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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

~~Memorandum regarding~~ ground-water conditions in the vicinity of the U. S. Veterans Administration Hospital, at Castle Point, Dutchess County, New York

by

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INTRODUCTION

In response to a request made by the United States Veterans Administration to the United States Geological Survey in February 1950, a memorandum was prepared describing ground-water conditions in the vicinity of the Castle Point Veterans Hospital (Dutchess County, New York) based upon data available in the files of the Albany Office of the Ground Water Branch of the Geological Survey. An estimate of expenses for additional ground-water investigations was included in the memorandum. In May 1950, the Veterans Administration asked the Geological Survey to proceed with the ground-water studies recommended by the Ground Water Branch. (Letter dated May 23, 1950 - - J. J. Rockefeller, Director of Construction, U. S. Veterans Administration to W. E. Wrather, Director, U. S. Geological Survey). This report is the result of those studies.

FIELD STUDIES

Field studies were conducted during the month of June on the property of the Veterans Hospital at Castle Point and in adjacent areas. All available hydrologic data have been collected, electric resistivity exploration

was performed, and a geologic map has been prepared showing all prominent bedrock outcrops, (attached).

It was planned originally to run only three electric resistivity profiles on the property of the Veterans Hospital but as these yielded but limited information it was thought desirable to continue investigations while personnel and equipment were at the site. Twelve additional electric resistivity lines were completed within a three mile radius of the hospital.

Two water samples were taken from two of the seven bedrock wells being pumped for Hospital supply. Analyses of these samples is included in this report.

RESULTS OBTAINED

Additional hydrologic data obtained in June for rock wells in the Hospital area has revealed one well with the comparatively large yield of 35 gallons a minute. It is on the property of Mr. Jefferow, one-eighth of a mile southeast of the Veterans Hospital.

The sites of the electric resistivity profiles have been plotted on the attached copy of the Wappinger Falls 7½ minute topographic map. Three of the sites are located on the property of the Veterans Hospital. The

electric resistivity profiles have given some indication as to the depth of bedrock and the character of the overburden, but the results are not entirely clear cut. Below are listed the approximate depth of bedrock indicated by the electric resistivity explorations, listed by numbers as given on the attached map:

Profile	1	Rock	± 30	feet	below land surface
do	2	do	± 25	feet	do
do	3	do	± 200	feet	do
do	4	Electric interference (No results possible)			
do	5	Rock	± 35	feet	below land surface
do	6	do	± 10	feet	do
do	7	do	± 25	feet	do
do	8	do	± 60	feet	do
do	9	do	± 20	feet	do
do	10	do	± 15	feet	do
do	11	do	± 25	feet	do
do	12	do	± 95	feet	do
do	13	do	± 30	feet	do
do	14	do	± 40	feet	do
do	15	do	± 15	feet	do

The log of a hand-augered hole at electric resistivity profile 1 is listed below:

Type of Material	Thickness (feet)	Depth (feet)
Topsoil with small boulders	0.5	0.5
Sand, fine (80%) and clay (20%) with some small angular gravel (dry)	0.5	1.0
Sand, medium, light-brown, coarse (80%) and clay (20%) (dry)	4.0	5.0
Sand, coarse, and fine gravel (dry) . . .	9.0	14.0

Prominent bedrock outcrops are plotted on the Wappinger Falls topographic map along with the sites of electric resistivity profiles. Types

of bedrock are indicated by symbols on the map.

Attempts were made to obtain information for a 14-inch well situated 300 feet southeast of electric resistivity profile 4. By means of a casing explorer it has been determined that the well has a depth of 36 feet and is cased to that depth. A verbal report from a local driller indicates that the well was originally 50 feet deep. The well is believed to have filled with sand. A pumping test showed that the yield of this well is very small. When pumping at the rate of 90 gallons a minute the water level was drawn down below 30 feet in less than a minute. Recovery of the water level after two hours was less than 3 inches.

SUMMARY OF GROUND-WATER CONDITIONS

Further hydrologic investigations have substantiated the original report that the chance of obtaining the needed quantity of well water, about 300,000 gallons daily, from bedrock is poor, except in areas underlain by the Wappinger limestone. The nearest limestone area is in the Fishkill valley 3 miles to the south and southeast. In places in the Fishkill valley, the Wappinger limestone is overlain by beds of highly permeable glacial outwash. The widespread distribution of bedrock outcrops (see map) indicates

the absence of extensive buried valleys filled with permeable glacial materials, in the vicinity or east of the Veterans Hospital. The electric resistivity profiles also indicate that depth to bedrock is not great.

The electric resistivity investigations indicate two areas of some promise. However, test drilling is necessary to determine if an adequate ground-water supply can be obtained. Resistivity profile 1, centered on Hospital property about 1,100 feet east of the east bank of the Hudson River, shows an estimated thickness of 30 feet of overburden. The nature of the overburden is not known other than from the hand-augered hole at the site. One or two shallow test holes are needed to determine fully the water-bearing possibilities of the overburden, and the upper part of the bedrock. Resistivity profile 3, centered on private property, and 1,100 feet south of the Hospital Power Plant, indicates an estimated thickness of overburden of 200 feet. Wells at this site might obtain large quantities of water either from permeable overburden or by induced infiltration from the Hudson River, or both. A water supply dependent upon infiltration undoubtedly would be affected by the quality of water in the Hudson River, although considerable natural filtering can be expected. The decrease in flow of

The Hudson River during the latter part of the summer permits greater quantities of tidal salt water to penetrate farther upstream. Each summer, this generally results in an increase in the chloride content of water obtained from wells adjacent to the Hudson River. Tests made at the Veterans Hospital at Castle Point show that on 47 days in 1949 the chloride content of the river water exceeded 250 parts per million, the maximum set for drinking water by the United States Public Health Service.

The Laboratory Division of the New YorkBoard of Water Supply obtained many samples of Hudson River water 1.5 miles north of the Castle Point Veterans Hospital to determine the quality of water at the place where the City plans to tap the Hudson River. The following excerpt from their report suggests that conditions in 1949 were exceptional, and that under average conditions, the chloride content of the Hudson River at Castle Point would be less than 100 parts per million the year round.

There is some evidence that the chlorides encountered during the past summer were unusually high. Burr, Herring, and Freeman (Report of the Commission on Additional Water Supply for the City of New York, 1903, Table 24) give some data covering the period

between March and September inclusive, from which may be deduced a maximum chloride of about 20 ppm in the vicinity of Shaft 6. Their data shows also that chlorides of less than 5 ppm were found during a goodly portion of the period studied. From their Table 24 the following summarization is assumed for chlorides in the vicinity of Shaft 6.

Month	Chloride Content
March	less than 5 ppm
April	" " 5 "
May	5 to 20 ppm
June	5 to 20 ppm
July	5 to 20 ppm
August	5 to 20 ppm
September	5 to 20 ppm

More recent data of the Conservation Department, State of New York (Biological Survey of the Lower Hudson Watershed No. XI) showed chlorides of 9-11 ppm at Danskammer Point during July 1936 (page 173 of report).

Mr. Coles, Chemist of the Poughkeepsie Water Supply system informed the writer that during the last September-October period chlorides at the Poughkeepsie intake rose to an unusual high, a maximum chloride content of about 50 ppm was observed during the

latter part of September.

From the above it seems that the chlorides found during the past summer were unusually high and that concentrations of less than 20 ppm may be anticipated generally the year round. Should this be the case, the increase of chlorides in mixed Hudson-Catskill water would range between 1 and 3 ppm. In an emergency such water may be used in the city with little difficulty. In any event by proper planning and control it may be possible to draw optimum quality water and stop pumping should chlorides or other characteristics go too high. A greater degree in flexibility of control may also be afforded through the new pumping stations being constructed at Cross River and Croton Falls.

Resistivity explorations at profile 4, centered on Hospital property about 40 feet south and 70 feet west of the Hospital Power Plant, were unsuccessful due to interference. However, it is believed this site is underlain by a considerable thickness of unconsolidated materials, as profile 3 - 1,100 feet to the south - indicated rock is 200 feet below land surface, and an examination of land surface reveals that the nearest

outcrop upstream is more than a half mile to the north. Pumping from permeable materials at this site undoubtedly will induce infiltration from the Hudson River. Thus, the salinity of well water would approximate the salinity of the Hudson River, as discussed above.

Information obtained from the files of the Veterans Hospital at Castle Point shows that in 1925 the total yield for the seven bedrock wells was about 125 gallons a minute. The results of a pumping test conducted in July 1946 indicated that the total yield for the seven wells had declined to 62 gallons a minute. This represents a loss of about 50 percent of available ground-water supply from existing wells. Water samples were taken on July 7, 1950 by the Geological Survey from well A and from well D. The results are listed below:

	Well A	Well D
Iron	0.17 ppm	1.0 ppm
Total solids	346. "	438. "
Hardness *	200. "	230. "
Sulfate	42.5 "	102.8 "
Chloride	10.2 "	2.0 "
pH value	8.7	8.1

* (as $CaCo_3$)

One of the water analyses shows a relatively high content of iron. The decreasing yields of the wells may partially be due to the precipitation

of iron by the air used in pumping them. With proper cleaning, including surging and wire-brushing, it is felt that much of the original yield of each of the wells could be recovered.

RECOMMENDATIONS

The most likely site on Hospital property for the development of a supply of water of 300,000 gallons a day is in the vicinity of the site of resistivity profile 4. It is recommended that one or two 6-inch test holes be sunk to a depth of not more than 250 feet at this site to determine the character and yield of the overburden and bedrock. The salinity of well water pumped at this site may be relatively high during periods of extended drought. However, the salinity of such water could be materially reduced by mixing it with water pumped from the existing rock wells.

If the required supply of water cannot be developed near the site of resistivity profile 4, it is suggested that one or two 6-inch test holes be sunk to depths not exceeding 100 feet at resistivity profile 1.

If the required supply of water cannot be obtained from wells near the site of resistivity profile 1 or near the site of resistivity profile 4,

it is believed that the only possible means of developing a suitable supply of water on Hospital property would be to improve the yield of the existing rock wells by cleaning them, and to drill additional rock wells. Such a procedure would require an evaluation of the original and present yield of the existing wells to determine which could be profitably cleaned, and an evaluation of the relation of the yield of the existing wells and the proposed test holes to local geologic conditions to select sites for additional rock wells.

COSTS

Verbal quotations obtained from local drillers indicate the cost of drilling 6-inch test holes with cable-tool rigs will likely be (1) about $4.00 per foot for cased hole and (2) about $2.50 per foot for uncased hole, including the furnishing of earth samples. The local drillers are not equipped to set test screens and do not have reliable pumping equipment. However, it is believed that sufficient information to warrant the drilling of a production well can be obtained by having a Ground Water Branch geologist examine earth samples collected from test holes and by pumping open-end test holes with Geological Survey equipment.

Alternate verbal quotations obtained from larger drilling contractors in the New York City area indicate the following costs: $250.00 for moving drilling rig to site; $10.00 per hour for drilling hole, taking core samples, setting screen, or test pumping; and cost plus about 20 percent for furnishing casing and other material.