Attachment 2

Section 404 (b)(1) Alternatives Analysis
Carryover Storage Project/San Vicente Dam Raise. March. (J&S MO00795.)
Irvine, CA. Prepared for San Diego County Water Authority.
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<tr>
<td>AF</td>
<td>acre feet</td>
</tr>
<tr>
<td>AMSL</td>
<td>above mean sea level</td>
</tr>
<tr>
<td>CCW</td>
<td>composite criterion weight</td>
</tr>
<tr>
<td>CEQA</td>
<td>California Environmental Quality Act</td>
</tr>
<tr>
<td>Corps</td>
<td>U.S Army Corps of Engineers</td>
</tr>
<tr>
<td>CSP</td>
<td>Carryover Storage and San Vicente Dam Raise Project</td>
</tr>
<tr>
<td>CW</td>
<td>criteria weights</td>
</tr>
<tr>
<td>DCF</td>
<td>downstream control facility</td>
</tr>
<tr>
<td>EIR/EIS</td>
<td>environmental impact report/environmental impact statement</td>
</tr>
<tr>
<td>ESP</td>
<td>Emergency Storage Project</td>
</tr>
<tr>
<td>GW</td>
<td>goal weights</td>
</tr>
<tr>
<td>HCP</td>
<td>Habitat Conservation Plan</td>
</tr>
<tr>
<td>IID</td>
<td>Imperial Irrigation District</td>
</tr>
<tr>
<td>LEDPA</td>
<td>least environmentally damaging practicable alternative</td>
</tr>
<tr>
<td>Master Plan</td>
<td>San Diego County Water Authority’s Regional Water Facilities Master Plan</td>
</tr>
<tr>
<td>MSHCP</td>
<td>Multiple Species Habitat Conservation Plan</td>
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MWD  Metropolitan Water District of Southern California
NCCP  Natural Communities Conservation Plan
NEPA  National Environmental Policy Act
OHWM  ordinary high water mark
OW    objective weights
PPS   preference point scores
RCC   roller compacted concrete
RFP   request for proposals
SV    San Vicente
TM 12.0 Technical Memorandum 12.0 – Emergency Reoperation, prepared by GEI Consultants and CDM (1994)
USEPA  U.S. Environmental Protection Agency
Water Authority  San Diego County Water Authority
Chapter 1
Introduction

Project Background

The San Diego County Water Authority (Water Authority) supplies water to an approximately 1,440 square-mile area serving 2.7 million users in western San Diego County. The Water Authority, which consists of 24 member agencies and is governed by a 35-person Board of Directors, purchases the majority of its water from Metropolitan Water District of Southern California (MWD), and augments the supply with transfers from the Imperial Irrigation District (IID) in Imperial County. The majority of the water supply is sourced from Colorado River entitlements, with a portion of MWD water sourced from the Northern California State Water Project. The Water Authority receives primarily gravity-fed transfers via two aqueducts containing five large-diameter pipelines. The pipelines are connected to reservoirs that provide storage capacity at a number of local facilities owned and operated by the various member agencies. The Water Authority’s Board of Directors adopted a Strategic Plan that includes a goal to “provide the necessary facilities for a safe, reliable, and operationally flexible water storage, treatment, and delivery system” (SDCWA 1999).

In 1998, the Water Authority’s Board of Directors approved an Emergency Storage Project (ESP) to provide storage for emergency situations such as system failure during seismic events. The ESP has a number of project components, including new dam, pipeline, and pump station construction, as well as improvements to existing facilities such as a 54-foot raise of the San Vicente Dam to provide an additional 52,100 acre feet (AF) of emergency storage capacity. While other components of the ESP are under construction or completed, the Water Authority is proposing to combine the previously approved San Vicente Dam raise with the proposed Carryover Storage and San Vicente Dam Raise Project (CSP), which is the subject of this Alternatives Analysis.

Section 404(b)(1) Regulatory Background

Section 404 of the Clean Water Act authorizes the U.S Army Corps of Engineers (Corps) to issue permits for the discharge of dredged or fill materials into waters of the United States (waters of the U.S.), including wetlands (33 USC 1344).
Waters of the U.S. include coastal and inland waters, lakes, rivers, and streams that are navigable, including adjacent wetlands and tributaries.

U.S. Environmental Protection Agency (USEPA) guidelines (40 CFR 230 et seq.) are the substantive environmental criteria used to evaluate permit applications to the Corps. Under the guidelines, an analysis of practicable alternatives is the primary screening mechanism used to determine the necessity of permitting a discharge.

USEPA’s guidelines prohibit discharges of dredged or fill material into waters of the U.S., if a practicable alternative to the proposed discharge exists that would have less adverse impacts on the aquatic ecosystem, including wetlands, as long as the alternative does not have other significant adverse environmental impacts (40 CFR 230[a]). An alternative is considered practicable if it is available and capable of being implemented after considering cost, existing technology, and logistics in light of overall project purposes; practicable alternatives may include locating a project in areas not owned by an applicant that could be reasonably obtained to achieve the basic project purpose (40 CFR 230[a][2]).

If a project is not water dependent (e.g., a port or marina facility that requires access to or locating in special aquatic sites to fulfill the basic purpose) and the project proposes to discharge into a special aquatic site (e.g., including sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes), the guidelines require the Corps to presume that a less environmentally damaging practicable alternative exists, unless the permit applicants can clearly demonstrate otherwise (40 CFR 230.10[a][2]). Thus, if a project is not water dependent and proposes to discharge dredged or fill material into a special aquatic site, the applicants must clearly refute the regulatory presumption that a less environmentally damaging practicable alternative exists if a permit is to be issued.

USEPA’s guidelines suggest a sequential approach to project planning that considers mitigation measures only after the project proponent shows no practicable alternatives are available to achieve the basic purpose with less environmental impacts. Once it is determined that no practicable alternatives are available, the guidelines then require that appropriate and practicable steps be taken to minimize potential adverse effects on the aquatic ecosystem (40 CFR 230.10[d]). Such steps may include actions controlling discharge location, material to be discharged, the fate of material after discharge or method of dispersion, and actions related to technology, plant and animal populations, or human use (40 CFR 230.70-230.77).

Beyond the requirement for demonstrating that no practicable alternatives to the proposed discharge exist, USEPA’s guidelines also require the Corps to compile findings related to the environmental impacts of discharge of dredged or fill material. The Corps must make findings concerning the anticipated changes caused by the discharge to the physical and chemical substrate and to the biological and human use characteristics of the discharge site.
Organization of Report

This Alternatives Analysis is based on the findings of the Draft Screening of Alternatives report prepared by GEI Consultants (February 2007) for the CSP. This report was prepared for the Water Authority to document the detailed alternatives development and screening process performed for the project.

The Alternatives Analysis document is organized to allow the user to proceed through the various alternatives development steps and decision points that led the Water Authority to a preferred alternative (the Proposed Action). This document will allow the Corps to make a determination of the least environmentally damaging practicable alternative (LEDPA) for the project.

Chapter 1 provides the Introduction, including the project background, Section (404)(b)(1) regulatory background, and this organization section. Chapter 2 provides the Basic and Overall Project Purpose. Chapter 3 discusses the Proposed Action: Carryover Storage Project, including the components of the project. Chapter 4 discusses the Proposed Action: Environmental Impacts, as set forth in Parts C through F of the Section 404(b)(1) Guidelines. Chapter 5 describes the Alternatives Considered, including several different categories of actions that would achieve the objectives of the project. Chapter 6 discusses the development of the Alternatives Screening Criteria. Chapter 7 provides the contents and conclusions of the Alternatives Screening Process, including those alternatives identified for inclusion in the environmental impact report/environmental impact statement (EIR/EIS) being prepared for the project. Chapter 8 includes the References and Preparers of this document.
Project Purpose

The project purpose defines the scope and focus of the alternatives analysis. For the 404(b)(1) evaluations, project purpose is expressed in terms of “basic purpose” and “overall purpose.” While these terms are not strictly defined in the guidelines, in practical application they are generally defined as presented in the following sections.

Basic Project Purpose

The basic purpose is a very general statement of the fundamental nature of the project and is used to determine whether the project is water-dependent. The 404(b)(1) guidelines state that if an activity associated with the discharge proposed for a special aquatic site does not require access or proximity to, or siting within, the special aquatic site in question to fulfill its basic purpose, the activity is not water-dependent. As such, projects that do not have a requirement to be located in wetlands are not water-dependent. For projects that are not water-dependent, the 404(b)(1) guidelines establish a “rebuttable presumption.” In making its permit decision, the Corps must demonstrate that there are no available, practicable alternatives that do not involve special aquatic sites. The applicant must rebut the presumption in the guidelines that all practicable alternatives to the proposed discharge that do not involve a discharge into a special aquatic site would have less adverse impact on the aquatic ecosystem.

The basic project purpose is water storage reliability. The proposed project is not considered water-dependent. Therefore, the presumptions above apply.

Overall Project Purpose

The overall project purpose is a statement that reflects the applicant’s goals in achieving the basic purpose. It is important that the overall project purpose be defined to provide for a meaningful evaluation of alternatives. It should not be so narrowly defined as to give undue deference to the applicant’s wishes, thereby
unreasonably limiting the consideration of alternatives. Conversely, it should not be so broadly defined as to render the evaluation unreasonable and meaningless.

*The overall purpose of the CSP is to increase the reliability and flexibility of the regional water supply by providing the Water Authority with facilities to accumulate and store approximately 100,000 AF of water.*

**Project Goals**

The Water Authority has further identified specific goals of the project as the following:

- By the year 2011, provide approximately 100,000 AF of readily available, locally stored water for distribution to member agencies during supply shortages.
- Increase system reliability and operational flexibility.
- Locate new facilities in a manner that reduces the need for additional improvements to the Water Authority’s infrastructure network.
- Minimize environmental and social impacts.
Chapter 3

Proposed Action: Carryover Storage Project

Carryover Storage and San Vicente Dam Raise Project

The Proposed Action being considered is the raising of the existing San Vicente Dam to provide an additional 100,000 AF of carryover storage capacity within the San Vicente Reservoir (see Figure 3-1, Regional Location Map, and Figure 3–2, Study Area). Construction for this capacity would require the dam to be raised by 63 feet. It is important to note that this new capacity would be in addition to the already approved and permitted ESP that would provide approximately 52,000 AF of usable emergency storage at the reservoir, requiring the dam to be raised by 54 feet. Following completion of combined ESP/CSP construction, the dam height would be raised by a total of 117 feet, from its existing 220 feet above mean sea level (AMSL) to a final structural height of 337 feet AMSL. The combined ESP and CSP would provide the reservoir with approximately 157,000 AF more reservoir capacity, from its existing 90,000 AF to a final storage capacity of approximately 247,000 AF.

This section describes in detail the components of the CSP Proposed Action. Although ESP and CSP would be constructed at the same time, because separate dam raises would not be viable from a cost or safety standpoint, this description does not include the components of the separate ESP project, which is subject to an existing Department of the Army permit pursuant to Section 404 of the Clean Water Act (Existing 404 Permit).

Project Components

Dam/Reservoir Construction

Construction of the San Vicente Dam and Reservoir was completed in 1943. The existing dam is a concrete gravity structure founded on bedrock. The San Vicente Reservoir is the southern terminus for the Water Authority’s First Aqueduct, a pipeline corridor that contains San Diego Pipelines 1 and 2. Control of the reservoir level is accomplished by an outlet tower and associated
conveyance systems. The San Vicente Dam and Reservoir are owned and operated by the City of San Diego.

For the new dam foundation, it is anticipated that 200,000 cubic yards of overburden and weathered rock would need to be excavated. The existing 220-foot high concrete dam would be raised 117 feet to a total height of 337 feet. The dam would be raised using roller compacted concrete (RCC). The increased reservoir capacity would also require construction of two saddle dams west of the primary dam. The westerly dam would be 18 feet high by 120 feet long, and the easterly dam would be 28 feet high and 270 feet long. The saddle dams act as auxiliary dams constructed in areas of lower elevation to confine the reservoir created by the existing primary dam and permit a higher water elevation.

Encroachment into federally jurisdictional areas would consist of permanent fills within non-wetland waters of the U.S. within the footprint of the main dam. The fill would occur during excavation of existing rock and soil and placement of roller compacted concrete and conventional concrete to raise the main dam. The saddle dams would be constructed outside of waters of the U.S. on an existing ridgeline. Please see Table 3-1 for the total cubic yards of fill and Table 3-2 for the total acreage of impacts to waters of the U.S.; see also Figure 3-3.

**Table 3-1. Total Cubic Yards of Fill**

<table>
<thead>
<tr>
<th>Project Component</th>
<th>RCC (cubic yards)</th>
<th>Conventional Concrete (cubic yards)</th>
</tr>
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<tbody>
<tr>
<td>Main Dam (CSP Only)</td>
<td>390,000</td>
<td>115,000</td>
</tr>
<tr>
<td>Fill Placed in Waters of the U.S.</td>
<td>4,937</td>
<td>0</td>
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</table>

*Source: GEI 2007*

**Marina Facilities**

New recreational facilities, to replace the existing marina that would be inundated by the ESP dam raise, were included as part of the ESP. The marina facilities would be shifted further west of the ESP planned location as part of the Proposed Action. In addition, a new access road to the relocated marina would follow a different alignment than what is permitted under the Existing 404 Permit. The site design for the proposed marina facilities was also modified, in comparison to the previous ESP design, to reflect changes requested by the City of San Diego Water Department, the owner of these facilities.

The changes proposed include expanded boating and fishing opportunities at the reservoir, replacing the facilities that would be impacted by the higher CSP inundation limit. The City has requested the CSP marina design accommodate twice the number of existing parking spaces, and in some cases additional facilities may be required that were not envisioned by the ESP plan. This is
Figure 3-1
Regional Location Map
San Diego County Water Authority Carryover Storage Project

Legend
- Red: San Vicente Reservoir

Basemap Legend
- Freeways
- River
- Lake/Reservoir/Lagoon

SOURCE: TAIC; PBS&J
Figure 3-3
Direct Impacts to Jurisdictional Wetlands and Waters of the U.S.
San Diego County Water Authority Carryover Storage Project

Legend
- Temporary Impact Overlay (vegetation without overlay is permanently impacted)
- Corps and CDFG Jurisdictional Wetlands and Waters
- CDFG Jurisdictional Wetlands
- Non-Wetlands within Impact Footprint

Note: Wetland mapping within previously permitted ESP and San Vicente Pipeline footprints is not shown on this map.
Note: Only one of the quarry options will be constructed as part of the proposed project.
See previous wetlands and waters impact graphics for quarry detail.
because the reservoir’s recreational uses are already in high demand, and with the additional water surface area from the Proposed Action, the current number of facilities would be insufficient to handle future demand.

Encroachment into federally jurisdictional areas would consist of permanent fills within non-wetland waters of the U.S. within a small portion of the shoreline of the reservoir at the confluence of an unnamed tributary for construction of the relocated marina. Additionally, temporary fills within wetland and non-wetland waters of the U.S. would occur within the area of the marina to construct temporary access roads and provide construction staging areas. Following construction of the proposed project, these fills would be removed. Please see Table 3-2 for the total acreage of impacts to waters of the U.S.

**Reservoir Operations**

In order to provide the safest construction environment for the Proposed Action, the existing reservoir water surface elevation would need to be lowered significantly. The reservoir is intended to be lowered to 590 feet AMSL for the duration of the dam construction period, approximately three years. This drawdown would reduce the usable reservoir storage from its existing 90,000 AF to approximately 35,600 AF. Assuming construction would start in early 2009, the reservoir drawdown would begin late in 2008.

Permanent inundation of waters of U.S. located in tributaries that flow into the reservoir would occur, due to the increase in water elevation from 650 feet to 766 feet AMSL as a result of raising the dam beyond the height of the ESP dam raise. Please see Table 3-2 for the total acreage of impacts to waters of the U.S.

**Construction Schedule**

The schedule for the Proposed Action includes the time to complete the combined ESP and CSP construction, since both projects would be constructed as one dam raise. Total construction time, including initial lowering of the reservoir and refilling the reservoir upon dam raise completion, is anticipated to take approximately 8 years. The project is anticipated to be bid and constructed in three phases.

- **Phase 1:** Excavation of dam foundation; marina grading; marina access road construction.
- **Phase 2:** Construction of dam raise, conveyance facilities, and appurtenant structures.
- **Phase 3:** Construction of marina facilities.
Impacts to Waters of the U.S.

The Proposed Action would result in permanent direct impacts to 0.34 acre of waters of the U.S. associated with the placement of fill to construct the main dam and a portion of the marina. Temporary direct impacts to 0.36 acre of wetlands and 5.35 acres of non-wetland waters of the U.S. would occur during construction to facilitate access and construction staging. Additionally, permanent indirect impacts to approximately 2.15 acres of Corps-regulated wetlands and 6.59 acres of unvegetated waters of the U.S. would occur as a result of reservoir inundation (above the ordinary high water mark [OHWM]) within tributaries that drain to the reservoir.

Table 3-2. Proposed Action: Impacts to Waters of the U.S. (Acres)

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Wetlands</th>
<th>Unvegetated Waters of the U.S.</th>
<th>Total Acres</th>
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<tbody>
<tr>
<td>Permanent Direct</td>
<td>0</td>
<td>0.34</td>
<td>0.34</td>
</tr>
<tr>
<td>Permanent Indirect</td>
<td>2.15</td>
<td>6.59</td>
<td>8.74</td>
</tr>
<tr>
<td>Temporary Direct</td>
<td>0.36</td>
<td>5.35</td>
<td>5.71</td>
</tr>
<tr>
<td>Temporary Indirect</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Impacts</strong></td>
<td><strong>2.51</strong></td>
<td><strong>12.28</strong></td>
<td><strong>14.79</strong></td>
</tr>
</tbody>
</table>

1 Indirect impacts are also considered secondary impacts for the purposes of this analysis. Indirect impacts would occur as a result of inundation by the increased water level of the raised dam.

The purpose of the 404(b)(1) guidelines is to restore and maintain the chemical, physical, and biological integrity of the waters of the U.S. through the control of discharges of dredged or fill material. Except as provided under Section 404(b)(2), no discharge of dredged or fill material will be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. In accordance with 404(b)(1) guidelines, the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment must determined.

The potential for environmental impacts as a result of construction and operation of the proposed project have been analyzed in the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project, prepared by PBS&J, dated August 2007. The following discussion provides the location of the analysis in the document for each of the criteria that must be considered, as set forth in Subparts C through F of the 404(b)(1) guidelines.

Subpart C: Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem

Substrate

The proposed project would involve the placement of fill within a 0.34-acre area at the base of the existing main dam and the proposed marina. The bottom of the existing reservoir is outside of the existing project footprint. All temporary impact areas would be restored following construction. Therefore, implementation of the proposed project would not result in a significant impact to substrate outside of the area of direct fill.
Suspended Particulates and Turbidity

The total sediment that would enter the San Vicente Reservoir over 100 years is estimated to be approximately 4,800 AF. Expansion of the reservoir would not result in a significant change to the amount of sediment that enters the reservoir from the surrounding watershed, nor would activities be conducted within the reservoir bottom that would result in a temporary increase in suspended particulates and turbidity. Best Management Practices implemented during construction would prevent increased sedimentation and erosion within the project area.

The analysis of the potential for direct, indirect, and cumulative impacts to water quality by the preferred project is provided in Section 3.17, “Water Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Water

The reservoir is used to store water for future public use. Ongoing water testing and management activities are implemented to meet water quality goals. Implementation of the proposed project would not result in impacts to downstream water quality since water is not currently released from the reservoir. Best Management Practices implemented during construction would prevent increased sedimentation and erosion within the project area.

The analysis of the potential for direct, indirect, and cumulative impacts to water quality by the preferred project is provided in Section 3.17, “Water Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Current Patterns and Water Circulation

The proposed project would consist of raising an existing inland dam. Implementation of the proposed project would not result in impacts to downstream water patterns or aquatic resources since water is not currently released from the reservoir. The drawdown and refilling of the dam would result in changes to the location of existing submerged aquatic vegetation. However, when the dam is refilled, a net increase of submerged aquatic vegetation is expected since water levels would be higher and the perimeter of the reservoir would increase.

The analysis of the potential for direct, indirect, and cumulative impacts to submerged aquatic vegetation by the preferred project is provided in Section 3.6, “Biological Resources,” of the Draft Environmental Impact
Normal Water Fluctuations

The fluctuations in the water levels of the reservoir are controlled by the City of San Diego in response to operational issues, including the amount of water available for storage, season, precipitation, and water usage, and may fluctuate as much as 30 feet within a year. Therefore, the dam is not subject to “normal” or natural water fluctuations that might be impacted by the proposed project.

Salinity Gradients

The proposed project would consist of raising an existing inland dam. It is not located in proximity to the ocean, where implementation of the proposed project might interfere with existing salinity gradients.

Subpart D: Potential Impacts on Biological Characteristics of the Aquatic Ecosystem

Threatened and Endangered Species

The proposed project would result in permanent impact to 30.7 acres of occupied habitat for the federally endangered arroyo toad (Bufo californicus) and 1.94 acres of occupied habitat for the federally endangered least Bell’s vireo (Vireo bellii pusillus). Depending upon the quarry alternative implemented, the project would temporarily and permanently impact up to 62.38 and 225.29 acres of occupied habitat for the federally threatened California gnatcatcher (Polioptila californica), respectively.

The analysis of the potential for direct, indirect, and cumulative impacts to threatened and endangered species by the preferred project is provided in Section 3.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).
Fish, Crustaceans, Mollusks, and Other Aquatic Organisms in the Food Web

Upon drawdown of the San Vicente Reservoir, the volume of open water in the dam would be reduced for the extent of the dam raise construction. The open water provides habitat for species such as fish, frogs, toads, and other aquatic wildlife. Although the habitat for these species would be temporarily reduced during construction, when the reservoir refills after construction of the dam raise, a net increase of open water habitat is expected since water levels would be higher and the perimeter of the reservoir would increase.

The analysis of the potential for direct, indirect, and cumulative impacts to aquatic organisms by the preferred project is provided in Section 3.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Other Wildlife

The proposed project is not expected to result in a permanent impact to habitat linkages or wildlife movement corridors since no regional or local movement corridors would be permanently blocked by the project and wildlife movement would not be impeded in the area. Drawdown of the reservoir would be maintained at an estimated 590 feet AMSL, therefore, wildlife would not lose this source of drinking water.

The analysis of the potential for direct, indirect, and cumulative impacts to wildlife by the preferred project is provided in Section 3.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007). See Table 3.6-13 for a summary of potential impacts to non-listed sensitive species.

Subpart E: Potential Impacts on Special Aquatic Sites

Sanctuaries and Refuges

The proposed project would consist of raising an existing inland dam. The project area is not located within a designated wildlife sanctuary or refuge. The project site is located within the boundaries of the City of San Diego Multiple Species Habitat Conservation Plan (MSHCP). The project is in compliance with all conditions and provisions of the City of San Diego MSHCP.
The analysis of the potential for impacts associated with a conflict with the City’s MSHCP is provided in Section 3.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

### Wetlands

The proposed project would result in temporary impacts to 0.36 acre of wetlands during construction to facilitate access and construction staging. Additionally, permanent indirect impacts to approximately 2.15 acres of Corps-regulated wetlands would occur as a result of reservoir inundation (above the OHWM) within tributaries that drain to the reservoir.

The analysis of the potential for direct, indirect, and cumulative impacts to wetlands and other waters of the U.S. by the preferred project is provided in Section 3.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

### Mudflats

The proposed project would consist of raising an existing inland dam. The project would not result in a discharge of fill material to mudflats. Please see Section 3.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007) for the analysis of potential impacts to waters of the U.S.

### Vegetated Shallows

The proposed project would consist of raising an existing inland dam. The project would not result in a discharge of fill material to vegetated shallows. Please see Section 3.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007) for the analysis of potential impacts to waters of the U.S.

### Coral Reefs

The proposed project would consist of raising an existing inland dam. The project would not result in a discharge of fill material in the ocean where coral reefs are located. Please see Section 3.6, “Biological Resources,” of the Draft
Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007) for the analysis of potential impacts to waters of the U.S.

Riffle and Pool Complexes

The proposed project would consist of raising an existing inland dam. The project would not result in a discharge of fill material in streams supporting riffle and pool complexes. Please see Section 3.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007) for the analysis of potential impacts to waters of the U.S.

Subpart F: Potential Effects on Human Use Characteristics

Municipal and Private Water Supplies

The proposed project is intended to increase the reliability of the Water Authority’s water supply in times of drought through the provision of carryover storage capacity in the existing San Vicente Reservoir. Implementation of the proposed project would not affect private water supplies or wells.

Recreational and Commercial Fisheries

The San Vicente Dam and Reservoir supports public recreational fishing. Access to the dam by the public would be closed during drawdown of the water levels and construction of the dam raise and new marina. Drawdown of the water level and construction of the dam is not expected to result in significant impacts to existing fish populations. Following construction and refilling of the dam, recreational fishing would be reopened to the public with new marina facilities.

The analysis of the potential for direct, indirect, and cumulative impacts to recreation (including recreational fishing) by the preferred project is provided in Section 3.15, “Recreation,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).
Water-Related Recreation

The San Vicente Dam and Reservoir supports a wide variety of water-related recreation, including boating, fishing, wakeboarding, and waterskiing. Access to the reservoir by the public would be closed during drawdown of the water levels and construction of the dam raise and new marina. Following construction and refilling of the dam, the San Vicente Dam and Reservoir would be reopened to the public with new marina facilities and a larger water surface area. Water-related recreation is also offered within San Diego County at the Pacific Ocean, Mission Bay Regional Park, and 20 freshwater reservoirs, all of which may be used by the public during construction of the dam.

The analysis of the potential for direct, indirect, and cumulative impacts to recreation (including recreational fishing) by the preferred project is provided in Section 3.15, “Recreation,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Aesthetics

The proposed project would consist of raising an existing inland dam. Following construction, the incremental increase in dam height would be barely detectable when compared to the existing dam. Resident and motorist views of the site would be restricted or screened and the saddle dams, onsite quarry, and dam construction zones would blend into the surrounding views from downstream of the dam.

The analysis of the potential for direct, indirect, and cumulative impacts to aesthetics by the preferred project is provided in Section 3.3, “Aesthetics,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).
Chapter 5

Alternatives Considered

The Water Authority retained GEI Consultants (GEI) to develop and implement a quantitative screening process to assess all possible alternatives, and combinations of alternatives, that could meet the purpose and need of the CSP to accumulate and store an additional 100,000 AF of water, beyond the already approved ESP 52,000 AF. The background data is available in a series of technical memorandums provided by GEI in the Background Data for Screening of Alternatives. In February 2007, GEI published the Draft Screening of Alternatives report, the culmination of a rigorous process involving multiple Water Authority and regulatory agency personnel. The report organized the process into three primary steps.

The first step, development and consideration of alternative methods of providing the 100,000 AF CSP, included evaluation of:

- new or expanded surface reservoirs,
- reoperation of existing local reservoir storage,
- local groundwater basin storage, and
- out-of-region groundwater basin storage.

The second step, “coarse” screening of those alternatives considered feasible to move forward through the process, consisted of developing first-level criteria (logistics, technology) and applying those criteria to the alternatives. The third step, “fine” screening of those alternatives carried forward from the first-level screening process, consisted of developing second-level criteria (environmental and social resources, implementability and cost), that were then used in a quantitative decision model to rank the performance of the alternatives.

This chapter describes the alternatives development process. Chapter 6 describes the subsequent first- and second-level screening process. Chapter 7 provides the outcome of the screening process.
Upland Alternatives

As discussed in Chapter 2, under the Section 404(b)(1) guidelines, CSP is not considered water dependent because it does not require access or proximity to, or siting within, waters of the U.S. to fulfill its basic purpose of “water storage reliability.” For projects that are not water-dependent, the 404(b)(1) guidelines establish a “rebuttable presumption.” The applicant must demonstrate that there are no available, practicable alternatives that do not involve special aquatic sites. The applicant must also rebut the presumption in the guidelines that all practicable alternatives to the proposed discharge that do not involve a discharge into a special aquatic site would have less adverse impact on the aquatic ecosystem.

The overall project purpose is to increase the reliability and operational flexibility of the regional water storage capacity by providing the Water Authority with additional capacity of approximately 100,000 AF of carryover storage. All of the alternatives considered for the Proposed Action in the Draft Screening of Alternatives report, prepared by GEI, are water-dependent options, including new or expanded surface reservoirs, reoperation of existing reservoirs, and local groundwater basin storage. Carryover storage options that do not involve working within existing wetlands and waters of the U.S. include the construction of enclosed water storage reservoirs or standpipes within upland areas. However, these options are not considered to be practicable for the following reasons:

- A prohibitive number of large reservoirs would be necessary to accommodate 100,000 AF (equivalent to 32.6 billion gallons) of water for carryover storage purposes. Under such an example, 3,260 storage tanks holding 10 million gallons each would be needed to contain this much water.

- The amount of land area needed for construction of multiple upland area reservoirs is not available. Each reservoir tank or standpipe would be situated on an approximately 2-acre parcel of land. Using the example above, construction of 3,260 storage tanks would require the purchase of 6,520 acres of property.

- The reservoirs must be geographically situated to provide optimal inflow, storage, and delivery of water for local use as dictated by peak demands and drought conditions. Even if the tanks could be clustered in groups of three, over 1,000 sites at suitable elevations, topography, and proximately to water users must be identified and purchased to meet the project purpose.

- The large-scale construction of upland area reservoirs, as well as the temporary and permanent roadways necessary to provide construction and maintenance access to the reservoirs, would result in significant environmental impacts, including impacts to sensitive biological resources and listed species.

- The construction of conveyance facilities (pipelines, pump stations, pressure reducing stations, etc.) would be required to connect the upland area storage
reservoirs to the Water Authority’s distribution system. Due to the extent of such a conveyance network, significant environmental impacts are anticipated to occur in upland areas and in areas containing wetlands and waters of the U.S.

- Capital construction, land acquisition, and energy (pump station operations) costs for this alternative would be significant

**Dam/Reservoir Alternatives**

The initial screening of possible new or expanded reservoirs was based on a 1992 Storage Study prepared by James M. Montgomery Engineers. The purpose of that study was to identify emergency storage options to meet regional needs through 2030, within a range of 73,000 to 143,000 AF.

**Initial Alternatives**

The study identified 27 new possible storage reservoirs and seven possible expanded reservoirs that could meet this need. That list of reservoirs was then screened down to a total of six sites considered viable to study further, using the criteria described below.

**Screening Criteria**

The screening process used included three phases of criteria (GEI 2007).

**Phase 1 Criteria**

- Volume greater than 25,000 AF.
- Minimum high water elevation of 1,000 feet.
- Maximum high water elevation of 2,000 feet.
- Within boundary of Water Authority member agencies.

**Phase 2 Criteria**

- Environmental criteria, including:
  - Population.
  - Transportation.
Public services.
Cultural resources.
Plant life.
Animal life.
Land use.
Wetlands.
Geologic hazards.

- Operations Criteria (efficiency, elevation, location, emergency operations).
- Engineering/technology (dam volume, associated facilities, gross area).

Phase 3 Criteria

- Environmental criteria, including:
  - Human development.
  - Transportation.
  - Public services.
  - Safety.
  - Cultural resources.
  - Biological resources.
- Operations Criteria (efficiency, elevation, location, emergency operations).
- Engineering/Cost Criteria (capital and annual operating costs).

New/Expanded Surface Reservoirs Selected for Further Screening

The outcome of the three phases of screening was the six highest ranked sites. These were Guejito Valley, Moosa North and South, Pamo, San Vicente, and Wohlford. This list of six sites was somewhat modified, and an additional alternative (El Capitan Reservoir) was added as the starting point for the GEI alternatives analysis for the CSP. The final list includes Guejito Valley (new reservoir), El Capitan Reservoir (expand existing), Moosa South Valley (new reservoir), Pamo Valley (new reservoir), San Vicente (expand existing beyond ESP volume), and Lake Wohlford (expand existing). Details on each of these sites are provided in the GEI 2007 report.
Reoperation of Existing Local Reservoir Storage

Changing the original use of existing County storage reservoirs to provide carryover storage capacity is the basis for the reoperation alternatives.

Initial Alternatives

In 1994, GEI/CDM prepared Technical Memorandum 12.0 – Emergency Reoperation, (TM 12.0), to consider a greater number of reoperation alternatives than had been considered in the original 1992 Storage Study, which only included two such options. After considering all reservoirs in San Diego County, six possible sites were identified as having the best reoperation potential.

Screening Criteria

The screening process is described in the 1994 TM 12.0. In TM 12.0, all existing reservoirs in San Diego County were considered in the screening process. Factors considered in evaluating reservoirs for reoperation potential included limitations on availability and existing capacity, hydrology, hydraulic delivery and filling constraints, and system demands. Also considered was whether new conveyance facilities would have to be constructed to accommodate the CSP.

Reoperation of Existing Local Reservoir Storage Selected for Further Screening

After considering the original criteria and reoperation alternatives evaluated in TM 12.0 and applying current conditions, GEI determined the following reoperation scenarios as viable for consideration for the CSP (GEI 2007):

- San Vicente Reservoir;
- El Capitan Reservoir;
- Lower Otay Reservoir;
- Sweetwater Reservoir;
- Loveland Reservoir; and
- Henshaw/Sutherland/Ramona Reservoir combination.

Details on each of these sites are provided in the GEI 2007 report.
Local Groundwater Basin Storage

The 1992 Storage Study considered the scenario of providing emergency storage through the use of local groundwater basins. The Water Authority then conducted a more detailed evaluation in the 1995 NBS/Lowry Groundwater Feasibility Study.

Initial Alternatives

The 1995 Groundwater Feasibility Study considered 12 groundwater basins as potential storage options for the CSP.

Screening Criteria

The screening criteria used to evaluate which of the original 12 basins would be suitable for further analysis include the following:

- Institutional factors (Indian Reservation rights, local agency and landowner rights, interagency brine disposal agreements).
- Regulatory factors (endangered species protection, reclaimed groundwater recharge, drinking water standards).
- Technical factors (brine disposal, seawater intrusion, basin volume).
- Economic factors (development cost).

Local Groundwater Basin Storage Selected for Further Screening

Following screening of the initial 12 groundwater basins, two were determined to be feasible for further consideration. Four additional basins were added subsequent to that study based on updated technical information provided to the Water Authority. Those six basins considered for further analysis include:

- Mission (San Luis Rey) Basin;
- San Pasqual Valley Basin;
- Pala/Pauma Basins;
- Santee/El Monte Basin;
- Warner Basin; and
San Diego Formation.

Details on each of these sites are provided in the GEI 2007 report.

Out-of-Region Groundwater Basin Storage

A demand and supply analysis completed for the Water Authority's *Urban Water Management Plan* identified a potential need for approximately up to 95,000 AF of additional carryover storage beyond the need for 100,000 AF in carryover storage identified in the Capital Improvement Program. This evaluation looked at a 3-year dry cycle scenario in which demands are high and imported water supplies are constrained by preferential rights. Based on that evaluation, the Water Authority issued a request for proposals (RFP) for potential groundwater conjunctive use partners, and short-listed three potential projects that would be eligible for state funding through the Water Authority. The partners for the three potential projects are Chino Basin Water Master, North Kern Water Storage District, and Semitropic Water Storage District. Water Authority staff have initiated an independent evaluation of potential conjunctive use projects with Water Master, North Kern, and Semitropic, focusing on potential legal, water quality, and institutional aspects. A pilot study program is being developed to evaluate these potential projects. However, should such an arrangement move forward, it would not affect the need for the in-region 100,000 AF CSP, and would be used only to reduce other existing shortfalls in the greater carryover storage needs of the Water Authority.

Compilation of Alternatives Selected for Further Screening

The initial screenings performed in previous Water Authority studies on the various methods of meeting CSP requirements resulted in the identification of multiple options for new/expanded reservoirs, reoperation of reservoirs, and local groundwater basin use. The GEI 2007 report presents these options as *building blocks* that can be combined in different alternatives to meet the overall project purpose of providing 100,000 AF of carryover storage. Out-of-region groundwater storage was eliminated from further study due to lack of available information on that scenario.

The 28 identified building blocks were then grouped by GEI into two categories: standalone alternatives, whereby a reservoir (new or expanded), reoperation scenario, or local groundwater basin alternative would meet the entire 100,000 AF CSP need; and combination alternatives, whereby components of the three categories were combined to meet the 100,000 AF CSP need. Those two categories of alternatives are provided below. It should be noted that most of the combination alternatives include expansion of San Vicente Reservoir because the Water Authority has determined it to be the least costly option per-acre foot of
storage, and considers it to be environmentally preferable to other options (discussed in greater detail in Chapters 5 and 6).

**Standalone Alternatives**

**Expanded Surface Reservoirs**

1. San Vicente – additional 100,000 AF beyond ESP.
2. Moosa Canyon.
4. Pamo Valley.

**New Dams**

1. Lake Wohlford Expansion.
2. El Capitan Reservoir Expansion.

**Reoperation of Existing Reservoirs**

1. San Vicente/El Capitan/Loveland/Sweetwater/Lower Otay.

**Local Groundwater Basin Storage**

1. Multiple San Diego Basins.

**Combination Alternatives**

**Surface Reservoirs**

1. Moosa Canyon + Reduced San Vicente Expansion.
2. Guejito Valley + Reduced San Vicente Expansion.
3. Pamo Valley + Reduced San Vicente Expansion.
4. Lake Wohlford Expansion + Reduced San Vicente Expansion.
5. El Capitan Reservoir Expansion + Reduced San Vicente Expansion.
**Reoperation + Surface Reservoirs**

1. San Vicente Reoperation + Reduced San Vicente Expansion.
2. El Capitan Reservoir Reoperation + Reduced San Vicente Expansion.
3. Loveland Reservoir Reoperation + Reduced San Vicente Expansion.
4. Sweetwater Reservoir Reoperation + Reduced San Vicente Expansion.
5. Lower Otay Reservoir Reoperation + Reduced San Vicente Expansion.
6. Henshaw/Sutherland/Ramona Reservoir Reoperation + Reduced San Vicente Expansion.
7. Loveland Reservoir Reoperation + Moosa Canyon.

**Local Groundwater + Surface Reservoirs**

1. San Luis Rey Mission Basin + Reduced San Vicente Expansion.
2. Pala/Pauma Basin + Reduced San Vicente Expansion.
3. San Pasqual Basin + Reduced San Vicente Expansion.
4. Santee/El Monte Basin + Reduced San Vicente Expansion.
5. Warner Basin + Reduced San Vicente Expansion.
6. San Diego Formation + Reduced San Vicente Expansion.
7. Local Groundwater + Non San Vicente Surface Reservoir.

**Local Groundwater + Reoperation**

1. Loveland Reservoir Reoperation + Local Groundwater.

Details on each of these standalone and combination alternatives are provided in the GEI 2007 report.
Screening Criteria Development

The 28 alternatives and alternative combinations discussed in Chapter 4 were subsequently put through a two-tiered screening process. The first tier was considered to be a coarse screening, intended to identify those CSP alternatives that could be carried over to the more rigorous fine screening. This chapter provides the development of the two tiers of criteria and discusses how they were used for screening the 28 CSP alternatives and alternative combinations. Chapter 7 discusses the results of the two-tier screening process. It should be noted that the Corps’ Section 404 practicability guidelines of cost, existing technology, and logistics, used in determining the LEDPA, are represented in the Tier 1 criteria (existing technology and logistics) and the Tier 2 criteria (cost), along with other criteria the Water Authority determined to be necessary for identifying practicable and reasonable alternatives.

Tier 1 Criteria (Coarse Screening)

Logistics

The Water Authority’s Regional Water Facilities Master Plan (Master Plan) completed in 2002 identified an immediate need for additional carryover storage for the region. As a result, the logistics criterion considered whether an alternative could reasonably be implemented (constructed and operational) in the timeframe of 2011, established by the Water Authority as the date by which the 100,000 AF of carryover storage would be available. Legal issues, such as regulatory compliance, and institutional issues, such as joint-use requirements and property acquisition, were considered part of the logistics criterion. Any alternatives that could not be implemented by the timeframe of 2011 were, therefore, eliminated from further consideration.
Existing Technology

The existing technology criterion considered whether implementation of an alternative would be constrained by any engineering or technology factors. For example, an alternative that could be adequate for one type of storage may not be adequate for the particular needs of the CSP. As a result, any groundwater basins that had less than 5,000 AF of developable storage capacity were not considered further. If a technology required to implement an alternative was untested or speculative, the alternative was dropped from further consideration. Finally, excessive time requirements for exploration or resolution of technological issues also rendered an alternative unfeasible.

Results of Tier 1 Screening

The Tier 1 screening resulted in 11 of the 28 alternatives being considered viable to carry through to the Tier 2 screening process. The assessments of these alternatives are provided in Appendix B of the 2007 GEI report. All alternatives with the component of reoperation of a City of San Diego reservoir were dropped from further consideration based on a March 24, 2005, letter to the Water Authority that stated the use of its reservoirs as part of the CSP would not be compatible with existing and future City water supply management and planning efforts. All other non-City reoperation alternatives, except for Loveland Reservoir, were eliminated due mainly to logistical constraints. Loveland Reservoir was retained to reflect the potential for a leasing arrangement between the Sweetwater Authority and the Water Authority. Logistical issues (institutional, jurisdictional, and ownership) prevented any of the local groundwater basin alternatives from being carried through to Tier 2 screening.

The 11 alternatives that were retained for fine screening include:

- San Vicente—additional 100,000 AF beyond ESP.
- Moosa Canyon.
- Guejito Valley.
- Pamo Valley.
- Lake Wohlford Expansion (new dam).
- Moosa Canyon + Reduced San Vicente Expansion.
- Guejito Valley + Reduced San Vicente Expansion.
- Pamo Valley + Reduced San Vicente Expansion.
- Lake Wohlford Expansion + Reduced San Vicente Expansion.
Loveland Reservoir Reoperation + Reduced San Vicente Expansion.

Loveland Reservoir Reoperation + Moosa Canyon.

Tier 2 Criteria (Fine Screening)

The Tier 2, or fine, screening process objectively ranked the 11 remaining alternatives to determine those that should be carried through the CSP EIR/EIS. For the fine screening process, the Water Authority developed a quantitative decision model that was used for the rankings. Development of the model involved convening a technical panel comprised of Water Authority and consultant staff to oversee the process. The Corps also participated in approving the methodology and process used to screen the CSP alternatives. The technical panel was charged with identifying the hierarchy of planning values; developing the systems of measurement, preference relationships, and weighting factors used in the model; collecting criteria measurement data (i.e., GIS data); and applying the model for use in scoring and ranking the alternatives. The fine screen criteria represented four goals of the alternatives screening process that were intended to identify the LEDPA while meeting the project’s purpose and need (GEI 2007). Each goal was then further divided into objectives, followed by measurable criteria to be used in the screening model. The four planning goals and their associated objectives and criteria are shown below.

Goal: Minimize Environmental Impacts

Objective: Minimize biological impacts

Criteria

- Wetlands are those areas defined by the Corps under 33 CFR 328.3(b).
- Other sensitive habitats include upland and lowland communities that may support a variety of plant and animal species.
- Threatened and endangered species include all federal Category 1 species and those threatened and endangered species regulated under federal and state laws.

Objective: Minimize cultural impacts

Criteria

- Cultural resources are those recognized under the National Historic Preservation Act of 1966 and Preservation of Historic and Archeological Data Act of 1974.
Native American values include established traditions, values, and sites as recognized under the Native American Religious Freedom Act of 1996.

**Goal: Minimize Social Impacts**

**Objective: Minimize community impacts**

**Criteria**

- Residential displacement associated with dam and reservoir construction and inundation should be avoided or minimized.
- Business displacement such as effects to commercial or agricultural operations as a result of construction or inundation should be avoided or minimized.
- Traffic effects, both temporary and permanent, due to both construction and road relocation from siting of dam/reservoir/pipeline components may occur and should be minimized.
- Recreation facilities such as state, regional, and community parks; golf courses; and marinas may be affected by reservoir expansion activities.

**Goal: Maximize Implementability**

**Objective: Maximize early availability**

**Criteria**

- Construction completion date refers to the preference given to those alternatives whose construction may be completed sooner than for other alternatives.
- Delay potential refers to the possibility that unforeseen technical issues may arise during project implementation, as well as institutional delays related to agreements between agencies or interest groups.
Goal: Minimize Cost

Objective: Minimize total costs

Criteria

- Total capital cost includes all aspects of the project financing from initial planning to post-construction monitoring, as well as the costs of all facilities required.

- Annual operating costs are those recurring costs that are associated with the alternatives over the 100-year lifetime of the project, such as resource replacement (energy and water) and labor/materials for regular O&M.
Evaluation Factors

Following the technical panel’s development of the Tiers 1 and 2 alternative screening criteria, a variety of weighting and measurement parameters were established in order to provide a quantitative basis for the screening model. Detail on the process by which the various quantitative performance and evaluation factors were developed and used is provided in the 2007 GEI report.

Criterion Measures

In developing these measurement factors, attention was given to the fact that the project components can generally be separated into “footprint” impacts, such as dam/reservoir construction, and “linear” impacts, such as pipeline construction. Therefore, in assigning criterion measures, a designation of “D” for dam, “P” for pipeline, and “A” for total alternative was given. The criterion measures are presented in the 2007 GEI report, and generally reflect such quantitative values as acreage of impact, number of species or sites impacted, cost, and various rating factors. Those measurements were obtained by GEI in the form of GIS data, which was acquired through site surveys or existing local and regional databases.

Preference Relationships

Preference relationships represent a graphically identified range of preferences for the specific criterion measures. Preference relationships for the criterion measures were identified for both the dam/reservoir components and the pipeline components of an alternative by plotting points on an X-Y axis, using a scale of 0 to 100 (least preferred to most preferred). Relative weights were then given to the components that further assessed the nature of the impact (temporary versus permanent, localized versus extended range, etc.), resulting in weighted preference points. These were then summed to obtain the final preference point scores (PPS), which ranged from 0 to 100.
Weighting Factors

Following identification of the preference relationships, weighting factors were assigned to the goals, objectives, and criteria discussed in Chapter 6. Goal weights (GW), objective weights (OW), and criteria weights (CW) were all assigned a number between zero and 1.0, with the four weights totaling 1.0. These enabled the technical panel to determine a “composite criterion weight” (CCW) using the equation:

\[ CCW_1 = CW_1 \times OW_1 \times GW_1 \]

The CCW was then multiplied by the PPS to obtain the ultimate criterion score. The sum of all criterion scores was then totaled to provide each alternative’s score. Those scores then allowed the alternatives to be ranked to a maximum score of 100.

Results of Screening

The model developed for use in screening the 11 CSP alternatives was created in Microsoft Excel and allows results to be displayed in summary tables and graphics. The 2007 GEI report includes all model output figures for reference.

Base Case

The model also allows variations in the weights of the four initial project goals to be used to perform sensitivity analyses. Therefore, a base case was established as the set of weights and conditions against which all other sensitivity analyses could be compared. For the base case, the weighting factors shown in Table 7-1 were used.
Table 7-1. Base Case Weighting Factors (%)

<table>
<thead>
<tr>
<th>Goals</th>
<th>Weight</th>
<th>Objectives</th>
<th>Weight</th>
<th>Criteria</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimize environmental impacts</td>
<td>28</td>
<td>Minimize biological impacts</td>
<td>60</td>
<td>Wetlands</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Other sensitive habitat</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T&amp;E Species</td>
<td>37</td>
</tr>
<tr>
<td>Minimize cultural impacts</td>
<td>40</td>
<td></td>
<td></td>
<td>Cultural resources</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Native American values</td>
<td>60</td>
</tr>
<tr>
<td>Minimize social impacts</td>
<td>27</td>
<td>Minimize community impacts</td>
<td>100</td>
<td>Residential displacement</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Business displacement</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Traffic</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Recreation</td>
<td>17</td>
</tr>
<tr>
<td>Maximize implementability</td>
<td>18</td>
<td>Maximize early availability</td>
<td>100</td>
<td>Construction completion date</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Delay potential</td>
<td>50</td>
</tr>
<tr>
<td>Minimize cost</td>
<td>27</td>
<td>Minimize total costs</td>
<td>100</td>
<td>Total capital cost</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Annual operating cost</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: GEI 2007

The results of the base case analysis are provided in the 2007 GEI report. In summary, the top four ranked alternatives, with total rounded scores of 90, 68, 56, and 52, respectively, were San Vicente Reservoir (additional 100,000 AF beyond ESP), Moosa Canyon, Moosa Canyon + Reduced San Vicente Expansion (50,000 AF), and Loveland Reservoir Reoperation + Reduced San Vicente Expansion (90,000 AF).

Sensitivity Analyses

Five initial sensitivity analyses were performed to evaluate the effects of using different weighting factors. These sensitivity analyses tested performance of the alternatives using factors such as increasing the environmental weight and decreasing social and implementability weights; reducing the environmental weight and balancing the remaining goals; and increasing nonenvironmental goal weights by 50%.

The results of the five sensitivity analyses are shown in the 2007 GEI report. While the alternatives performed differently depending on the weightings used, in all cases, the San Vicente Reservoir (additional 100,000 AF beyond ESP) ranked first of the 11 alternatives.
404(b)(1) Sensitivity Analysis

On May 9, 2007, at the request of the Water Authority, GEI performed an additional sensitivity analysis (Screening Case 6) that provided 100% weighting to jurisdictional wetlands, including the environmental goal, biological objective, and jurisdictional wetlands criterion. By comparison, the base case provided 28% weighting to the environmental goal, 60% weighting to the biological objective, and 40% weighting to jurisdictional wetlands (see Table 7-1).

It should be noted that in the 2007 GEI report, the first sensitivity analysis was indicated as the “404(b)(1) Weighting” but provided some values for social, implementability, and cost, which were all weighted as zeros in the subsequent 404(b)(1) sensitivity analysis performed on May 9. Regardless of whether partial or 100% weighting was given to jurisdictional wetlands, the model result was the same, and the San Vicente Reservoir (additional 100,000 AF beyond ESP) ranked first of the 11 alternatives (total score of 99).

The three next closest ranked alternatives with scores of 97, 96, and 94, respectively, were Lake Wohlford Expansion (new dam), Loveland Reservoir Reoperation + Reduced San Vicente Expansion, and Lake Wohlford Expansion + Reduced San Vicente Expansion. Please see Figures 6-1 through 6-4 for the 404(b)(1) sensitivity analysis results.

Alternatives Selected for Inclusion in the EIR/EIS

The results of the fine screening process provided the technical panel with a reduced number of ranked alternatives to include for full evaluation in the CSP EIR/EIS. Based on those results, the Water Authority has determined the following alternatives will be included:

- Alternative 1: San Vicente Reservoir (additional 100,000 AF beyond ESP);
- Alternative 2: Moosa 100K (new 100,000 AF reservoir); and
- Alternative 3: Moosa 50K (new 50,000 AF reservoir) + Reduced San Vicente Expansion (additional 50,000 AF beyond ESP).

San Vicente Reservoir Alternative: Environmental Effects

See Chapter 4, “Proposed Action Environmental Effects.”
### WEIGHTING FACTORS FOR FINE SCREENING

**Carryover Storage Project Alternatives**

**Sensitivity Analysis - Comparing Two Weighting Factor Cases**

<table>
<thead>
<tr>
<th>GOALS</th>
<th>OBJECTIVES</th>
<th>CRITERIA</th>
<th>Composite Criteria Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Weight %</td>
<td>Title</td>
<td>Weight %</td>
</tr>
<tr>
<td>Minimize Environmental Impacts</td>
<td>28</td>
<td>Minimize Biological Impacts</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minimize Cultural Impacts</td>
<td>100</td>
</tr>
<tr>
<td>Minimize Social Impacts</td>
<td>27</td>
<td>Minimize Community Impacts</td>
<td>100</td>
</tr>
<tr>
<td>Maximize Implementability</td>
<td>18</td>
<td>Maximize Early Availability</td>
<td>100</td>
</tr>
<tr>
<td>Minimize Cost</td>
<td>27</td>
<td>Minimize Total Costs</td>
<td>100</td>
</tr>
</tbody>
</table>

**First Comparison Case**: BASE

**Second Comparison Case**: 6

**Figure 6-1**

Sensitivity Analysis - Comparing Two Weighting Factor Cases

San Diego County Water Authority Carryover Storage Project
Figure 6-2
Comparison to Base Case
San Diego County Water Authority Carryover Storage Project
CARRYOVER STORAGE PROJECT
FINE SCREENING OF ALTERNATIVE PROJECTS

Total Score by Ranking - Case: 6

Alternative Score

100 90 80 70 60 50 40 30 20 10 0

SVe-1 1st  WO-5 2nd  LVr+SVe-16 3rd  WO+SVe-12 4th  GU-3 5th  GU+SVe-10 6th  LVr+MS-20 7th  MS+SVe-9 8th  MS-2 9th  PA+SVe-11 10th  PA-4 11th

San Diego County Water Authority Carryover Storage Project

Source: GEI Consultants, Inc. (5/9/07)
Figure 6-4
Breakdown of Scores by Goal
San Diego County Water Authority Carryover Storage Project
Moosa 100K Alternative: Environmental Effects

As evaluated in detail in Section 4.6, “Biological Resources for the Moosa 100K Alternative,” of this EIR/EIS, the Moosa 100K Alternative would result in the following impacts to waters of the U.S.:

- **Permanent direct** – permanent discharge of fill material directly into waters of the U.S. (i.e., placement of fill within Moosa Creek for dam construction, and placement of fill within drainages for construction of some of the outlying features such as pump stations and the offsite borrow area).

- **Permanent indirect** – permanent inundation of waters of U.S. along Moosa Creek and associated tributaries within Moosa Canyon to create Moosa Reservoir.

- **Temporary direct** – temporary discharge of fill material directly into waters of the U.S. (i.e., placement of fill for construction activities [e.g., temporary access roads, staging areas, electrical and water line installations/relocations] within the Moosa 100K footprint and along the Moosa Pipeline corridor).

- **Temporary indirect** – temporary loss of potentially occurring submerged aquatic vegetation or vegetated shallows within Turner Reservoir due to filling of the new Moosa Reservoir, and its subsequent reestablishment at the ultimate water level.

Table 7-2 presents a quantification of the permanent direct and indirect impacts and the temporary direct and indirect impacts to waters of the U.S. as a result of the Moosa 100K Alternative. The total amount of fill in waters of the U.S. due to permanent and temporary direct impacts is estimated to be 41.66 acres (5.33 acres for permanent direct impacts and 36.33 acres for temporary direct impacts).

**Table 7-2. Moosa 100K Alternative: Impacts to Waters of the U.S. (Acres)**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Wetlands</th>
<th>Unvegetated Waters of the U.S.</th>
<th>Total Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent Direct</td>
<td>4.77</td>
<td>0.56</td>
<td>5.33</td>
</tr>
<tr>
<td>Permanent Indirect</td>
<td>44.16</td>
<td>8.00</td>
<td>52.16</td>
</tr>
<tr>
<td>Temporary Direct</td>
<td>33.94</td>
<td>2.39</td>
<td>36.33</td>
</tr>
<tr>
<td>Temporary Indirect</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Impacts</strong></td>
<td><strong>82.87</strong></td>
<td><strong>10.95</strong></td>
<td><strong>93.82</strong></td>
</tr>
</tbody>
</table>

The environmental effects associated with implementation of the Moosa 100K Alternative is analyzed in the **Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project**, prepared by PBS&J, dated August 2007. The following discussion provides the
Subpart C: Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem

Substrate

The Moosa 100K Alternative would involve the placement of fill within 4.77 acres of wetlands and 0.56 acre of waters of the U.S. to construct a new inland dam, marina, and access roads. The substrate within the wetlands and jurisdictional waters would be permanently altered by these activities.

The analysis of the potential for direct, indirect, and cumulative impacts to water quality and biological resources by the Moosa 100K Alternative is provided in Section 4.17, “Water Resources,” and Section 4.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Suspended Particulates and Turbidity

The total sediment that would enter the Moosa 100K reservoir over 100 years is estimated to be approximately 1,800 AF. There are steep slopes within the watershed that are highly erodible, however, the low frequency of heavy and sustained storm events would result in relatively little erosion. Best Management Practices implemented during construction would prevent increased sedimentation and erosion within the project area.

The analysis of the potential for direct, indirect, and cumulative impacts to water quality by the Moosa 100K Alternative is provided in Section 4.17, “Water Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Water

The Moosa 100K Reservoir would be used to store water for future public use. Ongoing water testing and management activities would be implemented by the Water Authority to meet water quality goals. Implementation of the proposed project would not result in impacts to downstream water quality since water would not be released from the reservoir. Best Management Practices implemented during construction would prevent increased sedimentation and erosion within the project area.
The analysis of the potential for direct, indirect, and cumulative impacts to water quality by the Moosa 100K Alternative is provided in Section 4.17, “Water Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Current Patterns and Water Circulation

The Moosa 100K Alternative would consist of the construction of a new inland dam. Implementation of the proposed project would result in significant new impacts to onsite and downstream water patterns and aquatic resources associated with construction of the dam and reservoir and inundation of the dam.

The analysis of the potential for direct, indirect, and cumulative impacts to streambeds and aquatic vegetation by the Moosa 100K Alternative is provided in Section 4.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Normal Water Fluctuations

Normal water fluctuation and patterns within the Moosa 100K footprint would be significantly changed through construction of the dam and diversion of existing streambeds within the project area. Following construction of the dam, water levels within the dam would be controlled by the Water Authority in response to operational needs.

The analysis of the potential for direct, indirect, and cumulative impacts to streambeds and aquatic vegetation by the Moosa 100K Alternative is provided in Section 4.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Salinity Gradients

The Moosa 100K Alternative would consist of the construction of a new inland dam and reservoir. It is not located in proximity to the ocean, where implementation of the alternative might interfere with existing salinity gradients.
Subpart D: Potential Impacts on Biological Characteristics of the Aquatic Ecosystem

Threatened and Endangered Species

Implementation of the Moosa 100K Alternative is expected to result in permanent impacts to occupied habitat for the federally endangered least Bell’s vireo, federally threatened California gnatcatcher, federally endangered Quino checkerspot butterfly (*Euphydryas editha quino*), and federally endangered Stephen’s kangaroo rat (*Dipodomys stephensi*).

The analysis of the potential for direct, indirect, and cumulative impacts to threatened and endangered species by the Moosa 100K Alternative is provided in Section 4.6, “Biological Resources,” of the *Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project* (August 2007).

Fish, Crustaceans, Mollusks, and Other Aquatic Organisms in the Food Web

The existing riparian habitat, streambeds, and wetlands within the footprint of the Moosa 100K dam is expected to support aquatic organisms, including the southwestern pond turtle. These habitats would be permanently filled or inundated during construction of the dam. Following construction, when the reservoir is filled, a net increase of open water habitat for fish and other species would be created.

The analysis of the potential for direct, indirect, and cumulative impacts to aquatic organisms by the Moosa 100K Alternative is provided in Section 4.6, “Biological Resources,” of the *Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project* (August 2007).

Other Wildlife

The Moosa Canyon Regional Wildlife Corridor extends through the Moosa 100K Alternative footprint. Implementation of this alternative would require shifting the corridor around the dam and establishment of a setback from the inundation area to allow wildlife movement around the south side of the reservoir.

The analysis of the potential for direct, indirect, and cumulative impacts to wildlife by the Moosa 100K Alternative is provided in Section 4.6, “Biological Resources,” of the *Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project* (August 2007).
Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007). See Table 3.6-13 of the report for a summary of potential impacts to non-listed sensitive species.

Subpart E: Potential Impacts on Special Aquatic Sites

Sanctuaries and Refuges

The Moosa 100K footprint would not occur within a wildlife sanctuary or refuge, nor would it occur within the boundaries of any adopted Habitat Conservation Plan (HCP) or Natural Communities Conservation Plan (NCCP). The North County MSHCP is currently in development and the Moosa 100K footprint occurs within the planning area. However, the plan is not final and the Water Authority activities would not conflict with the North County MSHCP.

The analysis of the potential for impacts associated with a conflict with the North County MSHCP is provided in Section 4.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Wetlands

The proposed project would result in direct permanent impacts to 4.77 acres of wetlands and temporary impacts to 33.94 acres of wetlands during construction of the Moosa 100K Dam and Reservoir. Additionally, permanent indirect impacts to approximately 44.16 acres of Corps-regulated wetlands would occur as a result of reservoir inundation of existing wetlands within the project footprint.

The analysis of the potential for direct, indirect, and cumulative impacts to wetlands and other waters of the U.S. by the Moosa 100K Alternative is provided in Section 4.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Mudflats

Mudflats were not identified within the footprint of the Moosa 100K footprint. Please see Section 4.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007) for the analysis of potential impacts to waters of the U.S.
Vegetated Shallows

Turner Reservoir, which is located within the Moosa 100K footprint, may include submerged aquatic vegetation that could be regulated by the Corps as vegetated shallows. Please see Section 4.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007) for the analysis of potential impacts to waters of the U.S.

Coral Reefs

The proposed project would consist of raising an existing inland dam. The project would not result in a discharge of fill material in the ocean where coral reefs are located. Please see Section 4.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007) for the analysis of potential impacts to waters of the U.S.

Riffle and Pool Complexes

Riffle and pool complexes were not identified as occurring within the footprint of the Moosa 100K footprint. Please see Section 4.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007) for the analysis of potential impacts to waters of the U.S.

Subpart F: Potential Effects on Human Use Characteristics

Municipal and Private Water Supplies

The proposed project alternative would be constructed to increase the reliability of the Water Authority’s water supply in times of drought through the provision of carryover storage capacity. Implementation of the Moosa 100K Alternative would not affect private water supplies or wells.

Recreational and Commercial Fisheries

The existing Turner Reservoir is located at the southeast end of Moosa Canyon. The reservoir does not support recreational or commercial fishery uses.
The analysis of the potential for direct, indirect, and cumulative impacts to recreation (including recreational fishing) by the Moosa 100K Alternative is provided in Section 4.15, “Recreation,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

**Water-Related Recreation**

The existing Turner Reservoir is not open to the public for recreational use. No additional facilities within the Moosa 100K footprint exist that could support water related recreation.

The analysis of the potential for direct, indirect, and cumulative impacts to recreation by the Moosa 100K Alternative is provided in Section 4.15, “Recreation,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

**Aesthetics**

The proposed project would consist of the construction of a new dam and reservoir. Construction and operation of the facility is expected to result in significant impacts to community character, as well as to views from Old Castle Road (a County of San Diego third priority scenic route) and Lilac Road (identified as a significant visual resource in the Valley Center Community Plan).

The analysis of the potential for direct, indirect, and cumulative impacts to aesthetics by the Moosa 100K Alternative is provided in Section 4.3, “Aesthetics,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

**San Vicente 50K/Moosa 50K Alternative: Environmental Effects**

The environmental effects associated with implementation of the San Vicente (SV) 50K/Moosa 50K Alternative are analyzed in Chapter 5 of the CSP EIR/EIS.

Table 7-3 presents a quantification of the permanent direct and indirect impacts and the temporary direct and indirect impacts to waters of the U.S. as a result of the SV 50K/Moosa 50K Alternative (refer to Section 4.6, “Biological Resources for the SV 50K/Moosa 50K Alternative,” of this EIR/EIS for detailed evaluation). The total amount of fill in waters of the U.S. due to permanent and
temporary direct impacts is estimated to be 47.14 acres (4.84 acres for permanent direct impacts and 42.30 acres for temporary direct impacts).

**Table 7-3. SV 50K/Moosa 50K Alternative: Impacts to Waters of the U.S. (Acres)**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Wetlands</th>
<th>Unvegetated Waters of the U.S.</th>
<th>Total Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent Direct</td>
<td>4.06</td>
<td>0.78</td>
<td>4.84</td>
</tr>
<tr>
<td>Permanent Indirect</td>
<td>42.36</td>
<td>12.00</td>
<td>54.36</td>
</tr>
<tr>
<td>Temporary Direct</td>
<td>34.56</td>
<td>7.74</td>
<td>42.30</td>
</tr>
<tr>
<td>Temporary Indirect</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Total Impacts</td>
<td>80.98</td>
<td>20.52</td>
<td>101.50</td>
</tr>
</tbody>
</table>

The environmental effects associated with implementation of the San Vicente 50K/Moosa 50K Alternative is analyzed in the *Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project*, prepared by PBS&J, dated August 2007. The following discussion provides the location of the analysis in the document for each of the criteria that must be considered, as set forth in Subparts C through F of the 404(b)(1) guidelines.

**Subpart C: Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem**

**Substrate**

The SV 50K/Moosa 50K Alternative would involve the placement of fill within 4.06 acres of wetlands and 0.78 acre of waters of the U.S. to construct a new inland dam, marina, and access roads at the Moosa site and raise the existing San Vicente Dam to provide 50,000 AF of storage capacity. The substrate within the wetlands and jurisdictional waters would be permanently altered by these activities.

The analysis of the potential for direct, indirect, and cumulative impacts to water quality and biological resources by the SV 50K/Moosa 50K Alternative is provided in Section 4.17, “Water Resources,” and Section 4.6, “Biological Resources,” of the *Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project* (August 2007).
Suspended Particulates and Turbidity

Expansion of the San Vicente Reservoir and construction of the Moosa 50K Reservoir would not result in a significant change to the amount of sediment that enters the reservoir from the surrounding watershed, nor would activities be conducted within the reservoir bottom that would result in a temporary increase in suspended particulates and turbidity. Best Management Practices implemented during construction would prevent increased sedimentation and erosion within the project area.

The analysis of the potential for direct, indirect, and cumulative impacts to water quality by the SV 50K/Moosa 50K Alternative is provided in Section 5.17, “Water Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Water

Both the expanded San Vicente Reservoir and the Moosa 50K Reservoir would be used to store water for future public use. Water testing and management activities would be implemented by the Water Authority to meet water quality goals. Implementation of the SV 50K/Moosa 50K Alternative would not result in impacts to downstream water quality since water would not be released from the reservoirs. Best Management Practices implemented during construction would prevent increased sedimentation and erosion within the project area.

The analysis of the potential for direct, indirect, and cumulative impacts to water quality by the SV 50K/Moosa 50K Alternative is provided in Section 5.17, “Water Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Current Patterns and Water Circulation

The SV 50K/Moosa 50K Alternative consists of raising the existing San Vicente Reservoir and construction of the Moosa 50K Reservoir. Implementation of this alternative would not result in impacts to water patterns or aquatic resources downstream of the San Vicente Dam since water is not currently released from the reservoir. The drawdown and refilling of the dam would result in changes to the location of existing submerged aquatic vegetation. However, when the dam is refilled, a net increase of submerged aquatic vegetation is expected since water levels would be higher and the perimeter of the reservoir would increase.

Construction of the Moosa 50K Reservoir would result in significant new impacts to onsite and downstream water patterns and aquatic resources associated
with construction of the dam and reservoir and inundation of the area to fill the reservoir.

The analysis of the potential for direct, indirect, and cumulative impacts to water patterns and circulation by the SV 50K/Moosa 50K Alternative is provided in Section 5.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

**Normal Water Fluctuations**

The fluctuations in the water levels of the San Vicente Reservoir are controlled by the City of San Diego in response to operational issues, including the amount of water available for storage, season, precipitation, and water usage, and may fluctuate as much as 30 feet within a year. Therefore, the dam is not subject to “normal” or natural water fluctuations that might be impacted by the proposed project.

Normal water fluctuation and patterns within the Moosa 50K footprint would be significantly changed through construction of the dam and diversion of existing streambeds within the project area. Following construction of the dam, water levels within the dam would be controlled by the Water Authority in response to operational needs.

The analysis of the potential for direct, indirect, and cumulative impacts to streambeds and aquatic vegetation by the SV 50K/Moosa 50K Alternative is provided in Section 5.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

**Salinity Gradients**

The proposed project would consist of raising an existing inland dam and constructing a new inland dam. It is not located in proximity to the ocean, where implementation of the proposed project might interfere with existing salinity gradients.
Subpart D: Potential Impacts on Biological Characteristics of the Aquatic Ecosystem

Threatened and Endangered Species

The proposed project would result in permanent impacts to occupied habitat for the federally listed arroyo toad, least Bell’s vireo, California gnatcatcher, and Quino checkerspot butterfly.

The analysis of the potential for direct, indirect, and cumulative impacts to threatened and endangered species by the SV 50K/Moosa 50K Alternative is provided in Section 5.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Fish, Crustaceans, Mollusks, and Other Aquatic Organisms in the Food Web

Upon drawdown of the San Vicente Reservoir, the volume of open water in the dam would be reduced for the extent of the dam raise construction. The open water provides habitat for species such as fish, frogs, toads, and other aquatic wildlife. Although the habitat for these species would be temporarily reduced during construction, when the reservoir refills after construction of the dam raise, a net increase of open water habitat is expected since water levels would be higher and the perimeter of the reservoir would increase.

The existing riparian habitat, streambeds, and wetlands within the footprint of the Moosa 50K Dam are expected to support aquatic organisms. These habitats would be permanently filled or inundated during construction of the dam. Following construction, when the reservoir is filled, a net increase of open water habitat for fish and other species would be created.

The analysis of the potential for direct, indirect, and cumulative impacts to aquatic organisms by the SV 50K/Moosa 50K Alternative is provided in Section 5.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Other Wildlife

The San Vicente Dam raise is not expected to result in a permanent impact to habitat linkages or wildlife movement corridors since no regional or local movement corridors would be permanently blocked by the project and wildlife.
movement would not be impeded in the area. Drawdown of the reservoir would be maintained at an estimated 590 feet AMSL; therefore, wildlife would not lose this source of drinking water.

The Moosa Canyon Regional Wildlife Corridor extends through the Moosa 50K Alternative footprint. Implementation of this alternative would impact the corridor by blocking animal movement through flooding of a 2.5-mile segment of the canyon and creation of a reservoir.

The analysis of the potential for direct, indirect, and cumulative impacts to wildlife by the SV 50K/Moosa 50K Alternative is provided in Section 5.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Subpart E: Potential Impacts on SpecialAquatic Sites

Sanctuaries and Refuges

The proposed project would consist of raising the existing San Vicente Reservoir and construction of a new dam within Moosa Canyon. Neither project area is located within a designated wildlife sanctuary or refuge. The San Vicente Reservoir is located within the boundaries of the City of San Diego MSHCP. The project is in compliance with all conditions and provisions of this MSHCP.

The Moosa 50K footprint does not occur within a wildlife sanctuary or refuge, nor does it occur within the boundaries of any adopted HCP or NCCP. The North County MSHCP is currently in development and the Moosa 50K footprint occurs within the planning area. Water Authority activities would not conflict with the North County MSHCP, if and when it is adopted.

The analysis of the potential for impacts associated with a conflict with the North County MSHCP is provided in Section 5.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Wetlands

The proposed project would result in direct permanent impacts to 4.06 acres of wetlands and temporary impacts to 34.56 acres of wetlands during construction of the San Vicente Dam raise and the new Moosa 50K Dam and Reservoir. Additionally, permanent indirect impacts to approximately 42.36 acres of Corps-regulated wetlands would occur as a result of inundation following construction.
The analysis of the potential for direct, indirect, and cumulative impacts to wetlands and other waters of the U.S. by the SV 50K/Moosa 50K Alternative is provided in Section 5.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

**Mudflats**

The proposed project would consist of raising the existing San Vicente Reservoir and construction of a new dam within Moosa Canyon. Mudflats were not identified within either of the two project footprints. Please see Section 5.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007) for the analysis of potential impacts to waters of the U.S.

**Vegetated Shallows**

The proposed project would consist of raising the existing San Vicente Reservoir and construction of a new dam within Moosa Canyon. Turner Reservoir, which is located within the Moosa 100K footprint, may include submerged aquatic vegetation that could be regulated by the Corps as vegetated shallows. The San Vicente Reservoir does not support vegetated shallows.

Please see Section 5.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007) for the analysis of potential impacts to waters of the U.S.

**Coral Reefs**

The proposed project would consist of raising the existing San Vicente Reservoir and construction of a new dam within Moosa Canyon. The project would not result in a discharge of fill material in the ocean where coral reefs are located. Please see Section 5.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007) for the analysis of potential impacts to waters of the U.S.

**Riffle and Pool Complexes**

The proposed project would consist of raising the existing San Vicente Reservoir and construction of a new dam within Moosa Canyon. Riffle and pool
complexes were not identified within either project footprint. Please see Section 5.6, “Biological Resources,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007) for the analysis of potential impacts to waters of the U.S.

Subpart F: Potential Effects on Human Use Characteristics

Municipal and Private Water Supplies

The proposed project alternative is intended to increase the reliability of the Water Authority’s water supply in times of drought through the provision of carryover storage capacity. Implementation of the SV 50K/Moosa 50K Alternative would not affect private water supplies or wells.

Recreational and Commercial Fisheries

The San Vicente Dam and Reservoir supports public recreational fishing. Access to the dam by the public would be closed during drawdown of the water levels and construction of the dam raise and new marina. Drawdown of the water level and construction of the dam is not expected to result in significant impacts to existing fish populations. Following construction and refilling of the dam, recreational fishing would be reopened to the public with new marina facilities.

The existing Turner Reservoir is located at the southeast end of Moosa Canyon. The reservoir does not support recreational or commercial fishery uses.

The analysis of the potential for direct, indirect, and cumulative impacts to recreation (including recreational fishing) by the SV 50K/Moosa 50K Alternative is provided in Section 5.15, “Recreation,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Water-Related Recreation

The San Vicente Dam and Reservoir supports a wide variety of water-related recreation, including boating, fishing, wakeboarding, and waterskiing. Access to the reservoir by the public would be closed during drawdown of the water levels and construction of the dam raise and new marina. Following construction and refilling of the dam, the San Vicente Dam and Reservoir would be reopened to the public with new marina facilities and a larger water surface area. Water-related recreation is also offered within San Diego County at the Pacific Ocean,
Mission Bay Regional Park, and 20 freshwater reservoirs, all of which may be used by the public during construction of the dam.

The existing Turner Reservoir is not open to the public for recreational use. No additional facilities within the Moosa 50K footprint exist that could support water related recreation.

The analysis of the potential for direct, indirect, and cumulative impacts to recreation (including recreational fishing) by the SV 50K/Moosa 50K Alternative is provided in Section 5.15, “Recreation,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).

Aesthetics

The proposed project would consist of raising the existing San Vicente Reservoir and construction of a new dam within Moosa Canyon. Following construction of the dam raise, the incremental increase in dam height would be barely detectable when compared to the existing dam.

Construction and operation of the Moosa Reservoir is expected to result in significant impacts to community character, as well as to views from Old Castle Road and Lilac Road.

The analysis of the potential for direct, indirect, and cumulative impacts to aesthetics by the SV 50K/Moosa 50K Alternative is provided in Section 5.3, “Aesthetics,” of the Draft Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project (August 2007).
References


List of Preparers

Jones & Stokes

Michele Del Duca, Senior Environmental Regulatory Specialist

Shelah Riggs, Senior Regulatory Specialist

Paul Amberg, Senior Project Manager