MEMBER UNITS EXHIBIT NUMBER 74

LOMPOC PLAIN GROUNDWATER BASIN
WATER QUALITY WORK PLAN

1.0 Introduction

This work plan provides guidance for the development of a consensus understanding of the elements of groundwater flow and solute transport, as well as percolation of surface waters, in the Lompoc Plain Groundwater Basin (Lompoc Basin). It provides for examination of the effect of Santa Ynez River and tributary flow on the water quality in the Lompoc Basin. The work involves an evaluation of existing models of the hydrology and water quality of the Lompoc Groundwater Basin and the Santa Ynez River, analyzing the efficacy of their technical basis against their intended application. It will be conducted by a work plan manager (technical consultant) reporting to a steering committee composed of interested parties that will oversee the effort.

The impetus for this effort is twofold and includes:

1. The significant investment in the development of models by participating agencies;
2. The need for understanding and wide acceptance of these analytical tools, so as to provide for discussion and cooperation among all agencies engaged in water management.

Various legal and political concerns have made it difficult to develop a technical consensus on hydrology and water quality issues in the Lompoc Basin. The City of

Lompoc incurs significant water treatment costs because of high TDS. In addition, poor quality water limits agricultural practices in the Lompoc Basin. Contentions over groundwater quality in the basin have given rise to costly litigation and political disagreements. However, recent discussions among interested agencies indicate that some potential for a technical consensus exists. In order to move toward agreement on technical issues, interested agencies have initiated this process parallel to, and deliberately independent of, ongoing legal actions. This plan will be implemented pursuant to a Memorandum of Understanding (MOU) among the participating agencies.

The goal of the process is to reach a consensus on water quality issues through use of existing models and information. These models also may be capable of addressing management alternatives to ensure adequate water quality to water users in the Lompoc Basin area and along the Santa Ynez River. The participants in this work plan expect that use of these models in their current state of development and with available data will result in the consensus understandings that are desired. Should this not be the case, recommendations for model modifications and/or data collection efforts will be made.

2.0 Work Plan Challenges

The principal reason for this work effort is to achieve a common understanding of the factors contributing to the relatively high total dissolved solids (TDS) concentrations in the Lompoc Basin. This is to be achieved by an analysis of the existing models and other information and the results they provide. The City of Lompoc has filed litigation

which includes an assertion that there is a direct causal relationship between operation of Cachuma Reservoir and deterioration of water quality in the Lompoc Basin. Because there is disagreement regarding the City of Lompoc's assertion, clarifying this relationship is a key objective of Phase 1 of this work plan.

Various water management alternatives have been suggested to alleviate the water quality problems in the Lompoc Basin. Should a common understanding of the existing issues and use of the models be achieved, some or all of the management alternatives may be evaluated. These include: additional surface water development, redistribution of pumping demand, reduction in net M&I withdrawals, changes in managed recharge within the Lompoc Plain, changes in water demand, management of salty perched water zones, and management of other sources of salt.

3.0 Background Hydrology

The Santa Ynez River watershed extends from the Ventura County-Santa Barbara County line westward to the Pacific Ocean. Three reservoirs have been constructed on the Santa Ynez River; all are used for water supply principally by South Coast water purveyors not physically located within the Santa Ynez watershed. The easternmost reservoir (and highest in the watershed) is Jameson Reservoir, constructed in 1930. It is located roughly 88 river miles from the Pacific Ocean and has a watershed of roughly 14 square miles. It is owned and operated by the Montecito Water District. Gibraltar Reservoir, owned and operated by the City of Santa Barbara, was constructed in 1920 and is roughly 73 river miles from the Pacific Ocean. The

Gibraltar Reservoir watershed is approximately 216 square miles (including the Jameson Reservoir watershed).

The Cachuma Reservoir is by far the largest of the three reservoirs. It was completed in 1953, is 49 river miles from the Pacific Ocean and has a watershed of approximately 417 square miles (including the watershed of Gibraltar Reservoir). The reservoir is owned and operated by the U.S. Bureau of Reclamation (USBR). Water is diverted to four South Coast water purveyors (Goleta, Montecito, and Carpinteria Valley Water Districts and City of Santa Barbara), and one in the Santa Ynez Valley (Santa Ynez River Water Conservation District, Improvement District No. 1).

Flow from the Santa Ynez River and its tributaries is the principal source of recharge to the alluvial groundwater basin located between Bradbury Dam and the Lompoc Narrows (a section of the river valley just upstream of the "Robinson Bridge" on Highway 246). The river and its tributaries provide recharge to the Lompoc Plain as well. In addition to spills, water is released from Cachuma reservoir to replenish downstream groundwater basins.

As is typical of many southern California river systems, the Santa Ynez River is characterized by large seasonal and climatic variations in both instantaneous and average annual flow. Concentrations of TDS in the river and its tributaries vary as well. This variation, and the management challenges presented in meeting the water supply

and quality requirements of the region, have led to the development of various models of the river and the Lompoc Basin.

The principal hydrologic components addressed by these models include: 1) the surface water characteristics of the Santa Ynez River; 2) groundwater characteristics of the Lompoc Basin such as recharge from various sources and changes in gradient and flow with time; and 3) the "salt flux" through various elements of these hydrologic systems. The effects of reservoir operations, agricultural water use, and other activities within the watershed have led to the discussion of alternative approaches to water management. In particular, these alternative approaches have been intended to address changes in water quality and ways to provide the maximum amount of reliable water supplies from the basin.

Three models are available: 1) a model of the Santa Ynez River developed by the Santa Barbara County Water Agency under the direction of the Santa Ynez River Hydrology Committee, 2) a finite difference model of the Lompoc Groundwater Basin developed by the United States Geological Survey (USGS) in cooperation with the Santa Ynez River Water Conservation District (SYRWCD), and 3) a finite element model of the Lompoc Groundwater Basin (including modules for Cachuma reservoir and downstream river hydrology) developed for the City of Lompoc by Hydrologic Consultants, Inc. A brief discussion of each model is provided in the following paragraphs.

The Santa Ynez River Hydrology Model utilizes an accounting approach to calculate flow, reservoir storage, diversions, spills and releases for all three reservoirs as well as groundwater storage along the Santa Ynez River between Jameson Lake and the Lompoc Narrows. Only that part of the model between Cachuma Reservoir and the Lompoc Narrows is of interest in this work plan. While the model computes volumetric groundwater storage in the alluvial groundwater basin downstream from Bradbury Dam, it is primarily a surface water model utilizing monthly time steps. The base period extends from 1918 through 1993. The model has been developed through the Santa Ynez River Hydrology Committee, and is available for public use.

In cooperation with the SYRWCD coordinating efforts with various Lompoc basin agencies, the Regional Water Quality Control Board (RWQCB), and the County Water Agency, the USGS developed a finite difference model of the Lompoc Groundwater Basin. The model covers the period 1941 through 1988 and is layered so as to represent the principal aquifer units. In addition, the model is linked to a solute transport module intended to represent movement of total dissolved solids. It has a river module for percolation of Santa Ynez River flow in the Lompoc Basin and operates using approximately 6-month time steps (dry and wet periods). The model is expected to be publicly available by November, 1996.

The City of Lompoc has engaged Hydrologic Consultants Incorporated to develop a three dimensional finite element model of the Lompoc Groundwater Basin. This model, which relies heavily on data gathered by the USGS, includes a solute

transport module, and modules to simulate the Santa Ynez River between Bradbury Dam and the Lompoc Narrows as well as the operation of Cachuma Reservoir itself. It covers the years 1941 through 1994 and uses monthly time steps. The model is expected to be available to the public by November, 1996.

4.0 Work Plan Area

The work plan area will be the Lompoc Basin, Cachuma Reservoir and the Santa Ynez River and its tributaries downstream of Cachuma Reservoir. Past studies involved three basic areas: Cachuma Reservoir, Bradbury Dam to the Lompoc Narrows (and local tributary streams), and the Lompoc Basin and its tributary streams. While this work plan is expected to have a similar approach further definition could occur as the work plan efforts progress.

5.0 Work Plan Outline

The work will be conducted in three phases. Phase 1 addresses the immediate need of achieving a consensus understanding of existing models and the water quality (TDS) their results describe. Phase 2 addresses the potential needs of evaluating various water management alternatives. Recommendations for the refinement or expansion of models and data programs, as appropriate will be included in both phases. Phase 3 deals with potential future modification and use of modeling tools and data programs. The study participants have committed to complete Phase 1 of the work plan outline; the participants may or may not agree to initiate Phase 2 or Phase 3 based on their review of prior results.

Phase 1 - Evaluation of Existing Models and Water Quality Issues they Describe

Phase 1 comprises two parts. These include: 1) review of technical and historic materials; and, 2) evaluation of existing models. The results of Phase 1 Tasks will be provided to the Steering Committee in a written report.

Review of Technical and Historic Materials

Task 1.1.1

Task 1.1.1 comprises review of USGS reports and other information, as appropriate, as a way to become familiar with the basic meteorology, geology and hydrology of the basin as well as understanding the scope of information developed through early investigations.

Task 1.1.2

Task 1.1.2 entails a review of historic information relevant to the models including the permit conditions by the State Water Resources Control Board, USBR reports, consultant reports, and SYRWCD annual reports. This task would provide information on the management of the Santa Ynez River and groundwater basins downstream of Bradbury Dam. This task does not include development of additional historic water use information.

Task 1.1.3

Task 1.1.3 would entail review of the history and development of existing models including the Santa Ynez River hydrology model, USGS finite difference groundwater

model for the Lompoc Basin, and the City of Lompoc finite element groundwater model developed by HCI. This task would involve review of existing documentation of each model as well as in-depth interviews with key agency and consultant personnel including Jon Ahlroth (Santa Barbara County Water Agency), Peter Martin (U.S. Geological Survey), and Timothy Durbin (Hydrologic Consultants, Inc.). In addition, interviews with Barry Hecht (Balance Hydrology, Inc.) and Ali Shahroody (Stetson Engineers) are anticipated.

Evaluation of Existing Models

Task 1.2.1

In consultation with the consultants representing the various study participants and the parties responsible for the development of various modeling tools, each existing model would be evaluated to assess: 1) the purpose for its development, 2) the scope and type of the model, 3) numerical treatment (conceptualizations) of elements of the hydrologic systems, 4) scope, type and adequacy of input data, 5) model outputs and uncertainty (estimates of precision), 6) calibration and verification, and 7) potential model applications beyond those which initially were the purpose for development. The relationship between the conceptual basis of the model and the numerical approach (model code) will be a key evaluation. Each of the existing models, and as appropriate its modules, would be assessed as discussed above.

Task 1.2.2

The models would be evaluated to assess their overlap (that is areas or functions of similar capability.) In addition, the potential for complementary functions would be evaluated. Specifically, each model would be assessed as to where it could provide input data or quality assurance checks against other existing models. Based on the previous tasks, the relationship between operation of the Cachuma Reservoir and deterioration of water quality in the Lompoc Basin will be evaluated.

After its review of the foregoing evaluations, the Steering Committee will assess its degree of consensus understanding and agreement on the use and results of existing models and information. Consensus agreements or the lack thereof will be described. Based on this outcome, Committee decisions would be made pertaining to the scope and conduct of subsequent tasks.

Task 1.2.3

Based on the results from Tasks 1.2.1 and 1.2.2, the need for each model to be further refined will be evaluated. Some of the areas where additional refinement or data may be required include:

- data or data input shortcomings,
- necessity for model component development or upgrade,
- modeling period (time step) adequacy,
- aerial scope and aerial resolution,
- development of/synthesis of data output.

The results of Task 1.2.3 would be recommendations for refining or expanding modeling capability and, as appropriate, expanding data acquisition programs.

Phase 2 Review of Management Alternatives

Phase 2 would use the existing models to evaluate management alternatives which could improve Lompoc Basin water quality. Phase 2 would only be initiated upon direction of the Steering Committee pursuant to the terms of the MOU.

Task 2.1

This would comprise review of existing information regarding potential management alternatives, including City of Lompoc staff memoranda, USGS Water Resources Investigation Report 91-4172 (1991), miscellaneous reports prepared for, or by, the Santa Barbara County Water Agency in the late 1970's, and documents relating to the importation of "State Project Water" and enlargement of Cachuma Reservoir prepared during the 1980's. In addition, discussion of management alternatives with staff of the participating agencies, their consultants or others may be fruitful. The objective of this task is to provide a review of the model applications that may be addressed.

Review of management alternatives would include application of screening criteria to each potential alternative. The screening would focus on any reasons to eliminate certain alternatives as inappropriate, including:

- the objective or functional purpose,
- general engineering description of the alternative,
- permitting issues,
- economic feasibility, and
- any other factor.

Alternatives with elements which make them inappropriate will not be carried forward as a basis for evaluating modeling tools.

Task 2.2

For alternatives which successfully pass initial screening, an assessment of modeling requirements will be performed. This assessment will include evaluation of the applicability of existing modeling tools and data to each alternative. The results of this task will be evaluated as described in Task 1.2.3, resulting in modeling recommendations for management alternatives.

Phase 3 Future Use

Under the direction of the Steering Committee, the consultant would develop recommendations regarding future use of any consensus model(s) and any other work. This could include but not be limited to use of existing models and information, additional or ongoing collection of data, identification of responsibility for custody, and future model development. These efforts may or may not be undertaken as part of this work plan.

6.0 Work Products and Schedule

Specific work products and a specific schedule will be based on consultant proposals to implement the work plan. However, based on the needs of the Steering Committee and existing efforts by the Santa Barbara County Water Agency, USGS, and HCI to continue development of the existing models, the following schedule is anticipated.

Phase 1 - The Phase 1 report will be completed not later than June, 1997. Interim work products, as appropriate may be required by the Committee. Summaries of consultant discussions with key model development personnel would be distributed prior to the steering committee meetings.

Phase 2 - The Phase 2 report, if required, would be completed not later than September, 1997.

Phase 3 - A date for completion of Phase 3, if required, has not yet been established.

7.0 Role of the Steering Committee

The work plan will be overseen by a Steering Committee. It will comprise representatives from U.S. Bureau of Reclamation, Central Coast Regional Water Quality Control Board, Santa Barbara County Water Agency, Cachuma Conservation and Release Board, Santa Ynez River Water Conservation District, City of Lompoc and the Santa Ynez River Water Conservation District, Improvement District #1. Decision-

making shall be by consensus. The Committee may appoint working subcommittees in order to expedite certain tasks.

The work plan will be conducted by a technical consultant referred to as the Work Plan Manager. This manager will work under the direction of the Steering Committee. The responsibilities of the Work Plan Manager will include participation in all Steering Committee meetings. The development of meeting agendas and preparation of meeting summaries will be the responsibility of the Steering Committee through direction to the Committee Chairman and Work Plan Manager. To the extent possible the Steering Committee will develop its agenda in prior meetings. The Work Plan Manager may communicate directly with technical consultants of the Steering Committee, however, all such communications will be summarized in writing and circulated to the Steering Committee.