NAWAPA

NORTH AMERICAN WATER AND POWER ALLIANCE

Brochure 606-2934-19

THE RALPH M. PARSONS COMPANY

ENGINEERS-CONSTRUCTORS

LOS ANGELES
NEW YORK

THIS BOOKLET CONTAINS INFORMATION ABOUT THE NORTH AMERICAN WATER AND POWER ALLIANCE (NAWAPA). NAWAPA IS A CONCEPT DEVELOPED BY THE RALPH M. PARSONS COMPANY FOR UTILIZING THE EXCESS WATER OF THE NORTHWESTERN PART OF THE NORTH AMERICAN CONTINENT AND DISTRIBUTING IT TO THE WATER DEFICIENT AREAS OF CANADA, THE UNITED STATES AND MEXICO.

CONTENTS

NAWAPA CONCEPT

The North American Water and Power Alliance conceives the collection of surplus water from the high precipitation areas of the northwestern part of the continent and distributing it to water-scarce areas of Canada, the United States and northern Mexico.

Water now wasting into the sea from Alaska, Canada, and the northwestern United States would be collected and stored in an interconnected system of reservoirs at relatively high elevations. By means of a reservoir-canal-river system the water would then be redistributed throughout the continent generating power as it descends into the sea.

In addition, NAWAPA would, through its system of interconnecting rivers and canals, provide a network of navigable waterways throughout Canada and much of the United States.

The NAWAPA concept utilizes the unique geographical, geological, climatological and hydrological features of the North American continent to accomplish its purpose.

NAWAPA would require $5 billion in construction equipment and tools, 100 thousand tons of copper and aluminum, 30 million tons of steel, and $25 billion in construction labor.

NAWAPA is a continental plan to fulfill a continental need. It would provide North America water in sufficient quantities to assure adequate water supplies for the next one hundred years or more.

NAWAPA would deliver more than 40,000,000 acre feet of water annually to the Great Lakes thus alleviating the constantly falling water levels.

NAWAPA would return the investment in approximately 50 years. Returns from the sale of water and surplus power will start in approximately nine years from beginning of construction.

NAWAPA would stabilize the power production of the Niagara hydro-electric complex, the Columbia river system and others.

BENEFITS OF NAWAPA

Thirty-three states in the United States, seven provinces and one territory in Canada and the three northern states of Mexico would directly benefit from NAWAPA with the entire continent sharing in the resulting economic improvement.

A project of this magnitude would materially affect business and labor and the impetus given industry would, both directly and indirectly, accelerate the annual growth rates of the gross national product of all three nations. New industrial activity would be encouraged by the availability of power and water, and land values would increase, resulting in a broadened tax base. The benefits to be derived from reclamation and flood control are vast.

Tourism would benefit tremendously as a result of the recreational advantages related to the formation of scenic and functional waterways, reservoirs, and lakes.

Money invested in constructing NAWAPA would directly benefit industries such as electrical, construction equipment, copper, steel, cement, aluminum, and electronics, to name but a few. Jobs would be directly created by the project and indirectly by the industries supplying the materials, equipment, and services.

Benefits to Canada

NAWAPA would provide 22,000,000 acre-feet of water annually for industrial, municipal, and agricultural use.

NAWAPA would provide 30,000,000 kilowatts of power for sale in addition to the 30,000,000 KW which will be purchased by the system itself for pumping.

NAWAPA could provide Canada with an annual income from the sale of power and water, barge and ship tolls, etc., of as much as $2 billion annually.

NAWAPA construction, engineering, and supply investments in Canada would reach approximately $2 to $3 billion annually over the construction period.

NAWAPA would provide a seaway from the Atlantic Ocean via the St. Lawrence River and Lake Superior to the heart of Alberta and canal transportation between Lake Huron and James Bay, between Lake Huron and Astray Lake, and between Hudson Bay and Lake Superior via Lake Winnipeg. Such a waterway system would provide cheap ship and barge transport, thereby opening its iron ore, coal, potash, sulfur, forestry and agricultural resources to extensive development.

NAWAPA would stabilize and control water levels of the Great Lakes.

NAWAPA would increase and stabilize power production of the Niagara hydroelectric complex and optimize navigation of the St. Lawrence Seaway.

NAWAPA would lower, control, and stabilize the level of Lake

Winnipeg for the protection of existing farmlands for the recovery of new farmlands.

NAWAPA would increase the annual national income from agriculture, livestock, mining and manufacturing by approximately $9 billion annually.

Benefits to the United States

NAWAPA would deliver 78,000,000 acre feet of water annually for industrial, municipal, and agricultural use.

NAWAPA would make 38,000,000 kilowatts of power available for sale.

NAWAPA would provide a north-south seaway from the northern United States to Alaska.

NAWAPA would increase irrigable land by 40,000,000 acres.

NAWAPA would stabilize and control the level of the Great Lakes by providing more than 40,000,000 acre feet of water annually thus increasing and stabilizing the power production of the Niagara hydroelectric complex, optimizing navigation of the St. Lawrence Seaway, and allowing maximum ship loads in and out of Great Lakes' ports.

NAWAPA would provide an access canal through Lake Huron to Hudson Bay.

NAWAPA engineering, construction, supply and services investments

would approximate $3 to $4 billion annually in the United States during the period of construction.

NAWAPA would increase the annual national income from agriculture, livestock, mining, and manufacturing by approximately $30 billion.

NAWAPA would open large areas for industrial and agricultural development.

Benefits to Mexico

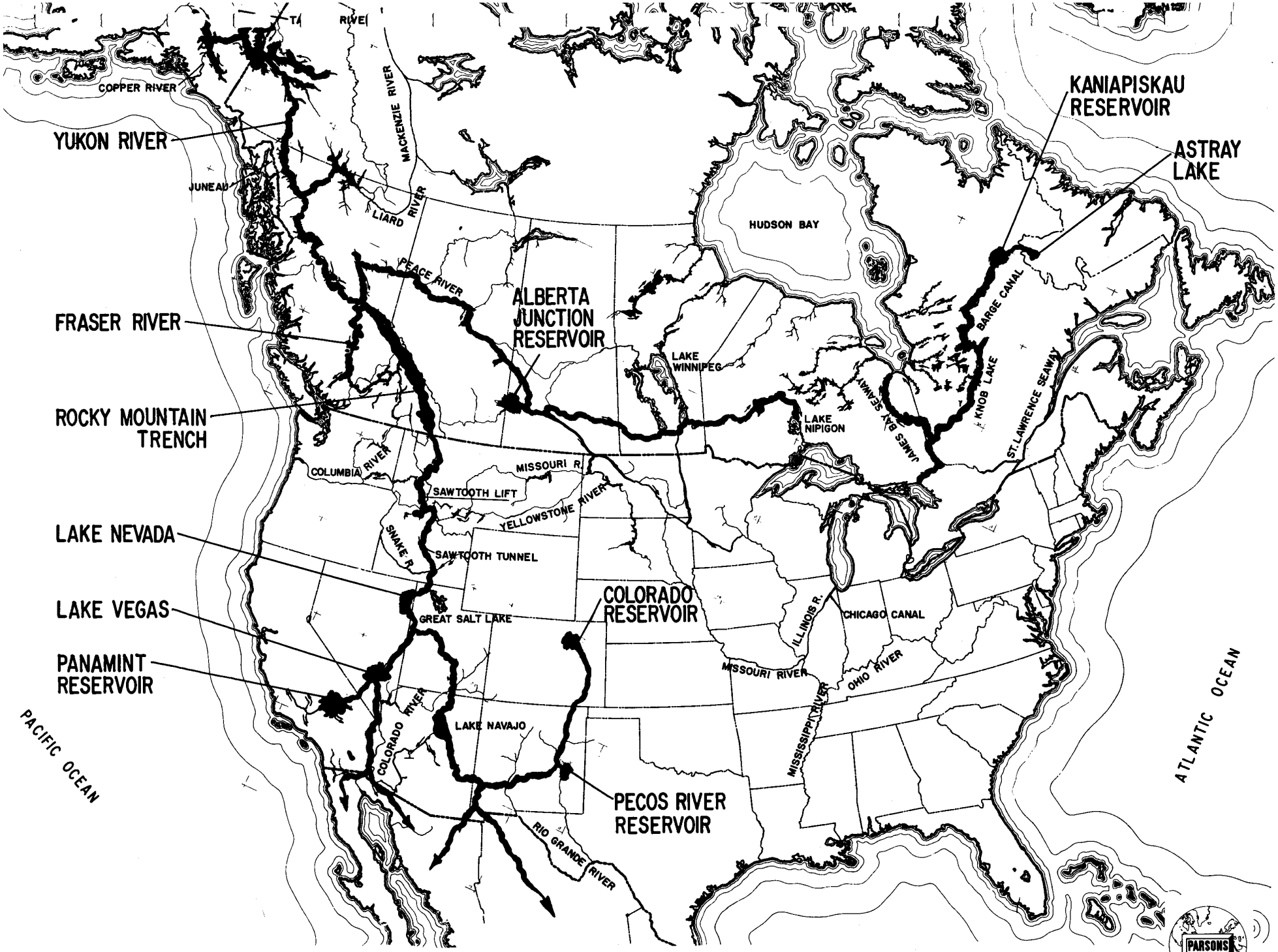
NAWAPA would deliver 25,000,000,000 cubic meters (20 million acre feet) of water annually for industrial, municipal, and agricultural use.

NAWAPA would make 2,000,000 kilowatts of power available, 1,200,000 of which would be generated in Mexico.

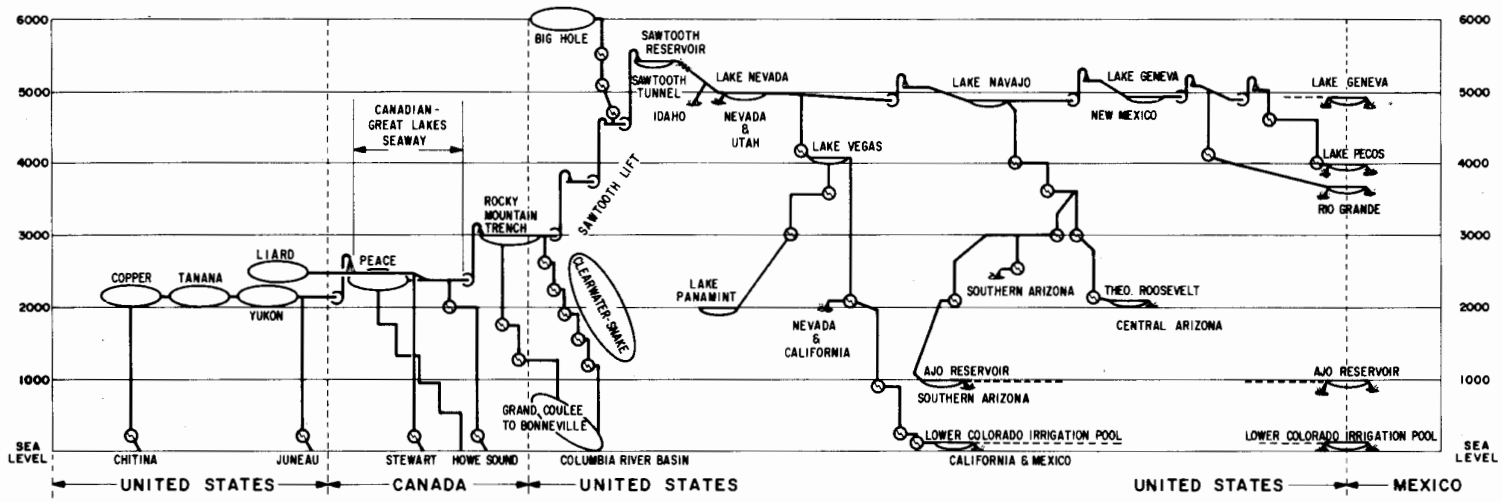
NAWAPA would almost triple the area of irrigable land.

NAWAPA would increase the annual national income from agriculture, livestock, mining, manufacturing, steel, and textiles by approximately $30 billion. (Mexican)

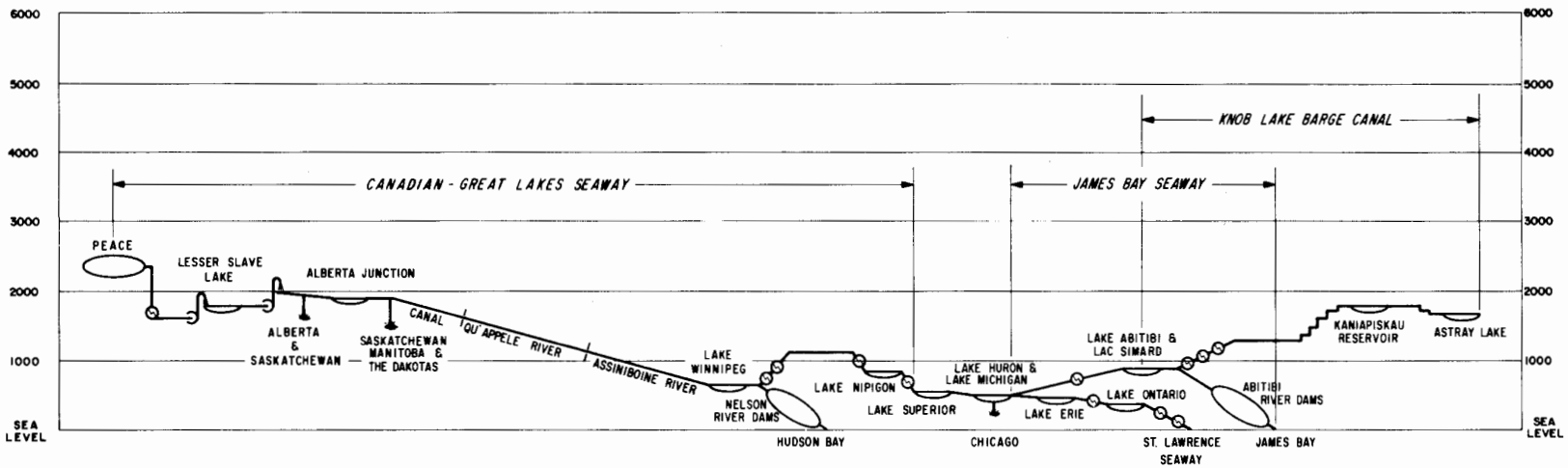
NAWAPA would substantially raise the standard of living of the entire population.



NAWAPA SYSTEM MAP



PROFILE NORTH - SOUTH ROUTE



PROFILE EAST - WEST ROUTE

NAWAPA FLOW CHART

SENATE SUBCOMMITTEE ON WATER DEVELOPMENT

A Senate Subcommittee of the Public Works Committee was formed in April, 1964, under the chairmanship of Senator Frank E. Moss of Utah to investigate the feasibility of NAWAPA.

The subcommittee is composed of the following senators: Moss (D-Chairman), Ernest Gruening (D-Alaska), Lee Metcalf (D-Montana), Gaylord Nelson (D-Wisconsin), Hiram Fong (R-Hawaii), and James B. Pearson (R-Kansas).

After formation of this subcommittee, various federal agencies such as the Corps of Engineers, Bureau of Reclamation, Federal Power Commission, etc., were asked to cooperate with the committee in providing all existing information regarding plans or proposals for dams, power projects, canals, flood control and other data relative to their investigation and study. The Ralph M. Parsons Company was asked to provide the same information on NAWAPA. When this data is collected it will be collated by the subcommittee.

As a result of this work by the subcommittee, reports will be made to the full committee which will in turn determine a further course of action to be pursued. This action could be in the form of legislation introduced in the Congress appropriating money for a reconnaissance study which would deal with all aspects of the NAWAPA concept, i.e. engineering, economic, legal, financial, sociological, management, and operational.

Interest in the concept is high and the need is great; therefore favorable action by lawmakers is anticipated.

In introducing the NAWAPA concept for consideration by his subcommittee, Chairman Moss said, "Whether or not this proposal is advanced further, whether or not it is ever adopted, we must not be deterred by its size. To perform the great task before us we may well need a program as farsighted as was the Louisiana Purchase."

THE RALPH M. PARSONS COMPANY

The Company was organized by Ralph Parsons in 1944 to perform engineering and construction services throughout the world for industry and governments. It is one of the world's leading companies of its kind employing 2500 scientists, engineers, draftsmen, technicans, and supporting staff, together with 5000 field construction personnel. The Los Angeles headquarters is in a 12-story building bearing the Company's name, with additional space in adjacent buildings. Wholly-owned subsidiaries also render engineering and construction services in New York, London, Paris, Frankfurt, and elsewhere.

Typical industrial projects include petroleum, petrochemical, chemical, power, nuclear, and mining operations. Metallurgical plants are designed by a wholly-owned subsidiary, Parsons-Jurden Corporation in New York City.

Services to governments include design and construction supervision of guided missile and space facilities (Minuteman, Titan, Nike-Zeus, and others); civil works covering ground-water development, water transmission and distillation; dams, canals, irrigation and other water projects; airfields, roads and related work. The Electronics Division in Pasadena develops, designs, and manufactures a wide variety of electronics equipment.

A computor center, model shop, photography laboratory, technical library and reproduction facilities support the engineering and

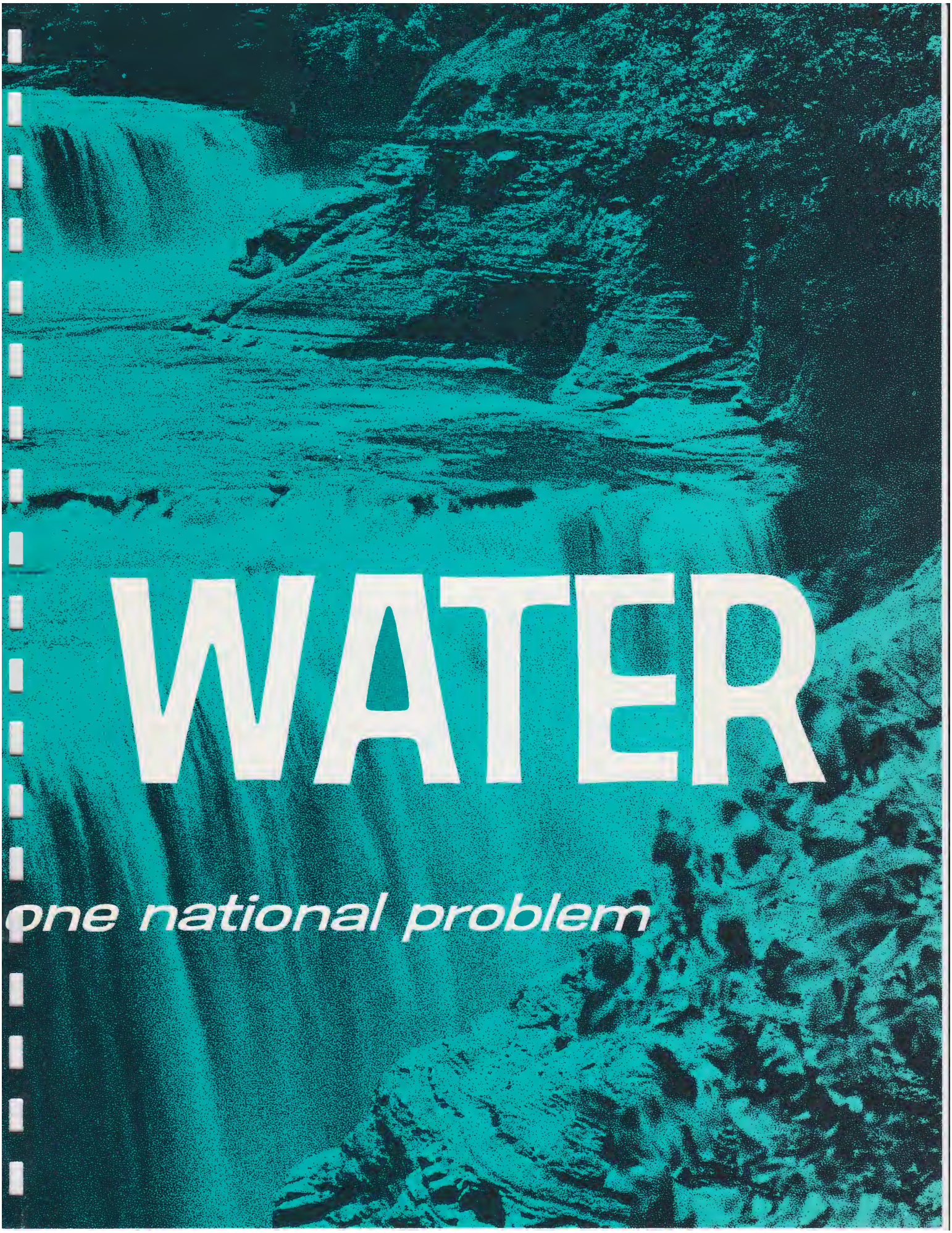
construction teams.

The value of facilities designed by Parsons averages approximately $500 million a year of which about half is constructed by the Company. Master planning is approximately $750,000,000 in value of facilities.

Engineering and construction projects are underway in the United States, Canada, Mexico and 24 other countries. Large projects are u ndertaken regularly; for example, a $60 million copper concentrator in Montana, a $45 million oil refinery in Germany, a $25 million tetraethyl lead plant in Mexico.


NEWS &
VIEWS
PARSONS
NUMBER SEVEN


Our number



WATER

one national problem

WE HAVE PLENTY OF WATER.

Our population is increasing and farm land is decreasing. Forecasts indicate doubling of the U.S. population by the year 2000, which is only 36 years away. Thus less land will have to produce more food. For this, water and fertilizer are required.

In the United States there are many water schemes under consideration. With the exception of NAWAPA they are largely projects for redistribution of water (taking water from one river and putting it into another), whereas NAWAPA involves bringing in water from the far Northwest where it is now going to waste.

NAWAPA includes collection of excess water from the Alaska, Yukon, and other Northwest rivers, and through a system of dams, canals, rivers, and pumping stations delivering that water to the water-scarce areas of Canada, the United States, and Mexico.

A few years from now water may be our most valuable commodity. At one time, water on the plains of Montana sold for $1 per barrel whereas oil was only 10c. Electricity can be produced by nuclear energy, fossil fuel, solar rays, and otherwise, but so far no one has produced a system for manufacturing water.

Man's chief concern has always been water. Where there was water, there was food for the hunter because it was there the wild animals found forage. For a varied diet and more dependable source of food, the early agriculturist planted his crops in these same areas of natural growth and nourishing water.

Cities grew in size and importance in proportion to their supply of fresh water. And when the supply of water failed, as it did in Babylon, the cities died. And most often the cause of water supply failure was the failure of man himself.

What solution to the problems has modern technology offered? Communities have generally chosen to meet their water problems head-on rather than to give up their homes and fields and industries. In India, Iran, Iraq, Pakistan, Lebanon, Saudi Arabia, Kuwait, Qatar and Egypt, Parsons ground-water geologists, agronomists, irrigation engineers, and civil engineers have made water and soil surveys, drilled test wells, started experimental farms, built water systems and aqueducts, and have drawn up master plans of water development which these countries are now following. They are on the long road back and will eventually reap their heritage.

Here in the United States we face a water problem that has crept up on us so gradually that the general populace has only recently become aware of it. To our forefathers the country seemed endless and its natural resources ever bountiful. We developed wasteful habits. There have been individuals along the way who warned of the problems ahead, but only a few would listen. We have not properly managed our watersheds. They have been steadily disappearing at the urging of the plow, the axe, overgrazing, and fire. Floods and erosion followed. We have constructed huge dams to control the flood waters. But one cannot stop floods halfway down the river; they must be prevented at their source.

Local and state organizations have met their individual water problems, but only temporarily. Solutions have been essentially stopgap programs to meet emergencies. What seemed like long-range planning proved grossly inadequate in a few short years.

As we deplete our watersheds the deficiency of water is compounded by other factors. Our population has grown far above normal expectations — and so has the demand for water to fill the needs

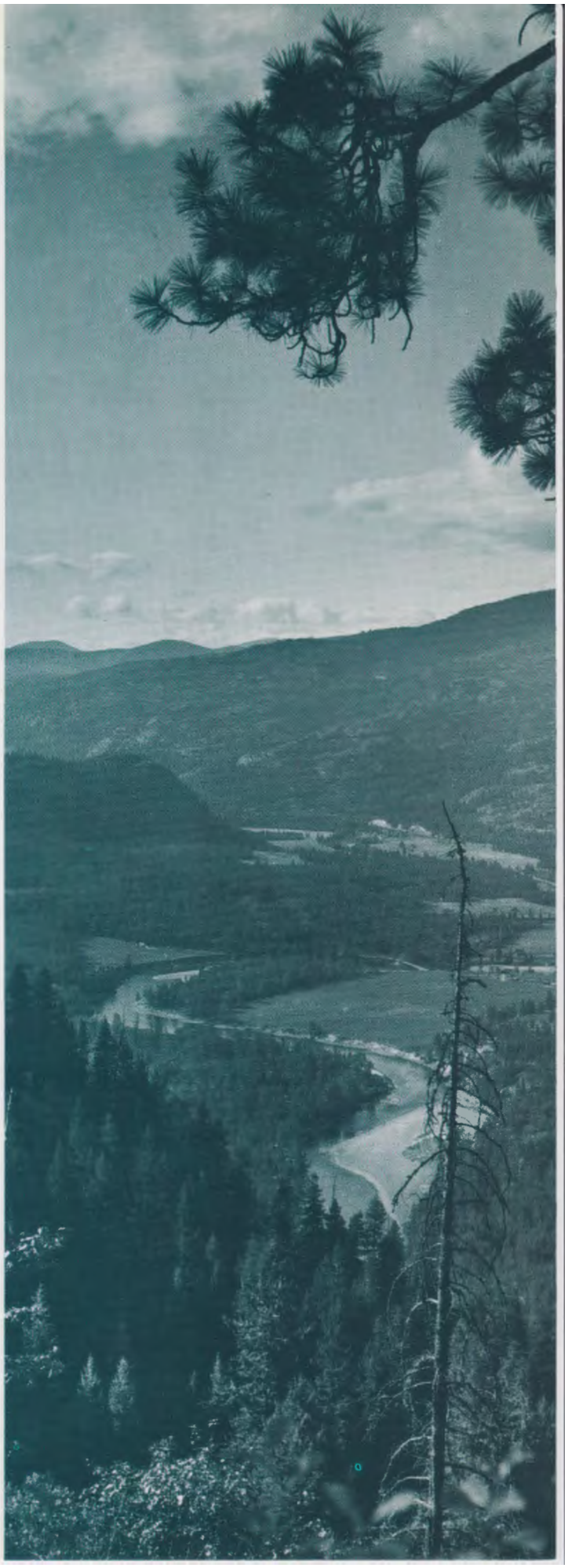
...but where is it?

of the people. As population increases, houses, factories, and roads take up more land, leaving less for farming; consequently, more food must be produced from less land.

It was estimated in 1940 that our population by 1975 would be 175 million. Since then the estimate has been revised upwards to over 200 million. A major shift in population began during the Second World War and is continuing. For climatic reasons people moved to the mild but semi-arid regions of the west, where water supplies were already overtaxed. In the last decade the population of some western states has increased 25 to 50 percent. Arizona and Nevada populations have increased over 70 percent in ten years. Now even the mighty Colorado River does not have enough water to go around and the Western States are fighting over its distribution in the Federal Courts.

Several other developments contribute to the water shortage. The country-wide industrial expansion that gives us all the advantages of modern technology not only uses more water, but increases stream pollution. In agriculture, in order to grow more crops per acre, supplemental irrigation is gaining in popularity throughout the Midwest and in the Eastern and Southern States. In the Far West, where irrigation is essential, precipitation is at a minimum. Our 17 Western States, with 90 percent of the irrigated land and 60 percent of the land area, receive only 25 per cent of the annual rainfall. Nature does not distribute water just to our liking.

So, as our population grows and spreads across the land, local water supplies become inadequate. As more food must be furnished for our growing population, additional acres must come under irrigation. The growth of industries that supply the needs of more people use more water. The time has come when we must realize that water has become our number one national concern, and that it must be considered a national resource on a national, rather than a regional, scale.



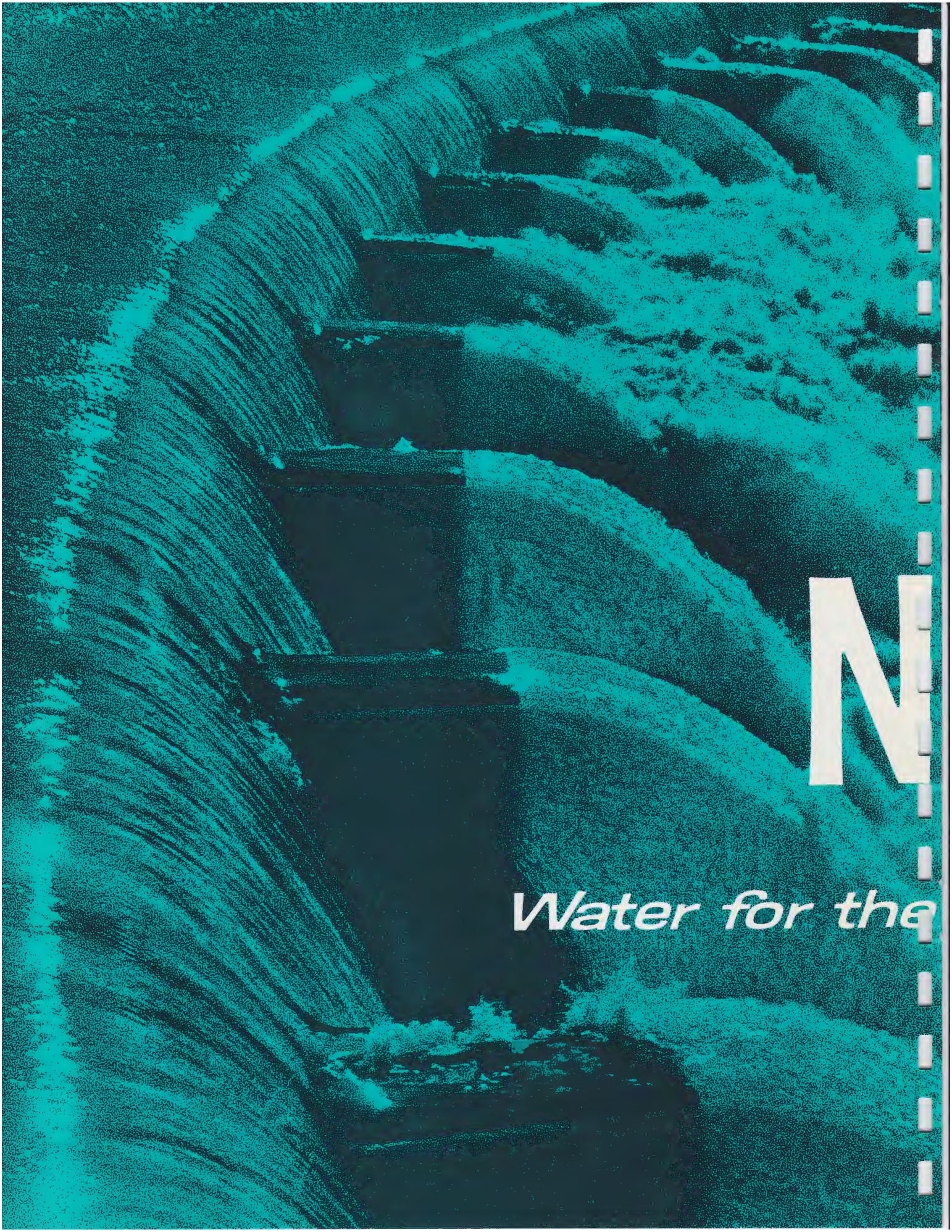
Water, land, people, and their livelihood – whether farmer, merchant, housewife or mechanic–are but parts of a single whole. As one goes, so do we all. No group is immune from our national economy.

The Ralph M. Parsons Company, Los Angeles, has been interested in our country's growing water problem for some time. Parsons geologists, irrigation engineers, agronomists, and civil engineers have proved their theories of conservation in many water projects in the over-populated and arid regions of the Middle East. Engineers of Parsons Power Department who viewed the water power potential of the Northwestern region of the North American continent, while designing and constructing power generating facilities, have been advocating their solution. The first group thinks of water in terms of people, crops and animals. The second group, when looking at a cascading stream, thinks not of fishing, like you and I, but of kilowatts. Combining the two objectives, electric power generation and water development, dictates the multipurpose dam which produces revenue for amortization and return of the investment. A third Parsons group, Systems Engineering, has been studying the feasibility of a continental water use program as proposed by the other engineers and have arrived at some startling estimates of what can be done to alleviate our growing water shortage.

The original concept of the North American continental water conservation and power generation plan came from Donald McCord Baker, considered by some to be the dean of water development engineers in the west. A few years after Mr. Baker's death The Ralph M. Parsons Company took the basic idea under consideration and explored it further. Basically the concept utilizes the only source of additional natural fresh water, Alaska, Yukon and Northwest areas of the continent, for redistri-

bution to water-short areas of Canada, United States and Mexico while, at the same time, generating needed power for industry, farms, and homes.

The immediate requirement is a definitive survey and criteria development based on known available data, detailing the master plan concept for presentation to the national, state and provincial governments, and to industrialists, of the three countries involved. The study would of necessity include a breakdown and comparative analysis of costs and benefits for each area, state and province. It would also check previous approximations and confirm rights of way of the planned route of the NAWAPA facilities. A construction schedule for each phase of the program would be outlined in order to permit staging of the project to satisfy the immediate needs of critical areas. These specifices, together with other details too numerous to cover here, must be analyzed and reported at the earliest possible moment. This detailed study is necessary for solution of the many problems involving treaties, financing, engineering and other matters.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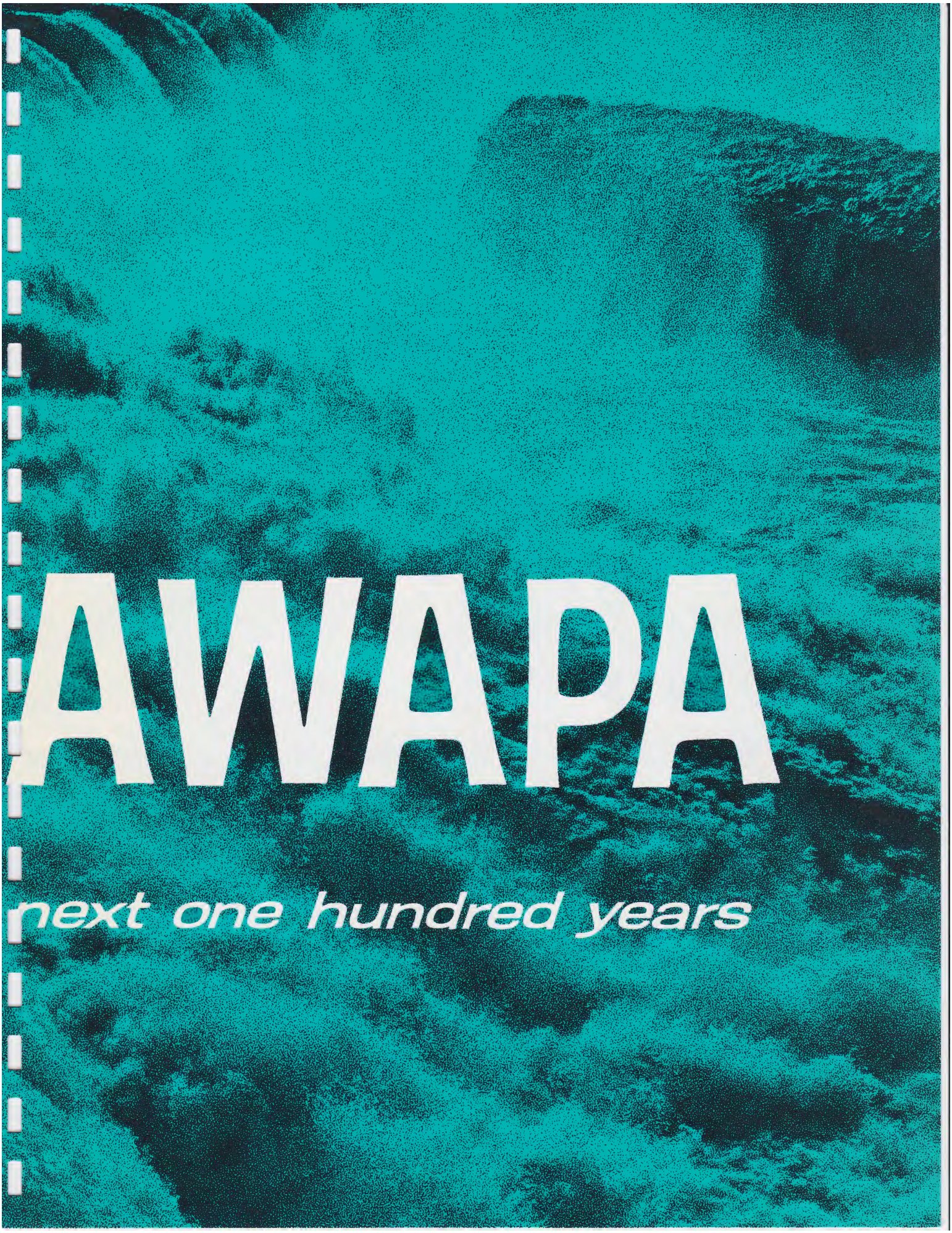
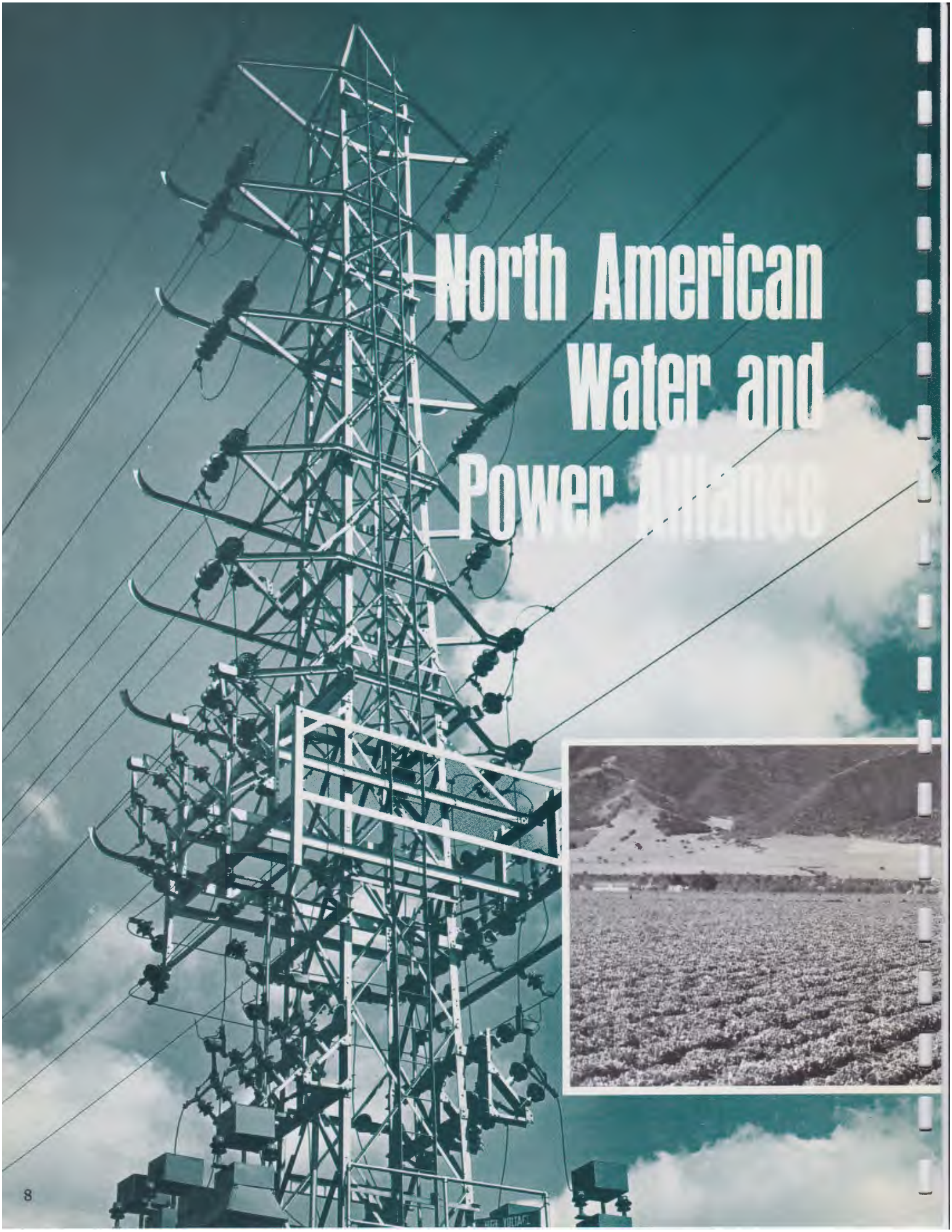
Water for the


AWAPA
next one hundred years

North American Water and Power Alliance



A comprehensive master plan concept by The Ralph M. Parsons Company that will take advantage of the geographical and climatological factors of the North American continent to utilize the excess water of the northwestern territories and distribute it to the water deficient areas of the Canadian Prairies, United States and Northern Mexico in sufficient quantities to assure adequate water supplies for the next hundred years plus.

A number of other water plans have been proposed and are under consideration at this time. For the most part, these are stopgap regional schemes for taking water from one river basin with a current surplus and transferring it to a particular area suffering from a critical shortage. The people in the supplying basin frequently regard such plans as political appropriation of their natural resources. Quite often the plan calls for an increase in taxes or in water rates for the recipients. NAWAPA is conceived on sound economic and moral principles. No area will have water taken from it except that which is now, or in the foreseeable future, going to waste. In return for its water, the supplying area will receive payment either in power or in revenue. Income derived from the sale of power and water at reasonable, and in some cases, lower rates should support the system and repay capital costs.

BENEFITS THREE COUNTRIES

To accomplish this goal, it is proposed that a North American Water and Power Alliance (NAWAPA) be formed. It would be comprised of, and supported by, the nations involved. Although international treaties would be required, political favor is encouraged because of the benefits to the participants. Canada would turn water which is now lost to the Arctic and Pacific Oceans into a profitable natural resource. Two-thirds of the states in the U.S. can benefit from the proposal.

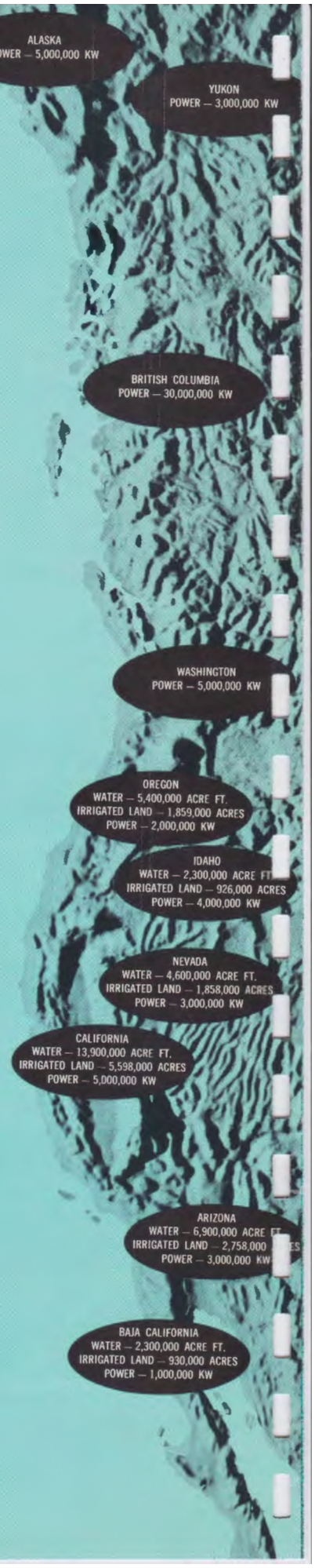
NAWAPA is a long-range plan to collect the surplus water of the Rocky Mountain region and redistribute it to the water poor areas of Canada, the Middle Western and Western United States and Northern Mexico. The heart of the system is a 500 mile long storage reservoir in Canada, in what is known as the Rocky Mountain Trench, at an elevation of 3,000 feet.

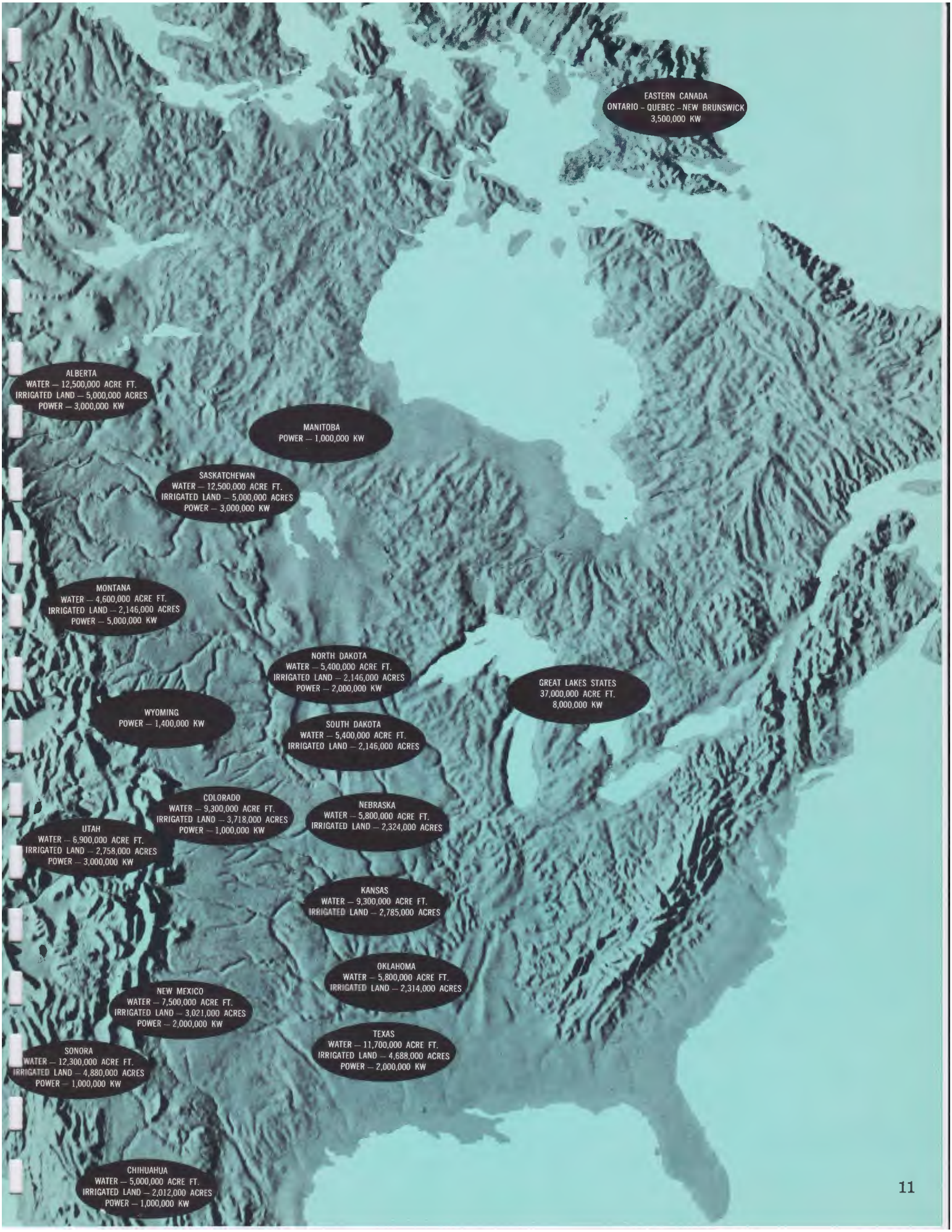
An indication of the magnitude of the project can be appreciated by the following benefits:

The NAWAPA system will not only generate its own power for the necessary pumping stations but will have a saleable excess. Using current costs, it appears that the system will produce income substantially in excess of $4 billion annually from the sale of power at the bus bar and water at the ditch side at today's competitive prices.

It could provide a navigable waterway from Vancouver on the Pacific to Duluth on Lake Superior. The canal would also deliver irrigation water to the northern plains from Alberta to South Dakota, and increase the flow through the Great Lakes-St. Lawrence System to alleviate water pollution in that area. It could assure adequate water supply to the continent for the next hundred years.

The conserved water would be sufficient to irrigate 86,300 square miles, equal to a 35-mile wide strip extending 500 miles into the Canadian agricultural belt, traversing the length of the U.S. and extending 200 miles into Mexico for a total length of 2500 miles. In delivering 20,000,000 acre feet of water to Mexico the plan allows that country alone to develop 8 times as much new irrigated land as the Aswan High Dam will provide Egypt. For the sake of illustration only, arbitrary allocations have been noted on a map of the continent to show what could be done with the proposed available water and power. Naturally, the actual distribution of these commodities will depend on need and the findings of the detailed studies proposed on page 5.




EASTERN CANADA
ONTARIO – QUEBEC – NEW BRUNSWICK
3,500,000 KW
ALBERTA
WATER — 12,500,000 ACRE FT.
IRRIGATED LAND — 5,000,000 ACRES
POWER — 3,000,000 KW
MANITOBA
POWER — 1,000,000 KW
SASKATCHEWAN
WATER — 12,500,000 ACRE FT.
IRRIGATED LAND — 5,000,000 ACRES
POWER — 3,000,000 KW
MONTANA
WATER — 4,600,000 ACRE FT.
IRRIGATED LAND — 2,146,000 ACRES
POWER — 5,000,000 KW
NORTH DAKOTA
WATER — 5,400,000 ACRE FT.
IRRIGATED LAND — 2,146,000 ACRES
POWER — 2,000,000 KW
GREAT LAKES STATES
37,000,000 ACRE FT.
8,000,000 KW
WYOMING
POWER — 1,400,000 KW
SOUTH DAKOTA
WATER — 5,400,000 ACRE FT.
IRRIGATED LAND — 2,146,000 ACRES
COLORADO
WATER — 9,300,000 ACRE FT.
IRRIGATED LAND — 3,718,000 ACRES
POWER — 1,000,000 KW
NEBRASKA
WATER — 5,800,000 ACRE FT.
IRRIGATED LAND — 2,324,000 ACRES
UTAH
WATER — 6,900,000 ACRE FT.
IRRIGATED LAND — 2,758,000 ACRES
POWER — 3,000,000 KW
KANSAS
WATER — 9,300,000 ACRE FT.
IRRIGATED LAND — 2,785,000 ACRES
OKLAHOMA
WATER — 5,800,000 ACRE FT.
IRRIGATED LAND — 2,314,000 ACRES
NEW MEXICO
WATER — 7,500,000 ACRE FT.
IRRIGATED LAND — 3,021,000 ACRES
POWER — 2,000,000 KW
TEXAS
WATER — 11,700,000 ACRE FT.
IRRIGATED LAND — 4,688,000 ACRES
POWER — 2,000,000 KW
SONORA
WATER — 12,300,000 ACRE FT.
IRRIGATED LAND — 4,880,000 ACRES
POWER — 1,000,000 KW
CHIHUAHUA
WATER — 5,000,000 ACRE FT.
IRRIGATED LAND — 2,012,000 ACRES
POWER — 1,000,000 KW

THE DRAINAGE BASINS

1/YUKON

NAWAPA considers four drainage areas as the primary source of water: 1. The headwaters of the Yukon and Tanana Rivers would be dammed to create a reservoir extending from the vicinity of Dawson, Yukon Territory, and from Cathedral Rapids, Alaska, southeastward into northwestern British Columbia. Excess water would be withdrawn from the reservoir by pumping it 250 feet to the Peace River Reservoir at the Taku Lift station. Power plants at American Eagle and Skagway would compensate the region for water used.

2/PEACE RIVER

Several streams in northern British Columbia would be dammed to form a chain of reservoirs from Taku Lift to Portage Mountain Dam on the Peace River. Power plants at Stewart, Howe Sound, Prince George, Revelstoke and Castlegar would be supplied with water power. The latter two plants would be fed from the Columbia-Fraser Interchange and would discharge to the Grand Coulee Dam on the Columbia. To regulate the flow of the Columbia for maximum firm power generation, water from the upper Fraser River would be fed into the Columbia above Revelstoke through an interchange tunnel between the two rivers. A portion of the outflow from the Peace River reservoir would be directed into the Alberta-Great Lakes Canal. Conservable excess would be pumped 750 feet through the Upper Fraser Lift into the Rocky Mountain Trench.

3/ROCKY MOUNTAIN TRENCH

The Rocky Mountain Trench is a gorge containing the upper reaches of the Columbia, Fraser, and Kootenay Rivers. By damming these rivers a reservoir 500 miles long would be created, extending southerly to Flathead Lake in Montana. The setting of the Rocky Mountain Trench is one of mountain grandeur, being adjacent to Banff and Jasper National Parks. This large artificial lake should enhance the scenic and recreational assets of the region.

4/CLARK-SNAKE

A supplemental drainage area lies in the Western United States and would draw from the Clark, Clear Water, Bitterroot, Big Hole, Jefferson, Salmon, Little Colorado, Snake and Escalante river basins.

Total drainage areas represent approximately 1,300,000 square miles with a mean annual precipitation of about 40 inches. Of an average annual runoff of 663,000,000 acre feet of water, approximately 110,000,000 acre feet, or less than 20 percent of the total flows of the basins, are withdrawn by the Plan for irrigation, industrial and municipal uses.

Although the NAWAPA Plan involves the Colorado River Basin and the Columbia River Basin, each of which are under development, neither will be adversely affected. Quite the contrary, the NAWAPA Plan will have direct beneficial effects on previous plans by the re-regulation of upstream waters, which may be diverted in or out of the basins as needed.

5/THE ALBERTA-GREAT LAKES CANAL

The Alberta-Great Lakes Canal would be supplied by outflows of the Peace River Reservoir (2) and diverted flows from several streams on the east slope of the Rocky Mountains. It would provide inflow in excess of 40,000,000 acre feet per year into Lake Superior, provide for irrigation and other water demands of the provinces and states traversed, and yield considerable power.

This diversion canal would alleviate falling levels and pollution of the Great Lakes. It would also augment the power potential of the Niagara and St. Lawrence Rivers. It is possible to develop this canal so it would be navigable by lake and ocean vessels from the Great Lakes and St. Lawrence Seaway to the heart of Alberta. It is conceivable that a transcontinental waterway could be developed, if warranted, with its western terminus at Howe Sound, British Columbia.

6/COLUMBIA RIVER BASIN

The NAWAPA system would not affect the present development of the Columbia River except to benefit the basin by regulating flows in the Columbia and Fraser River systems. The Bonneville Power Authority is presently hampered by the tremendous seasonal river variations. High water in early summer comes from melting snow and glaciers in the mountains. This is the time of lowest power consumption and a major part of the water runs into the sea unused. In winter, when the mountains are frozen in, water available for power generation is at its lowest level and the demand for power is at its greatest. The storage capacity of the NAWAPA reservoirs would regulate the flow of the Columbia River system to provide double the firm power generating capacity and assure more profitable operation.

7/CLEARWATER SUBSYSTEM

The Clearwater North Fork and Clearwater Rivers, along with the lower reaches of the Salmon and Snake Rivers, would be developed by a series of hydro-power plants in central Idaho and southeastern Washington. The spent flow would eventually discharge into the McNary Reservoir on the Columbia River, through the Ice Harbor project on the Snake River.

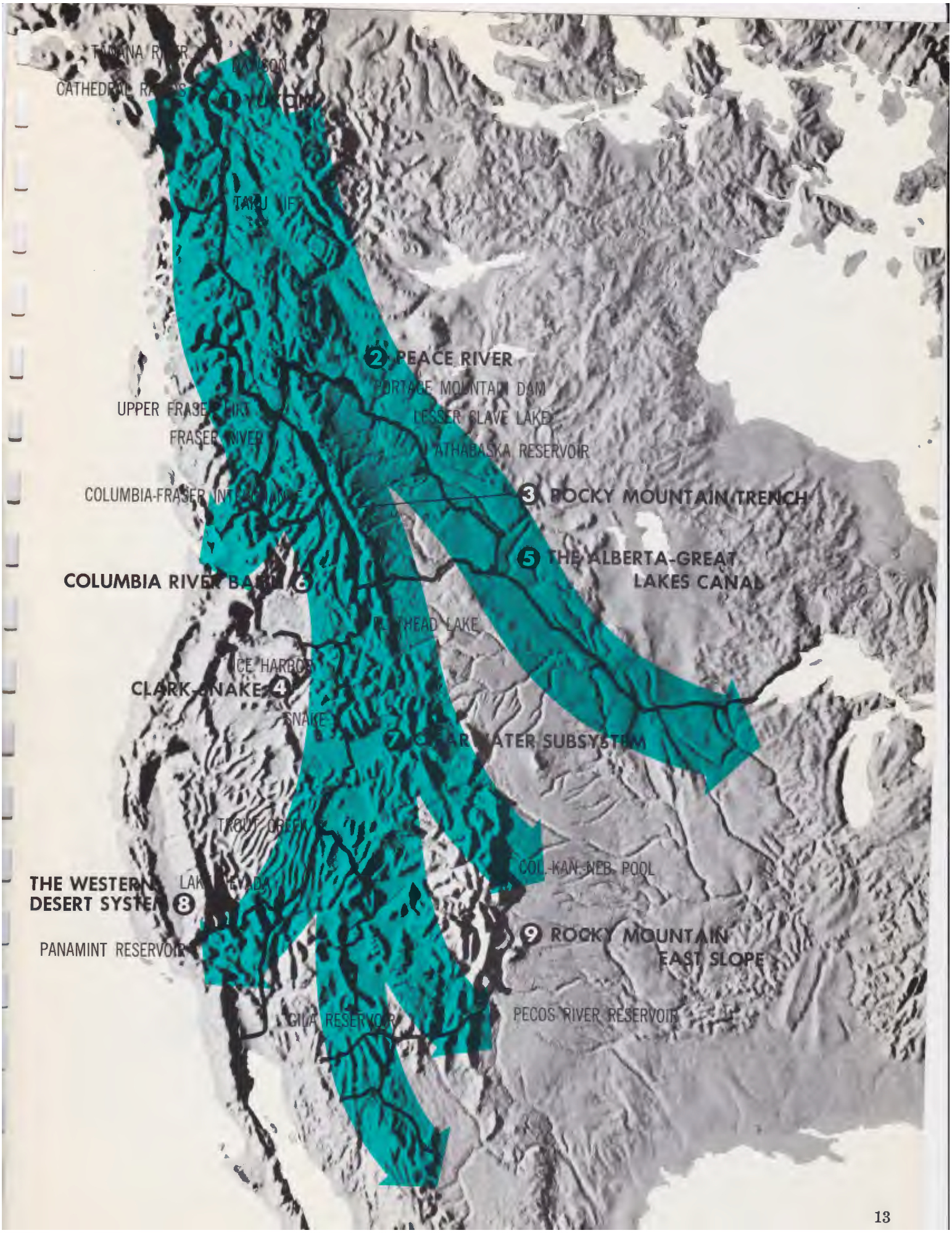
8/THE WESTERN DESERT SYSTEM

Water to meet the needs of the great North American Desert would be drawn from the outflow of the Rocky Mountain Trench, and combined with conservable flows of numerous mountain streams in the Great Basin Subsystem. Storage and transmission would be accomplished by a system of reservoirs, aqueducts, lift-pump stations, and hydropower plants. Water for irrigation and other uses would be distributed to Idaho, Oregon, Utah, Nevada, California, Arizona, and New Mexico in the United States and to Baja California, Chihuahua and Sonora in Mexico.

The Trout Creek Diversion Aqueduct from the proposed Lake Nevada would provide good quality water for Southern California as well as Baja California. The degradation of valuable farm land in these states by the use of Colorado River water with its excessive mineral content could thus be arrested and eventually remedied by leeching.

9/ROCKY MOUNTAIN EAST SLOPE

From the proposed Pecos River Reservoir water would be pumped into the Canadian and Purgatoire Rivers and eventually delivered east of the Continental Divide in Colorado. This water would be drawn upon by New Mexico, Texas, Colorado, Kansas, Nebraska, and Oklahoma, as well as Mexico.


TAKU RIVER
2 PEACE RIVER
PORTAGE MOUNTAIN DAM
LESSER SLAVE LAKE
ATHABASKA RESERVOIR
UPPER FRASER
FRASER RIVER
COLUMBIA-FRASER
3 ROCKY MOUNTAIN TRENCH
5 THE ALBERTA-GREAT LAKES CANAL
COLUMBIA RIVER BASIN 6
HEAD LAKE
ICE HARBOR
CLARK-SNAKE 4
SNAKE
7 SOLAR WATER SUBSYSTEM
TROUT CREEK
COL-KAN-NEB POOL
THE WESTERN DESERT SYSTEM 8
LAKE NEVADA
PANAMINT RESERVOIR
9 ROCKY MOUNTAIN EAST SLOPE
PECOS RIVER RESERVOIR
GILA RESERVOIR

COST AND CONSTRUCTION SCHEDULE

The questions of how much it will cost and who pays for it can only be answered by rule of thumb estimates at this time. Extensive studies of the physical features and of the economic trends of water and power marketing in the different areas are required for reliable estimates. However, preliminary estimates are a necessary part of a plan and engineers and economists of Parsons have compiled some interesting figures.

Total cost of the North American Water and Power Alliance program would be about $100 billion and would require a tremendous amount of preliminary study to satisfy state, federal, and international political interests, and to conclude treaties among the three countries. Solutions of these problems could take as long as 10 years. An additional 20 years might be necessary to complete construction. However, some increments can be completed and operating in considerably less time.

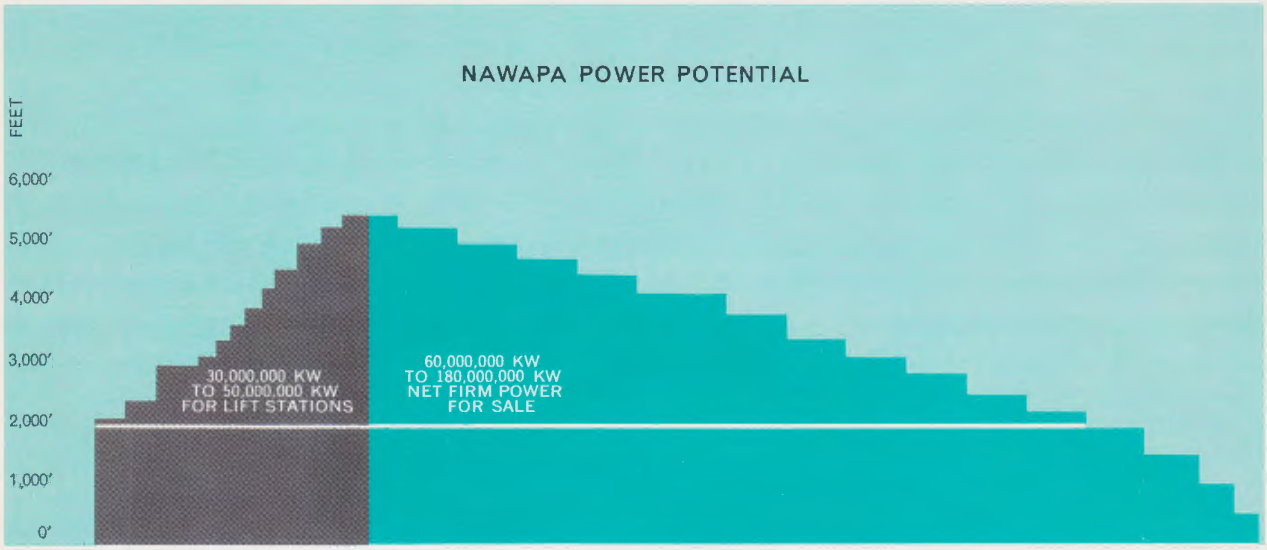
The quantities of water referred to on previous pages presume one scheme. Actually, there are a number of alternatives, any of which would accomplish the objective. The amount of water could be increased to 250 million acre feet per year and power available for sale could range from 60 to 180 million kilowatts. The optimum balance can only be determined after detailed studies.

ADDITIONAL BENEFITS

The total economic benefits arising from the project would transcend by far the estimated direct financial cost of construction and operation of the system. Overall increase in land values would result in a broadened tax base for each state. Tourism as an industry would benefit from the formation of scenic and navigable waterways, and the attendant burgeoning of fish and game resources. The recreational prospects of a 500 mile lake in the Canadian Rockies are fantastic. In the western U.S. which is short of recreation facilities, a series of aqueduct-connected reservoirs and man-made lakes will dot Utah, Nevada, Arizona, and New Mexico, terminating in Southern California and Eastern Colorado.

Business and labor would be materially affected by a public works project of this magnitude. Both directly and indirectly the impetus given industry should accelerate the annual growth rate of the gross national product and create millions of new jobs. New industrial activity will be encouraged by the availability of power and water.

ECONOMIC ASPECTS of NAWAPA



ONLY STANDARD METHODS REQUIRED

While the Project would require the movement of 32 billion cubic yards of earth, and 860 million cubic yards of tunneling, no break throughs in technology would be necessary. Only standard methods and tools would be used to construct such conventional civil works as canals, tunnels, siphons, locks, dams and hydro-turbine generators. Existing labor pools of the construction trades would be drawn upon.

NAWAPA would require $5 billion in construction equipment and tools. It would require 100 thousand tons of copper and aluminum, 30 million tons of steel, 200 million sacks of cement, and $25 billion in construction labor.

Thirty-three states would directly benefit from NAWAPA, with the entire country sharing in the resulting economic improvement. In Canada, direct benefits would accrue to 7 provinces and 1 territory. Three of the largest and most arid states in Mexico would receive water of untold value. NAWAPA would be a good neighbor policy in substance, rather than by subsidy, and would be amortized from revenues.

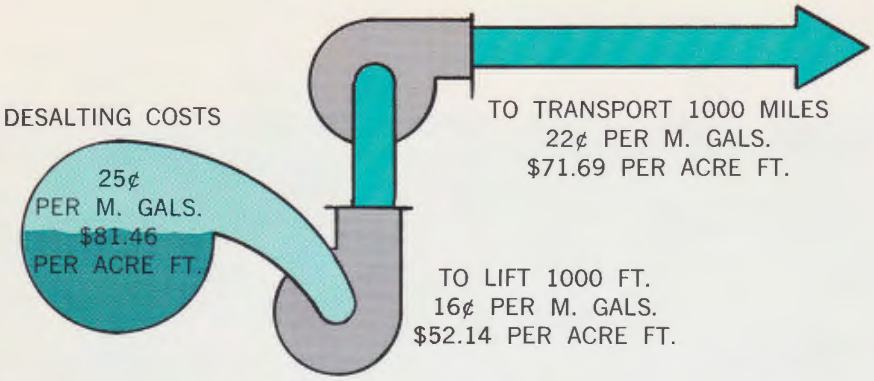
CANADA'S VIEWPOINT

How does Canada feel about sharing its water with the U.S.? According to a recent interview with John Davis, Prime Minister Lester Pearson's Parliamentary Assistant, the time will come when the United States will pay Canada for water now flowing unused into the Arctic Ocean. As a specific example, he cites the possibility of diverting the waters of the northern Peace River and its tributaries into the North and South Saskatchewan Rivers, and thence into the U.S. "I am convinced," Mr. Davis stated, "that in the long term it would be all in Canada's interests to invest tens of billions of dollars in river diversion projects. The United States needs the water that Canada can supply and I believe American capital would be found readily for such an investment."

U. S. SENATE CONSIDERATION

The U.S. Senate Committee of Public Works has set up a subcommittee on western water development to investigate various water plans. In introducing the NAWAPA concept for consideration by this subcommittee, Chairman Frank E. Moss was quoted as saying the group was excited over the proposal. "Whether or not this proposal is advanced further, whether or not it is ever adopted, we must not be deterred by its size," Moss said. "To perform the great task before us we may well need a program as farsighted as was the Louisiana Purchase."

The man is so right!



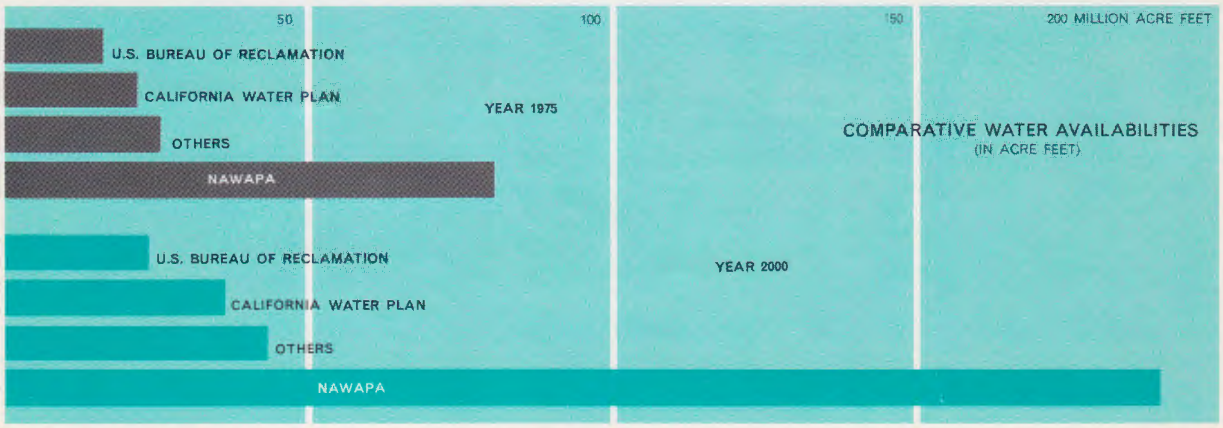
SEAWATER DESALTING

A great deal of interest has developed recently in seawater desalting processes, especially since Congress appropriated $75 million for research to the Interior Department's Office of Saline Water. A few plants have been built for studying various processes. Parsons constructed a seawater "flash" distillation plant for Westinghouse on Point Loma, near San Diego, and has seriously considered some of the other processes. According to a theoretical formula set up by the Office of Saline Water further technological improvements may reduce the processing cost to 20 to 25 cents per thousand gallons ($81/acre foot) from the present $1 to $1.25 cost. This does not include the costs of delivery to the consumer, who now pays only about 30 cents per thousand gallons ($97/acre foot) at the kitchen tap for natural fresh water which cost the supplying utility about 5 cents per thousand gallons ($16 /acre foot) at the source.

In some areas along the coast line, seawater conversion will probably be feasible. Actually, we may someday be utilizing every means to procure fresh water: nuclear plants for desalting, purification of waste water and polluted streams, as well as water from the northwest section of the North American continent. However, desalting may not be economical for agricultural purposes, which accounts for 80 percent of our water consumption. The amount a farmer can afford to pay for water for irrigation is a function of the entire farm operation. The additional yield received from any irrigated crop and the price received for it will be limiting factors. Generally, except in a few high-yield areas, five dollars per acre foot (or 1½ cents per thousand gallons) is considered maximum. Food-stuffs must be grown where the climate is favorable, the soil is available, and preferably near the areas of consumption. The chart at the top of this page demonstrates how much lifting and transporting of seawater would cost at today's prices. And it must be remembered that most agricultural areas are quite distant from the ocean, far above sea level.

January, 1962 issue of Fortune magazine discussed water transportation quite frankly: "Moreover, no matter how much engineers increase the efficiency of desalting, there is one substantial cost element they can do little about. Water from seaside desalting plants will have to be pumped uphill to where it is used; water from rivers and lakes runs downhill, and gravity is free. As a matter of fact, if the Mediteranean Sea were miraculously to turn fresh, the cost of transporting its water deep into the Sahara Desert would still be prohibitive."

Why does NAWAPA offer water at reasonable rates after transportation from Canada? The main reservoir is at 3,000 feet in the Rocky Mountains. Some of the water will be channeled through as many as a dozen power plants as it runs downhill. Income from the sale of surplus power not used for pumping will keep water rates reasonable.



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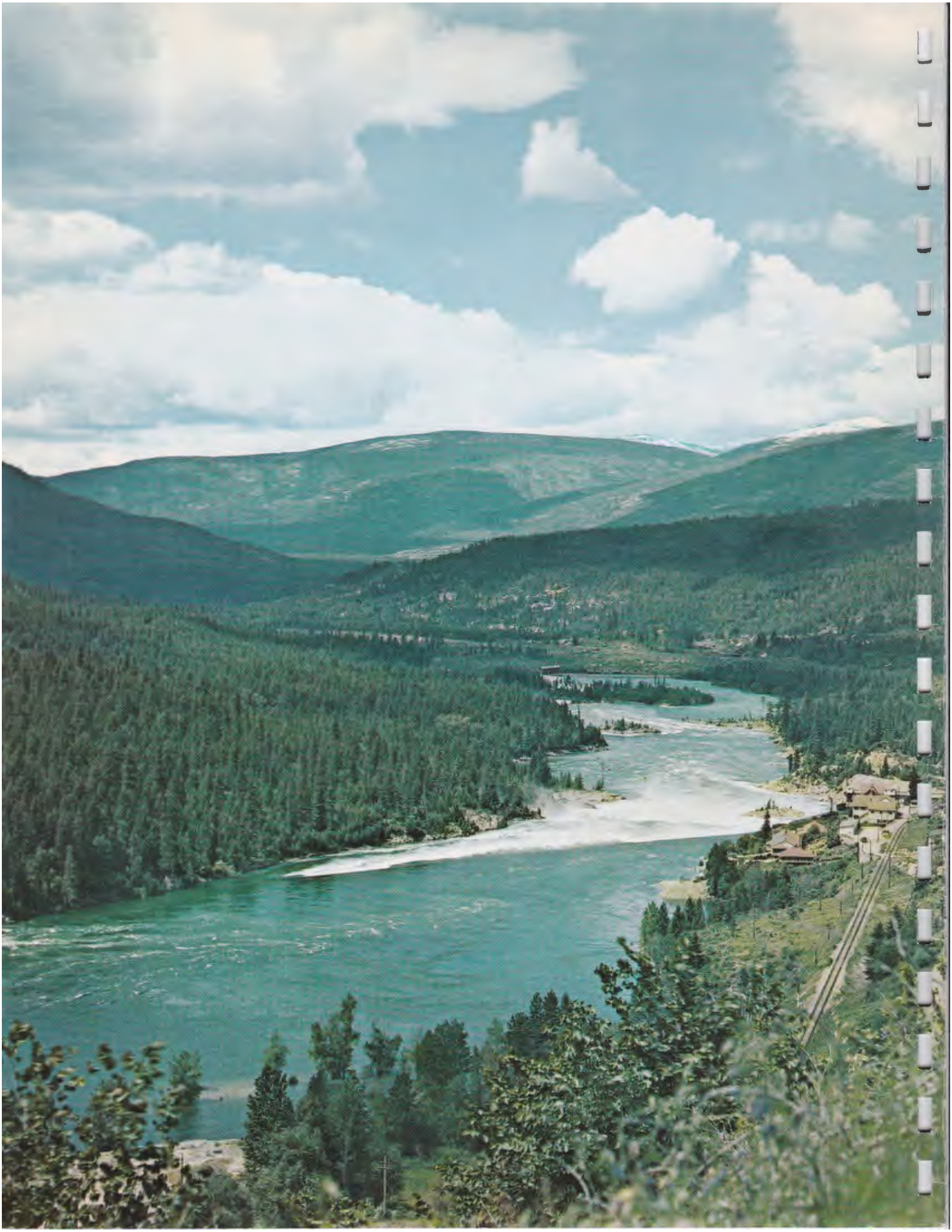

The Sun

TUESDAY, SEPT. 15, 1964

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The Coming Drought...

"Water development schemes should be planned now, taking into account the present transitional phase of climatic fluctuations . . . bad droughts are coming in the future."—Dr. A. Shnitnikov, Soviet climatological expert.

Russia is ahead of Canada in seriously planning to divert its north-flowing rivers southward.

It is facing serious economic difficulties because of the long-term drop in the level of Caspian Sea waters. But Russian needs and plans bear a distinct resemblance to the gigantic water diversion schemes such as Jack Davis, MP, sees ahead for North America.

Russian climatological research gives an additional urgency to such projects.

It is not only in Russia that scientists agree on the long-range (about 2,000-year) cycle of wet-cold and hot-dry climate. But the Russians, probably because of their vast inland continental range, have severe experience of the cyclical effects.

Water levels of such great bodies as the Caspian and Aral Seas have been subject to major and damaging fluctuations over the centuries. At present they are on a long-term decline.

To justify his suggestions for massive diversion of Alaskan, Arctic and Hudson Bay waters to the south, Mr. Davis relies on the expected four-fold increase in North American water demands in the next 36 years. This is impressive in itself.

But the Russians predict also a rise in temperatures and severe water shortages over the next several centuries. The shortages would be world wide.

On the Great Plains, Canadian-U.S. climatic conditions resemble those of Russia in many respects. We are already experiencing record low levels in the Great Lakes.

If the Russian predictions are valid they make river diversion projects appear an imminent necessity rather than an interesting possibility. The Russians themselves have passed beyond general acceptance of diversion plans to studies of ways and means to greatly increase the normal flows of the rivers they intend to divert. This, says Dr. Shnitnikov, is essential in view of the coming global drought.

...and the Flow of Water

The plans of MP Jack Davis for the diversion of northern waters to central Canada and the United States are passing the stage of imaginative conception to that of practical consideration. Mr. Davis's address Monday to the Pacific Northwest Trade Association in Prince George devoted more attention to the necessary mechanics of this gigantic scheme than to its attractive benefits.

To pour the waters of the Yukon, the Mackenzie, the Athabasca, the Nelson and the Hurricanaw into thirsty southern Canada and central United States is an inspiring conception.

The profitable results are obvious. But the costs would be immense. Mr. Davis does not balk at them. He considers them carefully, which is the natural second step in a project of such magnitude. This is an encouraging sign that the project is at least possible, even if not yet proved feasible.

The cost would not only be the financial one of, as Mr. Davis says, tens of billions of dollars.

The water-hunger of the affected regions is, or will be, such that between the two nations the money cost would not be out of proportion to what it would buy. Yet, as he states, "Water cannot be abruptly diverted from one place to another."

The whole scheme must be ecologically profitable. Its biological, geographical and economic effects must return a net gain in human values. Its side effects, such as in transport (canals on the Prairies?) and power demand and production must be considered. Since it will be planned to take place over decades, the development of nuclear power needs to be taken into account.

Politically, it will be a major undertaking. It would involve far-reaching federal-provincial and Canada-U.S. adjustments and treaties. All of which, as Mr. Davis points out, must be in the clearest possible terms. This includes the possible repatriation of both water and power by Canada.

The truth is, as he says, we do not now have sufficient data even on our own water resources to come to hard and fast financial or engineering decisions on almost any aspect of the scheme.

The conception is magnificent. By all known facts it ought to be practicable. If the urgency is such as the Russian studies imply, the first, immediate and pressing step must be a thorough scientific study of all the factors involved. And the sooner the better.

THE CHRISTIAN SCIENCE MONITOR, FRIDAY, APRIL 3, 1964

Think Very Big

It is not only in foreign policy, as Senator Fulbright says, that we must think about what has been unthinkable. What's more, we must think big, if only because every minute x number of new neighbors on the globe give yesterday's solutions a built-in obsolescence.

At least three examples of thinking very big have recently appeared. Some, having thought about them, will reject them. But they represent a scope we are more and more required to encompass.

● To meet much of North America's mounting water needs for the next hundred years, the Ralph M. Parsons Company of Los Angeles proposes a $100,000,000,000 North American Water and Power Alliance. The seriousness of "The Water Challenge" was recently discussed in a series by that name in this newspaper.

When we water the lawn this summer we'll be thinking about the Parsons plan to turn the so-called Rocky Mountain Trench of British Columbia into a 500-mile-long storage reservoir.

● In contrast with all the smaller Alliance for Progress projects, the Brazilian delegation to a businessmen's forum, headed by the president of the First National City Bank of New York, suggested uniting Latin-American efforts in completing an 18,000-mile highway from Mexico, down around the perimeter of Latin America, and back to Panama. It would foster an interchange of talents among countries, economic integration, improved communications.

We'll be thinking about it this summer when we pile the family into the car for a trip to grandmother's house.

● Most immediately controversial, perhaps, is Walter Reuther's idea for a "peace offensive" under which the United States would provide $20,000,000,000 to aid the developing countries. The Soviet Union would have to compete to preserve the balance of power, said the president of the United Auto Workers. It would face the choice of getting the resources through cutting living standards at home or through reducing armaments. If it reduced armaments, said Mr. Reuther, the United States could use its own savings on armaments to improve the economy at home and through new markets in the developing lands.

We'll be thinking about it as the Congress argues over a foreign-aid bill of $3,400,000,000.

WASHINGTON, D.C.
POST-TIMES-HERALD
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Water for North America

Too little attention has been given to the continental water-for-the-future plan that has made its debut on Capitol Hill. This fabulous proposal contemplates the collection of enormous quantities of surplus water in Alaska and Northwestern Canada and its transportation to the arid Southwest and even to the Great Lakes through a system of canals, tunnels and rivers. It is designed to supply the continent with ample water for the next century.

At present the idea is in the study stage. But a schematic plan has been outlined by the Ralph M. Parsons Co., a Los Angeles engineering and construction firm, and the Senate Public Works Committee has set up a special subcommittee under the chairmanship of Sen. Frank E. Moss of Utah to study its engineering feasibility. If the decision should be favorable, the project would call for a continental agreement on water involving the United States, Canada and Mexico as well as many states and provinces.

Because of the heavy rainfall in some parts of western Alaska, British Columbia and Yukon Territory, it is said that the plan would divert only 20 per cent of the water that now runs unused to the sea. No prospective use for the water in that area is in sight because it is too mountainous for either agriculture or extensive industry. The water diverted from the Fraser, Yukon, Peace, Athabasca and other rivers would be pumped into the Rocky Mountain Trench in Canada and vast quantities would be stored in reservoirs—one of them 500 miles long. This artificial lake would be connected by a navigable canal to Lake Superior, adding a substantial volume of water to the Great Lakes-St. Lawrence system.

Other huge canals would traverse the Great Basin through Idaho, Utah and Arizona, with branches extending to New Mexico, California, Colorado, and Mexico. According to Senator Moss, the plan would double the water supplies of these semi-arid western states. It is also estimated that Mexico would obtain enough water to reclaim eight times as much new land as the Aswan High Dam will provide in Egypt.

Some of the water would be used to operate enormous power plants, which in turn would supply current for lifting the water at various points. While the cost of the project is estimated at $100 billion over a period of 30 years, some engineers believe that it could be made self-liquidating through the sale of water and power. Construction of the project would provide, directly and indirectly, about 4 million jobs—a figure roughly equal to the number now unemployed.

Before any specific plans are laid or negotiations begun this fantastic project will have to be matched against the desalinization of sea water. But it represents the kind of bold thinking that will be necessary in view of the water shortages and the staggering increases in population now in sight. The Senate has shown good judgment in ordering a hard look at a water plan that is continental in scope.

$100 Billion Water Plan Envisages Banff Reservoir

MAMMOTH WATER PROPOSAL. Drainage basins and distribution routes of the proposed Parsons North American Water and Power Alliance show gathering of water by damming the Yukon and Tanana Rivers (1) in Alaska and Yukon Territory. This water is then pumped to the Peace River reservoir in B.C. (2), which is in turn pumped into the proposed Rocky Mountain Trench reservoir (3). Subsystems (4), (6) and (7) collect additional water to be used for power or sale in the northwest. Distribution east is by the Alberta-Great Lakes Canal (5) and southward to the Great Basin States, Southern California and Mexico (8) — thus over the Continental Divide east of the Rockies (9).

International Scheme Suggests Prairie Canal

By TED HEWITT
[Herald Staff Writer]

A 500-mile-long water reservoir in Banff and Jasper, and a canal system through Alberta linking the Prairies with the Great Lakes, are two segments of a mammoth project envisioned by a U.S. engineering and construction company.

The international scheme with an estimated price tag of $100 billion would involve water sources as far north as Alaska and as far south as Mexico.

The plan, put forward by the Ralph M. Parsons Co., Los Angeles, basically is aimed at averting an acute water shortage, expected to develop in the western half of North America.

WATER PINCH

Noting many of the semi-arid states in the western U.S. are already feeling the water pinch, the company suggests tapping unused resources in Canada's northwest to supply their needs.

It would be an international water distribution system extending from rivers in the Yukon and N.W.T. to the Great Lakes in the east, and the B.C. coast in the west; and with water channels probing into Mexico, in the south.

Scope of the project calls for establishment of an international governing body from Canada, U.S. and Mexico. The Parsons Co. suggests it might be called the North American Water and Power Alliance.

DIVERSION PLANS

Under the plan, about 20 per cent of surplus water from the Fraser, Yukon, Peace, Athabasca and other rivers of Alaska, B.C. and the Yukon, would be diverted.

This water would be pumped southward via a system of tunnels, canals, rivers and intermediate reservoirs, to be stored in the Rocky Mountain Trench in the Banff-Jasper area.

From this reservoir, which would dip into Montana, a web of channels draining south — tied in with a number of western U.S. reservoir systems — would ensure vast semi-arid areas of enough water to meet human, agriculture and industrial needs.

Another proposal envisages a canal through Alberta and Saskatchewan, bending south through North Dakota and Minnesota, and hooking into Lake Superior at Duluth, Minn.

Parsons Co. claims the total water distribution system would:

- Provide 147,000,000 acre feet of water for irrigation — enough to supply 86,300 square miles of land;
- Provide an additional 37,000,000 acre feet for municipal and industrial use;
- Result in a valuable navigable waterway from Vancouver to the Lakehead:
- Increase water flow through the Great Lakes, enough to boost the electrical generation capacity of Niagara Falls by 50 per cent;
- Produce a total boost in electrical generation capacity of 100,000,000 kilowatts per year; and
- Return revenues from water and power sales to more than $4 billion per year, which doesn't include side revenue-raising benefits such as water transport fees and recreational facilities.

The project also would increase land values in Canada, U.S. and Mexico by more than $48-billion, equal to about 30 per cent of the present value of all U.S. farm lands, say company sources.

How much would the whole project cost?

Company estimates put the figure at $100-billion, more than double Canada's present gross national product.

It would take 30 years and 4,000,000 new jobs to complete.

Based on annual revenues, operation and maintenance of the system could be handled, at the same time retiring the capital costs debt in 50 years of operation.

THE CALGARY HERALD Wed., March 18, 1964

THE FINANCIAL POST MAY 2, 1964

Vast waterway to link Vancouver, Great Lakes?

Pay-for-itself plan to cost $100 billion and take three decades

By C. KNOWLTON NASH

WASHINGTON—A prodigious scheme to dig a waterway from Vancouver to the Great Lakes and to redistribute surplus water from rivers in Alaska, the Yukon and British Columbia throughout the continent, is being studied seriously here.

Cost: $100,000 million.

It dwarfs the Columbia River project, the St. Lawrence Seaway and any other water scheme ever seriously proposed for North America.

The matter is being examined by a special subcommittee of the Senate public works committee. The scheme has been developed by **Ralph M. Parsons Co.**, a Los Angeles engineering and construction firm.

Under the proposal, it would take 30 years to build the vast project and the $100,000 million cost could be paid off by sales of water and electric power.

Utah Democratic Senator Frank Moss, chairman of the special subcommittee, presented the Parsons scheme, saying, "We must not be deterred by its size."

The scheme envisions collection of surplus water from rivers of Alaska, the Yukon and B.C., as well as surplus water in the northwest and redistribution of this water to water-scarce areas through a system of reservoirs, canals, tunnels and rivers.

Approximate allocations of water in acre-feet under the plan: for irrigation, 25 million for Canada, 97 million for the U. S., and 19 million for Mexico; for industrial use, 37 million for the U. S.

The proposal includes a ship waterway from Vancouver to Duluth on Lake Superior. This channel also would deliver water to the northern plains and increase the flow into the Great Lakes, relieving pollution and increasing power production.

Sen. Moss said, "To evaluate it, we must consider feasibility from engineering and financial standpoints, the effect of diversion on our water resources, international implications and the impact on present suppliers of energy of the production of large amounts of additional hydroelectric power . . . Should it in the future be implemented, the proposal will likely lie in areas of legislative jurisdiction of both (the Interior and Public Works) Committees, and likely require the services of both the Bureau of Reclamation and the U. S. Army Corps of Engineers."

Rivers specifically mentioned in the Parsons study from which the surplus would be drawn, include the Fraser, the Yukon, the Peace and the Athabasca Rivers.

The Parsons report says the ship waterway from Vancouver to the Great Lakes "might increase the flow through the Great Lakes-St. Lawrence system sufficiently to increase Niagara Falls power generation by 50%."

The Los Angeles firm says the project would assure adequate water supply in Canada, the U. S. and Mexico for the next 100 years.

The scheme is called NAWAPA, North American Water & Power Alliance.

It is estimated the increased land values brought about by NAWAPA would total more than $48,000 million. The scheme, through sale of water and power, would have an estimated gross income of more than $4,000 million a year. The annual operating costs are estimated at $500 million.

"While the job is large and complex," the Parsons report says, "it requires no technical breakthroughs but makes use of time - tested civil engineering works such as canals, tunnels, siphons, locks, dams, hydro turbine generators, etc."

The first immediate need, the Parsons firm says, is for a thorough engineering study for presentation to industrialists and government officials in Canada, the U. S. and Mexico. Also needed is a comparison analysis of costs and benefits for each area.

In running down the costs and materials needed for the vast scheme, the Parsons report cites these figures:

- $7,500 million for engineering.
- $5,000 million for construction equipment and tools.
- $25,000 million for construction labor.
- $10,000 million for power and facility equipment.
- 40,000 million tons of copper and aluminum.
- 45,000 million cu. yd. of earth to be moved.
- 500 million cu. yd. of tunneling.
- 80,000 million cu. yd. of concrete equal to 4,800 million sacks of cement.
- 70 million tons of steel.

NAWAPA water system

RUPD

That's What U.S. Is Considering 'Buying'

Water, $100 Billion Worth of It

by JAMES ROBINSON
Of Our Washington Bureau

WASHINGTON — Congress has started serious consideration of a $100 billion — that's right, $100 BILLION — project to solve the water needs of almost the entire North American continent for the next 100 years.

The vast public works plan dwarfs anything before proposed in this or any other nation. It would take 30 years to complete.

It would capture great quantities of fresh water in Canada and Alaska and transport it to the Great Lakes and to the major river systems of the western United States.

Known as NAWAPA (North American Water and Power Alliance), the proposal is the brainchild of the Ralph M. Parsons Co., a world-wide engineering and construction firm with headquarters in Los Angeles.

NAWAPA is now under active study by a special subcommittee of the Senate Public Works Committee headed by Sen. Frank E. Moss (D., Utah).

Just to list a few of the projects involved in NAWAPA, and the benefits expected to result, staggers the imagination.

A SYSTEM of dams and reservoirs would be built to capture annually about 160 million acre-feet of surplus water from the Fraser, Yukon, Peace, Athabasca and other rivers of Alaska, British Columbia and the Yukon territory. An acre-foot is the amount of water required to cover one acre of land one foot in depth.

A SERIES of tunnels, reservoirs, siphons, locks, canals and giant water pumps would lift the water across the northern Rocky Mountains and redistribute it to water-scarce area of Canada, the United States and North Mexico.

IN EFFECT, some of the largest rivers on the continent would be made to "run backwards" over and through the mountains.

WATER THAT NOW drains unused from the western slope of the Rockies would be made to flow into the Gulf of California, the Great Lakes and the Gulf of Mexico.

McNAMARA

MOSS

ALONG the route, it would irrigate more than 50 million acres of land and nearly double the electric power generating capacity of the United States.

THERE WOULD be a canal system, capable of handling ocean-going vessels, to link the St. Lawrence Seaway to the Pacific Ocean — a true Northwest Passage.

THE GREAT LAKES, now suffering from their lowest water level in recorded history, would be stabilized at normal depth.

SOME 37 MILLION acre-feet of additional water would become available for industrial and municipal use in the lake states of Michigan, Illinois, Indiana, Ohio, New York and Pennsylvania.

MEXICO ALONE could get 20 million acre-feet of water each year. This would permit it to develop eight times more new irrigated land than the Aswan High Dam will provide for Egypt.

★ ★ ★

IS THIS an idle dream or a fantastic "pork barrel" requiring virtually an endless flow of federal tax dollars?

The Senate Public Works Committee, headed by Michigan's Sen. Pat McNamara, doesn't think so.

Neither does Sen. Moss, whose special subcommittee is scheduled to make a preliminary feasibility report to the full committee in about six months.

"It is not only completely feasible," Moss said in an interview, "it is almost inevitable."

He points to a 1961 report by a Senate committee under the late Sen. Robert Kerr of Oklahoma which concluded that under present development plans at least five major river basins in the West covering one-fourth of the United States will have a major water shortage by 1970.

Three more regions, including the western Great Lakes, will be short of water by the year 2000.

★ ★ ★

IN ALL, nearly a dozen states will be faced with population losses due to the shortage of water between 1980 and 2000 unless new supplies are found.

"What we are talking about is a 30-year expenditure of $100 billion — less than $4 billion a year.

"That may sound big, but remember the central Arizona project is being considered at $1 billion, with another $1 billion needed to replace the water that would be lost to southern California."

★ ★ ★

BASICALLY, the NAWAPA concept advanced by the Parson's company, breaks down into two problems — engineering and finance.

From an engineering viewpoint, according to Parsons officials and Moss, preliminary studies show complete feasibility.

The key to the project is an area known as the Rocky Mountain trench — a 500-mile long depression at the upper levels of the Canadian Rocky Mountains, extending from central British Columbia to the point near Flathead Lake in Northwestern Montana.

NAWAPA proposes to build hydro-electric stations near the Pacific Ocean that would generate enough power to pump water up into the Rocky Mountain trench. The trench would become a giant holdover reservoir at an elevation of about 3,000 feet.

From there the water would flow south to the Gulf of California and the Rio Grande River, generating additional electric power on the way and irrigating vast areas of arid land.

It also would flow southeastward through a 750-foot-wide canal across the plains of Alberta, Saskatchewan, North Dakota and Minnesota to Lake Superior at Duluth.

★ ★ ★

ON THE BASIS of current prices for power and water, the Parsons study showed that the entire NAWAPA system could produce an annual gross revenue of more than $4 billion dollars. Operating costs would be $500 million a year, leaving $3.5 billion to pay interest and debt retirement on the original investment.

"While the job is large and complex it requires no technical breakthroughs in engineering or construction methods," the Parsons firm said.

Moss' subcommittee plans to explore both the engineering and cost feasibility of the NAWAPA proposal.

★ ★ ★

AS MOSS NOW sees the project, it will require at least 10 years to complete the preliminary engineering and technical studies and to conclude treaties with Canada and Mexico.

The latter be a job for the State Department to work out with the governments of the other two nations.

Moss' subcommittee and McNamara's full public works group should be ready to report the results of the preliminary inquiry this fall.

The most likely conclusion: A thorough engineering and economic feasibility study costing $25 million to be undertaken by the international joint commission.

How NAWAPA Water System Would Feed Three Nations
. . . key to the project is the Rocky Mountain trench

Los Angeles Times

SUNDAY, MARCH 22, 1964

L.A. Water Chief Urges Alaska Project Study

Undertaking Would Serve Canada, Mexico as Well as U.S. for More Than Century

BY RAY HEBERT
Times Urban Affairs Editor

Is visionary planning the answer to the West's endless struggle to find more water for its growing cities?

Experts are puzzling over that question in the light of a new master plan — perhaps the most ambitious ever conceived—to tap streams in Alaska and the Yukon Territory for use in the United States, Canada and Mexico.

Furthermore, because of its sheer size, some experts are predicting it may alter the course of Secretary of the Interior Stewart L. Udall's Pacific Southwest Water Plan — a proposal soundly criticized here and in Arizona.

10-Year Study

Bold and imaginative, the new water plan was formulated by the Ralph M. Parsons Co., engineers and constructors, after 10 years study.

It would provide enough water from the wet northwestern reaches of North America to meet the most critical urban and agricultural needs from the Great Lakes to Baja California for a century or more. One expert found the idea absorbing, but admitted he couldn't really take it seriously.

Others have shrugged it off as "far out" and "too visionary."

Serious Consideration

But Samuel B. Nelson, general manager and chief engineer of the Los Angeles Department of Water and Power, believes it should be carefully studied as a possible means of importing large quantities of "new" water to the arid Pacific Southwest.

Warren Butler, vice-chairman of the Metropolitan Water District's board of directors, shares his view.

Together, the department and Metropolitan are responsible for providing water for 9 million Southern Californians from Ventura County to the Mexican border.

Population Booms

That population figure will nearly double by 1980 and continue its upward spiral into the next century —only if fresh supplies of water are available.

Parsons' plan—the North American Water and Power Alliance—would be an expensive, long-range undertaking.

But once implemented it would probably end all bickering over water, water rights and the threat of water shortages like that faced by California and Arizona in their historic fight over the Colorado River.

4 Million Jobs

Building the plan's system of canals, aqueducts and dams would take 100,000 workers 30 years. The project would indirectly create another 4 million jobs.

California and 32 other states would receive an abudance of water and power under the alliance.

Three states in Mexico would get 20 million acre-feet of water annually—five times the yield of California's Feather River Project and enough to develop eight times as much irrigated land as Egypt's Aswan High Dam will permit.

The alliance, according to Parsons' engineers, would even help cities like Chicago. With the water level in the Great Lakes down, the NAWAPA would increase inflow into the lakes 33 1-3% from a projected transcontinental canal.

That would allow Chicago to increase its withdrawals and, in turn, clean up the miserably polluted Illinois River.

While the plan may sound like a dream, Nelson, Butler and others aren't discounting it as a springboard for the unfettered growth of the West's dry deserts and frequently thirsty cities.

Foresight Needed

Too often, water planners point out, Southern California must be reminded that foresight—and nothing more — was responsible for the two major aqueduct systems serving the Southland today.

Last year the D W P's Owens River Aqueduct observed its 50th anniversary. Now a second barrel is being built. Metropolitan's Colorado River Aqueduct was under construction 30 years ago and is already running at capacity.

That's why Nelson believes the Parsons plan—if it serves no other purpose — will inspire water planners to raise their sights "to consider a regional water plan of vast scope."

Specifically, he says Udall's Pacific Southwest Water Plan is too limited.

"It is essentially a project that encourages additional drains on the already limited Colorado River supply with no provision for increasing the total flow in any substantial amount," he says.

"The essential ingredient to solve the Southwest's water problems is more water not less water.

Snake River Use

With particular interest, Nelson notes that one phase of the NAWAPA would pour additional water into the Snake River. It would then be diverted across Nevada into Lake Mead in a manner similar to the Snake-Colorado Project proposal developed by Nelson's own engineers.

"Apparently the Snake Project could be one of the major features of the Parsons plan" he says.

Butler, who joined other Metropolitan directors last week in opposing Udall's plan, couples his appraisal of the Parsons plan with a renewed attack on the interior secretary's proposal.

"There's no question that the North American alliance —as fantastic as it sounds— is worth studying," he says. "But you don't jump info a thing like this overnight.

"That's the trouble with Udall's idea. He's trying to shove something down our throats in less than a year. Four or five years should go into studying a plan that involves—as Udall's does—a region embracing five states."

Conversely, one of Southern California's most knowledgeable water engineers, who prefers to remain unidentified, has catalogued the NAWAPA in the realm of fiction.

"Nobody living today will ever see it carried out," he says. "Its timing is off. Actual planning for it would have to come—at the soonest —two generations from now. We're not going to spend money on something 50 years ahead of time."

Apparently a great deal more will be heard about the plan.

Economists are confident that population growth, particularly in the West, is virtually limitless.

Further Look Necessary

Thus, as Nelson says, it may be necessary to look ever further ahead in planning water projects.

That, says M. S. Umbenhauer, manager of Parsons' water and power division, has been one of the major faults in recent water development. He puts it this way:

"We thought the Feather River Project would solve California's problems. Now, just a few years later, the federal government comes along with the Pacific Southwest Water Plan.

"If people knew a master plan as broadly conceived as the North American alliance was coming, they wouldn't have to fight over every bucket of water . . ."

Thirsty U.S. Casts Eyes On Water-Plentiful B.C.

Sun Washington Bureau

WASHINGTON, D.C. — A western U.S. water shortage is nearing crisis proportions and officials here are casting greedy glances at British Columbia waterways.

A special sub-committee of the Senate public works committee has nearly completed an engineering feasibility study of portions of the $100 billion Parsons plan affecting 11 water-short western states.

The aspect of the Parsons proposals currently under the closest scrutiny would siphon several B.C. rivers into the Gulf of California and the Gulf of Mexico.

TREMENDOUS NEED

Utah Sen. Frank E. Moss, chairman of the sub-committee, told The Sun that within the next 30 years the western states need three times as much water as they have today.

Not even the Parsons plan could meet that goal, he said. It would provide only twice as much water.

So far, officials here say, no approach has been made to Canada with regard to obtaining Canadian water.

But they say Canada is interested in the Parsons proposal and is awaiting U.S. initiative.

PIECEMEAL APPROACH

The sub-committee's concentration on the western aspects of the overall plan indicates it may seek to implement it piecemeal — ignoring, for the time being, projects which would divert B.C. rivers into the Great Lakes via the prairies.

But observers doubt that any Canada-U.S. accord could be reached on the deal unless the Great Lakes phase is included as a firm commitment.

Canada's water-short areas, they point out, are in Alberta, Saskatchewan and southern Ontario and they would get no relief from a purely western plan.

PLAN UNDER STUDY

Congress started seriously considering the Parsons plan earlier this year.

The proposal draws its name from the Ralph M. Parsons Co., the world-wide Los Angeles engineering firm which originated it.

In Washington it was christened the North American Water and Power Alliance.

Its supporters here claim NAWAPA will solve most of the water needs of all North America for the next century.

A list of just a few of the major projects which NAWPA involves staggers the imagination.

A system of dams and reservoirs would be build—many of them in B.C.—to capture 160 million acre feet of surplus water a year from the Fraser, Yukon, Peace, Athabasca and other rivers.

(An acre-foot is the amount of water required to flood an acre in area to a depth of one foot.)

A chain of tunnels, reservoirs, canals, siphons, locks and giant pumps would lift the water over the Rocky Mountains and redistribute it through the water-shy areas of Canada, the U.S. and Mexico.

Along the way it would irrigate millions of acres of valuable agricultural land and double the hydro output of the U.S.

STUDY ENVISIONED

A canal system capable of floating deep-sea ships would slice across the continent from the Great Lakes to the Pacific Coast.

If the Senate sub-committee's present studies indicate feasibility of the project, the U.S. will probably ask to have the matter placed in the hands of the International Joint Commission, the body which handled Columbia Power project planning and treaty negotiations.

The sub-committee expects to recommend a $25 million joint study of the proposal that would be financed by Canada, the U.S. and Mexico.

Early findings by the sub-committee indicate the project would take 30 years to build and ultimately produce revenue of $4 billion a year, amortizing its estimated cost 25 years after completion.

Moss said recently he considers the project not only feasible, but "almost inevitable."

VANCOUVER SUN
September 12, 1964

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VANCOUVER SUN
September 12, 1964

'It's Our Water,' Laing Warns U.S.

By JACK CAHILL
Sun Ottawa Bureau

OTTAWA — Northern Affairs Minister Arthur Laing issued a blunt warning to the U.S. Friday that Canada intends to manage its own water resources and not surrender any position of strength in continental water negotiations.

Laing described a report recently considered by the U.S. Senate on uses of Canada's water resources for a continental supply scheme as "imaginative, and to most people only a dream.

"It will be the policy of this government that this is our water," he said. "— that continental concepts do not mean continental ownership or any continental rights.

"We are aware of the value of this resource," he said, "and the extent to which in the near future it will draw investment, population and industry.

"The first — and for the time-being the sole interest of the government — will be to secure and develop this fantastic resource to the benefit of all the provinces."

He said Canada's water resources will be used as a prime magnet for development capital and a negotiating area of critical importance to Canada in its dealings with its continental neighbors.

"This is our water," he repeated in an interview. "We shall manage it to create a nation of power. We shall not surrender any position of strength.

"On this continent the population explosion, irrigation needs and industrial requirements are rapidly creating a water crisis," Laing said.

"There are actually areas of critical shortage in the U.S., and water needs plus population growth will accentuate this crisis in many states of the union."

He said this critical situation may explain the emergence of the Parsons plan for intercontinental water usage that was studied by the U.S. Senate.

"The Parsons plan would use Canada as a storage basin for controlled flows across most natural declines throughout the U.S.," he explained.

"Parsons' talks in terms of a $60 to $100 billion cost over 50 years.

"It is imaginative and to most people only a dream," he added.

However, Laing conceded the water crisis in the U.S. could remove the Parsons plan from the dream area within a generation or so.

VANCOUVER SUN
September 12, 1964

THE CHRISTIAN SCIENCE MONITOR, FRIDAY, MARCH 20, 1964

Giant Plan Proposed

Water for a Continent

An imaginative proposal has just been announced to develop North American water resources on the massive scale that today's growing water needs demand. The plan, by the Parsons Comapny, is pertinent to a recent series of articles on "The Water Challenge."

By Kimmis Hendrick
Chief of the Western Bureau of The Christian Science Monitor

Los Angeles

One of the world's biggest engineering construction firms has proposed a detailed water and power development plan to serve virtually all of North America.

It would meet much of the continent's foreseeable water needs for 100 years, including those of northern Mexico.

It would pay for itself in half that time at an estimated cost, including financing, of $100 billion.

It would make possible eight times as much new irrigated land in Mexico as the Aswan High Dam will be giving Egypt.

Water for Canada

It would give extra water to two Canadian provinces, Alberta and Saskatchewan, as well as big blocks of power clear across Canada to Quebec.

It would double California's water supply, give large additional supplies to Texas and to the mountain states, and even send some to the Eastern Seaboard.

It would increase by 50 percent the hydroelectric power output of Niagara Falls lifting the water level of the Great Lakes in the process.

It might, indeed, open up the Northwest Passage that history says was a lodestar to the exploration of this continent and make transcontinental ship navigation really possible.

Alliance for Power

The Ralph M. Parsons Company of Los Angeles, since its organization in 1944, has been building space facilties, water transmission systems, electronics equipment, petroleum and nuclear plants, and mining operations all over the world. Its staff of engineers, scientists, draftsmen, technicians, etc., numbers 2,500. Its 5,000 field construction workers bring its total force to 7,500.

It wants to help North America develop a water plan of the dimensions just described.

It calls its water project the North American Water and Power Alliance (NAWAPA).

While Parsons wants to play a leading role in the project, the company recognizes there must be complex operations, international treaties, many private participants, and doubtless much government action.

Reservoir Proposed

Briefly, the plan would convert the so-called Rocky Mountain Trench of British Columbia, adjacent to Banff and Jasper National Parks, into a 500-mile-long storage reservoir. It collects about 20 percent of the surplus water

The Water Challenge

from the Frazier, Yukon, Peace, Athabasca, and other rivers.

One canal system would cut across Canada to Lake Superior, providing a navigable waterway from Vancouver, B.C. Another, by an intricate series of lift-pump systems, would flow south. It would parallel the Colorado River at one point. It would bridge across it at another. In all, it would form the basis for water distribution into Mexico, Texas, the mountain area, and the West Coast region.

All in all, the plan would bring supplementary water to 33 of the United States.

Total Conception

Parsons engineers feel that, while the ultimate execution of this does not depend on any one set of detailed plans, the important thing is the total conception. It must be planned and carried out, they say, as a single project, not piecemeal.

In view of indications that water development now costs the United States approximately $10 billion annually, Parsons people do not see cost as a real obstacle.

One hundred million kilowatts of power, yielding about $4 billion in gross income, would be produced. Even this big output, Parsons people say, would equal only 10 percent of the additional power that North America will be needing by 1980.

Studies show the plan could deliver farm water at the ditchside for $3 an acre-foot, industrial and municipal water for $10.

Contrast Noted

This contrasts markedly with the expected cost of Feather River water in southern California, likely to be as high as $60 an acre foot.

"It's because of the huge power factor that it can be cheaper," M. S. Umbenhauer, Parsons manager of power operations explains. "But I think NAWAPA will not interfere with the California project. It will take 30 years to build NAWAPA, and, meanwhile, California will need all the water it can get."

Two eminent hydraulic engineers, Donald McCord Baker and Hillman Hansen, initiated the studies which the Parsons Company has since pursued.

Mr. Hansen became a consultant to Parsons in 1958 after his associate's passing, and the firm devoted a large section of staff time to the project which he advocated. Recently, following a long series of private conferences with numerous American water problem specialists, the company began discussing its plan with the Canadian Government and British Columbia officials.

Mr. Umbenhauer and Mr. Hansen say that until World War II developed aerial photography, the kind of mapping had never been possible which allowed the study of the Canadian-Alaskan mountain region which NAWAPA envisions.

John Davis, parliamentary assistant to Canada's Prime Minister Lester B. Pearson, recently said in an interview: "I am convinced that in the long term it would all be in Canada's interests to invest tens of billions of dollars in river diversion projects. The United States needs the water that Canada can supply and I believe American capital would be found readily for such an investment."

Parsons people say that their motive now in making known their proposal is to determine how ready American enterprise is to do the job and to solicit encouragement to go ahead.

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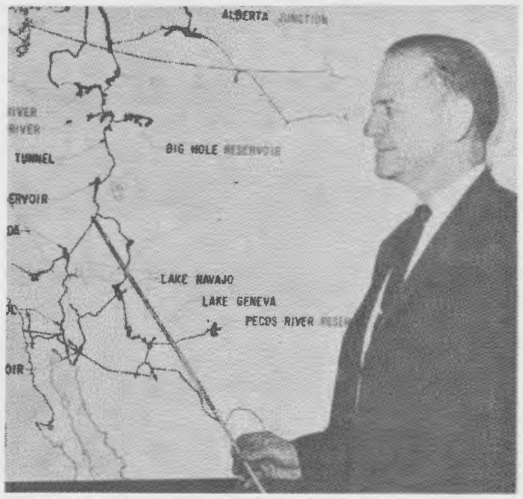
Pasadena, California
September 13, 1964



Sen. Moss indicates dry area which would benefit from proposed system to bring Arctic water south to U.S.

HOW TO MAKE A DESERT BLOOM

by FRANK MOSS
U. S. SENATOR FROM UTAH

Countless books and movies have dramatized how the West was won, but few Americans are aware that we are now faced with the problem of winning it for the second time. There will be no covered wagons jolting over mountain trails, nor Indians lurking in forest shadows. This time, it must be a triumph not of pioneering but of engineering.

While technology will be the tool, the raw material of this struggle is water. The era of space probes and miracle drugs has not changed man's dependence upon "the lifeblood of civilization." Cities and nations grow in direct ratio to their water supply. When that supply fails, they perish.

In many arid areas, the daily struggle for water is the accepted way of life. Yet it may come as a distinct shock to most Americans to learn that, even in our lush land, many communities now face water shortages. As our population increases, our water also becomes more polluted. It is not uncommon in crowded eastern cities to find tap water tainted or, equally bad, to find the tap dry.

The tenements and turnpikes of the East are teeming with people and problems. Many Americans seek room to escape, and room is what the West has plenty of. In 17 western states there are 48 million acres of usable land which only lizards and rattlesnakes now occupy. The missing ingredient is water. This land is irrigable and needs only water to make it bloom.

Only 117 years ago, the Mormon pioneers pushed into Salt Lake valley and found a bleak, baked desert. In the whole valley, there stood only one stunted tree. Today, that tree is preserved as an historic shrine in a valley of shade trees and green lawns. Where sagebrush once soaked in the sun, a bustling city has risen with pure mountain water bubbling from street-corner fountains.

CAPTURING THE SNOWS

What brought about this spectacular change? The settlers simply captured the water from the melting snows in the great mountains and used it to turn Salt Lake valley from a desert into a garden.

It took vision in those days to look at a desert and see a future Eden. But the time has come to enlarge that vision in terms of the entire North American continent. By diverting water from the Arctic, we can transform the wastelands of the West into a great, new productive area.

To study how this can be done, the Senate has appointed a water development subcommittee and has named me as its chairman. We are now gathering data on a bold new plan which could solve the continent's water problems for the next 100 years. The idea is to collect surplus water from the rivers of Alaska, the Yukon Territory and British Columbia and draw it southward through a gigantic system of canals, reservoirs, tunnels and rivers.

Heart of the system would be a vast reservoir-lake 500 miles long. This would fill to overflowing a gorge, known as Rocky Mountain Trench, high in the upper reaches of the Columbia, Fraser and Kootenay Rivers. Situated near Banff and Jasper National Parks, this great man-made lake

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would open up a vast new recreational area in addition to watering the West from central Canada deep into Mexico. Of course, this plan would require the endorsement and co-operation of the Canadian and Mexican governments, and they have already indicated their interest.

Is this great rearrangement of nature feasible? The Ralph M. Parsons Co., experienced in water projects all over the globe, claims it can be done. Though the project would be staggering in size, it would utilize techniques now in everyday use and require no new technological breakthroughs.

How much would it cost? It is estimated the project would take at least 30 years to complete and would require a $100 billion investment. This figure may seem less prohibitive, however, if we keep in mind that the revenue from the water and power will eventually repay the cost.

WATER, POWER AND SOIL

Here's what the system would do:

- Bring to the West its own, man-made Mississippi River. The other ingredients for development are already there, but advancement will be limited until the water arrives.
- Provide a navigable waterway from Vancouver on the Pacific to Duluth on Lake Superior.
- Raise the level of the Great Lakes enough to increase electric power production at Niagara by 50 per cent and cleanse the lakes of pollution.
- Not only double the water supply for all our own arid states but provide plentiful irrigation water for northern Mexico.
- Finally, provide an adequate water supply for the United States for the next 100 years.

The water and power could give birth to new mining, manufacturing, commercial and financial enterprises. Great modern cities could rise in Utah, Nevada and Arizona.

The rich soil would literally spring to life and produce a vast new food supply for our exploding population. Hunting, fishing, boating — indeed, all the fine recreational opportunities of the great West—would flourish. The mountains, deserts and vast prairies would beckon other Americans who could now have a choice of where to live their lives and how to live them.

This is a vast project, but we must not be deterred by its size. The challenges ahead are great and it will take just such a program to meet them.