

File F - Proposed Emergency and Remedial Response Plan

Note: This document contains Proposed Emergency and Remedial Response Plan information for the Kansas Small Scale Test Wellington Field. The contents were extracted from the original KGS permit document that was prepared prior to the new EPA submission format introduced to KGS on June 3rd 2014. This explains why the information in this Proposed Emergency and Remedial Response Plan document may contain references to figures, tables, and sub-sections in other permit sections that may not be included in this Proposed Emergency and Remedial Response Plan document. Therefore, to facilitate the review process, the entire original permit application has been submitted as a separate document titled “L - Other Information Required by the UIC Program Director”, which also contains an Executive Summary, cover letter, application forms, complete table of contents, list of tables and figures, appendices, and a cross reference table which lists sub-sections that address all Class VI 40 CFR sections 146.82 – 146.93 requirements.

The Proposed Emergency and Remedial Response Plan is documented in the following section:

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Section 13

Emergency Remedial Response Plan

Facility Name: Wellington Field Small Scale Carbon Capture
and Storage Project

Injection Well Location: Latitude 37.319485, Longitude -97.4334588
Township 31S, Range 1W, Section 28 NE SW SE SW

Facility Contact: Dana Wreath, Vice President

Contact Information: 2020 N. Bramblewood Street
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(316) 265-3311
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13.1 Introduction and Plan Overview (§146.94 [a-c])

40 CFR §146.94, Emergency and Remedial Response, requires the permittee to develop an emergency and remedial response plan that describes the actions that must be taken to address movement of injection or formation fluids that may endanger a USDW. The plan must address movement during construction, operation, and post-injection care time periods. The plan herein addresses actions that will be taken in the event of endangerment of a USDW due to movement of injectate or fluid attributed to injection-related activities. This plan ensures that if Berexco obtains evidence that the injected CO₂ stream and/or associated pressure front endangers the USDW, Berexco will take the following action:

1. Immediately shut down the injection well,
2. Identify and characterize the release,
3. Notify the EPA UIC program director of the event within 24 hours,
4. Implement the ERRP presented below.

The EPA may allow injection to resume before remediation if Berexco demonstrates that the injection operation will not endanger the USDW.

Emergency Contact Information

Contact information of Berexco site personnel and project manager as well as county emergency responders and stakeholders are listed below:

Personnel/Organization	Name	Phone Number	Email
Site supervisor	Evan Mayhew	(316) 265-3311	emayhew@berexco.com
Berexco project manager	Dana Wreath	(316) 265-3511	dwreath@berexco.com
Sumner County Sheriff	Darren Chambers	(620) 326-8943	dchambers@co.sumner.ks.us
Sumner County Emergency Management	James Fair	(620) 326-7376	jfair@co.sumner.ks.us

As described in the preceding sections, all proper steps for siting, construction, and operation of the injection and monitoring wells have been or will be undertaken. An extensive set of MVA activities is also proposed to detect movement of CO₂ above the confining zone. In the event that MVA activities show that endangerment of a USDW has occurred due to movement of formation fluid or injectate based on monitoring/testing results, or if there is a well mechanical failure or natural disaster, the emergency and remedial response plan (ERRP) described below will be implemented to prevent negative impacts to the USDW during pre-injection, injection, and post-injection phases.

13.2 Area Resources and Infrastructure (§146.94)

The facility occurs in a sparsely populated area where there are no major buildings, infrastructures, homes, or water wells. As shown in Figure 4.16, there are no potable water wells within the AoR. The injection well is located in a rural area with some non-irrigated crop cultivation (Figure 1.7). Additionally, there are no buildings or infrastructure near the site that would potentially be affected as a result of CO₂ emissions at the surface. Also, there are no municipal water supplies in the immediate area. The closest surface water feature is Slate Creek, which is approximately 3 mi south of the site (Figure 1.6a).

The key resources/infrastructure in the area that may be impacted by escape of CO₂ from

the confining zone include:

- Surface injection facility equipment: CO₂ storage tank, pump, and communication device,
- Injection well KGS 1-28 and monitoring well KGS 2-28 and related equipment,
- USDW within Upper Wellington Formation (ground surface to approximately 250 ft below ground).

13.3 Potential Risk Scenarios (§146.94 [a,b])

The classification of an emergency scenario is related to degree of USDW endangerment posed by the scenario. A list of potential failure/risk scenarios are presented below. Each scenario will constitute an emergency and trigger the ERPP, although response activities related to each scenario will depend on the nature of the failure and the severity of the event. Emergency events will result in:

1. Immediate notification of the Berexco project manager or designated subordinate by on-site staff and automatically over a cellular network;
2. Immediate cessation of CO₂ injection;
3. Evaluation of the nature of the emergency and characterization of any release;
4. Implementation of corrective action as described below for each emergency scenario.

As required in 40 CFR §146.94(b) if, upon evaluation, the owner/operator obtains evidence that the injected CO₂ stream and associated pressure front may cause an endangerment to a USDW, the following additional step will be taken:

5. Notify the director within 24 hours of determination.

All emergencies will require implementation of steps 1–4; those identified as indicating that the injected CO₂ stream and associated pressure front endangers a USDW will trigger step 5.

Emergency scenarios may be defined as major, serious, or minor in terms of anticipated impacts to life and property as indicated below:

- Major Emergency—Immediate risk to human health, resources, or infrastructure.

Area-wide evacuation with the assistance of emergency agencies is to be initiated.

- Serious Emergency—Potential risk to human health, resources, or infrastructure if no response is undertaken or if conditions deteriorate.
- Minor Emergency—No immediate risk to human health, resources, or infrastructure.

Because of the limited extent of the plume and pressure front, and the uninhabited location of the injection well, all potential emergencies listed below will fall in the Minor Emergency category, posing no risk to human health and safety.

Table 13.1 specifies operating parameters. Should operating parameters be exceeded or violated, Berexco will implement steps 1–4 above, evaluate the circumstances, and determine whether this violation resulted in the injected CO₂ stream and associated pressure front posing a danger to a USDW. If endangerment is determined, Berexco will implement step 5 above.

Table 13.1—Operating range for key injection parameters.

CO ₂ Injection Flow Rate	150 metric tons/day (+/- 5%)
Wellhead Inlet Pressure	< 800 psig
Bottomhole Pressure	< 3,408 psig @ 5,050 ft (90% of fracture gradient of 0.75 psi/ft)
Annulus Pressure at Surface	0 psig
Wellhead CO ₂ Temperature	-10° to +10° F
Bottomhole CO ₂ Temperature	20 - 60° F @ 5,050 ft

13.3.1 Mechanical Integrity Failure

Annulus Pressure Failure

Potential adverse event:	Release of injectate through annulus, potential to impact USDW
Timing of event:	Operational
Avoidance measures:	Well maintenance
Risk level:	Low
Potential response action:	Cease injection, evaluate cause of violation, and mitigate, if necessary. If evaluation shows that violation resulted in potential release

of injectate or fluid to impact the USDW, report per §146.94(b), including notification to the EPA director within 24 hours after the determination is made. Cease operations until the issue is resolved.

Response personnel: Berexco/KGS representative

Discussion: As discussed in Section 10.3.2.4, the annular pressure is to be monitored manually daily for internal mechanical integrity of the well. A sufficient anomalous pressure or fluid-level change in the annulus will require an investigation of the tubing/borehole, and the appropriate corrective action will be implemented. An annulus pressure test will be conducted after remediation to confirm well integrity. Results will be provided to the EPA Region VII director, and permission will be sought to resume injection.

Mechanical Integrity Test Failure

Potential adverse event: Monitoring violation

Timing of event: Operational

Avoidance measures: Well maintenance

Risk level: Low

Potential response action: Evaluate cause of violation and mitigate, if necessary. If evaluation shows that violation resulted in potential release of injectate or fluid to impact the USDW, report per §146.94(b), including notification to the EPA director within 24 hours after the determination is made. Cease operations until the issue is resolved.

Response personnel: Berexco/KGS representative

Discussion: If the annular pressure test fails (internal MIT) or an analysis of the temperature log indicates external MIT failure, appropriate steps

will be taken to address the loss of mechanical or wellbore integrity and determine whether the loss is due to the packer system or the tubing. An annulus pressure test will be conducted along with acquisition of temperature log after remediation to confirm integrity.

13.3.2 Equipment Failure

Damage to Wellhead

Potential adverse event:	Monitoring violation
Timing of event:	Operational
Avoidance measures:	Well maintenance and facility safety measures
Risk level:	Low
Potential response action:	Evaluate cause of violation and mitigate, if necessary. If evaluation shows that violation resulted in potential release of injectate or fluid to impact the USDW, report per §146.94(b), including notification to the EPA director within 24 hours after the determination is made. Cease operations until the issue is resolved.
Response personnel:	Berexco/KGS representative
Discussion:	In the event of damage to wellhead, the nearby area will be isolated, if needed. Safe distance and perimeter will be established using a hand-held air-quality monitor. Steps may be taken to log well to detect CO ₂ movement outside of casing. Appropriate steps will be implemented to repair the damage and a survey will be conducted to ensure wellhead leakage has ceased.

Well Blowout Due to Equipment Failure

Potential adverse event:	Monitoring violation
Timing of event:	Operational
Avoidance measures:	Well maintenance
Risk level:	Low
Potential response action:	Evaluate cause of violation and mitigate, if necessary. If evaluation shows that violation resulted in potential release of injectate or fluid to impact the USDW, report per §146.94(b), including notification to the EPA director within 24 hours after the determination is made. Cease operations until the issue is resolved.
Response personnel:	Berexco/KGS representative
Discussion:	In the event of a well blowout, the well will be “killed” by pumping fluid to stop the well from flowing.

13.3.3 Release to Ground Surface

Seismic Detection of CO₂ Escape

Potential adverse event:	Monitoring violation
Timing of event:	Operational and post-closure
Avoidance measures:	Injection following approved operational parameters
Risk level:	Low
Potential response action:	Evaluate cause of violation and mitigate, if necessary. If evaluation shows that violation resulted in potential release of injectate or fluid to impact the USDW, report per §146.94(b), including notification to the EPA director within 24 hours after the determination is made. Cease operations until the issue is resolved.
Response personnel:	Berexco/KGS representative

Discussion: If any monitoring technique detects escape of anthropogenic CO₂ into formations above the primary confining zone, then appropriate investigative and remediation actions will be immediately deployed. If the release is along the wellbore and above the primary confining zone, then a suite of wireline logs will be used to identify the location of failure in the well, and repairs will be made. If the leakage is farther away, or through the primary confining zone, then a plan will be developed in consultation with the EPA to identify the extent of the problem and to develop remedial measures.

13.3.4 Release to USDW
Water-Quality Changes

Potential adverse event: Detection of anthropogenic CO₂ in groundwater monitoring wells in statistically significant excess over background levels

Timing of event: Operational and post-closure

Avoidance measures: Well maintenance and injection in accordance with approved operational parameters

Risk level: Low

Potential response action: Evaluate cause of violation, including review of equipment and determination of alternative sources or origin of CO₂. If the source is determined to originate from injection fluid, resulting in the potential release of injectate or fluid that could impact the USDW, report per §146.94(b), including notification to the director within 24 hours after the determination is made and cessation of operations until the issue is resolved. With the recent classification of CO₂ as a non-hazardous waste by the EPA, any necessary remedial activity plan will be developed in consultation with the EPA director.

Response personnel:

Berexco/KGS representative

Discussion:

Water quality will be monitored in a network of observation wells in the shallow USDW and the Mississippian reservoir above the primary confining zone. Water samples from these wells will be collected periodically as described in Section 10.4. If the monitoring network shows a statistically significant change in groundwater quality as a result of CO₂ injection, then additional monitoring and remedial activities will be initiated as follows.

If poor-quality water is determined to be a consequence of well failure, then an attempt will be made to identify the source location in the wellbore. This will involve obtaining a suite of wireline logs to pinpoint the source location. On completion of the remedial work, a new set of logs will be acquired in conjunction with a pressure test to validate well integrity.

If the CO₂ migration is determined to be due to confining zone failure or flow along structural features, then a plan will be developed in consultation with the EPA to identify the extent of the problem and to develop remedial measures. This may involve installing additional wells near the affected groundwater well(s) to delineate the extent of contamination, and conducting additional modeling to predict the fate of the CO₂ and/or brine. If CO₂ is found in the USDW, then the modeling will involve predicting the impacts to any surrounding wells and water resources. The shallow monitoring wells may also be used to vent gas that has reached the USDW. Groundwater monitoring would continue during and after the remedial measures to demonstrate that the concentration levels are below minimum tolerance levels.

If CO₂ is detected in the under-pressured Mississippian reservoir, the Mississippian monitoring wells may be used to release any CO₂ that has leaked into the reservoir. A 2-D seismic survey may also be conducted to identify the extent of plume migration.

13.4 Remote Communication and Shutdown System (§146.94 [a,b])

An alarm and shutdown system that will be activated in the event of deviation of essential operating parameters specified in Table 13.1. The gages measuring flow rate at the wellhead, wellhead pressure, bottomhole pressure, surface temperature, and bottomhole temperature will be connected to the PLC, which will be programmed to cease operations and inform the project manager via cellular communication if the operating ranges are exceeded. The PLC will also be programmed to control injection rates to prevent exceeding the maximum bottomhole pressure and flow rates specified in Table 13.1. As indicated in Section 10.5.1.1, the pressure will be recorded continuously every 30 seconds.

The PLC will have a battery backup to supply power for at least 24 hours in the event of primary power failure. If the PLC malfunctions, the system will automatically shut down. Activation of the automatic shutdown system does not in itself constitute an emergency event. If the shut off is triggered by mechanical or electrical malfunctions, without endangering the USDW, then faulty components will be repaired and the system will be restarted.

13.5 Emergency Communications Plan (§146.94 [a,b])

Because the extent of the plume is very small and in a rural area with no potable wells or inhabitants, the consequences of CO₂ detection in the USDW would not pose any immediate endangerment to life and property. Therefore, upon detection of the plume, or an automatic shutdown that is caused by a compliance trigger with the potential to endanger the USDW, the Berexco project manager will cease injection and inform the EPA Region VII program director within 24 hours. The next step would be to identify the causes of the failure and implement any remedial action.

Due to the limited risk of any immediate harm to humans, Berexco does not believe that any emergency management agency or the media needs to be contacted in the event of implementation of an ERRP. However, Berexco is open to expanding the list of those who receive information when the ERRP is activated at the discretion of the EPA.

13.6 Emergency Remedial Response Plan Reevaluation (§146.94 [d])

This ERRP shall be reviewed and revised a) five years after commencement of injection, should the project extend for such a long duration; b) within one year of an area of review re-evaluation; c) after any significant changes to the facility, such as the addition of injection or monitoring wells; and d) whenever required by the director.

If no changes to the ERRP are required after the review, then all documents in support of this determination will be provided to the EPA for approval. If amendments to the ERRP are prepared, the revised ERRP will be submitted to the EPA for review and approval.