WATER IN MARYLAND

A Preliminary Report

On The

Water Resources Problem In Maryland

PREPARED AT THE REQUEST OF
THE GENERAL ASSEMBLY OF MARYLAND

BY

THE SPECIAL COMMISSION TO STUDY THE WATER
RESOURCES PROBLEM IN MARYLAND

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SPECIAL COMMISSION TO STUDY THE WATER RESOURCES PROBLEM IN MARYLAND

THE HONORABLE THEODORE R. MCKELDIN, *Governor of the State of Maryland,*
The Members of the General Assembly,
The Legislative Council, and
The People of Maryland

We, the members of the Special Commission to Study the Water Resources Problem in Maryland, respectfully submit this preliminary report for appropriate consideration.

Pursuant to House Joint Resolution Number 6, this special Commission of twenty-five members was appointed to study the water resources problem in Maryland and report to the Governor, the members of the General Assembly, and the Legislative Council including in the report such findings and recommendations as it may deem desirable.

The Special Commission represents users of water for all purposes —agricultural, municipal, industrial, and recreational. It came into being because numerous water users became concerned over water rights during periods of temporary shortages of water in certain areas. It was recognized that a careful study was needed in order to establish the nature of any water problems that existed in the State as well as those that might arise in the foreseeable future.

This report contains the findings of the various committees which were appointed by the Commission to study the different phases of the water resources problem together with certain conclusions and recommendations.

We respectfully request consideration and appropriate action on these recommendations to the end that the study may be continued until a final report can be prepared upon which to base sound and effective legislation leading to a maximum beneficial use and conservation of the State's water resources.

Very truly yours,

HARRY H. RIECK,
Chairman.

February 1, 1956.

FOREWORD

This Special Commission was appointed by Governor McKeldin August 19, 1955. Since its appointment, the Commission has held four meetings. The first meeting of the Commission was held September 28, 1955 at which time the members present directed the Chairman to appoint four committees to study different phases of the water resources problem in the State. Committees were appointed to study:

Existing Water Problems

The Water Resources in Maryland

The Beneficial Uses of Water

Current Water Laws and Legal Principles

The reports of these committees are presented herein. These reports were accepted by the Commission, and represent the work and opinions of the members of the respective committees, but do not necessarily express the views of the entire Commission.

No funds were available to the Commission to employ personnel to conduct studies or assemble data. The members of the Commission serving on the above committees performed these duties as a public service.

Water has always been, and will continue to be one of the important resources of the State. The high quality water in the fresh water streams has been a contributing factor in municipal, agricultural, industrial, and recreational development. This report contains a great deal of information that should be of interest to all citizens of Maryland.

COMMISSION TO STUDY THE WATER RESOURCES PROBLEM IN THE STATE OF MARYLAND

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ACKNOWLEDGMENTS

The Commission acknowledges the help of individuals in various agencies who cooperated by supplying data when requested by the Commission. To the individuals and organizations named here and to all others whose thoughts and effort went into this report, the Commission is grateful.

Important contributions were made by the following:

The Department of Geology, Mines, and Water Resources

The Maryland State Department of Health

The United States Geological Survey

The U. S. Soil Conservation Service

The Washington Suburban Sanitary Commission

The Maryland Water Pollution Control Commission

The U. S. Department of Defense, Corps of Engineers

The Interstate Commission on the Potomac River Basin

The Delaware Water Resources Study Committee

The University of Maryland

The Anne Arundel County Sanitary Commission

The Baltimore City Bureau of Water Supply

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REPORT OF COMMITTEE TO STUDY EXISTING WATER PROBLEMS

The Committee agreed that its first objective should be to determine how much relevant information has already been developed by other agencies. When we know what information is already available and just how we may use it in assembling the pieces of our total problem, then we can better visualize the magnitude of the job which remains to be done in those areas not already covered by other organizations and in reviewing and developing the already available data. Much of our information was secured from the agencies and publications listed at the end of this report, and our findings are presented herewith.

1. Shortages.

There are no major shortages of water in Maryland at the present time, but a severe drought or a substantial increase in the use of water would undoubtedly create serious shortages in some localities. At least one town in the State has already gone through the experience of having its water supply temporarily depleted by irrigation operations, and in several areas it was necessary to restrict the use of water as a result of the abnormally dry weather in 1953 and 1954.

Many small streams are presently being used as a source of supply for various purposes, and any decrease in the minimum stream flows could create a serious problem. In many cases additional demands by the present users or new demands by potential users could not be satisfied except at excessive cost. Such situations point to control of all uses of water as the only equitable method of handling a difficult problem.

It can be shown by statistics that there is no overall shortage of water in Maryland, but that is poor comfort to the individuals who are faced with a lack of water in the middle of summer. If the shortage is caused by the unequal distribution of available supplies, then it is possible that some reasonable controls would be helpful; but if the difficulty is caused by a seasonal local lack of water, then the solution would probably require the expenditure of a substantial sum of money. Unless the federal, state, or local government is willing to contribute to the cost of acquiring adequate quantities of satisfactory water, then it is up to the individual or the community to solve the problem in its own way.

2. Salt Water Encroachment.

The problem of salt water infiltration into fresh water supplies is relatively unimportant at the present time. It is understood that salt water caused some trouble in the Baltimore area due to excessive industrial pumping during the last war, but so far as is known no other area in the State has been affected.

However, the possibility of salt water encroachment is ever present; and it might become a problem if there is excessive pumping in the tidal areas of the State. The portions of the State which could be vulnerable to salt water infiltration are the areas around the Chesapeake Bay, along the tidal estuaries of the rivers flowing into the bay, along the Atlantic Ocean coastline, and along the Chesapeake & Delaware Canal.

The matter is serious if salt water is drawn into a fresh water aquifer as the result of heavy pumping because it probably would be necessary to abandon the well even though there is an ample supply of water but of a quality not satisfactory for the particular use. In order to reduce the possibility of such a situation the owner of the wells may have to control the rate of pumping, or he may distribute the pumping to more wells, or the center of pumping may have to be moved inland. The control of all wells, except those used for public water supplies or for domestic and farming purposes, is now vested in the Department of Geology, Mines and Water Resources.

It should not be inferred that heavy pumping near salt water will always draw salt water into the fresh water aquifer, since it is possible that the aquifer may be protected by overlying strata. A knowledge of the geological formations will be helpful in a determination of the precautions which should be taken.

Increase in salinity in a tidal stream will result when the natural flow of fresh water decreases. The result is the same, whether the decreased flow is due to drought or to the diversion of fresh water from the stream. In either case the salinity of the water in the estuary will increase and may make the water unsatisfactory for domestic, irrigation, or other uses.

3.a. Pollution—Sewage.

The Maryland State Department of Health has accumulated the following information on the amount of sewage discharged into Maryland streams. This does not include quantities of sewage discharged in adjacent States into streams which flow into Maryland.

		No. Persons	*M.G.D.*
1.	Treated Sewage—Discharged to Tidewater	1,638,027	192.775
2.	Untreated Sewage—Discharged to Tidewater	59,069	6.778
	TOTAL	1,697,096	199.553
3.	Treated Sewage—Discharged to Fresh water Streams	143,003	15.749
4.	Untreated Sewage—Discharged to Fresh Water Streams	66,029	4.950
	TOTAL	209,032	20.699
	GRAND TOTAL	1,906,128	220.252
	Untreated Sewage (included in Items 2 and 4) that will be receiving treatment within 12 to 24 months		
5.	To Tidewater	31,334	4.215
6.	To Fresh Water Streams	42,161	3.16
	TOTAL	73,495	7.375

An analysis of the above table indicates that when the presently scheduled treatment plants are completed, the treated sewage flowing into fresh water streams will account for over 90% of the total amount now discharged to those streams. This means that only 1,790,000 gallons per day or about 10% of the total sewage discharged into fresh water streams will remain untreated. The situation will be much better percentagewise for the sewage discharged into tidewater, since the amount which will remain untreated at the conclusion of the present improvement program will be but 2,563,000 gallons per day or about 1.3% of the total.

The method of treating sewage or industrial waste is based on a study of long-range stream flow records, and any unauthorized diversion or addition of water, particularly during periods of low flow, will produce erroneous records and will upset the calculations concerning the required treatment of wastes. Correct flow records are also necessary in order to evaluate the ability of a stream to assimilate various kinds of waste, whether they are treated or untreated. Therefore, it is important that some control be exercised over diversions from the streams, so that excessive amounts of water are not taken from a stream during a period of low flow.

3.b. Pollution—Industrial Wastes.

The State of Maryland has already taken steps to combat the stream pollution which is caused by the uncontrolled discharge of industrial waste. In 1947 the Water Pollution Control Commission was established, and in the ensuing 8 years it has accumulated much information and has been instrumental in controlling a large amount of the industrial waste which eventually finds its way into our streams.

The Commission's report for 1954-55, which will be available for distribution in a few weeks, shows by location the quality and quantity of waste, an analysis of the stream above and below the point of discharge, the present treatment of the waste, and the recommendations for correction, if any are required.

It is the practice of the Commission's field men to take a sample of the water in a stream above the outlet from an industry and then to take samples of the water at several points downstream from the point of discharge. When they reach the point downstream where the adverse effects of the waste have disappeared, due to the natural self-purification process which is always at work in a stream of water, then they cease taking samples. Such studies are usually made in August, September, and October, when the stream flow normally would be at a low point for the year, so that the worst conditions may be observed.

In conjunction with other agencies the Commission made a detailed study of the water pollution problem in Gwynns Falls, which was published as a report in May, 1955. The Commission has not made a similar analysis of other streams, because such studies are very expensive and can be justified only in populous or critical areas.

No overall inventory of the conditions of the streams in Maryland is currently available except the one made in 1933 by the Water Resources Commission. Such a survey would have to include streams originating in Virginia, West Virginia, and Pennsylvania, which flow into Maryland; and even though it was confined primarily to bringing the 1933 study up-to-date, it could be done only by assigning a number of technically trained men to the job. It has been estimated that such a survey would require 12 to 18 months for completion, depending upon the number and experience of the men used in the work.

3.c. Pollution—Soil.

The problem of the pollution and siltation of the streams due to soil erosion has received considerable attention from the Soil Conservation Service of the U. S. Department of Agriculture. Some harmful

effect is inevitable when a stream drains a cropland area, but, according to the S. C. S., when proper erosion control is practiced, the siltation amounts to only 5 to 10 percent of the quantity which would be deposited if no erosion control is used.

A lot of work has already been done to inaugurate proper erosion control practices, but much remains to be accomplished before the farmland and the streams can be adequately protected against the evils of erosion. We are indebted to Mr. M. B. Fussell, State Soil Conservationist, for the following data on erosion control.

	Already Accomplished	*Remaining to be done*
Contour farming	208,220 Acres	851,422 Acres
Strip cropping	140,933 "	702,055 "
Establishing perennial hay	60,771 "	262,328 "
Pasture improvement	210,361 "	547,452 "
Waterway development	1,873 "	8,598 "
Woodland protection	181,190 "	865,818 "
Open drains	2,952 Miles	14,738 Miles
Diversion terraces	446 "	2,621 "
Ditch construction	299 "	2,540 "

The last item, ditch construction, in the main refers to ditching made necessary by the silting of old streams which would have made good natural outlets but in which channels must now be dug in order to make them useful for tile or open drains.

4. Flood Control.

The Corps of Engineers, U. S. Department of Defense, has devoted a vast amount of time to the study of flood control requirements in Maryland and adjacent States, and the reports on those studies will be made available to this Commission if they are requested. The most extensive project covers the Potomac River and its tributaries in Maryland, Virginia, West Virginia, and Pennsylvania. That study was completed in 1946 and recommended the construction of 14 large dams.

The Savage River Dam was started in 1936 or 1937 as a WPA project; and although construction was halted during the war years, it was finally completed in 1952. It is interesting to note that although the Savage River Reservoir was designed primarily to supplement the low flows of the Potomac River, it was also used to control floods during the recent hurricanes. Its use for flood control in October, 1954,

during Hurricane "Hazel" is estimated to have reduced the flood crest at Cumberland several feet and to have thereby saved several millions of dollars in property damage in the Cumberland-Luke area.

The Corps of Engineers has also made studies of the Patuxent River, the Anacostia River, where flood control construction is now under way, and the Marshyhope Creek near Federalsburg.

Listed below is an outline of the work upon which the Washington District of the Corps of Engineers hopes to embark if the necessary funds are forthcoming. Some of the items cover requests from Congress for special information, and some items refer to existing reports which the Engineers hope to bring up-to-date.

1. Big Wills Creek and Little Wills Creek for flood control in the vicinity of Hyndman Borough, Pa.
2. Williamsport, Md., for flood control on Potomac River and tributaries.
3. North River and tributaries in Virginia for flood control.
4. South Branch of Potomac River and tributaries in Maryland, Virginia, West Virginia, and Pennsylvania.
5. Gilbert Run, Charles County, Md., for flood control and drainage.
6. Port Tobacco Run, Charles County, Md., for flood control and drainage.
7. South Branch of Potomac River and tributaries in West Virginia for flood control in West Virginia.
8. Potomac River and tributaries in Maryland, Virginia, West Virginia, and Pennsylvania for flood control.
9. North Branch of Potomac River and tributaries for flood control, water supply, pollution abatement, and allied purposes.

5. Drainage

The modern concept of drainage embraces water control, the development of improved field arrangements, integration with good cropping practices to increase water holding capacity of the soil, and disposal of excess surface and subsurface water.

The impoundment of water is encouraged during the dry seasons

in the same ditches and drains that are used to remove excess water during flood periods. This is readily accomplished by means of extremely simple structures located in the small headwater ditches wherever they may be. With this system, every landowner can become a manager of the surface water on his own farm except where his land borders or is traversed by a major tributary or stream. The possibilities of such management are of extreme importance when considered in the overall water situation. In areas where modern drainage and water management are practiced, it is entirely conceivable that the outlet ditches and even some of the small tributaries will become dry during the large part of the summer season except in periods of unusually heavy rainfall. If each owner were to keep all of his own water at the time when water supplies are low, riparian rights will have little or no meaning; because the water will have been retained on the land where it fell. Furthermore, since the right of every landowner to retain and use water that falls on his own land is clearly established, this situation is one that could actually come about in some localities in the years to come.

Tile pipe systems are used extensively in areas where it is necessary or desirable to lower the water table. Such systems now drain 126,294 acres with 679,498 lineal feet of pipe, and the Soil Conservation Service estimates that an additional 12,972,151 lineal feet of pipe will be required to drain the remaining 405,311 acres. It has been estimated that only about 1% of the farms uses its tile drained water in farm ponds, which means that only about one pond in 150 gets water from such drains.

6. Chemical Quality.

Assuming satisfactory sanitary quality, that is, the absence of pollution, the characteristic of water which would govern its usefulness would be the chemical nature of the dissolved solids, which is commonly referred to as the mineral quality.

In general, the ground waters in Maryland are of good chemical quality, except for the presence of iron in some areas. When water contains more than a few tenths of a part per million of iron, the excess may precipitate and settle as a reddish sediment when the water is exposed to air. Even with an excessive iron content the water may not be unpleasant for drinking purposes, but the iron oxide will stain clothes and plumbing fixtures; and it is, therefore, undesirable for domestic uses.

The surface waters are subject to pollution and salinity, both of which have been discussed in other parts of this report. In addition, there are some swamp areas of the State in which the chemical content

of the water is affected by the decomposition of vegetation. This appears to be a minor problem at present, and no specific data have been discovered.

7. Economics of Water Supply.

The cost of developing a water supply for a specific use depends on the quantity and quality of the water which is available, as compared with the quantity and quality of the water which is required for the specific purpose. If the source is surface water and the requirements are in excess of the amount available, then it may be feasible to construct a dam or a series of dams to store the water which normally would be lost through run-off so that the water would be available over a longer period of time. If the source is ground water, then the available quantity may be increased by constructing more wells, supplemented in some cases by a storage reservoir.

The treatment which may be required to improve the quality of the water can be determined only after an analysis of the available water and a knowledge of the quality which the usable water must possess.

It has been stated that there is an ample supply of water available for any conceivable use, if the user is willing to pay the cost. This statement is unquestionably true, so our whole problem resolves itself into one in which economics plays the dominant role. What we are really looking for is not water alone, but water at a reasonable cost.

Conclusion.

Although there is available a considerable amount of detailed information on existing water problems, much of it would have to be analyzed and arranged in the proper form for evaluation in order to determine whether it would be useful to this Commission. In some areas very little information is readily available, so it would require some additional searching; or in some instances, this Commission may have to develop its own data. In either event, it appears that a considerable amount of work must be done if we are to present a really comprehensive picture of the existing water problems.

Respectfully submitted,

COMMITTEE TO STUDY EXISTING WATER PROBLEMS

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Wilson A. Heaps
Dr. Gordon M. Cairns
George Hall
Thomas Kibler
Delegate Charles H. Smelser
Harry H. Rieck, *ex-officio*

RESOURCE GROUPS AND LITERATURE

1. Maryland Department of Health.
2. Maryland Water Pollution Control Commission.
3. U. S. Dept. of Agriculture, Soil Conservation Service.
4. U. S. Dept. of Defense, Corps of Engineers.
5. Recommendations as to Policy, Legislation and Method of Financing for the Preservation of the Water Supply Resources of the State of Maryland—Water Resources Commission of Md.—January 1933.
6. Flow Data and Draft Storage Curves for Major Streams 1929-1937 —Water Resources Commission and State Planning Commission of Maryland—May 1940.
7. Effects of Soil Erosion on Navigation in Upper Chesapeake Bay, by L. C. Gottschalk, Soil Conservation Service, U. S. Dept. of Agriculture—April 1945.
8. Annual Reports of Maryland Water Pollution Control Commission.
9. Water Pollution, A Policy and Program for Control—Md. Water Pollution Control Commission—January 1949.
10. Report to the City of Baltimore on Future Sources of Water Supply and Appurtenant Problems—Board of Advisory Engineers on Future Water Supply—December 1953.
11. A New Water Policy for South Carolina—The Water Policy Committee—1954.
12. Water in Delaware—Delaware Water Resources Study Committee—April 1955.
13. Gwynns Falls: An Analysis of a Water Pollution Problem—Md. Water Pollution Control Commission—May 1955.
14. A Symposium on Supplemental Irrigation—Interstate Commission on the Potomac River Basin—1955.

THE WATER RESOURCES OF MARYLAND

That there is a water problem is generally recognized. That the problem will become more acute as water consumption increases is true. There has been much discussion of the problem by those who have disregarded facts and drawn erroneous conclusions. Inadequacy of water supply facilities has been wrongly ascribed to inadequacy of water resources. On the basis of this false premise, falling ground-water levels and decreasing stream flows have been postulated, though such evidences of depleting water resources do not exist.

Water is unique in being the only mineral resource that is replenishable. An insufficiency of water resources can arise only if the rate of consumption exceeds the rate of replenishment. Such a situation does not exist and cannot arise in the foreseeable future.

Magnitude of the Water Resources

The average annual rainfall in Maryland exceeds 40 inches. The land area of Maryland is 9,887 square miles. The average annual rate of replenishment of water in Maryland is, therefore, more than 7 trillion gallons. Nature consumes 60 percent of this in evapotranspiration, leaving 40 percent for the replenishment of ground water and surface water, amounting to 2.8 trillion gallons. One half of this, 1.4 trillion gallons, is surface runoff which provides flood flow of streams. The other half, 1.4 trillion gallons, is ground-water recharge which overfills the ground-water reservoirs and spills out of them to provide the sustained flow of streams between periods of rainfall. Thus each year Maryland receives an increment of new water, initially equally divided between ground water and surface water, amounting to 1.4 trillion gallons each, equivalent to at least 8 inches of ground water and at least 8 inches of surface water. Insofar as the ground-water recharge is not consumed, it finds its way into the streams to augment the stream flow up to a total of more than 16 inches.

The most intensely concentrated use of water, both per capita and per unit area, is in Baltimore City. The consumption of water in Baltimore City in 1954 was 62 billion gallons, just about the same as the average annual rainfall on Baltimore City and at the rate of 200 gallons per person. The population of Maryland is 2,602,000. Even at the

Baltimore City rate of consumption, Maryland would need only 520 billion gallons of water annually, whereas the rate of replenishment is 2,800 billion gallons, or more than 5 times as much.

The estimated consumption of ground water in the 19 Maryland counties in which the State-wide inventory has been completed is 100 million gallons a day. The total for the 23 counties does not exceed 110 million gallons a day, or 40 billion gallons a year. The rate of ground-water replenishment is 1,400 billion gallons a year, or 35 times as much as the consumption.

The average amount of water needed for supplemental irrigation is estimated at about 4 inches. Even if the entire surface of Maryland were brought under supplemental irrigation, less than ½ of the replenishment of ground water or less than ½ of the replenishment of surface water or less than ¼ of the total annual replenishment would be adequate. This is the ultimate maximum that irrigation would consume.

Obviously even the most extravagant estimates of future water supply requirements fall far short of the rate of replenishment.

What is the Water Problem

The water problem is solely an economic problem. Maryland's water resources are more than adequate to supply whatever quantity of water may be demanded wherever and whenever needed. The water problem is whether the delivered water is worth the cost of delivery to the consumer. The water problem is to control the appropriation and the use of water in such manner and to such extent as to make the delivery price as economical as is compatible with the best interests of the people of Maryland.

The Control over the Use and Appropriation

Under the 1933 Water Resources Act, Maryland asserted control over the use and appropriation of the waters of the State "in order to conserve, protect, and utilize the water resources of the State in accordance with the best interests of the people of Maryland." That Act prohibits the use and appropriation of any waters without a permit from the Department of Geology, Mines and Water Resources. The Act provides if the Commission of the Department "be of the opinion that the proposed appropriation of State waters will be detrimental to the best public interest, the Commission may reject the application

or it may include in the grant of the permit such conditions, terms, and reservations with respect to the character, amount, means, and manner of such use as it may deem reasonably necessary to preserve the proper control in the State and to insure the safety and welfare of the people of Maryland." However, the Act exempts from this control approved municipal water supplies, domestic uses, and farm uses.

The control had been adequate and effective for surface waters. It was ineffective for ground water until it was supplemented by the Well Control Act in 1945, requiring the licensing of well drillers and requiring permits to drill wells. With the advent of supplemental irrigation, the control has become inadequate because of the exemption of farm uses. Its adequacy can be restored by repealing the exemption for irrigation uses.

The Water Resources Inventory

The Ground Water Inventory

A systematic inventory of the ground-water resources of the Baltimore industrial area was started late in 1942. In 1945 the scope of the inventory was expanded to ultimately cover the entire State. The investigations are conducted cooperatively by the United States Geological Survey and the Maryland Department of Geology, Mines and Water Resources. The results are published by the Department of Geology, Mines and Water Resources.

The investigations have been completed; and the results have been published covering the Baltimore industrial area, the five southern Maryland counties (Anne Arundel, Calvert, Prince George's, Charles, and St. Mary's), the three lower Eastern Shore counties (Somerset, Wicomico, and Worcester), two of the Central Maryland counties (Howard and Montgomery), and Garrett County in Western Maryland. The investigations have been completed; and the reports are being prepared for printing covering the other six counties on the Eastern Shore (Caroline, Dorchester, and Talbot; and Cecil, Kent, and Queen Anne's) and Baltimore and Harford Counties. The investigations in Carroll and Frederick Counties are in progress. The investigations in Allegany and Washington Counties will be started in 1956.

Availability of Ground Water Resources

Ground water occurs in unconfined aquifers under water table conditions in which the static water level is the level at which the un-

confined water stands. Its replenishment is from rain that falls in its vicinity. The water level fluctuates through an annual cycle, decreasing throughout the growing season and increasing throughout the period between growing seasons.

Artesian water occurs in confined aquifers under hydrostatic pressure. Recharge takes place in the outcrop area of the aquifer, and the hydrostatic pressure increases with increasing depth of the aquifer which may extend miles from the recharge area. The water in an artesian well rises higher than the aquifer to a level of equilibrium with the hydrostatic pressure in the aquifer.

When a well is pumped, the water level falls in the well an amount proportional to the rate of pumping. The decrease in pressure causes surrounding water in the aquifer to flow toward the well, resulting in lowering the water level in the vicinity. Since the circumference of the area of reduced pressure increases rapidly away from the well, the amount of lowering of the water level decreases rapidly with increasing distance from the well. The shape of the hydrostatic surface around a well is that of an inverted cone with its apex at the well, which is called the cone of depression. When pumping ceases, water levels gradually rise to the level of static equilibrium. The rate at which water may be withdrawn from an aquifer without exceeding the rate of recharge is called the "safe yield" of the aquifer. That rate depends on the hydrologic properties of the aquifer. It varies in aquifers and in different parts of the same aquifer. So long as the "safe yield" is not exceeded, the water is continuously available in undiminished quantity.

The geology of Maryland is such that wells with yields of hundreds of gallons a minute can be developed in the Tidewater counties from both water table aquifers and artesian aquifers. The recharge rate and the transmissibility of these aquifers is high. There is no need to exercise restrictive control over the quantity desired for supplemental irrigation. The only control needed is to control well locations so that the cone of depression at one irrigation well does not appreciably affect the yields of nearby irrigation wells and that irrigation wells are so located that the cone of depression will not cause recharge in the aquifer from saline tidewaters. The control provided in the Water Resources Act would afford this protection if the use and appropriation of water for irrigation were placed under that control. Fresh water streams are relatively small, and their courses are short so that surface waters are not generally available in Tidewater Maryland. Ground water must be the main source of water for supplemental irrigation in

the Tidewater counties. The ground-water resources are adequate, and there are no serious economic supply problems.

In Central and Western Maryland ground water occurs mostly under water table conditions. The rocks themselves are dense and impermeable. Water occurs in constricted openings in the rocks. Storage is relatively small and transmissibility is low. Yield of wells rarely exceeds tens of gallons a minute, and the average yield is about 15 gallons a minute. To obtain yields satisfactory for irrigation would require a number of wells. Though the annual potential recharge is more than 8 inches and its volume is more than 200,000 gallons per acre, the water in storage is not adequate to the temporary high rate of withdrawal required by irrigation. Ground water is not generally a satisfactory or economically practicable source of water for supplementary irrigation in Central and Western Maryland, so that little need for control over its use will arise. Surface water must be the main source of water for supplemental irrigation in Central and Western Maryland.

Geographically distributed through Maryland are 105 observation wells in which fluctuations in water levels are measured. These records are published annually in Water Supply Papers by the United States Geological Survey. The records are summarized in the county Water Resources Bulletins published by the Department of Geology, Mines and Water Resources. Except in a few restricted areas of heavy pumpage for industrial and public water supply consumption these records show no sustained decrease in water levels.

The Surface Water Inventory

Surface waters are inventories by continuous measurements of the volume of stream flow at stream-gaging stations. The flow measurements are tabulated as minimum, maximum, and average flow per day in each month, as inches and volume per square mile of drainage area of a stream by months and as average discharge in gallons per day per square mile of drainage area in each month. These monthly records are consolidated into averages for the year, and the yearly averages into averages for the period of record of the station. The records thus give the minimum recorded drought flow, the maximum recorded flood flow, and the average flow of the streams.

The stream-gaging stations are operated cooperatively by the United States Geological Survey and the Maryland Department of

Geology, Mines and Water Resources. The annual records are published annually in Water Supply Papers by the United States Geological Survey. The Department of Geology, Mines and Water Resources published in 1944 a summary of the records from 1892 to 1943. A summary of records after 1943 up to the date of publication is included in the county Water Resources Bulletins published by the Department of Geology, Mines and Water Resources.

At present 85 gaging stations are in operation on Maryland streams covering Maryland geographically by stream sizes and by stream types. By comparing spot measurements on ungaged streams and on gaged streams, the flow characteristics of ungaged streams can be predicted with reasonable accuracy.

Availability of Surface Water Resources

Surface water is available naturally only in the volume that is in transit as stream flow at the time of consumption. There is no large natural storage of surface water to cushion peak demands analogous to the large volume of water stored in the ground-water aquifers.

The nature of the demand for surface water supplies has been such that the control under the Water Resources Act has been adequate. The large demands have been for industry and for public water supplies and have been confined mainly to Central and Western Maryland.

With an average stream flow of about 8 billion gallons a day, there has been no problem of adequacy of surface water resources. Industry has had no difficulty in locating itself on a stream with adequate flow. Insofar as minimum drought flow may have been inadequate, industry has provided storage reservoirs behind dams. Public water supplies have had less latitude in choice of location of their sources of water, but they have also overcome inadequacies during periods of low flow by storing behind dams during periods of surplus flow. The daily average consumption of surface water in Baltimore City is 170,000,000 gallons. An estimate of twice that amount for the State would doubtless be too large. Yet 340,000,000 gallons a day is less than 4 percent of the surface water resources. The surface water problem of industrial and municipal supplies is an economic problem which has not been beyond their capacity to solve—the cost of the water supply system.

The use of surface water for irrigation presents an entirely new and more complex problem. The need for irrigation water comes when there is no surface runoff and when stream flows are lowest. The sur-

face water in transit as stream flow is available only to those with riparian rights. The quantity in transit is inadequate, and its use and appropriation are restricted to the point of prohibition by the law of riparian rights. The solution of the problem is obvious; the practicability of the solution is an economic question.

The average annual surface runoff is more than 8 inches or more than 200,000 gallons per acre, one half of which is adequate for irrigation. The farm pond program points to one solution of the surface water irrigation problem. The problem is an individual one for each prospective irrigation installation—will the impounded water be worth the cost of impoundment. In some cases it will be; in other cases it will not.

The average annual stream flow is more than 16 inches over the entire water shed of a stream. The amount is far more than needed to satisfy riparian rights on the stream. A riparian owner can store enough water in a reservoir behind a dam to supply his irrigation needs during periods of high water in the stream and thus not interfere with riparian rights by not intercepting the flow during periods of low water. The problem is an economic problem of the cost of storing the water and not one of inadequacy of water resources. On an individual basis this solution may in some cases be impossible because of the unsuitability of the terrain for reservoir storage.

The terrain difficulty can be solved by voluntary collective action within a watershed or within portions of a watershed under the existing exemption of farm use from the control of the Water Resources Act and without violation of riparian rights; that is, under existing laws, if the beneficiaries are willing to pay their proportionate shares of the cost.

Precedent for another solution of the economic problem is the procedure established by law for the installation of shore erosion protection works with public funds. This law authorizes a county, upon petition of 75 percent of the beneficiaries, to borrow funds for the installation and to amortize the bonds by an annual tax assessment levied against the beneficiaries. Similarly by compulsory collective action, the irrigation needs of riparian landowners can be provided by constructing dams to create adequate storage reservoirs.

SUMMARY

Maryland receives annually 7 trillion gallons of water. Nature consumes 4.2 trillion gallons through evapotranspiration. Ground

water recharge takes 1.4 trillion gallons. That which is not withdrawn by wells spills out of the overfilled ground-water reservoirs to provide the sustained flow of streams between periods of rainfall. Surface runoff takes 1.4 trillion gallons which provides the flood flow of streams.

Maryland consumes about 40 billion gallons of ground water annually and not more than 120 billion gallons of surface water annually. The annual consumption of ground water is less than 3 percent of the annual replenishment. The annual consumption of surface water is less than 9 percent of the flood flow of the streams and less than 4.5 percent of the total flow of the streams. The combined consumption of ground water and surface water is less than 6 percent of the annual replenishment.

The water problem in Maryland is not a problem of inadequacy or impending inadequacy of water resources. Maryland will always have adequate water resources—at a price. The problem is to supply the water in the quantity needed when needed and where needed by the consumers. The problem is the economic problem of cost of water supply systems and control over the use and appropriation of the more readily available supplies to the best interests of all of the consumers.

Heretofore, it has been satisfactory to leave to each consumer the solution of his own economic problem of water supply. Existing laws, the 1933 Water Resources Act and the 1945 Well Control Act, have provided adequate control over the use and appropriation.

The practice of supplemental irrigation has made existing control inadequate because of the exemption of farm uses from that control. Adequate control can be restored by bringing the use of water for irrigation under the control of the Water Resources Act.

The hydrologic conditions in Maryland are such that the problem of irrigation water supplies is more easily solved in Tidewater Maryland through the utilization of ground water. The resources are far more than adequate. The only control needed is to assure proper well locations. In Central and Western Maryland the economic problem of gound-water supply precludes the use of ground water for irrigation purposes. Hydrologic conditions provide the principal control and will adequately supplement the legal control over the use and appropriation of ground water in Central and Western Maryland. The solution of the economic problem of ground-water supplies can still be left to each consumer.

The lack of natural storage of surface water to cushion peak demands, in contrast to the adequate natural storage of ground water, and the distribution problems arising from the law of riparian rights do not permit as easy a solution of the surface water supply problem for irrigation uses.

Because the irrigation water supply problem of Tidewater Maryland is satisfactory solved through the use of ground water, Tidewater Maryland is not confronted with the complexity of the surface-water problem. Central and Western Maryland are beset with the surface-water irrigation supply problem. Surface water resources are more than adequate, but the natural supply is inadequate when needed for irrigation. The only solution of the supply problem is storage. The storage problem is an economic problem. For individual irrigation consumers the solution of the economic problem will often be prohibitive and even impossible under the law of riparian rights. Collectively the problem is more often solvable both economically and within the law of riparian rights. Voluntary collective action is usually unattainable and unsuccessful. Successful collective action requires the replacement of the law of riparian rights with legislative collective action, whereby the required storage is provided and its cost is distributed among the consumers proportional to their withdrawals from the supply. Such collective action is applicable to portions of watersheds and to whole watersheds.

Respectfully submitted,

COMMITTEE TO STUDY WATER RESOURCES

Dr. Joseph T. Singewald, Jr., *Chairman*
William J. Schluderberg
Ralph Dulaney
Senator Joseph A. Mattingly
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Harry H. Rieck, *ex-officio*

MEMORANDUM ON DOMESTIC, INDUSTRIAL, AND AGRICULTURAL WATER REQUIREMENTS IN THE STATE OF MARYLAND

by

The Sub-Committee on Beneficial Uses of Water,
E. Homer White, Jr., Chairman

Preliminary studies have been made on the amount of water now used for domestic, industrial, and agricultural purposes in the State of Maryland. To obtain this information we have gone to the following agencies, reports, and individuals:

Maryland State Department of Health
Department of Geology, Mines and Water Resources
Baltimore District Office of the United States Geological Survey
Anne Arundel County Sanitary Commission
Mr. Clarke Gardner, Consulting Engineer of Salisbury
Mr. Edward Davis, State Conservationist, University of Maryland
Mr. Ken Jarvis, State Conservation Engineer,
University of Maryland
Report of the Board of Advisory Engineers on the
Future Water Supply of Baltimore City
Report of the Water Supply System of Frederick
by Doctor Abel Wolman and John C. Geyer
Records of the Washington Suburban Sanitary Commission

It developed that it was not possible to obtain accurate separate figures for domestic and industrial water use in the State because of lack of records. However, we were fortunate in having available the report of the Board of Advisory Engineers on the Future Water Supply of Baltimore City and the records of the Washington Suburban Sanitary Commission, the two principal metropolitan areas of the State, which have large uses of water, particularly the former. In the above report and records, while the industrial use has not been specifically separated from the domestic use, the total value of the two is presently known and has been estimated together for the future, which served our purpose. There were made available to us the estimates of the Department of Geology, Mines and Water Resources on industrial use in other parts of the State; and, while they were not available for all counties, they were very helpful.

Using the information from all the above sources it appears that the present combined domestic and industrial water consumption in the various sections of the State is about as follows:

The Montana (3 westernmost counties)	9,500	million	gals.	annually
The Piedmont	9,100	"	"	"
Baltimore Metropolitan Area	84,300	"	"	"
Washington Metropolitan Area	12,000	"	"	"
Southern Maryland	10,200	"	"	"
Eastern Shore	11,700	"	"	"
	136,800	"	"	"

We have not believed it necessary to further break down the State geographically although there may be individual county or intra-county water problems depending upon developments in the counties of the Mountain and Piedmont Sections of the State. There is no immediate way of telling what these will be, however; so the subject has been approached from the standpoint of the availability of waters in economically similar areas.

Consultation with Mr. Ken Jarvis, State Conservation Engineer, develops that approximately 79,000 acres in the State of Maryland might be expected to be irrigated eventually, broken down geographically as follows:

10,400 acres in the Montana
27,000 acres in the Piedmont
7,900 acres in Southern Maryland
33,600 acres on the Eastern Shore

There are now nearly 12,000 acres being irrigated in the State.

It is estimated by agricultural authorities that about eight-tenths of an acre foot per acre per year be required for irrigation, which applied to the above geographical areas would make the irrigation requirements for those areas as follows:

Montana	2,700	million	gals.	annually
Piedmont	7,100	"	"	"
Southern Maryland	2,100	"	"	"
Eastern Shore	8,800	"	"	"
	20,700	"	"	"

The principal uses of irrigation would be in orchards, for pasture, for tobacco, and for truck crops. At the present time we are informed that there are 2,670 acres of pasture under irrigation and that this might be expanded to 14,300 acres. There appears to be some doubt as to the economic feasibility of irrigating pasture lands in this section of the country and that possibly better results may be had with pasture lands by using other agricultural methods. Therefore, we suggest caution in estimating water requirements for pasture irrigation purposes, although there may be some situations where pasture may be advantageously irrigated; but they are not too frequent. We believe, however, that irrigation can be used to advantage under certain conditions for truck crops, tobacco, and orchards and that due consideration should be given in any water requirement study to these.

We have attempted to project the water requirements of the State for the year 2000 with some trepidation. In fact we might not have attempted it at all had we not had available the attempts of other engineers to do the same for the large populations of the State. It is fully recognized that these estimates are really "guesstimates" and can only be regarded as an attempt to arrive at a necessary figure for a necessary time based upon available figures and judgment. Such figures are, therefore, subject to great limitation. The figures which we suggest for consideration for the domestic and industrial use and irrigation for the State for the year 2000 follows:

Geographical Subdivision	*Domestic and Industrial Use*	*Irrigation*	*Total*
The Montana	15,300	2,700	18,000 Mg annually*
The Piedmont	13,500	7,100	20,600 " "
Baltimore Metropolitan Area	180,300	.....	180,300 " "
Washington Metropolitan Area	37,200	.....	37,200 " "
Southern Maryland	15,700	2,100	17,800 " "
Eastern Shore	17,500	8,800	26,300 " "
	279,500	20,700	300,200

* Mg is million gallons.

This comprehends the scope of the duties of the present subcommittee, and what follows immediately hereafter is not an attempt to assume the prerogative of the whole commission. It is merely inserted at this point to point out the fact that the study of this committee cannot be complete without obtaining similar information for certain areas outside of the State, and the legislature should be informed of this.

A study of the above figures and the annual precipitation and

geology of the State will disclose that there are sufficient ground water supplies available to provide for the future domestic, industrial, and agricultural requirements of the State as far as we can see them on the Eastern Shore and in the Southern Maryland counties. The report of the Board of Advisory Engineers on the Future Water Supply of Baltimore City shows that there is ample water available in the Susquehanna River to meet the future domestic and industrial requirements of the Baltimore metropolitan area. It is uncertain at this time, however, as to whether the future water supply for the Maryland portions of the Washington metropolitan area will come from the Potomac River or from other sources. The overall use of the Potomac River, which derives its waters also from the states of Pennsylvania, Virginia, and West Virginia, must be considered; and the uses of the waters of the Potomac River and its tributaries in those states will have an important bearing upon the availability of the waters of the Potomac River without impoundment to the people of the Washington metropolitan area of Maryland and to the Piedmont and Montana sections of the State for both water supply and agricultural purposes.

If impoundment of the Potomac River is required, in order that all requirements for the use of its waters may be met, then negotiations of various kinds with other states and the Federal Government will be involved.

In view of the fact that, in order to determine the extent of the availability of the water resources of the Potomac River to Maryland consumers, it will be necessary to ascertain the uses of the waters of said river by the other states which contribute to its flow, it is recommended for the consideration of this Commission that the Interstate Commission on the Potomac River Basin be requested by this Commission to cooperate with a sub-committee of it in ascertaining the required information as to the uses of the Potomac River waters by the states of Virginia, West Virginia, and Pennsylvania.

Respectfully submitted,

COMMITTEE TO STUDY BENEFICIAL USES OF WATER

Delegate E. Homer White, Jr., *Chairman*
Harry B. Shaw
Joseph F. Kaylor
E. Earl Remsberg
Edmund Burke
Haile Chisholm

REPORT OF THE COMMITTEE TO STUDY CURRENT WATER LAWS AND LEGAL PRINCIPLES AFFECTING WATER USE IN MARYLAND

Water is one of our most important natural resources. It is essential to all forms of plant and animal life. It is essential to modern economic development of agriculture, industry, municipalities, and recreation.

Maryland has an average annual rainfall of over 40 inches. If all of this water supply could be controlled so that it would be available for use when needed, it would be more than adequate to meet any foreseeable future needs. We find there are times when there is too much water causing floods, waste of water, and destruction to persons and property. There are other times when water shortages occur due to droughts of different degrees of intensity. There is the problem of too much water at one time and place and too little at others.

Our population is constantly increasing, and this increasing population is demanding a higher and higher per capita consumption of water. The expansion of industry especially during and following World War II also requires greater and greater supplies of water. The same is true of municipalities, agriculture, and recreation. Putting all these expansions together we have what is often referred to as an expanding economy. It is very important that our available water supplies be controlled and conserved so that they will meet the needs of this expanding economy. If water laws are uncertain or inadequate, investments depending on a supply of water are often insecure. This insecurity will act to retard economic development. The water laws within any state should be such that they encourage the development of its water resources.

Since water rights are property rights, the logical place for control is with the respective states. The problem of water rights is not the same in all the states. The water laws of each state have been developing as the need arises. The water laws of our western states have of necessity developed differently from those in the East. The needs in relation to the available supply have been different in the two areas. The law of real property has developed on the basis of need; and where no need has existed, no law has developed.

There can be no question but that a state has power to control the waters within its borders subject to certain limitations. These limitations are:

1. Exercised powers of the Federal Government.
2. Vested property rights in the use of water.

The United States Supreme Court in the case of Trenton vs. New Jersey 262 US182 stated that:

> "The State undoubtedly has the power, and it is its duty to control and conserve its water resources for the benefit of all its inhabitants."

The Supreme Court in the case of Connecticut vs. Massachusetts 282 US660 stated that:

> "Every state is free to change its laws governing riparian ownership and to permit the appropriation of flowing waters to such purposes as it may deem wise."

Water is a natural resource, and a state may regulate and protect it in the interest of the public. Water is a resource that moves from place to place like air, wild game, and fish. These resources should be controlled by the state. Land owners have certain rights to these resources as an incident to the ownership of the land. Beyond this right, they are considered property in which all have a certain common interest.

The powers of the Federal Government are only those powers which are granted to it by the Constitution and such implied powers as are necessary to fully exercise those powers specifically granted. Under the broad interpretation which the United States Supreme Court places on the Commerce, War, Property, General Welfare, and Treaty making powers, there is no question but that the Federal Government can go a long way toward controlling the waters in any state. Although the Federal Government has the power to exercise a lot of control within the states, it has acted only where control by the states is inadequate. A good illustration is in state control of the public roads within its borders. These roads are as much involved in interstate commerce as any mode of transportation, but the Federal Government leaves the roads within a state under state control. Unless certain powers are granted exclusively to the Federal Government, a state may act until action is taken by the Federal Government. We can safely say then that a state has the power and the duty to control and conserve its water resources in the best interests of all its inhabitants

and that any action taken by the Federal Government will most likely result in assistance to the state in the carrying out of this duty. The Interstate Commission on the Potomac River Basin is a body created by Congress which is serving this purpose and is very cooperative with state and local groups. The State of Maryland should be able to exercise all the control necessary over its fresh water supplies, with one possible exception, that of artificially induced rainfall which might best be controlled either by the Federal Government or by interstate compacts.

The Federal Constitution, Article 1, Section 10, specifies that: "No State shall, without the consent of Congress—enter into any Agreement or Compact with another State or with a foreign power—." This section of the Constitution has not acted as a bar to interstate action to control and conserve natural resources. The consent of Congress may be inferred from circumstances, and expressed consent may be given either prior to or subsequent to the forming of the compact.

Virginia V. Tennessee, 148 U.S. 503 (1893)

W. Virginia V. Simms, 341 U.S. 22 (1951)

We look to the courts to tell us what the law is and what it has been, but we must look to the legislature to guide us in planning for the future. When present laws are inadequate to guide people in their plannings for the future, then it is the duty of the legislature to remove these uncertainties.

Any state legislation for the control of its water resources must give due consideration to all vested water rights at the time of the effective date of such laws. The Federal Constitution protects property rights, and the fourteenth amendment restricts the states from depriving any person of his property without due process of law. Therefore the state cannot take one person's property and give it to another. Private property can be acquired for public use, but just compensation must be paid. This comes under the right of eminent domain; therefore, any state legislation must preserve existing vested property rights in order for it to stand up in the courts.

PRESENT WATER LAWS IN MARYLAND

The laws governing water rights in Maryland come from three sources:

1. The Common Law of England.

2. This Common Law as it has been further developed or modified by Maryland case law—court decisions.

3. Statute Law.

Maryland adopted the Common Law of England in so far as it was applicable to Maryland conditions. Since the eastern part of the United States and England were both areas of plentiful rainfall, the English Common Law applied very well to the eastern states. In the past few years many of the states in the East are seeing a need for a change in their laws governing water rights to make possible a more beneficial use of water, in order to better meet the needs of all users.

In Maryland there are several sources of water, and there are different laws which apply to each source.

The sources of water in Maryland are as follows:

1. Water on the surface of the ground.
   a. Diffused surface water—water not flowing in well defined streams.
   b. Water in surface streams—water flowing continuously in well defined channels.
2. Water under the surface of the ground.
   a. Underground water flowing in well defined channels.
   b. Percolating water—all other underground water (over 90 percent of all underground water).
3. Water in the air.

Diffused Surface Water

This is the water that runs over the surface of the ground after rains and melting snows. It also includes water that collects in ponds and lakes with no constantly flowing outlet.

There are two rules prevailing with regard to diffused surface water. One is called the common law rule; the other, the civil law rule.

The common law rule, sometimes called the Massachusetts rule, treats surface water as a common enemy. A landowner can fight this water off as long as it is done in good faith in building up his land. If damage to adjoining land results, there is damage without fault; and

no liability results. This common law rule did not come from England but was developed in this country. It encourages development of property, so it is better suited to industrial and urban areas.

The civil law rule came to us from England. Under the civil law rule there is a natural right to the drainage of diffused surface water from higher or dominant land on to lower or servient land. The lower land is subject to this servitude, and the owner cannot fight the water off his land by backing it up on the higher land. The upper landowner cannot materially change the nature of flow from the higher to the lower land by changing the place of entry or by concentrating the flow. Although the lower landowner must not interfere with the entry of this water as it naturally drains on to his land, he has no right in these waters until they come on his land; and he cannot demand that they be permitted to flow on to his property. Therefore, in the eastern states anyone owning land can collect the water and store it in ponds or reservoirs; and no one can object. A different rule is followed in many of the western states.

Some states follow the civil law rule, while others follow the common law rule. Other states apply the common law rule in urban areas and the civil law rule in rural areas. Maryland follows the civil law rule. The following cases clearly establish the Maryland law as being that of the civil law rule:

Biberman vs. Funkhouser, 190 Md. 424, 58 A2d 668 (1948)

Bishop vs. Richards, 193 Md. 6, 65 A2d 334 (1949)

Whitman vs. Forney, 181 Md. 692, 31 A2d 630 (1943)

Hancock vs. Stull, 206 Md. 117, 110 A2d 522 (1955)

County Commissioners of Baltimore Couty vs. Hunter, 113 A2d 910 (1955)

Once diffused surface water enters a surface stream, it ceases to be diffused surface water any longer; and the law of surface streams will apply.

Water Flowing in Surface Streams

Water flowing in surface streams is defined as water flowing continuously in well defined channels. It does not necessarily have to flow every day in the year. There may be times when the stream is dry. It must be a stream fed by a relatively constant supply such as springs and not depending upon run-off water for its supply.

The Riparian Right

In the East the doctrine of riparian rights has been continuously applied to rights to the use of water in surface streams. Under the riparian doctrine the owner of land through or past which a surface stream flows has a right to have the stream flow past his property, undiminished in quantity and unimpaired in quality. A strict application of this doctrine would not permit any consumptive use of the water. This riparian doctrine has been modified to a more or less degree in the eastern states to permit each riparian owner to make a reasonable use of the water for his particular needs.

Maryland has applied the riparian doctrine in determining the rights of riparian owners to the water in surface streams. In the case of Baltimore City vs. Appold, 42Md. 442, the Maryland Court of Appeals said in its opinion:

> "The right of every riparian owner to the enjoyment of a stream of running water in its natural state, in flow, quantity, and quality is too well established to require the citation of authorities. It is a right incident and appurtenant to the ownership of land itself; and being a common right, it follows that every proprietor is bound so to use the common right as not to interfere with an equally beneficial enjoyment of it by others. This is the necessary results of equality of right among all the proprietors of that which is common to all. As such an owner he has the right to insist that the stream shall continue to run—that it shall continue to flow through his land in its usual quantity, at its natural place, and at its usual height. Without a grant, either expressed or implied, no proprietor has the right to obstruct, diminish, or accelerate the impelling force of a stream of running water. Of course we are not to be understood as meaning there can be no diminution or increase of the flow whatever, for that would be to deny any valuable use of it. There may be, and, there must be allowed to all of that which is common, a reasonable use, and such a use, although it may, to some extent diminish the quantity, or effect in a measure the flow of the stream, is perfectly consistent with the common right.
>
> The limits which separate the lawful from the unlawful use of a stream may be difficult to define. It is, in fact, impossible to lay down a rule to cover all cases; and the question must be

determined in each case taking into consideration:

The size of the stream
The velocity of the stream
The nature of the banks
The character of the soil
A variety of other facts

It is entirely a question of degree; the true test being whether the use is of such a character as to affect materially the equally beneficial use of the stream by others."

The quotation from the above opinion points out the Maryland law as following the riparian doctrine. The use of water from a stream for domestic purposes is clearly a reasonable use. Domestic use has been defined as use for household purposes, watering livestock and chickens, and in some cases use for watering a lawn and small garden. A domestic use does not include the irrigation of farm crops. The right of a riparian owner to use water for other than domestic purposes is indefinite. The amount that could be used for irrigation will depend upon the reasonableness of the use.

The Maryland Court of Appeals in Samuel D. Helfrich vs. The Catonsville Water Co., 74 Md. 269, held that the watering of cattle in a stream by a riparian owner was a reasonable use and could not be restrained even though the water was polluted for drinking purposes, as a result of cattle standing in the stream. The court stated that the landowner had this right in the beginning, and the granting of a charter to the Water Co. did not interfere with this right. It was also not within the power of the legislature to abridge this right. It is a right of property protected by the declaration of rights. The only way that the Water Co. could prevent the pollution resulting from this riparian use was by exercising its right of eminent domain—the taking of private property for public use by giving just compensation. This method would not be available to a private individual or organization.

The above case brings out two important points of law. One is the right of a riparian owner to a reasonable use of the water in a surface stream running through or past his property. The other is the Constitutional limitations which prohibit the State from taking private property without due process of law. Private property may be taken for public use by giving just compensation under the right of eminent domain.

When a person buys land, he buys not only the land but all the

trees, buildings, and water rights that are appurtenant to it. All these rights enter into the price. The presence of springs and streams of water is an asset to land, and certain rights to the use of water from these sources are property rights acquired with the land. These rights will be protected by the courts.

Under the riparian doctrine the use of water from a surface stream is limited to the riparian land in the watershed. Riparian land is only that which is contiguous to the stream; therefore, a person owning land in a watershed would have no riparian rights to the use of water in a stream unless his land bordered on this stream.

There is no reported case in Maryland involving the question of whether or not certain land is riparian. In the other states, there are two views followed by the courts. In some of these states, when a riparian owner buys additional land which joins his riparian land, this newly purchased land becomes riparian. All the land in the watershed under one ownership which is contiguous with the stream is riparian regardless of whether or not it was all purchased as one tract. In the other states, if a riparian owner buys additional land which does not border on any stream, this newly purchased land does not become riparian. If a riparian owner sells a portion of his riparian land not bordering on a stream, this land ceases to be riparian. Even if the riparian owner re-purchases this land, it does not again become riparian. Under the doctrine followed by the courts of these states riparian land is constantly diminishing and never increasing. Since there is no reported Maryland case on this question, it is uncertain which of the two doctrines the Maryland Court of Appeals will follow.

The riparian right to the use of water in a surface stream has the following characteristics:

1. Indefinite as to amount, time, and place—therefore does not encourage the development of water resources.
2. Not based on beneficial use.
3. Permits waste in contrast to beneficial use.
4. A right in common with other riparian owners.
5. Presents no problems in times of plentiful supply but does in times of scarcity.
6. Does not apply to non-riparian land but only to riparian land.
7. Applies only to water in surface streams.

8. A right not lost by non-use.
9. A prescriptive right may be acquired, thereby reducing the riparian right.

The Appropriative Right

The riparian doctrine applied very well in the East as long as there was plenty of water for everyone. A different doctrine has developed in the West because of the scarcity of water. Since water supplies were limited, it was considered best to encourage the development of water resources for beneficial use. Under this doctrine the one who first appropriated the water and put it to beneficial use had the right to continue to use this quantity of water as long as he continued to apply it to a beneficial use, and his right held priority over subsequent appropriators from the same water supply.

Today, in the western states, the right to appropriate water is defined by statute. Once water is appropriated in accordance with the laws of the particular state, this right will be protected.

The characteristics of the appropriative right are:

1. Definite as to amount, time, and place.
2. Encourages development of water resources—gives security of investments.
3. Based on beneficial use.
4. Not limited to riparian land.
5. Encourages the most beneficial use of water and prevents waste.
6. An exclusive right.
7. Applies to both ground water and surface water.
8. Where the waters of the state are declared to be the property of the state or of the people, no prescriptive right can be acquired.
9. The right can be lost by non-use.

The Prescriptive Right

Under the laws of real property one who takes adverse possession of land for the full statutory period of 20 years acquires title to this

property. Since water rights are real property rights, the same rule applies; and a prescriptive right can be obtained to the use of water. The original taking must be wrongful. If it is by permission, by license, by contract, etc., there is no adverse use. The essentials for acquiring a prescriptive right by adverse use are:

1. Open
2. Notorious
3. Continuous for the full statutory period.

In order for the use to be adverse the wrongful use must give rise to a legal cause of action. If no cause of action arises, no adverse use is present; and the prescriptive period is not running. The only way that a downstream property owner can acquire a prescriptive right against an upstream landowner is by backing water upon the upstream owner's land.

A prescriptive right can be acquired to use water beneficially, and it can also be acquired to pollute water.

Water Under the Ground

The appropriative right can apply to both types of underground water.

Water Flowing in Well Defined Underground Channels

In Maryland the same rules apply to underground streams as apply to streams on the surface. The existence of the underground stream must be established by competent persons, since the location of such streams is difficult. The total amount of underground water identified as flowing in underground streams is small.

In Western Maryland Railway Co. vs. Martin, 73A 267; 110 Md. 554, the Court said that the rights incident to streams of water on the surface and those flowing underneath, when the latter flow in well defined channels, are the same; but percolating waters not flowing in well defined channels do not ordinarily affect the owner with the same rights and duties as those incident to surface streams.

Percolating Water

All the water under the surface which is not flowing in well defined channels is percolating water. This comprises over 90 percent of all the underground water supply.

The leading English case of Acton vs. Blundell, 12 Mees. & W.

324 (1843), established the rule that the owner of the surface of the ground owned everything to the center of the earth below and to the heavens above. This case was followed extensively throughout the United States. Under the rule of this case a landowner could pump water from a well on his land and cause an adjoining property owner's well to go dry. He could do it with the intent of injuring his neighbor, and the neighbor could do nothing about it.

New York was the first state to break away from this harsh rule. The New York court held that a landowner could remove all the water he desired from beneath the surface as long as he used it beneficially on his land. The court said that taking the water off the land for sale was an unreasonable use.

Several of the western states have legislated to regulate the use of percolating waters. They limit the use of such waters to appropriation for beneficial use.

Among the states there are differences in the law affecting percolating ground water. They are the following:

1. Absolute ownership by the owner of the surface.
2. Absolute ownership but limits right to beneficial use on the land—the doctrine of reasonable use.
3. The Correlative Rights Doctrine based on equal rights of all landowners.
4. Ownership in the state which permits rights to be acquired according to the laws of the state—by appropriation for beneficial use.

There is no reported case in Maryland involving a dispute between two adjoining property owners over the right to remove percolating water. In the case of Western Md. Ry. vs. Martin 73A 267, 110 Md. 554 (1909), the court cited the early English and American doctrine that originated with the English case of Acton vs. Blundell. The court followed by saying that recent American cases show a decided tendency to recede from this early view; however, the question before the court was whether certain underground water was percolating water or water flowing in well defined channels. We, therefore, do not know for certain whether or not the Maryland Court of Appeals will adhere to the original harsh doctrine of absolute ownership. The Court further stated that the reason the American cases were receding from this early doctrine was to modify it, as may be re-

quired, to do substantial justice between the owners of adjacent lands. This language might indicate that if a case came before the Court involving the right of adjoining landowners to remove percolating water from beneath this land, a modification of the early doctrine may result.

There are other ways of acquiring water rights in addition to those heretofore mentioned. A right to use water may be obtained by contract or by license. Another method is by a grant from the legislature. Legislative grants are often made to municipalities, power companies, and industries. These legislative grants give the right to use water, but the grantee must give just compensation for vested property rights which are taken over or destroyed. Where these corporations are public or quasi-public in nature, they can be given the right to acquire property by the right of eminent domain. A private individual or an organization can be given no such right.

Water in the Air

The moisture in the air is the source of all our land water supply. As part of the hydrologic cycle it falls as rain, snow, sleet, etc. In the past six or eight years there has been considerable work, both experimental and otherwise, in artificially induced rainfall. Beneficial results are reported in many instances, but there are cases of considerable damage being caused by floods and intense storms which, many believe, were attributed to artificially induced rainfall.

If artificial rain making continues, legal problems are certain to arise involving:

1. Ownership of the moisture in the air.
2. Liability for damage caused by the fall of rain or snow in excess of that which would normally fall.
3. The extent to which precipitation was artificially induced above that which would have resulted under normal conditions.

If artificially induced rainfall is to be permitted, a state in which it takes place should show a definite interest for two reasons:

1. As an additional source of water supply to be used beneficially within the state.
2. To exercise the necessary regulation in order to reduce damage to a minimum and to place responsibility for the damage that does result.

The results of artificially induced rainfall are likely to affect more than one state. If this proves to be the case, it might be best to have control either by the Federal Government or by interstate compacts. Since artificial rainfall will affect more than one property owner and probably more than one state, there is a need for governmental control, either federal or state.

Legislation to regulate artificially induced rainfall has been proposed in Congress. Several of the western states have laws regulating rainmaking. The New York legislature passed a rainmaking law, but it was vetoed by the Governor.

MARYLAND STATUTE LAW

There are several laws now in effect in Maryland which apply to water resources. A water Resource Act was enacted in 1933 in order to conserve, protect, and utilize the water resources of the State in accordance with the best interests of the people of Maryland. It was declared to be the policy of the State to control, as far as practical, the appropriation or use of surface and underground waters of the State. A Water Resource Commission was created to administer this law. It issues permits to appropriate water. The Water Resources Commission was abolished in 1941. This law is now administered by the Department of Geology, Mines and Water Resources.

This law specifically exempts from control the use of water for domestic or farming purposes and the use of water for an approved water supply of any municipality. The law does not affect any particular use in existence on January 1, 1934.

This act was amended in 1950 to make it easier to comply with the law in obtaining permission to build farm ponds.

In 1945 the Maryland Legislature enacted a Well Drillers Act. This act requires all well drillers to obtain a license before operating in the State. The law also requires that a permit be obtained for each well. The law further states that a permit to drill a well shall not be refused for domestic use on a farm.

Maryland also has a pollution control law which establishes a Water Pollution Control Commission and specifies its duties. This law is felt adequate to prevent any new cases of pollution. It is also believed adequate to provide for a gradual abatement of present pollution as rapidly as deemed advisable to do so.

To facilitate the drainage of wet lands of the State, Maryland has a drainage law which authorizes the formation of Public Drainage Associations. This drainage law permits a number of adjoining landowners, with a common drainage problem, to organize a Drainage Association and have the necessary work completed. The costs are collected as taxes from the landowners benefited. Maryland Drainage Laws have a long history, beginning around 1789. A lot of drainage legislation has been enacted since that date. The present Maryland Drainage Law of 1941, with the 1949 amendments to this law, provides the needed authority and prescribes the duties and responsibilities necessary to have a workable drainage program in the State.

The Maryland Soil Conservation Districts Law authorizes the formation of Soil Conservation Districts to facilitate the conservation of soil on the farm lands of the State. Soil and water are so interrelated that in dealing with the conservation of soil, water conservation also enters into the picture. Nearly all soil conservation measures bring about water conservation and also reduced damage by water.

The Forest Conservancy Act of 1943 declared the policy of the State to be to encourage economic management and scientific development of its forests and woodlands, and to maintain, conserve, and improve the soil resources of the State to the end that an adequate source of forest products and a program of water conservation be maintained for the benefit of all its citizens. Legislation provides for the carrying out of the above policy.

Federal Legislation

Congress passed some legislation in 1954 which makes Federal assistance available to local groups and individuals interested in flood prevention and soil and water conservation.

The Watershed Protection and Flood Prevention Act provides for Federal assistance to local groups who seek assistance in watershed protection and flood control.

The Water Facilities Act provides among other things for the making of loans for the purpose of financing the improvement of farm land by soil and water conservation or irrigation and drainage facilities.

The statute law now in effect in the State clearly indicates that the Maryland Legislature has always been ready and willing to provide legislation for the protection of natural resources whenever the need is made clear to them. If additional legislation is necessary to provide for the most beneficial use of the water resources of the State in the best interests of all the people, this need must also be made clear to the legislators.

The present laws of the State as they apply to water resources should be studied carefully in order to determine whether or not they are adequate both from the standpoint of meeting present needs as well as any foreseeable need in the future.

The history of the development of water law in the United States has been as follows:

1. In the eastern states the English Common Law doctrine of riparian rights has applied to water in surface streams. The doctrine of absolute ownership with certain modifications has been applied to percolating underground water.

2. Some of the western states applied the doctrine of prior appropriation from the beginning and have never applied riparian law.

3. Other western states, in the beginning, followed either the riparian doctrine or a combination of the two doctrines. When competition for the use of water arose with development of the area, the law of these states gradually changed through court decisions and legislative action to the doctrine of prior appropriation.

This history of water law development shows that whenever competition arises for the use of available water supplies, the trend is away from the riparian doctrine as applied to water in surface streams and the doctrine of absolute ownership of percolating underground water, both of which permit waste in contrast to beneficial use, to the doctrine of prior appropriation which is based on beneficial use and prevents waste. Many of the eastern states have recently been studying their water laws and gathering data as to the available supplies and growing demand for water. The purpose of these studies is to determine whether or not a change in their laws is needed. Whether or not the existing water laws need revision is a question each state must decide for itself.

Respectfully submitted,

COMMITTEE TO STUDY CURRENT WATER LAWS AND LEGAL PRINCIPLES

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SUMMARY AND RECOMMENDATIONS

1. This preliminary report covers the studies made by the Commission, carried on as best it might, within the limitation of time and finances. The various committee reports point out the need for further study and careful consideration of the problem before legislation is considered.

2. It is recommended that this preliminary report be distributed widely among all users of water and to the public so that water problems may be brought to the attention of the Commission that otherwise might not receive due consideration.

3. It appears there is a substantial supply of both surface and underground water in the State, and this supply is replenished with an average annual rainfall of over forty inches. Even with this plentiful supply, there are times when shortages occur in certain areas. The water problem consists of having a sufficient quantity of the right quality of water at the right place at the right time and at a price which will make its use economical.

4. The present laws of the State, although exercising some control over the water resources, do little, if anything, toward defining water rights, particularly those of riparian owners.

5. When and if there is to be any change in the present law, action should be taken only after a thorough study has been made. Hastily drawn legislation can lead to confusion and result in a lot of litigation. When laws are made after careful study and thought, they serve as a guide to existing rights and duties. If this precaution is not taken, confusion and uncertainty result; and people have to go to the courts to have their rights and duties determined.

6. Since the time for preparing this preliminary report was short and additional study is needed upon which to base sound and effective legislation, it is recommended that this Commission be continued or a similar commission be appointed and assigned the duties and responsibilities of making the necessary studies upon which to base sound and effective recommendations for legislation leading to a maximum beneficial use and conservation of the State's water resources. It is further suggested that a minimum appropriation of $10,000 be made to cover any costs incurred by this Commission in the performance of its assignment.