo residents are not connected to PWSs, and many haul water from unregulated water sources.
 - arsenic, uranium, coliform and pesticides
 - New 10 ppb MCL for arsenic led to increase in systems out of compliance with SWDA and closure of wells.
- Water hauling imposes large financial burden on affected families.
 - >5% of average household annual income (\$1000) in 2001
 - NM Region 6 estimate: “equivalent to up to \$22,500/yr”.

The problems

- Problem 1: unregulated stock wells
- Problem 2: scarce water and COVID-19
- Problem 3: microbial contamination of hauled water
- Problem 4: impassable roads during monsoon season
- Problem 5: wells potentially contaminated with mine wastes

Solutions (I)

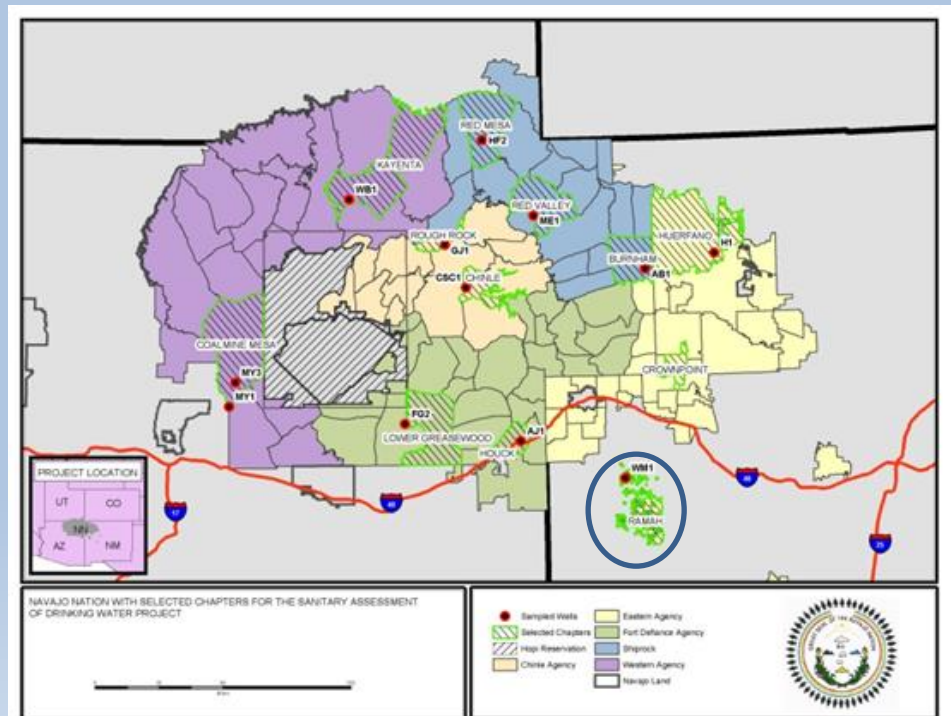
- Problem 1: unregulated stock wells are only local source for drinking water
- Solution: sampling and testing of stock wells and public education program in collaboration with local government

Location:

Ramah Navajo Chapter

Sponsor:

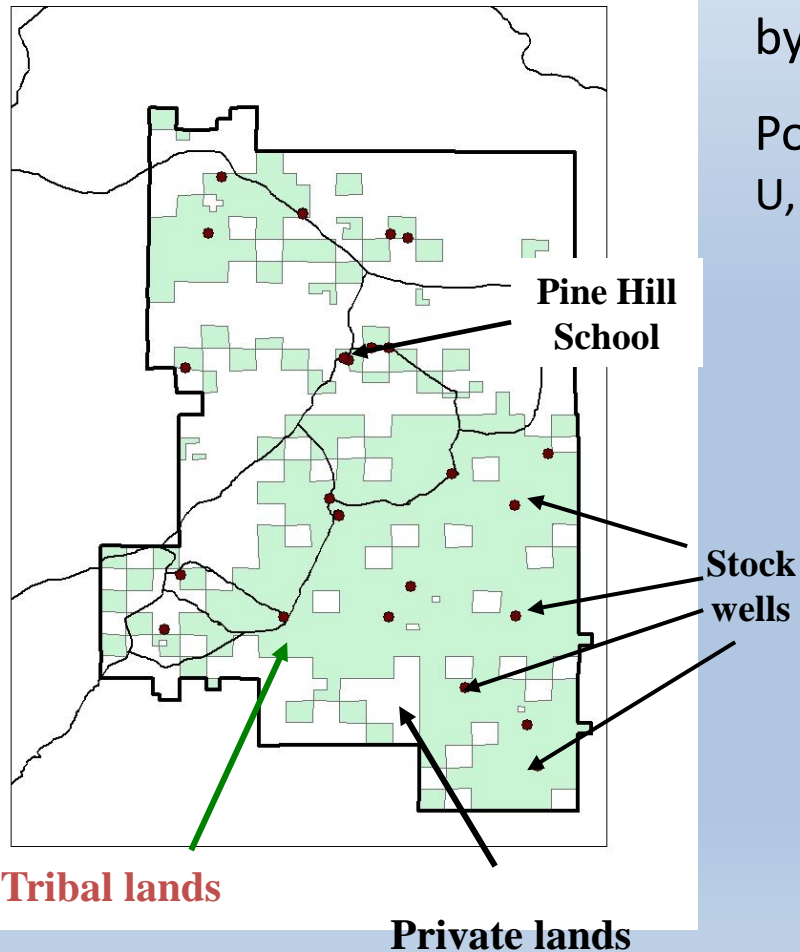
Engineers without Borders



Stock Wells on Ramah Navajo Reservation

T'lochini ("Place of Wild Onion")

Checkerboard prevents infrastructure development



26 unregulated stock wells used by stock and people (30%).

Potential contamination:
U, As, pesticides, coliform



EWB Water Quality Study: Chemical Analyses

Field measurements

- Temperature
- pH
- Sulfate, phosphate
- Turbidity
- Total dissolved solids (conductivity)
- Arsenic



Lab measurements

- Major cations
- Major anions
- Total As, As(III), As(V)
- Metals: Pb, Cu, Ni, Fe, Cd, Hg, Cr
- U, Gross alpha, beta
- Radium 226 & 228
- Toxaphene
- Total coliform and e-coli

Science Education



GPS mapping of wells



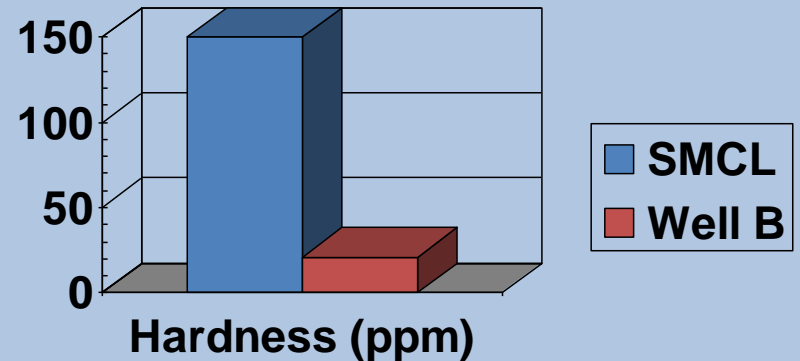
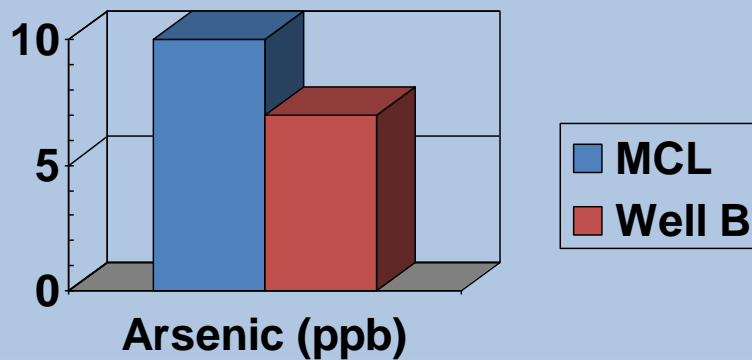
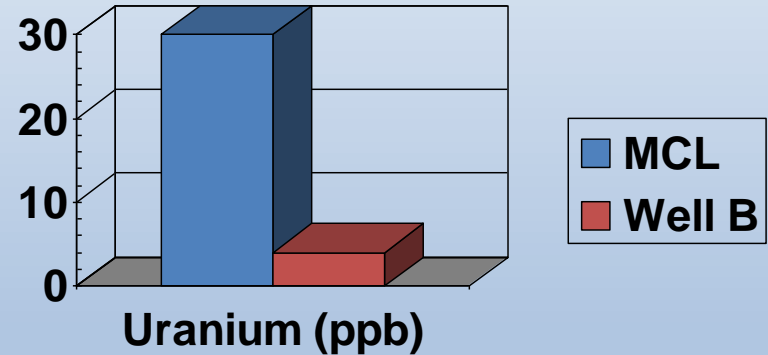
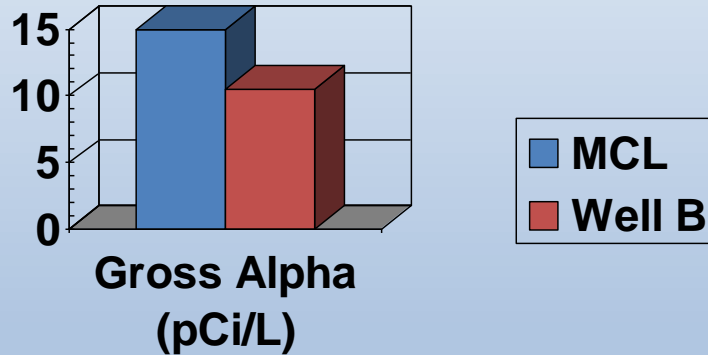
Field tests and water sampling



Solar Power at Weavers Hogan

Supplemental environmental education activities presented to mid- and high school students.

Public Education

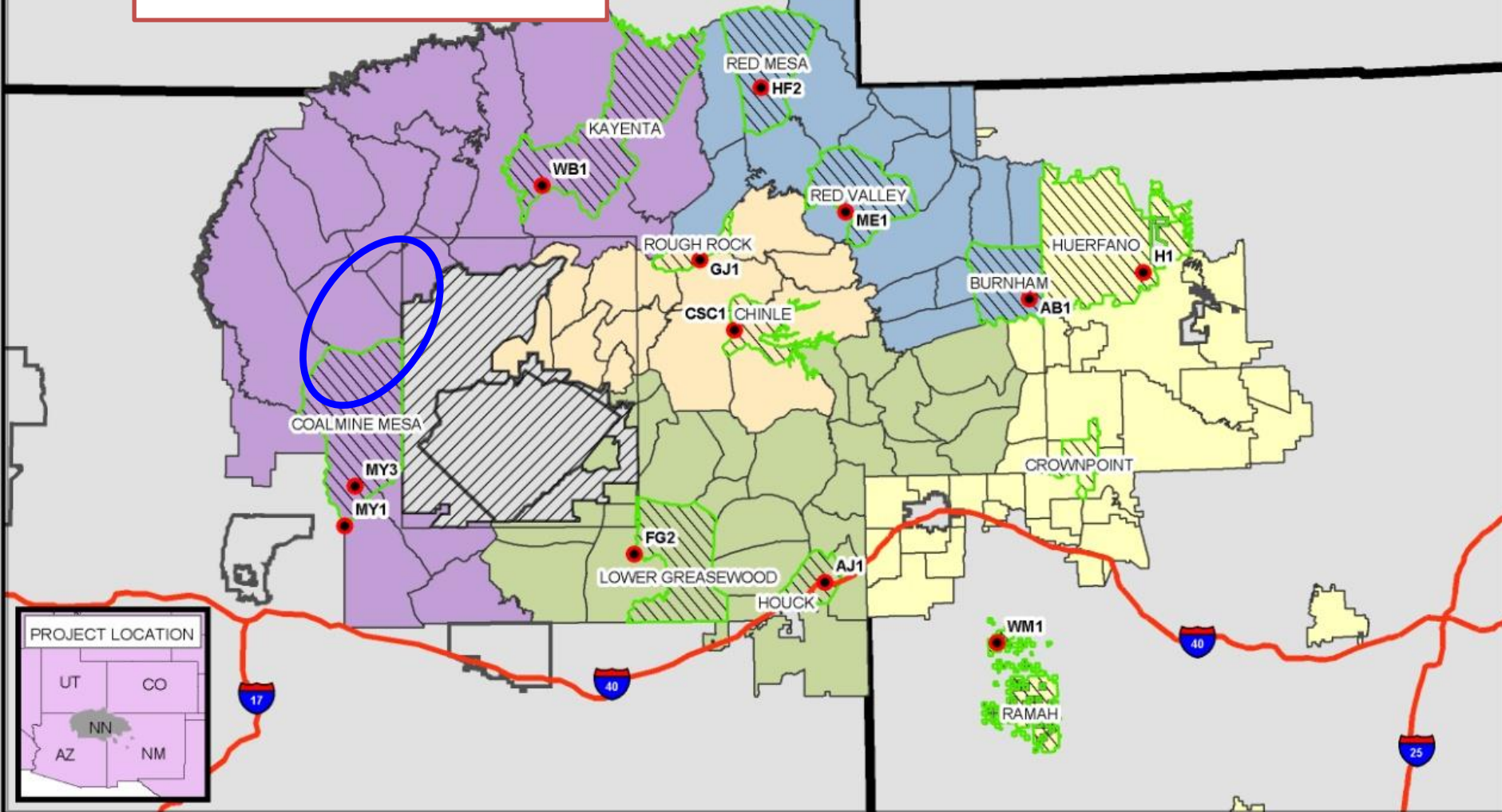


Unit 2- Well B

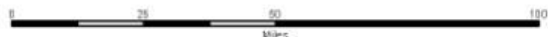
Summary of Results

- **All samples comply with USEPA Primary Drinking Water standards - Maximum Contaminant Levels (MCLs).**
 - No wells had bacterial contamination.
 - Four wells exceeded USEPA Secondary standards (SMCLs) for iron, total dissolved solids, or sulfate.
 - Two wells had concentrations of arsenic, uranium and radioactivity that are close to MCLs.
 - Concentrations of other metals were far below EPA standards in all wells sampled.
 - No pesticides were found in 2 wells where sheep dipping was done (Wells #5 and #7).
- Some stock well samples had high turbidity (cloudiness).
 - Some stock wells have hard water.
 - Dust, iron and hardness can make water cloudy
- Results provided to School Board to disseminate to population.

Bennett Freeze Area



NAVAJO NATION WITH SELECTED CHAPTERS FOR THE SANITARY ASSESSMENT OF DRINKING WATER PROJECT



- | | |
|---|--|
| ● Sampled Wells | Eastern Agency |
| Selected Chapters | Fort Defiance Agency |
| Hopi Reservation | Shiprock |
| Chinle Agency | Western Agency |
| | Navajo Land |



Bennett Freeze Area

- Approximately 2 million acres disputed land at borders of Hopi and Navajo Nations
- 43-year development freeze (repealed in 2009)
 - applied to public works projects (power, water, lines)
- About 20,000 people (3700 homes)
 - 73% of homes lack regulated drinking water source
 - Most residents haul water for human and livestock consumption (50 – 500 gallons/wk.)
 - Water scarcity made COVID-19 prevention difficult
- Concerns about contamination of drinking water from historic uranium mining in area

Solutions (II)

- Problem 2: Scarcity of water made COVID-19 mitigation difficult
 - Solution: Provide portable handwashing stations to families
- Sponsors: Water Resources Action Project, Forgotten People,



Solutions (III)

- Problem 3: handling of hauled water may lead to microbial contamination rendering it nonpotable
- Solutions:
 - Provide clean 55-gallon drums to families
 - Provide simple home filtration system and provide training on construction and maintenance
 - GA2030 microfilters used in Rwanda and Peru
 - Train families on simple tests for microbial contamination
- Sponsors: Water Resources Action Project, Forgotten People, Global Access 2030, Dig Deep

Filtration systems and 55-gallon drums



GA2030 filtration system



Delivery of 55- gallon storage drums



GA2030 filtration system in Peru



Pilot test of GA2030 system in Navajo home

Home test methods



Water Safe 15-minute Test Strip



Health Metrics P/A Test



Aquagenx MPN Test

Test methods will be selected based on considerations of sensitivity, ease of testing and intended water use after trial evaluations with families.

Solutions (IV)

- Problem 4: during monsoon season, rainwater is abundant, but roads are impassable.
- Solution:
 - Provide rainwater harvesting systems designed to reduce microbial contamination with filtration system and testing program
 - Rainwater harvesting system developed in Israel and used in Palestine, Africa and Latin America
- Sponsors: Water Resources Action Project, Forgotten People, Global Access 2030, Native American Emergency Relief

Water hauling routes



Israeli RWH tank installations in Latin America and Israel



Installations on the Navajo Reservation



5 systems funded by Native American Emergency Relief were installed in May 2022 and are used for education, engineering studies and as pilots for homes.

Solutions (V)

- Problem 5: isolated families must rely on wells potentially contaminated with mine wastes
- Solutions:
 - Testing program for contaminants from mine wastes
 - Low-tech treatment systems
 - Low-tech filters for As and U developed for use in Nepal
- Sponsors: ?

Unregulated Water Sources on Navajo Reservation



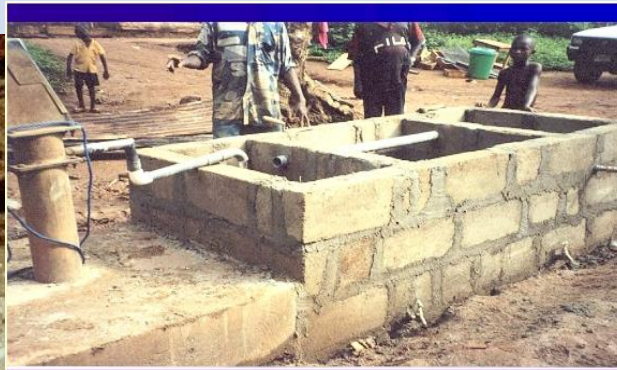
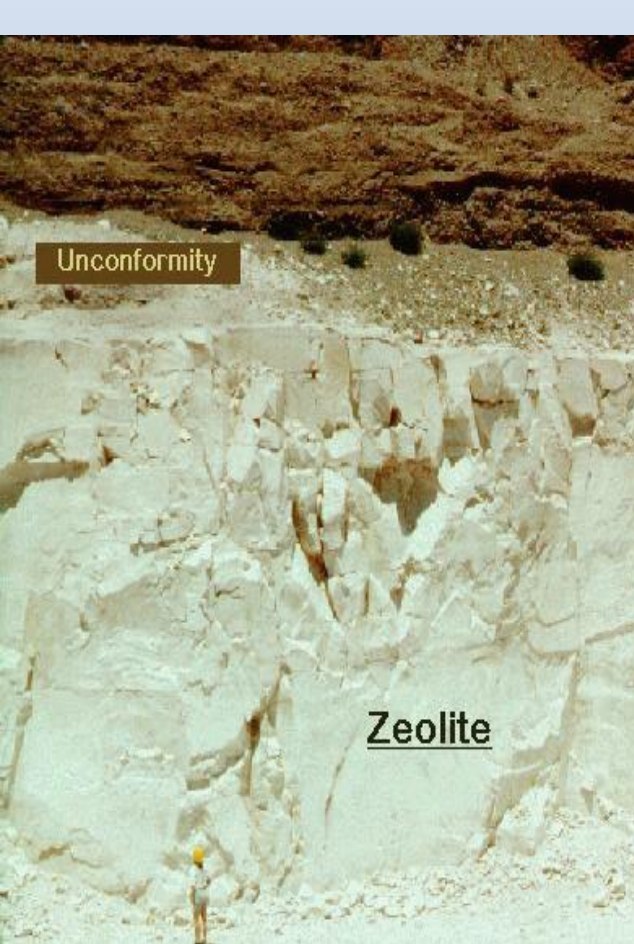
As, U > MCL



Problem is well-recognized;
but no funds to address it!

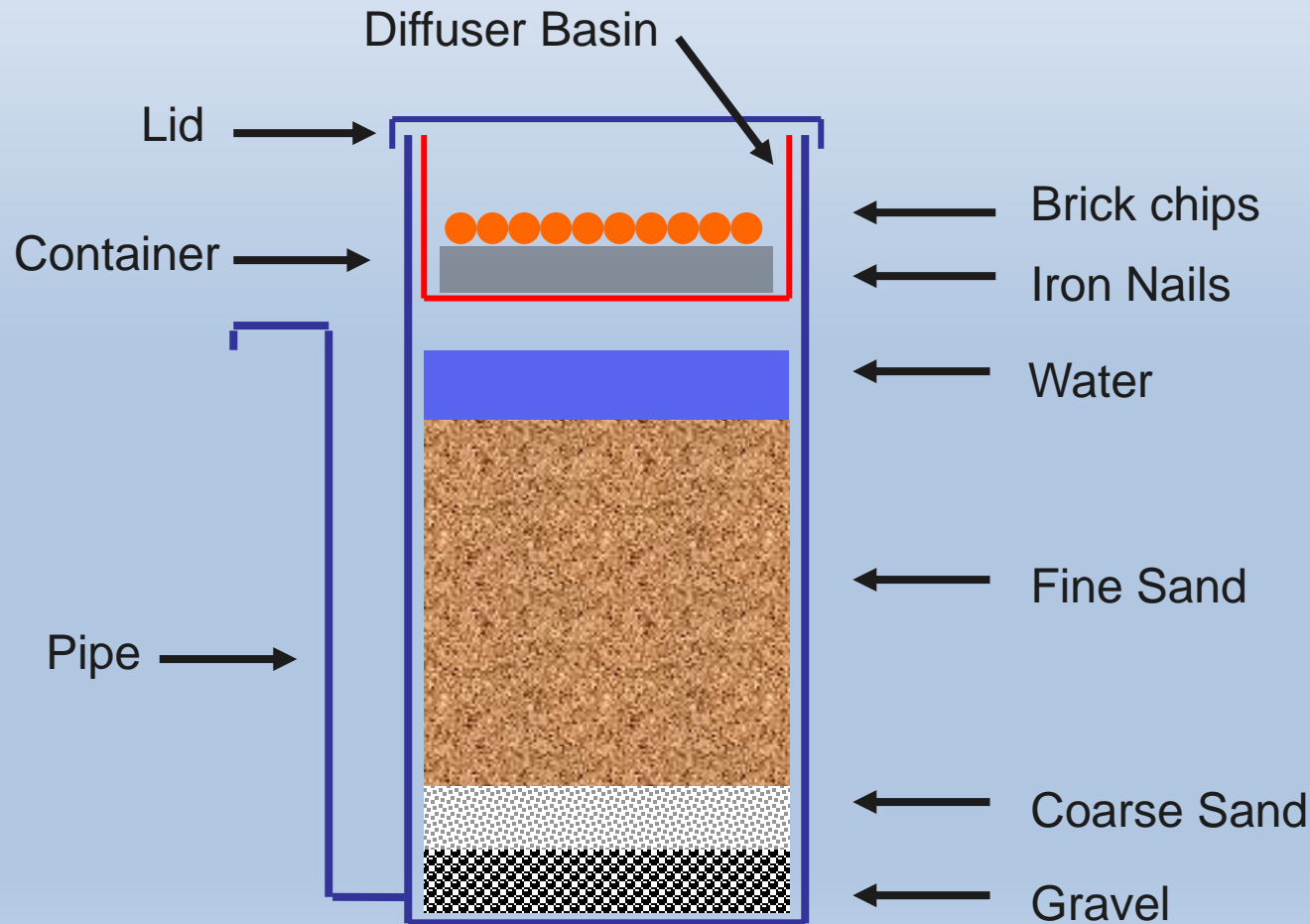
Regulatory agencies
discourage use of stock wells
rather than find treatment
solutions.

Treatment using Low-Cost Materials



Kanchan (Biosand) Filter for As

Adsorptive media



Summary

- Lack of coordination among different regulatory agencies leads to “holes” in the safety net for Navajo communities.
 - Delays in addressing pressing public health problems.
- Non-profit organizations can act relatively quickly to address immediate needs for small populations.
 - Participation by community members is essential for effectiveness and sustainability.
 - Donations and volunteers are backbone of efforts.
 - Low-tech solutions may be most practical
- Poor communities and families cannot afford NSF-approved water treatment devices.
 - Can low-cost devices from other countries be used?
 - Potential liability issues in US if regulations not strictly followed.

Acknowledgements

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