

ALASKA LEGISLATURE COMMITTEE FILES 1993-1994 8672

7988

HOUSE RESOURCES

253

to date, \$350.0 has been received from these other sources which is the largest amount ever. Half of this revenue was a one time transfer from DOT/PF for work as a part of their cooperative agreement on the environmental assessment for the Copper River Road project. Many of the Survey's activities are in response to requests by small communities for assistance in quantifying existing water uses or identification of new water sources. In these cases the Survey negotiates a match of state and local funds and often leverages federal funds for the project.

The Survey develops and maintains six (6) critical water data bases used by public and private groups statewide. They include a groundwater data base with 24,000+ entries, stream and lake data basis with over 16,000 entries, a water use data base with about 400 large water users, and a wind and precipitation data base with about 50 stations.

The Survey works very closely with the US Geological Survey in collecting water inventory and use data. Our Cooperative Water Resource Inventory Program is a federal/state matching effort to better understand our vast water resources. This effort has most often been focused to some immediate need rather than the more comprehensive and possibly more cost effective approach of a statewide stream gaging network.

In order to explore this cost efficiency, we have requested \$275.0 in the Network/Gaging CIP, which will be matched with USGS funds, to do a stream gaging network evaluation and establish regional gaging stations. These two actions have been requested as the highest priority of the State Water Resources Board, have been introduced in legislation in the past, and are anticipated to be endorsed as the highest priority for water resource management by the new Alaska Water Management Council a coordinating group representing 21 state and federal agencies, the University of Alaska, and the Water Resources Board. With the network evaluation and placement of regional gaging stations a much broader understanding of our water resources can be obtained, over time, at less cost to individual projects due to the use of synthetic data built on the information collected by the regional stations.

With 80% of Alaska's public water systems dependent on groundwater, common problems of inadequate yield and poor water quality create the need for technical assistance to citizens, local governments, and state agencies. Groundwater issues in Alaska present technically very difficult problems. The only certified groundwater professional in Alaska is one of our senior scientist.

Over the past year the Alaska Hydrologic Survey has emerged as a valuable asset in all aspects of water resource management across the state. With combined Alaskan experience of over 130 years, these 11 scientists and the water resources laboratory provide the essential inventory and use data upon which water management decisions are made. Without this critical data major projects can be delayed as much as 10 years.

**Dam Safety and Construction:** With over 80 structures under state Dam Safety authority and responsibility and only one full time engineer (with 23 years of Alaska experience), this program presents unique challenges in meeting our statutory responsibilities to protect public safety and the investment in these structures. With the creation of the Division of Water a review was initiated of all regulated (88) structures and a status report requested. It was discovered that the state engineer had not physically inspected a number high risk structures due to limitations in travel funding. By rearranging priorities within

the division the engineer was directed to visit all high risk structures in FY93. This resulted in discovery of a number of compliance issues which have been addressed over the past year. A formal report is now being prepared on the status of all structures annually. This report will be available to the legislature and the public.

In addition to general compliance issues on water impoundment structures, this section is very involved in reviewing and permitting dams for projects such as the Fort Knox Mine, the AJ Mine, the Kensington Mine. By using fees assessed against the developers of these mining activities we are able to secure assistance from a number of world class dam safety engineers. This approach has been very successful in augmenting the capabilities of our limited staff and in resolving design conflicts as there are many variations of such structures in Alaska.

Two other programs I would like to highlight.

1) We have requested \$60.0 in a CIP for one time wetlands work. The basic purpose of this CIP is to prepare scientific papers on four wetland issues that continue to raise questions. Is all tundra wetland? Does permafrost cause a wetland in current definition that does not function as a true wetland? In SE Alaska can you have organic material on bedrock that is considered a wetland, but again has no wetland function? Does glacial sediment cause wetlands under the Delineation Manual that do not function as wetlands?

With these four scientific papers the state will attempt to persuade the Army Corps and EPA that wetlands in Alaska be delineated based more on their function rather than arbitrary federal delineation criteria. This could mean a change in the location and extent of regulated wetlands in Alaska and alter the State's approach to wetland program assumption or general permit development.

2) The Division of Water has begun to assume responsibility for a number of flood and erosion mitigation efforts. Last year we assisted the Mat-Su Borough in their efforts to mitigate a significant loss of private land and homes along the Matanuska River. With the design and construction of four finger dikes at a total cost of \$500.0 a temporary solution was put in place for far less than the \$50,000,000 originally suggested by the Army Corps of Engineers.

By providing low-tech, low-cost flood and erosion mitigation alternatives to local communities through a matching effort we can leverage local participation with state funds with cost effective applications that solve problems. This effort takes a small amount of time from our Dam Safety Engineer who is very familiar with water related structures and one of our hydrologists who is also very familiar with such efforts. Let emphasize that this is a cooperative effort with local participation and investment.

Finally, the Division of Water will continue to pursue the philosophy of "leveraging". When ever presented with a challenge we will attempt to find others to participate with us in a team effort in crafting solutions. This is reflected in our coop-programs with USGS, our local assistance programs in water and flood and erosion mitigation, our dam safety program, and our cooperative planning efforts with federal and private sector partnerships. The Alaska Water Management Council will quickly develop as a valuable mechanism in these cooperative efforts.

# Navigability

With the submitted budget the navigability section will;

- 1) Review all federal navigability decisions to ensure that the state's title to submerged lands is properly addressed and challenge decisions that are not in the state's interest under the equal footing doctrine.
- 2) Prepare additional 180 day notices to be given to all federal land management agencies of intent to file for Quiet Title lands beneath 300 lakes and streams.
- 3) Support the AGO on the current federal court filings for quiet title to the submerged lands beneath 195 lakes and streams. Obtain clear title to over 300,000 + acres of state owned land.
- 4) Prepare navigability reports necessary to assert and defend the state's title to submerged land that contain oil and Gas, mineral, and gravel resources.

The navigability section cannot do the following under the submitted budget;

- 1) Continue to support the Water Resources Board.
- 2) Properly inventory and distribute accurate graphic depiction (maps) of the current status of the Quiet Title filings in federal courts.
- 3) Collect required physical field data to support the Quiet Title actions in federal court.
- 4) Identify state owned submerged lands within the Mental Health Trust settlement.

**DIVISION OF WATER  
WATER MANAGEMENT AND DEVELOPMENT**

It is estimated that Alaska has 30,000 streams and over 3,000,000 lakes with 40% of the Nation's surface water resources. The WMDS has 8.5 professionals managing this vast resource. Two of these positions are currently vacant due to budget constraints. It is estimated that 82.2% of the water needs in Alaska are from surface water sources and 17.8% are provided from groundwater. This same water, necessary for day to day use for domestic supplies, commercial, or industrial development, also provides for the unique Alaska experience by adding to Alaska's scenic wonders, rich fish and wildlife resources, and recreational and cultural values.

The WMDS is statutorily responsible for permitting any significant water use in the State. This section currently has a backlog of 1,661 casefiles that require action in FY93. As a result of permit consolidation and process streamlining, the section has kept this backlog from increasing, but, if adequate funding is not obtained, the backlog will increase to over 1750 casefiles by June 30, 1993. The WMDS anticipates a number of new projects starting this spring, including increased drilling activity on the North Slope, Goat Lake Hydroelectric project near Haines, Black Bear Lake Hydroelectric project, the new Elmendorf Hospital, Terror Lake Hydroelectric project amendment, Leanne Lake Hydroelectric project (Kodiak), Tazimina Hydroelectric, and the New State Court Building (Anchorage).

**WMDS PRIORITIES**

1. Adjudication of water rights applications > 500 gpd and Temporary Water Use Applications
2. Expired permits
3. Regulations, annual administrative service fees, and water appropriated and sold by the State.
4. Compliance with AS 46.15.040 and AS 46.15.180.
5. Planning team / Task Force work/ pre-application work
6. Water rights applications < 500 gpd and Instream Flow
7. Permit coordination ( state, federal and local agencies)
8. Policy and Procedure (regulations)

In FY 92 the WMDS averaged 2.8 persondays/casefile. Based on a current backlog of 1661 adjudication actions (507 pending applications, 802 expired permits and 352 applications expected in FY93) it would take 4597.6 persondays to adjudicate the pending and backlog files, or 20.5 people a year working 37.5 hours per week, taking into account normal leave and holidays. Each existing water manager (7.5 people) within the WMDS would be responsible for 221 files which would take them 2.75 years to complete and would not include, future applications, water resource planning, task force participation, regulations review or drafting, permit coordination, policy & procedures review or drafting, special or large project reviews or any other water management function normally done on a day to day bases.

The proposed FY94 budgets will result in an increase in the backlog of applications and expired permits and increase in the time it will take to adjudicate a water rights request. Of the priorities listed above, the WMDS will have trouble doing an adequate job on the first three and will not be funded to do the required work listed in priorities 4-8.

# **CORRECTION**

**THIS DOCUMENT  
HAS BEEN REPHOTOGRAPHED  
TO ASSURE LEGIBILITY**

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## DAM SAFETY & CONSTRUCTION

A realistic analysis of the proposed FY 94 budget for the Dam Safety & Construction Section reveals a very dismal picture for supervision of the safety of dams with the State of Alaska. The only real dollars available to the program will be the 56.3 General Fund money. Realistically, no significant federal funding or program receipts are anticipated. This general fund money will provide approximately 7 months of personal services for the State Dam Safety Engineer (PCN 10-1679)(the only position in the program) and no funding for 200 - 500 items.

Work planned for accomplishment is identified in the Division of Water Tactical Plan. This work includes continued work on issuing permits for dams associated with the AJ, Kensington, and Fort Knox Projects; insuring that statutorily required owner inspections of dams are accomplished; insuring owner completion of emergency action plans for high risk dams; maintaining and updating the inventory of dams; and assistance to local governments in dealing with flood and erosion mitigation. However, the funding which will be provided in the proposed FY 94 Budget will severely limited the amount of work which will be accomplished in the above areas.

It is estimated that issuance of the statutorily required permits for the AJ, Kensington, and Fort Knox Dams will be delayed. The schedule of statutorily required owner inspection of dams will not be maintained, creating the possibility of undetected threats to lives and property. Emergency Action Plans which detail coordinated actions of the dam owner and the local emergency management agency will not be completed, leaving the public at risk in the event of an emergency involving a dam. The inventory of dams, the data base from which the program is operated, will not be updated in a timely manner. This causes hazard classifications not to reflect real conditions and impedes the correct scheduling of inspections. Assistance to local governments for flood and erosion mitigation will be severely curtailed.

In short the Dam Safety and Construction Section cannot operate effectively under the proposed FY 94 budget and cannot fulfil its statutory responsibility for protection of public safety. A more immediate problem will be the certain delay in the issuance of permits for dams for large mining projects which will affect the Alaskan economy in a positive way.

## DIVISION OF WATER WATER MANAGEMENT AND DEVELOPMENT

It is estimated that Alaska has 30,000 streams and over 3,000,000 lakes with 40% of the Nation's surface water resources. The WMDS has 8.5 professionals managing this vast resource. Two of these positions are currently vacant due to budget constraints. It is estimated that 82.2% of the water needs in Alaska are from surface water sources and 17.8% are provided from groundwater. This same water, necessary for day to day use for domestic supplies, commercial, or industrial development, also provides for the unique Alaska experience by adding to Alaska's scenic wonders, rich fish and wildlife resources, and recreational and cultural values.

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## Water Right Backlog as of 1/1/93

Southcentral	230 Single Family Applications Pending (some dated 1985)
	169 Commercial Applications Pending
	275 Expired Permits requiring action
	74 Permits to expire in FY93
	50 Temporary Water Use Applications expected in FY93
	180 New Water Rights applications expected in FY93
Northern	12 Single Family Applications Pending (some dated 1985)
	24 Commercial Applications Pending
	271 Expired Permits requiring action
	43 Permits to expire in FY93
	40 Temporary Water Use Applications expected in FY93
	40 New Water Rights applications expected in FY93
Southeast	11 Single Family Applications Pending (some dated 1984)
	61 Commercial Applications Pending
	125 Expired Permits requiring action
	14 Permits to expire in FY93
	12 Temporary Water Use Applications expected in FY93
	30 New Water Rights applications expected in FY93
WMDS Backlog	507 Applications Pending
	671 Expired Permits requiring action
	131 Permits to expire in FY93
	102 Temporary Water Use Applications expected in FY93
	<u>250</u> New Water Rights applications expected in FY93
TOTAL BACKLOG:	1,661

Commercial Applications include: Industrial, agriculture, mining, construction, hydroelectric, seafood processing, public water supplies (cities, towns, and villages), logging, oil and gas exploration and development, instream flow reservations, community water (subdivisions), and other large water users.

## ALASKA HYDROLOGIC SURVEY

FY 94 Projected Task Potential (based on "requested budget")

### BACKGROUND:

The extreme difficulty in closing out FY 93 using the FY 93 general fund and other budgets has shown that many of the projected accomplishments of the Alaska Hydrologic Survey (AHS) are not reasonable to expect in FY94. The AHS is composed of 12 scientists and two administrative personnel, and requires a yearly budget of about \$1,100,000.00 dollars. The general fund budgeted amount of \$613,700.00 approximates one half of the necessary budget for operation of the AHS.

In past years general fund shortfalls have been made up through CIP, Interagency, Federal and Program receipts; BUT these other funds have never equalled one half of the needed budget. During FY 93 the \$360,000.00 received is the largest amount the AHS has received from other sources in the history of the section. A single RSA from DOT for \$170,000.00 accounts for the increase in the FY 93 "soft money". Such a large single contract is not expected in FY 94.

### PROJECTION:

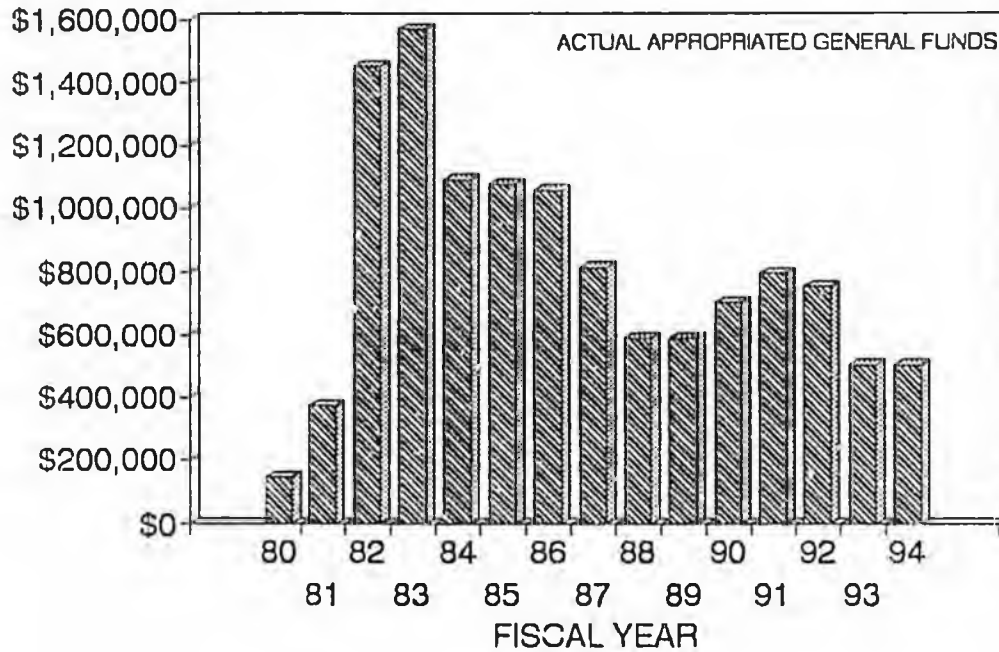
The FY 93 funds are **not adequate** for the AHS to operate at full strength for the fiscal year. Extreme measures of VLWOP, shortened work week, reorganization and potential layoffs threaten the continued performance of the AHS. **FY 94 projections are a continuation of this critically inadequate budget.** Therefore, only minimal important tasks and projects will be accomplished. A summary follows:

- Limited Navigability technical support
- Very few streams gaged for streamflow monitoring
- Reduced technical data for management of Alaska's waters
- Some data and analyses for development of Alaska's natural resources (minerals, timber, agriculture, oil and gas, tourism, parks, community water supplies).
- Maintain a ground water database but with no expansion of the database
- Provide limited information to public and agency requests for hydrologic information
- Operate a water quality laboratory at minimal levels
- Conduct site-specific projects, through contracts, for agencies or organizations

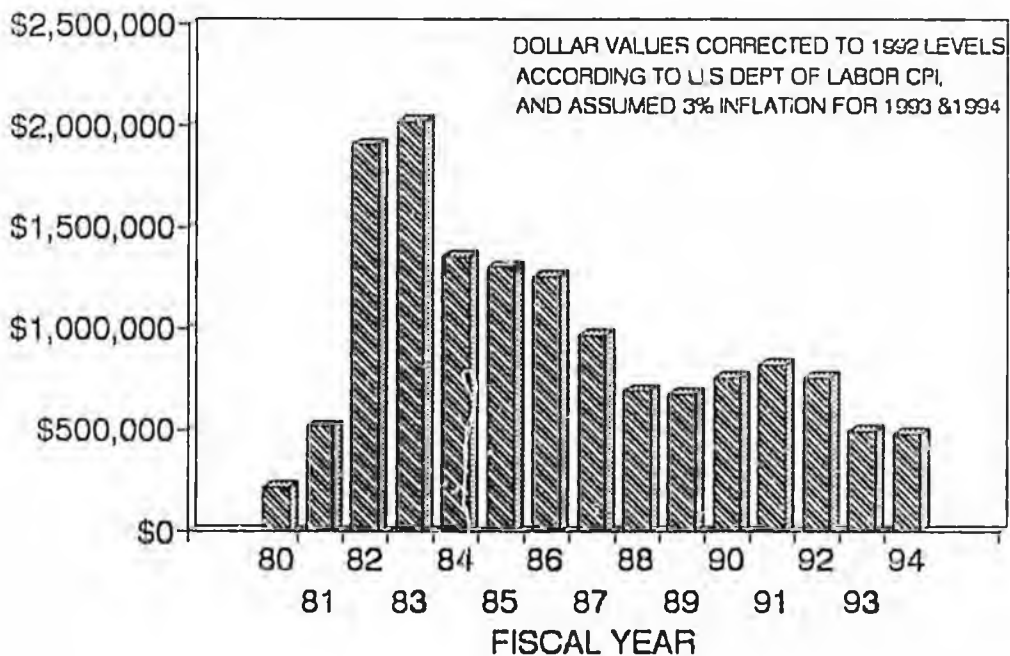
A general fund budget level of 50% of needed funds reduces the critical mass of scientific personnel necessary for projected operation and the following items **will not be achieved:**

- Technical navigability determinations
- USGS cooperative matching program for stream gages and well monitoring
- Wetlands evaluation and technical support
- Improvement and expansion of surface water and ground water databases
- Erosion and flood evaluation and interpretation
- Support through water resources data and information for development of other natural resources including fish and game.
- Evaluation of placer mining waters to stimulate mining in the state
- Strong state involvement in analyzing Kenai Peninsula ground water
- USGS stream gaging and cooperative program
- Assistance for providing drinking water for villages, promoting public health and safety

## HYDROLOGIC SURVEY BUDGET HISTORY



## HYDROLOGIC SURVEY BUDGET HISTORY



DNR reductions-closeout-final

FINAL-House Finance DNR budget subcommittee			
BRU/Component	GF Reduction	PR	Comments
Management & Admin			
Commissions-CACFA	(89.0)		Proposed by Dept - Eliminates CACFA staff
Resource Development			
Water Development-hydrology		(300.0)	Unrealized Program receipts
Oil & Gas Cons. Comm	(52.6)		Proposed by Dept-reduce vacancy, eliminate 1 engineer
Oil & Gas Development	(102.0)		Dept. Proposal 205.0 will need Fiscal Note for new legislation
Mining Development	(45.0)		Proposed by Dept-Admin asst. position
Land-Mining Reclamation		(83.3)	Proposed by Dept-Unrealized Program Receipts
Geological Development	(118.0)		Proposed by Department - 5% scenario eliminates GF increment
Land-Public Information Center	(360.0)	270.0	Partial change to PR
Water Development	(175.5)		eliminates GF increment
IRM-Status Graphics	(110.0)		Proposed by Dept-Verif. of graphic land records-reduces quality control
Land-RPL		(33.9)	Recreation Rivers-leaves 21.6
Land-RPL		(30.0)	Publications-leaves 25.0
Parks & Rec. Mgmt	(175.0)	175.0	Proposed by Department-Increase PR auth. Park maint. and operations
Challenge Alaska	(35.0)		Proposed by Department-eliminates grant
Agricultural Development			
Nursery Operations	(100.0)		Prop by Dept-Poss. Fed funds, incorp w/PMC,Priv seedling producers
Foundation Seed Production	(36.2)		Prop by Dept-rely on private producers-1PFT to 1PPT, reduce equip
S&W Board Travel	(18.6)		Prop by Dept-travel reduced, rely on teleconf, seek other sources
State Fairs	(43.3)		Leaves 75.0 for statewide fairs
Kawerak Reindeer Grant	(13.3)		Proposed by Department-eliminates grant
<b>TOTAL</b>	<b>(1,473.5)</b>	<b>(2.2)</b>	

# STATE OF ALASKA

## DEPARTMENT OF NATURAL RESOURCES

### DIVISION OF WATER

WALTER J. HICKEL, GOVERNOR

3601 C. Street  
P.O. Box 107005  
Anchorage, Alaska 99510-7005  
Phone: (907) 762-2575

March 29, 1993

Representative Con Bunde  
House Resources Committee  
State Capitol  
Juneau, Alaska 99801

Representative Bunde:

During the meeting between the State Water Resources Board and the House Resources Committee you offered some comments and criticisms that I, and members of the Board, felt needed response and clarification. But first, let me express my appreciation for your statement of appreciation to the members of the Board who are truly volunteers in that they pay their own travel, room and board, and take time away from their jobs to serve on the Board. As you know the legislature did not fund this board last year and we anticipate that it will not be funded again in FY94 based on both House and Senate Finance Committee efforts.

When the Division of Water was created in June of 1991, although authorized in statute in the early 60's, it was immediately faced with efforts by private companies to export bulk quantities of water from Alaska. In fact, one export permit had already been approved. As Director, I was initially very skeptical of the economic and environmental viability of such an enterprise. As Director of a resource agency, and consistent with law, I maintain a reasonable level of skepticism. I was also very concerned that, under existing law, the state had no mechanism to receive any revenue for such exports or adequate statutory guidance in permitting exports. As a result, and with the Governor's support, we presented the legislature a Water Fees Bill, a portion of which passed during the first special session in 1992. This legislation authorized the assessment of a Conservation Fee for any water removed and not returned to a Hydrologic Unit. Although the state is constrained by the US Constitution (Commerce Clause) from assessing "export" fees, this law now allows fees to be assessed in a manner that we believe will withstand challenge. As Director, I was able to convince one of the leading firms attempting to export water from Alaska to support the legislation in formal testimony.

The efforts of the Division of Water, in response to bulk water exports, are driven by law, regulations, permit applications, constant inquiries from around the world, and the pressing need for new jobs and new revenue for the state. Any person may apply for water rights from the State of Alaska. But we are concerned that the State have some understanding of this new industry, its market demands, transport logistics, economics, its viability - in the long-term interest of the State. Because of these concerns and the requirements we must consider "in the public interest" in our permit adjudication processes, the Director has spent a small portion of his time - with very limited assistance from the Hydrologic Survey and Water Management Sections as well as the US Geologic Survey, US Forest Service and other federal and state agencies - attempting to understand and guide the water export industry "in the public interest".

We have provided a map of "potential" export sources to steer applicants away from areas of conflict. One application has been withdrawn at the Director's request as it would have impacted a federal wilderness area. Another application will be withdrawn as it could impact recreational uses, again at the Director's request. The Director concluded that rather than continue to second guess applicants and spend limited funds responding to applications that are not realistic, we should give some direction to areas that may be more accommodating.

Although the Director has received dozens of requests to speak before various interest groups, media, and water districts in the southwestern states, due to very limited travel only a few invitations have been accepted and then in most cases coordinated with other out-of-state travel already required. In most cases, tele-conferencing is used. An annual report of expenditures by the Division on water exports is provided, as required by statute, in January of every year. I have enclosed a copy of our latest report.

Late last year, it became clear that the general issue of bulk water exports was becoming more and more complex, technical, and the same questions were being asked and answered. In an effort to use limited resources more productively, a discussion paper was crafted by the Director addressing key issues. This paper continues to be updated as new information becomes available. The paper has been reviewed by most of the top leaders in water management in the western states, financial groups interested in financing private efforts to export water from Alaska, national publications on water issues (with very positive results), marine transport experts, and many critics. With this discussion paper, we respond to most inquiries in the following manner: 1) Upon request we provide copies of the discussion paper to the group or person expressing interest at a fee of \$8 plus \$2 handling and postage. 2) A tele-conference is then scheduled in 10 to 14 days to discuss concerns or further interest. 3) If it is necessary, and the Director will be in the area of the party expressing interest while attending a Western State's Water Council meeting, at which he represents the Governor and the State of Alaska - a meeting may be scheduled. 4) An invitation is extended to the party expressing interest to visit Alaska. For example, the Director of the Colorado River Commission visited Anchorage and Juneau last year, nine "new leaders" from Mexico visited this month.

By using the discussion paper, tele-conferences, insistence that the party visit Alaska, or by trailering meetings at times the Director may be in the area - we have greatly increased our productivity, kept costs to a minimum, and returned revenue to the state as market representatives visit Alaska. In July of this year, at the invitation of the Director, over 100 experts from the southwest will visit Alaska (spending an estimated \$63,000 in our economy) and many will spend up to two weeks on business and personal travel in our state.

But why do any of this? If the use of water can pay for the management of water and generate a perpetual revenue stream that can begin to address the host of other water problems in Alaska - is that not good public policy? With the export of one million acre feet a year, spread across many sources in order to limit any impact, the Division can stimulate the creation of hundreds of new jobs and generate initially \$20 Million a year in fees alone for the state treasury. This is NEW revenue, from a resource that is more renewable than trees, fish, wildlife, minerals, oil or gas, and land. With over 300 million acre feet a year discharged in SE Alaska alone, and one billion acre feet discharged from Alaska every year - this is a very small amount of water to Alaska. It is however, a lot of water to the southwestern states.


Can we export bulk quantities of water in a sustainable and environmentally sound manner? Alaska statutes are generally considered the toughest in the west. Our "public interest" considerations are a model copied by other states, including Nevada this year. Our instream reservations for fish, required in any source adjudicated for export, are clear and specific. Our other instream protection laws are also a model for western states. As I often say, I can not permit the export of water necessary for the State - the water must clearly be surplus.

But you commented that, in essence, there is no such thing as "surplus water". The Division of Water, consistent with law, permits the taking and use of water for hundreds of sources for hundreds of commercial and industrial, domestic, and public drinking water uses daily. Our instream adjudications for fish have illustrated that in many cases there is surplus water even in streams with fish. But what about estuary impacts? This is an important question that must be examined on a case-by-case basis depending on the character of the source under application, the amount requested, and the area within which the discharge is located. We have made it very clear, from the beginning, that any environmental impacts that must be assessed will be done at the cost of the applicants.

But now comes the difficulty. How can the state adequately adjudicate permits and review environmental impact studies if the skill/talent bases needed to do so is cut from the state budget? The House and Senate proposed cuts in the Division, with programs already reduced by almost 70% in the last ten years, will harm our efforts to protect the public interest and responsibly apply state laws and regulations.

I have enclosed for your review a copy of the water export discussion paper and an assessment of the impacts of FY94 cuts on our ability to protect the public interest and responsibly manage our water resources. Those that understand the basic essential of water in any economic activity in Alaska understand that cuts in these budgets are harming jobs, economic growth, and economic diversification rather than accelerating it.

If you desire any additional information or would like an opportunity to discuss our efforts to serve the people of Alaska please let us know.



Ric Davidge  
Director of Water

Enclosures

cc: Raga/Olds  
Water Board

# ALASKA

*40% of our Nation's Freshwater Resources*

## ***WATER EXPORTS***

A discussion paper of key issues involved in moving bulk quantities of water from Alaska to the southwestern states and Mexico using marine transport.

Developed by

**Ric Davidge**

Director of Water  
Department of Natural Resources  
State of Alaska

(907) 762-2294

This paper will continue to be updated as new information becomes available.

March 17, 1993

# POTENTIAL WATER EXPORT SITES IN SOUTHEAST ALASKA

## LEGEND

- ★ Hydro-Electric Facility with Development
- ▲ Undeveloped Site

### Juneau Area

- 1) **Long and Crater Lakes (Snettisham Power Project):**  
These two lakes form the Snettisham Power Project that uses approximately 350,000 acre feet of water per year. The hydroelectric facility is located at tidewater. The combined drainage area is over 50 square miles. The area receives 200 to 240 inches of precipitation yearly. This site is located just south of Juneau and has an air strip and filled dock facilities.
- 2) **Tease Lake:**  
Tease Lake is a small lake located near the Snettisham Power Project. It is located just over one mile from tidewater at an elevation of 1,006 feet. The basin area is greater than 15 square miles, and receives 100 to 200 inches of precipitation yearly. There is an abandoned pipeline between the lake and tidewater.
- 3) **Turner Lake:**  
Turner Lake is located south of Juneau. It is nine miles long, and up to 1,500 feet wide. The lake is located less than one mile from tidewater and has a surface elevation of 73 feet, but is over 800 feet deep. Turner Lake has a drainage area over 40 square miles, and the area receives 140 to 160 inches of precipitation yearly.

### Sitka Area

- 4) **Blue Lake near Sitka:**  
This lake is over three miles long and up to 4,200 feet wide. The lake has a hydroelectric facility located at tidewater. The basin drainage area is over 37 square miles. The area receives 180 to 220 inches of precipitation yearly. This site is located near Sitka and has road access. From 13 years of USGS records, the average annual flow is 351,124 ac-ft.
- 5) **Green Lake near Sitka:**  
This lake is over one mile long and up to 1,200 feet wide. The lake has a hydroelectric facility located at tidewater. The basin drainage area is over 29 square miles. The area receives 180 to 220 inches of precipitation yearly. This site is located near Sitka. From nine years of USGS records, the average annual flow is 212,846 ac-ft.

### Western Islands (Chichagof and Baranof)

- 6) **Lake Eva:**  
Lake Eva is over one mile long, and 1,500 feet wide. The lake is located one mile from tidewater at an elevation of less than 100 feet with a drainage basin area of over ten square miles. The area receives 120 to 160 inches of precipitation yearly.
- 7) **Basket and Kook Lakes:**  
These lakes are located next to each other and have a combined drainage area of over 35 square miles. The lakes are located less than two miles from tidewater at an elevation less than 100 feet. The area receives 60 to 100 inches of precipitation yearly.
- 8) **Cliff and Deer Lakes:**  
These lakes are located within two miles of each other and have a combined drainage area greater than ten square miles. Deer Lake is approximately four miles long and 3,200 feet wide, and Cliff Lake is one mile long and 1,800 feet wide. The lakes are located less than one half mile from tidewater at elevations of 134 feet (Cliff Lake) and 400 feet (Deer Lake). The area receives 280 to 300 inches of precipitation yearly. From 16 years of USGS records, the average annual flow from Deer Lake is 112,215 ac-ft.
- 9) **Rosifal Lakes:**  
This is an inter-connected system over two miles long and up to 3,000 feet wide. The lakes are located less than one mile from tidewater at an elevation of 607 feet. Although the drainage area is only five square miles, the area receives 300 to 400 inches of precipitation yearly.

### Petersburg Area

- 10) **Scenery Creek and Lake:**  
Scenery Lake is three miles long and up to 1,800 feet wide with a drainage basin of 30 square miles. The lake is located four miles from tidewater at an elevation of 957 feet. The area receives 160 to 200 inches of precipitation yearly. From two years of USGS records, the average annual flow is 188,955 ac-ft.
- 11) **Cascade Creek (Swan Lake) near Petersburg:**  
This lake is over two miles long and up to 2,500 feet wide. The lake has a hydroelectric facility located at tidewater. The basin drainage area is over 23 square miles. The area receives 160 to 200 inches of precipitation yearly. This site is located near Scenery Creek and Petersburg. From 28 years of USGS records, the average annual flow is 533,563 ac-ft.

### Bradfield-Harding-Eagle Rivers Area

- 12) **Tyee Lake:**  
This lake is two miles long and up to 2,000 feet wide. The lake has a hydroelectric facility located at tidewater. The basin drainage area is over 15 square miles. The area receives 140 to 180 inches of precipitation yearly. This site is located near four other sites. From seven years of USGS records, the average annual flow out of the lake is 126,694 ac-ft.
- 13) **Bradfield River:**  
This river system drains over 63 square miles. The area receives 140 to 180 inches of precipitation yearly. This site is located near four other sites. From two years of USGS records, the average annual flow is 545,871 ac-ft.
- 14) **Harding River:**  
This river system drains over 67 square miles. The area receives 140 to 200 inches of precipitation yearly. This site is located near four other sites. From 40 years of USGS records, the average annual flow is 535,736 ac-ft.
- 15) **Eagle River:**  
This river system drains over 25 square miles. The area receives 140 to 160 inches of precipitation yearly. This site is located near four other sites.
- 16) **Annan Creek and Lake:**  
This drainage system consists of two interconnected lakes over four miles long and up to 1,800 feet wide in a drainage basin of 20 square miles. The lakes are less than two miles from tidewater at an elevation of 231 feet. The area receives 80 to 100 inches of precipitation yearly.

### Ketchikan Area

- 17) **Swan Lake near Ketchikan:**  
This lake is two miles long and up to 4,200 feet wide. The lake has a hydroelectric facility located at tidewater. The basin drainage area is over 35 square miles. The area receives 160 to 180 inches of precipitation yearly. From 32 years of USGS records, the average annual flow from it is 333,025 ac-ft.
- 18) **Margaret Creek and Lake:**  
This drainage system is over 15 square miles in area with some development. Margaret Lake is one mile long, has a surface elevation of 135 feet, and is within two miles of tidewater. The area receives 100 to 120 inches of precipitation yearly.

### Prince of Wales Island Area

- 19) **Old Frank and Mary Lakes:**  
Old Frank and Mary Lakes form an interconnected system over two miles long and up to 2,100 feet wide, with a drainage area greater than 15 square miles. The lakes are located two miles from tidewater at an elevation of 200 feet. The area receives 120 to 140 inches of precipitation yearly.
- 20) **Ratz and Eagle Creeks:**  
These two creeks are near each other, have a combined drainage area of over 27 square miles, and both contain lakes. The lake on Eagle Creek is two miles long, 2,500 feet wide, at an elevation of 80 feet and within two miles of tidewater. Ratz Creek has two small lakes at 182 and 31 feet. The area receives 120 to 140 inches of precipitation yearly.

Base map provided by USGS - Export sites and narrative developed by Alaska Division of Water



U.S. DEPARTMENT OF THE INTERIOR  
ECOLOGICAL SURVEY

Albers Equal Area Projection  
SCALE 1:2,000,000



FOR SALE BY U.S. GEOLOGICAL SURVEY  
RESTON, VIRGINIA 22092  
COMPILED 1967; REVISED 1972  
SHEET NUMBER 37

## FY94 Impacts of Senate Budget Reduction Targets

### DIVISION OF WATER

(3/30/93)

The proposed budget reduction of \$175,500 in General Funds, \$70,100 in line items 200-500, \$425,000 in proposed CIP, and \$520,000 in Program Receipt authorizations is a 40% reduction of the proposed FY94 budget resulting in major impacts to many public and private enterprises. It will also result in a drastic reorganization of the Division including the elimination of the Alaska Hydrologic Survey Section (AHS) as a separate section of the division. This reduction, combined with FY93 cuts, may require the layoff of 7 scientists from the AHS, the elimination of the Federal/State Cooperative Water Data Collection programs, the elimination of DNR's support of the Alaska Water Resources Board, and future participation in the Western State's Water Council.

It is estimated by the US Geologic Survey that Alaska has 30,000 streams and over 3,000,000 lakes with 40% of the Nation's free flowing surface water resources. In addition 75% of Alaska's water is frozen in glaciers and permanent snow fields. The Division of Water (DOW) has only 25 professionals statewide managing this vast resource. The proposed FY94 reduction will result in a 28% staff reduction. DOW's options are very limited. The programs in the Division of Water have seen a 66% reduction in General Fund Authorizations and a 60% reduction in staff since FY83. The knowledge and understanding of our waters are essential to accelerated economic diversification and sound resource development; and, as required by statute, the AHS is responsible for the collection, storage, and dissemination of this knowledge.

A reduction of \$30,200 from the travel budget and \$53,400 from the contractual budget of the Division will make it impossible to continue the critical and essential field work and permit monitoring required to effectively manage the use of water in most areas of the state. Also the already limited travel essential to generate additional revenues (\$20 million annually) from water exports will be further hindered, resulting in costly delays in implementing the water export program in response to pending applications.

The Alaska Hydrologic Survey plays an essential role for the Division and also for the other users of water resource data. Much of the hydrologic data used by water managers (state/private) for the purpose of decision making on projects is collected, stored, and disseminated by the Hydrologic Survey Section. The loss of any of our highly specialized Alaskan experienced (130 years) hydrologists will hinder the State's permitting functions, not only in DNR but in DEC, ADF&G, and OME/DGC, as well as the private sector in their planning and permitting for project development.

As a result of FY93 legislative cuts, and projected revenue short-falls, beginning April 1, 1993 the Division will go on 30 hour work weeks with most sections closed on Mondays. The Division is also implementing layoffs due to FY93 legislative cuts. Any cuts to the FY94 budget will greatly compound this problem and will result in additional layoffs and project delays that will be quickly felt by the public and private sectors. The Senate proposed cuts in FY94 will result in significant permitting delays, fewer navigability determinations, fewer dam safety inspections, and, most of all, a serious decline in the collection and evaluating of hydrologic data that is essential to support Alaska's economy and the water management responsibilities of the Division, other state and federal agencies, and the private sector. These impacts will be felt from small residential subdivisions to major mining projects.

Any delays in water use permitting, dam safety inspections, or navigability determinations resulting from additional budget cuts will also expose the state to unnecessary and costly litigation, for failure

to protect the rights of the public, and water users as required by law, and for failure to issue permits within a responsible time. Additionally, opportunities would be created for groups interested in stopping or seriously delaying projects such as Fort Knox, AJ Mine, and Kensington Mine.

### Office of the Director

The Senate note that a \$175.5 "increment" in the Director's Office be denied is incorrect. The \$175.5 is a total of all changes (which are not increments) in the Division of Water, not in the Director's Office. In addition, there are no (Senate notes 3) new positions in the Division other than the one proposed as a part of the CIP budget.

An increased authorization of \$70.0 has been requested for the Director's Office in IA revenue to continue to cover Mr. David Orr, who is on temporary duty with the Department of Commerce and Economic Development as the leading expert on the Northern Sea Route opening Europe to Alaskan markets. Mr. Orr was transferred from the former Policy and Procedures Section in the Division of Water to this position. As noted in the budget presentation the Policy and Procedures Section was eliminated as a result of FY93 budget reductions and the responsibilities of this section assumed by the Director and the Chief, Water Management and Development Section.

Included in the budget of the Office of the Director is the budget for the State Water Resources Board. This board was not funded in FY93 although it continues to exist and the Division is still expected to pay travel, per diem, space rent, staff support, supplies, notice publication of all meetings, etc. Although travel and per diem are not being covered in FY93 all other costs had to be covered resulting in a deficit. The cost of the Water Resources Board is \$28.7 in the Director's Office budget for FY94. The House Finance Committee has recommended denying this component. DNR has reluctantly agreed to this cut. If this cut is sustained by the legislature, the Division will no longer provide services to the Board.

The Director of Water functions as the only staff person in the Division dedicating a portion of his time developing new revenue sources for the state. The development of a new industry in response to market demand and pending applications, has the initial potential of generating \$20 million in NEW annual revenue to the state in Conservation Fees alone. The Division currently has four applications for export of close to 500,000 AFY. The Director has developed a discussion paper on the viability of bulk water exports that has attracted national attention and is hailed as an important development in the market area (southwestern states and northern Mexico) as many southwestern states and water districts try to find NEW WATER.

Southern Nevada will be out of water by 2006, northern Mexico will be out of water by 2005, and California will have a 4 - 6 million AF deficit by 2010. All water experts agree that the first decade of the next century (in 10 years) will face a water crisis, even with normal annual rain fall. The market is in demand, Alaska has the supply (40% of our Nation's free flowing fresh water), and the annual export of 1 million AFY from Alaska to this market opens significant new economic opportunities in SE Alaska and creates hundreds of new jobs.

Without adequate personnel and travel funding, in general fund dollars, until revenues from water exports can support the effort in late FY95, the development of this new economy will falter. Alaska must be in the forefront, with strong visible support of water exports, or the market will not take seriously what has already been accomplished and others will meet this demand.

Since the creation of the Division of Water less than two years ago, significant tasks have been accomplished. Alaska now has its first Water Management Policy, signed by the Governor after extensive public and agency review. Alaska has passed nationally prominent legislation assessing conservation fees for water taken out (exported) of hydrologic systems. Alaska is the first state to establish a federal/state water management council which institutionalizes interagency coordination and collaboration (22 state and federal agencies, the University of Alaska, and the Alaska Water Resources Board) on water management. Major efficiencies have been identified in permit coordination, processes streamlined, data standards established, etc. None of these accomplishments

would have likely occurred without the creation of the Division of Water which started with fewer staff in water management then before it was created.

The Director of Water also is the point person for the Department of Natural Resources on wetlands issues. As the state attempts to secure a Statewide General Permit and "activity" or "regional" general permits, the role of DNR in wetlands management has become more and more critical. Although DEC is preparing the wetland management regulations under an EPA grant, it will be DNR that eventually manages state owned wetlands. Without adequate funding for the Director, this essential function will be lost - at the most critical time in the development of this program which will allow Alaska to manage its own wetlands.

One of the most important network contacts of the State of Alaska on all water issues is the Western State's Water Council. This council of 17 western states, a subgroup of the Western Governor's Association, is THE most important water issues group in the west. With important Congressional re-authorizations of the Clean Water Act, the Endangered Species Act, the Drinking Water Act, etc. Alaska's voice will not be heard if the Director of Water, who represents the Governor and the state, is not at the table. Without adequate personnel, travel, and contractual services funding - this key function will be lost.

Finally, because the Director of Water is responsible for the management and development of our water resources, he provides an important and often different point of view in resolving resource management conflicts in Alaska. As almost every significant project requires water, his responsibility as a resource manager, rather than pollution mitigation which is principally the role of DEC, provides an important balance. Without this position, this perspective will be lost.

#### **Water Management and Development Section**

The Water Management and Development Section has the statutory responsibility to determine and adjudicate rights to the use of the waters of the State of Alaska and to administer the Water Use Act. **Any person using water in excess of 500 gallons per day without a permit is subject to criminal penalties including possible fines and jail.** The Water Management and Development Section has a current backlog of 1,661 water permitting actions. Of these backlog case files, many are requests for water use associated with large scale development projects, commercial construction, business expansion, public water supplies, village safe water projects, and individual homes. These are projects that are located in all parts of the state from the oil and gas fields of the North Slope, to placer mines in the interior and along the Canadian border, to new commercial development in Anchorage, to expanded seafood processing in Unalaska, to new or expanded public water supplies in every populated area of the State, to major hard rock mining in Fairbanks and Juneau. These projects effect hundreds of jobs in all walks of life, including contractors, consultants, labors, suppliers, special interest groups, and the general public. The common denominator is they all require water and the right to use water. Their receipt of a permit granting the right to use water helps protect the investment they have made in Alaska. Attached is an example of projects that this section is currently working on, and with 250+ new case files a year and the current backlog in permitting actions, most of these projects will continue to be open during FY94.

#### **Dam Safety and Construction Section**

The Dam Safety Program is statutorily responsible for issuing permits and reviewing structural design and public safety concerns on activities related to almost 100 existing impoundment structures. The Dam Safety Engineer is already only funded for 9 months of the year. Without this program many annual or semi-annual inspections will not be conducted putting at risk both life and property. Without sufficient travel funds critical inspections can not be conducted. As new dams are constructed in the state to facilitate resource development or to provide drinking water or power, the safety and reliability of dams will be in question without certification by the state Dam Safety program. Currently this program is working on major dams associated with the Kensington Mine, AJ Mine, and Fort Knox Mine.

## **Navigability Section**

The Navigability Section is already under funded and is struggling to keep up the complex workload that is being requested for it. A contractual, travel, and personnel reduction in this two person section will result in significant harm to the state's efforts to secure title to 14 million acres of submerged lands.

The Navigability Section will not be able to support ongoing litigation to assert and defend the state's title to 14 million acres of submerged lands. This is a two person section with highly specialized knowledge of navigability criteria, statutes and case law. It is vital that this staff continue to be supported if the state is to aggressively assert its ownership to submerged lands. Many of the 14 million acres of submerged lands have oil, gas, coal, gravel, and mineral potential. When we prove that these lands belong to the state the federal government must allow the state access. The submerged lands in ANWR alone may add millions of dollars to the general fund and the Alaska Permanent Fund from oil and gas development. The federal courts are currently supporting states rights, however, this is expected to change over the next two years. The Division and AGO have filed Quiet Title for 195 lakes and streams and anticipate another Quiet Title Notice of up to 200 additional waterbodies by the end of FY93.

**The federal government is selling gravel from land that rightfully belongs to the state in the pipeline corridor.** We will not be able to gather the data needed to challenge this federal trespass and prepare the documentation to enter into litigation. The state is and will continue to lose significant revenue from gravel and material sales - taken by the feds. It is critical that Alaska assert ownership to these 14 million acres as soon as possible.

This section will also not be able to assist Skagway and other communities resolve land title issues along navigable waterbodies. Owners and occupiers of land along navigable waters will not be able to clear their titles and thus be unable to borrow funds for improvements or sell their lands.

## **The Alaska Hydrologic Survey**

Senate proposed cuts in the Alaska Hydrologic Survey, combined with FY93 reductions, will result in the reduction of professional staff from 11 to 4 scientists. This is because a significant amount of other funds are generated by those supported by General Funds in this section. Such a staff reduction, in the most fundamental water resource inventory and use staff will destroy the Hydrologic Survey. This action will have drastic impact on economic, social and political activities in Alaska.

Community Water Supplies - Ground water and surface water databases and technical files have been developed and have been used regularly over decades to solve water supply crises for communities from the largest (Anchorage) to the very small Eek, Gambell, St. Paul, Slana, Kenny Lake, Elfin Cove, and many more. The data and expertise used to solve the water supply problems for these Alaskan communities can only come from a long-term ongoing hydrologic program dedicated to the mandate of Alaska statutes that require the collection and distribution of data on the surface and subsurface waters of the state.

In the Kenai Peninsula, the AHS has been the key agency in coordinating a massive state/federal/private investigation of the ground waters and aquifers in the vicinity of the industrial complexes of the peninsula. The results of this investigation, supported financially by industry and the local borough, will allow the Kenai Peninsula to continue to develop in the manner planned. Industry will continue to be able to provide a stable economic base for residents. Local communities will have abundant high quality water, the rivers will continue to provide outstanding runs of salmon, the forests will flourish, wildlife will have critical habitat, tourism will experience abundant clear, pure water for lakes, streams and in the motels and hotels. In order for all this life to occur we must know, understand, and responsibly manage the water resources of the Kenai. This is a single example of the essential and critical role of the Division of Water, Hydrologic Survey.

Petroleum Development - Wherever exploration and development of oil and gas occurs, water must be available and managed. Water is needed for road and pad construction, drilling operations, and for the workers. AHS projects from Cook Inlet to Prudhoe Bay provide critical information and advice requested by industry and state regulators to assure successful resource development operations and management of state owned resources. AHS will not be able to identify and quantify water sources for use and/or protection in the arctic and this lack of information will delay or stop responsible resource development.

Evaluation of river erosion and review of flood/erosion control installations will not be available to pipeline managers and regulators. An example of such work is the AHS evaluation of erosion impacting a bridge across the Theodore River in the Cook Inlet area. The investigation resulted in the design of a mitigation structure protecting the Unocal bridge and road as well as protecting the wildlife and fish of the area as required by law. Intelligent use of water information serves all aspects of our economy and society.

Mining Development - Detailed and extensive water data are critical and required for mining to occur in the state. AHS has actively participated in monitoring of stream flows and the quality of the waters in the streams for more than a decade. Sediment transported and its effect on the habitat for fish and for public water systems has been the focus of AHS investigations in the Birch Creek mining district. Results continue to be essential to the mining industry and to state and federal regulators. Studies of the sediment transported by the streams draining the Usibelli Coal Mine are critical to the ongoing success of a very progressive and productive mining operation. Water information also provides essential knowledge to mining law regulators who review and permit mining. **The water data must be present for mining to proceed. Miners and regulators both require data. THE AHS PROVIDES THE CRITICAL INFORMATION NEEDED.** This critical function will disappear if the AHS is eliminated.

Fish and Game Habitat - Water in streams and lakes must be present for fish and game to survive. State resource managers, hunters, recreational users all agree. But how much water is needed, how much water is there to be shared with all the other uses and activities? These questions create management conflicts and costly delays. Water data for managing Alaska's fish and wildlife is critical. AHS hydrologists investigated the waters of Potter's Marsh and accurately described the sources of water and the quality of the water. From this information the Division of Parks was able to maintain a high profile and successful water fowl viewing area. Critical water data makes possible good habitat management.

Agriculture and Forest Development - The necessity of water for agriculture is obvious. Farmers must know the amounts of water available in the ground for wells and in the streams, if they are to be used for water. The harvest of forests must be conducted in such a way that streams are minimally impacted and habitat continues to be productive. Water data are required for agriculture, the timber industry, and for the managers of state resources. Erosion can destroy valuable agricultural and forest land. AHS provides streamflow and precipitation monitoring in the Delta Agricultural area. The data are critical to designing erosion protection measures resulting in protection of soil and extremely unique habitat...especially the Clear Creek fishery. Ground water, surface water, precipitation and geography have combined to create year-round flowing water and outstanding fish habitat.

Stream Gaging and Network Evaluation - Stream data must be present for any activities occurring on state, private or federal land. The FY94 CIP request for funding of regional stream gaging stations and a critical network evaluation is essential. These basic tools provide the data used and necessary for the resource development scenarios discussed above as well as many more.

An example is hydropower development. Streamflow data is absolutely critical. AHS has measured flows at Cordova, Atka, Unalaska, Umnak, Elfin Cove and other locations to evaluate power generation potential. Federal and state budget cuts from past years have nearly eliminated the

state/federal cooperative stream-gaging programs. This data must be made available again. Federal matching funds double state dollars with this CIP.

### **Capital Projects**

The proposed CIP projects are essential in water management decision making. The state is entering an important era in its resource development history, with many large resource projects planned or under consideration. The proposed CIP projects will help fill a major water resource data gap which will result in money saved as decisions on project locations, environmental effects, and permitting will be made with knowledge of the water resources and water's effects on the development and the development's effects on water and its dependent resources such as fish and wildlife. A sound water resource data base, which Alaska lacks, can save millions of dollars - demonstrated by millions wasted in the past by not having adequate data to make development decisions.

### **Stream Gage Network Evaluation/Regional Gaging Stations**

For years the State Water Resources Board has called for a cooperative stream gaging network evaluation and the establishment of regional gaging stations. This is a cooperative state/federal effort that leverages an equal amount of federal funds. The network evaluation will determine where we need regional gages that allow the state and federal agencies to manage and develop our water resources. This is a most fundamental tool in water management. Once accomplished it will save not only state and federal agencies significant dollars it will also save the private economy significant costs and time delays which could stop projects. This CIP was endorsed by the Alaska Water Management Council (22 state/federal agencies and the Univ of Alaska) as one of the highest priorities for the state in water resource management.

Without the network evaluation and regional gaging stations private projects will have great difficulty designing, securing permits for, and developing major resource or transportation projects. The general rule is without 10 years of stream flow data it is very difficult to analyze water related impacts to projects. Regional gaging, with the network evaluation can allow area or regional extrapolations or synthetic data to be developed for assessing specific project impacts.

### **STORET System Completion**

One of the most fundamental tools for water resource management is an information system that assists an adjudicator in understanding cumulative allocations and water quality relationships. The Division of Water has a system that is over half completed, but not usable. With these capital funds, and with federal funds from EPA and BLM, this system can be completed.

The completion of the STORET system has also been one of the highest priorities of the State Water Resources Board and was recently endorsed by the Alaska Water Management Council as one of its highest priorities. The completion of this system will greatly increase the productivity of water adjudicators in issuing water development permits allowing some progress on the growing backlog (1661) of water rights case files. Without this essential tool the cost of water permitting will grow due to the inefficient necessity to manually review all case files for a waterbody prior to issuing permits. This includes groundwater allocations that may be interactive with surface water sources.

Navigability - Unless Alaska asserts ownership of its 14 million acres of submerged lands, and supports the required litigation to secure actual title to these extremely valuable resources and access they secure, efforts in Congress may be successful in stopping Alaska from receiving its statehood entitlement to these lands. We have proposed a capital project that supports the acceleration of field work critical and essential to securing title to these lands. Proving a waterbody is navigable under the current legal standards requires field investigation, especially of the upper limits of a stream. This CIP request will be augmented by volunteers in the field that are being organized by the Division to greatly extend the dollar per stream mile productivity of this effort. With the change in the federal

administration, sympathetic federal courts are expected to change within the next two years in their strong support of state's rights in this area.

Since statehood, Alaska has only secured title to about 20 streams. Only a federal court can transfer title to the state. We have accelerated Quiet Title Notice to secure title and currently have almost 200 waterbodies ready for court action. By the end of FY93 this list will expand to well over 400 waterbodies. The longer we delay, due to lack of adequate funding, the greater the cost and the likelihood we will not secure title.

The submerged lands and navigable waters in ANWR are a clear example of the significance of this effort. With state title we not only secure "state controlled" access but also ownership of the oil and gas contained in those submerged lands.

#### Wetlands Investigation & Classification

The Division of Water has identified four key wetlands issues that, if resolved, could make significant differences in wetlands delineation and regulation for Alaska.

Alaska has for years claimed that its hydrology is different than places like Arizona, Florida, New Jersey, or Idaho. National wetland delineation criteria do not take into consideration permafrost, glacial sediments, tundra, or organic material accumulations on bedrock. For the United States these are unique Alaskan conditions in wetland management.

This CIP requests only \$60.0 to be leveraged against federal funds to prepare creditable scientific papers that make clear these differences and their relationship to regulated wetlands. This is a low cost opportunity, due to unique staff qualifications, to address these core differences in wetland management. Without this funding, this work can not be accomplished and large areas of Alaska impacted by these four unique hydro-geologic differences remain under federal wetland regulations.

*(Attached is a list of some of the pending actions in the Division of Water that will be adversely impacted by the reductions suggested by the Senate)*

## Water Right Backlog as of 1/1/93

Southcentral	230 Single Family Applications Pending (some dated 1985) 169 Commercial Applications Pending 275 Expired Permits requiring action 74 Permits to expire in FY93 50 Temporary Water Use Applications expected in FY93 180 New Water Rights applications expected in FY93
Northern	12 Single Family Applications Pending (some dated 1985) 24 Commercial Applications Pending 271 Expired Permits requiring action 43 Permits to expire in FY93 40 Temporary Water Use Applications expected in FY93 40 New Water Rights applications expected in FY93
Southeast	11 Single Family Applications Pending (some dated 1984) 61 Commercial Applications Pending 125 Expired Permits requiring action 14 Permits to expire in FY93 12 Temporary Water Use Applications expected in FY93 30 New Water Rights applications expected in FY93
WM&DS Backlog	507 Applications Pending 671 Expired Permits requiring action 131 Permits to expire in FY93 102 Temporary Water Use Applications expected in FY93 <u>250</u> New Water Rights applications expected in FY93

**TOTAL BACKLOG: 1661**

Commercial Applications include: Industrial, agriculture, mining, construction, hydroelectric, seafood processing, public water supplies (cities, towns, and villages), logging, oil and gas exploration and development, instream flow reservations, community water (subdivisions), and other large water users.

**PENDING ACTIONS**

<u>FILE #</u>	<u>NAME, PROJECT, LOC., ETC.</u>	<u>Action</u>	<u>DEAD- LINE</u>	<u>COMMENTS ON NEEDS</u>
LAS 13044	CBJ; Pub. Water , Gold Creek, Juneau	Permit	Late spring 1993	Adjudicate concurrent with A-J Project
LAS 13216	GSA; Fed. Bldg. cooling system	Permit	Spring 1993	As above, but expedite to meet deadline
LAS 13128	Echo Bay; A-J Mine Project; Gold Creek	Permit	Now	Also, coord. w. CBJ permitting & mitigation, etc.
LAS 13129	Echo Bay; A-J Mine Project; Sheep Creek	Permit	Now	Also, coord. w. CBJ permitting & mitigation, etc.
ADL 44439, 100066	CBJ; public waters Gold Creek	Cert. Amend.	Now	Partial revocation, transfer, etc.
ADL 43152	AEL&P; hydro; Gold Creek	Cert. Amend.	Now	Partial revocation, transfer, etc.
LAS 13147	K-V; Kensington Mine project	Permit	Spring 1993	Coord. w. CBJ permitting, etc.
LAS 13148	"	"	"	"
LAS 13149	"	"	"	"
aplns. pending	State of Ak.; water export sites	Permit	4-5/93	ASAP after regs in place; needed to secure benefits to public.
LAS 208	Armstrong-Keta; hatchery expansion	Permit Amend.	6/93	Amend old permit; new application for expansion
LAS 11649	Kerr; Thomas Bay floating lodge	Permit	Spring 1993	
LAS 11335	Sitka Sound Seafoods fish buying scow	Permit	6/93 in use	
LAS 13366	Velikanje; placer mining; Hyder	Permit	4/93	

LAS 13666	KPC; Calder Bay float camp	Permit	5/93 in use	pulp mill logging site
LAS 13900	Marsh; microhydro	Permit	7/93	
ADL 44079	KPU; Beaver Falls hydro	Amend Cert., Permit	7/93	Parts of hydro system w.o. WR; hatchery w.o. WR.
LAS 11400- 11405	City of Sitka; Baranof Warm Springs pws	Amend Permit	7/93	Permit compliance key to other pending aplns. public water supply
LAS 7141	Port Protection public water	Permit	in use	extension of permit
LAS 7166	SE Ak. Sportfishing Adventures; lodge	Permit Amend	in use	extension of permit
LAS 12689	NSRAA; 17 1/2- Mi. Cr. incubation boxes	Permit	Summer 1993	fishery enhancement
LAS 13097	DOT&PF; Brouillette's Cr. fish enhancement	Permit	in use	Project to mitigate for Haines airport expansion
LAS 13107	Cross & Young; microhydro	Permit	in use	Possible energy savings for several families
LAS 13381	NSRAA; Shakuseyi Cr. incubation boxes	Permit	in use	
LAS 13162	Williams/Savik- ko; Hohlkam Bay glacier ice harvest	Permit	Summer 1993	ACMP review coastal consistency
<u>33</u> Files	Mat-Su Borough	Permit	Spring 1993	Schools, firehalls, community centers
New apln	Rainbow Mining	Permit	Spring 1993	
ADL 80095	AL-VON Mining Company	Permit	Spring 1993	
<u>12</u> Files	City of Unalaska public water	Permit	Now	Dam safety
<u>6</u> Files	City of Soldotna public water	Apln or Revoke	Now	Coastal consistency

<u>2</u> Files	Southcentral Utilities public water	Cert	Spring 1993	Calculate quantity
<u>2</u> Files	Eklutna Utilities public water	Permit	Spring 1993	Legal actions, Eagle River water supply expansion
LAS 13190	Sea Catch Inc	Permit	Spring 1993	quantify water use, evaluate meter records
LAS 12791	Seasonal Seafood	Permit	Spring 1993	Public notice, respond to objections
LAS 12663	Fort Rich Fish Hatchery	Cert	Spring 1993	proposed expansion, Ship Creek Water
LAS 13378	Elmendorf Hatchery	Permit	Spring 1993	Additional quantity
TWP 92-17	Tesoro remediation	Amend Permit	Spring 1993	Expand project
TWP 92-35	PetroStar hydro testing	Permit	Spring 1993	Coastal consistency
LAS 14030	BP's Yukon Gold oil well	Permit	Spring 1993	Coastal consistency
LAS 13944	Arco's Colville well	Permit	Spring 1993	Exploration
<u>13</u> Files	Arco's Kuparuk Oil Field	Permit	Spring 1993	Maintain current production
<u>2</u> Files	Healy Clean Coal Project	Permit	Spring 1993	Power Plant
<u>4</u> Files	Ft. Knox Gold Project	Permit	Spring 1993	Mental health lands
LAS 12853	Chena Hot Springs Resort	Cert	Spring 1993	Ownership transfer, new application needed
<u>6</u> Files	Northern Community Public Supply	Permit	Late spring 1993	Permit or certificate
New apln	Sun Belt Water	Permit	summer 1993	Coastal consistency, water export SE Alaska
New aplns	City of Sitka	Permit	Summer 1993	Coastal consistency, potential export site
pending	Arco's Swanson River new well	Permit	Summer 1993	Coastal consistency

pending	New Elmendorf Medical Facility	Permit	Summer 1993	Determine senior water right holders actual water use
LAS 14099	Unalaska Hatchery relocation	Permit	Spring 1993	Coastal consistency
LAS 14069	Anchorage Courthouse expansion	Permit	Spring 1993	Coastal consistency
not assigned	Alyeska Prince Hotel snow making	Permit	Summer 1993	Gather stream flow data
LAS 13868	City of Seward New Small Boat Harbor	Permit	Summer 1993	Quantify water needs for associated uses
not assigned	Turnagain Road Reconstruction	Permit	Spring 1993	Coastal consistency
ADL 62233	Trident Seafood Corporation	Permit	Summer 1993	Change water source; new application
pending	Eyak Corporation Logging	Permit	Summer 1993	Coastal consistency
LAS 11813	Alyeska Pipeline Company	Permit	ASAP	Terminal facility amended permit additional water
<u>6</u> files	City of Cordova	Permit	Summer 1993	amend permits and new applications expected
<u>2</u> files	Larson Bay public water	Cert and Permit	Summer 1993	amend certificate city hydro develop
LAS 13864	UAA Business Education Bldg	Permit	Spring 1993	respond to objection
<u>2</u> files	FAA Control Center	Permit	Now	permit extension
<u>2</u> files	City of Valdez	Cert	Now	field inspection and possible extension
LAS 13673	David Gottstein	Permit	Summer	
ADL 204276	Wasilla West Owners Assoc	Cert	Now	need to work on quantity of water use, community water

LAS 13976	International Shipping Services	Permit	Now	coastal consistency for new cold storage facility in Unalaska
LAS 13813	City of Palmer Public Water	Permit	Summer 1993	additional water supply
LAS 14049	City of Palmer	Permit	Summer 1993	Water for the Golf Course Club House
Las 13849	Salamatof Native Association	Permit	Summer 1993	Retreat facility
LAS 13786	Village of Takotna	Permit	Summer 1993	Watering point, public water
Las 13680	Calista Corporation	Permit	Fall 1993	Nyac hydropower
Las 13681	Calista Corporation	Permit	Fall 1993	Nyac hydropower, additional water source
<u>17</u> files	Tuluksak Mining	amend permits	ASAP	litigation
pending	City of King Cove	aplns/ permits	fall 1993	Proposed hydropower facility
pending	Iliamna- Newhalen- Nondalton	aplns/ permit	Summer 1993	Tazimina River hydropower project
<u>9</u> files	William Lorensen glacier ice	amend permits	spring 1993	Glacier ice harvesting Prince William Sound
pending	Haines Light and Power	pre-apln permit	1994	proposed hydropower facility
Las 11766	NSRAA Deer Lake fish bypass	Amend permit	Fall 1993	Fish enhancement project
pending	City of Petersburg	pre-apln	fall 1993	Public water supply addition
ADL 44121	City of Saxmen	Cert. pending	ASAP	Public water supply
39 pending	ADF&G Instream flow reservations	Cert pending	ASAP	Fish habitat protection
4 pending	Valdez Fisheries Development Corp	apln/ permit	ASAP	Fish Hatchery, Solomon Gulch, Valdez Alaska

7 pending	DOT&PF	Permit	Spring Summer	construction projects Dalton & Richardson Hwy and Deadhorse Airport
LAS 14113	Arctic Slope Regional Corp.	Permit	Spring	Western Arctic Surface Coal Mine
LAS 6744	ARA/ Outdoor World	amend Permit	ASAP	Mckinley Chalets
LAS 14035	City of Koyuk	Permit	Summer 1993	Public Water Supply
LAS 14031	City of Salawik	Permit	Summer 1993	Public Water Supply

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# ALASKA

## WATER EXPORTS

*[One Acre Foot = 325,851 gallons or 1,360 short tons]*

The vast water resource export potential of Alaska was not seriously considered until the election of Walter J. Hickel as Governor in 1980. Governor Hickel, who 20 years ago as Secretary of the Interior advocated construction of a water pipeline from Alaska to California, was asked by the City Council of Los Angeles if he would again consider the pipeline concept. The Governor made it clear that the state would work with the people of Los Angeles as they took initiative to review the sub-sea water pipeline. The City Council and the Congressional Office of Technology Assessment evaluated the pipeline idea, spurring interest in developing the less costly bulk marine transport of water by tankers or other technologies.

With recent legislation passed by the 1992 Alaska Legislature, the Division of Water is moving forward to finalize regulations that facilitate Alaska's first bulk water export. According to the US Geological Survey, Alaska discharges about 1 billion acre feet a year into the ocean. With 100 to over 400 inches of annual precipitation in some areas of southeast Alaska, we believe it appropriate to offer our vast water resources to the world. These water resources are viewed by Alaska as potential new revenue sources, partially offsetting declining oil and gas income. To assist those with interest in the development of this resource, we provide this general discussion of the key issues affecting Alaska bulk water exports and sales. This paper is intended to demonstrate that: 1) the bulk marine transport of water to Mexico or California and wheeling agreements with inland states could readily happen before 1995; 2) if it did happen, the economic benefits accruing to Mexico, California, and other southwestern states, and Alaska, could be significant; and 3) further cooperative work between all interested parties can make bulk water export a reality.

Water law in Alaska is recognized as very comprehensive, contemporary, forward thinking, and environmentally responsible. Our "public interest" considerations are specific and comprehensive. Our instream protection for fish, recreation, water quality is a model copied by many other states. The export of bulk quantities of water from Alaska can not be done in a manner that would allow harm to fish, wildlife, recreation or other public interest values.

The key concepts described in this paper are: the market for water; sources of water; delivery systems; economics of source development, transport and marketing; environmental and social impacts; limitations; and strategies for development. For specific information, copies of applicable source materials, or contacts with experts relied upon in the development of this paper, you may contact the Director of Water, Department of Natural Resources, State of Alaska at (907) 762-2294.

## THE MARKET DEMAND FOR WATER

The most attractive water export markets for Alaska water are southern California, southern Nevada, and the northern regions of Mexico including Baja California. These areas are most vulnerable to drought and rapidly growing population pressures. California coastal communities not directly connected to a surface water delivery system, mainly the California Water Project, and northern Mexico including Baja California are the most probable delivery points. In addition, coastal communities receiving water from the Colorado River may be delivery points for up river exchanges (wheeling agreements) for areas such as southern Nevada.

As a result of the cost of transportation, Alaska water may be more expensive depending on method of transport, source, and delivery point, than existing southwestern supplies. But local supplies are simply not sufficient to meet increasing demand, even if every effort by southwestern state and local governments is successful. According to the Secretary of Natural Resources of the State of California, if every water option is successful - even if it rains - southern California alone is facing a 4-6 million acre feet per year water deficit by 2010. The most recent and longest drought in a series of such events in the southwest over the past few decades lasted almost six years. Local water experts, however, already agree that the 1993 storms were a unique event, not likely to be repeated. In addition, storm runoff - according to some press reports, has resulted in contaminated water not readily usable in the reservoir systems were it is needed.

Officials in southern Nevada now predict that they will be out of water by 2006 with normal rainfall. Many coastal communities in northern Mexico are out of water and others will need new water by 1995. During formal hearings before the Nevada State Senate Resources Committee in February, 1993 a scientific paper developed by the University of Arizona and presented by the Desert Research Institute of Nevada caused serious concerns. This study reported that an in-depth investigation of drought cycles over the past 1000 years in the southwest clearly establishes that the area has developed at a time of unprecedented precipitation (last 200 years) and that droughts of longer than 20 years are common per century, and finally that droughts in excess of 150 years in the region have occurred.

They all need *new* water. "New Water" is water that cannot be developed locally through conservation, diversion, storage, reclamation or other means. In considering the development of new water, public officials must look at all economic and environmental costs to make informed, rational, and sustainable public policy decisions. This paper suggests that importing Alaska water to the southwestern states and Mexico is economically and environmentally more attractive than many of the other alternatives available, especially desalinization.

A report for the California Urban Water Agencies (April 1991) looked at the economic impact that extended water shortages will have on their economies. According to this report a one year 30% water shortage would cause a direct economic loss of \$8 billion and 56,000 jobs statewide. But this survey only included an analysis of 53% of all manufacturing industries in the state employing only about 18% of the work force. In addition, potential "ripple" effects could multiply the economic and job losses substantially. A similar report done in southern Nevada (1992) came to the conclusion that a loss of 100,00 jobs and a steady decline in employment over the following years would result in the appearance of a new "Great Depression" with massive out-migrations, devaluation of homes and businesses, and a catastrophic cost to families. The experts agree that a water shortage in the southwest will cause significant economic and social destruction.

In light of these studies and the reality that water has become a significant limitation on economic sustainability, many firms are already relocating or considering relocation. These include computer

and office equipment, food industries, aircraft/aerospace, and communications companies.

Many manufacturing interests in the market area are very dependent on large quantities of high quality water. Examples of such industries are:

- Breweries - The Anheuser Busch Plant in the San Fernando Valley is the largest single commercial water user in the Metropolitan Water District of Southern California.
- Computer manufacturing
- All water-based products including cosmetics and beverages
- Food industries

All solutions to developing new water for the southwest depend on local weather, except imports from Alaska and desalinization. Rather than consider relocation, these industries have the potential to obtain a competitive advantage in their markets by staying in the southwest and using Alaska water. Phrases such as "*Made from fresh Alaska water*", "*Clear Glacier Water*", or "*Alaska Ice Water*", that use the image and mystique of Alaska can be attractive marketing tools.

#### **Inland States and Water Transfers**

Many land-locked western states, particularly Nevada, are interested in augmenting their existing water supplies. Communities dependent on the Columbia River, Sacramento River, and especially the Colorado River are suitable for water imports through exchanges or "wheeling" agreements with California or Mexican coastal communities as a possible solution. This would work in the following way: If Nevada interests wished to purchase new water, they could either contract for water from a firm such as Sun Belt Water, Inc. or secure water rights directly from the State of Alaska and then contract for delivery. The actual delivery would be to a coastal community in California or Mexico served by the Colorado River or a system connected to it, allowing that community to "transfer" its downstream appropriation from the Colorado River to southern Nevada in exchange for the imported Alaskan water. Nevada users pay for the delivered Alaska water, and then receive more water from an existing source (Colorado River), and the California or Mexican community would receive the benefit of fresh water from Alaska. Due to the significant differences in water quality between Alaskan water and Colorado River water, there could be an offset payment by the California or Mexican coastal community, lowering the cost of clear Alaska water to the Nevada buyer. These types of water transfers or "wheeling" agreements are common in the western United States.

Recently the Division of Water sent a letter to the Governor of Baja California, Mexico suggesting that this area of northern Mexico could receive *free* clean water from Alaska if they could negotiate a wheeling agreement with southern Nevada. Such an exchange would allow Nevada to acquire the water for 20% less than if it were delivered to San Diego due to the Jones Act and other cost factors. Baja would receive high quality water in exchange for "dirty" Colorado River water, and could also sell its excess Alaskan water to San Diego, for a profit, using existing pipelines.

Such wheeling concepts have opened an entire new area in the market. In discussions at the Western States Water Council (17 western states), a number of states have expressed an interest in exploring this concept as they prepare their Drought Contingency Plans required under new federal law.

### **Bottled Water and Glacier Ice (see appendix for more information)**

Bottled Alaska water and glacier ice are currently marketed on a limited scale outside of Alaska and these markets are expanding.

## **POTENTIAL SOURCES OF WATER**

The southeast region of Alaska is considered to be the most probable location of sources of bulk exportable water (see enclosed map). It is approximately 42,000 sq mi in area, with 100 to over 400 inches annual precipitation; the mean annual surface runoff from southeast Alaska is estimated to be about 300 million acre-feet per year. Considering drainages that extend into Canada, total discharges of streams in the region are even greater. Several problems limit potential water capture sites, however. First, many of the larger streams drain basins containing extensive glaciers. This results in high sediment discharges and the need for more extensive treatment of the water prior to use. Also, much of southeast Alaska is comprised of low coastal mountain ranges and islands, resulting in thousands of small to moderate-sized drainages up to about 50 square miles in size. Selection of developable sites must, therefore, consider quality of water and drainage basin size in addition to precipitation, natural storage capacity (lakes), shipping access, existing delivery systems, and land ownership and management policies. As a result of the large size and diversity of southeast Alaska, initial export sites selections could be determined from an initial pool of the dozens of potential sites identified on the enclosed map.

Peak stream discharges in southeast Alaska occur in July, August, and September, coinciding with peak water demand months in the market area. Seasonally low discharges during the winter months are expected to coincide with periods of low demand in the market area.

Six potential sources of water in southeast Alaska are already developed with hydroelectric facilities, and existing municipal systems at tidewater may be useable. Use of existing developments could greatly reduce initial capital risk, minimize environmental impacts, and decrease delivery delays associated with undeveloped sites.

The water quality of many sources is expected to be very high. Many were surveyed for fish hatchery development due to low levels of organic and mineral constituents. The water is expected to be attractive for high-technology manufacturing and beverages with minimal or no treatment, depending on the end user. Chlorination can be done in the tanker during transport.

Initial review of potential export sites suggests that approximately 1 million acre feet of water per year is exportable in the near term. This could be achieved by developing 20 sites, producing an average of 140 acre feet/day per site.

## **DELIVERY SYSTEMS**

### **Pipelines**

The Congressional Office of Technology Assessment, at the request of members of Congress from California, evaluated the feasibility of constructing a sub-sea water pipeline from Alaska to California. They found that the per acre foot cost of a pipeline was high compared to market willingness. They also commented in their report that the use of tankers or other marine transport technologies may be economically viable and that eventually a pipeline may also be economically viable and should not be completely dismissed. Although interest in the pipeline concept has diminished, the Division of Water continues to receive requests from around the world for various studies on the pipeline concept. A collection of key studies and papers on the water pipeline are maintained in the files of the Division of Water.

### **Tankers and Bags**

The most promising immediate transfer technology is the use of single-hull very large crude carrier (VLCC) or ultra large crude carrier (ULCC) class tankers with near shore temporary storage in coated nylon bags. With changes in petroleum tanker regulations requiring double hulls following the Exxon Valdez spill, according to marine transport experts, many used single-hull tankers are on the wholesale market at prices from \$6 - \$10 million. In addition a number of new, never used, single-hull tankers are available at a cost of about \$80 - \$85 million.

The VLCC class tanker is most attractive because its size allows it to access a variety of sources in southeast Alaska and provides sufficient volume to make it economical. VLCC and ULCC class tankers, respectively, can carry 225 to 307 acre feet of water per trip, with a turn around time of 10-11 days depending on vessel speed and source and delivery point locations. These tankers generally have two large pumps that allow them to be filled within 20 hours.

One concern with tankers is ballast water discharge in Alaska, especially if the ballast is collected in contaminated coastal waters near California. Ballast tanks are not the same tanks used for cargo transport. Tanker engineers advise that almost all ballast is discharged prior to docking and, if contamination is an issue, standard operating procedure is to exchange ballast in the open ocean after leaving the barbor. Regardless, any discharge is subject to appropriate federal or state permitting.

### **Bags and Tugs**

Bag technology was originally developed by Dunlap Rubber of Great Britain during the 1960's to allow the capture of oil spills from tankers. Application of the technology was never achieved as a result of cost, material, and technological limitations. Research and development continued and adaptation for water transfers was explored by UNITOR (Norway), Avon Rubber (United Kingdom), Yokohama Rubber (Japan), and Medusa Corporation, Inc. (Alberta, Canada). Extensive tank testing of a patented design has been conducted by Medusa Corp. at the University of British Columbia, Vancouver (tow testing for drag and stability) and at The National Research Council in Ottawa, which has the largest wave basin in Canada. Current-generation bags are constructed of a commercially available industrial coated nylon fabric with reinforced stress-diffusing straps. The bags can be used for offshore storage or transport. The bags have an expected life of 10 years when used for storage and 7 to 8 years when towed. Bags can be constructed in shapes ranging from flattened disks to hockey pucks. The largest bag manufactured to date held 5,000 tons of water, but according to James Cran (President, Medusa Corporation) bags can be constructed to hold up to 812 acre-feet for storage. A 225 acre foot bag, sufficient to fill a VLCC tanker, would be 500 feet in diameter and 50 feet deep in a disk

shape. For additional technical data on bag technology and cost refer to The Numbers section of this paper.

Bags float just below the surface, allowing them to absorb wave and wind action. They can be filled through flexible and portable filling tubes using gravity. Tankers can load from bags using their own pumps and single mooring techniques.

Extensive testing has provided solutions for tug operator concerns with "fish-tailing" of towable bags. Solutions include speed reduction, rudders, and other design modifications. Illustrations of sea trials are appended to this discussion paper to assist in your understanding of the technology. Although the Division of Water does not endorse the Medusa Corporation, for permission to use these photographs we have included the front cover of this corporation's publication. We encourage those interested to contact other vendors as well.

Some communities in southern California are exploring the use of bags for transporting treated sewage for deep ocean disposal. Other applications under negotiation include hauling water from Turkey to Israel, according to the Wall Street Journal. The application of bag technology for storage and transport may also warrant evaluation as a solution to rural Alaska domestic drinking water needs and emergency drinking water needs in the event of a natural disaster such as the 1964 earthquake.

The use of bag technology for offshore storage offers Alaska a number of attractive solutions to storage, flow rate, transfer, and environmental problems. One challenge in using tankers is the need for sufficient on-site storage that allows a tanker to fill within 20 hours. This requires a flow rate (approximately 140 cfs) that exceeds the capturable natural flow rate of many accessible sources during most of the year. With the use of storage bags, sufficient water can be accumulated over a few days or weeks using natural diversion rates. The point of diversion of the water should not require extensive onshore pumping, pipeline, or service camp construction, thus significantly reducing permitting complexity, environmental impact, and cost.

The application of bag technology makes water exports attractive to small communities with existing tidewater delivery systems that have a surplus of potable water. With little or no investment risk and few permitting concerns, a community could either acquire a storage bag and contract with a transport firm for a scheduled stop once sufficient water is captured and available, or enter into a joint venture with a purchaser of water whereby the purchaser provides the bag, or enter into a cooperative venture with the state and a private firm. Small communities could participate in the development of this resource in a variety of ways.

The use of bag technology for offshore storage is a key ingredient in the concept of bulk water exports. The bags can greatly reduce cost and capital risk, environmental problems of onshore development, permitting costs and delays, and open new opportunities for small communities in southeast Alaska to participate in a new revenue source.

## ECONOMICS OF WATER EXPORTS

Markets for bulk water sales are relatively new in the western United States because only recently have sufficient transport systems been developed to provide sufficient market liquidity. Also, markets tend to vary somewhat from State to State because of different water rights laws amongst the states. Key to any market, however, are the concepts of price, availability, and security of source. Prices can commonly be determined by historic transactions, but availability can be a limiting factor because of lack of transportation means, drought, or the unwillingness of sellers to sell. This results in a wide variation in market prices, with low market prices not always being useful to potential buyers because of lack of availability. The water market should be viewed as a collection of individual transactions, many of which occur under somewhat unique circumstances and most subsidized by federal or state projects.

### Market Price of Water

The price of water in the market area is highly variable due to location, quantity, quality, government subsidies, source, precipitation, time of delivery, and type of water. Existing prices for water in the southwestern states are difficult to compare due to significant, long-standing subsidies by the Federal government (Bureau of Reclamation and the Army Corps of Engineers) and state governments. Capitalization, amortization, and depreciation of extensive and expensive surface delivery and storage systems are rarely totally passed on to the consumer in the delivered price of water, making it difficult to establish a market based value. The outgoing Commissioner of the Bureau of Reclamation reports that some agricultural water contracts are subsidized by as much as 93%.

Known market prices for water in the western states are:

Average cost of delivered water to coastal communities tied into the State Water Project is about \$500 per acre foot. It is not clear if this cost includes the value of all subsidies (capital and operating). For example, the federal Bureau of Reclamation reports that they have over \$16 billion (not adjusted for inflation) in water related capital investment in the west.

Average cost of reclaimed water (treated sewage) with delivery is \$700 to \$1,400 per acre foot. As a source of drinking water, California has not had good success, however, there is a willingness to use reclaimed water for agricultural use. This will require significant capital investment as most reclaimed water is in coastal communities and most agriculture is inland.

The California Water Bank purchased government subsidized water from agricultural water right holders for \$125 per acre foot in 1991 and \$75 per acre foot in 1992, and in most cases reallocated that water to urban users connected to existing delivery systems.

A new water pipeline, now under construction, for Santa Barbara, connecting it to the state water system delivering 70,000 AFY, is reported (in congressional testimony by Ionics, the developer of the desal plant in Santa Barbara) to cost \$5400 per acre foot, however, the California Director of Water, David Kennedy, claims the cost to be closer to \$1200 per acre foot.

A purchase of water in areas of Colorado (Colorado-Big Thompson Project) is averaging about \$2,000 to \$2,143 per acre foot. These are often municipal purchases from farmers.

In Reno, Nevada, subdivision developers are purchasing water rights at \$2,000 to \$2,500 an acre foot in order to meet local ordinance requirements that stipulate that any new

development prove they have a dedicated source prior to securing local approval to build.

The contract price for desalinated water (desalinization) from the newest plant in the market area (Santa Barbara) is \$1965 per acre foot for delivered water and \$1312 per acre foot when on short-term stand by, and \$1231 per acre foot on long-term stand by against a 3200 acre foot total delivery contract with no water being produced. The original capital cost of the plant was about \$30 million, however, this was recently revised upwards by 18% to \$35 million, and the plant has shut down after operating for less than 3 months due to a resupply of natural water (rain) in the area.

Water Intelligence Monthly and Water Strategist are two key publications on water market activities in the west. Both are published by Stratcon, Inc. in California.

Since 1989 the price of water in many countries, for example Australia, Italy, and Britain, has increased substantially faster than each country's rate of inflation. This is a function of governments reducing subsidies as they face revenue difficulties. In many cases, this phased reduction of subsidization has resulted in prices rising as much as 20% in a year (US Water News). As the southwestern states, in response to state and federal budget constraints, and northern Mexico begin to face the real cost of water and pass it on to customers, the competitive edge of Alaska water imports to this region is sharpened.

An important factor in the market price of water is the cost of treatment. Treated water typically has a different value than raw water, especially if the raw water is high in dissolved minerals, making it unsuitable for some uses. The price of high quality water for specialty uses such as manufacturing and water based products can be significantly higher than general market prices. It is reported that some manufacturing firms are spending up to \$.05 per gallon for treated water. At \$1700 an acre foot, *pure* Alaska water would only cost \$.005 a gallon. More specific information on the cost of water to manufacturing and bottled water products is being solicited.

### **Cost of Water Delivery**

When the notion of using existing tanker technology to transport water from Alaska to southern California, Nevada, and northern Mexico was first proposed to the Division of Water, we were skeptical of its economic feasibility. Ed Arobio, a commodities economist with the Department of Natural Resources - and a skeptic - reviewed the economics of tankering water from Alaska to the market and determined it not only viable but attractive. The division has identified the key variables in the export business and attempted to develop preliminary cost estimates to evaluate the economic feasibility of the concept.

The important cost variables considered in marine transport systems are:

- Length of contract (depreciation, amortization)
- Annual volume of water delivered
- Distance of delivery
- Security of source
- Capital cost of tankers/bags or tugs/bags
- Capital cost of onshore or nearshore facilities at source and delivery points
- Permitting and compliance costs at source and delivery points
- Operating cost of transport system (tankers/bags or tugs/bags)

Of these variables one of the most significant is the length of contract. Capital amortization and depreciation of initial capital investment and permitting compliance costs over a ten-year contract versus a twenty-year or longer contract is a significant factor in cost per acre foot. Operation and

maintenance is generally static depending on the use of tankers versus bags and tugs.

The "day-cost" of a new tanker, fitted for water transfer, is about \$30,460 per day or less according to Robert Byrd, a noted marine transport expert from California and a former US Coast Guard officer with Alaskan experience. This includes an assumption of a 10-year debt service, with interest and capitalization, crew cost of about \$7,900 per day and fuel cost of about \$9,300 per day. If the debt service for a new tanker is extended to 20 years, the day cost would be less. Assuming a 10-day average round trip schedule and 225 acre feet per trip, the estimated cost of transporting water is \$1353/acre foot. This day cost can be reduced by acquiring a used, less expensive, or a larger tanker and by using ballast tanks to haul potable water increasing capacity by 20%. The overall cost of delivery must also include such variables as shore facilities, bags, and onshore systems as necessary. With the careful selection of an already developed source and an existing delivery system at the point of sale, these additional costs can be minimized. For more information refer to The Numbers section.

Although available for near-shore storage, bags are not yet a proven technology for towing at large scales. The use of a tug and bag configuration for storage and transport could greatly reduce the cost of transporting water. According to James Cran, President, Medusa Corporation, a 225 acre foot towable bag would cost about \$1 million with a life expectancy of 10 years. Near shore storage bags would be less expensive per acre foot depending on design needs. Transport time, according to Robert Byrd, a marine transport expert, and James Cran, for towing bags is estimated to be about 14 days when traveling south under load with return time of 4 to 5 days depending on distance and weather. These estimates are based on extensive tank simulations but limited sea trials. The amount of drag on a large bag is estimated but, without actual sea trials of a large bag, drag effect is undetermined, resulting in towable cost estimates that may prove incorrect. Assuming a 20 day turnaround time, a one-tug/one-bag configuration could make 20 trips/year. For ocean going tugs at 5000-6000 horsepower, the estimated cost of a tug and bag system is about \$5000/day as compared to \$30,000 a day for tankers. In the event larger bags are used, tugs with 10-15,000 horsepower capabilities would be necessary. (see "The Numbers" in appendix) Actual costs from reported applications in the middle east have not yet been acquired.

Although we continue to explore the numbers on bag/tanker configurations, we believe the application of bag technology for storage and especially for transport will bring the economics of transporting water into competition with reclaimed water, desalinization, and some conventional land-based delivery systems in the market area. Due to our interest in bag applications we are encouraging investment groups actively pursuing water imports from Alaska to develop a full size bag and begin sea trials immediately.

## COMPETITORS

Alaska water competes in the marketplace with desalinization, water reclamation (from sewage), redistribution, ground-water management, land-based delivery systems, conservation, expanded storage, water marketing, and new source development. All except desal and new source development focus on making better use of existing water resources in the market area. All are dependent on local weather except desal and Alaska imports. Such efforts will continue, but these techniques will become increasingly constrained by economic, political, and environmental forces as population expands and national and state efforts to dedicate more water to fish and wildlife increase. Only two prospects offer significant potential for providing new water to the market area allowing sustained growth: bulk water imports and desalinization.

### Bulk Water Imports

Potential sources of bulk import water for southern California are located in northern California, Oregon, Washington, British Columbia, Panama, and Alaska. Legal, political, economic, technical and environmental problems associated with sources in northern California, Oregon, and Washington convinced private industry to look further north, to British Columbia. Consequently, about a dozen contracts were negotiated based on water sources in British Columbia. A subsequent change in attitude and political leadership in the British Columbia government resulted in the imposition of a moratorium on all bulk water transfers. This moratorium was to be for one year; however, it has been extended for a total of three years. This action and the economic uncertainty it created caused a number of ventures to lose significant investment money, time, and delivery contracts - and for many, the courage to proceed with the concept. Recent discussions with some of the parties impacted by the moratorium report litigation that further clouds the viability, stability, and security of these competing sources, even if the moratorium is eventually lifted.

Another potential source of water is Panama. In addition to the political uncertainties in Panama and the difficulty of shipping against prevailing currents and winds, Panama is farther from southern California and northern Mexico than southeast Alaska is. Gradually, most firms have left Panama although Sun Belt Water, Inc. reports that they still retain contracts for Panamanian sources of water.

### Desalinization

A major competitor for water imports from Alaska is desalinization. Meetings with government officials in Mexico revealed that they received seven desalinization proposals and only one import proposal. The California Urban Water Agencies have also been involved in an intensive investigation of desalinization. Desalinization technology has several significant disadvantages compared to Alaska water imports: 1) the energy consumption of desalinization far exceeds the energy cost of imported water; 2) desalinization generates a significant stream of hard-to-dispose-of waste products including sludge, processed chemicals, and concentrated brine; 3) other solid waste disposal costs include membranes and cartridge filters; 4) desalinization does not typically remove all dissolved salts in water, a concern for public health as well as costly corrosive impacts on existing delivery systems; 5) desalinization plants occupy valuable coastal property; 6) since all of California's major urban areas are not in compliance with federal air quality standards, major new distillation projects will be difficult, if not impossible to permit in these areas; and 7) existing plant development costs and contract prices of desalinated water may not represent real costs or future contract prices because of underpricing of desalinated water to promote the technology. These issues are explored further below.

At the request of the California Urban Water Agencies, the Boyle Engineering Corporation conducted a comprehensive review of desalination technologies, cost comparisons with alternatives, and potential technological breakthroughs. Their 1991 report concludes that although desalination has been understood in principle since Greek sailors in the 4th Century BC used an evaporation process, the difficulty of developing practical methods to desalt water is evident in the limited worldwide use of desalination. They also concluded that desalination technology is mature and, other than the discovery of a new cheaper source of energy, no significant technological breakthroughs or cost reductions are anticipated.

Although there are a number of desalination technologies, according to the Boyle report, the three most common methods of desalination used today are:

- 1) Distillation (thermal) processes,
- 2) Membrane processes, and
- 3) Ion exchange (not cost effective for desalting sea water).

All existing technologies for desalination are greatly dependent on low energy cost. Desalination consumes energy to a point that many argue against it due to its significant environmental costs. Consumption of energy also creates fuel storage and delivery and air quality concerns. A delivery price for desalination water based on low energy cost is misleading. After the capital plant is developed (59% of the unit cost), a buyer is vulnerable to rising operation and maintenance costs (41% of unit cost) due to energy costs and constrained by fixed energy inefficient technology. According to Stratecon, Inc., publishers of Water Intelligence Monthly, current trading in crude oil options reveals a standard deviation of the annual percentage change in fuel prices equaling about 20 percent. When compounded over a 20-to-30 year term of a desalination plant, this price volatility is substantial, suggesting that operation of a desalination plant will be subject to substantial risk of escalating operating costs. With any significant increase in the cost of energy or the cost of implementing ever more restrictive environmental regulations, the price of desalination water will escalate directly. The use of VLCC tankers to transport water from Alaska to southern California use less than half of the energy desalination does with little or no impact on local air quality. A single VLCC tanker can deliver more water per year than the largest desal plant in the market area. Ocean going tugs pulling bags would use less than a third of the energy of desalination.

The various processes used to desalinate water generate waste streams. In addition to the generation of concentrated brine and sludge, depending on the technology used, one must dispose of large volumes of arsenic and other chemicals used to inhibit scale (chemical inhibitors). No one anticipates the cost of waste stream management to go down, and most expect it to increase faster than the rate of inflation. Recent studies on the ecological impacts of large-scale concentrated brine discharges offshore have raised serious questions about impacts on aquatic life and commercial and sport fishing (tourism) industries. The Santa Barbara plant was permitted under a declared water emergency, allowing it to come on-line without the normal stipulations and permitting review requirements. As a result a number of modifications are now being required, raising the capital cost of the plant by 18% and impacting operational costs. It is, therefore, difficult to make an informed analysis of all the environmental costs/questions and permitting costs that will surround other desalination proposals.

How much salt do you want in your water? A single stage reverse osmosis seawater desalination plant does not remove all salt from the water. Desalination is allowed up to 800 milligrams per liter of total dissolved solids (TDS) in its delivered water. This standard has more to do with taste than health concerns. Desalination experts report that over 90% of the TDS from seawater desalination is salt. What are the long-term human health concerns of this large unnatural consumption of salt?

We have not been able, at this point, to satisfactorily resolve this question. There are reports of medical problems in the middle east where desalination has operated for long periods of time, but we have yet to receive independent confirmation of those reports. However, in discussions of the choices between desalination and fresh Alaska water, the question is often asked, "Do you know of any health professionals that recommend putting more salt in your water?" Most health experts recommend serious reduction of salt intake. And why take the risk when pure Alaskan water is cheaper and far more environmentally responsible than desal?

In addition to the health questions about desalinated water, there are concerns with its corrosive nature (500+ TDS salt). According to Tom Maddock, PE, Chairman of the Boyle Engineering Corporation, this is a concern that many proponents of desalination have not adequately addressed in their considerations. As a result of the corrosive nature of desalinated water, post treatment or mixing facilities/zones are essential to limit infrastructure damage. This single factor may increase the delivered cost of desalinated water by \$100 to \$200 an acre foot.

Desalination plants require very expensive coastal property which, in general, is already over-utilized. Few sites are available for applications that would not compete with existing users. Siting of large scale facilities may be less controversial when associated with electrical power generation plants. Nevertheless, marine transportation, by contrast, can be implemented in a way that will have little onshore land use or cost impact.

Finally, one of the difficulties with desalination is the representation of delivery price versus real cost. The only real example we have is the new \$30 million sea water desalination plant (1992) in Santa Barbara. This facility is the only sea water desal plant of its size operating in the United States and many experts claim it was underpriced to encourage further desalination development in the market area. The headlines of the Santa Barbara newspaper on December 31, 1992, reported plant costs had increased by 18% above the original \$30 million representation by Ionics.

## LIMITATIONS

### The Jones Act

Delivery of water from Alaska to California, other than from the Yukon River, is subject to the Jones Act. This federal Act requires that cargo transported from one American port to another must use vessels constructed in the United States and operated by American crews, thereby increasing the cost of capital investment and labor. The use of existing single-hull tankers built by other nations allows a far less risky capital investment. Some of those investigating large water transfers from one American port to another advocate a specific exemption in the Jones Act for the transport of fresh water. With the use of towable bags, the bags could be constructed in Alaska creating hundreds of new jobs. Water deliveries from Alaska to Mexico do not fall under the Jones Act.

### Public Perception

*"Water from Alaska?" "You've got to be kidding!" "Get real!"* The general public, both in Alaska and in the southwestern states, thinks of the viability of water imports from Alaska as an *exotic notion*. Limited public appearances by the Director of Water in southwestern communities have had some impact on this disbelief, but this effort is greatly limited by the minimal budget of the Division. We have found that, once the technologies and economics are explained and technical questions are addressed directly and understandably, the audience is receptive to the notion of water imports by tanker or bag and willing to investigate this concept further. This paper has been a great help in this effort.

### The Political Infrastructure of Water Development in Southern California

For decades the politics of water in southern California and the southwest have dominated state and local power struggles. Massive bureaucracies and political systems have developed to support various distribution schemes. Despite all the environmental and technological problems of desalinization and despite the millions of dollars being spent by communities to research desalinization - practically nobody is opening their minds to consider a more environmentally and economically viable external solution. Considering that desalinization cannot produce the volume or quality of water that marine transport can at a lower price with no municipal facility construction or long-term debt and far less environmental damage, it is even more perplexing. Thousands of engineers are now employed by governments at all levels to "design" solutions; but they are all looking inward, when at least a part of the solution may be outside of their experience or perspective.

### Can Alaska - Just say NO?

Some in Alaska have said that they do not want Alaskan water exported anywhere. There is immediate concern with environmental impacts on fish, wildlife and other public interest values such as recreation. Once audiences become more familiar with Alaska water laws and regulations these concerns become less feverish, however Alaskans do keep close vigil on the state to ensure responsible management decisions are made consistent with law. In addition most Alaskans are unaware that under the US Constitution, as articulated by the US Supreme Court, water is a commodity in interstate commerce and thus falls under the Commerce Clause of the Constitution. This simply means that a state can not deny the export of water. Water that is necessary, under Alaska law, to the needs of Alaska can not be exported. Only water that is determined excess to the hydrologic unit.

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## Conservation and Social Implications

One of the issues raised in discussions of the transport of water from Alaska to southern California, Nevada, and Mexico, is water conservation and the question of local responsibility. Some would argue that it is philosophically wrong to encourage greater growth in the southwest by providing new water; that the availability of water is a "natural" limitation on population and economic growth in the area, and to import water into this region delays local or national public policy decisions that should have been addressed years ago. When these questions are considered only in the context of the market area, which is often the case, this is a fair point for political debate. However, when considered in a broader context, the reality of shortages of water, energy, food, shelter, and space are evident in many parts of the world. Is it humane to tell starving people in regions of the world that it is more responsible to not send them food or the means of creating food because "their" environment may not support them? Is it humane to tell developing nations and struggling communities that they cannot reach for economic independence because "we" believe "their" dreams should be limited by our perception of "their" environment?

For centuries humankind has moved commodities found in large natural supply in one region to areas of the world with high demand and short supply. This is true for energy, food, minerals, construction materials, and water to name a few. History has found that people will live where they want to live based on many factors including economic vitality and employment opportunities, weather, and life style, and will adjust their expectations based on these same considerations. The projections of population increases in the southwest are built on the trends of significant immigration from outside of the United States. Persons immigrating to southwestern states find economic opportunities and lifestyles that are far more attractive than those they left. This perception may not be shared by some in the middle or upper economic classes, but they are real and very attractive to families climbing out of poverty or socio-political oppression.

Conservation of water is greatly affected by price and government restrictions. Some reports claim that Los Angeles County reduced its water consumption by 25% in one year as a result of drought ordinances alone. According to the Metropolitan Water District of Southern California, this conservation success resulted in an increase in the cost per acre foot. Rather than rewarding people and industry for conservation, rates were raised. Many now claim the higher price for conserved water worked as an economic disincentive after their conservation achievement. The economic incentive to further encourage conservation must be price. Studies on price and consumption clearly establish a relationship between greater conservation as a result of higher price. Price is also a much more cost effective tool than regulation. The study conducted by the Bay Area Economic Forum (October 1991) Using Water Better: A Market-Based Approach to California's Water Crisis is one of the most far thinking studies done of the relationship of price to consumption and is critical of continued government subsidies for infrastructure, operation, and maintenance costs that do not encourage conservation.

Alaska is blessed with natural resources, including water, at a scale unknown in many regions of the planet. Alaska believes it is appropriate to offer these resources to the world. As a sister state and a member of nation states, Alaska believes it responsible to offer its excess water for people in need. The sale and export of water from Alaska is a sound economic and environmental decision endorsed by the State Legislature and the Governor.

## Permitting and Land Management

Bulk water exports must to be conducted under existing laws and regulations, and conform to land management guidelines. Concerns of local residents or agencies about potential impacts on fish or other environmental values are addressed through these channels. As mentioned previously Alaska law protects fish, wildlife, recreation, water quality and many other public interest concerns. (see Alaska Water Laws in appendix)

## STRATEGY

The Alaska Department of Natural Resources recently completed a strategic plan calling for the responsible development of our natural resources, including water, while conserving Alaska's wild, scenic, and cultural values. The Division of Water has prepared a tactical plan to implement that strategy. Copies are available upon request.

The division intends to continue to evaluate the market. We understand that the export of water from Alaska by itself will not solve the major water deficit problems of the southwest or northern Mexico. Alaska water can be a part of a broader array of solutions to these problems. Price and security of source are, and will continue to be, the cornerstones of buyer and seller decisions.

Alaska, in cooperation with transport industries, can offer in the marketplace a very competitive price for a higher quality water with greater delivery volume, source security, little or no facility-construction risk to the customer, lower environmental cost, and significant flexibility in volume, delivery points, and schedules.

The target price for delivered water to this market must be less than the current price of desalinization (about \$2,000 per acre foot) if Alaska is to compete with desalinization. To compete with other new sources of water, we need to deliver water for less than \$1500 per acre foot - and we can.

Alaska water imports may not be competitive in some areas of the southwest; however a mixing of Alaska water with local supplies through systems like the California Water Project may ensure a greater confidence of supply in times of drought. By blending Alaska water with existing sources in the market area, the economic impact on end users is significantly reduced. For example, if Alaska water is delivered at \$2000 per acre foot and mixed with a source in the market area priced at \$100 per acre foot, the end "marginal" cost is \$1100 per acre foot. Considering the high reliability of water from Alaska, this cost can be viewed as the price of insurance. In addition, the mixing of pure Alaska water with local sources will enhance the quality of the combined water.

An exciting market opportunity is in Baja California, specifically Rosa Rita Beach, Tijuana, and Ensenada. They have an immediate need that can be satisfied within months by a single tanker. Additional tankers or bags can subsequently be added to meet demand. Deliveries to Baja are not subject to Jones Act limitations, allowing lower (20%) capital and operating cost. The Baja government has stated they will finance and build whatever onshore delivery systems are necessary in Mexico, thus reducing risk to investors and quickening the pace. Delivery to Baja also avoids potential political or permitting problems faced in southern California. With the potential of an instream wheeling agreement between Mexico and Nevada, Baja has become the key area of focus from many angles.

Formal proposals, based on the use of tankers, by such firms as Sun Belt Water, Inc. offer delivered water to market areas from Alaska at between \$1000 and \$2000 per acre foot, depending on variable assumptions, the most important of which are length of contract and distance. Delivery using bags would greatly reduce asking price and/or profit opportunities.

We have raised important questions in the minds of Baja officials about the long-term economic and environmental viability of the desalinization proposals they have received. Continuing discussions indicate that the Baja government is willing to work with the State of Alaska and Sun Belt Water, Inc. to obtain a contract beneficial to Mexico and Alaska.

Another possible market approach is a direct contract or appropriation (water rights) between Alaska and the buyer of the water, other than through a transport company. The buyer, the Baja government for example, would then arrange its own transport. Discussions on this approach have usually been short once the customer realizes the value of what private companies such as Sun Belt Water, Inc. and its subsidiary, Sun Belt Marine, Ltd. have already contributed in knowledge and investment. The Division of Water is willing to enter into negotiations with any qualified party interested in securing water rights or a purchase contract for water.

In discussions with southern Nevada officials, it is now clear that they will require a long-term, secure contract or water rights if they make a commitment to water imports and wheeling agreements. They are also looking at the Virgin River as a potential new water source, however, this would require agreements with other states, significant pretreatment, and desalinization due to high TDS (1,900 to 4,600) when the river is flowing. This source is also dependent on weather, low energy costs, and cost effective resolution of significant waste management and waste disposal problems.

The division also intends to further evaluate and characterize potential sources of water. With water achieving new stature as a valuable bulk commodity, basic information about water resources is essential.

The division intends to identify potential regulatory or land management concerns within state and federal governments in Alaska, and search for ways to resolve them. As an example, the Division of Water is completing negotiations with the US Forest Service and the US Geological Survey on a Memorandum of Agreement on a coordinated inventory and characterization of water export sources in SE Alaska. With appropriate information about the quantity and quality of these export sources and the localized effects of exporting water, these concerns should be resolvable.

An important part of the Division of Water's strategy is to promote public awareness of the possibilities of bulk water exports. The appeal of establishing a sustainable earth-friendly economic enterprise in Alaska, while conserving capital and environmental resources in Nevada, California or Baja should be compelling.

With the delivery of the first shipment transferring water from Alaska to southern California, Nevada, or northern Mexico - the world will change. Those who have objectively examined marine transport (tanker or bag) as a mechanism to bring new water to this market agree that once it is real - once a contract is signed and delivery begins - marine transport will become a dominant force in the market.

## **WATER RIGHTS APPLICATIONS**

### **Alaska Aquaculture, Inc. (Burnett Inlet Hatchery)**

In an effort to pay off outstanding state loans for the development of the fish hatchery at Burnett Inlet and provide some operating capital, Alaska Aquaculture, Inc. applied for and the Division issued a Temporary Water Use Permit to export up to one million gallons a week from the Burnett River system. Using a small tanker, this water is to be sold as potable water for no more than one cent a gallon to RairMaker Resources in Corte Madera, California.

### **Sun Belt Water, Inc. & Sun Belt Marine, Ltd.**

Sun Belt Water, Inc., of California, which was involved for over three years in efforts in British Columbia and Panama, studied water sources in Alaska and contacted the new Division of Water within days of its creation by the Governor. These discussions resulted in two applications for water from two sources in southeast Alaska for a total of 350,000 AFY using marine transport technologies. Sun Belt withdrew one application when it was discovered the source was located in a federal wilderness area and replaced it with another application.

### **City and Borough of Sitka**

Following a presentation by the Division of Water at the SE Conference in Sitka, a group of business and community leaders set up a meeting with the Division to explore local government involvement in water exports. This resulted in two applications from the City and Borough of Sitka for 54,750 acre feet a year from Blue Lake and 56,000 acre feet a year from Green Lake. Both of these sources are already developed for hydro-electric power and/or drinking water.

Although the Division of Water often receives calls and visits from individuals, firms, communities, and groups, these are the only pending applications for water rights with the state for exporting bulk quantities of water. The division does anticipate additional applications from communities in Southeast Alaska such as Ketchikan and Yakutat, a regional native corporation, and private firms such as Sun Belt Water. In the absence of competing applications, the Division of Water is working with these applicants for the export of over 450,000 acre feet per year. The division is working closely with the Alaska Water Management Council, the Division of Governmental Coordination, and the Attorney General's Office to ensure that these applications are processed according to applicable statutes and regulations.

## THE FUTURE

Given the expectations of growth in the southwestern United States and Mexico and a variety of developments impacting existing and potential local sources of water in the market area such as hundreds of new listings of instream dependent species under the Endangered Species Act and the required dedication of water to their recovery, and new directions in Congress for the Bureau of Reclamation that require more local water to be dedicated to fish and game, market demand will continue to grow - even if it rains. Although political leaders and professional water managers in the market area are making every effort to solve their water deficits with local sources, conservation, reclamation, and even desalinization, many have already come to the practical realization that it cannot be done. New sources of water must be found and the importation of water from Alaska can be a part of the solution to this challenge.

As a result of recent developments with out-of-court settlements on hundreds of new listings and other Endangered Species Act (ESA) complications, many experts predict that all of the key 35 rivers that flow to the pacific ocean in the west will be under some ESA limitations further increasing demand for imports.

The greatest market potential is southern California, northern Mexico, southern Nevada, and other southwestern inland states. Although we do not believe the State of California will allow significant economic harm to their agricultural industry by forcing large transfers of water from irrigation to industrial and urban uses, there is the potential under sufficient stress for political change. Some analysts predict this change may be completed at prices that may make imports and/or desal not competitive in the next decade, while other analysts conclude that local prices will have to be much higher before any significant policy change takes place. There is no such potential in southern Nevada with practically no agriculture or northern Mexico where very limited agriculture is based on overdrafted groundwater.

The Division of Water continues to explore all of these key issues. If you have any concerns or suggestions after reading this paper please feel free to contact the Director of Water directly at (907) 762-2294.

*References on information contained in this paper are available upon request of the Director of Water (907) 762-2294.*

# THE NUMBERS

A typical VLCC Class tanker hauls 225 acre feet  
 A ULCC Class tanker can haul up to 300 acre feet

[In each class if ballast tanks are used for fresh water transfers capacity can be increased by 20%]

[Towable Bags may haul more than 300 acre feet]

These numbers are estimates based on discussions with marine transport experts that have investigated the cost of the marine transport of water. The actual costs and profits may be higher or lower than presented.

## Annual Payload per Tanker

<u>Number of Tankers</u>		<u>@225 AF</u>	<u>@300 AF</u>	
1	can deliver	8,212.5	10,950	acre feet a year*
2		16,425.0	21,900	
3		24,637.5	32,850	
4		32,850.0	43,800	
5		41,062.5	54,750	
9		73,912.5	98,550	
10		82,125.0	109,500	
20		164,250.0	219,000	

\* 36.5 trips per tanker per year assuming a 10 day round trip

### Gross Receipts per tanker @ \$1,700 per acre foot

VLCC tanker per trip is \$382,500      per year is \$13,961,250  
 ULCC tanker per trip is \$510,000      per year is \$18,615,000

### Operational Costs (fuel/manpower)

\$ 7,900 crew and \$9,300 fuel = \$17,200 per day

### Capital Amortization over 10 years is \$13,260 per day

Total "Day Cost" for a 10 year contract is \$30,460 with a total cost per round trip of \$304,600

### Net Receipts (gross minus cost) per tanker @ \$1,700 per acre foot

VLCC tanker per trip is \$77,900      per year w/36.5 trips is \$2,843,350  
 ULCC Tanker per trip is \$205,400      per year w/36.5 trips is \$7,497,100

# THE NUMBERS

## BAG/TUG Costs

(Provided by Medusa, Inc.)

[these numbers are under independent review by the Division of Water]

	<u>225 AF Bag</u>	<u>1600 AF Bag</u>
Velocity through water	3.0 knots	2.0 knots
Velocity including California current	3.3	2.3
Velocity, miles per day	92.0 mpd	63.5 mpd
Loaded trip time	21 days	30 days
Return	7 days	10 days
Load and Unload	<u>2 days</u>	<u>4 days</u>
<b>Total Cycle</b>	30 days	44 days
Arrivals per year	12.16	8.3
Annual deliveries per bag	2,738 AF	13,280 AF'
No. of bags to deliver 250,000 AF/Y	91 bags	19 bags
<b>Capital Cost</b>	<b>\$1,270,000</b>	<b>\$6,000,000</b>
Annual charge @ 19.2% p.a. (8% money, 7 year life)	\$244,000	\$1,152,000
Insurance @ 2%	25,000	120,000
Repair @ 2%	<u>25,000</u>	<u>120,000</u>
<b>Annual Cost of Bag</b>	<b>\$294,000</b>	<b>\$1,392,000</b>
Tug size	2,000 Hp	3,000 Hp
Annual cost	<u>\$1,332,000</u>	<u>\$1,698,000</u>
<b>Total Annual Cost</b>	<b>\$1,626,000</b>	<b>\$3,090,000</b>
<b>Per AF Delivered</b>	<b><u>\$594/AF</u></b>	<b><u>\$233/AF</u></b>

Note: This is an example of the optimization process, which should also include the cost of the terminal (less for shallower bags). A complete optimization will certainly find a cost less than the \$233/AF haul cost shown here.

Bag Dimensions and Costs

	<u>225 AF Bag</u>	<u>1600 AF Bag</u>
Length L	1,250 Ft	2,400 Ft
Width (filled w	296	568
Depth (total) d	41.7	80.0
Draft	40.6	78.0
Area of top (filled)	25,939 yd <sup>2</sup>	95,622 yd <sup>2</sup>
Area of top (empty)	32,020	118,022
Total fabric area	69,040	236,044
Calculated volume before expansion due to pressure several percent	275,875 m <sup>3</sup> 223.6 AF	1,951,800 m <sup>3</sup> 1,582 AF
Costs @ \$15/yd <sup>2</sup>	\$ 961,000	N/A
Costs @ \$20/yd <sup>2</sup>	\$1,281,000	\$4,721,000

Note: To these costs must be added engineering costs, interest during construction (if many bags) and contingency. Also tackle, lights, reflectors, balloons, etc.

## Drag Force Calculations

### Friction Drag

$$F_f = 1/2 \rho C_f U^2 A_w$$

$$C_f = .075/(\log_{10} Re - 2)^2 = .00175$$

$$R_e = UL_w/\nu \quad (Re = \text{Reynold's \#}) \quad \nu = \text{viscosity}$$

$A_w$  = wetted area

### Form Drag

$$F_d = 1/2 \rho C_d U^2 A_n \text{ Newtons}$$

$$C_d = .05$$

$$\rho, \text{ density of seawater, } = 1025 \text{ k/m}^3$$

$A_n$  = largest cross section normal to flow

$$\text{Total Drag} = \text{Friction Drag} + \text{Form Drag} + \text{Wave Drag}$$

Wave drag, which varies as 3<sup>rd</sup> power of U, is ignored at low speeds, e.g., < 3 knots

$$\text{Total Drag} = 1/2 \rho (C_f A_w + C_d A_n) U^2 \quad \text{Newtons}$$

$$\text{For Medusa bags, } A_w = 7.504V^{2/3}, A_n = .2714V^{2/3}$$

$$\text{Total Drag} = .00154V^{2/3}U^2,$$

V = capacity in cubic meters  
 U = velocity thru water, m/s  
 1 Newton = .00011242 short tons

### Examples

Velocity, knots	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Total drag 225 AF bag	1.72	6.88	15.48*	27.53**
<u>Short Tons</u> 1,600 AF bag	6.55	25.06	55.02*	95.98**

Tugs

Costs for a U.S. west coast tug of 5,000 Hp, 50 ton Bollard pull, capital cost \$7 million in volume purchase.

\$000's

Crew	660			
Main Finance @ 4%	275			
Insurance @ 2%	140			
Other op. costs @ 2%	140			
Fuel 6000 tpy @ 100%	600			
Lube	<u>50</u>			
Total	1,265			
Service of capital @ 8% pa including depreciation	<u>625</u>			
30 year basis	1,830	+	660	= \$2,490/y or \$7,700/d

Capital costs are roughly linear with bollard pull so estimate is for smaller sizes:

Bollard pull (Tons)	<u>10</u>	<u>20</u>	<u>30</u>	<u>40</u>
Tug costs, inc. cap	366	732	1,098	1,464
Crew costs	<u>500</u>	<u>600</u>	<u>600</u>	<u>660</u>
Total \$000's	866	1,332	1,698	2,124
Day rate, 325 d/y	\$2,665	\$4,098	\$5,225	\$6,535

# THE NUMBERS

## MISCELLANEOUS

Removing 225 AF a day from a source would require the appropriation of 82,125 AF a year.

If the annual discharge rate of the source were 500,000 AFY, the removal of this amount of water would be less than 20% of the total discharge.

The Division of Water does not permit the appropriation of water based only on annual discharge rates. Due to seasonal fluctuations, the Division requires monthly appropriation stipulations.

# THE NUMBERS

## State of Alaska

Although initially it was suggested that Alaska could export up to 2 million acre feet a year from southeast Alaska we find this unlikely, in the near term, using tanker or bag/tug technologies. We do believe a more probable target of one million acre feet a year more realistic.

### Revenue to the State

With a "Conservation Fee" at a range from \$5 to \$20 per acre foot, as required by law, the total revenues generated to the state would be about \$20,000,000 per year. The Conservation Fee must be graduated up (higher cost per unit) as more water is removed from a hydrologic unit (see State Laws in appendix).

In considering the long term economic impact of this new source it is important to keep in mind that the price of water will increase in the market area. All experts agree on that. The Conservation Fee will be adjusted accordingly increasing the total revenue to the state. In addition the annual adjustment for inflation will be applied.

Income from other sources of taxation on this new industry may increase this annual revenue.

### Jobs for Alaskans

Although Alaska can not insist that those involved with water exports train and hire Alaskans, we have been very encouraged with the interest of those actively pursuing water exports in training and hiring Alaskans. The phrase often stated is, "It only makes sense if we are doing business in Alaska, to train and hire Alaskans." In small villages and rural communities in southeast Alaska, this is a critical issue.

With the application of bag technology, and concerns with the Jones Act, it is anticipated that the bags would be constructed in Alaska. According to James Cran with the Medusa Corporation, such an enterprise could, he estimates, employ several hundred Alaskans.

### Uses for this new Revenue Stream

Although Alaska does not allow the dedication of revenue, through separate accounting, the legislature may wish to use this revenue stream to resolve many other water related challenges. Yearly appropriations to the Village Safe Water Program and the purchase of single family water distillation systems in many remote areas would be two obvious choices.

### Based on existing applications:

Sun Belt Inc., exporting 350,000 AFY, would generate \$1,750,000 to \$7,600,000 in Conservation Fees Sitka, exporting about 100,000 AFY, would generate \$500,000 to \$2,000,000 in Conservation Fees

Water Sales - Revenue is unknown at this time

## Bottled Water

Alaska has several bottled water and beverage industries with plants located in Anchorage and Juneau. WETCO bottles water under the name Beluga Water with a large share of the shelf space in Anchorage retail outlets. WETCO water products are also delivered to other areas of the state and exported to Japan for perfume manufacturing. Alaska's Best Water of Anchorage supplies drinking water to many office buildings in Anchorage in five-gallon bottles. Alaska Pure Water Products and Alaska Pure Mountain Spring Water of Juneau, also supply drinking water in various size bottles to local markets with limited exports.

The Municipality of Anchorage has a limited contract to supply water to Alaska Glacier from the Eklutna Water Project, that is truck tankered on barges to Washington state for bottling in a test market. This is a back-haul using milk tank trucks from the Seattle area. If this market proves out, the owners will consider opening a bottling company near the municipal Eklutna Water Treatment Plant.

Alaska Aquaculture, Inc. (Burnett Inlet Hatchery), in southeast Alaska, has a permit to export one million gallons of water a week from the Burnett River system to RainMaker, a firm in California. A small tanker will be used for transport, and they anticipate 52 shipments a year for a total export of 52 million gallons or 159.6 acre feet. The hatchery will charge as much as 1 cent a gallon at the point of transfer. This income will pay off the debt (state loan) on the hatchery.

A group of businesses involved in the tourism market in SE Alaska have advanced the concept of bottling local water as a souvenir. This may prove to be a successful enterprise focused initially at a very limited market, however, with development and experienced marketing this approach may open new markets outside of Alaska.

Test-markets by private companies using Alaska bottled water have been very successful. The cost of shelf space and an economically viable delivery system are the greatest challenges to developing markets outside of Alaska. These are the same challenges faced by most in the bottled water industry.

### Glacier Ice

The harvesting and export of glacier ice continues to increase. Currently there about 20 permitted harvesters and a number of pending applications. The market demand for glacier ice continues to be predominately Japan and Hawaii. We have seen a recent increase in the level of interest in glacier ice exporting and in use for domestic tourism markets. The last reported wholesale price for "clean" glacier ice is \$500 per ton.

# Ric Davidge

Appointed Alaska's first Director of Water in June 1991, Ric Davidge is responsible for the management of 40% of our nation's free fresh water resources. He is also responsible for the State Dam Safety Program, Title Navigability determinations, the Alaska Hydrologic Survey, State Water Policy and Management Strategies, Water Resource Management and Development, and represents the Governor on the Western States Water Council. Ric has been a pioneer in the export and sale of water from Alaska and was successful in getting unique legislation passed in 1992 that authorizes state water sales and water conservation fees. With the appointment of Glenn Olds as Commissioner of DNR, Ric was asked to head the Strategic Planning Team for the department and while serving that function completed DNR's first strategic plan and a series of tactical plans.

Ric Davidge came to Alaska in 1973 to attend and teach at the University of Alaska, Fairbanks. He received his BA degree at the Fairbanks campus and his MPA degree from the Juneau campus. While at the University, Ric was elected Student Body President and later appointed to the Board of Regents by Governor Hammond. Ric started the Alaska Student Lobby representing almost 10% of the voting population of Alaska.

In 1978 Ric joined the staff of Alaska's senior US Senator, Ted Stevens, and was involved in the final year of Congressional action on ANILCA. He initiated a number of national policy reviews on federal land management issues resulting in a series of GAO investigations which began a period of national reform. As a result of his work with Sen. Stevens, Ric was hired as the Washington, DC representative of the National Property Owners Association as a recognized authority on federal policies towards private ownership and developed a very successful consulting and representation firm.

During the 1980 campaign for President, Ric was asked to prepare a number of issue papers for the Reagan Campaign which were adopted and became a cornerstone of Dept. of Interior policy following Reagan's election as President. Ric was then appointed to a sub-cabinet position in the Dept. of Interior and selected to Chair the Land Policy Group which oversees land policy issues for the Interior Dept. and the US Forest Service. He was also responsible for developing innovative historic preservation policies and tax reforms that caused a national surge in private historic property restoration. Among many other responsibilities with the administration, Ric served as the Federal Commissioner to the New Jersey Pinelands, a member of the President's Council on Historic Preservation, and Chairman of the Coastal Barriers Task Force that delineated over 900 miles of east and gulf coast shore line which Congress placed into a new conservation system.

In 1983 Ric returned to Alaska to head the Office of the Assistant Secretary for Fish, Wildlife and Parks in Anchorage and begin oversight of the conservation system management planning requirements in ANILCA. Working closely with the Alaska Land Use Council, a joint State/Federal group, he headed a number of initiatives for the Assistant Secretary. With the growing controversy in subsistence and access questions facing the US Fish and Wildlife Service, Ric was appointed as Assistant to the Director of the US Fish and Wildlife Service to head a series of high profile and controversial State/Federal task forces.

Ric left federal employment to join the campaign staff of Walter Hickel who was running for Governor in 1986. As Director of Issues for the campaign Ric wrote most of the campaign issue papers and speeches for Governor Hickel. After the Primary Ric left the campaign to serve as Ex Dir of the Citizens Coalition for Tort Reform and helped organize and set the direction for the organization including preparing a number of major legislative reforms.

In 1987, Ric was hired as the Director of Development Services for the Mat-Su Borough. In this capacity he directed 6 divisions, headed international trade missions to Europe and Asia, articulated economic development strategies in port and industrial park development, forest management and wood fibre production, recreation,

mining and other industries. Ric was appointed as the Acting Borough Manager in the absence of the Manager.

Continuing his economic development efforts Ric was hired by Susitna Industries as Vice President and Assistant General Manager. In this capacity Ric was responsible for the development and financing of projects ranging from \$250 million to \$1.5 billion. While working for Susitna Industries Ric also served as President of his own public policy consulting firm, often heard on national radio talk shows discussing Alaska; he also wrote a number of issue papers for political candidates. Ric also served as Ex Dir of the Alaska Professional Sportsman's Association, a professional trade organization concerned with professional standards, tourism development, marketing and state/federal relations.

With the Exxon tanker accident in Valdez, Ric was hired to immediately staff and set up environmental compliance offices in the Gulf of Alaska for VECO under contract to Exxon. Over the next few months Ric designed and had constructed the second largest and most diverse waste separation, transportation and management system on the spill in Seward. By the end of the summer Ric was asked to accept the position of Director for Planning, Permitting and Government Affairs with a leading environmental consulting firm in Anchorage. In this capacity he was instrumental in bringing together this firm with Soviet/Russian leaders resulting in a very large and successful joint venture for environmentally responsible resource development in a former Soviet Republic. While still working with the firm Ric was asked by Senator Jack Coghill to develop and manage all issues for his campaign for Lt. Governor. Ric was also brought in to prepare candidates for statewide TV debates and with Gov. Hickel joining the campaign Ric again took responsibility for issue papers and special interest group questionnaires.

In February of 1991, Governor Walter Hickel asked if Ric would join his personal staff as Special Assistant for Policy and Legislation. In this capacity Ric served as the Governor's principle assistant on Subsistence and the Governor's liaison with the House Minority. With the creation of the new Division of Water and the end of the legislative session, Ric was appointed Alaska's first Director of Water.

#### Community Service

Since coming to Alaska in 1973 Ric has been very active in community service. In addition to his leadership in post secondary education, he also served as Chairman of the Commission on Public Transit which developed the first mass transit system in the Fairbanks North Star Borough. He has served on a number of statewide private and public boards and commissions and as a Director in such organizations as the Resource Development Council and The Alaska Support Industry Alliance. Ric has written many articles and participated in writing books such as the Commonwealth North publication, "Going up in Flames". Ric was an original member of the Alaskan Coalition for American Energy Security.

#### Education

Masters in Public Administration, Univ of AK, Juneau  
Bachelor of Arts, Univ of AK, Fairbanks  
Post Graduate work in Economics, Political Science and Management

#### Personal Information

Married with three children all living in Alaska.  
Ordained Elder (Worship) in the Presbyterian Church  
Viet Nam combat Veteran (65-66) Also Korea, Japan (67-69)  
Former Professional Entertainer

# ALASKA

## 40% OF OUR NATION'S FRESH WATER RESOURCES

Superior quality fresh water can be provided by the private sector, on a turn-key basis, with zero capital funding by California water buyers. By using marine transport the buyers of quality Alaskan water allow themselves total flexibility in the location and rate of delivery at minimum cost.

### **THE MARINE TRANSPORT OF SUPERIOR QUALITY WATER FROM SOUTHEAST ALASKA TO SOUTHERN CALIFORNIA IS ECONOMICALLY MORE VIABLE AND ENVIRONMENTALLY MORE RESPONSIBLE THAN MANY OTHER ALTERNATIVES**

#### Major Advantages of Marine Transport Compared to Desalination

Uses approximately 33% less energy, most of which is used outside of California. Reduces future energy dependence and impacts on California air quality.

- \* Significantly less expensive, both in real dollars and environmental costs.
- \* Requires no significant on-shore land use thus minimizing the impact on sensitive coastal areas.
- \* Involves no toxic chemicals or expensive waste-stream management.
- \* Has no waste discharge thereby minimizing impacts on marine environments.

#### Secure Sources

Over 25 large lakes in Southeast, Alaska with watersheds that average annual precipitation between 150 to 400+ inches, many without fish, and are easily accessed by marine transport. Applications now being processed by the State of Alaska for annual deliveries in excess of 400,000 AFY.

#### Cost Estimates

Assuming a minimum of 8,300 AFY for 10 years with delivery to northern Mexico or San Diego, California, less than \$1,500 per acre foot. With bag technology the delivery cost is less than \$1,000 per acre foot. Direct tie-in with existing water delivery and storage systems allows mixing with lower cost sources, greatly reducing per acre foot economic impact at the tap.

#### Mitigation of other Environmental Concerns

Allows exchange (wheeling agreements) with inland states, such as Nevada, for existing water appropriations from Colorado or Sacramento Rivers as well as inland California agriculture with coastal communities.

Allows more inland water to meet growing endangered species demands.

# CALIFORNIA

If we are able to achieve every success, every advantage, in conservation, water reclamation (sewage/water recovery), redistribution, groundwater management, water marketing, new sources, expanded storage, and population control we will still be short 4 to 6 million acre feet a year by 2010 - if it rains. So said Douglas Wheeler, Secretary of Natural Resources for California at the Global Cities Project Water conference in San Francisco (3/20/92).

The southwest is now in its 7th year of drought and their ability to recover is seriously impacted by growing water demand.

## Population Increase

The experts agree that by the year 2008 the population of Southern California will increase by one third.

## The Colorado River

As a result of court decisions the State of Arizona has begun claiming their priority right to water from the Colorado River; efforts by federal agencies to protect threatened or endangered species that depend on this river system; international demands will cause more clean water to be passed to Mexico - each of these facts will significantly reduce the amount of water available to Southern California.

## The Sacramento River

California will become very familiar with the Endangered Species Act over the next decade. Some California groups openly claim to have dozens of species which are instream dependent, ready for "listing". This coupled with seismic, water quality and wetland concerns and the delays and exponential costs of new storage and diversions make more water from this source very problematic.

## Economic Impacts

California newspapers are full of stories of businesses leaving. Some businesses are already spending significant dollars to cleanup the water they receive for manufacturing. Sources are less and less dependable. Importing water from Alaska; it is a simple economic decision if you need dependable, low cost, high quality water.

## Desalination

Although the contract price for desal in Santa Barbara was \$1965 per AF, the current cost is reported to be much greater. After 3 months of operation the \$30 million plant was shut down, but the city is still paying \$1200 per acre foot against 3200 acre feet a year and no water is being produced. Desalination costs will escalate due to dependence on very large quantities of energy. As energy costs increase so will the cost of desal water. Desalination produces a huge waste stream. Existing discharge and waste stream management costs will increase with more restrictive environmental laws. Due to low volume production, dozens of large plants would need to be located along the California coast.

**LARGE VOLUME  
WATER EXPORT POTENTIAL  
FROM  
SOUTHEAST ALASKA**

**By**

**R. Noll, Hydrologist III  
and  
Ric Davidge, Director of Water**

**Department of Natural Resources  
Division of Water**

**April 1992**

**American Water Resources Association  
Alaska Section  
1992 Conference  
Fairbanks, Alaska**

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Davidge - Division of Water, PO Box 107005, Anchorage, AK 99510-7005**

## ABSTRACT

With over 400 inches of rain per year in some areas of Southeast Alaska, water exports to dryer areas of the world is a potential use of this renewable resource. Interest in marine transport of southeast Alaska water has State agencies identifying site requirements, regulations, and needed permits.

Water export sites need to meet the following hydrologic requirements: 1) the site stream, river, or lake should have a large enough drainage area to supply water year round without impacting fish and wildlife resources, 2) the site should have access to provide loading to large tankers, and 3) the site must be on land designated for resource use.

Most project proposals must have an Alaska Coastal Management Program (ACMP) review. The Division of Governmental Coordination (DGC) conducts the ACMP review to ensure the project is consistent with the Alaska Coastal Management Program. Within the ACMP process, regulatory review allows each department to ensure that their statutes are complied with. A pre-application meeting may be convened by DGC allowing the applicant to discuss the project with state and federal agencies. From that meeting the applicant will have an outline of what permits and follow up items are needed and what agencies they need to work with.

The right to use Alaska's water is based on appropriation permitted under the Water Use Act. Currently the state may only assess an application fee from \$50.00 to \$200 depending on the quantity of water involved. Consequently, the administration has introduced legislation to allow the assessment of water management fees, and to allow the state to sell water resources. Along with selling water resources, the state is exploring the concept of progressive water management fees based on the quantity of water being transferred out of a designated hydrologic unit or sub-unit. Declining revenues from North Slope oil will continue over the next eight to ten years. As the use of water resources increases within both Alaska and other western states, the proposed fees would help pay for the cost of managing the resource.

## INTRODUCTION

Southeast Alaska has the potential for exporting vast quantities of high quality water. The area has abundant rainfall throughout the year, is close to shipping lanes, and many of the area's water resources have not been developed. Recently Yakataga received 6.5 inches of rain in a 24 hour period, and at a time when other states have been experiencing a drought, southeast Alaska has had over 15 consecutive months of above average rainfall. Alaska is faced with increasing use of its vast water resources and the possibility of exporting water to other states. At present the state is unable to recover any revenues from the use or export of water. The potential to export water from Alaska ranges from speciality exports, such as bottled water or glacial ice, to large scale exports for municipalities.

Water export from the state has not been addressed in the regulations until now. At present, the Department of Natural Resources has received three water right applications for large volume water export projects. This has required the department to review certain parts of the permitting process, such as where the beneficial use of the water will occur. Along with DNR's authorizations, the size of these projects usually result in numerous permits from other state and federal agencies being required. The large number of agencies involved usually necessitates that an applicant have knowledge of

both the hydrology of the site, and the bureaucratic process. Any planned site selection should be carefully reviewed for land status, fish enhancement projects, natural fish runs, historic and cultural significance, and recreational use.

Allocation of Alaska's water is based on principles of prior appropriation for beneficial use in the public interest. The right to use water is gained through a permit process governed by the Water Use Act and regulations promulgated under it. The present application fee ranges from \$50 for use of up to 5000 gallons per day, to \$200 for all uses over 30,000 gallons per day. This is a one time fee for processing the application, permit and certificate. The administration has introduced legislation to allow the assessment of water management fees based on water use. The objective of the management fees is for the use of water resources to pay for the cost of managing those resources. A progressive fee based on the quantity of water being transferred out of designated hydrologic units would allow the state to gain revenue from appropriation or sale of water resources.

Along with managing the water resource, the state is developing data bases. Information such as who is using water and for what purpose, where water is being used, how much water is used, and what source of water is being used are all part of a water right application. This information is stored in the DNR Land Administration System (LAS), water subsystem. The information can be retrieved for a specific area or site by type of water use, quantity of water, or a combination of data. Ground water information received in the form of well logs is entered by location on a state data base system and is also incorporated into the USGS well log data base.

## SITE SELECTION

Numerous factors determine the feasibility of a site for water export. The amount of water requested and the desired method of transport will be most important in initial site selection. Once a number of sites are identified, the land status must be determined to ensure the project is compatible with the designated use in that area. After a site is identified as being able to supply the water requested and is found compatible with the land use, many other considerations must be factored in. Many streams in southeast have natural salmon runs, hatcheries, or artificial stocking of some type. Other areas have high recreational use, or commercial use such as canneries. Some sites may have existing water rights for use ranging from single family homeowners to municipalities.

Water requests for out of state export to municipalities or water districts require large year round water supplies, and access for large tankers. This limits the number of available sites. Small speciality exports such as bottled water have a larger selection and can be incorporated with other water uses. A hatchery in Burnett Inlet on Etolin Island was issued a permit to export water for bottling. Tanker export of large volumes (over 50,000 acre feet per year) necessitates a site that can supply 100 to 150 cfs to the tanker while maintaining required minimum in-stream flows. Site selection cannot usually be done based on available USGS stream flow records. Another parameter that can be easily determined from standard topographic maps such as drainage basin size must be used. Smaller drainage basins could be considered for selection based on the annual precipitation for the area. An estimate of annual precipitation can be determined from the US Forest Service Region 10 Water Resource Atlas. For large export operations, a lake close to tide water and at an elevation above 100 feet is desired to minimize pumping. The site must have access for tankers that can be up to 1000 feet long. Some sheltered area for support facilities must be located close to the loading site.

Once a site is found that meets the hydrologic and infrastructure requirements, and if the land is managed by the US Forest Service, the Tongass National Forest Land Management Plan must be checked. The plan divides the forest into Land Use Designations (LUD). LUD-I consists of wilderness and related national monument lands. These lands are generally managed to protect objects of ecological, cultural, geological, historical, prehistorical, and scientific interest. No development or water export is generally permitted. LUD-II lands are to be managed in a roadless state to retain their wildland character, but would permit wildlife and fish habitat improvement and primitive recreational facility development. LUD-III lands will be managed for a variety of uses to provide the greatest combination of benefits. These areas have either high use or high amenity values in conjunction with high commodity values. On LUD-IV lands, opportunities will be provided for intensive resource use and development where emphasis is primarily on commodity or market resources. The Tongass Timber Reform Act of 1990 should be checked to ensure a site selection is in the proper LUD.

Selection criteria related to land use, hydrology and access are problems that usually cannot be solved by some type of project design change. The remaining considerations will usually be reflected in different state and federal agencies request to the applicant. Fish and wildlife resources and recreational use are the two most important. The natural fish runs present in a stream can be determined by consulting the Atlas to the Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes, 1989 by the Department of Fish and Game, Habitat Division. This document identifies the species and life cycle of any anadromous fish in the selected site. The Alaska department of Fish and Game, US Fish and Wildlife Service, and National Marine Fisheries should be consulted to determine if any fish enhancement projects are being done at the selected site. Some sites will have a high recreation use for camping, hiking or fishing. At sites which may impact the fisheries or recreational use, the applicant will have to find solutions that are compatible with the agencies and consistent with public interest requirements.

### AGENCY REVIEW

Most projects related to water export are expected to be along the coastal areas of southeast (a small bottled water supplier in Juneau uses a spring above Lemon Creek) and will have to comply with the standards of the Alaska Coastal Management Program (ACMP). The ACMP standards were adopted by the Alaska Coastal Policy Council in 1978. The standards provide for a comprehensive, interdisciplinary perspective in decision making; balanced use and protection of coastal lands and waters; and a higher priority for uses that depend on a coastal location.

The ACMP process provides the State of Alaska with a coordinated system for reviewing applications and issuing permits for proposed projects that would affect natural resources in Alaska's coastal zone. In the consistency review process, project proposals are reviewed to ensure that they are consistent with the standards set out by the ACMP before any state or federal permits are granted.

Within some local communities and rural regions called coastal districts, additional standards for coastal development may apply. These district standards provide more specific guidelines for development in the local community.

The Division of Governmental Coordination (DGC) conducts the ACMP review to ensure a project is consistent with the Alaska Coastal Management Program. DGC has a number of functions when coordinating a project. They are responsible for bring the

applicant and all state and federal agencies together in a pre-application meeting to review the project. It is DGC's job to assist applicants in the permit process, to streamline and expedite state reviews and decisions on coastal development, and eliminate repetitive reviews and decisions. DGC will provide adequate opportunity for public and local participation in state decisions. DGC will render a consistency determination for a project within the Alaska Coastal Management Program that is balanced, factually documented, and will consider the cost and benefits of requiring particular stipulations.

After a DGC sponsored pre-application meeting, the applicant will have an outline of what permits and follow up items are needed. The applicant will have a better idea what agencies they need to work with, and the agencies will have a better idea of the project design. The permits needed for a water export project may include any number of the following:

Federal Permits:

Corps of Engineers Section 10  
USFS Special Use Permit

State Permits:

DEC Certificate of Reasonable Assurance  
DFG Fish Habitat Permit (dependent on location)  
DNR Right-of-way (if crossing State land)  
DNR Tideland Lease  
DNR Temporary Water Right  
DNR Water Right  
DNR Dam Safety Permit

Miscellaneous Items

ANILCA 906 (K) Concurrence  
Alaska Energy Authority Information  
Alaska Legislative Action  
Alternatives Analysis  
FERC Report  
NEPA Environmental Analysis  
Public Need Information

## WATER POLICY AND MANAGEMENT FEES

The State of Alaska is considering a water management fee for a number of reasons, not the least being a method for the state to recover the cost of managing Alaska's water resources from the users of that resource. A management fee has other benefits that the Department feels make the overall management fee proposal a complete management package. The management fee concept, in addition to cost recovery, promotes the idea that water is a valuable natural resource that is required by all Alaskans to fulfill their basic needs, such as for drinking and bathing, but is also used for the generation of power (hydroelectric, natural gas and oil), food (agriculture, seafood and other processing), timber, other petroleum products, mining, and many other products and services used on a day to day basis. These same water resources are used in their natural state to protect fish and wildlife and their habitat, recreation, transportation and water quality. A management fee concept will also promote water conservation. Studies clearly show that as the cost of water increases, the use decreases. Management of Alaska's water resource will also benefit the state's water rights program by providing the opportunity to update

many of its water rights files by eliminating those water rights no longer in use or by decreasing those water rights where the total quantity of water is no longer being used. Holders of water rights will advise the Department of Natural Resources when they stopped using water or if they are using less water than what was granted to them when they received their management fee notice each year. Updating of the water rights system will help water managers better understand the water use requirements for specific commercial and industrial water users, sources of water in specific areas, where water is used and what it's used for.

In reality it is not cost effective or feasible to charge all water users a fee. It has been estimated it costs the state \$50.00 to send and receipt a bill, so the lower limit of management fee would have to be \$50.00. If the management is set at \$1.00 per acre foot of water used, no water user using less than 50 acre feet per year would be charged. Fifty acre feet of water is equal to approximately 44,600 gallons per day. The homeowner using an individual water system and most small miners using a suction dredge smaller than six inches would not be subject to a management fee. The larger (greater than 50 acre feet per year) would be subject to the management fee. These could include commercial and industrial businesses, seafood processors, public water supplies, agriculture, mining, pulp mills, oil and gas development, oil and gas processing and others.

#### SUMMARY

Water export from southeast Alaska is a new use of one of Alaska's largest renewable resources. Water is currently being exported for bottling, and applications have been received for large volume export. These new uses of water resources have caused Alaska's water managers to review the process by which the State charges application and management fees.

Water export site selection is very dependent on the volume of water exported. Site evaluation must be done with the method of shipment in mind, quantity and quality of water available, availability of the water supply year round, and other potential uses for the water resource. Each site must be evaluated for access, land use designation, fish resources, and recreational use.

The Division of Governmental Coordination in the office of the Governor will coordinate the ACMP consistency review, assist the applicant, and provide an opportunity for the applicant and state and federal agencies to meet.

The Division of Water does not endorse  
the Medusa Corporation, Inc.  
or its bag technology.

The attached materials are only included to illustrate the bag technology discussed in this paper. In order to use these photographs, we have agreed with Mr. James A. Cran, President of Medusa Corporation, to include the cover page of the business plan from which these photographs are taken.

# MEDUSA

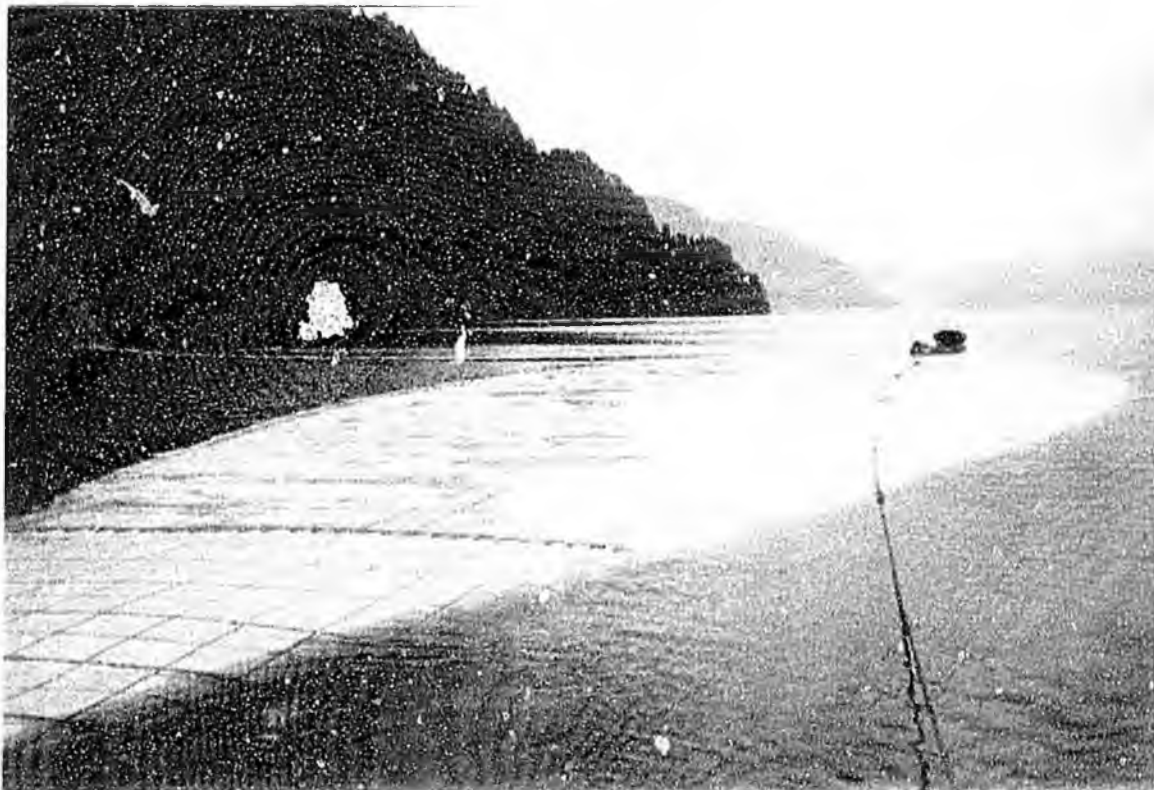
CORPORATION INC.

## BUSINESS PLAN

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The transportation of very large volumes of fresh water or sewage effluent in flexible barges at sea.

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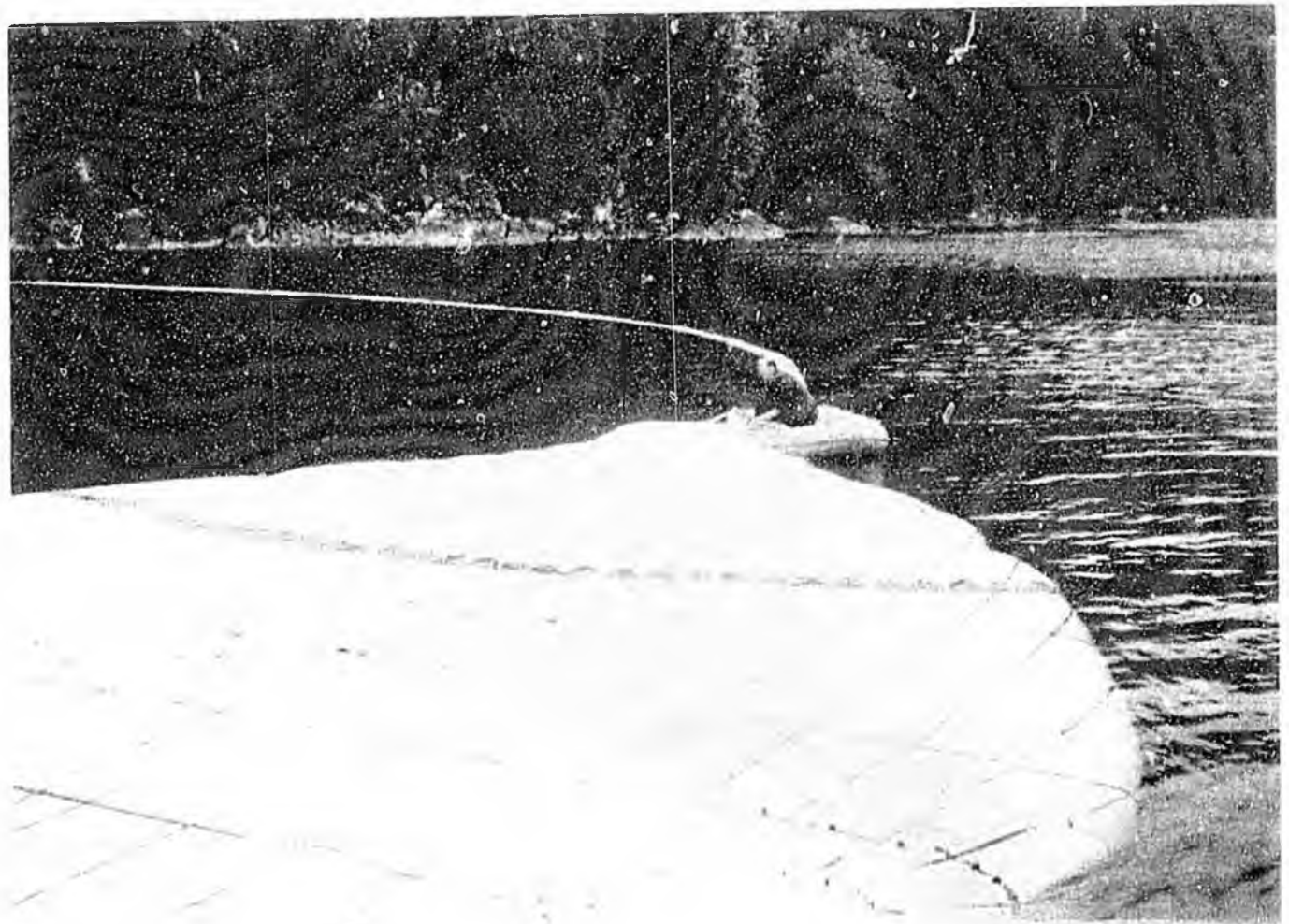
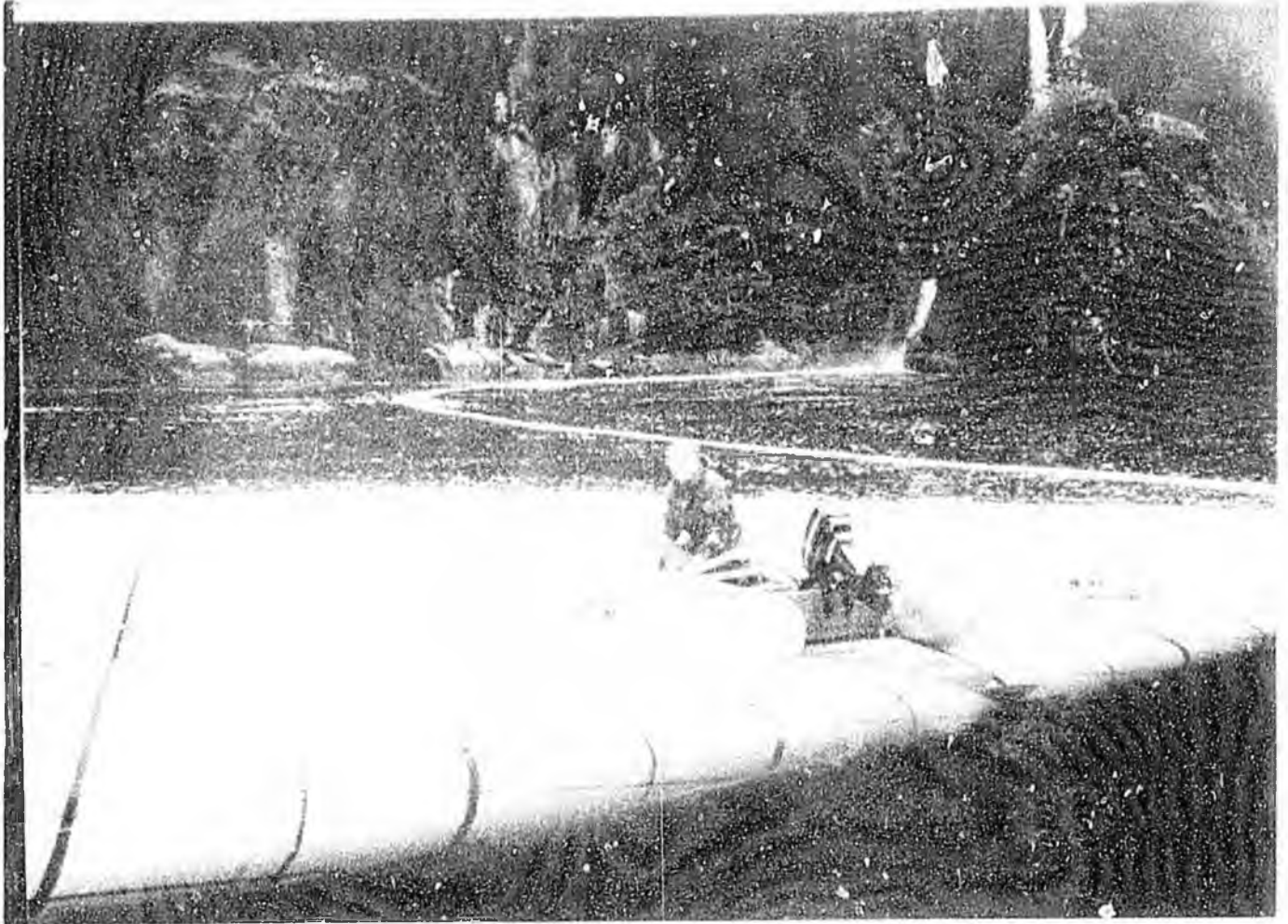
A 5000t engineering prototype medusa bag under test off Vancouver, B.C.

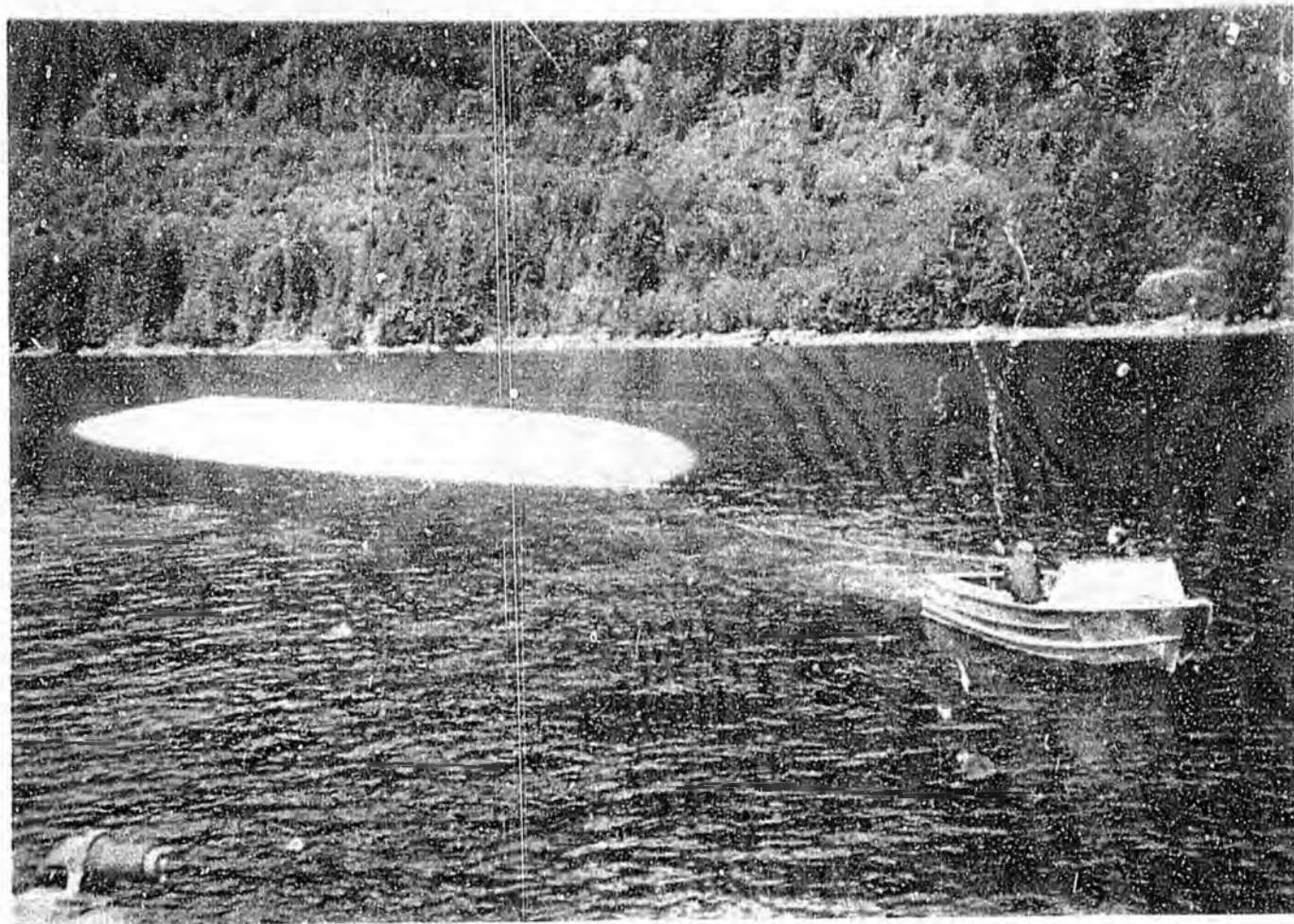
Prepared by:

James A. Cran, President  
C. Gaylord Watkins, Vice-President

March 1990

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625 Sifton Blvd. S.W.  
Calgary, Alberta  
Canada T2T 2K8  
Tel. (403) 243-3640  
245-8443  
Fax. (403) 244-5634





# Medusa Bag Strapping Pattern (Provisional)

Scale Approximately 1:2000

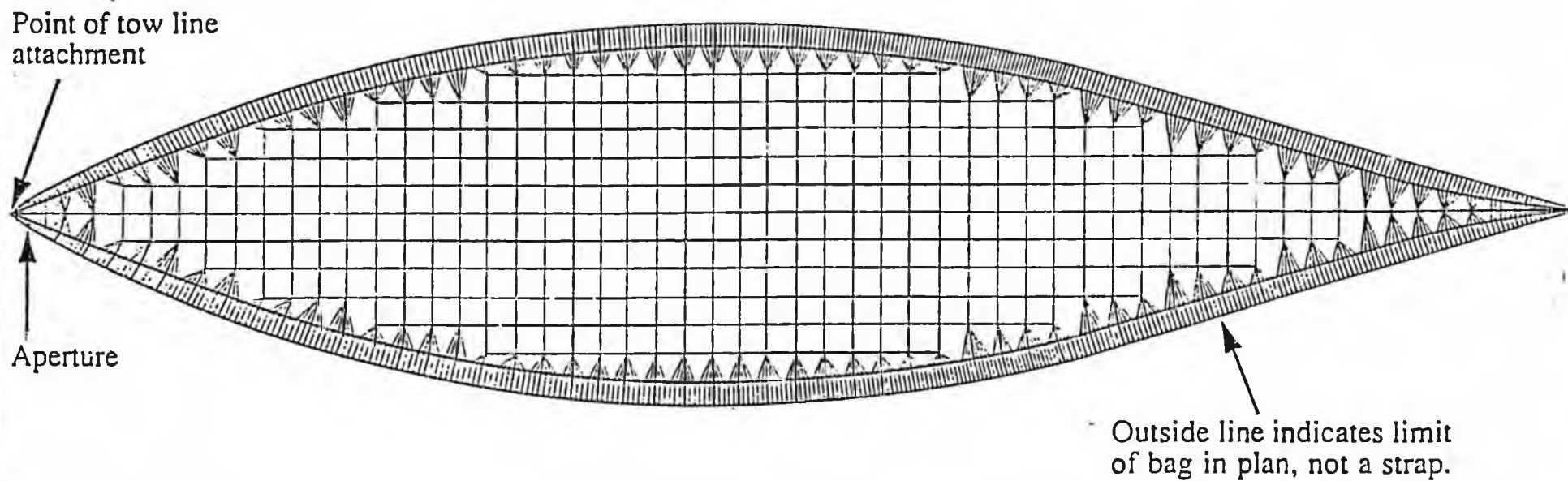


Figure 1

Fig 4.2 WATERBAG EDGE SHAPE

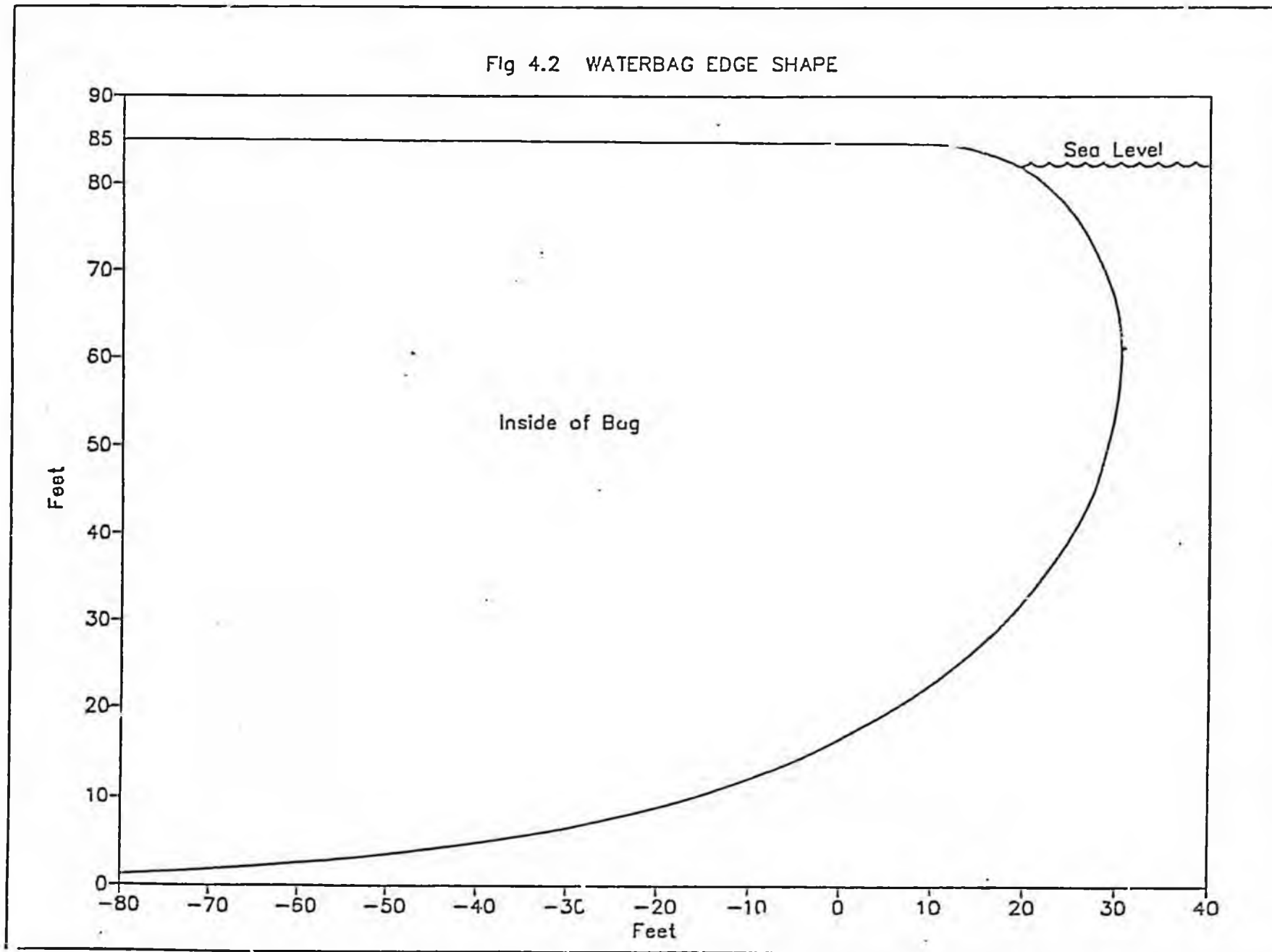
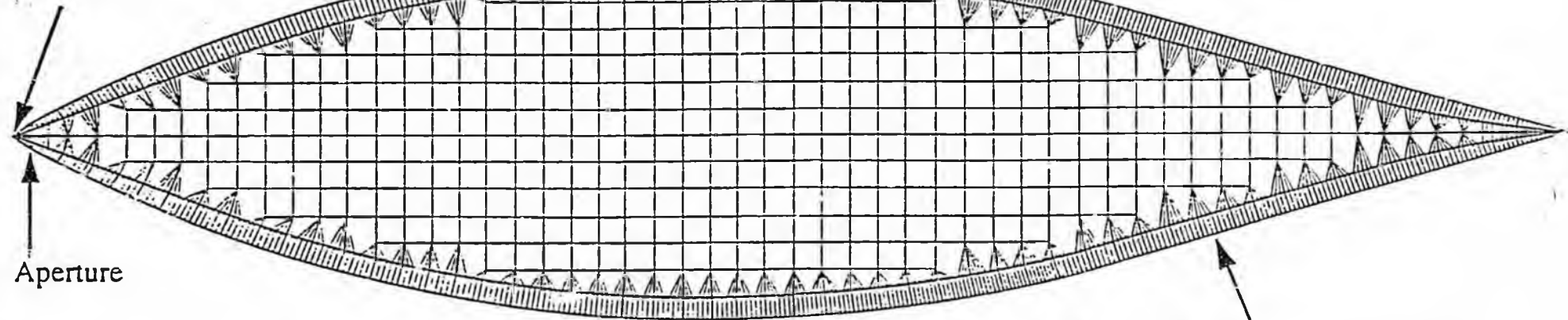


Figure 3

# Medusa Bag Strapping Pattern (Provisional)

Scale Approximately 1: 2000

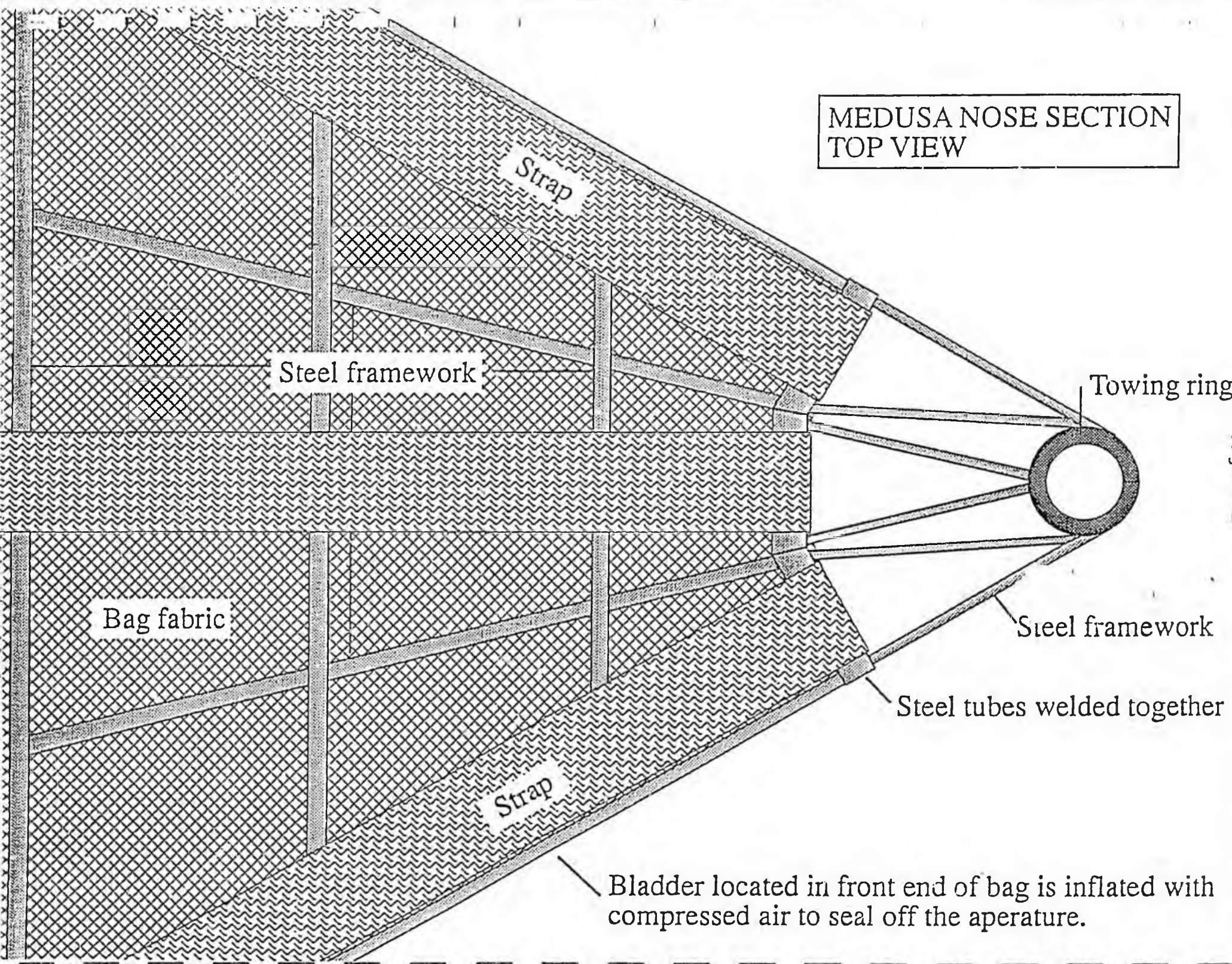
Point of tow line attachment



Outside line indicates limit of bag in plan, not a strap.

Figure 1

MEDUSA NOSE SECTION  
TOP VIEW



Steel framework

Strap

Towing ring

Bag fabric

Steel framework

Steel tubes welded together

Strap

Bladder located in front end of bag is inflated with compressed air to seal off the aperture.

Figure 2

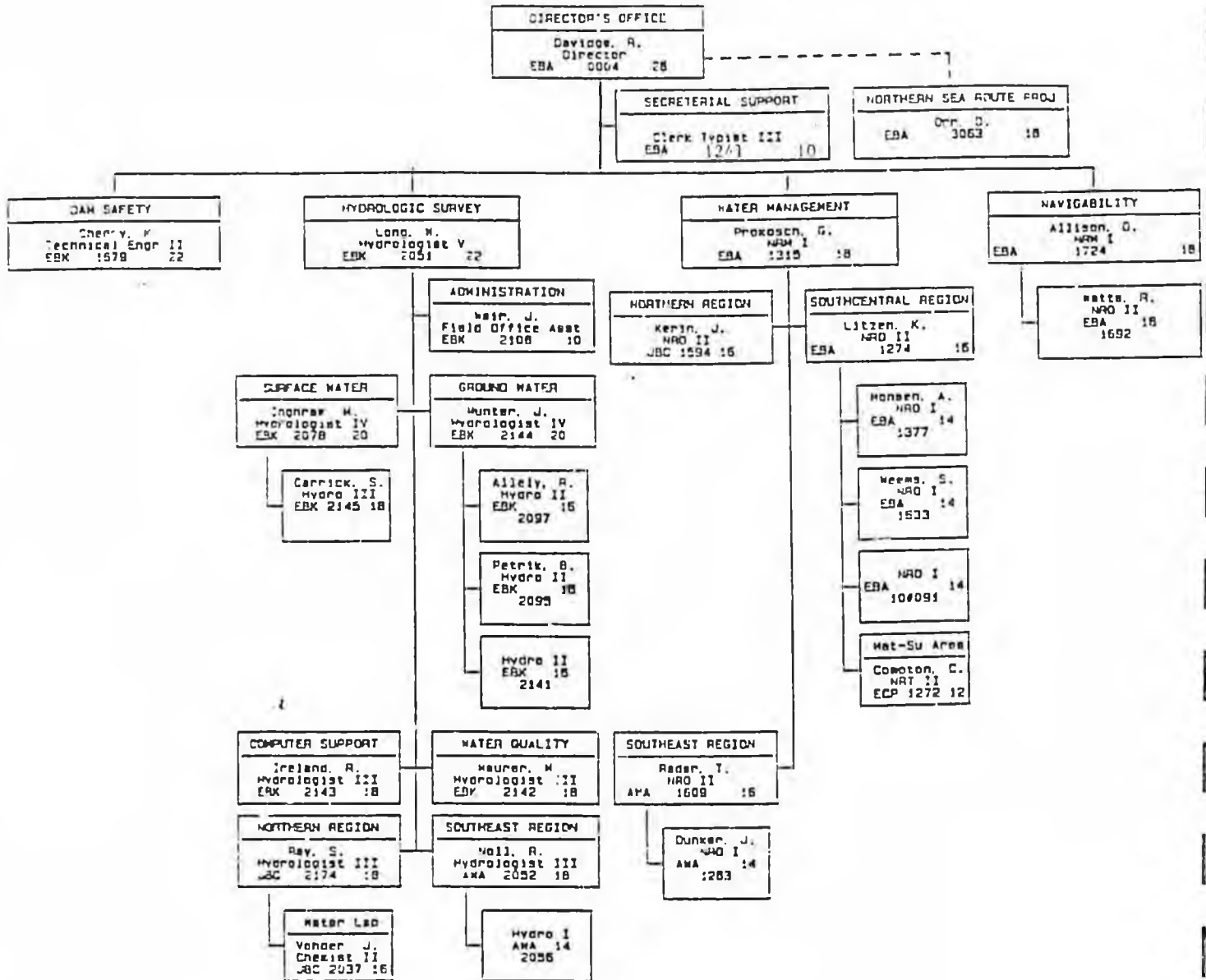


## THE DIVISION OF WATER

The Alaska Division of Water manages an estimated 40% of our Nation's free (not frozen) fresh water resources including over 3 million lakes larger than 50 acres and an estimated 30,000 streams. These responsibilities include the State Water Policy and Water Management Strategy; issuing water rights; administering the dam safety program; rendering and reviewing administrative navigability determinations, asserting ownership and management of submerged lands; surveying, collecting and disseminating water resource data related to the quantity and quality of surface, ground and coastal waters of Alaska; coordinating water related data collection and management activities with other agencies; providing support to the State Water Board; advocating responsible water development including water exports. The Director of the Division represents the Governor at the Western States Water Council consisting of 17 western states.

In addition to the Office of the Director, the Division of Water is comprised of four sections: The Alaska Hydrologic Survey which includes the State Water Lab, Water Management and Development, Dam Safety and Construction, and Navigability. The Division has offices in Anchorage, Fairbanks, Juneau, Eagle River, and Palmer.

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## Anticipating loss of oil revenues

# Alaska moving ahead with its plan to export water via ocean transport

ANCHORAGE, Ak. — The long-awaited boom in the market for potable water — reminiscent of oil prices in the 1970s — might be moving toward detonation in the panhandle of Alaska. Looking toward water marketing as a means offsetting declining oil and gas income, the Alaska Department of Natural Resources is drafting a formal proposal for water exports shipped via ocean tanker or moved in giant nylon bags towed behind tugboats.

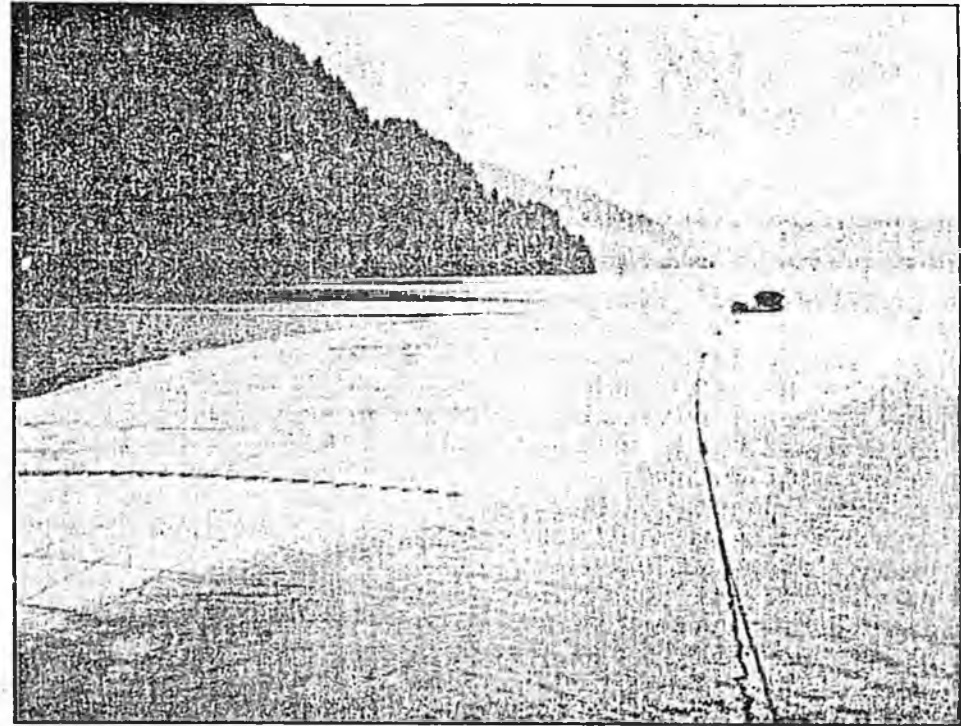
After proposals to deliver water from Alaska to California captured the imagination of the popular press last year, the public generally considers such water imports as an "exotic notion," admitted Ric Davidge, director of water for the State of Alaska. However, noted Davidge, after meeting with various potential buyers such as the Association of California Water Agencies and the Metropolitan Water District of Southern California, "we have found that once the technologies and economics are explained and technical questions are addressed understandably, the audience is receptive to the notion of water imports by tanker or bag."

To maintain this sense of viability, Davidge has written a water export discussion paper. The paper is being made available for review and revision, so that "we can continue to update it as we receive comments and as new or better information is developed," he said. Copies are available by calling the Alaska department's Division of Water at (907) 762-2294.

In essence, the paper describes an exportable supply of freshwater runoff in the Alaska panhandle of approximately 1 million acre feet a year. This sort of supply could be achieved by developing 20 sites, producing an average of 140 acre feet per day at each site. The most attractive water export markets, according to the paper, are southern California, southern Nevada, and the state of Baja California Norte in Mexico. The Alaska Division of Water currently is working with three applicants for the export of 450,000 acre feet of freshwater a year. Pending applications for water rights have been submitted by Alaska Aquaculture, Inc.; Sun Belt Water, Inc.; and the City and Borough of Sitka.

According to the paper, desalination is the principal existing competition to a potential Alaskan water export market. If Alaska is to compete with desalination, it is noted, the target price for delivered water must be under \$2,000 per acre foot.

In initial discussions, the means of delivery for exported Alaska water was ocean tanker. With changes in petroleum tanker regulations requiring double hulls following the Exxon Valdez oil spill, dozens of used single-hull tankers are available for water exports at a cost-effective rate. However, new technology being developed by the Medusa Corporation, Inc. of Vancouver, British Columbia, would use industrial coated nylon fabric bags to transport up to three times as much water per trip as tankers.



A prototype bag holding potable water has been successfully tested by the Medusa Corp. of Vancouver, B.C. Medusa officials say, however, that the bag technology must be successful in transporting up to 800 acre feet at a time before it can be considered feasible for ocean transport.

"Although we continue to explore the numbers on bag/tanker configurations, we believe the application of bag technology for storage and especially for transport will bring the economics of transporting water into competition with reclaimed water as well as desalination and even some conventional land-based delivery systems in the market area," noted Davidge.

James Cran, president of Medusa Corporation, said "there's nothing magic about bags ... they are difficult to engineer and manage, but they are very cheap." Cran pointed out that recent press reports have somewhat misconstrued the realities of the continually evolving bag technology. Medusa is preparing to test a bag that is capable of holding up to 81 acre feet of water, but the Medusa president said "that's still a demonstration."

In order for bags to be effective in importing water, he added, an export contract on the order of 200,000 acre feet of water annually for at least 15 years would be required. On this magnitude, Cran estimated that the cost of delivery would approximate \$500 an acre foot.

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## *Alaska Releases Report on Water Exports, Sales*

THE State of Alaska has now released a discussion paper on water exports and sales prepared by Ric Davidge, State Division of Water Director. Accompanying the paper are draft regulations to implement a new water conservation fee for any water removed from a hydrologic unit within the state.



The discussion paper asserts that: (1) marine transport of water to Mexico or California is possible before 1995; (2) the economic benefits of such transfers could be significant; and (3) cooperative work between interested parties could make water exports a reality. Concepts evaluated include the market for water, water sources, delivery systems, resource development economics, transportation and marketing, environmental and social impacts, other limitations, and strategies for development. For copies, call (907) 762-2294. (*Western States Water, the weekly newsletter of the Western States Water Council*)