Report on the Ground-Water Resources of the Bennettsville Area

with Alternatives for an Interim Water Supply

by
A. Michel Pelletier
Regional Hydrologist

South Carolina Water Resources Commission
221 Main Street
Conway, South Carolina

South Carolina Water Resources Commission
Open File Report 82-2
August, 1982

REPORT ON THE GROUND-WATER RESOURCES OF THE BENNETTSVILLE AREA

WITH ALTERNATIVES FOR AN INTERIM WATER SUPPLY

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City of Bennettsville

Bennettsville, South Carolina 29512

March 3, 1982

Mr. Camille Ransom, III, Director
South Carolina Water Resources Commission
P. O. Box 50506
Columbia, South Carolina 29251

Dear Mr. Ransom

Last week, while attending the Mid-Winter Meeting of the Municipal Association in Columbia, I had the pleasure of discussing the water supply in Bennettsville with a geologist in your office. Adequate water is absolutely essential to the City of Bennettsville and Marlboro County in the operation of the present industries, and hopefully, in future industrial expansion.

Three times in the past two years, temporary shortages in the present water system have caused short term shut-downs of several of the plants. All of the people in the City of Bennettsville have had to operate water during the summer months. Although we have eleven (11) deep wells, we still use about as much water as all eleven of these wells are pumping. I would appreciate your having someone in your office contact me at 479-7171, and hopefully, a technician can be sent down to make a study of the situation in Bennettsville as it now stands.

Several of our plants would like to expand their productions to make more jobs available to the people. But, it is doubtful in my mind, that the present water system will be able to take care of such a demand during dry periods. We are in the process of trying to obtain federal assistance for a new surface water plant, which will take water from Lake Paul Wallace. At the present time, we would like to know if there is any possible way to increase the capacity of water we can obtain from our eleven deep wells, and we desperately need your help in evaluating these wells.

Please give this matter your attention, and hopefully, we can get some expert help from you in the near future.

I am -

Yours very truly,

Wade R. Crow
Mayor
City of Bennettsville

WRC/dw

State of South Carolina
Water Resources Commission

Clair P. Guess, Jr.
Executive Director

August 17, 1982

The Honorable Wade Crow
Mayor of Bennettsville
P. O. Box 1036
Bennettsville, S. C. 29512

Dear Mayor Crow:

Enclosed is the report which you requested of the Water Resources Commission regarding the condition of the ground-water resources of the Town of Bennettsville and listing the alternatives for an interim water supply during the construction of the new surface water treatment plant.

I have sent copies of this report as well as copies of the basic well data, to both Jimmy McColl and Hugh Miley. If you or they have any further questions regarding the report or the findings, please do not hesitate to contact me again.

Sincerely,

A. Michel Pelletier

A. Michel Pelletier (CLB)
Regional Hydrologist

AMP:jkh
enc.
cc: Jimmy McColl
Hugh Miley

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INTRODUCTION

The Town of Bennettsville, in Marlboro County, has historically obtained its drinking water supply from a series of wells completed in the Middendorf Aquifer System. At present, the Town is utilizing nine wells, which pump approximately 300 to 350 gallons per minute apiece, into the Town's two water treatment plants.

Recently, funding has been obtained to construct a large surface water treatment facility using water from Lake Wallace instead of the well system. The new plant will have twice the capacity of the present well system and will serve to attract more industry, provide for expanded service and provide abundant fire protection reserves.

At present, the Town needs an additional 300 to 350 gallons per minute to use as backup for their present well system until the new plant is completed in the spring of 1984. The Honorable Wade R. Crow, Mayor of Bennettsville, has requested that the Water Resources Commission review the available well data and make recommendations concerning the alternatives available to the Town regarding this interim water supply requirement.

AREAL GEOLOGY

The Town of Bennettsville is underlain by two major geologic formations: the crystalline bedrock and the Middendorf Formation. The crystalline bedrock is a complex of igneous and metamorphic rocks composed of granite, schists, and gneisses. The Middendorf Formation is of cretaceous age and is composed of unconsolidated micaceous sands which are white to gray in color interbedded with red, brown, purple and white kaolinitic clays.

The bedrock surface slopes to the south and east at a rate of about 18 to 20 feet per mile. The sand and clay beds of the Middendorf Formation dip in the same direction, but at a lesser rate (see figure 1).

HYDROGEOLOGY

The bedrock formations yield little water to wells, and are therefore not considered to be aquifers in this area. The Middendorf Formation, however, contains two aquifer zones, labeled principal and secondary for this report (see figure 1). The principal aquifer is predominately composed of sand, with numerous clay beds and lenses included. It is located from just beneath the land surface to a depth of about 130 to 200 feet. It is the major source of ground water to well owners in the area. The secondary aquifer is separated from the principal aquifer by a clay bed of approximately 100 to 120 feet in thickness. The secondary aquifer contains more clay than the principal and it is only about 40 to 50 feet thick. Few wells have penetrated this aquifer, and only one well is known to have screened it solely. For these reasons there is very little known about the hydraulic properties of this lower zone.

Several pumping tests have been conducted in the area. However, the results indicate such wide variations in the apparent aquifer properites that it is difficult to assign these variations to actual differences in the aquifer hydraulics or to differences in the manner in which the different tests were conducted. For example, the same contractor constructed two nearly identical wells in 1978. One was pumped at 350 gpm with 57 feet of drawdown (for a specific capacity of 6.16 gpm/foot of drawdown) and the other was able to deliver only 120 gpm with 130 feet of drawdown (for a specific capacity of 0.92). The data from the second test indicates that the well may have been influenced by nearby pumping wells during the course of the test which would have invalidated the results. Because of uncertainties like

these, it is impossible to use the data from these tests in any but a generalized manner.

Water levels in the area as a whole have remained essentially unchanged since 1972. A USGS water-level recorder, installed in a well at the National Guard Armory, has measured only normal seasonal variations with no net rise or fall over the period of record.

On figure 1 it can be noted that the water levels in the wells near Lake Wallace are on the order of twenty feet higher than the water levels within the Town or the County wells. Since these water levels are close to the lake level, it may indicate a possible hydraulic connection between the sands of the principal Middendorf Aquifer and Lake Wallace. This is further confirmed by the pumping test at the Beauty Spot No. 2 well. The test indicates that a source of recharge was intercepted by the well's cone of depression after about 220 minutes of pumping. At this point, the well may have begun to obtain a part of its discharge from the lake.

ALTERNATIVES

Three alternatives are put forward for consideration by the Town. Separate determinations must be made to evaluate the relative cost-effectiveness of each of the proposals. However, the alternatives are listed in approximate order of desirability based on approximate costs, geologic feasibility, and conversations with Town officials.

Alternative 1: Drill a new shallow well along Wallace Road near Lake Wallace.

The new well should be drilled no deeper than 100 to 175 feet (no deeper than about 50 feet above mean sea level). Driller's logs and geophysical logs from nearby wells indicate that most water-bearing sands in the principal aquifer, occur above this level. Also, this depth would allow the well to utilize any existing connection between the aquifer sands and the lake to maximize well yield. The Wallace Road well (SCWRC No. 15H-j3) is of similar construction, and was pumped at 390 gpm with 50 feet of drawdown.

The new well should be constructed of 8" or 10" PVC casing and slotted PVC screens. This is recommended for cost considerations because plastic casing and screen is much less expensive than steel and many smaller well drillers can construct this type of well for less than some of the larger firms. This seems to be advisable in light of the interim nature of the need.

An abundance of screen should be used, say 50 or 60 feet, with an appropriate slot size determined from analysis of the formations penetrated and the gravel filter material, if used.

Alternative 2: Refurbish and treat one or more of the existing wells whose yield may have declined over time.

In the well records for the Town, there appear several wells which were initially pumped at rates far above the rates they are presently being pumped at. Depending on the causes of these differences, higher yields may be obtainable in these wells:

Well Name	Original Yield	Present Yield
Parsonage Street (15H-t1)	600	300-350
Bloxom Well (15H-t5)	800	300-350
Lyall and Broad Streets (15H-t4)	500	300-350

These wells are all relatively close together and may be interfering with and "robbing" each other of available drawdown and, hence, yield. If such is the case, then nothing can restore the yield. However, there could be other factors involved:

(a) Worn pumps which are no longer delivering designed quantities of water. These should be replaced or rebuilt as needed.

(b) Clogged formations and/or screens due to incrustation of carbonate material. These can be improved through acid treatment.

(c) Clogged formations and/or screens due to trapping of clay or rust. These problems can often be improved through the use of polyphosphate, acid, and chlorine treatments. These solutions should be strongly surged into the well and formation, allowed to remain for a period of time (about 24 hours), strongly pumped to clear the well, and then repeated.

(d) Inappropriately sized pumps, which are too small for the well, can be replaced with larger capacity pumps. This condition can be determined by measuring the pumping water level in the well and the pumping rate, and noting the available drawdown. By multiplying the

specific capacity of the well by the available drawdown, an approximation of the extra attainable yield can be obtained.

The sum of the additional yields from each well treated may equal the additional 300 to 350 gpm required by the Town. A knowledgeable engineer or well contractor would be required to determine which treatments (if any) are called for in each well, to carry those treatments out, and to test for their effectiveness.

Alternative 3: Purchase water, on a short term basis, from the County Rural Water System available just to the south of the Town. This would entail additional cost of pipelines and a booster pump. Also, it would add water to the southern end of the system, while it is the northern section which requires the additional water and pressure.

CONCLUSION

The Town of Bennettsville has basically four alternatives to obtain an interim water supply of 300 to 350 gpm until a new surface water supply can be obtained. The ground-water resources of the Bennettsville area seem to be in no way depleted or in danger of depletion, based on records from the USGS water level station. The Town should, therefore, realize that the investment they already have made in the existing well system should still be protected and maintained. A schedule, whereby the wells are pumped or exercised on a regular basis, should be maintained so that they will be serviceable in case of emergency or further, future expansion of the Town or the surrounding industries.

South Carolina Water Resources Commission Well Tabulations

Marlboro
COUNTY

SCWRC Well No.	County Number	Latitude Longitude	Elevation (MSL)	Owner/Location	Well Use	Total Depth	Casing Dia.	Casing Depth	Pump Rate	Date Comp.	Geophysical Logs	Chem. Anal.	Well Cons.	Remarks
15H-j1		343856 794044	162.25	Beauty Spot No. 1	P.S.	215	10	175	350	6/74	D,E,SP	Compl	C	Drilled by Carolina Well,
15H-j2	142	343848 794002	187	Beauty Spot No. 2	P.S.	200	10	170	350 Q/S= 6.2	10/78	E,SP,G,D	Comp. Parker 10/3/78	C	Drilled by Layne Atl., T= 10, 600 gpd/ ft
15H-j3	138	343835 794009	186	Wallace Road	PS	186	10	120	390 Q/S= 7.8	11/71	E,SP,D		C	Drilled by Pierce Ditching,
15H-k1	133	343754 794022	174	Gibson Highway	PS	350			600	1969	D			Drilled by Carolina Well,
15H-S1	105	343630 794105	150	Layne Test Well 1	Abd	444	10 6	297 ?	10	1/51	D		C	Drilled by Layne Atl, dryhole, filled in.
15H-S2	105-A	343630 794105	150	Layne Test Well 2	Abd	291	6	?	20	1/51	D		C	Drilled by Layne Atl, dryhole, filled in.
15H-S3	51	343626 794102	148	Fleet Street	PS	409			350 Q/S= 3.5	4/52	E,SP			Drilled by Carolina Well, reworked (new screens) in 1977. T=4300 gpd /ft (est. 300 gpm yield)
15H-S4		343626 794119	152	Hudson Street	PS	200	10	182	120 Q/S= 0.92	9/78	E,SP,G,D	Comp. Parker 11/6/78	C	Drilled by Layne Atl, T=3600 gpd/ft
15H-t1		343640 794039	148	Parsonage Street	PS	329	20 10	32 0-220	600	9/59	E,SP,D		C	Drilled by Heater Well, not metered 200 -300 gpm range estimated yield.
15H-t2	128	343635 794048	153	Broad Street Well	P.S. Dest.	375	10 8	154 325	350	2/69	D		C	Drilled by Carolina Well, contaminated with gasoline, abd. in 1973, Bedrock at 335.

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15H-t4		343634 794052	148	Lyall and Broad St. (new well behind Water Plant	PS	190			350	7/77	E,SP,D	Comp. Walker 7/77		Drilled by Carolina Well, new pump at 250 maybe 300 gpm
15H-t5	94	343629 794036	152	Bloxom Well (on Odom St. South of bypass)	PS	420	20 10	30 354	800 Q/SI 5.7	4/54	E,SP,D	Temp= 67°F	C	Drilled by Heater Well, new pumps only 350 gpm
	138 (Hole No. 3			"Off 15-401 Bypass"		268 (log)				3/20/ 70	E,SP, (USGS)			Carolina Well,
	135 (Hole No1)	343845 794045		"Well at Lake" Colored Swimming Pool	Dest.	328 (log)				5/8/ 70	E,SP			Carolina Well,
	95					235					D			Log by Layne Atlantic for hole by "other company"
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Other Wells Near Bennettsville

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15H-L1	25-A	343745 794125	160	Bennettsville Country Club	PS	93	6		220	5/47	D	T=22°C	P	Hickory Well
15H-L2	112 (134)	343734 794022	137	National Guard Armory	Obs	345	8	345	200 Q/S= 2.0	6/58	G, Cal		P	Carolina Well, Water level recorder by USGS
15H-t6	120	343647 794058	153	Marnat Packing Co.	P.S. Ind.	289		18 8	39 282	205 Q/S= 13	6/61	D	C	Heater Well
15I-a1	139	343404 794046	139	Marlboro County Water System Well No. 1	PS	225	24 10	62 135	400	7/75	E.Sp	Compl. Layne & Co. 8/8/75	C	Virginia Well
15I-a2	144	343404 794046	139	Marlboro County Water System (Test Well)	Test Well	167	4	127	30	2/75	E.Sp	Compl Parker 2/19/75	P	Drilled by Demco Ltd, used as a test well and supply well for two County wells. Well still serviceable.
15I-c1	140	343358 794109	139	Marlboro County Water System Well No. 2	PS	180	24 10	62 135	400	1/75	E.Sp	Compl Law&Co 11/11/75	C	Virginia Well

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HYDROGEOLOGIC CROSS SECTION THROUGH BENNETTSVILLE, S.C.