



WELL SUSPENSION AND ABANDONMENT GUIDELINES AND INTERPRETATION NOTES

**OFFICE OF THE REGULATOR OF OIL AND GAS
OPERATIONS**

Well Suspension and Abandonment Guidelines and Interpretation Notes

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Well Suspension and Abandonment Guidelines and Interpretation Notes

1. INTRODUCTION

Purpose	The <i>Well Suspension and Abandonment Guidelines and Interpretation Notes</i> (Guidelines) provide guidance to applicants and operators on the suspension and abandonment of wells and on the monitoring of suspended wells.
Legislative Requirements	<p>The legislative requirements for the suspension and abandonment of wells are:</p> <ul style="list-style-type: none">• Section 56 of the <i>Oil and Gas Drilling and Production Regulations</i> (OGDPR) requires operators to suspend or abandon wells so as to meet certain criteria.• Section 57 of the OGDPR requires operators of suspended wells to meet certain monitoring and inspection requirements.
Minimum Requirements	The Guidelines set out the minimum requirements for well suspension and abandonment. Applicants may suggest alternative approaches, where those approaches are demonstrated to meet or exceed the same standards for the protection of human safety and the environment.
Regulations are Paramount	Where a conflict exists between the Guidelines and the OGDPR, the OGDPR are paramount.
Regulator's Approval Required	Suspending or abandoning a well is a "well operation" as defined in the OGDPR. Proposals for well operations must be approved by the Regulator before they can proceed (see section 7 for details on the application process).
Objectives	<p>The objectives of the Guidelines are to:</p> <ul style="list-style-type: none">• Support compliance with the OGDPR;• Ensure good oil field practices are used to suspend and abandon wells in the Regulator's jurisdiction;• Be consistent with the requirements of other western Canadian regulators, where appropriate; and• Reflect the context of oil and gas activities in the Regulator's jurisdiction, particularly:<ul style="list-style-type: none">○ The legislative framework, and○ The remote operating environment.
Authority	These Guidelines are issued by the Regulator under section 18 of the <i>Oil and Gas Operations Act</i> (OGOA).

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Regulator's Discretion Application of these Guidelines is subject to the Regulator's discretion under OGOA.

Scope The Guidelines apply to all suspension and abandonment activities in the jurisdiction of the Regulator, effective February 1, 2017, unless otherwise required by the Regulator.

Jurisdiction



Previously Suspended Wells

The suspended well testing and inspection requirements in section 5D apply to wells suspended prior to the coming into effect of the Guidelines.

Wells suspended prior to the coming into force of the Guidelines will be assessed by the Office of the Regulator of Oil and Gas Operations (OROGO) for compliance with the Guidelines and the OGDPR. The assessment will use the most recent well inspection reports available, as well as information on the original suspension of the well.

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If a well suspended prior to the coming into force of the Guidelines is **not in compliance** with the Guidelines and/or OGDPR:

1. OROGO will notify the operator of the well;
2. The operator must re-suspend or abandon the well in accordance with these Guidelines within two years of notification, or as otherwise specified by the Regulator; and
3. If the operator chooses to re-suspend the well, the well must be abandoned within six years of the re-suspension, in accordance with these Guidelines, unless it is brought back into production.

If a well suspended prior to the coming into force of the Guidelines is **in compliance** with the Guidelines and/or OGDPR, it must be brought back into production or abandoned in compliance with the Guidelines by January 31, 2023.

To facilitate planning for these abandonments, operators of suspended wells must submit a plan to OROGO for the abandonment of those wells no later than January 31, 2021.

Previously Abandoned Wells and Zones

Wells and zones that were abandoned prior to the coming into force of the Guidelines are not required to be re-abandoned to the standards contained in these Guidelines.

If a previously abandoned well or zone is re-entered, it must be abandoned as required in these Guidelines from the re-entry depth to surface.

If a previously abandoned well or zone is found to be leaking, it must be re-abandoned as required in these Guidelines from the leaking zone to surface. As required under section 75 of the OGDPR, OROGO must be notified of a leaking previously-abandoned well as soon as possible and the leak must be repaired.

Open Hole Wells

The suspension or abandonment of open hole wells is not addressed in these Guidelines. The Regulator will consider applications for the abandonment or suspension of open hole wells on a case-by-case basis.

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2. WELL CLASSIFICATION FRAMEWORK

Contents This section describes the well classification framework used in these Guidelines.

Well Classification These Guidelines classify wells based on their type and their risk level at the time of proposed suspension or abandonment.

Well Type Wells are classified as exploratory, production or non oil and gas wells:

Well Type	Definition
Exploratory Well	A well drilled under an exploration licence or significant discovery licence issued under Part 3 of the <i>Petroleum Resources Act</i> (PRA), including “delineation wells” as defined in section 91 of the PRA.
Production Well	A well drilled under a production licence issued under Part 4 of the PRA, including injection and disposal wells and “development wells” as defined in section 91 of the PRA.
Non Oil and Gas Well	A well drilled for any purpose through sedimentary rocks to a depth of at least 150 meters that is not an Exploratory Well or a Production Well.

Risk Level The risk level of a well is determined based on the fluid produced or injected, the presence of hydrogen sulphide gas (H₂S) and well pressure:

Risk Level	Characteristics
Level I	Fluid: Acid gas wells and critical sour wells and/or H ₂ S: > 50 mole / kilomole and/or Pressure: A pore pressure that is greater than 18.1 kPa/m (~15.3 lbm/gal) or requiring a blow-out preventer with a rating in excess of 68.95 mPa (10,000 psi).
Level II	All other wells

Definitions An **acid gas well** is a well that produces a combination of any amount of H₂S and CO₂ or into which a combination of any amount of H₂S and CO₂ is injected.

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A **critical sour well** is a well with a known H₂S release rate upon completion of:

- 0.01 cubic meters per second (m³/s) or greater and less than 0.1 m³/s and located within 500 meters of the boundaries of a population centre;
- 0.1 m³/s or greater and less than 0.3 m³/s and located within 1.5 kilometers (km) of the boundaries of a population centre;
- 0.3 m³/s or greater and less than 2.0 m³/s and located within 5 km of the boundaries of a population centre; or
- 2.0 m³/s or greater.

A **population centre** is any incorporated, unincorporated or self-governing community in the Northwest Territories, any seasonal camp or similar area, or as otherwise determined by the Regulator.

Wells with Multiple Zones

For wells with multiple zones, the well must be classified based on the highest risk zone in the wellbore that has not been completely abandoned in accordance with these Guidelines.

3. CEMENT REQUIREMENTS

- Contents** This section contains the requirements for the cement used in suspension and abandonment programs.
- Objective** Appropriate cement is used to achieve well suspension or abandonment in accordance with section 56 of the OGDPR.
- Compressive Strength Requirements** The cement used for plugs must have a compressive strength of at least 3,500 kPa after curing for 48 hours.

4. GAS MIGRATION, SURFACE CASING VENT FLOW AND ANNULAR PRESSURE TESTING REQUIREMENTS

Contents This section contains the gas migration, surface casing vent flow and annular pressure testing requirements for all wells:

- Section 4A – Gas migration
- Section 4B – Surface casing vent flow
- Section 4C – Annular pressure
- Section 4D – Casing failures

Objective Gas migration, surface casing vent flows and annular pressures are identified and addressed during suspension and abandonment processes.

Definitions **Gas migration (GM)** is a flow of gas that is detectable at surface outside of the outermost casing string (often referred to as external migration or seepage).

The GM is considered **serious** if:

- There is a fire or public safety hazard or off-lease environmental damage, such as groundwater contamination;
- The GM occurs along with surface casing vent flow; or
- The GM occurs after the well is abandoned.

Otherwise the GM is generally considered **non-serious**.

Surface casing vent flow (SCVF) is the flow of gas and/or liquid or any combination out of the surface casing / casing annulus (often referred to as internal migration).

An SCVF is considered **serious** if the vent flow:

- 1) Constitutes a fire, public safety or environmental hazard;
- 2) Has a stabilized gas flow equal to or greater than 300 m³/day and/or equal to a surface casing vent stabilized shut-in pressure greater than:
 - a. One-half the formation leak-off pressure at the surface casing shoe, or
 - b. 11 kPa/m times the surface casing setting depth;
- 3) Contains H₂S;
- 4) Contains hydrocarbon liquid (oil);

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- 5) Contains saline water (any water with total dissolved solids (TDS) greater than 4,000 mg/l);
- 6) Contains non-saline water where the surface shut-in pressure is as referenced in 1(a) or (b);
- 7) Is due to a wellhead seal failure or casing failure; or
- 8) Occurs along with GM.

Otherwise the SCVF is generally considered **non-serious**.

Annular pressure is sustained pressure in a casing annulus, excluding the surface casing and the tubing/casing annulus.

Regulator's Decision

The Regulator may determine that a GM or SCVF is considered serious for reasons other than those described in the definitions above and require that corrective action be taken by the operator.

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4A. Gas Migration

Contents	This section contains the requirements for: <ul style="list-style-type: none">• The timing of gas migration (GM) testing;• Conducting GM testing;• GM testing equipment;• Notification of GM; and• Repair of GM.
Objective	GM is identified and addressed during suspension and abandonment processes.
Timing of Testing	Testing for GM must occur prior to beginning the downhole suspension or abandonment program. Testing must be done in frost free months only and periods immediately after a rainfall must be avoided.
Testing for GM	GM testing consists of: <ol style="list-style-type: none">1) Establishing the background methane level:<ol style="list-style-type: none">a. Testing points must be at least 10 meters from the well;b. A minimum of 3 test points within +/- 2 parts per million (ppm) must be established; andc. The background value is the average of the test points that are within +/- 2 ppm.2) Using air-soil interface gas detection to confirm the integrity of the well by measuring methane concentrations above the background methane level.3) If the air-soil interface measurements detect methane, using in-soil gas detection (augering holes in the soil) to measure methane concentrations.
Gas Detection Equipment	The proposed gas detection equipment and methodology must be approved by the Regulator before use as part of the application for approval to Alter the Condition of a Well.
Notification	If testing indicates the presence of GM, the operator must notify the Regulator as soon as possible.

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Repair

Repair requirements are contained in other sections of these Guidelines, as follows:

- Section 5C describes GM repair requirements during suspension programs.
- Section 6D describes GM repair requirements during abandonment programs.

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4B. Surface Casing Vent Flow

Contents	This section contains the requirements for: <ul style="list-style-type: none">• The timing of surface casing vent flow (SCVF) testing;• Conducting SCVF testing;• SCVF rate determination;• Determination of stabilized shut-in surface casing pressure;• Notification of SCVF; and• Repair of SCVF.
Objective	SCVF is identified and addressed during suspension and abandonment processes.
Timing of Testing	Testing for SCVF must occur prior to beginning the downhole suspension or abandonment program and again prior to surface abandonment.
Testing for SCVF	<p>SCVF testing consists of a bubble test, which must be conducted with a hose 2.5 cm below the water surface for a minimum of 10 minutes. If any bubbles are presented during the 10 minutes test, the well has an SCVF.</p> <p>The hose must have an inside diameter of 6 – 12 mm.</p>
SCVF Rate Determination	<p>If bubbles were present during the bubble test, an SCVF rate test must be conducted. This test should be continued until a stabilized rate is obtained.</p> <p>The operator must use either a positive displacement gas meter, an orifice well tester to measure vented gas volumes or another method approved by the Regulator.</p> <p>Rate determination must be completed in normal venting conditions (i.e. not immediately following a build up).</p>
Determination of Stabilized Shut-in Surface Casing Pressure	<p>If bubbles were present during the bubble test, the surface casing vent must be shut in until a stabilized pressure is obtained, to a maximum pressure of 11 kPa/m x length of surface casing setting depth (in meters). Another method may be used if approved by the Regulator.</p> <p>The pressure is considered stabilized if the change in pressure is less than 2 kPa/hr over a six hour period.</p>

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Notification If testing indicates the presence SCVF, the operator must notify the Regulator as soon as possible.

Repair Repair requirements are contained in other sections of these Guidelines, as follows:

- Section 5C describes SCVF repair requirements during suspension programs.
- Section 6D describes SCVF repair requirements during abandonment programs.

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4C. Annular Pressure

Contents	This section contains the requirements for: <ul style="list-style-type: none">• Timing of annular pressure testing;• Conducting annular pressure testing;• Notification of annular pressure; and• Repair of annular pressure.
Objective	Annular pressure is identified and addressed during suspension and abandonment processes.
Timing of Testing	Testing for annular pressure must occur prior to beginning the downhole suspension or abandonment program and again prior to surface abandonment.
Testing for Annular Pressure and Flow	The pressure on any casing must be recorded. In the event of pressure being present, the operator may safely bleed off the pressure. If the pressure continues to build or cannot be bled off, the annulus must be left to vent for up to 24 hours. A check for flow must then be performed as per section 4B.
Notification	If testing indicates the presence of annular pressure, the operator must notify the Regulator as soon as possible.
Repair	Repair requirements are contained in other sections of these Guidelines, as follows: <ul style="list-style-type: none">• Section 5D describes annular pressure repair requirements during suspension programs.• Section 6D describes annular pressure repair requirements during abandonment programs.

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4D. Casing Failure

Contents	This section contains the requirements for notification and repair of casing failures.
Definition	A casing failure is any loss of casing integrity, including casing damage that results in suspension of operations or in abandonment of the well.
Objective	Casing failures are repaired without delay, in accordance with section 38 of the OGDPR.
Casing Failure Notification	If a casing failure is suspected during the GM, SCVF or annular pressure repair process, the operator must notify the Regulator as soon as possible and provide a report, within 21 days, assessing the leak or failure, including a discussion of the cause, duration, damages, proposed remedial program and measures to prevent future failures.
Casing Failure Repair	Should the suspension or abandonment program be terminated due to an identified casing failure, the operator must begin repair planning immediately and perform remedial action on a casing failure without delay.

5. WELL SUSPENSION AND MONITORING REQUIREMENTS

Contents This section describes well suspension and monitoring requirements:

- Section 5A – Wellhead requirements
- Section 5B – Downhole requirements
- Section 5C – Gas migration and surface casing vent flow repair requirements
- Section 5D – Testing and inspection requirements

Definition The OGDPR define a **suspended well** as “a well or part of a well in which drilling or production operations have temporarily ceased”.

Requirement A suspended well must have at least two independent and tested well barriers in place during well suspension, in accordance with section 36(2) of the OGDPR.

Definition A **well barrier** is any fluid, plug or seal that prevents gas or oil or any other fluid from flowing unintentionally from a well or from a formation into another formation.

A **tested well barrier** does not include fluid, as the barrier properties of fluids are not testable and fluids may not remain in place over time.

Timing Well suspension must be completed during the timeframes shown below.

Type of Well	Timeframe to Suspension
Exploratory well	<p>If flow testing is being conducted through a dual-barrier configuration, then the well must be suspended immediately after completion.</p> <p>If another flow testing plan is proposed, the operator must provide this plan when applying to drill the well and must propose a timeframe for suspension.</p>
Production well	<p>Within one year of the anniversary of no production / injection / disposal, the operator must provide a plan for suspension to the Regulator for approval.</p> <p>Suspension must be completed within two years of the anniversary of no production / injection / disposal.</p>

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Non Oil and Gas well	Within one year of the anniversary of no use of the well for its original intended purpose, the operator must provide a plan for suspension to the Regulator for approval. Suspension must be completed within two years of the anniversary of no use of the well for its original intended purpose.
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Continued Responsibility

Operators must be able to demonstrate to the Regulator that wellbore integrity is being maintained at all times before, during and after well suspension activities.

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5A – Wellhead Requirements for Suspended Wells

Contents	This section contains information on: <ul style="list-style-type: none">• Standard wellhead requirements;• Critical sour wellhead requirements;• Wellhead maintenance requirements; and• Requirements for securing suspended wells.
Objective	The wellhead and Christmas tree on a suspended well should function as a barrier under the maximum load condition.
Standard Wellheads	Wellheads for suspended wells must be consistent with <i>Minimum Wellhead Requirements – An Industry Recommended Practice (IRP) for the Canadian Oil and Gas Industry</i> , issued by the Enform Drilling and Completion Committee, unless the well is classified critical sour.
Critical Sour Wellheads	Wellheads for suspended critical sour wells must be consistent with <i>Completing and Servicing Critical Sour Wells – Industry Recommended Practice (IRP)</i> , issued by the Enform Drilling and Completion Committee.
Definitions	<p>A critical sour well is a well with a known H₂S release rate upon completion of:</p> <ul style="list-style-type: none">• 0.01 cubic meters per second (m³/s) or greater and less than 0.1 m³/s and located within 500 meters of the boundaries of a population centre;• 0.1 m³/s or greater and less than 0.3 m³/s and located within 1.5 kilometers (km) of the boundaries of a population centre;• 0.3 m³/s or greater and less than 2.0 m³/s and located within 5 km of the boundaries of a population centre; or• 2.0 m³/s or greater. <p>A population centre is any incorporated, unincorporated or self-governing community in the Northwest Territories, any seasonal camp or similar area, or as otherwise determined by the Regulator.</p>
Wellhead Maintenance	Wellhead maintenance requirements for suspended wells are: <ul style="list-style-type: none">• There shall be no wellhead leaks;• Wellheads require servicing and pressure testing of sealing elements at time of suspension and at each subsequent inspection (see Section 5D) in accordance with the Original Equipment Manufacturer's (OEM) guidelines;

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- All outlets except surface casing vents are to be bull plugged or blind flanged with needle valves or an equivalent method of managing the hazard of trapped pressure;
- Valves must be functional (open/close); and,
- Grease and service as required to maintain functionality.

Securing Suspended Wells

Requirements for securing suspended wells are:

- All wellheads are to be conspicuously marked or fenced such that they are visible in all seasons with a well identification sign in plain view;
- All wellheads must be safely accessible for inspection and monitoring;
- Land uses in the area must be restricted to safe distances from the wellhead;
- Pumpjacks must be left in a secure condition;
- Valve handles must be chained and locked or, as an alternative, valve handles may be removed; and
- Physical barriers that are clearly visible must be constructed around wellheads to prevent accidental vehicular damage, unless otherwise approved by the Regulator.

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5B – Downhole Well Suspension Requirements

Contents This section contains information on downhole well suspension:

- Downhole suspension options for different well types and risk levels;
- Requirements for bridge plugs;
- Requirements for packer and tubing plugs; and
- Wellbore fluid requirements.

Objective A suspended well must have at least two independent and tested well barriers in place during well suspension and must be suspended in accordance with section 56 of the OGDPR.

Wells must be suspended in a manner that enables the safe resumption of operations.

Wellhead is a Barrier An approved wellhead, properly maintained and functioning as outlined in section 5A, is an independent barrier to flow for the purposes of suspension.

Downhole Suspension Downhole suspension requirements vary by type of well, as shown below.

Well Type / Risk Level	Downhole Suspension Requirements
Level I exploratory and production wells	Option 1 – Packer and a tubing plug, pressure tested as required in section 5D Option 2 – Bridge plug topped with 8 lineal meters of cement, pressure tested as required in section 5D
Level II exploratory and production wells	Option 1 – Packer and a tubing plug, pressure tested as required in section 5D Option 2 – Bridge plug, pressure tested as required in section 5D
Non oil and gas wells	Option 1 – Suspend using one of the options for Level II exploratory and production wells Option 2 – Apply to the Regulator for a waiver to the Level II well suspension requirements and propose an alternative approach.

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- Bridge Plugs** Retrievable bridge plugs are acceptable for use during suspension, but not during abandonment. Operators should consider the setting depth required for abandonment when placing bridge plugs for suspension.
- Packer and Tubing Plugs** Packer and tubing plugs are acceptable for use during suspension, but not during abandonment.
- Wellbore Fluid** The wellbore must be filled with corrosion-inhibiting fluid. Non-freezing liquid must be used within the permafrost zone.

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5C – Gas Migration and Surface Casing Vent Flow Testing and Repair Requirements during Well Suspension

Contents	This section contains direction on addressing GM and SCVF identified during well suspension programs.
Objective	GM and SCVF in suspended wells are risk managed in a way that reflects the severity of the issue.
Required Testing	Testing for GM and/or SCVF must occur prior to beginning the downhole suspension (see section 4).
Addressing GM or SCVF	If testing indicates the presence of GM or SCVF, the suspension program must be adjusted based on the serious or non-serious nature of the GM or SCVF:

Nature of GM / SCVF	Requirements
Serious GM or SCVF	<p>The GM or SCVF must be repaired before continuing with the suspension program. The repair program must be included in the application to Alter the Condition of a Well and must:</p> <ul style="list-style-type: none"> • Describe the proposed method to identify the source of the GM/SCVF flow; • Provide all relevant logs and analysis that identify the source of the fluids; • Provide details of the cementing program that include applicable perforation and cement squeeze operations and testing procedure; • Identify the base of groundwater protection depth; and • Provide complete details of the proposed repair program.
Non-Serious GM or SCVF	<p>The suspension program may continue without repairing the GM or SCVF.</p> <p>The suspended well testing and monitoring program must be adjusted (see section 5D).</p>

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5D –Testing and Inspection Requirements for Suspended Wells

Contents This section contains information on the pressure testing and inspection requirements for suspended wells:

- Types of testing required;
- Inspection frequencies for
 - Level I and Level II exploratory and production wells;
 - Wells with non-serious GM or SCVF; and
 - Non oil and gas wells; and
- Notification of failures, including annular pressure.

Objective All wells are monitored and inspected in accordance with section 57 of the OGPDR.

Types of Testing Required Suspended wells must be tested as follows:

- 1) SCVF test – see Section 4 for details on appropriate testing processes; and
- 2) Wellhead pressure test – pressure test the wellhead valves and the seal assembly as described in the OEM Guidelines.

If the well fails either of the above tests, a well integrity test (pressure testing the annulus and tubing or the casing to 7 mPa for 10 minutes) is also required.

Level I Exploratory and Production Wells Suspended Level I exploratory and production wells must be inspected as follows:

Downhole Suspension Approach	Inspection Frequency
Packer and Tubing Plug	Annual testing
Bridge Plug	Initial testing within 12 to 24 months after suspension; and subsequent testing at 5 years after suspension or prior to applying to abandon the well, whichever comes first.

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**Level II
Exploratory
and
Production
Wells**

Suspended Level II exploratory and production wells must be inspected as follows:

Downhole Suspension Approach	Inspection Frequency
Packer and Tubing Plug	Testing every 3 years
Bridge Plug	Testing at 5 years after suspension or prior to applying to abandon the well, whichever comes first.

**Wells with
Non-Serious
GM or SCVF**

Suspended wells with non-serious GM or SCVF must be inspected using the testing and inspection frequencies for Level I wells.

The Regulator may require additional testing or monitoring for the purposes of verification and/or analysis of the non-serious GM or SCVF.

**Non Oil and
Gas Wells**

Suspended non oil and gas wells must be inspected using the testing and inspection frequencies for Level II wells, unless otherwise required by the Regulator.

**Failure
Notification**

If a failure, including annular pressure, is discovered during the testing process, the operator must notify the Regulator as soon as the circumstances permit and provide a report, within 21 days, assessing the failure, including a discussion of the cause, duration, damages, proposed remedial program and measures to prevent future failures.

6. WELL ABANDONMENT REQUIREMENTS

Contents	This section contains the abandonment requirements for all wells: <ul style="list-style-type: none">• Section 6A – Downhole abandonment requirements<ul style="list-style-type: none">○ Section 6Ai – Requirements for non oil and gas wells• Section 6B – Groundwater protection• Section 6C – Confirming location of cement plugs• Section 6D – Gas migration and surface casing vent flow repair• Section 6E – Surface abandonment• Section 6F – Responsibility for abandoned wells
Definition	The OGDPR define an abandoned well as a well or part of a well that has been permanently plugged.
Interpretation	Permanently plugging a well requires both downhole abandonment and surface abandonment.
Timing	All wells must be abandoned in accordance with these Guidelines within 6 years of suspension, unless otherwise approved by the Regulator.

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6A – Downhole Abandonment Requirements

Contents	<p>This section contains information on the downhole abandonment requirements for:</p> <ul style="list-style-type: none">• Cement evaluation;• Wellbore fluid;• Cementing during abandonment;• Pressure testing;• Determining the appropriate abandonment method; and• Abandonment methods for:<ul style="list-style-type: none">○ Cased-hole wells with no perforations;○ Wells with cemented liners;○ Wells with uncemented liners across more than one zone;○ Wells with casing patching, casing failures and previously cement squeezed intervals;○ Cased hole wells with perforations; and○ Wells with existing Level I zonal abandonments.
Application	<p>This section of the Guidelines applies to Level I and Level II exploratory and production wells.</p>
Objective	<p>Each completed pool or zone must be abandoned separately and all non-saline groundwater zones must be covered with cement or isolated from each other.</p>
Cement Evaluation	<p>The operator must evaluate the existing cement behind the casing string(s) of a well before beginning abandonment operations. The evaluation must include:</p> <ul style="list-style-type: none">• Determining the cement top;• Evaluating cement bond in the casing annulus; and• Assessing any repairs or remedial cementing required to isolate all oil or gas bearing zones, discrete pressure zones and potable water zones, including consideration of any lost circulation zones.
Wellbore Fluid	<p>The wellbore must be filled with non-saline water.</p>
Cementing During Abandonment	<p>During abandonment, 15 meters of circulated cement is required for Level II wells and 30 meters of circulated cement is required for Level I wells.</p>

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Pressuring Testing	Cement plugs, bridge plugs and cement retainers must be pressure tested for 10 minutes at 7,000 kPa for both Level I and Level II wells, or as approved by the Regulator.
Determining Abandonment Method	<p>The approved abandonment method varies depending on the structure of the well and its risk level. The operator should work from the bottom of the casing upwards, using an approved method for each section.</p> <p>Applicants may propose alternative abandonment approaches that meet or exceed the same standards for the protection of human safety and the environment for the Regulator's consideration.</p>
Cased-hole Wells with No Perforations	For Level I and Level II wells, no additional cement plugs are required to be run if the existing casing string is pressure tested as described above within 12 months before the abandonment.
Wells with Cemented Liners and Uncemented Liners Across a Single Zone	<p>For Level I and Level II wells, the completed interval must be abandoned in accordance with these Guidelines.</p> <p>Following abandonment of the completed interval, the operator must use one of the following options for abandoning the liner top before surface abandonment:</p> <ol style="list-style-type: none">1) Setting a permanent bridge plug within 15 meters above the liner top or within 15 meters of the zone top in which the liner is landed, followed with a cement plug. The plug and cement must be tested as described above.2) Setting a cement plug across the liner top which extends from a minimum of 15 vertical meters below the cemented liner top to a minimum of 15 vertical meters above the cemented liner top. The cement must be tested as described above.
Wells with Uncemented Liners Across More Than One Zone	For Level I and Level II wells, the zones behind the liner must be evaluated for porosity and a cement squeeze(s) must be conducted to ensure isolation between the zones. Once the liner has been cemented, follow the requirements for wells with cemented liners.

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Wells with Casing Patching, Casing Failures and Previously Cement Squeezed Intervals

The operator must use one of the following options, based on the risk level of the zone where the failure occurred. If previously cement squeezed intervals are drilled out over more than one zone, each zone must be isolated by one of these methods. For casing failures that cover more than one zone, a cement squeeze must be conducted as per option #2:

Level I options:

- 1) Permanent Bridge Plug with Circulated Cement - Setting a permanent bridge plug within 15 meters above the interval and circulating cement. The plug and cement must be tested as described above.
- 2) Cement Plug and Squeeze - Setting a cement plug and squeezing cement from a minimum of 30 vertical meters below the interval to a minimum of 30 vertical meters above the top of the interval. The plug must be circulated in place and have a minimum volume of 1 m³. The final squeeze pressure must be at least 7,000 kPa. After the location of the plug is confirmed (see section 6C), the plug must be pressure tested as described above.

Level II options:

- 1) Permanent Bridge Plug with Circulated Cement – setting a permanent bridge plug within 15 meters above the interval and circulating cement. The plug and cement must be tested as described above.
- 2) Cement Plug and Squeeze - Setting a cement plug and squeezing cement from a minimum of 15 vertical meters below the interval to a minimum of 15 vertical meters above the top of the interval. The plug must be circulated in place and have a minimum volume of 1 m³. The final squeeze pressure must be at least 7,000 kPa. After the location of the plug is confirmed (see section 6C), the plug must be pressure tested as described above.

Cased Hole Wells with Perforations

The operator must use one of the following options, based on the risk level of the perforated zone to be abandoned:

Level I options:

- 1) Cement squeeze and cement retainer with a minimum of 30 meters of circulated cement.
- 2) Cement squeeze and cement/bridge plug with a minimum of 30 meters of circulated cement.

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- 3) Permanent bridge plug with a minimum of 30 meters of circulated cement.

Level II options:

- 1) Cement squeeze and cement retainer with a minimum of 15 meters of circulated cement.
- 2) Cement squeeze and cement/bridge plug with a minimum of 15 meters of circulated cement.
- 3) Permanent bridge plug with a minimum of 15 meters of circulated cement.

All plugs, retainers and cement must be pressure tested as described above.

Wells with Existing Level I Zonal Abandonments

If the previously abandoned Level I zone was not abandoned in accordance with these Guidelines, then an additional cement plug must be circulated and pressure tested as described above.

If the uppermost previously abandoned zone's plug is above the non-saline groundwater, it must be drilled out and an additional cement plug must be circulated on top of the uppermost previously abandoned zone and pressure tested as described above.

All perforations above this point must be abandoned as required in these Guidelines.

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6Ai – Requirements for Abandonment of Non Oil and Gas Wells

Contents	<p>This section contains the abandonment requirements for non oil and gas wells:</p> <ul style="list-style-type: none">• Wellbore fluid requirements;• Downhole abandonment requirements;• Requirements for pre-surface abandonment testing;• Information on fluid level testing; and• Surface abandonment requirements.
Limited Application	<p>This section of the Guidelines applies only to non oil and gas wells.</p>
Objective	<p>Non oil and gas wells are abandoned in accordance section 56 of the OGDPR.</p>
Wellbore Fluid	<p>The wellbore must be filled with non-saline water.</p>
Downhole Abandonment	<p>Non oil and gas wells may:</p> <ul style="list-style-type: none">• Be abandoned as required for Level II wells in section 6A of these Guidelines; or• The operator may apply to the Regulator for approval to abandon the well by cementing from total depth (TD) to at least the bottom 15 meters of the casing string.
Timing of Pre-Surface Abandonment Testing	<p>A fluid level test or pressure test must be completed prior to surface abandonment of a non oil and gas well and at least five days after downhole abandonment operations have been completed.</p>
Testing for Fluid Level	<p>A fluid level test requires a visual inspection of the well to ensure that the fluid level inside the casing is static and there are no gas bubbles present.</p>
Leaking Plug	<p>If the fluid level test reveals a leaking plug:</p> <ul style="list-style-type: none">• It must be reported to the Regulator as soon as circumstances permit;• The operator must develop and submit a repair program to the Regulator for approval within 21 days; and• The leak must be repaired prior to continuing with the abandonment program.

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Surface Abandonment Non oil and gas wells must be surface abandoned as required in section 6E of these Guidelines.

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6B – Groundwater Protection Requirements

Contents	<p>This section contains information on groundwater protection requirements during well abandonment operations:</p> <ul style="list-style-type: none">• Procedure when groundwater data is lacking;• Proof of existing groundwater isolation; and• Remedial isolation requirements.
Objective	<p>All wells must be abandoned in a manner that isolates potable water zones, in accordance with section 56 of the OGDPR.</p>
Interpretation	<p>Potable water is interpreted to mean non-saline groundwater.</p>
Definition	<p>Non-saline groundwater is water that has TDS less than or equal to 4,000 mg/l.</p>
Lack of Groundwater Data	<p>If no data is available on the salinity of the groundwater, protection must extend to 600 m below the surface.</p>
Existing Isolation	<p>If non-saline groundwater is already isolated through the construction of the well, the operator must provide proof of this isolation to the Regulator when applying to abandon the well.</p>
Remedial Isolation	<p>If non-saline groundwater is not already isolated, the operator must conduct remedial cementing operations to isolate the non-saline groundwater as follows:</p> <ol style="list-style-type: none">1) Identify the base of the non-saline groundwater requiring isolation;2) Perforate, mill or slot the casing at the base of non-saline groundwater;3) Attempt to establish circulation to surface with non-saline water:<ol style="list-style-type: none">a. If circulation to surface is successful, isolate the non-saline ground water using a cement retainer, a balanced cement plug and squeeze or a Bullhead cement and squeeze. Cement must be circulated with a minimum of 0.5 m³ cement to surface.

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- b. If circulation to surface is unsuccessful, attempt to establish a feed rate:
 - i. If a feed rate is established, isolate the non-saline groundwater zones using a cement retainer and squeeze or a balanced cement plug and squeeze.
 - ii. If a feed rate is not established, isolate the non-saline groundwater using a balanced cement plug and squeeze.

Cementing and Pressure Testing

The cementing and pressure testing requirements associated with Level II exploratory and production well abandonments (section 6A) apply to remedial isolation of non-saline groundwater.

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6C – Requirements for Locating Cement Plugs

Contents	This section contains information on the acceptable methods for confirming the location of cement plugs.
Objective	The location of cement plugs must be accurately determined and reported to the Regulator.
Acceptable Methods	<p>The following methods for confirming the location of cement plugs are acceptable:</p> <ul style="list-style-type: none">• Strap tally – measuring and counting joints of drill pipe or tubing (a minimum force of 18,000 decanewtons is required when locating the cement top);• Direct density plug logging – using a radioactive source and a detector run on wireline;• Hydrostatic pressure plug logging – using a pressure transducer run on wireline; and• Radioactive tracer logging – using a radioactive tracer introduced into the lead slurry.
Not Acceptable	The use of slick line or wireline is not an acceptable method for locating the plug top.
Reporting Requirements	The locations of cement plugs, the method used to identify them and the plug logs (for all methods except strap tally) must be reported to the Regulator in the Well Operations Report.

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6D – Gas Migration, Surface Casing Vent Flow and Annular Pressure Testing and Repair Requirements during Well Abandonment

Contents	This section contains direction on addressing GM, SCVF and annular pressure identified during well abandonment programs.
Objective	Abandoned wells do not have any GM, SCVF or annular pressure, in accordance with section 56 of the OGDPR.
Required Testing	<p>Testing for GM and/or SCVF and for annular pressure must occur as described in section 4 for exploratory and production wells.</p> <p>The Regulator may require testing for GM, SCVF or annular pressure for non oil and gas wells if necessary.</p>
GM, SCVF or Annular Pressure Repair	<p>All GM or SCVF (serious and non-serious) and annular pressure must be repaired prior to abandoning the well. The repair program must be included in the application to Alter the Condition of a Well and must:</p> <ul style="list-style-type: none">• Describe the proposed method to identify the source of the GM/SCVF or annular pressure;• Provide all related logs and log analysis;• Provide casing and cementing details;• Identify the base of groundwater protection depth; and• Provide complete details of the proposed repair program.
Not Considered Abandoned	Wells that demonstrate GM, SCVF or annular pressure after planned downhole and surface abandonment activities are complete will not be considered abandoned as they are not in compliance with section 56 of the OGDPR.

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6E – Surface Abandonment Requirements

Contents	<p>This section contains information on surface abandonment requirements:</p> <ul style="list-style-type: none">• Timing of surface abandonment;• Cutting and capping requirements; and• Well signage requirements.
Objective	<p>All well heads are removed from abandoned wells and the wells are easily locatable.</p>
Definition	<p>Surface abandonment is the cutting off of casing string(s) and the capping of a well.</p>
Timing	<p>The timing requirements for surface abandonment are:</p> <ul style="list-style-type: none">• The operator must not begin surface abandonment until SCVF and annular pressure testing (see section 4) has been performed (after downhole abandonment is complete) and the test results indicate the absence of any wellbore problem;• If the well is being abandoned due to an order of the Regulator, the operator must begin surface abandonment as directed; and• Debris associated with the entire well operation must be removed within 12 months of the cutting and capping operation.
Definition	<p>Debris is:</p> <ul style="list-style-type: none">• Any installation or structure that was put in place as a result of an authorized activity and that has been abandoned without the Regulator's authorization; or• Any material that has broken away or been jettisoned or displaced in the course of an authorized activity.
Cutting and Capping	<p>The requirements for cutting and capping are:</p> <ul style="list-style-type: none">• The casing string(s) must be cut off a minimum of 1 m below the natural ground level; and

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- Surface, intermediate and production casing strings must be capped at surface with a vented capping system: a steel plate that is fastened and installed in a manner as to prevent any potential for pressure to build up within the casings from the shallowest zonal abandonment to the surface, while restricting access to the casing strings at surface.

Reporting

Field-verified coordinates for the well center must be provided as part of the Well Operations Report as follows:

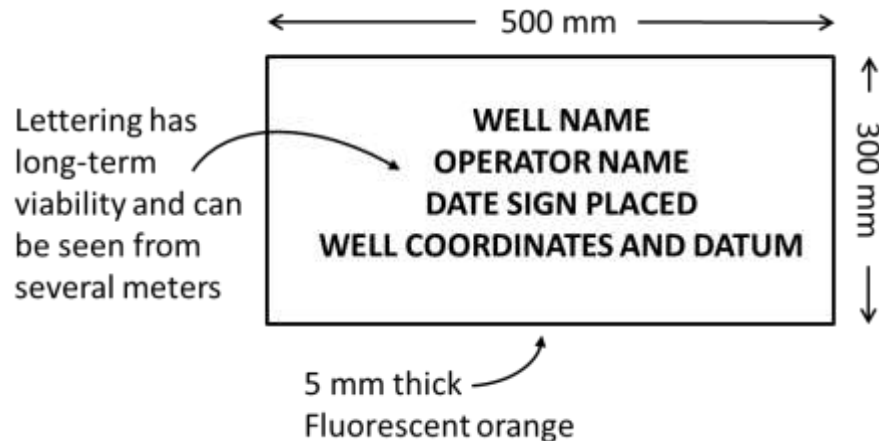
- The geodetic datum must be specified (NAD83 is recommended); and
- Coordinates must be provided:
 - In decimal degrees to 4 decimal places or more, or
 - In degrees, minutes and seconds to 2 decimal places, if decimal coordinates are not possible.

A field sketch of the area must also be submitted as part of the Well Operations Report.

Signage

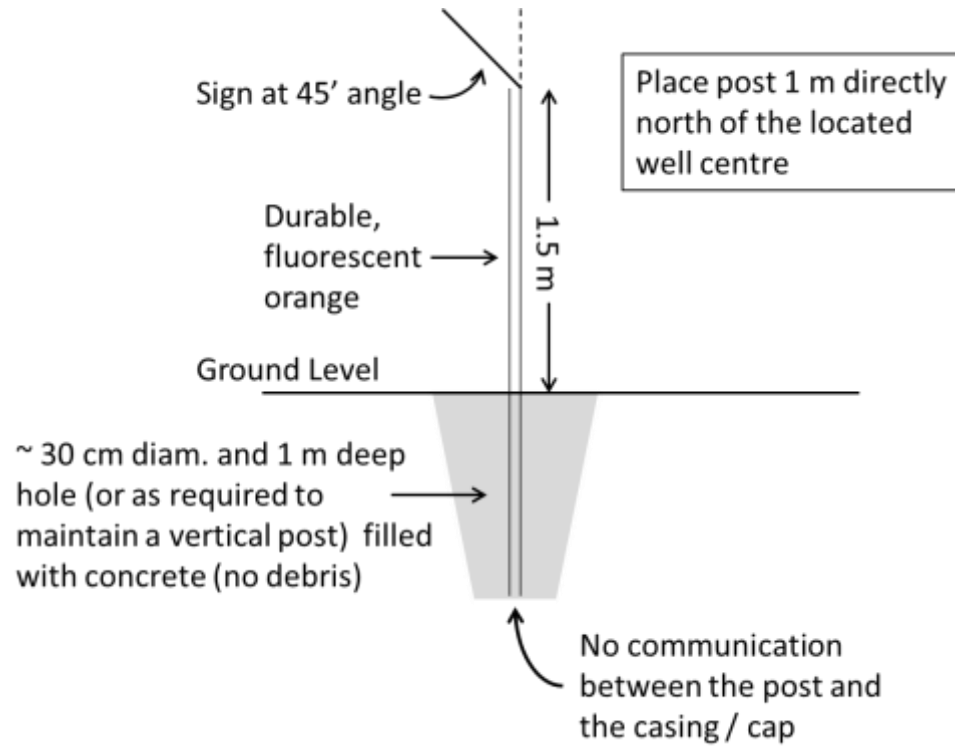
After surface abandonment is completed, all abandoned wells must be marked with a durable post and a sign as shown below.

Sign Requirements



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Post Requirements



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6F – Responsibility for Abandoned Wells

Contents	This section contains information on the impact of a change of operator for an abandoned well.
Objective	Abandoned wells are the responsibility of the company that performed the abandonment or any successor to the original company.
Change of Ownership	Abandoned wells are the responsibility of the company that performed the abandonment or any successor company to the original company.
Reporting to the Regulator	All changes in well operators must be reported to the Regulator within one month of the change.

7. APPLYING TO SUSPEND OR ABANDON A WELL

Well Operation Suspending or abandoning a well is a “well operation” as defined in the OGDPR. Proposals for well operations must be approved by the Regulator before they can proceed.

Application Requirements Application requirements depend on whether an Operations Authorization that includes suspension or abandonment within its scope is already in place for the well, as shown below.

Application Requirements	
No Existing Operations Authorization	<ul style="list-style-type: none"> • Submission of <i>Application for an Operations Authorization</i> form and supporting documentation as required under OGOA and the OGDPR; • Submission of an <i>Application to Alter the Condition of a Well</i> form and supporting documentation as required under the OGDPR; and • Submission of an <i>Information Disclosure Consent Form</i> as required under the <i>Information Disclosure Guidelines</i>.
Existing Operations Authorization	<ul style="list-style-type: none"> • Submission of an <i>Application to Alter the Condition of a Well</i> form and supporting documentation as required under the OGDPR; and • Submission of an <i>Information Disclosure Consent Form</i> as required under the <i>Information Disclosure Guidelines</i>.

Forms Application forms and the *Information Disclosure Consent Form* are available on the Regulator’s website: www.orogo.gov.nt.ca/documents.

Document Submission Guidelines Information on the number and type of copies required for an application can be found in the *Document Submission Guidelines* on the Regulator’s website: www.orogo.gov.nt.ca/documents.

Operations Authorization Review Process OROGO reviews an application for an Operations Authorization by:

- Reviewing the application for completeness against the requirements of OGOA and the OGDPR;
- Ensuring an approved Benefits Plan is in place that covers the scope of the proposed activity;

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- Assessing whether sufficient consultation has taken place with potentially affected Aboriginal governments and organizations;
- Confirming that the proposed work or activity conforms with the appropriate Land Use Plan (where applicable);
- Undertaking a technical review of the application;
- Issuing Information Requests (if additional information is required to complete the review);
- Ensuring the Regulator's preliminary screening obligations under the *Mackenzie Valley Resource Management Act* are met; and
- Assessing the proof of financial responsibility required.

Altering the Condition of a Well Review Process

OROGO reviews an application to Alter the Condition of a Well by:

- Reviewing the application for completeness against the requirements of the OGDPR;
- Undertaking a technical review of the application;
- Assessing whether sufficient consultation has taken place with potentially affected Aboriginal governments and organizations; and
- Issuing information Requests (if additional information is required to complete the review).

Timeframes for Decision

OROGO's standards for processing applications are:

- For Operations Authorizations related to exploratory work, a maximum of 90 calendar days from receipt of a complete application, not including any additional time required to complete an environmental assessment or environmental impact assessment.
- For Well Approvals (including well suspensions and abandonments) under an existing Operations Authorization, a maximum of 30 calendar days from receipt of a complete application.

Definition

A **complete application** contains all of the information required under OGOA and the OGDPR and requires confirmation of an approved benefits plan.

8. REGULATOR'S APPROVAL

These *Suspension and Abandonment Guidelines and Interpretation Notes* are issued under section 18 of the *Oil and Gas Operations Act* effective February 1, 2017.



Louis Sebert
Regulator