UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Statement on Ground Water in Connecticut

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GROUND WATER

Connecticut has a supply of ground water, most of it of good quality, which is largely undeveloped, and much of which would lend itself to industrial and other uses. Ground water is available in small quantities in nearly all parts of the State, and in moderate to large quantities in many areas, chiefly along the major streams. However, specific and detailed information on the ground water is available in report form for relatively few specific localities and areas. Definitive investigations of the occurrence, general availability, quantity, and quality of ground water in Connecticut are being made under cooperative agreements between the State Water Commission and the U. S. Geological Survey; and some progress has been made. Generalized information of a reconnaissance nature is shown on plate 1, which gives areas of estimated moderate to large yields, delineated on the basis of currently available data, and shows the locations of wells for which records are given in tables 1 and 2. Some specific information on particular areas is available in the open files of the agencies cooperating in the investigations.

Occurrence

Water occurs at least in small quantities in almost all rocks and deposits which make up the geologic formations of Connecticut. In this respect the formations of Connecticut may be divided into two groups: unconsolidated stratified deposits of glacial age, and much older consolidated bedrock, mostly crystalline. The consolidated bedrock includes some sedimentary rocks, which in this summary are not differentiated from the crystalline rocks. With some differences, given beyond, the areas underlain

by the stratified glacial deposits are essentially the same as those shown by diagonal ruling on plate 1.

The most productive water-bearing formations are the unconsolidated stratified deposits of glacial origin. They comprise bodies predominantly of gravel and sand, or silt and clay, in strata or lenses of varying thickness and continuity. The bodies occur principally in the valleys of the larger streams and in the lowlands bordering Long Island Sound. Locally they attain a total thickness of as much as 250 feet. In the sands and gravels, individual strata are generally continuous over distances of only a few tens of feet; and material may change from coarse gravel to sand abruptly. The bodies of silt and clay are relatively uniform over distances of hundreds or thousands of feet, although individual beds are ordinarily less than 1 foot thick. The sand and gravel are highly porous and store substantial quantities of water in pore spaces between grains. These spaces also permit relatively rapid movement of water to wells or other discharge points.

The consolidated rocks are mainly hard, crystalline metamorphosed gneiss and schist, with some limestone. These rocks underlie the upland areas that border the central Connecticut lowland (occupied by the valleys of the Connecticut, Farmington, and Quinnipiac Rivers) and that extend on either side of the lowland to the limits of the State. Included in the consolidated rocks on the map are areas of unmetamorphosed sandstone and shale with interbedded basalt, or trap rock. These rocks occur chiefly within the central Connecticut lowland where they border and extend beneath the unconsolidated stratified deposits. They are relatively thin on the west side, but reach thicknesses of several thousand feet on the east side of the lowland. The consolidated rocks are overlain by the stratified glacial

deposits where present; and elsewhere they are also overlain discontinuously by a generally compact, but relatively thin, deposit of clay, sand, and cobbles, known as glacial till and locally called hardpan, which is not differentiated on the map.

Except in the central lowland, and in the larger stream valleys, the bedrock at most places lies within 40 feet of the land surface, and is locally exposed in ledges. All the consolidated rocks are compact and tight, but they have fractures and other narrow openings in the uppermost few hundred feet which store and transmit water. Some strata of the unmetamorphosed sandstone are sufficiently little cemented that they contain appreciable water in pore spaces between grains and along planes of bedding, also down to depths of several hundred feet.

Availability

The stratified glacial deposits contain the most productive water-bearing beds in Connecticut. The promising areas of moderate to large ground-water development shown on plate 1 are chiefly coincident with the areas underlain by those deposits. However, areas where the stratified glacial deposits are thin, or where they consist essentially of clay and silt, are excluded. Even within the unit as mapped there is a substantial range of yield. Intercalated thick and extensive strata of clay and silt do not yield much water, but the sand and gravel portions do. Where the deposits are composed of coarse-grained sand and gravel, properly constructed wells may yield more than 1,000,000 gallons per day. Where the wells are favorably located with respect to sources of recharge such as perennial streams, such yields may be sustained for long periods. Where finer-grained sand predominates, yields to wells are substantially less than 1,000,000

gallons per day; and if recharge is limited, the yields may not be sustained. The expectable yield of individual wells within promising areas for moderate to large ground-water development is between 150,000 and 750,000 gallons per day (for example, see records of wells M 58, SW 78, and WL 16 in table 1), although yields either more or less are possible. The actual yield at any one place depends on local conditions; and nearly everywhere estimates would be subject to test results.

The yield from wells in bedrock is considerably less than that from unconsolidated stratified glacial deposits. Hence bedrock may be expected to yield quantities of ground water sufficient only for limited industrial operations, if any, although it is widely used as a source of domestic water supply. The gneiss, schist, limestone, and basalt or trap rock yield water almost solely from the fractures and similar narrow openings, which are widely spaced in comparison with the intergranular openings of stratified glacial deposits. Yields of known wells in these rocks range from less than 1 to a maximum of about 100 gallons per minute (about 150,000 gallons per day), but the average yield is 8 to 12 gallons per minute (for example, see records of wells Gl 76 and Sy 3 in table 1). Although many of these known, or reported, yields are probably less than the wells could produce under maximum development and draft, most wells in crystalline bedrock would have a sustained yield of only a few thousand gallons per day. The zone of most productive fractures in the rock at most places, extends less than 200 feet below the surface, although some wells obtain water from greater depths.

The unmetamorphosed sedimentary rocks (sandstone and shale) within much of the central lowland are more productive than the crystalline bedrock. Yields of some wells in these rocks exceed 400 gallons per minute (see records

of wells B1 32 and H14 in table 1); and the average is something more than 50 gallons per minute. The depth to the productive fractures or strata at most wells is less than 450 feet, although some wells obtain water from greater depths. Because only a few known wells obtain large yields from these sedimentary rocks, and because the rocks are extensively covered by the stratified glacial deposits, the areas which they underlie are not included in the promising areas shown on plate 1.

Quality

The quality of ground water in Connecticut in its natural condition is suitable for most industrial uses (see table 2). Analyses indicate that the water from some of the bedrock, particularly the unmetamorphosed sedimentary rocks, and from limestone, is relatively hard and is relatively high in dissolved solids (see wells H 14 and Sy 3 on table 2). The iron concentration varies considerably but seems to be somewhat high in water from the stratified glacial deposits in the central lowland, and locally in other scattered areas. At some places water in the unmetamorphosed sedimentary rocks (see well H 14 at Hartford on table 2 and map) has a rather high concentration of calcium or magnesium and sulfate. Insofar as is now known, the ground water in the stratified deposits in most of the stream valleys is in hydraulic continuity with the rivers. Hence, in those areas, heavy localized pumping from wells adjacent to polluted streams may produce polluted ground water. Similarly, heavy pumping near tidewater may cause encroachment of salty water into fresh-water bodies.

Temperatures of natural ground water throughout Connecticut range from 47°F to 54°F and average about 51°F.

The following tables give data on a few typical wells in Connecticut, and on the chemical composition of the ground water obtained. Records of depth to, and fluctuations of, water levels in observation wells in Connecticut are contained in reports published annually as water-supply papers of the U. S. Geological Survey. The latest published data are for 1951, in Water-Supply Paper 1191. Data for 1952 are in press in Water-Supply Paper 1221, for 1953 are in preparation as Water-Supply Paper 1265, and for 1954 are being compiled. References to other reports on ground water issued prior to February 1946 are contained in Geological Survey Water-Supply Paper 992. These publications are available in many public and institutional libraries, or can be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Table 1.--Records of selected wells in Connecticut.

Type of well: Dr, drilled; Gp, gravel-packed.

Use of well: AC, air-conditioning; Dom, domestic; Ind, industrial; Irr, irrigation; PS, public supply

Well number	Town	Type of well, and casing diam. (inches)	Depth (feet)	Depth to bedrock (feet)	Water-bearing material	Date of water-level measurement	Depth to water below land-surface datum (feet)	Temperature (°F)	Yield (gallons per minute)	Use of well
Bl 32	Bloomfield	Dr 10-8	609	12	Sandstone	Jan. 25, 1954	19	52	330	AC
H 14	Hartford	Dr 8	398	90	Sandstone	June 9, 1954	Flows	--	90	Ind
Cn 2	Canaan	Dr 6	162	30	Limestone	June 4, 1953	Flows	49	15	Dom
Sy 3	Salisbury	Dr 6	210	50	Limestone	- - -	- - -	48	25	Dom
Gl 76	Glastonbury	Dr 6	353	107	Gneiss	- - -	- - -	--	1	Dom
P 36	Portland	Dr 6	283	100	Gneiss	- - -	- - -	53	17	Dom
M 58	Manchester	Gp 12	64	- -	Sand and gravel	Apr. 5, 1954	5	48	450	PS
SW 71	South Windsor	Gp 12	56	- -	Sand and gravel	Nov. 15, 1951	18	--	400	Irr
WL 16	Windsor Locks	Gp 8	68	- -	Sand	Nov. 19, 1948	27	52	300	Irr

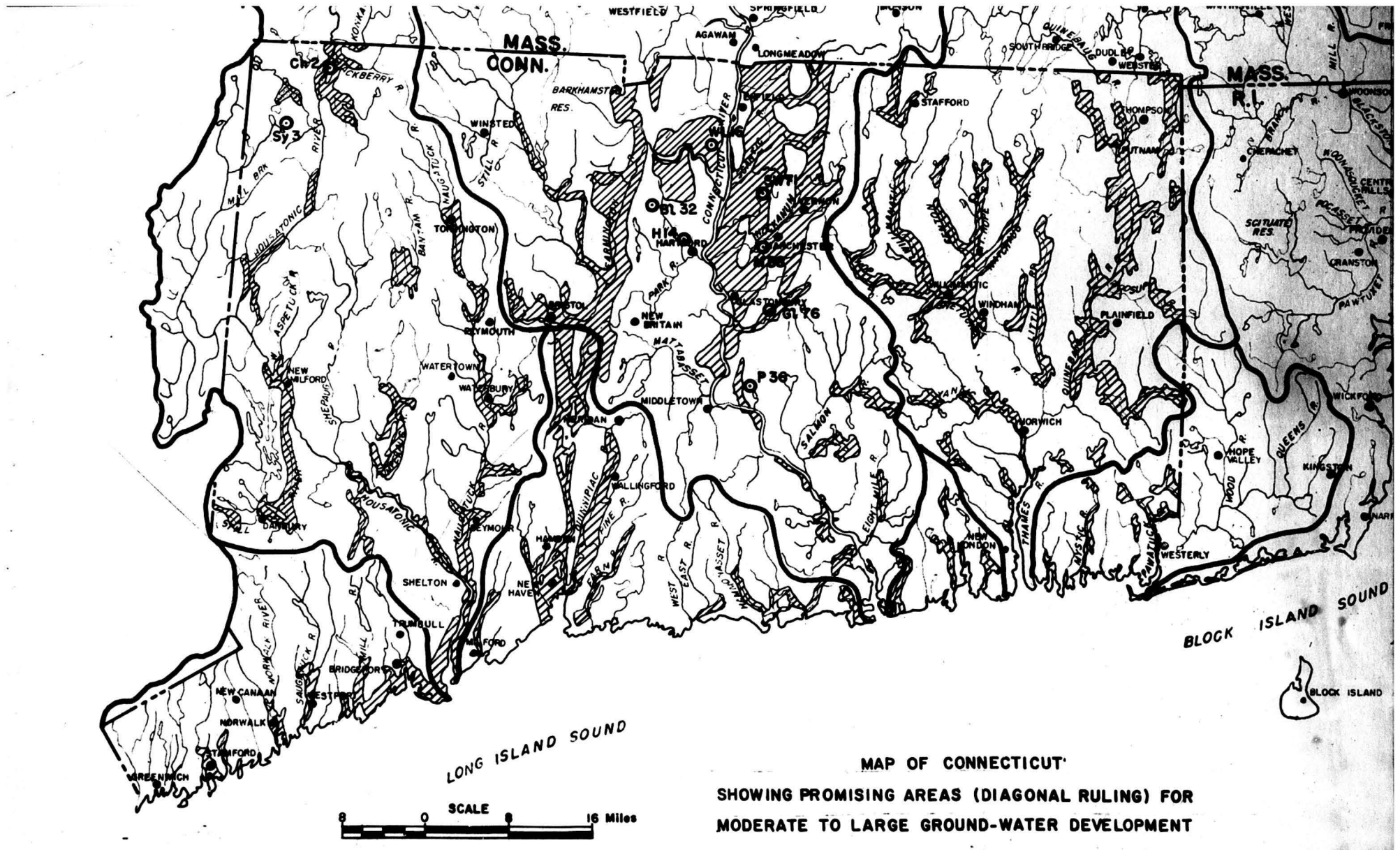
Table 2.--Chemical analyses of ground water from selected wells in Connecticut.

Analyses by Geological Survey, U. S. Department of the Interior

(Parts per million except specific conductance and pH)

Number of well	Date of sampling	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$	Specific conductance (micromhos at 25°C)	pH
Bl 32	Mar. 26, 1954	17	0.24	0.00	20	6.8	12	1.1	80	26	3.9	12	145	77	201	7.8
H 14	Mar. 3, 1938	..	..	..	233	43	121 1/	..	86	836	40	.15	..	734	..	..
Cn 2	June 4, 1953	5.2	.03	.02	43	21	4.1 1/	..	215	23	1.7	.2	205	194	366	7.8
Sy 3	June 4, 1953	10	.27	.22	58	31	8.6 1/	..	332	16	1.8	.5	291	272	516	7.8
Gl 76	Mar. 30, 1954	15	.39	.01	6.3	1.3	3.6	1.7	26	8.0	.9	.8	58	23	64	6.9
P 36	June 2, 1953	12	.06	.02	33	5.3	11 1/	..	100	17	10	16	167	104	262	7.7
M 58	Apr. 5, 1954	17	.21	.01	33	2.7	6.3	.7	90	21	5.0	12	144	95	212	7.9
SW 71	July 20, 1954	15	.02	.00	42	6.6	9.1	.6	28	74	3.5	62	259	132	324	6.7
WL 16	July 20, 1954	9.5	.01	.03	15	6.8	2.0	.5	61	13	2.8	5.0	88	65	138	7.5

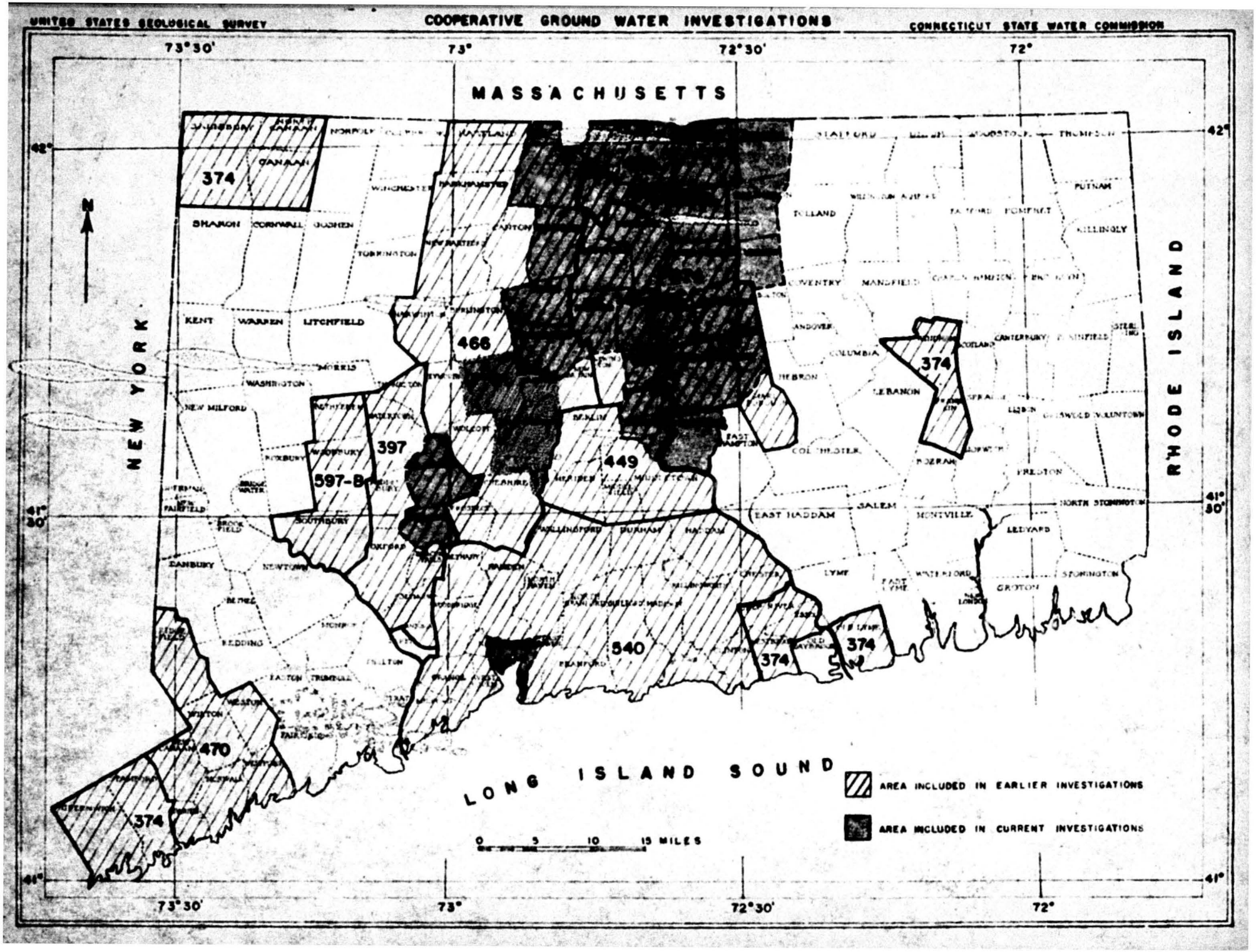
1/ Includes potassium (K).



MAP OF CONNECTICUT

SHOWING PROMISING AREAS (DIAGONAL RULING) FOR MODERATE TO LARGE GROUND-WATER DEVELOPMENT

U.S. GEOLOGICAL SURVEY


UNITED STATES GEOLOGICAL SURVEY
COOPERATIVE GROUND WATER INVESTIGATIONS
CONNECTICUT STATE WATER COMMISSION
MASSACHUSETTS
NEW YORK
RHODE ISLAND
LONG ISLAND SOUND
73°30'
73°
72°30'
72°
42°
41°30'
41°
374
466
397
597-B
449
540
470
KENT
WARREN
LITCHFIELD
SHARON
CORNWALL
GOSHEN
NEW MILFORD
SOUTHBURY
DANBURY
NEWTOWN
REDDING
WESTON
WILTON
NORWALK
STAMFORD
THOMPSON
PUTNAM
KILLINGLY
TOLLAND
COVENTRY
MANSFIELD
ANDOVER
COLUMBIA
HEBRON
LEBANON
COLCHESTER
EAST HADDAM
SALEM
MONTVILLE
LEDYARD
GROTON
STONINGTON
NORTH STONINGTON
LYME
OLD LYME
EAST LYME
WATERFORD
PRESTON
LISBON
CANTERBURY
BRANFORD
GUILFORD
MADISON
N
0 5 10 15 MILES
AREA INCLUDED IN EARLIER INVESTIGATIONS
AREA INCLUDED IN CURRENT INVESTIGATIONS