

Administrative Report 89-1

CENTRAL KENAI PENINSULA GROUND-WATER STUDY
SUGGESTED WORK

By

J.A. Munter¹

Alaska Division of
Geological and Geophysical Surveys

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3700 Airport Way
Fairbanks, Alaska 99709

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

CONTENTS

	<u>Page</u>
Introduction.	I
Discussion of problems.	1
Proposed work	4
Nikiski area hydrogeological evaluation	5
References cited.	6
Appendix	8

FIGURES

Figure 1. Location of central Kenai Peninsula study area	2
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TABLES

Table 1. Conceptual components of the central Kenai Peninsula hydrogeological study	4
Table 2. Phases of the Nikiski area hydrogeological evaluation	6

INTRODUCTION

The central Kenai Peninsula area of Alaska is almost completely dependent on ground-water for residential, commercial and industrial water supplies. This area includes the communities of Sterling, Soldotna, Kenai, and Nikiski (fig. 1). At least ten instances of ground-water contamination have been discovered in this area in recent years (Alaska Department of Environmental Conservation, 1988) causing widespread concern over the long-term potability of ground water. These concerns are expressed in a locally-circulated petition containing 213 signatures and in a resolution passed by the Kenai Peninsula Borough assembly (see Appendix). Both documents also express a request for hydrogeological work in the central Kenai Peninsula area to better define ground-water flow systems and risks to local wells. This report briefly reviews several ground-water issues in the area and outlines a comprehensive plan for determining ground-water conditions and movement in order to protect water supplies and facilitate the beneficial use of ground water.

DISCUSSION OF PROBLEMS

The most recent areawide study of the central Kenai Peninsula was conducted by Anderson and Jones (1972). They reported that area wells "are too few and too widely spaced to permit accurate mapping" of the water table or artesian potentiometric surface. These surfaces are useful for determining directions of ground-water flow. An inherent feature of the central Kenai Peninsula is that large areas are developed with lots ranging in size from one to five acres. Each developed lot typically has its own well. With large numbers of wells, the probabilities of any randomly-located contamination event having an effect on some private well is increased.

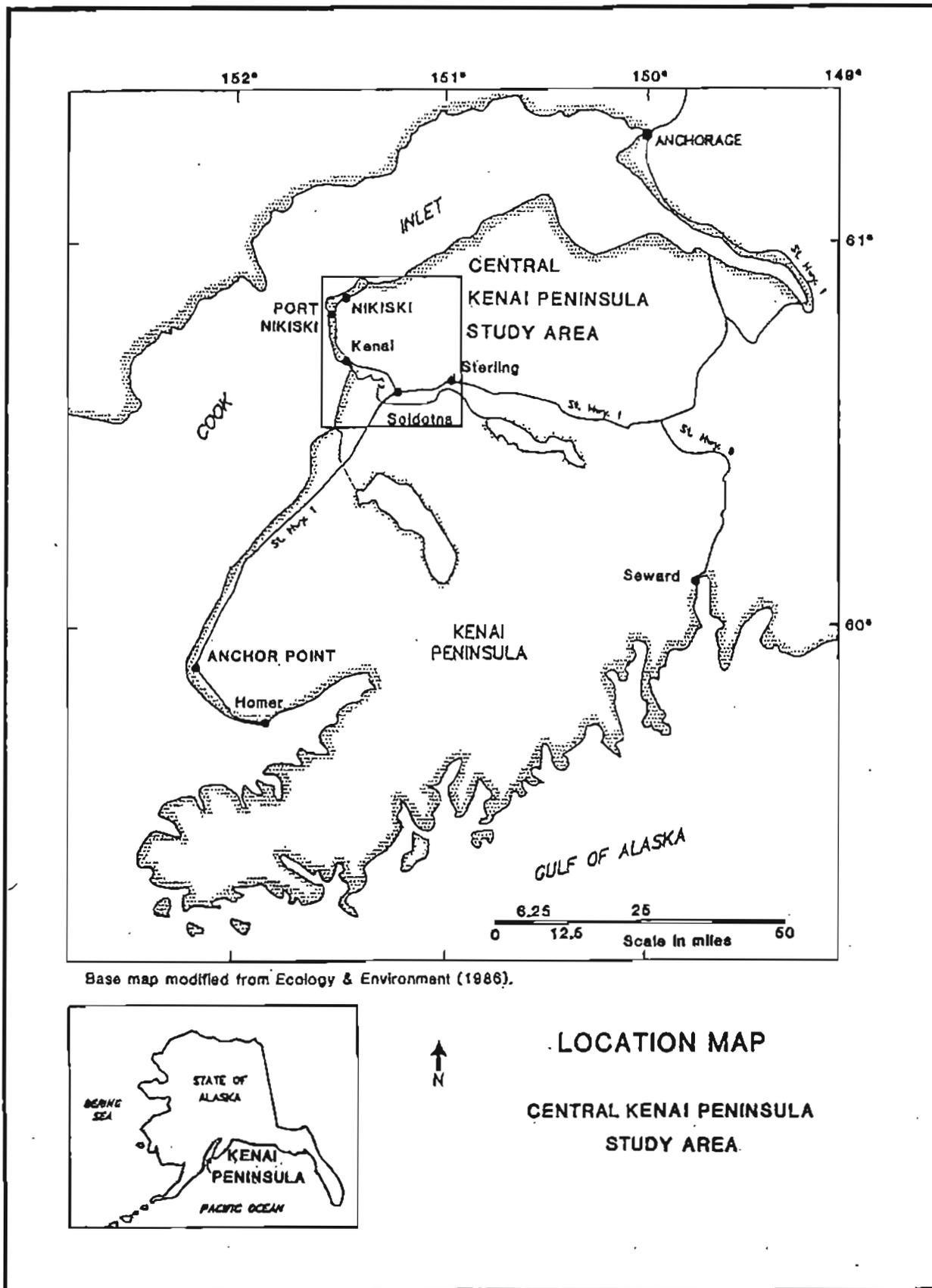


Figure 1. Location of central Kenai Peninsula study area.

Since 1972 substantial growth has occurred in the central Kenai Peninsula area and hundreds of water-supply wells have been drilled. Except for the Nikiski and Sterling areas, no significant effort has been made to collect the logs from these wells and evaluate their utility for mapping ground-water flow systems. In some areas, such mapping may be feasible and may contribute substantially towards resolving contamination or water supply problems.

Concerns for ground-water quality at Sterling stem from past practices of disposing of liquid wastes in ponds at the Sterling Special Waste Site (Munter, 1988). Hydrogeologic investigations in the area have been limited to on-site evaluations. No clearly defined contaminant plume has been found, possibly because of the extreme heterogeneity of the glacial, alluvial, and lacustrine deposits in the area and the absence of a clear definition of regional flow paths. Existing wells may not be properly located to detect such a plume. The occurrence of numerous residential wells throughout a wide swath of probable down gradient directions from the Sterling Special Waste Site lends particular importance to the issue of whether or not a significant plume actually exists and the direction that it may be travelling.

Nikiski (including the Port Nikiski area) is one of Alaska's leading industrial centers. Past leaks have resulted in areas where fuel products are floating on the water table, and major industrial water-supply wells tapping the upper confined aquifer described by Nelson (1981) have been contaminated by benzene (Bill Ashton, DEC, oral commun., 1989). Other contamination has been documented in nearby mixed commercial and residential areas (J. Hayden, DEC, oral commun., 1989). In addition, lake levels have been drawn down by industrial pumping in the area (Nelson, 1981; Howland and Freethey, 1978).

Unocal Corporation has requested a temporary water-use permit from the Department of Natural Resources to test pump three wells near Cabin Lake at a total combined rate of up to 2200 gallons per minute for three days (C. Rewolinski, Unocal Corp., written commun., 1989). Should historic industrial pumping patterns be significantly changed, resulting changes in the ground-water flow system could affect lake levels, water levels in private wells, and contaminant migration patterns in the area. Evaluation of these possibilities may be an important aspect of future permitting activities.

PROPOSED WORK

The comprehensive hydrogeological study of the central Kenai Peninsula area described below consists of five conceptual components (Table 1).

Table 1. Conceptual components of the central Kenai Peninsula hydrogeological study.

- I. Area-wide well log and water quality data acquisition and storage
- II. Sterling area hydrogeological evaluation (see Munter, 1988)
- III. Nikiski area hydrogeological evaluation
- IV. Area-wide ground-water flow system mapping
- V. Site-specific analysis and technical advisory

These conceptual components provide a logical means by which hydrogeological work in the central Kenai Peninsula area may be pursued. The first two components are largely self explanatory, and the third component will be reviewed in some detail in a subsequent section. The fourth component should be viewed as a practical task only for selected areas. The identification of these areas is dependent on the results of the first component and locations of contamination events, neither of which are

completely known at this time. The fifth component is dependent on site-specific issues, such as industrial well siting, water rights, and waste disposal permitting and facility clean-up planning. Although industry and regulatory agencies have substantial capabilities for conducting and reviewing pertinent investigations, the volume of work or the complexity of issues surrounding some of these sites may create a need for supplemental technical review or analysis.

NIKISKI AREA HYDROGEOLOGICAL EVALUATION

The water resources of the Nikiski area have been the subject of several investigations (Dames and Moore, 1975; Howland and Freethey, 1978; and Nelson, 1981). These studies have resulted in hydrogeologic cross sections, water-table maps, and conceptual and computer models of ground-water flow systems. Although water table and confined aquifers and confining units have been described in general terms, they have never been mapped in detail. Preparation of subsurface geologic maps showing the distribution of different lithologic units is proposed as Phase I of the Nikiski area hydrogeological evaluation (Table 2).

Phase II of the evaluation consists first of identifying time periods that are representative of relatively steady-state pumping conditions. Maps would be prepared showing the water-table surface of the unconfined aquifer and potentiometric surfaces of confined aquifers, if possible, for those periods. If sufficient data are not available for this task, then additional data collection would be conducted. The collection of additional water-level, well log, and water use data (Phase III) would be done to improve the accuracy of maps described above. Water-quality data collected by industry or state or

Table 2. Phases of the Nikiski area hydrogeological evaluation

- I. Reconnaissance-level Subsurface Geologic Mapping
 - A. Unconfined aquifer
 - B. Upper confining unit
 - C. Upper confined aquifer
 - D. Lower confined aquifer

- II. Reconnaissance-level Flow System Mapping
 - A. Identification of representative time periods
 - B. Water-level contour maps for each aquifer for each representative time period for which sufficient data exist.

- III. Acquisition and Storage of Additional Data
 - A. Well-log data
 - B. Water-level data
 - C. Water quality data (including developing a cooperative database with USGS)
 - D. Water-use data

- VI. Identification of Major Actual or Potential Flowpaths and Preparation of Report

local agencies would be entered into a permanent database in cooperation with the U.S. Geological Survey in order to provide long-term trends of contaminant levels or concentrations of natural dissolved constituents.

The subsurface geologic, water table, and potentiometric surface maps would be combined with information obtained from site investigations of contaminated ground water to identify major actual or potential contaminant flow paths (Phase IV). This information would be presented in one or more reports containing detailed maps of the area under investigation.

REFERENCES CITED

- Alaska Department of Environmental Conservation, 1988, Alaska's groundwater quality protection strategy, draft: Prepared by Alaska Department of Environmental Conservation, Juneau, Alaska.
- Anderson, G.S., and Jones, S.H., 1972, Water resources of the Kenai-Soldotna area, Alaska: U.S. Geological Survey Open-File Report, 81 p.

Dames and Moore, 1976, Report, ground water investigation, interrelationships between aquifers and surface water regimes, North Kenai area, Alaska: Prepared for Collier Carbon and Chemical Corporation, Los Angeles, CA, 92. p.

Ecology and Environment, Inc., 1986, Sterling Special Waste Site field investigation, Sterling, Alaska, TDD R10-8506-02, TDD F10-8612-02: Prepared for U.S. Environmental Protection Agency, Seattle, WA 59 p.

Howland, M.D., and Freethey, G.W., 1978, Selected hydrologic data related to the water table aquifer of the North Kenai area, Alaska: Alaska Division of Geological and Geophysical Surveys, Fairbanks, AK, 1 sheet.

Munter, J.A., 1988, Sterling area hydrogeological evaluation, project proposal: Alaska Division of Geological and Geophysical Surveys, Administrative Report 88-1, 5 p.

Nelson, G.L., 1981, Hydrology and the effects of industrial pumping in the Nikiski area, Alaska: U.S. Geological Survey Water-Resources Investigations 81-685, 22 p.

APPENDIX

Lennie Boston-Gorsuch
Commissioner
Dept. Of Natural Resources
400 Willoughby Ave.
Juneau, Ak. 99801

Dear Commissioner:

Enclosed is a petition that has been circulated recently. Some of us here on the North Kenai realize that contamination of groundwater is a widespread problem, not only in our area but in many parts of the country. Perhaps the idea that we were somehow immune to this was fostered by the sheer pristine and primal beauty that we enjoy here. However, times are changing. People are beginning to concern themselves with the important things that we have too long taken for granted. I think the positive response to this petition in the forms of comments such as "It's about time.", "We've got to do something soon.", and many simple earnest thank yous testify to this important change in attitude.

Some of us have seen for too many conflicting "facts about the groundwater" tossed about simply to justify permit applications and requests for variances by the industry. What really is happening with and to our groundwater?

The North Kenai Industrial Complex is the major refining sector of the state. Consequently, our community is not the typical residential area and should not be treated or examined as such. The state has accomodated the energy sector for 20 years, at certain times unchecked and loosely regulated environmentally.

Negative episodes involving the groundwater here are becoming ever more frequent. We believe the time has come for a comprehensive study here, if not for our safety and long term health factors, then certainly for everyone's knowledge and above all, peace of mind.

Sincerely


Gary Superman
Box 8425
Nikiski, Ak. 99635

JAN - 6 1988

cc;

Gov. Steve Cowper
William A. Mullen
Robert Forbes
Peg Tileston
Bill Ashton
Bill Lamoreaux
Sen. Mike Syzmanski
Sen. Jay Kertulla
Rep. Jim Zawacki

PUBLIC AWARENESS COMMITTEE FOR ENVIRONMENT
Box 3722, Soldotna, Ak. 99669

This summer we have seen a large number of plans and applications for permits concerning:

- 1.) Waste site openings and closures
- 2.) Wastewater discharge renewals
- 3.) Particulate emissions into the air

In addition, the number of identifiable illegal dumpings may be on the rise. Production rates at some of the industrial facilities are at the upper end of their capacity. Due to these mounting demands on our local groundwater resources and in the absence of any significant, cohesive data on that resource which may or may not be severely impacted by the activities aforementioned, we the undersigned hereby petition the Alaska State Dept. of Geophysical Surveys and the Water Resource Board undertake steps to initiate a comprehensive hydrology assessment of the North Kenai Industrial Complex and surrounding affected areas.

(213 signatures with addresses)

Introduced by: Brown
Date: Jan. 17, 1989
Action: Adopted
Vote: Unanimous

KENAI PENINSULA BOROUGH

RESOLUTION 89-10

REQUESTING THE STATE TO FUND AND CONDUCT HYDROGEOLOGIC SURVEYS IN THE CENTRAL PENINSULA AREA OF THE KENAI PENINSULA BOROUGH

WHEREAS, the communities in and around the cities of Kenai and Soldotna comprise an area of extensive oil and gas and chemical/industrial activity; and

WHEREAS, these activities can create problems with contamination of water supplies through lack of knowledge of movements of underground water; and

WHEREAS, in April, 1988, a hydrogeologic evaluation was proposed for the area around Sterling, Alaska by the Department of Natural Resources, Division of Geological & Geophysical Surveys, to provide information about the ground water movement; and

WHEREAS, such information would be highly useful in locating facilities to handle future waste from the area activities and in alleviating problems of contamination that have occurred or may occur in the area; and

WHEREAS, the activities generating the wastes and their attendant problems in the central Kenai Peninsula area are of significant financial benefit to the entire state; and

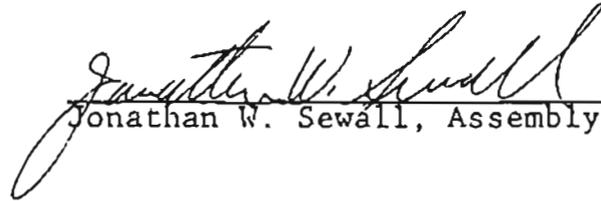
WHEREAS, hydrogeologic surveys should be performed for all areas in the central Kenai Peninsula and not just the Sterling area;

NOW THEREFORE, BE IT RESOLVED BY THE ASSEMBLY OF THE KENAI PENINSULA BOROUGH:

Section 1. That the Alaska legislature is requested to provide funding for hydrogeologic surveys of the central Kenai Peninsula areas to determine ground water geology and movement so that the benefits of oil and gas production to the state from that area can continue and be directed using information vital to the protection of the water supplies and resources of the Kenai Peninsula, its residents and visitors.

Section 2. That the clerk shall send copies of this resolution to Governor Cowper; Dennis Kelso, Commissioner of DEC; Lennie Boston-Gorsuch, Commissioner of DNR; Senators Fischer, Szymanski, Binkley, and Kerttula and Representatives Cato, Navarre, Swackhammer, Wallis and Zawacki.

ADOPTED BY THE ASSEMBLY OF THE KENAI PENINSULA BOROUGH ON
THIS 17th DAY OF January, 1989.


Jonathan W. Sewall, Assembly President

ATTEST:


Borough Clerk