STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS

Steve Cowper, *Governor*

Judith M. Brady, *Commissioner*

Robert B. Forbes, *Director and State Geologist*

December 1987

Report of Investigations 87-15

WATER-LEVEL DECLINES IN WELLS IN SOUTH ANCHORAGE, ALASKA: A PRESENTATION TO THE ALASKA WATER RESOURCES BOARD, September 12, 1985

By
J.A. Munter

STATE OF ALASKA
Department of Natural Resources
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

According to Alaska Statute 41, the Alaska Division of Geological and Geophysical Surveys is charged with conducting 'geological and geophysical surveys to determine the potential of Alaskan land for production of metals, minerals, fuels, and geothermal resources; the locations and supplies of ground water and construction materials; the potential geologic hazards to buildings, roads, bridges, and other installations and structures; and shall conduct such other surveys and investigations as will advance knowledge of the geology of Alaska.'

In addition, the Division of Geological and Geophysical Surveys shall collect, record, evaluate, and distribute data on the quantity, quality, and location of underground, surface, and coastal water of the state; publish or have published data on the water of the state and require that the results and findings of surveys of water quality, quantity, and location be filed; require that water-well contractors file basic water and aquifer data, including but not limited to well location, estimated elevation, well-driller's logs, pumping tests, flow measurements, and water-quality determinations; accept and spend funds for the purposes of this section, AS 41.08.017 and 41.08.035, and enter into agreements with individuals, public or private agencies, communities, private industry, and state and federal agencies; collect, record, evaluate, archive, and distribute data on seismic events and engineering geology of the state; and identify and inform public officials and industry about potential seismic hazards that might affect development in the state.

Administrative functions are performed under the direction of the Director, who maintains his office in Fairbanks. The locations of DGGS offices are listed below:

.794 University Avenue
(Suite 200)
Fairbanks
(907)474-7147

.400 Willoughby Avenue
(3rd floor)
Juneau
(907)465-2533

.18225 Fish Hatchery Road
P.O. Box 772116
Eagle River
(907)696-0070

This report is for sale by DGGS for $2. DGGS publications may be inspected at the following locations. Mail orders should be addressed to the Fairbanks office.

.794 University Avenue
(Suite 200)
Fairbanks, 99709

.400 Willoughby Avenue
(3rd floor)
Juneau

.U.S. Geological Survey
Public Information Office
701 C Street
Anchorage

.Information Specialist
U.S. Geological Survey
4230 University Drive, Room 101
Anchorage

CONTENTS

WATER-LEVEL DECLINES IN WELLS IN SOUTH ANCHORAGE, ALASKA: A PRESENTATION TO THE ALASKA WATER BOARD

by
J.A. Munter[1]

INTRODUCTION

A recently published report by Dearborn and Munter (1987) presented background information on water-level declines and well failures in the lower Hillside area of Anchorage. The report showed that water levels have been declining at a rate of 1 to 5 ft/yr, that significant numbers of private, domestic wells have low tolerances to water-level declines, that a few wells are known to have failed, and that potential large increases in water consumption in the area would create a significant potential for large numbers of well failures.

To clarify the extent and magnitude of water-level declines in south Anchorage and to understand the effects of ground-water pumpage in the area, field work was carried out during the summer of 1985 by the Division of Geological and Geophysical Surveys (DGGS) and the Division of Land and Water Management (DLWM). Water levels were measured in private water wells that met the following criteria:

1. The well was located in secs. 12, 15, 21, 22, 23, 27, or 28 of T. 12 N., R. 3 W., Seward Meridian.
2. The well reportedly contained $\leq$30 ft of water at the time of drilling.
3. A driller's log of the well, including static water level at the time of construction, was available.
4. The well could be located in the field.
5. The owner of the well allowed the water level to be measured.

Water levels were successfully measured in 98 wells, which is only a small percentage of the total number of wells in the area. To supplement this data, records of reported well failures in the area were maintained.

RESULTS OF FIELD WORK

The area affected by water-level declines is approximately bounded by Birch Road on the east and Rabbit Creek Road on the south. North and west of the lower Hillside area, water-level declines merge with other declines that have occurred throughout the Anchorage confined aquifer system as a result of ground-water pumping.

In the area west of Birch Road and north of Rabbit Creek Road, not all wells have exhibited water-level declines. In some areas, shallow wells (40- to 100-ft deep) have experienced water-level rises, even though nearby wells over 200-ft deep have required deepening. Generally, the deep aquifers appear to have experienced about 20 ft of historic water-level decline. The

[1]DGGS, P.O. Box 772116, Eagle River, Alaska 99577.

most pronounced area of water-level declines and residential well failures occurs in the SW¼ of sec. 10 and the west half of sec. 15. In total, 28 well failures have occurred during 1984-85 west of Birch Road and north of Rabbit Creek Road.

CAUSE OF WATER-LEVEL DECLINES

Residents of south Anchorage use local ground water for their water needs (as of 1985) from both public [Anchorage Water and Wastewater Utility (AWWU)] and private water-supply wells. Water-level declines observed in the lower Hillside have been caused by pumping from both these sources throughout the lower Hillside-south Anchorage area. The water-supply wells primarily responsible for water-level declines in specific areas of south Anchorage have not been identified.

MAGNITUDE OF PROBLEMS RELATED TO DECLINING WATER LEVELS

Declining water levels are currently (1985) found in private, domestic wells up to 300-ft deep. In most places, however, the probability is high that deeper aquifers are available and adequate for domestic water supply.

Ground-water problems on the lower Hillside are comparable in many ways to problems associated with the Eagle River confined aquifer system (Munter and Prokosch, 1985; Munter, 1987). The two areas are similar geologically, and both aquifer systems supply small and large water users. Ground-water problems on the lower Hillside, however, appear to be greater than those in Eagle River. Water levels on the Hillside have declined further over a longer period of time and over a larger area than in Eagle River. In addition, many more wells have failed on the lower Hillside, and the potential for future well failures is greater. Effective management actions were taken in Eagle River to avoid widespread disruption of their water-supply systems. In the lower Hillside area, however, it may be too late to take preventative action.

POSSIBLE RESOURCE DEVELOPMENT

Water-supply development in the lower Hillside area can be expanded by four processes: 1) deepening or redrilling individual wells; 2) connecting problem areas to public water systems; 3) limiting future ground-water extraction; and 4) importing water to areas currently served by public water systems that use local ground water.

The first process described above is already taking place. One senior water-rights holder deepened his well while junior water-rights holders and unpermitted water users continued to take water from the same aquifer system. Other water-rights holders may also have had to deepen or redrill their wells. This is relevant to DLWM water officers who, during the permitting process, must consider the possible adverse effects of additional appropriations on existing water-rights holders (Alaska Department of Natural Resources, 1981).

The second process of connecting existing neighborhoods to public water systems may be unworkable because many lots are large and are distant from

existing public water systems, resulting in prohibitively high hookup costs. In addition, water for expanded public water systems would have to come from local wells (Anchorage Water and Wastewater Utility, oral commun., September 1985), which would cause further declines of water levels in nearby areas. Most importantly, this process would not address the fundamental cause of declining water levels.

The third process of limiting ground-water use in south Anchorage can be accomplished by enacting water-conservation measures or by curtailing growth in residential, agricultural (including grass irrigation), commercial, and institutional water use.

Importing water to south Anchorage would require an analysis of AWWU water production, treatment, and transmission capabilities and an analysis of the ability of area water resources to sustain production. The three sources that may supply water to south Anchorage are Eklutna Lake, Ship Creek, and ground water in north Anchorage. Eklutna Lake is the long-term source of water for the Anchorage area, but because water problems in south Anchorage already exist, near-term options warrant consideration. A cursory examination of AWWU water-production data, Ship Creek streamflow data, and north Anchorage ground-water levels suggests that Ship Creek water could be imported during the summer months and north Anchorage ground water could be imported during the winter months. The current (1985) lack of water mains from north Anchorage to south Anchorage would be a major obstacle to implementing such a scenario.

ACKNOWLEDGMENTS

I wish to thank Carol Larson (DLWM), who performed much of the field work for this study, and area homeowners who allowed us access to their wells.

This manuscript was reviewed by W.E. Long (DGGS) and edited by K.E. Adams (DGGS); therefore, it is a slightly revised version of the paper presented to the Alaska Water Resources Board on September 12, 1985.

REFERENCES CITED

Alaska Department of Natural Resources, 1966, State of Alaska water user's handbook: Anchorage, Division of Land and Water Management, 46 p.

Dearborn, L.L., and Munter, J.A., 1987, Water-level declines in wells tapping lower hillside aquifers, Anchorage, Alaska (1985): Alaska Division of Geological and Geophysical Surveys Report of Investigations 87-12, 8 p.

Munter, J.A., 1987, Recent well failures in southwest Eagle River, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 87-14, 11 p.

Munter, J.A., and Prokosch, G.J., 1985, Recognition and resolution of Eagle River's ground-water conflicts: Roles of data and water rights, in Dwight, L.P., ed., Resolving Alaska's water resources conflicts: University of Alaska-Fairbanks Report IWR-108, p. 167-175.