



For more information refer to the Water Wells That Last video (Part I—Planning and Construction).

Water Well Drilling Agreements

This module outlines a checklist of items that you and your licensed water well contractor should discuss and agree to before starting any drilling. A clear understanding between both parties is crucial so there are no misunderstandings or false expectations. Disagreements can arise between licensed water well contractors and well owners after the well is drilled because they simply did not take the time to thoroughly discuss all aspects of the drilling operation ahead of time.

Water wells are far more than a deep wet holes in the ground. They are an important and significant investment for any household or farm. Well owners should take the time to ensure they understand what they are purchasing. Money spent on high quality well design and construction materials is money well invested. A low cost well may not deliver the quality, quantity or reliability you need.

A Water Well Drilling Agreement covers the topics you should discuss with your licensed water well contractor before any work begins. A blank copy of an example agreement is included at the back of this module and in the pocket on the back cover. Many contractors have their own version of a Water Well Drilling Agreement.



Water Well Drilling Agreement Example

This agreement is designed to prevent misunderstandings between the well owner and licensed water well contractor. It benefits both parties and can establish costs for materials and services.

Identification

Items 1-4 identify the parties involved in the agreement.

1. Well owner John G. Doe
Address Anywhere, Alberta
2. Licensed water well contractor Peters Water Well Services
Address Anywhere, Alberta
Licensed water well contractor approval no. _____
3. Land location of well
Qtr NE Sec 36 Twp 17 Rge 7 W of 4 Meridian
Lot _____ Block _____ Plan _____
4. Proposed starting date June 21, 2012
Proposed completion date June 25, 2012

You should discuss the purpose of any new well being drilled with your licensed water well contractor. If the well is going to be used for a non-household purpose it must be constructed in a manner that will allow it to be licensed.

Water Requirements

5. Proposed well use: Household X Livestock Irrigation

The well use should be specified as being for household, livestock, irrigation or a combination. Municipal and industrial wells are usually covered by a detailed contract.

6. Desired water quality

Finding groundwater with suitable water quality is important for all water uses. A licensed water well contractor can use a field testing kit to get a rough estimate of some parameters such as iron, hardness, pH and total dissolved solids, but only the tests done in a laboratory are really reliable.

Laboratories use the Guidelines for Canadian Drinking Water Quality to assess water quality. If testing shows some of the parameters are higher than these guidelines, water treatment equipment may be necessary.

7. Desired yield 0.4 (5) L/s (gpm) Min. acceptable yield 0.1 (1) L/s (gpm)

The desired yield is the flow rate of water, in gallons per minute (gpm), from an individual well. To calculate the desired yield, refer to the worksheet "Average Daily and Annual Water Requirements" in Module 2, "Planning Your Water System". Using this worksheet, calculate your daily and peak water use requirements. In some areas the desired yield is simply not available because of slow yielding aquifers. In such cases, the desired yield should be expressed as the normal yield for the area. A certain minimum yield should be established so if the well produces less than this minimum, it is not considered economically feasible to develop as a water well.

8. Groundwater supply options based on existing records Consolidated Bedrock, Paskapoo Formation Sandstone units – 30 to 60 m (100 to 200 ft.)

The licensed water well contractor or well owner should review groundwater information on local wells to determine potential target aquifers and appropriate well design considerations. Information is available from the Groundwater Information Centre. See Module 12, "Other Resources".

Well Construction

9. Maximum desired depth 65 (210) m (ft.)

A maximum desired depth should be established. Factors affecting this include the known depth of productive aquifers, and the water quality at the various depths. Also personal finances will be a factor.

10. Type of drilling Rotary

11. Diameter of hole 158 mm (6 1/4") and 124 mm (4 7/8")

The type of drilling equipment, aquifer composition, yield required and depth determine the type of well produced. Rotary drilled and cable tool drilled wells are typically 100-200 mm (4-8 in.) in diameter; bored wells range in diameter from 45-90cm (12-36 in.). The water well drilling industry is required by law to construct wells with casings 102mm (4in.) or more to accommodate submersible pumps.

12. Flowing well control N / A

In cases where a flowing well is anticipated, provision must be made to equip the well with a flow control device that allows the flow to be shut off completely and to prevent freezing.

13. Well connection Pitless Adaptor

Where the connection of the pumping equipment to the well casing is made below the ground surface, a pitless adaptor is required under the Water (Ministerial) Regulation. Well pits are no longer permitted. If a jet pump is being used, a pump house that houses only the well and the pumping equipment is allowed.

14. Formation logging procedure _____

Logging the geological formations during drilling provides key information about aquifer location and quality. This information is especially important to accurately place well screens. There can be several types of formation logging.

- *Descriptive logging records the material encountered as drilling proceeds (lithology).*
- *Electric logging, or E logging, verifies and supplements descriptive logging. It can only be performed in an uncased hole that is filled with drilling fluid. Basically it reveals the character of the material and relative quality of water in the formation. A limited number of licensed water well contractors in Alberta possess this equipment.*
- *Gamma-ray logging can be performed in cased holes without drilling fluid and reveals the character of the material present. Very few licensed water well contractors in Alberta have this equipment. A combination of descriptive logging and electric or gamma-ray logging provides very accurate information about the formations through which the well is constructed.*

Good well design, construction and material selection is necessary to reduce the effects of natural corrosion, biofouling and incrustation.

15. Annular or casing seal Bentonite

All wells must be constructed to prevent contaminated surface water from entering groundwater aquifers through the annulus (or space) between the outside of the well casing and the borehole. The annulus must be filled from immediately above the producing zone up to ground surface. The method of sealing is dependent on the type of rig the driller operates and the design of the well.

16. Artificial sand pack _____

The grain size distribution of the aquifer affects the efficiency of the screen during development. If the aquifer has a relatively uniform fine grain size, a well cannot be effectively developed without the installation of an artificial sand pack. This "pack" provides a natural filter which holds back the finer aquifer materials.

17. Well Development Method

Backwashing _____ Jetting _____ Surging X
Heavy pumping _____ Bailing _____

By regulation, the licensed water well contractor is responsible for ensuring a well is completed in a manner that ensures no damage will be incurred to the pumping system, plumbing or fixtures due to sediment in the water. If a newly constructed well produces sediment, it is usually because the licensed water well contractor did not properly develop it. Different types of well completion require different development techniques. In the rare case where a well cannot be adequately developed to produce sediment-free water, a sediment filter could be installed in the water distribution system. However, this alternative should be used only when it is evident that sufficient development of the well has been done, and the landowner is in agreement.

Material

18. Casing material Plastic Schedule 80* PVC * Steel Protector casing at Surface

Inside diameter 127 mm (5") wt. per m (ft.) _____ wall thickness 0.375

See Water Well Casing Specifications, page 33.

19. Well cover 6" well cap.
Distance from top of casing to ground surface 300 mm (12")

Minimum requirement is 20cm (8") above ground surface or 60cm (2") above the highest flood record unless a water tight cover is used. A water-tight, vented vermin-proof cap is ideal. For large diameter wells, a tight-fitting, vented cover should be specified.

The well cap should be removable or be designed to allow access to a dip tube for ease of monitoring the water level.

20. Liner material Plastic Schedule 40 PVC
Inside diameter 102 mm (4") wt. per m(ft.) _____ wall thickness 0.237

See Water Well Casing and Specifications, page 33. Plastic PVC or ABS casing lasts indefinitely because it does not rust like metal casing, however it must be protected at the ground surface with metal casing.

21. Screen Manufacturer ABC Screen Co.
Length _____
Material _____
Nominal diameter _____

Wells completed in unconsolidated aquifers, such as sand or gravel, should be screened. The length of screen required depends on the volume of water to be pumped and the ability of the aquifer to transmit water.

Yield Testing

22. Yield testing duration (hours) Minimum: 2 hour water removal and 2 hour recovery

The licensed water well contractor should conduct a yield test following completion of the well. It serves as a benchmark for monitoring future well performance. The test should include the following information:

- a) non-pumping (static) water level
- b) water removal rate in gpm(L/s)
- c) depth to the pumping water level as determined over a period of time at a constant pumping rate(drawdown)
- d) the length of time the well is pumped
- e) the recovery of the water level over a 2 hour period or until 90 percent recovery of the non-pumping water level is reached.

23. Pump Type Sub Size 0.5 HP

It is important to get a good pump yield test on the well when it is constructed. This provides a base condition to which the productivity of the well can be compared as it "ages."

The purpose of measuring the well's yield is to gather enough information to determine what pumping equipment will best ensure adequate water pressure and prevent damage to the well by over-pumping. Not all licensed water well contractors include pump installation as part of their business. Be sure to select your pump contractor carefully and provide them with the yield test data collected by your driller.

While the licensed water well contractor is on site, you may want to get an estimate to plug any unused wells on your property to protect water quality in your new well. For more information, see Module 9 "Plugging Abandoned Wells".

Contact local licensed water well contractors for cost estimates in your area.

Provincial regulation requires that a water well be completed to ensure no damage will be incurred to the pumping system, plumbing or fixtures due to sediment in the water.

Disinfection

24. Disinfection Well and pumping equipment to be disinfected

After the well is completed and pumping equipment is installed you should disinfect the water in the well with at least 200mg/L of chlorine and left in the well for a minimum of 12 hours. Use Table 1, Amount of Chlorine for a Chlorine Concentration of 200PPM, and the example in Step 3 on page 51 to calculate the amount of chlorine for 200 ppm.

25. Well head finishing Driller to remove all surplus materials and equipment on site.

Well head finishing includes the clean up of mud and aquifer debris and removal of material scraps.

Costs

26. Test holes per metre (foot) _____

27. Reaming per metre (foot) _____

28. Drilling/boring per metre (foot) _____

29. Casing per metre (foot) _____

30. Liner per metre (foot) _____

31. Screen _____

32. Sandpack _____

33. Development _____

34. Labor per hour _____

35. Water testing _____

36. Reclamation of unused well _____

37. Total Costs _____

38. Payment schedule _____

Guarantee

39. _____

Workmanship and materials should be guaranteed for a specific period of time.

Water Well Casing Specifications

Materials All well casing material must meet or exceed the specifications set for that material and purpose by the Canadian Standards Association or the American Society for Testing and Materials.

Non-Plastic Well Casing—Required Thickness

Type of Well Casing	Minimum Casing Thickness
Metal well casing	0.188 in. (4.78mm)
Metal liner casing	0.156 in. (3.96mm)
Cement-like casing * for 24in. (60.96 cm) casing or less	* 2.5in. (6.35cm)
* for casings larger than 24in.	* 2.5in. plus 1in. for every additional foot of well diameter
Corrugated and galvanized steel casing	16gauge

Plastic Well Casing—Required Thickness for ABS or PVC

Outside Pipe Diameter in. (mm)	Casing Schedule (SCH) Number	Minimum Wall Thickness in. (mm)
4.5 (114.3)	SDR21	0.214 (5.43)
4.95 (125.7)	SCH 40	0.260 (6.60)
5Nominal(127.0)	SCH 80	0.397 (10.1)
5.56 (141.2)		
6 (152.4)	WellCasing	0.390 (9.9)
6.625 (168.3)	SCH 40	0.432 (11.0)
6.625 (168.3)	SCH 80	0.280 (7.1)
8.625 (219.7)	SCH 40	0.322 (8.2)
8.625 (219.7)	SCH 80	0.5 (12.7)
10.75 (273.1)	SCH 40	0.365 (9.2)
10.75 (273.1)	SCH 80	0.593 (15.1)



Water Well Drilling Report

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well I.D.
GCA Well Tag No.
Date Report Received

Well Identification and Location

Owner Name: _____ Address: _____ Town: _____ Postal Code: _____

Location: 1/4 of LSE: SEC: TWP: RGE: W of MER: LOT: Block: Plan: Additional Description: _____

Measured from Boundary of: Quarter Lot

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude: _____ Longitude: _____ Elevation: _____

m/ft from N S E W Hand Held Auto 20-30m Diff. Corr. Hand Held 5-10m Surveyed GPS < 1m

Drilling Information

Method of Drilling:
 Auger
 Backhoe/Dug
 Boring
 Cable Tool
 Rotary (air)
 Rotary (mud)

Type of Work:
 New Well (Producing)
 Test Hole or New Well (Dry)
 Plugged with:
 Bentonite Slurry
 Bentonite Chips
 Cement
 Other (Specify): _____

Amount Used: _____

Deepened Well - Well ID (if applicable): _____
 Reconstructed Well - Well ID (if applicable): _____

Proposed Well Use:
 Household (up to 1250 m³/yr with residence on property)
 Other (Specify): _____

(Note: All wells, except household wells, must be licensed by Alberta Environment, to drill and use groundwater)

Formation Log

Measurements in: Metric Imperial

Depth from ground level	Indicate if Water Bearing	Lithology Description	Total Depth Drilled	Finished Well Depth	Start Date	End Date
1		Top Soil	97	97	13 01 08	13 01 09
23		Brown clay & Rocks				
77		Gray Clay				
83		Gray Sandstone				
97	✓	Sandstone				

Well Completion

Total Depth Drilled: 97
 Finished Well Depth: 97
 Start Date: 13 01 08
 End Date: 13 01 09

Borehole:
 Diameter: 6" From: 0 To: 80
 Diameter: 5" From: 80 To: 97

Surface Casings: (if applicable)
 Steel
 Galvanized Steel
 PVC
 Fiberglass
 Cement
 Other

Well Casing/Liner:
 Steel
 Galvanized Steel
 PVC
 Fiberglass
 Other

Size OD: 4 1/2 Wall Thickness: 0.237
 Top at: 77 Bottom at: 97

Perforations:
 From: 78 To: 96
 Size: 4" X 3/8"

Perforated by: Machine Saw Drill

Annular Seal: Bentonite Slurry Bentonite Chips Cement
 Placed From: 0 To: 79
 Amount: 4 BAGS

Drive Shoe, at: 80' Welded Ring, at: _____
 Shale Trap, at: _____

Screen Type: Stainless Steel PVC
 Size OD: _____ To: _____ Slot Size: _____
 Interval From: _____ To: _____ Slot Size: _____
 Telescoped Attached to Casing

Top Fittings: Packler Coupler Wash-down Ball Plug

Pack: _____

Artificial/Mechanical Natural Gravel Size: _____ Amount: _____

Yield Test

Test Date: 13 01 09 Start Time: 2:30 am/pm
 Distance From Top of Casing to Ground Level: 30' m/ft
 Static Water Level: 7.18' m/ft

Artesian Flow Rate: _____ L/min or gpm
 Yes, flow control installed Describe: _____

Method of Water Removal:
 Pump
 Bailor
 Pumping Rate: 8.6 L/min (gpm) Water Removal Rate: _____ L/min / gpm
 Depth Pumped From: 75 m/ft Depth Bailed From: _____ m/ft

If water removal period was < 2 hours, explain why: _____

Recommended Pump Rate: 6 L/min or (gpm) Pump installed Yes No
 Recommended Pump Intake Depth (From TOC): 75 m/ft Type: Sub Mode: Grundfos P: 0.5
 Depth: 75'

Did you Encounter: Saline Water (>4000 ppm TDS) Depth: _____ m/ft
 Gas Depth: _____ m/ft

Remedial Action Taken: Well Disinfected Upon Completion
 Geophysical Log Taken:
 Electric Gamma
 Other (Specify): _____

Additional Comments on Well:
 TDS @ 1500 ppm
 Sample Collected for Potability:
 Yes Result Attached No

Water Diverted for Drilling

Water Taken: _____ Amount Taken: _____
 Source: _____

Diversion Date: 13 01 08 Time: 7:15 am/pm

Contractor Certification

Copy of Drilling Report Given to Owner: _____
 Name of Journeyman responsible for drilling/construction of well: _____ Certification No: _____

Company Name: _____

Approval Holder Signature: _____ Date: 13 01 10

White copy: Alberta Environment Yellow copy: Well Owner Pink copy: Contractor

Pumping Minutes	Recovery
7.18	0
8.52	1
8.86	2
9.02	3
9.21	4
9.39	5
9.54	6
9.69	7
9.82	8
9.95	9
10.09	10
10.33	12
10.53	14
10.73	16
11.09	18
11.50	20
11.85	25
12.16	30
12.50	35
13.01	40
13.50	50
14.17	60
14.79	75
15.39	90
15.65	105
15.81	120

Water Well Drilling Agreement Form

Identification

1. Well owner _____
Address _____
2. Licensed water well contractor _____
Address _____
Licensed water well contractor approval no. _____
3. Land location of well: Qtr _____ Sec _____ Twp _____ Rge _____ W of _____ Meridian Lot _____ Block _____ Plan _____
4. Proposed starting date _____
Proposed completion date _____

Water Requirements

5. Proposed well use: Household _____ Livestock _____ Irrigation _____
6. Desired water quality On-site tests:
total dissolved solids _____ parts/million iron _____ parts/million
hardness _____ parts/million pH _____ parts/million
7. Desired yield _____ L/s (gpm) Min. acceptable yield _____ L/s (gpm)
8. Groundwater supply options based on existing records _____

Well Construction

9. Maximum desired depth _____ m (ft.)
10. Type of drilling _____
11. Diameter of hole _____
12. Flowing well control _____
13. Well connection _____
14. Formation logging procedure _____

- 15. Annular or casing seal _____
- 16. Artificial sand pack _____
- 17. Well development method: Backwashing _____ Jetting _____ Surging _____ Heavy pumping _____ Bailing _____

Material

- 18. Casing material _____
Inside diameter _____ wt. per m(ft.) _____ wall thickness _____
- 19. Well cover _____ Distance from top of casing to ground _____
- 20. Liner material _____
Inside diameter _____ wt.per m(ft.) _____ wall thickness _____
- 21. Screen
Manufacturer _____ Material _____
Length _____ Nominal diameter _____

Yield Testing

- 22. Yield testing duration (hours) _____
- 23. Pump type _____ Size _____

Disinfection

- 24. Disinfection _____
- 25. Well head finishing _____

Costs

- 26. Test holes per metre (foot) _____
- 27. Reaming per metre (foot) _____
- 28. Drilling/boring per metre (foot) _____
- 29. Casing per metre (foot) _____
- 30. Liner per metre (foot) _____
- 31. Screen _____
- 32. Sand pack _____
- 33. Development _____
- 34. Labor per hour _____
- 35. Water testing _____
- 36. Reclamation of unused well _____

Total

- 37. Total Costs _____
- 38. Payment schedule _____

Guarantee

- 39. Guarantee _____

* Working copies are included in the pocket on the back cover.