DSE

Department of Sustainability and Environment

Groundwater Notes

Drilling and Constructing a Water Bore

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Introduction

Water bore construction is a complex task requiring a highly skilled driller and expensive equipment. Short cuts in the construction of a bore can result in poor performance and, in many places, contamination of good aquifers by overlying salty ones.

Bore Location

Good bore construction in the proper location is of primary importance to ensure a 'top' water supply.

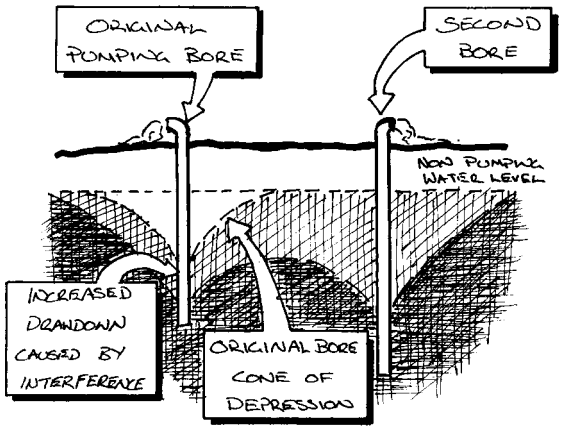
To avoid the possibility of contaminating the water supply, new bores should always be sited as far as practicable away from potential contamination sources such as drainage lines, feedlots and septic tanks. Locate the bore on high ground to prevent surface runoff and other material entering the supply.

Feature	Minimum recommended bore siting distance* (metres)
Building foundation	3
Drainage pipe	20
Power line	5
Lake, dam or waterway	20
Septic tank, drain fields system	40
Storage shed or feedlot	20
Bore not on your property	300

*your driller should contact appropriate authorities (eg *WorkSafe* and *OneDial*) before the start of drilling.

When water is pumped from a bore, water levels in the area around it are lowered. Any other bores inside this area will have their water levels affected to some extent, and this often reduces the rate at which each bore can be pumped. The closer together the bores, the more serious the interference, although it is generally impossible to predict these effects exactly. It is important that, before drilling a new bore, there be consultation with neighbours to enable the bore to be sited so that the effects may be minimised.

In many cases greater security of supply is achieved if a bore is drilled deep into an aquifer (and preferably deeper than the aquifer itself by a few meters) rather than stop at the upper part. The bore depth will be dependent on the aquifer to be tapped and advice received from the groundwater geologists.



Drilling Methods

The choice of drilling method is usually determined by the geological conditions. Some of the modern drilling rigs can drill in almost any aquifer type. However, the old cable tool method is still preferred by many drillers because of the low capital and operating costs. Drilling methods include Cable Tool, Rotary Mud, Rotary Air and Auger. Completion of the bore is similar, whichever method is used.

Contracting a driller

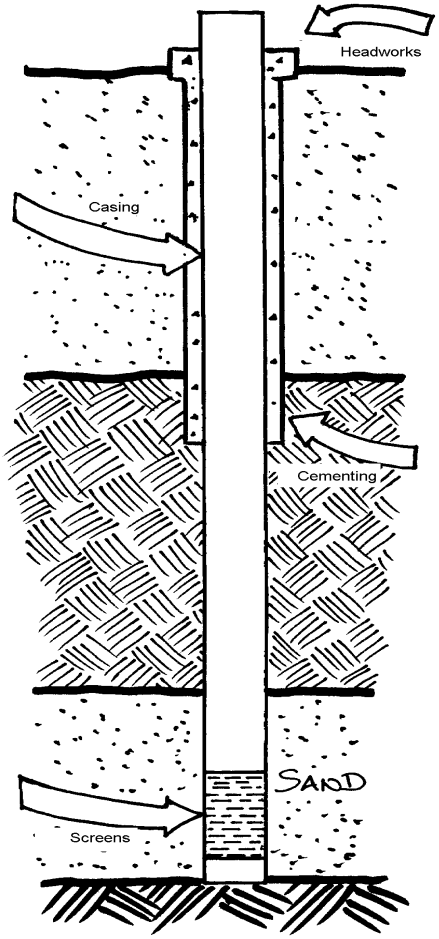
Your local Water Authority should be able to provide contacts for Licensed Drillers in your area. Please see Groundwater Notes Number 17 in this series for contacts.

Aspects of Bore Construction

Casing A bore consists of pipes (casing) extending into the ground through which groundwater is drawn from the aquifer to the surface. The casing supports the walls and prevents rocks and debris collapsing the bore and contamination by surface runoff. Where a major corrosion problem is known to exist then the casing should be of inert material.

The upper portion of the casing can serve as a housing for the pumping equipment. In some small bores the pump is connected directly to the top of the bore casing or to a suction pipe inside the bore.

Screens In water bearing loose sand and gravel formations, a bore screen may be installed in the bottom of the casing, alongside the aquifer, to prevent small particles from entering the bore. The screen apertures or gravel pack sections need to be carefully engineered to prevent sand intrusion and possible pump damage or bore blockage.



Headworks The headworks of completed bores must be constructed in such a manner that undesirable surface material cannot enter the bore. This usually entails a concrete collar and pad around the bore casing raised above the natural surface to prevent surface water entering the bore hole. Where the bore is artesian, headworks must be designed to prevent the water running to waste when it is not being used.

Cementing This is used in bore construction to provide a seal between the casing and the walls of the hole, preventing contaminated surface water from entering.

In many areas it is essential that the casing be properly cemented in the bore over its entire length. This protects the casing from corrosion and prevents contamination of a fresh aquifer by an overlying saline one. It can also prevent loss of pressure water by upward leakage behind the casing.

Geophysics Where mud circulation rotary drilling is used for drilling a water bore it is strongly advised that down-hole geophysical (wire-line) logging be undertaken. This technique uses such characteristics as natural radioactivity, electrical properties, formation density and bore diameter to obtain a clearer picture of sub-surface conditions.

Analysis of the logs, by a groundwater engineer or geologist, in conjunction with the geological log enables accurate setting of casing and screens and may aid in calculations on grout volumes for pressure cementing.

Disinfection: Disinfection of a newly completed bore is a preventative measure against iron bacteria. These bacteria occur naturally in dams, lakes, water courses and groundwater. The bacteria excrete iron on a solid surface resulting in encrustation and causing a drop in bore efficiency. A driller can disinfect the bore with a mild chlorine solution.

For further information on iron bacteria in bores refer to Groundwater Notes Number 14 in this series

Bore development All drilling methods impair the ability of an aquifer to deliver water to the drilled bore by producing fine particles which, if they are not removed from the bore, will cause clogging and reduction in the efficiency of the bore. Development aims to:

- remedy damage and clogging of the aquifer
- increase the permeability of adjacent aquifer material so that the water can flow freely through it
- stabilise the sands around a screened bore so that water pumped from the bore is free of sand

Development involves vigorous agitation of water and air in the borehole to flush out the fine particles and other material. It is a critical part of bore completion and cost saving on this item may cause poor bore performance and result in higher pumping costs.