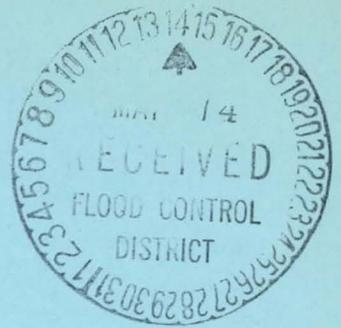


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Presented to the
Tucson City Council
At and Subsequent to its Meeting
of
February 8, 1974

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PREFACE

This is a compendium of statements supporting the Central Arizona Project which were either presented to Mayor Lewis Murphy and members of the Tucson City Council at a meeting on February 8, 1974, or provided to the Mayor and Council subsequent to that meeting. The statements include local evaluations of the relationship between the Project and the Tucson area as well as a factual description of the Project provided by the Arizona Water Commission. Locally provided statements are from people who collectively have given the Tucson community many years of leadership and personal involvement in community affairs and who possess decades of specific professional technical experience in fields germane to the overall problem of Tucson's need for Central Arizona Project water.

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Presented by
Quentin M. Mees, Member
Central Arizona Water Conservation District Board
February 8, 1974

Mr. Mayor, Members of the City Council

I should like to take this opportunity to express the appreciation of the members of the Central Arizona Water Conservation District Board for your providing the time to allow us to present the facts associated with subcontractual negotiations which have been authorized by the District Board. The elected Pima County representatives are present and I should like to introduce them at this time. (Introduce Armer, Sullivan, Clark and others.) In addition to members of the Board, we also have with us several members of the staff of the Arizona Water Commission as well as the legal counsel to the Commission and the Board. (Introduce Sutter, Clark, Steiner and Briggs.) Before turning the discussion over to Mr. Steiner and his staff, I should like to make a few personal remarks that I think are pertinent to this meeting.

As several of you know, I have appeared before this Council on several occasions in the past, generally as the result of a need for financing a project which I deemed important to the community and, for that matter, to the state. I have for many years served on several committees and councils for both the city and Pima County, and am currently continuing to serve on several of these. It is my impression that I have some capability for estimating what the needs of this community are, having lived here since 1946, and in addition, have a rather personal feeling for trying to advise community leaders in matters within my professional area of expertise. I do this partly because I feel that there is a need for this kind of citizen participation and partly because

I have a private feeling of indebtedness to the community for providing, through its climatological features, the type of living environment that made a difference between my being able to live out a rather normal life expectancy as opposed to a relatively short one that was predicted when I came here in 1946. So much for personal comments.

Since one of the newer documents being used to estimate future water needs of this community is the 701B study entitled "A Regional Plan for Water, Sewerage and Solid Waste Management," I cannot help but make what I think are several pertinent comments at this time relative to this study and the basis upon which it was developed. In general, I am in agreement with the recommendations concerning regional management of water, sewerage and solid waste systems and the manner recommended for implementing these recommendations. It is within the area of water needs that I find a sound basis for presenting an alternate posture. To do that, there are two specific areas that I would like to emphasize. The first of these is the fundamental premise upon which the management program was developed, "the needs of the resident population for urban water, wastewater, and solid waste management utilities, must be met at a minimum cost." If one approaches a planning assignment of this type rationally, I simply cannot agree with the absolute necessity for developing a plan based upon minimum cost. Glaring examples of environmental problems resulting from this approach to problem solution exist in every walk of our daily life. As a result of industrial development with minimum cost setting the pattern for production, we have developed problems in air pollution, water pollution, and solid waste disposal that defy the tools of technology available today which are capable of being applied to their solution. All of you are too familiar with the details of these problems to warrant elaboration on them at this time. Coming

closer to home, we need go no farther than the waste treatment facilities which currently exist and are treating wastes from this community. As a result of the lowest bidder technique and minimum cost considerations, the City of Tucson has one of the most unique and inefficient waste treatment facilities in existence for a community this size in the country. Instead of having a single type of treatment which could be operated efficiently and in such a way as to produce an excellent effluent, you have three different treatment facilities in parallel which were built at a minimum cost but which defy the most capable operators' expertise in trying to keep each of them operating efficiently simultaneously. I am sure there are other examples that each of you could give--these happen to be the most obvious which I know all of you are familiar with. I would therefore submit that minimum cost should neither be the only constraint placed on a planning document nor in some cases should it even be placed as a constraint on a good planning document.

The second item with which I simply cannot agree and which is emphasized in numerous places in the planning document is that of basing the future water supply of this community on a continued depletion of the underground supply, until the water level has been lowered an additional 500 feet below that at which it currently exists. In other words, the study recommends that no concern be expressed for our water supply until we have lowered the water table to approximately 800 feet below the surface of the ground. I would submit to you that if we had a service reservoir from which the water supply of Tucson were being pumped and the citizens of this community were able to drive along the tops of the dikes of this reservoir and observe a high water mark approximately 300 feet above the surface of the water and then observe this level receding at a rate in excess of 3-5 feet each year with nothing being done to

stabilize that recession. you would have more visitors than you could accommodate knocking on the Council doors wanting to know why something wasn't being done to stabilize the supply. You might feel that this type of comparison smacks of "pressing the panic button." I happen to be one who feels that that panic button is going to have to be pressed before we really get the kind of water resource planning this community deserves. I happen to come from a community where water was and is a precious commodity. Several years ago, in fact, it was such a precious commodity that the council had to pass an ordinance which subjected citizens to a fine of \$100 if they were observed watering shrubs or lawns in the city limits. You can imagine the popularity of a council that has to do something like this in order to keep the city from running out of water. You can also bet that something was done about the situation and it was. Several dams have been constructed since that time and water is currently being imported from several hundred miles away. The community is still skeptical and every effort is being made to add to that water resource. Minimum cost happened to be about the last thing they talked about when it came to bringing new water into the community. Their rates have been on the order of two to three times those of the City of Tucson. I simply cannot bring myself around to a frame of mind which would allow me to rationalize the kind of planning that is based on continued mining of a resource as precious as water is to any community.

Another factor which simply doesn't seem to me to be a reasonable one is that of the estimated life of this groundwater supply based on certain manipulations of the water within the basin. Without even considering the 1700-year prediction, let's look at the 620-year one. The fact that 2020 usage serves as the basis for the estimate makes it even less palatable. Perhaps the best

way to look at this estimated life is to subtract 620 years from 1974. This places you back at about 1354, more than 130 years before Columbus discovered America. I am of the opinion that we are in no better position to make predictions for the length of time implied than were planners in the Columbus era.

I would hasten to say that I do not disagree with the recommendations for reuse, reclamation, mineral processing, groundwater recharge--yes, and perhaps even retirement of agricultural land; however, when you have done all of this and still end up with an unbalanced resource, I can't understand why the importance of that balancing is relegated to a position of ninth on the list of nine and placed there because this planning document had to be developed on a minimum-cost basis. It so happens that the opportunity to balance the water budget in this community is available to us at the present time, not 620 years from now, and I happen to be one of those who think that this opportunity provides the rational basis for making plans for preserving the water resource for the future. I would hope that our successors could look back on this period in history and say, "This City Council and these members of this community had the foresight to plan in such a way as to minimize the water problems which we are currently trying to solve. If there ever was a people program (for people here now as well as those coming in the future) deserving of your support, CAP is that program.

At this point I should like to introduce an individual who will provide many of the statistical facts and figures which complement some of the statements which I have just made. I feel that we are fortunate to have an individual with the qualifications of Mr. Steiner, who is concerned with planning the water resources for the State of Arizona. I happen to have been involved in the selection of Mr. Steiner when he came here from California and would like to share some of his credentials with you. (Read from Steiner's VC.)

STATEMENT FOR PRESENTATION TO
TUCSON CITY COUNCIL

February 8, 1974

Early History of the Central Arizona Project

The concept of the CAP has been with us for a very long time, having surfaced, I am told, before the turn of the century. Efforts to implement the project began in earnest, however, in 1944 when the State made \$400,000 available to the U. S. Bureau of Reclamation for a cooperative study to plan the CAP and to develop a report that would serve as a basis for Congressional authorization. The resulting report was submitted to Congress in 1948. At that point the CAP was conceived as strictly an agricultural project.

A favorable vote was received in the Senate, but California blocked authorization in the House with the House Interior and Insular Affairs Committee deferring action until Arizona's right to Colorado River waters had been adjudicated or otherwise settled with California and the other states. In the summer of 1952, Arizona filed in the Supreme Court to confirm its title to Colorado River waters. I am sure that you are all aware that eleven years later Arizona emerged victorious. The Court confirmed Arizona's right to 2.8 million acre-feet of the first $7\frac{1}{2}$ million acre-feet of supply available to the three Lower Basin States in the mainstream of the Colorado River, plus 46% of any surplus. In addition, Arizona was given exclusive use of its tributaries with the exception of decreed amounts to New Mexico on the Gila.

Presented by Wesley E. Steiner, Executive Director of the Arizona Water Commission and State Water Engineer.

Late in 1959, the Mayor of the City of Tucson, Don Hummel, strongly protested the fact that water service to the City of Tucson from the Project was limited to the 12,000 acre-feet of new yield from the Charleston Dam on the San Pedro River and insisted that delivery of 100,000 acre-feet of Colorado River water to Tucson also be incorporated in the Project. State and federal monies were made available for a new study of the M&I potentials of the Project. The Committee concluded in its report that 100,000 acre-feet of waters derived from the Colorado River should be delivered to the City of Tucson.

On June 4, 1963, the day following issuance of the Supreme Court's opinion in Arizona v. California, bills to authorize the CAP were introduced in both houses of Congress. At this point the Project included 312,000 acre-feet per year for Phoenix and Tucson. This was the beginning of the change of emphasis from agriculture to municipal and industrial.

Many different versions of legislation were introduced before Arizona agreed to terms with California on the sharing of future shortages of mainstream waters. Inclusion of provisions in the act making satisfaction of the Mexican treaty burden a national obligation and relieving the states of the burden of supplying $1\frac{1}{2}$ million acre-feet annually to Mexico as soon as the River was augmented made acceptance of a priority to California acceptable as once relieved of the treaty obligation, the priority to California would be meaningless and the CAP supply would be essentially firm. The CAP was authorized September 30, 1968, as a rescue project. No new lands are to be developed for irrigation except on Indian Reservations.

In January of 1969, then Secretary of the Interior Stewart Udall, asked the prospective contractors for CAP water to file expressions of interest setting forth the amounts of water for which they desired to contract. To date the Secretary has received expressions of interest aggregating 5.4 million acre-feet per year or $4\frac{1}{2}$ times the average supply of the Project. Cities, industries and water companies of Central Arizona have asked for 1,100,000 acre-feet for municipal and industrial use. Recreation interests have asked for an additional 200,000 acre-feet per year to establish new fishing lakes and to maintain recreation pools behind some of the flood control structures in Maricopa County. Agricultural interests have asked for 4,000,000 acre-feet including a request from the Central Arizona Indian Tribes for 1,200,000 acre-feet. We recognize that an expression of interest is not the same thing as a contract to repay and that the requests may be considerably inflated, but we have analyzed the requests and are convinced that we have an allocation problem.

The original expression of interest from the City of Tucson was for 300,000 acre-feet per year. This amount was subsequently reduced by the city to 100,000 acre-feet per year.

We have undertaken comprehensive computerized studies using an economic-hydrologic-engineering systems approach to determine the allocation of our remaining entitlement in the Colorado River that maximizes economic benefits, minimizes the total cost of all water service regardless of source, and equalizes overdraft.

We have already concluded from these studies that municipal and

industrial interests should have a priority in contracting for CAP water and should be allocated such amounts as can be reasonably forecast as being required and for which the city or industry is willing to contract and assume the responsibilities of repayment.

A word about the history of CAP water rates. At the time that Tucson demanded inclusion in the Project, agricultural water was priced at \$4.50 per acre-foot and the very limited amount of municipal water at \$49.00/acre-foot (1947 Project plan). In 1964 these rates jumped to \$10 and \$50-56. Agricultural water is now pegged at \$15.00 per acre-foot and M&I (Municipal and Industrial) at \$45.50.

Current Status

The Central Arizona Project, as now conceived, has as its objective: (1) first and foremost, to provide new supplies to meet municipal and industrial requirements and to afford new options as to where municipal and industrial growth may take place; (2) to reduce overdraft to the maximum extent possible; (3) to extend the life of agricultural greenbelts in Central Arizona; (4) to provide flood control for much of the developed urban area of Central Arizona; and (5) to provide new water-oriented recreational opportunities in Central Arizona.

The Project as now conceived is a municipal and industrial project. It is no longer an agricultural project. The master contract between the Central Arizona Water Conservation District and the Secretary of the Interior is strongly oriented towards M&I. I will have more to say about that in a moment.

PROJECT STATISTICS

Storage Capacity in Acre/Feet

Orme	Total	1,650,000
	Flood Control	950,000
	Conservation	367,000
	Dead & Inactive	43,000
	Surcharge	290,000
Buttes	Total	420,000
	Flood Control	133,000
	Conservation	100,000
	Dead & Inactive	133,000
	Surcharge	54,000
Charleston	Total	241,000
	Flood Control	116,000
	Conservation	103,000
	Dead & Inactive	22,000
Hooker	Total	Not finalized
	Conservation	70,000
	Dead & Inactive	30,000

Aqueduct Length in Miles		Lift in Feet
to Orme	190	1200
Orme to Tucson	<u>117</u>	910
	307	

Construction on the Central Arizona Project is underway. The first unit of the power plant at Page started generating power last Friday and will go on line this spring. The intake structure at Lake Havasu, commenced last summer, is nearing completion. Much of the right-of-way has been purchased for the Granite Reef Aqueduct and flood retention structures through the Paradise Valley and North Scottsdale reach of the aqueduct. The environmental impact statement for the entire Granite Reef Aqueduct from the pumping plant at Lake Havasu to Orme Dam has been filed in final form

with the Council on Environmental Quality. It must rest there for thirty days before construction can start. I am not aware of any effort on the part of environmentalists to block construction of the Granite Reef Aqueduct and construction is scheduled to begin this spring in the Paradise Valley-Scottsdale reach.

Terms of the Master Contract

The Central Arizona Water Conservation District was formed in July of 1971, to serve as the contracting entity for repayment of federal costs incurred in providing Central Arizona Project water to non-Indian users in Maricopa, Pima and Pinal Counties. The District negotiated a very favorable master contract with the Secretary of the Interior for water service and repayment of costs. This contract, executed on December 15, 1972, has as its major provisions the following:

1. The Central Arizona Water Conservation District shall be responsible for repayment of costs associated with the delivery of water within the counties of Maricopa, Pinal, and Pima, except for deliveries to the Indian reservations. Repayment of the costs associated with deliveries to the reservations will be the responsibility of the federal government.

2. The maximum obligation of the District is limited to \$1.2 billion. Capital costs are to be repaid over a fifty-year period, with repayment responsibilities scheduled to increase gradually from 1% of the total obligation during each of the first seven years to 2.7% in each of the last fifteen years. This schedule, as opposed to the payment of 2% per year over the fifty-year

repayment period, recognizes increasing capacity to repay as municipal and industrial sales increase through the repayment period and the financing load on subcontractors imposed by the necessity to construct distribution systems during the early years decreases.

3. All costs for service of irrigation water will be repaid without interest.

4. Project costs allocated to municipal and industrial water service and to power generation at the Navajo Project will bear the very low interest charge of 3.342%.

5. Municipalities and industries may contract for water on a growth schedule. We estimate that municipal and industrial water sales will increase gradually from approximately 100,000 acre-feet in the first year of operation to roughly 500,000 acre-feet in the last or 50th year of the repayment period. During the interim, the water will be used by agriculture. Costs will not be allocated to municipal and industrial use and interest charges will not be levied until the water is actually transferred from agricultural to municipal and industrial use. This is a very important concession gained by the negotiators and will result in substantial savings in interest charges to the District. The fact that agriculture will be using the water not needed by the cities in the early years and the costs associated therewith will be interest-free, permits water deliveries to the cities at substantially lower rates than would be the case were the Project constructed solely to deliver water to the cities.

6. Surplus revenues from the generation of power at the Navajo Project, a feature of the Central Arizona Project, and from Arizona's share of Hoover, Parker, and Davis power revenues after pay out will be used to repay the costs allocated first to power, second to agriculture, and third to municipal and industrial water use. The first unit of the Navajo Project will go on line in 1974. 24.3% of the power generated by that unit and subsequent units belongs to the Central Arizona Project. All sales of energy generated by the federal share prior to operation of the Central Arizona Project and of power surplus to the needs of the CAP during operation will assist in the repayment of District costs. Costs of Hoover Dam and its associated power are scheduled to be rapid in 1987. However, District assistance from this source will not be available until 1991, after energy deficiency payments from the Colorado River Storage Project are repaid. Arizona's share of revenues surplus to operation and maintenance costs of the Parker and Davis projects will be available to the District in year 2005, immediately after scheduled payout in 2004.

7. While the master district will repay capital costs on the basis of a firm amortization schedule, the cities and irrigation districts that take water from the Project under subcontract will pay on the basis of water service, paying only for the amounts of water actually available within the limits of the individual subcontracts.

I would also cite three provisions of the master contract that are unique in reclamation law. They are contained in no other reclamation contract. The first was required by the Act and the other two were entered into to assure the optimum benefit from the Project and to maximize the impact of the Project on reduction of the current rate of overdraft in Arizona. These three provisions are:

1. Project waters may be used within the District for agricultural purposes only on those lands with a history of irrigation during the ten years preceding enactment of the Central Arizona Project legislation, i. e., lands receiving irrigation water must have been under irrigation at sometime during the period September, 1958, to September, 1968.

2. Municipal and industrial water users will have a 100% priority in the event of shortage. Agricultural uses will be dried up completely before municipal and industrial users are called upon to share in a shortage. The Secretary of the Interior has agreed and has published in the Federal Register as a condition of his contract with the District the requirement that all contracts and agreements for CAP water, including those with the Indians, will include this priority.

3. Agricultural districts receiving Project water must agree to reduce their pumping of groundwater by the amount of import supply that they receive from the Project.

All three of these provisions are of benefit to municipal and industrial water users in Central Arizona and assure that municipal and industrial water supplies from the Project will have a much greater value than those made available to agriculture.

Repayment Studies

The Commission staff has made a great number of financial studies as support for the Board of Director's decision-making process regarding use of the ad valorem taxing authority and the direct charges to be levied against municipal and industrial water users.

Reclamation law fixes the price of agricultural water at "the ability to pay" and the master district has little, if any, say in this matter. Hence, in our studies we concentrated on the flexible areas of repayment, the direct charge for M&I water and ad valorem tax rates. It now appears that under Reclamation law, the charge for agricultural water will be approximately \$15 per acre-foot, with \$2 per acre-foot as the capital repayment component and \$13 per acre-foot as the operation and maintenance charge.

Our financial studies required three major assumptions: The amount of surplus power revenues, the magnitude and schedule of M&I water sales, and the growth of assessed value in the three counties.

First, with respect to power revenues, we used in our studies a rate of 8.2 mills per kilowatt hour as the sale price for Navajo Power. Since making the repayment studies, we have learned that the Bureau of Reclamation is now using 8.6 mills as the estimated price for this energy. Additionally, we used the 1964 estimates of the Pacific Southwest Water Plan of 4 mills for Hoover and 4.7 mills for Parker-Davis energy after payout. With these rates we determined that there would be more than enough surplus revenues to assist in the repayment of power and agricultural costs. There would be money left over to help pay M&I costs as well. We believe that power rates

quoted and used in our study are ultra-conservative, and that additional power revenues will be available to assist in the repayment of M&I costs. There is noway, in our judgement, that the Secretary of the Interior will be able to hold rates for Hoover and Parker-Davis power substantially below market value. In fact, the Department of the Interior has proposed an immediate increase of 20% in Parker-Davis power rates.

With regard to municipal and industrial water sales, we estimate that M&I sales would rise on essentially a straight-line basis from a first year purchase of 119,000 acre-feet to a level of 511,000 acre-feet at the end of the repayment period.

Again, we believe this to be a very conservative estimate. Municipal and industrial interests have expressed a desire to contract for approximately twice that amount, or almost all of the CAP supply. While we believe that the cities' expressions of desire are inflated, we are convinced that the actual sales will exceed the estimates we are using. We have been using these estimates of M&I sales in our studies for approximately two years. In recent months, the power companies have evidenced interest in increasing the amount of water that they had asked for to provide cooling water for additional generation plants. A number of the irrigation districts abutting the Phoenix metropolitan area have also indicated a desire to amend their expressions of interest to include municipal and industrial service. In addition since the announcement of price by the Board of Directors, we have received expressions of interest in contracting for M&I water from many entities not heard from before.

The other big variable in our analyses has to do with the estimate of future growth of assessed value in the three counties of Maricopa, Pinal, and Pima. Our current studies start with the 1973 assessed valuation in the three-county area of \$3.3 billion and assumes that this base grows to \$42 billion in the 50th year of full Project operation or sixty years from now.

Over this period, the sixty-year growth rate assumed for the study, averages $4\frac{1}{4}\%$ per year. In the early years, prior to Project completion, the assumed growth rate figures out to be about 6% per year. The annual rate assumed after Project completion is about $3\frac{3}{4}\%$ per year. Based on recent growth, this overall schedule appears to be very conservative. Assessed valuation for the District in 1963 was 1.3 billion and has grown at an annual rate of 10% per year since then. Assessed valuation in Maricopa County has recently accounted for about 62%, Pima County 29%, and Pinal County 9% of the total assessed value in the District.

For purposes of the studies, we assumed that the Secretary of the Interior would allocate 20% of the agricultural water to the Indian reservations in Central Arizona. This is the amount recommended to the Secretary by the Bureau of Reclamation and represents a little over twice the amount determined by the Water Commission to be justified strictly on the grounds of economic efficiency. The Secretary's decision on this matter is expected momentarily, and while it is of great importance to the District, his decision will not affect the financial capability of the District.

Another variable that was found not to adversely affect the repayment capabilities of the District was that of water supply available from the Colorado River. The basic studies were based on average water supply conditions.

An analysis was also made utilizing the most adverse water supply sequence of history. No shortage in M&I water sales was experienced and no necessity was found to modify either the direct water charge or the ad valorem tax.

In the basic studies, we did not consider escalation of the cost of the Project beyond that utilized by the Department of Interior in fixing the District's obligation at a maximum of \$1.2 billion. The Department of Interior, in establishing this limit, estimated that the total cost of the Project would escalate from the 1968 level of \$832 million to a total of \$1.5 billion. We are advised that this increase was determined by escalating 1968 costs at rates shown by the construction index for reclamation type projects, approximately seven points per year, with escalation decreasing in the late years on the basis of the Administration's conviction that inflation will be brought under control before construction is completed.

Subsequently, staff of the City of Tucson asked us to run further studies based upon continued escalation at the current rate for water projects of 6-3/4% per year, compounded throughout the construction period. This rate, the maximum for which a rationale exists, results in a total project cost of \$2.1 billion and a District responsibility only, and I repeat only, if accepted by the Board of Directors of \$1.65 billion. Bear in mind that the Board may refuse to amend its contract and would not be liable for any costs incurred up to that point.

It is estimated that the CAP will commence full operation and the repayment period will begin in 1985. The Conservation District must raise considerable revenue prior to that time. A provision of the master repayment contract requires that a reserve fund of \$5,000,000 be accumulated for the purpose of assuring payment of the future obligations of the District. The contract also calls for a \$500,000 reserve fund to cover extraordinary OM&R expenditures. Additionally, it will soon be necessary for the District to fund its own staff activities as the legislative authorization of the Arizona Water Commission to provide staff support expires in 1975. It appears that the best and possibly the only way to meet these requirements is through what might be termed a "pre-taxing program"--that is through ad valorem taxing of District property prior to full operation of the Project.

Preliminary studies indicated that without an additional reserve from which to augment its annual revenue producing capabilities, the District could only meet its repayment obligations during the early years of operation by taxing near or at its authorized limit, by charging unusually high rates for M&I water, or through some combination of these actions.

The District, last December 3rd and 13th, held public hearings to receive testimony and to reach a decision on the use of the ad valorem taxing authority of the District and the direct charge to be made for municipal and industrial water supplies. The Board of

Directors decided on December 13th to establish a pre-taxing program including the additional reserve necessary to enable equal charges for M&I water throughout the repayment period. The Board also authorized their chief counsel and the staff of the Arizona Water Commission to negotiate subcontracts for municipal and industrial water supply on the basis of a direct charge for repayment of capital costs of municipal and industrial deliveries of \$32.50 per acre-foot. To this charge must be added an estimated \$13.00 to cover the costs of operation, maintenance, replacement, and energy. The Board took this action on the basis of financial studies prepared by the Arizona Water Commission which revealed that all costs allocable to the service of municipal and industrial water supply from the Central Arizona Project could be repaid with these charges and assistance from ad valorem taxes limited to a maximum of 4¢ per 100 of assessed value in the early years, declining to $\frac{1}{2}$ ¢ per 100 in the last ten years of the 50-year repayment period. Average tax throughout the study period would be 1.4¢ per \$100 assessed value. You may recall that the District's ad valorem taxing authority is limited to a maximum of 10¢ per 100 of assessed value. Copies of the Analysis supporting the \$32.50 rate are available to you (copy attached) as are copies of the statement presented to the Board of Directors on December 3 which includes analysis of alternative direct charges of \$25, \$30, \$35, and \$45.

At the maximum rate of 4¢ per 100 selected by the Board of Directors, a family owning a \$30,000 home would be required to pay only \$2.16 per year in taxes for the many benefits of the Central Arizona Project.

The fact should be noted that none of the tax revenues would be utilized to assist in the repayment of costs allocated to agriculture even though farm lands are also taxed. All tax revenues will be reserved to assist in the repayment of M&I costs.

If there is a further escalation beyond \$1.5 billion to the \$2.1 billion previously cited, it is safe to assume that assessed values will also escalate more rapidly than those associated with the \$1.5 billion level. For purposes of analysis of a \$2.1 billion project, we assumed an early growth rate of 8% instead of 6% scaling down to the same 2% in the later years. Additionally we assumed that all power from Page plant sold commercially and sales from Hoover, Parker-Davis would be at a 10 mill rate, still a most conservative assumption. We determined that the direct charge to the cities for capital repayment could be held at \$32.50 per acre-foot. It would be necessary, however, to increase the tax levy to a maximum of 7¢ in the first 6 years of operation, decreasing to 1.5¢ in the last years of the repayment period. The tax levy would average 2.75¢ per \$100 of assessed value during the study period.

Without additional legislation the Project cannot cost more than its authorized amount - \$832 million in terms of 1968 dollars. The authorizing legislation allows Project costs to escalate in keeping with the construction cost index for similar types of construction. Placed in proper time perspective, the estimated cost of \$832 million, \$1.5 billion or \$2.1 billion are all equal and are consistent with the letter and intent of the law. The cost of the Project cannot exceed \$832 million in terms of 1968 dollars without additional legislation authorizing a ceiling increase. No such legislation has been contemplated nor is anticipated.

It is not fashionable these days to be compared to Southern California, but the water supply situations of the two areas are quite analogous. The South Coastal Plain of California, Los Angeles to San Diego, has a groundwater basin much like ours that can be mined and eventually exhausted; but instead Southern Californians have on three occasions gone outside the south coastal basin to import water supplies at considerably greater immediate expense than continued mining of the groundwater basin. Back in the early 1920's when the people of Los Angeles found that they were mining the underlying groundwater basin, they went to the Owens River for a supplemental supply. With continued growth, mining of groundwater, again, became a threat. The Metropolitan Water District of Southern California was formed and the project to bring Colorado

River waters to Southern California was launched in the depression years. Explosive growth during the war years again threatened the groundwater basin and the Metropolitan Water District contracted for over 2,000,000 acre-feet of Northern California water to be delivered through the California State Water Project. The Metropolitan Water District will pay throughout the repayment period of the State project an average of \$86.00 per acre-foot at canalside for 2,011,500 acre-feet of project water. Interests in San Luis Obispo County will have to pay \$101.00 an acre-foot and those in Santa Barbara County, \$134.00 an acre-foot. All of these are estimates of costs at canalside prior to treatment and distribution.

On the other hand, the Metropolitan Water District of Southern California recently announced that it will decrease its ad valorem tax rate from 15¢ per \$100 assessed value to 14¢, down from a high of 50¢ per \$100 in 1945-46.

Compare these costs and tax rates with the \$45.50 direct charge and maximum tax levy of 4¢ established for CAP water by the Board of Directors of the Central Arizona Water Conservation District.

It should be obvious that we have a bargain water supply in CAP.

The cities and industries of Central Arizona have been advised of the actions of the Board of Directors of the Central Arizona Water Conservation District and have been put on notice that we are now

ready to negotiate municipal and industrial subcontracts. By decision of the Board, the opportunity to contract for municipal supplies will terminate on December 31, 1974, and agricultural subcontracting will begin.

The time is now. The CAP is not a timeless alternative. It is now or never.

The Commission's Studies of the Tucson Regional Water Problem

You are all aware I am certain that the City, the mines and the Farmer's Investment Company are involved in a court suit over the water supplies available to these three interests. At the request of the Governor over a year ago, in hopes of providing a basis for an out of court solution to the lawsuit, the Water Commission made studies which we believe to be considerably more comprehensive than the water supply portion of the 701(b) study. Using the escalated cost of the CAP and 1967-72 rates for the energy necessary to mine the groundwater basin, we compared the least costly system for meeting future needs in the Tucson area based on continued mining of groundwater on the one hand with systems that included importation of CAP water on the other. We have presented the methodology and findings of our studies on two occasions here in Tucson and have circulated rather widely the input data and the resulting groundwater decline maps. We have our maps and experts with us today and are prepared to go into detail should you desire.

In our studies we found the CAP to be a viable alternative to groundwater mining. Throughout much of the fifty-year repayment period the direct costs of continued mining were less than the costs of CAP importation. Near the end of the period, however, the cost curves crossed and the CAP became a cheaper solution. We determined that for the total repayment period CAP costs were approximately \$10 per acre-foot higher on a present worth basis than those for mining groundwater. This means then that it would cost the people of the Tucson region only an additional \$10 an acre-foot to take Central Arizona Project water and leave a like amount of groundwaters in storage and ready to meet any future emergency. As an acre-foot of water in Tucson meets the annual requirements of five people, retiring overdraft would cost about \$2 per person per year - certainly a reasonable price and within the capability of the city to face up to the groundwater mining problem rather than passing it on to future generations under crisis conditions.

Moreover, the direct costs of mining groundwater are not the total costs. I will have more to say in a few minutes about the costs of subsidence that will accompany continued groundwater mining.

It is also absurd to assume that the costs of electrical energy required to pump groundwater will continue at 1972 rates. It is probable that the rates for electrical energy for this purpose will increase appreciably by 1985, the estimated date of initial delivery

of CAP water, and may multiply several fold by the end of the repayment period in 2035. On the other hand, the cost of energy to pump CAP water from the Colorado River to Phoenix and Tucson is not expected to increase appreciably in that the costs of the power generating plant at Page will have been incurred and the supply of energy for that Project is under long-term contract.

To test the impact of increasing energy costs, we re-ran studies keeping all other parameters the same but doubling the cost of energy to pump groundwater. These studies are nearing completion and it appears that with the doubled power rate the direct cost of mining would still be cheaper in 1985, but that before the middle of the repayment period the annual cost of the system that includes 117,000 acre-feet of CAP import would become the cheaper of the two alternatives and the advantage in favor of CAP would increase throughout the remainder of the repayment period. Instead of costing \$10 per acre-foot more for the total 50-year repayment period, with doubled power rates it appears that the present worth of costs of the CAP system (including taxes) and the groundwater alternative would be approximately equal. Use of higher than doubled power rates would clearly establish the superiority of the CAP.

Much of our problem with the Marum and Marum 701(b) study revolves around difficulty in being able to ascertain the basis for the conclusions. When the summary report first came out last year, as

the State agency charged with water resource planning, we asked for copies of the final report and all of the supporting task force reports. The claim has been made repeatedly by the consultants that the conclusions are based upon the findings of the task force reports, yet to date we have been denied an opportunity to review those documents, and only last month finally received a copy of the final report.

Through friends outside city and county government, we were afforded the opportunity to review two of the task force reports: Task VIII, entitled "Select/Modify Models" and Task XI, entitled "Develop Data Water Resources Management System." In task Report VIII, dated September, 1972, it is stated that "It is premature to draw conclusions about the worth of the models documented in this task report with respect to enhancing the capability of the engineer to specify, examine and select alternative management systems." It appears, however, that the summary report of June, 1973, relies heavily on the effectiveness of the models. No details of model input or output are presented in the report. For example, we have yet to see maps of projected water level change. If we had had an opportunity to study such maps, we would be in a much better position to explain the differences in our conclusions.

In Task Report XI, Chapter 5, it is stated that "the compelling conclusion of the study of existing water resources and demands in the

Tucson Basin is that an alarming overdraft of the groundwater is in progress and will be inevitable in the future as well, unless supplemental water resources are developed. The overdraft, in itself, would not be as alarming if: (1) groundwater quality at deeper strata were of equally acceptable drinking quality; (2) quantities available in storage were guaranteed for the foreseeable future (the most optimistic estimates point to a depletion of the upper 1,000 feet of aquifer in the next fifty years; (3) other potential economically developable sources were accessible beyond the next few decades." This report is dated October, 1972. What a remarkable change in posture appears nine months later in the final document and again without support. Without showing justification the consultants have reversed their position and now ask you to bank the future of the great City of Tucson on a report that does not provide justification for this reversal.

The 701(b) report advocates for Tucson a series of so-called "alternatives." These are not true alternatives in that each one results in different accomplishments over different periods of time. All except the CAP alternative rely on continued overdraft. Only the CAP import has the potential of balancing supply and use. All so-called alternatives except the CAP would lower groundwater levels underlying the Tucson region by an additional 500 feet.

Subsidence

As groundwater levels are lowered, the void spaces between the

particles of earth are emptied, water pressures are relieved and the aquifer compacts. In time the surface of the earth also subsides. The U. S. Geological Survey drawing upon knowledge of the geology and aquifer and experience elsewhere in Arizona and in the world predicts that a 500 foot decrease in water level would result in a 10 to 30 foot subsidence of the ground surface in Tucson. They predict further that subsidence would be uneven and that major fissures would develop as they have in many of the agricultural areas of Arizona, where substantial, but lesser water table declines have occurred. The maximum subsidence in Arizona today occurs in the Eloy area where subsidence depths in excess of $7\frac{1}{2}$ feet have been experienced. I will circulate photographs of some of the fissures that have developed (copies attached). A crack south of Eloy broke Interstate 10 and requires continual repair. Another crack in the Apache Junction area has extended into a subdivision cracking roads and house foundations. Farmers who have encountered these fissures in their fields find them expensive to fill and maintain and very disruptive of farming and irrigation management. While subsidence has been most troublesome on the farms where it has occurred, the tilting of land and open fissures within the city limits of Tucson would present much more serious problems for the city.

Based on limited data in Arizona and more complete data from California, the U. S. G. S. finds that water levels must be drawn

down 100 to 150 feet before land subsidence becomes measurable. The average total level decline is estimated by the Survey to be about forty feet in the Tucson basin exclusive of the areas along the Santa Cruz River near Sahuarita where declines have been much greater. The average yearly decline in groundwater level in the urbanized portion of the basin is now about $2\frac{1}{2}$ feet per year. Analysis of this data by the Survey indicates that small amounts of subsidence might occur in ten to twenty years at the present rate of water level decline and that earth cracks will follow. Subsidence will escalate thereafter as groundwater mining continues.

On the basis of current operations in the basin and projected future needs, we have from our studies estimated probable future water levels throughout the Tucson basin. Projected groundwater declines during the period 1980 to 2030 are shown on Plate 1. Ground surface subsidence expected to accompany these declines in the water table are shown on Plate 2. You will note from the map on the wall (Plate 2) that estimated subsidence depths within the boundaries of the city range from 5 feet in some areas to as much as 15 feet in others. The new City Hall complex is in the ten to fifteen foot range. Subsidence of these magnitudes would disrupt storm and sanitary sewers, surface drainage and would enlarge the floodplain of the Santa Cruz River.

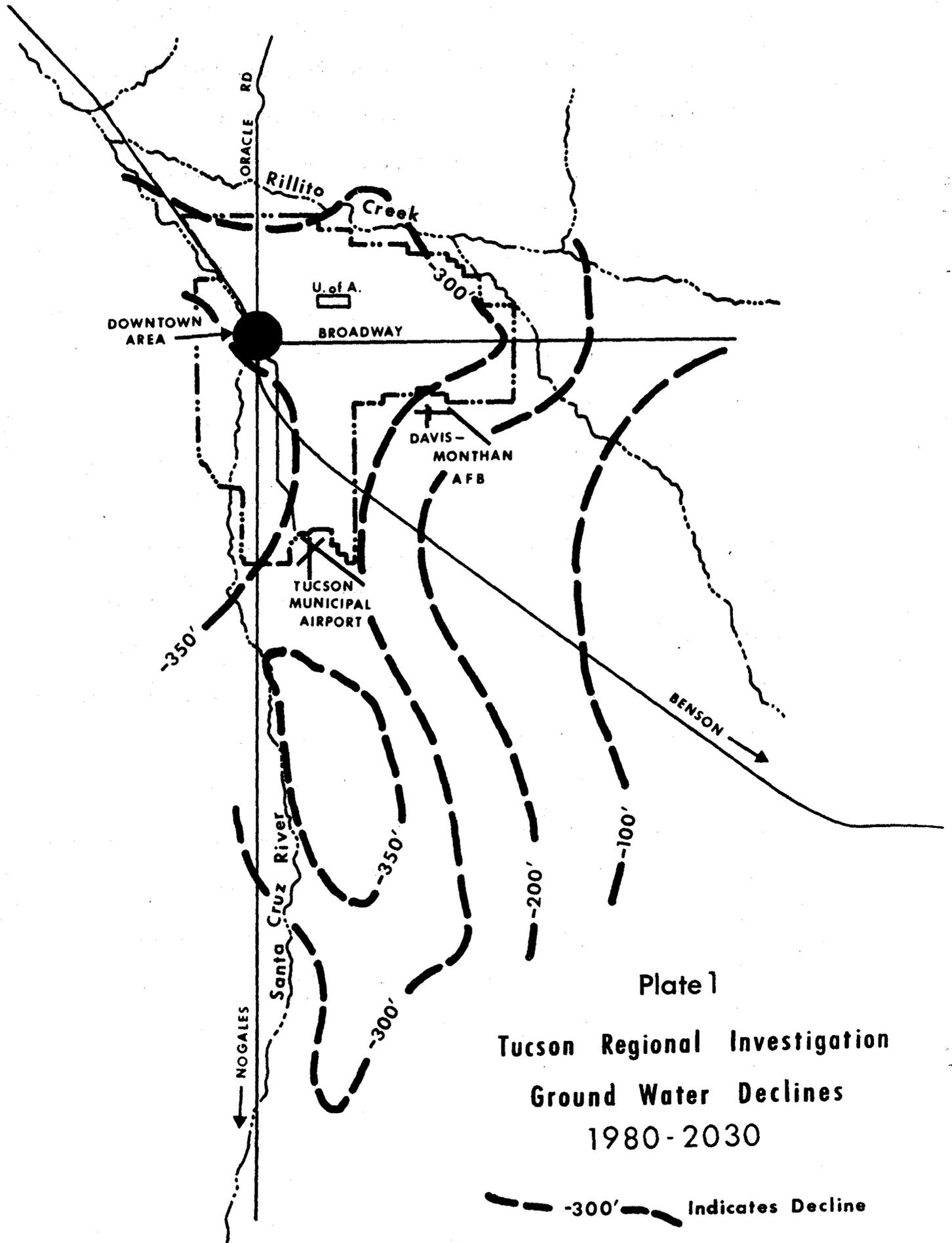


Plate 1
 Tucson Regional Investigation
 Ground Water Declines
 1980-2030

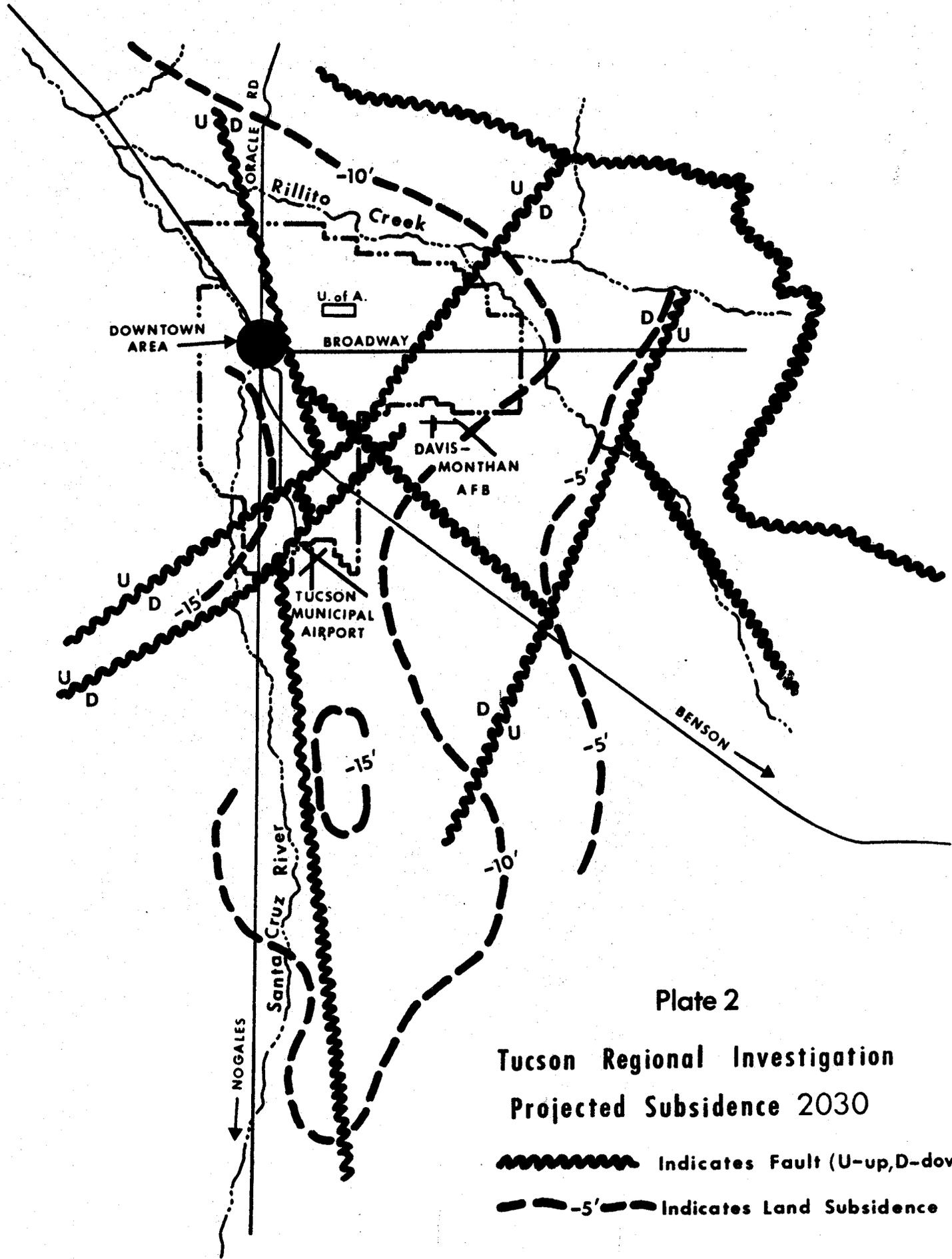


Plate 2

Tucson Regional Investigation
 Projected Subsidence 2030

~~~~~ Indicates Fault (U-up,D-down)  
 - - - - -5' - - - Indicates Land Subsidence

The lines on the map with 'U' and 'D' on either side indicate lithological changes within the aquifer which may function as locations of differential settlement and possibly earth cracks. These differences will modify the estimated depths. Generally, the areas on the 'U' sides of the lines are expected to subside less than the areas on the 'D' sides.

As we understand the final report of the 701(b) studies, the water supply system recommendations are based upon continued pumping from 115 wells within the city boundaries (page XI-3 of the June, 1973, report). It would appear certain that this operation cannot be performed without significant subsidence and the tilting and fracture of buildings and other structures.

#### Water Supply

Adversaries of the Project claim that "there is not now, nor will there in the future be, enough water available from the Colorado River for the Central Arizona Project."<sup>1</sup>

This is patently ridiculous.

The water supply for the CAP will consist of 662,000 acre-feet per year that is presently being diverted at Lake Havasu to the Metropolitan Water District of Southern California and increased releases from storage in Lake Powell and Lake Mead. The 662,000 acre-feet transfer of use from Southern California to Arizona is in

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<sup>1</sup>Mr. David Yetman in "A Need for the Central Arizona Project."

accordance with the Supreme Court's decision in Arizona v. California. California interests have recognized that the Metropolitan Water District of Southern California will have to cut back its use by this amount and have programmed importations from Northern California to replace the loss as soon as the Central Arizona Project goes on the line.

It is fact that the flow of the Colorado River for the past several years has been below the long-term average virgin flow of just under 15 million acre-feet per year at Lee Ferry. But it is not fact, as opponents of the Project purport, that the river is already bankrupt and doesn't have any water for the Central Arizona Project. Even though flow has been below normal in the eleven years since the reservoirs of the Upper Colorado River Storage Project have gone on line, major reservoirs of that Project and Lake Mead in the lower basin have stored over 29,000,000 acre-feet of water. This is all water over and above present needs. In addition, each year of the eleven-year period, 662,000 acre-feet of water belonging to Arizona or a total of 7.3 million acre-feet was delivered to Southern California. This means that additional demands totalling 36.6 million acre-feet or 3.3 million acre-feet per year could have been met in Arizona throughout the eleven-year period without diminishing storage.

Looking at it another way, the 662,000 acre-feet per year retrieved from California plus the 29.3 million acre-feet stored during

the past eleven dry years without any additions to this surplus in future years provide a full supply of 1.2 million acre-feet for the CAP for over fifty-four years, and it is probable that further surpluses will be added to storage prior to the time that the CAP goes on the line thereby extending the period of assured supply for the CAP.

This speaks well for the ability of the river flow to meet additional needs even during a period of below normal runoff.

Congress did not authorize a project for which there would be no water supply. It was well aware of the differing opinions as to the availability of water for the Central Arizona Project. House Report #1312 of the 90th Congress, Second Session, accompanied H. R. 3300 out of the House Interior and Insular Affairs Committee in April, 1968. In Section VI, Colorado River Water Supply, this report states ". . . so far as the history of modern civilization is concerned, the record is full of controversies over the water supply of various river systems. It is doubtful that any other river system in the world - and certainly no other river in the western hemisphere - has been the subject of so many disputes of such wide scope during the last half-century as the Colorado River of the southwest." The report goes on to discuss several studies of the water supply situation. As its last conclusion on water supply, the report states, "Notwithstanding the anticipated water shortage on the Colorado River, if there is no augmentation, the committee finds that the

Central Arizona Project is feasible with the presently known water supply."

It is important to note that the Congressional Committee's report was not developed by the Bureau of Reclamation, the Arizona Water Commission, the Central Arizona Project Association or any group which might be considered prejudiced as far as CAP is concerned. Chairman Wayne Aspinall of Colorado exercised very close control of this committee and spent many days developing the record relative to the Colorado River water supply. Only after he was assured that the Upper Basin was protected and that water remained for a feasible project did he move the CAP legislation.

The Arizona Water Commission has recently updated the Colorado River operation and water supply studies utilizing the historic 1906-1970 virgin flow of 14.95 million acre-feet (MAF) at Lee Ferry, the current available storage capacities of Upper and Lower Basin reservoirs, and the recently adopted Coordinated Operating Criteria for Colorado River Reservoirs. These studies showed a declining water availability with average annual diversions from the Colorado River of 1.70 MAF in 1980, 1.32 MAF in 2000, and leveling off at 1.09 MAF under 2030 conditions. The average annual project diversion for the 1980-2030 period was 1.33 MAF. This analysis assumes Upper Basin

development increasing up to the same "5.8 MAF level" as used by the Bureau of Reclamation. Recent reductions in appropriations and delays in authorizations for additional projects indicate that the projected rate of Upper Basin development is not being realized and that supplies available to the CAP will be greater than estimated above.

The above quoted averages for water available for CAP include years of surplus diversions, years of normal diversions (2.8 MAF for Arizona), and years of reduced shortage diversions (380,000 AF/yr). Additional studies showed conclusively that a firm delivery of 500,000 acre-feet per year, equal to the estimated CAP M&I requirement, could be sustained each and every year through the most critical period even under the most adverse 2030 development conditions, with only a slight reduction in the average annual diversion for year 2030 (1.04 MAF vs. 1.09 MAF).

Those who question the adequacy of water supply for the Project challenge the period of record used by the Bureau of Reclamation and the Water Commission in their studies. They argue that the "1906 to date" period used by these two agencies should be shortened to "1922 to date" on the basis that the records prior to 1922 are not as good as those following. The gage at Lee Ferry was installed in 1922. Prior to that time records were compiled by aggregating the flows of the tributaries

above Lee Ferry and making proper adjustments. While this record may not be as good as that of the gage at Lee Ferry, it is common practice and certainly we have sufficient record now at Lee Ferry to correlate with the upstream stations and to make certain that the correlations are valid. Therefore, the Commission does not believe that there is any justification for throwing away the earlier years of record.

Nevertheless, to test the thesis of the adversaries, we have made studies of water supply for the Central Arizona Project using only the record from 1922 to date. The virgin flow, unaffected by man's uses and reservoirs, for this shorter period is estimated to be 13.9 million acre-feet per year. For the longer period, 1906 to date, the virgin flow is estimated to be 15 million acre-feet or 1.1 million acre-feet greater. Operation studies with the lesser supply revealed that supply of the Project will be reduced somewhere between 14 and 23% depending upon the time of occurrence during the study period of critically dry years. We found that only the supply available to agriculture would be affected. Municipal and industrial demands would be met without shortage each and every year.

#### Water Quality

The current level of dissolved solids in the waters of the Colorado River at Lake Havasu is approximately 750 ppm. It is anticipated that levels may rise somewhat above this level in the

next few years, but return to 1972 levels by 1983. The seven states of the Colorado River Basin have adopted under prodding from EPA the salinity objective on the Colorado River of maintaining salinity at 1972 levels. We are all convinced that the Environmental Protection Agency intends to hold us to that objective. The seven states have united in support of a program that will control the input of salts to the Colorado River and are gearing up for an all out effort to get this program authorized in this session of Congress.

Typical local surface water quality ranges from about 280 ppm of total dissolved solids in the Verde River to about 700 ppm in the Salt River at Stewart Mountain Dam and to about 630 ppm in the Gila River at Buttes Dam site. Treated waste waters in the Phoenix area have about 900 ppm of dissolved solids and the quality of such waters in the Tucson area is about 650 ppm.

The majority of the water supply for the Project service area, however, comes from groundwater reserves. The average quality of the water pumped throughout the service area in 1965 was 955 ppm. The quality of groundwater available to the City of Tucson, 465 ppm, is considerably better than that of the average of the waters pumped throughout the service area.

Contrary to the statements in the 701(b) report, the U. S. Public Health Service has abandoned ceilings on salinity in domestic water supplies on the basis that a previous limit of 500 ppm was

arbitrary and there is no evidence of adverse impacts on health of much higher salinities. In fact, there is some evidence to indicate that there is less incidence of heart trouble in areas relying on waters with a salinity higher than 500 ppm.

The 701(b) studies include costs of softening Colorado River water even though the hardness of the water locally available to the city approaches that of the Colorado River and the city has never softened its supply. If the costs of softening are to be added to CAP costs in the 701(b) study they should also be added to the costs of groundwater.

#### Use of Arizona's Remaining Entitlement Along the Colorado River

Approximately 1,250,000 acre-feet of Arizona's mainstream entitlement of 2.8 million acre-feet per year is already committed by perfected water rights, contracts with the Secretary of the Interior and court decrees in favor of the mainstream Indian reservations. In addition, it appears that approximately 100,000 acre-feet of additional water for use along the mainstream will be contracted with the Bureau of Land Management for use on federal lands and with private interests along the river at the same time that contracts are entered into for CAP water. Hence, we estimate that of Arizona's entitlement to 2.8 million, 1.35 million will remain on the river.

In the fight for congressional authorization of the CAP, the Sierra Club and other conservation groups opposed construction of the Bridge Canyon Dam and Power Plant on the Colorado River and urged instead construction of a fossil fuel plant or a nuclear plant as being cheaper economic alternatives than hydroelectric power at Bridge Canyon. Immediately after winning the Bridge Canyon issue, the Sierra Club proceeded to pass resolutions in opposition to the construction of nuclear plants along the Pacific Ocean and the Gulf of Mexico and has worked diligently to stop the construction of the fossil fuel plant at Page, the alternative included in the CAP act in lieu of Bridge Canyon. In similar fashion, the Sierra Club now sings a siren song of weather modification, desalting of sea water and the exploitation of geothermal resources as viable alternatives to the Central Arizona Project. Because of costs and environmental impacts, these are not viable alternatives to the CAP, and because of the environmental impact will be opposed by the Sierra Club when in the future they become economically viable.

Similarly, the Sierra Club advocates that Arizona's remaining entitlement in the Colorado River should be used to bring into development new irrigated farms along the Colorado River rather than bring the water to Central Arizona to sustain existing development. I believe such action would be environmentally damaging and I can't bring myself to believe that the Sierra Club would not do everything

in its power to preclude the clearing of virgin lands along the Colorado River in the event they were able to stop the Central Arizona Project. In fact, it has recently come to my attention that John McComb, Southwest Regional Representative for the Sierra Club, has advised the Bureau of Land Management that the Club is opposed to the State's efforts to acquire lands along the river for future development. This is whip sawing of the first order.

### Economics

There are those who question the benefits of the Central Arizona Project. Let me enumerate a few for you and ask that you recognize that the benefits enumerated will not be limited to those who receive water directly from the Project. The CAP will greatly reduce the rate of groundwater overdraft in Central Arizona. The Project will stabilize the economy by providing an insurance policy against shortage for industry, commerce and domestic use. It will provide water supplies for new power plants and will permit the generation of additional energy for Arizonans. The CAP will greatly enhance recreational opportunities for all Central Arizonans. It will provide flood control protection for Phoenix, Mesa, Tempe, Scottsdale, Paradise Valley and many other areas along the route of the aqueduct. It will for a limited period of years prior to the time that urban growth takes it away provide supplemental water for agriculture and extend the life of that part of our environment. The

master contract for CAP water requires that all agriculturists who receive CAP water must agree to diminish their groundwater pumping by the amount of import supply they receive. This reduced draft will leave water in the ground for future use by the cities.

When the Project was authorized in 1968, it carried a benefit cost ratio of 2.2 to 1.0. That is, according to the prescribed governmental system of analysis developed over a period of years by government and academic experts, the expected benefits from the Project would be 2.2 times Project costs. Current Reclamation documents show the Project benefit cost ratio as 1.76 to 1.0. This reduction is due to the inclusions of cost escalation without corresponding adjustment in benefit valuation.

If benefits were updated, it is expected that the Project would have an even higher ratio than the 2.2 to 1.0 at the time of authorization. You all know what has happened to crop prices. Changes in the agricultural situation since Project irrigation benefits were calculated, we believe, would provide an increase in irrigation benefits proportionally greater than the cost escalation associated with irrigation. Flood control benefits are based on 1968 costs and conditions of development in the floodplains which the Project would protect. Arrangements are being made for a new flood control benefit study and the experts contend that a resulting increase of 100 percent would not be unreasonable.

Drs. Kelso, Martin and Mack, in a recent book, state that it would be irrational to purchase CAP water at costs greater than the economic losses which would be incurred without such a purchase. This is, of course, true if one is able to precisely measure costs and losses. The mechanisms used by the three economists, however, are not sufficient to provide such precision. We need to go no further than to see that in their analysis water is treated as a commodity and agriculture as an industry which respond predictably within the theoretical framework of pure competition. This is just not the real world. Certainly, institutional and legal considerations override the forces of unfettered economics and the behavior patterns associated with Arizona's water. Agriculture itself has been one of the more thoroughly manipulated industries in the United States. The history of extra-economic control in agriculture dates back to the time the first settlers took a liking to tobacco.

The claim is made that CAP water will be used primarily for crops which are at or close to the point where the costs of groundwater would drive them out of production. Again, it won't happen that way. The future cropping pattern will be essentially the same with and without CAP water. The theory on which the professors rely in their analysis is not consistent with the facts of the past or of the future.

Drs. Kelso, Martin and Mack contend that it is more economical

to continue to mine the groundwater basin at this time and postpone importation. The glaring error in this line of reasoning is the assumption that water will be available in the future to import to Central Arizona and that it will be available at the same prices as CAP water is now obtainable. The costs of CAP water are all transportation costs, the costs of moving the water from the river to Phoenix and Tucson. It has zero cost at the Colorado River. The costs of desalting sea water, desalting geothermal water or importing water from the Pacific Northwest to the Colorado will run at least \$200 an acre-foot at 1974 costs. Add to this anticipated escalation over fifty years and you should come to the obvious conclusion that if we are going to balance our water supply, now is the time to do it. We will never have a cheaper alternative.

### Conclusion

Arizonans must face up to the fact that they are heading toward a water crisis much more devastating in its eventual impact than the current energy crisis. Even though it may be a century or more away from full impact, its occurrence is as certain as death and taxes unless we take major preventative actions. Arizonans are using water at a rate which annually causes a 2.5 million acre-foot depletion of groundwater stores which have taken millions of years to accumulate. This mining of groundwater is made possible only

by overdrafts on what should be Arizona's emergency water bank account. Our dependable long-term supply, the amount that can be used each year without permanently lowering water levels in surface and groundwater reservoirs over a long period of time, is also approximately 2.5 million acre-feet per year. This means that we are using twice as much water each year as Mother Nature replaces and that a substantial part of our economy is based on the insecure foundation of groundwater overdraft.

Current usage in the Tucson area including Avra Valley is about 365,000 acre-feet per year - essentially all coming from groundwater. As there is only 130,000 acre-feet of recharge in the area annually, almost two-thirds of the area's water use is supplied from groundwater mining.

There are only two ways to balance the water supply-use equation: bring in new supplies of water and/or cut back drastically on current uses and hold future uses to the amount of supply that can be sustained without lowering water levels over the long term. Unfortunately, the State overdraft rate of 100% and the Tucson area's rate of 200% is so great that balance cannot be restored realistically without pursuing both avenues - increasing dependable supply and decreasing use.

The Central Arizona Project will increase Central Arizona's water supply by 1.2 million acre-feet per year and will permit a fifty

percent reduction in overdraft. The remaining 50% will have to be achieved by importation of much more expensive desalted sea or geothermal waters or by reducing uses. While the CAP will not totally resolve our water supply problem, certainly the Project will make the problem much more manageable. It will reduce the amount of expensive water that must be brought in from the sea or an area of surplus; or it will reduce by approximately 50% the amount of use and the economy which that use supports which would have to be foregone in the future if the annually renewable supply were not expanded.

The "alternatives" recommended by Marum and Marum and Engineering Science in the 701(b) summary report, except for reliance on continued mining of groundwaters, warrant implementation to the fullest extent practicable in that they would all result in higher and more efficient use of the waters available to the city and would minimize the amount of CAP water required to bring supply and demand into balance. But to predicate the city's future on a course of action that will be accompanied by subsidence problems and that will eventually lead to exhaustion of all water supplies is unthinkable. The city should also contract for sufficient CAP water to effect a balance.

Tucson has for years provided leadership in efforts to implement the CAP and to also gain changes in our water law that would result

in sharp reductions in overdraft. This is no time to abandon that posture.

Our comprehensive studies of the Tucson area use the same data and approaches as employed in the 701(b) study. We arrive at different conclusions, however, and although we cannot be certain on the basis of the limited opportunity we have had to review what stands behind the recommendations of 701(b), this may be due largely to the fact that we start with a different objective. The 701(b) study had as its objective identification of the least cost system for meeting needs of the study area through 2020 with continued mining of groundwater permitted without penalty. Our studies on the other hand sought the least cost system for meeting needs over the same period with the added condition that supply and demand be brought into as close a balance as possible, i. e., decrease overdraft to a minimum. The two study conclusions are easily reconciled. All one needs to do is delete from the recommendations of the 701(b) study extreme reliance on groundwater mining and add thereto the purchase of CAP water to balance supply and demand.

CAP water is hands down the least costly source of future import water foreseeable for the Tucson area even under the 701(b) analysis which made several assumptions that penalized the CAP. It would be unthinkable for the City of Tucson to plan its future on the

basis of a future water crisis, exhaustion of water supplies, when a solution is available within the economic capability of the city.

On page VII-35 of the June, 1973, report of the 701(b) study one finds the statement "One cannot exploit groundwater for a minimum cost water supply and minimum cost wastewater disposal and not degrade the resource." Let's not try!

## PAGE 1

## REPAYMENT PROGRAM - CAWCD

\$32.50 PER ACRE-FOOT MUNICIPAL AND INDUSTRIAL WATER RATE  
CAPITAL COSTS ONLY

| (1)         | (2)                                                                  | (3)                                                    | (4)                                                                 | (5)                                                         | (6)                                 | (7)                                                               | (8)                             |
|-------------|----------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------|---------------------------------|
| <u>YEAR</u> | <u>DISTRICT<br/>OPERATING<br/>EXPENSE <sup>1/</sup></u><br>(\$1,000) | <u>OM&amp;R<br/>RESERVE<br/>FUND REQ.</u><br>(\$1,000) | <u>CAPITAL REPAY.<br/>RESERVE FUND<br/>REQUIREMENT</u><br>(\$1,000) | <u>TOTAL DIST.<br/>REVENUE<br/>REQUIREMENT</u><br>(\$1,000) | <u>TAX<br/>REVENUE</u><br>(\$1,000) | <u>TOTAL<br/>DISTRICT<br/>RESERVES <sup>2/</sup></u><br>(\$1,000) | <u>TAX RATE<br/>\$PER \$100</u> |
| 1975        | 150                                                                  |                                                        | 500                                                                 | 650                                                         | 1,045                               | 895                                                               | .03                             |
| 1976        | 160                                                                  |                                                        | 500                                                                 | 660                                                         | 1,108                               | 1,896                                                             | .03                             |
| 1977        | 170                                                                  |                                                        | 500                                                                 | 670                                                         | 1,201                               | 3,041                                                             | .03                             |
| 1978        | 200                                                                  |                                                        | 500                                                                 | 700                                                         | 1,273                               | 4,296                                                             | .03                             |
| 1979        | 220                                                                  |                                                        | 500                                                                 | 720                                                         | 1,349                               | 5,683                                                             | .03                             |
| 1980        | 240                                                                  | 100                                                    | 500                                                                 | 840                                                         | 1,908                               | 7,692                                                             | .04                             |
| 1981        | 280                                                                  | 100                                                    | 500                                                                 | 880                                                         | 2,022                               | 9,896                                                             | .04                             |
| 1982        | 300                                                                  | 100                                                    | 500                                                                 | 900                                                         | 2,143                               | 12,333                                                            | .04                             |
| 1983        | 330                                                                  | 100                                                    | 500                                                                 | 930                                                         | 2,271                               | 15,014                                                            | .04                             |
| 1984        | 360                                                                  | 100                                                    | 500                                                                 | 960                                                         | 2,409                               | 17,964 <sup>3/</sup>                                              | .04                             |

<sup>1/</sup> Considered as OM&R expense after 1984.

<sup>2/</sup> Represents total District revenue minus operating expenses plus interest (6% annually).

<sup>3/</sup> At the beginning of full project operation \$5.5 million is required for continuing reserve funds and \$12,464,000 is available to assist in project repayment.

| (1)         | (2)                                                   | (3)                                                      | (4)                                      | (5)                                                | (6)                    | (7)                                    | (8)                             |
|-------------|-------------------------------------------------------|----------------------------------------------------------|------------------------------------------|----------------------------------------------------|------------------------|----------------------------------------|---------------------------------|
| <u>YEAR</u> | <u>ANNUAL<br/>CAPITAL<br/>SERVICE<br/>REQUIREMENT</u> | <u>IRRIGATION<br/>WATER &amp;<br/>POWER<br/>REVENUES</u> | <u>M&amp;I<br/>REVENUE<br/>@32.50/AF</u> | <u>TOTAL<br/>REVENUE<br/>WATER &amp;<br/>POWER</u> | <u>TAX<br/>REVENUE</u> | <u>TOTAL<br/>DISTRICT<br/>RESERVES</u> | <u>TAX RATE<br/>\$PER \$100</u> |
|             | (\$1,000)                                             | (\$1,000)                                                | (\$1,000)                                | (\$1,000)                                          | (\$1,000)              | (\$1,000)                              |                                 |
| 1985        | 15,197                                                | 4,552                                                    | 3,867                                    | 8,419                                              | 2,553                  | 14,817                                 | .04                             |
| 1986        | 15,219                                                | 5,896                                                    | 4,192                                    | 10,088                                             | 2,706                  | 13,281                                 | .04                             |
| 1987        | 15,279                                                | 5,942                                                    | 4,540                                    | 10,482                                             | 2,869                  | 12,150                                 | .04                             |
| 1988        | 15,340                                                | 5,996                                                    | 4,907                                    | 10,903                                             | 3,041                  | 11,483                                 | .04                             |
| 1989        | 15,406                                                | 6,040                                                    | 5,265                                    | 11,305                                             | 3,223                  | 11,294                                 | .04                             |
| 1990        | 15,477                                                | 6,092                                                    | 5,622                                    | 11,714                                             | 2,563                  | 10,771                                 | .03                             |
| 1991        | 15,558                                                | 7,884                                                    | 5,980                                    | 13,864                                             | 2,716                  | 12,440                                 | .03                             |
| 1992        | 18,988                                                | 7,918                                                    | 6,305                                    | 14,223                                             | 2,879                  | 11,300                                 | .03                             |
| 1993        | 18,968                                                | 7,947                                                    | 6,662                                    | 14,609                                             | 3,023                  | 10,642                                 | .03                             |
| 1994        | 18,949                                                | 7,971                                                    | 7,020                                    | 14,991                                             | 3,175                  | 10,498                                 | .03                             |
| 1995        | 18,936                                                | 8,002                                                    | 7,377                                    | 15,379                                             | 3,333                  | 10,904                                 | .03                             |
| 1996        | 18,930                                                | 8,026                                                    | 7,735                                    | 15,761                                             | 3,500                  | 11,919                                 | .03                             |
| 1997        | 18,930                                                | 8,055                                                    | 8,092                                    | 16,147                                             | 3,675                  | 13,526                                 | .03                             |
| 1998        | 18,944                                                | 8,085                                                    | 8,450                                    | 16,535                                             | 3,859                  | 15,788                                 | .03                             |
| 1999        | 22,304                                                | 8,116                                                    | 8,775                                    | 16,891                                             | 4,052                  | 15,374                                 | .03                             |
| 2000        | 22,220                                                | 8,142                                                    | 9,132                                    | 17,274                                             | 2,127                  | 13,477                                 | .02                             |
| 2001        | 22,137                                                | 8,089                                                    | 9,490                                    | 17,579                                             | 2,234                  | 11,962                                 | .02                             |
| 2002        | 22,061                                                | 8,117                                                    | 9,847                                    | 17,964                                             | 2,350                  | 10,933                                 | .02                             |
| 2003        | 21,993                                                | 8,149                                                    | 10,205                                   | 18,354                                             | 2,444                  | 10,344                                 | .02                             |
| 2004        | 21,945                                                | 8,176                                                    | 10,562                                   | 18,738                                             | 2,542                  | 10,352                                 | .02                             |

| (1)         | (2)                                                   | (3)                                                      | (4)                                      | (5)                                                | (6)                    | (7)                                    | (8)                             |
|-------------|-------------------------------------------------------|----------------------------------------------------------|------------------------------------------|----------------------------------------------------|------------------------|----------------------------------------|---------------------------------|
| <u>YEAR</u> | <u>ANNUAL<br/>CAPITAL<br/>SERVICE<br/>REQUIREMENT</u> | <u>IRRIGATION<br/>WATER &amp;<br/>POWER<br/>REVENUES</u> | <u>M&amp;I<br/>REVENUE<br/>@32.50/AF</u> | <u>TOTAL<br/>REVENUE<br/>WATER &amp;<br/>POWER</u> | <u>TAX<br/>REVENUE</u> | <u>TOTAL<br/>DISTRICT<br/>RESERVES</u> | <u>TAX RATE<br/>\$PER \$100</u> |
| 2005        | 21,884                                                | 10,108                                                   | 10,919                                   | 21,027                                             | 3,524                  | 13,641                                 | .02                             |
| 2006        | 25,989                                                | 10,121                                                   | 11,115                                   | 21,236                                             | 3,665                  | 13,371                                 | .02                             |
| 2007        | 25,285                                                | 10,123                                                   | 11,310                                   | 21,433                                             | 3,812                  | 14,133                                 | .02                             |
| 2008        | 24,579                                                | 10,141                                                   | 11,505                                   | 21,646                                             | 3,964                  | 16,012                                 | .02                             |
| 2009        | 23,873                                                | 10,154                                                   | 11,700                                   | 21,854                                             | 4,122                  | 19,076                                 | .02                             |
| 2010        | 23,165                                                | 10,158                                                   | 11,895                                   | 22,053                                             | 4,287                  | 23,396                                 | .02                             |
| 2011        | 22,520                                                | 10,110                                                   | 12,090                                   | 22,200                                             | 4,459                  | 28,938                                 | .02                             |
| 2012        | 22,520                                                | 10,126                                                   | 12,285                                   | 22,411                                             | 4,637                  | 35,203                                 | .02                             |
| 2013        | 29,276                                                | 10,124                                                   | 12,480                                   | 22,604                                             | 4,776                  | 35,419                                 | .02                             |
| 2014        | 29,276                                                | 10,142                                                   | 12,675                                   | 22,817                                             | 4,920                  | 36,005                                 | .02                             |
| 2015        | 29,276                                                | 10,152                                                   | 12,870                                   | 23,022                                             | 2,534                  | 34,446                                 | .01                             |
| 2016        | 29,276                                                | 10,126                                                   | 13,065                                   | 23,191                                             | 2,610                  | 33,037                                 | .01                             |
| 2017        | 29,276                                                | 10,135                                                   | 13,260                                   | 23,395                                             | 2,688                  | 31,827                                 | .01                             |
| 2018        | 29,276                                                | 10,147                                                   | 13,455                                   | 23,602                                             | 2,769                  | 30,831                                 | .01                             |
| 2019        | 29,276                                                | 10,162                                                   | 13,650                                   | 23,812                                             | 2,852                  | 30,069                                 | .01                             |
| 2020        | 30,402                                                | 10,168                                                   | 13,845                                   | 24,013                                             | 2,937                  | 28,412                                 | .01                             |
| 2021        | 30,402                                                | 10,127                                                   | 14,040                                   | 24,167                                             | 3,025                  | 26,917                                 | .01                             |
| 2022        | 30,402                                                | 10,136                                                   | 14,235                                   | 24,371                                             | 3,101                  | 25,602                                 | .01                             |
| 2023        | 30,402                                                | 10,151                                                   | 14,430                                   | 24,581                                             | 3,178                  | 24,495                                 | .01                             |
| 2024        | 30,402                                                | 10,160                                                   | 14,625                                   | 24,785                                             | 3,258                  | 23,606                                 | .01                             |

| (1)         | (2)                                                   | (3)                                                      | (4)                                      | (5)                                                | (6)                    | (7)                                    | (8)                             |
|-------------|-------------------------------------------------------|----------------------------------------------------------|------------------------------------------|----------------------------------------------------|------------------------|----------------------------------------|---------------------------------|
| <u>YEAR</u> | <u>ANNUAL<br/>CAPITAL<br/>SERVICE<br/>REQUIREMENT</u> | <u>IRRIGATION<br/>WATER &amp;<br/>POWER<br/>REVENUES</u> | <u>M&amp;I<br/>REVENUE<br/>@32.50/AF</u> | <u>TOTAL<br/>REVENUE<br/>WATER &amp;<br/>POWER</u> | <u>TAX<br/>REVENUE</u> | <u>TOTAL<br/>DISTRICT<br/>RESERVES</u> | <u>TAX RATE<br/>\$PER \$100</u> |
| 2025        | 30,402                                                | 10,177                                                   | 14,820                                   | 24,997                                             | 1,670                  | 21,287                                 | .005                            |
| 2026        | 30,402                                                | 10,157                                                   | 15,015                                   | 25,172                                             | 1,712                  | 19,047                                 | .005                            |
| 2027        | 30,402                                                | 10,174                                                   | 15,210                                   | 25,384                                             | 1,754                  | 16,953                                 | .005                            |
| 2028        | 30,402                                                | 10,187                                                   | 15,405                                   | 25,592                                             | 1,798                  | 14,929                                 | .005                            |
| 2029        | 30,402                                                | 10,203                                                   | 15,600                                   | 25,803                                             | 1,843                  | 13,069                                 | .005                            |
| 2030        | 30,402                                                | 10,212                                                   | 15,795                                   | 26,007                                             | 1,889                  | 11,347                                 | .005                            |
| 2031        | 30,402                                                | 10,228                                                   | 15,990                                   | 26,218                                             | 1,936                  | 9,780                                  | .005                            |
| 2032        | 30,402                                                | 10,251                                                   | 16,185                                   | 26,436                                             | 1,984                  | 8,385                                  | .005                            |
| 2033        | 30,402                                                | 10,251                                                   | 16,379                                   | 26,630                                             | 2,034                  | 7,150                                  | .005                            |
| 2034        | 30,402                                                | 10,271                                                   | 16,607                                   | 26,878                                             | 2,085                  | 6,140                                  | .005                            |



Surface crack east of Mesa,  
Maricopa County (USGS Photo)



Surface crack intersecting  
Interstate 10 east of Picacho,  
Pinal County (USGS Photo)



Surface crack east of Mesa,  
Maricopa County (USGS Photo)



Surface crack near Friendly  
Corners, Pinal County (USGS  
Photo)



Surface crack east of Mesa,  
Maricopa County (USGS Photo)

COMMENTS OF WM. WHEELER

CHAIRMAN OF TUCSON WATER ADVISORY COUNCIL

FEBRUARY 8, 1974

IT IS NOT GENERALLY KNOWN IN TUCSON THAT I AM THE FATHER OF THIS "MYSTERIOUS" 701 B REPORT.

I USE THE TERM "MYSTERIOUS" ADVISABLY. FIRST, BECAUSE WE HAVE BEEN UNABLE TO GET MORE THAN A 10 1/2 PAGE DIGEST OF THE REPORT EVEN THOUGH IT WAS APPARENTLY COMPLETED IN SEPTEMBER, 1973 AND SECOND, BECAUSE THREE OF THE ASSUMPTIONS USED AS A FOUNDATION FOR THE STUDY ARE MYSTERIOUS. THEY ARE:

1. THAT THE QUALITY AND QUANTITY OF WATER IN THE NEXT 500 FEET WILL BE DEPENDABLE ENOUGH TO PLAN THE FUTURE OF A CITY.
2. THAT THE LEGAL MEANS WILL BECOME AVAILABLE TO MANAGE THE FARMING, MINING AND MUNICIPAL USES OF OUR LIMITED SUPPLY.
3. THAT THE CITY CAN SOMEHOW COPE WITH A 10 TO 30 FOOT IRREGULAR LAND SUBSIDENCE.

IT IS NOT NECESSARY THAT WE EXPOSE OURSELVES TO THE GRAVE RISKS OF THESE ASSUMPTIONS.

PAGE - 2 -

COMMENTS OF WM. WHEELER

LET ME EXPLAIN THIS "FATHER" REFERENCE. IN LATE 1970, I RECEIVED A PHONE CALL FROM BUD KELLY, V. P. OF THE RALPH M. PARSONS COMPANY. HE WAS VISITING WASHINGTON AND HAD COME ACROSS THE THEN NEW 701 B PROGRAM IN THE HUD OFFICE. HE ASKED IF I THOUGHT TUCSON WAS A SUITABLE SUBJECT FOR A COMPREHENSIVE WATER RESOURCES STUDY. AFTER DISCUSSION WITH FRANK BROOKS AND MEMBERS OF THE WATER ADVISORY COUNCIL, WE ADVISED THAT THIS WAS AN IDEAL AREA FOR SUCH A STUDY. SO THATS HOW IT BEGAN. NOW, LOOKING AT THE BRIEF SUMMARY, I AM COMPELLED TO CRITICIZE IT ON THE BASIS OF THE THREE POINTS MENTIONED BEFORE BUT MORE IMPORTANT STILL, IT FAILS TO MEASURE UP TO THE FUNDAMENTAL REQUIREMENT THAT "ANY MASTER WATER PLAN FOR A CITY MUST HAVE AS ITS GOAL THE EQUALIZATION OF SUPPLY AND DEMAND." BECAUSE OF THESE FUNDAMENTAL DEFECTS, I AM COMPELLED TO DISOWN MY OFFSPRING.

NOW, LET ME TOUCH ON SOME POINTS THAT HAVE BEEN USED IN AN EFFORT TO DESTROY THE CAP.

1. THE CITIES WILL BE PAYING FOR THE FARMERS WATER.

ANS. NOT AT ALL. THE CITIES PAY ONLY THEIR PRINCIPAL, INTEREST AND OPERATIONAL COSTS MINUS OFFSETS FROM SALE OF ELECTRICITY AND A SMALL ADVALOREM TAX

PAGE - 3 -

COMMENTS OF WM. WHEELER

2. THE CITIES WILL HAVE TO CHARGE EXORBINATE RATES TO USE CAP WATER.

ANS. OUR CALCULATIONS INDICATE THAT AN INCREASE OF NO GREATER THAN THE PRESENTLY CONTEMPLATED INCREASE WILL BE SUFFICIENT

3. THE QUALITY OF THE WATER IS SO BAD THAT IT WILL CONTAMINATE ARIZONA.

ANS. THIS IS THE SAME WATER THAT YUMA, EL CENTRO, SAN DIEGO, AND LOS ANGELES HAVE USED 30 OR MORE YEARS. IF IT IS SO BAD, WHY DID CALIFORNIA FIGHT US TO THE SUPREME COURT TO RETAIN ITS USE.

4. SOME SUPER BREAKTHROUGH IN TECHNOLOGY WILL MAKE CAP UNNECESSARY BEFORE WE RUN OUT.

ANS. THIS HAS BEEN MANKINDS DREAM FOR THOUSANDS OF YEARS. ALL OF THE PRESENT POSSIBILITIES, DESALTING, GEOTHERMAL, CLOUD SEEDING, COLUMBIA RIVER, ETC., STILL REQUIRE TRANSPORTATION TO OUR POPULATION CENTERS. BELIEVE ME, IT IS EASIER TO MOVE WATER TO PEOPLE THAN PEOPLE TO THE WATER. THIS IS THE KIND OF CHOICE YOU MUST CONSIDER.

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COMMENTS OF WM. WHEELER

WE URGE, THEREFORE, THAT THE COUNCIL LEND EVERY EFFORT TOWARD:

1. CREATING A SINGLE WATER MANAGEMENT AGENCY THROUGH LEGISLATIVE AND OPERATIONAL CHANNELS.
2. DEVELOP THE 701 B RECOMMENDATIONS FOR CONSERVATION AND RECLAMATION OF WATER.
3. THE IMMEDIATE OPENING OF NEGOTIATIONS FOR THE PURCHASE OF CAP WATER.

ON THIS ISSUE, THIS BOARD MAY BE RECORDED IN THE HISTORY OF ARIZONA AS HAVING MADE A MOST FAR SIGHTED DECISION OR A MOST MOMENTOUS BLUNDER OF OUR GENERATION.



# THE UNIVERSITY OF ARIZONA

TUCSON, ARIZONA 85721

COLLEGE OF ENGINEERING

OFFICE OF THE DEAN

11 February 1974

Mr. William G. Ealy  
Deputy City Manager  
City of Tucson  
250 West Alameda  
Tucson, Arizona 85701

Dear Mr. Ealy:

I write in support of the City's participation in the Central Arizona Project.

The decision now before the City government in this matter will contribute irrevocably to the future shape of Tucson's history. There will be no opportunity for correction or substitution.

You have heard the quantitative arguments from persons far more expert than I in their respective areas. I will not repeat them here. Instead, let me focus upon the proposition that we must not continue to degrade and exhaust a finite natural resource, the ground water in our area.

Just the last few years have brought a newfound wisdom to many Americans regarding the need to balance the equations of our relationship to "space-ship Earth". This has not reached all ears and minds. However, the new wisdom is not unfamiliar to the community of business and industry.

The attraction of selected new business and industry to diversify Tucson's economy is greatly facilitated by evidence of sound planning and decisions by City government. In this regard, industry will see a balanced water equation for Tucson as a distinctly positive attribute. Conversely, deliberate risk of land subsidence, boundless invasion of a limited but essential resource, and irreversible rejection of access to Colorado River water will be perceived as short-sightedness and poor judgement. Rejection of the Central Arizona Project can make much more difficult the task of the Development Authority for Tucson's Economy, for example.

Participation in the Central Arizona Project is Tucson's only hope to balance its water equation. In my judgement, failure to participate would constitute a grave error.

Sincerely yours,

  
Walter J. Fahey ✓



# THE UNIVERSITY OF ARIZONA

TUCSON, ARIZONA 85721

COLLEGE OF AGRICULTURE  
AGRICULTURAL EXPERIMENT STATION

February 12, 1974

The Honorable Lewis Murphy, Mayor  
City of Tucson  
City Hall  
Tucson, Arizona 85701

Dear Mayor Murphy:

Reference is made to the City Council's study session held Friday, May 8, in the Council's conference room. We are pleased to present for the consideration of the Council a brief statement which may be of assistance to you in your consideration of the question relative to the possibility of the City of Tucson entering into a contractual agreement for the delivery of water to the City from the Central Arizona Project.

Our Experiment Station, since its organization in 1889, has been involved in the study of various aspects of the water problem of the state. Special attention has been given the Tucson area. When the court action, Arizona vs. California was initiated, the Experiment Station personnel were called upon to provide technical information and expertise to assist Judge Rifkin in reaching his recommendation relative to Arizona's claim to the Colorado River water. Our faculty members who presented evidence to the Trial Examiner were examined and cross examined by adversary attorneys.

When the authorization of the Central Arizona Project was before Congress, our faculty members were called upon again to provide supporting evidence and expertise relative to the need for Colorado River water in Central Arizona.

Water is in short supply in Arizona. The groundwater supply on which Tucson depends is not inexhaustible. The water from the Colorado River which will flow eventually into Central Arizona is the last water from that source which will be available to our State, except for possible supplementation from an out-of-state water source. In the initial planning phase for the use of Colorado River water in Central Arizona, Tucson, was not included. This deficiency was corrected by forward looking City Administrators, both Democrat and Republican, who insisted that Tucson should be included in the Central Arizona Project. Tucson is included in the current C.A.P. plan to receive water at the same cost per acre foot as all other cities in the project area even though the cost of lifting water to Tucson is considerably greater than the cost of water service to other central Arizona cities.

There are many sincere individuals and group members who oppose the Central Arizona Project. When the project was conceived there were those who opposed the idea. Opposition was evident during the lengthy hearings before

Judge Rifkin in the lawsuit, Arizona vs. California. The same was true at the congressional hearings relating to the authorization of the Central Arizona Project. Since Congress authorized the project there has been a continuous effort on the part of a few to block appropriations for the project but without success. Opponents of the project are expected to continue to fight a rear guard action until water flows into Central Arizona from the Colorado River.

The nature of the attacks on the Central Arizona Project has changed very little over the years. Judge Rifkin had to take the objections into consideration, as did Congress at the time the project was being considered for authorization. Each year the same type of assault is made upon the project, when the question of appropriation is before the Office of Management and Budget and the appropriation committees of Congress.

There were those who opposed the construction of the Salt River Project early in this century. Today, the Salt River Project, with its visible water supply, is a major asset to the State of Arizona. Fifty years from the date of completion of the Central Arizona Project, the citizens of Arizona may say the same thing about the Central Arizona Project.

Whether Tucson actually needs the water today is not the important question. The big question is, does Tucson have a foreseeable need for the additional water? The trend of the groundwater level in the Tucson basin provides the answer. The other question is, will Tucson even need water from the Colorado River?

The Central Arizona Project is not an irrigation plan, per se, but one to provide water to the State of Arizona. Agriculture will use the C.A.P. water until such time as it is needed for municipal use. The city will not pay for its potential share of the water until it is actually used by the City. Keeping in mind the long time trend of our Nation's economy, it appears evident that by the time Tucson will be using its full allotment of water from the project, the economic level will be appreciably higher than that which existed during the period of contract negotiation.

The probability is very great that if Tucson foregoes contracting for C.A.P. water at the present time in hopes of buying into the Central Arizona Project at sometime in the future, that it will be found that the costs will be much greater than if the city becomes a Charter Member in the initial water contract.

The past City Administrators have supported, consistently, the moves toward authorization and construction of the Central Arizona Project. It is my judgement that such support should be continued and that the City of Tucson should contract for the potential delivery of Central Arizona Project water to the City.

The Honorable Lewis Murphy, Mayor

Page 3

February 12, 1974

This statement is not to be interpreted as a reflection of University policy. It reflects my own personal appraisal based on my long association with water problems plus a familiarity with the water studies conducted by our faculty members including agricultural economists, engineers, water scientists, crop and soil scientists, groundwater specialists and others.

If we can be of assistance to you, please let me know.

Sincerely yours,

*Harold E. Myers*

Harold E. Myers  
Dean Emeritus

HED:edj

# The Tucson Regional Plan Inc.

810 LAWYERS TITLE BUILDING • TUCSON, ARIZONA 85701 • PHONE 623-0801

Statement to  
The Mayor and Council of the City of Tucson

February 8, 1974

on  
TUCSON & THE CENTRAL ARIZONA PROJECT

*Board of Directors*

Terry Atkinson *ais*  
William C. Bell  
Charles H. Broman  
Robert J. Brooks  
Hamilton R. Catlin  
Paul W. Cella  
James W. Cocks  
Marvin S. Cohen  
Herbert H. Cooper  
Joe Crystall  
Lee Davis  
The Hon. Lew Davis  
J. Luther Davis  
Oliver Drachman  
Roy P. Drachman  
William S. Dunipace  
William A. Estes, Jr.  
Mrs. Walter Fathauer  
Bernard J. Friedman *ais*  
Martin Ginsburg  
Kenneth H. Herman  
Dr. Donald F. Hill  
Mrs. Louis Hirsch  
Mrs. W. D. Kelley  
Mark H. Klaffer  
Cressworth C. Lander  
Roy Laos, Jr.  
William Lovejoy, Jr.  
Robert E. McCounell *ais*  
Paul A. McKalip  
Quentin M. Mees  
T. S. Sitterley  
Frior Pray  
John Prickett  
Henry Quinto  
Ruben D. Ramirez *aisp*  
Chris A. Reilly  
Eleanor Rice  
Edward A. Shaul  
William C. Skoug  
John H. Stufflebean  
J. B. Trimble  
P. M. Tidmarsh  
J. Thomas Via, Jr. *aisp*  
James A. Ware *ais*

I am Mrs. W. D. Kelley of 2708 East Third Street, Tucson 85716. I appear as Executive Secretary of The Tucson Regional Plan to tell you why we believe Tucson should and must participate in the Central Arizona Project.

Tucson Regional Plan, founded in 1938, consists of business, professional and civic leaders devoted to the wise development of Tucson and its metropolitan region. Our President, Roy P. Drachman, regrets he is unable to attend; this morning he is at Casa Grande as a member of the state's Environmental Planning Council.

Our statement is on three points:

- I. The dangers of continually mining the groundwater of the Tucson Basin;
- II. The erroneous belief that CAP is asking Tucson to subsidize agriculture;
- III. Why we must act now rather than waiting for "something better" to come along.

I. The Dangers of Mining Groundwater

At present Tucson, the one major city in the world so fully dependent on ground water, is withdrawing from the waters of its geological basin 200% of the amount of water that is added to that basin each year. That means that each year the top of the water table is lower and the depth of the wells must be deeper and the cost of pumping water supplies becomes ever greater.

More than that, if we continue to withdraw water down to another 500 foot decrease, we can expect land subsidence of 10 to 30 feet, varying from area to area, and producing fissures in the earth because of that variance. We are dismayed that anyone concerned for conservation of our natural resources could advocate

*Executive Secretary*  
Marion M. Kelley

or tolerate a continued over-draft of Tucson's ground water supply.

But, that is just what the Marum & Marum Engineering Science 701(b) report advocates. We in TRP agree with this report that Tucson must utilize every possible form of water recharge, water recycling, water reclamation and water exchange possible, but we cannot agree that it is acceptable to let the ground water level drop by another 500 feet. That is the missing item in the calculations of the 701(b) report -- it accepts and takes for granted a 500 foot drop in Tucson's water table. This is a very dangerous policy.

We submit that the only way to bring Tucson's water needs and water supply into balance, without lowering the water table at such a rate, is for Tucson to contract for the import of CAP water.

### II. Is CAP Asking Tucson to Subsidize Agriculture?

We note that many people believe that the higher rate for municipal and industrial use of CAP water over that for agriculture means Tucson and its industries will be subsidizing agriculture, which is a high water user.

The answer is that: (1) the federal portion of the project pays for the lower cost to agriculture; (2) municipal and industrial users will have complete priority over agriculture in years of water shortage; and (3) agricultural users must cut back their pumpage from ground water by one acre-foot for every acre-foot of CAP water they use. CAP is not financing an expansion of Arizona agriculture.

In addition, all those who are concerned to have green belts and open spaces not only in the vicinity of Tucson but also in that crystal-ball nightmare of a megalopolis from Phoenix to Tucson we've been warned to expect should welcome a continuation of agriculture as a way of maintaining open space and low-density use of land in the Santa Cruz Valley. And, with shortages on every hand, we may be glad to have the fibers and fodder produced on these lands.

### III. Why Tucson Must Act Now, in 1974

The directors of the Central Arizona Water Conservation District, operating under the master federal contract, have given a priority to municipal and industrial use and have allowed until January 2, 1975 for M & I users to contract for future water delivery. After that date, agriculture has its chance.

-Cont'd-

If Tucson does not contract for CAP water now and then later decides it is needed, what happens then?

Tucson could buy up water rights from agriculture. BUT -- and this is a very big BUT -- Tucson would also have to pay for constructing conduits to bring the water to Tucson. This would be without the federal aid in the CAP project and it would be mostly up-hill and therefore very expensive. In the meantime, of course the costs for construction would have gone up. A further hazard is that if Tucson opts out now, the boundaries of the District might be changed to include only Maricopa and Pinal counties, and then it would not be permitted to export CAP water into Pima County.

Some people seem to think that if Tucson says No, the CAP will not be built. That is just not so. The CAP would be a paying proposition even if it went only to Phoenix and its satellites and to Pinal County farmers. In fact, Tucson itself asked to be included. Phoenix doesn't need us, but we need them to get the facilities built, for our portion of the project is "at the end of the line" and the most expensive.

\* \* \* \* \*

Finally, for Tucson Regional Plan Inc., I hope I can convince you of the fallacy of basing Tucson's future on dreams of some new source of water which might, if we dream hard enough, turn up some day in the future. This is a fallacy which leads us to the fatal danger of letting Tucson's one true "treasure house" or "bank deposit" of water, its ground water supply, be used up while we wait and dream! It should instead be our water of last resort.

February 18, 1974

Mayor Lewis Murphy and Council  
250 West Alameda  
Tucson, AZ 85701

Gentlemen:

I attended the February 8 briefing given the Mayor and Council by the delegation from the Central Arizona Conservancy District and others. I was there not only as a member of the Central Arizona Project Association, but more importantly, as a concerned citizen of Tucson.

The adequacy of the water supply for the Tucson municipality for the years ahead is of paramount importance to everyone. We can learn a great deal from the current energy crisis of what not to do if we are to take steps to make certain that we don't find ourselves in the same predicament with water in the years ahead. We can live without gasoline and petroleum products, but we can't live without water.

I submit that the main issue to consider is: Does the Tucson basin have adequate water supply to meet its needs in the foreseeable future (at least the next fifty years) or not? In making this judgment, one must look at all the possible uses for water. The Marum and Marum 701b report concludes that if given certain restrictions on the use of water in the Tucson basin, we need no additional water supply. Some of these conditions are unrealistic, and the real issue is that Tucson does need additional water supplies. No one will quarrel with any reasonable alternative offered for the conservation of water and the reuse of effluent. However, the fact still remains that we cannot govern our future growth adequately nor can we eliminate the agricultural use of water upon which the Marum and Marum report is based to reasonably and validly arrive at the conclusion that we do not need additional water supply.

The statement is made by the opponents of the Central Arizona Project that a very small percentage of the State's total income is produced by agriculture yet most of the benefit of the Central Arizona Project will go to agriculture and that, in fact, agriculture was the interest that really started the CAP in the first place. Therefore, why should we spend so many millions of dollars taking care of such a small percent of the real contributors to the economic well-being of the State? This begs the question of whether or not we need more water.

The real limitation on the control of water at the present time is the Arizona State Water Law. I think the Arizona Daily Star's February 17, 1974, article

on groundwater makes a very succinct and illuminating presentation of the problems involved in changing the law that controls who can and cannot pump water out of the ground. Any sane and reasonable person will conclude that it's going to be years before we can change the law and arrive at a point where we have control over the amount of water that is pumped out of the ground. In the meantime, we are faced with an ever-decreasing depletion of Arizona's main water source--the underground water table.

Even if it were possible to eliminate all agricultural use of water in Arizona (and I question the legality or even the economic rational behind this), how would this be brought about? Unless one can lay out a very clear and precise plan for the elimination of agricultural use of water within the Tucson basin within the near or intermediate future, then you have to discard it as a viable alternative. If you do this and if you have no other way of controlling the industrial use of water (the mines are the second largest user of water in the Tucson basin), then the Marum and Marum conclusion that our water supply is adequate is unrealistic and we do, in fact, need additional water supply. Regardless of how much we wished other alternatives would be feasible and that we could eliminate other uses of water, in the absence of a definite plan to do this, we must plan on the need for additional water.

The Central Arizona Project offers the only present viable and economically sound way to supplement the water supply for the Tucson basin. The rest of the counties participating in the CAP do not need Pima County's participation in the CAP to proceed with the plan, but Tucson does need the additional water supply the CAP offers. Our short-sightedness at this point would cost the Tucson residents great anguish fifteen or twenty years from now unless we also furnish them with the plan to meet the unknown needs of twenty years hence with the water supply as we know it today.

In addition, you have to face the reality of damage to the terrain caused by the receding water table which was adequately explained in the February 8 meeting. Certainly this would cost the City of Tucson and the residents of this community millions of dollars to just maintain existing water mains, gas lines, and streets let alone repairs to building foundations, etc., that would be caused by the subsidence problem.

I feel strongly that the City of Tucson should contract for the maximum amount of CAP water. But I also urge that the Mayor and Council explore both sides of this issue thoroughly so that they can convince themselves and act in the best interests of the citizens of this community.

The main issue to be concerned with is not what will CAP water cost Tucson, or do we want additional growth in this area, or should the citizens of Tucson underwrite the cost of additional water for farmers in this area, or any other issues that are thrown up to cloud the basic issue--do we need additional water for the Tucson basin? Unless we can come up with specific plans--not just objectives or idealistic goals that we would like to see develop--that show why additional water is not needed, then we must conclude that additional water is

February 18, 1974

needed; and, therefore, what other alternative is there for providing this additional water in reasonable quantity and at a lower price than the CAP. We must keep in mind that the decisions we make on this issue will affect the next several generations of Tucsonans and are probably as important a decision as will be made by this particular Mayor and Council.

Sincerely,

R. B. O'Rielly

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**Clyde W. Doran**

**Consulting Ecologist**

**5452 E. Rosewood, Tucson Arizona 85711, Telephone (602) 793-2785**

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Feb. 15, 1974

Mr. Ealy - Acting City Manager  
Box 5547  
Tucson, Arizona 85703

Dear Sir:

I attended the Mayor-City Council meeting the morning of Feb. 8 concerning the Central Arizona Project. Mayor Murphy kindly granted that my written statement be submitted to you rather than be given orally because of the time limit on the meeting.

In spite of the great deal of conflicting opinion and data, and obvious lack of control of ground water which State legislators have recognized and promised to do something about since Territorial days, I still wish to express my confidence in Wes Steiner, Quentin Mees, and Bill Wheeler (long time chairman of Tucson ( of ( water resources committee and on which committee I served for several years).

After the long and difficult fight for Arizona's share of Colorado River water, authorization of CAP, and the extensive studies and reports that evolved, I recommend that the project be completed and controlled distribution of the water become a reality, including Tucson's allocation.

Certainly I have no special powers of projecting the future needs and economics of water in Tucson or central Arizona, but as a professional land manager, ecologist, and conservationist there is no doubt in my mind that any natural resource cannot be continually depleted without restoration and hope to survive. U.S. and world history of timber, forage, energy, wildlife, minerals, etc. testify to past predictions of unlimited and inexhaustible supplies that man now find in critical short supply.

Opponents and proponents of CAP emphasize many things that should be done to economize, reallocate, and reuse water, but the CAP is one project that creates new water for central Arizona -- and provides that such new water be specifically used to lessen the groundwater overdraft. This conservation objective has great priority and merit, and in the long run should greatly influence associated practices of conservation, pollution abatement, and environmental protection.

The Lower Colorado Region Comprehensive Framework Study (Appendix V June 1971) shows large amounts of ground water withdrawn from the alluvial basins, and steadily declining water tables as evidenced by land subsidence. The annual overdraft is estimated as about 2.5 million acre feet. Pumpage in excess of recharge has caused steady declines in ground-water levels. For the period 1923 to 1964 maximum ground-water level declines of over 300 feet were recorded near Starfield and Mesa. Near Eloy, a decline of 200 feet was noted. Northwest of Eloy the land subsided 7.5 feet during the period 1948 to 1967. Data from the cooperative U.S.G.S.-Bur. Reclamation subsidence program recorded subsidence amounts of 1.0 foot, 0.4 foot, and 2.2 feet from the spring of 1965 to December 1971 in the Eloy, Chandler Heights, and Luke Air Force Base areas, respectively. Earth fissures and associated differential subsidence have damaged irrigation systems, interstate highways, and railroads. Earth fissures have damaged Picacho Reservoir, while differential settlement across Interstate Highway 10 near Picacho necessitates continued maintenance. (Ref. USDOJ Bureau of Reclam. Final Environmental Statement, CPA, FES 72-1, Sept. 1972) I read these statements in USDOJ Bur. of Land Management Draft Environmental Statement on the proposed T&E EISol to Vail 745 kv Transmission Lines which has just been distributed for review. Also I noted this statement: "The mineral quality of ground water ranges from excellent to unsuitable for any purpose. Ground water in the alluvial deposits of the Basin and Range Lowlands, for example, contain from less than 100 to more than 100,000 mg/l of dissolved solids. In most of these deposits, however, dissolved solid concentrations are less than 1,000 mg/l. Concentrations vary not only areally but also with depth. As a result, the concentrations for a given well will change abruptly and so will the ionic makeup."

The numerous questions submitted by the Citizens Ad Hoc Committee, League of Women Voters, Sierra Club, etc. are certainly valid and thought provoking, and will no doubt require many City staff hours in order to rationalize signing a long term contract.

City officials should carefully evaluate, however, the possible loss forever to other users if a contract is not signed. We have seen how inflation makes costs or prices almost meaningless when the basic resource (water) is either gone or severely rationed.

Enclosed is a copy of "New Directions in U.S. Water Policy", a summary of the final report of the National Water Commission. At least there is some comfort in their thoughts for improvements in the future, but their recommendations will require years of piecemeal legislation to implement. Your decision on CPA cannot wait.

Sincerely yours,

Clyde W. Doran

Clyde W. Doran



# THE UNIVERSITY OF ARIZONA

TUCSON, ARIZONA 85721

WATER RESOURCES RESEARCH CENTER

February 7, 1974

## STATEMENT

TO: The Mayor and Council, City of Tucson

FROM: The Water Resources Research Center, University of Arizona

This statement concerns the desirability of negotiating a contract for the long-range importation of water to Tucson and vicinity, and is offered as the collective opinion of the several staff members of the University of Arizona Water Resources Research Center, who have a combined total of more than 60 years of experience in the field of water resources in the state of Arizona.

It is our firm opinion that the City of Tucson, in combination with other water agencies and interests in eastern Pima County, should proceed to develop the appropriate terms and conditions for the negotiation of a contract with the Central Arizona Water Conservancy District or other works and auspices as provided in the Colorado River Basin Project Act of 1968 (PL90-537), for the importation of water from the Colorado River to the Tucson area.

This course is considered desirable because of inherent uncertainties in long-range predictions in water supply and water needs. It does not seem assured, on the basis of current data on hydrology and water conditions, that the quantity, quality, and availability of local ground-water supply sources will be adequate for long periods of time. We deem it essential, not only to employ and improve water conservation measures, including wastewater reuse, to make better use of existing local supplies, but also to obtain, for long-range planning, an additional renewable source of water to this area as provided from the Central Arizona Project.

*L. G. Wilson*

L. G. Wilson  
Hydrologist

*Sol Resnick*

Sol Resnick  
Director

Respectfully submitted,

*C. Brent Cluff*

C. Brent Cluff  
Associate Hydrologist

*K. J. DeCook*

K. J. DeCook  
Associate Hydrologist

*Kennith E. Foster*

Kennith E. Foster  
Research Associate

cc: Dr. A. R. Kassander, Jr.