

Plan revision number: 0
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**EMERGENCY AND REMEDIAL RESPONSE PLAN
40 CFR 146.94(a)**

**Lorain Carbon Zero Solutions
Class VI Permit Application**

This plan is provided to meet the requirements of 40 CFR 146.94(a) for action to be taken, and to be prepared to take, if unanticipated fluid movement or any other emergency events occur. A plan to prevent unexpected carbon dioxide (CO₂) movement was completed during the risk analysis and planning phase of the project.

Facility Information

Facility name: Lorain County Landfill
Well No. CCS #1

Facility contact: Gary McCuiston/Division VP Business Development
Lorain County Landfill
43502 Oberlin-Elyria Road
Oberlin, Ohio 44074
832-399-4516/GMcCuiston@republicservices.com

Well location: Oberlin, Ohio

Well No. CCS #1 Location (US STP NAD27 Ohio North)		
Location	Easting (X)	Northing (Y)
Surface	2087845	595505.8
Heel	2088075	595833.5
Toe	2090333	599058.5

This Emergency and Remedial Response Plan (ERRP) describes actions that the owner (Lorain Carbon Zero Solutions, LLC) shall take to address movement of the injection fluid or formation fluid in a manner that may endanger an underground source of drinking water (USDW) during the construction, operation, or post-injection site care periods.

If Lorain Carbon Zero Solutions, LLC obtains evidence that the injected CO₂ stream and/or associated pressure front may cause an endangerment to a USDW, Lorain Carbon Zero Solutions, LLC must perform the following actions:

1. Initiate shutdown plan for the injection well.
2. Take all steps reasonably necessary to identify and characterize any release.

3. Notify the permitting agency (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: Lorain Carbon Zero Solutions, LLC will immediately cease injection. However, in some circumstances, Lorain Carbon Zero Solutions, LLC will, in consultation with the UIC Program Director, determine whether gradual cessation of injection (using the parameters set forth in Attachment A of the Class VI permit) is appropriate.

Local Resources and Infrastructure

Resources in the vicinity of the Lorain Carbon Zero Solutions, LLC Lorain County Landfill that may be affected as a result of an emergency event at the project site include:

Underground sources of drinking water (USDWs); potable water wells; the creek that runs alongside the facility, and potentially Lake Erie which is 10 miles north of the facility.

Infrastructure in the vicinity of the Lorain Carbon Zero Solutions, LLC Lorain County Landfill that that may be affected as a result of an emergency at the project site include:

The wellhead, Lorain Carbon Zero Solutions, LLC facilities, and local farms.

Resources and infrastructure addressed in this plan are shown in Figure 1 which is a map of the local area surrounding the Lorain Carbon Zero Solutions, LLC Lorain County Landfill.



Figure 1. Map of the site resources and infrastructure.

Potential Risk Scenarios

The following events related to the Lorain Carbon Zero Solutions, LLC Lorain County Landfill that could potentially result in an emergency response:

- Injection or monitoring (verification) well integrity failure;
- Injection well monitoring equipment failure (e.g., shut-off valve or pressure gauge, etc.);
- A natural disaster (e.g., earthquake, tornado, lightning strike);
- Fluid (e.g. brine) leakage to a USDW;
- CO₂ leakage to USDW or land surface; or

- Induced seismic event.

Response actions will depend on the severity of the event(s) triggering an emergency response. “Emergency events” are categorized as shown in Table 1.

Table 1. Degrees of risk for emergency events.

Emergency Condition	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 taken.
Minor emergency	Event poses no immediate risk to human health, resources, or infrastructure.

In the event of an emergency requiring cessation of injection, CO2 slated for injection may be released to the atmosphere.

Emergency Identification and Response Actions

Steps to identify and characterize the event will be dependent on the specific issue identified, and the severity of the event. The potential risk scenarios identified in Part 2 are detailed below.

In the event of an emergency requiring outside assistance, the lead project contact shall call Lorain Carbon Zero Solutions, LLC Security Dispatch at (###)###-#### and ##### at (###)###-####

Well Integrity Failure

Integrity loss of the injection well and/or verification well may endanger USDWs. Integrity loss may have occurred if the following events occur:

- Automatic shutdown devices are activated:
 - Wellhead pressure exceeds the specified shutdown pressure specified in the permit.
 - Annulus pressure indicates a loss of external or internal well containment.
 - Pursuant to 40 CFR 146.91(c)(3), Lorain Carbon Zero Solutions, LLC must notify the UIC Program Director within 24 hours of any triggering of a shut-off system (i.e., down-hole or at the service).
- Mechanical integrity test results identify a loss of mechanical integrity.

Response actions:

- Immediately notify the Lorain Carbon Zero Solutions, LLC Lorain County Landfill manager.

- Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c).
- The landfill manager or competent senior leader will make an initial assessment of the situation to determine which other Lorain Carbon Zero Solutions, LLC personnel to notify.
- Project leadership will determine the severity of the event, based on the information available, within 24 hours of notification.
- For a Major or Serious emergency:
 - Initiate shutdown plan.
 - Shut in well (close flow valve)
 - Vent CO₂ from surface facilities
 - Limit access to wellhead to authorized personnel only
 - Communicate with Lorain Carbon Zero Solutions, LLC leadership and local authorities to initiation evacuation plans, as necessary.
 - Monitor well pressure, temperature, and annulus pressure to verify integrity loss and determine the cause and extent of failure based on possible leak rate; identify and implement approximate remedial actions to repair damage to the well (in consultation with the UIC Program Director)
 - If contamination is detected, identify and implement appropriate remedial actions (in consultation with the UIC Program Director).
- For a Minor emergency:
 - Conduct assessment to determine whether there has been a loss of mechanical integrity.
 - If there has been a loss of mechanical integrity, initiate shutdown plan.
 - Shut in well (close flow valve).
 - Vent CO₂ from surface facilities.
 - Reset automatic shutdown devices.
 - Monitor well pressure, temperature, and annulus pressure to verify integrity loss and determine the cause and extent of failure based on possible leak rate; identify and implement approximate remedial actions to repair damage to the well (in consultation with the UIC Program Director).

Injection Well 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.

Response actions:

- Notify Lorain Carbon Zero Solutions, LLC Lorain Landfill manager and leadership team.
- Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c).
- The landfill manager or competent senior leader will make an initial assessment of the situation to determine which other Lorain Carbon Zero Solutions, LLC personnel to notify.
- Determine the severity of the event, based on the information available, within 24 hours of notification.
- For a Major or Serious emergency:
 - Initiate shutdown plan.
 - Shut in well (close flow valve).
 - Vent CO₂ from surface facilities.
 - Limit access to wellhead to authorized personnel only.
 - Communicate with Lorain Carbon Zero Solutions, LLC landfill leadership and local authorities to initiation evacuation plans, as necessary.
 - Monitor well pressure, temperature, and annulus pressure (manually if necessary) to determine the cause and extent of integrity failure.
 - Identify and, if necessary, implement appropriate remedial actions (in consultation with the UIC Program Director).
- For a Minor emergency:
 - Conduct assessment to determine whether there has been a loss of mechanical integrity.
 - If there has been a loss of mechanical integrity, initiate shutdown plan. Shut in well (close flow valve).
 - Vent CO₂ from surface facilities.
 - Reset or repair automatic shutdown devices.
 - Monitor well pressure, temperature, and annulus pressure (manually if necessary) to determine the cause and extent of failure.
 - Identify and, if necessary, implement appropriate remedial actions (in consultation with the UIC Program Director).

Potential Brine or CO₂ Leakage to USDW

Elevated concentrations of indicator parameter(s) in groundwater sample(s) or other evidence of fluid (brine) or CO₂ leakage into a USDW.

Response actions:

- Immediately notify Lorain Carbon Zero Solutions, LLC landfill manager and/or senior leadership.
- Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c).
- The landfill manager will make an initial assessment of the situation and determine which other landfill personnel to notify. Project contacts will determine the severity of the event, based on the information available, within 24 hours of notification.
- For all emergencies (Major, Serious, or Minor):
 - Initiate shutdown plan.
 - Shut in well (close flow valve).
 - Vent CO₂ from surface facilities.
 - Collect a confirmation sample(s) of groundwater and analyze for indicator parameters. (Potential indicators are listed in Tables # and ## of Attachment #, the Testing and Monitoring Plan).
 - If the presence of indicator parameters are confirmed, develop (in consultation with the UIC Program Director) a case-specific work plan to:
 - Install additional groundwater monitoring points near the affected groundwater well(s) to delineate the extent of impact; and
 - Remediate unacceptable impacts to the affected USDW.
 - Arrange for an alternate potable water supply, if the USDW was being utilized and has been caused to exceed drinking water standards.
 - Proceed with efforts to remediate USDW to mitigate any unsafe conditions (e.g., install system to intercept/extract brine or CO₂ or “pump and treat” to aerate CO₂-laden water).
 - Continue groundwater remediation and monitoring on a frequent basis (frequency to be determined by Lorain Carbon Zero Solutions, LLC and the UIC Program Director) until unacceptable adverse USDW impact has been fully addressed.

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. An earthquake may disturb surface and/or

subsurface facilities; and weather-related disasters (e.g., tornado or lightning strike) may affect surface facilities.

If a natural disaster occurs that affects normal operation of the injection well, perform the following:

Response actions:

- Immediately notify the Lorain Carbon Zero Solutions, LLC landfill manager or designee.
- Notify the UIC Program Director within 24 hours of the emergency event, per 40 CFR 146.91(c). The landfill manager will make an initial assessment of the situation and determine which other landfill leadership to notify.
- Landfill personnel will determine the severity of the event, based on the information available, within 24 hours of notification.
- For a Major or Serious emergency:
 - Initiate shutdown plan.
 - Shut in well (close flow valve).
 - Vent CO₂ from surface facilities.
 - Limit access to the wellhead to authorized personnel only.
 - Communicate with Lorain Carbon Zero Solutions, LLC personnel and local authorities to initiate evacuation plans, as necessary.
 - Monitor well pressure, temperature, and annulus pressure to verify well status and determine the cause and extent of any failure.
 - Determine if any leaks to ground water or surface water occurred.
 - If contamination or endangerment is detected, identify and implement appropriate remedial actions (in consultation with the UIC Program Director).
- For a Minor emergency:
 - Conduct assessment to determine whether there has been a loss of mechanical integrity.
 - If there has been a loss of mechanical integrity, initiate shutdown plan.
 - Shut in well (close flow valve).
 - Vent CO₂ from surface facilities.
 - Limit access to the wellhead to authorized personnel only.
 - Monitor well pressure, temperature, and annulus pressure to verify well status and determine the cause and extent of any failure.
 - Identify and, if necessary, implement appropriate remedial actions (in consultation with the UIC Program Director).

Induced Seismic Event

Seismic risk is very low in this region. Only very small ground motion and minimal damage occur when infrequent earthquakes occur. Lorain Carbon Zero Solutions, LLC, however, will place seismic monitoring devices on the monitor wells.

Based on the project operating conditions, it is highly unlikely that injection operations would ever induce a seismic event outside an 7-8 mile radius from the wellhead. Therefore this portion of the response plan is developed for any seismic event with an epicenter within an 8 mile radius of the injection well. Based on the project operating conditions from the permit model, it is highly unlikely that injection operations would ever induce a seismic event outside a 10-mile radius from the wellhead. As such, this part of the response plan is developed for any seismic event with an epicenter within an 8-mile radius of the injection well.

To monitor the area for seismicity, the site has installed two (2) surface seismic monitoring stations at the monitoring wells that continuously record the site's seismic activity within 1 mile. In addition to these stations, the USGS may deploy a network of several surface seismic monitoring stations and borehole monitoring stations if they deem it necessary. Based on the periodic analysis of the monitoring data, observed level of seismic activity, and local reporting of felt events, the site will be assigned an operating state. The operating state is determined using threshold criteria which correspond to the site's potential risk and level of seismic activity. The operating state provides operating personnel information about the potential risk of further seismic activity and guides them through a series of response actions. In the following table the Lorain County Landfill Monitoring System is presented. The table corresponds each level of operation state with the threshold conditions and operational response actions.

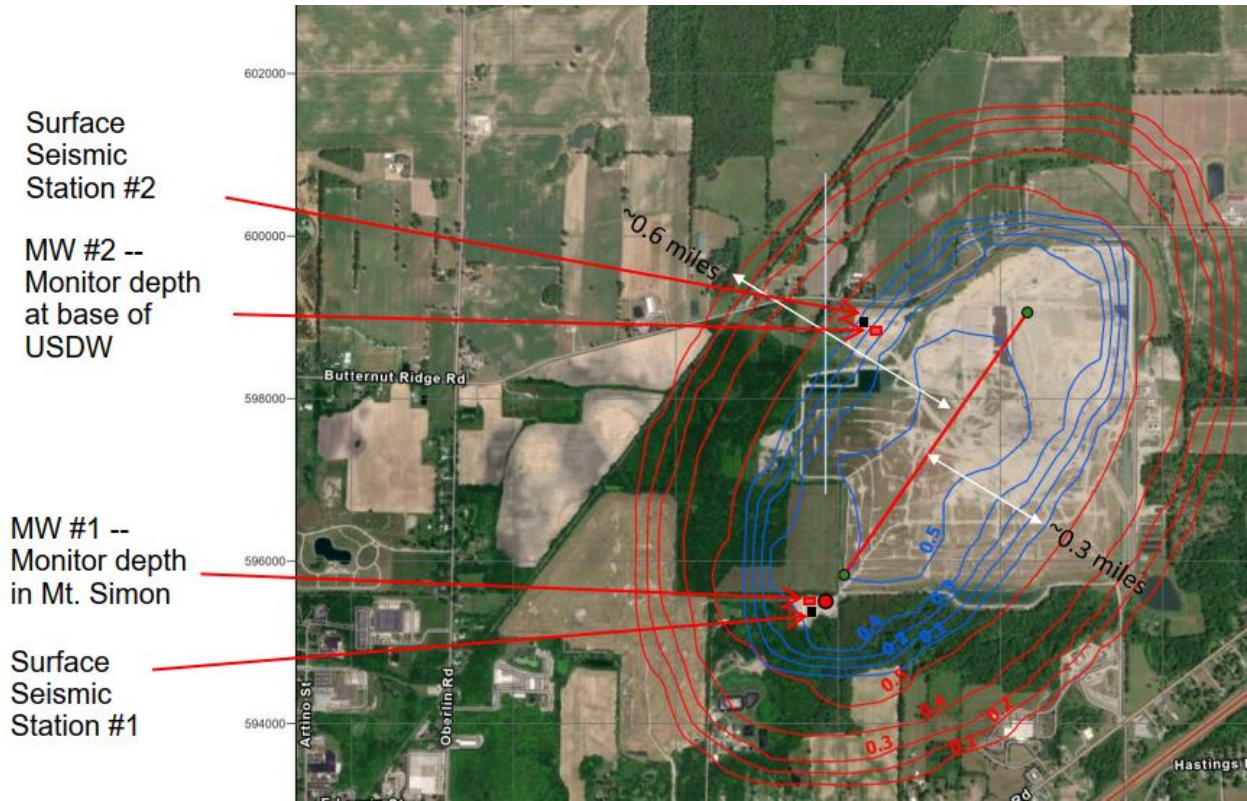


Figure 2. Map of the surface seismic monitoring stations.

Table 2. Seismic monitoring system, for seismic events > M1.0 with an epicenter within an 8 mile radius of the injection well.

Operating State	Threshold Condition ^{1,2}	Response Action ³
Green	Seismic events less than or equal to M1.5	1. Continue normal operation within permitted levels.
Yellow	Five (5) or more seismic events within a 30 day period having a magnitude greater than M1.5 but less than or equal to M2.0	1. Continue normal operation within permitted levels. 2. Within 24 hours of the incident, notify the UIC Program Director of the operating status of the well.
Orange	Seismic event greater than M1.5 and local observation or felt report	1. Continue normal operation within permitted levels. 2. Within 24 hours of the incident, notify the UIC Program Director, of the operating status of the well.
	Seismic event greater than M2.0 and no felt report	3. Review seismic and operational data. 4. Report findings to the UIC Program Director and issue corrective actions.
Magenta	Seismic event greater than M2.0 and local observation or report	1. Initiate rate reduction plan. 2. Within 24 hours of the incident, notify the UIC Program Director, of the operating status of the well. 3. Communicate with facility personnel and local authorities to initiate evacuation plans, as necessary. <i>[Note to user: blue text indicates suggestions, please delete text when complete] (Insert additional appropriate steps.)</i> 4. Monitor well pressure, temperature, and annulus pressure to verify well status and determine the cause and extent of any failure; identify and implement appropriate remedial actions (in consultation with the UIC Program Director). 5. Determine if leaks to ground water or surface water occurred. 6. If USDW contamination is detected: a. Notify the UIC Program Director within 24 hours of the determination. b. <i>[Note to user: blue text indicates suggestions, please delete text when complete] (Insert additional appropriate steps.)</i> 7. Review seismic and operational data. 8. Report findings to the UIC Program Director and issue corrective actions.

¹ Specified magnitudes refer to magnitudes determined by local Northern Ohio Geological Society or USGS seismic monitoring stations or reported by the USGS National Earthquake Information Center using the national seismic network.

² “Felt report” and “local observation and report” refer to events confirmed by local reports of felt ground motion or reported on the USGS “Did You Feel It?” reporting system.

³ Reporting findings to the UIC Program Director and issuing corrective action will occur within 25 business days (five weeks) of change in operating state.

Operating State	Threshold Condition ^{1,2}	Response Action ³
<p>Red</p>	<p>Seismic event greater than M2.0, and local observation or report, and local report and confirmation of damage⁴</p>	<ol style="list-style-type: none"> 1. Initiate shutdown plan. 2. Within 24 hours of the incident, notify the UIC Program Director of the operating status of the well. 3. Communicate with facility personnel and local authorities to initiate evacuation plans, as necessary. 4. Monitor well pressure, temperature, and annulus pressure to verify well status and determine the cause and extent of any failure; identify and implement appropriate remedial actions (in consultation with the UIC Program Director). <i>[Note to user: blue text indicates suggestions, please delete text when complete] (Insert additional appropriate steps.)</i> 5. Determine if leaks to ground water or surface water occurred. 6. If USDW contamination is detected: <ol style="list-style-type: none"> a. Notify the UIC Program Director within 24 hours of the determination. b. <i>[Note to user: blue text indicates suggestions, please delete text when complete] (Insert additional appropriate steps.)</i> 7. Review seismic and operational data. 8. Report findings to the UIC Program Director and issue corrective actions.
	<p>Seismic event >M3.5</p>	

⁴ Onset of damage is defined as cosmetic damage to structures, such as bricks dislodged from chimneys and parapet walls, broken windows, and fallen objects from walls, shelves, and cabinets.

The seismic data acquired from the two surface seismic operations stations will be analyzed on a continuous basis and compared to other seismic data in the perimeter of the landfill.

Response Personnel and Equipment

Site personnel, project personnel, and local authorities will be relied upon to implement this ERRP. The injection well will be located in the New Russia township of the city of Oberlin in Lorain County, Ohio. Township, city, and county emergency responders (as well as state agencies) may need to be notified in the event of an emergency.

Site personnel to be notified (not listed in order of notification):

1. Lorain Carbon Zero Solutions, LLC CO₂ Superintendent
2. Lorain Carbon Zero Solutions, LLC Corporate Communications

A site-specific emergency contact list will be developed and maintained during the life of the project. Lorain Carbon Zero Solutions, LLC will provide the current site-specific emergency contact list to the UIC Program Director.

Table 1. Contact information for key local, state, and other authorities.

Agency	Phone Number
City of Oberlin Police Department	440-774-1061
Ohio State Police	330-725-4921
Lorain County Sheriff	440-329-3709
Ohio Emergency Management Agency	614-889-7150
Lorain County Emergency Management Agency	440-329-5117
UIC Program Director (US EPA Region V)	312-353-7648
EPA National Response Center (24 hours)	800-424-8802
ODNR – Division of Geological Survey	614-265-6576
Ross Environmental Services	440-366-2000

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, Lorain Carbon Zero Solutions, LLC shall be responsible for its procurement.

Emergency Communications Plan

Lorain Carbon Zero Solutions, LLC Corporate Communications will communicate to the public about any event that requires an emergency response to ensure that the public understands what happened and whether or not 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.

Lorain Carbon Zero Solutions, LLC Corporate Communications will manage all media communications with the public in the event of an emergency situation related to the injection project.

Lorain Carbon Zero Solutions, LLC will describe what happened, any impacts to the environment or other local resources, how the event was investigated, what responses were taken, and the status of the response. For responses that occur over the long-term (e.g., ongoing cleanups), Lorain Carbon Zero Solutions, LLC will provide periodic updates on the progress of the response action(s).

Lorain Carbon Zero Solutions, LLC will also communicate with entities who may need to be informed about or take action in response to the event, including local water systems, CO₂ source(s) and pipeline operators, land owners, and Regional Response Teams (as part of the National Response Team).

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) reevaluation;
- Within a prescribed period (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, Lorain Carbon Zero Solutions, LLC 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 (6) months following an event that initiates the ERRP review procedure.

Staff Training and Exercise Procedures

Lorain Carbon Zero Solutions, LLC will integrate the ERRP into the landfill specific standard operation procedures and training program as described in the Lorain County Landfill SOP.

Periodic training will be provided, not less than annually, to well operators, CO₂ superintendent, and corporate communications. The training plan will document that the above listed personnel have been trained and possess the required skills to perform their relevant emergency response activities described in the ERRP.

The landfill and CO₂ operations are owned and operated separately but due to their proximity, they will share safety programs and guidelines in any emergency response.