

# Well Logging Requirements

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Directive PNG010

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February 2018

Revision 1.1

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Governing Legislation:

Act: *The Oil and Gas Conservation Act*

Regulation: *The Oil and Gas Conservation Regulations, 2012*

Order: 51/18

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**Record of Change**

<b>Revision</b>	<b>Date</b>	<b>Description</b>
0.0	September, 2015	Draft
1.0	November, 2015	Added Directive Number, updated document
1.1	February, 2018	Update for clarity and inclusion of shallow water source well requirements

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## 1. Introduction

This Directive sets out the requirements of the Saskatchewan Ministry of Energy and Resources (ER) for well logging. This applies to all well types licensed under *The Oil and Gas Conservation Act* (OGCA). It provides details on what well logs must be submitted for a variety of well types. The well logs that will be required for a proposed well must be disclosed at the time a licence application is submitted in the Integrated Resource Information System (IRIS).

This Directive also covers the logging requirements for vertical, directional, re-entry and horizontal wells. Additional wellbore integrity logging requirements for disposal and injection wells are outlined in *Directive PNG008: Disposal and Injection Well Requirements*. Lithological logs are not discussed in this document as they align with geological reporting requirements outlined in *Directive PNG013: Well Data Submission Requirements*.

Questions concerning the requirements set out in this document should be directed to the ER Service Desk at 1-855-219-9373 or email at [ER.servicedesk@gov.sk.ca](mailto:ER.servicedesk@gov.sk.ca).

### 1.1 Governing Legislation

The requirements outlined in this Directive are based on the OGCA and *The Oil and Gas Conservation Regulations, 2012* (OGCR). The objective of the OGCR is to ensure appropriate well log data is available for stratigraphic unit identification, correlation, and determination of reservoir and petrophysical parameters.

Clause 17(1)(j) of the OGCA provides the legislative authority to set requirements for well logging. Regulations pertinent to well logging are found in section 90 of the OGCR. This section requires that well logs be submitted by the licensee and allows ER to obtain additional well logs beyond what is specified in this Directive. Licensees should consult the OGCR in conjunction with this Directive.

It is the responsibility of all operators, as specified in the OGCA, to be aware of ER's requirements and to ensure compliance with all requirements prior to submission of a well licence application.

### 1.2 Definitions

**Defined pool:** means a pool that has a pool boundary defined by Minister's Order.

**Miscellaneous pool:** means a pool established by ER other than a defined pool.

**Directional well:** means a well drilled directionally from surface that is not horizontal.

**Horizontal well:** means a well drilled that has a productive portion that is at least 80 degrees from vertical for a minimum of 100 m or as otherwise deemed to be horizontal via Minister's Order.

**Multi-well pad:** means a surface lease that contains more than one well.

**Re-entry well:** means a well that has been abandoned and is being entered again, or a well that is being entered in order to alter trajectory or deepen to a new stratigraphic unit.

**Single-well pad:** means a surface lease that contains one well.

**Shallow Water Source Well:** means a well that bottoms in or above the Glacial Drift stratigraphy, is less than 75 meters in total vertical depth and the completion type is water source well.

**Stratigraphic Test Well:** means a wellbore drilled for the sole purpose of gaining structural or stratigraphic information with no intent to produce oil or gas from such a well.

**Intermediate casing shoe:** means the base of the intermediate casing string.

**Build section:** means the portion of a horizontal well where the path angle is transitioning from vertical to horizontal.

**'As-run' format:** means measured depth is the reference scale.

**'Corrected-to-TVD' format:** means corrected and displayed in reference to true vertical depth.

**Landing point:** refers to the point where the well path has reached horizontal or near horizontal position within the target pool.

**TVD:** means true vertical depth.

## 2. Logging Requirements for Vertical and Directional Wells

Open-hole logs for stratigraphic test wells are required in all situations, unless a waiver is provided through application.

Shallow water source wells are not required to run or submit logs.

### 2.1 Single-Well Pads

For a well on a single-well pad, open-hole logging is required with the following exceptions:

- The well is within a defined pool that stipulates logging requirements other than those specified within this Directive and the licensee is meeting the logging requirements of that pool.
- Viking Sand Oil Wells – for wells drilled for the production of oil from this stratigraphic unit, logs are to be run on the first well drilled in each quarter-section. For subsequent wells, the licensee must, at a minimum, take an acceptable cased-hole log from total depth to the base of the surface casing, unless, pursuant to the above exception, the well is within a defined pool that stipulates other logging requirements.

### 2.2 Muti-Well Pads

- For the first well on a multi-well pad, the licensee must take an acceptable open-hole log from the total depth of the well to the base of the surface casing, unless the well is within a defined pool that stipulates logging requirements other than those specified within this Directive and the licensee is meeting the logging requirements of that defined pool.
- The total depth of the open-hole logged well must be equivalent to or deeper than the total depth of the deepest stratigraphic unit penetrated by all wells on the pad.
- For all remaining wells on the same pad, the licensee must, at a minimum, take an acceptable cased-hole log from total depth to the base of the surface casing.

### 2.3 Re-entry Wells

If a well is being re-entered with a trajectory type of vertical or directional, open-hole logs are required on any new open-hole portion that is drilled if that open hole portion extends the well deeper than the previously logged stratigraphic unit. If the re-entry does not result in new drilling, all logging requirements are waived unless otherwise required by ER.

### 3. Other Requirements

ER may require open-hole logs, cased-hole logs or well integrity logs (as detailed within *Directive PNG008: Disposal and Injection Well Requirements*) to be run, at any time, for any type of well, if deemed necessary.

### 4. Acceptable Logs

All logs stipulated as a minimum requirement within this Directive are to be run:

- For vertical/directional wells, from the total depth of the well to the base of the surface casing and shall record all pertinent data.
- For horizontal wells, from at or near the intermediate casing/landing point to the base of surface casing and shall record all pertinent data.

Any logging conducted above and beyond the minimum requirements at a licensee's discretion may be conducted in whatever manner the licensee deems appropriate but shall be submitted in accordance with *Directive PNG013: Well Data Submission Requirements*.

#### 4.1 Open Hole

The logging requirements for open-hole logs are as follows:

- gamma ray;
- induction or resistivity or standard electrical log on a 1:240 scale (including conductivity on a 1:600 scale); and
- sonic porosity or neutron porosity and density porosity on a 1:240 scale (including bulk density on a 1:600 scale and photoelectric on 1:240 scale).

#### 4.2 Cased Hole

The logging requirements for cased-hole logs are as follows:

- gamma ray; and

- neutron porosity on a 1:240 scale.

## **5. Logging Requirements for Horizontal Wells**

### **5.1 Open Hole**

Open-hole logging requirements are waived on horizontal wells.

### **5.2 Cased Hole**

Cased hole logs must be run through casing from a point at or near the intermediate casing point (ICP).

Logs that reach a minimum of 70 degrees from vertical or that contact the top of the target pool will be accepted. This applies to wells with an ICP or monobore design.

Cased-hole logging for horizontal wells is not required in the following situations:

- The well is within a defined pool that stipulates logging requirements other than those specified within this Directive and the licensee is meeting the logging requirements of that pool.
- A stratigraphic test well is to be drilled and open-hole logged prior to re-entering for horizontal drilling.
- There is sufficient log coverage (see Figure 1) within the vertical well drainage unit(s) containing the build section (surface to intermediate casing point or landing point) of the proposed horizontal well. The total vertical depth of the logged well must be equivalent to or deeper than that of the proposed horizontal well.
- There is sufficient log coverage (see Figure 1) from a well within a 300 m radius of the build section of the proposed horizontal well. The total vertical depth of the logged well must be equivalent to or deeper than that of the proposed horizontal well.
- Horizontal wells are sharing a multi-well pad and the first well drilled shall be logged. The total depth of the logged well must be equivalent to or deeper than the total vertical depth of the deepest zone penetrated by all wells on the pad.

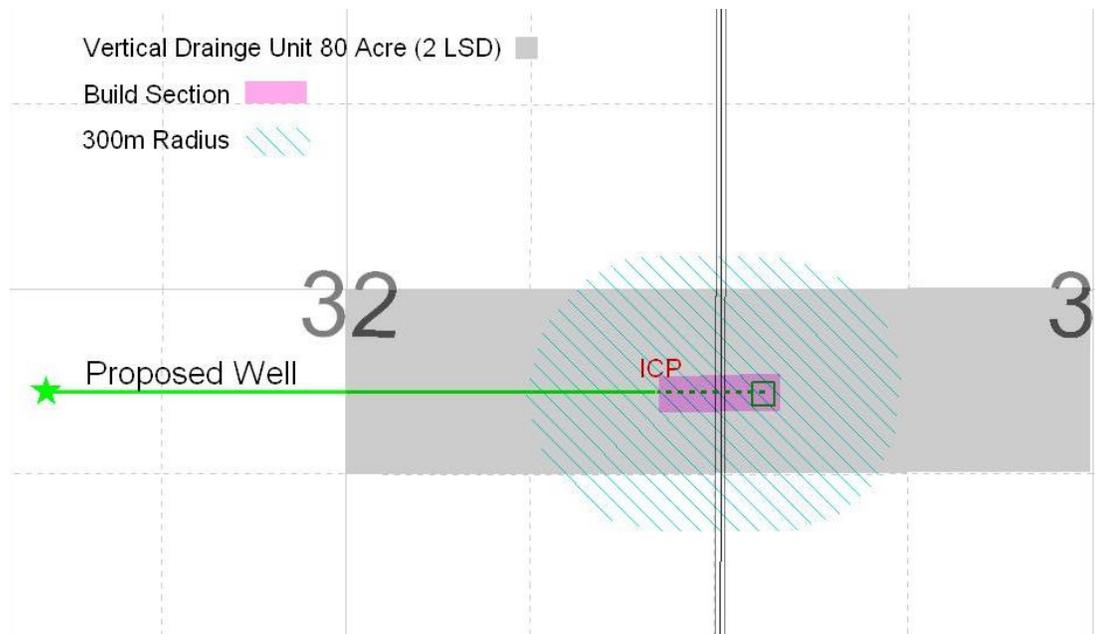


Figure 1 – Logging coverage example. If there was log coverage to/through the target stratigraphic depth of the proposed well (as per minimum requirements outlined) within the solid grey or blue hatched areas, cased-hole logging requirements are waived for the proposed horizontal well.

## 6. Application for Waiver of Logging Requirements

As outlined in subsection 90(1) of the OGCR, a licensee may apply for relief from the well logging requirements of this Directive and those outlined within *Directive PNG008: Disposal and Injection Well Requirements* where special circumstances warrant.

A logging amendment application may be submitted for review. The logging amendment application should not be made until the licence has been issued and the logging requirement obligations have been set. If a company does not make an application for logging amendment prior to commencement of drilling, it may be subject to a penalty if logs are not submitted. The applicant would need to provide all reasoning and technical support for the request to amend or waive the logging requirements.

ER may grant waivers from well logging requirements as the result of an unplanned technical or operational event that inhibits the successful completion of the planned well logging program. If an emergency situation occurs in the course of drilling or logging the well that prevents the required logs from being run, a logging waiver request may be made to the ER Service Desk at 1-855-219-9373 or to the PNG Emergency Support Line at 1-844-764-3637 (after business hours), additional details may be required. A verbal approval to waive logs may be granted. Further to a verbal approval, an email confirmation from the approver is required. The licensee can then apply for a waiver of logging requirements, and must provide the correspondence on the approval as part of their logging amendment application within IRIS.