EMERGENCY AND REMEDIAL RESPONSE PLAN
40 CFR §146.94(a)

Brown Pelican CO_2 Sequestration Project

1.0 Facility Information

Facility name: Brown Pelican CO_2 Sequestration Project
BRP CCS1, CCS2 and CCS3 Wells

Facility contact: [redacted]

Well location: Penwell, Texas

BRP CCS1	31.76479314	-102.7289311
BRP CCS2	31.76993805	-102.7332448
BRP CCS3	31.76031163	-102.7101566

2.0 Plan Overview

This Emergency and Remedial Response Plan (ERRP) describes actions Oxy Low Carbon Ventures, LLC (OLCV) shall take to address movement of the injection fluid or formation fluid to prevent endangerment of an underground source of drinking water (USDW) during the construction, operation, or post-injection site care periods.

If OLCV obtains evidence that the injected CO_2 stream and/or associated pressure front may cause an endangerment to a USDW, OLCV will perform the following actions:

1. Initiate the shutdown plan for the injection well.
2. Take all steps reasonably necessary to identify and characterize any release.
3. Notify the permitting agency Underground Injection Control (UIC) Program Director of the emergency event within 24 hours.
4. Implement applicable portions of the approved ERRP.

Where the phrase "initiate shutdown plan" is used, the following protocol will be employed: OLCV will immediately cease injection. However, in some circumstances, OLCV in consultation with the UIC Program Director, will determine whether gradual cessation of injection is appropriate (using the parameters set forth in the Summary of Operating Conditions document of the Class VI permit).

3.0 Local Resources and Infrastructure

The USDWs in the vicinity of the Brown Pelican CO_2 Sequestration Project (BRP CCS or Project) that may be affected as a result of an emergency event at the project site include the Pecos Valley major aquifer and the Dockum minor aquifer. The base of the USDW in the Project area of review (AoR) is in the Dockum minor aquifer in the Santa Rosa Formation (depth range: 600 to 1,150 ft below ground level). Drainage of the Pecos Valley and Dockum aquifers from the study area is directed towards the Pecos River (30 miles SW). Figure 1 shows the surface features within the project AoR, which mainly consist of Holocene sand and silt, dunes and dune ridges, caliche, associated alluvium, and other undivided Quaternary deposits.

The Area of Review and Corrective Action Plan document provides further details on the USDWs within the project area.

Infrastructure in the vicinity of the BRP Project that may be affected as a result of an emergency at the project site includes local solar power generation operations on the surface projection of the AoR and the direct air capture (DAC) facility adjacent to the AoR.

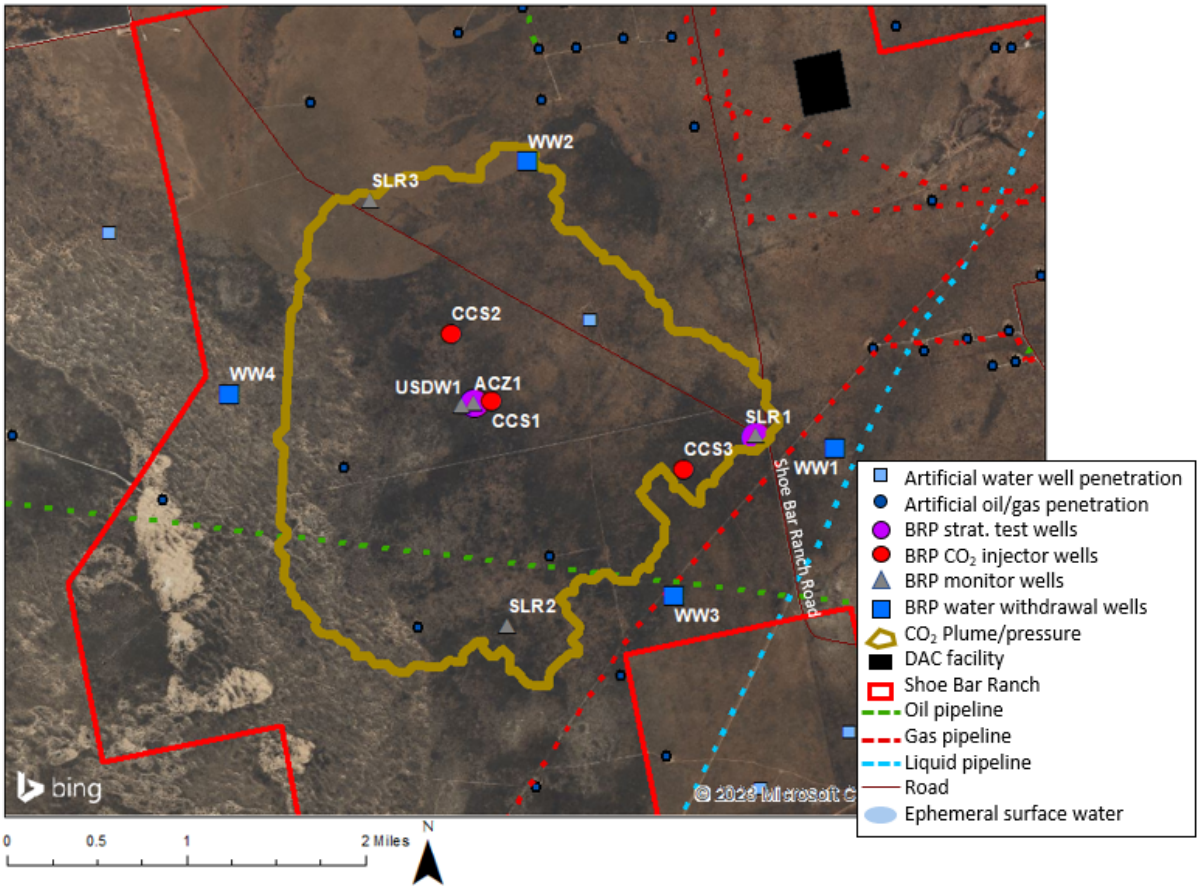

Figure 1—Map of surface features within the area of review.

4.0 Potential Risk Scenarios

The events related to the BRP Project that could potentially result in an emergency response are included in Table 1. This table lists the types of potential adverse incidents that will trigger response actions to protect USDWs if the incidents occur during the construction, injection, or post-injection site care periods. OLCV will undertake emergency or remedial actions in response to these incidents. The worst-case consequences of various scenarios have been developed to ensure that response plans are in place for all eventualities.

Table 1—Potential Emergency Events

Construction / Pre-Injection Period
• Well control event during drilling or completions with loss of containment
Injection Period

• Well integrity failure
  ○ Loss of mechanical well integrity due to tubing or packer leak in injection or monitoring well
  ○ Loss of mechanical well integrity due to casing leak in injection, monitoring, or water withdrawal well
• Potential leakage to USDW
  ○ Vertical migration of CO_2, brines, or applicable production fluid in injection, monitoring, or water withdrawal well
  ○ Vertical migration of CO_2 from the Injection Zone through plugged and abandoned (P&A'd) wells in the storage complex or undocumented wells
  ○ Vertical migration of CO_2 from the Injection Zone through failure of the confining zone, faults, and fractures (loss of containment)
  ○ Lateral migration of CO_2 outside the defined AoR
• Well monitoring equipment failure or malfunction (e.g., shutoff valve or pressure gauge)
• A natural disaster (e.g., earthquake, tornado, hurricane, lightning strike)
• Induced seismic event
• Surface impacts
  ○ External impact to injection, monitoring, or water withdrawal wellhead
  ○ External impact to surface piping or buried pipelines
  ○ Loss of mechanical integrity pipeline on the surface piping or buried pipelines (e.g., internal or external corrosion)
  ○ Incorrect valve position leading to pipeline overpressure
  ○ CO_2 thermal expansion in injection pipeline

Post-Injection Site Care Period

• Well integrity failure
  ○ Loss of mechanical well integrity due to tubing or packer leak in monitoring well
  ○ Loss of mechanical well integrity due to casing leak in monitoring well
• Potential leakage to USDW
  ○ Vertical migration of CO_2, brines, or applicable production fluid in monitoring well
  ○ Vertical migration of CO_2 from the Injection Zone through P&A'd wells in the storage complex or undocumented wells
  ○ Vertical migration of CO_2 from the Injection Zone through failure of the confining zone, faults, and fractures (loss of containment)
  ○ Lateral migration of CO_2 outside the defined AoR
• Natural disaster (e.g., earthquake, tornado, lightning strike, freezing)
• Induced seismic event
• Surface impacts
  ○ External impact to monitoring wellhead

Response actions will depend on the severity of the event(s) triggering an emergency response. "Emergency events" are categorized as shown in Table 2.

Table 2—Risk Severity for Emergency Events

Risk Severity	Definition
Major	Emergency event poses immediate substantial risk to human health, resources, or infrastructure. Emergency actions involving local authorities (evacuation or isolation of areas) should be initiated.
Serious	Emergency event poses potential serious (or significant) near-term risk to human health, resources, or infrastructure if conditions worsen or no response actions are taken.
Minor	Emergency event poses no immediate risk to human health, resources, or infrastructure, no response action required.

5.0 Emergency Identification and Response Actions

Steps to identify and characterize the event will depend on the specific issue identified and the severity of the event. The potential risk scenarios listed in Table 1 are detailed below. OLCV will also submit a report to the Director where applicable under 40 CFR §146.91(c).

5.1 Well Control Event

Loss of containment could occur during drilling and completions operations if the hydrostatic column controlling the well decreases below the formation pressure, allowing fluids to enter the well.

Severity (residual)[1]: Serious

Timing of event: Construction / Pre-Injection

Avoidance measures: Blowout prevention (BOP) equipment, kill fluid, well control training, BOP testing protocol, kick drill, lubricators for wireline operations.

Detection methods: Flow sensor, pressure sensor, tank-level indicator, tripping displacement practices, mud weight control.

Potential response actions:

- Drilling
    - Stop operation.
    - Close BOP.

[1] Residual severity accounts for consequences after implementation of avoidance measures and detection methods.

  - Clear floor and secure area.
  - Execute well control procedure.
  - Evaluate drilling parameters and identify root cause.
  - Resume operations.

- Completion
  - Stop operation.
  - Close BOP.
  - Clear floor and secure area.
  - Execute well control procedure.
  - Resume operations.

Response personnel: Rig crew and downhole (DH) contractors, rig manager, field superintendent, project manager.

5.2 Well Integrity Failure

Integrity loss of the injection well, monitoring well, and/or water withdrawal well may endanger USDWs. Integrity loss may occur during the following scenarios:

- Loss of mechanical integrity due to a tubing or packer leak in the injection well or monitoring well.
- Loss of mechanical integrity due to a casing leak in the injection well, monitoring well or water withdrawal well.

5.2.1 Loss of Mechanical Integrity: Tubing or Packer Leak in Injection Well

Loss of mechanical integrity due to a tubing or packer leak in the injection well could occur due to corrosion, damage in the tubulars during installation, packer leak (undetected), fatigue, or higher load profiles. This loss could cause a communication of the formation fluids within the annulus between the casing and tubing and sustained casing pressure. There is no loss of containment in this scenario and no movement of injection or formation fluids anticipated to endanger USDW.

Severity (residual): Minor

Timing of event: Injection

Avoidance measures: Coated tubing, inhibited packer fluid in the annulus, corrosion monitoring plan, dry CO_2 injected, trim on tubing hanger and tree, corrosion-resistant (CR) tubing tailpipes below packers, CR or Inconel® carrier for the sensors, new casing and tubing installed.

Detection methods: Real-time pressure and temperature gauges at the surface and downhole, electromagnetic casing inspection log, annulus pressure test, CO_2 sensor on the wellhead, distributed temperature sensing (DTS) fiber alongside production casing with real-time monitoring.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- Follow protocol to stop operation, vent, or deviate CO_2.
- Troubleshoot the well.
- If tubing leak is detected, discuss action plan with regulating authority.
- Schedule well service to repair tubing.

Response personnel: Operations engineer, field superintendent, project manager, rig crew and DH contractors.

5.2.2 Loss of Mechanical Integrity: Tubing or Packer Leak in Monitoring Well

Loss of mechanical integrity due to a tubing or packer leak in the monitoring well could occur due to corrosion, damage in the tubulars during installation, packer leak (undetected), fatigue, or higher load profiles. This loss could cause a communication of the formation fluids within the annulus between the casing and tubing and sustained casing pressure. There is no loss of containment in this scenario and no movement of injection or formation fluids anticipated to endanger USDW.

Severity (residual): Minor

Timing of event: Injection and Post-Injection

Avoidance measures: Coated tubing, inhibited packer fluid in the annulus, corrosion monitoring plan, CR tubing tailpipes below the packer, CR or Inconel carrier for the sensors, new casing and tubing installed.

Monitoring wells are designed to be outside the projected plume for the majority of the project operation, reducing the risk of contact with CO_2.

Detection methods: Real-time pressure and temperature gauges at the surface, downhole pressure monitoring, annulus pressure test.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- Troubleshoot the well.
- If tubing leak is detected, discuss action plan with regulating authority.

- Schedule well service to repair tubing.

Response personnel: Operations engineer, field superintendent, project manager, rig crew and DH contractors.

5.2.3 Loss of Mechanical Integrity: Casing Leak in Injection Well

Loss of mechanical integrity due to a casing leak in the injection well could occur due to corrosion, damage to the tubulars during installation, packer leak (undetected), fatigue, or higher load profiles. This loss could cause a migration of CO_2 and brines through the casing, the cement sheath, and into different formations than the injection target or into a USDW.

Severity (residual): Minor

Timing of event: Injection

Avoidance measures: CO_2-resistant cement and metallurgy (casing) across the Injection Zone, injection through tubing and packer, CR or Inconel carrier sensors, inhibited packer fluid in the annulus, cement to surface, corrosion monitoring plan, cement bond log (CBL) after installation, new casing installed.

Detection methods: Real-time pressure and temperature gauges at the surface and downhole, electromagnetic casing inspection log, CO_2 sensor on the wellhead, DTS fiber alongside production casing with real-time monitoring, flow rate monitoring, soil gas probes, neutron-activated logs, USDW water monitoring.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- Follow protocol to stop operation, vent, or deviate CO_2.
- Troubleshoot the well.
- Evaluate if there is movement of CO_2 or brines to USDW.
- If USDW is affected, discuss remediation with regulating authority.
- If casing leak is detected, discuss action plan with regulating authority.
- Schedule well service to repair casing or plug and abandon (P&A) well based on findings of assessment.

Response personnel: Operations engineer, field superintendent, project manager, rig crew and DH contractors, remediation contractors.

5.2.4 Loss of Mechanical Integrity: Casing Leak in Monitoring Well

Loss of mechanical integrity due to a casing leak in the monitoring well could occur due to corrosion, damage in the tubulars during installation, packer leak (undetected), fatigue, or higher load profiles. This loss could cause a migration of CO_2 and brines through the casing, the cement sheath, and into different formations in the injection target or USDW.

Severity (residual): Minor

Timing of event: Injection and Post-Injection

Avoidance measures: CO_2-resistant cement, inhibited packer fluid in the annulus, CR or Inconel carrier sensors, cement to surface, corrosion monitoring plan, CBL after installation, new casing and tubing installed.

Monitoring wells are designed to be outside the projected plume for the majority of the project operation, reducing the risk of contact with CO_2.

Detection methods: Real-time pressure gauges at surface, downhole pressure monitoring, pulsed neutron logs, annulus pressure test.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- Troubleshoot the well.
- Evaluate if there is movement of CO_2 or brines to USDW.
- If USDW is affected, discuss remediation with regulating authority.
- If casing leak is detected, discuss action plan with regulating authority.
- Schedule well service to repair casing or P&A the well based on findings of assessment.

Response personnel: Operations engineer, field superintendent, project manager, rig crew and DH contractors, remediation contractors.

5.2.5 Loss of Mechanical Integrity: Casing Leak in Water Withdrawal Well

Loss of mechanical integrity due to a casing leak in the water withdrawal well could occur due to corrosion, damage in the tubulars during installation, fatigue, or higher load profiles. This loss could cause a migration of brines through the casing, the cement sheath, and into different formations than the injection target or into a USDW.

While a water withdrawal well is down for repairs, it is unable to pull water from the reservoir to decrease pressure across the formation to allow for CO_2 injection. It is possible this would increase pressure in the formation from excess water and increase the area of review. However, multiple water withdrawal wells are included in the design of the Brown Pelican CO_2 Sequestration Project,

so the loss of one water withdrawal well would not cause significant project concerns. Multiple water wells would need to be down for pressure to increase in the formation.

Severity (residual): Minor

Timing of event: Injection

Avoidance measures: CO_2-resistant cement and metallurgy (casing) across producing zones, CO_2-resistant electrical submersible pump (ESP) equipment, cement to surface, corrosion monitoring plan, CBL after installation, new casing and tubing installed.

Detection methods: Real-time pressure and temperature gauges at the surface and downhole, electromagnetic casing inspection log, flow rate monitoring.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- Follow protocol to stop water production.
- Troubleshoot the well.
- Evaluate if there is movement of CO_2 or brines to USDW.
- If USDW is affected, discuss remediation with regulating authority.
- If casing leak is detected, discuss action plan with regulating authority.
- Schedule well service to repair casing or P&A the well based on findings of assessment.

Response personnel: Operations engineer, field superintendent, project manager, rig crew and DH contractors, remediation contractors.

5.3 Potential Brine or CO_2 Leakage to USDW

Potential brine or CO_2 leakage to the USDW from the injection well, monitoring well, or water withdrawal well may endanger USDWs. Integrity loss may occur during the following scenarios:

- Vertical migration of CO_2 or brine between formations through the injection well, a monitoring well, or a water withdrawal well.
- Vertical migration of CO_2 or brine between formations through legacy or P&A'd wells.
- Vertical migration of CO_2 or brine between formations due to failure of the confining rock, faults, or fractures.
- Lateral migration or CO_2 outside the defined AoR.

5.3.1 Vertical Migration of Brine or CO_2 to USDW: Injection Well

Vertical migration of brine or CO_2 during injection could occur if there are induced stresses or a chemical reaction on the tubulars or cement of the injection well exposed to the CO_2 pressure or plume.

Severity (residual): Minor

Timing of event: Injection

Avoidance measures: CO_2-resistent cement and metallurgy (casing) across the Injection Zone, injection through tubing and packer, cement to surface, CBL after installation, USDW covered as section barrier with surface casing and surface cement sheath, new casing installed, corrosion monitoring plan.

Detection methods: CO_2 sensors on the wellhead, DTS fiber alongside production casing with real-time monitoring, soil gas probes, USDW water monitoring, pulsed neutron logs to be run to determine external mechanical integrity (MI), pressure gauges at the surface, flow rate monitoring, downhole pressure monitoring.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- Follow protocol to stop operation, vent, or deviate CO_2.
- Troubleshoot the well.
- Evaluate if there is movement of CO_2 or brines to USDW.
- Discuss remediation options, action plan, and monitoring plan with regulating authority, if necessary.
- Discuss plan to repair the well with the regulating authority or P&A the well based on findings of assessment.

Response personnel: Operations engineer, field superintendent, project manager, rig crew and DH contractors, remediation contractors.

5.3.2 Vertical Migration of Brine or CO_2 to USDW: Monitoring Well

Vertical migration of brine or CO_2 during or after injection could occur if there are induced stresses or a chemical reaction on the tubulars or cement of the monitoring well exposed to the CO_2 pressure or plume.

Severity (residual): Minor

Timing of event: Injection and Post-Injection

Avoidance measures: CO_2-resistent cement across Injection Zone, CO_2-resistent metallurgy (casing) in select monitoring wells, cement to surface, CBL after installation, USDW covered as section barrier with surface casing and surface cement sheath, new casing installed, corrosion monitoring plan.

Detection methods: USDW water monitoring, pulsed neutron logs to be run for external MI, pressure gauges at surface, downhole pressure monitoring.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- Troubleshoot the well.
- Evaluate if there is movement of CO_2 or brines to USDW.
- Discuss remediation options, action plan, and monitoring plan with regulating authority, if necessary.
- Discuss plan to repair or P&A the well with the regulating authority.

Response personnel: Operations engineer, field superintendent, project manager, rig crew and DH contractors, remediation contractors.

5.3.3 Vertical Migration of Brine or CO_2 to USDW: Water Withdrawal Well

Vertical migration of brine or CO_2 during injection could occur if there are induced stresses or a chemical reaction on the tubulars or the cement of the water withdrawal well exposed to the CO_2 pressure or plume.

Severity (residual): Minor

Timing of event: Injection

Avoidance measures: CO_2-resistent cement and metallurgy (casing) across producing zone, CO_2-resistent ESP equipment, cement to surface, CBL after installation, USDW covered as section barrier with surface casing and surface cement sheath, new casing installed, corrosion monitoring plan.

Detection methods: Real-time pressure and temperature gauges on surface and downhole, USDW water monitoring, electromagnetic casing inspection log, flowrate monitoring.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- Follow protocol to stop water production.
- Troubleshoot the well.
- Evaluate if there is movement of CO_2 or brines to USDW.

- Discuss remediation options, action plan, and monitoring plan with regulating authority, if necessary.
- Discuss plan to repair or P&A the well with the regulating authority.

Response personnel: Operations engineer, field superintendent, project manager, rig crew and DH contractors, remediation contractors.

5.3.4 Vertical Migration of Brine or CO_2 to USDW: Legacy and P&A'd Wells

Vertical migration of brine or CO_2 during injection or post-injection could occur if there is poor cement bonding, cement degradation, or cracking in the legacy or P&A'd wells exposed to the CO_2 pressure or plume.

Severity (residual): Minor

Timing of event: Injection and Post-Injection

Avoidance measures: Legacy wells to be properly plugged and abandoned for brine movement and CO_2 plume according to the corrective action plan, injectors will be abandoned as soon as CO_2 injection in the project ends, unless they are left as monitoring wells.

Detection methods: Soil gas probes, monitoring of USDW, monitoring of injector wells that could indicate a broken seal and be causing CO_2 migration.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- Evaluate if there is movement of CO_2 or brines to USDW due to a leak in a legacy or P&A'd well.
- Discuss remediation options, action plan, and monitoring plan with regulating authority, if necessary.
- Discuss plan to repair the well and specific remediation actions with the regulating authority.

Response personnel: Operations engineer, field superintendent, project manager, rig crew and DH contractors, remediation contractors.

5.3.5 Vertical Migration of Brine or CO_2 to USDW: Failure of Confining Rock, Faults, or Fractures

Vertical migration of brine or CO_2 during injection could occur if the pressure of the Injection Zone exceeds the sealing capacity of the caprock or seal above or if fault or fracture features are reactivated. Brine or CO_2 could leak to a shallower formation, including a USDW.

Severity (residual): Minor

Timing of event: Injection and Post-Injection

Avoidance measures: Seismic survey in the area shows no faults in the sequestration zone, injection is limited to 90% of the fracture gradient, characterization of the rocks show good sealing capacity.

Detection methods: USDW water sampling, time-lapse seismic survey, pulsed neutron logs in injection and monitoring wells, soil gas monitoring, surface pressure monitoring.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- Follow protocol to stop CO_2 injection and/or water production.
- Assess root cause by reviewing monitoring data.
- If required, conduct geophysical survey to delineate potential leak path.
- Evaluate if there is movement of CO_2 or brines to USDW due to a failure of confining rock, faults, or fractures.
- Discuss remediation options, action plan, and monitoring plan with regulating authority, if necessary.
- Take actions to restore injection depending on nature of the leak path and the extent.

Response personnel: Monitoring staff, geologist, reservoir engineer, project manager, remediation contractors.

5.3.6 Lateral Migration of CO_2 to Outside the Defined AoR

Lateral migration of CO_2 outside the defined AoR could occur during or after injection if the plume moves faster or in an unexpected pattern and expands beyond the secure pore space and AoR for the project.

Severity (residual): Minor

Timing of event: Injection and Post-Injection

Avoidance measures: Detailed geologic model with nearby well logging as a calibration, seismic survey integrated in the model, characterization of the rocks and formation, AoR review and calibration at least every five years, monitoring of the plume until stabilization.

Detection methods: Time-lapse seismic survey, pulsed neutron logs in monitoring wells, real-time pressure and temperature gauges in monitoring wells.

Potential response actions:

- During Injection:

  - Trigger alarm by the monitoring system or monitoring personnel.
  - Review monitoring data and trends compared with simulation.
  - Discuss findings with regulating authority; request to maintain injection during AoR evaluation if data show that CO_2 will stay in secured pore space.
  - Perform logging in monitoring wells.
  - Conduct geophysical survey as required to evaluate AoR.
  - Recalibrate model and simulate new AoR.
  - Assess if additional corrective actions are needed and if additional pore space is needed.
  - Assess if remediation is needed; prepare action plan and review with regulating authority.
  - Present AoR review to regulating authority for approval; adjust monitoring plan.

- Post-Injection:
  - Trigger alarm by the monitoring system, or monitoring personnel.
  - Review monitoring data and trends compared with simulation.
  - Discuss findings with regulating authority.
  - Conduct geophysical survey as required to evaluate AoR.
  - Recalibrate model and simulate new AoR.
  - Assess if additional corrective actions are needed and if additional pore space is needed.
  - Assess if remediation is needed; prepare action plan and review with regulating authority.
  - Present AoR review to regulating authority for approval; adjust monitoring plan.

Response personnel: Monitoring staff, geologist, reservoir engineer, project manager.

5.4 Monitoring Equipment Failure

The failure of monitoring equipment for wellhead pressure, temperature, and/or annulus pressure may indicate a problem with the injection well that could endanger USDWs.

Severity (residual): Minor

Timing of event: Injection

Avoidance measures: Preventative maintenance program, periodic inspections.

Detection methods: Real-time monitoring systems redundancy, field inspections.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- Follow protocol to stop operation, vent, or deviate CO_2, if needed.
- If there is an injury or property damage, contact field superintendent and activate emergency evacuation to secure the location.
- Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR §146.91(c).
- Determine the severity of the event, based on the information available, within 24 hours of notification.
- Assess mechanical integrity of the system and propose repair actions, if necessary.
- Assess potential environmental impact and discuss remedial action with regulating authority.
- If assessment allows, discuss plan with the regulating authority to safely resume injection.
- Repair or replace instrumentation; calibrate equipment.
- Review monitoring records and, if needed, perform a falloff test to evaluate the reservoir.

Response personnel: Operations engineer, field superintendent, project manager, remediation contractors, emergency teams, geologist, reservoir engineer, monitoring staff, rig crew and DH contractors.

5.5 Natural Disaster

Well problems (integrity loss, leakage, or malfunction) may arise as a result of a natural disaster affecting the normal operation of the injection well. A major seismic event may disturb surface and/or subsurface facilities; weather-related disasters (e.g., tornado, lightning strike, or freezing) may affect surface facilities.

Severity (residual): Depending on severity of event, potentially serious

Timing of event: Injection and Post-Injection

Avoidance measures: Seismic survey of the storage complex shows no faults that could be activated in the Injection Zone, shutdown devices present on wellhead and piping to shutoff CO_2 and water production.

Detection methods: Seismometers on the surface to monitor induced seismicity will detect naturally occurring major seismic event.

Potential response actions:

- Major Seismic Event
    - For event with local magnitude level (ML) from 2.0 but below 3.5 within 5.6 miles of injection well:
        - Monitor seismic activity.
        - If needed, pause operations or make adjustments to operations at a reduced rate.
    - For event with ML from 3.5 to 4.5 within 5.6 miles of injection well:
        - Initiate contact with regulating authority regarding seismic event.
        - If needed, pause operations or make adjustments to operations at a reduced rate.
        - Review regional information and monitoring records to determine origin of the event.
        - If event is induced, re-evaluate model, define new injection parameters, and discuss with regulating authority.
        - If assessment allows for resuming injection safely, increase surveillance to validate effectiveness of actions.
    - For event above ML 4.5 within 5.6 miles of injection well:
        - Trigger alarm by the monitoring system or monitoring personnel.
        - If there are injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure the location.
        - Follow protocol to stop injection.
        - Assess mechanical integrity of the system; propose repair actions based on findings.
        - Assess environmental impact; discuss remedial action with regulating authority, if necessary.
        - Review regional information and monitoring records to determine origin of the event.
        - If event is induced, re-evaluate model, define new injection parameters, and discuss with regulating authority.
        - If assessment allows for resuming injection safely, increase surveillance to validate effectiveness of actions.

- Weather Disaster
    - Trigger alarm by the monitoring system or monitoring personnel.
    - If there are injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure the location.
    - Follow protocol to stop CO_2 injection and/or water production.
    - Assess mechanical integrity of the system; propose repair actions based on findings.
    - Assess potential environmental impact and discuss remedial action with regulating authority.
    - If assessment allows for resuming injection and/or production safely, increase surveillance to validate effectiveness of actions.

Response personnel: Operations engineer, field superintendent, project manager, geologist, reservoir engineer, monitoring staff, remediation contractors, emergency teams.

5.6 Induced Seismic Event

Based on the project operating conditions, it is highly unlikely that injection operations would ever induce a seismic event outside a 5.6-mile radius from the wellhead. Therefore, this portion of the response plan is developed for any seismic event with an epicenter within a 5.6-mile radius of the injection well. A geophone array on surface will be used to monitor the area for seismicity.

Severity (residual): Depending on severity of event; potentially serious

Timing of event: Injection and Post-Injection

Avoidance measures: Seismic survey of the storage complex shows no faults that could be reactivated, detailed geomechanical model created to evaluate whether the storage complex and region is seismically stable.

Detection methods: Geophone array on surface.

Potential response actions:

- For event with ML from 2.0 to 3.5 within 5.6 miles of injection well:
    - Monitor seismic activity.
    - If needed, pause operations or make adjustments to operations at a reduced rate.
- For event with ML from 3.5 to 4.5 within 5.6 miles of injection well:
    - Initiate contact with regulating authority regarding seismic event.
    - If needed, pause operations or make adjustments to operations at a reduced rate.

  - Review regional information and monitoring records to determine origin of the event.
  - If event is induced, re-evaluate model, define new injection parameters, and discuss with regulating authority.
  - If assessment allows for resuming injection safely, increase surveillance to validate effectiveness of actions.

- For event above ML 4.5 within 5.6 miles of injection well:
  - Trigger alarm by the monitoring system or monitoring personnel.
  - If there are injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure the location.
  - Follow protocol to stop injection.
  - Assess mechanical integrity of the system; propose repair actions based on findings.
  - Assess environmental impact; discuss remedial action with regulating authority, if necessary.
  - Review regional information and monitoring records to determine origin of the event.
  - If event is induced, re-evaluate the model, define new injection parameters, and discuss with regulating authority.
  - If assessment allows for resuming injection safely, increase surveillance to validate effectiveness of actions.

Response personnel: Operations engineer, field superintendent, project manager, geologist, reservoir engineer, monitoring staff, remediation contractors, emergency teams.

5.7 Surface Impacts

Surface impact may cause loss of containment during the follow scenarios:

- External impact to the injection wellhead.
- External impact to the monitoring wellhead.
- External impact to the water withdrawal wellhead.
- External impact to the surface piping or buried pipelines.
- Loss of mechanical integrity due to internal or external corrosion on the surface piping or buried pipelines.
- Incorrect valve position leading to pipeline overpressure.

- CO_2 thermal expansion in the injection surface piping or buried pipelines.

5.7.1 Loss of Containment: External Impact to Injection Wellhead

External impact to the injection wellhead due to heavy trucks or equipment could cause loss of containment of brine or CO_2 if the wellhead is disconnected from the well pipe or the surface pipeline. No movement of injection or formation fluids is anticipated to endanger USDW.

Severity (residual): Serious

Timing of event: Injection

Avoidance measures: Fenced location and bollards installed, signage.

Detection methods: Real-time pressure and temperature at the wellhead and surface facilities, field inspections, optical gas imaging (OGI) cameras.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- Automated shutdown will initiate; follow protocol to shut down CO_2 delivery if the automated shutdown devices are not functional.
- If there are injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure the location.
- Contact the field superintendent or asset manager to activate emergency plan and uncontrolled release protocol.
- Clear the location and secure the perimeter.
- Contact well control special team to execute uncontrolled release protocol that may include capping the well, drilling a relief well to kill the injector, repairing the well, or abandoning the well; discuss plan with regulating authority.
- Evaluate environmental impact to soil, water, vegetation; present remediation plan to regulating authority.
- Execute remediation and install monitoring system as needed.

Response personnel: Operations engineer, field superintendent, project manager, rig crew and DH contractors, remediation contractors, well control specialist.

5.7.2 Loss of Containment: External Impact to Monitoring Wellhead

External impact to the monitoring wellhead due to heavy trucks or equipment could cause loss of containment of brine if the wellhead is disconnected from the well pipe. No movement of injection or formation fluids is anticipated to endanger USDW.

Severity (residual): Minor

Timing of event: Injection and Post-Injection

Avoidance measures: Fenced location and bollards installed, signage, reduced pressure in the monitoring well compared with the injection well.

Detection methods: Real-time pressure at the wellhead, field inspections.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- If there are injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure the location.
- Contact the field superintendent or asset manager to activate emergency plan and uncontrolled release protocol.
- Clear the location and secure the perimeter. If possible, install containment devices or equipment to direct fluid away from possible sensitive areas around the location.
- Contact well control special team to execute uncontrolled release protocol that may include capping the well, drilling a relief well, repairing the well, or abandoning the well; discuss plan with regulating authority.
- Evaluate environmental impact to soil, water, and vegetation; present remediation plan to regulating authority.
- Execute remediation and install monitoring system as needed.

Response personnel: Operations engineer, field superintendent, project manager, rig crew and DH contractors, remediation contractors, well control specialist.

5.7.3 Loss of Containment: External Impact to Water Withdrawal Wellhead

External impact to the water withdrawal wellhead due to heavy trucks or equipment could cause loss of containment of brine if the wellhead is disconnected from the well pipe or the surface pipeline. No movement of injection or formation fluids is anticipated to endanger USDW.

Severity (residual): Minor

Timing of event: Injection

Avoidance measures: Fenced location and bollards installed, signage.

Detection methods: Real-time pressure and temperature monitoring at surface and downhole, field inspections.

Potential response actions:

- Trigger alarm by the monitoring system or monitoring personnel.
- Automated shutdown will initiate; follow protocol to shut down water withdrawal if the automated shutdown devices are not functional.
- If there are injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure the location.
- Contact the field superintendent or asset manager to activate the emergency plan and uncontrolled release protocol.
- Clear the location and secure the perimeter. If possible, install containment devices or equipment to direct fluid away from possible sensitive areas around the location.
- Contact well control special team to execute uncontrolled release protocol that may include capping the well, drilling a relief well, repairing the well, or abandoning the well; discuss plan with regulating authority.
- Evaluate environmental impact to soil, water, and vegetation; present remediation plan to regulating authority.
- Execute remediation and install monitoring system as needed.

Response personnel: Operations engineer, field superintendent, project manager, rig crew and DH contractors, remediation contractors, well control specialist.

5.7.4 Loss of Containment: External Impact to Surface Piping or Buried Pipeline

External impact to the surface piping or buried pipeline due to heavy trucks or equipment could cause loss of containment of brine or CO_2 if the pipe ruptures. No movement of injection or formation fluids is anticipated to endanger USDW.

Severity (residual): Serious

Timing of event: Injection

Avoidance measures: Fenced location and bollards installed to protect surface piping, field pipeline is buried, pipeline right-of-way is identified with signage, One Call 811 program.

Detection methods: Real-time pressure, temperature, and flow measurement; field inspections.

Potential response actions:

- Trigger alarm by the system or operations staff.
- Automated shutdown will initiate; follow protocol to shut down CO_2 delivery or water withdrawal if the automated shutdown devices are not functional.
- If there are injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure the location.

- Clear the location and secure the perimeter. If possible, for water withdrawal pipelines, install containment devices or equipment to direct fluid away from possible sensitive areas around the location.
- Assess mechanical integrity of the system and propose repair actions based on the findings.
- Evaluate environmental impact to soil, water, vegetation; present remediation plan to the regulating authority.
- Execute remediation and install monitoring system as needed.

Response personnel: Operations engineer, field superintendent, project manager, remediation contractors, plant manager, HSE representatives.

5.7.5 Loss of Mechanical Integrity: Internal or External Corrosion on the Surface Piping or Buried Pipeline

Loss of mechanical integrity due to internal or external corrosion in the injection pipeline or water withdrawal pipeline could cause loss of containment of brine or CO_2 if a leak develops. No movement of injection or formation fluids anticipated to endanger USDW.

Severity (residual): Serious

Timing of event: Injection

Avoidance measures: Application of asset integrity / mechanical integrity (AI/MI) program, use of lined pipe, as appropriate.

Detection methods: Real-time pressure, temperature, and flow measurement, field inspections.

Potential response actions:

- Trigger alarm by the system or operations staff.
- Automated shutdown will initiate; follow protocol to shut down CO_2 delivery or water withdrawal if the automated shutdown devices are not functional.
- If there are injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure the location.
- Clear the location and secure the perimeter. If possible, for water withdrawal pipelines, install containment devices or equipment to direct fluid away from possible sensitive areas around the location.
- Assess mechanical integrity of the system and propose repair actions based on the findings.
- Evaluate environmental impact to soil, water, vegetation; present remediation plan to regulating authority.
- Execute remediation and install monitoring system as needed.

Response personnel: Operations engineer, field superintendent, project manager, remediation contractors, plant manager, HSE representatives.

5.7.6 Loss of Containment: Incorrect Valve Position on the Surface Piping or Buried Pipeline

An incorrect valve position within the injection or production piping network could lead to high pressure within the piping and possible loss of containment of brine or CO_2 if the pipe ruptures. No movement of injection or formation fluids anticipated to endanger USDW.

Severity (residual): Serious

Timing of event: Injection

Avoidance measures: Relief valve located on pipeline at CO_2 injection wellhead, pipeline pressure rating exceeds max compressor or pump discharge pressure.

Detection methods: Real-time pressure monitoring with automatic shutdown, pressure monitoring in control room with operator response.

Potential response actions:

- Trigger alarm by the system or operations staff.
- Automated shutdown will initiate; follow protocol to shut down CO_2 delivery or water withdrawal if the automated shutdown devices are not functional.
- If there are injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure the location.
- Clear the location and secure the perimeter. If possible, for water withdrawal pipelines, install containment devices or equipment to direct fluid away from possible sensitive areas around the location.
- Assess the mechanical integrity of the system and propose repair actions based on the findings.
- Evaluate environmental impact to soil, water, and vegetation; present remediation plan to regulating authority.
- Execute remediation and install monitoring system as needed.

Response personnel: Operations engineer, field superintendent, project manager, remediation contractors, plant manager, HSE representatives

5.7.7 Loss of Containment: CO_2 Thermal Expansion in the Injection Surface Piping or Buried Pipeline

High-pressure CO_2 has the potential for thermal expansion when exposed to high temperatures and could lead to loss of containment of CO_2 if the pipe ruptures. No movement of injection or formation fluids anticipated to endanger USDW.

Severity (residual): Serious

Timing of event: Injection

Avoidance measures: Relief valve located on the pipeline at the CO_2 injection wellhead, thermal relief valve, pipeline pressure rating exceeds maximum compressor discharge pressure.

Detection methods: Real-time pressure monitoring with automatic shutdown, pressure monitoring in control room with operator response.

Potential response actions:

- Trigger alarm by the system or operations staff.
- Automated shutdown will initiate; follow protocol to shut down CO_2 delivery if the automated shutdown devices are not functional.
- If there are injured personnel or property damage, contact the field superintendent to activate emergency evacuation and secure the location.
- Clear the location and secure the perimeter.
- Assess mechanical integrity of the system and propose repair actions based on the findings.
- Evaluate environmental impact to soil, water, and vegetation; present remediation plan to the regulating authority.
- Execute remediation and install monitoring system as needed.

Response personnel: Operations engineer, field superintendent, project manager, remediation contractors, plant manager, HSE representatives.

6.0 Response Personnel and Equipment

Site personnel, project personnel, and local authorities will be relied upon to implement the ERRP.

Monitoring, control, and routine maintenance of the injection operations will be the responsibility of the Injection Operations Staff. Site personnel are expected to include, at a minimum, the positions listed below in Table 3.

If an adverse event is discovered, the Operations Manager and Emergency Coordinator on duty will be notified immediately. The Emergency Coordinator will be responsible for notifying offsite emergency agencies and resources. The Operations Manager will contact outside emergency

response organizations if the Emergency Coordinator is not available. The EPA Region 6 UIC Program Director will also be notified within 24 hours.

Table 3–Operations Staff Descriptions

Position	Function	Qualifications
Emergency Coordinator	Responsible for notification of offsite support agencies in accordance with written procedures. Responsible for coordination and overseeing contact with the media.	Trained in the Communications Plan and Emergency Notification Procedures requirements as contained in the ERRP.
Operations Manager	Serves as the Emergency Response Manager responsible for the overall management of the Incident Response Team. Manages facility operations and personnel during an emergency and is responsible for implementation of appropriate emergency procedures and their follow-up activities.	Trained in the requirements of the ERRP and facility operations.
Project Manager	Serves as the Emergency Response Coordinator responsible for the overall communication between Incident Response Team members. Directs facility operations during an emergency and is responsible for communication between on-site personnel and professional services. Implements emergency procedures and ensures documentation of follow-up activities.	Trained in the requirements of the ERRP and facility operations.
Reservoir Engineer	Responsible for injection operation and monitoring. Lead incident response manager regarding injection and storage zone operation at the facility.	Undergraduate degree in engineering, related to chemical or reservoir engineering.
Geologist/ Geophysicist	Professional serving to assist in operation, maintenance, and monitoring of the injection process. Conducts routine data management and interpretation. Assists in implementing response actions regarding Injection Zone integrity.	Undergraduate degree in geophysics or geology with specialization in hydrology/fluid mechanics.
Operations Engineer	Oversees mechanical and fluid management operation of the injection wells, annulus pressure control system, and wellhead piping systems. Maintains and repairs injection-related equipment, including valves, instruments, and piping. Assists in mechanical and electronic control of the injection process.	Undergraduate degree in engineering related to mechanical, chemical, or process control.

A site-specific emergency contact list will be developed and maintained during the life of the project. OLCV will provide the current site-specific emergency contact list to the UIC Program Director.

A list of contacts for state agencies having jurisdiction within the AoR and key local emergency agencies is presented below in Table 4.

There are no federally recognized Native American Tribes located within the AoR. If a federally recognized Native American Tribe were to exist in the AoR at the time of a site emergency, then that tribe(s) will be notified of the site emergency at that time.

Table 4–Contact Information for Key Local, State, and Other Authorities

Agency	Location	Phone
West Odessa Fire Department	West Odessa, TX	911 or 432-381-3033
Odessa Fire Rescue	Odessa, TX	911 or 432-257-0502
Odessa Police Department	Odessa, TX	911 or 432-333-3641
Odessa Regional Hospital	Odessa, TX	432-334-8000
Odessa Medical Center	Odessa, TX	432-640-4000
Highway Police	Odessa, TX	432-332-6100
Ector County Sheriff	Odessa, TX	432-335-3050
Texas Division of Emergency Management	Austin, TX	512-424-2208
Ector County Office of Emergency Management	Odessa, TX	432-257-0502
US EPA Region 6	Dallas, TX	214-665-2294

Equipment needed in the event of an emergency and remedial response will vary, depending on the triggering emergency event. Response actions (cessation of injection, well shut-in, and evacuation) will generally not require specialized equipment to implement. Where specialized equipment (such as a drilling rig or logging equipment) is required, OLCV shall be responsible for its procurement.

7.0 Emergency Communications Plan

OLCV will communicate to the public about any event that requires an emergency response to ensure that the public understands what happened and whether there are any environmental or safety implications. The amount of information, timing, and communications method(s) will be appropriate to the event, its severity, whether any impacts to drinking water or other environmental resources occurred, any impacts to the surrounding community, and their awareness of the event.

OLCV will describe what happened, impacts to the environment or other local resources, how the event was investigated, what response actions were taken, and the status of the response. For

responses that occur over the long term (e.g., ongoing cleanups), OLCV will provide periodic updates on the progress of the response action(s).

OLCV will communicate with entities who need to be informed about or take action in response to the event, including local water systems, CO_2 source(s), pipeline operators, landowners, and regional response teams (as part of the National Response Team).

If a seismic event occurs, OLCV will provide information about whether the event was naturally occurring or induced by the injection, whether any damage to the well or other structures in the area occurred, the investigative process, and what responses, if any, were taken by OLCV or others.

8.0 Plan Review

This ERRP shall be reviewed:

- At least once every five (5) years following its approval by the permitting agency;
- Within one (1) year of an area of review (AOR) re-evaluation;
- Within a prescribed period (to be determined by the permitting agency) following any significant changes to the injection process or the injection facility, or an emergency event; or
- As required by the permitting agency.

If the review indicates that no amendments to the ERRP are necessary, OLCV will provide the permitting agency with the documentation supporting the "no amendment necessary" determination.

If the review indicates that amendments to the ERRP are necessary, amendments shall be made and submitted to the permitting agency within six months following an event that initiates the ERRP review procedure.

9.0 Staff Training and Exercise Procedures

All operations employees will receive training related to health and safety, operational procedures, and emergency response according to the roles and responsibilities of their work assignments. Initial training will be conducted by, or under the supervision of, the operations manager or a designated representative. Trainers will be thoroughly familiar with the Operations Plan and ERRP.

Facility personnel will participate in annual training that teaches them to perform their duties in ways that prevent CO_2 discharge. The training will include familiarization with operating procedures and equipment configurations appropriate to the job assignment as well as emergency response procedures, equipment, and instrumentation. New personnel will be instructed before beginning their work.

Refresher training will be conducted at least annually for all operations personnel. Monthly briefings will be provided to operations personnel according to their respective responsibilities and will highlight recent operating incidents, actual experience in operating equipment, and recent storage reservoir monitoring information.

Only personnel who have been properly trained will participate in drilling, construction, operations, and equipment repair at the storage site. A record including the person's name, date of training, and instructor's signature will be maintained.