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**ACTION ON APPLICATIONS FOR PERMITS TO DRILL  
AT LOCATIONS FROM ONE-HALF MILE  
TO THREE MILES FROM THE PROJECT RULISON BLAST SITE**

This memorandum will explain the decision of the Acting Director of the Colorado Oil and Gas Conservation Commission (COGCC) to conditionally approve on a case-by-case basis pending Applications for Permits-to-Drill (APDs) at locations greater than one-half mile and less than three miles from the Project Rulison blast site. As set forth below, these APDs will be approved subject to new special conditions that will require the operators to implement a comprehensive monitoring, sampling, analysis, and emergency response plan, and to limit the number of drilling rigs operating at one time. With these conditions, the COGCC technical staff, its expert consultants, and the Colorado Department of Public Health and Environment (CDPHE) believe that the permits in question will protect public health, safety, and welfare and the environment. These conditions will also apply to the 13 existing producing wells and the 40 permitted and undrilled wells in that area.

**Background**

Project Rulison was a 1969 underground nuclear blast conducted by the Atomic Energy Commission to investigate the use of nuclear explosives to stimulate gas production. It involved the detonation of a 40 kiloton nuclear device approximately 8,400 feet deep at a site about 40 miles from Grand Junction. Detonation of the device created a cavity in the rock which contained approximately 170 million cubic feet of gas and fractured the surrounding rock. In 1970, a test well was drilled back into the cavity to evaluate the effect of the blast. Approximately 450 million cubic feet of gas was produced from the cavity and surrounding rock. At the conclusion of the testing and flaring period the radioactivity of the gas produced from the well was below levels hazardous to human health. This testing demonstrated that the 1970 flaring removed much of the gas-phase radioactive contamination from the blast site. In 1976, the test well was plugged and abandoned. Annual sampling of wells, springs, and streams in the Rulison area has been conducted by the Environmental Protection Agency since the time of the test, with no radionuclides detected above background.

The federal government established a 40-acre area around the blast site within which drilling is prohibited below 6,000 feet. This no drill zone extends approximately 325 feet from the blast site, and it remains the only area near the blast site in which drilling has been prohibited by any federal, state, or local agency. The COGCC has, however, adopted special procedural requirements regarding APDs in the Project Rulison area. In 1998, the COGCC determined that APDs for locations within three miles of the blast site would be forwarded to the Department of Energy (DOE) for review and comment. A three-mile area was adopted for this purpose because as of 1998 no active or proposed wells were located within that area. As part of that 1998 action, the COGCC Deputy Director prepared an extensive review of the literature regarding Project Rulison, which is available on the COGCC website. In 2004, the COGCC further directed that APDs for locations within one-half mile of the blast site would require a formal COGCC hearing.

For three decades after the test, little drilling activity occurred near the blast site. After 2000, however, a number of APDs were filed and permits were issued for locations within the three-mile area. Only one APD was filed for a location within one-half mile of the blast site, and it was withdrawn prior to COGCC action. All such APDs were forwarded to the DOE for review and comment. The DOE did not express

concern over issuance of the permits or request any additional information, but instead asked the COGCC to include language in the permits requiring permittees to accommodate future DOE sampling requests. The COGCC has imposed four special conditions on such permits: (1) special conductor pipe requirements to protect surface and ground water; (2) a radionuclide monitoring program requirement; (3) special wellbore survey requirements; and (4) a requirement regarding compliance with DOE requests for sampling and analysis.

At this time, within three miles of the blast site, there are 13 producing wells, 40 wells that have been permitted but not yet drilled, and 19 pending APDs. All of the pending APDs are located at least one-half mile from the blast site, and several of these APDs have been pending for more than 120 days.

### **Review of the Pending APDs and Development of the Sampling and Analysis Plan**

At the COGCC's October 2007 meeting, the COGCC conducted a three-hour information session regarding the Project Rulison area, which included presentations by the COGCC technical staff, the CDPHE, and the DOE, as well as an extensive opportunity for public comment. The COGCC staff and CDPHE provided background information on the area. The DOE described its recent subsurface modeling exercise, in which it evaluated the possibility that tritium, a radioactive material, could migrate from the blast site to a single hypothetical production well located approximately 800 feet away. The model results are not conclusive, but suggest that such migration is very unlikely under the assumptions used. Approximately half of the public urged that additional drilling permits be issued within the three-mile area around the blast site, and approximately half of the public opposed such action. The COGCC directed the staff to consult with the CDPHE regarding the pending APDs before acting upon them.

Subsequently, the three entities that currently hold most of the oil and gas rights within three miles of the blast site, Noble Energy, Inc., Williams Production RMT, and EnCana Oil & Gas (USA) (collectively, the Companies), retained URS Corporation to develop a comprehensive monitoring, sampling, analysis, and emergency response plan for the three mile area (Plan). The COGCC technical staff and the CDPHE have actively consulted with each other and with URS regarding development of this Plan. The COGCC staff included two hydrogeologists, a geochemist, and an engineer, who collectively have 7 college and graduate degrees and 96 years of professional experience, including experience with: sampling plan development and implementation; radionuclide sampling, analysis, and regulation; and petroleum production and reservoir engineering. The CDPHE staff included an environmental engineer and a geophysicist who collectively have 7 more college and graduate degrees and more than 64 years of additional professional experience, including experience with radiation regulation, nuclear decommissioning, environmental corrective actions, and emergency preparedness. The COGCC also retained two expert consulting firms to assist it in reviewing the Plan, S.S. Papadopoulos & Associates, Inc. (Papadopoulos) and M.H. Chew and Associates (Chew), who provided additional expertise in hydrogeology, geochemistry, health physics and data quality assurance. Their personnel have an additional 7 college and graduate degrees and another 64 years of professional experience. The COGCC staff also obtained input from DOE technical staff and consultants, the Local Governmental Designee for Garfield County (Garfield County LGD), and the attorney and consultants for several local residents and groups who have expressed concern over additional drilling in the three mile DOE notification area (Concerned Resident Consultants and Attorney).

The Plan is lengthy, comprehensive, and detailed, and the Companies have agreed that it will apply to all existing producing wells, all permitted but undrilled wells, and all future wells located within three miles of the blast site. Their agreement on this point is important because it is uncertain whether the COGCC has the authority to impose these requirements on existing or permitted wells. The Plan requires certain monitoring and baseline data collection for all wells located within this three-mile area, with additional

monitoring and data collection for those wells located within one mile of the blast site. Monitoring within three miles of the blast site will include: gamma logging of completed boreholes and one time sampling of produced water and gas from new and existing wells. Monitoring within one mile of the blast site will include: atmospheric monitoring during drilling and completion, real time screening of cuttings and drilling fluid, laboratory analysis of drilling fluids and cuttings, sampling and laboratory analysis of produced water and gas, and gamma logging of completed boreholes. The Plan includes specific requirements for field methods and sampling procedures, data quality assurance, sample documentation and handling, sample analysis and quality control, and data verification and validation. The Plan also includes a radiological incident management plan, which sets forth specific actions to be taken in the event of a radiological release. The Companies must designate a professional radiation safety officer, subject to approval by the COGCC, whose responsibilities include radiation safety training, and the monitoring and control of radiological operations, radiological measurements, interpretation of laboratory data results and emergency notifications to the COGCC and other authorities as described in the plan. The final Plan will be posted on the COGCC website.

All monitoring results and other data collected pursuant to the Plan will be reported to and reviewed by the COGCC staff and the CDPHE and will also be provided to the DOE. The COGCC staff will post this data on the COGCC website, where it will be available for review by the Concerned Residents and the general public. The Plan will continue to apply in the future until it is modified or rescinded by the COGCC, and the COGCC will annually meet with the CDPHE and Companies to determine whether any modifications are appropriate. The DOE, Garfield County LGD, and Concerned Resident Consultants will be invited to attend these meetings, and the meetings will be publicly noticed on the COGCC website.

A draft of the Plan has been reviewed by the COGCC technical staff, the CDPHE, Papadopoulos, Chew, the DOE, the Garfield County LGD, and the Concerned Resident Consultants, all of whom have provided detailed comments to and participated in a follow up meeting with URS and the Companies. URS and the Companies have agreed to make all changes to the draft Plan that the COGCC technical staff and CDPHE require, many of which reflect the comments of other participants. URS is now in the process of preparing a final Plan to reflect these changes, and this final Plan will be subject to review and approval by the COGCC and CDPHE to ensure that it reflects the agreed upon changes. With these changes, the COGCC technical staff, CDPHE, Papadopolous, and Chew have respectively concluded that the Plan and other conditions will protect public health, safety, welfare, and the environment in connection with the approval of the pending APDs. The DOE has not expressed concern over the approval of these APDs, and it has not opposed the prior approval of APDs within three miles of the blast site even without such a plan. The Garfield County LGD has stated that she will defer to the COGCC technical staff regarding the approval of the pending APDs. The Concerned Resident Consultants and Attorney have expressed concerns over the approval of the APDs subject to the Plan, and their concerns are addressed in the next section.

In addition to the Plan, the Companies have voluntarily committed that they will not submit any APDs for surface or subsurface drilling operations within one-half mile of the blast site until at least 2009. They also understand that any such applications would be subject to a formal hearing before the COGCC and that they would have to demonstrate that such drilling will protect public health, safety, and welfare and the environment. Combined with the Plan, this commitment will ensure that if an APD is later filed for a location within one-half mile of the blast site, the COGCC will have additional information for evaluating the APD.

Finally, to ensure that the Plan is effectively implemented, the COGCC technical staff has determined that it is appropriate to limit the number of drilling rigs operating at one time. There is some lag time between sampling and receipt of the analysis results. Limiting the number of rigs will help ensure that the pace of

development allows data from the initial wells to be used to make decisions on subsequent wells and that the staff can properly oversee this development. COGCC inspections to verify compliance with the Plan and management of the data generated will be within staff resources. Therefore, no individual operator shall utilize more than one rig within one mile of the blast site at any given time and no individual operator shall utilize more than two rigs within a three mile radius of the site at any given time. The total number of rigs allowed by all operators within three miles of the site shall be limited to five at any given time.

### **Protection of Public Health, Safety, and Welfare and the Environment and Responses to Concerns Raised by the Concerned Resident Consultants**

As set forth above, the COGCC's technical staff has determined that the approval of pending APDs for locations greater than one half mile and less than three miles from the blast site will protect public health, safety, and welfare and the environment provided that such approval is subject to a final Plan reflecting the modifications required by COGCC and CDPHE and to the limitation on the number of drilling rigs operating at one time. In making this determination, the staff has considered all information available to it and has relied upon numerous factors, including the following:

- Previous studies by the DOE (AEC, 1973) and COGCC (COGCC, 1988), including testing and extensive literature review, that demonstrate the low permeability of the Williams Fork Formation in the Rulison area;
- An assessment of likely fracture lengths from the Rulison test and from hydraulic fracturing of proposed wells;
- An assessment of the relative mobility of various Rulison related radionuclides and the medium in which they are most likely to be present;
- The available mechanisms for monitoring and laboratory analysis during drilling, completion and production from the proposed wells;
- An extensive review of the sampling and analyses and quality assurance protocols proposed by the Companies;
- The opinions and comments of experts from both state and federal government agencies (DOE and CDPHE); and
- The opinions and suggestions from independent, third party experts retained by the COGCC (Papadopoulos and Chew).

These expert reviews have indicated that the likelihood of encountering Rulison related radionuclides outside of a half mile radius from the site is low. They have also indicated that the proposed Plan is protective of public health safety, welfare and the environment. This Plan is being implemented with the intention, not only of monitoring for Rulison-related radionuclides, but also of developing a statistically significant database for subsurface characteristics in the Rulison area,

The staff has also considered the various concerns raised by the Concerned Resident Consultants and Attorney. It believes that these concerns have generally been answered by the Plan or by other actions described above. The following are responses to some of the most significant concerns that were raised:

- A need for more public participation: There has been significant public participation to date. At the COGCC's October meeting in Grand Junction, there was an informational session regarding Rulison issues and interested members of the public addressed the Commission regarding this subject. Over 20 people spoke, with about half supporting additional drilling in the Rulison area and about half opposing such drilling. At the COGCC's December meeting,

three people addressed the Commission regarding this subject, with one person expressing concern about the approval of APDs subject to the Plan and two other people voicing support for such action.

- A need for future local government and citizen involvement: An existing advisory group, the Garfield County Energy Advisory Board, will be kept updated on developments in the Rulison area. Reports and data will be made available to the Garfield County LGD, the Concerned Residents, and the general public through the COGCC website. The Garfield County LGC and the Concerned Resident Consultants will be invited to attend the annual review meetings regarding the Plan and these meetings will also be noticed on the COGCC website.
- A need for a detailed hydrogeologic study similar to that carried out for the Mamm Creek Field: Numerous reports and data already exist regarding the Rulison area. An additional hydrogeologic study is not being required at this time because all of the APDs pending or to be filed before at least 2009 are or will be for locations more than one-half mile from the blast site and are or will be subject to the Plan. As previously noted, it is unlikely that any Rulison-related radionuclides would be encountered more than one-half mile from the blast site, and the Plan would require prompt corrective action in the remote event that this occurred.
- A need for a designated government agency to monitor activities in the area and provide access to data generated by the plan: The COGCC staff will be responsible for monitoring and permitting drilling activities in the area. The COGCC will receive quarterly reports from the Companies and will conduct field inspections to ensure that the procedures outlined the Plan are properly implemented.
- A need for a compilation of all available data: As mentioned above, a great deal of data exists for the Rulison area, and much of it is available through the COGCC. This includes water and gas sampling data submitted by operators or developed on behalf of the COGCC and local government agencies. Sample locations are indicated on the MapGuide section of the COGCC website and data are available on request. In addition, all future data obtained by the COGCC pursuant to the Plan will be made available in an electronic format that facilitates analysis and interpretation.
- A concern that the Plan will last for decades in its current form: Although the Plan is of indefinite duration, it will be reconsidered and revised as necessary based upon the annual review meetings. It is intended to be a living document, and the COGCC's willingness to revisit the Rulison issues is demonstrated by its current action as well as the procedural requirements adopted in 1998 and 2004.

### **Conditional Approval of Pending APDs**

The COGCC is responsible for ensuring that additional well drilling will protect public health, safety, and welfare and the environment. The Acting Director and staff take that responsibility very seriously and it has governed our work regarding the pending APDs within three miles of the blast site. To that end, the COGCC has considered extensive information, including scientific literature, prior monitoring results and other data, the 1998 literature review, information presented at the October 2007 COGCC meeting, the draft Plan, comments and responses regarding the draft Plan, and correspondence from the Concerned Resident Consultants and Attorney. The COGCC has also actively consulted with CDPHE, Papadopulos, Chew, DOE, the Garfield County LGD, the Concerned Resident Consultants and Attorney, and the Companies. Based on all of this information, and for the reasons set forth above, the Acting Director intends to approve conditionally and on a case-by-case basis APDs for locations greater than one-half mile and less than three miles from the blast site. All such permits will be subject to the following special conditions:

- **Operator shall obtain COGCC and CDPHE approval of the final Plan prior to the spudding of a well.**
- **Monitoring prior to and during drilling, completion and production will comply with provisions set forth in the approved Sampling and Analysis Plan.**
- **Spud notice must identify if this well is located within Tier I or Tier II of the approved Project Rulison Sampling and Analysis Plan.**
- **Operator shall provide complete, well-specific emergency contact information to the COGCC Area Engineer in the spud notice prior to spudding the well.**
- **Comply with all DOE Office of Legacy Management requests for sampling and analysis of natural gas and other materials associated with drilling and production.**
- **A closed loop mud system shall be utilized to ensure containment of all materials that have been in contact with downhole strata and fluids. All cuttings and water storage pits shall be lined to ensure containment. Contour features, French drains and other stormwater BMPs as necessary shall be employed to ensure site integrity.**
- **No individual operator shall utilize more than one rig within one mile of the blast site at any given time and no individual operator shall utilize more than two rigs within a three mile radius of the site at any given time. The total number of rigs allowed by all operators within three miles of the site shall be limited to five at any given time.**
- **To prevent the loss of drilling fluid to shallow formations and to protect shallow groundwater and surface waters, conductor pipe shall be set at a depth sufficient to insure absolute wellbore integrity during drilling operations. Conductor pipe must be set at a minimum depth of 200', or at a depth at which formation integrity is sufficient to prevent a loss of drilling fluid, whichever is greater, on the first well on each pad and cemented by the pumped plug method. Conductor pipe setting depths on subsequent wells on the pad may be increased or decreased based on geologic conditions encountered in the first well so as to insure absolute wellbore integrity (applied only to wells within the Battlement Creek drainage).**
- **Perform a high accuracy gyroscopic directional wellbore survey upon reaching total depth of the well. E-mail a copy of the survey along with a Sundry Notice, Form 4 requesting approval to jaime.adkins@state.co.us. The directional drilling survey report shall include a map view and a vertical profile view showing wellbore trajectory and distance from the 1/2 mile radius from Project Rulison. The operator shall obtain approval from the COGCC prior to commencing casing perforating and other completion operations (applied only to wells between 1/2 mile and 1 mile from the site).**

The above conditions are in addition to standard conditions applied to permits. The COGCC's position on these issues is subject to future modification based on additional information or changed circumstances.

At the December 2007 COGCC meeting, the Acting Director informed the Commission that he intends to begin approving APDs subject to a final Plan that is satisfactory to the technical staff and CDPHE. The Commission requested that such approval be deferred until after the January 2008 COGCC meeting only if it would raise new policy issues. No new policy issues have been raised. The only APDs expected to be approved prior to the January 2008 meeting are those submitted by Noble Energy, Inc. for the Battlement Mesa 34-21A and Battlement Mesa 34-21C wells, both of which are located more than two miles from the blast site. The approval of any APD will require compliance with all applicable statutory and regulatory requirements.

The COGCC thanks all of the participants, including in particular the Concerned Residents and the Companies, for their input and participation in this process. The results reached should ensure that public

health, safety, and welfare and the environment are protected, not just in connection with the permitting of new wells in the vicinity of Project Rulison but also regarding the drilling of previously permitted wells and the operation of existing wells in that area.

David Neslin  
Acting Director

21 December 2007