ITEM: ACTION ITEMS

26. RECEIVE REPORT ON THE POTENTIAL FOR INCREASING THE STORAGE CAPACITY OF LOS PADRES RESERVOIR

Meeting Date:	**June 15, 2009**	**Budgeted:**	**No**
From:	**Darby Fuerst, General Manager**	**Program/ Line Item No.:**	**N/A**
Prepared By:	**Andrew M. Bell**	**Cost Estimate:**	**N/A**

General Counsel Approval: N/A
Committee Recommendation: N/A
CEQA Compliance: N/A

SUMMARY: In 2008, the Board directed staff to investigate the feasibility of increasing the storage capacity of Los Padres Reservoir. The purpose of the project would be to create additional storage capacity in the reservoir so that stored water could be released to increase streamflow in the Carmel River to benefit the river and its associated environment. This report is an update on what District staff has learned in regard to the concerns of various parties and the technical and regulatory requirements that would apply to various options for increasing the reservoir capacity.

RECOMMENDATION: The Board should receive staff's presentation, and open the meeting to the public for comment. If the Board wishes further action by staff, the Board should provide direction as to what action is desired.

BACKGROUND: At the February 28, 2008 Board meeting, the Board approved a request by Director Brower to direct staff to prepare, for review at a future Board meeting, a report regarding the feasibility of increasing the height of the existing Los Padres Dam. Staff presented a report on three basic options for increasing reservoir capacity to the Board for the April 21, 2008 meeting (see **Exhibit 26-A**, the staff note for that item, and **Exhibit 26-B**, a memorandum report by District Engineer Andrew Bell dated April 7, 2008). The Board directed staff to confer with NOAA Fisheries, California Department of Fish and Game, and California America Water regarding a potential project to increase the capacity of Los Padres Reservoir.

Los Padres Dam, constructed in 1948 and 1949 by California Water and Telephone, a predecessor of California American Water, is an embankment dam (zoned earthfill) approximately 150 feet high. It is located on the Carmel River at River Mile 24.8, approximately 12 miles southeast of Carmel Valley Village near the settlement of Princes Camp. When built, the reservoir had a capacity of 3,030 acre-feet, but due to accumulation of sediment, the storage capacity has decreased to approximately 1,770 acre-feet.

Increasing the height of the dam would require extensive engineering, geotechnical, and planning efforts. In order to evaluate the technical feasibility of this project, the District would need to

retain experts in dam construction and rehabilitation. A summary of factors to consider is provided in **Exhibit 26-B**. Two alternatives to increasing the height of Los Padres Dam that could be considered are also described in this report: (1) sediment that has accumulated in Los Padres Reservoir could be removed; and (2) an inflatable dam could be installed in the existing spillway and raised to create additional storage space when it is deemed safe to do so.

Activities and Findings Since April 21, 2008 Board Meeting

Since the April 21, 2008 Board meeting, District staff has contacted the following entities to learn their concerns regarding projects that would increase the storage capacity of Los Padres Reservoir:

National Marine Fisheries Service (NOAA Fisheries)
California Department of Fish and Game (CDFG)
California American Water (CAW)
California Department of Water Resources, Division of Safety of Dams (DSOD)

The federal and state resource agencies, NOAA Fisheries and CDFG, have been working with CAW and others regarding means to improve fish passage at Los Padres Dam, primarily downstream passage for steelhead. NOAA Fisheries and CDFG would be generally supportive of increasing storage capacity in the reservoir to enhance instream flows, but any project would need to incorporate or facilitate fish passage improvements. District staff have asked for input from NOAA Fisheries and CDFG, but no specific comments on any of the options have been provided by these agencies to the District to date.

CAW, as owner of the dam, would need to be in agreement with any modifications to the dam or with a dredging project. CAW General Manager Craig Anthony has indicated CAW has no interest in raising the dam or spillway elevation to increase storage capacity.

In CAW's General Rate Case application for 2009, 2010, and 2011, CAW proposed approval of $200,000 for a dredging feasibility study for Los Padres Reservoir. The November 2008 settlement agreement between CAW and the Division of Ratepayer Advocates includes agreement on a slightly inflated cost for this work, and the recent proposed decision by the Administrative Law Judge in the General Rate Case proceeding includes approval of the settlement agreement. CAW's schedule for this work was to begin in January 2009 and finish in December 2009, but CAW has yet to begin the study. CAW General Manager Craig Anthony has stated that no work has been done on the dredging feasibility study because of delays in finalizing the decision on the General Rate Case application.

Staff contacted staff of the California Division of Safety of Dams (DSOD) by telephone and by letter dated April 8, 2009 (**Exhibit 26-C**)to learn what concerns they may have regarding three options for increasing the reservoir capacity and what the process for obtaining the needed approvals to modify the dam or spillway. David Gutierrez, Chief of DSOD, responded with a letter dated May 1, 2009 (**Exhibit 26-D**). Staff has scheduled a follow-up meeting with DSOD staff for June 26, 2009 in Sacramento, and CAW has been invited to attend. CAW General Manager Craig Anthony has stated that he does not plan to attend the meeting.

MPWMD staff also met with an engineer on the staff of Monterey County Water Resources Agency and one of their consultants regarding that agency's project to modify the spillway at Nacimiento Dam. Several features of that project apply to the option for Los Padres Dam of installing an inflatable dam in the spillway to allow seasonal storage of water. District staff reviewed three of the consultant reports for the project: hydrology for probable maximum flood and routing through the reservoir, seismic stability review of the spillway and adjacent embankment materials, and a geotechnical investigation of the dam and spillway and adjacent area. These are the type of studies that are required by DSOD to demonstrate that a proposed addition or modification to a dam meets their stringent safety standards.

Pursuit of any of the options would require environmental review. CEQA (California Environmental Quality Act) would apply in all cases. NEPA (National Environmental Policy Act) would apply if any of the work were deemed to involve dredge or fill in "waters of the United States" (the Carmel River is in this category), or to affect steelhead or California red-legged frogs, species listed as threatened under the federal Endangered Species Act.

EXHIBITS

26-A April 21, 2008 staff note for item titled "Review Procedure and Timeline for Conducting a Feasibility Study of Increasing the Height of the Existing Los Padres Dam to Increase Its Water Storage Capacity"

26-B April 7, 2008 Memorandum Report by Andrew M. Bell, MPWMD District Engineer

26-C April 8, 2009 letter from Andrew M. Bell, MPWMD District Engineer, to David Gutierrez, Chief, Division of Safety of Dams, California Department of Water Resources

26-D May 1, 2009 letter from David A. Gutierrez, DSOD, to Andrew M. Bell, MPWMD

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EXHIBIT 26-A

ITEM: ACTION ITEMS

24. REVIEW PROCEDURE AND TIMELINE FOR CONDUCTING A FEASIBILITY STUDY OF INCREASING THE HEIGHT OF THE EXISTING LOS PADRES DAM TO INCREASE ITS WATER STORAGE CAPACITY

Meeting Date:	**April 21, 2008**	**Budgeted:**	**No**
From:	**Darby Fuerst, General Manager**	**Program/ Line Item No.:**	**N/A**
Prepared By:	**Andrew M. Bell**	**Cost Estimate:**	**N/A**

General Counsel Approval: N/A
Committee Recommendation: N/A
CEQA Compliance: N/A

SUMMARY: The purpose of this item is for the Board to receive a staff report regarding procedure and timeline for conducting an evaluation of the feasibility of increasing the height of the existing Los Padres Dam, or of otherwise increasing the capacity of Los Padres Reservoir. The purpose of the project would be to create additional storage capacity in the reservoir so that stored water could be released to increase streamflow in the Carmel River to benefit the river and its associated environment. The District Engineer's report on factors that would need to be considered is provided as **Exhibit 24-A**.

RECOMMENDATION: The Board should receive staff's presentation, ask questions, and open the meeting to the public for comment. The Board should then decide whether to direct staff to issue requests for proposals to consulting firms for completing the needed engineering, geotechnical, and environmental studies to evaluate the feasibility of increasing the storage capacity of Los Padres Reservoir, and to determine the timeline for doing so.

BACKGROUND: At the February 28, 2008 Board meeting, the Board approved a request by Director Brower to direct staff to prepare, for review at a future Board meeting, a report regarding the feasibility of increasing the height of the existing Los Padres Dam.

The existing Los Padres Dam, constructed in 1948 and 1949 by California Water and Telephone, a predecessor of California American Water (CAW), is an embankment dam (zoned earthfill) approximately 150 feet high. It is located on the Carmel River at River Mile 24.8, approximately 12 miles southeast of Carmel Valley Village near the settlement of Princes Camp. When built, the reservoir had a capacity of 3,030 acre-feet, but due to accumulation of sediment, the storage capacity has been decreased by at least half.

Increasing the height of the dam would require extensive engineering, geotechnical, and planning efforts. In order to evaluate the technical feasibility of this project, the District would need to

retain experts in dam construction and rehabilitation. A summary of factors to consider is provided in **Exhibit 24-A**, a memorandum report by District Engineer Andrew Bell.
A location map of the area of the dam and reservoir is provided in **Exhibit 24-B**. This is a figure from the 1998 Draft Supplemental EIR for CAW's proposed Carmel River Dam and Reservoir Project, which was a new, higher concrete gravity dam to be located approximately one-half mile downstream of the existing dam and a reservoir with a capacity of 24,000 acre-feet. **Exhibit 24-B** shows the "Existing Wilderness Boundary" and the "Proposed Los Padres National Forest Boundary Adjustment," which would be an addition of approximately 140 acres (Parcel B) to the Ventana Wilderness in exchange for removing approximately 23 acres (Parcel A). An increase in the elevation of the existing spillway of five feet or more would cause the reservoir to extend into the Ventana Wilderness along Danish Creek near its mouth. This would require either a land exchange similar to that shown in **Exhibit 24-B** or other arrangement acceptable to the U.S. Forest Service and other entities with interests in wilderness areas.

Two alternatives to increasing the height of Los Padres Dam that could be considered are described in **Exhibit 24-A**: (1) sediment that has accumulated in Los Padres Reservoir could be removed; and (2) an inflatable dam could be installed in the existing spillway and raised to create additional storage space when it is deemed safe to do so.

The conclusion of the staff report (**Exhibit 24-A**) is as follows:

> "Increasing the height of Los Padres Dam, or otherwise increasing the storage capacity of Los Padres Reservoir, would require extensive engineering, geotechnical, environmental review, and project planning efforts. In order to evaluate the technical feasibility of this project, the District would need to retain expertise in dam construction and rehabilitation, in environmental impacts of such a project, and most likely in fish passage biology and engineering. MPWMD staff members are not qualified to make such determinations. The timelines and costs for such studies would require staff to developing scopes of work for the desired studies, obtain proposals from consultants, and analyze the proposals."

IMPACT TO DISTRICT STAFF/RESOURCES: If the Board decides to proceed with feasibility investigations of increasing the storage of Los Padres Reservoir, the initial tasks by Planning & Engineering Division staff would be to issue requests for proposals to obtain formal scope of work, cost, and timeline from engineering, geotechnical and environmental impact consultants to complete the needed evaluations. Once funds are authorized and agreements are executed, staff would administer the contracts and oversee the consultants' work. These are work efforts not currently anticipated by the Planning & Engineering Division, and they would impact the Division staff's current highest priority, which is to process the existing backlog of approximately 60 Water Distribution System permit applications and pre-applications that have been received by the District.

There would be a significant direct financial impact to the District if consultant services were retained to conduct the feasibility investigations. At its December 10, 2007 meeting, the Board approved a "pay-as-you-go" approach as an alternative to financing the $1.7 million estimated cost to complete the Seaside Basin Phase 1 ASR Project, which will reduce the District's general operating reserve below the Board's 5% minimum for the next 12 to 24 months. Since the

District would have insufficient reserves to pay for the additional environmental and engineering work required to conduct feasibility studies of increasing the storage capacity of Los Padres Reservoir, the Board would need to either temporarily borrow the amount from one of the District's designated reserves such as the Flood/Drought Reserve, or do some other type of short-term borrowing. In either case the funds would need to be recovered by a User Fee increase to cover the engineering and environmental consultant costs for feasibility investigations of increasing the storage capacity of Los Padres Dam and Reservoir.

EXHIBITS

24-A April 7, 2008 Memorandum Report by Andrew M. Bell, MPWMD District Engineer

24-B Figure 2-2. Location Map - Proposed Carmel River Dam and Reservoir. From Jones & Stokes Associates, November 13, 1998, Draft Supplemental EIR for the Carmel River Dam and Reservoir Project

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EXHIBIT 24-A

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

MEMORANDUM

DATE: April 7, 2008

TO: Darby Fuerst, General Manager

FROM: Andrew M. Bell, District Engineer

SUBJECT: Report on Factors to Consider in Determining the Feasibility of Raising Los Padres Dam, or Otherwise Increasing the Storage Capacity of Los Padres Reservoir

BACKGROUND

At the February 28, 2008 Board meeting, the Board approved a request by Director Bob Brower to direct staff to prepare, for review at a future Board meeting, a report regarding the feasibility of increasing the height of the existing Los Padres Dam. The stated purpose of the project is to create additional storage capacity in the reservoir so that stored water could be released to increase streamflow in the Carmel River to benefit the river and its associated environment. This Memorandum is written in fulfillment of that request.

The existing Los Padres Dam, constructed in 1948 and 1949 by California Water and Telephone, predecessor of California American Water, is an embankment dam (zoned earthfill) approximately 150 feet high. It is located on the Carmel River at River Mile 24.8, approximately 12 miles southeast of Carmel Valley Village near the settlement of Princes Camp. When built, the reservoir had a capacity of 3,030 acre-feet, but due to accumulation of sediment, the storage capacity has been decreased by more than half.

DISCUSSION

Some important questions to consider in determining a project description for raising Los Padres Dam are as follows:

1. *How much additional storage is desired (and therefore how much would the height of the dam need to be increased)?*

One set of inputs to this decision is what benefits in terms of increased streamflow are desired. This would require a hydrologic analysis of streamflow, combined with biological input on the needs for different animal and plant species that are intended to benefit from the project.

2. *Can all or any of the existing structures be kept as part of the ultimate project?*

It is most likely that the existing dam is not capable of being built upon, and that in order to have a higher spillway at the same location would require removing the existing dam, spillway, and outlet

works and replacing them with newly-engineered structures. See further discussion below under "Determining Whether the Existing Dam Could Be Built Upon" for additional information.

3. *When full, would the new reservoir extend into the Ventana Wilderness?*

If so, a land exchange similar to that proposed for MPWMD's New Los Padres Dam and Reservoir Project and CAW's Carmel River Dam and Reservoir Project, or other arrangement acceptable to the U.S. Forest Service and other entities with interests in wilderness areas, would be required. An increase in the elevation of the existing spillway of five feet or more would cause the reservoir to extend into the Ventana Wilderness along Danish Creek near its mouth. **Attachment 1** is a figure from the 1998 Draft Supplemental EIR for California American Water's proposed Carmel River Dam and Reservoir Project, which was a new, higher concrete gravity dam to be located approximately one-half mile downstream of the existing dam and a reservoir with a capacity of 24,000 acre-feet. This figure shows the "Existing Wilderness Boundary" and the "Proposed Los Padres National Forest Boundary Adjustment," which would be an addition of approximately 140 acres (Parcel B) to the Ventana Wilderness in exchange for removing approximately 23 acres (Parcel A).

4. *Would the existing fish passage facilities be adequate, or would improved fish passage be a requirement of the project?*

Steelhead passage facilities at Los Padres Dam are considered by some to be inadequate. Upstream migrants must find a fish ladder that leads to a holding tank. During the upstream migration season, the tank is checked daily by a California American Water (CAW) employee, and if steelhead are in the tank, the CAW employee transports them to the reservoir. Downstream migration is achieved only via the spillway, resulting in significant mortality to migrants. If the dam were raised or replaced, California Department of Fish and Game and National Marine Fisheries Service would likely call for significant improvements to the existing methods of fish passage for both upstream and downstream migrants. One potential method of providing improved passage would be to install a fish ladder.

5. *How would access to upper Los Padres Reservoir, the Ventana Wilderness, and private parcels upstream of the dam be maintained, both during construction and once the new project facilities are in place?*

Existing access is provided by a road across the dam face and extending approximately one-half mile upstream along the west side of the reservoir. From there, trails suitable for hikers, fishermen, backpackers, horses, and other pack animals extend southerly and westerly into the Ventana Wilderness. These access paths would need to be maintained during and after any construction.

6. *What routes would be used for construction access?*

Existing public road routes are (1) Carmel Valley Road to Cachagua Road, southerly and southeasterly on Cachagua Road to Nason Road in Princes Camp, then southerly on Nason Road to the existing dam; and (2) Carmel Valley Road to Tassajara Road in Jamesburg, southwesterly on Tassajara Road to Cachagua Road, westerly on Cachagua Road to Nason Road in Princes Camp, then southerly on Nason Road to the existing dam. Cachagua Road is narrow and curvy, with steep sections west of Nason Road. Construction equipment, materials, and workers would need to have

access to the construction areas. Deliveries of large equipment and materials could be scheduled well in advance. Construction workers would likely commute to and from the construction site daily.

Determining Whether the Existing Dam Could Be Built Upon

Primary in determining the feasibility of "raising" the existing dam is to determine the condition of the foundation and abutment formation materials in the area of the damsite. Some of this type of exploration work was done prior to building the existing dam, but it would be necessary to do additional testing, including foundation coring and possibly exploration of nearby seismic faults. Deciding factors in determining whether all or part of the existing dam could be preserved include whether proposed structures would be capable of withstanding seismic and flooding standards of the California Department of Water Resources, Division of Safety of Dams (DSOD). In order to learn whether the new structures would be approved by DSOD typically requires conducting geotechnical and engineering field studies and analyses, and presenting the results of those studies along with a proposed design as part of a permit application to DSOD.

It would be necessary to determine what types of construction (e.g., embankment, concrete gravity, concrete arch) would be appropriate. In the event DSOD would allow adding to the height of the existing dam, the appropriate method of new construction may be earthfill, the same category as the existing structure. However, DSOD no longer allows spillways to be incorporated in large embankment dams on streams with the potential for significant streamflow. Alternative spillway types include a tunnel separated from the embankment. This means that either a different type of spillway than the current concrete-lined channel built into the embankment would be required, or else the existing dam would need to be removed and replaced with a different type of dam construction.

Flood and Seismic Safety

Current DSOD standards require a dam to safely resist forces that would occur during significant flood and seismic events. The basic requirements are to safely pass the peak streamflow during what is termed the Probable Maximum Flood, and to safely resist the Maximum Credible Earthquake. Hydrologic, seismologic, and structural analyses must be conducted to determine to the satisfaction of DSOD that a proposed structure will meet these requirements.

Environmental Review and Permitting Requirements

Environmental review would likely require completion of state (CEQA) and federal (NEPA) environmental review processes. Permits for a major revision or reconstruction of Los Padres Dam would at minimum require the following permits:

US Army Corps of Engineers Section 404 Permit (brings in NMFS and USFWS)
California Department of Fish and Game Stream Alteration Agreement
Monterey County grading or use permit

It may also be necessary to obtain a change to CAW's water rights license for Los Padres Dam and Reservoir. In conducting the studies needed to bring the New Los Padres Dam and Reservoir Project to a vote in 1995, the District learned that there are a host of other requirements, including

mitigations for potential impacts to steelhead, California red-legged frogs, riparian, wetland, and upland habitats, historical and cultural resources, and other resources

Rights of Way
Los Padres Dam and Reservoir and much of the surrounding land belong to CAW. It would be necessary to obtain either ownership of some or all of the facilities and land, or agreement by CAW to allow any proposed modifications to their property. In addition, if the spillway elevation were raised five feet or more, the new reservoir would extend into the Ventana Wilderness along Danish Creek near its mouth. In this case, some property arrangement acceptable to the U.S. Forest Service and other entities with interests in the Ventana Wilderness, and wilderness areas in general, would be required.

ALTERNATIVES THAT COULD BE CONSIDERED

Staff is aware of two alternatives to raising the existing dam that would increase the storage capacity of the reservoir. These are described below.

Remove Accumulated Sediment from the Existing Reservoir
A significant amount of sediment has become deposited in Los Padres Reservoir since it was created by the construction of Los Padres Dam in 1948 and 1949. MPWMD has periodically looked at the potential for removing the sediment. The most recent MPWMD report on this topic, dated July 28, 2000 and titled "Preliminary Draft, MPWMD Issue Paper 2000-001, Assess Potential Feasibility of Dredging Existing Reservoirs on the Carmel River," is attached as **Attachment 2**. In 1996, CAW consultant Moffatt & Nichol issued a report titled "San Clemente Reservoir Dredging Feasibility Study, Carmel Valley, California," but MPWMD staff is not aware of more recent reports conducted by or for CAW regarding removal of sediment from Los Padres and/or San Clemente Reservoirs.

Install an Inflatable Dam in Los Padres Spillway
An inflatable dam could be installed in the spillway to raise the reservoir elevation during periods when it is considered safe to do so without adversely affecting the spillway's ability to safely pass flows. To determine this would require confirming with DSOD the dates when the reservoir level could be raised.

CONCLUSION

Increasing the height of Los Padres Dam, or otherwise increasing the storage capacity of Los Padres Reservoir, would require extensive engineering, geotechnical, environmental review, and project planning efforts. In order to evaluate the technical feasibility of this project, the District would need to retain expertise in dam construction and rehabilitation, in environmental impacts of such a project, and most likely in fish passage biology and engineering. MPWMD staff members are not qualified to make such determinations. The timelines and costs for such studies would require staff to developing scopes of work for the desired studies, obtain proposals from consultants, and analyze the proposals.

Attachments

1. Figure 2-2. Location Map - Proposed Carmel River Dam and Reservoir. From Jones & Stokes Associates, November 13, 1998, Draft Supplemental EIR for the Carmel River Dam and Reservoir Project
2. Preliminary Draft, MPWMD Issue Paper 2000-001, Assess Potential Feasibility of Dredging Existing Reservoirs on the Carmel River, July 28, 2000, prepared by Andrew Bell, District Engineer, and Henrietta Stern, Project Manager

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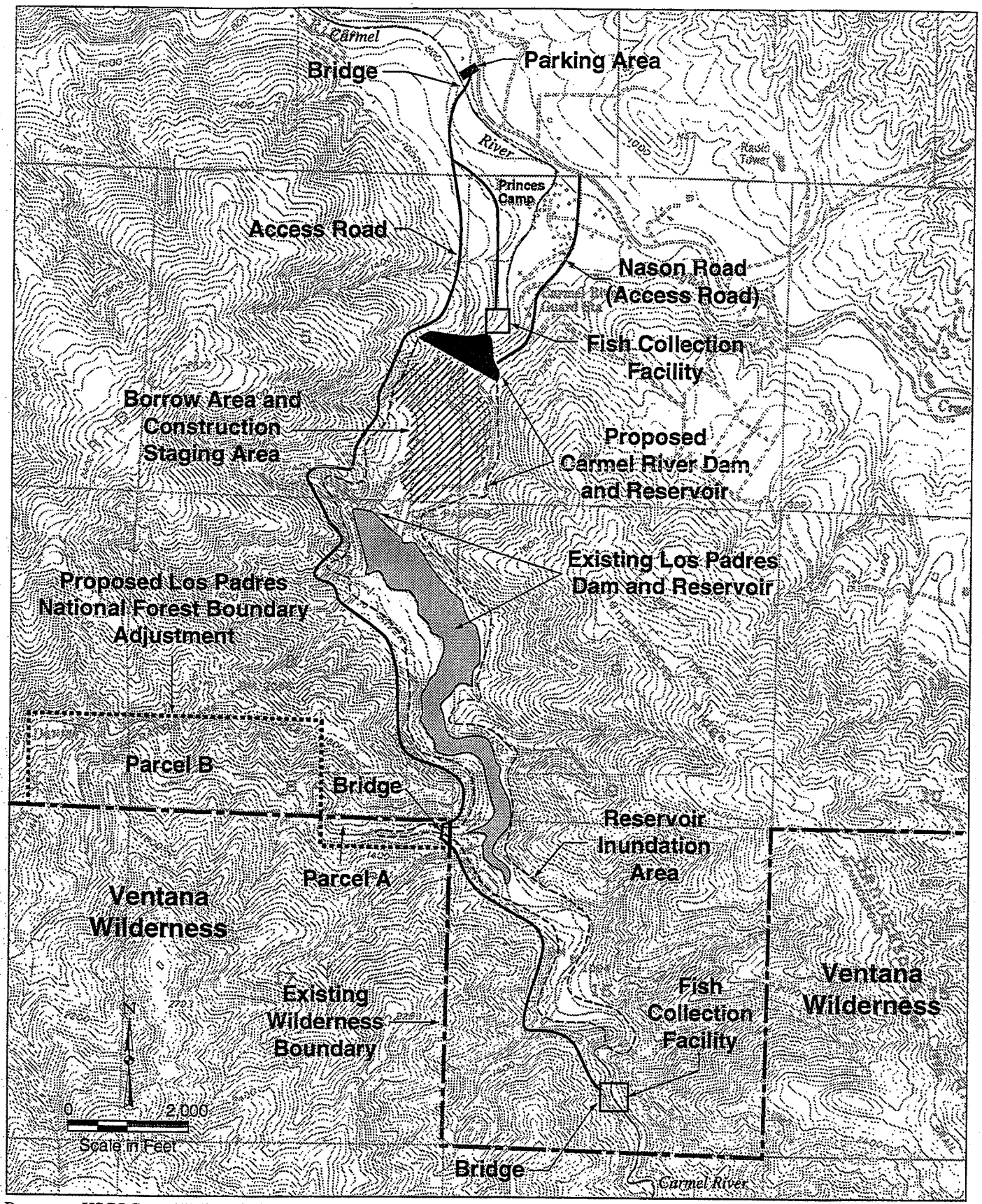

Base map: USGS Carmel Valley 1956 (PR 1984) and Ventana Cones 1956 (PR 1974), California 7.5-minute quadrangles.

Jones & Stokes Associates, Inc.

Figure 2-2
Proposed Carmel River Dam and Reservoir

Attachment 2
PRELIMINARY DRAFT

MPWMD ISSUE PAPER 2000-01
ASSESS POTENTIAL FEASIBILITY OF DREDGING EXISTING RESERVOIRS ON THE CARMEL RIVER

Prepared by Andrew Bell, District Engineer; and Henrietta Stern, Project Manager
Monterey Peninsula Water Management District
August 2000

This preliminary draft is for discussion purposes only. This issue paper will be updated following receipt of the Revised Draft EIR for the San Clemente Dam Seismic Retrofit Project, which is being prepared by the California Department of Water Resources.

ISSUE

The storage capacities of the two existing reservoirs on the Carmel River have been significantly reduced due to sediment deposition over the past eight decades. This paper reviews current information to address the question, "Should the District, in cooperation with California- American Water Company (Cal-Am), pursue sediment removal from the two existing reservoirs to either: (a) maintain storage capacities at current levels, or (b) increase storage capacities to all or part of the original reservoir volumes?" This effort is pursuant to Objective 8 of the Monterey Peninsula Water Management District (MPWMD) Year 2000 Water augmentation Plan approved by the Board on April 17, 2000, which states:

> *Evaluate feasibility of increased storage in existing reservoirs through sediment removal (dredging).*

OBJECTIVE

The objective of this document is to summarize into a concise format:

- $ existing information on sediment volume and management issues for each reservoir;
- $ potential benefits of sediment removal;
- $ potential problems in removing sediment from the reservoirs; and
- $ additional information needs in order to guide decision-making regarding sediment removal from San Clemente and Los Padres Reservoirs.

SUMMARY

This paper reviews current information about sedimentation trends at the two existing reservoirs -- San Clemente Reservoir, completed in 1921, and Los Padres Reservoir, completed in 1948 -- as well as the potential feasibility of dredging and other sediment removal methods. The paper concludes

that sediment management at San Clemente Dam and Reservoir, whether by dredging or other means, has become increasingly important due to potential effects on aquatic life and downstream flood elevations. This paper finds that sediment removal from the reservoirs is technically feasible, but may result in potential significant adverse impacts to people, aquatic resources, and wildlife. The high cost of dredging may be partially offset by marketing the dredged materials. More information is needed on the characteristics and volume of dredged materials at both reservoir sites, as well as further information on the effects of existing regulations, such as the Endangered Species Act, before a definitive determination can be made on the feasibility of dredging in the Carmel River.

BACKGROUND AND LOCAL SETTING

Sediment deposition has significantly decreased the storage volumes of the two reservoirs. Storage capacities in acre-feet (AF) at the respective spillway elevations (525 feet at San Clemente Dam and 1,040 feet at Los Padres Dam) are as follows:

Reservoir	Year Completed	Original Capacity	Current Capacity	Decrease in Volume	Avg. Rate of Decrease
San Clemente	1921	1,425 AF	149 AF	1,276 AF	16 AF/yr
Los Padres	1948	3,033 AF	1,569 AF	1,464 AF	28 AF/yr

These decreases in storage have prompted investigations of the feasibility, costs, and impacts of sediment removal, both to preserve the ability to operate and maintain the reservoirs, and as a potential means of augmenting the Monterey Peninsula's water supply. The District has included dredging of the two reservoirs in its evaluation of water supply project alternatives since the late 1980s. Previous District evaluations have determined that dredging as a water supply option is too costly when compared with other options, and that dredging activities would result in significant potential environmental problems. Cal-Am has retained consultants to investigate the potential for sediment removal from San Clemente Reservoir. The purpose of a 1996 study prepared for Cal-Am (Moffatt & Nichol Engineers, 1996) was "...to evaluate several dredging alternatives for removal of accumulated sediments, such that the water storage capacity of San Clemente Reservoir is restored to, and maintained at, functional levels." Cal-Am is currently considering sediment management options at San Clemente Reservoir as part of its plans for strengthening San Clemente Dam. These studies contemplate bypassing incoming sediment in order to maintain storage capacity at or slightly above the current volume, but not restoring the original capacity.

PREVIOUS FINDINGS

To date, information relating to dredging San Clemente and Los Padres Reservoirs has been obtained primarily from reservoir dredging experience by the City of Santa Barbara and from studies commissioned by Cal-Am.

Santa Barbara's Experience: The City of Santa Barbara removed approximately 700 acre-feet of "wet silt" from Gibraltar Lake over a five-year period from 1984 through 1988. The project was discontinued due to the high costs in terms of water supply benefits and limited space available for storing the dredged material. A report is available for the first three years of the dredging operations (City of Santa Barbara, 1987). A copy of the executive summary from the report is attached (**Attachment 1**).

Cal-Am Sediment Removal Study: A 1996 report by a consultant to Cal-Am provides information on the potential for removing sediment from San Clemente Reservoir (Moffatt & Nichol Engineers, 1996). This report summarizes a reconnaissance-level investigation of sediment characteristics in the reservoir, alternative dredging, conveyance and disposal methods, required facilities and equipment, and estimated costs, assuming removal of two volumes of sediment: 1 million and 2 million cubic yards (620 and 1,240 acre-feet, respectively). Estimated total costs to dredge and dispose of 1 million cubic yards range from $8 million to $29 million. For removing 2 million cubic yards, estimated total costs range from $25 million to $48 million. A summary of the alternatives evaluated, including a brief description, estimated cost per cubic yard, and years of duration of dredging operations, is provided in **Attachment 2**. These costs do not include mitigation costs. On the other hand, the report recognized but did not consider potential cost reductions that could be achieved if the sediment were marketed as construction materials. The report summary contains the following statement: "A potential market value for the excavated sediments exists, and should be explored in more detail including partnering efforts with construction companies and miners" (Moffatt & Nichol Engineers, 1996, page 76-3). In addition, the report did not recognize the potential cost savings that could occur if selected portions of the dredged materials were placed downstream of the dam to improve steelhead habitat, rather than trucked offsite.

The evaluation of San Clemente Reservoir sediment characteristics in the Moffatt & Nichol Engineers study is based on a reconnaissance-level field sampling and testing program. Over 80 sediment samples from two-thirds of the inundation area at various depths were collected and analyzed, either visually or in a laboratory. Sediment grain sizes ranged from cobble and gravel to fine silts and clays, with some organic material. Samples taken consisted predominantly of sand and gravel-sized particles; an independent review of the sampling program by Woodward-Clyde Consultants concluded that more than 95% of the sediment samples is in the size range from fine sand to gravel (greater than 0.075 millimeter). However, the maximum depth at which sediments were sampled and tested was 14 feet, and the majority of the samples were taken from depths of 5 feet or less. The Woodward-Clyde Consultants assessment stated that "[t]his estimate [95% sand and gravel] is based on sampling of the upper few feet and deeper sampling will be required to verify that no pervasive fine-grained layers exist." Additional sampling is important in order to anticipate quantities of fines that could degrade water quality during dredging operations, as well as quantities and gradation of sediment that could be processed and sold.

Seismic Retrofit Studies for San Clemente Dam: Studies have been performed regarding the potential for passing sediment through San Clemente Reservoir as part of Cal-Am's evaluation of options for strengthening San Clemente Dam, which is required to meet California seismic safety

standards. The California Department of Water Resources (DWR) is the lead agency for an Environmental Impact Report (EIR) on the seismic retrofit project. Cal-Am has indicated that a Revised Draft EIR, including information related to sediment removal, will be released for public review in the August-September 2000 time frame. One of the principal concepts being addressed by Cal-Am and its consultants is the construction of gated sluiceways through the dam below the spillway to allow sediment in the reservoir to be sluiced downstream during periods of high winter flows. During the review of the December 1998 Draft EIR, the National Marine Fisheries Service and other parties expressed a preference for removing San Clemente Dam entirely. To the knowledge of MPWMD staff, sediment issues related to dam removal have not been addressed. When the Revised Draft EIR on the San Clemente Dam Seismic Retrofit Project is released, additional information relating to the potential for sediment removal should be available.

Need for Sediment Control: It is anticipated that the Revised Draft EIR for the San Clemente Dam Seismic Retrofit Project will discuss the changing sediment situation on the Carmel River due to the filling of San Clemente Reservoir with sediment in recent years. Since 1998, there have been signs of uncontrolled releases of fine sediment carried in river waters passing over San Clemente Dam. This situation will become more pronounced in the future unless action is taken. Sediment deposition downstream of San Clemente Dam is of concern because it has the potential to degrade steelhead habitat and increase flood elevations in Carmel Valley. Preliminary computer modeling performed by consultants to Cal-Am and the District indicates that more than two feet of sediment could be deposited in river reaches downstream of San Clemente Dam without sediment management (Balance Hydrologics, personal communications, 2000). Because of the serious nature of this situation, it is District staff's understanding that the San Clemente Dam Seismic Retrofit Project now identifies sediment management as a basic project purpose (Marc Lucca, Cal-Am Project Manager, personal communication, July 2000). District consultants have indicated that increased capacity in existing reservoirs, via dredging or other means, would enable the reservoirs to serve as a "sediment shock absorber" to retain the sediment and keep it from depositing downstream in an uncontrolled manner.

It is notable that rivers without dams tend to be in a state of dynamic equilibrium with regard to sediment transport. Because the dams have been in place for many decades, the river channel downstream of both dams has been deprived of sediment. This has resulted in larger-sized sediment, as well as channel downcutting in reaches downstream of the dams. The river channel has largely adjusted to these new changes and is in a new, altered state of equilibrium. Sediment deposition is not desirable today due to the extensive floodplain development that has occurred throughout the 20th Century, as it would result in a higher potential for loss of property and threat to public safety in flooding situations. Unless there are major changes in public policy and federal regulations, such a situation is not considered acceptable.

Los Padres Dam: No specific evaluation has been conducted regarding sediment removal options from Los Padres Reservoir. Feasibility and other issues, including benefits and negative impacts, are expected to be similar to those for San Clemente Reservoir, with one notable exception. Dredging Los Padres Reservoir would increase the volume of surface water available for release and use during summer months. In contrast, dredging San Clemente Reservoir would serve primarily to

continue the 70-year process of trapping sediment in the reservoir. Increased storage of surface water in San Clemente Reservoir would not necessarily increase water available for release or diversion because San Clemente Reservoir is kept essentially full to maintain head on Cal-Am's Filter Plant and to allow migration of steelhead past the dam.

MPWMD Yield Analysis: In 1997, MPWMD staff performed an analysis of the effect of reservoir dredging on the Peninsula's water supply (MPWMD, 1997). The analysis showed that dredging one or both of the reservoirs would have a minor effect on the number of months of mandatory 20% rationing, but would significantly reduce the number of months of voluntary 10% water rationing over a 91-year period (Water Years 1902 through 1992). Moreover, the analysis concluded that legal diversions at San Clemente Reservoir could be increased if reservoir capacity were increased by dredging. **Attachment 3** presents the results of this analysis. It should be noted that certain assumptions in the 1997 report are no longer valid due to subsequent reductions in reservoir storage as well as regulatory changes.

River Temperature Increases Affect Aquatic Life: Increased sedimentation in San Clemente Reservoir has created a wide, flat channel exposed to solar radiation. In turn, this topography results in the heating of river water to temperatures greater than those known to be suitable for steelhead. When warm reservoir water is discharged from San Clemente Dam to downstream waters in summer, steelhead and other aquatic organisms are affected until the stream naturally cools farther downstream. The MPWMD Sleepy Hollow Steelhead Rearing Facility, located one mile downstream of San Clemente Dam, has been affected by warm water discharges in recent years. The District rears steelhead rescued from drying pools in the lower river until conditions warrant their release in the fall. A cooling tower is being installed at a cost of $335,000 to help combat the dangerously high influent temperatures at the facility so that reared fish are not subject to increased disease and mortality. Restoration of reservoir capacity at San Clemente and Los Padres Reservoirs by dredging or other means would result in deeper, cooler reservoirs that would help correct the existing situation. Addressing temperature impacts of existing facilities will likely become more important in the future given the federal Endangered Species Act, Section 4(d) Rules that require protection of steelhead and their habitat.

POTENTIAL BENEFITS OF SEDIMENT REMOVAL

As noted in the above paragraphs, the potential benefits of removing sediment from reservoirs include increased municipal yield and system operational flexibility, increased instream flows released from reservoir storage in summer months, and cooler reservoir and river water temperatures. Increased capacity in the existing reservoirs, especially San Clemente Reservoir, would serve as a "sediment shock absorber" to avoid uncontrolled releases of fine sediment downstream of San Clemente Dam. There is a good possibility that a portion of dredged materials could be marketed to the construction industry, which could help offset dredging costs. Selected portions could also be placed downstream of the dam to improve steelhead habitat.

POTENTIAL CONSTRAINTS TO SEDIMENT REMOVAL

A key concern in the removal of sediment from reservoirs is the potential adverse impacts to the

fishery and aquatic habitat downstream of dredging operations. Releases of fine sediment during dredging or de-watering operations can negatively impact both water quality (e.g., turbidity, anaerobic or release of compounds toxic to aquatic life) and the substrate (e.g., fine sediments in the channel bottom could degrade steelhead habitat and food sources). If the dredged materials were trucked to an offsite location for storage or use, traffic impacts would be significant. For example, 1 million cubic yards (CY) of sediment, which is equivalent to 620 AF, would result in the need for 50,000 to 125,000 truckloads, depending of the loading rate of the truck (CY/truck). Using an alternative slurry pipeline method of transport would require a significant amount of water (in the range of 850-1,200 AF/year) to keep the sediment suspended in the pipeline, thereby reducing streamflow available for downstream aquatic life, or water stored in a reservoir, or both. Other potential problems include limited disposal sites without adverse environmental effects and a relatively high cost per acre-foot of yield.

These potential problems are further described in Appendix A, Evaluation of Water Supply Alternatives, to the Draft Supplemental EIR for the Carmel River Dam and Reservoir Project (MPWMD, 1998). The portions of Appendix A addressing dredging of San Clemente and Los Padres Reservoirs (pages A-25 through A-28 and Table A-8) are included as **Attachment 4**.

ADDITIONAL INFORMATION NEEDED

$ Further information is needed regarding sediment characteristics in both reservoirs. This information is especially important to accurately assess the type and volume of dredged materials that could be marketed or released below the dam for habitat enhancement. (For San Clemente Reservoir, sediment samples extended to a maximum depth of 14 feet, and the majority were to 5 feet or less. No analysis of sediment characteristics has been conducted at Los Padres Reservoir.)

$ The 1996 Moffatt & Nichol Engineers study, the most comprehensive local study available, addressed sediment removal only at San Clemente Reservoir. Similar analysis is required to assess potential sediment removal, de-watering, and transport methods and costs for Los Padres Reservoir.

$ Critical review of the 1996 Moffatt & Nichol Engineers report is needed. Information in the report such as transport routes, potential sediment storage sites, environmental impacts, and estimated costs should be reviewed for accuracy and completeness.

$ Further information is required regarding existing regulations regarding reservoir dredging and required permits.

FINDINGS AND CONCLUSIONS

- $ Removal of sediment from San Clemente and Los Padres Reservoirs is technically feasible.

- $ The high costs of removing, transporting, and disposing of sediment reported in the 1996 Moffatt & Nichol Engineers report could be partially offset by the sale of the portion of dredged material that is usable.

- $ In addition to high costs, key concerns are traffic impacts associated with trucking operations, the need for large quantities of water if a slurry pipeline were used, and instream impacts to water quality and substrate conditions.

- $ Sediment management at San Clemente Dam and Reservoir has become increasingly important due to warm water releases that affect downstream aquatic life, and the potential for increased flood elevations in lower Carmel Valley.

- $ For San Clemente Reservoir, ongoing Cal-Am consideration of methods for retrofitting San Clemente Dam includes sediment management options. The final outcome of these efforts will determine how sediment in San Clemente Reservoir is managed.

REFERENCES CITED

City of Santa Barbara, May 1987, Gibraltar Lake Restoration Project, Final Report

Moffatt & Nichol Engineers, September 10, 1996, San Clemente Reservoir Dredging Feasibility Study, Carmel Valley, California (prepared for California-American Water Company, Monterey Division)

Monterey Peninsula Water Management District, September 29, 1997, Preliminary Water Supply Analysis of Reservoir Dredging Alternatives (memo from Darby Fuerst to PUC Workshop Participants)

Monterey Peninsula Water Management District, November 13, 1998, Draft Supplemental Environmental Impact Report for the Carmel River Dam and Reservoir Project, Appendix A. Evaluation of Water Supply Alternatives

PERSONAL COMMUNICATIONS

Balance Hydrologics, Inc. (Barry Hecht and Mark Woyshner). Telephone and in-person discussions in January-June 2000.

Marc Lucca, Cal-Am Project Manager. Discussions in July 2000.

Attachment 1

GIBRALTAR LAKE
RESTORATION PROJECT

FINAL REPORT

Submitted to

U.S. Environmental Protection Agency

"Clean Lakes Program"

Prepared by

The City of Santa Barbara

Public Works Department

Water Resources Division

May, 1987

EXECUTIVE SUMMARY

This report presents the results of the Gibraltar Lake Desiltation Project under the Clean lakes Act.

The reclamation program was proposed by the City of Santa Barbara in May 1977 to the U. S. Environmental Protection Agency's Clean Lakes Program. A Clean Lake EPA Grant to restore Gibraltar Lake was awarded to the City of Santa Barbara on May 15, 1978. This funding and desiltation method of Gibraltar Lake was the first of its kind in the United States.

Within three years from the initial construction of the desiltation project, approximately 445 acre-feet of wet silt had been dredged from the lake at a total cost of $4,197,316.84.

Gibraltar Lake is a 273.6 acre reservoir located within the rugged Santa Ynez Mountains about seven miles north of Santa Barbara City. The reservoir provides an average of 35% of the City's drinking water supply in conjuction with the other supply sources such as Lake Cachuma 53%, and the City's 12% ground water source.

The lake's water capacity has been decreasing since the completion of the Gibraltar Dam in 1920 and subsequent enlargement in 1948, because of siltation. The reservoir formed by the damming of the Santa Ynez River had an initial maximum capacity of 14,500 acre - feet and a subsequent capacity of 22,500 acre-feet in 1948. The lake's last capacity measurement in 1986 was reported to be reduced to about 8,241 acre-feet or 37 % of the total volume of 22,500 acre-feet. Over this 66 year period between 1920 through 1986, 14,259 acre-feet of silt entered Gibraltar Lake at an average rate of 216 acre-feet of silt per year.

The purpose of the Gibraltar Lake Restoration Project was to safely attempt to reclaim a portion of the reservoir's lost water capacity. The construction and dredging operations took nearly three years to complete. The actual project length satisfied the proposed 36 months originally stated in the Federal Assistance Application.

EXECUTIVE REPORT (continued)

EPA and representative of the Federal Government are to receive "thanks" from the citizens of Santa Barbara for participating in this grant. The purpose of the "Clean Lakes" Grant has been fulfilled and this report is documentation of that participation between the agencies (EPA and the City of Santa Barbara).

1978 GRANT NO. S804814-010 (later S009344-013, 1983)

ENVIRONMENTAL CONCERNS

1. The City of Santa Barbara Water Supply -"Gibraltar Reservoir"- has benefitted from the grant by both sustaining 3 years of dredging and by entering into a Watershed Management Agreement with the U. S. Forest Service.

2. A special "Pneuma Pump" was employed as the dredging equipment to be both tested and operated during the period of the Grant. This pump handled mercury contaminated silt removal with no degradation or disruption to the City of Santa Barbara's water supply.

3. Construction of a silt retention dam within lands owned and controlled by the U. S. Forest Service caused no habitat disruption to either man or animal.

PROJECT COST SUMMARY

1. (EPA) (City)
   PHASE I - PHASE "A" - The initial Research and Development Phase including construction of the initial retention dam; mobilization/ demobilization and pumping of approximately 220,000 cubic yards of liquid silt or 92,000 of bottomsilt for-------$2,255,000.

2. PHASE II - PHASE "B" - Continued testing and purchase of the Pneuma Pump and raising retention dam 38 feet for----------$ 718,611.

3. PHASE II - PHASE "C" - Operational costs of "Pneuma" equipment using City personnel for a sustained period of 18 months for----------$ 1,223,705.

TOTAL COST $ 4,197,316.

NOTE: Authorized EPA Grant = $4,225,000.

DREDGING COSTS

EPA GRANT PHASE	CITY PHASE	ACTUAL COSTS	TOTAL LIQUID* PUMPED C.Y.	BOTTOM SILT** WET C.Y.	COST PER CUBIC YARD (C.Y.)
Actual					
I	"A"	$2,255,000	230,000	92,000	$24.51
II	"B"	718,611	420,000	168,000	$ 4.28
	SUBTOTAL	$2,973,611	650,000	260,000	$11.44
II	"C"	1,223,705	1,145,260	458,000 (284 AF)	$ 2.67
	TOTAL	$4,197,316	1,795,260	718,000 (445 AF)	$ 5.85
		(648,674 O&M COSTS)			

Phase "A" included construction of initial silt retention dam, R&D and planning, environmental and engineering/inspection costs.

Phase "B" including raising initial retention dam 38', pumping and purchasing equipment.

Phase "C" PUMPING costs only for 18 months sustained dredging.

* Liquid slurry is the pumped liquid which is composed of 40% wet silt and 60% water.
** Wet silt is composed of 40% dry silt and 60% water.

LONG TERM PROBLEMS AND COSTS

The Desilting Project, during its three years in operation, was able to mitigate the impact of annual siltation at Gibraltar Reservoir. Water yield of the reservoir was sustained during that period of time. However, it is recognized that the long term will bring about continued siltation. Watershed management measures are being undertaken by the U.S. Forest Service, with financial support by the City of Santa Barbara. This will help mitigate watershed erosion and reservoir siltation to a certain extent. In the long term, however, significant erosion/siltation will continue.

The current silt basin has been filled with approximately 445 acre feet (AF) of wet silt dredged from Gibraltar Reservoir. There is still remaining in the basin the equivalent storage capacity for a final 275 AF of wet silt from the reservoir. It has been calculated that to complete the filling up of this silt basin will require portions of two additional years of operations and will cost some $450,000 in operation and maintenance cost. The long-term gain in average water yield by completing the dredging to the extent made possible by the remaining 275 AF of wet silt storage in the existing silt basin would be about $700/AF. This is the incremental yield over the yield available if no further dredging were to be done.

The removal of 445 AF of wet silt by the dredging operations of Phases A, B and C have been estimated to provide a long-term incremental yield over thc base conditions of no dredging program of some 100 AFY at a unit cost of $4,470/AF (please see backup calculations in Addendum "A"). The long-term yield of completing the dredging over the base condition is 150 AFY with a unit cost of $3210/AF. (See table below.)

Investigations are continuing into the possibility of obtaining silt storage capacity elsewhere, above or below Gibraltar Reservoir.

PROJECT WATER YIELD COSTS

Description	Cost ($000)	Wet Silt Removed (AF)	Incremental Average Water Yield (AFY)	Yield Cost ($/AFY)
Phase A, B, & C	$4000	445	100	4470
Complete Dredge Project *	450	275	50	700
Total*	4450	720	150	3210

* Projected Figures

Attachment 2

SAN CLEMENTE RESERVOIR DREDGING FEASIBILITY STUDY CARMEL VALLEY, CALIFORNIA

Prepared For
California American Water Company, Monterey Division
50 Ragsdale Drive, Suite 100
Monterey, CA 93942-0951

Prepared By
Moffatt & Nichol Engineers
131 Steuart Street, Suite 300
San Francisco, CA 94105
Job No. 3675

September 10, 1996

Summary

- Dredging of practically all accumulated reservoir sediment is technically feasible;
- Adequate off-site disposal areas are available, as identified in Section 5;
- Key issue related to hydraulic pipeline operations is the water availability (need 850 to 1200 acre-feet of water per year for pumping);
- Key issue related to truck off-haul operations is the potential environmental impact on existing conditions;
- A potential market value for the excavated sediments exists, and should be explored in more detail including partnering efforts with construction companies and miners;
- Removing and disposing about 1 million cubic yards of sediment is estimated to cost between $8 and $30 per cubic yard, over a time period of 1 to 15 years, depending on the alternative(s) selected;
- Removing and disposing about 2 million cubic yards of sediment is estimated to cost between $12 and $17 per cubic yard, over a time period of 5 to 30 years, depending on the alternative(s) selected;
- All alternatives would facilitate maintenance dredging of incoming sediment load on an annual or similar recurrence. Also, the sediment bypassing concept (see Section 5.4.7) is promising and should be evaluated.

TABLE 7.1 : SUMMARY OF ALTERNATIVES EVALUATION

Alternative	Disposal Site	Description	Unit Rate ($/CY for following dredge volumes)*			Duration of Operations (for 1,000,000 CY)	Comments
			1,000,000 CY	2,000,000 CY	2,000,000 CY (1,000,000 CY confined disposal at filter plant)		
I	Filter Plant (confined disposal)	Confined disposal at Filter Plant, via mech. dredging & conveyor	$9.40	--	--	1 -2 years	Potential floodplain impacts, limited by capacity
IB	Filter Plant + Others (confined disposal + processing)	Confined disposal + processing at Filter Plant, via mech. dredging, conveyor, and truck off-haul (20 mi distance)	$17.20 (515,000 CY disposed on-site)	$17.00 (515,000 CY disposed on-site)	$14.50	8 - 9 years	Potential floodplain impacts, limited by capacity and off-haul rates (60,000 CY/yr)
IC	Filter Plant (confined disposal)	Confined disposal at Filter Plant, via hydraulic dredging & slurry pipeline	$8.00	--	--	3 - 4 years	Potential floodplain impacts, limited by capacity and water for slurry (850 to 1200 AF/yr)
II	Various (processing at Garland Ranch)	Mech. dredging, conveyor to Filter Plant, slurry pipeline to Garland Ranch and truck off-haul (20 mi distance)	$29.20	$23.80	$16.80	6 - 7 years	Limited by site area, off-haul rates (150,000 CY/yr), and water for slurry (850 to 1200 AF/yr)
IIB	Various (processing at Garland Ranch)	Hydraulic dredging, slurry pipeline to Garland Ranch and truck off-haul (20 mi distance)	$24.10	$20.45	$15.75	6 - 7 years	Limited by site area, off-haul rates (150,000 CY/yr), and water for slurry (850 to 1200 AF/yr)
III	Tularcitos Valley sites (confined disposal)	Mechanical dredging, conveyor to Filter Plant & truck off-haul to Tularcitos Valley sites	$19.00	$15.35	$12.30	5 - 6 years	Capacity related to land availability. Off-haul rate assumed to be 200,000 CY/yr.
IV	Various (pipeline to Carmel beaches)	Hydraulic dredging, slurry pipeline to Carmel beaches and barge off-haul (60 mi distance)	$26.60	$20.85	$16.40	3 - 4 years	Unlimited disposal capacity. Limited by water for slurry (850 to 1200 AF/yr)
V	Fort Ord sites (confined disposal)	Truck off-haul to Fort Ord sites from processing site - from Filter Plant - from Garland Ranch	 $24.30 $24.80	 $21.45 $20.90	 $14.20 $14.65	 15 -16 years 6 - 7 years	Unlimited disposal capacity. Limited by water for slurry (850 to 1200 AF/yr), and/or off-haul rate (60,000 CY/yr from Filter Plant; 150,000 CY/yr from Garland)

* Unit rates rounded to nearest 10 cents

Attachment 3

MONTEREY PENINSULA
WATER MANAGEMENT DISTRICT
187 ELDORADO STREET • POST OFFICE BOX 85
MONTEREY, CA 93942-0085 • (408) 649-4866
FAX (408) 649-3678 • http://www.mpwmd.dst.ca.us

To: PUC Workshop Participants
From: Darby Fuerst, MPWMD General Manager DWF
Subject: Preliminary Water Supply Analysis of Reservoir Dredging Alternatives
Date: September 29, 1997

To evaluate the effect of reservoir dredging on water supplied by the California-American Water Company (Cal-Am), four simulations were run using the District's computer model of the Monterey Peninsula Water Resources System. This model, CVSIM, was designed as a planning tool to simulate the performance of the water resources system under varying physical, structural, and management conditions. CVSIM incorporates both Cal-Am and non Cal-Am uses and both surface and ground water responses. The four dredging simulations include:

(1) **Maintain San Clemente and Los Padres Reservoir at Existing Capacities:** San Clemente Reservoir at 200 acre-feet (AF) and Los Padres Reservoir at 2,179 AF of total storage;

(2) **Dredge San Clemente Reservoir to Original Capacity:** San Clemente Reservoir at 1,425 AF and Los Padres Reservoir at 2,179 AF of total storage;

(3) **Dredge Los Padres Reservoir to Original Capacity:** San Clemente Reservoir at 200 AF and Los Padres Reservoir at 3,033 AF of total storage; and

(4) **Dredge Both San Clemente and Los Padres Reservoirs to Original Capacities:** San Clemente Reservoir at 1,425 AF and Los Padres Reservoir at 3,033 AF of total storage.

All the simulations were run at the current Cal-Am annual production limit set by the District, i.e, 17,641 AF, and included a management plan involving increasing levels of water rationing during extended dry periods. The simulations were run to determine the effect of the proposed reservoir dredging alternatives on water supply reliability and utilized a 91-year period of record, i.e., Water Years 1902-1992. In the simulations, water supply reliability is measured by the frequency and severity of water rationing. The effect of reservoir dredging on water supply reliability is shown in the table below.

The table shows that dredging has a minor effect on the number of months of mandatory 20% water rationing. This period of mandatory water rationing occurs during the simulated 1977-1978 period. In contrast, the number of months of voluntary 10% water rationing are significantly reduced by the dredging proposals. By dredging each reservoir individually, the number of

months of voluntary 10% rationing is reduced by 58 months and by dredging both reservoirs together, the number of months of voluntary rationing is reduced by 75 months.

EFFECT OF RESERVOIR DREDGING ON WATER SUPPLY RELIABILITY			
Number	Simulation	Months of Voluntary 10% Rationing	Months of Mandatory 20% Rationing
1	Existing Reservoir Capacities	99	12
2	Dredge San Clemente Reservoir	41	11
3	Dredge Los Padres Reservoir	41	11
4	Dredge San Clemente and Los Padres Reservoirs	24	10

With respect to yield, by increasing reservoir storage capacity, Cal-Am would be able to legally store and redivert more water each year. Specifically, by dredging Los Padres Reservoir to its original capacity, Cal-Am's licensed right could be increased from the 2,179 AF to 3,033 AF annually, an increase of 854 AF. Similarly, by dredging San Clemente Reservoir to its original capacity, Cal-Am may be able to apply for rights to divert water to storage during the high flow winter period -- when it is presently available for appropriation -- for release and rediversion during the low flow period[1]. This represents a potential increase in legal diversions at San Clemente Reservoir of approximately 1,425 AF annually. If both San Clemente and Los Padres Reservoirs were dredged to their original capacities, the potential increase in legal diversions to storage would total 2,279 AF per year. These changes would need to be reviewed and approved by the State Water Resources Control Board (SWRCB).

Please note that this analysis does not address environmental, economic or regulatory concerns. If there are any questions regarding the preliminary analysis, please let me know.

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[1] It is the District's understanding that Cal-Am has a pre-1914 appropriative right for 1,137 acre-feet per year of direct diversion at the San Clemente Reservoir site.

Attachment 4

Draft Supplemental Environmental Impact Report for the Carmel River Dam and Reservoir Project

Volume II: Appendices

Lead Agency:

Monterey Peninsula Water Management District

EIR Consultant:

Jones & Stokes Associates, Inc.

November 13, 1998

- function as the water supply source for a redevelopment area in Sand City while at the same time offsetting a portion of Cal-Am's diversions from the Carmel River.

A.3.2.2 Conclusions

Desalination plants of various sizes have been shown to be technically feasible throughout the world, although questions exist about the physical and institutional feasibility of large plants (larger than 6 MGD) in certain locations on the Monterey Peninsula because of potential limitations on the locations of intake and outfall facilities. Capital costs of larger plants are comparable to those of other large-scale alternatives, such as dams, but O&M costs are much higher. Advantages of desalination include a relatively short construction period once permits have been obtained; relative ease to add phased modules; a consistent, "drought-proof" source of supply (the ocean); various operational options; and lack of inundation effects. Disadvantages include substantial capital costs for facilities that must be incurred every 20–25 years; high operating costs and energy use; the need for regular replacement of major capital components required as a result of corrosion by seawater and other chemicals; and potential adverse environmental impacts on marine life, endangered coastal dune species, and wetlands.

A.3.3 DREDGING OF EXISTING RESERVOIRS

Dredging refers to the removal, dewatering, conveyance, and disposal of accumulated sediment from existing reservoirs to regain lost capacity (or maintain existing capacity). Cal-Am, MPWMD, and the City of Santa Barbara have evaluated the feasibility and cost effectiveness of various dredging projects. For more information, refer to summaries of earlier analyses in the 1994 NLP Final EIR (MPWMD 1994a); MPWMD worksheets prepared for the February 8, 1996 Alternatives Workshop; the San Clemente Reservoir Dredging Feasibility Study prepared for Cal-Am (Moffatt & Nichol Engineers 1996); a draft matrix of alternatives prepared for the September 8, 1997 CPUC workshop; and an MPWMD preliminary evaluation of dredging yield dated September 29, 1997 (MPWMD 1997c). Table A-8 provides a summary of information presented in these studies.

A.3.3.1 Discussion

Project Description and Operations. The two dredging options for the Carmel River system are sediment removal from the existing San Clemente and Los Padres Reservoirs, which are both owned and operated by Cal-Am. San Clemente Reservoir was completed in 1921 with an original capacity of 1,425 af at the spillway elevation of 525 feet (flashboards are assumed to be lowered permanently); existing (1998) capacity is estimated by Cal-Am to be 147 af. Los Padres Reservoir was completed in 1949 with an original capacity of 3,033 af; current capacity is estimated at 2,179 af. The estimated capacity lost to sedimentation from upstream sources (both natural and as a result of human intervention) is 1,278 af for San Clemente Reservoir and 854 af for Los Padres Reservoir, for a total lost capacity of 2,132 af.

An important new development (as of August 1998) is the fact that dredging San Clemente Reservoir presently does not appear to be an option, based on discussions to date by an interagency group of

engineering and fishery experts convened by the DWR and Cal-Am to address the existing and long-term sedimentation problems in San Clemente Reservoir. After weighing the pros and cons of several sedimentation options (including dredging the reservoir), the group favors the concept of maintaining a long-term average of about 200 af of storage in the reservoir by building sluice gates into the dam. Operated in accordance with a detailed plan to be developed by the interagency group, the sluice gates would be opened when the riverflow through the reservoir is suitable to carry sediment downstream. These gates would be incorporated into seismic retrofit designs currently being prepared at the direction of DSOD. A separate EIR on the San Clemente Dam Seismic Retrofit Project is being prepared by DWR and is scheduled for release in fall 1998; the analysis in that document will be used to update this discussion in the Final SEIR.

Water Yield. Two concepts are discussed in the following paragraphs: dredging only Los Padres Reservoir, and dredging both Los Padres and San Clemente Reservoirs. The feasibility of dredging both reservoirs is questionable in light of the current (but not formally confirmed) plans to maintain approximately 200 af of storage and build sluice gates at San Clemente Dam.

Preliminary analyses conducted by MPWMD in September 1997 indicate that neither dredging concept would substantially increase Cal-Am system reliable water yield or drought protection because of the small amounts of water storage involved. In general, the increase in the amount of storage is typically much greater than the reliable, long-term yield gained. However, from a water rights perspective, reclaiming lost reservoir storage capacity could enable Cal-Am to legally store and redivert more water each year. Specifically, by dredging Los Padres Reservoir to its original capacity, Cal-Am's licensed right at that site could be increased from the current 2,179 af to 3,033 af annually, an increase of 854 af. If both Los Padres and San Clemente Reservoirs were dredged, the potential increase in legal diversions to storage could total as much as 2,132 af. Cal-Am would have to apply for rights to divert San Clemente Dam water to storage during the high-flow winter period—when it is presently available for appropriation—for release and rediversion during the low-flow period. These changes would need to be reviewed and approved by the SWRCB. As noted above, dredging of San Clemente Reservoir does not appear to be feasible.

The Moffatt & Nichol report evaluated use of slurry pipelines (as an alternative to trucks) to convey dredged materials to help reduce traffic impacts; however, this method would require 850–1,200 af/year to keep the dredged material suspended in the pipelines. This is a substantial amount of water and would offset any capacity gained by dredging; for that reason, this method is not recommended.

Cost Parameters. As described in the Moffatt & Nichol 1996 evaluation of San Clemente Reservoir dredging options, the selected dredging conveyance method and disposal location have a substantial effect on costs. Estimated total costs to dredge and dispose of 620 af (1 million cubic yards [CY]) would range from $8 to $29 million; for 1,240 af (2 million CY), total capital costs would range from $25 to $48 million. Depending on the disposal site, estimated costs would range from about $8 per CY ($13,000 per af) to more than $29 per CY ($47,000 per af) for 1 million CY, and from about $12 to $24 per CY for 2 million CY. It is notable that these estimates do not include mitigation costs, which could be substantial. To maintain the water rights described above, a maintenance dredging program would be required to remove the estimated average of 17 af of sediment deposited each year. The 1996 Moffatt & Nichol report did not include a description of or a cost estimate for such a

ırogram but noted that the dredged material from San Clemente Dam (e.g., sorted sand, gravel, and :obble) would have a market value. The report suggested that entering into a partnership with :onstruction or mining companies could help offset the anticipated costs but did not incorporate potential revenue into the cost estimates because of the questionable environmental feasibility of many of the options.

A similar detailed study has not been performed for dredging Los Padres Dam, which would entail removal of about 1.38 million CY (854 af) of sediment. Costs are assumed to be higher because of the longer distance to disposal sites. Assuming a range of $8–29 per CY (similar to San Clemente Dam costs), the estimated capital cost to completely regain capacity would be about $11–40 million (at 1996 price levels). Again, these estimates do not consider mitigation costs or the potential market value of the dredged and sorted materials.

Implementation Timing and Project Life. The environmental review and permitting process for a major dredging project would take at least 1-3 years to complete, given that federal (Clean Water Act Section 401 and 404, Endangered Species Act Section 7) and state (streambed alteration, regional water quality control board [RWQCB] discharge) permits would be required and substantial fishery, wetland, and water quality issues would be associated with this alternative. According to the Moffatt & Nichol report, the actual dredging and disposal of material from San Clemente Reservoir would take 1–15 years for 1 million CY (620 af) and 5–30 years for 2 million CY (1,240 af). The number of years needed would be greatly affected by the disposal option and conveyance rate used (variations of slurry pipeline, truck haul-off, barge haul-off) and weather-related impacts. Variations that feature truck haul-off would take at least 10–15 years. These periods are assumed to be similar for the same process at Los Padres Reservoir. In theory, if dredging of San Clemente Reservoir were feasible, an estimated 10–30 years would be needed to dredge both reservoirs.

Previous estimates by MPWMD consultants indicated that each reservoir receives an average of about 20 af/yr of new sediment. This is equivalent to about 32,300 CY of additional sediment that must be removed each year. Thus, the timing estimates for removal described above are low by at least 3%. Additional time may be needed because these estimates do not consider "bulking" (expansion) of material, which occurs when sediment is handled and moved.

Environmental Issues. The primary environmental benefit of dredging is that additional reservoir capacity can be obtained without inundating new habitat. The major potential adverse biological impact is the smothering of fishery and other aquatic wildlife habitat downstream of the reservoirs by uncontrolled releases of fine sediment during the dredging process. This possibility is of great concern to federal and state fishery experts and is one reason why the use of controlled sluice gates rather than dredging is presently preferred at San Clemente Dam.

Of significant local concern is the substantial traffic impact on local roads as a result of the thousands of truck trips that would be involved over many years. For example, 1 million CY (620 af) of sediment would equate to 50,000 and 83,000 truckloads at the assumed loading rates of 20 CY and 12 CY per load, respectively. Disposal of 2 million CY would require 100,000–166,000 truckloads. The number of one-way truck trips would be double this amount (i.e., 200,000–332,000) to first carry the materials to the disposal site, then return (empty) to the processing site in Carmel Valley.

Assuming an off-haul rate of 175,000 CY per year (the average of the 150,000–200,000 CY per year cited in the Moffatt & Nichol report), this would be nearly 29,200 truck trips per year [(175,000 CY per year ÷ 12 CY per load) x 2 one-way trips], which equates to 80 truck trips per day, every day of the year (actual daily trips would be higher because no trucking would take place on weekends and holidays), or at least 10 truck trips per hour for an 8-hour day. At 175,000 CY per year, a total of 5.7 years would be required to remove 1 million CY (620 af) and 11.4 years to remove 2 million CY (1,240 af). Given the already inadequate level of service on Carmel Valley Road, Highway 1, and other area roadways, the traffic impacts that would be associated with dredging seriously impair the viability of this alternative. San Clemente Drive would require ongoing maintenance and repair because of the heavy truck traffic. The estimates presented above may be 10–15% low because they do not account for the bulking (expansion) factor associated with handling and processing the dredged material. In-reservoir estimates of volume are based on measurements of compacted sediment; a 10–15% increase in volume is expected once the material is loaded into a truck.

Other Issues. The experience of the City of Santa Barbara, in a 3-year dredging project to regain some of the lost storage in Gibraltar Reservoir (City of Santa Barbara 1986), and other experts indicates that dredging to regain lost reservoir storage "is an extremely expensive, if not impossible" undertaking (Annandale pers. comm.). High cost and environmental concerns resulted in a decision by Santa Barbara to abandon dredging as a solution to developing additional water yield for the city. Internationally, water managers and engineers are now designing sediment management programs to maintain new or existing reservoir storage, rather than attempting to regain storage lost to sedimentation.

A.3.3.2 Conclusions

The concept of dredging is appealing in that lost reservoir storage could be regained and certain lost water rights could be reclaimed. The Moffatt & Nichol study at San Clemente Dam determined that removal of sediment from the reservoir is technically feasible, but serious questions exist with regard to the economic and regulatory feasibility of conveyance and disposal. Key concerns are the extremely high overall cost (and cost per af), need for large quantities of water to implement pipeline slurry options, substantial traffic impacts associated with trucking, and environmental impacts on downstream fishery and aquatic wildlife habitat. Because of these concerns, an interagency oversight group has selected a nondredging method to facilitate sediment management and maintain about 200 af of storage at San Clemente Dam. Thus, for the purposes of this appendix, subsequent evaluations of alternative plans that include dredging assume that dredging can be performed only at the Los Padres Dam site; dredging at San Clemente Dam is not presently considered a reasonably foreseeable option.

A.3.4 GROUNDWATER DEVELOPMENT, INCLUDING INJECTION AND RECOVERY

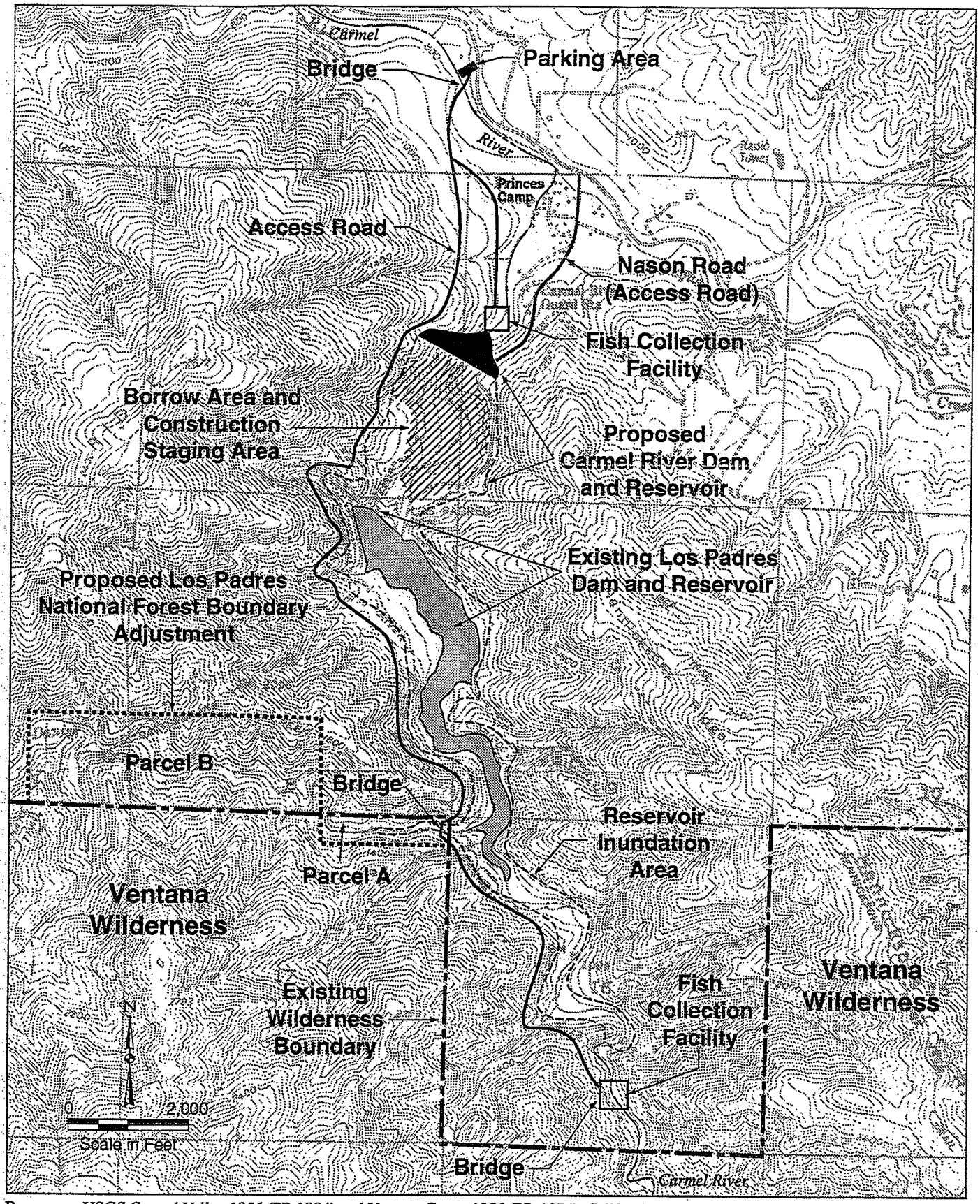
Groundwater development refers to production of additional water from alluvial (river-based) aquifers, groundwater basins, or upland sources such as fractures in mountain bedrock that may yield water. Groundwater development also refers to means of increasing groundwater storage or availability by methods such as injection and recovery, which are described below. Groundwater development typically relies on the creation and use of large production wells and other facilities (e.g.,

Table A-8. Summary of Dredging Project Alternatives

Project Description	Water Yield	Cost Parameters (1996 dollars)	Project Timing and Life	Environmental Issues	Conclusions and Other Comments*
Regain lost storage capacity at existing San Clemente and Los Padres Reservoirs. Facilities include means to remove, dewater, convey, and dispose accumulated sediment. Trucking and slurry pipelines were considered as conveyance means. Slurry pipelines require 850-1,200 af/yr of water to move material. Thus, this method is not recommended, as annual water use may outweigh storage capacity gain. Operations must be coordinated with fish life cycle and river hydrology.	Maximum capacity to be regained is 1,278 af at San Clemente Reservoir and 854 af at Los Padres Reservoir. Firm yield from dredging is minimal, but water rights could be regained by dredging, equal to regained capacity. Sediment management plans at San Clemente Dam do not include dredging there. Thus, the Los Padres site value of 854 af is assumed for this evaluation.	Capital costs for 854 af at Los Padres site are roughly estimated at $11-40 million, based on $8-29 per cubic yard ($13,000-47,000 per acre-foot). O&M costs not provided in cited reports. These estimates do not include removal of annual sediment inflow, bulking factors, or mitigation costs, which could be substantial. Costs do not reflect possible income from dredged material, if separated into salable components.	Up to 3 years needed for environmental review and to obtain permits. 5-15 years for truck haul-off (854 af), depending on disposal site, quantity, and weather conditions. At 20-af/yr infill rate, regular sediment removal is needed to maintain storage capacity at Los Padres Reservoir.	Major Benefits: Recovered reservoir capacity obtained without inundating habitat. Avoids sediment passage over San Clemente Dam. Major Adverse Effects: Smothering of fishery and aquatic wildlife habitat downstream of dredge site during dredging period; water chemistry effects. Substantial, chronic, long-term traffic impacts from reservoir to disposal site.	Dredging is technically feasible, but serious questions about environmental and economic feasibility remain. Dredging at San Clemente site is not likely based on interagency discussions in summer 1998. Only the Los Padres site will be considered in this analysis. Advantages include recovery of storage capacity without inundating new areas. Disadvantages include extremely high cost per acre-foot, substantial traffic impacts, location of suitable disposal site, and potential harm to fishery habitat during dredging.

* "Feasible" means project is a reasonably foreseeable means to provide lawful supply for Cal-Am water system. See text for further discussion.

EXHIBIT 24-B



Base map: USGS Carmel Valley 1956 (PR 1984) and Ventana Cones 1956 (PR 1974), California 7.5-minute quadrangles.

Jones & Stokes Associates, Inc.

Figure 2-2
Proposed Carmel River Dam and Reservoir

EXHIBIT 26-B

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

MEMORANDUM

DATE: April 7, 2008

TO: Darby Fuerst, General Manager

FROM: Andrew M. Bell, District Engineer

SUBJECT: Report on Factors to Consider in Determining the Feasibility of Raising Los Padres Dam, or Otherwise Increasing the Storage Capacity of Los Padres Reservoir

BACKGROUND

At the February 28, 2008 Board meeting, the Board approved a request by Director Bob Brower to direct staff to prepare, for review at a future Board meeting, a report regarding the feasibility of increasing the height of the existing Los Padres Dam. The stated purpose of the project is to create additional storage capacity in the reservoir so that stored water could be released to increase streamflow in the Carmel River to benefit the river and its associated environment. This Memorandum is written in fulfillment of that request.

The existing Los Padres Dam, constructed in 1948 and 1949 by California Water and Telephone, predecessor of California American Water, is an embankment dam (zoned earthfill) approximately 150 feet high. It is located on the Carmel River at River Mile 24.8, approximately 12 miles southeast of Carmel Valley Village near the settlement of Princes Camp. When built, the reservoir had a capacity of 3,030 acre-feet, but due to accumulation of sediment, the storage capacity has been decreased by more than half.

DISCUSSION

Some important questions to consider in determining a project description for raising Los Padres Dam are as follows:

1. *How much additional storage is desired (and therefore how much would the height of the dam need to be increased)?*

One set of inputs to this decision is what benefits in terms of increased streamflow are desired. This would require a hydrologic analysis of streamflow, combined with biological input on the needs for different animal and plant species that are intended to benefit from the project.

2. *Can all or any of the existing structures be kept as part of the ultimate project?*

It is most likely that the existing dam is not capable of being built upon, and that in order to have a higher spillway at the same location would require removing the existing dam, spillway, and outlet

works and replacing them with newly-engineered structures. See further discussion below under "Determining Whether the Existing Dam Could Be Built Upon" for additional information.

3. *When full, would the new reservoir extend into the Ventana Wilderness?*

If so, a land exchange similar to that proposed for MPWMD's New Los Padres Dam and Reservoir Project and CAW's Carmel River Dam and Reservoir Project, or other arrangement acceptable to the U.S. Forest Service and other entities with interests in wilderness areas, would be required. An increase in the elevation of the existing spillway of five feet or more would cause the reservoir to extend into the Ventana Wilderness along Danish Creek near its mouth. **Attachment 1** is a figure from the 1998 Draft Supplemental EIR for California American Water's proposed Carmel River Dam and Reservoir Project, which was a new, higher concrete gravity dam to be located approximately one-half mile downstream of the existing dam and a reservoir with a capacity of 24,000 acre-feet. This figure shows the "Existing Wilderness Boundary" and the "Proposed Los Padres National Forest Boundary Adjustment," which would be an addition of approximately 140 acres (Parcel B) to the Ventana Wilderness in exchange for removing approximately 23 acres (Parcel A).

4. *Would the existing fish passage facilities be adequate, or would improved fish passage be a requirement of the project?*

Steelhead passage facilities at Los Padres Dam are considered by some to be inadequate. Upstream migrants must find a fish ladder that leads to a holding tank. During the upstream migration season, the tank is checked daily by a California American Water (CAW) employee, and if steelhead are in the tank, the CAW employee transports them to the reservoir. Downstream migration is achieved only via the spillway, resulting in significant mortality to migrants. If the dam were raised or replaced, California Department of Fish and Game and National Marine Fisheries Service would likely call for significant improvements to the existing methods of fish passage for both upstream and downstream migrants. One potential method of providing improved passage would be to install a fish ladder.

5. *How would access to upper Los Padres Reservoir, the Ventana Wilderness, and private parcels upstream of the dam be maintained, both during construction and once the new project facilities are in place?*

Existing access is provided by a road across the dam face and extending approximately one-half mile upstream along the west side of the reservoir. From there, trails suitable for hikers, fishermen, backpackers, horses, and other pack animals extend southerly and westerly into the Ventana Wilderness. These access paths would need to be maintained during and after any construction.

6. *What routes would be used for construction access?*

Existing public road routes are (1) Carmel Valley Road to Cachagua Road, southerly and southeasterly on Cachagua Road to Nason Road in Princes Camp, then southerly on Nason Road to the existing dam; and (2) Carmel Valley Road to Tassajara Road in Jamesburg, southwesterly on Tassajara Road to Cachagua Road, westerly on Cachagua Road to Nason Road in Princes Camp, then southerly on Nason Road to the existing dam. Cachagua Road is narrow and curvy, with steep sections west of Nason Road. Construction equipment, materials, and workers would need to have

access to the construction areas. Deliveries of large equipment and materials could be scheduled well in advance. Construction workers would likely commute to and from the construction site daily.

Determining Whether the Existing Dam Could Be Built Upon

Primary in determining the feasibility of "raising" the existing dam is to determine the condition of the foundation and abutment formation materials in the area of the damsite. Some of this type of exploration work was done prior to building the existing dam, but it would be necessary to do additional testing, including foundation coring and possibly exploration of nearby seismic faults. Deciding factors in determining whether all or part of the existing dam could be preserved include whether proposed structures would be capable of withstanding seismic and flooding standards of the California Department of Water Resources, Division of Safety of Dams (DSOD). In order to learn whether the new structures would be approved by DSOD typically requires conducting geotechnical and engineering field studies and analyses, and presenting the results of those studies along with a proposed design as part of a permit application to DSOD.

It would be necessary to determine what types of construction (e.g., embankment, concrete gravity, concrete arch) would be appropriate. In the event DSOD would allow adding to the height of the existing dam, the appropriate method of new construction may be earthfill, the same category as the existing structure. However, DSOD no longer allows spillways to be incorporated in large embankment dams on streams with the potential for significant streamflow. Alternative spillway types include a tunnel separated from the embankment. This means that either a different type of spillway than the current concrete-lined channel built into the embankment would be required, or else the existing dam would need to be removed and replaced with a different type of dam construction.

Flood and Seismic Safety

Current DSOD standards require a dam to safely resist forces that would occur during significant flood and seismic events. The basic requirements are to safely pass the peak streamflow during what is termed the Probable Maximum Flood, and to safely resist the Maximum Credible Earthquake. Hydrologic, seismologic, and structural analyses must be conducted to determine to the satisfaction of DSOD that a proposed structure will meet these requirements.

Environmental Review and Permitting Requirements

Environmental review would likely require completion of state (CEQA) and federal (NEPA) environmental review processes. Permits for a major revision or reconstruction of Los Padres Dam would at minimum require the following permits:

US Army Corps of Engineers Section 404 Permit (brings in NMFS and USFWS)
California Department of Fish and Game Stream Alteration Agreement
Monterey County grading or use permit

It may also be necessary to obtain a change to CAW's water rights license for Los Padres Dam and Reservoir. In conducting the studies needed to bring the New Los Padres Dam and Reservoir Project to a vote in 1995, the District learned that there are a host of other requirements, including

mitigations for potential impacts to steelhead, California red-legged frogs, riparian, wetland, and upland habitats, historical and cultural resources, and other resources

Rights of Way
Los Padres Dam and Reservoir and much of the surrounding land belong to CAW. It would be necessary to obtain either ownership of some or all of the facilities and land, or agreement by CAW to allow any proposed modifications to their property. In addition, if the spillway elevation were raised five feet or more, the new reservoir would extend into the Ventana Wilderness along Danish Creek near its mouth. In this case, some property arrangement acceptable to the U.S. Forest Service and other entities with interests in the Ventana Wilderness, and wilderness areas in general, would be required.

ALTERNATIVES THAT COULD BE CONSIDERED

Staff is aware of two alternatives to raising the existing dam that would increase the storage capacity of the reservoir. These are described below.

Remove Accumulated Sediment from the Existing Reservoir
A significant amount of sediment has become deposited in Los Padres Reservoir since it was created by the construction of Los Padres Dam in 1948 and 1949. MPWMD has periodically looked at the potential for removing the sediment. The most recent MPWMD report on this topic, dated July 28, 2000 and titled "Preliminary Draft, MPWMD Issue Paper 2000-001, Assess Potential Feasibility of Dredging Existing Reservoirs on the Carmel River," is attached as **Attachment 2**. In 1996, CAW consultant Moffatt & Nichol issued a report titled "San Clemente Reservoir Dredging Feasibility Study, Carmel Valley, California," but MPWMD staff is not aware of more recent reports conducted by or for CAW regarding removal of sediment from Los Padres and/or San Clemente Reservoirs.

Install an Inflatable Dam in Los Padres Spillway
An inflatable dam could be installed in the spillway to raise the reservoir elevation during periods when it is considered safe to do so without adversely affecting the spillway's ability to safely pass flows. To determine this would require confirming with DSOD the dates when the reservoir level could be raised.

CONCLUSION

Increasing the height of Los Padres Dam, or otherwise increasing the storage capacity of Los Padres Reservoir, would require extensive engineering, geotechnical, environmental review, and project planning efforts. In order to evaluate the technical feasibility of this project, the District would need to retain expertise in dam construction and rehabilitation, in environmental impacts of such a project, and most likely in fish passage biology and engineering. MPWMD staff members are not qualified to make such determinations. The timelines and costs for such studies would require staff to developing scopes of work for the desired studies, obtain proposals from consultants, and analyze the proposals.

Attachments

1. Figure 2-2. Location Map - Proposed Carmel River Dam and Reservoir. From Jones & Stokes Associates, November 13, 1998, Draft Supplemental EIR for the Carmel River Dam and Reservoir Project
2. Preliminary Draft, MPWMD Issue Paper 2000-001, Assess Potential Feasibility of Dredging Existing Reservoirs on the Carmel River, July 28, 2000, prepared by Andrew Bell, District Engineer, and Henrietta Stern, Project Manager

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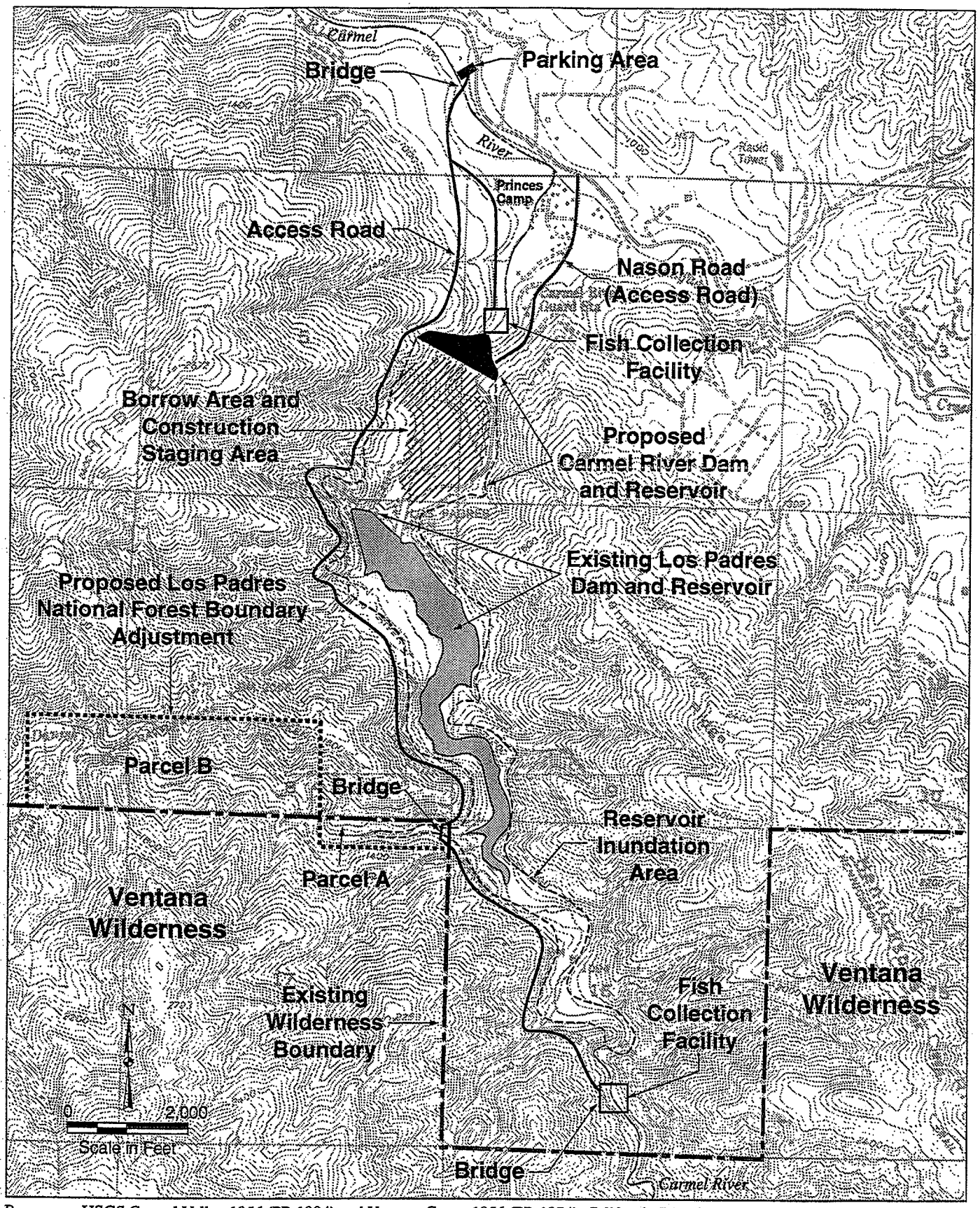

Base map: USGS Carmel Valley 1956 (PR 1984) and Ventana Cones 1956 (PR 1974), California 7.5-minute quadrangles.

Jones & Stokes Associates, Inc.

Figure 2-2
Proposed Carmel River Dam and Reservoir

Attachment 2
PRELIMINARY DRAFT

MPWMD ISSUE PAPER 2000-01
ASSESS POTENTIAL FEASIBILITY OF DREDGING EXISTING RESERVOIRS ON THE CARMEL RIVER

Prepared by Andrew Bell, District Engineer; and Henrietta Stern, Project Manager
Monterey Peninsula Water Management District
August 2000

This preliminary draft is for discussion purposes only. This issue paper will be updated following receipt of the Revised Draft EIR for the San Clemente Dam Seismic Retrofit Project, which is being prepared by the California Department of Water Resources.

ISSUE

The storage capacities of the two existing reservoirs on the Carmel River have been significantly reduced due to sediment deposition over the past eight decades. This paper reviews current information to address the question, "Should the District, in cooperation with California- American Water Company (Cal-Am), pursue sediment removal from the two existing reservoirs to either: (a) maintain storage capacities at current levels, or (b) increase storage capacities to all or part of the original reservoir volumes?" This effort is pursuant to Objective 8 of the Monterey Peninsula Water Management District (MPWMD) Year 2000 Water augmentation Plan approved by the Board on April 17, 2000, which states:

> *Evaluate feasibility of increased storage in existing reservoirs through sediment removal (dredging).*

OBJECTIVE

The objective of this document is to summarize into a concise format:

- existing information on sediment volume and management issues for each reservoir;
- potential benefits of sediment removal;
- potential problems in removing sediment from the reservoirs; and
- additional information needs in order to guide decision-making regarding sediment removal from San Clemente and Los Padres Reservoirs.

SUMMARY

This paper reviews current information about sedimentation trends at the two existing reservoirs -- San Clemente Reservoir, completed in 1921, and Los Padres Reservoir, completed in 1948 -- as well as the potential feasibility of dredging and other sediment removal methods. The paper concludes

that sediment management at San Clemente Dam and Reservoir, whether by dredging or other means, has become increasingly important due to potential effects on aquatic life and downstream flood elevations. This paper finds that sediment removal from the reservoirs is technically feasible, but may result in potential significant adverse impacts to people, aquatic resources, and wildlife. The high cost of dredging may be partially offset by marketing the dredged materials. More information is needed on the characteristics and volume of dredged materials at both reservoir sites, as well as further information on the effects of existing regulations, such as the Endangered Species Act, before a definitive determination can be made on the feasibility of dredging in the Carmel River.

BACKGROUND AND LOCAL SETTING

Sediment deposition has significantly decreased the storage volumes of the two reservoirs. Storage capacities in acre-feet (AF) at the respective spillway elevations (525 feet at San Clemente Dam and 1,040 feet at Los Padres Dam) are as follows:

Reservoir	Year Completed	Original Capacity	Current Capacity	Decrease in Volume	Avg. Rate of Decrease
San Clemente	1921	1,425 AF	149 AF	1,276 AF	16 AF/yr
Los Padres	1948	3,033 AF	1,569 AF	1,464 AF	28 AF/yr

These decreases in storage have prompted investigations of the feasibility, costs, and impacts of sediment removal, both to preserve the ability to operate and maintain the reservoirs, and as a potential means of augmenting the Monterey Peninsula's water supply. The District has included dredging of the two reservoirs in its evaluation of water supply project alternatives since the late 1980s. Previous District evaluations have determined that dredging as a water supply option is too costly when compared with other options, and that dredging activities would result in significant potential environmental problems. Cal-Am has retained consultants to investigate the potential for sediment removal from San Clemente Reservoir. The purpose of a 1996 study prepared for Cal-Am (Moffatt & Nichol Engineers, 1996) was "...to evaluate several dredging alternatives for removal of accumulated sediments, such that the water storage capacity of San Clemente Reservoir is restored to, and maintained at, functional levels." Cal-Am is currently considering sediment management options at San Clemente Reservoir as part of its plans for strengthening San Clemente Dam. These studies contemplate bypassing incoming sediment in order to maintain storage capacity at or slightly above the current volume, but not restoring the original capacity.

PREVIOUS FINDINGS

To date, information relating to dredging San Clemente and Los Padres Reservoirs has been obtained primarily from reservoir dredging experience by the City of Santa Barbara and from studies commissioned by Cal-Am.

Santa Barbara's Experience: The City of Santa Barbara removed approximately 700 acre-feet of "wet silt" from Gibraltar Lake over a five-year period from 1984 through 1988. The project was discontinued due to the high costs in terms of water supply benefits and limited space available for storing the dredged material. A report is available for the first three years of the dredging operations (City of Santa Barbara, 1987). A copy of the executive summary from the report is attached (**Attachment 1**).

Cal-Am Sediment Removal Study: A 1996 report by a consultant to Cal-Am provides information on the potential for removing sediment from San Clemente Reservoir (Moffatt & Nichol Engineers, 1996). This report summarizes a reconnaissance-level investigation of sediment characteristics in the reservoir, alternative dredging, conveyance and disposal methods, required facilities and equipment, and estimated costs, assuming removal of two volumes of sediment: 1 million and 2 million cubic yards (620 and 1,240 acre-feet, respectively). Estimated total costs to dredge and dispose of 1 million cubic yards range from $8 million to $29 million. For removing 2 million cubic yards, estimated total costs range from $25 million to $48 million. A summary of the alternatives evaluated, including a brief description, estimated cost per cubic yard, and years of duration of dredging operations, is provided in **Attachment 2**. These costs do not include mitigation costs. On the other hand, the report recognized but did not consider potential cost reductions that could be achieved if the sediment were marketed as construction materials. The report summary contains the following statement: "A potential market value for the excavated sediments exists, and should be explored in more detail including partnering efforts with construction companies and miners" (Moffatt & Nichol Engineers, 1996, page 76-3). In addition, the report did not recognize the potential cost savings that could occur if selected portions of the dredged materials were placed downstream of the dam to improve steelhead habitat, rather than trucked offsite.

The evaluation of San Clemente Reservoir sediment characteristics in the Moffatt & Nichol Engineers study is based on a reconnaissance-level field sampling and testing program. Over 80 sediment samples from two-thirds of the inundation area at various depths were collected and analyzed, either visually or in a laboratory. Sediment grain sizes ranged from cobble and gravel to fine silts and clays, with some organic material. Samples taken consisted predominantly of sand and gravel-sized particles; an independent review of the sampling program by Woodward-Clyde Consultants concluded that more than 95% of the sediment samples is in the size range from fine sand to gravel (greater than 0.075 millimeter). However, the maximum depth at which sediments were sampled and tested was 14 feet, and the majority of the samples were taken from depths of 5 feet or less. The Woodward-Clyde Consultants assessment stated that "[t]his estimate [95% sand and gravel] is based on sampling of the upper few feet and deeper sampling will be required to verify that no pervasive fine-grained layers exist." Additional sampling is important in order to anticipate quantities of fines that could degrade water quality during dredging operations, as well as quantities and gradation of sediment that could be processed and sold.

Seismic Retrofit Studies for San Clemente Dam: Studies have been performed regarding the potential for passing sediment through San Clemente Reservoir as part of Cal-Am's evaluation of options for strengthening San Clemente Dam, which is required to meet California seismic safety

standards. The California Department of Water Resources (DWR) is the lead agency for an Environmental Impact Report (EIR) on the seismic retrofit project. Cal-Am has indicated that a Revised Draft EIR, including information related to sediment removal, will be released for public review in the August-September 2000 time frame. One of the principal concepts being addressed by Cal-Am and its consultants is the construction of gated sluiceways through the dam below the spillway to allow sediment in the reservoir to be sluiced downstream during periods of high winter flows. During the review of the December 1998 Draft EIR, the National Marine Fisheries Service and other parties expressed a preference for removing San Clemente Dam entirely. To the knowledge of MPWMD staff, sediment issues related to dam removal have not been addressed. When the Revised Draft EIR on the San Clemente Dam Seismic Retrofit Project is released, additional information relating to the potential for sediment removal should be available.

Need for Sediment Control: It is anticipated that the Revised Draft EIR for the San Clemente Dam Seismic Retrofit Project will discuss the changing sediment situation on the Carmel River due to the filling of San Clemente Reservoir with sediment in recent years. Since 1998, there have been signs of uncontrolled releases of fine sediment carried in river waters passing over San Clemente Dam. This situation will become more pronounced in the future unless action is taken. Sediment deposition downstream of San Clemente Dam is of concern because it has the potential to degrade steelhead habitat and increase flood elevations in Carmel Valley. Preliminary computer modeling performed by consultants to Cal-Am and the District indicates that more than two feet of sediment could be deposited in river reaches downstream of San Clemente Dam without sediment management (Balance Hydrologics, personal communications, 2000). Because of the serious nature of this situation, it is District staff's understanding that the San Clemente Dam Seismic Retrofit Project now identifies sediment management as a basic project purpose (Marc Lucca, Cal-Am Project Manager, personal communication, July 2000). District consultants have indicated that increased capacity in existing reservoirs, via dredging or other means, would enable the reservoirs to serve as a "sediment shock absorber" to retain the sediment and keep it from depositing downstream in an uncontrolled manner.

It is notable that rivers without dams tend to be in a state of dynamic equilibrium with regard to sediment transport. Because the dams have been in place for many decades, the river channel downstream of both dams has been deprived of sediment. This has resulted in larger-sized sediment, as well as channel downcutting in reaches downstream of the dams. The river channel has largely adjusted to these new changes and is in a new, altered state of equilibrium. Sediment deposition is not desirable today due to the extensive floodplain development that has occurred throughout the 20th Century, as it would result in a higher potential for loss of property and threat to public safety in flooding situations. Unless there are major changes in public policy and federal regulations, such a situation is not considered acceptable.

Los Padres Dam: No specific evaluation has been conducted regarding sediment removal options from Los Padres Reservoir. Feasibility and other issues, including benefits and negative impacts, are expected to be similar to those for San Clemente Reservoir, with one notable exception. Dredging Los Padres Reservoir would increase the volume of surface water available for release and use during summer months. In contrast, dredging San Clemente Reservoir would serve primarily to

continue the 70-year process of trapping sediment in the reservoir. Increased storage of surface water in San Clemente Reservoir would not necessarily increase water available for release or diversion because San Clemente Reservoir is kept essentially full to maintain head on Cal-Am's Filter Plant and to allow migration of steelhead past the dam.

MPWMD Yield Analysis: In 1997, MPWMD staff performed an analysis of the effect of reservoir dredging on the Peninsula's water supply (MPWMD, 1997). The analysis showed that dredging one or both of the reservoirs would have a minor effect on the number of months of mandatory 20% rationing, but would significantly reduce the number of months of voluntary 10% water rationing over a 91-year period (Water Years 1902 through 1992). Moreover, the analysis concluded that legal diversions at San Clemente Reservoir could be increased if reservoir capacity were increased by dredging. **Attachment 3** presents the results of this analysis. It should be noted that certain assumptions in the 1997 report are no longer valid due to subsequent reductions in reservoir storage as well as regulatory changes.

River Temperature Increases Affect Aquatic Life: Increased sedimentation in San Clemente Reservoir has created a wide, flat channel exposed to solar radiation. In turn, this topography results in the heating of river water to temperatures greater than those known to be suitable for steelhead. When warm reservoir water is discharged from San Clemente Dam to downstream waters in summer, steelhead and other aquatic organisms are affected until the stream naturally cools farther downstream. The MPWMD Sleepy Hollow Steelhead Rearing Facility, located one mile downstream of San Clemente Dam, has been affected by warm water discharges in recent years. The District rears steelhead rescued from drying pools in the lower river until conditions warrant their release in the fall. A cooling tower is being installed at a cost of $335,000 to help combat the dangerously high influent temperatures at the facility so that reared fish are not subject to increased disease and mortality. Restoration of reservoir capacity at San Clemente and Los Padres Reservoirs by dredging or other means would result in deeper, cooler reservoirs that would help correct the existing situation. Addressing temperature impacts of existing facilities will likely become more important in the future given the federal Endangered Species Act, Section 4(d) Rules that require protection of steelhead and their habitat.

POTENTIAL BENEFITS OF SEDIMENT REMOVAL

As noted in the above paragraphs, the potential benefits of removing sediment from reservoirs include increased municipal yield and system operational flexibility, increased instream flows released from reservoir storage in summer months, and cooler reservoir and river water temperatures. Increased capacity in the existing reservoirs, especially San Clemente Reservoir, would serve as a "sediment shock absorber" to avoid uncontrolled releases of fine sediment downstream of San Clemente Dam. There is a good possibility that a portion of dredged materials could be marketed to the construction industry, which could help offset dredging costs. Selected portions could also be placed downstream of the dam to improve steelhead habitat.

POTENTIAL CONSTRAINTS TO SEDIMENT REMOVAL

A key concern in the removal of sediment from reservoirs is the potential adverse impacts to the

fishery and aquatic habitat downstream of dredging operations. Releases of fine sediment during dredging or de-watering operations can negatively impact both water quality (e.g., turbidity, anaerobic or release of compounds toxic to aquatic life) and the substrate (e.g., fine sediments in the channel bottom could degrade steelhead habitat and food sources). If the dredged materials were trucked to an offsite location for storage or use, traffic impacts would be significant. For example, 1 million cubic yards (CY) of sediment, which is equivalent to 620 AF, would result in the need for 50,000 to 125,000 truckloads, depending of the loading rate of the truck (CY/truck). Using an alternative slurry pipeline method of transport would require a significant amount of water (in the range of 850-1,200 AF/year) to keep the sediment suspended in the pipeline, thereby reducing streamflow available for downstream aquatic life, or water stored in a reservoir, or both. Other potential problems include limited disposal sites without adverse environmental effects and a relatively high cost per acre-foot of yield.

These potential problems are further described in Appendix A, Evaluation of Water Supply Alternatives, to the Draft Supplemental EIR for the Carmel River Dam and Reservoir Project (MPWMD, 1998). The portions of Appendix A addressing dredging of San Clemente and Los Padres Reservoirs (pages A-25 through A-28 and Table A-8) are included as **Attachment 4**.

ADDITIONAL INFORMATION NEEDED

$ Further information is needed regarding sediment characteristics in both reservoirs. This information is especially important to accurately assess the type and volume of dredged materials that could be marketed or released below the dam for habitat enhancement. (For San Clemente Reservoir, sediment samples extended to a maximum depth of 14 feet, and the majority were to 5 feet or less. No analysis of sediment characteristics has been conducted at Los Padres Reservoir.)

$ The 1996 Moffatt & Nichol Engineers study, the most comprehensive local study available, addressed sediment removal only at San Clemente Reservoir. Similar analysis is required to assess potential sediment removal, de-watering, and transport methods and costs for Los Padres Reservoir.

$ Critical review of the 1996 Moffatt & Nichol Engineers report is needed. Information in the report such as transport routes, potential sediment storage sites, environmental impacts, and estimated costs should be reviewed for accuracy and completeness.

$ Further information is required regarding existing regulations regarding reservoir dredging and required permits.

FINDINGS AND CONCLUSIONS

- $ Removal of sediment from San Clemente and Los Padres Reservoirs is technically feasible.

- $ The high costs of removing, transporting, and disposing of sediment reported in the 1996 Moffatt & Nichol Engineers report could be partially offset by the sale of the portion of dredged material that is usable.

- $ In addition to high costs, key concerns are traffic impacts associated with trucking operations, the need for large quantities of water if a slurry pipeline were used, and instream impacts to water quality and substrate conditions.

- $ Sediment management at San Clemente Dam and Reservoir has become increasingly important due to warm water releases that affect downstream aquatic life, and the potential for increased flood elevations in lower Carmel Valley.

- $ For San Clemente Reservoir, ongoing Cal-Am consideration of methods for retrofitting San Clemente Dam includes sediment management options. The final outcome of these efforts will determine how sediment in San Clemente Reservoir is managed.

REFERENCES CITED

City of Santa Barbara, May 1987, Gibraltar Lake Restoration Project, Final Report

Moffatt & Nichol Engineers, September 10, 1996, San Clemente Reservoir Dredging Feasibility Study, Carmel Valley, California (prepared for California-American Water Company, Monterey Division)

Monterey Peninsula Water Management District, September 29, 1997, Preliminary Water Supply Analysis of Reservoir Dredging Alternatives (memo from Darby Fuerst to PUC Workshop Participants)

Monterey Peninsula Water Management District, November 13, 1998, Draft Supplemental Environmental Impact Report for the Carmel River Dam and Reservoir Project, Appendix A. Evaluation of Water Supply Alternatives

PERSONAL COMMUNICATIONS

Balance Hydrologics, Inc. (Barry Hecht and Mark Woyshner). Telephone and in-person discussions in January-June 2000.

Marc Lucca, Cal-Am Project Manager. Discussions in July 2000.

Attachment 1

GIBRALTAR LAKE
RESTORATION PROJECT

FINAL REPORT

Submitted to

U.S. Environmental Protection Agency

"Clean Lakes Program"

Prepared by

The City of Santa Barbara

Public Works Department

Water Resources Division

May, 1987

EXECUTIVE SUMMARY

This report presents the results of the Gibraltar Lake Desiltation Project under the Clean lakes Act.

The reclamation program was proposed by the City of Santa Barbara in May 1977 to the U. S. Environmental Protection Agency's Clean Lakes Program. A Clean Lake EPA Grant to restore Gibraltar Lake was awarded to the City of Santa Barbara on May 15, 1978. This funding and desiltation method of Gibraltar Lake was the first of its kind in the United States.

Within three years from the initial construction of the desiltation project, approximately 445 acre-feet of wet silt had been dredged from the lake at a total cost of $4,197,316.84.

Gibraltar Lake is a 273.6 acre reservoir located within the rugged Santa Ynez Mountains about seven miles north of Santa Barbara City. The reservoir provides an average of 35% of the City's drinking water supply in conjuction with the other supply sources such as Lake Cachuma 53%, and the City's 12% ground water source.

The lake's water capacity has been decreasing since the completion of the Gibraltar Dam in 1920 and subsequent enlargement in 1948, because of siltation. The reservoir formed by the damming of the Santa Ynez River had an initial maximum capacity of 14,500 acre - feet and a subsequent capacity of 22,500 acre-feet in 1948. The lake's last capacity measurement in 1986 was reported to be reduced to about 8,241 acre-feet or 37 % of the total volume of 22,500 acre-feet. Over this 66 year period between 1920 through 1986, 14,259 acre-feet of silt entered Gibraltar Lake at an average rate of 216 acre-feet of silt per year.

The purpose of the Gibraltar Lake Restoration Project was to safely attempt to reclaim a portion of the reservoir's lost water capacity. The construction and dredging operations took nearly three years to complete. The actual project length satisfied the proposed 36 months originally stated in the Federal Assistance Application.

EXECUTIVE REPORT (continued)

EPA and representative of the Federal Government are to receive "thanks" from the citizens of Santa Barbara for participating in this grant. The purpose of the "Clean Lakes" Grant has been fulfilled and this report is documentation of that participation between the agencies (EPA and the City of Santa Barbara).

1978 GRANT NO. S804814-010 (later S009344-013, 1983)

ENVIRONMENTAL CONCERNS

1. The City of Santa Barbara Water Supply -"Gibraltar Reservoir"- has benefitted from the grant by both sustaining 3 years of dredging and by entering into a Watershed Management Agreement with the U. S. Forest Service.

2. A special "Pneuma Pump" was employed as the dredging equipment to be both tested and operated during the period of the Grant. This pump handled mercury contaminated silt removal with no degradation or disruption to the City of Santa Barbara's water supply.

3. Construction of a silt retention dam within lands owned and controlled by the U. S. Forest Service caused no habitat disruption to either man or animal.

PROJECT COST SUMMARY

1. (EPA) (City)
PHASE I - PHASE "A" - The initial Research and Development Phase including construction of the initial retention dam; mobilization/ demobilization and pumping of approximately 220,000 cubic yards of liquid silt or 92,000 of bottomsilt for--------$2,255,000.

2. PHASE II - PHASE "B" - Continued testing and purchase of the Pneuma Pump and raising retention dam 38 feet for--------------------$ 718,611.

3. PHASE II - PHASE "C" - Operational costs of "Pneuma" equipment using City personnel for a sustained period of 18 months for-----------$ 1,223,705.

TOTAL COST $ 4,197,316.

NOTE: Authorized EPA Grant = $4,225,000.

DREDGING COSTS

EPA GRANT PHASE	CITY PHASE	ACTUAL COSTS	TOTAL LIQUID* PUMPED C.Y.	BOTTOM SILT** WET C.Y.	COST PER CUBIC YARD (C.Y.)
Actual					
I	"A"	$2,255,000	230,000	92,000	$24.51
II	"B"	718,611	420,000	168,000	$ 4.28
	SUBTOTAL	$2,973,611	650,000	260,000	$11.44
II	"C"	1,223,705 (648,674 O&M COSTS)	1,145,260	458,000 (284 A.F.)	$ 2.67
	TOTAL	$4,197,316	1,795,260	718,000 (445 A.F.)	$ 5.85

Phase "A" included construction of initial silt retention dam, R&D and planning, environmental and engineering/inspection costs.

Phase "B" including raising initial retention dam 38', pumping and purchasing equipment.

Phase "C" PUMPING costs only for 18 months sustained dredging.

* Liquid slurry is the pumped liquid which is composed of 40% wet silt and 60% water.
** Wet silt is composed of 40% dry silt and 60% water.

LONG TERM PROBLEMS AND COSTS

The Desilting Project, during its three years in operation, was able to mitigate the impact of annual siltation at Gibraltar Reservoir. Water yield of the reservoir was sustained during that period of time. However, it is recognized that the long term will bring about continued siltation. Watershed management measures are being undertaken by the U.S. Forest Service, with financial support by the City of Santa Barbara. This will help mitigate watershed erosion and reservoir siltation to a certain extent. In the long term, however, significant erosion/siltation will continue.

The current silt basin has been filled with approximately 445 acre feet (AF) of wet silt dredged from Gibraltar Reservoir. There is still remaining in the basin the equivalent storage capacity for a final 275 AF of wet silt from the reservoir. It has been calculated that to complete the filling up of this silt basin will require portions of two additional years of operations and will cost some $450,000 in operation and maintenance cost. The long-term gain in average water yield by completing the dredging to the extent made possible by the remaining 275 AF of wet silt storage in the existing silt basin would be about $700/AF. This is the incremental yield over the yield available if no further dredging were to be done.

The removal of 445 AF of wet silt by the dredging operations of Phases A, B and C have been estimated to provide a long-term incremental yield over the base conditions of no dredging program of some 100 AFY at a unit cost of $4,470/AF (please see backup calculations in Addendum "A"). The long-term yield of completing the dredging over the base condition is 150 AFY with a unit cost of $3210/AF. (See table below.)

Investigations are continuing into the possibility of obtaining silt storage capacity elsewhere, above or below Gibraltar Reservoir.

PROJECT WATER YIELD COSTS

Description	Cost ($000)	Wet Silt Removed (AF)	Incremental Average Water Yield (AFY)	Yield Cost ($/AFY)
Phase A, B, & C	$4000	445	100	4470
Complete Dredge Project *	450	275	50	700
Total*	4450	720	150	3210

* Projected Figures

Attachment 2

SAN CLEMENTE RESERVOIR DREDGING FEASIBILITY STUDY CARMEL VALLEY, CALIFORNIA

Prepared For
California American Water Company, Monterey Division
50 Ragsdale Drive, Suite 100
Monterey, CA 93942-0951

Prepared By
Moffatt & Nichol Engineers
131 Steuart Street, Suite 300
San Francisco, CA 94105
Job No. 3675

September 10, 1996

Summary

- Dredging of practically all accumulated reservoir sediment is technically feasible;
- Adequate off-site disposal areas are available, as identified in Section 5;
- Key issue related to hydraulic pipeline operations is the water availability (need 850 to 1200 acre-feet of water per year for pumping);
- Key issue related to truck off-haul operations is the potential environmental impact on existing conditions;
- A potential market value for the excavated sediments exists, and should be explored in more detail including partnering efforts with construction companies and miners;
- Removing and disposing about 1 million cubic yards of sediment is estimated to cost between $8 and $30 per cubic yard, over a time period of 1 to 15 years, depending on the alternative(s) selected;
- Removing and disposing about 2 million cubic yards of sediment is estimated to cost between $12 and $17 per cubic yard, over a time period of 5 to 30 years, depending on the alternative(s) selected;
- All alternatives would facilitate maintenance dredging of incoming sediment load on an annual or similar recurrence. Also, the sediment bypassing concept (see Section 5.4.7) is promising and should be evaluated.

TABLE 7.1 : SUMMARY OF ALTERNATIVES EVALUATION

Alternative	Disposal Site	Description	Unit Rate ($/CY for following dredge volumes)*			Duration of Operations (for 1,000,000 CY)	Comments
			1,000,000 CY	2,000,000 CY	2,000,000 CY (1,000,000 CY confined disposal at filter plant)		
I	Filter Plant (confined disposal)	Confined disposal at Filter Plant, via mech. dredging & conveyor	$9.40	--	--	1 -2 years	Potential floodplain impacts, limited by capacity
IB	Filter Plant + Others (confined disposal + processing)	Confined disposal + processing at Filter Plant, via mech. dredging, conveyor, and truck off-haul (20 mi distance)	$17.20 (515,000 CY disposed on-site)	$17.00 (515,000 CY disposed on-site)	$14.50	8 - 9 years	Potential floodplain impacts, limited by capacity and off-haul rates (60,000 CY/yr)
IC	Filter Plant (confined disposal)	Confined disposal at Filter Plant, via hydraulic dredging & slurry pipeline	$8.00	--	--	3 - 4 years	Potential floodplain impacts, limited by capacity and water for slurry (850 to 1200 AF/yr)
II	Various (processing at Garland Ranch)	Mech. dredging, conveyor to Filter Plant, slurry pipeline to Garland Ranch and truck off-haul (20 mi distance)	$29.20	$23.80	$16.80	6 - 7 years	Limited by site area, off-haul rates (150,000 CY/yr), and water for slurry (850 to 1200 AF/yr)
IIB	Various (processing at Garland Ranch)	Hydraulic dredging, slurry pipeline to Garland Ranch and truck off-haul (20 mi distance)	$24.10	$20.45	$15.75	6 - 7 years	Limited by site area, off-haul rates (150,000 CY/yr), and water for slurry (850 to 1200 AF/yr)
III	Tularcitos Valley sites (confined disposal)	Mechanical dredging, conveyor to Filter Plant & truck off-haul to Tularcitos Valley sites	$19.00	$15.35	$12.30	5 - 6 years	Capacity related to land availability. Off-haul rate assumed to be 200,000 CY/yr.
IV	Various (pipeline to Carmel beaches)	Hydraulic dredging, slurry pipeline to Carmel beaches and barge off-haul (60 mi distance)	$26.60	$20.85	$16.40	3 - 4 years	Unlimited disposal capacity. Limited by water for slurry (850 to 1200 AF/yr)
V	Fort Ord sites (confined disposal)	Truck off-haul to Fort Ord sites from processing site - from Filter Plant - from Garland Ranch	 $24.30 $24.80	 $21.45 $20.90	 $14.20 $14.65	 15 -16 years 6 - 7 years	Unlimited disposal capacity. Limited by water for slurry (850 to 1200 AF/yr), and/or off-haul rate (60,000 CY/yr from Filter Plant; 150,000 CY/yr from Garland)

* Unit rates rounded to nearest 10 cents

Attachment 3

MONTEREY PENINSULA
WATER MANAGEMENT DISTRICT
187 ELDORADO STREET • POST OFFICE BOX 85
MONTEREY, CA 93942-0085 • (408) 649-4866
FAX (408) 649-3678 • http://www.mpwmd.dst.ca.us

To: PUC Workshop Participants
From: Darby Fuerst, MPWMD General Manager DWF
Subject: Preliminary Water Supply Analysis of Reservoir Dredging Alternatives
Date: September 29, 1997

To evaluate the effect of reservoir dredging on water supplied by the California-American Water Company (Cal-Am), four simulations were run using the District's computer model of the Monterey Peninsula Water Resources System. This model, CVSIM, was designed as a planning tool to simulate the performance of the water resources system under varying physical, structural, and management conditions. CVSIM incorporates both Cal-Am and non Cal-Am uses and both surface and ground water responses. The four dredging simulations include:

(1) **Maintain San Clemente and Los Padres Reservoir at Existing Capacities:** San Clemente Reservoir at 200 acre-feet (AF) and Los Padres Reservoir at 2,179 AF of total storage;

(2) **Dredge San Clemente Reservoir to Original Capacity:** San Clemente Reservoir at 1,425 AF and Los Padres Reservoir at 2,179 AF of total storage;

(3) **Dredge Los Padres Reservoir to Original Capacity:** San Clemente Reservoir at 200 AF and Los Padres Reservoir at 3,033 AF of total storage; and

(4) **Dredge Both San Clemente and Los Padres Reservoirs to Original Capacities:** San Clemente Reservoir at 1,425 AF and Los Padres Reservoir at 3,033 AF of total storage.

All the simulations were run at the current Cal-Am annual production limit set by the District, i.e, 17,641 AF, and included a management plan involving increasing levels of water rationing during extended dry periods. The simulations were run to determine the effect of the proposed reservoir dredging alternatives on water supply reliability and utilized a 91-year period of record, i.e., Water Years 1902-1992. In the simulations, water supply reliability is measured by the frequency and severity of water rationing. The effect of reservoir dredging on water supply reliability is shown in the table below.

The table shows that dredging has a minor effect on the number of months of mandatory 20% water rationing. This period of mandatory water rationing occurs during the simulated 1977-1978 period. In contrast, the number of months of voluntary 10% water rationing are significantly reduced by the dredging proposals. By dredging each reservoir individually, the number of

months of voluntary 10% rationing is reduced by 58 months and by dredging both reservoirs together, the number of months of voluntary rationing is reduced by 75 months.

EFFECT OF RESERVOIR DREDGING ON WATER SUPPLY RELIABILITY			
Number	Simulation	Months of Voluntary 10% Rationing	Months of Mandatory 20% Rationing
1	Existing Reservoir Capacities	99	12
2	Dredge San Clemente Reservoir	41	11
3	Dredge Los Padres Reservoir	41	11
4	Dredge San Clemente and Los Padres Reservoirs	24	10

With respect to yield, by increasing reservoir storage capacity, Cal-Am would be able to legally store and redivert more water each year. Specifically, by dredging Los Padres Reservoir to its original capacity, Cal-Am's licensed right could be increased from the 2,179 AF to 3,033 AF annually, an increase of 854 AF. Similarly, by dredging San Clemente Reservoir to its original capacity, Cal-Am may be able to apply for rights to divert water to storage during the high flow winter period -- when it is presently available for appropriation -- for release and rediversion during the low flow period[1]. This represents a potential increase in legal diversions at San Clemente Reservoir of approximately 1,425 AF annually. If both San Clemente and Los Padres Reservoirs were dredged to their original capacities, the potential increase in legal diversions to storage would total 2,279 AF per year. These changes would need to be reviewed and approved by the State Water Resources Control Board (SWRCB).

Please note that this analysis does not address environmental, economic or regulatory concerns. If there are any questions regarding the preliminary analysis, please let me know.

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[1] It is the District's understanding that Cal-Am has a pre-1914 appropriative right for 1,137 acre-feet per year of direct diversion at the San Clemente Reservoir site.

Attachment 4

Draft Supplemental Environmental Impact Report for the Carmel River Dam and Reservoir Project

Volume II: Appendices

Lead Agency:

Monterey Peninsula Water Management District

EIR Consultant:

Jones & Stokes Associates, Inc.

November 13, 1998

- function as the water supply source for a redevelopment area in Sand City while at the same time offsetting a portion of Cal-Am's diversions from the Carmel River.

A.3.2.2 Conclusions

Desalination plants of various sizes have been shown to be technically feasible throughout the world, although questions exist about the physical and institutional feasibility of large plants (larger than 6 MGD) in certain locations on the Monterey Peninsula because of potential limitations on the locations of intake and outfall facilities. Capital costs of larger plants are comparable to those of other large-scale alternatives, such as dams, but O&M costs are much higher. Advantages of desalination include a relatively short construction period once permits have been obtained; relative ease to add phased modules; a consistent, "drought-proof" source of supply (the ocean); various operational options; and lack of inundation effects. Disadvantages include substantial capital costs for facilities that must be incurred every 20–25 years; high operating costs and energy use; the need for regular replacement of major capital components required as a result of corrosion by seawater and other chemicals; and potential adverse environmental impacts on marine life, endangered coastal dune species, and wetlands.

A.3.3 DREDGING OF EXISTING RESERVOIRS

Dredging refers to the removal, dewatering, conveyance, and disposal of accumulated sediment from existing reservoirs to regain lost capacity (or maintain existing capacity). Cal-Am, MPWMD, and the City of Santa Barbara have evaluated the feasibility and cost effectiveness of various dredging projects. For more information, refer to summaries of earlier analyses in the 1994 NLP Final EIR (MPWMD 1994a); MPWMD worksheets prepared for the February 8, 1996 Alternatives Workshop; the San Clemente Reservoir Dredging Feasibility Study prepared for Cal-Am (Moffatt & Nichol Engineers 1996); a draft matrix of alternatives prepared for the September 8, 1997 CPUC workshop; and an MPWMD preliminary evaluation of dredging yield dated September 29, 1997 (MPWMD 1997c). Table A-8 provides a summary of information presented in these studies.

A.3.3.1 Discussion

Project Description and Operations. The two dredging options for the Carmel River system are sediment removal from the existing San Clemente and Los Padres Reservoirs, which are both owned and operated by Cal-Am. San Clemente Reservoir was completed in 1921 with an original capacity of 1,425 af at the spillway elevation of 525 feet (flashboards are assumed to be lowered permanently); existing (1998) capacity is estimated by Cal-Am to be 147 af. Los Padres Reservoir was completed in 1949 with an original capacity of 3,033 af; current capacity is estimated at 2,179 af. The estimated capacity lost to sedimentation from upstream sources (both natural and as a result of human intervention) is 1,278 af for San Clemente Reservoir and 854 af for Los Padres Reservoir, for a total lost capacity of 2,132 af.

An important new development (as of August 1998) is the fact that dredging San Clemente Reservoir presently does not appear to be an option, based on discussions to date by an interagency group of

engineering and fishery experts convened by the DWR and Cal-Am to address the existing and long-term sedimentation problems in San Clemente Reservoir. After weighing the pros and cons of several sedimentation options (including dredging the reservoir), the group favors the concept of maintaining a long-term average of about 200 af of storage in the reservoir by building sluice gates into the dam. Operated in accordance with a detailed plan to be developed by the interagency group, the sluice gates would be opened when the riverflow through the reservoir is suitable to carry sediment downstream. These gates would be incorporated into seismic retrofit designs currently being prepared at the direction of DSOD. A separate EIR on the San Clemente Dam Seismic Retrofit Project is being prepared by DWR and is scheduled for release in fall 1998; the analysis in that document will be used to update this discussion in the Final SEIR.

Water Yield. Two concepts are discussed in the following paragraphs: dredging only Los Padres Reservoir, and dredging both Los Padres and San Clemente Reservoirs. The feasibility of dredging both reservoirs is questionable in light of the current (but not formally confirmed) plans to maintain approximately 200 af of storage and build sluice gates at San Clemente Dam.

Preliminary analyses conducted by MPWMD in September 1997 indicate that neither dredging concept would substantially increase Cal-Am system reliable water yield or drought protection because of the small amounts of water storage involved. In general, the increase in the amount of storage is typically much greater than the reliable, long-term yield gained. However, from a water rights perspective, reclaiming lost reservoir storage capacity could enable Cal-Am to legally store and redivert more water each year. Specifically, by dredging Los Padres Reservoir to its original capacity, Cal-Am's licensed right at that site could be increased from the current 2,179 af to 3,033 af annually, an increase of 854 af. If both Los Padres and San Clemente Reservoirs were dredged, the potential increase in legal diversions to storage could total as much as 2,132 af. Cal-Am would have to apply for rights to divert San Clemente Dam water to storage during the high-flow winter period—when it is presently available for appropriation—for release and rediversion during the low-flow period. These changes would need to be reviewed and approved by the SWRCB. As noted above, dredging of San Clemente Reservoir does not appear to be feasible.

The Moffatt & Nichol report evaluated use of slurry pipelines (as an alternative to trucks) to convey dredged materials to help reduce traffic impacts; however, this method would require 850–1,200 af/year to keep the dredged material suspended in the pipelines. This is a substantial amount of water and would offset any capacity gained by dredging; for that reason, this method is not recommended.

Cost Parameters. As described in the Moffatt & Nichol 1996 evaluation of San Clemente Reservoir dredging options, the selected dredging conveyance method and disposal location have a substantial effect on costs. Estimated total costs to dredge and dispose of 620 af (1 million cubic yards [CY]) would range from $8 to $29 million; for 1,240 af (2 million CY), total capital costs would range from $25 to $48 million. Depending on the disposal site, estimated costs would range from about $8 per CY ($13,000 per af) to more than $29 per CY ($47,000 per af) for 1 million CY, and from about $12 to $24 per CY for 2 million CY. It is notable that these estimates do not include mitigation costs, which could be substantial. To maintain the water rights described above, a maintenance dredging program would be required to remove the estimated average of 17 af of sediment deposited each year. The 1996 Moffatt & Nichol report did not include a description of or a cost estimate for such a

rogram but noted that the dredged material from San Clemente Dam (e.g., sorted sand, gravel, and obble) would have a market value. The report suggested that entering into a partnership with onstruction or mining companies could help offset the anticipated costs but did not incorporate otential revenue into the cost estimates because of the questionable environmental feasibility of many of the options.

A similar detailed study has not been performed for dredging Los Padres Dam, which would entail removal of about 1.38 million CY (854 af) of sediment. Costs are assumed to be higher because of the longer distance to disposal sites. Assuming a range of $8–29 per CY (similar to San Clemente Dam costs), the estimated capital cost to completely regain capacity would be about $11–40 million (at 1996 price levels). Again, these estimates do not consider mitigation costs or the potential market value of the dredged and sorted materials.

Implementation Timing and Project Life. The environmental review and permitting process for a major dredging project would take at least 1-3 years to complete, given that federal (Clean Water Act Section 401 and 404, Endangered Species Act Section 7) and state (streambed alteration, regional water quality control board [RWQCB] discharge) permits would be required and substantial fishery, wetland, and water quality issues would be associated with this alternative. According to the Moffatt & Nichol report, the actual dredging and disposal of material from San Clemente Reservoir would take 1–15 years for 1 million CY (620 af) and 5–30 years for 2 million CY (1,240 af). The number of years needed would be greatly affected by the disposal option and conveyance rate used (variations of slurry pipeline, truck haul-off, barge haul-off) and weather-related impacts. Variations that feature truck haul-off would take at least 10–15 years. These periods are assumed to be similar for the same process at Los Padres Reservoir. In theory, if dredging of San Clemente Reservoir were feasible, an estimated 10–30 years would be needed to dredge both reservoirs.

Previous estimates by MPWMD consultants indicated that each reservoir receives an average of about 20 af/yr of new sediment. This is equivalent to about 32,300 CY of additional sediment that must be removed each year. Thus, the timing estimates for removal described above are low by at least 3%. Additional time may be needed because these estimates do not consider "bulking" (expansion) of material, which occurs when sediment is handled and moved.

Environmental Issues. The primary environmental benefit of dredging is that additional reservoir capacity can be obtained without inundating new habitat. The major potential adverse biological impact is the smothering of fishery and other aquatic wildlife habitat downstream of the reservoirs by uncontrolled releases of fine sediment during the dredging process. This possibility is of great concern to federal and state fishery experts and is one reason why the use of controlled sluice gates rather than dredging is presently preferred at San Clemente Dam.

Of significant local concern is the substantial traffic impact on local roads as a result of the thousands of truck trips that would be involved over many years. For example, 1 million CY (620 af) of sediment would equate to 50,000 and 83,000 truckloads at the assumed loading rates of 20 CY and 12 CY per load, respectively. Disposal of 2 million CY would require 100,000–166,000 truckloads. The number of one-way truck trips would be double this amount (i.e., 200,000–332,000) to first carry the materials to the disposal site, then return (empty) to the processing site in Carmel Valley.

Assuming an off-haul rate of 175,000 CY per year (the average of the 150,000–200,000 CY per year cited in the Moffatt & Nichol report), this would be nearly 29,200 truck trips per year [(175,000 CY per year ÷ 12 CY per load) x 2 one-way trips], which equates to 80 truck trips per day, every day of the year (actual daily trips would be higher because no trucking would take place on weekends and holidays), or at least 10 truck trips per hour for an 8-hour day. At 175,000 CY per year, a total of 5.7 years would be required to remove 1 million CY (620 af) and 11.4 years to remove 2 million CY (1,240 af). Given the already inadequate level of service on Carmel Valley Road, Highway 1, and other area roadways, the traffic impacts that would be associated with dredging seriously impair the viability of this alternative. San Clemente Drive would require ongoing maintenance and repair because of the heavy truck traffic. The estimates presented above may be 10–15% low because they do not account for the bulking (expansion) factor associated with handling and processing the dredged material. In-reservoir estimates of volume are based on measurements of compacted sediment; a 10–15% increase in volume is expected once the material is loaded into a truck.

Other Issues. The experience of the City of Santa Barbara, in a 3-year dredging project to regain some of the lost storage in Gibraltar Reservoir (City of Santa Barbara 1986), and other experts indicates that dredging to regain lost reservoir storage "is an extremely expensive, if not impossible" undertaking (Annandale pers. comm.). High cost and environmental concerns resulted in a decision by Santa Barbara to abandon dredging as a solution to developing additional water yield for the city. Internationally, water managers and engineers are now designing sediment management programs to maintain new or existing reservoir storage, rather than attempting to regain storage lost to sedimentation.

A.3.3.2 Conclusions

The concept of dredging is appealing in that lost reservoir storage could be regained and certain lost water rights could be reclaimed. The Moffatt & Nichol study at San Clemente Dam determined that removal of sediment from the reservoir is technically feasible, but serious questions exist with regard to the economic and regulatory feasibility of conveyance and disposal. Key concerns are the extremely high overall cost (and cost per af), need for large quantities of water to implement pipeline slurry options, substantial traffic impacts associated with trucking, and environmental impacts on downstream fishery and aquatic wildlife habitat. Because of these concerns, an interagency oversight group has selected a nondredging method to facilitate sediment management and maintain about 200 af of storage at San Clemente Dam. Thus, for the purposes of this appendix, subsequent evaluations of alternative plans that include dredging assume that dredging can be performed only at the Los Padres Dam site; dredging at San Clemente Dam is not presently considered a reasonably foreseeable option.

A.3.4 GROUNDWATER DEVELOPMENT, INCLUDING INJECTION AND RECOVERY

Groundwater development refers to production of additional water from alluvial (river-based) aquifers, groundwater basins, or upland sources such as fractures in mountain bedrock that may yield water. Groundwater development also refers to means of increasing groundwater storage or availability by methods such as injection and recovery, which are described below. Groundwater development typically relies on the creation and use of large production wells and other facilities (e.g.,

Table A-8. Summary of Dredging Project Alternatives

Project Description	Water Yield	Cost Parameters (1996 dollars)	Project Timing and Life	Environmental Issues	Conclusions and Other Comments*
Regain lost storage capacity at existing San Clemente and Los Padres Reservoirs. Facilities include means to remove, dewater, convey, and dispose accumulated sediment. Trucking and slurry pipelines were considered as conveyance means. Slurry pipelines require 850-1,200 af/yr of water to move material. Thus, this method is not recommended, as annual water use may outweigh storage capacity gain. Operations must be coordinated with fish life cycle and river hydrology.	Maximum capacity to be regained is 1,278 af at San Clemente Reservoir and 854 af at Los Padres Reservoir. Firm yield from dredging is minimal, but water rights could be regained by dredging, equal to regained capacity. Sediment management plans at San Clemente Dam do not include dredging there. Thus, the Los Padres site value of 854 af is assumed for this evaluation.	Capital costs for 854 af at Los Padres site are roughly estimated at $11-40 million, based on $8-29 per cubic yard ($13,000-47,000 per acre-foot). O&M costs not provided in cited reports. These estimates do not include removal of annual sediment inflow, bulking factors, or mitigation costs, which could be substantial. Costs do not reflect possible income from dredged material, if separated into salable components.	Up to 3 years needed for environmental review and to obtain permits. 5-15 years for truck haul-off (854 af), depending on disposal site, quantity, and weather conditions. At 20-af/yr infill rate, regular sediment removal is needed to maintain storage capacity at Los Padres Reservoir.	Major Benefits: Recovered reservoir capacity obtained without inundating habitat. Avoids sediment passage over San Clemente Dam. Major Adverse Effects: Smothering of fishery and aquatic wildlife habitat downstream of dredge site during dredging period; water chemistry effects. Substantial, chronic, long-term traffic impacts from reservoir to disposal site.	Dredging is technically feasible, but serious questions about environmental and economic feasibility remain. Dredging at San Clemente site is not likely based on interagency discussions in summer 1998. Only the Los Padres site will be considered in this analysis. Advantages include recovery of storage capacity without inundating new areas. Disadvantages include extremely high cost per acre-foot, substantial traffic impacts, location of suitable disposal site, and potential harm to fishery habitat during dredging.

* "Feasible" means project is a reasonably foreseeable means to provide lawful supply for Cal-Am water system. See text for further discussion.

EXHIBIT 26-C

MONTEREY PENINSULA
WATER MANAGEMENT DISTRICT

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April 8, 2009
David Gutierrez, Chief
Division of Safety of Dams
California Department of Water Resources
2200 X Street, Suite 200
Sacramento, CA 95818

SUBJECT: Los Padres Dam – No. 642-4
Carmel River, Monterey County
Potential for Increasing Storage Capacity in Los Padres Reservoir

Dear Mr. Gutierrez:

The Monterey Peninsula Water Management District (MPWMD) Board of Directors has directed its staff to investigate opportunities for increased storage capacity at Los Padres Reservoir. Specifically, the Board members directed me to meet with staff of your agency to discuss potential methods for doing so. The purpose of the project is to provide additional storage to allow releases for greater instream flows to benefit the Carmel River environment, and not for increased municipal water supply.

I spoke with Aspet Ordoubigian of your staff in this regard, and he encouraged me to send a letter spelling out my request in more detail. Below are some of the concepts and potential issues MPWMD staff has identified. We would appreciate your comments and recommendations. Following your review of this letter, please contact me to set a meeting at your convenience to discuss the concerns and requirements of your agency.

Concept 1 – Remove Accumulated Sediment

Since construction of Los Padres Dam in the late 1940s, the reservoir capacity at spillway crest elevation has decreased from 3,030 acre-feet (AF) to approximately 1,760 AF due to sedimentation. Methods of sediment removal investigated in the past include hydraulic dredging using barge-mounted equipment and drawing down the reservoir and excavating the sediment. At least once in the past, sediment was sluiced through the outlet works, but this method is no longer considered appropriate due to the effects on water quality in the river downstream of the dam.

California American Water (Cal-Am), owner of Los Padres Dam, has proposed a dredging feasibility study for Los Padres Reservoir. Cal-Am's proposal is included as part of its General Rate Case application to the California Public Utilities Commission for calendar years 2009, 2010, and 2011. MPWMD has expressed support for this study, which is proposed to be completed in December 2009. Results of this study will provide valuable information as to the potential for dredging the reservoir as a means of restoring storage capacity.

We would appreciate learning whether the Division of Safety of Dams has regulations or concerns that would need to be considered in planning the implementation of a sediment removal project for Los Padres Reservoir.

Concept 2 – Install Facilities to Seasonally Raise the Reservoir Level

Facilities such as an inflatable rubber dam, Obermeyer gates, or drum gates could be installed in the spillway to seasonally raise the reservoir level, thereby increasing the storage capacity. The spillway crest elevation is approximately 1,040 feet, and the dam crest elevation is approximately 1,058 feet. Depending on the stability of the embankment, this method may be feasible, and there may be the potential for increasing the reservoir's storage capacity during certain periods. We would appreciate learning your agency's concerns and considerations for such a plan.

Concept 3 - Increase the Height of the Dam by Adding to Existing Embankment or Removing the Existing Dam and Building a New Dam

Increasing storage capacity by adding to the existing embankment and raising the spillway has been suggested by some. Although this method seems unlikely to be a preferred alternative, it may have some merit.

A new dam and reservoir located approximately ½ mile downstream of the existing dam, creating a reservoir with a 24,000 AF capacity was the primary water supply project from 1989 through 2004 proposed for the Monterey Peninsula area, first by MPWMD and then by CAL-AM. For this project, the existing dam would be breached, not removed. The concept suggested in connection with the current desire to increase the capacity of Los Padres Reservoir is different: if adding material to the existing embankment to increase its height is determined to be either infeasible or not a preferred method, the existing dam could be removed and a new, higher dam could be constructed in its place.

Again, we would appreciate your comments and recommendations regarding these alternatives. Please contact me to set a meeting at your convenience to discuss the concerns and requirements of your agency. My telephone number is (831) 658-5620 and my e-mail address is andy@mpwmd.dst.ca.us.

Sincerely,

Andrew M. Bell
District Engineer

cc: Craig Anthony, General Manager, Central Division, California American Water
Aspet Ordoubigian, Division of Safety of Dams, Area Engineer, Area 5
MPWMD Board of Directors

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY
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Mr. Andrew M. Bell, District Engineer
Monterey Peninsula Water Management District
Post Office Box 85
Monterey, California 93942-0085

Los Padres Dam, No. 642-4
Monterey County

Dear Mr. Bell:

This is in reply to your letter dated April 8, 2009 requesting our comments for the three proposed alternatives to increase the storage capacity of Los Padres Dam. All three alternatives are acceptable conceptually, subject to the following general requirements:

Alternative 1) – "Remove Accumulated Sediment":

Removing the sediments from the reservoir will not require an application from this Division, as long as the dredging operation does not encroach into the dam embankment or the outlet works.

Alternative 2) – "Install Facilities to Seasonally Raise the Reservoir Level":

Altering the spillway to increase the storage capacity will require updated hydrology and stability studies, plans and specifications, submitted with an enlargement application and appropriate filing fee for our review and approval. The hydrology study must show adequate residual freeboard during spillway operation. The safety and stability of the dam and appurtenances must not be compromised.

Alternative 3) – "Increase the Height of the Dam by Adding to Existing Embankment or Removing the Existing Dam and Building a New Dam":

Enlarging the existing dam or building a new dam will require filing an "Application for Approval of Plans and Specifications for the Construction or Enlargement of a Dam and Reservoir," including a complete set of drawings, an engineering evaluation of the enlarged or new dam, and a filing fee. Building a new dam will require extensive geotechnical, hydrologic, and stability evaluations and will likely require more work compared to the other aforementioned alternatives.

If you have any questions or need additional information, you may contact Area Engineer Aspet Ordoubigian at (916) 227-4625 or Regional Engineer Mike Zumot at (916) 227-4631.

Sincerely,

Michael Wagaman FOR

David A. Gutierrez, Chief
Division of Safety of Dams

cc: Mr. Craig Anthony, General Manager
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