THE MUNICIPAL WATER SUPPLY OF NEWCASTLE, WYOMING

This report is based on (1) field work by Dr. S. H. Knight, State Geologist, on May 27, 1934 (2) field work by Dr. R. H. Beckwith, Associate Professor of Geology, University of Wyoming, and Mr. J. E. Ferren on May 27-29, 1934 and (3) previously published data on the geology and water supply of the region.

The problem presented for investigation was, "What can be done to increase the supply of water for Newcastle". The following means of solving the problem have been suggested:

1. Deepen the outlets of the springs which now supply the city.

Both Bear Run Springs and Parmalee Springs issue from flat-lying beds in valley heads near the South Dakota line. The water of Bear Run Springs comes from the Deadwood sandstone and that of Parmalee Springs from the Pahasapa limestone. The water of both springs is of excellent quality for domestic consumption. The springs are not on an artesian structure, but flow out where the water table cuts the respective valley floors. The geological structure of the area indicates that the water is not under appreciable hydraulic head. Consequently deepening the outlets of the springs would have little effect on increasing the flow by removal of back pressure.

2. Develop the underground flow of water along the valley of Stockade Beaver Creek in T. 46 N., R. 60 W.

The underground flow of water mentioned above is a part of the water of Stockade Beaver Creek, which sinks into the gravel filling of the valley floor and appears at the surface again farther down the valley. In the part of the course beneath the gravel filling the water flows over gypsum beds in the Spearfish formation. Where the water appears at the surface it is charged with gypsum and cannot be considered as of good quality for domestic use.

3. Increase the reservoir capacity of the present city water system so that water not required at certain times can be saved for use at times of heavy consumption.

This is largely a problem for an engineer. If, however, a reservoir is to be constructed, the reservoir site should be examined by a geologist for possible leakage.

4. Bore wells in the vicinity of Newcastle to obtain artesian water.

An adequate consideration of this problem requires a discussion of some features of the local geology. The following formations outcrop in the area to the north and east of Newcastle:

Stratigraphy

Formation (top)	Thickness in feet	Character
Graneros formation	1000	Gray and black shale. Buff to gray sandstone ("Muddy") 0-40' thick 800' below the top of the formation.
Dakota sandstone	50-100	Gray to buff sandstone.
Fuson formation	15-30	Gray to red shales with thin sandstones.
Lakota sandstone	150-200	Gray to buff sandstones and conglomeratic sandstones.
Morrison shale	150	Shales of various colors.
Sundance formation	350	Sandy gray and red shales with a massive gray sandstone approximately 50' thick near the base.
Spearfish formation	500	Red sandy shale and soft red sandstone with beds of gypsum.
Minnekahta limestone	40	Thin-bedded gray limestone.
Opeche formation	75	Red sandy shale and red sandstones.
Minnelusa sandstone	600+	Hard white sandstone including brecciated red sandstone (upper part) and buff and gray limy sandstone (lower part).
Pahasapa limestone	700+	Massive light-gray limestone.
Englewood limestone	50	Pink to buff slabby limestone.
Deadwood formation (bottom)	100+	Reddish sandstone and shale and green glauconitic sandstone.

Structure.- The sedimentary beds enumerated in the table above are inclined downward (dip) to the southwest and their edges have been eroded, so that the oldest formation, the Deadwood, is exposed in the northeast corner of the Newcastle quadrangle and younger beds are exposed successively to the southwest. Newcastle is built on the lower part of the Graneros formation. The oldest beds are exposed at elevations several thousand feet above Newcastle. The geological conditions are almost ideal for the obtaining of artesian water from wells.

Character of Water in Various Beds.

Most of the beds of the succession contain water which can be obtained by boring, but water from many of the beds is so highly charged with dissolved mineral material that it is unfit for domestic consumption.

The Dakota and Lakota sandstones have yielded water in a number of wells in an area to the northwest, south and southeast of Newcastle. The water from some of the wells is of good quality, but the water from others is so heavily charged with sodium sulfate that it is unfit for domestic use. Water from the Lakota in the vicinity of Mount Pisgah is used at the Flying V ranch and is of excellent quality. It is reported that the water flowing from a pipe east of the coal tipple at Cambria is piped from the Sweetwater Lakes. As nearly as the writers can ascertain, this water is from springs flowing from the Lakota.

The Morrison shales contain no water.

The Sundance is mostly shale and any water obtained from this formation would come from the sandstone near the base. The sandstone is comparatively thin and would not likely yield a flow large enough to augment materially the Newcastle city supply.

The Spearfish contains salt and gypsum beds and water from this formation is heavily charged with mineral matter.

The Minnekahta contains no water.

The water from the spring east of the road following Stockade Beaver Creek comes through the Opeche and Minnelusa formations. The water is heavily charged with gypsum.

The water from the Martin well, sec. 3, T. 45 N., R. 61 W., on Salt Creek comes from the Minnelusa formation. An analysis of this water made by Mr. O. A. Beasth of the University of Wyoming Agricultural Experiment Station shows that the water contains six-tenths of one per cent of gypsum, which is enough to make the water unfit for domestic consumption.

The waters of the Bear Run Springs and Parmalee Springs come from the Deadwood, Englewood and Pahasapa formations and are of excellent quality.

In summation it may be said that the only large supplies of waters fit for domestic use come from the Lakota-Dakota sandstones and from the Deadwood, Englewood and Pahasapa formations. In the case of waters obtained by drilling into the Dakota and Lakota there is no certainty that the waters might not contain a relatively high percentage of sodium sulfate (Glauber's salt).

Artesian Wells.

Artesian water could be obtained from the Dakota or Lakota by drilling a few hundred feet in Newcastle or a short distance to the south. It is certain, however, that the water in such wells would not be under sufficient hydraulic head to flow into the city reservoir, since these formations are cut by valleys at the same elevation as Newcastle or only a few feet higher. The lack of hydraulic head would also make for great uncertainty as to the amount of flow, in addition to to the uncertainty as to the quality of water which could be obtained at a given place.

N. H. Darton gives, in U. S. Geological Survey Folio No. 107, the figure of 2,740 feet for the probable depth of a well drilled to the top of the Pahasapa in Newcastle. In order to obtain a good flow it would be necessary to drill some hundreds of feet farther. It is also probable that water in such a well would not be under sufficient head to rise to the surface, or at least would not give an adequate flow without pumping. The water in the well drilled into the Pahasapa at Cambria rose to within 200 feet of the surface. With pumping from this depth the maximum flow was somewhat less than 300,000 gallons per day. Although the Newcastle reservoir is at an elevation some four or five hundred feet below the mouth of the Cambria well, it is notlikely that a flow sufficient to augment the city supply appreciably could be obtained without pumping.

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