UNDERGROUND INJECTION CONTROL PROGRAM
AREA PERMIT

Permit No. CO32210-00000

Class III Solution Mining
Rio Blanco County, CO

Issued To

Shell Frontier Oil & Gas Inc.
3737 Bellaire Blvd
Houston, TX 77025

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PART I. AUTHORIZATION TO CONSTRUCT AND OPERATE

Under the authority of the Safe Drinking Water Act and Underground Injection Control (UIC) Program regulations of the U. S. Environmental Protection Agency (EPA) codified at Title 40 of the Code of Federal Regulations (40 CFR) Parts 2, 124, 144, 146, and 147, and according to the terms of this Area Permit,

Shell Frontier Oil & Gas Inc.
3737 Bellaire Blvd
Houston, TX 77025

hereby referred to as the "Permittee", is authorized to construct and to operate Class III well or wells within the permitted area which is described by:

Township 2S, Range 98W, Section 4, Lots 9, 10, 15, 16

The well included in this area permit is CO32210-09191:

H01
1820 FNL, 2050 FWL, SWNW S4, T2S, R98W
Rio Blanco County, CO

EPA regulates the injection of fluids into injection wells so that injection does not endanger underground sources of drinking water (USDWs). EPA UIC Permit conditions are based on authorities set forth at 40 CFR Parts 144 and 146, and address potential impacts to USDWs.

Under 40 CFR Part 144, Subpart D, certain conditions apply to all UIC Permits and may be incorporated either expressly or by reference. General permit conditions for which the content is mandatory and not subject to site-specific differences are not discussed in this document. Issuance of this Permit does not convey any property rights of any sort or any exclusive privilege, nor does it authorize injury to persons or property or invasion of other private rights, or any infringement of other Federal, State or local laws or regulations (40 CFR §144.35). An EPA UIC Permit may be issued for the operating life of the injection well or project unless terminated for reasonable cause under 40 CFR §144.39, §144.40, §144.41, and may be reviewed at least once every five (5) years to determine if action is required under 40 CFR §144.36(a).

This Permit is issued for the life of the well(s) or project unless modified, revoked and reissued, or terminated under 40 CFR §144.39 or §144.40. This EPA Permit may be adopted, modified, revoked and reissued, or terminated if primary enforcement authority for a UIC Program is delegated to the State of Colorado. Upon the effective date of delegation, reports, notifications, questions and other correspondence should be directed to the State Director.

Issue Date: _____ Effective Date _____

_____
Stephen S. Tuber
Assistant Regional Administrator*
Office of Partnerships and Regulatory Assistance

*NOTE: The person holding this title is referred to as the "Director" throughout this Permit.

PART II. SPECIFIC PERMIT CONDITIONS

Section A. WELL CONSTRUCTION REQUIREMENTS

These requirements represent the approved minimum construction standards for well casing and cement, injection tubing, and monitoring equipment standards for all wells associated with this area permit. All materials used for construction of the well and selected monitoring equipment shall be capable of withstanding the temperature range planned for this project and compatible with all fluids with which the materials are expected to come into contact.

Details of the approved well construction plan for newly drilled wells and are incorporated into this Permit as APPENDIX A. Changes to the approved plan that may occur during construction must be approved by the Director prior to being physically incorporated. Existing wells that are candidates for conversion to injection wells also must, at a minimum, satisfy the following requirements. The approved conversion plan is also found in APPENDIX A.

1. Casing and Cement

The well shall be cased and cemented to prevent the movement of fluids into or between underground sources of drinking water. The well casing and cement shall be designed for the life expectancy of the well and constructed according to the well construction requirements found in APPENDIX A. Remedial cementing may be required if shown to be inadequate by a cement evaluation log or other attempted demonstration of Part II (External) mechanical integrity (MI).

2. Tubing

A packerless tubing system shall be suspended within the longstring casing as shown in APPENDIX A.

3. Sampling and Monitoring Devices

The Permittee shall install and maintain in good operating condition for the duration period specified in Appendix D:

(a) recording devices capable of continuously monitoring at the surface, within a certified accuracy of 95% or better, the following:

(i) injection tubing pressure, volume, flowrate, density, and temperature; and
(ii) production tubing pressure, volume, flowrate, density, and temperature; and
(iii) automatic alarms to sound:
- if a temperature of 400 degrees Fahrenheit is reached in injection or production tubings; and
- if Gas Cap MAIP is reached in longstring casing tubing annulus.

(b) a "tap" at a conveniently accessible location on the injection flow line, between heater and the injection well, isolated by shut-off valves, for collection of representative samples of the injected fluid; and

(c) one-half (1/2) inch female iron pipe fitting, isolated by shut-off valves and located at the wellhead at a conveniently accessible location, for the attachment of a pressure gauge capable of monitoring pressures ranging from normal operating pressures up to:

(i) the Maximum Allowable Injection Pressure (MAIP) on the production and injection tubing strings; and
(ii) the Gas Cap Maximum Allowable Injection Pressure (Gas Cap MAIP) on the annulus between the injection and production tubing strings and longstring casing; and

(d) a pressure actuated shut-off device attached to the injection flow line set to shut-off the injection pump before or when the MAIP is reached at the wellhead; and

(e) thermocouples and transducers attached to the production tubing, to measure reservoir temperature and pressure; and

(f) thermocouples cemented into the longstring casing (H01 well only), to measure temperature and to sound if 400 degrees Fahrenheit is reached; reasonable efforts must be made to keep the thermocouples operational; and

(g) Time Domain Reflectometry (TDR) cables (or an equivalent technology, see PART II Section D.2(c)(ii)) from dissolution surface to approximately 70 feet above injection zone, to be grouted into OB02; reasonable efforts must be made to keep the cables operational; and

(h) radioactive markers approximately 20 feet apart will be attached to the casing on OB02 (approximate depth of 1,800' – 2,124') and OB04 (approximate depth of 1,800' – 2,270') between successive tubes in the workstring and permanently cemented in the well; and

(i) pressure and temperature sampling equipment for the 5 wells located on the 138-4-298 well pad and the 135-4-298-L4 well described in *The Sampling and Analysis Plan For: Environmental Water Quality Monitoring East Research, Development, and Demonstration Lease* dated May 2011 and submitted with the permit application.

4. Well Logging and Testing

Well logging and testing requirements for the well(s) included in this permit are found in APPENDIX B. The Permittee shall ensure the log and test requirements are performed within the time frames specified in APPENDIX B. Well logs and tests shall be performed according to current EPA-approved procedures. Well log and test results shall be submitted to the Director within sixty (60) days of completion of the logging or testing activity, and shall include a report describing the methods used during logging or testing and an interpretation of the test or log results.

5. Postponement of Construction or Conversion

The Permittee shall complete well construction within one year of the Effective Date of the Permit, or in the case of an Area Permit within one year of Authorization of the additional well. Authorization to construct and operate shall expire if the well has not been constructed within one year of the Effective Date of the Permit or Authorization and the Permit may be terminated under 40 CFR §144.40, unless the Permittee has notified the Director and requested an extension prior to expiration. Notification shall be in writing, and shall state the reasons for the delay and provide an estimated completion date. Once Authorization has expired under this part, the complete permit process including opportunity for public comment may be required before Authorization to construct and operate may be reissued.

6. Workovers and Alterations

Workovers and alterations shall meet all conditions of the Permit. Prior to beginning any addition or physical alteration to an injection well that may significantly affect the injection or production tubings or casing, the Permittee shall give advance notice to the Director and obtain the Director's approval. The Permittee shall record all changes to well construction on a Well Rework Record (EPA Form 7520-12), and shall provide this and any other record of well workover, logging, or test data to EPA within sixty (60) days of completion of the activity.

A successful demonstration of Part I MI is required following the completion of any well workover or alteration which significantly affects the injection casing. Injection operations shall not be resumed until the well has successfully demonstrated mechanical integrity and the Director has provided written approval to resume injection.

Section B. MECHANICAL INTEGRITY

The Permittee is required to ensure each injection well maintains mechanical integrity at all times. The Director, by written notice, may require the Permittee to comply with a schedule describing when mechanical integrity demonstrations shall be made.

An injection well has mechanical integrity if:

(a) There is no significant leak in the injection or longstring casings (Part I); and

(b) There is no significant fluid movement into an underground source of drinking water through vertical channels adjacent to the injection well bore (Part II).

1. Demonstration of Mechanical Integrity (MI)

The operator shall demonstrate MI prior to commencing injection and periodically thereafter. Well-specific conditions dictate the methods and the frequency for demonstrating MI and are discussed in the Statement of Basis and the requirements are found in APPENDIX B. The logs and tests are designed to demonstrate both internal (Part I) and external (Part II) MI as described above. The conditions present at this well site warrant the methods and frequency required in this Permit.

In addition to these regularly scheduled demonstrations of MI, the operator shall demonstrate internal (Part I) MI after any significant workover which affects the casings.

The Director may require additional or alternative tests if the results presented by the operator are not satisfactory to the Director to demonstrate there is no movement of fluid into or between USDWs resulting from injection activity. Results of MI tests shall be submitted to the Director as soon as possible but no later than sixty (60) days after the test is complete.

2. Mechanical Integrity Test Methods and Criteria

EPA-approved methods shall be used to demonstrate mechanical integrity. Ground Water Section Guidance No. 34 "Cement Bond Logging Techniques and Interpretation", Ground Water Section Guidance No. 39, "Pressure Testing Injection Wells for Part I (Internal) Mechanical Integrity", and guidelines for demonstrating Part II (External) Mechanical Integrity, including “Radioactive Tracer Surveys for Evaluating Fluid Channeling Behind Casing near Injection Perforations”, and “Temperature Logging For Mechanical Integrity” are available from EPA and will be provided upon request.

The Director may stipulate specific test methods and criteria best suited for a specific well construction and injection operation.

3. Notification Prior to Testing

The Permittee shall notify the Director at least 30 days prior to any scheduled mechanical integrity test. The Director may allow a shorter notification period if it would be sufficient to enable EPA to witness the mechanical integrity test. Notification may be in the form of a yearly or quarterly schedule of planned mechanical integrity tests, or it may be on an individual basis.

4. Loss of Mechanical Integrity

If the well fails to demonstrate mechanical integrity during a test, or a loss of mechanical integrity becomes evident during operation (such as unstable pressure in the tubing – casing annulus, water flowing at the surface, etc.), the Permittee shall notify the Director within 24 hours (see Part III Section E Paragraph 11(e) of this Permit) and the well shall be shut-in within 48 hours unless the Director requires immediate shut-in.

Within five days, the Permittee shall submit a follow-up written report that documents test results, repairs undertaken or a proposed remedial action plan.

Injection operations shall not be resumed until after the well has successfully been repaired and demonstrated mechanical integrity, and the Director has provided approval to resume injection.

Section C. WELL OPERATION

INJECTION BETWEEN THE OUTERMOST CASING PROTECTING UNDERGROUND SOURCES OF DRINKING WATER AND THE WELL BORE IS PROHIBITED.

Injection is approved under the following conditions:

1. Requirements Prior to Commencing Injection

Well injection authorized by an Area Permit under 40 CFR §144.33(c), may commence only after all well construction and pre-injection requirements herein have been met and approved and a written authorization to commence injection has been obtained from the Director. The Permittee may not commence injection until construction is complete, and

(a) The Permittee has submitted to the Director a notice of completion of construction and a completed EPA Form 7520-9 or 7520-12; all applicable logging and testing requirements (see APPENDIX B for requirements pertinent to the well included in this permit) have been fulfilled and the records submitted to the Director; mechanical integrity pursuant to 40 CFR §146.8 and Part II Section B of this Permit has been demonstrated; and

(i) The Director has inspected or otherwise reviewed the new injection well and finds it is in compliance with the conditions of the Permit; or

(ii) The Permittee has not received notice from the Director of his or her intent to inspect or otherwise review the new injection well within 13 days of the date of the notice in Section C.1.(a), in which case prior inspection or review is waived and the Permittee may commence injection.

2. Injection Interval

Injection is permitted only within the approved injection interval listed in APPENDIX C. The mining interval development must be wholly contained within the injection interval.

3. Injection Pressure Limitation

(a) The permitted Maximum Allowable Injection Pressure (MAIP) for the well(s) included in this permit, measured at the wellhead, is found in APPENDIX C. Injection pressure shall not exceed the amount the Director determines is appropriate to ensure that injection does not initiate new fractures or propagate existing fractures in the injection zone. In no case shall injection pressure initiate fractures in the injection zone or cause the movement of injection or formation fluids into a USDW.

(b) The Permittee may request a change of the MAIP, or the MAIP may be increased or decreased by the Director in order to ensure that the requirements in Paragraph (a) above are fulfilled. The Permitee may be required to conduct a step rate injection test or other suitable test to provide information for determining the fracture pressure of the injection zone. Change of the permitted MAIP by the Director shall be by modification of this Permit and APPENDIX C.

4. Injection Volume Limitation

Injection volume is limited to the total volume specified in APPENDIX C.

5. Injection Fluid Limitation

Injected fluids are limited to:

(a) fresh water (no additives) and reinjection of concentrated brine from the dissolved nahcolite within the injection zone; and

(b) inert gas placed in the annulus of the injection and production tubings and longstring casing.

6. Tubing –Casing Annulus (TCA)

The TCA is the annulus between the injection and production tubing strings and longstring casing. The TCA may be filled with a gas cap, or inert gas injected into the TCA. If utilized, the permitted Gas Cap Maximum Allowable Injection Pressure (Gas Cap MAIP) for the well(s) included in this permit, measured at the wellhead, is found in APPENDIX C.

7. Maximum Injection Well Operating Temperatures

The maximum allowable injection and production fluid temperatures, reservoir temperature, and temperature measured by the thermocouple cemented longstring casing (if available), at any time is 400 degrees Fahrenheit. In addition to a maximum allowable temperature, the maximum allowable number of days for a given temperature or range are:

Temperature deg F	Number of Days	Number of Years
370	4,417	~12
371 - 380	2,276	~6.2
381 – 390	1,191	~3.3
391 – 400	633	~1.7

Section D. MONITORING, RECORDKEEPING, AND REPORTING OF RESULTS

1. Monitoring Parameters and Frequency

Monitoring parameters are specified in APPENDIX D. The listed parameters are to be monitored, recorded and reported at the frequency and duration indicated in APPENDIX D.

Monitoring records must include:

(a) the date, time, exact place and the results of the observation, sampling, measurement, or analysis; and

(b) the name of the individual(s) who performed the observation, sampling, measurement, or analysis; and

(c) the analytical techniques or methods used for analysis.

2. Monitoring Methods

Monitoring observations, measurements, samples, etc. taken for the purpose of complying with these requirements shall be representative of the activity or condition being monitored.

The Sampling and Analysis Plan For: Environmental Water Quality Monitoring East Research, Development, and Demonstration Lease (RDD SAP) dated May 2011 submitted with the permit application describes the monitoring plan and sampling protocol that will be employed by Permittee. Portions of this document are incorporated into this permit. This document may be periodically revised and the referenced monitoring and sampling plans will be conducted according to the most current version.

(a) Injection Well

(i) Methods used to monitor the nature of the injected fluids must comply with analytical methods cited in Table 1 of 40 CFR §136.3 or Appendix III of 40 CFR Part 261, or by other methods that have been approved in writing by the Director.

(ii) Continuous monitoring of the annulus pressure, injection and production densities, flowrates, volumes, pressures, and temperatures, shall be at the wellhead. Monitoring will be carried out with digital equipment and the instrumentation shall be capable of recording at least one value for each of the parameters at least every thirty (30) seconds. Recordings should be made at least once every ten (10) minutes. Pressures are to be measured at the surface in pounds per square inch gauge (psig). Densities to be measured in pounds/cubic feet (lbs/ft^3). Fluid rates are to be measured in gallons per minute (gpm) and reported in gpm and barrels per day (bbl/day). Fluid volumes are to be measured in gallons and reported in gallons and bbls. Temperatures are to be measured in degrees Fahrenheit (deg F).

(iii) Continuous monitoring of the reservoir pressure and temperature shall be carried out with transducers and thermocouples. Pressure is to be measured in psig. Temperature is to be measured in deg F.

(iv) Continuous monitoring of the temperature shall be carried out with thermocouples cemented in the longstring casing. This monitoring requirement is only required for the H01. Temperature is to be measured in deg F.

(b) Mining Interval Monitoring

Mining interval development shall be monitored to be able to estimate radius and height development, as well as geometry of mined region.

(i) Material balances of the volumetric fluid flow rates into and out of the solution mining interval shall be performed. Monitoring of flow rates and sodium bicarbonate equivalent assay will provide an ongoing material balance, which will allow the Permittee to make calculations of the mass of nahcolite extracted.
(ii) The RDD SAP describes the planned network of monitoring or observations wells surrounding the injection well to gauge temperature and pressure. The data collected will be used to provide a qualitative summary of the mining interval development.

(c) Subsurface Subsidence Monitoring

(i) TDR cables will be installed in OB02 and shall be capable of continuously monitoring from the dissolution surface (approximately 2,013 feet) to the approximately 2,074 feet (approximately 70 feet above the injection zone). Reasonable efforts must be made to keep the cables operational. Quarterly analysis of TDR data will be provided.
(ii) Radioactive Marker Logs will be run quarterly. Radioactive pip tags will be located in the casing on OB02 approximately every 20 feet from 1,800 feet to 2,124 feet and in OB04 approximately every 20 feet from 1,800 feet to 2,342 feet that are permanently cemented in the well. Logs will be conducted quarterly and results submitted with analysis of the log within 30 days after log completion.

Other subsurface monitoring techniques may be employed, provided the operator submit sufficient information to demonstrate that the alternative will provide equivalent subsidence monitoring to that of the existing monitoring technique, and the alternative monitoring technique is approved by the Director. If approved, the Permit will be changed to include the new alternative by issuance of a Minor Modification.

(d) Groundwater Monitoring Wells

The RDD SAP is incorporated into this permit. The groundwater monitoring plan describes the aquifer monitored for each dedicated monitoring wells, sampling procedure, constituents sampled, monitoring frequency and duration.

The Director may require greater monitoring frequency or additional monitoring wells, as appropriate.

3. Records Retention

(a) Records of calibration and maintenance, and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit shall be retained for a period of AT LEAST THREE (3) YEARS from the date of the sample, measurement, report, or application. This period may be extended anytime prior to its expiration by request of the Director.

(b) Records of the nature and composition of all injected fluids must be retained until three (3) years after the completion of any plugging and abandonment (P&A) procedures specified under 40 CFR §144.52(a)(6) or under Part 146 Subpart G, as appropriate. The Director may require the Permittee to deliver the records to the Director at the conclusion of the retention period. The Permittee shall continue to retain the records after the three (3) year retention period unless the Permittee delivers the records to the Director or obtains written approval from the Director to discard the records.

4. Quarterly Reports

Whether the well is operating or not, the Permittee shall submit Quarterly Reports to the Director that summarizes the results of the monitoring required by Part II Section D and APPENDIX D. The report of fluids injected during the quarter must identify each new fluid source.

The Quarterly Report shall cover the period from the January 1 through March 31, April 1 through June 30, July 1 through September 30, and October 1 through December 31. Quarterly Reports shall be submitted within 30 days following the end of the data collection period. Parameters recorded annually will be reported in the quarter that the data was collected. EPA Form 7520-8 may be copied and used to submit the Quarterly Report.

Section E. PLUGGING AND ABANDONMENT

1. Notification of Well Abandonment, Conversion or Closure

The Permittee shall notify the Director in writing at least forty-five (45) days prior to: 1) plugging and abandoning an injection well, or 2) converting to a non-injection well.

2. Well Plugging Requirements

Prior to abandonment, the injection well shall be plugged in a manner which isolates the injection zone and prevents the movement of fluids into or between underground sources of drinking water, and in accordance with 40 CFR §146.10 and other applicable Federal, State or local law or regulations. The Plugging Record must be certified as accurate and complete by the person responsible for the plugging operation.

3. Approved Plugging and Abandonment Plan

The approved plugging and abandonment plan and required tests are incorporated into this Permit as APPENDIX E. Changes to the approved plugging and abandonment plan must be approved by the Director prior to beginning plugging operations. The Director also may require revision of the approved plugging and abandonment plan at any time prior to plugging the well.

4. Forty Five (45) Day Notice of Plugging and Abandonment

The Permittee shall notify the Director at least forty-five (45) days prior to plugging and abandoning a well and provide notice of any anticipated change to the approved plugging and abandonment plan.

5. Plugging and Abandonment Report

Within sixty (60) days after plugging a well, the Permittee shall submit a report (EPA Form 7520-13) to the Director. The plugging report shall be certified as accurate by the person who performed the plugging operation. Such report shall consist of either:

(a) A statement that the well was plugged in accordance with the approved plugging

and abandonment plan; or

(b) Where actual plugging differed from the approved plugging and abandonment plan, an updated version of the plan, on the form supplied by the Director, specifying the differences.

6. Inactive Wells

After any period of two years during which there is no injection or post-operational monitoring, the Permittee shall plug and abandon the well in accordance with Part II Section E Paragraph 2 of this Permit unless the Permittee:

(a) Provides written notice to the Director; and

(b) Describes the actions or procedures the Permittee will take to ensure that the well will not endanger USDWs during the period of inactivity. These actions and procedures shall include compliance with mechanical integrity demonstration, Financial Responsibility and all other permit requirements designed to protect USDWs; and

(c) Receives written notice by the Director temporarily waiving plugging and abandonment requirements.

Section F. REQUIREMENTS FOR ADDITIONAL WELLS

The Permittee may convert and/or construct and operate additional wells within the permitted area, provided that all additional wells meet all conditions as set forth in the permit. All sections of this permit apply to any additional well(s) approved for injection. Additional requirements beyond those described in this permit may be required for additional injection wells that will be included in this area permit.

1. Conversion/Construction Notification Requirements

The Permittee shall submit a plan consisting of:

(a) If different from the approved well construction plan in APPENDIX A, a well schematic and construction details of the additional well(s) to meet the well construction requirements described in Section A of this permit; and

(b) If converted well(s) and if different from the approved well conversion plan, a well schematic and construction details of the additional well(s) to meet the well construction requirements described in Section A of this permit. This information shall also include casing and cementing details (cement evaluation log, if available), depths to top and bottom of USDWs, confining zone, and injection zone, and formation depths; and

(c) Information on additional wells within a 1/4 mile of the injection well location that have not been previously provided. This information shall include the well location, completion report including casing and cementing details, CBL (if available), depths to top and bottom of any USDWs, formation depths, and P&A record (if applicable); and

(d) If different from the approved plugging and abandonment plan in APPENDIX E, submit a plan for plugging and abandonment that includes a well schematic and description of type, number, and placement of the plugs and method used to place the plugs. The plan should demonstrate adequate protection of

USDWs; and

(e) Demonstration of financial responsibility and resources to close, plug, and abandon the well(s).

The plan must first be approved by the Director and the Permittee shall not begin construction or conversion of the well(s) of the plan until after receiving written authorization from the Director.

2. Formation Logging and Testing

The Permittee shall perform the well logging and testing requirements that will be stipulated in the written Authorization for Additional Well from the Director and submit the information. These requirements may be different than those found in APPENDIX B that are applicable for the well included in this Area Permit. Well logs and tests shall be performed according to current EPA-approved procedures. Well log and test results shall be submitted to the Director within sixty (60) days of completion of the logging or testing activity, and shall include a report describing the methods used during logging or testing and an interpretation of the test or log results. Injection shall not commence until the receipt of the written Authorization to Inject from the Director.

PART III. CONDITIONS APPLICABLE TO ALL PERMITS

Section A. EFFECT OF PERMIT

The Permittee is allowed to engage in underground injection in accordance with the conditions of this Permit. The Permittee shall not construct, operate, maintain, convert, plug, abandon, or conduct any other activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR Part 141 or may otherwise adversely affect the health of persons. Any underground injection activity not authorized by this Permit or by rule is prohibited. Issuance of this Permit does not convey property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of any other Federal, State or local law or regulations. Compliance with the terms of this Permit does not constitute a defense to any enforcement action brought under the provisions of Section 1431 of the Safe Drinking Water Act (SDWA) or any other law governing protection of public health or the environment, for any imminent and substantial endangerment to human health or the environment, nor does it serve as a shield to the Permittee's independent obligation to comply with all UIC regulations. Nothing in this Permit relieves the Permittee of any duties under applicable regulations.

Section B. CHANGES TO PERMIT CONDITIONS

1. Modification, Reissuance, or Termination

The Director may, for cause or upon a request from the Permittee, modify, revoke and reissue, or terminate this Permit in accordance with 40 CFR §124.5, §144.12, §144.39, and §144.40. Also, this Permit is subject to minor modification for causes as specified in 40 CFR §144.41. The filing of a request for modification, revocation and reissuance, termination, or the notification of planned changes or anticipated noncompliance on the part of the Permittee does not stay the applicability or enforceability of any condition of this Permit.

2. Conversions

The Director may, for cause or upon a written request from the Permittee, allow conversion of the well from a Class III injection well to a non-Class III well. Conversion may not proceed until the Permittee receives written approval from the Director. Conditions of such conversion may include but are not limited to, approval of the proposed well rework, follow up demonstration of mechanical integrity, well-specific monitoring and reporting following the conversion, and demonstration of practical use of the converted configuration. APPENDIX B provides a list of the required logs and tests. At the time conversion to a non-Class III well is requested, additional requirements may be added.

3. Transfer of Permit

Under 40 CFR §144.38, this Permit is transferable provided the current Permittee notifies the Director at least thirty (30) days in advance of the proposed transfer date (EPA Form 7520-7) and provides a written agreement between the existing and new Permittees containing a specific date for transfer of Permit responsibility, coverage and liability between them. The notice shall adequately demonstrate that the financial responsibility requirements of 40 CFR §144.52(a)(7) will be met by the new Permittee. The Director may require modification or revocation and reissuance of the Permit to change the name of the Permittee and incorporate such other requirements as may be necessary under the Safe Drinking Water Act; in some cases, modification or revocation and reissuance is mandatory.

4. Permittee Change of Address

Upon the Permittee's change of address, or whenever the operator changes the address

where monitoring records are kept, the Permittee must provide written notice to the Director within 30 days.

5. Construction Changes, Workovers, Logging and Testing Data

The Permittee shall give advance notice to the Director, and shall obtain the Director's written approval prior to any physical alterations or additions to the permitted facility. Alterations or workovers shall meet all conditions as set forth in this permit. The Permittee shall record any changes to the well construction on a Well Rework Record (EPA Form 7520-12), and shall provide this and any other record of well workovers, logging , or test data to EPA within sixty (60) days of completion of the activity.

Following the completion of any well workovers or alterations which affect the casing, tubing, or packer, a successful demonstration of mechanical integrity (Part III, Section F of this permit) shall be made, and written authorization from the Director received, prior to resuming injection activities.

Section C. SEVERABILITY

The Provisions of this Permit are severable, and if any provision of this Permit or the application of any provision of this Permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this Permit shall not be affected thereby.

Section D. CONFIDENTIALITY

In accordance with 40 CFR Part 2 and 40 CFR §144.5, information submitted to EPA pursuant to this Permit may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice. If a claim is asserted, the validity of the claim will be assessed in accordance with the procedures in 40 CFR Part 2 (Public Information). Claims of confidentiality for the following information will be denied:

(a) The name and address of the Permittee; and

(b) Information which deals with the existence, absence or level of contaminants in drinking water.

Section E. GENERAL PERMIT REQUIREMENTS

1. Duty to Comply

The Permittee must comply with all conditions of this Permit. Any noncompliance constitutes a violation of the Safe Drinking Water Act (SDWA) and is grounds for enforcement action; for Permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application; except that the Permittee need not comply with the provisions of this Permit to the extent and for the duration such noncompliance is authorized in an emergency permit under 40 CFR §144.34. All violations of the SDWA may subject the Permittee to penalties and/or criminal prosecution as specified in Section 1423 of the SDWA.

2. Duty to Reapply

If the Permittee wishes to continue an activity regulated by this Permit after the expiration date of this Permit, under 40 CFR §144.37 the Permittee must apply for a new permit prior to the expiration date.

3. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Permit.

4. Duty to Mitigate

The Permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this Permit.

5. Proper Operation and Maintenance

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this Permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this Permit.

6. Permit Actions

This Permit may be modified, revoked and reissued or terminated for cause. The filing of a request by the Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

7. Property Rights

This Permit does not convey any property rights of any sort, or any exclusive privilege.

8. Duty to Provide Information

The Permittee shall furnish to the Director, within a time specified, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The Permittee shall also furnish to the Director, upon request, copies of records required to be kept by this Permit. The Permittee is required to submit any information required by this Permit or by the Director to the mailing address designated in writing by the Director.

9. Inspection and Entry

The Permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

(a) Enter upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this Permit; and

(b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Permit; and

(c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Permit; and

(d) Sample or monitor at reasonable times, for the purpose of assuring permit

compliance or as otherwise authorized by the SDWA, any substances or parameters at any location.

10. Signatory Requirements

All applications, reports or other information submitted to the Director shall be signed and certified according to 40 CFR §144.32. This section explains the requirements for persons duly authorized to sign documents, and provides wording for required certification.

11. Reporting Requirements

(a) Planned changes. The Permittee shall give notice to the Director as soon as possible of any planned changes, physical alterations or additions to the permitted facility, and prior to commencing such changes.

(b) Anticipated noncompliance. The Permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

(c) Monitoring Reports. Monitoring results shall be reported at the intervals specified in this Permit.

(d) Compliance schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this Permit shall be submitted no later than 30 days following each schedule date.

(e) Twenty-four hour reporting. The Permittee shall report to the Director any noncompliance which may endanger human health or the environment, including:

(i) Any monitoring or other information which indicates that any contaminant may cause endangerment to a USDW; or
(ii) Any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between USDWs.

Information shall be provided, either directly or by leaving a message, within twenty-four (24) hours from the time the permittee becomes aware of the circumstances by telephoning (800) 227-8917 and requesting EPA Region VIII UIC Program Compliance and Technical Enforcement Director, or by contacting the EPA Region VIII Emergency Operations Center at (303) 293-1788.

In addition, a follow up written report shall be provided to the Director within five (5) days of the time the Permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause, the period of noncompliance including exact dates and times, and if the noncompliance has not been corrected the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

(f) Oil Spill and Chemical Release Reporting: The Permittee shall comply with all reporting requirements related to the occurrence of oil spills and chemical releases by contacting the National Response Center (NRC) at (800) 424-8802, (202) 267-2675, or through the NRC website http://www.nrc.uscg.mil/index.htm.

(g) Other Noncompliance. The Permittee shall report all instances of noncompliance not reported under paragraphs Part III, Section E Paragraph 11(b) or Section E, Paragraph 11(e) at the time the monitoring reports are submitted. The reports shall contain the information listed in Paragraph 11(e) of this Section.

(h) Other information. Where the Permittee becomes aware that it failed to submit any relevant facts in the permit application, or submitted incorrect information in a permit application or in any report to the Director, the Permittee shall promptly submit such facts or information to the Director.

Section F. FINANCIAL RESPONSIBILITY

1. Method of Providing Financial Responsibility

The Permittee shall maintain continuous compliance with the requirement to maintain financial responsibility and resources to close, plug, and abandon the underground injection well(s). No substitution of a demonstration of financial responsibility shall become effective until the Permittee receives written notification from the Director that the alternative demonstration of financial responsibility is acceptable. The Director may, on a periodic basis, require the holder of a permit to revise the estimate of the resources needed to plug and abandon the well to reflect changes in such costs and may require the Permittee to provide a revised demonstration of financial responsibility.

2. Insolvency

In the event of:

(a) the bankruptcy of the trustee or issuing institution of the financial mechanism; or

(b) suspension or revocation of the authority of the trustee institution to act as trustee; or

(c) the institution issuing the financial mechanism losing its authority to issue such an instrument,

the Permittee must notify the Director in writing, within ten (10) business days, and the Permittee must establish other financial assurance or liability coverage acceptable to the Director within sixty (60) days after any event specified in (a), (b), or (c) above.

The Permittee must also notify the Director by certified mail of the commencement of voluntary or involuntary proceedings under Title 11 (Bankruptcy), U.S. Code naming the owner or operator as debtor, within ten (10) business days after the commencement of the proceeding. A guarantor, if named as debtor of a corporate guarantee, must make such a notification as required under the terms of the guarantee.

APPENDIX A

WELL CONSTRUCTION REQUIREMENTS

NEW WELL: H01

The H01 will be a newly constructed well drilled to a total depth of approximately 2,285'.

Surface Casing: A 10 3/4" casing will be set at approximately 50' depth in a 14 3/4" hole and cemented to surface.

Longstring Casing: A 7 5/8" casing will be set at approximately 2,122' in a 9 7/8" hole and cemented to surface.

The 12 1/4" open hole will be underreamed from approximately 2,132’ to 2,285’.

Two 2 3/8” flush joint tubing will be installed in the well to depths below the casing shoe.

Additionally, a dual thermocouple will be cemented on the exterior of the longstring casing. Two dual thermocouples and two transducers will be placed on the production tubing.

CONVERSION WELLS: OB01 and OB03

Original Construction
The OB01 and OB03 wells are deviated wells that will be drilled to a total vertical depth (TVD) of approximately 2,285’. Initially, the OB01 and OB03 will be used as observation or monitoring wells, and if needed, converted to injection well(s).

Surface Casing: A 10 3/4" casing will be set at approximately 50' depth in a 14 3/4" hole and cemented to surface.

Longstring Casing: A 7 5/8" casing will be set at approximately 2,122' (TVD) in a 9 7/8" hole and cemented to surface.

One 2 3/8” tubing with a bull plug will be set at approximately 2,275’, with a 1/4” bubbler line for pressure-associated monitoring.

Conversion
Remove the 2 3/8” flush joint tubing with bull plug, 1/4” bubbler line, and other monitoring instrumentation.

Install two 2 3/8” flush joint tubing strings and monitoring equipment. Two dual thermocouples and two transducers will be placed on the longstring tubing.

Notes:
1) Depths noted above are approximate and will be determined after the well has been drilled.
2) The casing and tubing size and weight may be changed during construction, provided that approval by the Director is obtained prior to being physically incorporated. A final well completion schematic will be provided to the Director prior to authorization to inject.

WELL: H01 | CNTY: Rio Blanco | FT.: 1834′ FNL 2059′ FWL

FIELD: Multi-Mineral RDD | STATE: Colorado | Q-Q: SENW

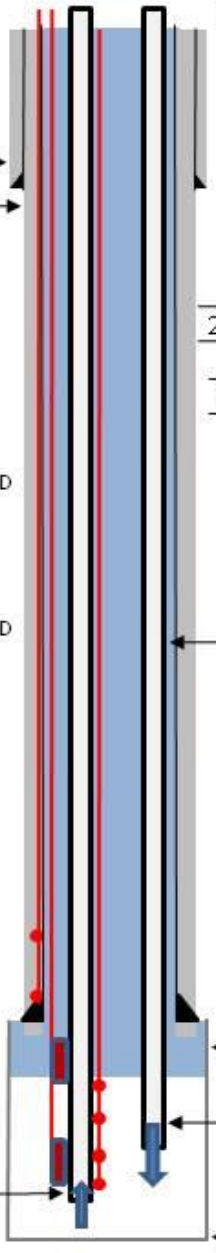
API#: | SEC: 4

LEASE#: | TWS: 2S

EPA PERMIT#: | RGE: 98W

WELL BORE SCHEMATIC DIAGRAM

KB (ft):
GL (ft): 6612
TD (ft): 2285
PBTD (ft):



CASING RECORD

HOLE (in)	SIZE (in)	WT (lb/ft)	GRADE	TOP (ft)	BTM (ft)
14 3/4	10 3/4	40.5#	H-40	0	50
9⅞	7⅝	26.4#	J-55	0	2122

TUBING RECORD

SIZE (in)	WT(lb/ft)	GRADE	TOP (ft)	BTM (ft)
2 3/8"(production)			0	TBD
SIZE (in)	WT(lb/ft)	GRADE	TOP (ft)	BTM (ft)
2 3/8"(injection)			0	TBD

OPEN HOLE

ZONE	TOP (ft)	BTM (ft)	SPF	DATE SHOT	STATUS
Green River	2132	2285			

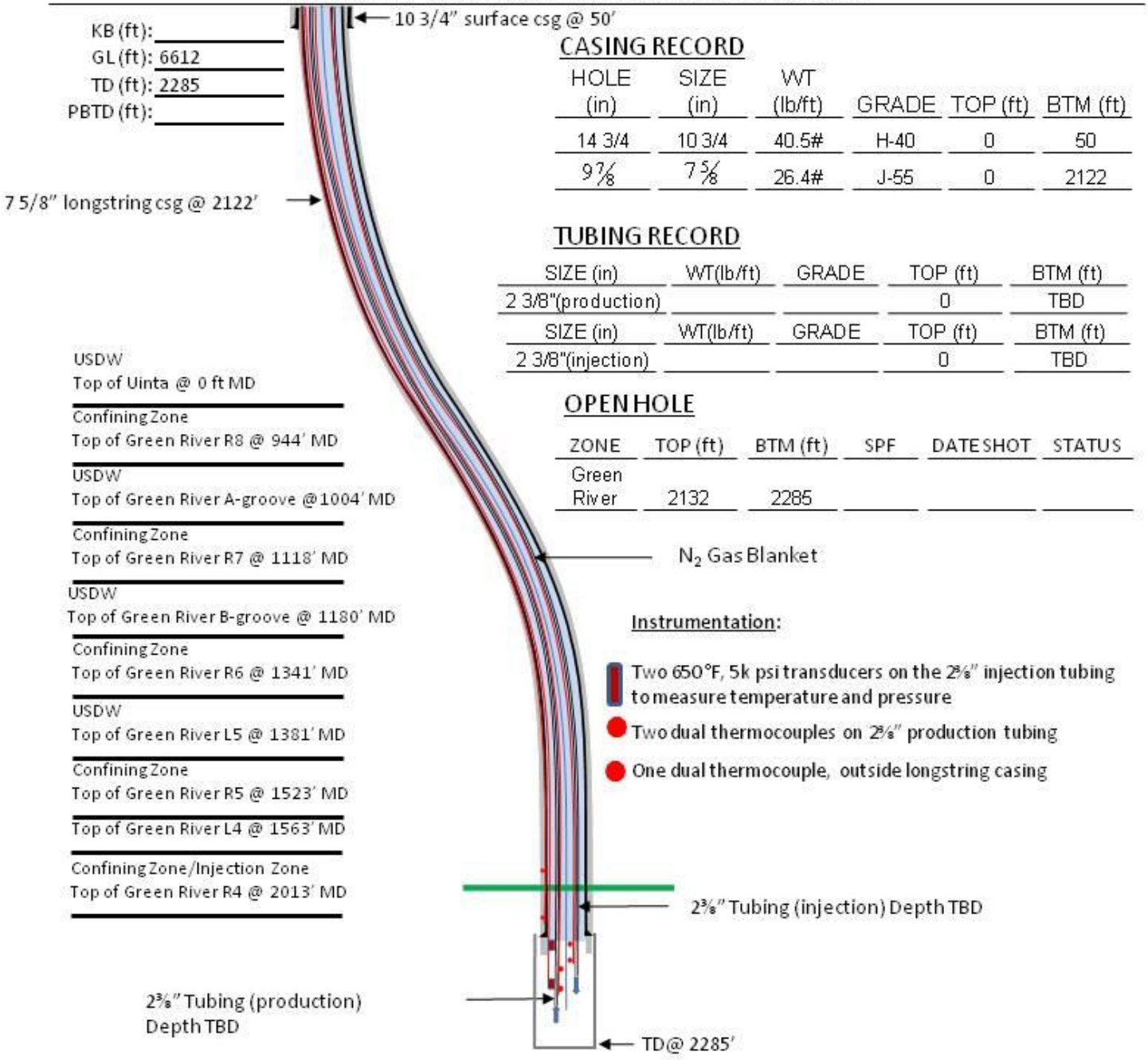
Instrumentation:

- Two 650°F, 5k psi transducers on the 2⅜" injection tubing to measure temperature and pressure
- Two dual thermocouples on 2⅜" production tubing
- One dual thermocouple, outside longstring casing

NOT TO SCALE - depths are approximated

WELL: OB01 or OB03 | CNTY: Rio Blanco | FT.: 1834' FNL 2059' FWL
FIELD: Multi-Mineral RDD | STATE: Colorado | Q-Q: SENW
API#: | SEC: 4
LEASE#: | TWS: 2S
EPA PERMIT#: | RGE: 98W

DEVIATED WELL BORE SCHEMATIC DIAGRAM



CASING RECORD

HOLE (in)	SIZE (in)	WT (lb/ft)	GRADE	TOP (ft)	BTM (ft)
14 3/4	10 3/4	40.5#	H-40	0	50
9 7/8	7 5/8	26.4#	J-55	0	2122

TUBING RECORD

SIZE (in)	WT(lb/ft)	GRADE	TOP (ft)	BTM (ft)
2 3/8"(production)			0	TBD
SIZE (in)	WT(lb/ft)	GRADE	TOP (ft)	BTM (ft)
2 3/8"(injection)			0	TBD

OPEN HOLE

ZONE	TOP (ft)	BTM (ft)	SPF	DATE SHOT	STATUS
Green River	2132	2285			

NOT TO SCALE - depths are approximated

APPENDIX B

LOGGING AND TESTING REQUIREMENTS

Well logs and tests shall be performed according to EPA-approved procedures. It is the responsibility of the permittee to obtain and use guidance prior to conducting any well logging or test required as a condition of this permit.

Well log and test results shall be submitted to the Director within sixty (60) days of completion of the logging or testing activity, and shall include a report describing the methods used during logging or testing and an interpretation of the log or test results.

TYPE OF LOG OR TEST	DATE DUE
WELL NAME(S):	*H01*
Compensated Density Neutron Log	Prior to receiving Authorization to Inject.
Caliper Log	Prior to receiving Authorization to Inject.
Temperature Log (Part II MI)	1. Baseline temperature log required prior to receiving Authorization to Inject. 2. First temperature log will be require no less than two years after authorization to inject and will be repeated no less than five years after the last successful MIT demonstration. 3. Prior to Plugging and Abandonment or Conversion to non-Class III well.
Cement Evaluation Log	1. Prior to receiving Authorization to Inject. 2. Prior to Plugging and Abandonment.
Well Completion Report and Diagram	Prior to receiving Authorization to Inject.
Cement Records	Prior to receiving Authorization to Inject.
Casing Pressure Test or Standard Annulus Pressure Test (Part I MI)	1. Prior to receiving Authorization to Inject. 2. Pressure Test will be repeated no less than five years after the last successful MIT demonstration. 3. Prior to Plugging and Abandonment or Conversion to non-Class III well.
Radioactive Tracer Survey (RTS)	If cement bond log does not show 80% bond index, a RTS is required prior to receiving Authorization to Inject.

AOR WELL NAME(S):	*AOR Wells (H02-H13 (12 wells), OB01-OB06(6 wells)*, P01,P02)*
Cement Bond Logs	Prior to receiving authorization to inject.
Cement Records	Prior to receiving authorization to inject.

* Corrective action is required for OB04, after remedial work has been performed, a new CBL will need to be run after work is completed. See Appendix F.

WELL NAME(S):	*OB02 and OB04*
Radioactive Marker Log	1. Prior to receiving Authorization to Inject. 2. Prior to Plugging and Abandonment or Conversion to non-Class III well.

APPENDIX C

OPERATING REQUIREMENTS

INJECTION ZONE:
Injection is permitted only within the approved injection intervals listed below.

FORMATION/STRATIGRAPHIC UNIT	APPROVED INJECTION INTERVAL (GL, ft) TOP	BOTTOM	FRACTURE GRADIENT (psi/ft)
Green River - R4 Seal	2,100	2,300	0.68

MAXIMUM ALLOWABLE INJECTION PRESSURE:
Maximum Allowable Injection Pressure (MAIP) as measured at the surface shall not exceed the pressure(s) listed below.

WELL NAME	MAXIMUM ALLOWED INJECTION PRESSURE (PSIG)
H01	370
Injection Well Gas Cap	1,510

MAXIMUM INJECTION VOLUME:
There is no limitation on the number of tons of fluids that shall be injected into this well, provided further that in no case shall injection pressure exceed the MAIP.

APPENDIX D

OPERATIONAL, MONITORING, AND REPORTING PARAMETERS

This is a listing of the parameters required to be observed, recorded, reported, and relevant permit condition. Refer to the permit Part II, Section D, for detailed requirements for recording, and reporting of these parameters.

Quarterly Reporting of all parameters are required as described in Part II, Section D.4. Parameters recorded annually will be reported in the quarter that the data was collected.

Injection Well					
Parameter	**Method**	**Permit Condition***	**Automatic Alarm or Shutoff Device?****	**Record Frequency**	**Quarterly Report**
Injected and Produced Volumes (gals and bbls)	Wellhead			10 minute intervals	Monthly and yearly cumulative injected volumes
Injection and Production Fluid Temperatures (degrees F)		At or below 400 deg F	Auto Alarm		Monthly minimum, average and maximum flow rates, temperatures, pressures, and $NaHCO_3$ produced
Injection and Production Pressures (psig)		At or below MAIP	Shut-off Device		
TCA Pressure (annulus may contain inert gas blanket)		At or below Gas Cap MAIP	Auto Alarm		
Injection and Production Flow Rates (gal/min and bbl/day)					
Injection and Production Densities (lbs/ft^3)	Densitometers			10 minute intervals	
$NaHCO_3$ produced (tons/day)				Daily	
Mining Interval Development	Mass Balance Calculation			Monthly	Monthly summary of mass balance calculations
Reservoir Temperature	Thermocouples (4)	At or below 400 deg F		10 minute intervals	Monthly minimum, average and maximum temperatures and pressures
Reservoir Pressure	Transducers (2)	At or below MAIP			
Temperature in cement behind longstring casing	Thermocouples (2)	At or below 400 deg F	Auto Alarm		

Sample and Analyze					
Injectate and Produced Fluids	Sodium bicarbonate assay			Weekly	Monthly minimum, average and maximum values
The injectate is required to be sampled and analyzed on a quarterly basis for the analyte(s) listed below. However, if there is a change in operation that will affect the analysis, then the injectate fluid must be sampled and results submitted within 15 days of the change in operation. If no injection occurs for the entire quarter, then Sample and Analyze requirements will not be required for that quarter. Analytical method used must comply with analytical methods cited and described in Table 1 of 40 CFR §136.3, Appendix II of 40 CFR Part 261.					
Parameter	**Method**	**Permit Condition***	**Automatic Alarm or Shutoff Device?****	**Record Frequency**	**Quarterly Report**
Specific Gravity				Quarterly	Quarterly
pH				Quarterly	Quarterly
Total Dissolved Solids (mg/L)				Quarterly	Quarterly
Specific Conductivity (umhos/cm)				Quarterly	Quarterly

Monitoring Wells					
Parameter	**Method**	**Permit Condition***	**Automatic Alarm?***	**Record Frequency**	**Quarterly Report**
Temperature (deg F)	Various, see RDD SAP***			Monthly	Data collected from monitoring/ observation wells will be use to qualitatively provide a monthly analysis of retort growth and size/shape
Pressure (psi)					
Mining Interval Development: radius (ft), height (ft), geometry	Analysis of temperature and pressure data	Retort confined to injection zone			

Subsidence Monitoring				
Parameter	**Method**	**Permit Condition**	**Record Frequency**	**Reporting**
Subsurface Subsidence Monitoring	Radioactive Marker Log in OB02 and OB04	If log or TDR shows subsidence (6" or more) has occurred, EPA must be immediately notified. If the subsidence has affected a USDW, proceed to the shutdown process.	Quarterly	Submit within 30 days after log completion, including analysis of log
	TDR* in OB02 monitoring from the dissolution surface (approximately 2,013') to the approximately 2,074' (approximately 70' above the injection zone)		Continuous	Quarterly analysis of TDR data

*Equivalent Approved Technology is also acceptable in lieu of the TDR (see PART II Section D.2(c)(ii))

Groundwater Monitoring				
Parameter	**Method**	**Permit Condition**	**Record Frequency**	**Reporting**
Hydraulic Head (ft water)	RDD SAP***	If any monitoring well shows a verified deviation from baseline trend, EPA must be immediately notified.	See current RDD SAP***	A summary of hydraulic heads reported at the frequency collected, shall be provided in the quarterly report in which data collection occurs.
Fluid Sampling	RDD SAP***	If any monitoring well shows a verified deviation from baseline trend, EPA must be immediately notifie**d**.	See current RDD SAP***	A summary of fluid sampling results reported at the frequency collected, shall be provided in the quarterly report in which data collection occurs.

*** Upon discovery of an exceedance of a permit condition, Shell shall proceed to the Response and Shutdown Process.**

Response and Shutdown Process

The response and shutdown process entails investigating the origin to determine that the permit exceedance and/or alarm sounded as a result of a valid concern and not a false alarm before proceeding to the shutdown process. The shutdown process entails immediately ceasing injection, to determine cause and remediate the problem.

All events that trigger the shutdown process will be reported to the EPA within 24 hours. All events that sound an alarm due to a permit condition exceedance will be documented and reported in the quarterly report.

** Monitored parameters that automatically sound an alarm shall be immediately responded to by an onsite 24/7 operator and the operator on duty will proceed to the Response and Shutdown Process. All events triggering an auto-alarm will be reported in the quarterly report.

******* Shell has submitted a *Sampling and Analysis Plan For: Environmental Water Quality Monitoring East Research, Development, and Demonstration Lease* dated May 2011 (RDD SAP). Portions of this document are incorporated into the Subsurface Subsidence and Groundwater Monitoring plans. This document may be periodically revised and the referenced monitoring plan and sampling protocol will be conducted according to the most current version.

APPENDIX E

PLUGGING AND ABANDONMENT REQUIREMENTS

Prior to plugging the well:

- Inert gas used to create the gas cap will be collected at the surface and properly disposed.
- Pull tubing(s), thermocouples, and transducers as necessary.
- Run a Cement Bond Log or Cement Evaluation Log to verify integrity of cement behind the casing has not been compromised.
- Run a radioactive marker log and compare to log obtained prior to authorization to inject to determine if any changes occurred in the positions of the casing collar locations.

A bridge plug will be set near the base longstring casing, at approximately 2,122 feet. Dump cement from bridge plug to surface. Top off cement as necessary.

See P&A diagram.

WELL: H01 CNTY: Rio Blanco FT.: 1834' FNL 2059' FWL

FIELD: Multi-Mineral RDD STATE: Colorado Q-Q: SENW

API#: SEC: 4

LEASE#: TWS: 2S

EPA PERMIT#: RGE: 98W

WELL BORE SCHEMATIC P&A DIAGRAM

KB (ft):
GL (ft): 6612
TD (ft): 2285
PBTD (ft):

10 3/4" surface csg @ 50'
7 5/8" longstring csg @ 2122'

USDW
Top of Uinta @ 0 ft MD

Confining Zone
Top of Green River R8 @ 944' MD

USDW
Top of Green River A-groove @1004' MD

Confining Zone
Top of Green River R7 @ 1118' MD

USDW
Top of Green River B-groove @ 1180' MD

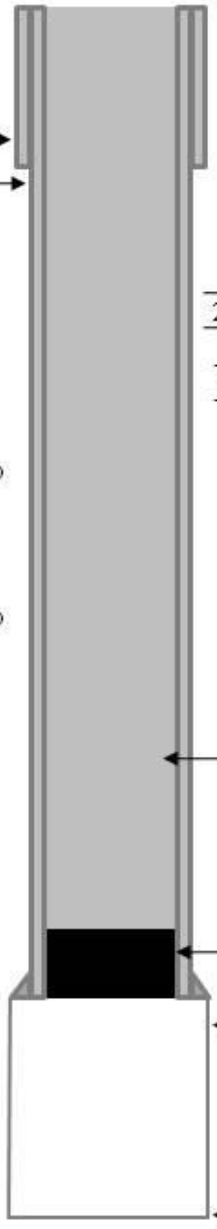
Confining Zone
Top of Green River R6 @ 1341' MD

USDW
Top of Green River L5 @ 1381' MD

Confining Zone
Top of Green River R5 @ 1523' MD

Top of Green River L4 @ 1563' MD

Confining Zone/Injection Zone
Top of Green River R4 @ 2013' MD



CASING RECORD

HOLE (in)	SIZE (in)	WT (lb/ft)	GRADE	TOP (ft)	BTM (ft)
14 3/4	10 3/4	40.5#	H-40	0	50
9 7/8	7 5/8	26.4#	J-55	0	2122

TUBING RECORD

SIZE (in)	WT(lb/ft)	GRADE	TOP (ft)	BTM (ft)
2 3/8"(production)			0	TBD
SIZE (in)	WT(lb/ft)	GRADE	TOP (ft)	BTM (ft)
2 3/8"(injection)			0	TBD

OPEN HOLE

ZONE	TOP (ft)	BTM (ft)	SPF	DATE SHOT	STATUS
Green River	2132	2285			

NOT TO SCALE depths are approximated

APPENDIX F

CORRECTIVE ACTION PLAN

The 135-L4(SAW) well is presently cased with 8 5/8” longstring casing from surface to 2025 feet. At 2025 feet is a 2.5 feet parting from 2025 feet to 2028 feet, and two 20’ joints in the bottom of the cased interval are separated from the casing above. Total depth (TD) of the bottom joint is at 2077 feet, which is 65 feet below the dissolution surface at 2013 feet. The 7 5/8” open hole interval extends from 2077 to 2323 feet and 5.5” interval from there to TD, which is at 2325 feet.

Perforate and squeeze cement across the R5 seal from approximate depths of 1,523 to 1,563 feet. Follow with pressure test to ensure well casing integrity.

A 4 ½” casing will be installed to 2282 feet, and cemented to surface by displacement method. A cement bond log will be run from TD to surface, to assure cement bond integrity. If cement bond indicated inadequate cementing, measures will be determined and implemented to assure proper cementing. Cementing will assure proper cementing from TD to surface, including the casing parting of the 8 3/8” casing at 2,025 feet to 2,028 feet.