ASSESSMENT OF GROUND WATER QUANTITY IN MAINE

JUNE 1980

A Report by the

Ground Water Quantity Subcommittee

to the

Ground Water Protection Commission

ASSESSMENT OF GROUND WATER QUANTITY IN MAINE

by the

Ground Water Quantity Subcommittee
of the
Ground Water Protection Commission

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to the

Maine Land and Water Resources Council

Ground Water Quantity Subcommittee

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Financial support for this project was provided by the U.S. Water Resources Council under the Water Resources Planning Act of 1965.

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Section I

Introduction

There has been insufficient research done on the sand and gravel, and bedrock ground water aquifers in Maine to be able to make an informed and accurate evaluation as to the quantity of ground water reserves in the state. In the "Ground Water Handbook for the State of Maine," Dr. Bradford Caswell stated that,

> "the total ground water in storage in the soils and rocks of Maine can be calculated only crudely. Using some rough estimates of the specific yield of these porous materials, it is calculated that every square foot of land in Maine to a depth 1,020 feet has 14.5 cubic feet of ground water. Maine then has 100 trillion gallons of ground water, or 20 times the total volume of surface water in storage. Annual ground water recharge in Maine is dependent upon the average annual rainfall, and the percentage of this that infiltrates the ground surface. Both parameters vary considerably over the state. Using the average annual rainfall figure of 41 inches, and an average recharge of 15% of the total rainfall, the annual recharge to ground water reservoirs is calculated as follows:
>
> 41 inches of rain X 0.15 = 6.15 inches of annual rainfall.
>
> Thus, over every square foot of the state there is an annual recharge of about 0.51 cubic foot of water. Annual recharge, then, is only about 3.5% of the volume of ground water available in the upper 1,020 feet of the crust. This is the amount of ground water that is replenished each year; that is, the long-term <u>safe yield</u> of Maine's ground water resource."[1]

Although this discussion on the absolute quantity of ground water in the state is of interest, the real concern is how much ground water is available in each "discrete" aquifer and at what rate can it safely be extracted. Currently, information gained from pumping tests, usually of newly installed wells, provides an estimate on the safe yield from the individual well or well field. However, no data exists for any of Maine's ground water aquifers which would allow the setting of a safe yield limit for an aquifer as a whole.

There has been very little research related to the quantity of ground water in the State. Research conducted by federal and state agencies has been largely to identify the location of ground water aquifers, predict the favorability of finding ground water in specific areas, and to monitor seasonal water table fluctuations to predict relative ground water availability. Additionally, the Maine Public Utilities Commission collects information from the water utilities in the state on sources of water supply, customers served, gallons pumped, and other related information which provides partial insight into the extent of use of ground water in the state.

Section II - Agencies and Organizations Collecting Ground Water Quantity Data, discusses the federal and state agencies, and private organizations which have collected ground water quantity data and the purpose of their efforts. Section III - Trends in Ground Water Use, analyzes and discusses data collected by the Maine Public Utilities Commission and the U. S. Geological Survey. Section IV - Findings and Recommendations, discusses the conclusions reached in the report and recommends directions for future efforts in ground water quantity data collection and resource management.

SECTION II

Agencies and Organizations Collecting Ground Water Quantity Data

United States Geological Survey

The United States Department of the Interior Geological Survey has a Water Resources Division office in Augusta, Maine. The two major Geological Survey programs that relate to ground water are the Observation Well Program and the Hydrologic Studies Program.

Observation Well Program - The Observation Well Program is designed to measure water levels in selected wells to provide information on the fluctuation of the ground water table. The information for a specific period of time can be compared with data from similar periods in past years to enable predictions on ground water availability to be made. The Observation Well Program was initiated in 1942 with the establishment of five observation wells. From 1957 until 1974, there were only ten wells in the network. Currently (May, 1980) there are 21 wells in the network: seventeen wells are in unconsolidated materials and six wells are in bedrock. Nine of the wells have continuous readout water level monitors and the other 14 are measured by hand generally on a monthly basis. The Fiscal Year 1980 observation well network costs are $18,000, which includes construction of three additional wells. The U. S. Geological Survey is the only organization monitoring water table levels in the State.

Data from the Observation Well Program have shown that in Maine, wells in sand and gravel react quickly to water recharge. Wells in glacial till also react quickly due to water entering the well from shallow ground water sources. Wells in bedrock generally react more slowly to recharge; however, bedrock wells show greater variability in their reaction to recharge due to the variability in extent of fracturing in the rock, number of fractures intercepted, and extent and type of overburden materials present. There are no regional trends of falling or rising ground water tables in Maine as is the case in the West where ground water extraction has exceeded recharge resulting in continuously declining water tables.

Hydrologic Studies Program - Hydrologic studies include comprehensive studies of particular aquifers, preparation of regional ground water reports and collection of data on ground water use.

The first intensive ground water modeling effort in Maine will be conducted on the aquifer in the Little Androscoggin River Valley. Both quantity and quality aspects of the aquifer will be examined. The principal concern is the possible contamination of the aquifer from six areas as the demand for water in the area increases the rate of extraction.

The U. S. Geological Survey also has been developing ground water favorability maps and reports for several areas in Maine. A list of these published U. S. Geological Survey reports is contained in the back of this report and the actual areas that have been mapped are depicted in Figure 1. These reports are based on a detailed geologic reconnaissance of the areas, discussions with well owners and well drillers, and some sampling of wells. Basic geologic and hydrologic data obtained during these surveys are contained in basic U. S. Geological Survey data reports, see Figure 2. The reports give users a sense of the likelihood of finding water in various locations. The favorability maps indicate that surficial sand and gravel deposits are likely to produce water at rates anywhere from 0 to 2,500 gallons per minute and that bedrock wells are likely to yield from 0 to 500 gallons a minute. A 500 gallon a minute yield is most probable in the limestones in Aroostook County. An average bedrock yield is about five gallons per minute.

The U. S. Geological Survey also produces, every five years, a report on "Estimated Use of Water in the United States." The State offices contribute data on ground water and surface water uses for public supplies, rural use, irrigation, industrial use, and electric utility use. In the past, there has been difficulty in compiling the report because of the lack of accurate accounting of the amount of water used in most states. The U. S. Geological Survey has funds to establish a National Water Use Data System. This effort will fund states to systematically collect water use data which would be used for various purposes including the five year reports.

Maine Gelogical Survey

The Maine Geological Survey's Hydrogeology Division is concerned with mapping surficial and bedrock aquifers, conducting various aquifer studies, and providing technical assistance to water utilities and others in the state, often in conjunction with the U. S. Geological Survey. The major ground water related activities or products of the Survey are discussed below.

Gravel Aquifer Maps - The gravel aquifers are located and evaluated on ground water favorability maps prepared by the U. S. Geological

Survey, and on gravel aquifer maps prepared by the Maine Geological Survey, see Figure 1. Each map is accompanied by a report. The gravel aquifers were identified through detailed field mapping of glacial sand and gravel deposits, and through inventory and analysis of available hydrologic information such as well yeild, spring flow, depth to water table, and proximity to streams and lakes. Sand and gravel deposits identified by earlier, more general geologic mapping, were re-examined through field investigation and aerial-photo interpretation: (1) to accurately define aquifer boundaries commensurate with a map scale of 1:50,000, (2) to identify the geologic origin of the deposits, (3) to describe the sediment textures and their horizontal and vertical continuity (layering), and (4) to determine the relative permeability of the deposits. Hydrologic information was obtained from residents in the area by door-to-door survey, from municipal water company personnel, and from the Maine Department of Human Services, Division of Health Engineering. This information helped to define: (1) the thickness of the aquifers, (2) the depth to the water table (which subtracted from overall aquifer thickness gives the saturated thickness), (3) the quality of the water, and (4) the probable yield, or flow, of water available from each aquifer through individual wells. Each aquifer is evaluated for its potential to provide ground water.[1]

Ground Water Resource Maps of Maine Counties - These maps show yield and depth of bedrock wells, overburden thickness, bedrock surface topography, and potentiometric surface of bedrock wells, see Figure 2. The U. S. Geological Survey also has information on selected wells, springs and test borings with location maps, see Figure 2. The Ground Water Resource Maps can be used to locate areas that are favorable for drilling bedrock wells that are likely to yield ten or more gallons per minute.

Water Well Records - The Maine Geological Survey also has compiled, using voluntarily contributed information from Maine water well drillers, a listing of over 20,000 wells drilled in the state. The data collection form that the Survey uses to obtain the water well information is contained in Appendix A. This information is of great value in that it helps to provide an understanding of ground water availability in various geologic settings in the state. The well depths and yields for a specific geologic area can be used as a guide to estimate the degree of difficulty that will likely be encountered in obtaining water from proposed well locations.

Maine Coastal Area Water Supply and Demand Study - This report describes water supply problems in 133 coastal municipalities. The report projects that 57% of the coastal towns will have some type of water supply problem between 1976 and 1986.[2] The projected problems are expected to include excessive iron, other

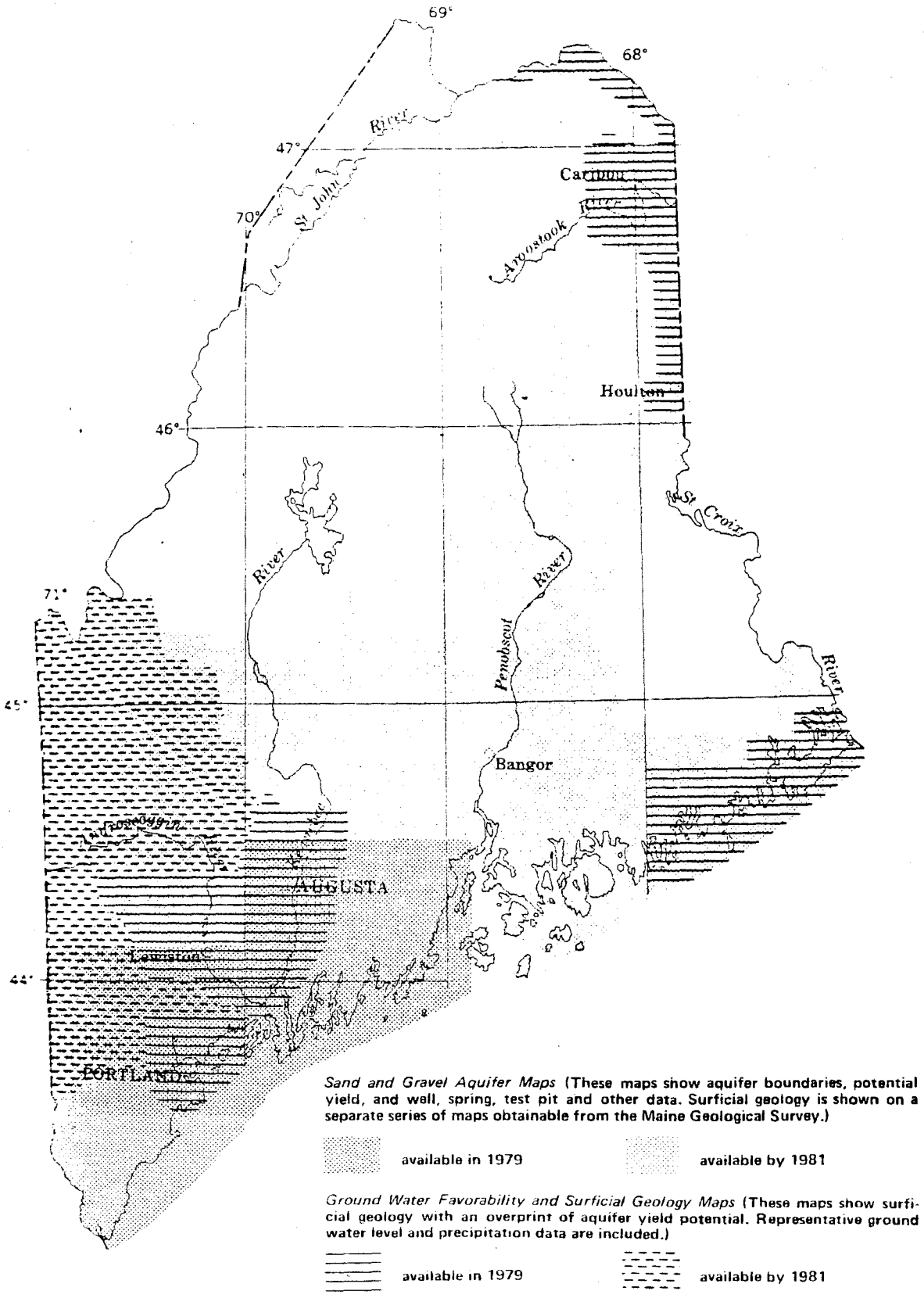

FIG. 1 Index of sand and gravel aquifer maps available in 1979, and projected to be available by 1981. *Sand and Gravel Aquifer* maps (1:50,000) are obtainable from the Maine Geological Survey. *Ground-Water Favorability and Surficial Geology* maps (1:62,500) are obtainable from the U.S. Geological Survey.

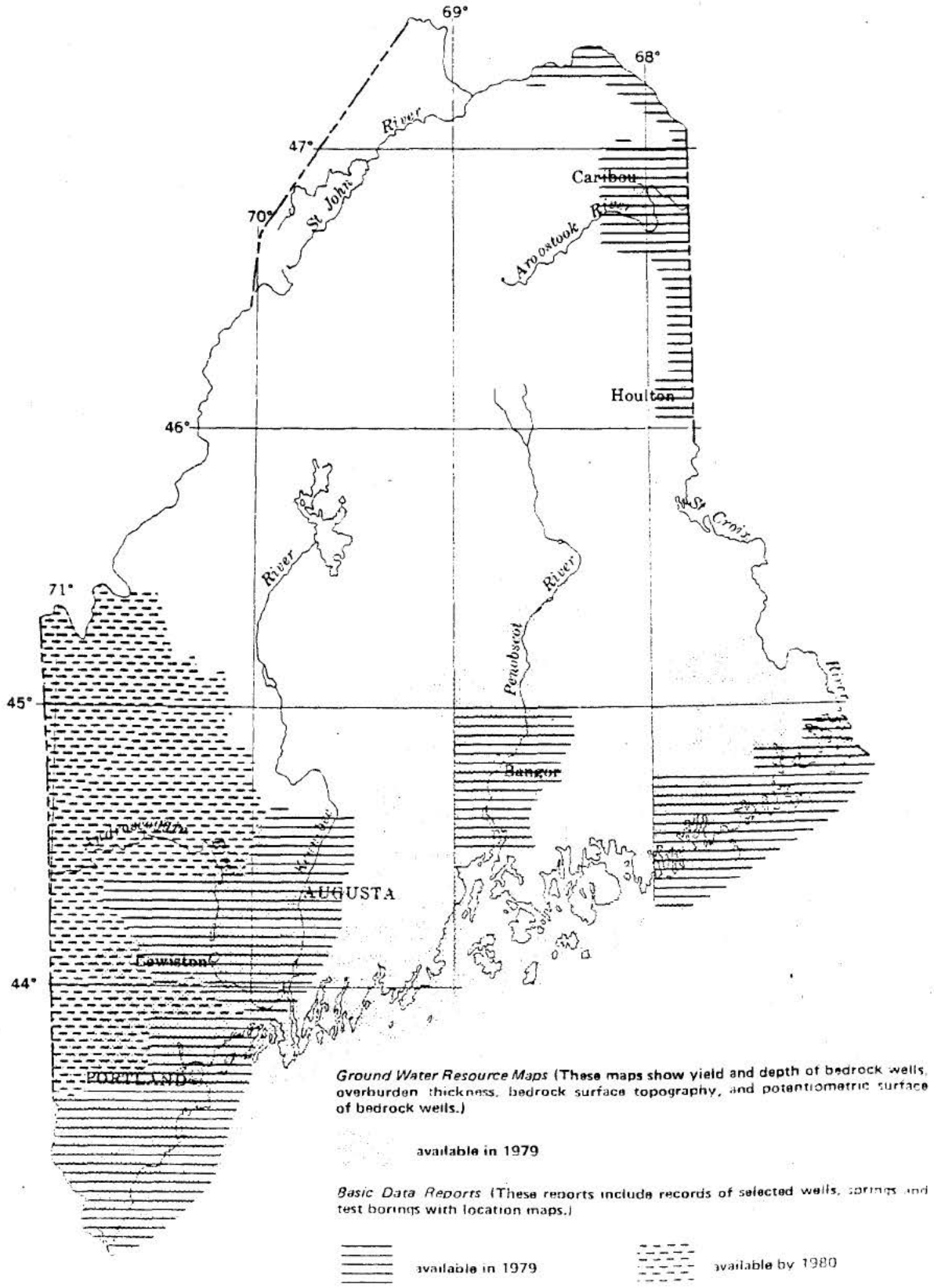

FIG. 2 Index of ground water resource maps and basic data reports available in 1979, and projected to be available by 1980. *Ground Water Resource* maps of Maine counties (1:250,000) are obtainable from the Maine Geological Survey. *Basic Data Reports* are obtainable from the U.S. Geological Survey.

quality problems, insufficient quantity, and inadequate distribution facilities. Of the 132 towns for which data was available, 17%, that is 22 towns, have quantity problems (these may include surface supplies).[2] The municipal and domestic water supply problems (surface and ground water) found in preparing the report are summarized in a table in Appendix B.

The report states that gravel and bedrock aquifers are found in most coastal towns. Some of the aquifers are tapped for all or part of municipal supplies. Some coastal area aquifers that could provide sufficient volumes for municipal use are as yet untapped. The most extensive use of ground water is by homes with wells.

Maine Public Utilities Commission Annual Reports of Maine Water Utilities

The Public Utilities Commission requires that all Maine Water Utilities with more than $3,000 of annual revenue submit annual reports on their activities. These reports cover the financial situation of the utility, number of customers served, water sources, gallons of water pumped, system water losses, and other related information. The information contained in these reports is used as the basis for discussion in Section III - Ground Water Use Trends, and the data is compiled in tables in Appendix C.

The reports, in some instances, are incomplete. For some utilities which do not have metered water systems there is no estimate of amount of water pumped.

Other Organizations

The members of other private organizations such as the Maine Water Well Drillers Association and the Maine Water Utilities Association are sources of information on ground water quantity. The water well drillers have voluntarily contributed their information on water wells to the Maine Geological Survey. Maine Water Utilities are required to report information (in their Annual Reports) to the Public Utilities Commission.

Section III

Trends in Ground Water Use

It is possible to make generalizations about the relative availability of ground water throughout the state. Ground water occurs in very diverse geologic settings. Ground water in glacial till can be extracted from dug wells. Dug wells, because they tap the surface water table, are very susceptible to seasonal fluctuations in the water table, and are usually the first wells to go dry in a drought. Wells drilled into bedrock can often be relied upon for a steady, usually low-yield supply of water, suitable for small municipal supplies and small-scale industrial use. However, there is great variability in the quantity of water that can be extracted from drilled wells. This variability is due to the depth of the well, number of fractures intercepted, amount of overburden, and the extent of the recharge area to the well location. Sand and gravel aquifers, suitable for large-scale municipal or industrial supplies, are more limited in extent than bedrock aquifers or those shallow water table aquifers from which dug wells extract water.

Figure 3 - Location of Sand and Gravel Deposits in Maine - shows the major locations of sand and gravel deposits in the state. These sand and gravel deposits occur over about 15% of the state.[1] They are most extensive in York, Cumberland, Oxford, Hancock, and Washington Counties.[1] Not all of these deposits are aquifers, but all of the major aquifers are contained within the areas covered by these deposits. These deposits, which occupy many valleys and lowlands, have been mapped; however, the probable safe water yield from these deposits is not known. Although not exclusively the concern of this report, the major sand and gravel aquifers are the focus of this report because of their potential for supplying large volumes of ground water in proximity to the most populated and industrially developed portion of the state. Additionally, the location and extent of sand and gravel aquifers has been more fully defined than for bedrock aquifers, making them an easier resource to identify and manage at this time.

The quantity of ground water available from a sand and gravel aquifer is largely dependent on the source of water recharging the aquifer. Individual sand and gravel aquifers in Maine are of small areal extent, and unless they are in contact with a source of recharge, such as a river or other body of surface water, the sustained yield from the aquifer may be substantially less than the short-term yield. Frequently, wells for municipal water supplies in the state have been drilled in sand and gravel deposits adjacent to bodies of surface water to take advantage of a permanent and dependable source of recharge.[3] Bodies of surface

FIGURE 3 - Location of Sand and Gravel Deposits in Maine. (Based on "Glacial Map of the United States East of the Rocky Mountains," published in 1959 by the Geological Society of America.)

Map extracted from -

"Reconnaissance of Ground-Water Conditions in Maine." Geological Survey Water-Supply Paper 1669-F. United States Government Printing Office, Washington: 1963.

water also may serve as sources of recharge to bedrock aquifers, particularly where a stream flows over fractured bedrock.[3] Because of the direct interrelationship between surface and ground water, in many aquifers the management of the quality and quantity of surface water can have a very significant impact on ground water.

Currently there is a sufficient quantity of ground water in sand and gravel aquifers to meet municipal water supply needs in most Maine municipalities. Towns with municipal water supply systems, which have been identified as having ground water quantity related problems, include: South Berwick, Yarmouth, East Boothbay, Monhegan Plantation, Hampden, Franklin, Milbridge, Sanford, Lisbon, Monson, Freeport, and Waldoboro. Some of these towns have a severe enough quantity problem to cause them to look outside their own borders for additional sources of water, and/or curtail expansion of water supply services. These towns were identified from the information in the "Coastal Area Water Supply and Demand" report and communications with Glenn Prescott, U. S. Geological Survey; Raymond Hammond, Maine Public Utilities Commission; and Bradford Caswell, BCI Geonetics, a consulting firm in Augusta.

Maine water utilities are required to file annual reports with the Maine Public Utilities Commission. Of 149 water utilities, five were not required to file a report because they are exempt due to the fact that their annual revenues are under $3,000, and two utilities have abandoned service. Of the remaining utilities, 70 rely exclusively on surface water, 54 rely exclusively on ground water, 13 have systems mixing surface and ground water, one has separate systems using surface and ground for different portions of the service area, and four utilities purchase water for their service areas from other utilities. Approximately 1/3 of the water utilities in the state are relying exclusively on ground water. Approximately 1/2 of the water utilities in the state have either complete or partial reliance on ground water as their supply source.

Examining the grand totals on the last page of the tables in Appendix C shows that between 1970 and 1979 there has only been a 1% increase in the growth of the number of households served by water districts, that is from 207,958 households in 1970 to 210,048 households in 1979. The current number of Maine households (1980) is 380,013; therefore, approximately 55% of Maine households receive water from water utilities. Of the 210,048 households on municipal water systems, 45,558 households are on municipal systems using exclusively ground water as their source of supply. Of the total number of households in Maine, that is 380,013, about 12% rely exclusively on ground water from municipal systems. In total, about 57% of Maine's population use ground water either from water utilties or home wells, (45% on private systems and 12% on municipal ground water systems equals 57%)
Examining the grand totals on the last page of Appendix C shows

that in 1979, 84.1555 million gallons per day (MGD) of surface water and 18.0287 MGD of ground water were used by water utilities. Therefore, daily ground water use by municipal water supply systems is approximately 1/4 that of surface water use. Contrasting the 1970 and 1979 ground water use by water utilities shows only a 0.5% increase in ground water use for this period. However, people knowledgeable about municipal water supply systems expect to see an increasingly greater reliance on ground water as a source of supply in the future.

The increasing reliance on ground water will primarily be due to economic factors. Surface supplies require more testing, and due to turbidity and parasites, surface supplies will more frequently require relatively expensive treatment in filtration plants to meet the requirements of the Safe Drinking Water Act, P.L. 93-523, which went into effect on June 24, 1977. The Southeastern New England Study, a broad natural resource and growth management study done by the New England River Basins Commission, estimated development costs for ground and surface water supply systems. The 1975 cost estimates in the report are revised here to reflect 1980 costs. The report estimated ground water development costs, which include limited exploration, well development and operation, and chlorination--to be $150 per million gallons. The report estimated surface water development costs, which include land acquisition for reservoirs, construction of dams, aqueducts and water mains, as well as treatment and system maintenance to be between $600 (costs for larger regional systems) and $1,000 (costs for local systems) per million gallons.[4] Ground water supply development costs are about 1/4 those of surface supply development costs because ground water wells can usually be situated in closer proximity to the service area than surface supplies which require storage reservoirs, and because of its higher quality, ground water requires less treatment than surface water. However, in some respects ground water supplies are more difficult to protect than surface supplies. Spills of hazardous wastes or leaching from salt piles, solid waste sites, septic tank leach beds, sludge sites, and animal manure piles can all contribute contaminants to ground water which are not as easily detectable as similar incidents in surface water. Often pollution to surface water can be visually traced across the surface of the ground or along a water course. For these reasons, protection of ground water requires identification and protection of the aquifer recharge area contributing ground water to a specific well or well field. Degradation of ground water quality is a concern not only because of its potential impact on human health, but also because loss of a portion of an aquifer due to pollution results in a reduction in the quantity of ground water available for use.

Many industries in Maine use ground water supplied by water districts; however, some industries have developed their own wells to supply their needs. There is no systematic reporting to any state agencies by industries using their own ground water supplies on

the quantity used. The U. S. Bureau of the Census collects data on industrial water use when they conduct the census of manufacturers. This data is used by the U. S. Geological Survey in compiling their water use reports which are discussed below. Therefore, it is very difficult to estimate self-supplied industrial use of ground water in the state. Information developed by the U. S. Geological Survey for their five year reports--"Estimated Water Use in the United States"--for the years 1960, 1965, 1970, and 1975 are shown in Table 1. Based on the ground water use for the four specific ground water use categories in 1975, Maine had a daily ground water use of approximately 46 million gallons per day. The fresh surface water withdrawn by industrial users in the state was estimated to be 420 MGD in 1975.[5] This means that approximately 35 times as much surface water as ground water was used daily by industries in the state in 1975. Ground water, because of its high quality, is the preferred water source for the food processing and metal plating industries.

Municipal wells are usually constructed in sand and gravel deposits which yield 500 to 1,000 or more gallons per minute.[1] Bedrock wells yielding several hundred gallons per minute can serve small communities or be used to augment the supply of an existing system. Some municipalities use multiple well systems consisting of a group of closely spaced wells (called a well field) that are usually pumped simultaneously. This is done to reduce drawdown in a single well by spreading it over a wide area. This can provide a large volume of water with a small drawdown in any one well.

The long-term yield of an aquifer is calculated through analysis of well pump test data, and through analysis of the surface area likely to contribute recharge to the aquifer. The ultimate long-term yield cannot be greater than the volume of precipitation that falls on the contributing area, less the runoff and evapotranspiration. Exceptions to this are planned ground water mining and ground water recharge through inducement from an adjacent water body. The safe yield of ground water is not known for any entire aquifer in the state. The ground water pumped from an individual well may exceed the recharge capacity to the well; however, rather than an inadequate supply of ground water, the real problem may be that the well is insufficient in its design and/or construction to supply water at the rate of pumping. Wells in a well field may also, when pumped together, draw ground water from the same reserve and exceed the aquifers short-term capacity to recharge the wells. This problem is again one of well design, location, and management of the rate and frequency of pumping. Wells which draw water from aquifers recharged by surface water, such as a stream, may have, for practical purposes, an unlimited supply of water, see Figure 4.

In developing a ground water supply system, not only must the safe yield of a well or well field be taken into account, but the potential

TABLE 1. MAINE GROUND WATER USE TRENDS
(in millions of gallons per day = MGD)

Specific Ground Water Use	1960	1965	1970	1975	Comments
Ground Water Used For Public Supplies	11	17	20	19	The figures developed for this report from Maine Public Utilities Commission data show ground water use by water utilities to be in 1970 - 17.935 MGD, and in 1979 - 18.0287 MGD
Ground Water Used For Rural Domestic Use	6.7	9.4	11	14	
Thermoelectric Power Ground Water Withdrawal (Not for Condenser and or Reactor Cooling)	0	0	1.0	1.0	The power plants responsible for this water use were not identified
Other Industrial Ground Water Use	12	16		12	Data from "Water Used in Manufacturing, Census of Manufacturers", U.S. Bureau of the Census.

Compiled from U.S. Geological Survey Reports on "Estimated Use of Water in the United States" from reports for 1960, 1965, 1970, and 1975.

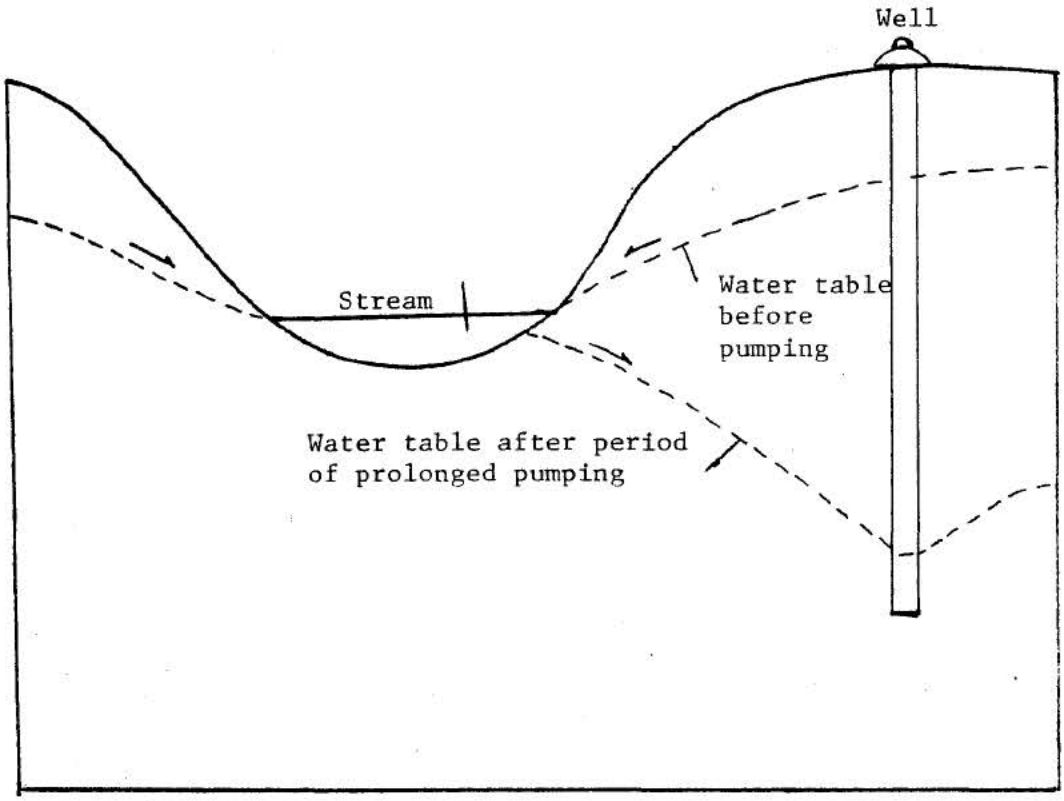

Figure 4 - Diagram showing how recharge may be induced from a stream by a well near the stream.

Diagram extracted from -

"Reconnaissance of Ground-Water Conditions in Maine." Geological Survey Water-Supply Paper 1669-T. United States Government Printing Office, Washington: 1963

for periodic droughts must also be considered. Water districts should have sufficient excess supply to meet demand so that in a drought situation, the supply will be sufficient to meet priority needs.

Severe droughts, such as in the fall of 1978, result in thousands of home wells going dry, particularly in the southern and western portions of the state. However, these home supply shortages usually occur in dug wells and putting in a drilled well usually solves the problem.

Although the safe yield of ground water from Maine's aquifers is not known, based on past trends of ground water use, it is unlikely that inadequate quantities of ground water for domestic and industrial use will be a widespread problem in Maine before the end of this century. Some water utilities in the state have inadequate supplies of ground water, or have had difficulty locating new supplies; however, these are localized problems in part due to not being in proximity to ground water supply sources. Except for the ground water quantity problems affecting a relatively few municipal water supplies, the major ground water problem facing Maine will be protection of ground water quality, which is necessary to maintain an adequate quantity.

SECTION IV

Findings and Recommendations

The following findings and recommendations are based upon the information contained in this report.

Findings

1. Sand and gravel deposits which cover 15% of the state, have largely been identified by surficial geologic mapping programs of the U. S. Geological Survey and the Maine Geological Survey; which are continuing.

2. Located within the sand and gravel deposits are the major ground water aquifers of the state, which are capable of supplying water for large-scale municipal and industrial needs (500 to 1,000 gallons per well).

3. The potential quantity of ground water available from any of the sand and gravel aquifers is not known. In some instances, the ground water available from a specific well or well field has been quantified.

4. The physical limits and shapes of the sand and gravel aquifers have not been defined. Specific hydrologic modeling is necessary to identify an aquifer's "watershed" and describe its water budget. The U. S. Geological Survey is developing a hydrologic model for the aquifer in the Little Androscoggin River Valley, this will be the first aquifer modeled in Maine.

5. The extent of bedrock aquifers have not been defined in Maine; however, some areas where high yield bedrock wells are located have been identified in the County Ground Water Resource Maps.

6. Wells in bedrock aquifers generally supply less water than wells in sand and gravel aquifers, but in many instances water yields from bedrock wells are adequate for small-scale municipal and industrial supplies. Locally bedrock wells, such as those drilled in the limestone deposits in Aroostook County, may supply large volumes (500 gallons per minute) of ground water.

7. Future dependence by water utilities on ground water will increase because of increasing treatment costs for surface water and the lower development costs for ground water.

8. Data on the quantity of ground water used by water districts is available from the Public Utilities Commission; however, no

state agency currently has data on ground water used by self-supplied industries.

9. Statewide, the quantity of ground water available from sand and gravel, and bedrock aquifers is sufficient to meet current demand. In some localized areas, particularly in southern and coastal areas, finding adequate supplies of ground water is currently a problem and will likely become a more severe problem in the future.

Recommendations

1. It is recommended that the Maine Geological Survey and the U. S. Geological Survey continue their cooperative programs to map the sand and gravel, and bedrock aquifers in the state. In situations where contamination threatens an aquifer, detailed hydrologic modeling should be conducted to determine the extent of the aquifer and the area affected by pollution.

2. It is recommended that the Maine Geological Survey continue to seek a general fund appropriation of $10,000 a year in its budget, to provide that joint-funding match to the U. S. Geological Survey necessary to carry on the observation well network program, and a general fund appropriation of $23,000 a year to provide the joint-funding match to the U. S. Geological Survey for the Little Androscoggin River Valley aquifer study.

3. It is recommended that the Maine Geological Survey and the U. S. Geological Survey collaborate to prioritize where future aquifer hydrologic studies will be undertaken, and seek funds and make arrangements for the conduct of these studies. Delineating the extent of aquifers and understanding their water budgets will become more important in the future as competitive demands intensify on the ground water resource.

4. It is recommended that aggressive steps be taken to protect ground water quality in order to assure that an adequate quantity of ground water is available to meet future needs. Also, surface waters adjacent to aquifers must be stringently protected when they are acting as a source of water recharge to the aquifer.

5. It is recommended that Maine agencies participate in the U. S. Geological Survey - National Water Use Data System program. A state agency should assume a lead role and seek funds from the U. S. Geological Survey to develop a work program and subsequently carry on the data collection and analysis efforts.

6. It is recommended that the Department of Environmental Protection request on their waste discharge license application forms information from industries on their source of water, that is, ground or surface, and amount used.

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_____ "Records of selected wells, springs, and test holes in the lower St. John River valley": Basic-Data Report No. 6

_____ "Ground-water favorability and surficial geology of the lower St. John River valley, Maine": HA-485

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_____ "Records of selected wells and test holes in the Windham-Freeport-Portland area of Cumberland County, Maine": Basic-Data Report No. 9

_____ "Ground-water favorability and surficial geology of the Portland area, Maine": HA-561

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APPENDIX A

WATER WELL DATA COLLECTION FORM

DEPARTMENT OF CONSERVATION – BUREAU OF GEOLOGY – DIVISION OF HYDROGEOLOGY

GANG PUNCH LINES 1 - 10

WELL OR OBSERVATION NUMBER	COUNTY & TOWN CODE	LOCATION: QUADRANGLE CODE	LOCATION: LATITUDE	LOCATION: LONGITUDE	LAND OWNER: LAST	LAND OWNER: FIRST	STEET OR ROAD	ELEVATIONS (FT MSL): LAND SURFACE	ELEVATIONS (FT MSL): BEDROCK SURFACE	ELEVATIONS (FT MSL): STATIC WATER	WELL USE	CARD TYPE
			° ' "	° ' "								01

WELL: TYPE	WELL: CONST.	WELL: DEPTH FT	WELL: DIAM IN	CASING: LENGTH FT	CASING: DIAM IN	CASING: MATERIAL AND WEIGHT	FIRST SCREEN: LENGTH FT	FIRST SCREEN: DIAM IN	FIRST SCREEN: TYPE	FIRST SCREEN: DEPTH FT	SECOND SCREEN: LENGTH FT	SECOND SCREEN: DIAM IN	SECOND SCREEN: TYPE	SECOND SCREEN: DEPTH FT	STATIC WATER: DEPTH FT	STATIC WATER: FLOWING	STATIC WATER: DATE OF MEASUREMENT: MO	STATIC WATER: DATE OF MEASUREMENT: DAY	STATIC WATER: DATE OF MEASUREMENT: YEAR	CARD TYPE
																				02

WELL YIELD: G P M	WELL YIELD: DRAWDOWN FT	VEIN YIELD: FIRST G P M	VEIN YIELD: FIRST DEPTH FT	VEIN YIELD: SECOND G P M	VEIN YIELD: SECOND DEPTH FT	VEIN YIELD: THIRD G P M	VEIN YIELD: THIRD DEPTH FT	PUMP TEST: DATE OF TEST MO	PUMP TEST: DATE OF TEST DAY	PUMP TEST: DATE OF TEST YEAR	PUMP TEST: TRANS	PUMP TEST: STORAGE COEFF.	CONTRACTOR: NAME	CONTRACTOR: CODE	DATE DRILLED: MO	DATE DRILLED: DAY	DATE DRILLED: YEAR	CARD TYPE
																		03

WELL DEEPENED: FT	WELL DEEPENED: DATE MO	WELL DEEPENED: DATE DAY	WELL DEEPENED: DATE YEAR	COMMENTS	DATA SOURCE	CARD TYPE
						04

OVERBURDEN: TOTAL THICKNESS FT	OVERBURDEN: GLACIAL FORM	OVERBURDEN: FIRST LAYER TYPE	OVERBURDEN: FIRST LAYER THICKNESS FT	OVERBURDEN: SECOND LAYER TYPE	OVERBURDEN: SECOND LAYER THICKNESS FT	OVERBURDEN: THIRD LAYER TYPE	OVERBURDEN: THIRD LAYER THICKNESS FT	BEDROCK: LITHOLOGY	BEDROCK: FORMATION	BEDROCK: META GRADE	CARD TYPE
											05

APPENDIX B

MUNICIPAL AND DOMESTIC WATER SUPPLY PROBLEMS

		MUNICIPAL WATER SUPPLY PROBLEMS									RURAL DOMESTIC (GROUND WATER) SUPPLY PROBLEMS						
		QUANTITY	QUALITY				DISTRIBUTION				QUANTITY	QUALITY					
TOWN NAME	MAP NUMBER		Color, Turbidity	Fe,Mn	Pollution	Other	Low Pressure	Mains	Storage	Other		Salt-Water Intrusion	Road Salt	Fe,Mn	Sulfur	Hardness	Pollution
Kittery	1	LOW															
Eliot	2																
York	3	X	LOW				X	X	X				LOW	LOW			
South Berwick	4	X		X													
Wells	5	X	X		X		X	X	X					X			X
Kennebunk	6	X	X		X			X									
Arundel	7												LOW,				X
Kennebunkport	8	LOW	X		X			X				LOW	LOW	X			
Biddeford	9																
Saco	10																X
Old Orchard Beach	11																
Scarboro	12													X			X
Cape Elizabeth	13																
South Portland	14																X
Portland	15																
Falmouth	16										LOW						
Cumberland	17				X						LOW						
Yarmouth	18	X															
Freeport	19	X						X	X			LOW					
Harpswell	20											X		X			
Brunswick	21			X					LOW					X			
Topsham	22			X													
Bowdoinham	23																
Richmond	24						LOW	LOW						LOW		LOW	
Gardiner	25		X	X	LOW	TASTE, ALGAE		X						LOW			
Farmingdale	26															LOW	
Hallowell	27						LOW			X							
Augusta	28		X		X	TASTE	LOW									LOW	
Chelsea	29															LOW	
Randolph	30																
Pittston	31													LOW			
Dresden	32										LOW	LOW		LOW			X
Woolwich	33													LOW			
Bath	34		X														
West Bath	35											LOW		LOW			
Phippsburg	36	LOW				ALGAE	X					LOW			LOW		
Georgetown	37													X			X
Arrowsic	38										LOW	LOW					
Southport	39	X	X			CORROSIVE					X	LOW		X			
Westport	40										LOW	LOW		X			
Wiscasset	41	X	X	X	X	OIL, ALGAE								LOW			
Alna	42												LOW				
Newcastle	43		X								LOW						LOW
Edgecomb	44										X	LOW					
Boothbay	45	X LOW (TURB)		X	X	CORROSIVE		X			LOW	LOW		X			
Boothbay Harbor	46	X	X	X	X	ALGAE (CORROSIVE)								X			
South Bristol	47											LOW		X	X	X	X
Bristol	48										X	X		HIGH			X
Bremen	49										LOW	LOW		LOW			
Damariscotta	50					ALGAE								X			
Nobleboro	51																
Waldoboro	52						X			X		X		X			
Friendship	53													LOW			
Cushing	54													X			

TOWN NAME	MAP NUMBER	MUNICIPAL WATER SUPPLY PROBLEMS									RURAL DOMESTIC (GROUND WATER) SUPPLY PROBLEMS						
		QUANTITY	QUALITY				DISTRIBUTION				QUANTITY	QUALITY					
			Color, Turbidity	Fe,Mn	Pollution	Other	Low Pressure	Mains	Storage	Other		Salt-Water Intrusion	Road Salt	Fe,Mn	Sulfur	Hardness	Pollution
St. George	55					CORROSIVE				X		LOW		X			
Monhegan Plt.	56	X				HARDNESS	X	X	X		X						
South Thomaston	57										X						
Owls Head	58											LOW		X			
Rockland	59		X		X	ALGAE		X									
Thomaston	60							X									
Warren	61												LOW	X			
Rockport	62		X		X	ALGAE								X			
Camden	63		X		X	ALGAE											
Lincolnville	64													LOW			
Islesboro	65																
Northport	66			X		ALGAE		X		X				X			
Belfast	67		X		X				X					X			
Searsport	68	X				TASTE, CORROSIVE		X		X				X			
Stockton Springs	69	LOW				ALGAE		X		X				X			
Prospect	70											LOW				X	
Frankfort	71																
Winterport	72							X									
Hampden	73	X														X	
Bangor	74	LOW															
Brewer	75		X														
Orrington	76												LOW				X
Bucksport	77													X			
Verona	78													LOW			
Orland	79													LOW			
Surry	80																
Blue Hill	81											LOW			X		
Penobscot	82													X			
Castine	83		X														
Brooksville	84														X		
Sedgwick	85														LOW		
Brooklin	86													LOW			
Deer Isle	87																
Stonington	88	LOW	X														X
North Haven	89					ALGAE	X			X							
Vinalhaven	90	X	X			ALGAE	X			X		LOW					
Matinicus Isle Plt.	91																
Isle Au Haut	92																
Swans Island	93											X		X			
Tremont	94						LOW					LOW					
Southwest Harbor	95																
Cranberry Isles	95.1		X								X	LOW		X		X	
Mount Desert	96																
Bar Harbor	97													LOW			
Trenton	98										LOW	LOW		LOW			
Ellsworth	99		X														
Lamoine	100		X				X	X						X			
Hancock	101													X			
Franklin	102	LOW	X							X							
Sullivan	103											LOW					LOW
Sorrento	104		X		LOW												
Gouldsboro	105													X			
Winter Harbor	106		X														

TOWN NAME	MAP NUMBER	MUNICIPAL WATER SUPPLY PROBLEMS									RURAL DOMESTIC (GROUND WATER) SUPPLY PROBLEMS						
		QUANTITY	QUALITY				DISTRIBUTION				QUANTITY	QUALITY					
			Color, Turbidity	Fe,Mn	Pollution	Other	Low Pressure	Mains	Storage	Other		Salt-Water intrusion	Road Salt	Fe,Mn	Sulfur	Hardness	Pollution
Steuben	107											low					
Cherryfield	108																
Milbridge	109	X					X	X				X			X		
Harrington	110				low		X										
Columbia	111																X
Columbia Falls	112								X							X	
Addison	113							X	X					X			
Beals	114											low		X			
Jonesport	115											low					
Jonesboro	116																
Centerville	117												low				
Whitneyville	118																X
Roque Bluffs	119											X					
Machias	120															X	
Machiasport	121													X			
Marshfield	122										low						
East Machias	123													low			
Whiting	124												X				
Cutler	125																
Dennysville	126																
Pembroke	127												X				
Lubec	128					hardness taste		X									
Eastport	129		X					X		X							
Perry	130															X	
Robbinston	131																
Calais	132																

X = average severity
low = low severity
high = high severity

APPENDIX C

MAINE WATER UTILITIES ANNUAL REPORT DATA 1970 AND 1979

MAINE WATER UTILITIES ANNUAL REPORT DATA 1970 AND 1979

MIXED = Ground and Surface Water Combined

N.D. = No Data

UTILITY	TOTAL NUMBER OF CUSTOMERS SERVED 1970	1979	1970 SURFACE WATER USED (MGD)	1970 GROUND WATER USED (MGD)	1979 SURFACE WATER USED (MGD)	1979 GROUND WATER USED (MGD)	PERCENT CHANGE IN GROUND WATER USE
1) Addison Point Water District	53	N.D.	N.D.	(Springs) .0095	N.D.	N.D.	N.D.
2) Friendship Water Co. (ABANDONED)	82	N.D.	N.D.	N.D.	N.D.	N.D.	
3) Hancock W.L. & P. Co. (ABANDONED)	75	N.D.	N.D.	N.D.	N.D.	N.D.	
4) Hebron Water Co.	18	N.D.	Ponds N.D.	N.D	N.D.	N.D.	
5) Alfred Water Co.	223	217	-	Dug Well .028	-	Dug Well .045	60+
6) Andover Water Co.	147	N.D.	Brook .075	-	Reservoir on Brook N.D.	-	
7) Anson Water District	594	555	Pond N.D.	-	Pond .37	-	
8) Ashland Water & Sewer Dist.	292	306	River .127	-	River .102	-	
9) Auburn Water District	7,688	5,502	Lake 2.4	-	Lake 2.8	-	
10) Augusta Water District	8,063	5,369	Ponds 4.0	3 wells Mixed	Ponds 3.6	3 Wells Mixed N.D.	
11) Baileyville Util. Dist. (Formerly Woodland)	531	609	-	Well .42	-	Well .44	

UTILITY	TOTAL NUMBER OF CUSTOMERS SERVED 1970	1979	1970 SURFACE WATER USED (MGD)	1970 GROUND WATER USED (MGD)	1979 SURFACE WATER USED (MGD)	1979 GROUND WATER USED (MGD)	PERCENT CHANGE IN GROUND WATER USE
12) Bangor Water District	10,678	11,602	Pond 3.9	-	Pond 7.1	-	
13) Bar Harbor Water Co.	1,589	1,491	Lake 1.78	-	Lake 1.34	-	
14) Bath Water District	3,096	3,189	Lake 1.9	-	Lake 1.74	-	
15) Belfast Water District	1,608	1,589	River 0.2	Well 1.5	River N.D. Mixed	2 Wells 1.59	6+
16) Berwick Water Dept.	462	511	River .144	-	River .150	-	
17) Bethel Water District	369	389	Brook 0.19	-	Brook 0.17	-	
18) Biddeford and Saco Water Co.	10,447	11,505	River N.D.	-	River 5.03	-	
19) Bingham Water District	545	507	-	Well 0.4	-	Well .445	11+
20) Boothbay Harbor Water System	2,051	2,000	Pond 0.495	-	Pond 0.432	-	
21) Bowdoinham Water District	118	195	-	Well 0.03	-	Well .052	73+
22) Brewer Water District	3,139	3,420	Pond 0.82	-	Pond 1.11	-	
23) Bridgton Water District	636	660	Lake 0.22	-	Lake .294	-	
24) Brownville Water District	132	118	-	5 Wells 0.035	-	5 Wells 0.037	6+
25) Brownville Junction Water District	300	300	-	2 Wells N.D.	-	1 Well N.D.	
26) Brunswick & Topsham Water District	5,108	4,032	-	Wells 1.7	-	Wells 1.66	2-
27) Buckfield Water Dept.	185	N.D.	Pond N.D.	-	Pond N.D.	-	
28) Bucksport Water Co.	673	598	Lake 0.2	-	Lake .199	-	

UTILITY	TOTAL NUMBER OF CUSTOMERS SERVED 1970	1979	1970 SURFACE WATER USED (MGD)	1970 GROUND WATER USED (MGD)	1979 SURFACE WATER USED (MGD)	1979 GROUND WATER USED (MGD)	PERCENT CHANGE IN GROUND WATER USE
29) Calais Water & Power Co.	1,766	1,249	-	Well 0.576	-	Well .322	44-
30) Camden and Rockland Water Co.	6,386	6,481	Lake 3.3	Wells Not Mixed	Lakes 03.61	Wells Not Mixed	
31) Canton Water District	99	115	Lake .032	-	Lake .029	-	
32) Caribou Water Works Corp.	1,903	1,838	River 0.8	-	River 0.656	-	
33) Castine Water District	306	324	-	5 Wells 0.06	-	6 Wells N.D.	
34) Clinton Water District	299	362	-	1 Well 0.07	-	Gravel Pack Well .118	68+
35) Corish Water District	222	236	-	Springs .0685	-	Springs .068	0
36) Damariscotta Newcastle Water District	590	496	Pond 0.21	-	Pond .158	-	
37) Danforth Water District	121	160	-	Dug & Drilled Wells N.D.	-	Dug & Drilled Wells N.D.	
38) Dexter Water Works	1,119	863	Lake 0.91	-	Lake N.D.	-	
39) Dixfield Light & Water Co.	554	521	Brook N.D.	-	Brook, Pond (Auxillary) .227	-	
40) Dover & Foxcroft Water District	1,100	958	Pond .346	-	Pond .326	-	
41) Eagle Lake Water & Sewer District	116	191	River N.D.	-	River .05	-	
42) East Boothbay Water Dist.	523	562 1978 Data	-	Wells .09	-	7 Wells .063	30-
43) East Millinocket Water Works	747	658	-	Wells .626	-	3 Wells 0.555	11-

UTILITY	TOTAL NUMBER OF CUSTOMERS SERVED 1970	1979	1970 SURFACE WATER USED (MGD)	1970 GROUND WATER USED (MGD)	1979 SURFACE WATER USED (MGD)	1979 GROUND WATER USED (MGD)	PERCENT CHANGE IN GROUND WATER USE
44) Eastport Water Co.	921	798	River 0.31	-	River 0.298	-	
45) East Vassalboro Water System	83	N.D.	Lake N.D.	-	Lake N.D.	-	
46) Ellsworth Water Co.	1,158	1,173	Stream .53	-	Stream .468	-	
47) Farmington Village Corp.	1,181	1,356	Pond 0.8	-	Pond .67	2 Wells (Auxillary)	
48) Fort Fairfield Utilities District	788	819	Brook Mixed	Wells & Spring 0.74	Brook Mixed	Wells 0.277	62-
49) Fort Kent Water Company	581	622	-	Well 0.5	-	Well .139	72-
50) Franklin Water System	93	160	Brook .012	Well Mixed N.D.	Reservoir N.D.	2 Wells Mixed N.D.	
51) Freeport Water Co.	680	612	Stream .13	Wells N.D. Mixed	Pond & Impounded Stream N.D.	3 Wells .171 Mixed	
52) Fryeburg Water Co.	519	569	-	Well 0.156	-	Well .137 - May be low due to Meter Problem	12- May Not Be Correct.
53) Gardiner Water District	3,580	2,995	Stream 1.8	Wells N.D.	Stream 1.33	Wells not used	
54) Gray Water District	512	659	-	Springs 0.134	-	Springs 0.232	73+
55) Greenville Water Company	449	476	Pond 0.14	-	Pond .129	-	
56) Guilford & Sangerville Water District	532	614	Pond N.D. Mixed	Well 0.28	-	Well .26	7-
57) Hallowell Water District	878	724	Pond 0.254	-	Pond .21	-	
58) Hampden Water District	1,027	1,147	Purchase from Bangor - (Floods and Burnt Ponds) 0.3	Wells Used occassionally N.D.	Ponds .443	One well used occassionally N.D.	

UTILITY	TOTAL NUMBER OF CUSTOMERS SERVED 1970	1979	1970 SURFACE WATER USED (MGD)	1970 GROUND WATER USED (MGD)	1979 SURFACE WATER USED (MGD)	1979 GROUND WATER USED (MGD)	PERCENT CHANGE IN GROUND WATER USE
59) Harrison Water Co.	200	219	-	1 Well .078	-	1 Well .099	27+
60) Hartland Water Company	379	417	Pond 0.193	-	Pond .285	-	
61) Houlton Water Company	2,047	1,854	Stream N.D. Mixed	4 Wells 1.14	Stream N.D. Mixed	Wells 1.0	12+
62) Howland, Town of	440	479	River N.D.	-	River N.D.	-	
63) Island Falls Water Depart.	229	243	Brook 0.21	-	Brook .149	-	
64) Jackman Water District	347	373	Pond N.D.	-	Pond .094	-	
65) Jay Village Water Dist.	191	272	Purchased from Livermore Falls	-	Purchased from Livermore Falls .160	-	
66) Kennebec Water Dist.	10,019	7,719	Lake 8.4	-	Stream 7.17	-	
67) Kennebunk, Kennebunkport and Wells Water District	6,492	7,575	Stream 1.41	-	Stream 2.16	-	
68) Kezar Falls Water Co.	379	405	-	3 Wells 0.095	-	3 Wells 0.129	36+
69) Kingfield Water Dist.	255	310	Pond N.D.	-	Pond N.D.	-	
70) Kittery Water Dist.	4,361	3,937	Ponds 2.74	Spring N.D. Mixed	Ponds 3.14	-	
71) Lewiston Public Works Dept. Water Div.	8,295	8,755	Lake 6.6	-	Lake 6.2	-	
72) Limerick Water Dist.	196	196	-	2 Wells .046	-	2 Wells .046	0
73) Limestone Water and Sewer District	367	344	Brook .257	-	Brook .18	-	
74) Lincoln Water District	934	1,083	Pond (Auxillary) N.D.	2 Wells 0.67	-	3 Wells .73	9+

UTILITY	TOTAL NUMBER OF CUSTOMERS SERVED 1970	1979	1970 SURFACE WATER USED (MGD)	1970 GROUND WATER USED (MGD)	1979 SURFACE WATER USED (MGD)	1979 GROUND WATER USED (MGD)	PERCENT CHANGE IN GROUND WATER USE
75) Lisbon Water Dept.	N.D.	1,922	-	2 gravel wells 8 drilled or driven wells N.D.	-	2 gravel wells 8 drilled or driven .87	
76) Livermore Falls Water Dist.	1,689	1,822	Pond 0.64	Gravel pack well used very little in 1970	Pond .549	-	
77) Long Pond Water Co.	156	151	Pond N.D.	-	Pond N.D.	-	
78) Lubec Water and Electric Dept.	700	742	-	3 gravel packed wells 0.28	-	3 Wells 0.28	0
79) Lucerne Water Co.	78	76	Lake 0.0137	-	Lake .0135	-	
80) Machias Water Co.	608	529	River (Auxillary) N.D.	1 Well 0.18	River (Auxillary) N.D.	Well 0.175	3-
81) Madawaska Water Dist.	842	1,066	Brook 0.356	-	Brook 0.41	-	
82) Madison Water Dist.	1,134	1,063	Pond N.D	-	Pond .746	-	
83) Mars Hill & Blaine Water Co.	626	571	Lake 0.193	-	Lake .278	-	
84) Mechanic Falls Water Co.	506	513	Brook 0.16	-	Brook .239	-	
85) Mexico Water Dist.	1,223	1,348	River (Auxillary) N.D.	Well 0.3	Brook (Auxillary) N.D.	Well .233	22-
86) Millbridge Water Co.	190	N.D.	-	1 Spring 3 Wells N.D.	-	1 Spring 3 Wells N.D.	
87) Millinocket Water Company	2,429	2,135	Pond 1.66	-	Pond 1.09	-	
88) Milo Water District	713	707	River .201	-	River .178	-	
89) Monhegan Water Co.	113	125	-	Driven Well Points N.D.	-	Driven Well Points N.D.	
90) Monson Spring Water Co.	142	151	-	2 Wells N.D.	-	2 Wells N.D.	

UTILITY	TOTAL NUMBER OF CUSTOMERS SERVED 1970	1979	1970 SURFACE WATER USED (MGD)	1970 GROUND WATER USED (MGD)	1979 SURFACE WATER USED (MGD)	1979 GROUND WATER USED (MGD)	PERCENT CHANGE IN GROUND WATER USE
91) Moscow Water District	127	145	Purchased from Bingham N.D.	Deep Well N.D.	Purchased from Bingham N.D. (Well) .052	(Ground Water Purchased)	
92) New Harbor Water Co.	95	104	-	2 Wells N.D.	-	2 Wells N.D.	
93) Newport Div. of the Maine Water Company	431	550	Lake 0.235	-	Lake .167	-	
94) New Portland Water Dist.	56	48	-	Springs N.D.	-	Spring N.D.	
95) New Sharon Water Dist.	79	92	-	2 Wells N.D.	-	3 drilled wells .0195	
96) Norridgewock Water Dist.	330	355	-	1 gravel pack well 0.131	-	1 gravel pack well 0.181	38+
97) North Berwick Water Co.	382	410	Brook .096	-	Brook .117	-	
98) Northeast Harbor Water Company	495	525	Ponds .292	-	Ponds .257	-	
99) North Haven Water Dept.	238	300	Ponds N.D.	-	Pond N.D.	-	
100) North Jay Water Dist.	117	200	Purchased from Wilton 0.034	-	Purchased form Wilton .046	-	
101) North port Mountain Spring Co.	218	231	-	1 Spring 3 Wells N.D.	-	1 Spring 3 Wells N.D.	
102) North Yarmouth Water Dist.	82	102	Purchased from Portland Water District N.D.	-	Purchased from Portland Water District N.D.	-	
103) Norway Water Dist.	1,041	830	Lake (Auxillary)	Gravel pack well 0.26	Lake (Auxillary)	Gravel pack well .302	16+
104) Oakland Water Co.	652	821	Lake 0.45	-	Lake .317	-	
105) Old Town Water Dist	2,724	2,715	River (Auxillary)	3 gravel packed Wells 0.664	-	1 gravel packed Well 1.05	58+

UTILITY	TOTAL NUMBER OF CUSTOMERS SERVED 1970	1979	1970 SURFACE WATER USED (MGD)	1970 GROUND WATER USED (MGD)	1979 SURFACE WATER USED (MGD)	1979 GROUND WATER USED (MGD)	PERCENT CHANGE IN GROUND WATER USE
106) Orono - Veazie Water Dist.	1,643	1,652	Lake (Auxillary)	2 gravel packed Wells 1.15	-	2 gravel packed Wells 1.07	7-
107) Oxford Water Dist.	N.D.	259	-	gravel packed Well .007	-	gravel packed Well N.D.	
108) Paris Utilities District	1,111	957	-	Gravel Packed Wells 1.31	-	Gravel Packed Wells 0.88	33-
109) Patten Water Dept.	178	180	-	Drilled Well N.D.		2 Drilled Wells N.D.	
110) Phillips Water Company	261	257	Pond N.D.	-	Pond N.D.	-	
111) Pittsfield Water Works	1,157	1,005	-	1 Gravel packed & 3 driven wells 0.51	-	2 Gravel packed Wells .489	4-
112) Port Clyde Water Dist.	95	N.D.	-	3 Wells (2 in service) N.D.	-	N.D.	
113) Portland Water District	35,655	39,159	Lake 22.4	Wells Mixed N.D.	Lake 20.26	5 Wells Mixed N.D.	
114) Presque Isle Water Dist.	1,913	2,100	Stream 0.91	-	Stream 0.98	-	
115) Quantabacook Water Co. (Harrington)	138	140	-	Spring N.D.	-	Spring N.D.	
116) Rangeley Water Company	N.D.	420	N.D.	N.D.	Reservoir N.D.	N.D.	
117) Richmond Utility Dist.	461	502	-	1 gravel pack Well 0.148	-	1 gravel pack Well .112	24-
118) Rumford Water Dist.	2,890	2,919	Reservoir 0.735	Spring (Idle) Gravel pack Wells Mixed N.D.	Reservoir .67	Spring (Idle) 2 gravel pack Wells Mixed N.D.	
119) Sabuttus Water Dist.	196	350	-	1 Well .04	-	2 Wells .07	75+

UTILITY	TOTAL NUMBER OF CUSTOMERS SERVED 1970	1979	1970 SURFACE WATER USED (MGD)	1970 GROUND WATER USED (MGD)	1979 SURFACE WATER USED (MGD)	1979 GROUND WATER USED (MGD)	PERCENT CHANGE IN GROUND WATER USE
120) Sandy Point Water Co. (No Report required)	36	N.D.	N.D.	N.D.	N.D.	N.D.	
121) Sanford Water Dist.	5,616	6,545	Pond (Auxillary)	Drilled Wells(54) gravel packed Wells (3) 2.3	Pond (Auxillary)	Drilled Wells(54) gravel packed Wells (14) 2.37	3+
122) Seal Core Water Works, Inc.	56	36	Pond N.D.	-	Pond N.D.	-	
123) Seal Harbor Water Co.	283	303	Pond N.D.	-	Pond N.D.	-	
124) Searsport Water District	826	798	Pond 0.41	-	Pond .376	-	
125) Skowhegan Water Co.	1,971	1,884	Pond and Brook 0.52	-	Pond, & Brook (Auxillary) 0.51	-	
126) Small Point Water Co.	N.D.	44	Pond N.D.	-	Pond N.D.	-	
127) Solon Water Dist.	113	161	-	Well .037	-	Well .06	62+
128) South Berwick Water Dist.	604	604	-	5 Wells (4 Active 1 inactive) 0.16	-	Wells 0.188	17+
129) South Freeport Water Dist.	187	246	-	Spring, Gravel Packed Well 0.037	-	Spring Gravel Pack Well 0.0474	28+
130) Southport Water System	409	375	N.D.	N.D.	Reservoir .166	-	
131) Southwest Harbor Water Dept.	565	671	Pond 0.245	-	Pond .401	-	
132) Starks Water Dist. (No Report required)	24	N.D.	N.D.	N.D.	N.D.	N.D.	
133) Stonington Water Co.	227	245	Pond 0.075	-	Pond N.D.	-	219+
134) Stratton Water Co.	148	138	Brook (Auxillary)	Gravel pack Well 0.02	-	Gravel pack well .0638	

UTILITY	TOTAL NUMBER OF CUSTOMERS SERVED 1970	1979	1970 SURFACE WATER USED (MGD)	1970 GROUND WATER USED (MGD)	1979 SURFACE WATER USED (MGD)	1979 GROUND WATER USED (MGD)	PERCENT CHANGE IN GROUND WATER USE
135) Strong Water Dist.	243	246	Pond 0.19	-	Pond N.D.	-	
136) Sullivan (No report required)	36	N.D.	N.D.	N.D.	N.D.	N.D.	
137) Van Buren Water Dist.	1,017	1,030	Brook .037	-	Brook .60	-	
138) Vinal Haven Water Co.	379	383	Pond 0.067	-	2 Ponds N.D.	-	
139) Waldoboro Water Co.	286	299	Brook 0.166	Wells Mixed	Brook .151	4 Wells Mixed	
140) Washburn Water Co.	283	318	-	1 Well 0.18	-	2 Wells 0.19	5+
141) West Paris Utility Dist.	172	207	-	Gravel Packed Well 0.09	-	Gravel Packed Well .093	3+
142) West Skowhegan Aqueduct Co. (No Report required)	52	N.D.	N.D.	N.D.	N.D.	N.D.	
143) Wilton Div. Maine Water Co.	807	891	Pond 0.45	-	Pond .367	-	
144) Winter Harbor Water Co.	237	251	Pond N.D.	-	Pond .110	-	
145) Winterport Water Dist.	238	280	Brook 0.0525	3 Wells Mixed	Brook N.D.	3 Wells Mixed N.D.	
146) Winthrop Water Dist.	844	783	Pond 0.5	-	Pond .309	-	
147) Wiscasset Water Co.	361	334	Brook 0.07	Spring N.D. Mixed	Brook .093	Spring 2 Wells Mixed N.D.	
148) Yarmouth Water Dist.	1,806	2,664	-	Spring 2 Gravel packed Wells .679	Purchase Some Water from Portland Water Dist.	2 Springs 2 Gravel packed Wells .67	0
149) York Water Dist.	3,352	3,480	Pond 0.84	-	Pond 1.29	-	
GRAND TOTAL	207,958	210,048	78.4362	17.9350	84.1555	18.0287	