Progress Report
Storage and Conveyance Component Refinement
CALFED Bay-Delta Program

INTRODUCTION

The purpose of this progress report is to provide an update on work in progress for the Storage and Conveyance Component Refinement task. This progress report includes an expanded objective statement and overview of the task, a preliminary outline for the task report, and detailed discussions of the work in progress for two of the main efforts included in this task. The first item discussed in detail includes an initial list, attribute matrix, and ranking criteria to formulate storage, conveyance, and conjunctive use opportunities. The second expanded discussion relates to the initial assumptions identified for operations and facilities modeling and analysis.

TASK OBJECTIVE STATEMENT

The overall objective of the Storage and Conveyance Component Refinement task is to refine ranges of storage (surface and groundwater), conveyance, and groundwater conjunctive use components for subsequent refinement of the alternatives to be evaluated in the Programmatic EIR/EIS as part of Phase II of the CALFED Bay-Delta Program (Program).

TASK DESCRIPTION

Preliminary ranges for storage and conveyance components were previously identified by the Program and are shown in Table 1. The storage and conveyance components will be grouped into four categories by region: (1) the Sacramento River tributary, (2) the San Joaquin River tributary, (3) in-Delta, and (4) off-aqueduct. The first two categories correspond to the *North of Delta* terminology used previously in other Program documents. The off-aqueduct category corresponds to the previously used *South of Delta* category and represents storage and conveyance components downstream of the South Delta export pumping facilities.

Individual storage and conveyance opportunities will be evaluated based on their ability to (1) adequately meet Program goals to restore ecological health and improve water management and beneficial uses in the Bay-Delta system and (2) be reasonably implemented. General operational assumptions aimed at meeting water quality objectives and biological-ecological flow objectives will be developed in conjunction with the ranges for storage and conveyance components.

The Storage and Conveyance Component Refinement task has been divided into four main technical subtasks. Throughout the effort, information from existing and ongoing studies will be collected and reviewed to define the existing operations, water quality conditions, and biological and ecological flow conditions of the Sacramento and San Joaquin Rivers and of the Bay-Delta. Previous analyses performed as part of the Existing Conditions and No Action Alternative will be reviewed and incorporated as appropriate with the goal of maintaining consistency between the two efforts. A brief description of the four main technical subtasks is provided below.

- **Formulation of Storage (Surface and Groundwater), Conveyance, and Conjunctive Use Opportunities**

  Information from previous and ongoing studies will be collected to compile a list of reasonable surface storage, groundwater storage, conjunctive use, and conveyance opportunities for the four regions--tributary to Sacramento River, tributary to San Joaquin River, off-aqueduct, and in-Delta. Attribute matrices will be developed for each of the storage, groundwater conjunctive use, and conveyance opportunities. Ranking criteria have been developed to narrow the list of storage and conveyance opportunities to a representative set of opportunities matching Program objectives and solution principles. The representative set of opportunities will be used in the operations and facilities modeling and analysis.

- **Water Quality Analysis**

  Parameters for operations and facilities modeling and analysis will be developed for key monitoring locations. The parameters of interest include Delta inflow, outflow, salinity, dissolved oxygen, and toxicity. Key locations include export facility locations, Suisun Marsh, and other selected compliance monitoring locations in the Delta. Post-processing analyses of operations and facilities studies will be performed using various tools such as DWRDSM to identify parameter variability (influence diagrams) by range and location for individual and combined storage and conveyance components.

- **Biological and Ecological Flow Analysis**

  Assumptions for operations analyses will be identified to determine critical periods when augmentation of flow will provide the most benefit to key species. Assumptions also will be identified regarding the time periods when flows could be diverted for storage without significant adverse biological and ecological impacts. Post-processing analyses of operations and facilities studies will be performed to identify opportunities to divert flood flows or supplement low streamflows for various water year types for individual and combined storage and conveyance components.

- **Operations and Facilities Modeling and Analysis**

  Assumptions and operational parameters for modeling of facilities will be identified based upon the representative set of opportunities matching Program objectives and solution principles, water quality parameters, and biological and ecological flow assumptions. Variances between assumptions for the Existing Conditions and No Action Alternative previously developed by the Program and assumptions used in the comparable benchmark simulation developed for this task will be identified. Utilizing output from DWRSIM model runs conducted by DWR, post-processing analyses will be made of individual or bundled storage and conveyance components. Initial results from the modeling and analysis will be compiled to determine if operating criteria and component ranges meet Program objectives. In cases where certain criteria or component ranges do not meet the objectives, such criteria and components will be modified and the operations studies repeated to achieve the objectives. The results will be evaluated in terms of Water Supply Reliability, Cost Effectiveness, Water Quality Objectives, and Biological and Ecological Flows.

A draft Conveyance/Storage Evaluation Report will be prepared describing the methods, analysis, and preliminary results of the Storage and Conveyance Component Refinement task. A preliminary outline of the draft report is shown in Attachment 1.

FORMULATION OF STORAGE, CONVEYANCE, AND CONJUNCTIVE USE OPPORTUNITIES

The objectives of this task are to (1) develop a reasonable inventory of storage and conveyance components, (2) rank the individual components relative to one another, and (3) develop bundles which couple conveyance and storage components to meet the objectives of the CALFED Bay-Delta Program and its Solution Principles. The first and second items, development of storage and conveyance component inventories and ranking, are under way. Progress on these items is detailed below. When the first and second items have been completed, the third item, bundling conveyance and storage components, will begin.

The development of storage and conveyance component inventories, while relatively straightforward, involves reviewing numerous studies and ongoing investigations to ensure that the most appropriate components are included. To aid in the selection of individual components, a set of first-level selection criteria have been developed. The compilation of the inventories also includes the development of an Attribute Matrix which contains information useful in the subsequent ranking and evaluation. The Attribute Matrix includes items such as physical capacities, estimated costs (adjusted to 1996 dollars), and other qualitative and quantitative descriptors of each component.

To determine which of the many storage or conveyance components will best suit the objectives of the Program, ranking criteria have been developed. The ranking criteria have been designed to aid in determining (1) which components will work together effectively and (2) in the instances where two components may serve the same function, which component should be considered ahead of the other. The ranking criteria will not be used as an exclusionary tool. No components included in the inventories will be eliminated through this ranking process. Those components which rank lower may not be considered for bundling at this stage, but will be retained for possible later consideration as either new information is obtained or priorities for operations change, making previously low-ranking components more attractive.

Components will be bundled to form a range of water supply and ecosystem alternatives. For example, one conveyance facility can be bundled with a number of storage (surface or groundwater) components which combine to provide the range of storage necessary to achieve the operational flexibility required to meet the Program objectives. Alternatively, a single off-stream reservoir may be bundled with existing conveyance facilities in an attempt to meet the Program objectives.

Each bundled set of components will be evaluated under the *Operations and Facility Modeling and Analysis* task. Modeling of component bundles will be accomplished primarily through post-processing of various DWRSIM model outputs. The results of these modeling efforts may, in some instances, create the need to reevaluate the bundling of components. In such cases, components may be replaced with other more suitable components; for example, off-stream storage instead of groundwater banking. Accordingly, it is anticipated that some iterations between the post-processing analyses and component bundling may be necessary to achieve appropriate sets of component bundles.

Inventories for Storage and Conveyance Components

As indicated previously, information from prior and ongoing studies has been collected to compile an inventory of reasonable storage and conveyance components. The storage components include groundwater conjunctive use, groundwater banking, off-stream storage, enlargement of existing on-stream storage, and new on-stream storage. The list of conveyance components includes those facilities that have the potential to meet the Program's objectives to resolve issues in the Bay-Delta. As such, only conveyance facilities which potentially improve the movement of water from north to south of the Delta are included in this refinement process. Existing storage and conveyance facilities are not included in these inventories. Existing facilities, whether storage or conveyance, will be a consideration when bundling components.

The selection of storage (surface and groundwater), conjunctive use, and conveyance components entailed the review of many previous studies and documents. In particular, the analyses performed as part of the CVPIA Least-Cost CVP Yield Increase Plan and ongoing

efforts by the Department of Water Resources, Division of Planning, Bulletin 160-98 update were reviewed. Because a large number of potential storage and conveyance facilities have been suggested and/or studied over the past several decades, first-level selection criteria were developed to help guide the selection of components.

The intent of the first-level selection criteria developed for this phase of the refinement process was to exclude those storage or conveyance components which would not satisfy the Program objectives or solution principles. The first-level selection criteria were used as a guide and do not represent a final decision-making tool. In many instances, professional judgment was used to determine whether a potential component would meet the Program's objectives and solution principles. The first-level selection criteria are identified below.

- **Violation of Existing Law** - Components that would, if implemented, conflict with existing laws were not included for further consideration. Examples include projects located on federally designated Wild and Scenic Rivers or within a federally designated Wilderness Area.

- **Insufficient Water Supply or Conveyance Capacity** - Components that would provide an average annual water supply opportunity of less than 10,000 acre-feet per year will not be included for further consideration. While the present water supply opportunity of many of the potential components (storage and conveyance) is not known at this time, it was assumed that a storage facility with 10,000 acre-feet or less would not meet this criterion and therefore would not be included for further consideration. Likewise, conveyance facilities with the capacity to deliver 10,000 acre-feet per year or less would not be included for further consideration.

Table 2 shows the inventory of storage components. Individual storage components are listed according to geographical area as follows: tributary to Sacramento River, tributary to San Joaquin River, in-Delta, and off-aqueduct. Additionally within each of the geographical areas, the storage components are listed according to the following relative levels of priority (from highest to lowest): groundwater conjunctive use, groundwater banking, off-stream storage, expansion of on-stream storage, and new on-stream storage.

Table 3 shows the inventory of conveyance components that will be forwarded for further consideration. This inventory follows a slightly different geographical categorization than the storage component inventory.

Both Tables 2 and 3 have the following category headers: Name of the Component, Location, Type, and Description. This information, taken from existing studies and documents, is a precursor to the information that will be developed for each of the storage and conveyance components in the coming weeks. The next section describes the Attribute Matrix that will provide a level of information sufficient to evaluate the components in upcoming phases of the refinement process.

Attribute Matrix

The attribute matrix will be developed from information obtained from existing sources. The matrices for storage and conveyance components will contain information which will assist in the ranking and evaluation of components. The attribute matrices are currently being developed.

Following are the attribute headings that will comprise the attribute matrices. Along with each of the attribute headings is a description of the information which will be contained under each heading.

Name of Component - This attribute identifies the name of the component. Some names may be very descriptive as with surface storage reservoirs and some conveyance facilities. Other names may be somewhat vague, such as those associated with groundwater conjunctive use programs which might simply be identified as a regional area.

Location - The location will contain the county in which the component is located and more specific information if appropriate. For example, all surface storage components will include the waterway on which the project is located.

Type - This would provide the basic type of component being considered. The types of components that would be included in the attribute matrices are conjunctive use storage, groundwater banking, off-stream storage, enlargement of on-stream storage, new on-stream storage, expansion of existing conveyance facilities, and new conveyance facilities.

Component Description - This category would contain additional descriptive information required to distinguish the component from other components.

Storage/Conveyance Capacity - The capacity of storage facilities will be described in thousand acre-feet (taf) of gross storage capacity. Conveyance facilities will be described in gross conveyance capacity as cubic feet per second (cfs).

Constructability - Constructability will quantify the construction feasibility of the component as (1) very feasible, (2) feasible, (3) marginally feasible, and (4) not feasible. For example, a component that proposes constructing a project on unstable geology might receive a rating of (3) or (4) depending on the particular conditions of the project.

Construction Time - This category will estimate the time required for construction. This time estimate is not intended to refer to "implementation time," which would entail the time to develop appropriate environmental documentation and permitting, completion of a public review process, and actual construction time. Construction time, rather than implementation time, was chosen as an attribute because it offers the fairest comparison of

components, recognizing that certain projects may require lengthy environmental and public review processes.

Cost - The cost of a component is broken down into total estimated construction costs and annual cost. All costs are represented in:

Capital - The total estimated cost of construction adjusted to 1996 dollars using the U.S. Bureau of Reclamation Construction Cost Trends updated to January of 1996.

Annual - Annual cost represents annual O&M costs estimated from prior studies and adjusted to 1996 dollars using the Consumers Price Index.

Expected Service Life - The estimated service life of the project.

Component-Specific Environmental Evaluation - This evaluation will be in the form of a brief description of the environmental concerns associated with developing the proposed project. The description will be limited to the specific project/component and will not include indirect environmental impacts/benefits for the Bay-Delta system. This type of general evaluation will allow components to be fairly evaluated against one another. The impacts of a given component and all other related components will be undertaken in the formal impact analysis of the EIR/EIS.

Legal and Institutional Issues - This attribute would generally describe the existence of any legal or institutional issues that could hinder the development of the project; for example, the existence of water rights claims and mandated flow requirements.

Source Water Quality - This attribute will generally indicate the quality of water as determined at the component's source. For example, the water conveyed through the Delta in an isolated facility will generally have good quality because of its diversion location in the lower Sacramento River. This attribute will apply primarily to conveyance facilities.

Site or Route Land Ownership and Use - The alignment of a conveyance facility or the inundation area of a new or expanded surface storage facility will be examined to determine if there is overlap with lands that can not be affected according to state and federal laws.

Socioeconomic Issues - Socioeconomic impacts will be qualified generally with regard to potential third-party impacts, changing land uses, or right-of-way considerations.

Compatibility - This attribute will generally and briefly describe the compatibility of this component with other components and with the Program objectives.

References - The source or sources of information used to complete the attribute matrix will be listed.

Ranking Criteria

The ranking criteria will be used as a guide in determining which of the components included in the inventories best suit the Program objectives and solution principles. At the time this progress report was being prepared, the ranking criteria were being refined. The ranking criteria refinement included several meetings with CALFED staff. The ranking criteria are intended to provide simple tools which will provide some guidance in coupling components into bundles by determining which components best suit the Program objectives and which components work together effectively. It is anticipated that the ranking criteria will be completed before the completion of the attribute matrices. When the attribute matrices have been completed, each component will be ranked and the bundling of components can then take place.

Components will be ranked in relation to one another, based on a variety of parameters indicating their relative costs, benefits, and ability to meet CALFED objectives. The ranking will be based on a variety of factors that do not constitute fatal flaws. These factors will be assigned numerical values that provide a measure of the level to which each component achieves a particular purpose.

The ranking criteria include:

Capital Cost - Capital cost represents the estimated total construction cost of the project represented by the component adjusted to 1996 dollars.

Component-Specific Environmental Evaluation - This criterion represents only a general description of the specific environmental issues surrounding the development of the project represented by the component. This criterion does not include evaluation of the environmental issues surrounding the Bay-Delta system as an indirect consequence of developing the project represented by the component.

Compatibility - This criterion will qualitatively describe the individual component's compatibility with the Program objectives and solution principles as well as the major features that might be associated with the component.

Criteria will be assigned values -1 (poor), 0 (fair), and 1 (good), corresponding to the following definitions:

Capital Cost ($/acre-foot of storage)	Rank
< 1,000	+1
1,001-3,000	0
> 3,000	-1

Capital Cost ($/acre-foot/year of conveyance capacity)	Rank
< 1,000	+1
1,001-3,000	0
> 3,000	-1

Component-Specific Environmental Evaluation	Rank
Minor Impacts	+1
Moderate Impacts	0
Severe Impacts	-1

Compatibility	Rank
Good	+1
Fair	0
Poor	-1

The total score for either a storage or a conveyance component will range from 4 to -4, where a score of 4 represents the least favorable conditions. No weighting will be applied to the four criteria categories since the degree of importance of each category would be interpreted differently depending on the viewpoint of the evaluator. For the purposes of this refinement, we are summing the three categories to be generally equal in importance for meeting the Program objectives.

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After the ranking has been completed, the attribute matrices will be sorted according to component type and ranking score to enable an easy examination of the components that rank well within each type of storage and conveyance component.

Bundling of Components

The bundling of components will take place after the attribute matrix has been completed and the components are ranked according the ranking criteria. Bundling will entail coupling components which would work together effectively to meet the objectives of the Program. For example, a new conveyance facility component can be coupled with one or several storage facilities (either groundwater and/or surface storage). The ranking of components will provide assistance in determining which storage facility might more effectively work with the conveyance facility.

WATER QUALITY ANALYSIS

[Work has been initiated for this subtask in conjunction with ongoing work being conducted by Jones & Stokes Associates Inc. (JSA) for other Phase II efforts. Preliminary information developed by JSA for the Storage and Conveyance Component Refinement task will be incorporated into this analysis next week. No additional information can be reported at this time.]

BIOLOGICAL AND ECOLOGICAL FLOW ANALYSES

[Work has been initiated for this subtask in conjunction with ongoing work being conducted by Jones & Stokes Associates Inc. (JSA) for other Phase II efforts. Preliminary information developed by JSA for the Storage and Conveyance Component Refinement task will be incorporated into this analysis next week. No additional information can be reported at this time.]

OPERATIONS AND FACILITIES MODELING AND ANALYSIS

The simulation of the many possible alternatives will be simplified for the refinement process. The simplification entails use of a single surrogate facility within each region to represent the aggregate size of each facility type within that region.

APPROACH

The refinement process entails five steps:

1. Review existing studies and/or analyses to define preliminary ranges for various combinations of storage elements and conveyance approaches.

2. Define and document operational parameters for component evaluation.

3. Perform comprehensive system simulation studies that include approximate "boundary conditions" for components and operational scenarios of alternatives to provide a database for more detailed refinement. These studies will be conducted by DWR utilizing the new DWRSIM model.

4. Perform post-processing analyses of completed simulation studies to evaluate individual facility configurations and to refine definition of component elements, including operating assumptions.

5. Perform comprehensive system confirmation simulations that include findings developed from post-processing.

The first step of the process led to the development of Table 1 described above. The latest version of DWRSIM has been determined to be the most readily adapted tool for comprehensive system simulations. The operational parameters are thus keyed to those most readily employed in this model. Because the new version of DWRSIM was developed with input from the U.S. Bureau of Reclamation and this is a refinement process, not the impact assessment, it is not considered necessary to provide cross-checking simulations with PROSIM.

The comprehensive simulation runs of boundary conditions will incrementally address the estimated upper development range of water supply facilities under the CALFED process. Six simulations are envisioned to encompass these boundary conditions. Table 5 lists the generic facility type and size by region contemplated for these initial simulations. Results of these simulations will provide the platform from which electronic spreadsheet post-processing of facility-specific options can be performed. The post-processing will determine the relative merit of certain combinations of facilities and sizes. Criteria and size constraints developed from the post-processing will then be tested in comprehensive simulations to verify the conclusions.

Regional Categories

Four regions are defined for purposes of the refinement:

- Sacramento River Tributary
- San Joaquin River Tributary
- The Delta
- Off-Aqueduct Areas

Areas tributary to the Delta include not only the Sacramento River Basin, but also Delta tributary watersheds to the east and the San Joaquin River Basin. The post-processing of tributary facilities will recognize the subregions relative to the Sacramento and San Joaquin Valleys. A facility in any of these subareas could potentially supply the Delta. The Delta region is unique as a water supply feature because it provides the most downstream site to capture and convey water to critical needs. Any facility in the off-aqueduct region is linked to conveyance from the California Aqueduct and Delta-Mendota Canal.

Types of Facilities

Three types of facilities will be addressed in the refinement process:

- Surface and Groundwater Storage
- Groundwater Conjunctive Use Projects
- Conveyance

The various storage sites within a region will initially be evaluated as a single facility. Likewise, the diversion capacity serving the storage will be aggregated by region. With respect to conveyance, the comprehensive simulations will address Delta conveyance including through-Delta and isolated facilities and combinations of both. Post-processing will address conveyance issues outside the Delta.

Storage and Release Criteria

The Program recently initiated an effort to identify the "time-value of water." The relative value of water, expressed in flow benefits, at key locations is crucial to the determination of volume and timing of operations. Although there are numerous locations of concern, the time-value of water at certain locations would be instrumental in developing thresholds and priorities in the simulations. Considering the time constraints of the refinement tasks, the following five key locations are envisioned to require preliminary valuations:

1. Sacramento River at Chico Landing.
2. Sacramento River below Hood.
3. San Joaquin River at Vernalis.
4. Delta export areas.
5. Sacramento River at Chipps Island.

Criteria for Determination of the Size Range of Facilities

Criteria used to determine the size range of facilities are key elements in the refinement task. Preliminary criteria for determining these size ranges are described below.

Principles of Sizing. The facility being considered should directly influence the water available to that region. Accordingly, the water availability required (minimum) and reasonably desired (maximum) could be set as a function of frequency of exceedence, thus establishing goals for water supply opportunities. Facility size would then be determined to meet those goals by region.

- Tributary facilities most directly influence Delta inflows. The required and desired annual water supplies would be set at certain frequencies that fit within the available flow; i.e., the area under the frequency curves with the project should roughly equal the area without the project.

- Delta conveyance directly influences both Delta exports and Delta water quality. Because the primary purpose of Delta conveyance is alleviating environmental losses and water quality degradation resulting from exports, the maximum conveyance should not exceed the combined capacity of export and south Delta diversions. A minimum capacity should reduce vulnerability to supply interruptions and improve south Delta water quality to some specified minimum set of standards.

- Off-aqueduct facilities most directly influence the ability to meet water deliveries; accordingly, the range of facility sizes in that region should be determined relative to water delivery goals as described above for the tributary facilities.

Demands Used for Sizing. Sizing of facilities is most dramatically affected by water demand because water demand is the driver for all system facilities. The demand and the frequency of satisfaction of that demand are the key issues in determining the number of facilities and aggregate storage required.

- Presently contemplated maximum demand for the comprehensive simulation is full CVP and SWP contract entitlements and the May 1995 Bay-Delta standards.

- The frequency of satisfaction of those demands has not been established; however, a de facto frequency will result from the Run 1 simulation.

- Demands reflecting either existing groundwater overdraft or future growth are not included.

- For estimating facility size ranges, demands for environmental sharing will be addressed in the post-processing by approximately equal distribution of additionally developed water supply between consumer and environmental uses.

ASSUMPTIONS FOR SIMULATIONS

The following discussion generally covers the principal assumptions and criteria as well as means of addressing these criteria.

Simulation Tools

The newly enhanced version of DWRSIM incorporates significantly increased detail for the operation of the CVP facilities, the Delta channels, and the San Joaquin River system facilities. The latter aspect was notably addressed by incorporation of the SANJASM model. As a result of this increased level of detail in DWRSIM, checking results by alternative comprehensive models such as PROSIM is considered unnecessary for the refinement process.

Data files developed through comprehensive boundary conditions simulations will be used in the previously developed EXCEL spreadsheet analyses for post-processing.

The simulations will be based on 1995 hydrology with 2020 Level diversion demands and will employ a monthly time step for the 1922 through 1994 period of record. Updated hydrology for 2020 Level depletion will not be available for use within the time constraints of the component refinement task. This should not affect the relative merits of alternative components.

As described above, the demands include full entitlement for CVP contractors and for the SWP contractors as allocated under the Monterey Agreement. Effects of certain key contractor facilities such as the MWD Eastside Reservoir now under construction are to be addressed in the demand patterns.

The reduced need for imported water typically experienced in wet years will not be reflected in the simulated water demand. Although this would tend to overestimate production in wet years, it partially offsets the use of only contract demands in the benchmark simulation as opposed to developing means to address demands for groundwater overdraft and environmental uses not specifically included in the initial comprehensive simulations.

Benchmark Simulations

The benchmark simulation generally reflects the no-action basis from which to measure the relative benefits of the facilities considered. Particular components of the system assumptions are summarized in the four documents in Attachment 2. The following discussion summarizes the major factors included in the base case simulations. By contrast, Attachment 3 lists the major elements of the existing conditions and No-Action Alternative provided in the Program Information Packet for the July 11, 1996 Existing Conditions, No-Action, and Cumulative Action Workshop. Any adjustments to the benchmark simulations to more closely reflect the no-action alternative will be included in the confirmation runs. At

the conclusion of the confirmation runs, variances with the existing conditions and No-Action Alternative will be addressed and the relative effect of these variances of the benchmark simulations as compared on the refinement process will be assessed.

The SWRCB May 1995 Bay-Delta standards are the base case Delta water quality standard. Because the simulations are all performed with year 1995 hydrology, interim south Delta facilities are assumed to be operational. These facilities allow total CVP and SWP Delta exports of about 15,000 cfs and reduce carriage water impacts. Although the appropriateness of the current treatment of New Melones Reservoir in the Coordinated Operations Agreement has been questioned by the USBR, the current approach and sharing percentages will be employed. The relative impacts of alternative facilities considered in the refinement process on either SWP or CVP operations are not an overriding factor in sizing of facilities as the overall (unallocated) change in water availability will be the measure of benefit.

A major component of water supply to the Central Valley is imported water from the Trinity River. As presently configured, the simulations will include the Trinity River flows described in the May 1991 letter agreement between the USBR and USFWS. The present (not yet adopted) version of the proposed Trinity River Restoration Plan includes additional releases to the Trinity River, particularly in wet years. The resulting reduction of imports to the Central Valley could increase the current mismatch of supply and demand.

The May 1995 Bay-Delta standards for Vernalis require substantial releases from New Melones Reservoir. In addition, additional San Joaquin River tributary releases are required for which there is neither an appropriative right or agreement to provide. The method of addressing these anomalies has not been resolved.

INITIAL BOUNDARY CONDITION SIMULATIONS

Table 5 lists the principal features of the initial simulations needed to develop the data for post-processing refinements. In order to facilitate the inclusion of alternative facilities in the simulations, each proposed facility will be treated as a SWP facility. Accordingly, the releases from the proposed facilities can be balanced and prioritized relative to each other and to existing SWP facilities. Additionally, adjustment of the SWP carryover storage/delivery rule curve will allow prioritizing the new supplies for any combination of increased annual delivery and reduced risk of shortage.

Use of Surrogate Facilities

Surrogate facilities representing conveyance, groundwater storage, and surface water storage will be used in each region for the comprehensive simulations. Surface water storage will be treated as off-stream storage requiring diversion facilities to store water. Groundwater storage will be treated as a direct recharge facility for both the tributary region and the off-aqueduct region.

Accounting of Water Supply Benefits

Changes in the combined deliveries of the CVP and SWP system will provide the initial measure of water supply opportunity. As increased SWP deliveries impose additional Delta outflow requirements under the export/inflow ratio, this should also be included in the initial measurement of water supply opportunity.

Sharing of water supply benefits between environmental and consumer demands will affect demand patterns and sizing. When the initial water supply benefit estimate has been made, the time-value of water will be used in the post-processing to apportion those benefits equally between consumer and environmental uses for sizing purposes.

FACILITY-SPECIFIC ASSUMPTIONS

The following discussion covers the general assumptions for the various types of facilities simulated in each region to be applied in the refinement process.

Tributary Facilities

The operation of tributary facilities contemplated for the initial assessment of component sizes is keyed to use of surplus local and Delta flows. Subsequent analyses incorporating storage transfer are expected to substantially increase the water supply opportunity.

Diversion Constraints

Diversion schedules to reflect the concept of hydrograph sculpting[1] are not directly addressable in monthly models. Spreadsheets of DAYFLOW values will be reviewed to refine monthly parameters that appropriately address this concept. The preliminary simulations will address this concept by setting local flow thresholds above which diversions above the threshold may occur during excess conditions in the Delta (when Delta outflow exceeds amounts needed to maintain simulated Delta water quality and flow requirements).

Chico Landing, which corresponds with the latitude of Hamilton City, is the northernmost site considered for diversions from the Sacramento River. Other tributary diversions may be

[1]Hydrograph sculpting is the deferral of diversions from rivers until the receding limb of the first hydrograph has exceeded 60,000 cfs. A preliminary evaluation of the historical records suggests that when Sacramento River flow at the latitude of Hamilton City (River mile 200) equals or exceeds 250,000 acre-feet per month, the river will experience peak flow in the range of 30,000 cfs to 60,000 cfs. For this preliminary analysis, these flows are deemed to be sufficient to meet the need for seasonal flushing. Accordingly, DWRSIM will divert only during periods of surplus flows in the Delta and only after at least one monthly flow at the latitude of Hamilton City has exceeded 250 taf. The same rule would be applied to determine when flows could be diverted to groundwater storage.

possible. Releases (withdrawals) from tributary storage will have a two-tiered priority and will be balanced with other facilities linked to the SWP system. The first tier of releases will provide space in which to catch surplus flows in drier years. The second tier of releases would be for long-term drought relief after substantial drafts from Oroville Reservoir.

Storage and Release Priorities

The following tabulation summarizes the relative priorities of storage and releases. Certain of these priorities are constrained within regions resulting from export capacities and operational constraints.

Operational Priorities in Descending Order

Diversions to Storage	Releases from Storage
1. Off-aqueduct groundwater	1. Delta
2. Off-aqueduct surface storage	2. Off-aqueduct surface storage
3. San Luis Reservoir	3. Off-aqueduct groundwater
4. Sacramento/San Joaquin tributary groundwater	4. San Luis Reservoir
5. Sacramento/San Joaquin tributary surface water	5. Oroville Reservoir
6. Oroville Reservoir	6. Sacramento/San Joaquin tributary surface water
7. Delta	7. Sacramento/San Joaquin tributary groundwater

Tributary storage would be filled subsequent to diversions to groundwater recharge although much of the recharge will occur naturally. Releases from off-stream storage would be of two-tiered nature. The initial tier would create space commensurate with the likelihood of refilling that season or the subsequent year. The second tier would be long-term withdrawals to mitigate drought year shortage. This second tier would not be triggered until Oroville Reservoir storage is low enough to induce deficiencies.

Surface Storage. An aggregate total of 3 million acre-feet of storage is estimated to be the upper range of developable off-stream storage sites. About 4,500 cfs of diversion and release capacity is considered the likely maximum of aggregate diversion for this storage.

Groundwater Storage. The aggregate of operable storage assumed to be available in the tributary area is about 500,000 acre-feet and will be simulated through a single surrogate facility. Diversions to and from groundwater is initially limited to 500 cfs (almost one-tenth of the surface diversion capacity); accordingly, storage to these facilities will be base loaded. The maximum annual draft on this facility will not exceed 80 percent of operable storage.

The estimated natural recharge from streamflow depletion will be simulated as a function of vacated storage. The aggregate annual percentage of vacated storage applied in the five years subsequent to the last project withdrawal or recharge operation is estimated to be:

Year 1	23%

Year 2	14%
Year 3	10%
Year 4	7%
Year 5	5%

These values will be translated into a river loss as a function of vacated storage. Although not specifically a "defined objective," these recharge algorithms may induce storage withdrawals that, by default, become a storage transfer.

As evidenced from summing the above-listed values, the total volume of storage cannot be recharged though natural processes because the groundwater basin in the Sacramento County area has relatively low conductivity with the Sacramento River system. In this case, the recharge will principally occur through surface deliveries.

Groundwater withdrawals would occur subsequent to long-term drafts of tributary off-stream storage. Specific operating criteria related to the individual basins are included in Attachment 2.

Delta Facilities

Two types of facilities are being addressed in the Delta: conveyance and storage.

Conveyance. In addition to the existing channel configuration, three variants of Delta conveyance are scheduled for component refinement:

- Through-Delta Conveyance
- Isolated System
- Dual System

The existing channel system entails only strengthening levees and channel improvements in the South Delta that would enable a combined export of 15,000 cfs. No new channels or levee set-backs are contemplated. Existing schedules for cross-channel gate closures are included in this simulation.

The through-Delta conveyance is postulated as a wide expanse of flow across existing islands sufficient to provide 15,000 cfs of cross-channel capacity. Because this broad cross section would deliver water into an environmentally and structurally sound fishery habitat, gated operation of this cross section and the existing cross channels is not scheduled. The split of flow between the Sacramento River and central Delta would be simulated by adjusting flow coefficients.

Isolated conveyance is postulated to divert water directly from the Sacramento River to Clifton Court Forebay, the Tracy pumps, and the Contra Costa Canal intake. The simulation

will include 15,000 cfs of conveyance capacity for this facility. No releases would be scheduled for the central and southern Delta. Inclusion of the Contra Costa Canal intake would eliminate the need for municipal/industrial water quality requirements at that site. The X2 standard would satisfy the environmental flow requirement in this area. DWRSIM will include provisions for either including or isolating this facility from the export/import ratio computations.

Dual system conveyance entails a combination of both through-Delta and isolated facilities. The through-Delta component allows north-to-south flow from the Sacramento River to the central and southern Delta with existing capacities and an alternative conveyance capacity of 7,500 cfs. The isolated components would have capacities of 5,000, 10,000, and 15,000 cfs. These alternative sizes address operation for:

- Export water quality and reduction of risk resulting from levee failure (5,000 cfs).
- SWP exports only (10,000 cfs).
- Ability to schedule full export requirement with timely induction of cross-Delta flow (15,000 cfs).

Simulation of the dual system will provide for monthly percentage splits of exports between the isolated and through-Delta components.

Delta Surface Storage. Up to 600,000 acre-feet of active storage will be simulated during the refinement process. As part of this facility, diversion capacities of up to 4,500 cfs will be addressed. Surplus Delta outflow is the only source of water considered available for diversion to storage. This diversion will be treated as exports in the export/inflow ratio computations. Releases from storage are assumed to discharge directly into the Clifton Court Forebay and therefore do not affect the export/inflow ratio. Because this component of system storage provides the last opportunity to capture system surplus, maintaining space to capture the surpluses is a high priority; accordingly, Delta storage will have the first priority for storage withdrawal.

Off-Aqueduct Storage

Off-aqueduct facilities would be directly linked to the California Aqueduct and Delta-Mendota Canal and are totally dependent on the aqueducts for supplies for storage and transporting releases to the delivery points. Two components of off-aqueduct storage will be addressed in the refinement process:

- Surface Storage
- Groundwater Storage

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Because these types of facilities were previously simulated as part of the SWP system, supplies for storage will include both surplus Delta outflow and transfers of storage from Delta and tributary facilities. Off-aqueduct facilities would have first priority for diversion of existing intermittent Delta surplus flows (excluding scheduled entitlements), which will have some effect on existing groundwater banking efforts.

In concept, surface storage filling capacity will be greater than groundwater storage filling capacity; accordingly, surface storage would have second priority for filling relative to off-aqueduct groundwater storage. The relative priority for storage withdrawals is first from surface storage and second from groundwater storage.

Surface Storage. Two volumes of surface storage are contemplated for the initial comprehensive simulations: 750,000 and 1,500,000 acre-feet. A single surrogate facility will be used to assess the aggregate volume of surface storage that can be effectively utilized in conjunction with other facilities. Storage to an off-aqueduct surface reservoir will be simulated in the same manner as has been done for the existing San Luis Reservoir. Initial diversion and release capacities will be assumed to be 3,000 cfs.

Groundwater Storage. A surrogate capacity of up to 500,000 acre-feet will be addressed. Capacity for diversions to storage, extraction, and pumpback to the aqueducts is initially set at 1,000 cfs. In order to extract the stored volume with limited capacity and to ensure creation of space to capture winter surpluses, off-aqueduct groundwater extraction (withdrawal) would have a higher priority than long-term drafts of storage from facilities tributary to the Delta.

Table 1
Phase II Alternatives--Preliminary Ranges for Conveyance and Storage Components

	Existing Channels	Modified Channels	Dual System	
			Modified Channels	Isolated Conveyance
Conveyance (cfs)	up to 15,000	up to 15,000	up to 15,000	from 5,000 up to 15,000
Storage (TAF)				
Sacramento River Tributary	up to 1,500	up to 1,500	up to 3,000	
San Joaquin River Tributary	(1)	(1)	(1)	
Off-Aqueduct	up to 1,000	up to 1,500	up to 1,500	
In-Delta	up to 600	up to 600	up to 600	
Groundwater/Conjunctive Use (TAF)				
Sacramento River Tributary	up to 500	up to 500	up to 500	
San Joaquin River Tributary	(1)	(1)	(1)	
Off-Aqueduct	up to 500	up to 500	up to 500	

(1) Indicated ranges for Sacramento River Tributary are the combined totals. The allocation between Sacramento and San Joaquin Rivers Tributaries has not been determined at this time.

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Table 2
Surface and Groundwater Storage Component Inventory

Name of Alternative	Location	Type	Description
Sacramento River and Tributary Areas			
Butte Basin	Butte County	Groundwater Conjunctive Use	In-lieu and artificial recharge operations
Sacramento County	Sacramento County	Groundwater Conjunctive Use	In-lieu and artificial recharge operations - urban area
Stony Creek Fan	Tehama County Stony Creek	Groundwater Conjunctive Use	In-lieu operations
Thomes Creek Fan	Tehama County Thomes Creek	Groundwater Conjunctive Use	In-lieu operations
Yolo County/Colusa County	Western Yolo and Colusa Counties	Groundwater Conjunctive Use	In-lieu and artificial recharge operations
Yuba County	Yuba County - South of the Yuba River	Groundwater Conjunctive Use	In-lieu operations
Cache Creek	Yolo County Cache Creek	Groundwater Banking	In-lieu and artificial recharge operations
Placer/Sutter Counties	Placer/Sutter Counties	Groundwater Banking	In-lieu and artificial recharge operations
Clay Station	Sacramento County Laguna Creek	Off- Stream Storage	Storage for American River flows
Colusa Reservoir Complex	Colusa County Funks Creek	Off- Stream Storage	Storage for new westside canal and Sacramento flows
Cottonwood Creek Reservoir Complex	Tehama/Shasta Counties Cottonwood Creek	Off- Stream Storage	Storage for new westside canal and Sacramento flows
Countyline Dam and Reservoir	El Dorado/Sacramento Counties - Deer Creek	Off- Stream Storage	Storage for American River flows
Deer Creek Reservoir	Sacramento County near Rancho Murietta	Off- Stream Storage	Storage for American River flows
Dippingvat Reservoir	Tehama County S.F. Cottonwood Creek	Off- Stream Storage	Storage for T-C Canal or new westside canal
Duck Creek Reservoir	Calaveras County Calaveras watershed	Off- Stream Storage	Storage for Mokelumne and Calaveras River flows
Fiddler Reservoir	Tehama/Shasta Counties M.F. Cottonwood Creek	Off- Stream Storage	Storage for new westside canal and Sacramento flows
Glenn Reservoir	Glenn County Stony Creek	Off- Stream Storage	Storage for T-C Canal or new westside canal
Lake Berryessa Enlargement	Napa County Putah Creek	Off- Stream Storage	Storage for North Bay Aqueduct and/or new westside canal
Mountain House	Colusa County Freshwater Creek	Off- Stream Storage	Storage for T-C Canal or new westside canal
Nashville Reservoir	El Dorado/Sacramento Counties - Consumnes Riv	Off- Stream Storage	Storage for American River flows
Paskenta/Newville Reservoir	Glenn County Thomes & Stoney Creek	Off- Stream Storage	Storage for T-C Canal or new westside canal

Table 2
Surface and Groundwater Storage Component Inventory

Name of Alternative	Location	Type	Description
Sites Reservoir	Tehama County Funks & Stone Corral Cks	Off- Stream Storage	Storage for T-C Canal or new westside canal
Squaw Valley Reservoir	Shasta County Squaw Valley Creek	Off- Stream Storage	Storage for Sacramento River flows
Tuscan Buttes Reservoir	Tehama County Paynes & Inks Creeks	Off- Stream Storage	Storage for Sacramento River flows
Waldo Reservoir	Yuba County Dry Creek	Off- Stream Storage	Storage for Yuba River flows
Clair Engle Lake Enlargement	Trinity County Trinity River	Enlarged Existing On-Stream Storage	Increase regulating capabilities and yield opportunities
Folsom Reservoir Enlargement	El Dorado County American River	Enlarged Existing On-Stream Storage	Increase regulating capabilities and yield opportunities
Pardee Reservoir Enlargement	Calaveras/Amador Counties Mokelumne River	New On Stream Storage	Increase regulating capabilities and yield opportunities
Shasta Lake Enlargement	Shasta County Sacramento River	New On Stream Storage	Increase regulating capabilities and yield opportunities
Allen Camp Reservoir	Modoc County Pit River	New On Stream Storage	Increase regulating capabilities and yield opportunities
Antelope Basin Reservoir		New On Stream Storage	Increase regulating capabilities and yield opportunities
Auburn Reservoir	Placer County N.F. American River	New On Stream Storage	Increase regulating capabilities and yield opportunities
Bella Vista Reservoir	Shasta County Little Cow Creek	New On Stream Storage	Increase regulating capabilities and yield opportunities
Canyon Creek Reservoir	Yuba County North Yuba River	New On Stream Storage	Increase regulating capabilities and yield opportunities
Clear Creek ***(Petty Butte)***	Shasta County Clear Creek	New On Stream Storage	Increase regulating capabilities and yield opportunities
Coloma Reservoir	Placer County S.F. American River	New On Stream Storage	Increase regulating capabilities and yield opportunities
Deer Creek Meadows Reservoir	Tehama County Deer Creek	New On Stream Storage	Increase regulating capabilities and yield opportunities
Dry Creek	Tehama County Dry Creek	New On Stream Storage	Increase regulating capabilities and yield opportunities
Freemans Crossing Reservoir	Yuba/Nevada Counties Middle Yuba River	New On Stream Storage	Increase regulating capabilities and yield opportunities
Gallation Reservoir	Tehama County Elder Creek	New On Stream Storage	Increase regulating capabilities and yield opportunities
Garden Bar Reservoir	Sutter County Bear River	New On Stream Storage	Increase regulating capabilities and yield opportunities
Hulen Reservoir	Shasta County N.F. Cottonwood Creek	New On Stream Storage	Increase regulating capabilities and yield opportunities
Kosk Reservoir	Shasta County Pitt River	New On Stream Storage	Increase regulating capabilities and yield opportunities

Table 2
Surface and Groundwater Storage Component Inventory

Name of Alternative	Location	Type	Description
Marysville Reservoir	Yuba County Yuba River	New On Stream Storage	Increase regulating capabilities and yield opportunities
Millville Reservoir	Shasta County S. Cow Creek	New On Stream Storage	Increase regulating capabilities and yield opportunities
Parks Bar Reservoir	Yuba County Yuba River	New On Stream Storage	Increase regulating capabilities and yield opportunities
Rosewood Reservoir	Shasta/Tehama Counties S.F. Cottonwood Creek	New On Stream Storage	Increase regulating capabilities and yield opportunities
Schoenfield Reservoir	Shasta County Red Bank Creek	New On Stream Storage	Increase regulating capabilities and yield opportunities
Wambo Bar Reservoir	Yuba County North Yuba River	New On Stream Storage	Increase regulating capabilities and yield opportunities
Wilson Valley Reservoir	Lake/Colusa Counties Cache Creek	New On Stream Storage	Increase regulating capabilities and yield opportunities
Wing Reservoir	Shasta County Inks Creek	New On Stream Storage	Increase regulating capabilities and yield opportunities
San Joaquin River and Tributary Areas			
Eastern San Joaquin County	San Joaquin County	Groundwater Conjunctive Use	In-lieu and artificial recharge operations
James I.D.	Fresno County	Groundwater Banking	In-lieu and artificial recharge operations
Kern County	Kern County	Groundwater Banking	In-lieu and artificial recharge operations
Madera Ranch	Madera County	Groundwater Banking	In-lieu and artificial recharge operations
Mojave River Basins	Los Angles/King Counties	Groundwater Banking	In-lieu and artificial recharge operations
Montgomery Area	Eastern Stanislaus Cty	Groundwater Banking	In-lieu and artificial recharge operations
Montgomery Reservoir	Stanislaus County Dry Creek	Off- Stream Storage	Capture and store spills from Lake McClure
South Gulch Reservoir	San Joaquin County South Gulch trib to Calaveras Riv	Off- Stream Storage	Store flows from the Calaveras and Stanislaus Rivers
Upper Del Valle	Alameda County	Off- Stream Storage	Off stream storage for the South Bay Aqueduct
Hungry Hollow Dam and Reservoir	Tulare County Deer Creek	Off- Stream Storage	Storage for Friant Canal or new Eastside Canal
Farmington Reservoir Enlargement	San Joaquin County Littlejohns Creek	New On Stream Storage	Increase flow regulating opportunities
Millerton Lake Enlargement	Fresno County San Joaquin River	New On Stream Storage	Increase flow regulating opportunities

Table 2
Surface and Groundwater Storage Component Inventory

Name of Alternative	Location	Type	Description
In Delta Storage			
Delta Wetlands Project	Sacramento/San Joaquin Delta	Off- Stream Storage	Island Storage Southern Delta
Chain of Lakes Facility	Sacramento/San Joaquin Delta	Off- Stream Storage	A Chain of Contiguous Island Storage Facilities from the North Delta to the Export Facilities
Off-Aqueduct Storage			
Del Puerto Reservoir	Stanislaus County Del Puerto Creek	Off- Stream Storage	Off aqueduct storage for the California Aqueduct
Garzas Reservoir	Stanislaus County Garzas Creek	Off- Stream Storage	Off aqueduct storage for the California Aqueduct
Kellogg Reservoir	Contra Costa County Kellogg Creek	Off- Stream Storage	Off aqueduct storage for the California Aqueduct
Little Salado-Crow Reservoir	Stanislaus County Crow Creek	Off- Stream Storage	Off aqueduct storage for the California Aqueduct
Los Banos Grande	Merced County Los Banos Creek	Off- Stream Storage	Off aqueduct storage for the California Aqueduct
Orestimba Reservoir	Stanislaus County Orestimba Creek	Off- Stream Storage	Off aqueduct storage for the California Aqueduct
Ortigalita Reservoir	Merced County Ortigalita Creek	Off- Stream Storage	Off aqueduct storage for the California Aqueduct
Romero Reservoir	Merced County Romero Creek	Off- Stream Storage	Off aqueduct storage for the California Aqueduct
Salt Creek Reservoir	Merced County Salt Creek	Off- Stream Storage	Off aqueduct storage for the California Aqueduct
Sunflower Reservoir	Kings/Kern Counties Avenal Creek	Off- Stream Storage	Off aqueduct storage for the California Aqueduct

Table 3
Conveyance Components

Name of Component	Location	Description
WESTSIDE (NORTH)		
Westside Sacramento Valley Conveyance Alt. A	Shasta Lake to Sites Reservoir	Connects Westside Reservoirs
Westside Sacramento Valley Conveyance Alt. B	Shasta Lake to Sites Reservoir	East of Reservoir Alignment
Cottonwood/Redbank Canal	Cottonwood Creek to Redbank Creek	Cottonwood Creek diversion to Cottonwood/Redbank Canal to Redbank Creek to Tehama-Colusa Canal
Tehama-Colusa Canal Enlargement	Red Bluff Diversion to Sites Reservoir	
Chico Landing Intertie	Sacramento River to Tehema-Colusa Canal	
Oroville Intertie	Lake Oroville to Sites Reservoir	Multiple large-diameter pipelines
WESTSIDE (SOUTH)		
Tehama-Colusa Canal Enlargement	Sites Reservoir to Present Terminus	
Tehama-Colusa Canal Extension	Tehama-Colusa Canal Terminus to No.Bay Aqueduct	
Tehama-Colusa Canal Extension	Tehama-Colusa Canal Terminus to Clifton Court Forebay	Tunnelled crossing of Delta, direct discharge into California Aqueduct or Delta-Mendota Canal
Berryessa Intertie	Tehama-Colusa Canal to Lake Berryessa	Tunnel
EASTSIDE FOOTHILLS		
Eastside Canal	Folsom-South Canal to Merced River	Approximate 51 miles Farmington, Cooperstown and Montgomery Pumping Plants
Eastside Foothills Conveyance Facility	Sacramento River (upstream of Feather River confluence) and Feather River (upstream of Sacramento River confluence) to	
Folsom-South Canal (Enlarged)	Folsom-South Canal @ Hood-Clay Canal Interconnection to Proposed Eastside Canal	Approximately 31 miles
Hood-Clay Canal	Sacramento River @ Hood-Freeport to Folsom South Canal	18.7 miles with 3 pumping plants

Table 3
Conveyance Components

Name of Component	Location	Description
San Joaquin East-West Aqueduct	Eastside Canal to California Aqueduct and Delta-Mendota Canal	
DUAL DELTA		
Isolated Conveyance Facility		
Alternative A	Sacramento River @ Hood-Freeport to Clifton Court Forebay	41.5-mile buried pipeline, single screened intake and pumping facility at Hood
Alternative B	Sacramento River @ Hood-Freeport to Clifton Court Forebay following I-5 Alignment	48.7-mile buried pipeline, two screened intakes - Hood and Freeport, one pumping plant. Alignment follows I-5 south past Stockton, then SW to Clifton Court Forebay.
Alternative C	Sacramento River @ Hood-Freeport to Clifton Court Forebay, east of Highway 99 Alignment	68.3-mile buried pipeline, two screened intakes - Hood and Freeport. Possible intertie with Folsom-South Canal.
EASTSIDE		
Isolated Conveyance Facility	Sacramento River @ Hood-Freeport to Clifton Court Forebay	43-mile earth channel, single screened intake, and pumping facility at Hood.
CHAIN OF LAKES		
Chain of Lakes Isolated Facility	Sacramento River in North Delta to Clifton Court Forebay	A chain of islands will be converted into water storage reservoirs connected by large inverted siphons.
SHIP CHANNEL		
Ship Channel Conveyance	Upstsram of Bryte to Isolated Conveyance Facility	Divert water from Sacramento River upstream of Bryte. Utilize either Yolo Bypass or Sacramento Ship Channel to convey water to Liberty Island. Cross Ryer Island and Grand Island, Sacramento River, and join isolated conveyance facility.

Table 3
Conveyance Components

Name of Component	Location	Description
MISCELLANEOUS		
Cache Creek - Sac.River Canal	Cache Creek toSac. River	
Delta Mendota Canal Enlargement	Clifton-Court Forebay to Mendota Pool	
Eastside Canal Extension	Merced River to Kern River	Approximately 230-mile-long canal, possible interconnection with Cross Valley Canal, Little Dry Creek Pumping Plant.
Friant-Kern Canal Enlargement	Friant-Kern Intertie to White River	
Import from Sacramento River	Cache Creek to Willow Canal	
Knights Ferry Diversion Canal	Tulloch Reservoir to Eastside Canal	
Mid-Valley Canal (Main Branch)	Mendota Pool to White River	
Mid-Valley Canal (North Branch)	Mendota Pool to Chowchilla	
Mid-Valley Canal (Main Br. Intertie)	Mendota Pool to Friant-Kern Intertie	
Porterville-Bakersfield Canal	Hungry Hollow Reservoir to Bakersfield	46.5-mile-long canal begins at Deer Creek and terminates 10 miles north of Bakersfield, Deer Creek and Hungry Hollow Pumping
Stony Creek Conveyance Channel	Black Butte Reservoir to Sacramento River	
South Bay Aqueduct Enlargement	Delta to Del Valle Turnout	
San Luis to Tehachapi Parallel Canal	San Luis to Wheeler Ridge	
Tuolumne River to Stanislaus Conveyance Facility	Tuolumne River to Stanislaus River	

Table 4 (sheet 1 of 2)
Example of Storage and Conveyance Component Attribute Matrix

Name of Component	Location	Type	Component Description	Storage/Conveyance Capacity (cfs or taf)	Constructability Issues	Construction Time (years)	Cost		Component Specific Environmental Evaluation
							Construction 1996 $M	Annual O&M 1996 $M	
Orestimba Reservoir	Stanislaus County Orestimba Creek	Off-Stream Storage	Storage for the California Aqueduct	150-620[1]	Not available	Not available	890	Not available	Inundate 33 miles of Orestimba Creek Inundate 2200 acres of wildlife habitat
Lake Berryessa Enlargement	Napa County Putah Creek	Enlarged On-Stream Storage	Storage for the North Bay Aqueduct, extended Tehama Colusa Canal, or new westside canal	13,000	Seismic activity from 4 active faults. Filling reservoir increases seismic activity.	Not available	1,208	72	Diversion could impact fisheries Loss of wildlife habitat Diversion route would result in loss of farmland and interferes with existing water distribution and drainage
Isolated Delta Conveyance Facility Alternative A	Sacramento River @ Hood-Freeport to Clifton Court Forebay	Isolated Delta Conveyance Facility	41.5-mile buried pipeline, single screened intake and pumping facility at Hood	5,000 cfs	High groundwater; seismic risk	6.0	2,593.0	50.5	3 archaelogical sites exist in ROW 7 historical sites exist in ROW Loss of crop during construction 6 sensitive wildlife species exist in ROW

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Table 4 (sheet 2 of 2)
Example of Storage and Conveyance Component Attribute Matrix

Name of Component	Legal and Institutional Issues	Source Water Quality	Site/Route Land Ownership and Use	Socioeconomic Issues	Compatibility	References
Orestimba Reservoir	Not available	Orestimba Creek Good quality	Public and private lands No known conflict	Not significant	Very good	[1]DWR, May 1984
Lake Berryessa Enlargement	Legal opposition very likely Pope Valley area will be very sensitive	Lower Sacramento River Good quality	Public and private lands	ROW acquisition	Very good	CVPIA, 1996
Isolated Delta Conveyance Facility Alternative A	Lower Sacramento River Good quality	Lower Sacramento River Good quality	Combination of public and private lands; no known conflicts	ROW acquisition	Very Good	Draft memorandum dated 1/29/96 to Steve Yeager (CALFED) from Stein Buer (DWR)

Table 5
Conveyance and Storage Simulation Studies
Initial Set (Boundary Conditions)

	Benchmark Study	Run 1	Run 2	Run 3	Run 4	Run 5
Channel Conveyance (cfs)	Existing	7,500	15,000	0	Existing	Existing
Isolated Facility (cfs)	-----	15,000	0	15,000	5,000	10,000
Storage (TAF)						
Sacramento River Tributary	-----	3,000	3,000	0	0	1,500
San Joaquin River Tributary	-----	(1)	(1)	(1)	(1)	(1)
In-Delta	-----	400	400	0	0	200
Off-Aqueduct	-----	1,500	1,500	0	1,500	750
Conjunctive Use (TAF)						
Sacramento River Tributary	-----	500	500	0	0	250
San Joaquin River Tributary	-----	(1)	(1)	(1)	(1)	(1)
Off-Aqueduct	-----	500	500	0	500	250

(1) Indicated ranges for Sacramento River Tributary are the combined totals. The allocation between Sacramento and San Joaquin Rivers Tributaries has not been determined at this time.

Attachment 1

Preliminary Outline
Draft Conveyance/Storage Evaluation Report
CALFED Bay-Delta Program

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Preliminary Outline
Draft Conveyance/Storage Evaluation Report

Storage and Conveyance Component Refinement
CALFED Bay-Delta Program

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1. EXECUTIVE SUMMARY

2. PURPOSE AND OBJECTIVES

   2.1 Purpose and Objective of Task
   2.2 Organization of Report

3. BACKGROUND

   3.1 Programmatic EIR/EIS for Program
      3.1.1 Existing Conditions
      3.1.2 No-Action Alternative

4. CONVEYANCE, STORAGE AND CONJUNCTIVE USE COMPONENTS

   4.1 Inventory and Characterization of Potential Components
      4.1.1 Conveyance
      4.1.2 Surface and Groundwater Storage
      4.1.3 Conjunctive Use
   4.2 Ranking of Components
   4.3 Component Bundling for Operations Analysis
   4.4 Variances with No-Action Alternative

5. WATER QUALITY ANALYSIS

   5.1 Ongoing Studies
   5.2 Assumptions and Criteria for Operations Analysis
      5.2.1 Parameters of Interest
      5.2.2 Key Monitoring Locations
   5.3 Performance Measures

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Attachment 2

1. **Draft Storage and Conveyance Refinement Process**

2. **Preliminary Draft of DWR Planning Simulation Model (DWRSIM) Assumptions for CALFED Alternative Conveyance/ Storage Facilities**

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Storage and Conveyance Alternative Component Refinement Process

Prepared by the CALFED Storage and Conveyance Refinement Team
August 9, 1996

I. Introduction

The purpose of the storage and conveyance component refinement process is to develop a range in which the storage and conveyance components are reasonably well balanced in capacities. By this we mean that all components would operate efficiently over a normal range of hydrologic conditions, thus incurring the least cost and environmental impact associated with providing water supply opportunities. The ranges developed in this process will be further refined in Phase II. In addition, a full range of operating assumptions and impact analyses will be conducted in Phase II.

The refinement process evaluates various storage and conveyance components, including north of Delta surface storage and conjunctive use, through-Delta and dual transfer conveyance, in-Delta storage, and south of Delta surface storage and conjunctive use. The effect of various combinations of these components, added to the existing water management infrastructure, will be modeled using DWRSIM.

As a starting point, the combination of facilities shown in Table 1 will be simulated using DWRSIM. Based on the preliminary results of these simulations, further changes and refinements will be made to achieve balanced combinations of components.

At this stage of the analysis it is impossible to anticipate what changes in operational rules may eventually be selected for operating the system to achieve environmental and water supply goals. For the most part, it was assumed that the system would be operated according to existing rules, including the May 1995 Water Quality Control Plan. Additional assumptions were required to operate the proposed additional storage and conveyance components. These assumptions are set forth in the attached "**DWR Planning Simulation Model (DWRSIM) Assumptions for CALFED Alternative Conveyance/Storage Facilities**". The following paragraphs provides additional detail regarding the Team's reasoning in arriving at these assumptions, as well as caveats regarding their intended use.

II. Water Supply Opportunities

The proposed surface and groundwater storage components north of the Delta would be filled only after existing demands for water are met, including in-basin consumptive use, in-stream flow requirements, and Delta protective standards. In addition, this analysis also assumes that the Sacramento River system would be operated to provide seasonal flushing flows to restore river gravels, to maintain the river meander zone above Chico Landing, and to move salmon smolts downstream. A preliminary evaluation of the historical record suggests that when Sacramento

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River flow at the latitude of Hamilton City (River mile 200) equal or exceed 250,000 acre feet, the river will experience peak flow in the range of 30,000 cfs to 60,000 cfs. For the sake of this preliminary analysis, these flows are deemed to be sufficient to meet the need for seasonal flushing.

Accordingly, in deciding when to divert surface flows to storage in a particular water year, DWRSIM will test to make sure that all existing water requirements, including Delta standards, are met and that at least one monthly flow has exceeded 250 taf. The same rule would be applied to determine when flows could be diverted to groundwater storage. If flows are limiting, DWRSIM would give a higher priority to filling ground water storage reservoirs and second priority to filling surface water storage. The reason for this is that diversion rates to groundwater are often limited by the rates at which water can be injected or infiltrated to storage.

III. Accounting for Water Supply Benefits and Impacts

It is likely that future storage and conveyance components would be integrated into both the State Water Project and Central Valley Project, with an effect on the water supply from both systems. At this point in the process, we really have no criteria for allocating the components between the two existing systems, and it is likely that the impact on total State water supplies would be about the same. Therefore it is assumed that the new components are all added to the SWP.

Similarly, there are many ways to allocate new supplies between environmental, agricultural, and urban needs but it is premature to attempt to distribute the water during this refinement process. Rather, the incremental change in SWP supplies will be taken as an index of net water supply available for all beneficial purposes.

IV. Conveyance Assumptions

The 1994 Bay-Delta Accord is based on the need to protect a wide range of beneficial uses, based on the existing configuration of the Bay-Delta system. A significant alteration of the existing through-Delta water supply system would likely require a re-evaluation both to assure that beneficial uses are protected and to assure that operating rules are not unnecessarily restrictive.

Among the most likely candidates for re-evaluation would be the Delta export-inflow ratio standards, designed to limit entrainment of eggs, larvae, and fish at export facilities. If part of the inflow to the Delta is diverted through one or more screened intakes into an isolated conveyance channel, that portion of the inflow could be either counted as part of the Delta inflow or subtracted from the Delta inflow. Similarly, export flows taken through an isolated conveyance could be counted either way. Thus there are four possible ways to compute the new export-inflow ratio. The two most likely approaches would be to:

o Include the isolated component in both inflow and export when computing the ratio.

o Delete the isolated flow from both inflow and export when computing the ratio.

In order to gain some insight into the sensitivity of the system to changes in this criterion it was decided to run the evaluations both ways.

V. Surface Storage Facility Assumptions

In order to evaluate the performance of the various storage components we needed to assume specific locations, capacities, and operating rules for filling and emptying. For example, as a surrogate for north of Delta surface storage we assumed a reservoir in the foothills west of Colusa. For south of Delta surface storage, we assumed a reservoir in the vicinity of the existing San Luis Reservoir.

For in-Delta storage, specific islands were not selected. However, the assumption was made that the islands would be close enough to the SWP and CVP export facilities to provide direct connections through a series of siphons, thus eliminating the need to screen export water from this source twice.

It is important to emphasize that these choices in no way reflect an endorsement of or rejection of specific facilities. Detailed site and facility evaluations would not take place until Phase II or Phase III of the process.

VI. Conjunctive Use Facility Assumptions

A groundwater storage complex on the Kern River fan was assumed for south of Delta groundwater storage due to previous planning investigations and operational experience with region.

The evaluation of north of Delta conjunctive use of groundwater was more simplistic due to the lack of detailed hydro-geologic information and lack of operational experience.

The overall approach was to identify areas within the Sacramento Valley in which there was significant isolation between surface water and groundwater. Where such isolation does not occur, pumping from groundwater simply depletes surface water in the region with very little time delay, in effect yielding no additional storage over time. For the areas selected, natural recharge from surface water is assumed to occur over periods ranging from two to five years.

The basins consist of the following areas:

Butte Basin - that portion of Butte County east of the Sacramento River, west of the Feather River and north of the Sutter Buttes. (contains small portions of Sutter and Yuba Counties).

Yuba/American Basin - those portions of Yuba, Sutter and Placer Counties west of the Feather

River and north of the Sacramento County line.

Valley Westside - the portion of the valley west of the Sacramento River and south of the Tehama/Glenn County line.

Sacramento County Basin - Sacramento County.

For the sake of modeling efficiency, it was assumed that the groundwater basins could be simulated as a single basin, with composite recharge, storage, and discharge characteristics. This basin would be incorporated into DWRSIM through a single node, through which flow project recharge, non-project recharge, and pumped withdrawals from storage.

A maximum of 500,000 acre-feet of operable groundwater storage capacity was assumed. A maximum project recharge rate of 500 cfs and discharge rate of 1000 cfs were assumed. In addition, the total annual recharge volume was limited to less than the full 500,000 acre-feet to reflect hydro geologic constraints, particularly in the Sacramento County basin.

Non-project recharge will be accounted for in project operations whenever the groundwater basins are only partly filled. The rate of recharge is greatest when the groundwater basin is empty, then diminishes as it fills. These rules crudely simulate the natural recharge pattern. Whenever artificial recharge occurs, the simulated volume of water in storage is updated, and the natural recharge rate adjusted downward accordingly.

Table 1.
Conveyance and Storage Simulation Studies--Initial Set (Boundary Conditions)

	Base Study	Run 1	Run 2	Run 3	Run 4	Run 5
Channel Conveyance (cfs)	Existing	7,500	15,000	0	Existing	Existing
Isolated Facility (cfs)	-----	15,000	0	15,000	5,000	10,000
Storage (TAF)						
Tributary	-----	3,000	3,000	0	0	1,500
Sacramento Valley						
San Joaquin Valley						
In-Delta	-----	400	400	0	0	200
Off-Aqueduct	-----	1500	1,500	0	1,500	150
Conjunctive Use (TAF)						
Tributary	-----	500	500	0	0	250
Off-Aqueduct	-----	500	500	0	500	250

PRELIMINARY DRAFT - SUBJECT TO REVISION

DWR PLANNING SIMULATION MODEL (DWRSIM) ASSUMPTIONS FOR CALFED ALTERNATIVE CONVEYANCE/STORAGE FACILITIES

The following assumptions overlay DWRSIM Base study assumptions for compliance with the SWRCB's May 1995 Water Quality Control Plan. The Base study assumes a hydrology defined by 1995 level of development and demands for a 2020 level of development. The Base study meets instream flow requirements, including selected ESA and CVPIA criteria.

I. SYSTEM DESCRIPTION

The modeled system includes all existing CVP and SWP facilities and the following CALFED alternative conveyance and storage facilities. For modeling convenience, these alternative facilities are assumed to be SWP facilities.

A. South Delta Improvements (SDI): These facilities include barriers, channel dredging, a new Clifton Court Forebay intake. A permit to operate Banks Pumping Plant at 10,300 cfs capacity is assumed.

B. North-of-Delta Surface Storage (NDSS): This facility diverts spills and unregulated flows from Oroville and/or Shasta Reservoirs. Facility location is assumed in the foothills west of Colusa.

C. North-of-Delta Groundwater Storage (NDGS): The groundwater storage facilities are modeled as a single basin with composite hydrogeologic characteristics. Facility location is assumed north of Sacramento.

D. Delta Conveyance (DC): Conveyance is provided through existing Delta channels and/or an isolated facility at in the vicinity of Hood.

E. In-Delta Storage (IDS): Three or more islands provide in-Delta storage. These islands are physically linked to Clifton Court Forebay.

F. South-of-Delta Surface Storage (SDSS): Facility location is assumed near the existing San Luis Reservoir.

G. South-of-Delta Groundwater Storage (SDGW): Facility location is assumed on the Kern River fan.

II. SYSTEM STORAGE AND RELEASE CONSIDERATIONS

A. In any year, excess (surplus) flows that follow a monthly "flushing" volume of at least 250 TAF may be diverted to NDSS, NDGS and IDS, up to facility diversion and storage capacities.

B. All new surface storage is included in system carryover. However, only a fraction of new groundwater storage is included in system carryover. The Base study delivery-carryover storage curve is modified to account for increased carryover with added facilities.

C. The order of priority for storage diversions upstream of export facilities is as follows: (1) NDGS, (2) NDSS and (3) IDS. The order of priority for storage diversions downstream of export facilities is as follows: (1) SDGS, (2) SDSS and (3) SWP San Luis Reservoir.

D. The order of priority for storage releases to meet demands is as follows: (1) IDS, (2) SDSS, (3) SDGS and (4) SWP San Luis Reservoir. The order of priority for storage transfer is as follows: (1) NDSS and (2) NDGS.

E. Oroville releases are balanced with NDSS releases.

F. SWP San Luis releases are balanced with SDSS releases.

III. OPERATION OF ALTERNATIVE FACILITIES

A. North-of-Delta Surface Storage (NDSS)

1. Maximum and minimum reservoir storage capacities are 3 MAF and 50 TAF, respectively. Evaporation losses and local inflows are incorporated in reservoir operations.

2. Maximum reservoir diversion and release capacity is 5,000 cfs. Monthly diversion rates are a function of Delta surpluses and the monthly thresholds provided in Item IIA.

B. North-of-Delta Groundwater Storage (NDGS)

1. An operable capacity of 500 TAF is assumed.

2. Natural recharge from streamflow depletion is assumed to be a function of available storage capacity. The aggregate annual percentage of available storage applied in the five years subsequent to the last project withdrawal or recharge operation is assumed as follows: 25% in the first year, 14% in the second year, 10% in the third year, 7% in the fourth year and 5% in the fifth year.

3. A maximum recharge rate of 500 cfs and a maximum pumping rate of 1,000 cfs are assumed.

4. A maximum annual extraction of 425 TAF is assumed.

5. Net depletion of groundwater storage is not permitted over the study period.

C. Delta Conveyance Facilities (DC)

1. DC is modeled as a combination of through-Delta and isolated facility conveyance.

2. The size of existing cross channel gates is increased to accommodate higher conveyance through Delta channels.

3. The maximum capacity of the isolated component of DC is 15,000 cfs.

4. Monthly conveyance through the isolated component of DC can be limited to specified percentages of total Delta export to address south Delta water quality problems:

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX

5. Two export-inflow ratios will be considered when diversions are made through the isolated component of DC:

a. Diversion are excluded from Delta inflow and export computations.

b. Diversion are included in Delta inflow and export computations.

D. In-Delta Storage Facilities (IDS)

1. Diversions are classified as exports in the export-inflow ratio and follow the export-inflow ratio criteria.

2. Diversions are stored in accordance with the priorities outlined in Item IIC.

3. Maximum storage capacity is 400 TAF.

4. Maximum diversion and release capacity is 5,000 cfs.

5. Facilities are physically linked to Clifton Court Forebay through siphons. Therefore, releases from storage are not limited by the export-inflow ratio and do not require additional screening.

6. Evaporation losses are included in Delta consumptive use estimates.

E. South-of-Delta Surface Storage (SDSS)

1. Maximum and minimum reservoir storage capacities are 1.73 MAF and 50 TAF, respectively. Evaporation losses and local inflows are included in reservoir operations.

2. Maximum diversion and release capacity is 3,500 cfs.

3. San Luis (SWP) and SDSS operations are triggered by combined south-of-Delta target storage (South-of-Delta rule curve). This combined storage is filled during some high outflow periods and with storage transfer from upstream reservoirs.

4. First priority is given to SDSS diversions and releases when balancing with San Luis Reservoir operations (see Items IIC and IID).

F. South-of-Delta Groundwater Storage (SDGS)

1. Maximum storage capacity is 500 TAF.

2. Recharge operations are based on surplus Delta outflow and storage transfer.

3. Maximum recharge and extraction capacities are 500 cfs and 1,000 cfs, respectively.

4. Recharge and extraction are functions of SWP delivery and Oroville storage.

PHH August 9, 1996

Attachment 3

Elements of Existing Conditions and No-Action Alternative (July 11, 1996 Existing Conditions, No-Action, and Cumulative Action Workshop)

ELEMENTS OF EXISTING CONDITIONS

This section discusses the existing elements to be included, and the reasons for their inclusion, as part of existing conditions for preparation of the Programmatic EIR/EIS being developed for the CALFED Bay-Delta Program. Elements include the long-term biological opinions for winter-run chinook salmon and delta smelt, the Coordinated Operations Agreement (COA), water conservation, and CVPIA actions that been implemented to date.

Bay-Delta Water Quality Standards

SWRCB's May 1995 interim water quality control plan (95-1 WR) will be incorporated into the existing conditions baseline. The plan was an outgrowth from the December 15, 1994 Bay-Delta Accord. Because the interim water quality control plan is currently in place, CALFED believes that it should be included. Some participants have expressed concern about using this decision because it has led to a reduction in available water supplies. To address this issue, CALFED is considering conducting an analysis of recent hydrologic conditions to document the effects of the SWRCB decision.

Biological Opinions

The long-term biological opinions governing operations of the Central Valley Project (CVP) and State Water Project (SWP) are proposed to be included as part of existing conditions.

Coordinated Operations Agreement

The current COA is proposed to be included as part of existing conditions. COA has been in place for many years and has governed the operations of CVP and SWP.

Central Valley Project and State Water Project Facilities

All existing CVP and SWP facilities and their current operations are proposed for inclusion as part of existing conditions.

Trinity River Flows

Trinity River flows are the subject of a separate ongoing study. For purposes of CALFED, Trinity River flows will be assumed to be 340,000 acre-feet per year (af/yr) in all year types. This assumption generally reflects current operations of the Trinity River system.

Contract and Water Rights Deliveries

Appropriate assumptions for contract and water rights deliveries under existing conditions are under consideration by CALFED. One possible approach is to use actual deliveries over a period of recent years to establish appropriate assumptions.

Water Conservation

Current water conservation levels as estimated in California Department of Water Resources Bulletin 160-93 are proposed for inclusion as part of existing conditions.

Power

Current power production policies are proposed for inclusion as part of existing conditions. Power is assumed to be produced incidental to CVP operations and current wheeling arrangements are assumed to be in place.

Population Projections

It is proposed that current population estimates will be based on census data.

CVPIA Actions

CALFED proposes to include the dedication of up to 800,000 af/yr of CVP water for fish and wildlife enhancement, the delivery of firm "Level 2" water supplies to wildlife refuges, and the "ramping up" of deliveries to refuges to "Level 4" quantities within the existing conditions scenario. Wildlife refuges are assumed to have received 30% of the additional increment of Level 4 water supplies as of 1995. Because these quantities have been delivered only as firm water for a very short period of time (since enactment of CVPIA) the discussion of existing conditions will describe conditions both prior to and since enactment of CVPIA under several resource categories.

Instream Flow Requirements

CALFED proposes to include instream flow requirements currently in place as part of existing conditions. These include Federal Regulatory Energy Commission (FERC) requirements on the Mokelumne and Tuolumne Rivers and upstream river conditions related to temperature as required in the biological opinions for winter-run chinook salmon and delta smelt.

ELEMENTS OF NO-ACTION ALTERNATIVE

This section discusses the elements assumed to be included, and the reasons for their inclusion, as part of the No-Action Alternative for preparation of the Programmatic EIR/EIS being developed for the CALFED Bay-Delta Program. Elements discussed below are similar to those discussed under existing conditions and include such items as Bay-Delta water quality standards, the long-term biological opinions for winter-run chinook salmon and delta smelt, and the COA.

Bay-Delta Water Quality Standards

CALFED has determined that SWRCB's May 1995 water quality control plan (95-1 WR) should be incorporated into the No-Action Alternative because it is representative of the standards that are likely to be used in the future.

Biological Opinions

The long-term biological opinions governing operations of CVP are assumed to apply to the No-Action Alternative. Although these opinions may be modified, CALFED believes that the current opinions represent a reasonable approximation of future requirements for delta smelt and winter-run chinook salmon under the No-Action Alternative.

Coordinated Operations Agreement

CALFED proposes to include the current COA in the No-Action Alternative. Although various changes may be made to the COA to reflect future changes in operational requirements, there is no specific information on what these future changes may include; therefore, CALFED believes that the current COA represents the best available information.

CVP and SWP Facilities

Although there are numerous proposals under consideration to modify and add to CVP and SWP facilities, none of these proposals have received complete environmental and regulatory approval; therefore, for purposes of the No-Action Alternative, CALFED proposes to include only currently operating facilities. Major modifications and additions to these facilities will be included, as appropriate, to the cumulative impact analysis.

Trinity River Flows

Trinity River flows are the subject of a separate ongoing study. CALFED proposes to include minimum flows of 340,000 af/yr as a baseline measurement in the No-Action Alternative. The Trinity River study is examining the need for higher flows; these higher flows will be considered in the study's cumulative impact analysis. Additionally, CALFED will consider

conducting additional analysis, if appropriate, to determine what effect changes to these flows might have on water availability and sensitive resources.

Contract and Water Rights Deliveries

Appropriate assumptions for contract and water rights deliveries under the No-Action Alternative are under consideration by CALFED. One possible approach is to assume that water rights and CVP and SWP contract amounts are delivered unless such deliveries would be restricted by other requirements or current physical facility limitations.

Water Conservation

CALFED proposes to assume the conservation levels under future conditions that are described in DWR Bulletin 160-93.

Power

CALFED proposes to assume that CVP power will continue to be generated incidental to CVP operations and that no power generation optimization would occur. CALFED also proposes to assume that a wheeling or similar arrangement would be in place to assist in CVP power marketing and delivery.

Population Projections

CALFED proposes to use future statewide population projections contained in DWR Bulletin 160-93.

CVPIA Actions

CALFED proposes to include the dedication of up to 800,000 af/yr of CVP water for fish and wildlife enhancement and delivery of "Level 4" quantities of water to wildlife refuges in its No-Action Alternative. Level 4 water supplies to wildlife refuges must be delivered by 2004 and are assumed to continue through the timeframe being considered by CALFED.

Instream Flow Requirements

In developing hydrologic modeling assumptions for the No-Action Alternative, CALFED will need to establish a reasonable scenario for future water use and instream flow assumptions for future years. For example, there are substantial entitlements to water in the American River system that are not currently being fully used. CALFED does not believe that it is appropriate to assume full contract and water right deliveries under the No-Action Alternative because, in some cases, substantial new and costly facilities would be required to make those deliveries. Those deliveries are most likely to be constrained by institutional, regulatory, and ecosystem requirements; and such an assumption would not recognize the recent cooperative approach to integrated water-resource planning that is being undertaken by California water

interests. Over the next several months, CALFED will be working to develop appropriate assumptions.

Monterey Agreement

The Monterey Agreement was approved in 1995 and environmental documentation on the agreement was subsequently challenged in court. The court recently upheld the environmental documentation and the agreement is therefore considered appropriate to include in the No-Action Alternative. The Monterey Agreement includes 14 principles for water management for the SWP.

Projects Included in the No-Action Alternative

The following projects are being considered for inclusion in the No-Action Alternative:

- Kesterson Reservoir Cleanup Program,
- Shasta Temperature Control Device,
- Spring Creek Toxicity Program,
- Stone Lakes National Wildlife Refuge,
- Cache Creek Basin Improvements,
- Sacramento River Flood Control System Evaluation (partial),
- West Sacramento Project,
- Coastal Aqueduct,
- Kern Water Bank (phases already completed or under construction),
- Sacramento-San Joaquin Delta Levees Subvention Project,
- Central Valley Project Improvement Act (dedication of 800,000 af/yr and portion of incremental Level 4 water to refuges),
- Interim Reoperation of Folsom Reservoir, and
- Los Vaqueros Reservoir Project.