

Project Rulison

COGCC Regulation of Natural Gas Drilling and Production Near the Nuclear Test Site

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Agenda

- Historical perspective
- Drilling activity near Project Rulison
- Regulatory approach
- Sampling and Analysis Plan
- Sampling Results
- Q&A



View the AEC Film on Project Rulison

- 7 minute video available on YouTube

- <http://www.youtube.com/watch?v=myXswNUQgLs>

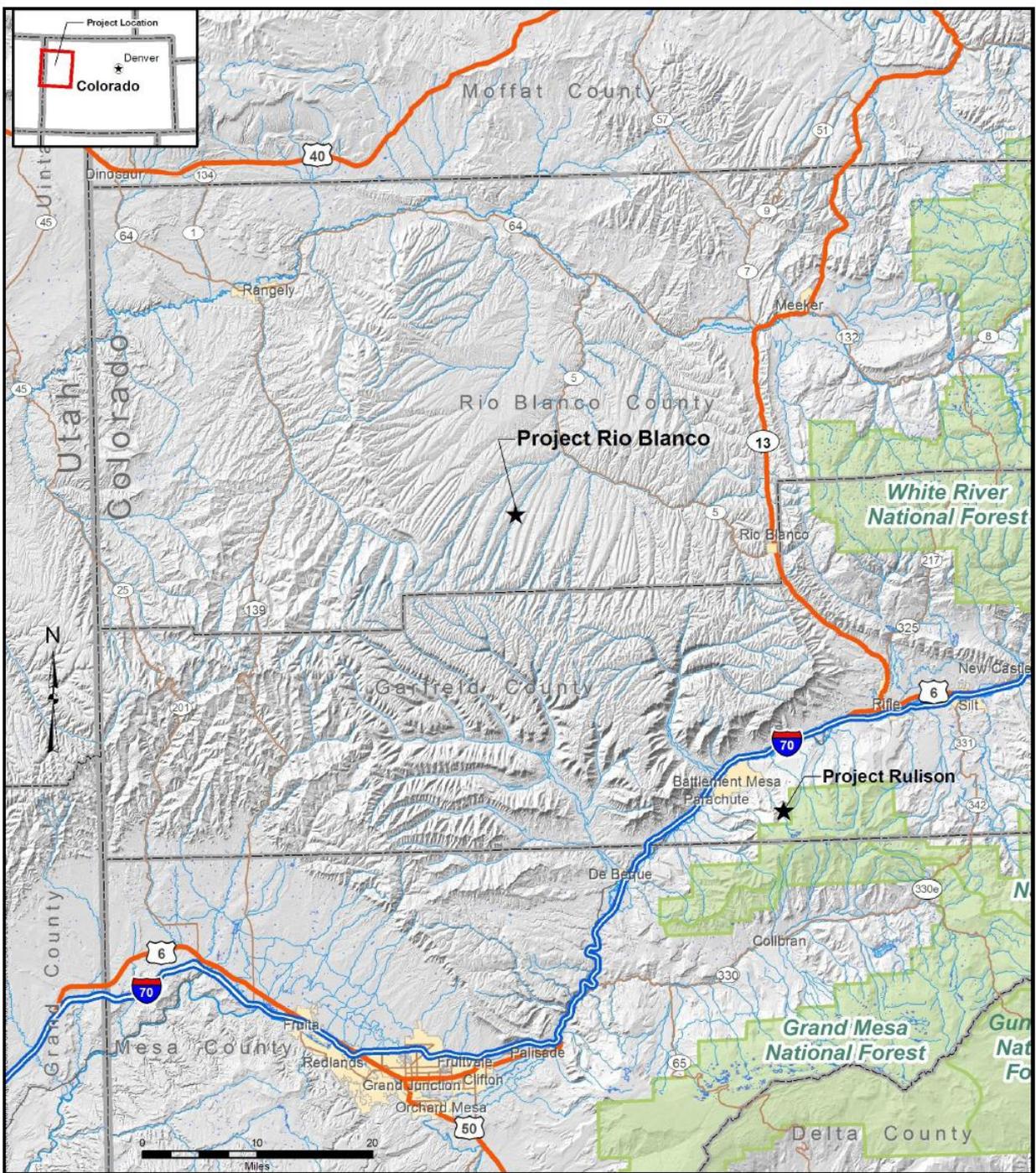




AEC Plowshare Program – Nuclear Gas Generation Projects

- **Natural gas stimulation using nuclear devices to fracture the geologic formation**
- **Three similar tests**
 - **Project Rulison – near Parachute**
 - **Project Rio Blanco – 36 miles NW of Rifle**
 - **Project Gas Buggy – near Farmington, NM**





AEC Plowshare Program – Nuclear Gas Generation Projects

■ Project Rulison

- 1969
- 40 kilo-Ton thermonuclear device
- 8426 feet below the surface
- Equivalent to exploding 80 million pounds of TNT

■ Major data collection efforts



Data Collected Prior to COGCC Regulation

- Pre-shot baseline
 - USGS, AEC, CDH
- Post-shot monitoring
 - USGS, AEC, CDH
- DOE Cleanup Studies
 - Environmental (soil and water)
 - Gas wells 3 to 7 miles away



Data Collected Prior to RSAP

- DRI sampled 5 gas wells 3 miles W and NW of ground zero in 2005
- PRESCO, a former lease holder, sampled environmental media and 3 gas wells in 2005 and 2006
- Noble sampled 7 gas wells ranging from 0.7 to 1.7 miles from GZ in 2007

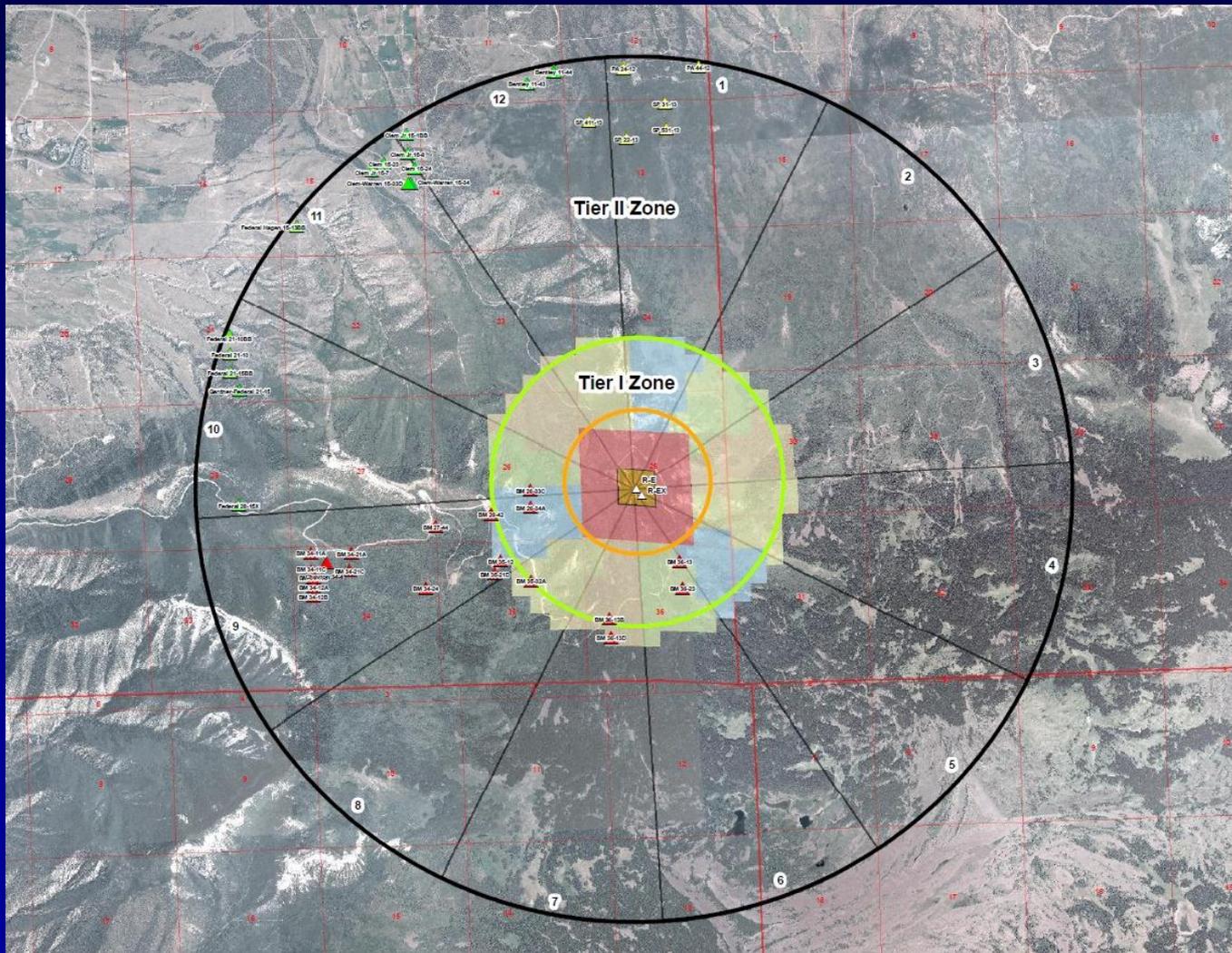


AEC/ DOE Drilling Exclusion Area

- AEC became DOE
- DOE set a 26 acre exclusion area with radius approximately 0.1 mile
- DOE has recently modeled gas flow



Rulison Area Gas Wells & Sampling Grid



COGCC Regulates Drilling Beyond the DOE Exclusion Area

- Hearing required for wells within ½ mile of ground zero since 2004
- Companies agreed to year-by-year moratorium on drilling within ½ mile
- RSAP defines careful approach to DOE Exclusion Area
 - 12 sectors
 - 2 tiers



What Role Does CDPHE Play?

- CDPHE lacks regulatory authority under the US Atomic Energy Act – BUT:
- Colorado Department of Public Health and Environment – Radiological Branch assists COGCC by:
 - Participation in meetings
 - Sampling and Analysis Plan review
 - Data review



Tritium (Radioactive Hydrogen) is the Isotope of Concern at Rulison

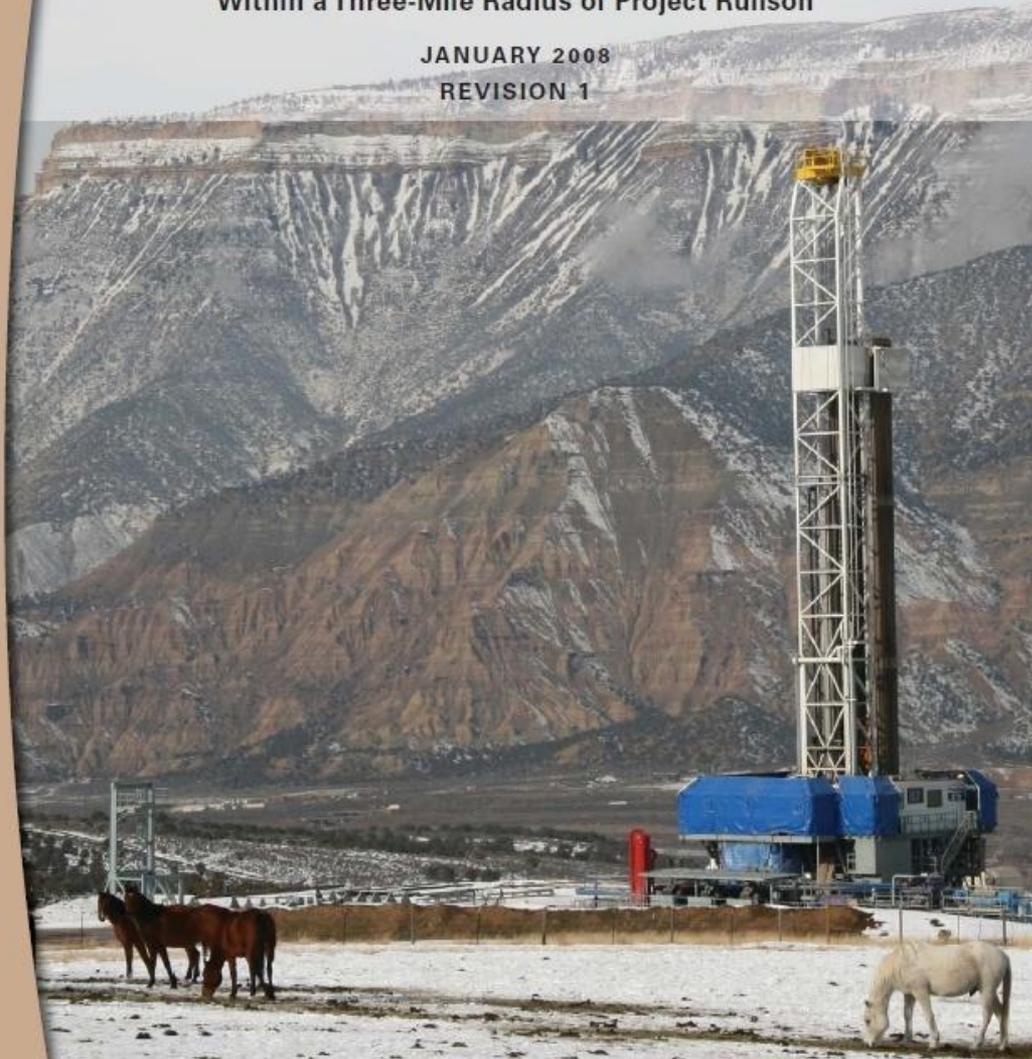
- 990 curies (Ci) remain in 2011
- Tritium is mobile in the environment
 - Tritium can be incorporated in water
 - Tritium can be incorporated in gas
- All other isotopes are much less mobile or much less abundant



RULISON SAMPLING AND ANALYSIS PLAN

Operational and Environmental Radiological Monitoring
Within a Three-Mile Radius of Project Rulison

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REVISION 1



Prepared by:
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Produced Gas and Water Sampling Criteria

- Every new Tier I well
 - Well completion “flowback” fluids
 - Gas and water as soon as possible after fracing
 - Quarterly sampling of gas and produced water in year 1
- Closest well (Tier I or Tier II) in sector
 - Twice-a-year sampling of gas and produced water in years 2 and 3
 - Annual sampling in years 4 and beyond



Sampling and Monitoring During Drilling Closest Tier I Well in Sector

- Environmental TLD
- Real-time tritium and gamma screening
- Sampling/analysis of drilling fluids prior to use
- Sampling drill cutting composite from two elevations



Other Topics in the RSAP

- Written sampling procedures
- Data Quality Objectives
- Sample documentation and handling
 - QC samples
 - Labeling
 - Chain of custody
 - Shipping



Tritium in Natural Gas Analysis is a Challenge

- Produced gas sample is taken in a propane tank
- Only lab that will analyze gas for tritium specializes in carbon-dating



RSAP- Sample Analysis and QC

- Specified sampling analysis and QC
 - Each analytical method specified
 - Which lab does the analysis
 - Detection limits
 - Turn-around time
 - Lab Calibration
 - Blanks, spikes, replicates



RSAP – Data Verification and Validation

- Formal reviews are conducted by
 - Lab producing the analysis result
 - Independent third party hired by the operator
 - Colorado Department of Public Health and Environment
 - GOGCC consultant MH Chew & Associates
- Data reports are posted on COGCC website for public viewing



RSAP – Radiological Incident Management Plan

- Radiological Incident Management Plan
 - Site safety office and Radiation Safety Officer duties are defined
 - Action levels
 - Emergency contact lists
 - Decon procedures
 - Bioassay collection procedures/supplies
 - Field instruments and calibration

■ Safe Work Plan



Criteria for Verifying a Positive Result

- Radionuclide is a fission product
- Half-life > 10 years
- Activity present above background level
 - Screening level
 - Action level
- QA validity checks are passed



No Rulison-Related Radioactivity Has Been Found in Any of the Samples

- 10 Tier I wells have been sampled
- 90 Tier II wells have been sampled
- 673 samples have been taken including
 - 142 natural gas and
 - 207 produced water samples



Q&A



What Are the Dose Implications?

- ORNL *Radiation Doses from Hypothetical Exposures to Rulison Gas 1973*
- Assumed that gas was stranded in a pipeline serving Rifle and Parachute
- Dose in first year of use is mostly from tritium due to cooking: 0.6 millirem
- Perspective: annual background dose
 - Grand Junction = 379 millirem
 - Rifle = 387 millirem

