Draft Directive 065 (released November 2024)
What We Heard – And Our Response

We would like to thank all those who provided comments. We reviewed each one and consolidated comments covering similar issues. What follows is a summary of the issues raised and our responses.

Comments on grammar, punctuation, and cross-referencing have not been summarized, but changes were made where needed.

A list of the respondents is provided at the end of this document.

Stakeholder Feedback – Issue	AER Response
1. Application Review Process	
Recommend adding the following to step 3 a) The application shall be returned if the applicant has an active application against it under section 36 of the *Surface Rights Act*. b) The application shall be returned if the applicant has any municipal tax arrears.	a) The AER does not have jurisdiction with respect to the *Surface Rights Act*. The suggested addition is out of scope of this project. Any person that may have concerns about a *Directive 065* application may file a statement of concern with the AER if they believe they may be directly and adversely affected by the application. Notice of applications can be found on the AER's website. The statement of concern will be considered in the AER's decision of whether to approve or deny the application. b) As outlined in *Bulletin 2024-22*, and in accordance with *Ministerial Order 096/2024*, unpaid property tax arrears must exceed a certain threshold to be considered. If an applicant's unpaid property tax arrears have exceeded that threshold, then the application must include evidence that the arrears have been resolved before we can process the application.

Stakeholder Feedback – Issue	AER Response
2. Notification Requirements	
Brine-hosted mineral licensees, and brine-hosted mineral lessees are not specifically mentioned nor included in the Parties to notify column for any of the Application Types in table 1 nor in table 3 for Application Types: “Disposal except waste disposal (Class I) and acid gas disposal (4.1)” and “Underground Gas Storage (4.2).” While mineral lessees are included in the Parties to notify column for some of the Application Types in Table 1, there seems to be misinterpretation surrounding the notification process. This has resulted in significant time and resources being invested by industry, the AER, and other parties. It is expected to continue until further clarification can be provided. Not notifying brine-hosted mineral licensees and brine-hosted mineral lessees would lead to potential detrimental impacts to brine-hosted minerals via dilution of resource from the Application Types in Table 1, and potential loss of resource producibility. It is noted that “Geothermal lease holders” are specifically mentioned in the Parties to Notify column for certain Application Types in Table 1 to provide certainty for applicants. It is equally as important that brine-hosted mineral licensees and brine-hosted mineral lessees are also specifically mentioned to provide absolute clarity, and to avoid misinterpretation and unnecessary conflict down the road.	The lessee of a brine-hosted mineral lease is considered a mineral lessee in tables 1 and 3. But a mineral lessee does not include a brine-hosted mineral licence holder.
Please include all Freehold mineral rights owners and lessees within a 9-section block entered on the well for notification. Issues will occur when owners of rights are effectively sterilized by the injection into a well as migration of the fluids and gases flows to the offsetting holders. As with recent Manitoba carbon capture and storage (CCS) regulations, the Crown has determined that they own the pore space, however compensation may be required to holders of the mines and minerals. Limitations in their legislation is notification of the Freehold mineral owners.	The notification of Freehold mineral owners and lessees in a 9-section block is not required as applicants are required to demonstrate that the proposed injected fluids will not interfere with the orderly exploitation of hydrocarbon resources. The onus is on the applicant to demonstrate that the proposed site is suitable for injection and does not present a containment risk.

Stakeholder Feedback – Issue	AER Response
Notification is provided to ensure stakeholders are notified of the subject application and to allow stakeholders to submit any concerns. Notifications prior to an AER decision could be past the period for filing a statement of concern, therefore it is recommended that that notification is provided prior to application like table 1 and table 2 in *Directive 065*. Recommend changing the table 3 title to “Minimum notification requirements prior to filing an application.”	We agree that notification prior to an AER decision could be past the period for filing a statement of concern. We have changed the title of table 3 to ensure that parties are notified prior to filing an application.
Notification by other disposal to carbon sequestration agreement holders is only for wells completed into injection zone. Recommend adding holders of Crown agreements or authorizations to sequester CO_2 to the list of parties to be notify under the Underground gas storage in table 3.	We do not see the need to notify of gas storage applications because gas storage is done within an existing active or depleted pool and will not affect or impinge on any other potential activities outside the pool.
Table 1. Notification by other disposal to carbon sequestration agreement holders is only for wells completed into injection zone. Notifications should also include drilling through a CO_2 plume area (or within the sequestration lease boundary). Should also include CCS storage complex seals in the event of hydraulic fracturing of seals. Drilling through storage complex represents a leakage risk.	Proponents of fluid disposal activities other than CO_2 sequestration are not required to provide notification to the proponents or holders of CO_2 sequestration schemes in their proposed area of operations. We have noted this suggestion. The AER will evaluate this suggestion to understand the implications and impacts to regulated parties, AER’s systems (e.g., OneStop), well licensing application process, and regulatory instruments (e.g., *Directive 056*). This is out of scope of the current amendment.
The following language is vague, leading to potential confusion on the area of notification. “Sequestration agreement or authorization holders within the approved zone from the sequestration boundary.” What does from in this case mean? Within the sequestration boundary? Also, “Notification should also cover all zones that overlie and underlie within the sequestration agreement boundary.” All zones? This implies to pre-Cambrian to surface. Is that intended? If so, is that practical/fair? Suggested wording, “Neighboring sequestration agreement or authorization holders from the sequestration boundary with the same approved zone. Notifications should also cover all zones that overlie and underlie within the sequestration agreement boundary.”	We have revised the text pertaining to notification of adjacent carbon sequestration agreement or authorization holders.

Stakeholder Feedback – Issue	**AER Response**
Add "municipality where the project is located" to the list of parties to be notified, and all landowners and occupants within 1.5 miles of the surface location of the project.	We have reviewed the feedback and have not changed the notification tables to include the municipality. All project applications are posted to encourage public participation in our decision-making process, and any person who believes they may be impacted by an application may file a statement of concern, which will be reviewed by the AER.
Consider aligning *Directive 056* and *Directive 065* through the following possible changes: • Using the same language in both directives from table 1 of *Directive 065* "Notification of holders of Crown agreements or authorizations to sequester CO_2" and adding it to table 4 of *Directive 056* for the appropriate well categories to improve consistency across directives and protect CO_2 storage complex and the risks other operators may pose to CO_2 containment. • All proposed wells drilled within the boundary of a carbon evaluation or sequestration agreement be automatically reviewed as nonroutine to allow CCS operators to submit a statement of concern should the proposed well introduce a risk to containment. • *Directive 056* section 4.9.9 or details in the participant involvement program modified to include consistent language with *Directive 065* "Notification of holders of Crown agreements or authorizations to sequester CO_2."	We will evaluate the suggestions as part of the upcoming planned major revisions to *Directives 056* and *065*.
3. Unit 1: Equity	
Equity between the various mineral tenures is not described *Oil and Gas Conservation Act* (OGCA) Recommendation: Add section explaining how equity between petroleum and natural gas (PNG) tenure, oil sands tenure, carbon sequestration tenure, geothermal tenure, and *Mineral Resource Development Act* tenure is achieved using the *Directive 065* application process.	Section 1.1.1 highlights the purpose of the *OGCA* and what the AER is mandated to do under section 36 of the *OGCA*. *Directive 065* is not the tool to describe how to achieve equity between the various tenures issued by Alberta Energy & Minerals. This recommendation pertains to the tenure management policy set by the Government of Alberta and potential amendment to legislation, which are both out of scope of this project.

Stakeholder Feedback – Issue	AER Response
4. Unit 2: Conservation	
Linkage to non-*OGCA* resources not clear. Recommend adding content explaining the application of *Directive 065* to non-*OGCA* resources (e.g., the linkage from *Directive 090*, which requires brine-hosted minerals to apply under enhanced recovery for brine-hosted minerals schemes).	The linkage is not pertinent as *Directive 090* does not envisage enhanced oil recovery, but enhanced recovery.
5. Unit 4: Disposal/Storage; Section 4.1.1, "Background"	
Section 4.1.1 references only *OGCA*, *Oil and Gas Conservation Rules*, and *Geothermal Resource Development Regulation*, omitting *Bine-Hosted Mineral Resource Development Rules* and *MRDA*. Recommendation: Add content explaining the linkage to *MRDR / MRDA*.	We have included references to section 4.1.1 pertaining to the *Mineral Resource Development Act*.
6. Unit 4: Disposal/Storage; Section 4.1.2, "When to Make This Application"	
For the two-step application process, confirm that the *Directive 065* notification process is for two years and does not require a yearly status update unless the ownership structures and potentially affected parties change, or if there is a material change in development plan in the interim between and first step application and the second step application.	The notifications carried out for the first of the two-step process are valid for two years. Renotification would only be required if there is a change to ownership structure and potentially affected parties.

Stakeholder Feedback – Issue	AER Response
7. Unit 4: Disposal/Storage; Section 4.1.3, "Application Requirements for a Disposal Scheme"	
Not including brine chemistry of disposal zone as a requirement omits (1) baseline data, to understand temporal variation in disposal zone brine chemistry; (2) understanding the commodity entities (e.g., bromine, lithium, magnesium) existing in proposed disposal zone brines; and (3) verification/validation of compatibility of chemistry between disposal streams and existing disposal formation fluids/rock. Under 1(d) disposal fluid class, add subheader to require brine chemistry analyses (formation water fluid analyses – both routine water chemistry and trace elemental chemistry) to provide baseline datasets and best understand temporal variations in brine chemistry (if any), as well as fully quantifying commodity/economic potential of the disposal zone brine.	We have noted the suggestion; however, we have not changed *Directive 065* to mandate disposal scheme applicants to provide brine chemistry data. We do not use this data to decide whether to approve a disposal scheme. The onus is on the proponents of brine-hosted minerals to gather data to arrive at a clear understanding of the mineral content of the brine in the saline aquifers of the province.
Hydrocarbon detriment is acknowledged but brine-hosted mineral detriment is not. Updated text in caps lock: Under 2(c), an explanation of why the proposed disposal would not be detrimental to ultimate hydrocarbon or brine-hosted mineral OR BRINE-HOSTED MINERAL recovery.	The *OGCA* section 39(1.1) gives the AER legislative authority to address the detrimental effects of subsurface activities on the recovery or conservation of oil and gas. There is no similar provision regarding brine-hosted mineral recovery in section 39 of the *OGCA* or any other legislation.
Maximum Operation Pressure (MOP) need to be defined. For depleted reservoirs, the pressure to stop the injection is when the reservoir reaches a pressure below the initial. In some cases, fluids are injected until it reaches between 70 and 90% of the initial pressure. For aquifers, the fluids can be injected until the reservoir pressures reaches the cap seal pressure, which is pressure calculated based on capillary pressure of the overburden formation (seal). Cap seal pressure is lower than the fracture pressure, and fracture pressure should be use at well level to control the injection, but to stop the injection, cap seal pressure should be used at reservoir level.	We have noted the suggestion; however, the text in the directive says that MOP will be based on the initial pressure of the zone. Applicants can use a valid technical justification to request MOP on some other basis.

Stakeholder Feedback – Issue	AER Response
For the general requirements of the proposed disposal scheme, there is currently no requirement to provide an analysis of the native reservoir fluids. As a result, it remains unknown whether any elements of economic interest (e.g., dissolved lithium in brine) are present in these fluids, or if these elements—or their extraction processes—could be adversely affected by the disposed fluids through dilution or chemical reactions. While an analysis of native reservoir fluids is mandatory for Class III fluid disposal scheme applications, it is recommended that this requirement be extended to all disposal scheme applications. Additionally, this analysis should be provided to the brine-hosted mineral rights holder to ensure they are fully informed of the circumstances. In cases where elements of economic interest are present in the reservoir fluid, the applicant should also provide sufficient information and data to confirm that the disposal of fluids will not adversely affect these elements in any way.	We have noted the suggestion, however, we have not changed *Directive 065* to mandate disposal scheme applicants to provide brine chemistry data. We do not use this data to decide whether to approve a disposal scheme. The onus is on the proponents of brine-hosted minerals to gather data to arrive at a clear understanding of the mineral content of the brine in the saline aquifers of the province.
In the conservation section, it is stated that if disposal is to occur in a hydrocarbon pool or an associated aquifer, it must be demonstrated that such disposal will not have a detrimental effect on the ultimate hydrocarbon recovery from the pool. However, there is currently no conservation policy regarding aquifers containing brine, which could potentially be enriched with elements of economic interest (e.g., dissolved lithium in brine). The conservation policy should be expanded to include aquifers containing brine with elements of economic interest.	This suggested expansion of the conservation policy requires a legislative change and is beyond the scope of this project. Policy rests with the Government of Alberta.
References only *Directive 089* scheme approval. Add an equivalent requirement to indicate whether *Directive 090* approval has been applied for or obtained.	We have included a reference to *Directive 090*.
Comment for “evidence” is unclear. Add “pore space” to “tenure must be granted…” to clarify the type of tenure approval needed.	We have deleted “evidence” from the text and substituted it with “authorization,” which we believe provides clarity. Addition of “pore space” is not needed as the requirement is broad to accommodate any type of tenure granted to inject fluid into the subsurface zone or formation.

Stakeholder Feedback – Issue	AER Response
Conservation requirement 2(e) in draft directive states “Approvals may be conditioned on the acquisition of annual shut-in reservoir pressure tests as per *Directive 040*.” It is unclear how pressure management changes will be managed with multiple storage hub operators in a region and recommends this be given consideration.	It is not expected that schemes will be located that close to one another. It is expected that scheme approval holders will account for the pressure plume size and locate their schemes in relation to other projects. This comment, however, provides notice to industry that approvals may be so conditioned.
8. Unit 4: Disposal/Storage; Section 4.1.4, “Additional Requirements for Class I Disposal”	
The term “maximum expected area of influence” appears in section 4.1.4. Although this term appears in the current version of *Directive 065*, it is undefined, and proponents may benefit from additional clarity.	It relates to the maximum area of influence that can be estimated with the information that the applicant has available to it. We have included the text above in the directive to provide clarity.
9. Unit 4: Disposal/Storage; Section 4.1.5, “Additional Requirements for Class III Disposal”	
What is the AER’s rationale behind requiring risk assessments, simulation models, and monitoring plans for medium- to high-risk assessed Class III schemes? Has the AER considered defining what parameters within a risk assessment needs to be “medium or high” in order to trigger requirement for measurement, monitoring, and verification (MMV) plan with baseline conditions.	There is some level of risk associated with any disposal operation. It is therefore necessary that all hazards in the area of influence of the activity be examined, reviewed, and mitigation identified. Where residual risk remains for any of the identified hazards, the proponent must present its assessments to the AER listed under the categories low, medium or high. A justification for these assessments must be presented to the AER for review and acceptance. Proponents are required to follow the Canadian Standard Association (CSA) standard.
Further define “if subsurface risk to geological containment of the disposal formation is known, interpreted or presumed by the applicant.” What is the trigger event for monitoring wells and how is this different that the “medium to high” risk associated with a trigger for an MMV plan?	The trigger event for the need for monitoring wells must be the identification of geological containment as a specific risk to fluid containment.
What is the definition of “risk to groundwater” as per a risk assessment? Base of groundwater protection (BGWP) and *Directive 051* casing requirements provide the protection of the nonsaline groundwater.	The closer an injection activity is to the BGWP, the higher the risk of groundwater contamination. There are several ways to mitigate most of the risks, and a risk assessment will inform this.

Stakeholder Feedback – Issue	AER Response
Section 4.1.5 "Reservoir models and results from simulations predicting the extent of the disposal fluid plume." The "must" statement and inclusion of reservoir simulation models implies all class III (H_2S acid gas disposal etc.) disposal will require a simulation model.	The feedback on reservoir models and results from simulations predicting the extent of the disposal fluid plume does not belong in this section. We have deleted it.
Will the AER stipulate the simulation modeling requirements for all Class-II disposal? How will those results be used by the AER to decide on an application? Will the AER provide guidance for Class-III applicants on simulation modelling requirements? This requirement for all Class-III disposal represents an increased regulatory burden and cost without clear outcomes. The requirement for numerical reservoir simulation should be done at the discretion of the operator and based on the project's site-specific risks. Consider other methods such as analytical to estimate the plume radius for Class-III fluids. Suggested change: "Submission of predicted disposal fluid plume extent evaluation and results."	The AER has no intention of mandating reservoir simulation requirements for fluid disposal activities except for CO_2 sequestration schemes. With CO_2 sequestration schemes, the size of the project and containment risk assessment is considered in the mandate.
Section 4.1.5 (page 4-11): "It is expected that the risk assessment be carried out in accordance with the requirements of CSA Z741-12, its successor, or equivalent standard (e.g., ISO 27914-2017(E), EU Directive 2009/31/EC." The referenced document's scope is only for CO_2 and does not include other types of Class-III fluids such as H_2S or mixtures as described in *Directive 051*. Recommend that AER either describe its own set of requirements or include references that are applicable to Class-III fluids.	We have described our requirements regarding the risk assessment and added appropriate CSA references (see section 4.1.5, page 4-11).

Stakeholder Feedback – Issue	AER Response
Containment requirements, requirement 2: Assessments of risk to geological containment of disposal formations are unlikely to be zero, but in many cases, will be very low. The current wording in the draft directive could be interpreted that any risk, no matter the likelihood or magnitude, would be subject to above-zone monitoring intervals. Monitoring requirements should be commensurate with site- and project-specific risks. Above-zone monitoring adds significant project costs and should not be required for very low likelihood or magnitude risks Consider adding the conditional language below to requirement (2): If a subsurface risk to the geological containment of the disposal formation is known, interpreted, or presumed to be likely by the applicant, then the application must also identify proportionate above-zone monitoring intervals and proposed monitoring well locations if warranted.	This requirement points to the applicant's interpretation of the likely risk to fluid containment. The monitoring requirements can be tailored to the risks identified at any site. The applicant is required to propose the above-zone intervals to be monitored. The applicant can also propose the specific requirements, subject to AER's review and agreement. This is inherent in the process of arriving at *Directive 065* approval-related requirements. Monitoring required for a scheme will be commensurate with the scope and scale of and the risk associated with the scheme. The applicant's assessment of a specific risk to be of low likelihood or low magnitude must be documented and presented to the AER for concurrence. We have reviewed the recommendation and have not changed the wording of the requirement.
Containment requirements, requirement 3: Risk assessment is complex. Many risks which may be identified, may be very low likelihood or magnitude, and it is unlikely that a risk assessment will ever result in a finding of zero risk. This should be recognized within the draft directive, enabling the proponent to propose a monitoring program commensurate with the risk for that specific site and project. For example, requirement 3 could be reworded as follows: "A groundwater monitoring program is required if the risk assessment shows a risk to the groundwater, with a proposed monitoring program commensurate with project- and site-specific risks."	The requirement as written inherently addresses the suggested wording, so we have not changed it. The AER is cognizant of the fact that there is no such thing as zero risk. It is a question of degree of risk and its justification. If there is a risk of groundwater contamination, an applicant must propose a mitigation strategy including how it would be addressed as part of the scheme application.

Stakeholder Feedback – Issue	AER Response
In containment requirements, requirement 7, it is unclear how an applicant would be able to ensure that wells that need improved abandonments can be completed in circumstances where the applicant is not the owner of the well.	When offsetting wells are identified as presenting a risk in the area of influence of the sequestration scheme, remediation is required prior to the scheme approval being granted. The AER cannot know of a risk and waive it off because the at-risk well is owned by another licensee. It also goes to site selection. Developing a map of the wells identified to have a potential risk for fluid crossflow is part of the area of influence review.
Fluid properties requirement 3: There are several sections in the draft directive with wording that may benefit from further definition. An example of this is the use of the word “low” in the geological containment risk assessment for requirement 3. Recognizing it is difficult to define qualitative statements like “low risk,” the AER is encouraged to enable proponents to propose risk levels based on site- and project-specific information.	Proponents are so enabled. Yes, this requirement and the directive generally use phrases that are qualitative and subjective. That is why the onus is on the applicant to decide on the risk level, document the process undertaken to arrive at this decision, and submit it for review by the AER.
10. Unit 4: Disposal/Storage; Section 4.1.6, “Additional Application Requirements for CO_2 Sequestration Schemes”	
CO_2 Injection in aquifers is different than in depleted reservoirs. Because different considerations, issues, problems, and challenges will be faced when injecting CO_2 in aquifers vs depleted reservoirs, the regulations should be separated. That will help the applicant when applying for CO_2 injection in a depleted reservoir or in an aquifer. Some of the rules/regulations mentioned applied to aquifers but not necessarily applied to depleted reservoirs.	The conditions pertaining to aquifers versus depleted hydrocarbon reservoirs are not that different such that separate requirements and regulations are required to address them.
Section 4.1.6, page 4-17: If the predicted fluid plume at the end of the project life exceeds 2.5 km around the sequestration well or if the geological containment risk assessment is medium to high, the applicant must execute and maintain a dynamic simulation model. This contradicts the draft requirements in section 4.1.5 (page 4-11); “Reservoir models and results from simulations predicting the extent of the disposal fluid plume” for all Class-II injectors. Clarify whether the 2.5 km metric refers to diameter, radius, square kilometers, or some other metric.	The 2.5 km metric refers to the radius of the estimated plume extent circle. Modelling is not mandated for proposed CO_2 sequestration into depleted reservoirs.

Stakeholder Feedback – Issue	AER Response
Recommend that the AER consider a volume or mass threshold requirement instead of a radius for a dynamic simulation model requirement.	We do not believe this would be an improvement and have not changed the requirement.
The 2.5 km radius may not be representative of the scale of the CCS. • The radius is a function of several parameters and primarily the net pay interval (storage zone thickness). Larger net pay intervals will have smaller CO_2 plume radius. • Additionally, a CCS hub with more than one injector may have wells with different performance (injectivity) profile. Injection wells may consist of injectors with isolated plumes smaller than 2.5 km.	The 2.5 km radius provision is intended for small-scale and remote CO_2 sequestration projects. It is not intended for the hub scale CO_2 sequestration projects.
Section 4.1.6 further states "When CO_2 sequestration is proposed for depleted reservoirs, it is prudent to assume that the fluid and pressure plumes will permeate the entire reservoir." Note that the entire reservoir could be a significant area and undertaking. Recommend adjusting wording to "When CO_2 sequestration is proposed for depleted reservoirs, subsurface modelling should be used to determine both the geological and stratigraphic extent of the impact of the injection volumes."	The statement that fluid and pressure plumes in depleted reservoirs will permeate the entire reservoir is only advanced as a matter of prudence. If cases come up where the reservoir area is so extensive that it is not likely that the entire area will be in play, then this must be technically justified to the AER for consideration. The mobility of the injected fluid is such that it is prudent to make this assumption. Again, goes to site selection. We have not changed the wording.
Baseline conditions currently omit brine chemistry of the saline aquifers targeted for CO_2 sequestration and MMV specific to monitoring chemistry of overlying units, which would indicate leakage incurring. Baseline conditions should include (as a requirement, and in the public domain), the analyses of the saline aquifer chemistry for baseline data and for MMV purposes (i.e., containment of sequestered target/aquifer).	CO_2 sequestration scheme approval holders are required to assess the potential of altering regional groundwater flow/pressures/chemistry regimes as part of the MMV plan and monitor these throughout the life cycle of the operations.

Stakeholder Feedback – Issue	AER Response
11. Unit 4: Disposal/Storage; Section 4.1.7, "Additional Application Requirements for CO2 Sequestration"	
Notification and Equity section inconsistent with table 1 (page 4-21, requirement 7). Add mineral lessor, lessee, etc. from table 1 to 4.1.7 for consistency.	Notifications under 4.1.7 talks about estimating the fluid injection area. It is not about the parties to be notified. The requirement applies after acquiring the Crown authorization or agreement, which occurs after submitting a sequestration scheme application.
The initial application submission to the AER after obtaining a valid Crown agreement or authorization to sequester CO_2 must include the MMV and closure plan. The text reads as if the MMV plan need to be submitted and approved prior to drilling an appraisal well to confirm the reservoir/caprock is viable and a project exists. Clarify when the MMV plan needs to be submitted and approved.	An MMV plan is required as part of *Directive 065* CO_2 sequestration scheme application. Note that a *Directive 065* scheme application and an MMV plan are not required during the evaluation phase of a CO_2 sequestration project. See our website for details: https://www.aer.ca/providing-information/by-topic/carbon-capture.
Under Reporting, requirement 8 states that "The scheme operator must provide a complete baseline MMV, including a full set of baseline measurements collected during the pre-injection evaluation period." It is noted that the terms "full" and "complete" are undefined, and as currently worded, could be interpreted to include competitively sensitive and costly data collected (i.e., all vintage, proprietary, or licensed seismic data). Consider clarifying and limiting the data reporting requirements to what is needed, driven by the site-specific risk assessments and analysis completed by the applicant, and to specify that baseline seismic information is not expected to be submitted.	We can delete "complete," as there is no incomplete MMV. The "full set of baseline measurements," however, is pertinent. We will not exclude baseline seismic data. If the baseline seismic information is needed to evaluate the application, then it must be provided.
There is currently no general reporting requirement for the analysis of brine chemistry over time. If the disposal formation contains brine enriched with elements or minerals of economic interest, it should be mandatory to report the brine chemistry annually to ensure that the disposed fluid does not adversely impact these elements or minerals.	*Directive 065* does not have a reporting requirement for brine chemistry because the brine chemistry is not needed to demonstrate the performance of enhanced recovery, enhanced oil recovery, and disposal schemes. Mandating disposal scheme approval holders to collect, analyze, and report on brine chemistry would require a legislative change, which is beyond the scope of this project. Furthermore, brine chemistry data is not required on *Directive 065* scheme applications. Parties that have brine mineral leases to explore geological formations that may contain mineral enriched brine can apply for a well licence to drill wells to acquire such data.

Stakeholder Feedback – Issue	AER Response
Consider clarifying the AER expectations for the construction of a risk assessment. The current text is: "Establish a site-specific risk assessment that will allow for thorough risk management throughout the life of scheme approval," Consider the following: "Establish a site-specific risk assessment that will allow for thorough risk management throughout the life of a scheme approval and outline risk factors, threats, preventative barriers, top events, hazards, mitigative barriers, and consequences."	We have described our requirements regarding the risk assessment and added appropriate CSA references (see section 4.1.5, page 4-11).
12. Unit 4: Disposal/Storage; Section 4.1.8, "Induced Seismicity Potentially Related to Disposal Wells"	
The term "any infrastructure" is too broad and would require that owners of all infrastructure (i.e. all physical structures) within 10 kms of the disposal well be engaged, not just owners/operators of critical infrastructure. This is a significant undertaking, not practical, and of limited benefit to the MMR and traffic light protocol. Requirement 13(b) references essential infrastructure. Also, the term "engage" can be interpreted in several ways. Define the term. Does engagement involve a letter similar to the participant involvement process, or is personal consultation or sign-off required? Adjust requirement 11 to read, "If any identified infrastructure as defined in the *Critical Infrastructure Defence* Act falls within a ten-kilometre radius of the disposal well, the applicant or the scheme approval holder must inform the owners of the infrastructure when developing the MMR plan." This phrasing still captures the AER's intent to protect critical infrastructure, and it would ensure that owners of this type of infrastructure are informed of a planned operation and how the operator will monitor, mitigate and respond to potential induced seismicity associated with a disposal operation.	We agree with the proposed recommendations. The intent is to keep this focused on private property, essential infrastructure, and the owners of such, and to inform and notify the owners, not receive consent from them. Requirement 11 has been reworded to, "If private property or essential infrastructure falls within the assessment radius, the applicant or the scheme approval holder must notify the landowners and essential infrastructure owners in writing for informational purposes when developing the MMR plan." To reflect the change to requirement 11, and for consistency, the wording in requirement 14 has been updated. The third sentence now reads, "If the applicant or the scheme approval holder and the owners of affected essential infrastructure and private land (see requirement 11) cannot come to an agreement…"

Stakeholder Feedback – Issue	AER Response
What specific seismic monitoring data is the AER looking for? And what does "near real time" mean? Please clarify.	We expect submission of all waveform data (miniseed data). The data is to be submitted to the AER and IRIS in near real time. Near real time means that the data submission is required as it becomes available, and in this case that will not be instantaneous. Factors such as distance of the station to the receiver and the stability of the network may affect transmission speed. The submission is done by the vendor sending an additional stream of data.
Does the statement about data being made public no later than one year apply to the data submitted to the AER or to Incorporated Research Institutions for Seismology? Please clarify.	This statement has been removed from *Directive 065*. *Open File Report 2019-09* (hyperlinked in requirement 15(a)) speaks to the public release of data in IRIS after a one-year embargo. Data submitted to the AER is not released publicly.
Criteria and mechanism for associating a well with seismicity, or designating a well as seismogenic, are unclear. Is the measure based on the observation of a seismic event above a specific magnitude? Is it based on observed seismicity (then this is magnitude resolution is monitoring system dependent)? Is it based on seismicity within a specific distance from the disposal wells (10 km)? Is it based on events being detected by public stations (or Alberta array which has different resolution in different parts of the province)?	Determination of a seismogenic well is based on the level and timing of seismicity, site-specific conditions, factors at the surface, etc. The seismogenic determination is initiated either by the operator or the AER. Before the determination is finalized, the AER will discuss it with the operator. To improve clarity, the following sentence has been added to the first paragraph of section 4.1.8.1: "The seismogenic determination is initiated either by the operator or the AER."
Is there an opportunity for a proponent to challenge the seismogenic status? Would the regulatory appeal process apply?	Please refer to the AER's regulatory appeal process. Under the *Responsible Energy Development Act*, an eligible person may file a request for a regulatory appeal on an appealable decision. Eligible persons and appealable decisions are defined in section 36 of the *Responsible Energy Development Act* and section 3.1 of the *Responsible Energy Development Act General Regulation*. A regulatory appeal request must be submitted in the form and manner and within the timeframe required by the AER. You can find filing requirements and forms on the AER website.
"Safe state" is mentioned [requirement 7(c)(iii)] and at the end of section 4.1.8.1. Does a green light status correspond to a safe state? Define safe state as shut in, allowing for an appropriate turn-down period, which would be consistent with requirement 9, that specifies what must be done "resuming affected operations"	"Safe state" is the outcome that is desired and allows the operator to use the most appropriate method for the situation. There are scenarios when shutting in is not appropriate. In a red-light event, the operator and AER will discuss what "safe state" means for the unique situation.

Stakeholder Feedback – Issue	AER Response
Risk assessment is mentioned in the header of section 4.1.8.2, but no information or detail has been provided for the risk assessment, only the induced seismic hazard assessment. Please clarify.	We have included information on risk assessment under section 4.1.8.2. The seismic risk assessment is to be completed by the operator when the seismic hazard assessment indicates the likelihood of induced seismicity in the area. The seismic risk assessment evaluates potential impacts of induced seismicity on infrastructure, stakeholders, private property, and populations and helps to define acceptable magnitude thresholds.
Certain areas of Alberta have higher potential for seismic activity (https://www.researchgate.net/figure/Simplified-Seismic-Hazard-Zones-inAlberta_fig4_369300158, https://ags.aer.ca/publication/iam-005). Consider creating known areas or special zones of moderate-to-high potential seismic activity instead of requiring an induced seismic hazard assessment for all new and amended fluid disposal applications in Alberta.	We do not believe an area-based approach is the most appropriate at this time. Induced seismicity can occur anywhere in the province, even though some areas may have a higher likelihood. Therefore, it is important that all new and amended fluid disposal operations assess the chance of induced seismicity. This province-wide approach lets us proactively mitigate induced seismicity, especially in two scenarios: wells with persistent induced seismicity and wells experiencing induced seismicity for the first time. This does not preclude us from altering our approach in the future, as more data is gathered.
It is unclear as to the level of spatial accuracy desired from the seismometer network. Specifically, is the operator expected to produce a seismometer network that not only is capable of detecting a [x] ML magnitude event within 10 km of the disposal well but also to differentiate whether the event is within or without the 10 km radius of the disposal well?	We are asking for a seismic network with the capacity to detect events equal to or larger than the lower magnitude thresholds in the disposal well's traffic light protocol, in an area 10 km around the well. In practice, the seismic network should guarantee a magnitude of completeness equal to or lower than the lower magnitude threshold in that 10 km area around the disposal well. The magnitude of completeness can be estimated via simulations, and it is driven by the station setting and seismometer capacity. The network will detect events out of the 10 km area, but the emphasis is on the capacity to detect all events larger than the lower magnitude threshold inside the 10 km area. Finally, with respect to the location uncertainty, we would expect event reporting if the estimated location plus associated error location falls into the 10 km area around the disposal well. The error location will depend on the event and network setting.
The current radius for these reviews is 1.6 km, so an increase to 10 km is substantial. Please clarify the impact of the radius increase to 10 km on well compatibility reviews.	The 10 km radius is based on observations of induced seismicity cases related to disposal wells. While the 10 km radius is less than what current induced seismicity scientific literature dictates regarding scope of effect (see Keranen et al., 2014; Goebel et al., 2017; Schoenball et al., 2018, Peterie et al., 2018) it was determined to be appropriate in these circumstances.

Stakeholder Feedback – Issue	**AER Response**
From the perspective of a geothermal developer, 10 km is a significantly inappropriate radius to apply to all disposal wells. Given the density of operations in the Western Canada Sedimentary Basin, it is untenable for all operations to enact their MMR for a seismic event within a 10 km distance that is not related to their operation. What is the scientific basis for this radius? • The radius in which the MMR is enacted for seismicity should be in proportion to the location accuracy and threshold of the local seismic network. • There are significant differences in the risk profiles of a disposal well associated with a conventional open loop geothermal system compared to a wastewater or carbon, capture, utilization and storage (CCUS) disposal well. Caveats should be placed based on the local seismic network's ability to locate events and for the type of disposal well. Rather than stating "within ten kilometres of their disposal well (or a greater distance if directed by the AER)," the distance should be determined on the well type and on a case-by-case basis.	The 10 km radius is a current requirement in *Directive 089* for geothermal operators and has been in place since August 2022. While the 10 km radius is less than what current induced seismicity scientific literature dictates regarding scope of effect (see Keranen et al., 2014; Goebel et al., 2017; Schoenball et al., 2018, Peterie et al., 2018) it was determined to be appropriate in these circumstances.
Currently data from the Regional Alberta Observatory for Earthquake Studies Network (RAVEN) can be streamed in near real time from the IRIS Data Management Centre. Where appropriate, using this data would save many disposal scheme holders from spending money on an essentially redundant seismic network. This is particularly important for small operators that do not have the capacity to fund a real-time seismic monitoring array, especially in areas where subscription-based seismic arrays are not available. There is no need for a disposal scheme approval holder to employ a seismic network if the regional network can meet the needs of an MMR (i.e., detecting a seismic event of local magnitude at least equal to the "yellow light" threshold defined in the MMR).	We expect operators to deploy an independent seismic network, functional during the duration of the activities, and take responsibility for the maintenance of that network. This is a requirement for all CO_2 sequestration activities and is only a requirement for a Class II or Class III (other than pure CO_2) fluid disposal well or scheme that is determined to be seismogenic. The data from the RAVEN stations can be used for comparative purposes, but its intention is not to provide real-time data to operators under the traffic light protocol. The RAVEN network has other purposes, and the operator should ultimately rely on the network they deploy.

Stakeholder Feedback – Issue	AER Response
Requirement 14 should be amended to state that the seismic array must include at least the following: a) a seismometer network that can reliably detect a seismic event of local magnitude (ML) at least equal to the “yellow light” threshold defined in the MMR within a ten-kilometre radius of the disposal wells (or at a greater distance as directed by the AER) b) at least one accelerometer c) an accelerometer at locations (e.g., essential infrastructure or private property) within a ten-kilometre radius of the disposal wells (unless otherwise directed by the AER) assessed in the seismic risk assessment to be particularly susceptible or sensitive to ground motion	We have noted the suggestion, however, we have not changed requirement 14 to mandate the installation of at least one accelerometer within a ten-kilometer radius around a disposal well. The installation of an accelerometer will be triggered by the presence of essential infrastructure or private property identified by the seismic risk assessment.
There is ambiguity in what the AER will consider acceptable when it comes to setting low and high threshold magnitudes. The AER should consider issuing additional guidance on how the thresholds should be determined to provide additional certainty to proponents, and consistency across the industry.	The thresholds allow for flexibility based on geography, population, infrastructure, geology, and historic seismicity. The AER will discuss with operators as thresholds are proposed and set for an area. In addition, operators can refer to the Alberta Geological Survey’s *Open File Report 2023-04*, which contains publicly available earthquake iso-nuisance and iso-damage mapping that sets public regional thresholds calibrated to regional differences in site amplification and population density.
13. Appendix P: MMV Principles and Objectives for CO_2 Sequestration Projects	
Require proof of notification to ensure oil sands, geothermal, and MRDA affected parties are aware, as the CCS tenure process has a gap in this area.	Minimum notification requirement for parties to be notified are outlined in tables 1–3. *Directive 065* is not the tool for addressing CCS tenure gaps. Alberta Energy & Minerals issues CCS tenure and can address the gap identified.

Stakeholder Feedback – Issue	AER Response
The AER should consider a more expansive review of appendix P, which relates to the requirements for measurement, monitoring, and verification plans. The requirements for an MMV do not include • the express consideration of impacts of carbon sequestration upon treaty and Indigenous rights or • ongoing and direct involvement of First Nations who live proximate to CCUS projects in monitoring or modifying the project in light of information gathered in the monitoring process. It is deeply problematic that once the AER approves a CCUS project there will be no legal requirement for the AER or the project operator to notify First Nations about their monitoring and findings even though the risk to these First Nations is likely to change with time and may be more significant as the project operates. If approved, CCUS projects will be operating on and under First Nations lands for hundreds of years with absolutely no requirement on the part of operators or the AER to keep us apprised of unexpected or evolving impacts to our health, safety, treaty rights, and reserve lands.	CO_2 sequestration schemes involve the subsurface. Any person that may have concerns about an application may file a statement of concern with the AER if they believe they may be directly and adversely affected by the application. Notices of application can be found on the AER's website. The statement of concern will be considered in the AER's decision of whether to approve or deny the application.
Per section 7(2) of the *Carbon Sequestration Tenure Regulation*, a permittee must not conduct any operations or activities under the evaluation permit unless an MMV plan has been approved in relation to the permit and the permittee complies with the approved plan." Reads as a MMV plan needs to be submitted and approved prior to drilling an appraisal well to confirm the reservoir/caprock is viable and a project exists. Clarify when the MMV plan needs to be submitted	An MMV plan is required as part of *Directive 065* CO_2 sequestration scheme application. Note that a *Directive 065* scheme application and MMV plan is not required during the evaluation phase of a CO_2 sequestration project (see https://www.aer.ca/providing-information/by-topic/carbon-capture).

Stakeholder Feedback – Issue	AER Response
14. Licence Transfers	
Insufficient risk assessment. Recommend adding the following: The license holder making the transfer request shall: a) Receive written consent from the landowner or owner of the surface lease attached to the Site. b) Prior to a transfer, the license holder shall update any interest in land to include the current survey plan for the site and the current copy of the surface lease agreement. c) The application shall be returned if the applicant has an active application against it under Section 36 of the *Surface Rights Act*. d) The application shall be returned if the applicant has any municipal tax arrears.	a) Licence transfer requirements and process are outlined in *Directive 088: Licensee Life-Cycle Management*. The recommendations have been passed on to the team that deals with licence transfers to evaluate and determine the appropriate course of action. b) Same as above. c) Same as above. d) As outlined in *Bulletin 2024-22*, and in accordance with *Ministerial Order 096/2024*, unpaid property tax arrears must exceed a certain threshold to be considered. If an applicant's unpaid property tax arrears have exceeded that threshold, then the application must include evidence that the arrears have been resolved before we can process the application.

Stakeholders Who Submitted Feedback (in alphabetical order)

Canadian Association of Petroleum Producers

Canadian Geothermal Energy Association

Cold Lake First Nations

E3 Lithium Ltd

Enbridge Inc.

Freeholders Owners Association

Gilchrist Consulting and Investigations

Orlen Upstream Corporation

Pathways Alliance

Shell Canada Ltd

Wolf Midstream