Section

15

Water Quality Monitoring

A system of specialized groundwater monitoring wells has been installed in the Oilfield Development Area, significantly enhancing the Project's ability to monitor groundwater water levels and quality in the region. The last two years of water withdrawal and groundwater level monitoring data shows that the Project's water use has not adversely impacted the availability of the water resources utilized by the local population. To date, the Project's water quality monitoring program has not detected any Project-related water contamination.

New Groundwater Monitoring Wells

During the fourth quarter of 2002, the Project installed 35 specialized groundwater monitoring wells (called piezometers) at strategic locations in and around the three oilfields in southern Chad.

- 19 wells in the Komé field area.
- 9 wells in the Miandoum field area.
- 7 wells in the Bolobo field area.

The wells have been drilled to depths of 17 to 52 meters with most being in the 20 to 25 meter range. These wells, an enhancement to the Project's existing water source monitoring program, allow environmental monitors to better measure the level of the water table in the area. These new special purpose monitoring wells also allow for the periodic taking of subsurface water samples, which will be tested to track groundwater quality.

Information obtained from the newly installed monitoring wells has already improved the Project's understanding of groundwater flow patterns in the region and, based on the new data, groundwater contour maps for the area have been updated.

The Project also decided this quarter to enhance its water monitoring capabilities in Cameroon. A limited number of groundwater monitoring wells will be installed at Pump Stations 2 and 3, and at the Pressure

Reducing Station. Although the wells are not explicitly required by the Project's Water Monitoring Program, their installations will improve the Project's ability to monitor groundwater in the vicinity of these sites and help ensure the protection of local residents' water sources.

An EMP monitor uses a special tool called a "bailer" to take a sample from one of the groundwater monitoring wells in the Oilfield Development Area.

2002 Ongoing Local Source Monitoring

In addition to its own groundwater monitoring wells, the Project also monitors the surface waters and wells used by local residents. Baseline data is collected before beginning work in an area, and before beginning water withdrawals. Local water source monitoring then continues during the work or water withdrawal period, using the initial baseline information to detect any adverse Project impacts. No such impacts have been detected so far at any of the Project's work sites or water withdrawal points.

Exceeding the Monitoring Requirement

In its environmental documentation, the Project committed to monitoring locally used water sources within one kilometer of a Project worksite or water withdrawal location. However, at many locations in Chad and Cameroon, the Project has extended its monitoring beyond

the one kilometer boundary and monitors water sources as much as three or more kilometers away. For example, in the Oilfield Development Area, 26 of the 30 community water wells monitored in 2002 are outside the standard one kilometer boundary.

The Project decided this quarter to increase the frequency of groundwater level measurements in the monitored village water wells from quarterly (as originally required by the Water Monitoring Program) to monthly. The increased amount of data has made it possible to better understand seasonal groundwater level fluctuations in Chad and Cameroon and thus make certain that Project activities and water withdrawals are not adversely impacting water supplies used by local inhabitants.

No Quantity or Quality Impact Found

Data gathered by the Project during 2002 consistently showed that groundwater withdrawals by the Project have not led to lower water levels in nearby village water wells. The fluctuations seen in village wells are well within normal variations caused by the alternating rainy and dry season patterns in the Project area.

During 2002, more than a dozen village water wells were sampled and analyzed for quality, looking for any evidence of Project-related contamination. Chemical analyses of the samples showed that some of the village wells did not meet the water quality guidelines of the World Health Organization (WHO) for certain parameters. However, this condition was detected during baseline testing and pre-dated Project construction activity, as noted in the Environmental Assessment. Water quality monitoring to date has not detected any project-related contamination.