GROUND-WATER LEVELS IN ALLUVIUM ON THE SOUTH COAST OF PUERTO RICO,

FEBRUARY 1978

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GEOLOGICAL SURVEY

GROUND-WATER LEVELS IN ALLUVIUM ON THE SOUTH COAST OF PUERTO RICO, FEBRUARY 1978

By José Raúl Diaz

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By José Raúl Díaz

ABSTRACT

Ground-water levels in the alluvial aquifer of the south coast of Puerto Rico in February 1978 were similar to or slightly higher than those of February 1977. Water levels rose about 2 to 3 meters in the upper section near the foothills in the coastal plain area from Salinas to Patillas and in the Guánica-Peñuelas area.

Pumpage remained unchanged in most of the areas under study. Pumping-water levels were above mean sea level in all industrial well fields. Pumping and static water levels were below mean sea level (1 to 3 meters) in public supply and irrigation wells in the areas of Playa de Ponce, Descalabrado-Punta Petrona, and in the vicinity of the town of Salinas. These levels are considered to be normal during the dry season in these highly irrigated areas. Sixty-four water samples collected from irrigation, industrial and salinity observation wells exhibited similar or lower chloride concentration than in previous years. The average chloride concentration for 1978 was 57 milligrams per liter.

INTRODUCTION

This report describes the results of ground-water-level measurements and chloride ion concentration determinations made during February 1978 in the south coast alluvial aquifer from Guánica to Patillas.

The study includes the alluvial valley of Río Loco in the Guánica area; the lower valleys of Ríos Macaná, Guayanilla, and Yauco as far north as the town of Yauco in the Yauco-Guayanilla area; the alluvial valley of Río Tallaboa south of the town of Peñuelas; and the coastal plain from Ponce to Patillas.

The Ponce-Patillas section is the most important area of ground-water development in Puerto Rico. The aquifer in this section is located in the south-sloping plain formed by the streams draining the southern flanks of the mountains. Cretaceous rocks underlie the eastern part of the plain, and Tertiary rocks underlie the central and western parts.

On the coastal plain and in river valleys the alluvium is composed mostly of unconsolidated deposits containing coarse permeable sand and gravel which are the principal water-bearing materials. The consolidated rocks underlying the alluvium are not important as aquifers except in those areas where the

limestone lies close to the surface and is in hydraulic connection with the alluvium. The average aggregate thickness of the south coast alluvial aquifer is about 60 m (meters).

During this study, water levels were measured in 172 water-table wells and 64 water samples were collected from pumping wells and from salinity observation test holes. The observations were made during a drought when most of the rivers had been diverted from their normal courses for irrigation, and pumpage had increased substantially in all of the study areas.

The water-level data are presented on contour maps that generalize the shape and altitude of the water surface; selected hydrographs of observation wells from which data are collected on a monthly basis are included. Similar studies of ground-water levels and chloride ion concentration in the aquifer of the south coast have been made by the U.S. Geological Survey since 1968.

For those readers interested in using the inch-pound system, multiply metric (S.I.) units (meters) by 3.28 to obtain inch-pound units (feet).

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As a result of heavy rainfall during October and November 1977 and rainfall considerably above normal in January 1978, ground-water levels recovered in all areas on the south coast of Puerto Rico.

Static water levels in the Guánica to Patillas area rose by 1 to 3 m from those measured in 1977. The greatest ground-water change was observed in wells located in areas near the foothills. In the Guánica-Peñuelas section, water levels rose (3 m) in the upper Río Loco basin; in the vicinity of the town of Yauco; and in the upper Tallaboa Valley. In the middle and lower sections of these valleys, water levels remained unchanged. In the Ponce-Patillas section water levels in several wells in the upper part of the plain near the foothills rose about 1 to 2 m as compared with 1977 records.

Pumpage in all industrial centers remained unchanged in the south coastal areas. Pumping-water levels in the Barinas, Macaná, Tallaboa and Guayama industrial well fields were 2 to 15 m above mean sea level. In the Playa de Ponce and between Río Descalabrado and Punta Petrona, pumping-water levels were about 1 to 5 m below mean sea level; these levels are considered to be normal during the dry season in these highly irrigated areas. Another area of depressed water levels is around the town of Salinas, but under static conditions wells usually show recovery above mean sea level.

The water-level data are presented in figures 1, 2, and 3 and in accompanying hydrographs. The contour maps were drawn from 148 static-water-level measurements made in wells not being pumped at the time of measurement. The contour maps show the approximate configuration of the water surface. The well hydrographs were plotted from monthly measurements of water levels in observation wells.

Most of the observation well hydrographs indicated that water levels in February 1978 were about the same or slightly higher than those measured in February 1977. Water levels in a few observation wells were lower than those measured in irrigation wells of the same area. This condition depends on the location of the observation well and the time when the measurement was made.

CHLORIDE CONCENTRATION

Water samples collected from 64 wells in the areas under study exhibited chloride concentrations similar to or lower than those of previous years. The average chloride concentration for all samples collected in 1977 was 74 mg/L (milligrams per liter); for 1978 it was 57 mg/L. Only seven of the 64 samples showed chloride concentration greater than 100 mg/L; five of these samples were collected in wells tapping the limestone aquifer. The chloride concentration in wells tapping the limestone aquifer ranges from 110 to 390 mg/L. The other two samples were collected from wells located close to the shoreline; one is used for public supply (990 mg/L chloride); the other for a swimming pool (7,800 mg/L chloride concentration).

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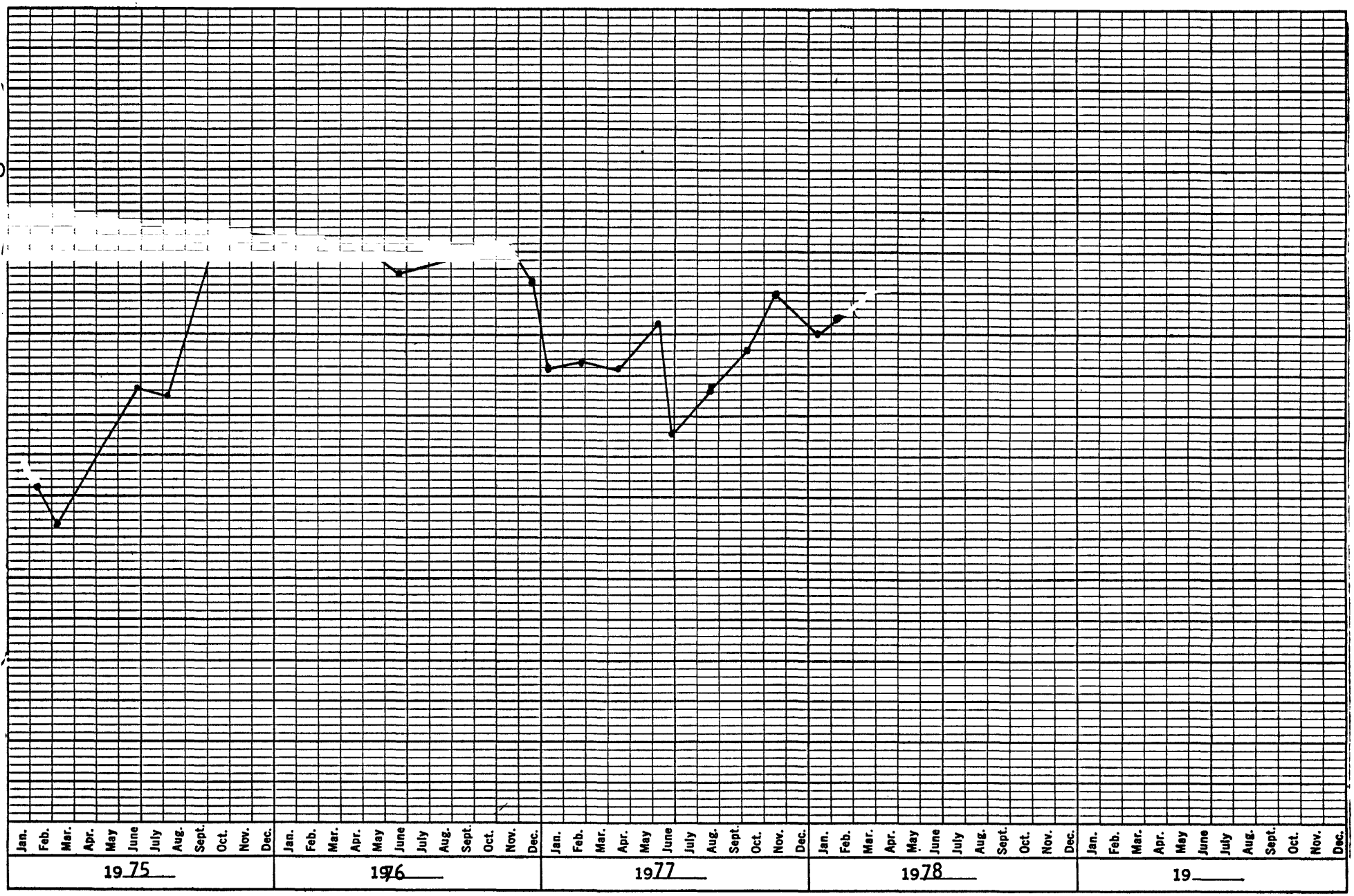

Figure 1a.--Hydrograph of static water levels, observation well 16 (location shown in fig. 1).

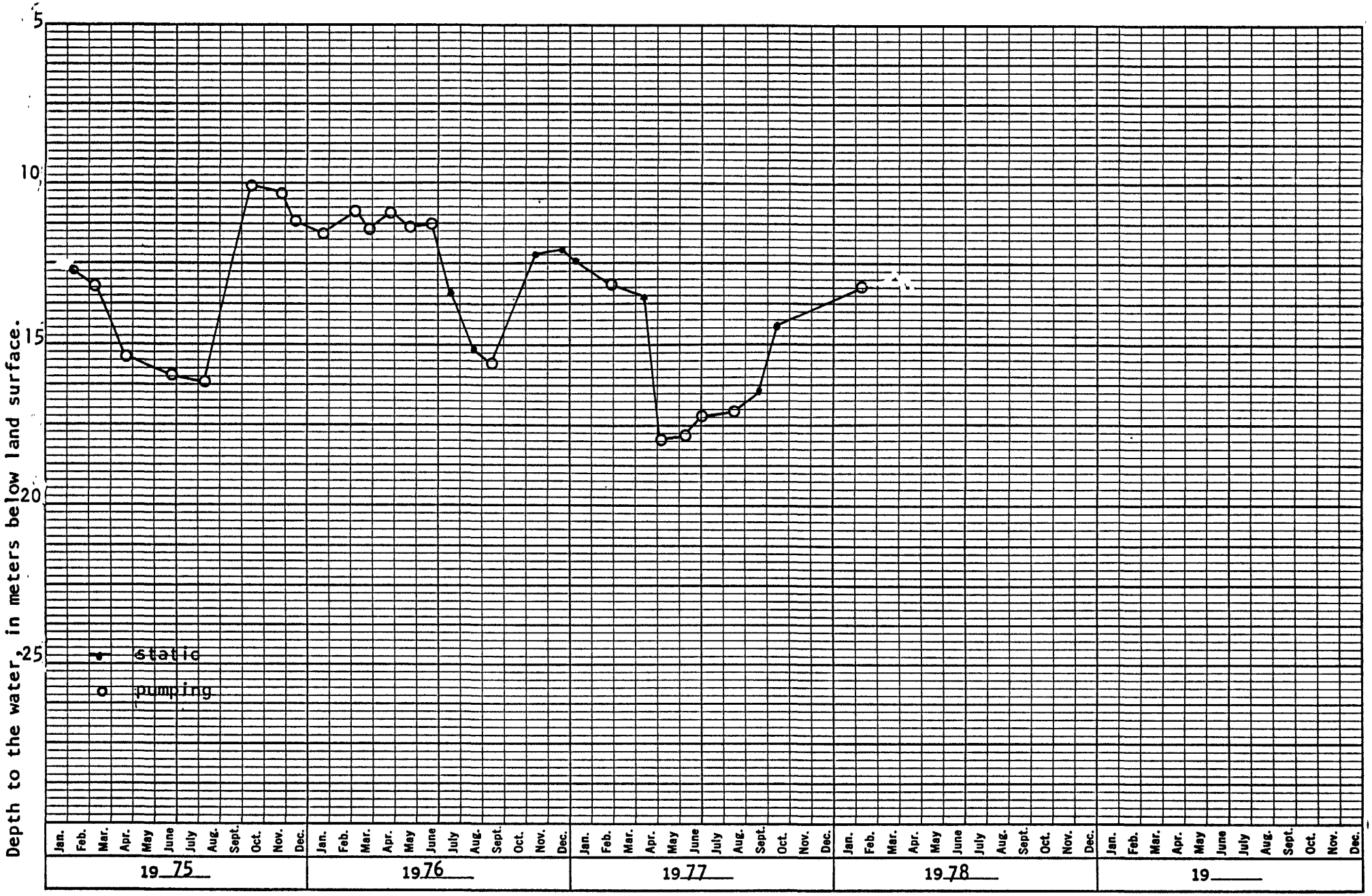

Figure 1b.--Hydrograph, observation well 27 (location shown in fig. 1).

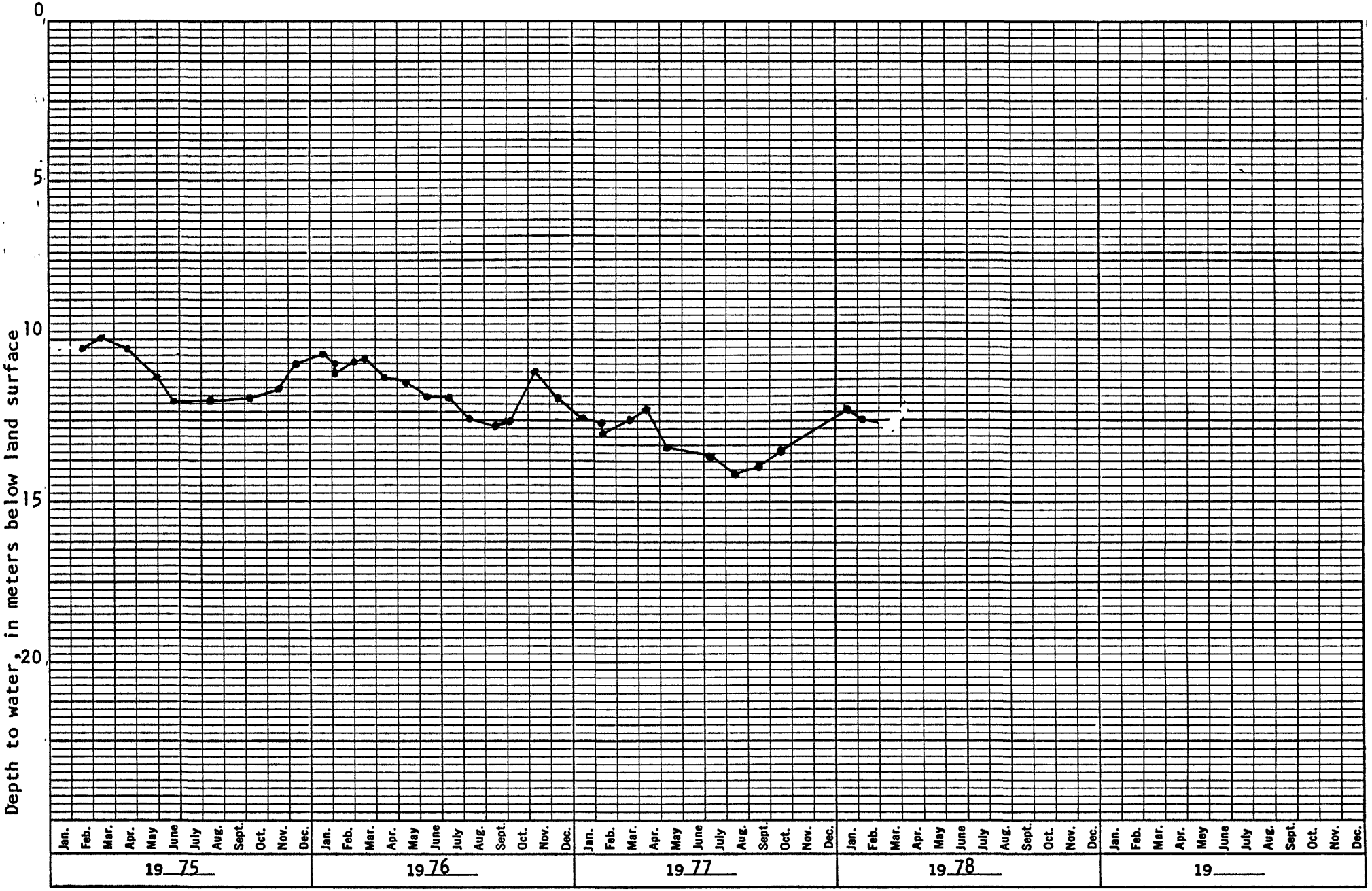

Figure 2a.--Hydrograph of static water levels, observation well 87 (location shown on Fig. 2).

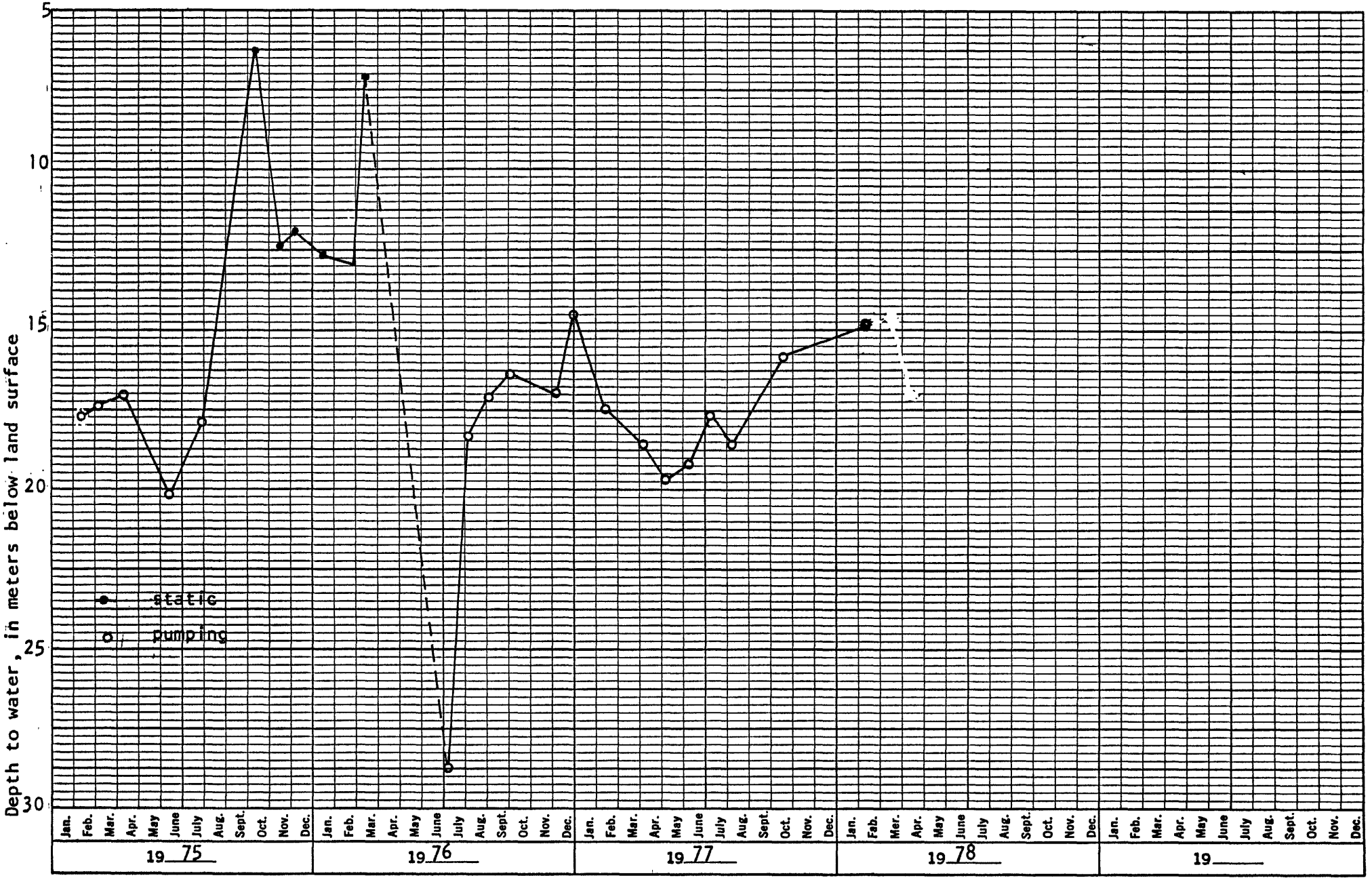

Figure 2b.--Hydrograph, observation well 21 (location shown on fig. 2).

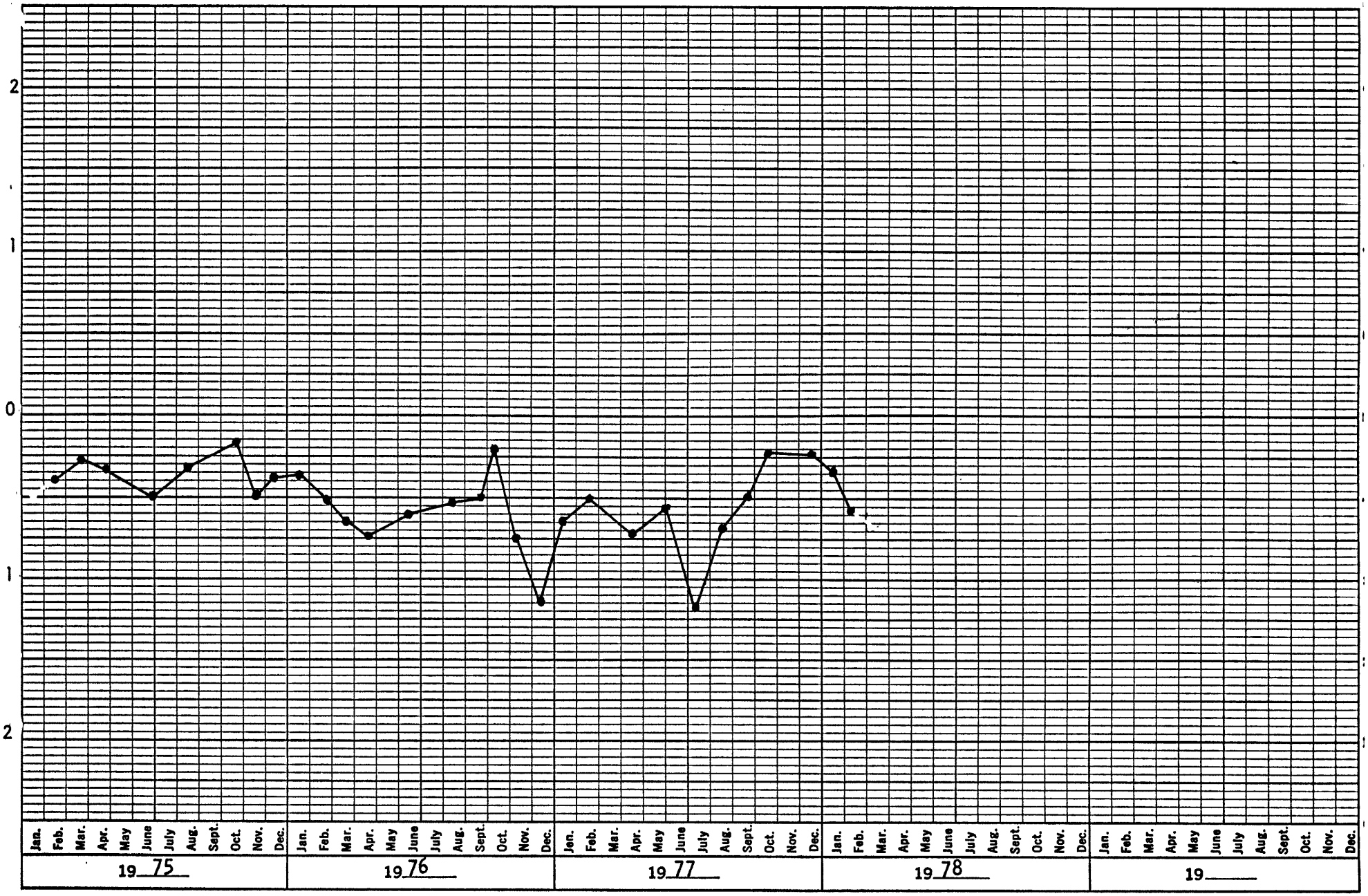

Figure 3a.--Hydrograph of static water levels, observation well 1 (location shown in fig. 3).

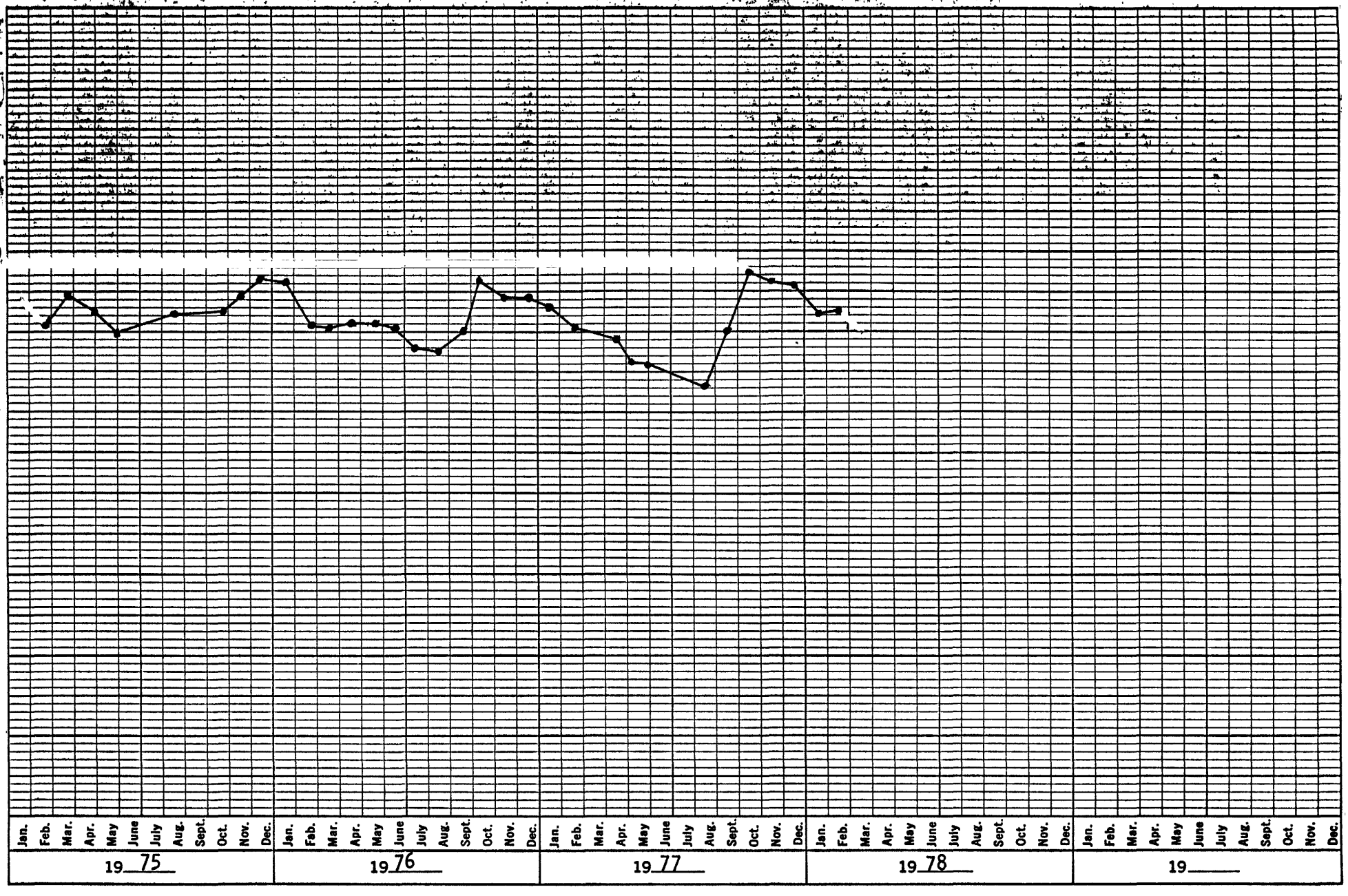

Figure 3b.--Hydrograph of static water levels, observation well 3 (location shown on fig. 3).

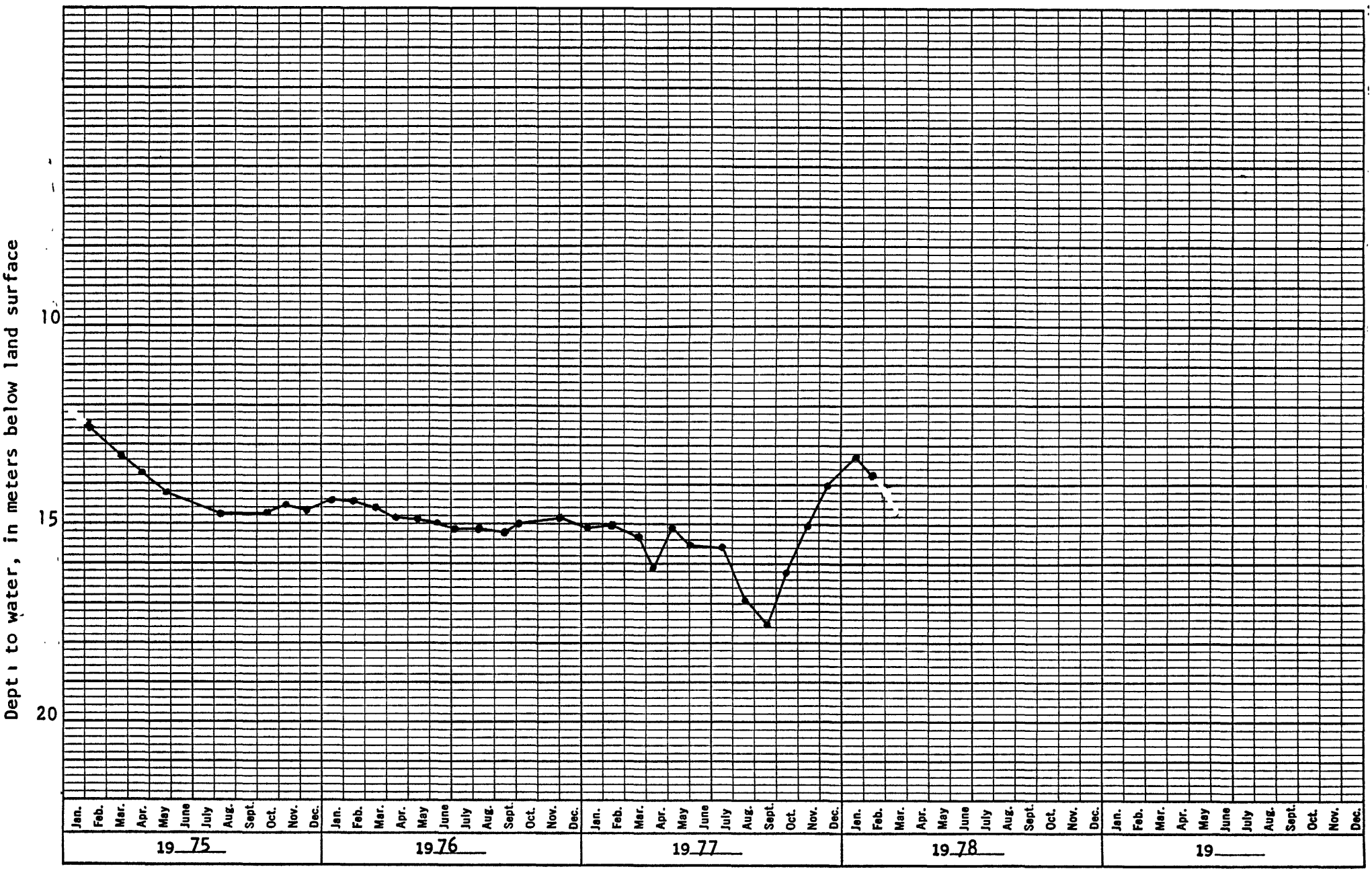

Figure 3c.--Hydrograph of static water levels, observation well 6 (location shown in fig. 3).

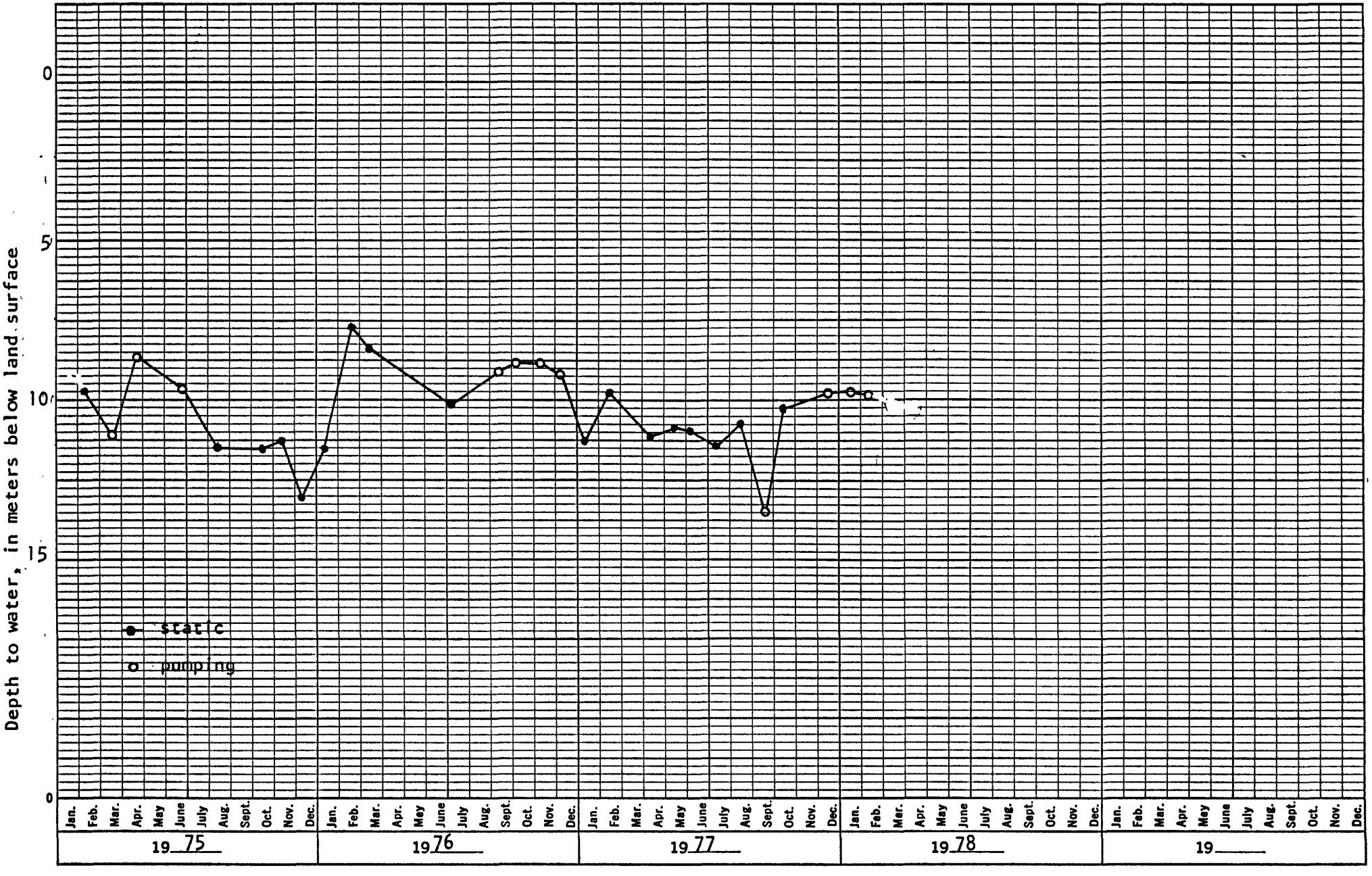

Figure 3d.--Hydrograph, observation well 8 (location shown in fig. 3).

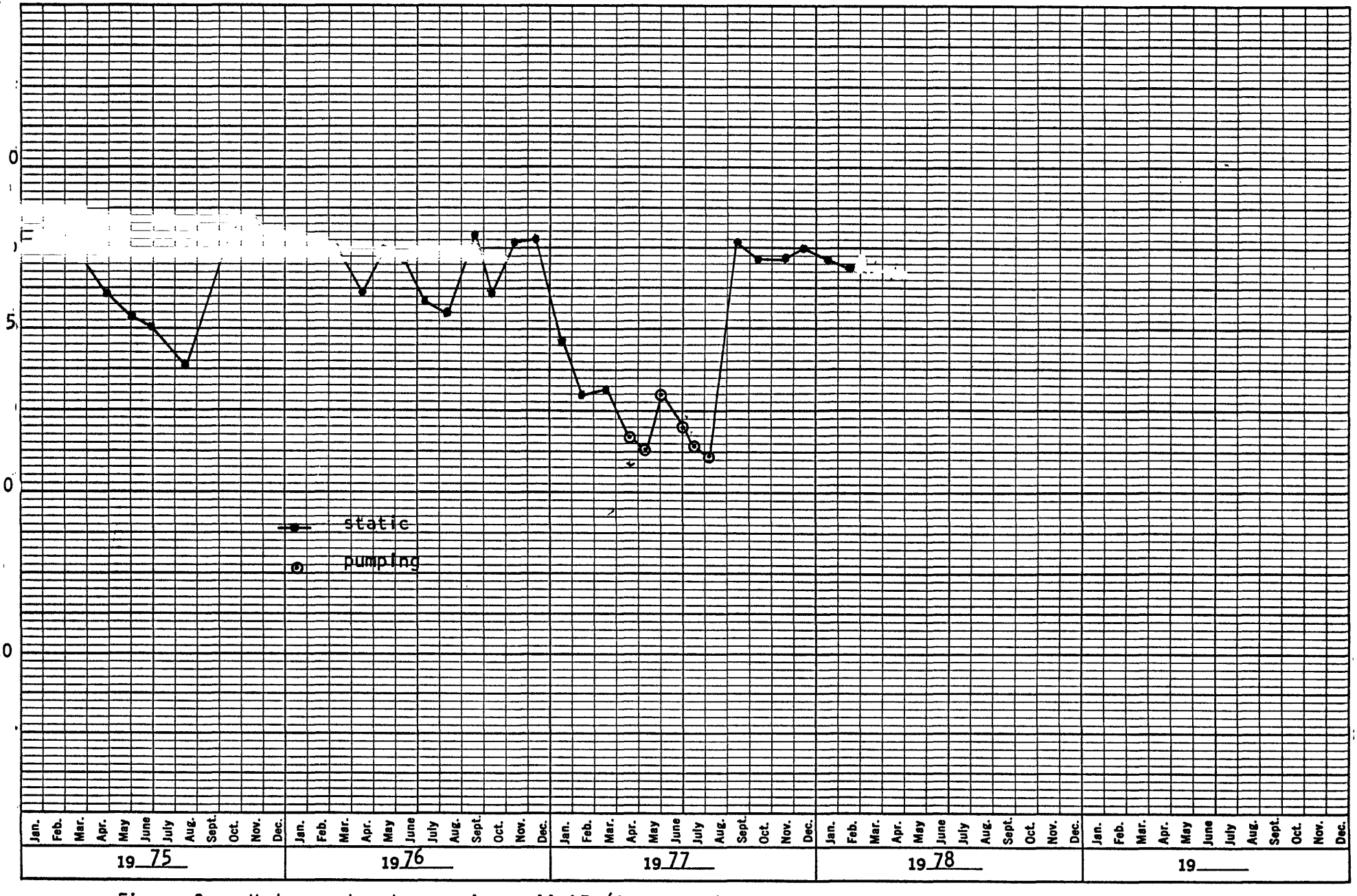

Figure 3e.--Hydrograph, observation well 15 (location shown in fig. 3).

Figure 3f.--Hydrograph of static water levels, observation well 18 (location shown in fig. 3).

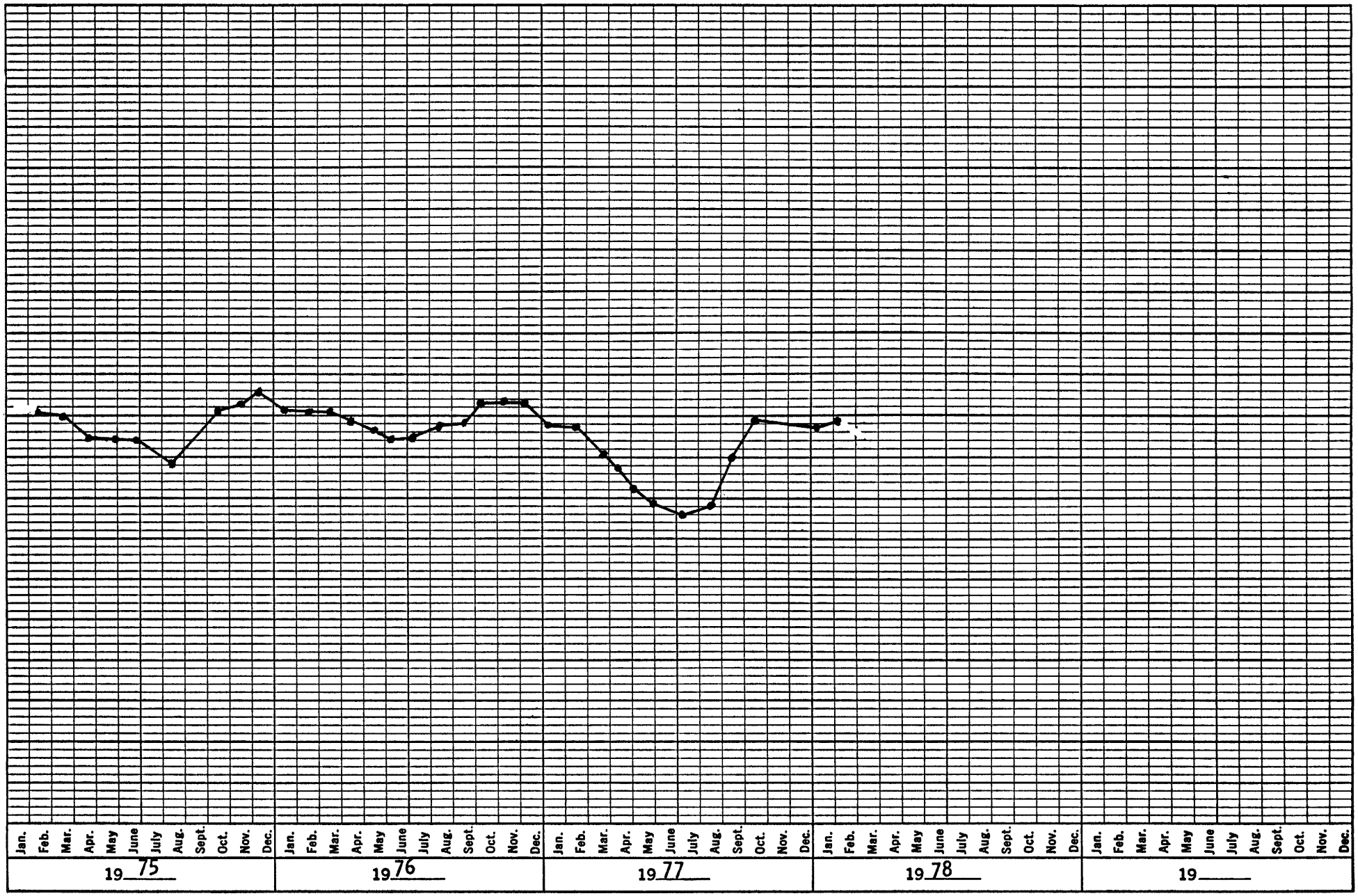

Figure 3g.--Hydrograph of static water levels, observation well 89 (location shown in fig. 3).