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AN ANALYSIS OF WATER RESEARCH PROGRAMS
OF THE UTAH WATER RESEARCH LABORATORY
AND CENTER FOR WATER RESOURCES RESEARCH

Prepared by

The Water Resources Research
Citizen Advisory Panel

December 18, 1974

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TABLE OF CONTENTS

| | |
|---|----|
| Foreword | 1 |
| Water, Society, and the Role of Research | 4 |
| Establishment and Role of Utah Water Research Laboratory (UWRL) and Center for Water Resources Research (CWRR) | 5 |
| Evaluation of Operating Policies and Strategies | 8 |
| Interdisciplinary Collaboration | 9 |
| Stimulation to University Programs | 9 |
| Building Completion Problem | 10 |
| State Agency Cooperation | 11 |
| Federal Agency Cooperation | 11 |
| Program Planning and Budgeting | 12 |
| Contract Research Emphasis | 14 |
| Budgetary Factors | 16 |
| Priority Research Directions | 20 |
| Energy Related Water Problems | 20 |
| Water Quality Problems | 21 |
| Land Use Planning and Water Implications | 22 |
| Water Supply Development and Conservation | 23 |
| Comprehensive Management Plan for the Great Salt Lake | 24 |
| Conclusions | 25 |

Foreword

As a means of keeping water research programs at Utah State University responsive to needs in terms of both timeliness and emphasis, President Glen L. Taggart, in 1970, requested a number of Utah citizens to serve as a panel to give counsel and advice to the Utah Water Research Laboratory and Center for Water Resources Research. Membership of this 16-member panel represents a broad spectrum of water-related experience gained from a variety of professional backgrounds and organizational affiliations. The objective was to keep the panel small enough for it to be a "working" group but large enough to obtain the full range of experience, understanding, and association with Utah's water-related aspirations and their many problems. The panel, as presently constituted, is a compromise of representation from economic sectors, water professionals, and those in administrative and policy making roles. The panel has normally met once a year with a counterpart panel of Utah State University deans and directors who constitute a council to oversee and coordinate campus research programs. Although meetings have been infrequent, discussions have been open and lively resulting in many constructive suggestions about research needs and their priorities, as well as program orientation and productivity.

At the November, 1973, meeting of the Advisory Panel and the Water Resources Research Council, the panel was asked to develop a statement summarizing its observations about any or all facets of the water research programs (including operating policies and goals, dissemination of results, budgeting, financing, etc.) and to make recommendations about needed changes in emphasis, priorities, or operating policies. An ad hoc sub-committee consisting of Leonard Johnson, chairman; Ival Goslin; Lynn Thatcher; Dale Carpenter (representing Gordon Harmston); and Angus Belliston; was appointed to develop an initial draft statement. This draft was subsequently circulated to the full panel for suggestions and criticism. This report then constitutes an evaluation by the entire Advisory Panel. It is hoped that it will serve as a constructive guide to those administering water research programs at Utah State University. Those who sponsor research through its organized units and entities that relate closely in a "user" capacity may also benefit from this report.

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Water, Society, and the Role of Research

Water research needs stem from social aspirations as well as physical needs. Meeting social objectives has greatly expanded the number and kind of water uses and their appurtenant physical, institutional, legal, political, and financial mechanisms. Because of the interaction and interdependency between and among these social interests, and the competing demands placed on given water supplies, water problems are becoming increasingly complex and difficult to solve. It is extremely important to assess the impacts and trade-offs associated with any change in water use patterns if society's water-dependent objectives are to be achieved in an optimal manner. Research priorities are dictated by changing social objectives. Over the years social needs and preferences with respect to water uses have shifted gradually from productive uses to amenity uses. More recently, there has been a swing back to food and energy production and related problems having high priorities.

Research programs should be sensitive to shifting social goals, anticipate impending problems, and provide the right balance of immediate and long-range solutions to the important water problems.

If a water research program is to serve its purpose in today's social climate, it must (1) maintain a broad interdisciplinary and systems perspective in a highly trained and diversified staff; (2) have

access to the facilities, equipment, and instrumentation necessary for precisely controlling and measuring variables of interest so as to most effectively identify and relate the factors involved; (3) have a quick response capability; (4) maintain a flexible organizational structure where the problem of interest dictates professional groupings (in an ad hoc way) rather than along rigid disciplinary or functional lines; (5) have adequate insulation from special interest organizations and agencies to assure objectivity; and (6) develop effective communication with legislative decision makers as well as with administrative departments of government in order that research results and their social interpretations can be effectively utilized.

Establishment and Role of
Utah Water Research Laboratory (UWRL) and
Center for Water Resources Research (CWRR)

Recognition that water constitutes a "common denominator" for practically all Utah enterprises emphasizes the need for integrated water research capability. Planning and management entities require special background studies and analytic aids with which enlightened assessments of complex situations can be made. Planning and management entities must also have access to, and the assistance of, a viable water research capability to aid in providing answers and information needed to assure greatest cost effectiveness in water development and management.

These considerations led to the establishment of the Utah Water Research Laboratory (UWRL). It was felt that the needs of various agencies and organizations of Utah could be most economically and effectively served through a highly trained and diversified staff in a well-organized central facility. The location of such a laboratory on the campus of Utah State University was a natural complement to the traditionally strong programs of research and training in water and natural resources on that campus. It permitted a mutual strengthening of UWRL and the University through the interaction of a broadly based staff. This close University association has led to the notion that the laboratory is strictly a Utah State University creation. While included as a separate line item in the budget of Utah State University, the UWRL is truly a State-created laboratory serving as the water research arm of all State agencies. Its facilities have been used by other State universities and colleges. Their staffs have been involved on occasion with UWRL research. Many off-campus agencies and business enterprises have been greatly benefited by its activities.

The establishment of the Center for Water Resources Research (CWRR) at Utah State University as the result of the Federal Water Resources Research Act (1964) have added strength, breadth, and viability to the water research program. The CWRR program, also, is Statewide in scope. The UWRL and CWRR programs, while separate in identity, have been carefully coordinated. At the present time, the Director of each is the same person.

Briefly stated, the objectives which have guided UWRL/CWRR activity over the years are to:

1. Develop and maintain a research capability which can respond quickly, efficiently, and effectively to a wide variety of water research opportunities by:
 - a. Attracting and maintaining a competent, multi-disciplinary, self-motivating staff with an interest in many of the complex problems of water resources and with the innovative capacity to generate unique research approaches and cost-effective solutions to specific problems;
 - b. Providing adequate facilities, equipment, and space commensurate with the needs of a dynamic and diversified staff and a balanced water research program; and
 - c. Implementing operational policies and organizational patterns which result in maximum creative contribution through streamlined project management, unfettered administrative support, and easy interdepartmental and interdisciplinary interactions;
2. Provide a responsive and effective research arm for State agencies and other local governmental organizations and entities having concern with planning, management, development, allocation, and administration of water for any and all purposes;

3. Foster cooperation and coordination with Federal agencies, and contribute meaningfully to the solution of regional, national, and international water problems through contract and grant programs;
4. Provide a source of research and testing for private industries and organizations where services and facilities are not otherwise available;
5. Provide stimulation to academic departments of Utah State University in establishing balanced high quality training needed to meet the urgent manpower requirements in water science and engineering; and
6. Disseminate effectively the results of research to those having need for information through high quality publications and technical assistance.

Evaluation of Operating Policies and Strategies

The guiding objectives of UWRL/CWRR are still appropriate and if consciously pursued will assure the maintenance of a most valuable State research asset. Not only will the State research needs be met but the program will continue to fit well into the general mission of Utah State University as a quality land grant institution.

Although operating policies and organizational patterns were not examined in minute detail, the panel believes that caution should be exercised in avoiding too much formal structuring in terms of

organization. In an atmosphere where projects are phased in and out, there must be freedom to organize interdisciplinary teams without the encumbrances of rigid organizational patterns. The panel knows that the UWRL/CWRR have assembled and are maintaining a group of compatible yet highly competent researchers who are doing a good job of project management.

Interdisciplinary Collaboration

The objective of achieving good interdepartmental and interdisciplinary integration on the USU campus has been accomplished. The panel noted with pride the significant increase in interaction and cooperation with other universities in the region to better address certain problems of multi-state concern.

Stimulation to University Programs

Student involvement and participation in research activities has been substantial. During FY 1974, 62 graduate and undergraduate students were provided \$142,000 in compensation for their assistance with water research. The panel endorses this involvement and notes the significant training advantage it provides. However, it is suggested that student assistance be considered incidental to the primary research mission and that student research productivity be a strict requirement.

The growing and broadly oriented water research program stimulated the establishment and influenced the character of important complementary programs on the USU campus; such as, the Ecology Center

in 1968, the Rockefeller Foundation-supported Environment and Man Program in 1974, and the Kellogg Foundation-supported Quality of Rural Life Program in 1973. Greater involvement of social scientists in water research has been attained through the Institute for Social Science Research on Natural Resources which was organized in 1968.

Building Completion Problem

This important UWRL/CWRR State water research program is housed in an excellent, well maintained basic structure. Some of the existing equipment and other facilities have been provided through the ingenuity of an interested faculty and efforts of inspired graduate students. It is evident that the overall program is suffering severely from lack of adequate space and laboratory facilities. Delays in completing the last phase of the laboratory building construction is seriously affecting the capability to continue a viable water quality research program. Makeshift partitioning of some of the open bay space has kept the program going for several years. However, such temporary space is poorly served by electricity, lighting, heating, water supply, and sewer. In view of the importance of the UWRL program to the University and the State, and considering the critical constraint that these makeshift provisions impose on productivity, we strongly urge that the completion of UWRL be given the highest priority. It is incredible that this urgent need has been so long overlooked.

State Agency Cooperation

The panel observes that UWRL/CWRR has been reasonably effective in support of State agency missions, particularly the Water Resources Division and the Bureau of Environmental Health. There appears to be room for broadening of support to other State agencies. The relationships of the State water research organization and the action agencies of State government need to be analyzed to assure that efforts are coordinated in the most productive and efficient manner. The panel noted a lack of research collaboration at municipality and county levels, and suggests that the reasons for this be analyzed. Have the services and capability of the UWRL/CWRR been adequately explained to these local levels of government?

Federal Agency Cooperation

Cooperation and coordination with Federal agencies seems to have been adequately achieved. UWRL has had successful association with practically every Federal agency that has grant or contract programs for water research. Reports of satisfaction with UWRL/CWRR performance are generally excellent. The national and international reputation of water research programs is outstanding and reflects favorably on the University and the State. A stable operation within a framework of carefully conceived objectives should be developed and maintained year after year. Such an operation will provide a coherent program with a balance in Utah's favor, in spite of the significant

imbalance between State and non-State financial support. The return on the State investment at this time is extremely high because a Utah emphasis has been maintained, resulting in a substantial proportion of non-State funded research having a high transferability to Utah situations.

Program Planning and Budgeting

The panel is cognizant of the serious water problems facing Utah in connection with the development of energy potentials, recreational opportunities, industrial growth, etc. Heavy pressure will be placed on UWRL/CWRR to assist with finding solutions to these complex problems. It is imperative that water research efforts be properly associated with the natural resources programs they support. Therefore, research needs should be adequately exposed to the legislative process so that their merit and importance can be properly weighted in planning, budgeting, and appropriations processes.

The panel notes a basic weakness in the program planning and budgeting process of the water research program that oftentimes frustrates or negates the correlation of the research program with the State agency missions it is meant to support. The need and desirability of integrating the UWRL program with other research and academic programs of Utah State University is recognized. (In fact, we feel the State has received substantial "double duty" from its investment in research as a result of the training opportunity and student assistance

the research program provides.) Although there have been continued and conscious efforts to develop research programs in close concert with identified agency priorities, proposed programs have been quite regularly eliminated at the University and Board of Regents level in the budgeting process. The panel notes that it was this very problem which led to the transfer of the State Geological and Mineralogical Survey from the University of Utah budget to that of the Department of Natural Resources. While we do not recommend such a transfer of UWRL at this time, we do strongly recommend that the UWRL budget request be considered in concert with the Department of Natural Resources and Division of Health budgets of which the UWRL research program should constitute a coherent part so that the relevance can be better evaluated in the legislative process. In a word, we question whether the review of budgets and programs of water research through higher education channels alone provides the best kind of "weighing" in relation to agency missions and within the set of public programs and social goals for which the legislature must allocate resources. We recommend that UWRL programs and budgets be more formally formulated in collaboration with the Department of Natural Resources and the Division of Health and be subject to examination by the same legislative and executive units which analyze budget requests for these agencies. In other words, there should be a cross-referencing between the Board of Regents and the relevant agencies of the State in the evaluation of the UWRL budget request.

Contract Research Emphasis

Since its beginning, UWRL has followed a policy of vigorously seeking financial support from outside of the State to supplement appropriations by the legislature and mineral lease allocations. The success of this funding approach has been a vital factor in the Utah Water Research Laboratory achieving its enviable reputation for outstanding research capability in the many varied and complex problems involving water and related land resources. This favorable position is one in which all segments of Utah citizenry should be proud. This prestige continues to attract a wide spectrum of out-of-state industrial and governmental financing of research projects. Although some may conclude these projects are unilateral or self-centered, the corollary benefits have been of great value to the State of Utah.

The principal benefits to Utah resulting from contract research are: (1) the problems studied often coincide with specific Utah problem priorities, hence, a very substantial amount of research on State problems is conducted with non-State funding; (2) contract funds underwrite salaries for a more diversified and highly competent staff whose technical capabilities become available to academic departments and to State and local entities who seek advice; and (3) contract research provides an important problem experience and financial assistance for students.

Over 150 contracts and grants have been secured by UWRL since 1965 amounting to about \$9 million. These contracts and grants represent 22 different Federal agencies along with 5 State, 1 county, and 13 private organizations. These include:

| <u>Federal</u> | <u>State</u> |
|---|-----------------------------|
| Environmental Protection Agency | Water Resources Division |
| U.S. Department of Agriculture | Fish and Game Division |
| National Academy of Sciences | State Engineer |
| Forest Service | Highway Commission |
| Soil Conservation Service | Division of Health |
| Bureau of Reclamation | Salt Lake County |
| Office of Water Resources Research | |
| Agricultural Research Service | <u>Private</u> |
| National Science Foundation | U&I Sugar Company |
| Office of Saline Water | U.S. Steel |
| Public Health Service | Procter & Gamble |
| Agency for International Development | Thiokol Chemical Corp. |
| Dept. of Housing & Urban Development | Metropolitan Water District |
| Industrial Services Administration | Delta Irrigation Company |
| Department of State | Carl Nelson Construction |
| Geological Survey | Ideal Cement Company |
| Fish and Wildlife Service | Johns-Manville |
| U. S. Navy | Detroit Metro Water Dept. |
| U. S. Air Force | Del Monte Corporation |
| Federal Highway Administration | Brown & Root |
| Organization of American States-- (CIDIAT) | Centaur Manufacturing Inc. |

During any given year, UWRL may be administering 35 to 40 active contracts or research grants involving numerous agencies and clients.

Success in obtaining contract and grant funds requires awareness of critical research needs, and an imaginative and timely proposal to investigate the problem. Consequently, the preparation of research proposals and negotiation of contracts constitutes a highly significant

UWRL activity. During the past year, UWRL scientists submitted about 60 research proposals to various agencies and organizations. The panel endorses this emphasis on contract research and recognizes many State advantages emanating therefrom.

Budgetary Factors

The basic operating budget for the laboratory is derived from:

- (1) a legislative appropriation to the Utah State University budget;
- (2) an allocation of 3 1/3 percent of the mineral lease funds assigned to the Uniform School Fund; and
- (3) contracts and grants generally received on a competitive basis for conducting specific research.

To those interested in sound financing, it is surprising that in recent years there has been a trend towards a lesser and lesser proportion of State funding for UWRL programs. For 1973, the legislature appropriated only 6 percent of the total, 6 percent came from mineral lease funds, and 88 percent from grants and contracts. Over the years, the legislative appropriation has been scarcely adequate to cover costs of administering the growing research program.

A most encouraging departure from the trend of diminishing proportion of State support occurred in the FY 1974 appropriation. The UWRL appropriation for that year included \$93,000 to initiate three high priority State studies. The current (FY 1975) budget continues this same level of support. The panel applauds this legislative recognition of the fact that timely attention to Utah problems can only be

assured through adequate State support. While much contract research can be of direct benefit to Utah, there are sometimes drawbacks in terms of timing and purpose which diminish the value to Utah agencies and citizens in general. To make sure that UWRL meets its responsibilities to the state in prompt direct-to-the-problem fashion, the legislature must provide an adequate base of State support.

The mineral lease fund allocation has enabled the laboratory to provide non-Federal matching funds required by most Federal agencies supplying grants for research. This procedure has thus aided in expanding research capabilities at Utah State University. Mineral lease funds vary somewhat according to leasing activity but have normally ranged from between \$80,000-\$125,000 per year.

Although about two-thirds of the mineral lease funds (MLF) is allocated to meeting matching requirements, this is not done unless there is a substantial Utah benefit from the research. The balance of the MLF is used to initiate work on specific Utah problems--generally selected in close collaboration with State water agencies. The laboratory is certainly making effective use of its mineral lease funds and these are fully dedicated to research as intended under the basic allocation of such funds.

In addition to the State appropriation, mineral lease allocation, and contract funding, Utah State University has had a standing policy of returning a certain percentage of the overhead collections from contract research. The overhead rate is determined by Federal audit. At the

present time, the rate is 60 percent of salaries and wages. The rationale for returning a portion of overhead collections to the generating unit is that certain of the overhead costs are borne at that level. For example, UWRL is largely responsible for its own business management services and its service functions (such as shop, secretarial, chemical analysis lab, computer and simulation facilities, etc.). Special word-processing units, office furniture, equipment, supplies, and full costs of printing of some 30 substantive reports and about 60 research proposals are borne annually by laboratory budgets. The nature of the program also entails a significant amount of "pre-proposal" kind of expense in promoting and negotiating contracts. While these kinds of expenditures are normally paid from profit and fees permitted under contracts with private research organizations, the guides which govern University-Federal contracting (non-profit) leave no way of charging for some of these pre-award expenses either as direct or indirect charges. Although the panel did not examine the justification for the particular percentage (25 percent) derived for overhead return, it is aware that the whole matter of overhead return policy and its level have been recently examined by an independent firm, the Board of Regents, and the legislature. The level of 25 percent has been adopted and we certainly endorse this general policy so long as there is good evidence that a decentralizing of some of the overhead costs is more efficient and effective than handling all such costs at the University administration level.

The panel concurs in the general policy of collecting full overheads on contract research. The University has a policy which permits some reductions if there are valid reasons for doing so, such as some very evident benefit accruing to the University or the State. The policy of a significantly reduced overhead charge on State-supported research would also seem appropriate. We believe the UWRL should be considered an extension or an arm of State agencies operating in tandem and supported by the same general State appropriation. The full overhead charge on State agency contracts would seem to be unjustified on the face of it, but may even create some barrier to the unification of research and agency effort in a programmatic sense.

All of the additional financial support need not come directly from the State Legislature. The laboratory can take certain steps to aid itself. For instance:

1. Unless there are legal restrictions against the procedure, county, multi-county, and community government funding of special research problems beyond the capability or interest of private enterprise should be encouraged; and
2. Funding of special studies in which there is an element of mutual interest by industries, organizations, or institutions could be stimulated.

The laboratory should broaden contacts among these categories of potential users to make them aware of the availability of expertise

if needed, and to disseminate research results which may have application to their needs.

Priority Research Directions

Five broad categories were identified by the Advisory Panel as having highest priority for water research in Utah:

1. Water problems related to energy;
2. Water quality and environmental problems;
3. Land use problems;
4. Water resource development and conservation; and
5. Great Salt Lake management problems.

Proposed projects unrelated or related only incidentally to these should receive lower priority. Every proposed project should be critically reviewed to assure its practicality in helping solve problems in these areas.

Energy Related Water Problems

Research to quantify needs, address the resulting water quality problem, and how the water required for orderly development of Utah's energy resources can be provided with minimal adverse impacts to established uses should command the highest priority. Oil shale distillation, coal gasification, coal-powered generation plants, the conversion of other resources--including waste products--into energy, are problems that require thorough study about water. The UWRL should actively seek to aid government and industries in making the

required investigations. Here is a challenge for innovative research leadership that will have far-reaching impacts on Utah's limited water resources.

Water Quality Problems

Each use of water causes some deterioration in quality; therefore, quality is closely related to quantity. Research should be expanded to include development of technology to maintain pollution at levels which will not destroy water's usefulness.

Much has been learned about treating waste water for removal of microorganisms, organic matter, and suspended matter. Little is known about practical removal of dissolved minerals.

A major research thrust should be in the direction of either removing salinity or preventing its entrance into streams and underground waters, or a combination of both, as well as continuing to study the use of waste water.

With the impetus given to fuel development by the energy crisis and as technology emerges for processing oil shale, early investigation to perfect means of controlling mineral input to streams and underground waters is critically needed. Brine pollution related to oil wells also needs attention.

Another pressing water quality problem is related to the unprecedented and not properly regulated land development which results in recreational and residential communities in mountain areas once

reserved exclusively for watersheds. Community growth in valley areas also complicates existing problems of municipal and industrial waste collection and treatment. Additional research is needed in Utah in these fields.

Land Use Planning and Water Implications

A major impediment to sound land use planning in Utah is the inadequacy of basic water data and the lack of public understanding of the relationship between land use and water.

The potential demand on the State's water research center and water-trained scientists is unknown.

Water research relative to land use planning would include:

1. Identification of water-related constraints upon particular land uses;
2. Assessment of impacts on water sources produced by alternative land uses;
3. Post-mortem and monitoring studies of water and land uses to verify that projected goals are attained as forecasted;
4. Research to establish municipal and industrial water requirements and the potential for reuse of water. Coefficients for economic input-output analyses of value of water in alternative uses would be helpful;
5. Research that emphasizes water quantity and quality for in-stream uses, including waste-carrying capacity, biological

habitat considerations, and accurate, "in-place" water quality monitoring.

Water Supply Development and Conservation

One of the most critical water needs of Utah is the augmentation of existing water resources. Today water resources development is undergoing severe and adverse criticism. Some critics advocate "no more development." Others would like to believe that practices of the past should continue. Obviously, under a literal interpretation of a "no more" concept of water development one could assume that "no more" research might be needed.

Water development is presently in a transition stage directed toward goals different from the traditional ones. The resulting changes are due to many factors including: scarcity of the remaining supplies of water; increasing demands for those supplies; the realization on the part of the public that choices as to water uses have to be made; that the public should participate in those choices; and that food, energy, and environmental needs must find a logical balance in emerging goals.

Because remaining unused water resources are limited, the development and utilization of Utah's waters without first considering alternative uses is no longer acceptable. This situation demands research leading to greater understanding of the highest priority uses of remaining supplies. Such studies should continue or be initiated at an accelerated pace. Research projects involving efficiencies of use,

reuse, recycling, management practices, economics of alternative uses, augmentation by watershed management, weather modification, interbasin transfers, cost sharing, regulatory policies, and the need for new legal and institutional arrangements should be given priorities.

Comprehensive Management Plan for the Great Salt Lake

The Great Salt Lake has long been regarded by knowledgeable people as one of Utah's great water resources. Its development requires careful planning. Being heavily endowed with mineral values, as well as aesthetic, recreational, scenic, and water-supply values, this body of water is a unique asset. The lake always has been--and probably always will be--an object of controversy so far as planning for its ultimate, multiple-uses is concerned. The UWRL and CWRR can assume an important supporting role to politicians, engineers, and others charged with the development of a water plan for the lake. It should seek to do so with special State-appropriated funds and other available funds.

Present management of the lake's water quality is guided by the broad principle that existing uses of the lake, such as recreation, shrimp harvesting, mineral extraction, and, to a limited extent, use as a waste depository, should be preserved. New-use needs of society are to be provided by further lake development. The fact that decisions based on these principles are current events, emphasizes the need for

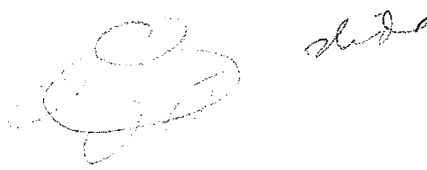
acceleration of research which will aid in determining more definite guidelines for development of the lake resources.

Conclusions

1. Utah has an outstanding Water Research Laboratory and Center for Water Resources Research with a distinguished staff of water scientists. Citizens can be proud of the regional, national, and international reputation for leadership in the field of water research which UWRL/CWRR has achieved. It attracts a wide spectrum of out-of-state-financed research projects. The spin-offs from such research have provided extraordinary benefits to Utah citizens.
2. Five broad categories of needed research are identified as Utah's highest priority for attention by researchers:
 - a. Water problems related to energy;
 - b. Water quality and environmental problems; *- dangerous treatment plants*
 - c. Land use problems;
 - d. Water resource development and conservation problems; and *Trevor Hughes*
 - e. Management of the Great Salt Lake. *Play - Jones*

*emphasis
problems*

Research projects in these five spheres should be given highest priority. Proposed unrelated projects, or those related only incidentally to these, should receive lower priority. In addition, every proposal for research should be critically reviewed to assure its practicality in helping solve problems in these areas.



3. Application of Research Results -- To increase public awareness of water research needs, as well as to increase the usefulness of research information, the following three-point plan is recommended:
 - a. In all research projects, the potential beneficiaries of the research, especially sponsoring organizations, should be closely involved in planning the project, both in its general conception and in the detailed programming of its scope and specifics;
 - b. Included in the project planning and funding should be stipulated provisions for adequate dissemination of the final report. This should include involvement of researchers, when possible, beyond the report stage in aiding the implementation of the findings by the sponsor, or by other users;
 - c. To promote the widest possible dissemination and use of research findings, it is suggested that all final reports should contain a section restating the uses originally anticipated for the research, together with any modifications or additional applications identified as the project progressed. Detailed identification of potential users or interested parties to whom the research results would be useful. Recommendations for dissemination of the results should be a vital part of all research project reports.

4. Practical Research -- Although the benefits of water resources research are varied, the ultimate justification for expenditure of time and money for this purpose lies with the application of the results. Such worthy side benefits as providing scientific challenges for professors, and training and subsistence support for students, must be subordinate under the present inadequate State funding system to the economic and social benefits which accrue to sponsors who pay the bill. In emphasizing the need for applied focus in water research, the panel does not mean to imply that there is no place for theoretical or basic research within the UWRL/CWRR program. Indeed, some of this is needed as a basis for estimating the success of some applied research projects.

The panel urges UWRL/CWRR to make every effort to disseminate the results of the research to all possible interested parties.

5. Increase in State Financial Support -- For the foreseeable future, out-of-state funding should continue to be vigorously solicited as a vital financial support for Utah water research. The legislature should be made aware that research of the State's specific and unique water problems cannot be financed satisfactorily by non-Utah funding.

A four-point program is proposed to increase the water research funding by State legislative appropriations and other sources from within the State of Utah:

*Appropriation
State - Federal*

- a. The Utah Water Research Laboratory and Center for Water Resources Research programs and achievement are not fully understood by Utah political and business leaders. It is essential that a broad cross-section of State leaders be provided opportunity to become informed and indeed involved in the water research projects of UWRL/CWRR. Developing citizen awareness of the problem-solving capability upon which they might draw is one of the important paths to better financial support of water research;
- b. Annual requests for appropriations should be presented to the State legislature in terms of the relevance of the budget to agency programs and high priority research needs identified jointly with mission agencies;
- c. County, multi-county, and community units of government should be fully informed about the availability of expertise and facilities to assist with solution of their water problems.
- d. Opportunity should continue to be provided for funding from private industry, organizations and institutions. The flow of funds from Federal agencies and other non-Utah sources at current levels or higher should be maintained.

*Chart showing
levels of coordination*

6. Since UWRL operates as an arm of State agencies (and has certain operational costs covered within the USU appropriation), it would seem inappropriate for USU to collect full overheads on State-supported research. The panel endorses the USU policy of significantly reducing overhead charges for special studies conducted for, or in collaboration with, State agencies.
7. There is a basic weakness in the program planning and budgeting process of UWRL in that programs are developed and coordinated to support identified agency priorities, yet routed through higher education budgeting channels for approval. There needs to be a connective or cross-referencing mechanism between the Board of Regents and the administrative agencies of State government regarding UWRL budget requests so that a better weighing of proposed programs in terms of State priorities is assured.
8. Delays in completing the last phase of construction are seriously affecting the capability of UWRL to maintain a viable water quality research program. In view of the importance of the water research program to the State, and considering the critical constraint the present make-shift provisions impose on productivity, we strongly urge that completion of UWRL be given the highest priority.

*Diagnose
the
problem*

Realize