EXECUTIVE SUMMARY:
ACCOMPLISHMENTS, OBSERVED TRENDS, CONCLUSIONS AND RECOMMENDATIONS FOR MITIGATION PROGRAM, JULY 2002-JUNE 2003
Prepared March 2004

ACCOMPLISHMENTS:

Many activities are carried out as part of the MPWMD Mitigation Program to address the environmental effects that community water use has upon the Carmel River and Seaside Groundwater Basins. Highlights of the accomplishments in fiscal year 2002-2003 (FY 2003), defined as July 1, 2002 through June 30, 2003, for each major category are shown below:

MITIGATION ACTION	ACCOMPLISHMENTS IN FY 2003
Monitor Water Resources	Regularly tracked precipitation, streamflow, surface and ground water levels and quality, and lagoon characteristics between Los Padres Dam and the Carmel River Lagoon, using real-time and computer monitoring methods at numerous data collection stations. Maintained extensive monitoring network, continuous streamflow recorder at San Clemente Dam and other sites; installed new gaging station at Arroyo del Rey in Del Rey Oaks.
Manage Water Production	Developed and implemented multi-agency Memorandum of Agreement and quarterly water supply strategies; worked cooperatively with resource agencies implementing the federal Endangered Species Act. Implemented Ordinance No. 96, 105 and 106 regulating water distribution systems.
Manage Water Demand NEEDS UPDATE	Inspected about 1,360 properties for permit compliance, which saved an estimated 44 acre-feet through required retrofits; provided retrofit refunds for 277 toilets, saving an estimated 6.4 acre-feet per year; conducted public outreach for conservation program; explored funding options to expand Pebble Beach reclamation program. Processed 984 permits of various types under allocation program; passed Ordinance No. 102 to end water credit transfer program; coordinated with jurisdictions to help streamline permit process.
Monitor Water Usage	Complied with SWRCB Order 95-10 for water year 2002.
Augment Water Supply Augment Supply, continued	Completed Phase 1 engineering and environmental studies for revised EIR on long-term water supply alternatives. Board approved contract and scope for Phase 2 preparation of a Draft EIR, with emphasis on an 8,400 AFA desalination project in the Sand City area; alternatives to be assessed include Cal-Am's Coastal Water Project (Moss Landing desalination and ASR) and Carmel River Dam, among others. Participated on technical committee evaluating options for seismic safety and sediment management at San Clemente Dam. Injected ___ acre-feet into Seaside Basin through May 2003 as part of aquifer storage and recovery project (ASR) testing. Began recovery tests to assess

	fate and productivity of injected water. Began environmental review of draft ordinances related to preparation of Seaside Basin Groundwater Management Plan.
Allocate New Supply	Remained within overall limits set by Water Allocation Program.
Determine Drought Reserve	Rationing was not required due to adequate storage reserve.
Steelhead Fishery Program	Counted 483 adult fish passing San Clemente Dam; rescued 16,238 young steelhead from drying reaches of the Carmel River in July 2002-June 2003 period; constructed extensive retrofit project at Sleepy Hollow steelhead rearing facility to protect pumps and other equipment from significant increase in sediment emanating from San Clemente Dam; conducted annual juvenile population survey. Completed multiple grant-funded projects, including (1) placed 600 tons of spawning gravel to improve steelhead habitat in selected locations; (2) improved steelhead passage in four ways, including removing or modifying barriers, and dredging a low-flow channel, and constructing a boulder weir; and (3) inflow bypass project at a private dam on San Clemente Creek to reduce effects of springtime reservoir filling. Conducted benthic invertebrate sampling at 5 stations for bioassessment of Carmel River; coordinated with Cal-Am regarding operations to maximize fish habitat.
Riparian Habitat Program Riparian Habitat (continued)	Continued revegetation at three restoration sites in the area between Via Mallorca and Esquiline Roads; continued planning and engineering for removing car bodies and restoring a streambank at Valley Hills Restoration Project; installed grant-funded instream fish habitat structures at deDampierre Restoration Project; continued working with federal agencies toward Regional General Permit for MPWMD river activities; diversified restoration techniques and experimented with planting techniques to allow trees to mature more quickly with less irrigation; inspected private projects for compliance with permit conditions; continued long-term monitoring of physical and biological processes; provided extensive technical support to Carmel River Watershed Council's watershed assessment plan; made several presentations on MPWMD restoration techniques to general interest and scientific groups.
Lagoon Habitat Program	Provided technical expertise and data to multi-agency sponsors of lagoon restoration program; continued vegetation habitat monitoring at eight transect locations; monitored four bathymetric transects; participated in interagency meetings regarding management of lagoon in winter storm events.
Aesthetic Measures	See Riparian Habitat Program measures.

OBSERVED TRENDS, CONCLUSIONS AND/OR RECOMMENDATIONS:

The following paragraphs describe observed trends (primarily qualitative), conclusions and/or recommendations for the mitigation program. General conclusions are followed by a summary of selected categories.

General Overview

In general, the Carmel River environment is in better condition than it was 10 years ago. This improvement is evidenced by biological/hydrologic indicators such as consistent steelhead adult spawner counts of roughly 400-850 fish in recent years as compared to 0-5 fish per year when the Mitigation Program began; improved densities of juvenile steelhead in quantities that reflect a healthy seeded stream; consistently increased bird diversity in MPWMD restoration project areas compared to control areas; fewer miles of dry river in summer and fall than in the past; and higher water tables in the Carmel Valley alluvial aquifer at the end of the water year.

The comprehensive MPWMD Mitigation Program is an important factor responsible for this improvement. Direct actions such as fish rescues and rearing, and riparian habitat restoration literally enable species to survive and reproduce. Indirect action such as conservation programs, ordinances/regulations and cooperative development of Cal-Am operation strategies result in less environmental impact from human water needs than would occur otherwise. The District's comprehensive monitoring program provides a solid scientific data baseline, and enables better understanding of the relationships between weather, hydrology, human activities and the environment. Better understanding of the water resources system enables informed decision-making that achieves the District's mission of benefiting the community and the environment.

It is acknowledged that there are other important factors responsible for this improved situation. For example, since 1991, the Carmel River watershed has received normal or wetter rainfall and runoff in nine out of ten years. Actions by federal resource agencies under the Endangered Species Act (ESA) or the State Water Resources Control Board (SWRCB) under its Order WR 95-10 have provided strong incentive for Cal-Am and other local water producers to examine and amend water production practices to the degree feasible, and for the community to reduce water use. Except for one year in 1997, the community has complied with the production limits imposed on Cal-Am by the SWRCB since Order 95-10 became effective in July 1995.

Despite these improvements, challenges still remain due to human influence on the river. The steelhead and red-legged frog remain listed as Threatened species under the ESA. Several miles of the river still dry up each year, harming habitat to fish and frogs. The presence of the two existing dams, flood plain development and water diversions to meet community needs continue to alter the natural dynamics of the river. Stream bank restoration projects may be significantly damaged in large winter storm events, and some people continue to illegally dump refuse into the river or alter their property without the proper permits. Thus, the Mitigation Program (or a comprehensive effort similar to it) will be needed as long as significant quantities of water are diverted from the Carmel River and people live in close proximity to it.

Water Resources

Streamflow and precipitation data continue to provide a scientific basis for management of the water resources within the District. These data continue to be useful in Carmel River Basin planning studies, reservoir management operations, water supply forecast and budgeting, and defining the baseline hydrologic conditions of the Carmel River Basin. The District's streamflow monitoring program

continues to produce high quality data in a cost effective manner. For example, the current annual cost of maintaining a single streamflow gaging station charged by the United States Geological Survey (USGS) is $16,100/year. If the District's streamflow monitoring program was maintained by the USGS, the annual cost would be $282,000/year (based on 16 gage sites). In addition, this annual cost does not include the labor costs associated with District staff installing new streamflow gages, such as the five installed in 2002, as these costs were absorbed into regular staff hours. The District is able to maintain its streamflow monitoring network with approximately 75 percent of a full-time District staff position (Associate Hydrologist), and an annual equipment operating budget of about $2,000.

Ground water levels, and consequently ground water storage conditions, in the Carmel Valley alluvial aquifer have maintained a relatively normal pattern in recent years, in contrast to the dramatic storage declines that were observed during the prolonged 1987-91 drought period. The relatively stable storage in the Carmel Valley alluvial aquifer in recent years is attributable to a combination of more favorable hydrologic conditions and the adoption of improved water management practices that have tended to preserve high storage conditions in the aquifer.

In contrast, storage conditions in the coastal portion of the Seaside Basin have not been stable in recent years, in particular with respect to the deeper Santa Margarita aquifer, from which over 80 percent of the Cal-Am production in the Seaside Basin is derived. This downward trend in water levels reflects the changed production operations in the Seaside Basin stemming from SWRCB Order 95-10. The increased annual reliance on production from Cal-Am's major production wells in Seaside, along with significant increases in non-Cal-Am use, have dramatically lowered water levels in this aquifer, and seasonal recoveries have not been sufficient to reverse this trend. One of the means to mitigate this observed trend is a program that the District has been actively pursuing since 1996-- the Seaside Basin groundwater injection program (also known as aquifer storage and recovery, or ASR). Further expanded testing of the District's full-scale test injection well was carried out during FY 2003 to further confirm the feasibility of this water augmentation concept. Ground water quality conditions in both the Carmel Valley alluvial aquifer and Seaside Basin have remained acceptable in terms of potential indicators of contamination from shallow sources such as septic systems, and there have been no identifiable trends indicative of seawater intrusion in the coastal areas of these two aquifer systems. It is notable that development of a Seaside Basin Groundwater Management Plan was one of the high-priority strategic initiatives identified by the MPWMD Board in 2002-2003.

Steelhead Resource

Monitoring conducted by the District shows that the Carmel River steelhead population continues to recover from remnant levels that prevailed as a result of the last drought and past water supply practices. Since 1992, the spawning population has recovered from a handful of fish to levels approaching 900 adults per year as counted at San Clemente Dam (most recently, 483 fish in Winter 2003). In addition, monitoring of the juvenile population at several sites along the mainstem Carmel River below Los Padres Dam shows that the population is recovering from low densities during the 1989-91 period (ranging below 0.50 fish per foot [fpf] of stream) to levels frequently ranging above 1.00 fpf during RY 2002, values that are typical of well-stocked steelhead streams. In RY 2002, average population density was above the long-term average for the Carmel River. District staff believes the recovery of steelhead in the Carmel River is directly related to the following factors:

- Improvements in streamflow patterns, due to favorable natural fluctuations, exemplified by relatively high base flow conditions since 1995,

- The District's and the SWRCB rules to actively manage the rate and distribution of groundwater extractions and direct surface diversions within the basin,

- Changes to Cal-Am's operations at San Clemente and Los Padres Dams, providing increased streamflow below San Clemente Dam,

- Improved conditions for fish passage at Los Padres and San Clemente Dams due to physical improvements,

- Recovery of riparian habitats, tree cover along the stream, and increases in woody debris, especially in the reach upstream of Robinson Canyon,

- Extensive rescues (and rearing) by MPWMD of juvenile steelhead over the last ten years, now totaling 197,000 fish through December 31, 2003; and by the transplantation of the younger juveniles to viable habitat upstream, and of older smolts to the lagoon or ocean, and

- Implementation of a captive broodstock program by Carmel River Steelhead Association and California Department of Fish & Game, and planting of 186,882 juvenile fish, including 73,786 fry, 84,679 fingerlings, and 28,417 smolts during the period from 1991 to 1994.

A recent challenge that may remain for some years is the potential effects of substantive physical and operational changes to San Clemente Dam required by the California Department of Water Resources (DWR) - Division of Safety of Dams (DSOD), including possible removal of the dam. The most significant issue is the effect of released sediment from the reservoir on downstream river habitat, proper functioning of MPWMD's Sleepy Hollow Steelhead Rearing Facility, and downstream property owners (flood elevations). Major changes include: (1) lowering of the reservoir water level to address seismic safety concerns; (2) significant changes in the sediment regime in the Carmel River downstream of San Clemente as the dam fills with sediment; and (3) loss of reservoir storage, which, in the past, has helped maintain adequate river flows in the lower Carmel River.

District staff continues to provide technical expertise and scientific data to Cal-Am engineers and environmental consultants, DWR/DSOD, California Department of Fish & Game, National Marine Fisheries Service, U.S. Fish and Wildlife Service, and others involved in addressing the resource management issues associated with seismic retrofit of San Clemente Dam.

Riparian Corridor

The Carmel River is showing many signs of recovery after the extreme drought and flood events during the 1990's that impacted property owners, threatened species, and riparian habitat. Sand and gravel that was washed out of streambanks and into the river bottom during floods is slowly migrating through the system and is leaving behind a more complex channel with diverse habitat and a richer riparian community. Areas with perennial flow (upstream of Schulte Bridge) or a high groundwater table, such as downstream of Highway 1, have experienced vigorous natural recruitment in the channel bottom, which has helped to stabilize streambanks and diversify aquatic habitat.

In these areas, natural recruitment has led to vegetation encroachment that, in some areas, may constrict high flows and threaten bank stability. MPWMD continues to monitor these areas closely and to develop a management strategy to balance protection of native habitat with the need to reduce erosion potential. Environmental review of proposed projects and the process of securing permits is quite complex and requires an exhaustive review of potential impacts.

In contrast to areas with perennial flow, the recovery of streamside area between Rancho Cañada and Quail Lodge appears to be impacted by increased groundwater extraction. In this reach, only irrigated areas appear to be able to sustain a diversity of plant species and plant stress in the late summer and fall is

evident.

Restoration project areas sponsored by MPWMD over the past 20 years are maturing and beginning to exhibit more features of relatively undisturbed reaches, such as plant diversity and vigor, complex floodplain topography, and a variety of in-channel features such as large wood, extensive vegetative cover, pools, and riffles. However, many areas that were repaired after the 1995 and 1998 floods are still limited in these natural features. In part, this may be due to the location and geomtery of the projects (i.e., several are located in narrow sections of the river impacted by groundwater extraction). Also, many of these projects relied heavily on the use of rip-rap to stabilize banks, which can discourage plant vigor and diversity.

The most significant trends include the following:

- increased oversight of channel maintenance and restoration activities by Federal agencies,
- increased groundwater extraction downstream of Schulte Road,
- vegetation encroachment into the channel bottom,
- increased avian species diversity, and
- maturing of previous restoration projects.

Carmel River Erosion Protection and Restoration

Sand contributed by erosion in the Tularcitos Creek drainage and from the collapse of mainstem banks covered the channel bottom of the mainstem for about 16 miles in 1998. This sand appears to have been washed down to the lower two to three miles of river, except in areas with pools greater than 300 feet in length. Spawning-sized gravel and cobble has moved as far downstream as the Rancho Cañada golf course (or sand has been stripped away to reveal larger material) and spawning has been observed in this area. This is additional evidence that streambanks in the mainstem are relatively stable and that tributary input of sediment has stabilized.

However, there are a few areas where bank erosion may occur during high flows. The following list is based primarily on observations of current vegetative bank cover and past erosion at these sites. These are (from downstream to upstream):

1. in the vicinity of Hacienda Carmel (River Mile (RM) 3.2 to RM 3.9);
2. the south bank upstream of the Rancho San Carlos Road Bridge (RM 3.9), at the Quail Lodge golf course;
3. the south bank at the upstream end of the Valley Hills Restoration Project (RM 5.5);
4. the north bank at the upstream end of Garland Park (RM 11.2);

Sites 1 through 3 lie in areas where groundwater extraction continues to be a key factor affecting the establishment and sustainability of streamside vegetation. Some natural recovery of the riparian corridor may be possible through irrigation; however, long-term recovery and stability is unlikely until overly steep streambanks are graded and protected against erosion. Site 4 at Garland Park has, perhaps, the most significant encroachment problem along the river. However, the habitat for steelhead and California red-legged frogs is among the highest quality along the river. MPWMD will continue to monitor these areas for degradation and/or instability.

It is likely that the following trends will continue or develop in the near future:

Permit applications by MPWMD for river work will come under increasing scrutiny at all levels of

government. More stringent avoidance and mitigation requirements will be placed on activities that could have negative impacts on sensitive aquatic species or their habitats.

Activities that interrupt or curtail natural stream functions, such as lining streambanks with riprap, will be discouraged or denied permits. Activities that increase the amount of habitat or restore natural stream functions are more likely to be approved in a streamlined manner.

Additional work to add instream features (such as large logs for steelhead refuge or backwater channel areas for frogs) will be necessary to restore and diversify aquatic habitat.

Major restoration projects completed between 1992 and 1999 will require additional work to diversify plantings and to maintain irrigation systems during the establishment period (varies from 5 to 10 years depending on environmental conditions and the availability of staff resources). Streambank repair may be necessary after high flows as previously installed structural protection goes through an initial adjustment period.

A comprehensive long-term solution to river degradation requires a significant increase in dry season water flows in the lower river to pre-development levels, a reversal of the incision process, and reestablishment of a natural meander pattern. Of these, MPWMD has made progress with increasing summer low flows and in studying the effects of an increased sediment load to the river. Reversal, or at least halting of channel incision, which contributes to bank collapse, may be possible if the supply of sediment is brought into balance with the transport capacity of the river (the system is currently "sediment starved"). With San Clemente Reservoir over 90% filled with sediment, it is likely that the supply of sediment downstream of the San Clemente Dam will increase in the very near future. The California Department of Water Resources has set a November 2004 deadline for implementing a plan to remediate San Clemente Dam either by removing the dam or retrofitting the existing dam in place to meet seismic saftey requirements. In either case, the sediment supply in the mainstem downstream of the dam will increase, which could increase bed elevations. Over the long term, an increase in sediment supply could help reduce streambank instability. Reestablishing a natural meander pattern presents significant political, environmental, and fiscal challenges, and is not currently being considered as part of the Mitigation Program.

Vegetation Restoration and Irrigation

Since 1998, a fundamental shift has taken place in streambank restoration design, which incorporates a functional floodplain that would be inundated in relatively frequent storm events (those expected every 1-2 years). For example, low benches at the Red Rock and All Saints Projects have served as natural recruitment areas and are currently being colonized by black cottonwoods, sycamores and willows. In addition, willow and cottonwood pole plantings in these areas were installed with a backhoe, which allows them to tap into the water table. These techniques have been successful and have reduced the need for supplemental irrigation. However, as pumping has increased in the lower Carmel Valley (pursuant to direction by the SWRCB and a Conservation Agreement between Cal-Am and NOAA Fisheries) supplemental irrigation was installed on the engineered floodplain opposite the All Saints School. Summer pumping at Cal-Am's Schulte Well impacted the District's deep pole plantings, causing premature leaf drop. Riparian moisture stress was mitigated by installing a drip irrigation system. It is anticipated in wet years this system will not have to be operated, but in average to below-average years, this system will have to be used.

The Conservation Agreement between Cal-Am and NOAA Fisheries will change the lower Carmel Valley pumping regime. The increased pumping at the Cañada Well may cause significant stress to the riparian corridor and create the need for supplemental irrigation. The severity of these impacts will be

monitored through the Conservation Agreement Monitoring Plan.

Channel Vegetation Management

Another notable trend relating to the District's vegetation management program was the widening of the channel after the floods in 1995 and 1998. With relatively normal years following these floods the channel has narrowed as vegetation recruits on the streambanks and gravel bars. Current Federal regulations such as the "4 (d)" rules promulgated by NOAA Fisheries to protect steelhead significantly restrict vegetation management activities. Currently, there are limited physical channel restrictions and erosion hazards in the lower 15 miles of the river. However, if normal to low flows continue in the next several years, expanding vegetation may significantly restrict the channel. As vegetation in the river channel recovers from the high flows of 1995 and 1998 and matures in the channel bottom, more conflicts are likely to arise between preserving habitat and reducing the potential for property damage during high flows. MPWMD will continue to balance the need to treat erosion hazards in the river yet maintain features that contribute to aquatic habitat quality.

Permits for Channel Restoration and Vegetation Management

Obtaining individual permits for conducting activities in the channel of the Carmel River has become increasingly complex since 1995 with the listing of steelhead and California red-legged frogs as Threatened species under the protection of the Federal Endangered Species Act. Staff time for obtaining authorizations from CDFG and the Corps has risen dramatically; the lead-time for obtaining these authorizations can stretch to years for a complex project. Much more emphasis is also being placed on incorporating habitat enhancements for steelhead and California red-legged frogs into projects. This has increased project development time and costs.

To cope with the rising level of environmental analysis and documentation necessary to obtain permits, MPWMD is actively seeking a long term permit from the Corps and is negotiating a renewal of a long term Memorandum of Understanding with the California Department of Fish and Game to conduct regular maintenance and restoration activities. The District will also seek long-term permits or agreements with other regulatory agencies including the California Regional Water Quality Control Board, the Monterey County Planning and Building Inspection Department, and the Monterey County Water Resources Agency.

Monitoring Program

Vegetative moisture stress on a whole fluctuates depending on the rainfall, proximate stream flow, and average daily temperatures, and tends to be much lower in above-normal rainfall years. Typical trends for a single season start with little to no vegetative moisture stress in the spring when soil is moist and the river is flowing. As the river begins to dry up in the lower Carmel Valley (around June) and temperatures begin to increase, an overall increase in vegetative moisture stress occurs. For much of the riparian corridor this stress has been mitigated by supplemental irrigation and prevented the die off of large areas of riparian habitat. However, many recruiting trees experience high levels of stress or mortality in areas difficult to irrigate. Riparian vegetation exposed to rapid or substantial lowering of groundwater levels (i.e., below the root zones of the plants) will continue to require monitoring and irrigation during the dry season.

With respect to riparian songbird diversity, populations dropped after major floods in 1995 and 1998 because of the loss of streamside habitat. However, they have rebounded in the last few years and have

shown some of the highest diversity since monitoring began in 1992, indicating that the District mitigation program is preserving and improving riparian habitat.

Carmel River Lagoon

The District continues to support and encourage the ongoing habitat restoration efforts in the wetlands and riparian areas surrounding the Carmel River Lagoon. These efforts are consistent with goals that were identified in the Carmel River Lagoon Enhancement Plan, which was partially funded by the District. Currently, District staff is participating in multi-agency and landowner discussions to implement restoration of approximately 100 acres on the Odello West property, including expansion of the south arm of the lagoon and re-establishment of riparian and wetland habitat. Because of the restoration activities on the south side of the lagoon, the District has concentrated its monitoring efforts on the relatively undisturbed north side. Staff have also attended meetings and had discussions with other agencies regarding a proposal to use treated water from the Carmel Area Wastewater District to augment the lagoon during periods of low water.

The District expanded its long-term monitoring around the lagoon in 1995 in an attempt to determine if the reduction in freshwater flows due to groundwater pumping upstream might be changing the size or ecological character of the wetlands. Demonstrable changes have not been identified. Because of the complexity of the estuarine system, a variety of parameters are monitored, including vegetative cover in transects and quadrats, soil and water conductivity, and hydrology. It is notable that due to the number of factors affecting this system, it would be premature to attribute any observed changes solely to groundwater pumping. During this period, for example, there have been two extremely wet years (1995 and 1998), and two above normal years (1996 and 1997), in terms of runoff. Other natural factors that affect the wetlands include introduction of salt water into the system as waves overtop the sandbar in autumn and winter, tidal fluctuations, and long-term global climatic change. When the District initiated the long-term lagoon monitoring component of the Mitigation Program, it was with the understanding that it would be necessary to gather data for an extended period in order to draw conclusions about well draw-down effects on wetland dynamics. It is recommended that the annual vegetation, soil conductivity, topographical and wildlife monitoring be continued in order to provide a robust data set for continued analysis of potential changes around the lagoon.

Lagoon bathymetric cross sectional surveys, initially conducted in 1988, have been completed annually since 1994 in August or September. These data are useful in assessing changes in the sand supply within the main body of the lagoon. So far, no major trends indicating sand accumulation or depletion have been identified. These data provide answers to questions concerning whether or not the lagoon is filling up with sand, thus losing valuable habitat.

Program Costs

The annual cost of mitigation efforts varies because several mitigation measures are weather dependent. However, the overall costs have remained fairly constant (about $1.3-$1.6 million) over the past few years. The one exception was FY 2000 (July 1999-June 2000) when an additional $981,786 was added to the capital expense program to fund one half of the acquisition cost of the District's new office building, bringing the expenditure total to over $2.6 million that year. This cost is being reimbursed over a period of 15 years.