

The Water Challenge

The Navajo Nation is located in a large region in the rural, desert Southwest. Many communities do not have running water in their homes, and must haul water from local wells that may take several hours per haul. The problem is complex and involves not only science and engineering solutions, but also includes social, economic, and cultural considerations to solve it.

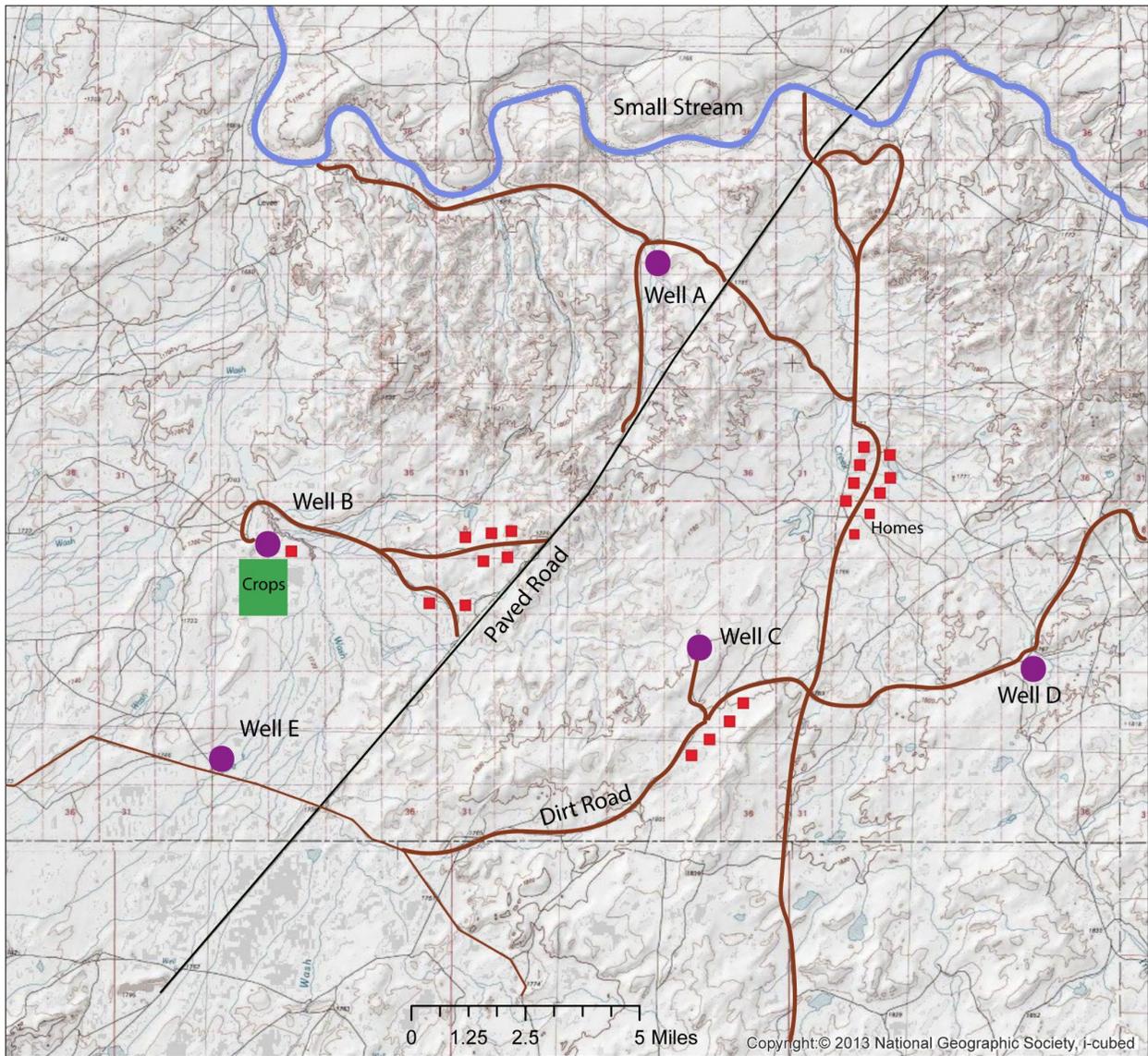
We describe a hypothetical, but realistic scenario below and we are asking for your help to come up with creative solutions. The challenge is to provide safe, reliable drinking water to the community in the short-to-medium term, with a long term goal of engaging the community to contribute to sustainable infrastructure with a robust workforce. While science and engineering solutions are extremely important, so is community engagement as well as recognizing that solutions must be able to provide clean water for generations to come.

Any solution is a good start. The ultimate goal is to design an innovative solution that adds value to society by improving something that already exists, using something that exists in a new way, or inventing something totally new. Ideas to think about:

- What could be done better?
- What could be done in a new way?
- How can you reimagine the way we clean, transport, use, or dispose of our water?
- Could your solution balance the needs of people, the planet, and prosperity?

A rural community relies on hauling water from a combination of 5 wells described below. Several of the wells have very slow flow rates or frequently go dry, causing residents to travel long distances for water. Two wells might have bad water quality, but the community isn't sure if it just smells bad or if it is unsafe to drink.

- *Well A: Deep drinking water well. This well pumps at 20 gpm, and has good quality water. The residents rely on this well for drinking and cooking, but it's a long drive to fill up their tanks.*
- *Well B: Agricultural well. This well can pump 15 gpm but is privately owned by a community member to support his small agricultural business in the summer.*
- *Well C: Shallow livestock well. This well can pump 5 gpm but sometimes the water smells bad. The water quality of this well is not tested regularly.*
- *Well D: Shallow livestock well. This well can pump at 2 gpm and fills a livestock tank. Community members have been known to fill up water barrels from this spot when wells B and C go dry.*
- *Well E: Unused well. This well can produce 15 gpm, but the water smells like rotten eggs and doesn't taste good. The community does not use this well and isn't sure how deep it is.*



*hypothetical map created for the challenge, not meant to represent any existing community

Scoring Rubric - a total of 6 chances to score points (3 on problem identification and analysis, 3 on solution development). Maximum possible score is 90 points.

Beginning (2 pts)	Developing (5 pts)	Accomplished (10 pts)	Exemplary (15 pts)
Problem Identification: Clear definition of the different aspect of the problem being studied			
Unclear; few details	Partially clear; details missing	Mostly clear; detailed, some problem aspects considered	Clear; very detailed, many problem aspects considered
Sources of Information: Quality and variety of data/evidence and sources cited.			
Minimal quality; variety limited	Quality OR variety need improvement; did not include professional(s)/community	Sufficient quality and variety; included professional(s)/community	Extensive quality and variety; included multiple professionals and/or community
Problem Analysis: Depth to which the problem was studied and analyzed by the team; including extent of analysis of existing solutions			
Minimal study; no analysis	Minimal study; some analysis	Sufficient study and some analysis	Extensive study and analysis
Team Solution: Clear explanation of the proposed solution and the description of how it solves the problem			
Difficult to understand	Some parts confusing	Understandable	Easy to understand by all
Innovation: Degree to which the team's solution makes life better by improving existing options, developing a new application of existing ideas, or solving the problem in a completely new way.			
Existing solution/application	solution/application contains some original element(s)	Original solution/application; potential added value	Original solution/application; demonstrated added value
Solution Development: Explained the process that would be used to select, develop, evaluate, test and improve the solution			
Process AND explanation need improvement	Process OR explanation need improvement	Systematic process included evaluation	Systematic process included evaluation; implementation considered