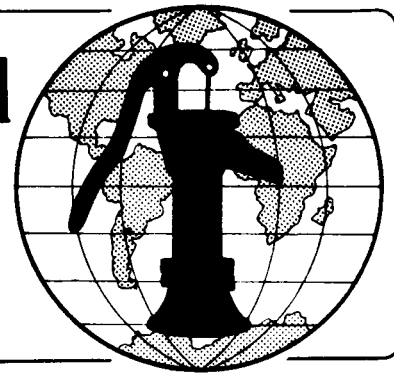


Water for the World



Constructing Jetted Wells Technical Note No. RWS. 2.C.3

Constructing a jetted well correctly is important to ensure a year-round supply of water and to protect the water from contamination. Construction involves assembling all necessary personnel, materials, and equipment, preparing the site; jetting the well shaft; and installing the casing and screen. Finishing the well is discussed in "Finishing Wells," RWS.2.C.8.

This technical note describes how to construct a jetted well. Read the entire technical note before beginning construction.

Useful Definitions

AQUIFER - A water-saturated geologic zone that will yield water to springs and wells.

WATER TABLE - The top, or upper limit, of an aquifer.

Materials Needed

The project designer must provide three papers before construction can begin:

1. A location map similar to Figure 1.
2. A design drawing of the well screen similar to Figure 2.
3. A materials list similar to Table 1.

After the project designer has given you these documents and you have read this technical note carefully, begin assembling the necessary workers, supplies and tools.

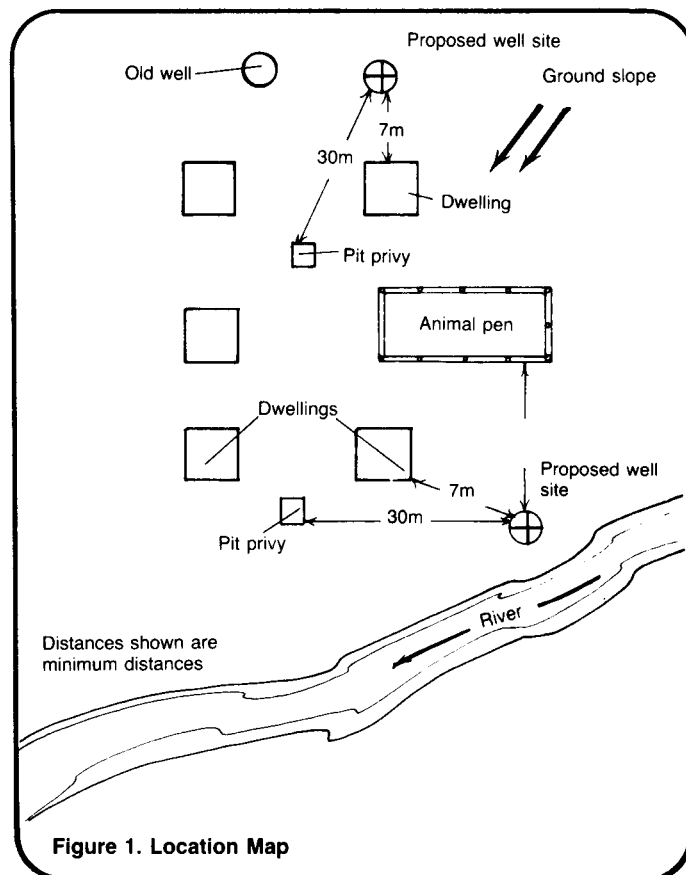


Figure 1. Location Map

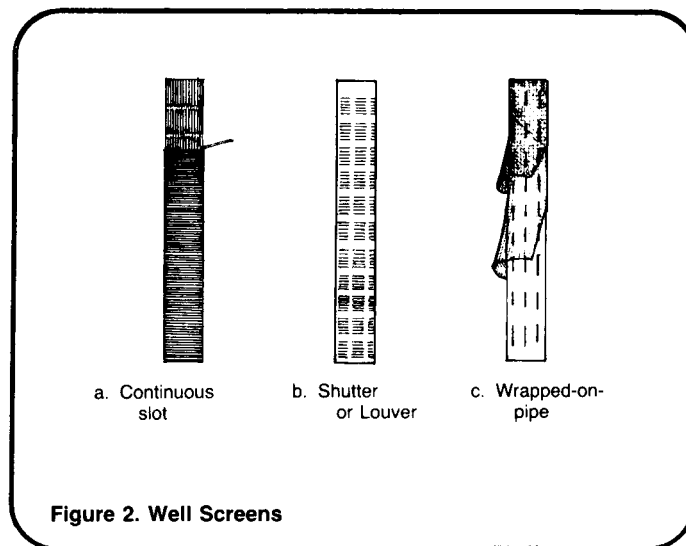


Figure 2. Well Screens

Table 1. Sample Materials List for a Jetted Well

| Item | Description | Quantity | Estimated Cost |
|----------------------------------|-------------------------------|-------------------|----------------|
| Personnel | Foreman | 1 | --- |
| | Workers | 3 | --- |
| Supplies | Well screen (continuous-slot) | --- | --- |
| | Casing; 50mm diameter | ---m | --- |
| | Plug for screen | --- | --- |
| | Concrete mix | ---m ³ | --- |
| Equipment | Tripod | --- | --- |
| | Pulley | --- | --- |
| | Rope | --- | --- |
| | Drill pipe; 38mm diameter | ---m | --- |
| | Jetting drill bit | --- | --- |
| | Pump (hand-operated) | --- | --- |
| | Hose | --- | --- |
| | Swivel hose connection | ---m | --- |
| | Hose connections (standard) | --- | --- |
| | Pipe couplings | --- | --- |
| | Pipe wrenches | --- | --- |
| | Crescent wrenches | --- | --- |
| | Screwdrivers | --- | --- |
| | Pipe cutter | --- | --- |
| | Shovels | --- | --- |
| Containers (for mixing concrete) | --- | --- | |
| Measuring tape | --- | --- | |
| Other | --- | --- | |

Total Estimated Cost = ---

Construction Schedule

Depending on local conditions, availability of materials, and skills of workers, some construction steps will require only a few hours, while others may take a day or more. Read the construction steps and make a rough estimate of the time required for each step based on local conditions. You will then have an idea of when specific workers, materials, and tools must be available during the construction process. Draw up a work plan similar to Table 2 showing construction steps.

Caution!

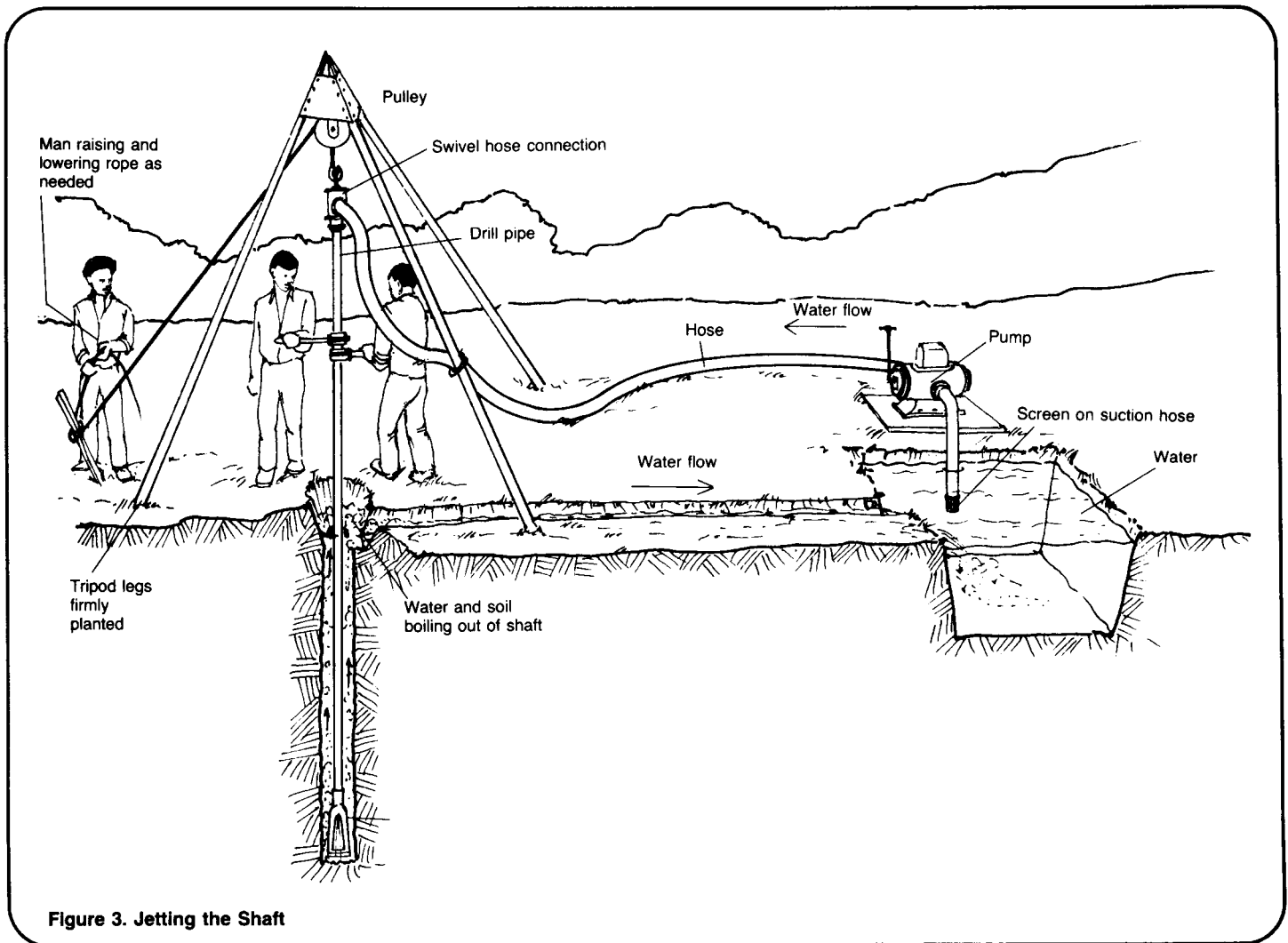
The well must be jetted at the exact location specified by the project designer.

Construction Steps

- Using the location map and a measuring tape, locate the well site. Clear the area of any vegetation or debris that might interfere with work.
- Assemble all laborers, materials, and equipment needed to begin construction.
- Erect a sturdy tripod over the site. The tripod legs should be planted firmly in the ground, and the tripod should be tall enough to accommodate the sections of drill pipe and casing. Lower a plumb bob from the tripod's pulley to mark the exact point where the well will be jetted, and dig a starter hole about 1m deep.
- Dig a settling pit to reuse jetted water 6-8m from the well site. The size of the pit depends on the size of the well to be jetted. For most wells, an adequate sized pit would be 1m deep, 1m wide, and 1-2m long. Dig a shallow, narrow trench sloping downward

Table 2. Sample Work Plan for a Jetted Well

| Time Estimate | Day | Task | Personnel | Materials/Equipment |
|---------------|-----|--|---|---|
| 1 day | 1 | Locate and prepare site; assemble materials | Foreman (present during entire construction); 1-2 workers | Measuring tape, drawings |
| 1 day | 2 | Erect tripod; dig starter hole; dig settling pit and trench | 3 workers | Wood, hammer, saw, nails, shovels |
| 1 day | 3 | Set up pump; attach suction hose; attach hose to drill pipe and bit; excavate shaft by jetting | 3 workers | Pump, hoses, drill pipe, bit, couplings, swivel couplings, rope, pipe wrenches, crescent wrenches, screwdrivers |
| 1/2 day | 4 | Remove drill pipe; set screen and casing in shaft; install plug | 3 workers | Casing sections, couplings, well screen, plug |
| 1/2 day | 4 | Pour gravel and concrete mix around outside of casing; fill in settling pit | 3 workers | Gravel, concrete mix, containers, shovels |



from the starter hole to the settling pit. Fill the settling pit with water. See Figure 3.

5. Set up the pump near the settling pit. Attach a length of hose with a screen to the suction end of the pump and lower it into the settling pit away from the trench.

6. Attach a length of hose to the outlet end of the pump. Fit a swivel hose connection on the other end of the hose and attach the first section of drill pipe. Attach a jetting bit on the end of the drill pipe. Lower a rope through the tripod's pulley, attach it to the swivel connection, and raise the drill pipe until it hangs vertically.

7. Have one or two workers grip the drill pipe with pipe wrenches. Start the pump.

8. The pump will begin to force water from the settling pit, through the hose, and out through the jetting bit. The workers should turn the drill pipe with the wrenches. The swivel hose connection will allow the pipe to turn without leaking water. The jetting action of the water and the rotating of the drill pipe and bit will cause the pipe to sink into the ground. Water and suspended matter will boil up around the sides of the drill pipe, then flow through the trench into the settling pit. The solid matter will settle and the water will be re-pumped. See Figure 3.

9. When the swivel hose connection nears ground level, that is, when the first section of drill pipe has been almost entirely sunk in the ground, shut off the pump. Disconnect the swivel connection, attach another section of pipe, and connect the swivel connection to the new section of pipe. See Figure 4.

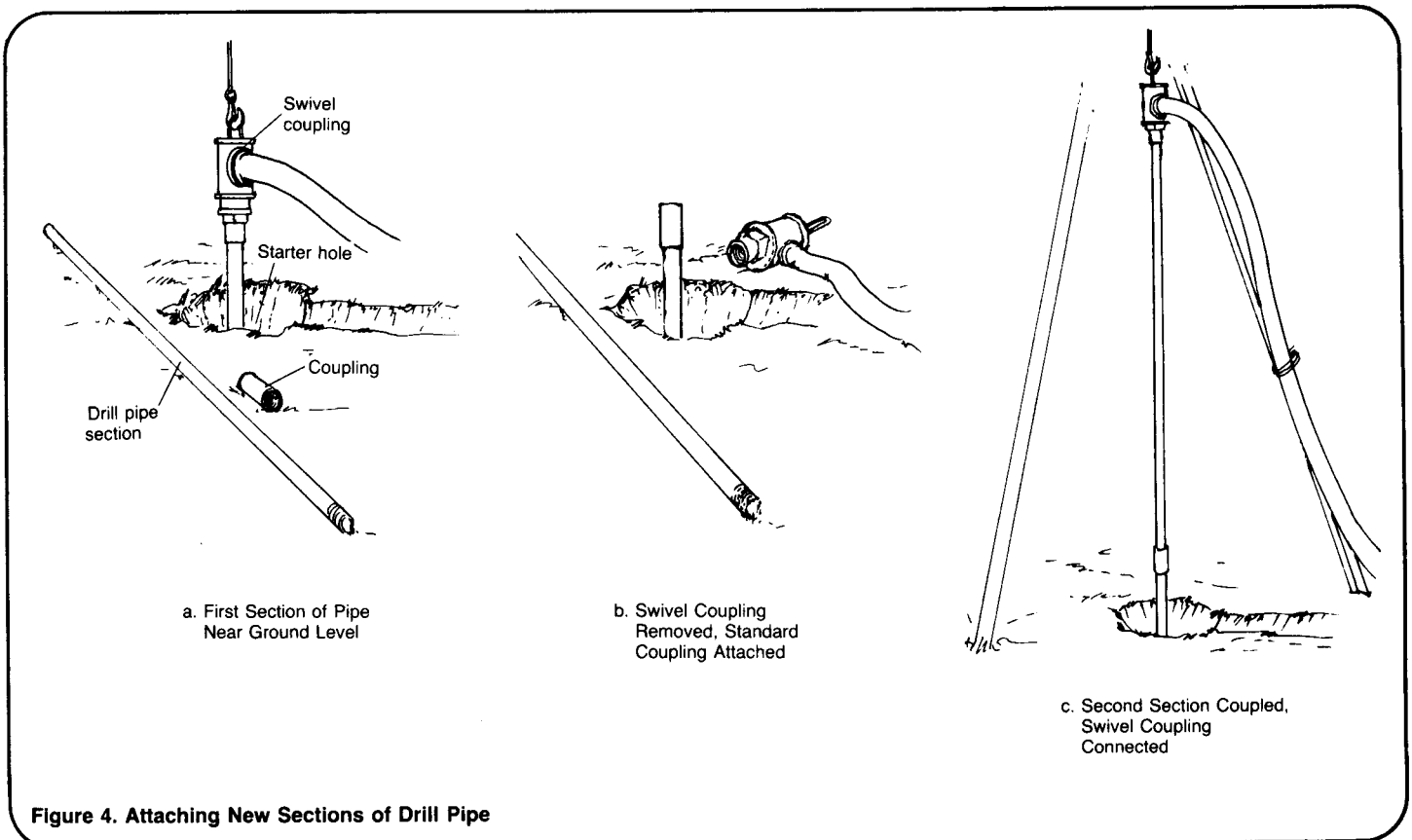
10. Restart the pump and continue the jetting process. Add more sections of drill pipe as needed.

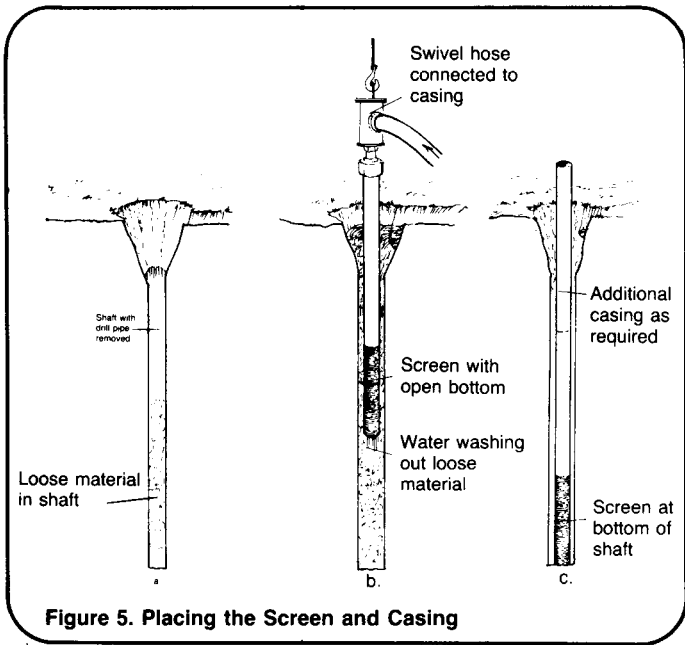
11. Drill through the water table and into the aquifer. You can tell when the aquifer has been reached by examining the suspended matter boiling up out of the well shaft. Compare the suspended matter with material that is known to be in aquifers in your region. Another indication that the aquifer has been reached is a noticeable drop in the level of the jetting water and an increase in the speed with which the shaft is being sunk.

12. When the shaft has been sunk to the desired depth, pull all sections of drill pipe out of the shaft. This may entail stopping and starting the pump. Disconnect the sections of drill pipe from the hose. See Figure 5.

13. Connect the hose to the first section of casing. Attach the well screen to the casing with the bottom end open. Raise the casing over the shaft with the rope and pulley. Lower the casing and screen into the shaft and start the pump. The water will jet out the bottom of the screen and wash out material that has fallen back into the shaft. The casing and screen should sink easily. See Figure 5.

14. When the first section of casing nears ground level, shut off the pump. Disconnect the hose, attach a new section of casing, and reconnect the hose to the new section. Restart the pump and continue to sink the casing. Add more sections of casing as needed.





15. When the screen reaches the bottom of the shaft, shut off the pump and disconnect the hose. The casing should protrude about 0.5m above ground level, so part of it may now have to be cut off with a pipe cutter. Drop a pre-seated plug into the casing to seal the bottom of the screen. The plug should be made from concrete or other non-corrosive material. It will prevent aquifer material from entering the screen. See Figure 6.

16. Pour gravel or crushed rock around the outside of the casing and fill the last 3m with concrete mix, pouring it carefully around the outside of the casing.

17. Pump as much water as possible out of the settling pit and let it flow on the ground surface away from the well site. Fill in the settling pit with excavated soil.

18. To finish the well see "Finishing Wells," RWS.2.C.8.

