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THE ALASKA COUNCIL ON SCIENCE AND TECHNOLOGY

September 20, 1982

Dear Contributors:

Enclosed for your review is the draft report on Alaska Water Resources; Issues, Priorities and Recommendations. The issues and recommendations were compiled with your assistance and input from 54 other individuals, who either responded to a questionaire or attended workshops in March, 1982. The contributers are listed at the end of the report.

In April, The Alaska Council on Science and Technology Committee Chairman Richard Dworsky and the Council's Science Advisor, Linda Perry Dwight, presented a preliminary draft of the report to the Alaska Water Resources Board. As a result of the input received, a number of issues and recommendations were modified and clairified. In August, the University of Alaska's Arctic Environmental Information and Data Center completed publication of the 1981 Current Research Profile. This draft has been updated to include a 1981 water resources research summary.

Please review this draft to ensure that your concerns have been correctly summarized. After comments are received, Chairman Dworsky, with the assistance of several Alaskan water resources experts, will review the comments and prepare a final draft for presentation to the Council. We intend to utilize this report to bring water related issues before the new governor and the state legislature. Council members and I greatly appreciate your help.

We would appreciate receiving your comments by Friday, October 22. Please send the response to:

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Thank you for your continued assistance.

Sincerely,

David M. Hickok
Chairman

DMH:LPD/pp

cc: Chris Noah, Executive Director

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THE ALASKA COUNCIL ON SCIENCE AND TECHNOLOGY

DRAFT

ALASKA WATER RESOURCES

Issues, Priorities and Recommendations

DRAFT

A Special Report

Based Upon the Results of the

Alaska Council on Science and Technology

Water Resources Workshops

Held March 1982 in Anchorage, Fairbanks, and Juneau, Alaska

September 1982

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ALASKA COUNCIL ON SCIENCE AND TECHNOLOGY SPECIAL REPORT

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ALASKA WATER RESOURCES: Issues, Priorities and Recommendations

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EXECUTIVE SUMMARY:

Alaska's water resources problems and research and management needs are well documented. It is crucial that state policies be directed toward the acceleration and continuity of organized and directed data collection programs. Equally important is the archiving and exchange of data, which must be expanded to receive information from the many diverse agencies involved in collection and to avoid duplication of effort. Finally, data collection, planning, implementation, and management of water resources research and development must occur in a more orderly manner. Only in these ways may existing programs and new efforts be cost and manpower effective.

BACKGROUND AND STATUS OF CURRENT ACTIVITIES IN ALASKA WATER RESOURCES:

In Alaska, several organizations have been established to identify water resources problems and needs. The most comprehensive effort has been undertaken by the Alaska Water Study Committee, which has published a number of reports. Important contributions have been made by other

agencies and organizations, including several University of Alaska research institutes; state agencies such as the Alaska Departments of Environmental Conservation, Fish and Game, and Natural Resources, federal agencies such as the Bureau of Land Management, the Environmental Protection Agency, the Fish and Wildlife Service, and the U.S. Geological Survey, the Inter-Agency Hydrology Committee for Alaska; the Water Resources Board; and Alaska chapters of national organizations including the American Water Resources Association; the National Water Well Association; and the Water Pollution Control Federation. Citizens groups, special interest groups, and municipal organizations have also participated. A description of the cooperative efforts undertaken by several groups is presented.

Alaska Water Study Committee - The Alaska Water Study Committee, working under the guidance of the U.S. Water Resources Council, was composed of representatives from state and federal agencies, the Alaska Federation of Natives, and the Alaska Municipal League. The Alaska Water Study Committee sponsored the Alaska Water Assessment. Its general purpose was to present the state perspective on water and related land problems and sufficient information for the U.S. Water Resources Council to establish national priorities on water problems.

The assessment was divided into four steps or activities. The first activity was an identification of present and future water problems (Alaska Water Study Committee, 1975a). The second activity involved compilation of information and assumptions on future levels of resource use, income, employment, population, and estimates of future water requirements. Several geographic problem areas and statewide problem issues that appeared sufficiently complex and important to warrant more

detailed analysis were selected (Alaska Water Study Committee, 1976a). The third activity provided more detailed information for these problem areas and issues (Alaska Water Study Committee, 1976b). The Alaska Water Study Committee (1977) has published a summary report as the last step of the Alaska Water Assessment, which summarized previous steps in the assessment and set out views of the Alaska region on relative importance and priorities for addressing water problems, together with conclusions and recommendations for solving Alaska's water and related land resource problems.

Southcentral Alaska Water Resources Study (Level B) - The Alaska Water Study Committee (1975b) proposed a more detailed (Level B) study of the water and related land resources of Southcentral Alaska. The goal of the study was to reach agreement among local, state, and federal governments, private interests, and the public on a recommended strategy involving policies, programs, and projects for guiding future conservation, management, development, and preservation of water and related land resources.

The study was designed to address problems and issues of regional significance based primarily upon existing information, to prioritize these problems and issues, to understand and evaluate the interrelationships of water resource allocation and land use, and to seek an agreement on recommended strategies (Alaska Water Study Committee, 1978). The study was coordinated with other ongoing planning efforts of the local government units in the study area, the Alaska Coastal Management Program, the various land use planning efforts related to the Alaska Native Claims Settlement Act, ongoing Level C studies such as the Metropolitan Anchorage Urban Study (MAUS) recently completed by the U.S. Army Corps of Engineers,

and basin plans prepared under Section 303(e) and Section 208 of the Federal Water Pollution Control Act Amendments of 1972.

The final report was published in 1981. It appeared that, with proper planning and management, the major issues could be resolved. It was unclear whether the State of Alaska and the federal government were prepared to operate in a coordinated manner to address and solve problems relating to timing and funding of data collection, feasibility studies and other investigations. The report focused on concensus areas of concern that need resolution.

Although responsible agencies have been indentified to achieve implementation of recommended program actions, agreement has not necessarily been reached that agencies will take up the management program recommendations. Implementation is further clouded at this time with the pending dissolution of the U.S. Water Resources Council. Implementing activities may be undertaken by the State of Alaska agencies, or by the State Water Board setting priorities for implementation and by making recommendations to the Governor and the Legislature. Federal activity may be undertaken when requested by the state, or through normal program channels.

Alaska Department of Environmental Conservation - In 1977, the Alaska Department of Environmental Conservation published a water quality status report. The Department published Issues and Choices in Alaska's Environment in 1978. The report defined land, air, and water quality problems and recommended a variety of actions. The Department's Division of Water Programs (1978) identified the need for explicit and detailed

information on the physical, chemical, and biological characteristics of Alaskan waters and the ways in which water quality characteristics are altered by pollution in order to identify water quality problems and measure the progress of solutions.

The Alaska Department of Environmental Conservation (1979a,b) and the U.S. Environmental Protection Agency agreed that the initial phase of the Alaska Water Quality Management Planning Program would concentrate on nonpoint source pollution control, as authorized by Section 208 of PL 92-500 (the 1972 Amendments to the Federal Water Pollution Control Act). Five areas of study included: village sanitation, waste oil, timber harvesting, transportation corridors, and placer mining. Each study focused on identifying the problem, developing best management practices that could avoid or mitigate adverse water quality impacts from the activities, and recommending institutional and legal measures to implement the best management practices.

Although the five study topics were statewide in focus, nonpoint source pollution control was also examined in the Municipality of Anchorage (Anchorage, Municipality, 1979). The study focused on urban runoff in developed and developing areas, soil erosion and sediment control from construction sites, runoff and percolation from snow disposal sites, and failures on onsite wastewater disposal systems. The U.S. Army Corps of Engineers (1979) conducted a concurrent study to plan for water resources development in the Anchorage bowl. Studies included water supply, estuarine water quality, and wastewater facility plan.

University of Alaska-Institute of Water Resources - In October 1972 the Institute of Water Resources sponsored a seminar, "Alaska Water Resources

Needs for the '70s." The objectives of the seminar were to identify the water resources problems peculiar to Alaska, to delineate the state of the art, and to establish directions for future research (Carlson and Butler, 1973). The Institute has continued its efforts to identify problem areas and solicit input in the identification process. For the past seven years, the Institute has published a quarterly newsletter and an annual report. Questionnaires have been circulated with the newsletter to obtain input.

The Institute initiated a problem identification process for its five-year plan at the 30th AAAS Alaska Science Conference in September 1979. The five-year plan was published in June 1980. It focused on research problems and priorities in the following areas: hydraulic and hydrologic processes; geochemistry of Alaskan waters; aquatic and terrestrial ecology; aquatic ecosystem impacts and management strategies; pollution control technology; and information dissemination and training. The purpose of this report was to summarize Alaskan water resources problems that have been identified through several cooperative efforts, to describe those problems that require research answers as opposed to administrative solutions or expansion of data collection programs, and to develop the Institute's plan for water resources research during the next five years.

Current Research Summary

An overview of current research is presented to identify areas that are receiving attention. The current research data base (1977-1981) at the University of Alaska's Arctic Environmental Information and Data Center was examined and the following topics were chosen: glaciology; snow;

permafrost; hydrology; limnology; fish; and water supply and utility systems.

There are many other research areas that relate to water resources. These include the atmosphere, geology and geomorphology, forestry, soils, and land use planning. Approximately one-quarter of all of the research being conducted in Alaska by state and federal agencies and university research units has relevance to water resources. Over the years, results of these studies have influenced management decisions for major activities such as the trans-Alaska pipeline design and construction, outer continental shelf exploration and development, and hydroelectric power generation.

In the field of glaciology, about 15 research projects were conducted each year, with most of the research being carried out by universities and the remainder by federal agencies, notably the U.S. Geological Survey (USGS). Research is focusing on the stability of Columbia Glacier, glacier surging, glacial depositional processes, and effects of climatic changes on glacier formation.

About ten research projects on snow were conducted in 1977 and 1980, mostly by federal agencies; while only six were carried out in 1978, 1979, and 1981, of which half of the research was done by the state. Snow research is currently limited to avalanche, snow depth, and ice thickness forecasting and development of collection techniques for engineering and water supply uses. However, the cooperative snow survey program includes the efforts of many agencies.

In the area of permafrost, about 25 research projects were conducted each year, mostly by universities and the U.S. Army's Cold Regions Research and Engineering Laboratory (CRREL). Permafrost research includes assessment of geotechnical hazards in developed and developing areas, control of permafrost under highways, effects of construction on permafrost, properties of frozen soils, and engineering properties of subsea permafrost. These activities are mainly carried out by the University of Alaska's Geophysical Institute, the Alaska Department of Transportation and Public Facilities, and CRREL.

Over 60 projects were conducted annually on hydrology every year except 1979. Three-quarters of this research was done by federal agencies--about half of that by USGS, with some participation by the University of Alaska and the private sector. In 1979, 40 projects on hydrology were underway, of which one-quarter were USGS, one-quarter were other federal, and one-quarter were university. Hydrology projects include a number of data collection programs and reconnaissance studies. Research is being conducted on aufeis formation and control, flood analysis techniques, hydrologic models, and arsenic in groundwater.

Most of the limnological research has been conducted by the University of Alaska's Institutes of Marine Science and Arctic Biology and out-of-state universities, but has decreased from 40 projects in 1977 to 20 projects in 1979, 1980, and 1981. Limnological research includes a number of studies on nutrient dynamics, effects of oil spills and road construction on arctic lakes, studies related to salmon spawning success, and baseline water quality and benthos investigations at the Delta agricultural demonstration project.

Almost three-quarters of the fisheries-aquatic habitat research is conducted by the Alaska Department of Fish and Game, but the number of projects has averaged about 120 in 1977, 1978, and 1980 with a low of 75 in 1979 and an increase to 153 in 1981. Many of these projects are data collection programs for management purposes. Other projects are directed at obtaining information on life history and habitat requirements of certain species.

During 1977 and 1978, many of the 45 projects listed under water supply and utilities were carried out by the private sector, in most cases, under contract to the Alaska Department of Environmental Conservation. The increase of projects in 1979 to 76 reflects large and small hydro-power reconnaissance and feasibility studies being conducted by the private sector, the Alaska Power Authority, and the U.S. Army Corps of Engineers. In 1980, the category "energy resources and development" was added to differentiate these studies, but the total number conducted under both categories averages 75.

CURRENT RESEARCH CONDUCTED IN ALASKA

1977 (1550 Total Projects)

	Federal	State	University	Other	Total
Glaciology	5	-	10	-	15
Snow	7	2	1	-	10
Permafrost	8	3	8	2	21
Hydrology	38	7	13	6	64
Limnology	7	5	29	2	43
Fish	27	115	23	9	174
Water Supply & Utility Systems	10	10	5	18	43
					370

1978 (1700 Total Projects)

	Federal	State	University	Other	Total
Glaciology	5	-	7	1	13
Snow	3	3	-	-	6
Permafrost	8	4	12	3	27
Hydrology	40	6	7	4	57
Limnology	4	5	25	2	36
Fish	35	127	25	12	189
Water Supply & Utility Systems	16	13	2	17	48
					376

1979 (1675 Total Projects)

	Federal	State	University	Other	Total
Glaciology	4	-	6	3	13
Snow	4	2	-	-	6
Permafrost	8	4	5	4	21
Hydrology	24	2	11	4	41
Limnology	1	1	18	2	22
Fish	12	75	4	4	95
Water Supply & Utility Systems	9	18	6	43	76
					277

CURRENT RESEARCH CONDUCTED IN ALASKA (Con'd)

1980 (1900 Total Projects)

	Federal	State	University	Other	Total
Glaciology	6	-	10	2	18
Snow	4	4	1	-	9
Permafrost	8	6	14	2	30
Hydrology	44	3	10	6	63
Limnology	2	3	14	1	20
Fish	14	121	18	5	148
Water Supply & Utility Systems	5	19	5	11	40
Energy Resource & Development	5	16	8	10	39
					365

1981 (1980 Total Projects)

	Federal	State	University	Other	Total
Glaciology	7	-	10	1	18
Snow	4	1	1	-	6
Permafrost	7	3	10	3	23
Hydrology	42	3	8	8	61
Limnology	2	3	13	2	20
Fish	15	153	15	7	193
Water Supply & Utility Systems	-	12	2	1	15
Energy Resource & Development	6	26	7	17	56
					372

ISSUES:

1. There is a continued lack of coordinated data collection, data storage, and data exchange (or information on where to obtain data). There is no mechanism for requiring a standard reporting format when the same data is being collected and recorded by different groups. Institutional arrangements are difficult to achieve.

2. Baseline data needed to evaluate proposed developments does not exist for much of Alaska. The State of Alaska is reducing or eliminating state data collection programs while supporting developments, the majority of which cannot be approved or authorized until certain data are available. Should the State establish a baseline data base program for all proposed developments, or should the State stipulate the information that a developer needs to obtain? What happens when the State is the developer?

   Baseline data are also essential for forcasting water supply, floods, and avalanche dangers, etc. It is much more cost effective for the State to prevent disasters than to finance disaster losses?

3. There has been no prioritization of state-financed development plans or integration with private development plans. It is therefore difficult for state resource and regulatory agencies to prioritize data collection efforts or respond efficiently to permitting and review requirements. Present funds cannot support a comprehensive, statewide data collection effort or timely review and response to

all concurrent proposed projects, which ultimately increases the costs of proposed projects and does not serve the public interest.

4. In reviewing, commenting on, and recommending stipulations for proposed projects, the State follows one procedure for state permits and another for federal permits. This can result in issuance of permits with conflicting stipulations for the same project. There needs to be a mechanism for resolving conflicting agencies requirements.

5. There is a need for regional water resources management and planning. Water requirements of different existing and proposed users need to be quantified. Cummulative effects of concurrent developments needs to be considered.

6. There is no state policy on whether to support data collection and research through administrative agencies or through research grant programs, or both. The role of governmental, academic, and private sectors in conducting data gathering and research needs to be clarified. Funding of coordinating groups, such as advisory and regulatory boards and committees, has been haphazard.

PRIORITIES AND RECOMMENDATIONS:

Data Gathering, Archiving, Exchange, and Coordination Needs

1. A statewide system of hydrologic, climatological, and water quality stations should be funded and operated to obtain multi-year data for monitoring existing conditions, establishing baseline coordi-

nation for proposed projects, and improving design features. Where possible, new stations should be located so that data can be integrated and correlated with that from long-term stations and supplemented with satellite and remote sensing data. Location of new stations should be prioritized.

2. Real-time stations should be established in areas subject to natural hazards or water shortages to increase predictive capabilities and planning. Satellite and meteor burst telemetry are available.

3. Water required for different existing and proposed uses should be quantified. The total amount of water available in individual basins, including snow and glacier sources, should also be quantified if needs are to be met.

4. Data should be collected on Alaskan lakes to establish baseline information for predicting conditions in existing and proposed reservoirs.

5. The gathering and sharing of water resources information should be coordinated on an interagency basis with cooperation from the private and academic communities. To the extent that management and regulatory functions can utilize similar data, the types of data that need to be collected should be prioritized and formats should be standardized. The role of advisory and regulatory boards and committees in coordinating data collection, research, and management should be established.

Research Needs - Hydrology

1. Research is needed on improving instrumentation for functioning at

remote sites under Alaskan conditions.

2. Methodologies for predicting runoff and precipitation in ungaged watersheds need to be analyzed, improved and developed.

3. The impacts of drainage basin modification and aufeis need to be determined, and methods to prevent aggravation of aufeis formation need to be developed.

4. Research is needed to evaluate ice-related aspects of proposed hydroelectric projects. Improved modeling of ice-covered lakes is crucial. Understanding changes in downstream icing patterns and effects on biological productivity and discharge into saltwater inlets is important.

Research Needs - Water Quality

1. There is a need for chronic toxicity research on waters discharged from petroleum operations into the marine environment. The research should establish sublethal threshold response levels for benthic organisms, including behavioral and physiological indices of stress. This information could be used to establish or refine water quality standards designed to mitigate the environmental impacts of such discharges.

2. Study is needed to address the specific effects of continuous regulated discharges from refineries, ballast treatment plants, petrochemical plants, heavy industrial plants, and offshore oil and gas platforms. Since these discharges are subject to regulation

through the federal NPDES permit program and various state permits, the understanding of expected effects, if any, should foster development by more responsible permit conditions, monitoring frequency, and effluent limitations necessary to protect the environment.

3. There is a need to study nearshore mixing and pollutant transport in Alaskan estuaries. The data resulting from such studies would be critical for planning and site selection for coastal development activities, providing for maximum dispersion and hence minimum water quality degradation.

4. Research is needed on seafood and industrial waste recovery and utilization.

5. The suitability of "lower-48" water quality standards to Alaska need to be evaluated.

6. With an increase in mining activity, there is a need to examine the acute and chronic toxicity of dissolved metals and metalloids for native Alaskan plant and animal species. Research should include a review of existing literature, flow-through laboratory tests, and an analysis of synergistic effects. There is also a need to examine the biological and chemical mechanisms of heavy metal leaching.

7. The effects of fire retardants on water quality and aquatic life should be investigated.

8. Innovative and inexpensive water supply and waste disposal systems, including those used in third world countries, should be evaluated for their potential use in rural Alaska.

Research Needs - Aquatic Biology

1. Salmonoid rearing and overwintering areas must continue to be identified to refine the State's listing of anadromous fish streams.

2. The effects of salmon enhancement programs on the genetics of wild stocks needs to be examined.

3. Minimum requirements for instream flow to maintain different fish species throughout their life cycle need to be defined.

4. Effects of hydroelectric project development on impoundment area and downstream environments need to be quantified.

Management and Educational Needs

1. There is a need for timely review of permit applications and proposed development plans; state agency responses need to be coordinated. The water management responsibilities of various agencies should be evaluated in order to effect organizational and statutory changes for more efficient and responsive state water resources administration.

2. The potential of establishing and utilizing regional water management committees or areawide water authorities in Alaska should be evaluated.

3. The staffing capabilities of state agencies to address water resource management problems should be evaluated. Comparisons should be made between Alaska and other states with similar laws and programs.

4. A study is necessary to stimulate a concerted effort to provide regulatory and resource managers with new cost-effective examples of biological monitoring strategies. These strategies would provide sensitive, statistically defensible measures of changes at acceptable cost to industry (when required in permits) or to agencies in their own routine monitoring programs.

5. State agencies need to develop policies and procedures on mitigation strategies and enforcement stipulations that could be applied to proposed developments.

6. Research watersheds should be established in each climatic region.

7. Public education is needed on a variety of water-related issues. The relationship of drinking water quality and public health needs to be promoted. Citizens need to know what water quality parameters to test, and how often. Education on care of septic systems and erosion control measures for local drainage systems would be useful.

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ABOUT THE COUNCIL:

The Alaska Council on Science and Technology reports annually to the Governor and the Legislature on research activities funded by the state and recommends research and funding priorities. Though the Council itself does not perform research, it is charged with helping to coordiante research activities and to enhance standards of research. Nonpartisan advisory services to assist planning at both state and local levels are provided by the Council; for this and other purposes the Council convenes committees, task forces, and conferences as needs arise. Utilizing funds appropriated to the Council's Scientific and Technological Account, the Council has conducted the Northern Technology Grants Program to foster Alaskan innovation. From the Account, the Council has also awarded research grants and contracts for purposes specified.