

# Reasonable Foreseeable Development for Northern New Mexico

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## **The technical objectives of our study for the Farmington BLM office are:**

- To determine the potential subsurface development of the Gallup/Mancos Formation supported by geological and engineering evidence and to further estimate the associated surface impact of this development in terms of actual wells drilled and expanded infrastructure.
- ***To include a hydrologic assessment of the water supply for the San Juan Basin.***

# **HYDROGEOLOGIC ASSESSMENT TASK 1**

## **Water Use**

Summarize the existing water rights held in the San Juan Basin

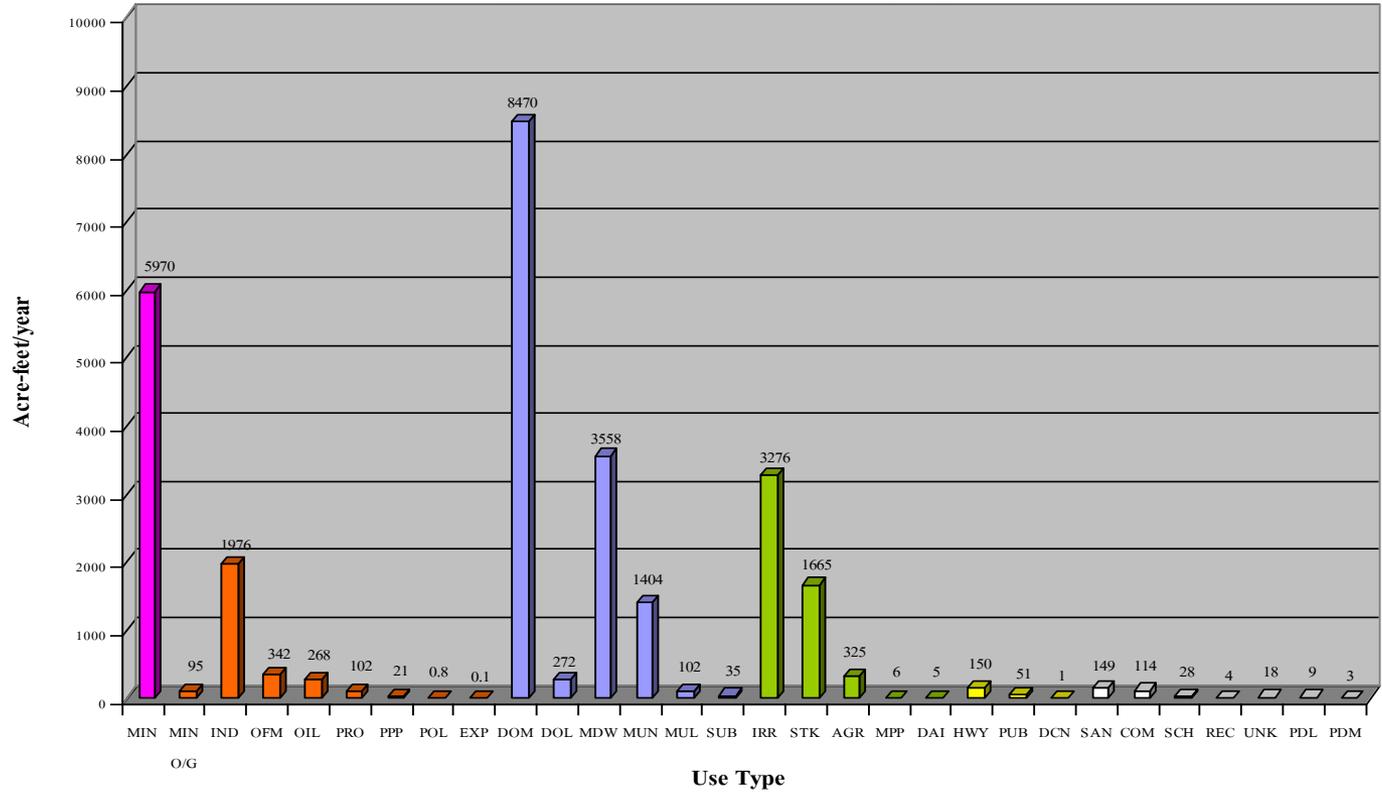
Categorize the current water rights in the basin by use

Tabulate the amount of water used during stimulation of vertical wells during the development of Dakota and Mesaverde reservoirs in the first decade of this century

Tabulate the amount of water used by more recent horizontal drilling

3517 records

### Water Rights in San Juan Basin by Type



### Homes and cities

### Agriculture

### Construction

### Other

### Mining

### Oil and gas

|     |                 |
|-----|-----------------|
| MIN | Mining, milling |
|-----|-----------------|

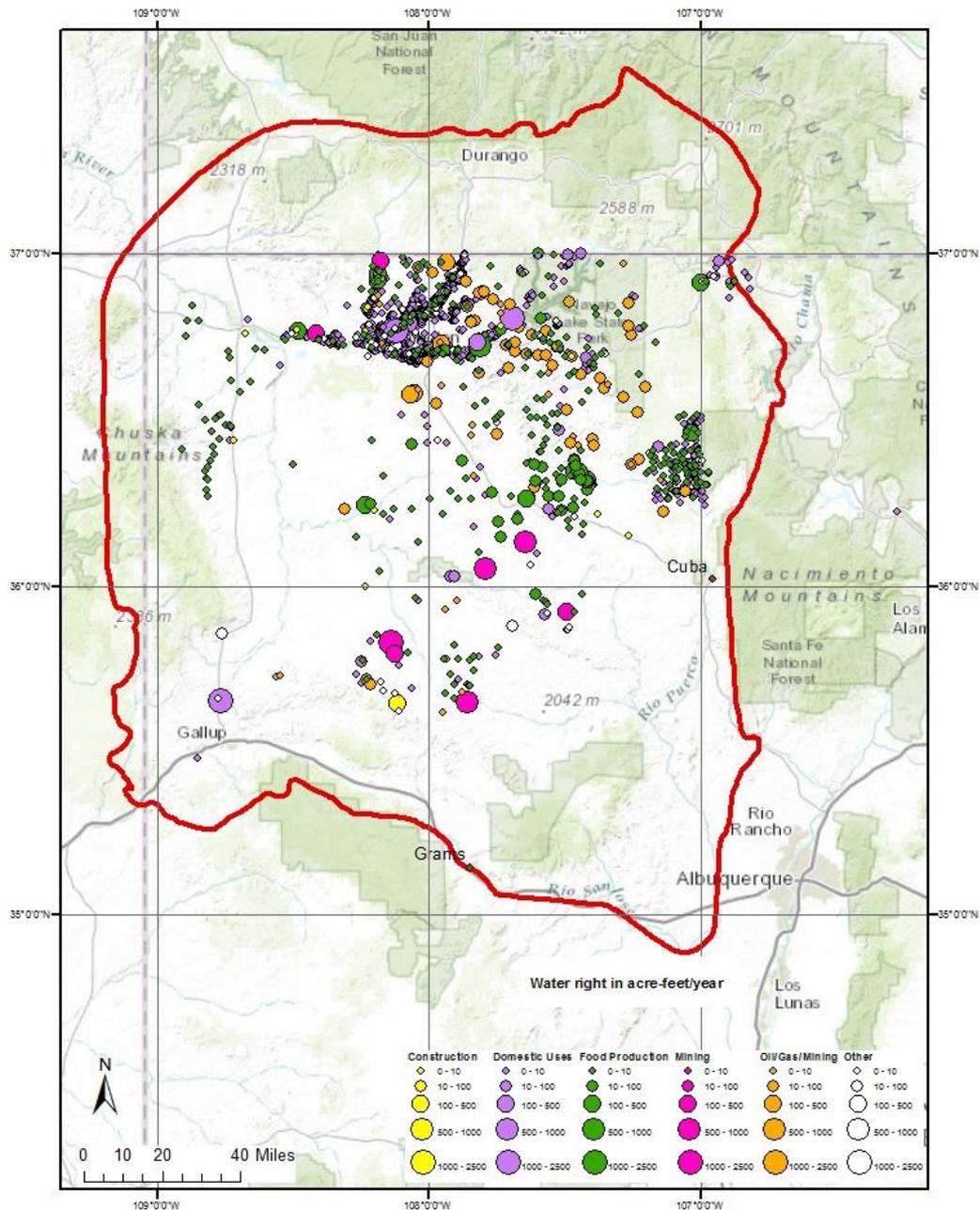
|         |                                  |
|---------|----------------------------------|
| MIN O/G | Mining Oil/Gas                   |
| IND     | Industrial                       |
| OFM     | Oil field maintenance            |
| OIL     | Oil production                   |
| PRO     | Prospecting/developing nat. res. |
| PPP     | Petroleum processing plant       |
| POL     | Pollution control well           |
| EXP     | Exploration                      |

|     |                                 |
|-----|---------------------------------|
| DOM | Domestic (one household)        |
| DOL | Domestic and livestock watering |
| MDW | Community type use              |
| MUN | Municipal; city/county water    |
| MUL | Multiple domestic households    |
| SUB | Subdivision                     |

|     |                                   |
|-----|-----------------------------------|
| IRR | Irrigation                        |
| STK | Livestock watering                |
| AGR | Agriculture other than irrigation |
| MPP | Meat packing plant                |
| DAI | Dairy operation                   |

|     |                              |
|-----|------------------------------|
| HWY | Highway construction         |
| PUB | Construction of public works |
| DCN | Domestic construction        |

|     |                           |
|-----|---------------------------|
| SAN | Sanitary w/commercial use |
| COM | Commercial                |
| SCH | School use                |
| REC | Recreation                |
| UNK | Unknown                   |
| PDL | Non-domestic & livestock  |
| PDM | Non-domestic              |



**HYDROGEOLOGIC ASSESSMENT  
TASK 2  
Data compilation**

Location  
Well depth  
Water production capacity  
Rock types  
Formation depths and elevations  
Formation of completion  
Water level  
Water chemistry  
Hydraulic properties –aquifer tests  
porosity  
permeability  
hydraulic conductivity  
transmissivity  
storage coefficient

**NMWells database**

Contains nearly 48,000 records of petroleum, water, and geothermal wells across the state of New Mexico

25,000 of those records are from the San Juan Basin

The last publically available assessment of water in the San Juan Basin was done by the U.S.G.S. in the mid 1990s.

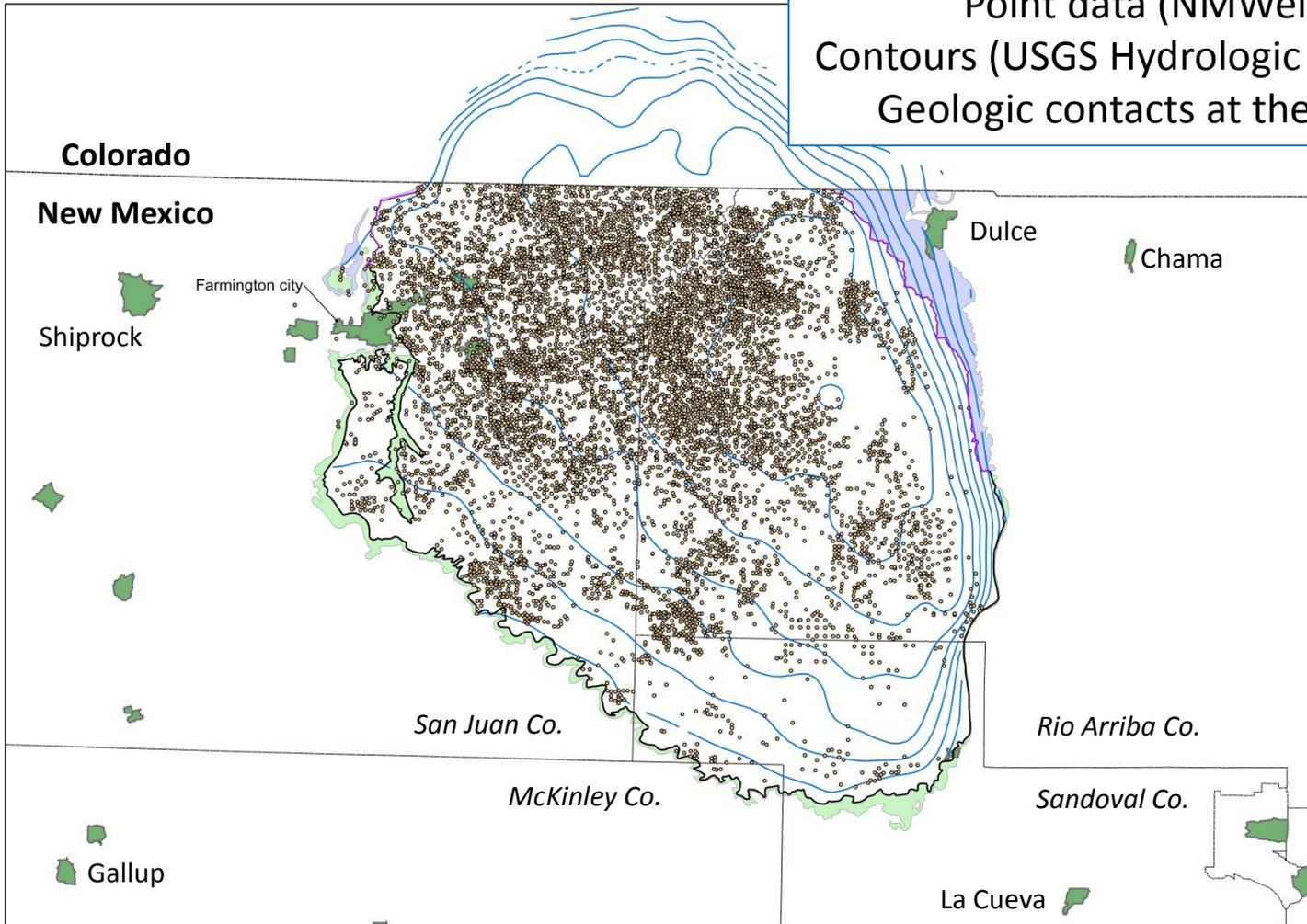
We have records for 5800 wells that were spud after 1995 in the San Juan Basin in the NMWells database alone.

### HYDROGEOLOGIC ASSESSMENT TASK 3 Construction of Formation Top Surfaces

Point data (NMWells; brown dots)

Contours (USGS Hydrologic Atlas Series; blue lines)

Geologic contacts at the surface; black lines



**Map of Top of  
Ojo Alamo  
Sandstone (TOA)**

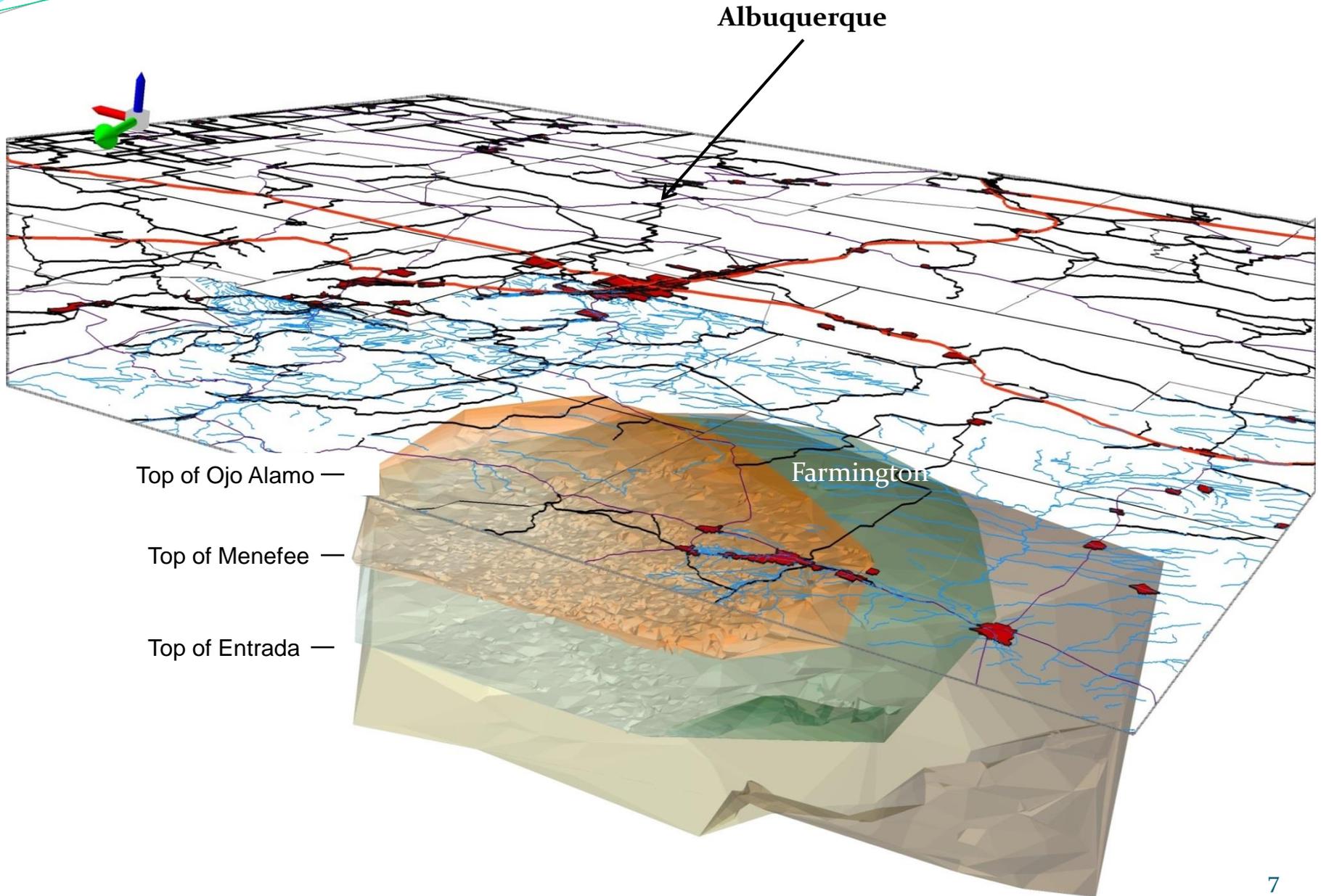
TKA= Animas  
Formation

#### Legend

• TOA\_Top    — TKA\_Contact    — TOA\_Contact    — TOA\_Contour    □ NM\_County    ■ City    ■ TOA\_Outcrop    ■ TKA\_Outcrop

0 5 10 20 Miles





Albuquerque

Top of Ojo Alamo —

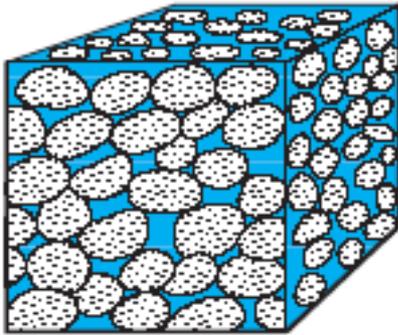
Top of Menefee —

Top of Entrada —

Farmington

## HYDROGEOLOGIC ASSESSMENT TASK 4

### Volume Calculations



- Calculate volume of material between formation tops
- Estimate volume of fluids in pore space and the amount of fluid retrievable
- Complications: discontinuity of units , mixtures of rock types, variable porosity and permeability
- Potable versus brackish(< 1000 mg/L TDS)
- OSE jurisdiction <2500 ft. versus >2500 ft.

