



Ministry of Energy and Resources

Notice of Accepted Amendments

Directive PNG008: Disposal and Injection Well Requirements

In February 2018, the Ministry of Energy and Resources (ER) - formerly the Ministry of the Economy - posted documents for consultation in regard to proposed changes to *Directive PNG008: Disposal and Injection Well Requirements*. The proposed changes fell into the following categories:

- General reordering of the various sections in the document to accommodate additional information and for document formatting consistency.
- Introduction of various new definitions and addition of clarifying information for some existing definitions.
- Changes to reflect current and upcoming practices in the Integrated Resource Information System (IRIS).
- Miscellaneous additions/revisions/clarifications related to the Directive. This includes references to other Directives that include requirements that the licensee must address.

ER received comments on the proposed changes and those comments and ER's responses are reflected in the following pages.

Thank-you for your review and participation in the consultation process.

For further information, please contact:

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Directive PNG008: Disposal and Injection Well Requirements - Consultation Results and Summary of Changes

Directive PNG008: Disposal and Injection Well Requirements	Directive PNG008: Disposal and Injection Well Requirements	Directive PNG008: Disposal and Injection Well Requirements	Directive PNG008: Disposal and Injection Well Requirements	Directive PNG008: Disposal and Injection Well Requirements
<p>1. Introduction</p> <p>The purpose of this Directive is to detail the wellbore design, wellbore integrity logging, operational monitoring, and reporting requirements for disposal and injection wells. Injection refers to injection of fluids into subsurface pools for the purpose of enhanced recovery and storage. Disposal refers to disposing of fluids into subsurface pools for purposes other than enhanced recovery or storage. The requirements in this Directive are designed to ensure hydraulic isolation of stored, injected or disposed fluids, and to protect groundwater and energy resources.</p>	<p>1 Introduction</p> <p>The purpose of this Directive is to detail the wellbore design, wellbore integrity logging, operational monitoring, and reporting requirements for disposal and injection wells. Injection refers to injection of fluids into subsurface pools for the purpose of enhanced recovery and storage. Disposal refers to disposing of fluids into subsurface pools for purposes other than enhanced recovery or storage. The requirements in this Directive are designed to ensure hydraulic isolation of stored, injected or disposed fluids, and to protect groundwater and energy resources.</p> <p>Disposal and injection wells that were approved before the release of this Directive Revision 1.1 dated March 28, 2018 must meet the current completion, operation, monitoring and logging requirements within five years of the effective date of this revised Directive, unless otherwise approved by ER.</p>	<p>“This Directive” is replaced with “Directive PNG008: Disposal and Injection Well Requirements (Directive PNG008)” for clarification.</p> <p>A new paragraph is added to clarify that existing disposal and injection wells must meet the Directive requirements within five years of the effective date of this revision, unless otherwise approved by ER.</p>	<p>It provides definitions for injection and disposal wells, however the definitions are different than those provided under Section 2.</p>	<p>Clarification</p> <p>They are different concepts. Section 1, second paragraph describes what “disposal” and “injection” activities are; the section 2, provides definitions for “Disposal well” and “Injection well”, which are related to a well completion.</p> <p>Clarification</p> <p>For a well previously approved under a Minister’s Order (MRO), the MRO is still valid and so as any conditions in the MRO as long as wellbore conditions remain unchanged from the original approval; other applicable requirements of this Directive, if not stipulated in the MRO, will be applied. Specifically for MWHIP, the value stipulated in the MRO is still valid subject to the well is operated at same conditions as when it was approved. Calculation of MWHIP in this Directive will be applied for any wells authorized in IRIS.</p> <p>Notwithstanding previously approved or newly authorized MWHIP, at any time, it is the licensee’s responsibility to ensure the injection pressure in the subsurface formation must not exceed the formation fracture pressure.</p>

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Original Directive/Regulation/Code	Amendment/Change/Revision	Comments/Justification	Comments/Justification	Comments/Justification
	ER refers to the latest edition of Canadian Standards Association Standard (CSA) Z341: Storage of Hydrocarbons in Underground Formations and Salt Cavern Waste Disposal, for additional requirements for the design, construction, testing, operation, maintenance and repair of underground hydrocarbon storage and cavern waste disposal projects in Saskatchewan. CSA Z341 can be accessed at CSA website at http://www.csagroup.org/ .		<p>It was proposed to change the five-year compliance requirement for Potash Waste Disposal Wells to instead be "when the well is next pulled for workover." Is this proposal no longer being considered?</p> <p>Will this include previously sanction sand disposal cavern wells? If so, will the CSA Z341 MIT testing and logging requirements be required to continue operations on these cavern wells after the 5 year period?</p>	<p>No Change No change for this statement. The intent of this Directive is to provide general requirements for all disposal and injection wells. However, if a licensee wishes to deviate from these requirements the licensee can obtain case-by-case approval upon application to and approval by ER.</p> <p>Clarification/Addition Requirements in this Directive are applied to all disposal/injection wells licensed with ER. Wells approved as a part of underground hydrocarbon storage project and waste disposal cavern project are still subject to CSA Z341 requirements in addition to requirements in this Directive. These wells are authorized by a Minister's Order (MRO) stating additional specific conditions that align with CSA Z341. Under this circumstance, the conditions of a MRO supersede the corresponding requirements in this Directive. The MRO, authorized by the Minister or delegation acting on Minister's behalf, also reflects the statement "...., unless otherwise approved by ER." Section 3 refers to CSA Z341 for requirements. 3rd paragraph of section 8 also states "Please refer to CSA Z341 for additional logging requirements for wells used for hydrocarbon storage or cavern waste disposal."</p> <p>The last paragraph in section 3 is</p>

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Original Section/Paragraph/Section	Proposed Section/Paragraph/Section	Change Description	Comments	Response/Action
				moved into section 1. Similar wording as section 8 is added in section 7 to clarify completion, testing, operation and monitoring requirements for wells used for hydrocarbon storage or cavern waste disposal.
1.2 Definitions	2 Definitions Commingled disposal means the disposal of fluids into two or more pools through a common wellbore without separate measurement of the disposal into each pool. Routine application means an application submitted to ER where a licensee self-declares that all the necessary regulatory requirements are met. Routine applications are authorized without additional review and they may be reviewed after authorization through the auditing process.	Added definitions for clarity.		Added Definition of "Commingled disposal" is added. Definition of "Routine application" are added.
2. Types of Disposal/Injection Wells 2.1 Routine Well Completion Types The following well types are considered routine for purposes of well licensing using the Integrated Resource Information System (IRIS): 1) Disposal Well (Non-Project) Non-project disposal wells are used for the disposal of fluids where the well is not part of an active project approved	4 Well Completion Types of Disposal/Injection Wells 4.1 Well Completion Types without Authorizations before Licensing The following well completion types do not require additional authorization in IRIS before licensing, as long as they are not used for commingled disposal: (1) Disposal Well Disposal wells are used for the disposal of produced salt water or brine equivalent fluids and when the well is not part of an active project approved	Subsection 4.1 is reworded for clarity.		Clarification/Addition Subsection 4.1 is reworded for clarity. "Commingled disposal" is now defined in section 2. Agreed ER has incorporated this suggestion.
				Subsection 4.1(1) "Disposal well is used for the disposal...". Suggest changing to "Disposal wells are used for the disposal..."

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Proposed Amendments	Accepted Amendments	Comments/Changes	Comments/Changes	Comments/Changes
by ECON (i.e., waterflood project, EOR project, etc.). Common disposal fluids include: a) ... b) ... c) ... d) ...	by ER (i.e., waterflood project, EOR project, storage project, etc.). Examples of the disposal fluids include the following: (a) ... (b) ... (c) ... (d) ... (e) brine, excluding potash waste brine as described in Appendix 4 and brine as a by-product from the prescribed industries in subclause 4.1(3)(b).	Subclause 4.1(1)(e) is added to clarify only specified brine can be disposed into a Disposal Well.	Subclause 4.1(1)(e) is the only mention of solution mining in the document and has raised questions as to whether solution mining wells (i.e. potash production wells) are included in the scope of PNG008. Further clarification is requested.	Clarification/Addition Subclause 4.1(1)(e) is an example of brine fluids that can be disposed through a Disposal Well. The brine, if characterized as “Potash Waste Brines” as described in Appendix 4 of this Directive, cannot be disposed into this type of well. The brine that is a by-product from prescribed industries in subclause 4.1(3)(b) and is characterizes as industrial waste fluids, cannot be disposed into this type of well and must be disposed into a Waste Disposal Well. Subclause 4.1(1)(e) is reworded for clarity.
2.3 Well Completion Types Requiring Pre-Authorization 8) Commingled Disposal Well (Commingled disposal occurs when two or more formations are perforated and are being injected simultaneously through a common well casing or a single tubing string.)	4.2 Well Completion Types Requiring Authorization before Licensing (8) Disposal wells listed in section 4.1 and used for commingled disposal (28) Waste Disposal Well, used for the disposal of cooling formation water after a heat extraction process and is part of geothermal project	Clause 4.2(8) is reworded to clarify that “Commingled Disposal Well” is not a well completion type in IRIS; instead, “Commingled Disposal” requires an IRIS application and authorization under “Reservoir - Commingling” before licensing.		Clarification/Addition Clauses 4.2(8) is reworded for clarity. “Commingled disposal” is now defined in section 2. Added Clauses 4.2(28) is added to indicate a waste disposal well as part of a geothermal project will require prior authorization.
New	5.2 Drainage Unit/Area for Disposal/Injection Wells The drainage unit/area assigned to a disposal/injection well is that which would be assigned to an oil producing well. Please refer to Directive PNG006 and Guideline PNG021 on how to determine the drainage unit/area. Please note that target area is not applied to disposal/injection wells. A	New subsection 5.2 is added to clarify how the Drainage Unit/Area (DU/DA) for disposal and injection wells is assigned.	Clarification on whether there is also a target area assigned within the drainage unit? (As if there was an existing or proposed disposal/injection well which fell outside of the target area, would we need to apply for an off-target waiver?) Would like to have more explanation as to why ER can make modification of	Clarification Target area is not applied to disposal/injection wells. A target area is only valid for producing completions within a defined drainage unit/area (DU or DA). Clarification/Addition In this Directive, we deem the mineral lands impacted by the disposal or

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Existing Directive Section/Wording	New Directive Section and Wording	Rationale for Changes	Comments	Response/Decision
	request for modification of drainage unit/area for a disposal/injection well that is subject to a lease of spaces agreement issued under The Oil and Gas Tenure Registry Regulations must be emailed to petlands@gov.sk.ca .		drainage unit/area on a disposal/injection well?	injections are the same lands defined as being oil well spacing (DU/DA). Based on comments and response, subsection 5.2 is reworded for clarity.
3.1 Rights to Dispose 1) Freehold land: written consent must be obtained from the mineral lessors and lessees, other than the applicant.	5.3 Written Consent for Disposal Wells (1) Freehold land: written consent from all freehold mineral owners, other than the applicant, within the drainage unit/area of the proposed disposal well. 5.4 Written Consent for Injection Wells Written consent is required from all freehold mineral owners within the drainage unit/area of the proposed injection well, before submitting an application for the injection well.	. New subsection 5.4 is added to clarify written consent requirements for injection wells.	Section 5.4 states that consent is required from all freehold mineral owners, while Section 5.3 (1) suggests that consent is only required from freehold lessees/lessors. These requirements are significantly different for potash. Please provide clarification.	Clarification/Addition Written consents from of all mineral owners are required to dispose of fluids into subsurface pools. Clause 5.3(1) is reworded for clarity and consistent with clause 5.4.
5. Casing and Cementing Requirements 1) Waste Disposal Wells – Acid Gas Acid-resistant cement must be used from total depth to above the disposal zone.	6 Casing and Cementing Requirements (1) Acid gas disposal well Acid-resistant cement must be used from total depth to above the disposal zone. (2) Any new injection and disposal wells within an approved thermal EOR project area, as defined in a Minister’s Order for that specific project, will be required to have thermal cement and casing from total depth to surface. It is recommended that all new injection and disposal wells, currently outside of an approved	The term “Waste Disposal Wells – Acid Gas” is changed to “Acid gas disposal well” to align with the addition of the new well completion type. Clause 6(2) is added for casing and cementing requirements for new injection and disposal wells in thermal EOR project areas.	The definition of acid gas includes CO2. Acid gas disposal wells are required to have acid-resistant cement from the total depth to above the disposal zone. Does this include cyclic injection/production wells in addition to disposal wells? What is the proximity/distance to the thermal projects?	Clarification In this Directive, acid-resistant cement is required only for acid gas disposal wells. Cyclic injection/production wells are outside of this requirement. Clarification/Addition In this Directive, clause 6(2) is only applied to new injection and disposal wells within a thermal EOR project area, which is defined in a specific Minister’s Order (MRO) when issuing an authorization. However, from a field practice perspective, if a company has future plans for thermal development outside of an approved thermal EOR area it is recommended that all wells

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Original Regulatory Requirement	Proposed Amendment	Comments	Comments	Comments
	thermal EOR project area but may be included as part of the future thermal development, be completed with thermal casing and cement.			are completed with thermal casing and cement. Clause 6(2) is reworded for clarity.
<p>4. Common Requirements for Disposal/Injection Wells</p> <p>7) For potash waste disposal wells, annual pressure fall-off test must be conducted and submitted, unless otherwise approved by ECON. Refer to Appendix 4: Potash Waste Disposal Well for details.</p>	<p>7 Completion, Operation and Monitoring Requirements Please refer to CSA Z341 for additional completion, testing, operation and monitoring requirements for wells used for hydrocarbon storage and cavern waste disposal.</p> <p>8) For potash waste disposal wells, unless otherwise previously exempted by ER or on an application and authorization in IRIS, annual pressure fall-off tests must be conducted. The test report must be submitted in IRIS in accordance with Directive PNG013. Refer to Appendix 4: Potash Waste Disposal Well for details.</p>	<p>Clause 7(8) is the former clause 4.7). It is reworded.</p>	<p>Please provide clarification on what constitutes an acceptable "annual formation pressure survey".</p> <p>Many potash sites have exemptions for performing annual fall-off testing on potash waste disposal wells in lieu of alternative formation evaluation methods - are these exemptions still valid going forward? If not, do they have to be re-submitted into IRIS?</p> <p>Please provide clarification on how to enter annual pressure survey data and/or waiver into IRIS.</p>	<p>Added. Based on comment and response in section 1, a paragraph is added to specify wells used for hydrocarbon storage and cavern waste disposal are subject to additional CSA Z341 requirements.</p> <p>Clarification/Addition "annual formation pressure survey" is equivalent to "Bottom-hole pressure surveys" as stipulated in section 91 of OGCR. To be consistent with previous approval, "annual pressure fall-off tests" is used to replace the "annual formation pressure survey".</p> <p>The previous exemptions are still valid and re-submission is not required.</p> <p>Please refer to section 9 of Directive PNG013: Well Data Submission Requirements to enter well test data. The licensee must submit information into IRIS within 30 days of the date of a test or analysis being performed. The test data can be uploaded under Test tab – Test & Analysis - File Type as Bottom Hole Pressure Survey.</p> <p>Request to deviate from annual fall-off test requirement must be submitted in</p>

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Initial Proposed Amendment	Revised Proposed Amendment	Comments and Changes	Comments	Response/Action
	<p>9) All surface casing vent issues (presence of gas or fluid at surface) must be reported to the appropriate field office or the Ministry's Petroleum and Natural Gas Emergency Support Line at 1-844-764-3637. Management of the issue after consultation and assessment review will be dealt with in manner that ensures worker, public, environmental and subsurface reservoir protection.</p>	<p>New clause 7(9) is added to specify surface casing vent flow requirements.</p>	<p>Does this only apply to producing injection/disposal wells or does it also apply to inactive?</p> <p>Does this also apply to non-serious vent flows? What's the definition of non-serious?</p> <p>Does this mean that any detectable surface casing vent flow on any disposal/injection well will require the well to be shut in, and remedial work required to correct the surface casing vent flow before the well can be put back into service? Recommendation that a threshold be put in place to dictate whether a SCVF is serious or non-serious and the requirement and timing for remedial work.</p>	<p>IRIS: Applications – Reservoir – Well Test for each requested well separately. Based on all comments and response, clause 7(8) is reworded for clarity. Appendix 4: Operational Monitoring (4) is reworded accordingly.</p> <p>Clarification Clause 7(9) applies to all wells Licensed by the Saskatchewan Ministry of Energy and Resources regardless of their status or record type.</p> <p>Clarification The risk and the required appropriate response will be determined once we have the conversation at the time of notification.</p> <p>Clarification The tolerance for not reporting SCV issues (presence of gas or fluid at surface) has always been and shall remain zero. The spectrum for industry action requirements is report, assess, manage by approved simple engineering solution on surface through to major well bore integrity assessment which will likely result in a significant intrusive remedial repair or possible abandonment. The successful management of this type of common occurrence will be assured when Ministry Field Operation staff, are included in the process from the start. When a surface casing vent is found</p>

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Section	Section	Section	Section	Section
			<p>Some wells (production and/or injection) may have surface casing vent flows, whether minor or major, due to stray gas or biogenic methane found in shallow, near- surface formations. Quite often it has nothing to do with the integrity of the well casing. Surface casing vent flows and gas migration are very different and should be managed/regulated differently. We request that Directive Condition 7 (9) be removed from PNG008. If this is not an option, then please provide detailed guidance related to surface casing vent flow (e.g. how to check, testing methodologies and frequency, pass/fail criteria, etc.). The reference to PNG026 could be replaced with reference to the new document that includes these details.</p>	<p>closed or not properly plumbed during a routine regulatory inspection it is sited as a non-compliance item in IRIS requiring a response from the Licensee. Refer to subsection 42(5) of <i>The Oil and Gas Conservation Regulations, 2012</i> for SCV requirements.</p> <p>Clarification The intent of the clause 7(9) is to specify the regulatory process requirements for surface casing vent flow. We are setting the threshold requirement for notification in the statement. All surface casing vent issues (presence of gas or fluid at surface) must be reported to the appropriate field office and at that time a decision can be made. There are a number of surface casing flow testing techniques used in the industry, as listed in Alberta Energy Regulator (AER) Bulletin 2011-35.</p> <p>Addition Based on all comments and response, the clause 7(9) will remain but is reworded. The reference to PNG026 is removed.</p>
6. Logging Requirements	<p>8 Logging Requirements</p> <p>(3) Casing Inspection Log</p> <ul style="list-style-type: none"> A subsequent casing inspection log must be run every ten (10) years on waste disposal wells and potash waste disposal wells. 		<p>Section 8(3) last bullet point, "... waste disposal wells <u>or</u> potash waste disposal wells." Suggest changing to, "...waste disposal wells <u>and</u> potash waste disposal wells."</p>	<p>Agreed ER has incorporated this suggestion.</p>
Appendix 1: Common Disposal Pools	Appendix 1: Common Disposal Pools			

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Amendment Number	Amendment Description	Amendment Subject	Comments	Response
Map 2 – Routinely Approved Dina Disposal Pools in the Lloydminster District Common Dina Disposal Area: Townships 44 to 52, Ranges 23W3 to 28W3M; Townships 48 to 50, Ranges 19W3M to 22W3M.	Map 2 Common Disposal Pool in Lloydminster Area Pool Name: Dina Sand (Misc.) Pool Code: 236116 Stratigraphic Unit: 6900 – Dina Member Area within Common Disposal Pool: Townships 44 to 52, Ranges 23W3 to 28W3M; and Townships 48 to 50, Ranges 19W3M to 22W3M.		In Appendix 1 Map 2 there is a typo in the Formation Name. Dina is incorrectly spelled as Dian in one instance.	Agreed Corrected “Dian” to “Dina”.
Appendix 3: Calculation of Maximum Wellhead Injection Pressure $MWHIP = (P_{Fracture} \times 0.9) - P_{Fluid}$ $P_{Fracture}$: Formation fracture pressure, in kPa, determined from procedures outlined in section 9 of this Directive. In the absence of local fracture pressure data, the MWHIP can be calculated using the following equation: $MWHIP = \text{depth to top of injection/disposal interval (mTVD)} \times (18.1 - \text{disposal fluid gradient}) \text{ (kPa/m)}$	Appendix 3: Calculation of Maximum Wellhead Injection Pressure $MWHIP = (P_{Fracture} \times 0.9) - P_{Fluid}$ $P_{Fracture}$: Formation fracture pressure, in kPa, determined from procedures outlined in section 11 of this Directive. A more conservative safety factor may be required, by a Minister’s Order, subject to the well completion type, higher operational risks, wellbore and reservoir integrity, etc. In the absence of local fracture pressure data, the MWHIP can be calculated using the following formula: $MWHIP = \text{depth to top of injection/disposal interval (mTVD)} \times (18.1 - \text{disposal/injection fluid gradient}) \text{ (kPa/m)}$	Appendix 3 is amended to provide greater clarity for the determination of MWHIP, safety factor, fluid gradient and alternative method.	Appendix 3, under $P_{Fracture}$, change reference to “Section 9” to “Section 11”. Existing potash waste disposal wells each have an MRO that states the MWHIP. This stated value is often lower than the MWHIP value arrived at using the calculation instructions within PNG008. Please provide clarification on which we are bound to follow.	Agreed. ER has incorporated this suggestion. Clarification Existing wells: The previous MROs are still valid and so as any conditions stipulated in the MROs if wellbore conditions remain unchanged. Other applicable requirements of this Directive, if not stipulated in the MROs, will be applied. New authorized wells (new licensed or reclassified/recompleted): The calculation instructed in this Directive will be applied. Please note that with IRIS implementation, ER typically doesn’t issue MRO for disposal wells if they are not part of an authorized project. Requirements in this Directive are default conditions for any authorized disposal wells. If the MWHIP in the previous MRO is

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Revised, Deleted, or New Wording	Original Wording	Comments/Changes	Comments	Response/Clarification
				lower than the newly calculated instructed by this Directive and a licensee wishes to increase the MWHIP, please follow instructions in clause 7(1) in this Directive to reflect the changes in IRIS. Please note that at any time, it is the licensee's responsibility to ensure the disposal pressure in the disposal formation must not exceed the formation fracture pressure.
Appendix 4: Potash Waste Disposal Well Operational Monitoring 1) The maximum wellhead injection pressure must not exceed the formation fracture pressure and is subject to calculating criteria in this Directive; 4) Annual formation pressure survey must be conducted and submitted, unless otherwise stipulated by ECON.	Appendix 4: Potash Waste Disposal Well Operational Monitoring (1) The MWHIP must not exceed the formation fracture pressure and is subject to the calculation criteria in this Directive; (4) Unless otherwise previously exempted by ER or authorized on an application through IRIS, an annual pressure fall-off test must be conducted and the test result must be submitted through IRIS within 30 days after the test is performed. Refer to Directive PNG013 for requirements on submission of well data for a test – Bottom Hole Pressure Survey.		Same clarification requested as Appendix 3 for MWHIP values for previously approved wells by MRO and new authorized wells in IRIS.	Response. See clarifications in Appendix 3 and in section 1. Clarification/Addition Operational Monitoring item (4) is reworded based on comments and response for clause 7(8).