

The following sequence of figures illustrates the procedure for installing the "WERI WELL":



Figure 13. Digging the hole. The hole should be 3 feet by 3 feet and at least 3 feet below the low tide water level.



Figure 14. Disinfecting the well. Add chlorox, calcium hypochlorite, or other disinfectant to the well through the well casing. This will disinfect both the well and piping system. The taste of chlorine will disappear in a few days.



Figure 15. Backfilling with aggregate, step 1. Place about 6 inches of aggregate in the bottom of the well.



Figure 16. Placing the well casing. Place the 6-inch PVC pipe in the center of the well. This pipe will serve as the well casing.



Figure 17. Backfilling with aggregate, step 2. Carefully place aggregate in the well around the 6-inch pipe until it reaches the water level.

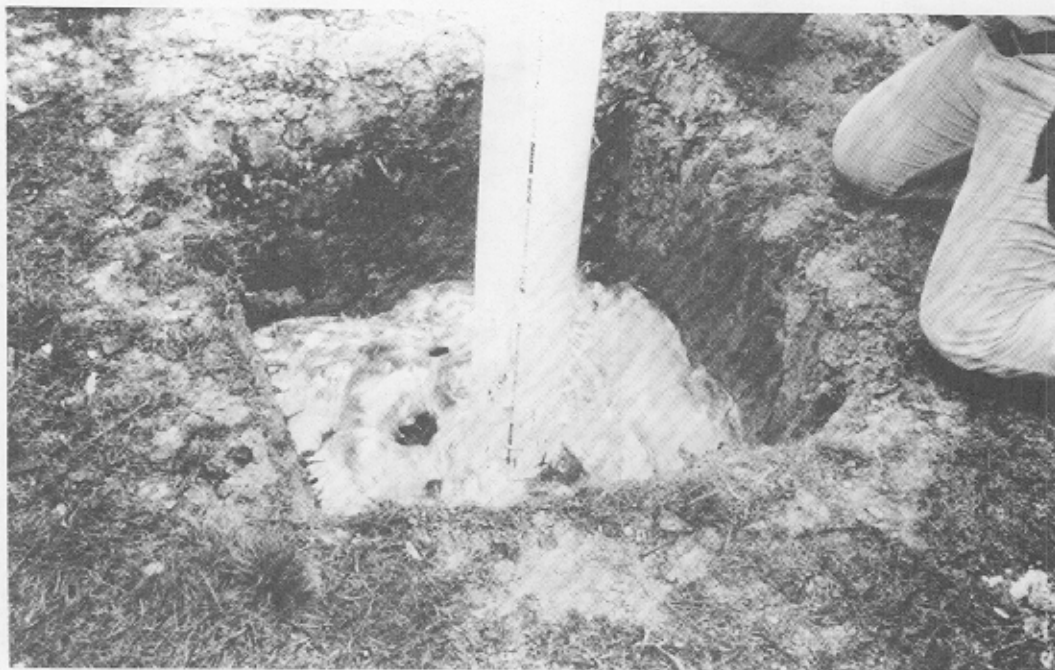


Figure 18. Placing the plastic liner. Make a small hole in the center of the plastic sheet and slide it down the 6-inch pipe and over the surface of the aggregate.



Figure 19. Backfilling with sand. Backfill the remaining portion of the well with sand originally dug from the well. Tamp it thoroughly every 6 inches.

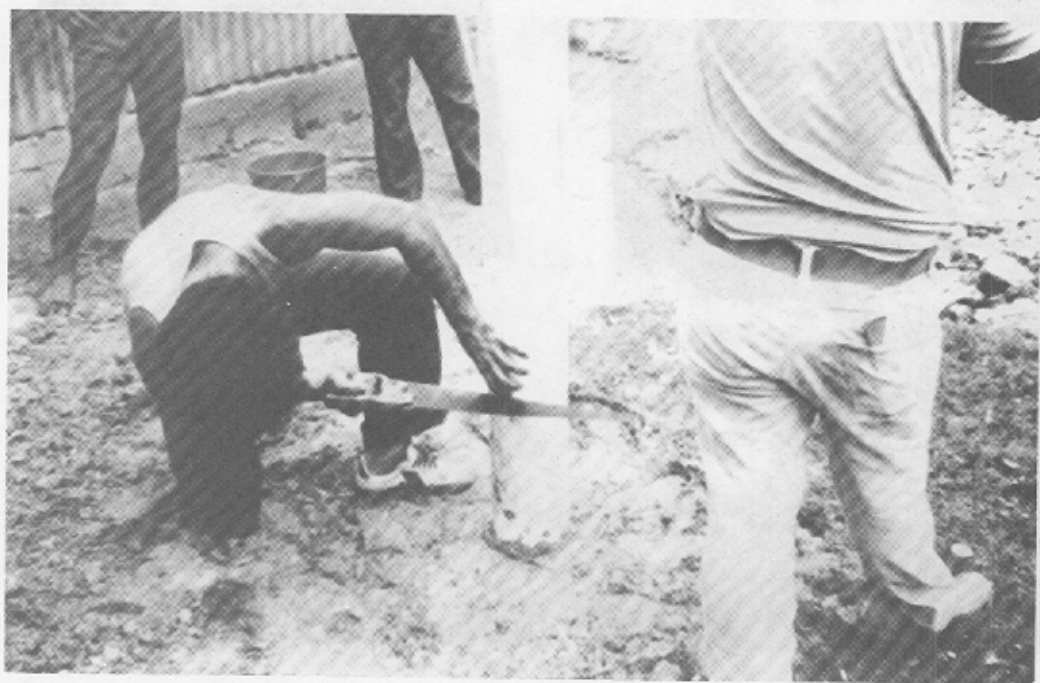


Figure 20. Cutting the well casing. Saw off the well casing approximately 1 foot above the ground.

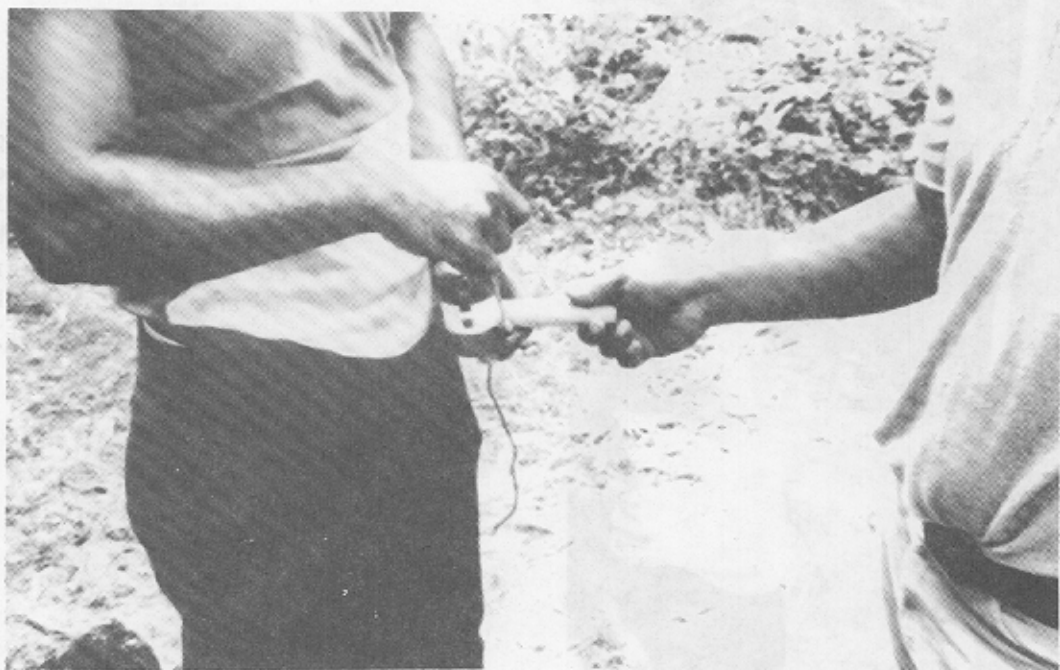


Figure 21. Connecting the pump and hose. Using a hose clamp, connect the 3-inch long piece of rubber hose to the pump.

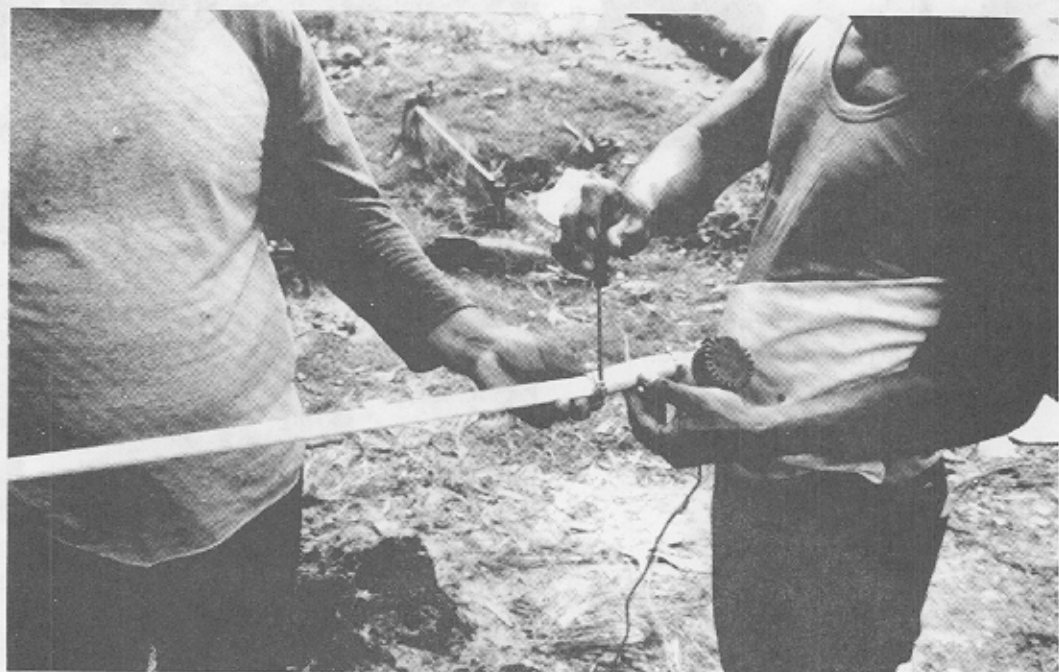


Figure 22. Connecting the well pipe and hose. Use another hose clamp to connect the other end of the rubber hose to a 10-foot length of  $\frac{1}{2}$ -inch PVC pipe (the well pipe).



Figure 23. Installing the pump. Place the well pipe/pump assembly in the well casing, allowing the pump to rest on the aggregate at the bottom of the well (photo on the left).

Figure 24. Installing the well cap. Place the 6-inch PVC pipe cap (the well cap) over the end of the well and fit the cap snugly on the well casing (photo on the right).





Figure 25. Measuring the well pipe. Lift the well pipe/pump assembly 6 inches off the bottom of the well and mark the pipe where it comes out of the well cap (photo on the left).

Figure 26. Cutting the well pipe. Cut the well pipe off at the mark (photo on the right).

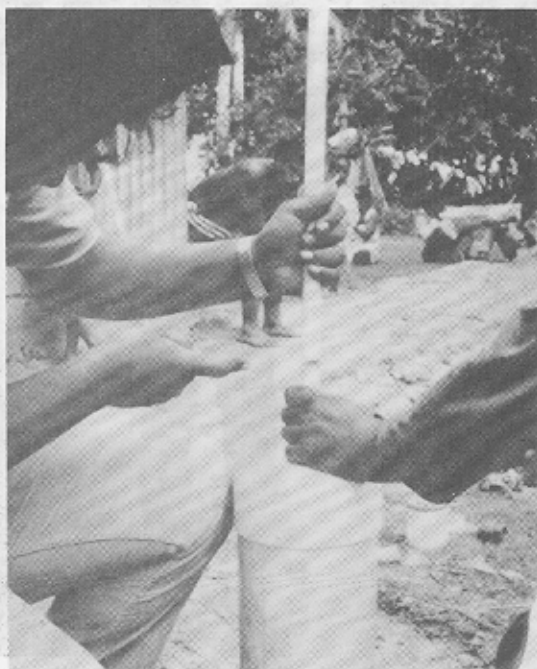




Figure 27. Installing the union/elbow assembly. Use PVC glue to attach the elbow end of the assembly to the well pipe. (Note: before gluing, rough edges of the pipe end should be removed with a knife and the end of the pipe should be sanded lightly). After gluing, the elbow will rest on the well cap keeping the pump 6 inches from the aggregate at the bottom of the well.

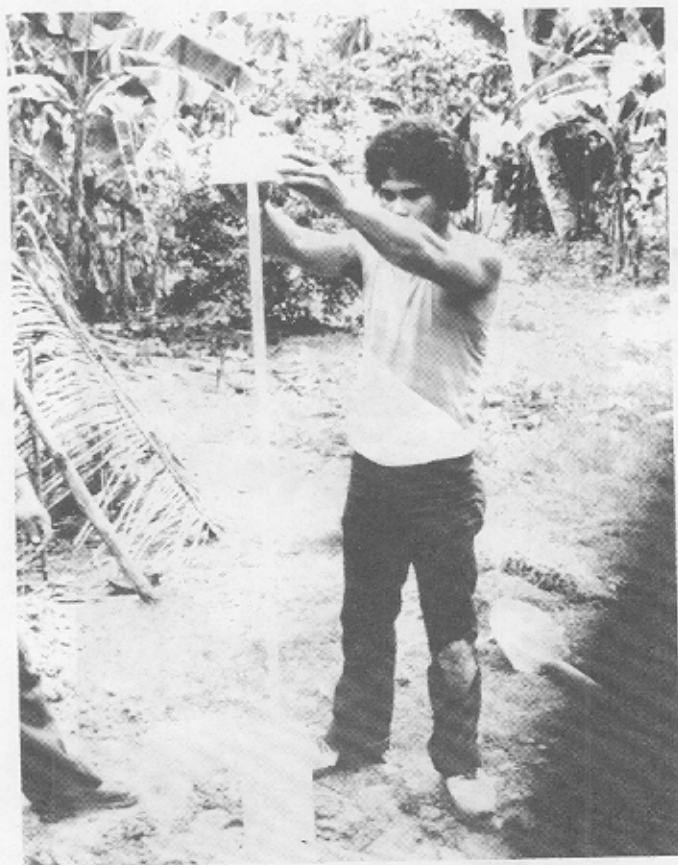


Figure 28. Removing the well pipe/pump assembly. Lift up the well cap and remove the well pipe/pump assembly from the well casing.



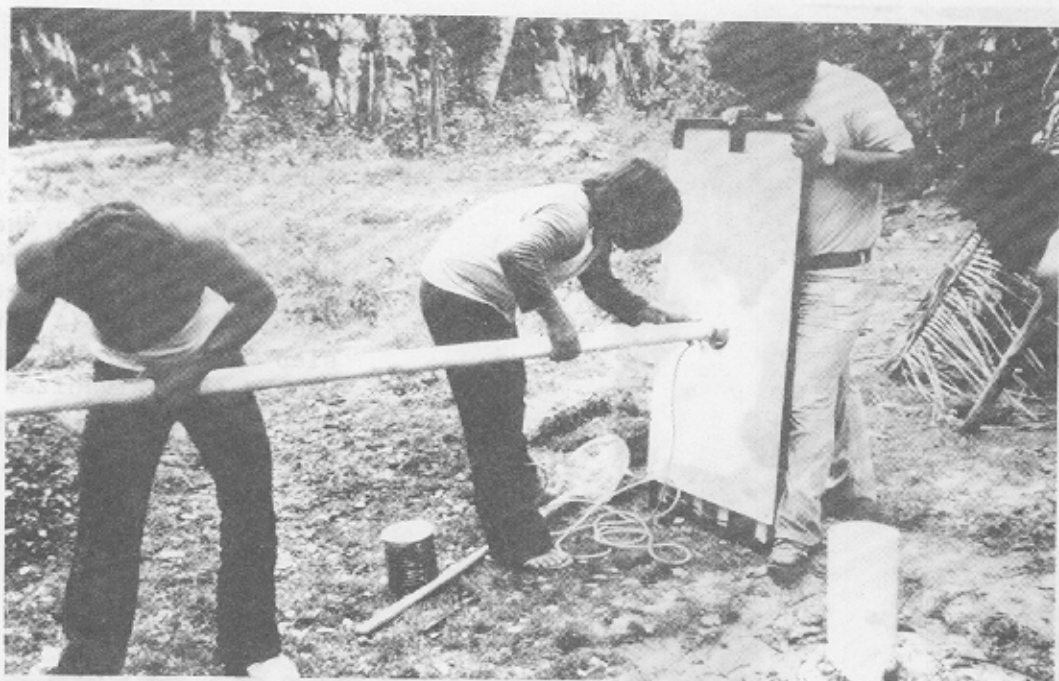


Figure 29. Attaching the galvanized pipe. Screw the 10 foot long piece of 2-inch galvanized pipe into the flange (located on the back of the solar panel assembly) until it is snug.

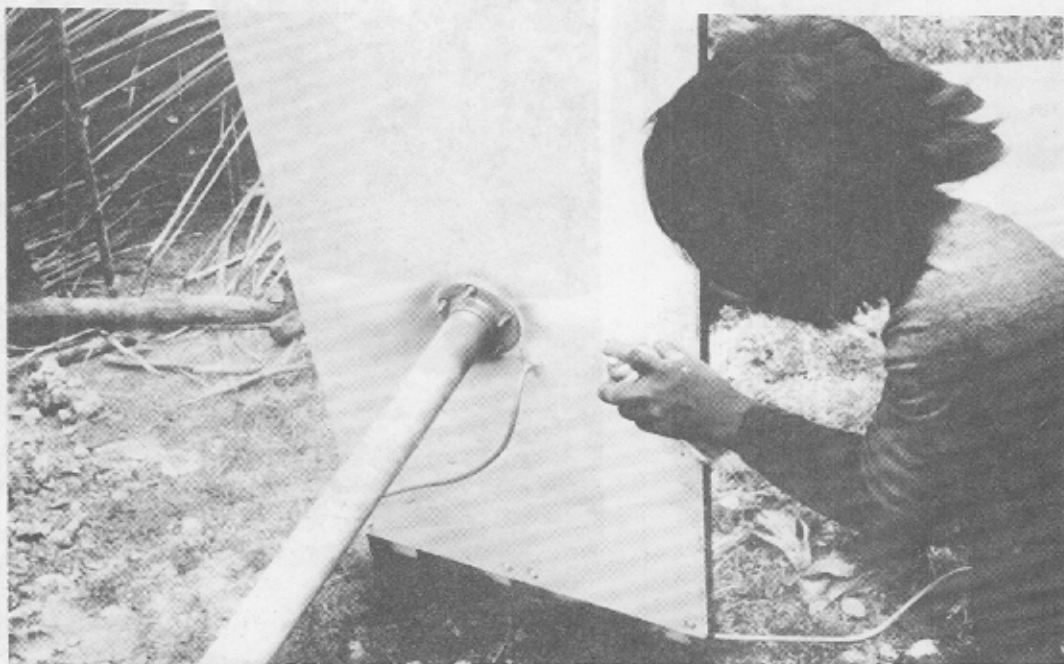


Figure 30. Spraying the pipe. Apply the cold galvanizing spray to the threaded end of the galvanized pipe to prevent rust. (Note: The face of the solar panels should remain covered with cardboard or cloth until the well installation is complete).



Figure 31. Installing the solar panels. Raise the solar panel/pipe assembly and place the pipe end at least 1 foot in the backfilled sand near the well casing (A concrete slab will later be poured around the galvanized pipe and well casing) (photo on the left).

Figure 32. Connecting the wiring, step 1. Insert the electrical cord from the solar panels through the pre-drilled hole in the well cap (photo on the right).

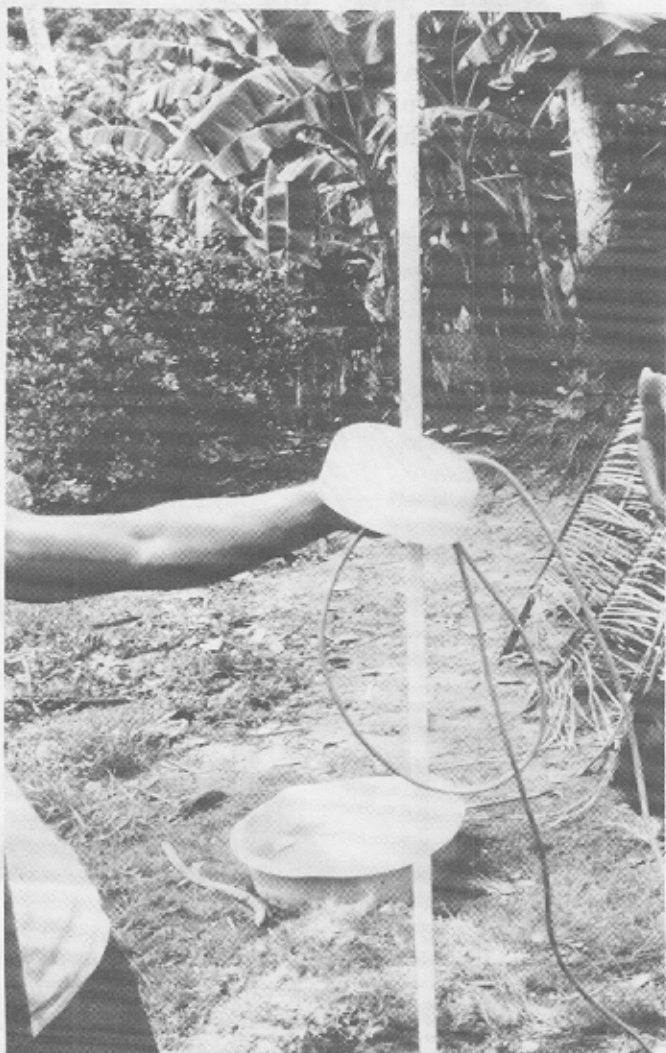




Figure 33. Connecting the wiring, step 2. Connect the white wire from the solar panel cord to the white wire from the pump cord by twisting them together. Do the same for the dark wires.

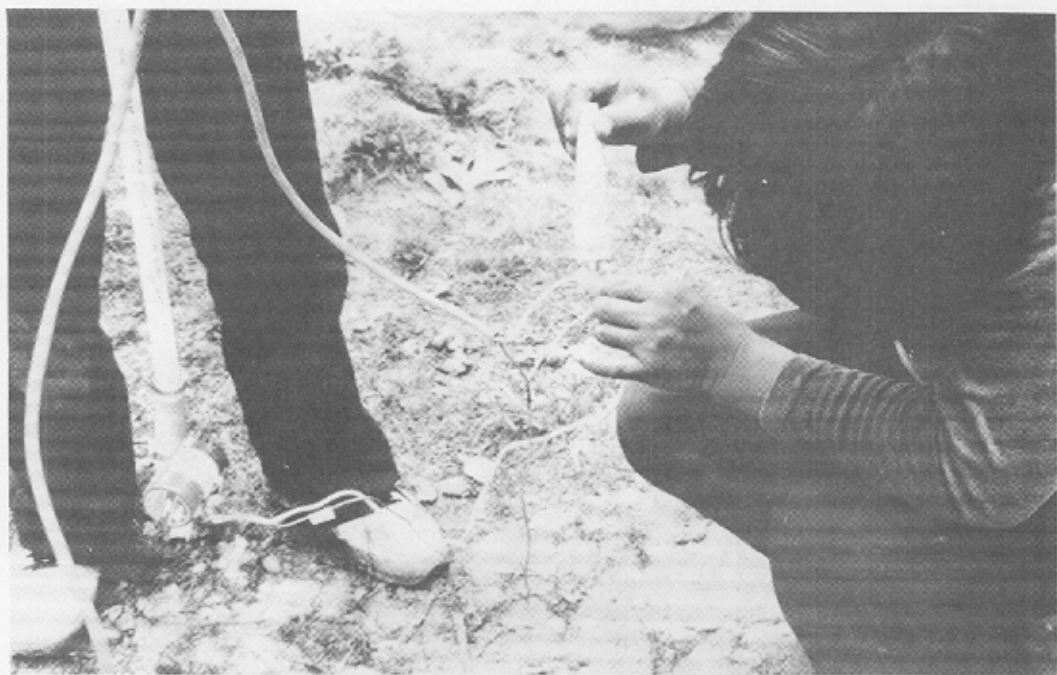


Figure 34. Insulating the connection. Apply silicone sealant to the connecting wires.

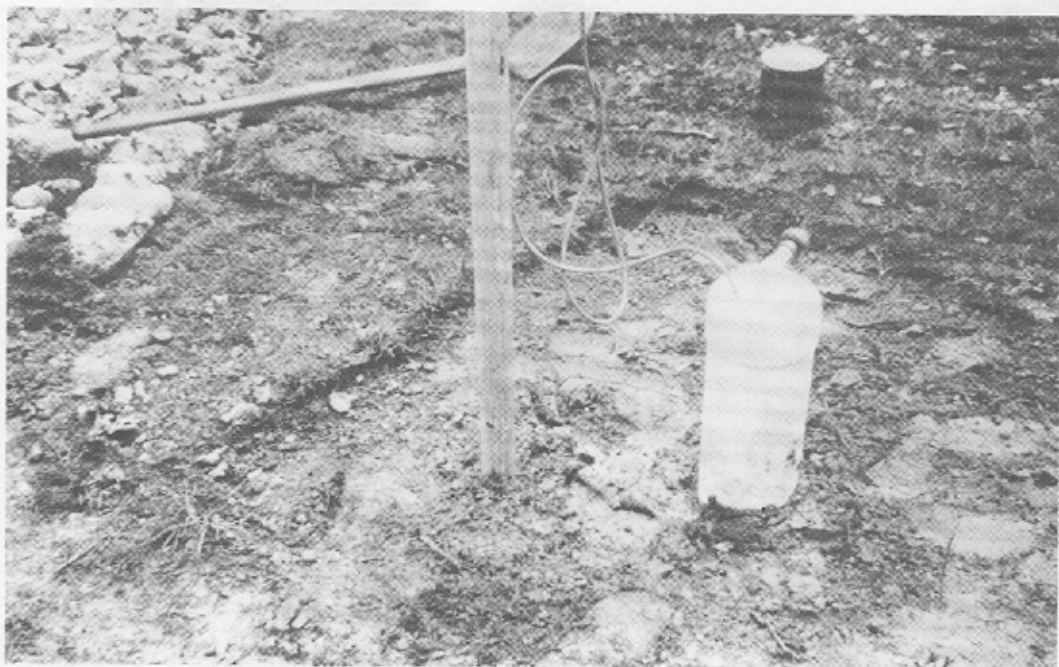


Figure 35. Reinstalling the pump. After the silicone sealant has "skinned over", place the well pipe/pump assembly back in the well casing and reinstall the well cap.



Figure 36. Running the  $\frac{1}{2}$ -inch PVC pipe. Run pipe from the well to the tank location. The pipe should be buried slightly below the ground to help protect it from damage.

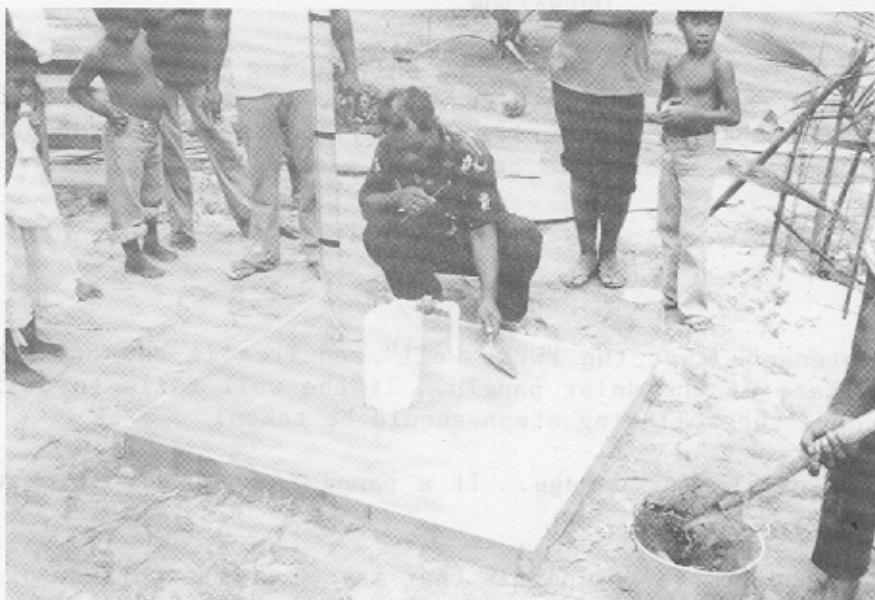


Figure 37. Pouring the slab. Use the 2-inch by 4-inch lumber to make a 4 feet by 4 feet form around the well, mix concrete, and pour into the form.



Figure 38. Energizing the pump. Remove the cardboard or cloth from the face of the panels. If there is sunlight, the pump will begin the run.

### OPERATION

"The "WERI Well" is designed to operate only during the hours when the sun is fairly high in the sky (roughly from 9 a.m. to 3 p.m.). Should it be necessary to stop pumping water during the day, a piece of cardboard or other lightweight material should be carefully placed over the panels to block the sunlight.

### MAINTENANCE

The only maintenance that the "WERI Well" requires is the occasional rinsing of the surface of the solar panels. If the well fails to deliver water on a sunny day, the following steps should be taken:

1. Check the panels for damage. If a panel is damaged, it must be replaced.
2. Check for and remove any debris that may be on the surface of the panels.
3. Check the electrical cord and repair any damaged portions.

To open the well or gain access to the pump, the two halves of the union should be disconnected (be careful not to lose the rubber o-ring). The well cap can then be removed from the casing along with the well pipe/pump assembly (Figure 28).

4. Check that the water in the well is deep enough to cover the pump. If it is not, the well may have to be abandoned or dug deeper and reconstructed (this should not occur if the well was installed correctly).
5. Check for and remove any debris from the pump filter.
6. If all of the above items check out satisfactorily, the pump has probably failed. Remove the pump and replace it with a new one (see INSTALLATION section of this report for information on pump installation).
7. If the well still does not function, one or both of the solar panels have become defective (this is very unlikely). The agency who installed the well should be contacted to check the panels.

### CONCLUSIONS

This report is based on the installation of over 20 "WERI Wells" in Truk State. It is believed that all are functioning according to design specifications. Over 100 additional wells will be installed in Truk State in the near future by local personnel. Owing to the comparative success of this project (compared to many others in Micronesia), serious consideration should be given elsewhere to the use of the "WERI Well" to address water supply problems. It is cautioned, however, that the installation of a great number of the wells in a small area or of a larger capacity well should be preceded by a groundwater assessment.

### ACKNOWLEDGEMENTS

The writers wish to thank Mr. Nachsa Siren, Rural Sanitation Program Coordinator, for his assistance in making this project possible. We also express our gratitude to Mr. Wilfred Robert, Mr. Eris Hain, Mr. Peter Wallace, and Mr. Paul Halverson of the Rural Sanitation Program Office for their assistance in the field. In addition, we wish to acknowledge other staff members of the Rural Sanitation Program Office who assisted with the project. Also, we express our thanks to Herta Yosiwo for the use of her warehouse and for providing housing for one of the project participants. Finally, we express our thanks to the many people on the islands of Truk State who participated in the installation of the wells, who provided us with food and drink, and whose warm hospitality and smiling faces made the project a memorable one.

