SOME ASPECTS OF THE DEVELOPMENT OF GROUND WATER IN THE UNITED STATES AND IN NORTH DAKOTA

ND-48

Talk to be Made at Meeting of North Dakota Well Drillers Association - July 25, 1950.

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Members of the Association and visitors:

I am very happy to have this opportunity to attend and take part in your meeting again this year. Dr. Laird could not be here ~~this year~~ as he is out of the country on some special work. I am sure that he regrets his inability not being able to be present. ~~attend your meeting this year.~~

Most of you know of our test drilling activities in the State and of the equipment we are using, and ~~so I don't believe that~~ I will not discuss that part of our work at this time. Instead, I will attempt to present to you some aspects of the development of ground water in the United States and North Dakota, and perhaps describe some of the work that goes into ground-water investigations with which you may not be so familiar.

~~Our job with~~ The function of the Geological Survey is not to find water or do an engineering or a well-drilling job for a particular town, ~~or~~ industry, or individual, but rather ~~it is to~~ to make an appraisal of the ground-water resources throughout the United States and its territories and to make that information available to the public at large. All in all that is a pretty big order. The geological conditions vary greatly from one area to another. In some areas, the geology affecting the occurrence of ground water is infinitely more complex than in other areas and so a proper appraisal of the ground-water resources may be much more costly in the first case than in the second. Also, local economics in regard to the value of ground water generally influences the thoroughness or the intensiveness with which an investigation can be undertaken. In addition, a great part of our work has been done on what might be called a "disaster relief" basis, consisting of securing obtaining data that might be used immediately to relieve some serious water shortage or other condition. As a consequence, substantial ground-water

information for less than 5 percent of the nation ~~of~~ in presently available to the public, although nearly 2,000 reports and papers have been published by the Geological Survey and cooperating agencies.

The need for more widespread and intensive investigation of the ground-water resources of the nation as a whole is becoming more apparent day by day. The total use of water in the United States is now estimated to be in the order of 150 billion gallons a day, or 1,000 gallons a day for every man, woman, and child in the country, and it appears likely that even more and more water will be required to maintain and expand our economy.

A thousand gallons a day per person for 150 million people adds up to 150 billion gallons a day.

How do we use all this water?

Irrigation takes a lot of it. In the southwest about 2½ acre-feet of water is required to grow cotton. About 4 acre-feet is required for alfalfa. In the industrial field, 20 to 25 thousand gallons of water are required in the production of a ton of sugar. As much as 250 gallons of water per case may be required in the canning operations for certain vegetables. Up to 10,000 gallons of water per 100 pounds of goods may be required in the production of certain linen and rayon fabrics. Water requirements for air conditioning may range from 6 to 15 thousand gallons per person per season. The production of a ton of steel may require the use of from 20 to 35 thousand gallons of water, as much as 200 thousand gallons of water per ton of explosive may be required in the manufacture of gun powder. Tremendous amounts of water are required in the production of atomic energy.

Now, of course, a lot of these items are things that we could do without, possibly, and still survive, but they have generally come to be considered necessities in our modern way of living, and it appears that such goods will be more and more in demand than heretofore and, in filling this demand, the use of water will increase.

Ground water supplies are about one-eighth of the water used in the United States at the present time. In 1945 it was estimated that about 20 billion gallons a day of ground water were being used in this country for irrigation, industrial, municipal and rural domestic purposes. It is likely that the present use of ground water is in the order of 25 billion gallons a day.

~~Maybe you would be able to imagine a little better just how much water that is if I converted gallons into some other units of measurement.~~ Twenty-five billion gallons a day is 9,125 billion gallons a year. This is equivalent to about 28 million acre-feet or enough water to cover the entire State of North Dakota to a depth of nearly 7½ inches. It is a little more than 8 cubic miles.

The estimated use of ground water in North Dakota in 1945 was only about 40 million gallons a day or about 0.2 of 1 percent of the total amount of ground water being used in the nation. Nearly 90 percent of the ground water is for rural domestic and municipal supplies. Industrial development has been very slight and no substantial ground-water irrigation projects have ever been undertaken.

The lack of development of ground-water supplies for industrial and irrigation purposes has not been due entirely to lack of interest or ~~because there has been no need for ground water for these purposes.~~

In many instances the poor quality of the known ground-water supplies has retarded development in places where the quantity of water available may have appeared to be adequate for the purposes desired. But the truth is that a considerable amount of development is being passed up in North Dakota because we do not know enough about the aquifers that we have here, their location, depth, areal extent, and the amount of water they would yield perenially without depleting the supplies. We have received inquiries regarding the possibilities of developing ground-water supplies in the order of 1 to 2 million gallons a day up

to 20 million gallons a day. In regard to the smaller supplies, we can generally suggest a few possible locations in the State where the development of such supplies might be feasible, although there probably are many such undeveloped supplies of which we are not aware. In regard to the larger needs, there may be a few places in the State where perennial supplies in the order of 20 million gallons a day could be developed, but, if there are, they have not been studied in sufficient detail to assure investors that a 10 to 15 million-dollar plant requiring that amount of water for operation would be assured of a lasting supply.

There are some areas in the State where ground-water irrigation probably could be practised successfully. The idea of irrigation is a little new in North Dakota and especially the idea of irrigating from wells. However, as a result of the publicity attendant to the Missouri Basin development program, North Dakotans are becoming better acquainted with irrigation farming. During the past decade, precipitation in most parts of North Dakota has been relatively good and crop yields have been good without irrigation. However, it is almost certain that we will again experience drought conditions sometime in the future and, if future drought periods compare at all with those experienced in the thirties, North Dakotans will begin to utilize any ground-water supplies that may be adequate and suitable for this purpose.

I have little hope that irrigation from ground-water sources will ever be very widespread in North Dakota and certainly will never approach in magnitude the possible development of surface-water irrigation under the Missouri Basin development program. Nevertheless, irrigation from ground-water sources in relatively restricted areas in those parts of the State which can obtain surface water may be of substantial benefit locally and may be of considerable importance in maintaining the economy of the State as a whole.

The development and utilization of ground-water supplies of magnitude is a fairly expensive undertaking and certainly should not be considered unless there is reasonable assurance that the water supplies will be available to operate the project long enough to pay for the investment and allow the investor some profit.

We believe that the Geological Survey, with the cooperation of the well drillers and various State agencies, is now making a good start in obtaining information in North Dakota that will be very useful in the future development of the ground-water resources in the State. The greater part of our work during the past 5 years has been in obtaining data, in areas adjacent to various cities and towns, that would be of assistance in solving municipal water-supply problems. In many instances these many investigations have not been made in sufficient detail for all purposes and the size of the areas which the investigations cover are studied is generally influenced by the interests of the various towns concerned. Nevertheless, we are learning a great deal about the general geology of the State and about the occurrence of some of the more important aquifers. Many of these aquifers should be mapped in considerably more detail than is being done at present in order to learn more about their location, extent, and potential yield and in order to learn what areas would be most benefitted by their ultimate development. We hope to be able to do more of this type of work as soon as we can catch up with present demands for assistance in connection with the municipal water-supply problems.