MONTEREY PENINSULA
WATER MANAGEMENT DISTRICT

2021-2022 ANNUAL REPORT
(July 1, 2021 - June 30, 2022)

for the

MPWMD MITIGATION PROGRAM

A report in compliance with the

MPWMD WATER ALLOCATION PROGRAM
FINAL ENVIRONMENTAL IMPACT REPORT
(originally certified in November 1990)

Prepared by MPWMD Staff
April 2023

2021-2022 ANNUAL REPORT
MPWMD MITIGATION PROGRAM
WATER ALLOCATION PROGRAM EIR

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(July 1, 2021 - June 30, 2022)

MPWMD MITIGATION PROGRAM
WATER ALLOCATION PROGRAM ENVIRONMENTAL IMPACT REPORT

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT
Prepared April 2023

I. EXECUTIVE SUMMARY

INTRODUCTION AND BACKGROUND:

In April 1990, the Water Allocation Program Final Environmental Impact Report (EIR) was prepared for the Monterey Peninsula Water Management District (MPWMD or District) by J.L. Mintier and Associates. The Final EIR analyzed the effects of five levels of annual California American Water (CAW or Cal-Am) production, ranging from 16,744 acre-feet per year (AFY) to 20,500 AFY. On November 5, 1990, the MPWMD Board certified the Final EIR, adopted findings, and passed a resolution that set Option V as the new water allocation limit. Option V resulted in an annual limit of 16,744 AFY for Cal-Am production, and 3,137 AFY for non-Cal-Am production, with a total allocation of 19,881 AFY for the Monterey Peninsula Water Resource System (MPWRS). The MPWRS is the integrated system of water resources from the Carmel River Alluvial Aquifer and Seaside Groundwater Basin that provide the Monterey Peninsula community's water supply via the Cal-Am water distribution network.

Even though Option V was the least damaging alternative of the five options analyzed in the Water Allocation Program EIR, production at this level still resulted in significant, adverse environmental impacts that must be mitigated. Thus, the findings adopted by the Board included a "Five-Year Mitigation Program for Option V" and associated mitigation measures.

In June 1993, Ordinance No. 70 was passed, which amended the annual Cal-Am production limit from 16,744 AF to 17,619 AF, and the non-Cal-Am limit from 3,137 AF to 3,054 AF; the total production limit was increased from 19,881 AF to 20,673 AF per year due to new supply from the Paralta Well in Seaside. In April 1996, Ordinance No. 83 slightly changed the Cal-Am and non-Cal-Am annual limits to 17,621 AF and 3,046 AF, respectively, resulting in a total limit of 20,667 AFY. In February 1997, Ordinance No. 87 was adopted to provide a special water allocation for the planned expansion of the Community Hospital of the Monterey Peninsula, resulting in a new Cal-Am production limit of 17,641 AFY; the non-Cal-Am limit of 3,046 AFY was not changed. These actions did not affect the implementation of mitigation measures adopted by the Board in 1990.

The Five-Year Mitigation Program formally began in July 1991 with the new fiscal year (FY) and was slated to run until June 30, 1996. Following public hearings in May 1996 and District Board review of draft reports through September 1996, the Five-Year Evaluation Report for the 1991-

1996 comprehensive program, as well as an Implementation Plan for FY 1996-1997 through FY 2000-2001, were finalized in October 1996. In its July 1995 Order WR 95-10, the State Water Resources Control Board (SWRCB) directed Cal-Am to carry out any aspect of the Five-Year Mitigation Program that the District does not continue after June 1996. To date, as part of the annual budget approval process, the District Board has voted to continue the program. The Mitigation Program has accounted for a significant portion of the District's annual budgets in terms of revenue (derived primarily from a portion of the MPWMD user fee on the Cal-Am bill) and expenditures. It should be noted that this fee was removed from Cal-Am's bill in July 2009, resulting from actions subsequent to a California Public Utilities Commission ruling regarding a Cal-Am rate request. Cal-Am continued to pay the Carmel River Mitigation Program fee under a separate agreement with MPWMD through June 2010. The District and Cal-Am have negotiated an annual funding agreement that funded part of the 2016-2017 mitigation program. In April 2017, the MPWMD resumed collection of its user fee from Cal-Am ratepayers. The District's other revenue sources were used to fund the remainder of the program.

The California Environmental Quality Act (CEQA) (Pub. Res. Code 21081.6) requires that the MPWMD adopt a reporting or monitoring program to insure compliance with mitigation measures when implementing the Water Allocation Program. Findings Nos. 387 through 404 adopted by the Board on November 5, 1990 describe mitigation measures associated with the Water Allocation Program; many entail preparation of annual monitoring reports. This 2021-2022 Annual Report for the MPWMD Mitigation Program responds to these requirements. It covers the fiscal year period of July 1 through June 30. It should be noted that hydrologic data and well reporting data in this report are tabulated using the water year, defined as October 1 through September 30, in order to be consistent with the accounting period used by the SWRCB.

This 2021-2022 Annual Report first addresses general mitigation measures relating to water supply and demand (Sections II through XI), followed by monitoring related to compliance with production limits, drought reserve and supply augmentation (Sections XII through XV), followed by mitigations relating to specific environmental resources (Sections XVI through XIX). Section XX provides a summary of costs for the biological mitigation programs as well as related hydrologic monitoring, water augmentation and administrative costs. Section XXI presents selected references.

Table I-1 summarizes the mitigation measures described in this report. In subsequent chapters, for each topic, the mitigation measure adopted as part of the Final EIR is briefly described, followed by a summary of activities relating to the topic in FY 2021-2022 (July 1, 2021 through June 30, 2022, unless otherwise noted). Monitoring results, where applicable, are also presented. Tables and figures that support the text are found at the end of each section in the order they are introduced in the text.

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 FY 2021-2022 for each major category are shown in **Table I-2**.

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 Mitigation Program categories.

General Overview

Overall, the Carmel River environment with respect to riparian vegetation, river flow, and aquifer levels is in better condition today than it was in 1990 when the Allocation Program EIR was prepared. This improvement is evidenced by increased riparian habitat and higher water tables in the Carmel Valley alluvial aquifer. However, the steelhead fishery was rebounding until the onset of the 2012-2015 drought. During and after the drought, steelhead numbers declined to levels similar to those seen in previous droughts. Then in 2017, with abundant winter rains, adult steelhead were observed in the system and the District did not have to rescue juvenile steelhead in the mainstem of the Carmel River. However, rescues were carried out in the tributaries. This was also the case in the summer of 2019. Then in the summer of 2020,2021, and 2022, because of lower rainfall, rescues resumed in the mainstem of the Carmel River.

The comprehensive MPWMD Mitigation Program is an important factor responsible for helping maintain steelhead populations in the Carmel River. 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, water augmentation, 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 MPWRS 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 Water Year (WY) 1991, the Carmel River has received normal or better runoff in 19 out of 31 years. Actions by federal resource agencies under the Endangered Species Act (ESA) or the SWRCB under its Order WR 95-10 and follow-up orders 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 remain due to human influence on the river. The steelhead and red-legged frog remain listed as threatened species under the ESA. At least several miles of

the river still dry up in most years, harming habitat for listed fish and frog species. The presence of the one existing dam, floodplain development and water diversions to meet community and local user needs continue to alter the natural dynamics of the river. Streambank 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 Monitoring Program

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. Also, the District's streamflow monitoring program continues to produce high quality and cost-effective data.

There is limited storage of surface water on the Carmel River. Los Padres Reservoir, completed in 1948, holds 1,667 AF of storage (without flashboard), based on 2017 survey data. In addition, San Clemente Reservoir (SCR), completed in 1921, was removed in the fall of 2015 by order of the Department of Water Resources (DWR) due to seismic safety concerns.

Groundwater levels, and consequently groundwater 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 1987-1991 drought period. The relatively stable storage in the Carmel Valley alluvial aquifer in recent years is attributable to a combination of periods of more favorable hydrologic conditions and the adoption of improved water management practices that have tended to preserve higher storage conditions in the aquifer. In WY 2022, Carmel Valley Alluvial Aquifer storage was average compared with recent years as this year was classified as "dry."

In contrast, storage conditions in the coastal portion of the Seaside Groundwater Basin have not been stable in recent years, in particular with respect to the deeper Santa Margarita aquifer, from which over 90 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 primarily from changed practices after 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. However, now that primary pumpers in the Seaside Groundwater Basin are at their adjudicated limit, this downward trend is decreasing.

To address this storage depletion trend, the District initiated efforts in the 2000-2001 timeframe to prepare a Seaside Basin Groundwater Management Plan in compliance with protocols set by the State of California (AB 3030, as amended by SB 1938). This process was superseded by litigation filed by Cal-Am in August 2003, requesting a court adjudication of water production and storage rights in the Seaside Basin. The District participated in all litigation proceedings as an intervening "interested party". The Superior Court held hearings in December 2005 and issued a final

adjudication decision in March 2006, which was amended through an additional court filing in February 2007. The final decision established a new, lower "natural safe yield" for the Basin of 3,000 AFY, and an initial Basin "operating safe yield" of 5,600 AFY. Under the decision, the operating safe yield would be reduced by 10% every three years until the operating safe yield matches the natural safe yield of the Basin in 2021. The Court also created a nine-member Watermaster Board (of which the District is a member) to implement the Court's decision. With the triennial reductions in operational yield required by the Seaside Basin Adjudication Decision, water levels have not been declining as fast as previously observed.

One of the means that could potentially mitigate this observed storage depletion 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). ASR entails diverting excess water flows (typically in Winter/Spring) from the Carmel Valley Alluvial Aquifer through existing Cal-Am facilities and injecting the water into the Seaside Groundwater Basin for later recovery in dry periods.

The primary goal of the MPWMD ASR Project is better management of existing water resources and production facilities to help reduce impacts to the Carmel River, especially during the dry season. The projects are viewed as being complementary to other larger, long-term water augmentation projects that are currently being pursued for the Monterey Peninsula. These projects, also known as Phase 1 and 2 ASR projects, entail a maximum diversion of 2,426 AFY, and 2,900 AFY respectively from the Carmel River for injection. The combined average yield for both projects is estimated at about 2,000 AFY. The operation of the Phase 1 and 2 ASR Projects result in reduced unauthorized pumping of the Carmel River in Summer/Fall and increased storage in the Seaside Basin, which are both considered to be environmentally beneficial.

The ASR water supply efforts in 2021-2022 included: (1) continued work with regulatory and land use agencies on expansion of the Phase 1 Santa Margarita ASR site; (2) continued work on the utility water system for the Phase 2 ASR Project at the Seaside Middle School site; (3) coordination with Cal-Am and other parties to construct the necessary infrastructure for the ASR project expansion; and (4) continued implementation of a Memorandum of Understanding (MOU) with Cal-Am on operation and maintenance at the ASR facilities.

In 2022, Pure Water Monterey continued to inject 3,500 Acre Feet per year into the Santa Margarita for water supply. 1,200 AF was left in the Seaside Basin for Pure Water Monterey Operational Reserve, the rest was recovered for water supply to Peninsula residents. Approximately 540 additional Acre Feet of Operational Reserve will be built up over WY 2023.

Groundwater 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. There have been no identifiable trends indicative of seawater intrusion into the principal supply sources the coastal areas of these two aquifer systems to date.

Steelhead Fishery Program

- **Adult Steelhead**

Redd surveys conducted downstream of the former San Clemente Dam confirm improvements in spawning habitat and increased spawning success in the lower river over the last 24 years. Additionally, juvenile steelhead rescued from the lower river that survive to adulthood may return to reaches lower in the river to spawn.

Variability in adult steelhead counts results from:

- Highly dynamic ocean conditions, increasing water temperatures, and degraded ocean water quality likely affect the abundance of food resources and at-sea survival of returning steelhead.
- Variable river conditions and flow regimes can affect migration and spawning success.
- Variable lagoon conditions, caused by artificial manipulation of the sandbar and/or naturally occurring periods of low winter flows.
- Variable densities of juvenile fish affecting subsequent adult populations.

- **Juvenile Steelhead**

Long-term monitoring of juvenile steelhead at eleven sites along the mainstem Carmel River below Los Padres Dam suggests that fish density continues to be quite variable between years and among sites, from less than 0.10 fish-per-foot (fpf) of stream to levels frequently above 1.00 fpf, values that are typical of well-stocked steelhead streams. However, fish density has been improving since the last long drought of 2013-15. In this 2022 reporting period, the average population density was 1.05 fpf, much higher than the long-term average of 0.74 fpf for the Carmel River, continuing the strong upward trend.

The juvenile steelhead population in the Carmel River Basin is influenced by:

Positive Factors:

- General improvements in streamflow, due to favorable natural fluctuations, exemplified by higher base-flow conditions and several high precipitation years.
- District and SWRCB rules to actively manage the rate and distribution of groundwater extractions and direct surface diversions within the basin, coupled with changes to Cal-Am's operations at LPD, the increased availability of ASR and Pure Water Monterey in the summer, and extensive conservation measures, all help provide increased streamflow.
- Restoration and stabilization of the lower Carmel River's stream banks, providing improved riparian habitat (tree cover/shade along the stream, an increase in woody debris and the associated invertebrate food supply) while preventing erosion of silt/sand from filling gravel beds and pool.
- The removal and restoration of the San Clemente Dam and Reservoir, and other barriers in the mainstem and tributaries, improved passage and habitat values for adults and juvenile fish.

- Extensive juvenile steelhead rescues by the District over the last 33 years, now totaling 487,941 fish through 2022.
- Rearing and releases of rescued fish from the SHSRF of 114,149 juveniles and smolts into the river and lagoon over the past 26 years (19 years of operation), at sizes generally larger than the naturally reared fish, which could enhance their ocean survival.

Negative Factors:

- Variable lagoon conditions, including highly variable water surface elevation changes caused by mechanical breaching, chronic poor water quality (especially in the fall), and predation by birds and striped bass.
- Barriers or seasonal impediments to juvenile and smolt emigration, such as intermittent periods of low flow below the Narrows during the normal spring outmigration.
- Spring flow variability such as low-flow conditions that could dewater redds prematurely or high flows that could either deposit sediment over redds or completely wash them out.
- Occasionally elevated temperature and hydrogen sulfide levels below LPD, and the recent large landslide into LPR that affects the outlet works.
- The potential for enhanced predation on smolts and YOY migrating through the sediment field above LPD.
- Invasive species: striped bass have recently (2015) started migrating up the river from the lagoon and are likely preying on juvenile steelhead. New Zealand Mud Snails (NZMS) were first discovered during BMI surveys at Red Rock (mid-valley) in 2016 and have now been found in the Stonepine reach in the upper valley. NZMS can outcompete native invertebrates and are a poor food item themselves for steelhead.

District staff continues to provide technical expertise and scientific data to CAW engineers and environmental consultants, DWR/DSOD, CDFW, NMFS, U.S. Fish and Wildlife Service, and others involved in addressing the resource management issues associated with both LPD and the area influenced by the SCD Removal and Carmel River Reroute Project. District staff also continues to provide technical expertise and scientific data to California Department Parks and Recreation, Monterey County Water Resources Agency, Monterey County Public Works Department, California Coastal Commission, U. S. Army Corps of Engineers, Carmel Area Wastewater District, and other regulatory agencies and stakeholders involved in the management of the Carmel River, the Carmel River Lagoon and the barrier beach.

Riparian Habitat Mitigation

With the exception of the Rancho Cañada to Rancho San Carlos Road Bridge reach, the Carmel River streamside corridor has stabilized in nearly all reaches that were affected by a combination of increased groundwater extraction, extreme drought and flood events that occurred during the 1970s, 1980s and 1990s. Prior to the 2016-17 winter high flows, a complex channel had developed in the lower 16 miles of the river with improved steelhead spawning substrate, diverse habitat, and a richer riparian community. Areas with perennial or near perennial flow (upstream of Schulte Bridge) or a high groundwater table, such as downstream of Highway 1, experienced vigorous

natural recruitment in the channel bottom, which has helped to stabilize streambanks and diversify aquatic habitat. Areas that continue to be dewatered annually have less significant growth.

The recovery of streamside areas subjected to annual dewatering requires monitoring. Plant stress in the late summer and fall is evident in portions of the river that go dry. In these areas, streambanks can exhibit unstable characteristics during high flows, such as sudden bank collapse, because of the lack of healthy vegetation that would ordinarily provide stability. The drought that began with Water Year 2013 (beginning October 2012) and ended in Water Year 2016 is an ongoing concern because of the past history of channel erosion and bank instability after severe droughts in 1976-77 and 1987-1991. Impacts to streamside vegetation can manifest themselves for several years even after the end of a drought.

Based on annual cross-section work by CSUMB, several areas have experienced a filling in of pools with sand. Absent high flows like those that occurred in 2017, it is likely that the sand will be winnowed out and sent downstream over the next several years. When river flows drop in late spring or early summer of 2023, District staff will investigate the overall scour and deposition of the streambed and report on this in next year's mitigation report. Current results still show many of the pools are still filled with sand.

Restoration project areas sponsored by MPWMD since 1984 continue to mature and 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, riffles, and cut banks.

As cited in previous reports, the most significant trends continue to include the following:

- increased natural recruitment of vegetation into the active channel of the Carmel River,
- effects to areas with groundwater extraction downstream of Schulte Road,
- channel changes and erosion due to new supply of sediment from upstream associated with high flows, San Clemente Dam removal, and the Soberanes Fire in Water Year 2017,
- healthy avian species diversity, and
- maturing of previous restoration projects.

Carmel River Erosion Protection and Restoration

With the exception of the channel area between the Via Mallorca Road bridge and the Rancho San Carlos Road bridge, streambanks in the main stem appear to be relatively stable during average water years with "frequent flow" storm events (flows with a return magnitude of less than five years). The program begun by MPWMD in 1984 (and later subsumed into the Mitigation Program) to stabilize streambanks appears to be achieving the goals that were initially set out, i.e., to reduce bank erosion during high flow events up to a 10-year return flow, restore vegetation along the streamside, and improve fisheries habitat.

Consistent with previous reports, it is likely that the following trends will continue:

- Local, State and Federal agencies consider the Carmel River watershed to be a high priority

area for restoration, as evidenced by the interest in addressing water supply issues, the removal of San Clemente Dam, proposed projects in the lower Carmel River, and continued oversight with the management of threatened species. Stringent avoidance and mitigation requirements will continue to 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, have come under increasing scrutiny and now require significant mitigation offsets. Approximately 35% to 40% of the streambanks downstream of Carmel Valley Village have been altered or hardened since the late 1950s. Activities that increase the amount of habitat or restore natural stream functions are more likely to be approved or funded through State and Federal grant programs.
- Additional work to add instream features (such as large logs for steelhead refuge or backwater channel areas for frogs) can restore and diversify aquatic habitat.
- Major restoration projects completed between 1987 and 1999 have had extensive and successful work to diversify plantings. However, maintenance of irrigation systems is ongoing and requires extensive work in water years classified as below normal, dry and critically dry.
- The channel will change due to a new supply of sediment coming from upstream of the old San Clemente Dam and additional sources of sediment associated with the Soberanes Fire of 2016.

Vegetation Restoration and Irrigation

To the maximum extent possible, MPWMD-sponsored river restoration projects incorporate a functional floodplain that is intended to 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.

Channel Vegetation Management

Another notable trend relating to the District's vegetation management program was the widening of the channel after floods in 1995 and 1998. With relatively normal years following these floods, the channel has narrowed as vegetation recruits on the channel bottom and gravel bars. Current Federal regulations such as the Endangered Species Act (ESA) "Section 4(d)" rules promulgated by NOAA Fisheries to protect steelhead significantly restrict vegetation management activities. Because of these restrictions, the District can carry out activities only on the most critical channel restrictions and erosion hazards in the lower 15 miles of the river. 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

In 2018, MPWMD renewed its long-term permits with the U.S. Army Corps of Engineers and the California Regional Water Quality Control Board for routine maintenance and restoration work. In 2014, the District also renewed a long-term Routine Maintenance Agreement (RMA) with the California Department of Fish and Wildlife to conduct regular maintenance and restoration activities in the Carmel River.

Monitoring Program

Vegetative moisture stress fluctuates depending on the rainfall, proximate stream flow, depth to groundwater, 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 the soil is moist and the river is flowing. As the river begins to dry up in lower Carmel Valley (normally around June) and temperatures begin to increase, an overall increase in vegetative moisture stress occurs. The District irrigates around large production wells to help mitigate impacts from groundwater extraction. However, many recruiting trees experience high levels of stress or mortality in dry years 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. Since 1998, species diversity recovered and now fluctuates depending on habitat conditions. Values from 2018 avian point count surveys indicate that the District's mitigation program is preserving and improving riparian habitat.

Strategies for the future

A comprehensive long-term solution to overall environmental degradation requires a significant increase in dry-season water flows in the lower river, a reversal of the incision process, and reestablishment of a natural meander pattern. Of these, MPWMD has made progress on increasing summer low flows and groundwater levels by aggressively pursuing a water conservation program, implementing the first and second phases of the Seaside Groundwater Basin Aquifer Storage and Recovery Project, and recommending an increase in summer releases from Los Padres Reservoir.

Reversal, or at least a slowing, of channel incision may be possible if the supply of sediment is brought into better balance with the sediment transport forces. Additional sediment from the tributary watersheds between San Clemente Dam and Los Padres Dam will pass into the lower river in the foreseeable future now that San Clemente Dam has been removed. District staff are already seeing signs of additional sediment in the Carmel River below Esquiline Road Bridge.

However, reestablishing a natural supply of sediment and restoring the natural river meander pattern through the lower 15.5 miles of the Carmel Valley presents significant political, environmental, and fiscal challenges, and is not currently being considered as part of the Mitigation Program.

Integrated Regional Water Management (IRWM) Grant Program

The IRWM program promoted by the California DWR encourages planning and management of water resources on a regional scale and promotes projects that incorporate multiple objectives and strategies. In addition, the IRWM process brings stakeholders together and encourages cooperation among agencies in developing mutually beneficial solutions to resource problems.

MPWMD adopted the 2019 Update to the IRWM Plan for a region encompassing Monterey Peninsula areas within the District boundary, the area in the Carmel River watershed outside of the MPWMD boundary, Carmel Bay and the Southern Monterey Bay. The IRWM Plan combines strategies to improve and manage potable water supply, water conservation, stormwater runoff, floodwaters, wastewater, water recycling, habitat for wildlife, and public recreation.

Funding from the IRWM grant program and other programs requiring an adopted IRWM Plan provide the incentive to undertake a set of projects that would continue to improve the Carmel River environment and engage a larger number of organizations in helping to develop and implement a comprehensive solution to water resource problems in the planning region. The Monterey Peninsula region is expecting to take advantage of about $4.3 million from Proposition 1 IRWM funds over the next several years. In 2018, $252,693 was awarded to the region as a part of the Disadvantaged Community Involvement grant. In 2020, $2,238,904 was awarded to the region as a part of the Implementation Round 1 grant. MPWMD prepared an IRWM Implementation Round 2 Grant application for the Monterey Peninsula region in the amount of $1,488,961 which was submitted in January, 2023.

More information about the IRWM Plan and the group of stakeholders in the planning region can be found at the following web site:

https://www.mpwmd.net/environmental-stewardship/irwm-program/

Carmel River Lagoon Habitat

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. The District continues to work with various agencies and landowners to implement ongoing restoration of the Odello West property and future restoration of the Odello East property across the highway.

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 change 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, 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. The following illustrates the Water Year (October 1 – September 30) classifications since 1995 in terms of total annual runoff.

Classification	Number of Years	Water Year
Extremely Wet	4	1995, 1998, 2017, 2019
Wet	2	2005, 2006
Above Normal	5	1996, 1997, 2000, 2010, 2011
Normal	6	1999, 2001, 2003, 2008, 2009, 2020
Below Normal	3	2004, 2016, 2018
Dry	6	2002, 2012, 2013, 2015, 2021, 2022
Critically Dry	2	2007, 2014

Thus, the hydrology of the watershed has been at least normal or better 61% of the time during the 28-year period. However, monitoring in 2014 occurred during a Critically Dry Water Year that followed two consecutive Dry Water Years, and 2015 was the first time a fourth year of drought was ever monitored. 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 production drawdown effects on wetland dynamics. It is recommended that the current vegetation, 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 during the dry season since 1994. These data are useful in assessing changes in the sand supply within the main body of the lagoon and are necessary to answer questions concerning whether or not the lagoon is filling up with sand, thus losing valuable habitat. As indicated in the survey plots, the sandy bed of the lagoon can vary significantly from year to year. Substrate elevations at cross sections 1 through 4 mostly show light sand accumulation between the 2021 and 2022 water year. In the recent "Critically Dry" years of WY 2007 and 2014 and "Dry" years of WY 2012 and 2013, no significant changes were documented compared to the respective prior years. The "Extremely Wet" WY 2019 resulted in no significant changes at the cross sections even though 155,000 AF of runoff (measured at the HWY1 gage) passed through the lagoon. This is inconsistent with WY 2017, the last "Extremely Wet" year when significant scour was observed at the cross sections. Although data suggests that substrate elevations at the cross sections generally remain stable in low-flow years, data are now somewhat inconclusive regarding the effects of high flow years on lagoon sand supply. WY 2023 will be a good opportunity to further study the effect of high flows on lagoon bathymetry as it is shaping up to be an extremely wet year.

Program Costs

Mitigation Program costs for FY 2021-2022 totaled approximately $3.46 million including direct personnel expenses, operating costs, project expenditures, capital equipment, and fixed asset

purchases. The annual cost of mitigation efforts varies because several mitigation measures are weather dependent. Expenditures in FY 2021-2022 were $0.813 million higher than the prior fiscal year due to increase in Mitigation Program costs related to projects that were completed during the current fiscal year. However, the overall costs have remained constant (average of $3.254 million per year) for last five years. In the past, expenditures had trended upward due to expenditures for the Aquifer Storage Recovery (ASR) Project. ASR Project costs are no longer captured under Mitigation Program Costs. FY 2019-2020 expenditures were $3.19 million; and FY 2020-2021 expenditures were $2.65 million.

During FY 2021-2022, revenues totaled $4.13 million including user fees, grant receipts, investment income, project reimbursements, and miscellaneous revenues. The Mitigation Program Fund Balance as of June 30, 2022, was $6.953 million.

Table I-1

SUMMARY OF COMPONENTS OF MPWMD MITIGATION PROGRAM
July 1, 2021 - June 30, 2022

WATER MANAGEMENT

- Monitor Water Resources
- Manage Water Production
- Manage Water Demand
- Monitor Water Usage
- Augment Water Supply
- Allocation of New Supply
- Determine Drought Reserve

STEELHEAD FISHERY

- Capture/Transport Emigrating Smolts in Spring
  -- Smolt rescues
  -- Pit tagging study
- Prevent Stranding of Fall/Winter Juvenile Migrants
  -- Juvenile rescues
- Rescue Juveniles Downstream of Robles del Rio in Summer
- Operate Sleepy Hollow holding/rearing facility
- Monitoring Activities for Mitigation Plan
  -- Juvenile population surveys
- Other Activities not required by Mitigation Plan
  -- Spawning habitat restoration
  -- Modify critical riffles

RIPARIAN VEGETATION AND WILDLIFE

- Conservation and Water Distribution Management
- Oversee Riparian Corridor Management Plan
- Implement Riparian Corridor Management Program
  -- Cal-Am well irrigation (4 wells)
  -- Channel clearing
  -- Vegetation monitoring
  -- Track and pursue violations
  -- River Care Guide booklet
  -- CRMP Erosion Protection Program

LAGOON VEGETATION AND WILDLIFE

- Assist with Lagoon Enhancement Plan Investigations (See Note 1)
- Expand Long-Term Lagoon Monitoring Program
  -- Water quality/quantity
  -- Vegetation/soils
- Identify Alternatives to Maintain Lagoon Volume

AESTHETICS

- Restore Riparian Vegetation (see above)

Note 1: Mitigation measures are dependent on implementation of the Lagoon Enhancement Plan by the California Department of Parks and Recreation, the land owner and CEQA lead agency. Portions of the Enhancement Plan have been implemented by CalTrans as part of a "mitigation banking" project.

Table I-2
Summary of MPWMD Mitigation Program Accomplishments: 2021-2022 Report

MITIGATION ACTION	MAJOR ACCOMPLISHMENTS
Monitor Water Resources	Regularly tracked precipitation, streamflow, surface and groundwater levels and quality, and lagoon characteristics between Los Padres Dam and the Carmel River Lagoon, using real-time methods at numerous data collection stations. Maintained extensive monitoring network, and continuous streamflow recorders below the former San Clemente Dam and other sites.
Manage Water Production	Developed and implemented multi-agency Memorandum of Agreement and quarterly water supply strategies based on normal-year conditions; worked cooperatively with resource agencies implementing the federal Endangered Species Act. Implemented ordinances that regulate wells and water distribution systems.
Manage Water Demand	A total of about **1,721** inspections were conducted in 2022. An estimated **12.020** Acre-Feet ("AF") of water were saved by new retrofits verified this year in these two categories. From January 1, 2022, through December 31, 2022, a total of **826** applications for rebates were received and **642** applications were approved with the use of the rebate refund, as described in Section VIII. As of June 30, 2022, a total of 87.289AF of water remained available in the areas served by CAW, as described in Section IX. This includes water from pre- and post-Paralta Allocations and water added to a Jurisdiction's Allocation from Water Use Credit transfers and public retrofits.
Monitor Water Usage	Complied with SWRCB Order 95-10 for Water Year 2022.
Augment Water Supply	Long-term efforts to augment supply included: (1) Continued participation in meetings about Monterey Peninsula Water Supply Project (MPWSP) construction, operations, financing, management, and oversight; (2) Helped fund environmental work to qualify Pure Water Monterey Expansion as a potential alternative; (3) Operated Aquifer Storage and Recovery (ASR) Phase 1 and 2 projects in WY 2022; (4) Held regular coordination meetings with Cal-Am regarding planned infrastructure upgrades to deliver water supply to the ASR project wells at full capacity; (5) Provided project management and technical support to Monterey One Water for the Pure Water

MITIGATION ACTION	MAJOR ACCOMPLISHMENTS
	Monterey Project; (6) Participated in CPUC hearing process on Cal-Am related rate requests. Other ongoing activities included: (1) Served as member of both the Seaside Basin Watermaster Board and as the Technical Advisory Committee; (2) Participation in a technical role regarding alternatives for Los Padres Dam and associated sediment management.
Allocate New Supply	Remained within Water Allocation Program limits.
Determine Drought Reserve	Rationing was not required due to maintenance of adequate storage reserve.
Steelhead Fishery Program	Rescues were conducted on 46 days from early June through early September, yielding 14,212 steelhead, including: 13,334 young-of-the-year (YOY), 777 yearlings (1+), 2 adults, and 99 mortalities (0.69%). Staff tagged 1,581 fish of size with Passive Integrated Transponder (PIT) tags before release from the Sleepy Hollow Steelhead Rearing Facility. Since 1989, District staff has rescued 487,941 steelhead from drying reaches of the Carmel River watershed. Compared to previous rescue seasons, the total number of rescued fish in the 2022 dry season was 99% of the 1989-2022 average of 14,351, as described in Section XVI.
Riparian Habitat Program	Continued revegetation efforts at exposed banks with little or no vegetation located between Via Mallorca and Esquiline Roads; Continued long-term monitoring of physical and biological processes along the river in order to evaluate the District's river management activities; Continued the annual inspections of the Carmel River from the upstream end of the lagoon to Camp Steffani; Continued enforcement actions to address serious violations of District riparian ordinances; Carried out vegetation management activities; Operated under Routine Maintenance Agreement with CDFW for MPWMD vegetation maintenance activities.

MITIGATION ACTION	MAJOR ACCOMPLISHMENTS
Lagoon Habitat Program	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. The District continues to work with various agencies and landowners to implement ongoing restoration of the Odello West property and future restoration of the Odello East property across the highway. The District also surveyed and analyzed bathymetric transects, participated in interagency meetings regarding management of lagoon in winter storm events (see also steelhead efforts that benefit lagoon) and monitored lagoon stage.
Aesthetic Measures	See Riparian Habitat Program measures in Section XVII.

II. HYDROLOGIC MONITORING

The Water Allocation Program EIR concluded that Water Supply Option V would have less-than-significant impacts on the water resources in the Monterey Peninsula area, and that no mitigation measures were required. This conclusion was based solely on changes to the hydrologic regime and not on changes to water-dependent resources. Impacts on water-dependent resources (e.g., riparian vegetation and wildlife and steelhead fishery) due to changes in the hydrologic regime were identified as significant in the EIR. Implementation of the mitigation measures proposed for the impacts on these water-dependent resources are described in subsequent sections. It was suggested in the EIR that the District continue and expand its current monitoring programs to establish baseline conditions for assessment of long-term changes (Finding No. 381). Accordingly, the District currently maintains ongoing precipitation, streamflow, storage, water-level and water-quality monitoring programs. These programs and the activities to implement them for Water Year 2022 (October 1, 2021 through September 30, 2022), are summarized below.

A. Precipitation Monitoring

Description and Purpose

During the period from October 1, 2021 through September 30, 2022, the District continued to process long-term precipitation records at Los Padres Dam (LPD), the former San Clemente Dam Site (SCDS), and the Santa Margarita Aquifer Storage and Recovery site, collected by District tipping bucket rain gages that automatically report to the District website. District staff also manually records precipitation at its Monterey office located at Ryan Ranch, and receives daily rainfall reports from the National Weather Service climate station at Monterey. In addition, real-time and historical rainfall data for the Monterey Peninsula area can be accessed via the Internet. These data support a variety of District programs, including erosion control, riparian vegetation management and identifying long-term precipitation trends and hydrologic-year conditions.

Implementation and Activities During 2021-2022

Work during this period involved continuing maintenance of the existing precipitation monitoring network. A summary of daily precipitation at SCDS during Water Year (WY) 2022 is shown in **Figure II-1**. The average annual recorded precipitation at this site for the period from 1922 through 2022 is 21.03 inches. WY2022 was a "dry" precipitation year with 13.23 inches of precipitation recorded at SCDS, 63 percent of average and the 16th driest WY on record since 1922.

Figure II-2 shows a comparison between WY 2022 monthly rainfall and average monthly rainfall at SCDS. A large portion of the annual rainfall occurred early in the water year, with 9.52 inches falling between Oct-Dec 2021. January and February of 2022 were extremely dry, with a combined rainfall of only .44 inches. These are historically the wettest months in the region, with an average of 8.64 inches between January and February.

With the exception of a small late season storm causing higher than average rainfall in September, all other months were drier than the historical average.

B. Streamflow Monitoring

Description and Purpose

Since its inception, the District has collected streamflow measurements on the mainstem of the Carmel River, its tributaries, and surrounding streams within the District. The District's current principal streamflow measuring sites within the Carmel River Basin (CRB) are shown in **Figure II-3**. Prior to 1991, the streamflow measurements were instantaneous measurements made by the current-meter method. In 1991, a concerted effort was made to upgrade the streamflow monitoring network as staff installed continuous recorders at six selected tributary sites. Since that time, the District has continued to expand its streamflow monitoring network, which currently consists of 17 continuous-recording gaging stations.

Data collected at the District streamflow monitoring sites are analyzed for use in water-supply planning, fishery, riparian and erosion control programs. More specific uses of streamflow data include, but are not limited, to the items listed below:

- Defining the general hydrologic conditions in the basin
- Setting flow requirements for meeting aquatic life goals
- Monitoring compliance with minimum-flow requirements
- Forecasting water-supply availability
- Assessing and scheduling fish rescue activities
- Assessing effectiveness of riparian mitigations
- Evaluating surface and groundwater interaction
- Developing and calibrating hydrologic models
- Delineating and managing flood plains
- Evaluating and designing water-supply projects
- Providing data for forecasting floods and defining flood-recurrence intervals
- Assessing hydrologic impacts from water-development projects
- Supporting Aquifer Storage and Recovery (ASR) operations

Implementation and Activities During 2021-2022

During the WY2022 period, the District operated and maintained (O&M) 15 streamflow gaging stations within the CRB / District Boundary and collected continuous water-level data at both Los Padres Reservoir and at the Carmel River Lagoon. In addition, instantaneous measurements of discharge were collected at the Carmel River above Los Padres Reservoir and Danish Creek sites on a monthly basis during the “dry season” which runs approximately from June through November. The District continuous recording gaging stations are listed below:

Tributary/other
Cachagua Creek
Pine Creek
San Clemente Creek
Tularcitos Creek
Hitchcock Creek
Garzas Creek near Lower Garzas Canyon
Garzas Creek at Garzas Road
Potrero Creek
Robinson Canyon Creek
San Jose Creek
Arroyo del Rey at Del Rey Oaks

Mainstem
Carmel River below Los Padres Reservoir
Carmel River at Sleepy Hollow Weir
Carmel River at Don Juan Bridge
Carmel River at Highway 1 Bridge
Carmel River above Los Padres Reservoir (non-recording)

Continuous Water Level
Los Padres Reservoir
Carmel River Lagoon

Streamflow gaging station O&M at each of the above sites involves obtaining monthly discharge measurements, maintaining recording equipment, obtaining staff gage readings and occasional surveying. Subsequently, river/creek stage and discharge data are processed in-house utilizing Hydstra Time-Series Software (Kisters North America, Inc.), to produce continuous streamflow records for the sites. **Table II-1** summarizes the computed annual flows in acre-feet (AF) for the District sites for the WY 1992-2022 period. In addition, **Table II-1** includes annual flow values for the two mainstem sites operated by the U.S. Geological Survey (USGS) for the 1992-2022 period.

During WY22, District staff continued to maintain the existing streamflow monitoring network (network). Work within this period involved collecting numerous, routine streamflow measurements with the midsection method to refine the stage/discharge relation at the gaging stations. In addition, several low-flow measurements were obtained at the sites utilizing a three-inch modified Parshall Flume.

Automation of Streamflow Data on District Website

During the 2021-2022 period, District staff continued to maintain automated daily posting of real-time streamflow data to the District website for the following locations:

CR below Los Padres Reservoir
CR at Sleepy Hollow Weir
CR at Don Juan Bridge
CR at Highway 1 Bridge
Carmel River Lagoon

This automated process facilitates data dissemination which reduces the volume of data inquiries.

- **Summary of Streamflow Conditions --** Streamflow during WY 2022 within the CRB classified as "dry". The highest peak streamflow of the year of 1,275 cfs occurred on December 23, 2021 at the MPWMD Carmel River at Don Juan Bridge gaging station (Garland Park). The late December 2021 storm events caused the only significant runoff events in the Carmel River Basin during the water year.

During WY 2022, 22,894 acre-feet (AF) of unimpaired runoff were estimated at the San Clemente Dam Site (SCDS). This total represents 34% of the average annual runoff (68,274 AF) expected at the SCDS.

C. Carmel River Lagoon Water-Level Monitoring

Description and Purpose

Since 1987, the District has monitored the level of surface water in the CR Lagoon. The water level is monitored with a continuous recorder located in the South Arm of the Lagoon that utilizes pressure transducer technology. The water-level data have been used, in part, to support technical studies for use by the Carmel River Steelhead Association, California Department of Parks and Recreation, California Coastal Conservancy, California Department of Fish and Wildlife, Monterey County Water Resources Agency (MCWRA), Monterey County Public Works Department (MCPWD) and MPWMD. In addition, the water-level data are monitored by the MCWRA via their ALERT system to enhance flood warning for residents located along the northern margin of the Lagoon and wetland.

Implementation and Activities During 2021-2022

During WY2022 , District staff continued to maintain the continuous water-level recorder located in the South Arm of the Lagoon, and a complete record of water-level readings (i.e., 15-minute intervals) was obtained. Staff continued to utilize the telecommunications capability established at the Lagoon gage in September 2007 to post Lagoon water-level data on to the District's website. These continuous water-level data are automatically plotted and posted daily on the District website under the "Carmel River Lagoon Water Levels" as an 8-day plot that shows the past week's levels. Staff continued to maintain the monthly lagoon level plots that are available on the District website from WY 2006 to the present. This allows interested parties to access the data to view historical and recent water-level trends.

Figure II-4 shows the water surface elevation at the Carmel River Lagoon over the 2021 water year. The first Lagoon breach of WY 2022 occurred on the evening of December 16, 2021. Lagoon levels reached 10.76 ft (NGVD29) before breaching the county maintained pilot channel.

Figure II-1
San Clemente Reservoir Site Daily Rainfall: Water Year 2022

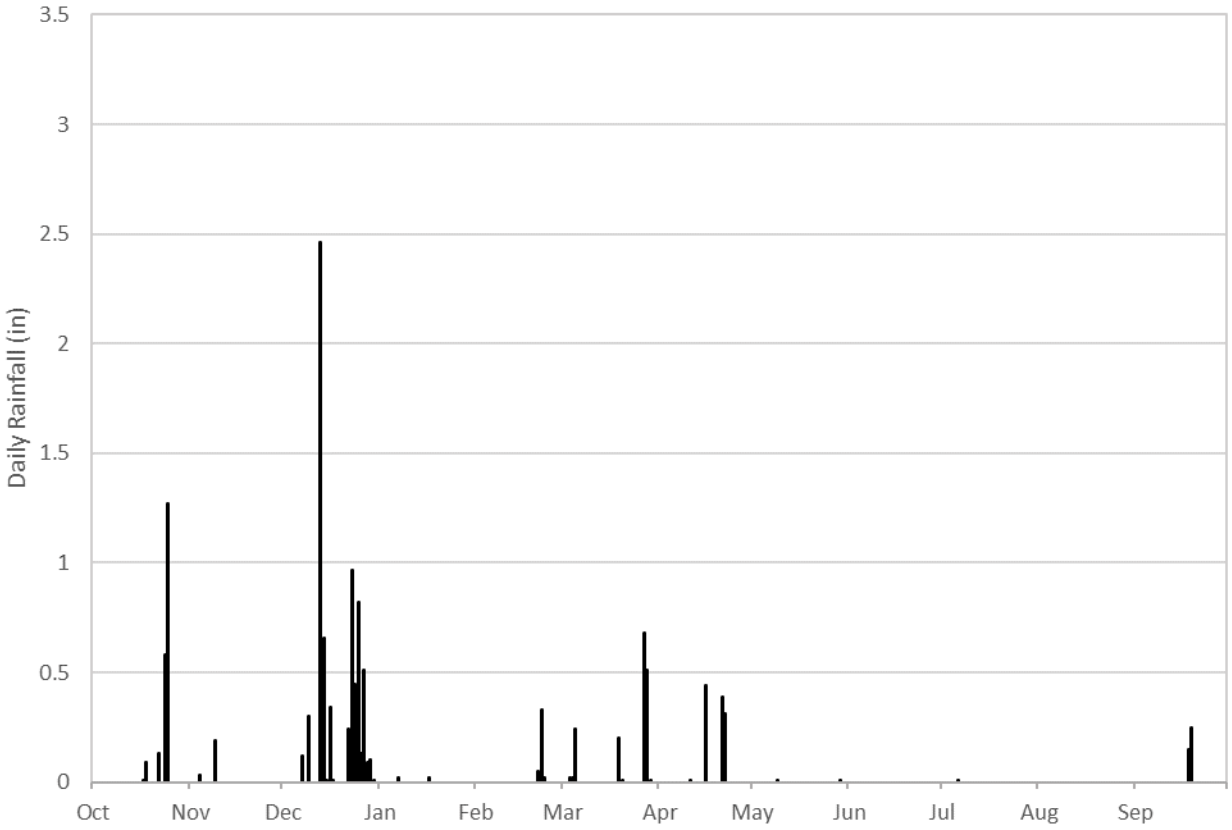


Figure II-2
Monthly Distribution of Rainfall at San Clemente Reservoir Site
Water Year 2022 Compared to 1922-2022 Long-Term Average

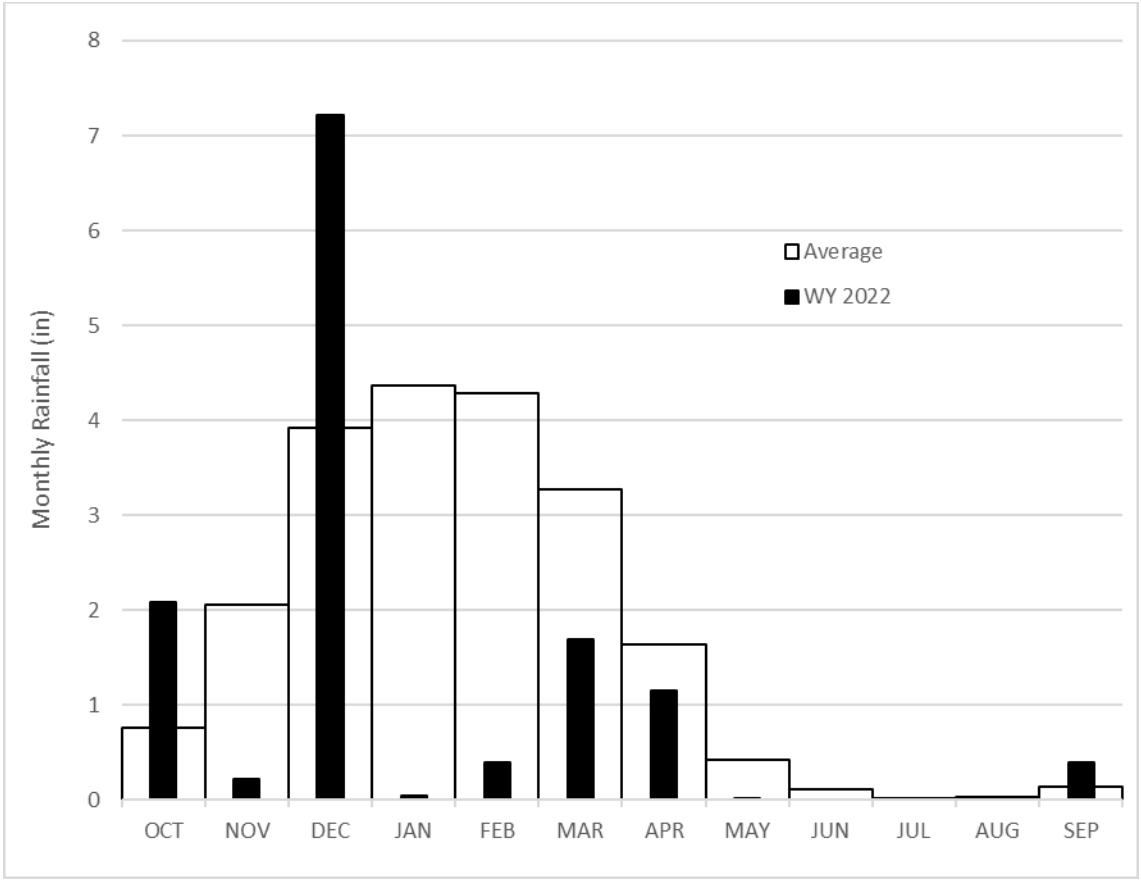


Figure II-3
Carmel River Basin Principal Streamflow Gaging Stations

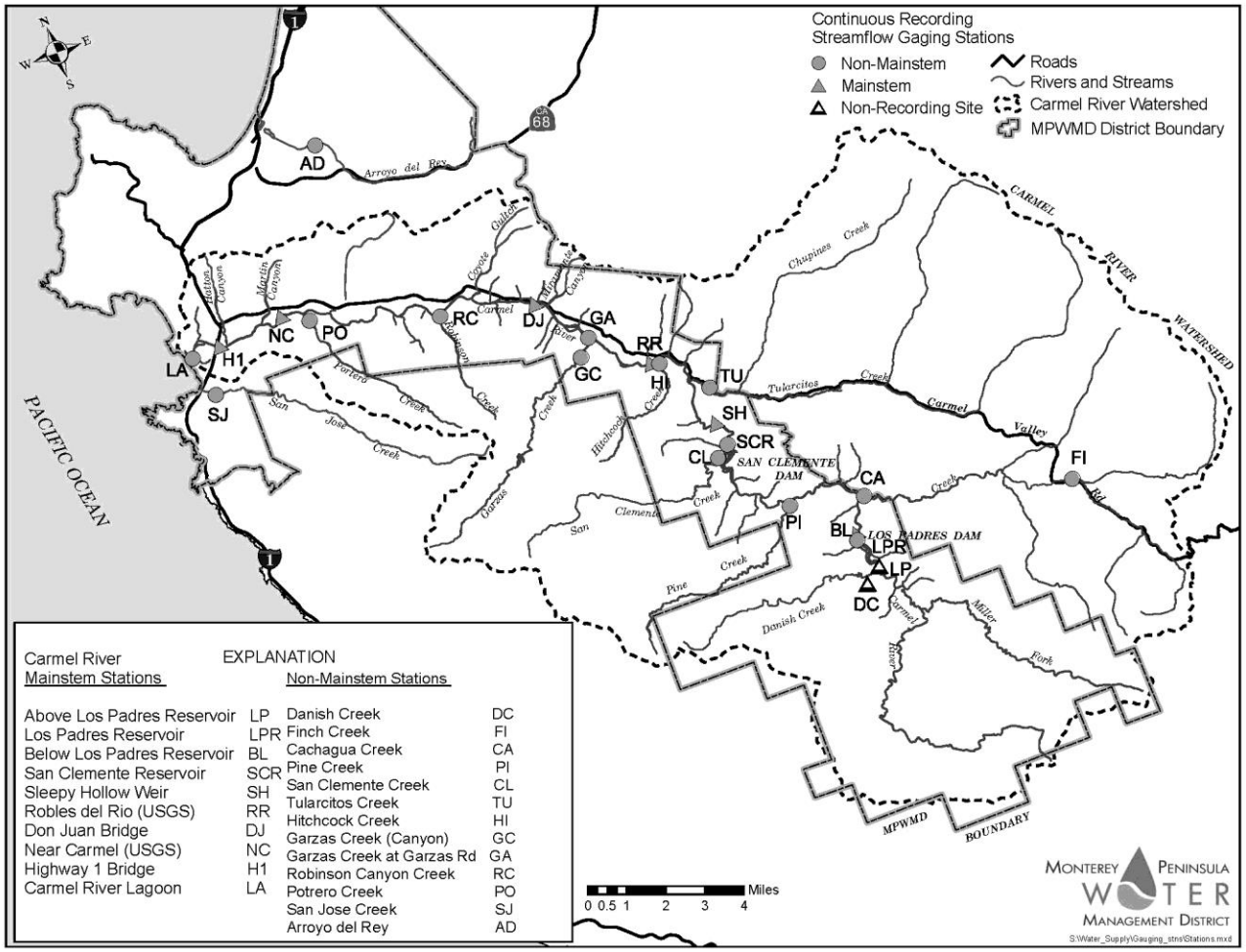


Figure II-4
Carmel River Lagoon Water Level

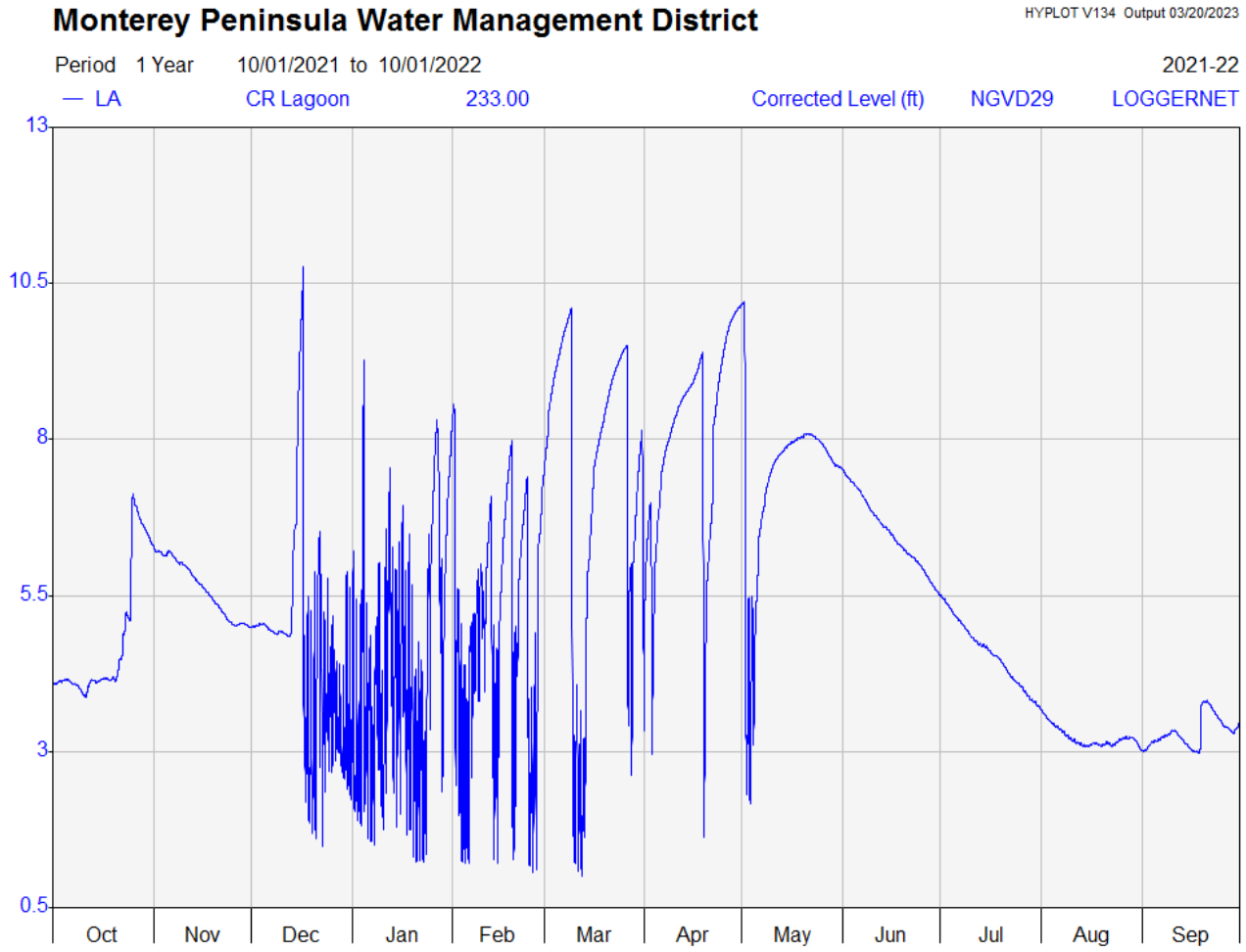


Table II-1
Carmel River Basin Annual Streamflow Summary Water Years 1992 – 2022
(Values in Acre-Feet)

	Drainage Area																															
TRIBUTARY SITES	(Sq.Mi.)	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
FINCH CREEK	22.1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	2860	3420	558	290	28	165	458	3,570	424	4,740	*	*	*
CACHAGUA CREEK	46.3	1,780	7,340	560	16,320	3,840	4,990	23,800	2,590	1,730	1,500	245	1,270	1,250	4,340	5,210	261	2,200	1,020	5,030	5,320	695	237	0	234	777	7,120	416	8,000	1,610	460	20
PINE CREEK	7.8	3,750	9,800	1,230	11,110	6,550	8,300	15,610	4,540	5,300	3,270	2,300	4,250	2,350	8,910	8,020	849	3,840	2,830	6,140	6,950	1,310	1,870	406	1,210	3,910	15,450	3,120	11,450	3,620	1,470	2,380
SAN CLEMENTE CREEK	15.6	5,450	17,070	1,820	20,580	9,310	14,100	33,380	7,130	9,830	5,340	3,270	5,850	3,720	16,330	13,720	1,360	5,520	4,270	9,950	12,950	1,970	2,570	469	1,670	6,900	26,010	3,910	20,030	5,880	2,010	3,280
TULARCITOS CREEK	56.3	635	3,220	444	5,100	1,650	2,450	22,610	3,810	2,450	1,490	630	552	503	1,000	2,480	503	917	405	1,140	1,430	451	327	94	88	246	1,720	151	2,570	546	425	158
HITCHCOCK CREEK	4.6	*	*	52	1,820	451	716	2,970	169	482	214	18	274	234	863	691	2	383	152	550	629	7	56	0	18	275	1,270	36	1,170	103	54	28
GARZAS CREEK	13.2	3,700	11,170	746	12,140	4,890	8,570	24,610	5,050	4,980	3,070	1,200	2,760	1,810	8,590	7,420	381	3,010	2,500	5,720	7,620	641	1,320	46	619	4,710	14,620	1,320	11,100	2,910	822	1,140
ROBINSON CANYON CR.	5.4	619	2,360	89	2,230	619	1,430	6,890	545	823	433	82	448	354	1,710	1,010	25	455	450	1,120	1,150	40	152	14	116	919	2,660	88	1,520	366	45	91
POTRERO CREEK	5.2	*	*	30	1,790	506	1,210	5,970	855	1,020	310	43	210	164	1,470	1,050	13	308	356	985	1,170	14	50	0	135	735	1,770	57	1,360	404	17	79
SAN JOSE CREEK	14.2	*	*	*	*	*	*	*	6,400	6,260	2,890	1,100	1,880	1,480	7,640	6,870	862	1,740	2,330	5,220	5,760	1,200	1,540	250	1,050	4,470	11,360	1,940	9,020	4,100	713	1,300
ARROYO DEL REY	13.8	*	*	*	*	*	*	*	*	*	*	*	392	376	1150	843	213	572	449	772	726	252	255	142	442	887	1,380	266	1,110	586	187	257
MAINSTEM SITES																																
CR AT ROBLES DEL RIO	193	38,240	109,000	11,800	155,000	75,210	99,340	250,300	54,640	76,750	47,180	31,850	60,560	38,060	114,400	110,100	12,220	49,080	45,930	104,500	108,900	20,750	31,970	6,410	23,360	48,690	200,300	33,100	131,500	45,620	16,430	24,252
CR AT DON JUAN BRIDGE	216	*	122,000	12,760	173,600	83,090	111,800	252,200	53,570	73,960	49,360	31,330	60,420	38,330	121,800	118,300	12,150	52,510	47,710	107,000	114,400	20,920	28,530	5,600	21,550	49,060	198,300	31,530	155,800	46,990	16,480	23,680
CR NEAR CARMEL	246	35,570	123,400	8,200	177,400	74,500	104,100	261,100	55,000	76,190	47,790	28,340	55,400	35,220	119,200	119,200	7,440	43,960	41,590	105,800	115,700	17,120	24,390	516	14,980	45,760	208,100	28,680	142,900	42,350	13,680	19,792
CR AT HIGHWAY 1 BRIDGE	252	*	123,000	7,410	179,500	83,430	112,000	280,900	50,810	72,660	42,860	24,860	52,000	30,300	115,200	115,000	6,470	42,520	39,170	102,700	111,300	16,300	23,410	26	13,420	44,730	201,300	27,180	155,300	43,900	13,070	21,310

Notes: 1. Carmel River (CR) at Robles del Rio and near Carmel sites are maintained by the USGS.
2. (*) No continuous stage data collected.
3. Streamflow sites listed in downstream order.
4. San Jose Creek and Arroyo Del Rey are outside the Carmel River Basin, but are shown for comparison.
5. WY 2014 - 2021 values at Don Juan and HWY1 are subject to revision.

III. Carmel River Surface-Water Quality Monitoring

Description and Purpose

This monitoring is used to help assess whether or not water-quality criteria for aquatic life are being met in various reaches of the Carmel River, and whether habitats for resources such as Carmel River steelhead (*Oncorhynchus mykiss*) and red-legged frogs (*Rana aurora draytonii*) are being sustained or impaired. Monitoring also provides District staff with a way of measuring trends over extended time periods. These data are used as an indicator of habitat quality, supports staff in recommending appropriate reservoir release schedules, and assists in determining timing of fish rescues.

Since 1991, surface-water quality data have been collected at three sampling stations along the Carmel River on a semi-monthly basis. In 2017, staff added a monitoring site lower in the river, at Garland Park. The locations of the current four sampling stations are as follows: (1) below Los Padres Reservoir (BLP) at River Mile (RM) 25.4, (2) Sleepy Hollow Weir (SHW) at RM 17.1, (3) Don Juan Bridge at Garland Park (GAR) at RM 10.8, and (4) Carmel River Lagoon (CRL) at RM 0.1. River miles are measured from the mouth of the Carmel River where it meets the Pacific Ocean. District staff also continued its vertical profile sampling of the Carmel River Lagoon on a monthly basis. Monitoring at these specific stations gives District staff information on the quality of water released from the reservoir, quality conditions in the main-stem river, and the quality conditions in the lagoon.

District staff also monitors river temperatures continuously at five locations within the Carmel River Basin (**Figure III-1**). Previously, a sixth location was monitored at the South Arm Lagoon; this station has been discontinued due to continuous problems with erroneous readings and vandalism. The objective is to document the temperature regime in different stream reaches and to determine whether water-quality criteria for maximum stream temperatures are exceeded. In addition, these data allow District staff to monitor changes in the thermal regime of the river over time.

Implementation and Activities During 2021-2022

District staff carried out a semi-monthly surface water quality sampling program for the Reporting Year (RY) 2022 (July 1, 2021 to June 30, 2022); data were collected for the following chemical and physical parameters (units in parentheses): temperature (°F), dissolved oxygen (mg/L), carbon dioxide (mg/L), pH, specific conductance (uS/cm), salinity (ppt), and turbidity (NTU). The emphasis for this suite of parameters is on the suitability for rearing juvenile steelhead. In addition, continuous recording temperature data loggers (Optic StowAway temperature data loggers from the Onset Computer Corporation) were deployed at five locations on the Carmel River (**Figure III-1**), as follows:

1. ALP Above Los Padres Reservoir (RM 27.0)
2. BLP Below Los Padres Reservoir (RM 25.4)

3. ASC	Above San Clemente Reservoir	(RM 18.5)
4. SHW	Sleepy Hollow Weir	(RM 17.1)
5. GAR	Garland Park	(RM 10.8)

The District continued its vertical profiling program on the Carmel River Lagoon, on a monthly basis during RY 2022. The suite of parameters that were measured is depth, temperature, dissolved oxygen, and salinity. Vertical profiling helps better understand seasonal changes in the limnological cycles, such as stratification, internal mixing, community respiration, and how that relates to available habitat for steelhead.

The following paragraphs describe the results of the water quality monitoring efforts:

- **Carmel River Lagoon--** Surface water-quality data collected at the CRL station, which is located on the south side of the main body of the lagoon, are listed in **Table III-1**. The minimum dissolved-oxygen measurement recorded during surface water quality sampling was 7.0 mg/L. The pH measurements ranged from 7.5 to 8.0. Carbon dioxide measurements ranged from 5 to 20 mg/L. The conductivity measurements ranged from 505 to 10,692 uS/cm. The surface salinity ranged from 0.3 to 7.6 ppt. The conductivity and salinity are highly variable at the lagoon due to tidal influences and river inflows. The turbidity measurements ranged from 0.1 to 4.6 NTU during the sampling period.

- **Carmel River Lagoon Vertical Profile -** Vertical profiling helps staff understand the seasonal changes in water quality that occurs in the lagoon throughout the water column over time. The lagoon was closed off to the ocean during the beginning of the sampling period, opening on December 17, 2021 and closing off once again on May 4, 2022. A narrative of the results for the reporting period is found in the conclusions/recommendations section.

- **Garland Park--** Water temperature for the Garland Park (GAR) station is shown in **Figure III-2**. During this period, maximum annual water temperature was 67.9°F, occurring on June 11, 2022. The overall average water temperature during this period was 57.1°F. Maximum daily average water temperature was 64.3°F, occurring on June 12, 2022. Daily average water temperatures were within adequate range for steelhead rearing during the entire sampling period. The Water-quality data collected at this station are listed in **Table III-2.** The dissolved-oxygen measurements recorded ranged from 7.9 to 12.9 mg/L. Carbon-dioxide measurements ranged from 5 to 15 mg/L. The pH measurements ranged from 7.5 to 8.0. The conductivity measurements ranged from 162 to 453 uS/cm and the turbidity measurements recorded were between 0 to 0.8 NTU.

- **Sleepy Hollow Weir--** Water temperature for the Sleepy Hollow Weir (SHW) station is shown in **Figure III-3**. During this period, maximum annual water temperature was 74.8°F, occurring on June 11, 2022. The overall average water temperature during the sampling period at this station was 57.8°F. The maximum

daily average water temperature was 69.9°F, occurring on June 12, 2022. Constant water temperatures over 68°F are considered stressful for steelhead (Brungs and Jones, 1977). Average daily water temperatures over 68°F occurred 16 times or 4.4% of the sampling record. The Water-quality data collected at this station are listed in **Table III-3.** The dissolved-oxygen measurements recorded ranged from 8.9 to 12.9 mg/L. Carbon-dioxide measurements ranged from 5 to 10 mg/L. The pH measurements ranged from 7.5 to 8.0. The conductivity measurements ranged from 130 to 319 uS/cm and the turbidity measurements recorded were between 0 to 2.3 NTU.

- **Above San Clemente Reservoir--** Water temperature for the Above San Clemente (ASC) station is shown in **Figure III-4**. The maximum annual water temperature observed during sampling was 71.5°F, occurring on July 10, 2021. The overall average water temperature during this period was 56.7°F. Maximum daily average water temperature was 68.5°F, occurring on June 12, 2022. Average daily water temperatures over 68°F occurred 4 times or 1% of the sampling record.

- **Below Los Padres Reservoir--** Water temperature for the Below Los Padres (BLP) station is shown in **Figure III-5**. The maximum annual water temperature observed during sampling was 73.7°F, occurring on August 15, 2021. The overall average water temperature observed at this station during the sampling period was 59.4°F. The maximum daily average water temperature at this station was 72.2°F, occurring on August 16, 2021. Constant water temperatures over 68°F are considered stressful for steelhead (Brungs and Jones, 1977). Average daily water temperatures over 68°F occurred 64 times, representing 17.5% of the time during the sampling period and is directly related to reservoir water levels and releases. Water quality data collected at this station are listed in **Table III-4**. Water quality at this station is highly influenced by reservoir water quality and release location. The dissolved oxygen measurements recorded ranged from 6.0 to 13.3 mg/L. Carbon dioxide measurements ranged from 5 to 20 mg/L. The pH measurements ranged from 7.5 to 8.0. The conductivity measurements ranged from 125 to 314 uS/cm and the turbidity measured at this station ranged from 0.1 to 14.3 NTU.

- **Above Los Padres Reservoir--** Water temperature for the Above Los Padres (ALP) station is shown in **Figure III-6**. During the sampling period, maximum annual water temperature was 73.1°F, occurring on July 10, 2021. The overall average water temperature during this period was 55.4°F. Maximum daily average water temperature was 69.4°F, occurring on July 11, 2021. Average daily water temperatures over 68°F occurred 3 times or 0.8% of the sampling record.

CONCLUSIONS AND/OR RECOMMENDATIONS:

During the rainy season the Carmel River basin accumulated 13.2 inches of rain, as measured by the San Clemente Dam rain gage. The reporting year period includes the summer months of Water Year (WY) 2021 and the fall, winter, spring of WY 2022. The WY 2021 and WY 2022 were characterized as "Dry". Continuous temperature loggers

observed water temperatures that were within stressful ranges to steelhead in the summer months. The farthest downstream logger, located in Garland Park, was the only logger that recorded adequate rearing temperatures ($\leq 68^{o}$F) the entire period. Water released from Los Padres Reservoir during the reporting year was adequate for steelhead from late fall to spring, but water temperatures reached suboptimal range 17.5 percent of the time, all during the summer months. Water temperatures below the San Clemente Reroute Project were recorded as the highest observed overall this season. There is a lack of mature riparian vegetation around the restored river channel currently; this will change as restoration continues and the riparian grows a larger canopy, hopefully resulting in reduced stream temperatures. The restored river channel has also widened and shallowed significantly from the original design, which allows more solar radiation to heat the water in that reach. These suboptimal temperatures potentially reduce growth rates and/or displace fish to other sections of river that have more favorable conditions. Water quality conditions other than water temperature, at the sampling sites were adequate for steelhead rearing during most of the sampling period.

Water quality conditions in the Carmel River Lagoon during the summer through early fall were commonly within stressful ranges and likely decrease growth and survival rates of rearing steelhead. This is mainly caused by a lack of river inflow and variability in tidal influences. On December 17th, river inflow filled the lagoon and opened it to the ocean. The lagoon mouth opened and closed daily up until the end of January, then as inflows decreased, due to the lack of rainfall, the lagoon closures lasted a few days, this occurred until late February. By early March lagoon closures lasted about 14 days because of continued lack of rainfall and reduced inflows. Because of these closures, steelhead chances to enter and leave the lagoon were only able to occur about 50% of the time during the migration period. The lagoon closed for the season on May 4th, 2022. Water quality conditions during the migration period were adequate for fish rearing and migration. During the summer period, lagoon water temperatures are at suboptimal range, water surface elevation is decreasing slowly, and aquatic vegetation is abundant, causing highly variable dissolved oxygen. These variables likely contributed to displacing steelhead and reducing the amount of habitat available to rear in. Fall typically is the time of year that tidal wave over-wash from large swell events start to enter the lagoon and change the water quality dynamics. This was observed in late September and more pronounced in October this season, where these over-wash events created a stratified layer of freshwater and salt water. Typically, the salt layer is the deeper layer and has suboptimal water quality conditions for juvenile fish rearing. The top layer or freshwater layer had reduced water temperatures and favorable water quality conditions. Overall, the biggest water quality threats to steelhead rearing in the lagoon continues to be the high water temperature and salinity measurements observed in the summer and fall after the lagoon closes and seasonally stratifies, causing fish to be displaced and reducing the amount of habitat available for favorable rearing.

Figure III-1
Temperature and Semi-Monthly Water Quality Monitoring Locations in the Carmel River Basin during RY 2022

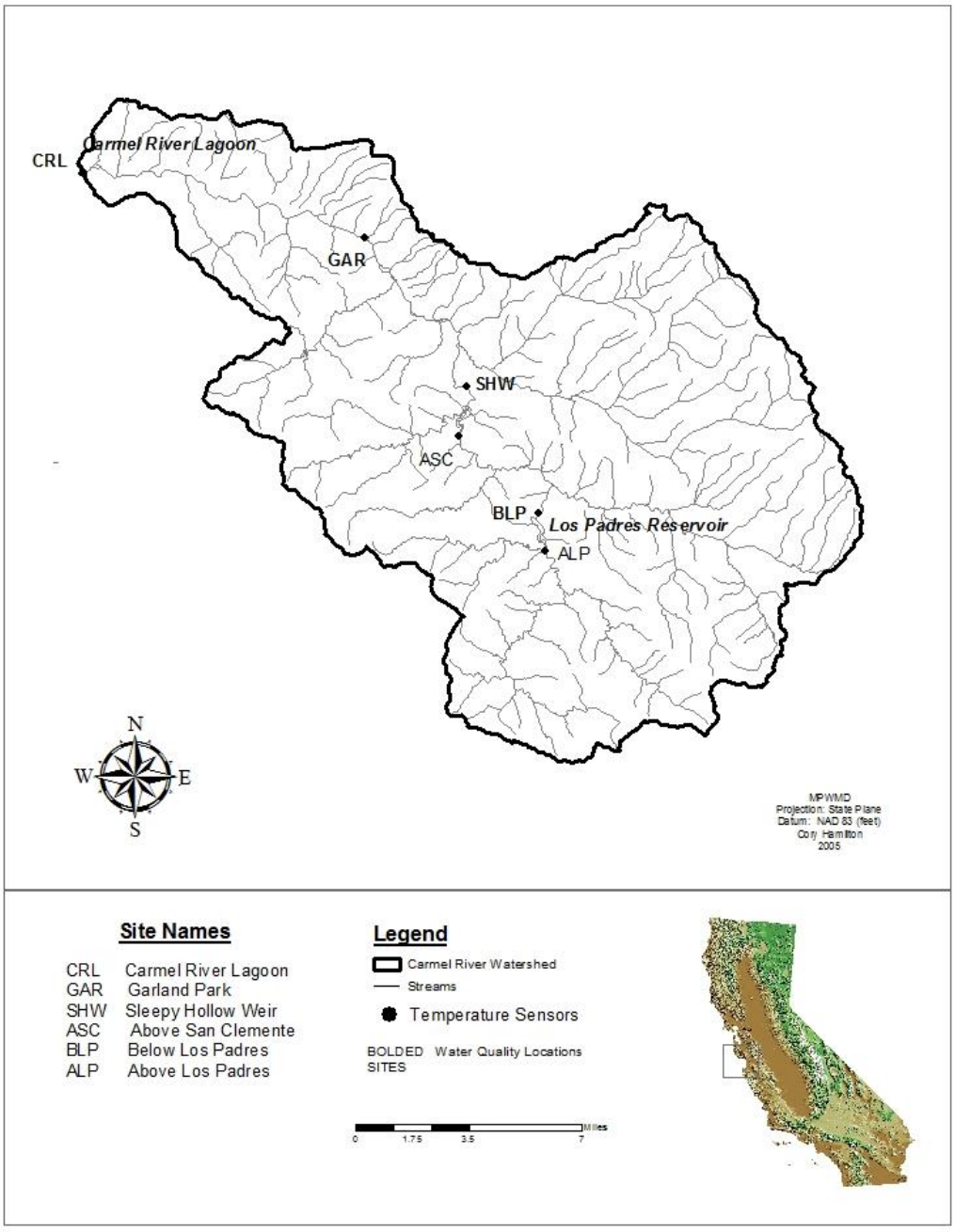


Figure III-2
Daily temperatures recorded from a continuous temperature data logger at the Garland Park (GAR) station during RY 2022

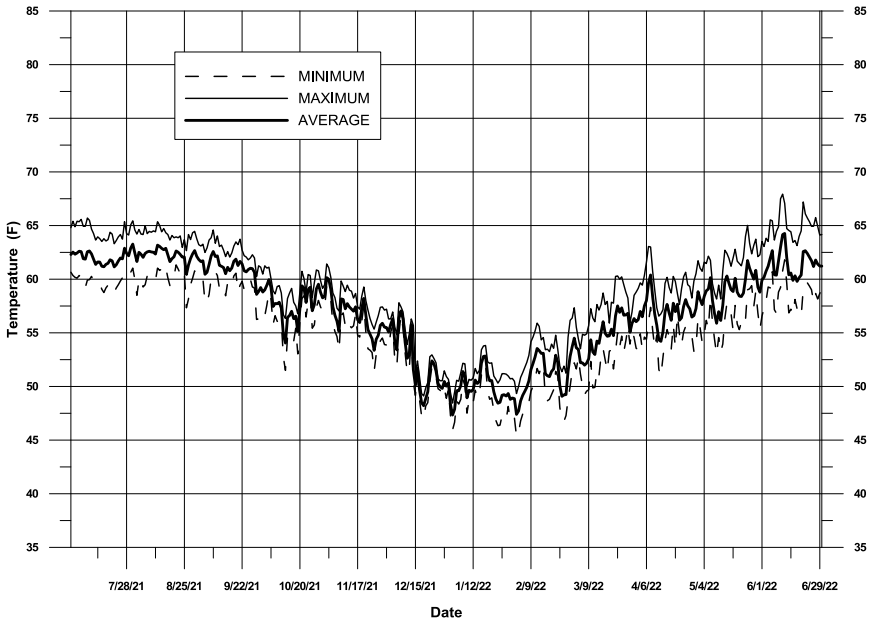


Figure III-3
Daily temperatures recorded from a continuous temperature data logger at the Sleepy Hollow Weir (SHW) station during RY 2022

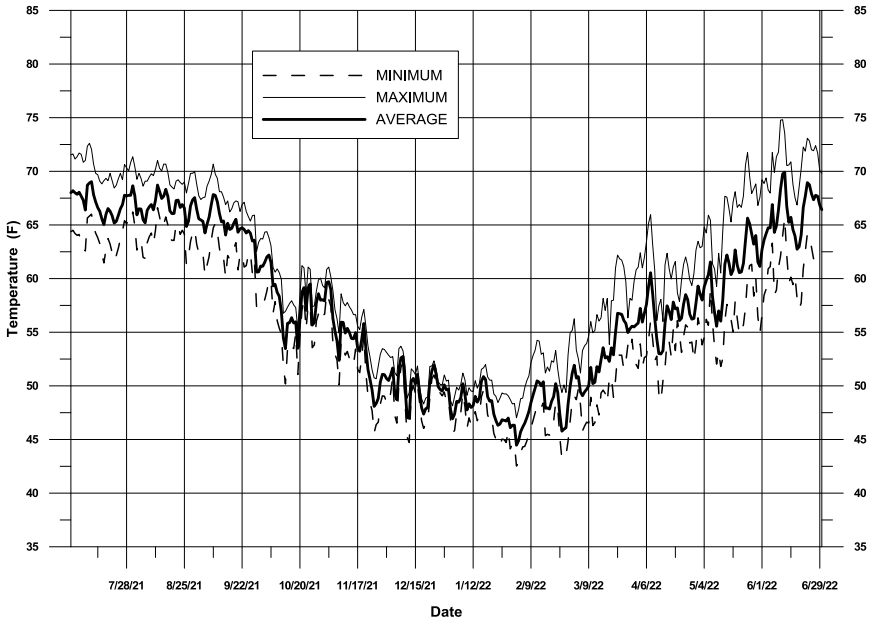


Figure III-4
Daily temperatures recorded from a continuous temperature data logger at the Above San Clemente (ASC) station during RY 2022

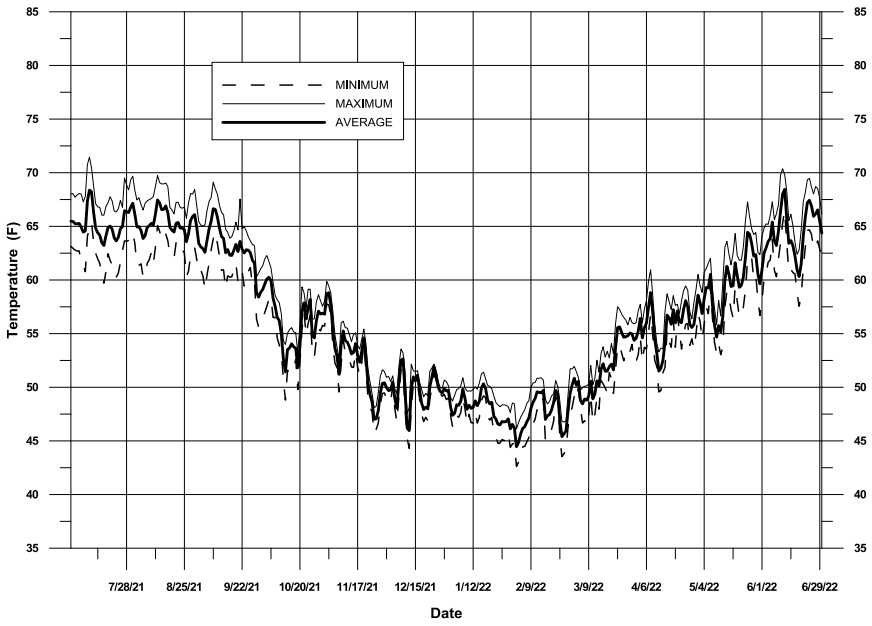


Figure III-5
Daily temperatures recorded from a continuous temperature data logger at the Below Los Padres (BLP) station during RY 2022

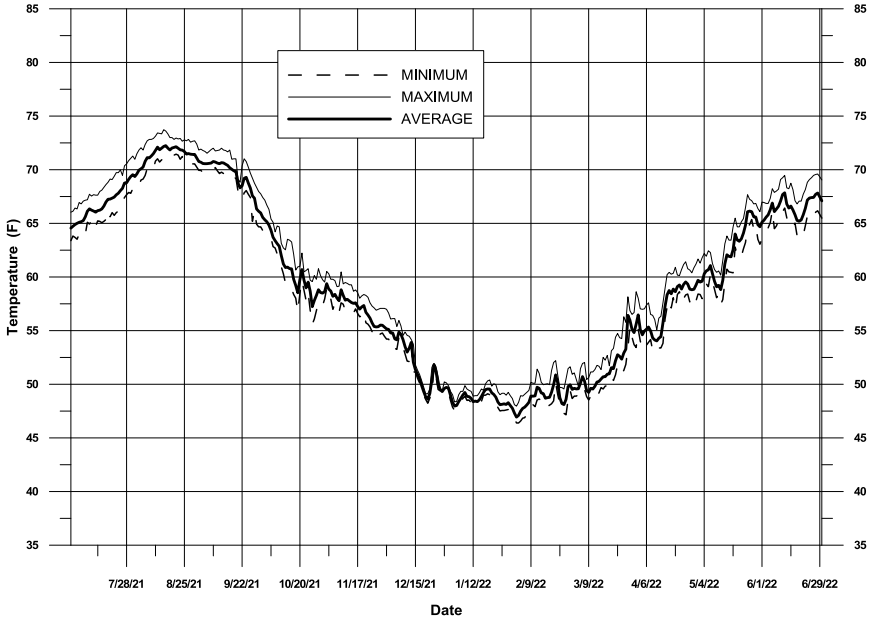


Figure III-6
Daily temperatures recorded from a continuous temperature data logger at the Above Los Padres (ALP) station during RY 2022

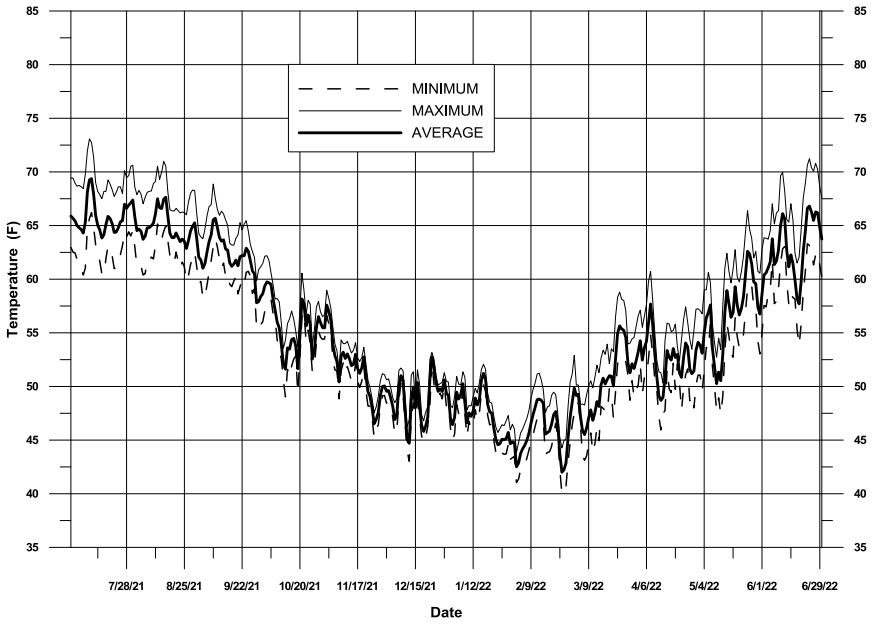


Table III-1
Water quality data collected by MPWMD during RY 2022 at Carmel River Lagoon (CRL) site.

Date	Time 24 Hr	Temperature (F)	Dissolved Oxygen (mg/L)	Carbon Dioxide (mg/L)	pH	Conductivity (uS/cm)	Nacl (ppt)	Turbidity (NTU)
16-Jul-21	1530	68.1	9.3	10	8.0	2,157	1.2	0.82
09-Aug-21	1615	73.2	9.0	10	8.0	4,357	2.4	0.94
26-Aug-21	1245	62.7	11.4	10	8.0	3,841	2.3	1.04
17-Sep-21	1630	68.2	11.5	5	7.5	4,015	2.4	1.33
30-Sep-21	1245	65.7	10.0	5	8.0	6,879	4.3	1.02
13-Oct-21	1700	60.2	11.5	5	8.0	6,469	4.4	0.55
28-Oct-21	1115	62.0	7.0	20	7.5	6,937	4.6	2.54
16-Nov-21	1615	59.8	9.6	15	8.0	10,692	7.6	2.64
23-Nov-21	1230	55.0	11.0	20	8.0	8,497	6.3	4.63
06-Dec-21	1600	53.1	10.8	10	8.0	7,035	5.3	2.02
20-Dec-21	1115	48.7	11.1	5	8.0	4,316	3.4	0.82
28-Jan-22	1050	51.0	11.9	10	8.0	1,830	1.3	0.1
07-Jan-22	1520	53.3	10.8	10	7.5	505	0.3	0.6
11-Feb-22	1500	58.1	11.3	10	8.0	1,694	1.1	1.55
28-Feb-22	1100	54.1	10.8	10	8.0	4,755	3.4	1.43
10-Mar-22	1500	59.5	9.3	15	7.5	7,148	4.9	1.31
21-Mar-22	1315	56.0	9.5	10	7.5	1,183	0.8	0.19
04-Apr-22	1530	61.7	9.3	5	8.0	2,026	1.3	0.53
26-Apr-22	1200	61.9	8.8	10	7.5	1,244	0.7	1.38
12-May-22	1600	65.8	9.1	10	8.0	2,056	1.2	0.46
24-May-22	1215	65.3	7.9	15	8.0	1,232	0.7	0.68
10-Jun-22	1800	73.0	7.8	10	7.5	1,240	0.6	1.19
20-Jun-22	1200	70.3	8.4	15	7.5	1,525	0.8	1.37
Minimum		48.7	7.0	5.0	7.5	505	0.3	0.1
Maximum		73.2	11.9	20.0	8.0	10,692	7.6	4.6
Average		61.2	9.9	10.7	7.8	3,984	2.7	1.3

Table III-2
Water quality data collected by MPWMD during RY 2022 at Garland Park (GAR) station.

Date	Time 24 hr	Temperature (F)	Dissolved Oxygen (mg/L)	Carbon Dioxide (mg/L)	pH	Conductivity (uS/cm)	Turbidity (NTU)
16-Jul-21	1430	62.7	8.5	5	7.5	350	0.08
09-Aug-21	1530	64.1	8.4	15	7.5	365	0.11
26-Aug-21	1330	60.9	8.3	5	7.5	355	0.05
17-Sep-21	1530	62.3	8.4	10	7.5	359	0.02
30-Sep-21	1405	61.4	10.2	10	7.5	453	0.01
13-Oct-21	1600	55.7	9.1	5	7.5	333	0.02
28-Oct-21	1215	58.5	9.0	10	7.5	357	0.01
16-Nov-21	1530	58.8	9.2	10	8.0	342	0.14
23-Nov-21	1345	56.1	10.6	5	7.5	358	0.76
06-Dec-21	1515	54.5	10.4	5	7.5	315	0.09
20-Dec-21	1200	48.8	11.7	5	7.5	187	0.53
28-Jan-22	1140	48.8	12.6	5	7.5	201	0.09
07-Jan-22	1430	51.6	11.2	5	7.5	162	0.61
11-Feb-22	1415	54.4	12.9	5	7.5	224	0.1
28-Feb-22	1150	53.5	12.9	5	8.0	241	0.1
10-Mar-22	1420	57.4	11.8	5	8.0	260	0.08
21-Mar-22	1350	56.9	11.4	5	8.0	266	0.03
04-Apr-22	1420	58.9	10.6	5	8.0	278	0.4
26-Apr-22	1240	58.1	11.1	5	7.5	261	0.82
12-May-22	1500	57.6	10.9	5	8.0	270	0.05
24-May-22	1300	61.3	9.8	5	7.5	299	0.02
10-Jun-22	1700	67.4	8.8	5	7.5	339	0.58
20-Jun-22	1300	60.5	7.9	10	7.5	317	0.1
MINIMUM		48.8	7.9	5.0	7.5	162	0.0
MAXIMUM		67.4	12.9	15.0	8.0	453	0.8
AVERAGE		57.8	10.2	6.5	7.6	300	

Table III-3
Water quality data collected by MPWMD during RY 2022 at Sleepy Hollow Weir (SHW) station.

Date	Time 24 hr	Temperature (F)	Dissolved Oxygen (mg/L)	Carbon Dioxide (mg/L)	pH	Conductivity (uS/cm)	Turbidity (NTU)
16-Jul-21	1300	66.6	9.8	10	8.0	304	0.99
09-Aug-21	1400	69.8	9.4	5	8.0	319	0.8
26-Aug-21	1430	67.8	9.1	5	8.0	319	1.02
17-Sep-21	1400	66.0	9.4	5	8.0	318	0.71
30-Sep-21	1510	62.3	10.6	5	8.0	315	2.28
13-Oct-21	1430	54.0	11.4	5	8.0	284	0.78
28-Oct-21	1320	58.3	10.9	5	8.0	316	0.55
16-Nov-21	1100	54.3	10.5	5	8.0	272	0.32
23-Nov-21	1440	50.5	11.9	5	8.0	255	0.55
06-Dec-21	1350	48.9	12.8	5	8.0	248	0.28
20-Dec-21	1315	48.2	12.5	5	7.5	150	2.32
28-Jan-22	1225	47.1	12.9	5	8.0	143	0.19
07-Jan-22	1300	50.6	11.7	5	8.0	130	0.15
11-Feb-22	1300	51.4	12.7	5	7.5	160	0.08
28-Feb-22	1240	51.9	11.8	5	8.0	173	0.32
10-Mar-22	1330	54.8	11.4	5	8.0	188	0.37
21-Mar-22	1445	56.6	10.8	5	8.0	199	0.01
04-Apr-22	1330	58.1	12.1	5	8.0	218	0.22
26-Apr-22	1400	60.8	10.1	5	8.0	217	0.34
12-May-22	1400	57.9	10.9	5	8.0	218	0.08
24-May-22	1345	66.5	10.0	5	7.5	257	0.29
10-Jun-22	1530	73.0	8.9	5	8.0	292	0.51
20-Jun-22	1400	66.0	9.8	5	8.0	275	0.55
MINIMUM		47.1	8.9	5.0	7.5	130	0.0
MAXIMUM		73.0	12.9	10.0	8.0	319	2.3
AVERAGE		58.3	10.9	5.2	7.9	242	

Table III-4
Water quality data collected by MPWMD during RY 2022 at Below Los Padres (BLP) station.

Date	Time 24 hr	Temperature (F)	Dissolved Oxygen (mg/L)	Carbon Dioxide (mg/L)	pH	Conductivity (uS/cm)	Turbidity (NTU)
16-Jul-21	1200	67.5	8.9	10.0	7.5	252	0.82
09-Aug-21	1245	72.1	8.0	10.0	7.5	275	1.53
26-Aug-21	1630	72.0	6.9	20.0	7.5	296	4.23
17-Sep-21	1300	70.9	8.4	10.0	7.5	312	2.95
30-Sep-21	1650	67.4	6.0	10.0	7.5	314	8.25
13-Oct-21	1330	62.5	9.1	5.0	7.5	266	12.7
28-Oct-21	1545	59.2	9.1	10.0	7.5	288	14.3
16-Nov-21	1230	58.3	9.6	10.0	7.5	262	1.55
23-Nov-21	1615	56.7	10.3	10.0	7.5	254	1.89
06-Dec-21	1245	53.9	11.3	5.0	8.0	240	2.3
20-Dec-21	1500	48.9	11.9	5.0	8.0	137	0.98
28-Jan-22	1340	49.1	11.8	5.0	7.5	142	0.17
07-Jan-22	1145	49.3	11.7	5.0	7.5	125	0.1
11-Feb-22	1200	49.7	13.3	5.0	7.5	153	0.2
28-Feb-22	1400	50.9	12.1	5.0	8.0	165	0.2
10-Mar-22	1215	50.7	11.5	5.0	8.0	167	0.15
21-Mar-22	1555	53.1	10.7	5.0	8.0	176	0.23
04-Apr-22	1215	55.2	11.2	5.0	7.5	184	0.24
26-Apr-22	1530	60.5	9.0	5.0	8.0	206	0.42
12-May-22	1230	59.0	10.1	5.0	7.5	192	0.25
24-May-22	1500	65.9	9.0	5.0	8.0	225	0.98
10-Jun-22	1445	68.8	8.6	5.0	7.5	241	1.2
20-Jun-22	1515	66.8	8.8	5.0	7.5	239	1.77
MINIMUM		48.9	6.0	5.0	7.5	125	0.1
MAXIMUM		72.1	13.3	20.0	8.0	314	14.3
AVERAGE		59.5	9.9	7.2	7.7	222	

IV. GROUNDWATER MONITORING

A. Groundwater-Level Monitoring

Description and Purpose

The District maintains a groundwater-level monitoring program in the Carmel Valley Aquifer and the Seaside Groundwater Basin. The data collected as part of this program are used to support a variety of programs including: (a) storage monitoring, (b) compilation of annual and long-term well hydrographs, (c) water-table contour mapping, (d) Carmel River Management Program, (e) Seaside Basin Watermaster Program, and (f) other special projects. The monitor-well measurements are stored in a database developed by the District to facilitate data entry, access and manipulation of the water-level data. In addition, groundwater-level measurements are collected on a regular basis by California American Water (Cal-Am) from each of their production wells, and these measurements are also utilized in the District's program. The District also participates in the cooperative California Statewide Groundwater Elevation Monitoring (CASGEM) program administered by the California Department of Water Resources (https://water.ca.gov/Programs/Groundwater-Management/Groundwater-Elevation-Monitoring--CASGEM).

Implementation and Activities During 2021-2022

- **Carmel Valley Aquifer --** The District's monitor well network in the Carmel Valley Aquifer consists of dedicated monitor wells and producer production wells, and currently totals approximately 50 water-level monitoring wells. During this period, the wells were measured on a monthly basis, and these measurements were used to compute end-of-month storage volume estimates for the aquifer. In addition, more frequent monitoring of selected wells was conducted during winter storm events to more closely monitor aquifer recharge.

During the October 2021-September 2022 period, monitoring data indicated that overall groundwater storage in the Carmel Valley Aquifer decreased in WY2022, characterized as "Dry" following a "Dry" WY 2021. Overall groundwater storage decreased from 26,950 AF in October 2020 to 25,250 AF in September 2021 and had a maximum storage capacity of 29,310 AF in February 2021.

Figure IV-1 is a typical hydrograph from the lower Carmel Valley, showing groundwater-level fluctuations at the Rancho Cañada West monitor well (River Mile [RM] 2.13) and the Rio North monitoring well (RM 1.65) compared with mean daily streamflow in the Carmel River at Highway 1 (RM 1.09). The Rancho Cañada West monitor well is located about one mile downstream (i.e., westerly) of the farthest downstream Cal-Am production well in Carmel Valley, the Cañada well, and approximately 1,350 feet from the river channel.

At the Rancho Cañada West well, the groundwater elevation began slightly over 20 feet above sea level in October 2020, and there was small rise of about one foot in response rainfall and runoff, that lasted until June 2021, and then gradually decreased to just under 20 feet above sea level by the end of September 2021. Cal-Am pumped from their Cañada and Mal Paso wells throughout WY 2021.

The Rio North well is approximately 790 feet from the river channel. At this well the groundwater elevation began around 13 feet above sea level in October 2020, showed a similar pattern to the Rancho Cañada hydrograph, and ultimately decreased approximately three feet by the end of September 2021.

- **Seaside Groundwater Basin --** In the Seaside Basin, monthly water-level measurements were collected from 20 monitor wells in the Seaside Coastal Subareas, and four were monitored in the Seaside Inland Subareas. An additional 29 wells in the Seaside Inland and Laguna Seca Subareas were monitored on a quarterly schedule during the year. These additional wells are a combination of active or inactive production wells, and dedicated monitor wells.

Figure IV-2 shows water-level data available from representative wells in the coastal portion of the Seaside Basin monitor well network. This graph shows the water-level elevations in the two principal aquifer zones, the shallower Paso Robles Formation and the deeper Santa Margarita Sandstone, at both upgradient (Site FO-07) and downgradient (Site PCA East) locations from the Paralta production well, the largest capacity Cal-Am well in the coastal area. The graph illustrates the more pronounced effect that production from the coastal Seaside Basin wells has had on water levels in the Santa Margarita Sandstone. The graph also illustrates the effect of changed water-supply practices resulting from SWRCB Order WR 95-10. Under the Order, Cal-Am was directed to maximize production from its Seaside Basin sources in order to reduce production from Carmel Valley, thereby reducing impacts to the Carmel River system. This increased pumping resulted in a declining trend in Santa Margarita aquifer water levels, which are currently below sea level over a large area of the coastal portion of the basin. The peaks and troughs on the lower portion of the graph correspond to Santa Margarita groundwater elevation responses to reduced production in the winter and seasonal operation of the District's Aquifer Storage and Recovery (ASR) project.

B. Groundwater-Quality Monitoring

Description and Purpose

The District maintains an ongoing groundwater-quality monitoring program for the two principal groundwater sources within the District: (a) the Carmel Valley alluvial aquifer, and (b) the coastal subareas of the Seaside Groundwater Basin. The purpose of the program is threefold:

(1) to characterize the quality of water in the aquifers,

(2) to detect groundwater contamination from septic systems or other sources in the shallow zones of the Carmel Valley aquifer, and
(3) to monitor sea-water intrusion potential in the coastal portions of the Carmel Valley aquifer and Seaside Basin.

The District has maintained a groundwater-quality monitoring program for the Carmel Valley aquifer since 1981, and for the Seaside Basin since 1990. The District's program is in addition to the extensive water-quality monitoring that is conducted by Cal-Am at its production wells. The District manages all well construction, maintenance, and field-sampling activities associated with the program. Water samples are analyzed at Monterey Bay Analytical Services. The Monterey County Environmental Health Bureau, Cal-Am, and the Monterey County Water Resources Agency have also provided assistance with this program in the past. Collection of the water-quality data is intended to detect problems before they can affect the community's water supply.

Implementation and Activities During 2021-2022

The sampling schedule for Carmel Valley is normally staggered, with Upper Valley wells (i.e., upgradient of the Narrows) sampled in Spring and Lower Valley wells (i.e., downgradient of the Narrows) in Fall, to coincide with the historically higher nitrate concentrations in these respective areas. Collection of samples from the Seaside Basin monitor wells is conducted once per year in Fall, coinciding with historically low water levels in the basin at that time of the year. Additionally, since 2014, samples were collected quarterly from six wells closest to the coast in the Seaside Basin monitoring network by District staff in cooperation with the Seaside Groundwater Basin Watermaster.

- **Carmel Valley Aquifer –** Groundwater-quality data were collected from six of the seven wells in the monitor well network in the lower Carmel Valley aquifer in November 2022. One of the seven wells in lower Carmel Valley was not sampled earlier because it was submerged under high water in the Carmel River Lagoon during the sampling period. Another well that had historically been sampled during this period was destroyed by flooding in March 2011 when the river scoured away the south end of the Carmel River State Beach parking lot. The locations of these sampling points are shown in **Figure IV-3** and **Figure IV-4**. The results indicated that, in general, there were only minor changes in overall water quality compared to samples collected in 2021. Staff is particularly interested in tracking indicators of potential seawater intrusion in the coastal portion of Carmel Valley. Accordingly, three clustered sets of wells were established west of Highway 1, with each set being made up of three wells completed at different depths. Review of historical data indicated that the shallower and intermediate wells at the two well clusters closest to the coast are subject to the mixing of fresh water and saline water as high tides and surf overtop the sand berm between the lagoon and the ocean. This contributes to episodic mixing within the shallower and intermediate zones of the aquifer, but is not necessarily representative of larger-scale seawater intrusion into the aquifer. As described above, the three wells in the cluster closest to the ocean were destroyed by river erosion in March 2011, and the wells in the next closest cluster to the ocean were inaccessible due to

high water during the sampling period, so during this Mitigation Report period, only the deeper well at the farthest well cluster from the coast (Well 16S/1W-13Lc) was sampled.

Well 16S/1W-13Lc is the deepest in the array of three wells located on State Parks property near the Carmel Area Wastewater District treatment plant at River Mile (RM) 0.65, currently the most proximate well to the ocean in Carmel Valley that was available for sampling. Specific Electrical Conductance (SEC) and Chloride concentration fluctuate slightly from year to year (**Figure IV-5**), and although both were lower in this well in 2022 relative to 2021, both constituents continue to show an overall slight increase over the period of record. Additional background on historical water-quality at the coastal monitor well sites can be found in District Technical Memorandum 90-04, *Summary of Carmel Valley Groundwater-quality from Coastal Monitor Wells*, which is available at the District office. Staff will continue to track future results for trends that might indicate significant changes in concentrations of these or other constituents in the coastal area of the aquifer.

Water quality in well 16S/1E-23La, located 6.72 miles upstream from the river mouth, had higher results for both SEC and Chloride concentration in 2022 relative to 2021, as shown on the graph of SEC and Chloride that is included to track long-term trends (**Figure IV-6**). Staff will continue to track changes in all of the monitor wells in the basin to determine if they are indicative of long-term trends, or anomalous short-term events.

- **Seaside Groundwater Basin --** Eleven monitor wells in the coastal subareas of the Seaside Basin were sampled in September 2022. The locations of the Seaside monitor wells are shown in **Figure IV-7**. One function of the District's monitor-well network in the Seaside Basin is to serve as an early warning of potential sea-water intrusion into the two principal aquifer zones, the Paso Robles Formation and the Santa Margarita Sandstone. The water-quality results from the Seaside Basin indicate that very little water-quality changes have occurred over the period of record since monitoring began in 1990, and that there is no indication of sea-water intrusion in this area of the basin at this time. **Figure IV-8** shows SEC and Chloride concentrations in two coastal wells, one in the shallower Paso Robles Formation aquifer, and one in the deeper Santa Margarita Sandstone aquifer, for the historical period of record beginning in April 1991. Results from the District's monitoring program indicate that SEC averages approximately 370 and 970 microSiemens/centimeter (μS/cm), for the Paso Robles and Santa Margarita aquifer zones, respectively; and that the Chloride concentration averages approximately 50 and 150 milligrams/liter (mg/L), for the Paso Robles and Santa Margarita aquifer zones, respectively.

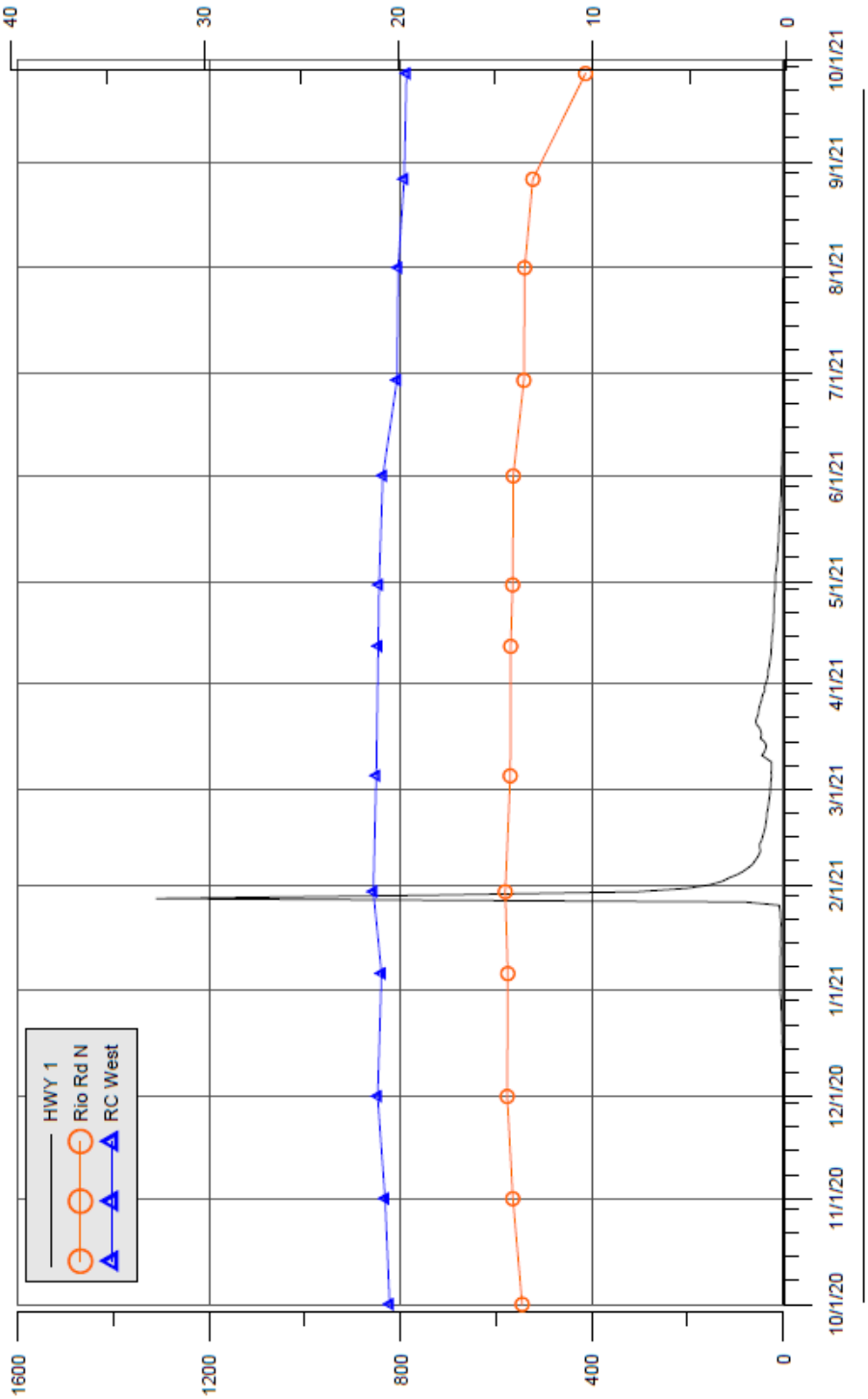


Figure IV-1 Hydrographs of Monitor Well Levels and Carmel River Streamflow

Well levels measured at Rancho Canada West and Rio Road North Monitor Wells.
Carmel River Streamflow measured at Highway 1 Bridge.

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

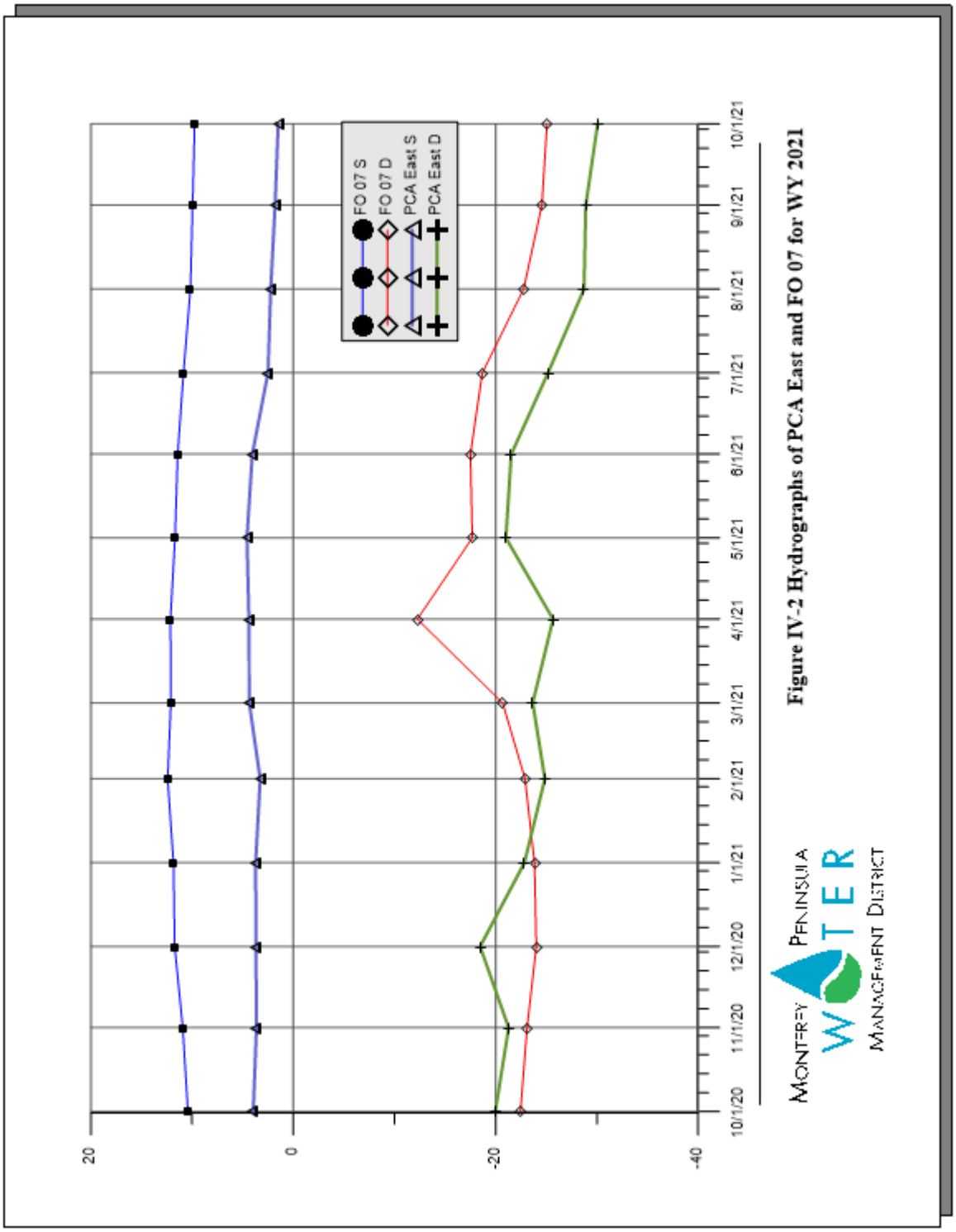


Figure IV-2 Hydrographs of PCA East and FO 07 for WY 2021

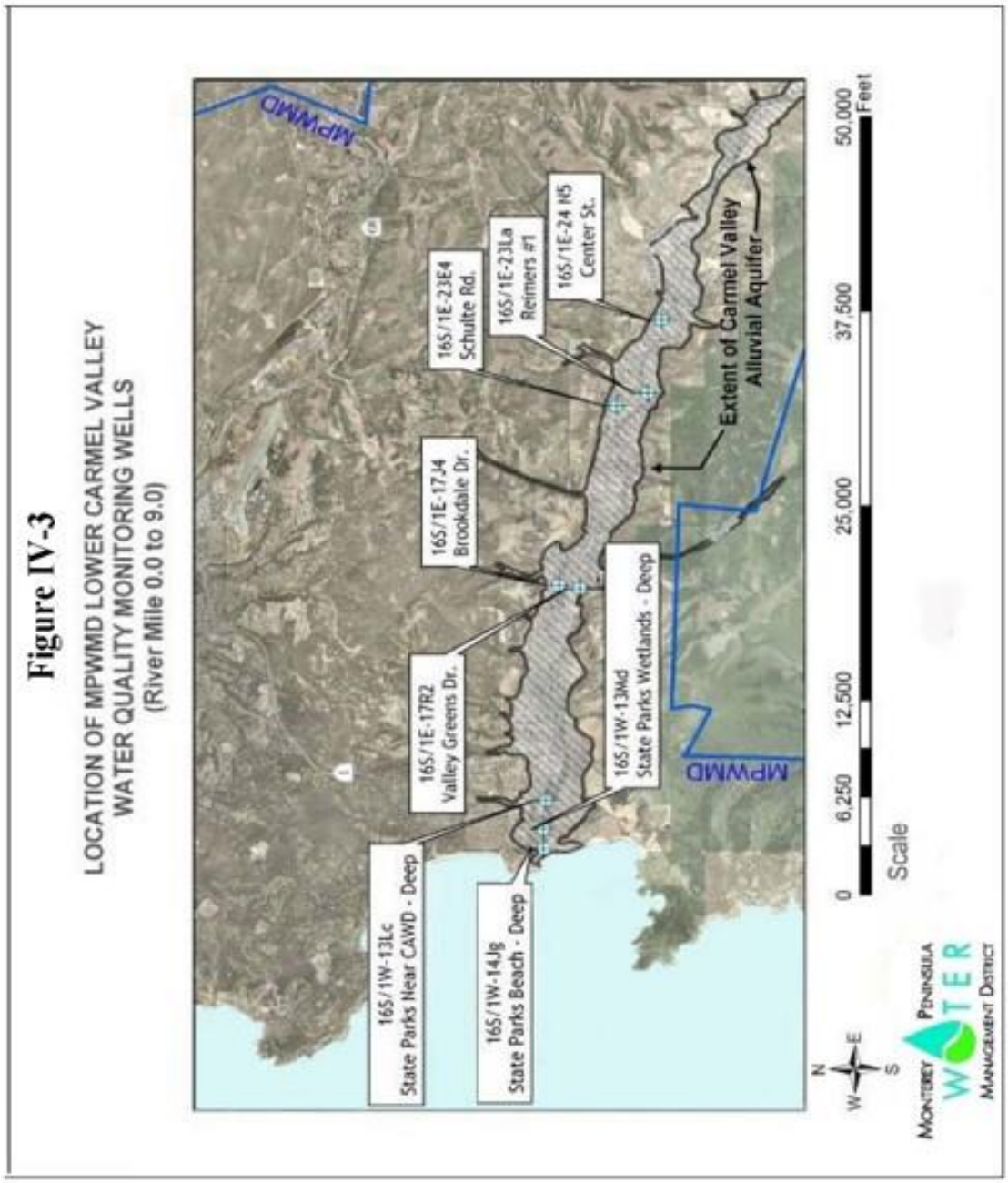
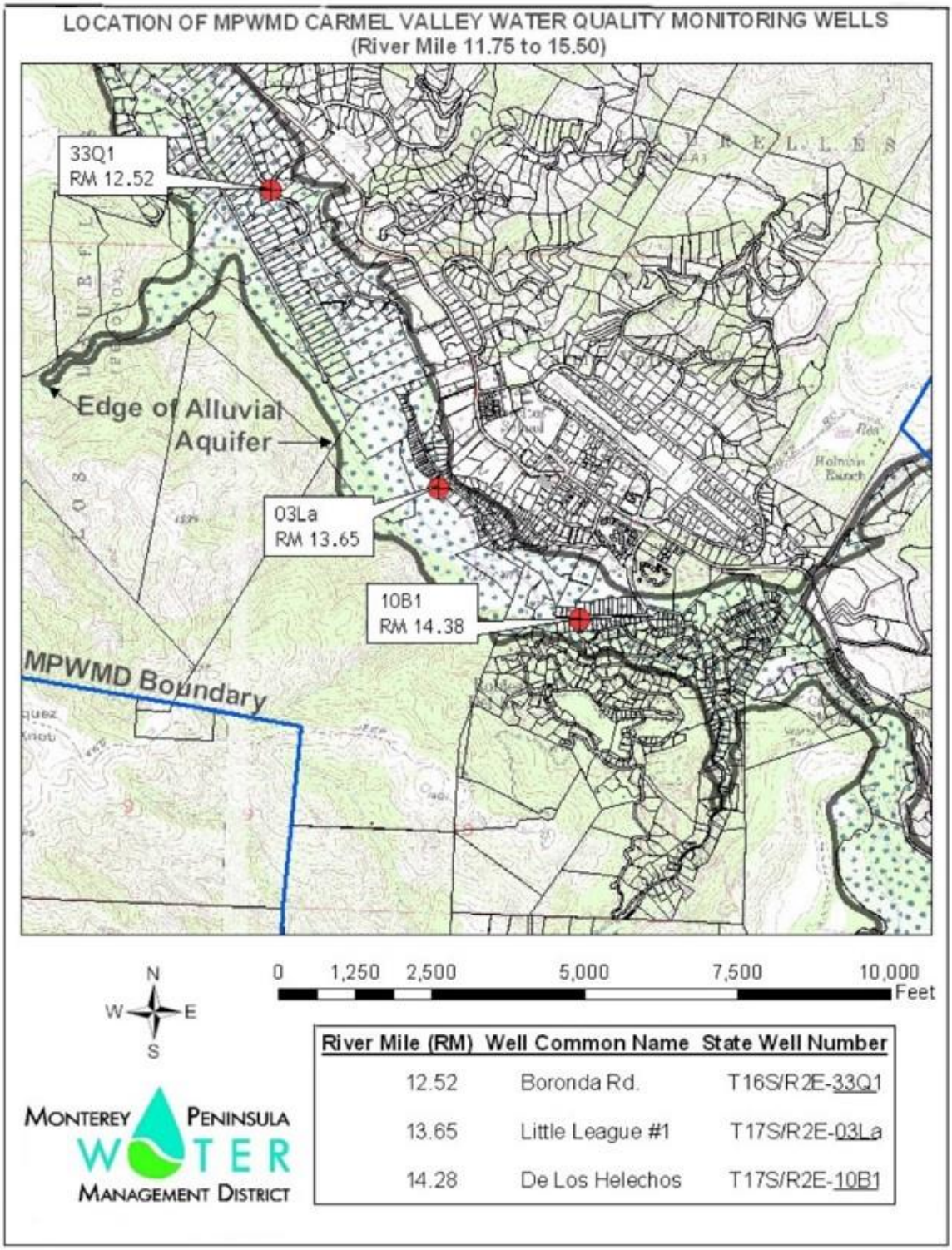


Figure IV-3
LOCATION OF MPWMD LOWER CARMEL VALLEY
WATER QUALITY MONITORING WELLS
(River Mile 0.0 to 9.0)
MPWMD
165/1W-13Lc
State Parks Near CAWD - Deep
165/1W-14Jg
State Parks Beach - Deep
165/1E-17R2
Valley Greens Dr.
165/1E-17J4
Brookdale Dr.
165/1E-23E4
Schulte Rd.
165/1E-23La
Reimers #1
165/1E-24 H5
Center St.
165/1W-13Md
State Parks Wetlands - Deep
Extent of Carmel Valley
Alluvial Aquifer
MPWMD
0
6,250
12,500
25,000
37,500
50,000
Feet
Scale
N
W
E
S
Monterey Peninsula
WATER
Management District

Figure IV-4



River Mile (RM)	Well Common Name	State Well Number
12.52	Boronda Rd.	T16S/R2E-33Q1
13.65	Little League #1	T17S/R2E-03La
14.28	De Los Helechos	T17S/R2E-10B1

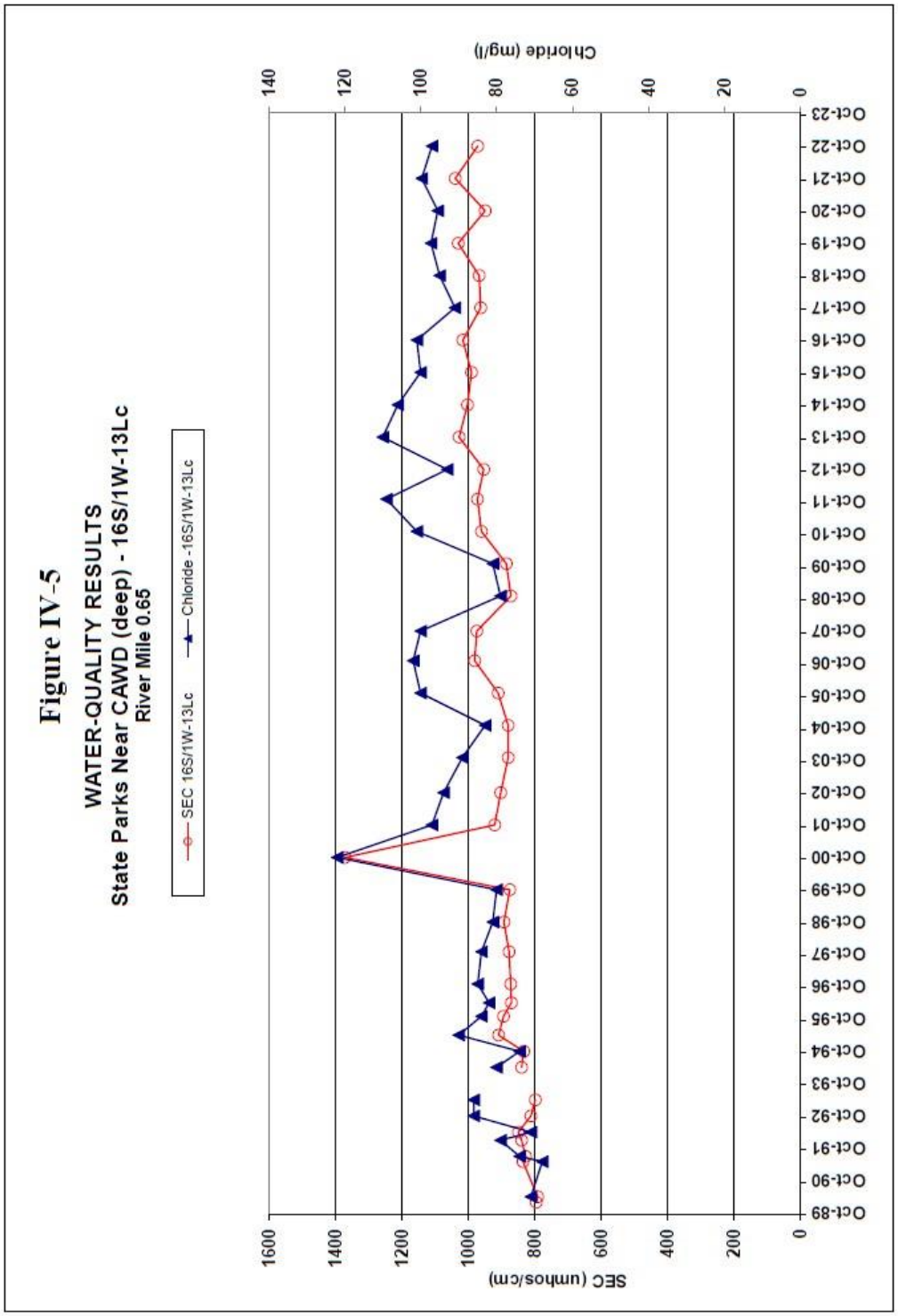


Figure IV-5
WATER-QUALITY RESULTS
State Parks Near CAWD (deep) - 16S/1W-13Lc
River Mile 0.65
SEC 16S/1W-13Lc
Chloride -16S/1W-13Lc
SEC (umhos/cm)
Chloride (mg/l)
/U:\Tomlexcel\quality\2022_graph13Lc

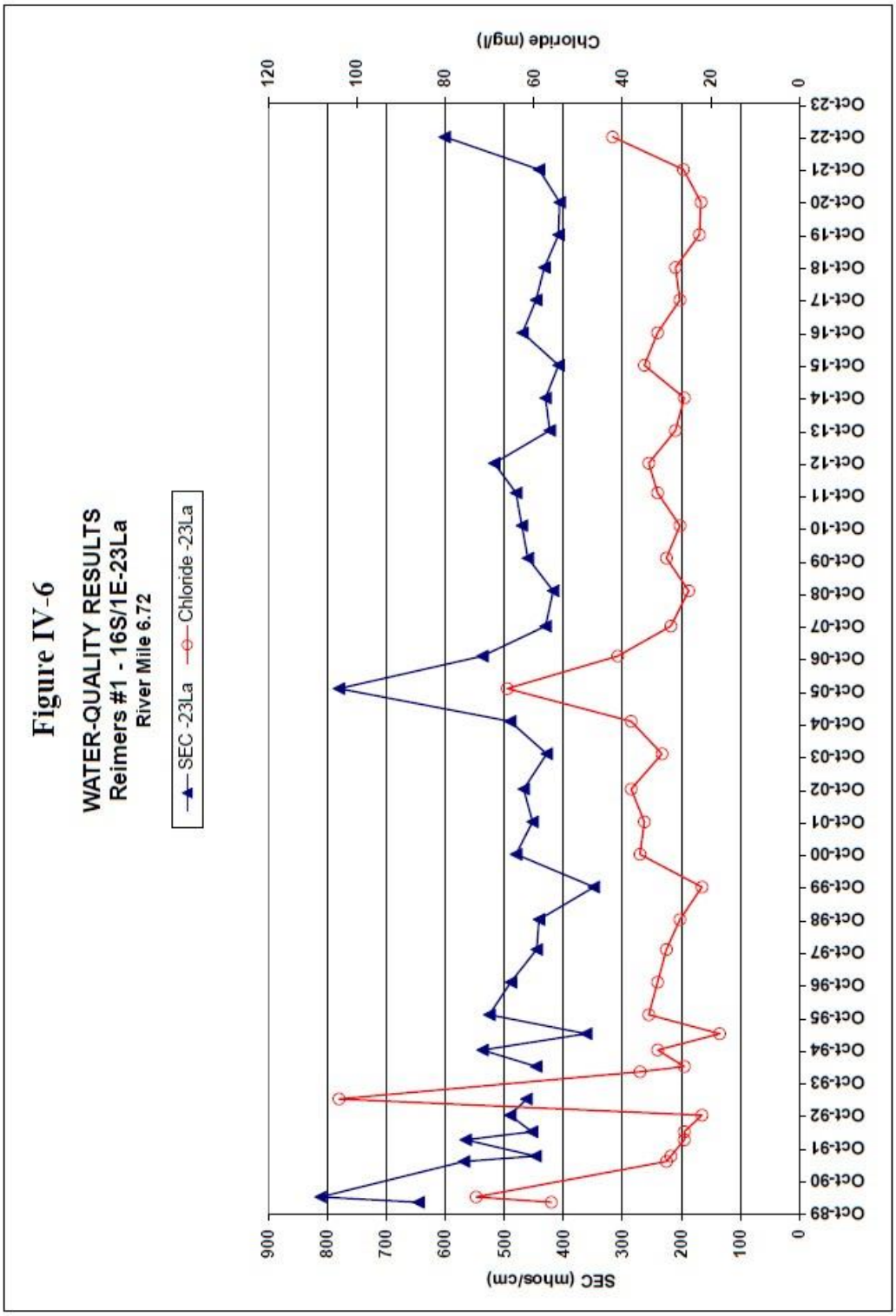


Figure IV-6
WATER-QUALITY RESULTS
Reimers #1 - 16S/1E-23La
River Mile 6.72
SEC -23La
Chloride -23La
SEC (mhos/cm)
Chloride (mg/l)
U:\Tom\excel\quality\2022_graph23La

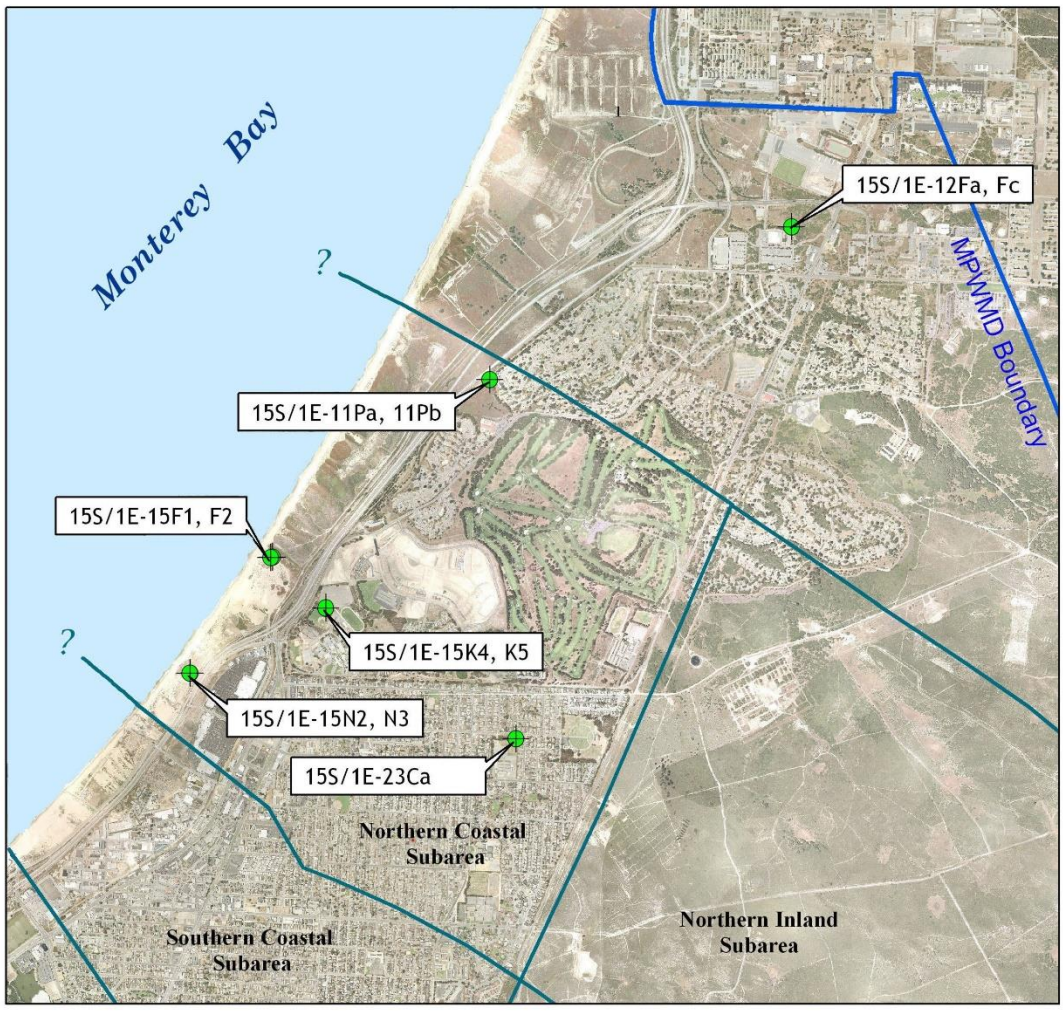


Figure IV-7 Seaside Basin Coastal Ground Water Quality Monitor Well Locations

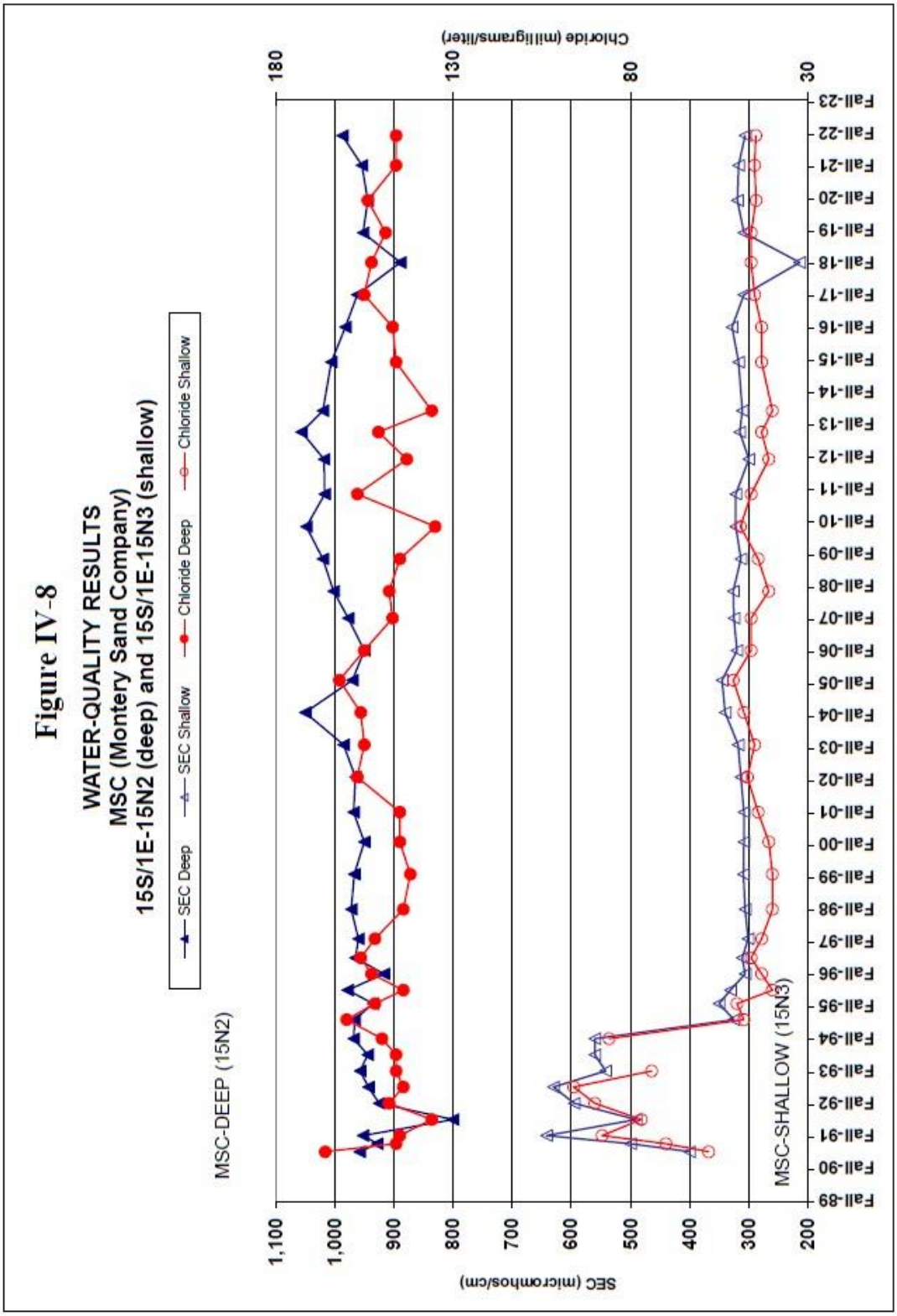


Figure IV-8
WATER-QUALITY RESULTS
MSC (Montery Sand Company)
15S/1E-15N2 (deep) and 15S/1E-15N3 (shallow)
SEC Deep
SEC Shallow
Chloride Deep
Chloride Shallow
MSC-DEEP (15N2)
MSC-SHALLOW (15N3)
SEC (micromhos/cm)
Chloride (milligrams/liter)
U:\Tom\excel\quality\2022_SCB_graph/MSCschart

V. ANNUAL LOW-FLOW MEMORANDUM OF AGREEMENT

Description and Purpose

The original Memorandum of Agreement (MOA) between the California Department of Fish and Wildlife (CDFW), Cal-Am, and the District was developed in July 1983 to balance CDFW's requirement to conserve and protect the fish and wildlife resources of the state and Cal-Am's responsibility to supply water to the citizens of the communities of the Monterey Peninsula. This MOA is modified each year to reflect specific storage conditions and inflow projections at Los Padres Reservoir (San Clemente Dam was removed in 2015) in the Upper Carmel River watershed. Historically, the MOA addressed the release of water into the Carmel River from San Clemente Dam and was originally designed to maximize surface flow to the Narrows during the low-flow season. In addition to specifying minimum flow releases from San Clemente Dam, the past MOAs limited Cal-Am diversions from San Clemente Dam to the Carmel Valley Filter Plant (CVFP) and directed how Cal-Am was to produce water from the Lower Valley Wells. Currently, the MOA focuses on Los Padres Reservoir, and is formulated in May and remains in force until the end of December. The agreement may be modified or extended by mutual consent of all the parties.

Implementation and Activities During 2021-2022

- **2021 MOA** – The 2021 MOA was approved by the District Board on July 19, 2021. The final document was signed by the District and forwarded to Cal-Am for their concurrence, but was not signed by CDFW due to the same unresolved language that was proposed in 2009 by CDFW. Based on storage conditions and expected reservoir inflows, it was agreed that Cal-Am would maintain minimum flows in the Carmel River below Los Padres Dam (LPD) of 5.0 cubic feet per second (cfs) through September 14, 2021. Then on September 15, 2021, Cal-Am will step down the release to 4.0 cfs and then on January 1, 2022, if the reservoir has not spilled, the release will be stepped up 6.0 cfs. The 2021 MOA included terms to: (a) limit operation of Cal-Am wells in the Carmel Valley above Robinson Canyon Road Bridge during low-flow periods; and (b) require Cal-Am to make reasonable efforts to operate the lower Carmel Valley wells in sequence from the most downstream well, progressing upstream as wells are needed and available for production.

VI. QUARTERLY WATER SUPPLY STRATEGY AND BUDGET

Description and Purpose

Under Ordinance No. 19, which was adopted in December 1984, the District was required to develop an annual water-supply strategy. This strategy included estimates of projected demands and proposed production targets for the Cal-Am system. The strategy was designed to limit Cal-Am surface-water diversions from the Carmel River to no more than 35 percent of total Cal-Am production. Based on the District strategy, Cal-Am developed a water-supply budget specifying monthly production targets.

Under Ordinance No. 41, which was adopted in March 1989, development of the water-supply strategy and budget was changed from an annual to a quarterly process, and Cal-Am's annual surface-water diversions were reduced to a goal of no more than 29 percent of total production. Currently, the quarterly strategy and budget values are developed jointly by Cal-Am, the District, CDFW and NMFS, in conformance with the annual low-flow Memorandum of Agreement (MOA). The strategy is designed to maximize the long-term production potential and protect the environmental quality of the Carmel Valley and Seaside basins. The budget includes monthly production targets for each of Cal-Am's major production sources -- Upper Carmel Valley (UCV) Aquifer, Lower Carmel Valley (LCV) Aquifer, and the Coastal Subareas of the Seaside Basin -- which reflect current and expected system conditions. The quarterly strategies and budgets are normally developed in December, March, June, and September of each year.

Starting in April 2002, the Quarterly Water Supply Strategy and Budgets were fundamentally changed by the State Water Resources Control Board (SWRCB), which adopted Order WRO 2002-0002 on March 21, 2002, and by NMFS and Cal-Am, who signed a Conservation Agreement on September 18, 2001. This order and agreement changed the way that Cal-Am operates its diversions and wells upstream of Robinson Canyon Road Bridge. Specifically, Cal-Am was ordered to:

1. Immediately upon issuance of SWRCB Order WRO 2002-0002, cease withdrawal of water from the San Clemente Dam (removed in 2015) during low-flow periods except during an emergency. For the purpose of the Order, “low-flow periods” are defined as times when stream flow in the Carmel River at the Don Juan Bridge gage (RM 10.8) is less than 20 cfs for five consecutive days.

2. Reduce diversions during low-flow periods from the Scarlett No. 8 Well, Los Laureles Wells Nos. 5 and 6, Panetta Wells, Garzas Wells Nos. 3 and 4, and the Robles Well. Current diversions are 1-7 days per month at each well. Diversions at these wells shall be reduced to a maximum of two eight-hour days per month, except that those wells that currently operate only one eight-hour day per month shall continue to operate at not more than one eight-hour day per month. To the maximum degree practicable, Cal-Am shall operate these wells at night. In consultation with NMFS, USFWS, CDFW and the District, Cal-Am can operate the Scarlett 8 well incrementally to meet maximum daily demand after using all other available downstream sources at maximum capacity.

3. Install, not later than March 31, 2002, a pump that delivers water from the Begonia Zone to the Carmel Valley Village Zone. The "Begonia Zone" is defined to include water well production facilities in AQ3, AQ4 and the Seaside Groundwater Basin. The "Carmel Valley Village Zone" is defined to include all Cal-Am users upstream from the Del Monte Regulating Station.

4. The Russell Wells shall be limited to a combined total instantaneous diversion rate of not more than 0.5 cfs during low-flow periods (these wells are no longer used and deemed under the influence of surface water).

5. During the low-flow periods, except for 0.5 cfs, all water diverted to Carmel Valley Village Zone shall be water that originates from the Begonia Zone (as defined in Paragraph 3 above).

In addition, the production goals for the quarterly budget process have changed over time. Beginning in 1998, the quarterly budgets were formulated with an annual production goal of 11,285 AF during each Water Year from the Carmel River Basin, in conformance with goals and requirements established by SWRCB Orders WR 95-10, WR 98-04, and subsequently in conformance with WRO 2002-0002, CDO 2009-0060, and WRO 2016-0016. Releases from San Clemente Reservoir were maximized throughout the year and groundwater production in the UCV was limited to periods when sufficient streamflow was available to recharge the aquifer.

Starting in March 2006, the annual limit for Cal-Am's production from its wells in the Coastal Subareas of the Seaside Groundwater Basin for customers in its main system used in the quarterly budgets was reduced from 4,000 AF per year to 3,504 AF per year based on the final judgment in the basin adjudication. Accordingly, the total annual limit for Cal-Am from the Carmel River and Seaside Groundwater Basins for its main system was set at 14,789 AF. It should be noted that the March 2006 Seaside Basin adjudication decision was amended in February 2007. The decision was amended in part to allow Cal-Am to combine its production allocation from the Coastal Subareas with its production allocation from the Laguna Seca Subarea.

On January 15, 2008, the SWRCB issued a draft Cease and Desist Order (CDO) against Cal-Am. The Draft CDO refers to the 1995 SWRCB Order 95-10, and notes that compliance with Order 95-10 had not been achieved after 12 years. The CDO institutes a series of cutbacks to Cal-Am production from the Carmel River and prohibits new or intensified connections in the Cal-Am main system. MPWMD and several other parties participated in formal hearings before the SWRCB in the summer of 2008. After several draft versions, the final SWRCB determination on the CDO was issued on October 20, 2009. The District subsequently filed a suit to challenge this ruling, and the Monterey County Superior Court issued a stay on November 3, 2009. In response to a challenge by SWRCB, the court ruled on November 23, 2009 that the stay will remain in effect until the hearing that was held in Santa Clara in April 22, 2010. At that hearing, the Court lifted the stay and the CDO was reinstated. The CDO reduced the Cal-Am annual upper limit of diversion from the Carmel River previously set by Order 95-10 at 11,285 AF to 10,429 AF in WY 2010.

In WY 2015, the CDO (Order 2009-0060) set Cal-Am Carmel River production to 9,945 AF. In WY 2016, the CDO (Order 2016-0016) set the Cal-Am River production to 8,310 AF. Then because a milestone was missed in the pursuit of new water it was reduced to 7,310 AF. In WY 2022 it was 4,110 AF and then finally in WY 2023 it will be set at its base value of 3,376 AF. The Seaside adjudication decision limited Cal-Am production in the Coastal and Laguna Seca Subareas of the Seaside Basin to 1,474 AF and 0 AF, respectively. This brought the total production limit from the Monterey Peninsula Water Resource System to 4,850 AF (not including any adjustments for supplemental supplies or carryover storage). The remaining demand comes from water resource projects (ASR, Pure Water Monterey, and Sand City Desal).

Implementation and Activities During 2021-2022

During 2021 and 2022, the quarterly strategies and budgets were structured to optimize production from the Coastal Subareas of the Seaside Basin and minimize impacts from production in the Upper Carmel Valley (UCV). Activities in Water Year 2022 are described below.

- **Cal-Am Main System Production in Water Year 2022[1]** – During WY 2022, Cal-Am produced 9,482 acre-feet (AF) of water for customer service from all sources in its Carmel River, Seaside Coastal and Laguna Seca Subarea systems. This production consisted of 3,946 AF from Carmel River source wells, 1,513 AF of native water from Seaside Coastal wells, 3,683 AF of Pure Water Monterey recovery, 138 AF from Laguna Seca Subarea wells, 120 AF from the Sand City desalination plant, 68 AF from Table 13, 0 AF from ASR Recovery, and 13 AF produced from the MalPaso well and delivered to the Cal-Am system. Of the system total, no water was diverted at San Clemente Dam because it was removed in the summer of 2015.

[1] Beginning with the 2002-2003 Mitigation Report, Cal-Am production is reported on a Water Year basis, from October 1 of one Calendar Year through September 30 of the following Calendar Year. This is a change from previous annual reports in which the reporting period was July of one year through June of the following year. This change makes the mitigation report consistent with reporting requirements under SWRCB Order No. WR 95-10.

VII. WELL REGISTRATION AND REPORTING PROGRAM

Description and Purpose

All owners of wells within the District are required to register and report their annual water production. The purpose of the program is to provide annual aggregate estimates of water production from both Cal-Am and non-Cal-Am wells in the various groundwater production zones in the District. The information provided is used to make decisions regarding management of the limited water resources of the Monterey Peninsula area.

The District began its Well Registration and Reporting Program in 1980. From 1981 through 1990, well owners were allowed to report water production by one of three methods: Water Meter, Land Use, or Power Consumption Correlation. In March 1990, the District adopted Ordinance No. 48 requiring installation of water meters on all large production wells (i.e., those producing 20 or more AFY). In November 1991, District rules were further amended with the adoption of Ordinance No. 56, which extended the metering requirement to all existing medium production wells, defined as those producing between 5 and 20 AFY, and all new wells within the District. Ordinance No. 56 also eliminated the Power Consumption Correlation reporting method.

Implementation and Activities During 2021-2022

Figure VII-1 shows summaries of reported production from Cal-Am and non-Cal-Am wells in WY 2022, and **Figure VII-2** shows the WY 2021 data for comparison.

With respect to the District's Water Allocation Program limits, Cal-Am production from the MPWRS in WY 2022 was 9,449 AF, or 8,192 AF (46.4%) less than the Cal-Am production limit of 17,641 AF that was established with the adoption of Ordinance No. 87 in 1997. Non-Cal-Am production within the MPWRS in WY 2022 was 3,298 AF, or 252 AF (8.3%) more than the non-Cal-Am production limit of 3,046 AF established by Ordinance No. 87. Combined production from Cal-Am and non-Cal-Am sources within the MPWRS was 12,747 AF in WY 2022, which is 7,940 acre-feet (38.4%) less than the 20,687 acre-feet production limit set for the MPWRS as part of the District's Water Allocation Program. Therefore, no action is necessary at this time, although staff will continue to monitor production trends within the MPWRS and District-wide. A comparison of reported water production from the MPWRS in Reporting Year 1997, WY 2007, and WY 2022 relative to the District's Water Allocation limits is presented in **Figure VII-3**. 1997 was the last time the production limits were adjusted. Prior to 2008, the LSS was not included in the MPWRS, but was added with the adoption of Ordinance 135 on September 22, 2008. However, the production limits in the District's Allocation Program did not change. Production from the MPWRS in RY 1997 and WY 2007 presented in **Figure VII-3** was adjusted to include production from the LSS. Production from non-Cal-Am sources does not fluctuate a great deal from year to year, and since production from LSS is included in the calculation of production from the MPWRS, but not in the production limit, non-Cal-Am production has occasionally exceeded the production limit as seen in the data presented in **Figure VII-3**. Historical Cal-Am production presented in **Figure VII-3** was also adjusted to include production from the LSS. Cal-Am production from the MPWRS has greatly decreased and combined production from Cal-Am and non-Cal-Am sources has also decreased over the last several years.

During WY 2022, District staff inspected eight new water meter installations and five replacement meters

to ensure compliance with water meter installation standards and guidelines. In addition, staff reviewed copies of applications for permits for construction of new wells within the District from the Monterey County Environmental Health Bureau and advised recipients of County well construction permits that MPWMD requires permits or written exemptions for wells within the District's boundary.

Lastly, it should be noted that 99% of the groundwater production within the District was reported by the water meter method in WY 2022. In addition, 98% of registered well owners in the District reported annual production for their wells or had their well meters read by District staff in WY 2022.

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT
DRAFT WATER PRODUCTION SUMMARY FOR WATER YEAR 2022

SOURCE AREAS [1,2]	NON CAW (NON CAL-AM) WELLS						CAW (CAL-AM) WELLS		AQUIFER SUBUNIT TOTALS	
	WATER METER		LAND USE		SUB-TOTAL		WATER METER			
	NO. OF WELLS	PRODUCTION (AF) [3]	NO. OF WELLS	PRODUCTION (AF)	NO. OF WELLS	PRODUCTION (AF)	NO. OF WELLS	PRODUCTION (AF)	NO. OF WELLS	PRODUCTION (AF)
AS1	10	62.9	1	0.1	11	62.9	0	0.0	11	62.9
AS2	60	168.3	24	24.7	84	193.0	4	58.4	88	251.4
AS3	143	1,580.9	36	23.6	179	1,604.4	8	[5] 3,411.4	187	5,015.8
AS4	27	184.6	2	0.4	29	185.0	2	615.2	31	800.2
SCS	10	704.9	2	1.3	12	706.2	7	5,176.4	19	5,882.6
LSS	10	533.3	1	2.8	1	536.1	4	187.8	5	723.9
CAC	10	48.5	6	8.0	16	56.5	0	0.0	16	56.5
CVU	326	534.1	42	34.4	368	568.5	0	0.0	368	568.5
MIS	136	343.3	10	5.5	146	348.9	0	0.0	146	348.9
ACTIVE	732	4,160.7	124	100.8	856	4,261.5	25	9,449.2	871	13,710.7
INACTIVE	371		32		403		10		413	
NOT REPORTING	13		7		20		0		20	
SAND CITY DESAL							0	120.1		adjusted for SC desal
METHOD TOTALS:	1,116	4,160.7	163	100.8	1,279	4,261.5	35	9,569.3	1,304	13,830.8

NOTES:
1. Shaded areas indicate production within the Monterey Peninsula Water Resources System. The LSS was added to the Monterey Peninsula Water Resources System in Septembter 2008.
2. CAW - California American Water
3. Source areas are as follows:
   AS1 - UPPER CARMEL VALLEY - San Clemente Dam to Esquiline Bridge
   AS2 - MID CARMEL VALLEY - Esquiline Bridge to Narrows
   AS3 - LOWER CARMEL VALLEY - Narrows to Via Mallorca Bridge
   AS4 - LOWER CARMEL VALLEY - Via Mallorca Bridge to Lagoon
   SCS - SEASIDE COASTAL SUBAREAS
   LSS - LAGUNA SECA SUBAREA (Ryan Ranch Area is within LSS)
   CAC - CACHAGUA CREEK and UPPER WATERSHED AREAS
   CVU - CARMEL VALLEY UPLAND - Hillsides and Tularcitos Creek Area
   MIS - PENINSULA, CARMEL HIGHLANDS AND SAN JOSE CREEK AREAS
4. Any minor numerical discrepancies in addition are due to rounding.
5. 70.55 AF is included in CAW production from AS3 to account for water delivered to ASR in WY 2022.
6. In Water Year 2022, this total includes water produced in both SCS and LSS, and does not include 3,0683.28 AF of Pure Water Monterey water that was recovered for customer service. No water was recovered from ASR this year.
7. The Ryan Ranch and Bishop Units of CAW became part of the CAW Main System in WY 2021. 17.29 AF of water was transferred to the City of Seaside in Water Year 2022.

DISTRICT-WIDE PRODUCTION	
SURFACE WATER DIVERSIONS:	
CAW Diversions (San Clemente Dam):	0.0
Non Cal-Am Diversions Within MPWRS:	10.4
CAW WELLS:	
[6] SEASIDE:	5,364.3
CARMEL VALLEY:	4,084.9
Within the Water Resources System:	9,449.2
Outside the Water Resources System:	0.0
Sand City Desal	120.1
[7] CAW TOTAL, Wells and Diversion:	9,569.3
NON CAW WELLS:	
Within the Water Resources System:	3,287.6
Outside the Water Resources System:	973.9
Non Cal-Am Diversions Outside the MPWRS:	98.4
NON CAW TOTAL, Wells and Diversion:	4,370.3
GRAND TOTAL:	13,939.5

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Figure VII-1

Figure VII-2

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT
DRAFT WATER PRODUCTION SUMMARY FOR WATER YEAR 2021

SOURCE AREAS [1,2]	NON CAW (NON CAL-AM) WELLS						CAW (CAL-AM) WELLS		AQUIFER SUBUNIT TOTALS	
	WATER METER		LAND USE		SUB-TOTAL		WATER METER			
	NO. OF WELLS	PRODUCTION [3] (AF)	NO. OF WELLS	PRODUCTION (AF)	NO. OF WELLS	PRODUCTION (AF)	NO. OF WELLS	PRODUCTION (AF)	NO. OF WELLS	PRODUCTION (AF)
AS1	9	81.7	1	0.1	10	81.8	0	0.0	10	81.8
AS2	63	392.4	25	24.7	88	417.2	4	347.7	92	764.9
AS3	137	1,907.9	37	24.2	174	1,932.1	8	[5] 3,509.2	182	5,441.3
AS4	26	202.4	3	0.5	29	202.9	2	913.5	31	1,116.4
SCS	12	716.6	2	1.3	14	717.8	7	4,506.3	21	5,224.2
LSS	9	342.8	1	2.8	10	345.5	4	187.8	14	533.4
CAC	7	25.8	6	8.5	13	34.3	0	0.0	13	34.3
CVU	317	631.0	42	34.4	359	665.3	0	0.0	359	665.3
MIS	137	369.8	10	5.5	147	375.4	0	0.0	147	375.4
ACTIVE	717	4,670.4	127	101.9	844	4,772.3	25	9,464.6	869	14,236.9
INACTIVE	378		30		408		6		414	
NOT REPORTING	13		9		22		0		22	
SAND CITY DESAL							0	131.5		adjusted for SC desal
METHOD TOTALS:	1,108	4,670.4	166	101.9	1,274	4,772.3	31	9,596.0	1,305	14,368.4

NOTES:

1. Shaded areas indicate production within the Monterey Peninsula Water Resources System. The LSS was added to the Monterey Peninsula Water Resources System in Septembter 2008.

2. CAW - California American Water

3. Source areas are as follows:
   - AS1 - UPPER CARMEL VALLEY - San Clemente Dam to Esquiline Bridge
   - AS2 - MID CARMEL VALLEY - Esquiline Bridge to Narrows
   - AS3 - LOWER CARMEL VALLEY - Narrows to Via Mallorca Bridge
   - AS4 - LOWER CARMEL VALLEY - Via Mallorca Bridge to Lagoon
   - SCS - SEASIDE COASTAL SUBAREAS
   - LSS - LAGUNA SECA SUBAREA (Ryan Ranch Area is within LSS)
   - CAC - CACHAGUA CREEK and UPPER WATERSHED AREAS
   - CVU - CARMEL VALLEY UPLAND - Hillsides and Tularcitos Creek Area
   - MIS - PENINSULA, CARMEL HIGHLANDS AND SAN JOSE CREEK AREAS

4. Any minor numerical discrepancies in addition are due to rounding.

5. 66.06 AF is included in CAW production from AS3 to account for water delivered to ASR in WY 2021.

6. In Water Year 2021, this total includes water produced in both SCS and LSS, and does not include 3,027.17 AF of Pure Water Monterey water that was recovered for customer service. No water was recovered from ASR this year.

7. No water was transferred to Ryan Ranch from the CAW Main System in WY 2021. No water was delivered to Seaside Municipal System in WY 2021.

DISTRICT-WIDE PRODUCTION	
SURFACE WATER DIVERSIONS:	
CAW Diversions (San Clemente Dam):	0.0
Non Cal-Am Diversions Within MPWRS:	9.4
CAW WELLS:	
[6] SEASIDE:	4,694.1
CARMEL VALLEY:	4,770.4
Within the Water Resources System:	9,464.6
Outside the Water Resources System:	0.0
Sand City Desal	131.5
[7] CAW TOTAL, Wells and Diversion:	9,596.0
NON CAW WELLS:	
Within the Water Resources System:	3,697.4
Outside the Water Resources System:	1,075.0
Non Cal-Am Diversions Outside the MPWRS:	50.7
NON CAW TOTAL, Wells and Diversion:	4,832.4
GRAND TOTAL:	14,428.5

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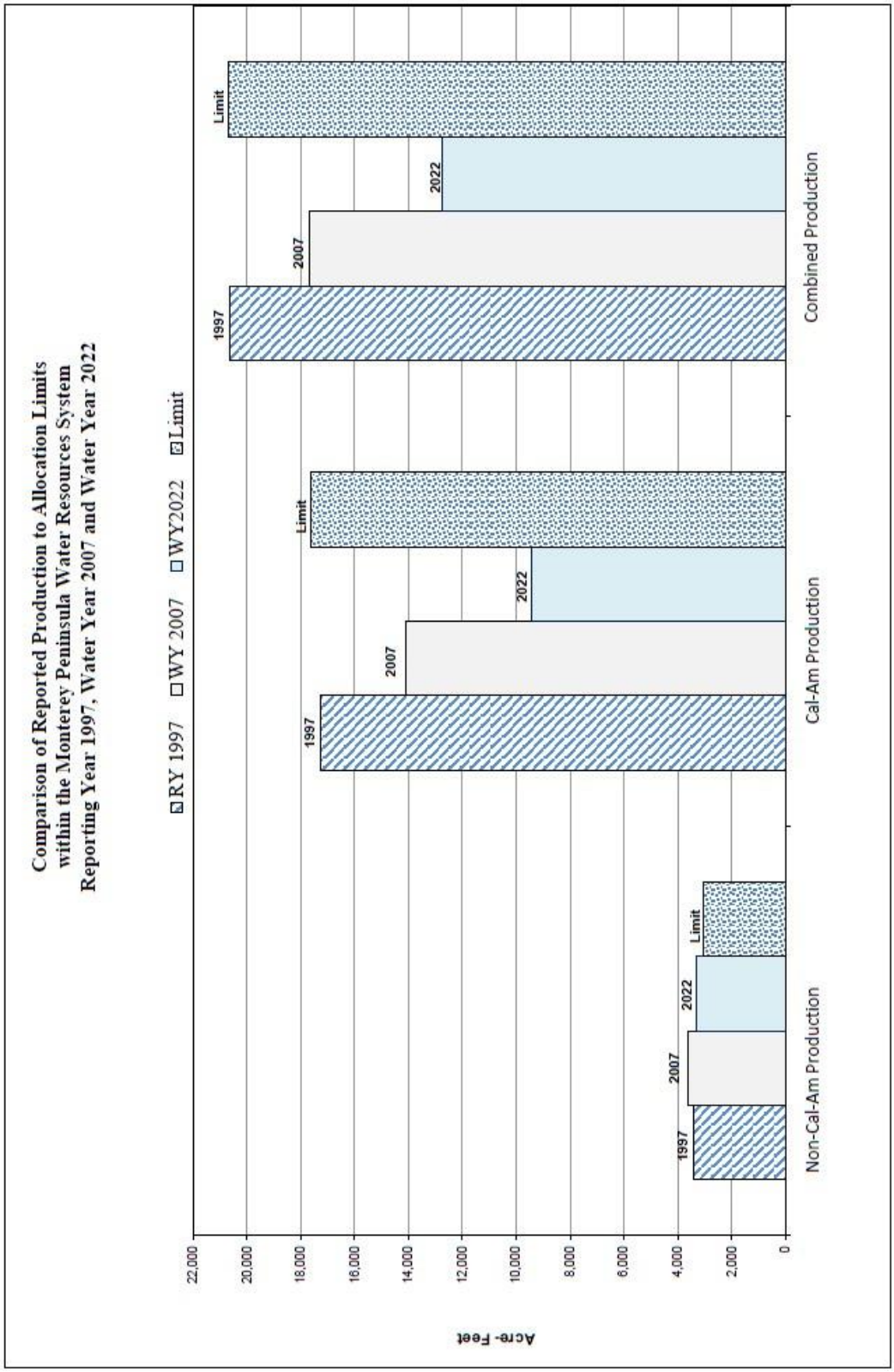
EXHIBIT VII-3



VIII. WATER EFFICIENCY AND CONSERVATION

Description and Purpose

As a legislated function of the Monterey Peninsula Water Management District ("MPWMD" or "District"), a comprehensive water Conservation Program was implemented in October 1979. The Conservation Program expanded in 1983 when the District facilitated development of *The Water Conservation Plan for Monterey County*. The Conservation Plan, adopted by the MPWMD Board in 1986, included a goal to reduce demand by 15 percent of the then-estimated year 2021 demand through implementation of a number of water saving measures including retrofits, use of recycled water, education and other means. At the time the plan was adopted, 2021 demand was expected to be 24,000 AFY for the Peninsula, making the conservation goal 3,600 AF.

Ordinance No. 30, adopted in 1987, was the cornerstone conservation ordinance for the Monterey Peninsula. This ordinance required retrofit to Ultra-Low Flush 1.6 gallons per flush toilets upon resale and in new construction, remodels/additions and changes in use. The ordinance was adopted in July 1987 and codified as MPWMD Regulation XIV, Water Conservation. Regulation XIV also implemented other mandatory water saving measures and a verification process. MPWMD's Regulation XIV has been regarded as a model for other agencies.

Between 2009 and 2019, MPWMD undertook an extensive overhaul of Regulation XIV. Revisions incorporated new technology and Best Management Practices and the regulation was re-written to be easier to understand. Substantial amendments to the program included significantly expanded indoor and outdoor water efficiency requirements for New Construction, Visitor-Serving Facilities and all Non-Residential customers, and water efficiency requirements for all Multi-Family Residential and Common Interest Developments.

One of the legislated functions of the MPWMD is the authority to implement and enforce water rationing. A water rationing plan developed by the Monterey Peninsula Water Management Agency (the predecessor to the MPWMD) was available when the MPWMD was established. Amendments to the plan were made in 1981 (Ordinance No. 7) and in 1988 (Ordinance Nos. 35 and 37) during drought-related rationing administered by MPWMD that continued through 1991. Water-use reductions of approximately 30 percent were achieved during the 1988-91 rationing.

In 1997, in response to SWRCB Order 95-10[1], the MPWMD Board of Directors tasked its staff with preparing a plan to address compliance with the Order (i.e., regulatory supply shortage) as well as with physical water shortages. MPWMD worked with a variety of community interests including California American Water ("Cal-Am"), to conceive and develop the Expanded Water Conservation and Standby Rationing Plan ("Plan"), which was adopted as Ordinance No. 92 in 1998 (codified as Regulation XV). The Plan consisted of seven stages. The first four stages

1 SWRCB Order No. WR 95-10 concluded that Cal-Am does not have a legal right for about 10,730 AFA (about 69% of the water then supplied to Cal-Am customers) which was being diverted from the Carmel River and that diversions were having an adverse effect on the public trust resources of the river.

provided Cal-Am and the District with conservation "tools" to keep community water use within regulatory limits. Stages 5-7 of the Plan were ever-more stringent actions including per-capita rationing that would be triggered by a drought-induced water supply shortages and/or non-compliance with regulatory restrictions.

In February 2017, the MPWMD Board of Directors adopted Ordinance No. 169 which repealed the old Regulation XV, The Expanded Water Conservation and Standby Rationing Plan of the Monterey Peninsula Water Management District, and replaced it with a streamlined conservation and rationing plan known as "The 2016 Monterey Peninsula Water Conservation and Rationing Plan." Cal-Am's rationing plan, known as Rule 14.1.1, mirrors the District's requirements.

A key element of the Conservation Program was added in 1997 when the District began issuing rebates for voluntary toilet replacements with Ultra-Low Flush ("ULF") 1.6 gallons-per-flush toilets. Initially, the District shared funding with Cal-Am. Today, the rebate funds for Cal-Am customers are supported by the ratepayers through a conservation surcharge on the Cal-Am bill, with the District administering the program. Rebates for non-Cal-Am customers are paid by the District through its general fund.

Implementation and Activities During Calendar Year 2022

Conservation Inspections -- District staff continued an intensive inspection program to ensure compliance with the Conservation and Permit Regulations. Most of the **912** properties that changed ownership in 2022 had been inspected prior to the close of escrow and were able to certify compliance through on-line electronic submittals of receipts and/or photographs, although staff did complete inspections of **557** properties for compliance with Water Permit conditions during 2022. All in all, a total of about **1,721** inspections were conducted in 2022. An estimated **12.020** Acre-Feet ("AF") of water were saved by new retrofits verified this year in these two categories.

Other Conservation Incentives -- The District continued to offer incentives for property owners who agree to install water efficient appliances to offset new water fixtures as a condition of a Water Permit. Credit, in the form of water fixture units, remained available to offset new water fixtures in remodels when an older model appliance was replaced with a High Efficiency Dishwasher, High Efficiency Clothes Washer, or HET, or when an Instant-Access Hot Water System is installed. Credit was also available for rainwater and graywater systems that utilize Alternative Water Sources for clothes washing and toilet flushing. This incentive program is one way to allow limited remodeling without increasing water use.

Rebate Program -- The Rebate Program offers generous rebates for a wide array of water saving devices (e.g., up to $500 for a High Efficiency Clothes Washer). Rebates become unavailable once a Qualifying Device is globally mandated, such as when all Clothes Washers had to be High Efficiency Clothes Washers in all Non-Residential uses by 2014, or when the device is required by the District due to a permit condition or Change of Ownership. From January 1, 2022, through December 31, 2022, a total of **826** applications for rebates were received and **642** applications were approved. Rebates are available on a first-come, first-served basis as long as funding is available. **Table VIII-1** summarizes the Rebate Program for 2022.

At the conclusion of 2022, the following items qualified for a rebate[2]:

Residential Indoor Rebates

High Efficiency Toilet

Ultra High Efficiency Toilet

Pint and Zero Water Consumption Urinal

Toilet Flapper

High Efficiency Residential Dishwasher

High Efficiency Residential Clothes Washer

Instant-Access Hot Water System

On-demand pump or point-of source water heater as part of an Instant-Access Hot Water System

Smart Flowmeter

Multi-Family Dwelling Meter Splits

Non-Residential Indoor Rebates

Ultra High Efficiency Toilet

Zero Water Consumption Urinal

Water Broom

Commercial Ozone Laundry System

Cooling Tower Conductivity or Conductivity/pH Controller

High Efficiency Connectionless Steamer

Commercial Waterless Wok Stove

Water Efficient Commercial Steam or "Combi' Oven

High Efficiency Commercial Dishwashers

X-ray film processor recirculation system

Medical equipment steam sterilizer retrofit with a water tempering device

Dry Vacuum Pumps

Removal of Large Bathtubs in Hotel Rooms

Toilet Flapper

Outdoor Rebates

[2] Rebates are issued when funding is available.

Graywater Irrigation System supplied by one Clothes Washer for irrigation and/or one or more Bathrooms that have a Bathtub/Shower connected to a Graywater Irrigation System

Non-Residential Graywater system

Smart or Weather-Based Irrigation System Controller

Soil Moisture Sensor

Rainwater Harvesting based on water storage capacity and roof area

Lawn removal and replacement with low water use plants or permeable surfaces

Rotating Sprinkler Nozzles (minimum purchase and installation of ten)

Non-Residential Graywater Irrigation Systems considered on a case-by-case basis

Conservation Education and Outreach – Despite the challenges of Covid-19 and the reduced interaction resulting from the pandemic, District activities remained focused on public education and encouraging Peninsula residents and businesses to implement water conservation and efficiency practices and to maintain existing equipment and behaviors.

Community Outreach – The District hosted 15 virtual classes on water conservation topics such as rainwater capture, composting to improve soil water holding capacity, landscape design, and removing lawn. Staff distributed water conservation devices at various community events including the Carmel Valley Fiesta, Monterey County Fair, and the West End Celebration. The District posted regular updates to its Facebook page and Twitter account. As a partner with the Water Awareness Committee for Monterey County, the District participated in presentations and assemblies at local schools. The District also ran monthly ads covering District activities in local media.

Summer Splash –Now in its third year, the District, in partnership with Cal-Am, again sponsored a fun family-oriented conservation game called *Summer Splash Water Challenge Giveaway 3*. The challenge was to complete an educational gameboard where participants visited the event website and watched water efficiency videos to find the answers to the gameboard questions. The Challenge was designed for families and was launched in the summer when children were out of school. Completed gameboards could be submitted for an entry into a sweepstakes to win prizes. The prizes offered included a High Efficiency Clothes Washer, a Cistern and Amazon Gift Cards. The gameboards were printed in the newspaper, and the event was promoted on Facebook. The challenge went for one month and received 90 entries for the sweepstakes.

Table VIII-1
Rebate Program Summary

Type of Devices Rebated	Number of devices	Rebate Paid	Estimated AF
High Efficiency Toilet (HET)	121	8,600.00	0.61
Ultra HET	31	$3,725.00	0.31
Toilet Flapper	2	$30.00	0.00
High Efficiency Dishwasher	137	$19,325.00	0.41
High Efficiency Clothes Washer - Residential	338	$168,670.60	5.44
High Efficiency Clothes Washer-Commercial	0	$525.00	0.00
Instant-Access Hot Water System	18	$3,497.00	0.09
Zero Use Urinals	0	$0.00	0.00
Pint Urinals	0	$0.00	0.00
Cisterns	26	$32,041.00	0.00
Smart Controllers	23	$2,160.72	0.00
Rotating Sprinkler Nozzles	0	$0.00	0.00
Moisture Sensors	1	$25.00	0.00
Lawn Removal & Replacement	1	$3,400.00	0.00
Graywater	0	$0.00	0.00
Other	38	$6,863.99	0.00
TOTALS	736	$248,863.31	6.86

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IX. ALLOCATION AND MANAGEMENT OF NEW WATER SUPPLIES

The MPWMD Water Allocation Program requires that each new water Connection or Expansion of Use be accounted for so that System Limits are not exceeded. The District balances water supply and demand by carefully tracking the amount of water permitted and used in the eight Jurisdictions within the MPWMD boundaries and by numerous small Water Distribution Systems (Wells). The Monthly Water Allocation Program Report, found in the District's regular meeting Board packet, summarizes the water available in each Jurisdiction.

The current Allocation system was implemented after adoption of the Water Allocation Program Environmental Impact Report ("EIR") and replaced a system where each Jurisdiction received a percentage of the total available production on an annual basis. The current process makes only newly developed water supplies available for new and expanding uses through an Allocation by Jurisdiction system, through a Water Entitlement, or through the setting of System Limits which are tracked each time a Water Permit is issued.

Ordinance No. 70, adopted on June 21, 1993, ended the moratorium on the issuance of new water Connections in the Main California American Water ("Cal-Am") System that was imposed in January 1991 as a result of the Water Allocation Program EIR. The ordinance established a consumption Allocation of water for each Jurisdiction from a total of 358 Acre-Feet Annually (AFA) calculated from a formula based on the production capacity of the Paralta Well in Seaside. The Paralta Well was a water supply project developed by the District in cooperation with Cal-Am (see also **Section X**).

In addition to issuing "Allocations" of water from the Paralta Well to each Jurisdiction and recognizing water from projects permitted but not built before the Water Allocation Program EIR was done, a 50 AF District Reserve Allocation was established for community benefit projects. In February 1995, Ordinance No. 73 rescinded the District Reserve and allocated the remaining water equally among the eight Jurisdictions. The District Reserve was recently reinstated (2015) with nine AF from the Pacific Grove Water Project (see Ordinance No. 168 below).

In addition to Paralta Well Allocations for each of the Jurisdictions, there have been several recognized Water Entitlements in recent years. Water Entitlements are a discrete quantity of water designated by a District ordinance to a specified Water Entitlement Holder available for new and expanded uses. Water Entitlement Holders include: The Pebble Beach Company (Ordinance Nos. 39 and 109), Hester Hyde Griffin Trust (Ordinance No. 39), J. Lohr Properties Inc. (Ordinance No. 39), the City of Sand City (Ordinance No. 132), Cypress Pacific Investors LLC (Water Distribution System Permit approved September 15, 2014), Malpaso Water Company LLC (Ordinance No. 165), D.B.O. Development No. 30, a California Limited Liability Company (Ordinance No. 166), and the City of Pacific Grove (Ordinance No. 168). These Entitlements are not water "Allocations," and are therefore tracked separately and summarized in the following section.

Implementation and Activities During 2021-2022

Between August 1993 and June 2022, a total of **316.254** AFA of the 342.720 AFA available from the Paralta Well Allocation had been permitted for use by Jurisdictions, leaving **26.466** AFA

remaining, or **7.8** percent of the Jurisdictions' Paralta Well Allocation. Credits from expired or canceled Water Permits that were issued prior to the Paralta Allocation ("Pre-Paralta Credits") are tracked for each Jurisdiction and may be used for Expansions of Use and New Connections similar to the Paralta Allocation. Finally, credits that were received for public retrofit projects from March 1995 to July 1998 (pursuant to Ordinance Nos. 75 and 91) and Water Use Credits that were transferred to a Jurisdiction are tracked as "Public Credits." The status of water Allocations for each Jurisdiction as of June 30, 2022, can be found in **Table IX-1**.

Table IX-2 summarizes the Entitlements of water available to specific areas of the Cal-Am service area. The process of using a Water Entitlement is twofold: An applicant obtains a "Water Use Permit" from the District that documents the vesting of the Entitlement water on a specific property, and when ready to build, the applicant obtains a Water Permit that allows the Jurisdiction to issue a building permit.

Water Permit Activity

From July 1, 2021, through June 30, 2022, a total of **738** Water Permits were issued in the Main Cal-Am System. As of June 30, a total of **87.289 AF** of water remained available in the Jurisdictions' Allocations. This includes water from pre- and post-Paralta Allocations and water added to a Jurisdiction's Allocation from Water Use Credit transfers and public retrofits. Not all permits issued involved the use of water from an Allocation or Entitlement. Many Water Permits are issued with a neutral water demand, meaning that actions taken on the Site to reduce water use offset the addition of new fixtures or uses.

Water Entitlements Activity

Ordinance No. 109. The Carmel Area Wastewater District/Pebble Beach Community Services District (CAWD/PBSCD) Recycled Water Project began operation in 1994, producing Reclaimed Water to replace Potable water previously used to irrigate golf courses and recreational open space in the Del Monte Forest (Pebble Beach area). At the start of operation, the District released Water Entitlements to the project sponsors for their fiscal participation. The PBC received 365 AF, Macomber Estates received 10 AF, and the Griffin Trust received 5 AF. The District retains 420 AF of the project's estimated savings of 800 AFA; none of the District share has been allocated.

In May 2004, the Board adopted Ordinance No. 109 (amending Rule 23.5) to enable financing upgrades to the CAWD/ PBCSD Recycled Water Project. Whereas previously Pebble Beach's Entitlement water could only be conveyed to specific properties in the Del Monte Forest, this ordinance enabled Water Entitlements to be made available to properties throughout the Del Monte Forest to finance the Project Expansion. Ordinance No. 109 also provided a framework for several ancillary agreements for financing, construction, operation, and sale of Recycled Water.

In April 2005, the first Water Use Permits were issued to property owners in the Del Monte Forest who purchased water from the Pebble Beach Company (PBC). Property owners taking advantage of this program pay PBC for the Entitlement and receive documentation of their purchase. The District processes and records a Water Use Permit on the title of the property that provides notice of the amount of Water Entitlement available. Water Permits are required when the property owner desires to use the water available from a Water Use Permit. As of June 30, 2022, **702** Water Use Permits and Water Permits had been issued for a total of **68.326 AFA** new and expanded uses.

Ordinance No. 132. In January 2008, the Board adopted Ordinance No. 132 (adding Rule 23.6) to

allow the expansion and extension of the Cal-Am system to provide Connections to, and Potable water service for the use on and benefit of property located within Sand City. This rule enables the issuance of Sand City Water Use Permits for new and expanded water uses on Sand City Sites, in a cumulative amount of no more than 206 AFA. As of June 30, 2022, **31** Water Use Permits and Water Permits had been issued for a total of **7.753 AFA**.

Ordinance No. 165. In August 2015, the Board adopted Ordinance No. 165 (adding Rule 23.8) to allow the expansion and extension of the Cal-Am system to provide Connections to, and Potable water service for the use on and benefit of property located within the Carmel River watershed and the City of Carmel-by-the-Sea. This rule enables the issuance of Malpaso Water Use Permits for new and expanded water uses on Carmel River watershed and the City of Carmel-by-the-Sea Sites, in a cumulative amount of no more than 80 AFA. As of June 30, 2022, **272** Water Use Permits and Water Permits had been issued for a total of **20.598 AFA**.

Ordinance No. 166. In August 2015, the Board adopted Ordinance No. 166 (adding Rule 23.8) to allow the expansion and extension of the Cal-Am system to provide Connections to, and Potable water service for the use on and benefit of property located within the Seaside Groundwater Basin. This rule enables the issuance of D.B.O. Development Water Use Permits for new and expanded water uses on Sites within the Seaside Groundwater Basin, in a cumulative amount of no more than 13.950 AFA. As of June 30, 2022, **14** Water Use Permits and Water Permits had been issued for a total of **3.784 AFA**.

Ordinance No. 168. On December 15, 2015, the Board adopted Ordinance No. 168 (adding Rule 23.9) to allow the expansion and extension of the Cal-Am system to provide Connections to, and Potable water service for the use on and benefit of property located within City of Pacific Grove. This rule enables the issuance of City of Pacific Grove Water Use Permits for new and expanded water uses on Sites within the City of Pacific Grove, in a cumulative amount of no more than 38.390 AFA. The District Reserve was also replenished by nine acre-feet by this ordinance. As of June 30, 2022, **103** Water Use Permits and Water Permits had been issued for a total of **7.465 AFA**.

Interagency Coordination

District staff continues extensive coordination with community development personnel from the local Jurisdictions to facilitate communication regarding the Water Permit process. In addition to periodic meetings of the Technical Advisory Committee ("TAC"), presentations on the local water-supply situation are given regularly, and meetings are held to discuss permit procedures and to answer questions about Allocation management. Through these meetings, rapport has been developed with the local land use agencies, making the management of water supplies more productive and accurate.

Table IX-1

WATER ALLOCATION REPORT
Reported in Acre-Feet
Water Year 2021-2022

Jurisdiction	Paralta Allocation	Pre-Paralta Water	Public Credit	Total Water Available
Airport District	5.197	0.000	0.000	5.197
Carmel-by-the-Sea	1.398	1.081	0.182	2.661
Del Rey Oaks	0.000	0.000	0.000	0.000
Monterey	0.293	0.181	2.451	2.925
Monterey County	10.578	0.352	1.181	12.111
Pacific Grove	0.000	0.014	0.002	0.016
Sand City	0.000	0.000	23.373	23.373
Seaside	0.000	30.862	1.144	32.006
District Reserve	9.000	0.000	0.000	9.000
TOTALS	**26.466**	**32.490**	**28.333**	**87.289**

Special Allocation	Water Available	Total Demand from Water Permits Issued	Remaining Water Available
Quail Meadows	33.000	32.320	0.680
Water West	12.760	9.892	2.868

Table IX-2

WATER ENTITLEMENT REPORT
Reported in Acre-Feet
Water Year 2022

Entitlement Holder	Entitlement	Total Demand from Water Permits Issued	Remaining Entitlement/and Water Use Permits Available
Pebble Beach Co. [1]	204.570	32.261	172.309
Del Monte Forest Benefited Properties [2] **(Pursuant to Ord No. 109)**	160.430	68.326	92.104
Macomber Estates	10.000	10.000	0.000
Griffin Trust	5.000	4.829	0.171
CAWD/PBCSD Project Totals	**380.000**	**115.416**	**264.584**

Entitlement Holder	Entitlement	Total Demand from Water Permits Issued	Remaining Entitlement/and Water Use Permits Available
City of Sand City	206.000	7.753	198.247
Malpaso Water Company	80.000	20.598	59.402
D.B.O. Development No. 30	13.950	3.784	10.166
City of Pacific Grove	38.390	7.465	30.925

[1] Increases in the Del Monte Forest Benefited Properties Entitlement will result in reductions in the Pebble Beach Co. Entitlement.

Table IX-3
Water Year 2022
Summary of Water Permits Using Entitlements

Type of Water Permit and Entitlement Holder	No. of Permits	Capacity (Acre-Feet)
New Projects		
• Pebble Beach Entitlements	13	0.306
• Sand City Entitlement	5	0.467
• Malpaso Water Entitlement	9	0.146
• D.B.O. Development No. 30	0	0.000
• Pacific Grove Entitlement	0	0.000
Remodels/Additions		
• Pebble Beach Entitlements	41	0.071
• Sand City Entitlement	1	0.171
• Malpaso Water Entitlement	6	0.163
• D.B.O. Development No. 30	0	0.000
• Pacific Grove Entitlement	33	0.047

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X. WATER-USE TRENDS

Description and Purpose

Based on data provided by California American Water (Cal-Am), Monterey Peninsula Water Management District staff tracks water use (Cal-Am metered consumption) over time to assess community water-use trends. These data are used in water-supply planning (augmentation) as well as development of conservation programs.

Implementation and Activities During 2022

Water-use trends may be tracked by using production data at the well head, as described above, or by considering Cal-Am metered consumption information, as described below. **Figure X-1** provides water-use trends from 1980 through 2021, as represented by consumption in Acre-Feet per Cal-Am Connection (AF/Connection) for customers[1] in the Main Cal-Am System. This is based on an annual report titled "Customers & Consumption by Political Jurisdiction & Classification" that provides metered use information for each political jurisdiction and for the Cal-Am system subunits, as well as several user classifications. For WY 2022, the use per Connection is based on Cal-Am's total metered consumption[2] (8,404 AF) divided by Cal-Am's total customers (40,107) and equaled 0.210 AF/Connection.

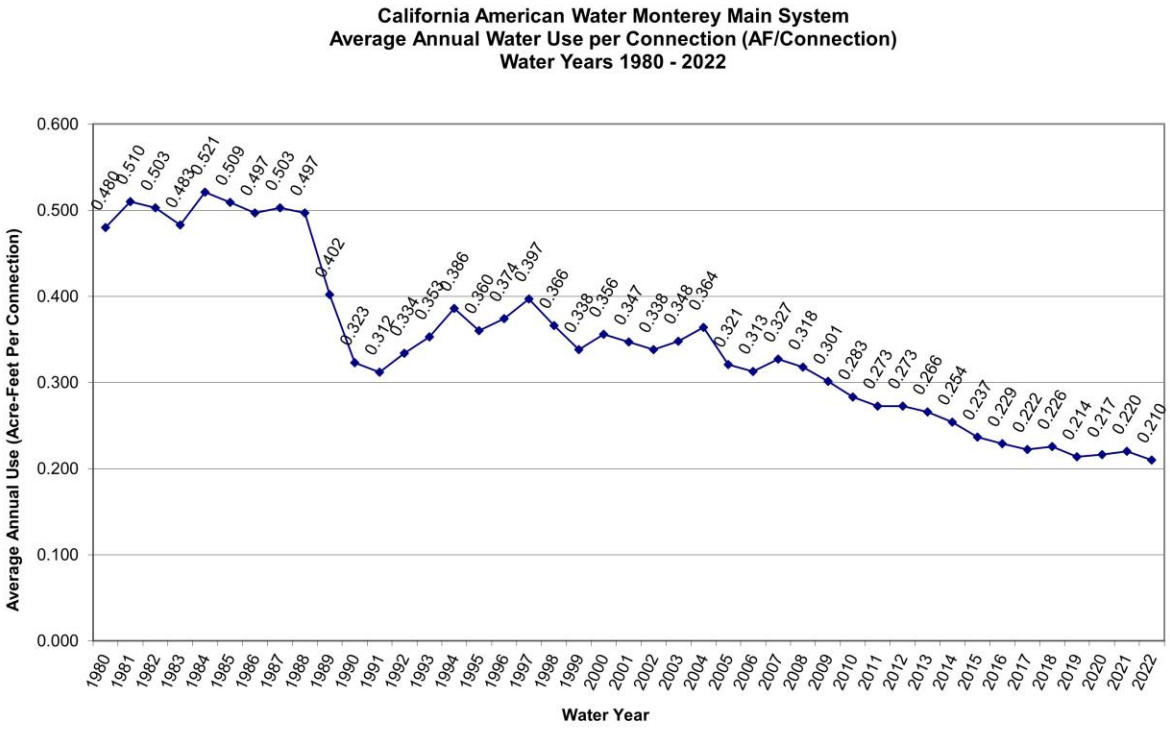
Water consumption in WY 2022 continued a trend of reduced demand. Review of **Figure X-1** indicates that water use per Connection for the last 33 years (1989-2022) is significantly less than in the preceding nine years (1980-1988). The sharp decline in WYs 1989, 1990, and 1991 is attributable to mandatory water rationing in response to the 1987-1991 drought period. From 1992-2004, annual water consumption remained relatively stable, with a range from approximately 0.33 to 0.40 AF/Connection, and average of 0.359 AF/Connection, compared to the average of 0.500 AF/Connection for the 1980-1988 period. Since WY 2004, a general annual declining trend has occurred. Notably, water consumption per Connection in WY 2022 (0.21 AF/Connection) was 58% less than the pre-drought consumption per Connection in RY 1987 (0.503 AF/Connection).

During 2022, MPWMD continued to enforce its water efficiency requirements. Requirements for all Non-Residential Users (by 2014), all Multi-Family Dwellings of four or more units and Common Interest Developments (CID) (by 2021) have driven down demand. District enforcement of the Non-Residential business requirements resumed in 2022 following the pandemic years of 2020-2021. Additional outreach and enforcement of Multi-Family and CID property requirements will occur in the next two years. Staff anticipates further reductions in use per Connection as a result of these programs and as a result of encouraging separate metering in Multi-Family and Non-Residential uses.

[1] Includes residential, multi-residential, commercial, industrial, golf course, public authority, other and non-revenue metered connections.

[2] Excludes Cal-Am satellite systems with separate well sources (i.e., Ryan Ranch, Hidden Hills, Bishop, Ralph Lane, Chualar and Ambler). Also excludes water supplied to MPWMD by Cal-Am wells to irrigate Carmel River riparian vegetation as part of the Allocation EIR Mitigation Program.

Figure X-1



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XI. WATER DISTRIBUTION SYSTEM MANAGEMENT (WATER PERMITS)

See Section IX, Allocation of New Water Supply.

XII. MONITOR PRODUCTION AND COMPLIANCE WITH SWRCB ORDER WR 2009-0060 AND WR 2016-0016

Implementation and Activities During 2021 - 2022

Regarding compliance with State Water Resources Control Board (SWRCB) Order WR 2016-0016 (i.e, the "Cease and Desist Order" or CDO), California American Water (Cal-Am) target production from the Carmel River Basin in Water Year (WY) 2022 for the SWRCB tally was based on the initial regulatory limit of 4,110 acre-feet (AF). Other sources of production were Sand City Desalination Project production of 120 AF, 3,683 AF of PWM Recovery, and ASR Recovery of 0 AF over the 600 AF cap on ASR diversion counted in river pumping, resulting in an adjusted base amount of 4,110 AF. Actual Cal-Am Carmel River Basin diversions (after adjustments) for WY 2022 were 4,085 AF. Thus, Cal-Am reported diversions were below the adjusted diversion limit from the Carmel River Basin imposed by the SWRCB. WY 2022 was the 25th straight year in which compliance with Order WR 95-10 was achieved, the 13th year for compliance with Order WR 2009-0060, and the 5th year of compliance with SWRCB 2016-0016. A major purpose of the District's *Expanded Conservation Plan and Standby Rationing Program* is to ensure continued compliance with the SWRCB Orders. The community was in Stage 1 of the conservation program throughout the 2021-2022 reporting period.

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XIII. MONITOR PRODUCTION AND COMPLIANCE WITH MPWMD ALLOCATION LIMITS

Description and Purpose

The adoption of Ordinance No. 70 in June 1993 revised the Monterey Peninsula Water Resource System (MPWRS) supply limit from an annual production limit of 19,881 acre-feet per year (AFY) to 20,673 AFY. The California American Water (Cal-Am) annual production limit of 16,744 AFY (Option V from Finding No. 403 of the Final Water Allocation Program EIR; Ordinance No. 53) was revised to 17,619 AFY, and the non-Cal-Am production limit of 3,137 AFY was revised to 3,054 AFY. This new water supply limit reflected the 385 AFY of new water production allocation from the Paralta Well project and minor adjustments to reflect the integration of the Water West system into the Cal-Am system, the annexation of Quail Meadows Subdivision into Cal-Am, and the refinement of the non-Cal-Am production estimate.

Ordinance No. 83, adopted in April 1996, set Cal-Am's annual production limit at 17,621 AFY and the non-Cal-Am annual production limit at 3,046 AFY, based on permanent reductions in water use by non-Cal-Am water users in exchange for water service from Cal-Am. As part of the agreement, 15% of the historical non-Cal-Am production was set aside to meet the Monterey Peninsula Water Management District (District) long-term water conservation goal. Based on these changes, a new limit for the MPWRS as a whole was set at 20,667 AFY.

The Cal-Am production limit was again amended in February 1997, when Ordinance No. 87 was adopted as an urgency ordinance to provide a special community benefit reserve allocation of 19.6 AFY of production to the Community Hospital of the Monterey Peninsula. Ordinance No. 87 increased the total annual Cal-Am production limit to 17,641 AFY, but did not change the non-Cal-Am limit. Thus, the new limit for the MPWRS as a whole is 20,687 AFY.

In addition to District-imposed production limits as part of its Water Allocation Program, Cal-Am must also comply with limits set by the State Water Resources Control Board (SWRCB) in 1995 as part of Order WR 95-10. The Order includes a provision that Cal-Am water diversions (surface and groundwater production) from the Carmel River basin should not exceed 11,990 AF in Water Year (WY) 1996, and not exceed 11,285 AF in WY 1997 and subsequent years. In 2009, the SWRCB issued Order 2009-0060 (i.e., the "Cease and Desist Order" or CDO), which further modified the Cal-Am production limits and imposed a production ramp-down schedule by water year (see **Section XII**). The water year begins on October 1 and ends on September 30 of the following year. The District program to monitor water use includes tracking Cal-Am compliance with the SWRCB goals.

Implementation and Activities During 2021-2022

District staff continued to manage the overall supply budget, sending periodic reports to the cities and/or county and providing updates and general information as needed. The monitoring programs initiated by Ordinance Nos. 52 and 53 continue to be implemented. Beginning with the 2001-2002 Annual Report, the District changed the reporting period for the Well Registration and Reporting Program from a Reporting Year (July 1-June 30) to a Water Year (October 1-September 30) to be

consistent with the SWRCB Order reporting requirements, and other hydrological reporting programs. The 2001-2002 Annual Mitigation Report was the last report in which groundwater production within the District was presented in a Reporting Year format. Water production tables for the current year in this report use WY 2022 data (October 1, 2021 through September 30, 2022). Compliance with production limits imposed by MPWMD as part of the Water Allocation Program are shown in **Table XIII-1**.

Table XIII-1

Production vs. CDO and Adjudication to Date: WY 2022

(All values in Acre-Feet)

Year-to-Date Values	MPWRS					Water Projects and Rights				
	Carmel River Basin [2,6]	Seaside Groundwater Basin			MPWRS Total	ASR Recovery	PWM Recovery	Table 13 [7]	Sand City [3]	Water Projects and Rights Total
		Coastal	Laguna Seca	Ajudication Compliance						
Target	5,670	1,075	0	1,075	**6,745**	71	3,422	174	300	**3,967**
Actual [4]	4,085	1,513	138	1,651	**5,736**	0	3,683	68	120	**3,871**
Difference	1,585	-438	-138	-576	**1,009**	71	0	106	180	**96**
WY 2021 Actual	4,896	1,479	187	1,541	**6,563**	0	3,027	17	147	**3,191**

1. This table is current through the date of this report.
2. For CDO compliance, ASR, Mal Paso, and Table 13 diversions are included in River production per State Board.
3. Sand City Desal, Table 13, and ASR recovery are also tracked as water resources projects.
4. To date, 71 AF and 68 AF have been produced from the River for ASR and Table 13 respectively.
5. All values are rounded to the nearest Acre-Foot.
6. For CDO Tracking Purposes, ASR production for injection is capped at 600 AFY.
7. Table 13 diversions are reported under water rights but counted as production from the River for CDO tracking.

Monthly Production from all Sources for Customer Service: WY 2022

(All values in Acre-Feet)

	Carmel River Basin	Seaside Basin	ASR Recovery	PWM Recovery	Table 13	Sand City	Mal Paso	Total
Oct-21	438	41	0	344	0	0	2	824
Nov-21	407	45	0	234	0	6	2	693
Dec-21	361	39	0	162	42	28	2	634
Jan-22	268	39	0	301	26	2	2	638
Feb-22	230	40	0	419	0	0	2	691
Mar-22	253	92	0	400	0	24	1	769
Apr-22	249	87	0	400	0	17	1	753
May-22	309	190	0	350	0	25	1	874
Jun-22	342	292	0	249	0	6	0	889
Jul-22	370	286	0	274	0	0	0	929
Aug-22	370	278	0	287	0	0	0	935
Sep-22	350	225	0	264	0	13	0	852
Total	**3,946**	**1,651**	**0**	**3,683**	**68**	**120**	**13**	**9,482**
WY 2021	**4,723**	**1,667**	**0**	**3,027**	**17**	**147**	**61**	**9,641**

1. This table is produced as a proxy for customer demand.
2. Numbers are provisional and are subject to correction.

XIV. DETERMINE DROUGHT RESERVE

Description and Purpose

In conceptual terms, drought reserve can be defined as the balance between water supply and water demand that is necessary to insure a specified level of drought protection. The question that remains is how much protection is "adequate". There is no universally accepted standard for quantifying "adequate" levels of drought protection for municipal water supply systems. Moreover, drought protection can be measured in a number of ways including safe or firm yield, annual shortfalls, frequency or severity of water rationing, carryover storage, or some indicator of environmental stress.

For the Monterey Peninsula Water Management District (MPWMD), the level of desired drought protection has been specified by the Board of Directors in terms of water rationing. Adequate drought protection exists as long as the frequency of mandatory water rationing is less than predetermined standards. The determination of whether or not mandatory water rationing would be imposed during a reoccurrence of particular drought periods is based on simulated system operations for the 1958-2002 period of record.

In more specific terms, drought reserve can be expressed as the total usable storage in the Monterey Peninsula Water Resources System that is required on May 1 to limit mandatory water rationing to the predetermined frequency. The total storage that is required includes carryover storage for use during the following water year and the storage necessary to satisfy the demand that is expected to occur during the remainder of the current water year. In August 1993, the Board adopted a drought protection goal that allows no more than 20 percent mandatory water rationing two percent of the time, or two out of 100 years, on average.

Implementation and Activities During 2021-2022

In 2022, District staff determined that approximately **13,552 acre-feet (AF)** of usable storage were required on May 1, 2022 to avoid requesting a District-wide voluntary 15 percent reduction in water demand. Given that actual, usable storage on May 1 was estimated at **29,160 AF**, no demand reductions beyond existing Stage 1 restrictions were necessary for 2021 based on physical water availability. The 2022 trigger values are based on the maximum California American Water (CAW) production limit set by the State Water Resources Control Board in Order No. WR 2009-0060 (4,110 AF) for CAW's diversions from the Carmel River, the maximum production limit for CAW's diversions from the Coastal Subareas of the Seaside Groundwater Basin set by the Court as a result of the Seaside Groundwater Basin adjudication (1,474 AF), and the non CAW water production limit that was specified in the District's Water Allocation Program (3,046 AF).

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XV. AUGMENT WATER SUPPLY

The Findings for Adoption of the Water Allocation Program EIR in 1990 identified a set of general mitigation measures that relate to increasing the water supply. Finding No. 403-A stated that the Monterey Peninsula Water Management District (MPWMD or District) shall pursue construction of a major, long-term water supply project to provide water for restoration of the environment and for public water supply. Finding No. 403-B stated that the District should pursue a series of smaller "near-term" water supply projects to provide additional water for drought protection and some new growth until the long-term project is completed.

The District brought forth the New Las Padres Dam project, which would have provided sufficient long-term supply well into the future, but unfortunately voters turned it down in 1995. In 1996, District efforts related to both long-term and near-term projects were consolidated into the MPWMD Water Augmentation Plan. Specific goals and objectives were adopted in January 1997, and revised in January 1998, April 2000, and March 2001. Since 2001, the MPWMD Board has held Strategic Planning Workshops to set strategic planning initiatives, set goals and objectives to guide District activities, receive progress reports and provide policy guidance. Augmenting the water supply remains a major focus. For example, on April 17, 2023, the District Board adopted Strategic Goal #1 is: "Secure a safe, reliable, sustainable, diversified, affordable, legal water supply for the Monterey Peninsula through support and investment in Pure Water Monterey Expansion (PWM-X)."

To maintain consistency with the Water Allocation Program EIR, the following sections describe MPWMD efforts for long-term and near-term projects separately. In practice, District water augmentation efforts are integrated. For aquifer storage and recovery (ASR), the long-term MPWMD ASR Phase 1 and Phase 2 projects and associated water rights are described under **Section XV-A**; the annual ASR operation activities are discussed under **Section XV-B**.

A. Long-Term Water Supply Project

Description and Purpose

The mission of the District is to "sustainably manage and augment the water resources of the Monterey Peninsula to meet the needs of its residents and businesses while protecting, restoring, and enhancing its natural and human environments.". The following paragraphs provide background information followed by a review of actions in the July 2021 through June 2022 period. Additional information is provided by the General Manager at most monthly regular board meetings, available on the District website at: www.mpwmd.net.

Background: In the early 1990s, the electorate did not approve public funding for two major water supply projects – a small 3,000 acre-foot per year desalination project in 1993 and the proposed 24,000 acre-foot (AF) New Los Padres Dam and Reservoir (NLP) Project in 1995. Since then, the District has focused its efforts on non-dam alternatives. The District participated extensively in the 1999-2002 California Public Utilities Commission (CPUC) "Plan B" process to identify a non-dam alternative to the NLP. Since 2012, the District has worked with Cal Am on the Monterey Peninsula Water Supply Project (MPWSP), a portfolio comprised of (i) a 6,200 AFA

desalination plant owned by Cal-Am, (ii) a 3,500 AFA Advanced Water Purification Facility known as "Pure Water Monterey", a joint project of Monterey One Water (M1W) and the District, and (iii) additional ASR by the District and Cal-Am. In 2022, the District worked diligently to receive approval of the Pure Water Monterey Expansion project that will bring another 2,250 AFA to the permanent Peninsula water supply.

The State Water Resources Control Board (SWRCB) decisions on Carmel River issues in July 1995 and subsequent orders continue to influence water augmentation efforts to the present. The SWRCB Order WR 95-10 identified an estimated 10,730 acre-feet per year (AFY) of historical unauthorized Cal-Am diversions from the Carmel River that must be replaced by another water project or projects. That number has declined due to permanent demand reductions within the service territory, primarily due to District conservation programs and Cal-Am rate structures.

Because of a lack of progress toward completion of a replacement water supply and despite strong objections from the Monterey Peninsula, the SWRCB issued a Final Cease and Desist Order on October 20, 2009 (CDO 2009-0060). This Order set mandatory reductions in Carmel River diversions that were to culminate in reducing Cal-Am Carmel River diversions to an authorized amount of 3,376 AFY by December 31, 2016.

Cal-Am, in conjunction with the District, Monterey Peninsula Regional Water Authority (a joint powers authority comprised of the six cities on the Monterey Peninsula, now defunct), the City of Pacific Grove and the Pebble Beach Company, submitted an application to amend the CDO on April 28, 2016. On July 19, 2016, the SWRCB adopted Order 2016-0016 extending the CDO period to December 31, 2021. The effective diversion limit (EDL) for the Carmel River was lowered to no more than 7,310 AFY and additional mitigation measures to offset impacts to public trust resources were ordered by the SWRCB[1]. Then in Water Year 2022, that limit was set at 4,110 AF. That limit today is 3,376 AFA and Cal-Am has successfully met the limit.

Seaside Basin Setting: Management of the Seaside Groundwater Basin also has important ramifications for long-term community water supply. SWRCB Order 95-10 directed Cal-Am to maximize pumping in the Seaside Basin to the extent practicable in order to reduce diversions from the Carmel River. Thus, since 1995, the Seaside Basin became an increasingly important source of water supply. Unfortunately, it also began to exhibit signs of stress from over-pumping due to Order 95-10, as well as significant increases in non-Cal-Am use. As a result, to protect its rights, Cal-Am brought a complaint to the courts in 2003, where the defendants were 9 other pumpers and 4 cities.

The Superior Court rendered a Final Decision on adjudication of basin water rights on March 27, 2006 (as amended). The Decision determined that the Seaside Basin is in overdraft; quantified water rights for parties with overlying water rights ("Alternative Producers"); and set a reduced "natural safe yield" and a near-term "operating yield" allowed to be produced by certain parties with appropriative rights ("Standard Producers") as they work toward a "physical solution" to eliminate the overdraft. The Decision set a timetable that included triennial reductions in basin production to 3,000 AFA. Thus, by 2021, Cal-Am's legal share of water rights in the basin will

1 Additional detailed background information can be found in previous years Mitigation Program Annual reports and in SWRCB Orders 95-10 and 2009-0060.

be reduced to 1,474 AFY – down from production of nearly 4,000 AFY prior to adjudication. A nine-member Watermaster Board was created to implement the Decision with continued oversight by the Court. The MPWMD holds one seat on the Watermaster Board with two out of 13 votes; a MPWMD Board member serves as the MPWMD representative. The Watermaster has generally held monthly meetings since its formal commencement on April 5, 2006. The Watermaster website is at: http://www.seasidebasinwatermaster.org/.

District staff chairs the Watermaster Technical Advisory Committee and contributes data and analysis for several technical reports required by the Court. MPWMD staff and consultants, along with other partners, have been retained by the Watermaster to provide contract technical services, including project management, data collection, and preparation of documents required by the Court as part of the Seaside Basin Monitoring and Management Program.

Water Supply Needs: Community water-augmentation efforts have focused on compliance with SWRCB Orders and the Seaside Basin Adjudication. Because of continuing water conservation outreach and incentives and the enactment of a steeply-tiered rate structure, water use on the Monterey Peninsula has trended down and is currently hovering at levels not seen since 1958. Nevertheless, the Monterey Peninsula community continues to pursue the last needed permanent replacement water supply to ensure there is no long unlawful reliance on the Carmel River or the Seaside Basin beyond its adjudicated limits.

MPWMD Water Supply Project Priorities: On April 17, 2023, the District Board adopted its Strategic Goals and Objectives, which can be found here:

https://www.mpwmd.net/wp-content/uploads/2023-District-Strategic-Goals-and-Objectives.pdf

XVI. STEELHEAD FISHERY MITIGATION MEASURES

The Findings for Certification of the Water Allocation Program Final EIR (Findings Nos. 388-A through D) identified mitigation measures to reduce impacts to the Carmel River steelhead population, including: (a) expansion of the program to capture and transport smolts during spring, (b) prevent stranding of early fall and winter migrants, (c) rescue juveniles downstream of Robles del Rio during summer, and (d) implement an experimental smolt transport program at Los Padres Dam (LPD). Monitoring of adult returns and juvenile populations provides an indication of the overall success of the steelhead mitigation measures. The following sections briefly describe the purpose of each mitigation measure and activities during the current reporting period.

A. Capture and Transport Emigrating Smolts during Spring

Description and Purpose

The goal of this program is to reduce disruption of the steelhead life cycle due to streamflow diversions. During spring months, when steelhead smolts are actively emigrating from freshwater to the ocean, the diversion of surface and groundwater from the river and alluvial aquifer sometimes interferes, and in some cases, blocks migration into the ocean. This threatens individual fish, reduces the number of smolts that successfully reach the ocean, and indirectly affects the number of adults that eventually return to freshwater. When streamflow is too low for natural emigration, or when smolts are at risk of stranding, the Monterey Peninsula Water Management District (MPWMD or District) monitors streamflow, captures emigrating smolts, and transports them to the lagoon or ocean.

Implementation and Activities During 2022

During the primary three-month smolt migration period, March-May 2022, flows in the lower river at the Highway 1 Gage were low, but adequate for smolt migration until late May with mean-daily flows ranging from approximately 3 to 39 cubic feet per second (cfs) **(Figure XVI-1)** and no smolt trapping was needed **(Figure XVI-2).**

B. Prevent Stranding of Fall/Winter Juvenile Migrants

Description and Purpose

As in other central California streams, juvenile steelhead in the Carmel River move downstream into lower reaches of the river prior to the peak smolt emigration. Depending on river conditions and diversions during the previous dry season, there is some risk that pre-smolts and other juvenile steelhead will be stranded following early fall and winter storms. These storms can increase flows and stimulate the fish to move downstream into habitats that are subsequently dewatered after the storm peak passes. This risk occurs primarily from October through January, although during severe droughts, the risk period may extend into March. The District mitigates this problem by capturing and transporting juveniles when necessary during the high-risk period. Currently, juveniles trapped during fall/winter months are transported upstream to viable habitats above the Narrows or held at the District's Sleepy Hollow Steelhead Rearing Facility (SHSRF).

Implementation and Activities During 2022

District staff monitored river conditions during the fall and winter months of 2022, but no additional rescues were needed **(Figure XVI-1)**.

C. Rescue Juveniles Downstream of Robles Del Rio during Summer

Description and Purpose

About 1.5 miles of habitat between Boronda Road and Robles del Rio Road, and up to nine miles of habitat below the Narrows, are seasonally subject to dewatering depending on the magnitude of streamflow releases at LPD, seasonal air temperatures, and drought conditions. Beginning as early as April or May of each dry season, the District may need to rescue juvenile steelhead from the habitat in these reaches. Additionally, the lower reaches of many of the tributaries dry back each summer and may need to be rescued. The goal of this program is to help maintain a viable steelhead population by transplanting juveniles to permanent river habitat above the Narrows (if it is available), and/or rearing juvenile steelhead at the SHSRF if existing habitat is not available or is already fully saturated with juvenile steelhead.

Implementation and Activities 2022 Rescue and Rearing Season

- **MPWMD Fish Rescues -** Since 1989, District staff has rescued 487,941 steelhead from drying reaches of the Carmel River watershed. Compared to previous rescue seasons, the total number of rescued fish in the 2022 dry season was 99% of the 1989-2022 average of 14,351 **(Figure XVI-3)**. Rescue and transport mortality for the 2022 dry season was 0.69%. Average rescue transport mortality for the 1991-2022 period is 0.56% **(Figure XVI-4).**

2022 Annual Mainstem Rescue Totals – Rescues were conducted on 46 days from early June through early September, yielding 14,212 steelhead, including: 13,334 young-of-the-year (YOY), 777 yearlings (1+), 2 adults, and 99 mortalities (0.69%) **(Table XVI-1)**. Staff tagged one adult with Passive Integrated Transponder (PIT) tags before release into the ocean and there were one adult and 29 yearling recaptures.

2022 Tributary Rescues Totals – One rescue day was conducted on Garzas Creek in mid-June, yielding 39 yearling (1+) steelhead, and no mortalities (0.0%) **(Table XVI-1)**.

2022 Transplant Locations - The majority of rescued mainstem fish were taken to the Sleepy Hollow Steelhead Rearing Facility (SHSRF) (12,397). An additional 1,716 fish rescued from marginal water quality conditions were released in the upper valley to avoid potential disease cross contamination with the fish already at the Facility, and 1 adult kelt was released into the ocean **(Table XVI-2)**.

Tributary fish were all released near the confluence with the mainstem **(Table XVI-2)**.

- **Sleepy Hollow Steelhead Rearing Facility (SHSRF)**

Summary of 2022 Fish Stocking and Releases – The first of 12,397 rescued fish were brought to the Facility on June 1, 2022, and all fish were released back into the Carmel River by January 13, 2022. Due to the dry year and the early start of rescues, a large percentage of the young-of-year fish were fry. Approximately 14% of the fry died in quarantine, primarily from post-rescue handing stress.

After the quarantining period, 10,645 fish were stocked in the rearing channel including: 717 1+ year-olds, and 9,928 YOY fish. At the end of the six-month holding period, 8,573 fish (80.5% survival) in excellent condition were released by size class between Scarlett Well and Rancho San Carlos Road bridge **(Table XVI-3)**. Of those, 1,581 fish were PIT tagged by District staff before release.

D. Monitoring of Steelhead Population

Description and Purpose

The District uses three primary techniques to monitor the health of the steelhead population: (1) counts of adult steelhead passing the new lower river weir and LPD, (2) surveys of winter steelhead redds, and (3) surveys of the juvenile steelhead population at the end of the dry season in October.

Implementation and Activities during 2022

- **Winter Steelhead Adult Counts at LPD –** The LPD Fish Trap is operated and monitored by Cal-Am Water. The trap was operated from December 23, 2021 to April 14, 2022. During the 2022 adult steelhead migration season 40 fish were trapped, trucked to the reservoir, then released **(Figure XVI-5)**. The average annual run size for the 1996-2022 period is 107 fish.

- **Winter Steelhead Adult Counts at the Resistance-Board Weir –** The Carmel River receives annual returns of federally threatened South-Central California Coastal (S-CCC) steelhead (*Oncorhynchus mykiss).* As part of the National Marine Fisheries Service (NMFS) Section 10(A)(1)(a) permit, the District has been tasked with estimating annual run sizes of upstream migrating adult steelhead. Using a resistance-board weir and integrated box trap, returning steelhead are temporarily captured in the trap then sexed, measured, and implanted with electronic Passive Integrated Transponder (PIT) tags, before being released upstream of the trap. PIT antennae arrays are installed upstream of the weir (see Section E below for details) to detect tagged fish and improve estimates of the run size using tag-recapture techniques.

From January 7 – April 19, 2022, MPWMD fisheries biologists PIT tagged 58 adult steelhead and released an additional fourteen adults, including three previously PIT tagged fish (recaptures). Total returning steelhead numbers were likely higher, as undocumented fish may have passed through the system prior to the weir installation and days the weir was not operated. Sizes (fork length, mm) of tagged fish ranged from 450-750 mm (mean = 655 mm) and the sex ratio was 39 males to 30 females **(Table XVI-4)**. According to the tagging data, the peak of the run (n = 7) occurred on March 13. The weir was not actively fished for 21 of 103 days, because the river flow was too low, or the lagoon backwatering caused the stage height to rise above the effective fishing height of the weir.

● **Winter Redd Surveys –** Since 1994, the District has conducted winter steelhead redd (nest) surveys downstream of LPD. The surveys provide a thorough assessment of steelhead redds, adult spawning pairs, kelts, and carcasses in the Carmel River, and help evaluate the health and abundance of the steelhead population. Additionally, the general condition of the spawning habitat is documented as well as the numbers of steelhead smolts, juveniles, and fry for each reach. Also noted are areas where low flows might be creating migration barriers to upstream or downstream fish passage.

The surveys are used to monitor gravel movement and spawning activity in conjunction with the District's Spawning Gravel Enhancement Project below LPD. In 2014, approximately 1,500 tons of 1.5 – 4" gravel was placed in the plunge pool with the goal of increasing the available spawning habitat between LPD and Cachagua Creek by 50%. In 2019, in partnership with California-American Water, an additional 1,000 tons of gravel was placed below LPD to keep the reach seeded with spawning-sized material. In 2021, an additional 1,000 tons of gravel were added to help fully seed the reach.

2022 Redd Survey Summary:
Two redd survey passes were conducted in mid-March and late April between Highway 1 (RM 1.0) and Esquiline Bridge (RM 14.45), with spot checks at Sleepy Hollow and LPD, by MPWMD fisheries staff. River flows at the time of the surveys ranged from ~15 to 25 cfs at the survey locations.

Overall, 89 steelhead redds were observed, along with six pairs of spawning adults, 12 single adults, and one kelt.

Pacific Lamprey – Lamprey numbers are increasing in the Carmel River watershed the past few years, and with the removal of San Clemente Dam (SCD) they are able to spawn in the upper watershed for the first time since the 1920's. In 2022, staff counted 53 lamprey redds, primarily downstream of Garland Park.

● **Juvenile Steelhead Population Surveys –** Since 1990, the District has surveyed the juvenile steelhead population in the Carmel River below LPD. This information is crucial to assess escapement and to determine whether freshwater habitats are adequately seeded with juveniles.

In 2022, seven survey sites were sampled throughout the 16-mile reach between Scarlett Narrows (mid-valley) and Cachagua. Juvenile densities remained healthy and were the second highest since 2008, ranging from 0.63 – 1.62 fish-per-foot (fpf) (5,544 fish-per-mile) **(Table XVI-5)**. The average this year was 1.05 fpf – well above the long-term average of 0.74 fpf (3,905 fish per mile). The three-year moving average continued its steep upward trend that started in 2016 after a long drought **(Figure XVI-6)**.

● **Constraints to Cal-Am Diversions from the Lower Aquifer –** During the 1992 SWRCB hearings on complaints against Cal-Am's diversions from the Carmel River, testimony was presented that outlined the potential benefits of a modified way of managing the sequence of pumping from Cal-Am well fields in the Carmel Valley Alluvial Aquifer. Pursuant to Condition No. 5 of SWRCB Order WR 95-10, Cal-Am was required to operate its Carmel Valley production wells beginning with the most downstream well and moving upstream to other wells as needed to meet demand. The

goal of this order was to maximize the length of viable stream and aquatic habitats in the lower Carmel Valley.

During the 2022 dry season, we estimated that this mode of operation and flow releases from Los Padres Reservoir did not result in additional viable aquatic habitat. Drought conditions required fish rescues up to Robinson Canyon Road Br.

E. Other Activities Related to the Steelhead Resource

The District continues to carry out several activities that were not specifically identified as part of the original Allocation EIR Mitigation Program but aim to improve habitat conditions and provide additional steelhead life history information. These include: (a) rescue and relocation of kelts, (b) spawning habitat restoration and monitoring, (c) assessment of steelhead migration barriers, (d) PIT tagging, (e) assessment of the benthic macro-invertebrate (BMI) communities, and (f) Carmel River habitat mapping.

Implementation and Activities in 2022

- **Passive Integrated Transponder (PIT) Tagging** – Since 2013, the District has been collaborating with the NMFS Southwest Fisheries Science Center on establishing a steelhead tagging and monitoring array system in the Carmel River. An array is a wired antenna that detects the tags as fish pass by. Each tagged individual has a unique identification number, which allows identification of individual fish, length, sex, location of tagging, and direction of travel. Data collected assists in management decisions, recovery efforts, and ongoing mitigation evaluations.

In 2022, the District operated three of five PIT tag antenna arrays in the mainstem Carmel River. To date, the collaborators have PIT tagged over 23,000 steelhead.

- **Rescue and Transportation of Kelts** – "Kelts" are adult steelhead that have already spawned, typically from January through April, and begin to out-migrate to the ocean in late spring and early summer. Under existing conditions, kelts are threatened by receding flows in many years, especially when the upstream migration of adults is delayed due to lack of early-season storms. District staff rescue and relocate kelts to more suitable waters.

In 2022, no trapping was necessary but two kelts were captured during summer rescues and released into the lagoon or ocean.

- **Bioassessment Program** – The California State Water Resources Control Board's Reach Wide Benthic (RWB) protocol's Surface Water Ambient Monitoring Program (SWAMP) procedures are followed to sample benthic macroinvertebrates (BMI) and assess their physical habitats.

The "20-Year Summary Report of the MPWMD's Bioassessment Program" was completed by J. Thomas King of BioAssessment Services in 2021. The report provides an in-depth analysis and comparisons of stream health at the various sample locations between the lower Carmel River and the Los Padres Wilderness from 2000-2020. The report is available on the District's website.

In November 2022, four locations were sampled between the control site in the Los Padres Wilderness above Los Padres Reservoir (CRALP) and Stonepine Resort (CRSP). Sites are given an Index of Biotic Integrity (IBI) score between 0 (poor) and 100 (excellent). IBI scores at most sites were lower than in recent years due to the two-year drought conditions. (**Figure XVI-7).**

- District staff continues to provide technical expertise and scientific data to CAW engineers and environmental consultants, DWR/DSOD, CDFW, NMFS, U.S. Fish and Wildlife Service, and others involved in addressing the resource management issues associated with both LPD and the area influenced by the SCD Removal and Carmel River Reroute Project. District staff also continues to provide technical expertise and scientific data to California Department Parks and Recreation, Monterey County Water Resources Agency, Monterey County Public Works Department, California Coastal Commission, U. S. Army Corps of Engineers, Carmel Area Wastewater District, and other regulatory agencies and stakeholders involved in the management of the Carmel River, the Carmel River Lagoon and the barrier beach.

OBSERVED TRENDS, CONCLUSIONS AND/OR RECOMMENDATIONS:

- **Adult Steelhead**

Redd surveys conducted downstream of the former SCD confirm improvements in spawning habitat and increased spawning success in the lower river over the last 24 years. Additionally, juvenile steelhead rescued from the lower river that survive to adulthood may return to reaches lower in the river to spawn.

Variability in adult steelhead counts results from:

- Highly dynamic ocean conditions, increasing water temperatures, and degraded ocean water quality likely affect the abundance of food resources and at-sea survival of returning steelhead.
- Variable river conditions and flow regimes can affect migration and spawning success.
- Variable lagoon conditions, caused by artificial manipulation of the sandbar and/or naturally occurring periods of low winter flows.
- Variable densities of juvenile fish affecting subsequent adult populations.

- **Juvenile Steelhead**

Long-term monitoring of juvenile steelhead at eleven sites along the mainstem Carmel River below LPD suggests that fish density continues to be quite variable between years and among sites, from less than 0.10 fish-per-foot (fpf) of stream to levels frequently above 1.00 fpf, values that are typical of well-stocked steelhead streams. However, fish density has been improving since the last long drought of 2013-15. In this 2022 reporting period, the average population density was 1.05 fpf, much higher than the long-term average of 0.74 fpf for the Carmel River, continuing the strong upward trend.

The juvenile steelhead population in the Carmel River Basin is influenced by:

Positive Factors:

- General improvements in streamflow, due to favorable natural fluctuations, exemplified by higher base-flow conditions and several high precipitation years.
- District and SWRCB rules to actively manage the rate and distribution of groundwater extractions and direct surface diversions within the basin, coupled with changes to Cal-Am's operations at LPD, the increased availability of ASR and Pure Water Monterey in the summer, and extensive conservation measures, all help provide increased streamflow.
- Restoration and stabilization of the lower Carmel River's stream banks, providing improved riparian habitat (tree cover/shade along the stream, an increase in woody debris and the associated invertebrate food supply) while preventing erosion of silt/sand from filling gravel beds and pool.
- The removal and restoration of the San Clemente Dam and Reservoir, and other barriers in the mainstem and tributaries, improved passage and habitat values for adults and juvenile fish.
- Extensive juvenile steelhead rescues by the District over the last 33 years, now totaling 487,941 fish through 2022.
- Rearing and releases of rescued fish from the SHSRF of 114,149 juveniles and smolts into the river and lagoon over the past 26 years (19 years of operation), at sizes generally larger than the naturally reared fish, which could enhance their ocean survival.

Negative Factors:

- Variable lagoon conditions, including highly variable water surface elevation changes caused by mechanical breaching, chronic poor water quality (especially in the fall), and predation by birds and striped bass.
- Barriers or seasonal impediments to juvenile and smolt emigration, such as intermittent periods of low flow below the Narrows during the normal spring outmigration.
- Spring flow variability such as low-flow conditions that could dewater redds prematurely or high flows that could either deposit sediment over redds or completely wash them out.
- Occasionally elevated temperature and hydrogen sulfide levels below LPD, and the recent large landslide into LPR that affects the outlet works.
- The potential for enhanced predation on smolts and YOY migrating through the sediment field above LPD.
- Invasive species: striped bass have recently (2015) started migrating up the river from the lagoon and are likely preying on juvenile steelhead. New Zealand Mud Snails (NZMS) were first discovered during BMI surveys at Red Rock (mid-valley) in 2016 and have now been found in the Stonepine reach in the upper valley. NZMS can outcompete native invertebrates and are a poor food item themselves for steelhead.

Figure XVI-1

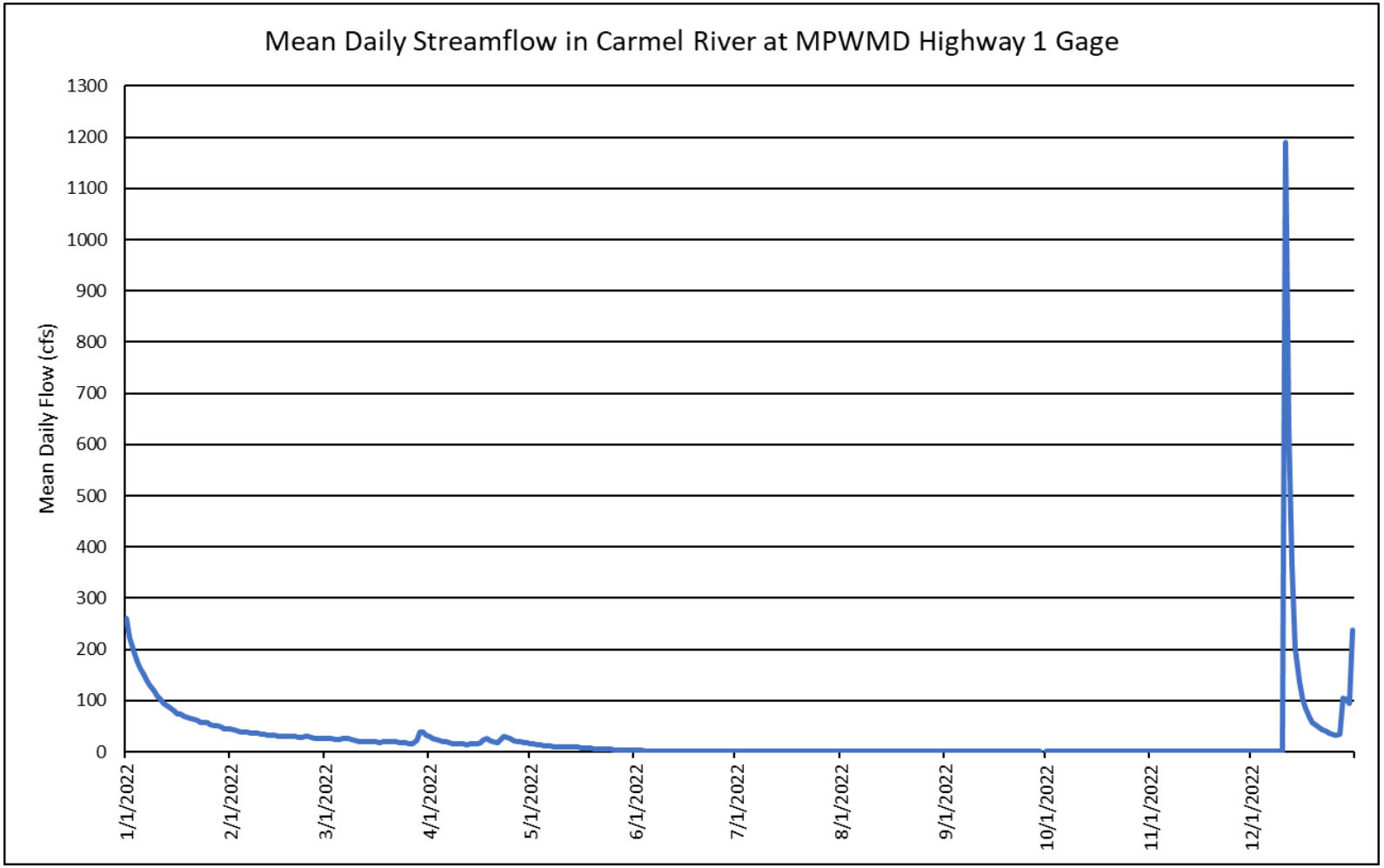

Mean Daily Streamflow in Carmel River at MPWMD Highway 1 Gage
Mean Daily Flow (cfs)
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
1/1/2022
2/1/2022
3/1/2022
4/1/2022
5/1/2022
6/1/2022
7/1/2022
8/1/2022
9/1/2022
10/1/2022
11/1/2022
12/1/2022

Figure XVI-2

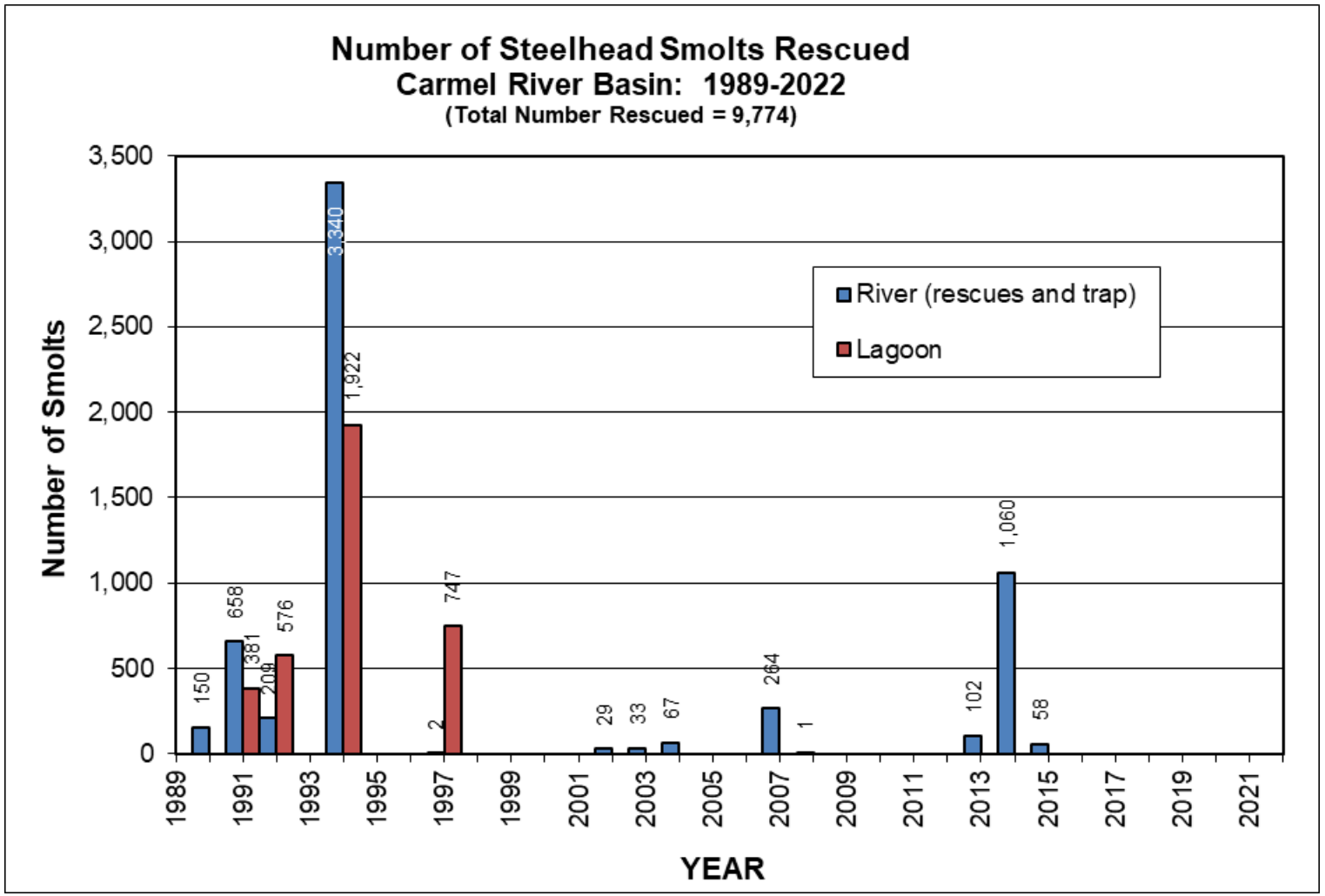

Number of Steelhead Smolts Rescued
Carmel River Basin: 1989-2022
(Total Number Rescued = 9,774)
Number of Smolts
YEAR
River (rescues and trap)
Lagoon
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
150
658
381
209
576
3,340
1,922
2
747
29
33
67
264
1
102
1,060
58

Figure XVI-3

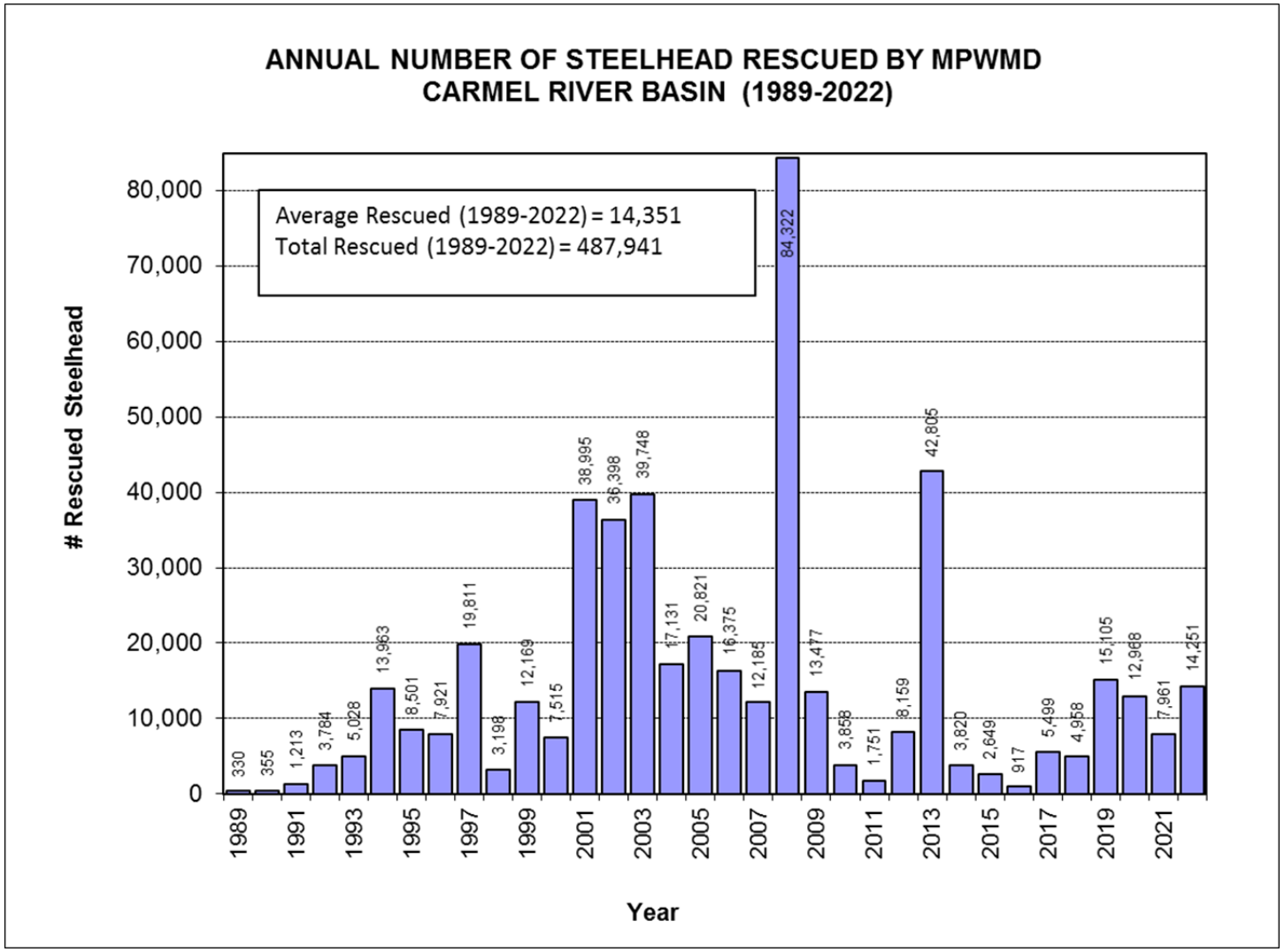
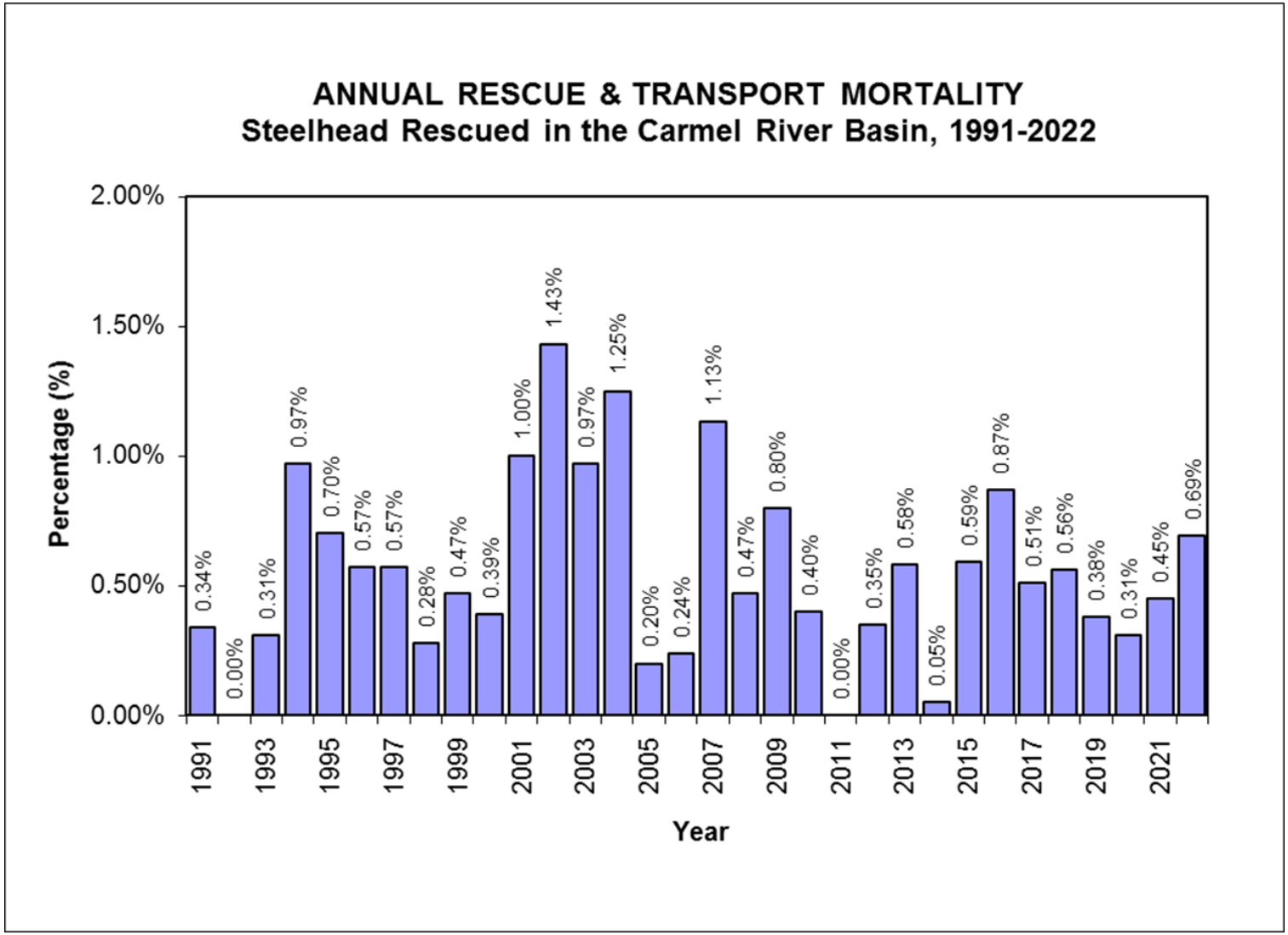


Figure XVI-4



Average Rescue/Transport Mortality = 0.56%

Figure XVI-5

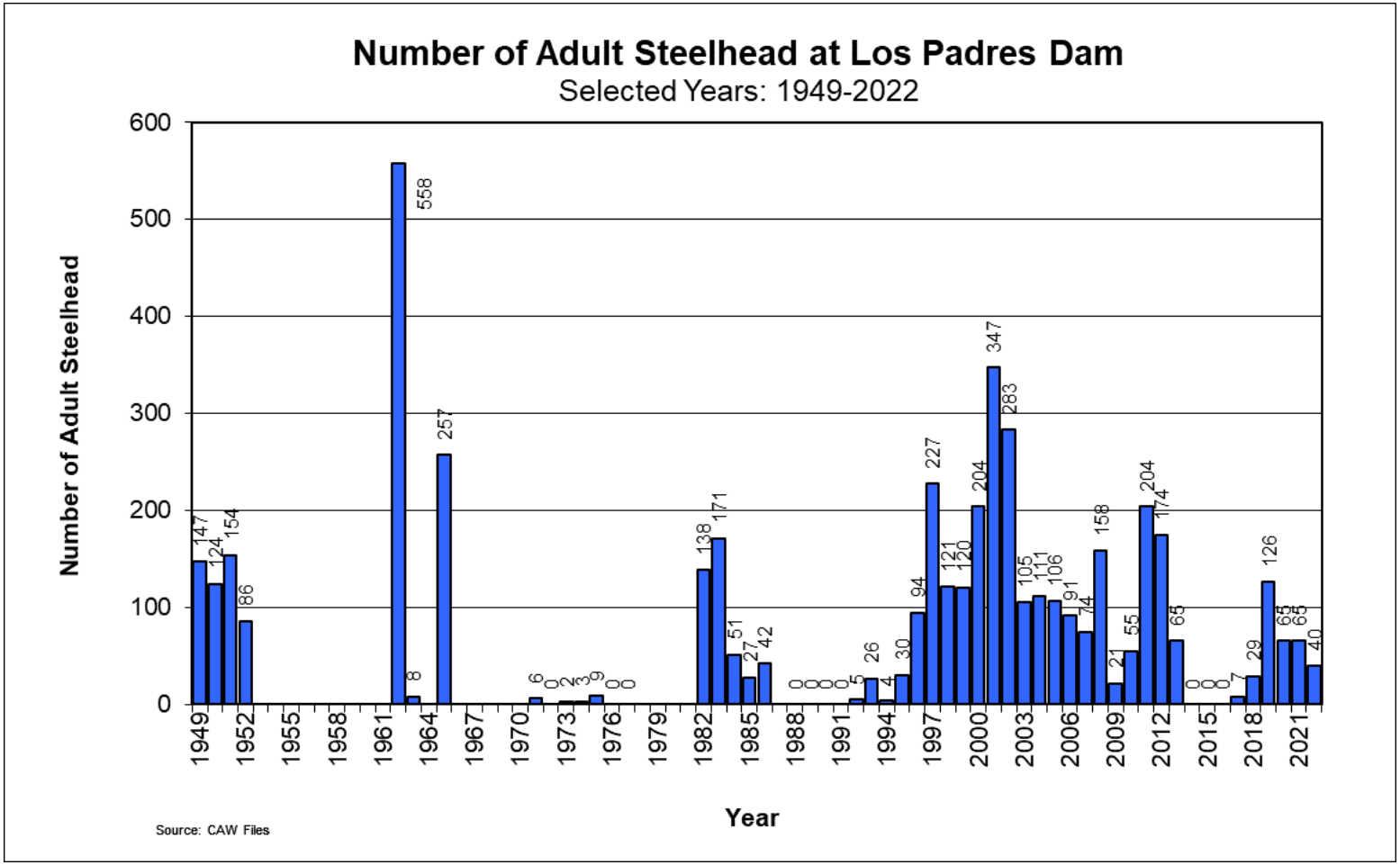

Number of Adult Steelhead at Los Padres Dam
Selected Years: 1949-2022
Number of Adult Steelhead
Year
Source: CAW Files
600
500
400
300
200
100
0
1949
1952
1955
1958
1961
1964
1967
1970
1973
1976
1979
1982
1985
1988
1991
1994
1997
2000
2003
2006
2009
2012
2015
2018
2021
147
124
154
86
558
8
257
6
0
2
3
9
0
0
138
171
51
27
42
0
0
0
0
5
26
4
30
94
227
121
120
204
347
283
105
111
106
91
74
158
21
55
204
174
65
0
0
7
29
126
65
65
40

Figure XVI-6

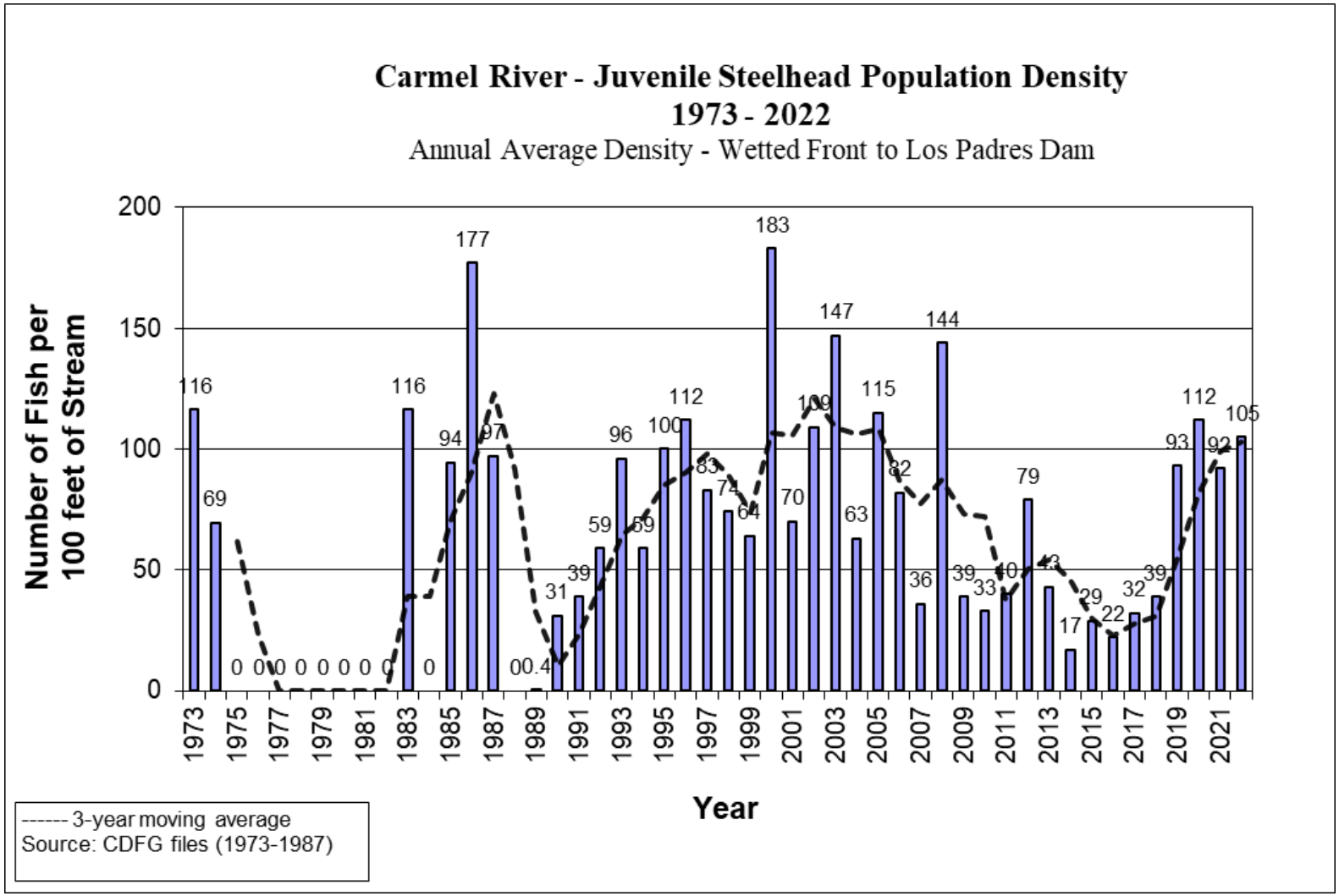
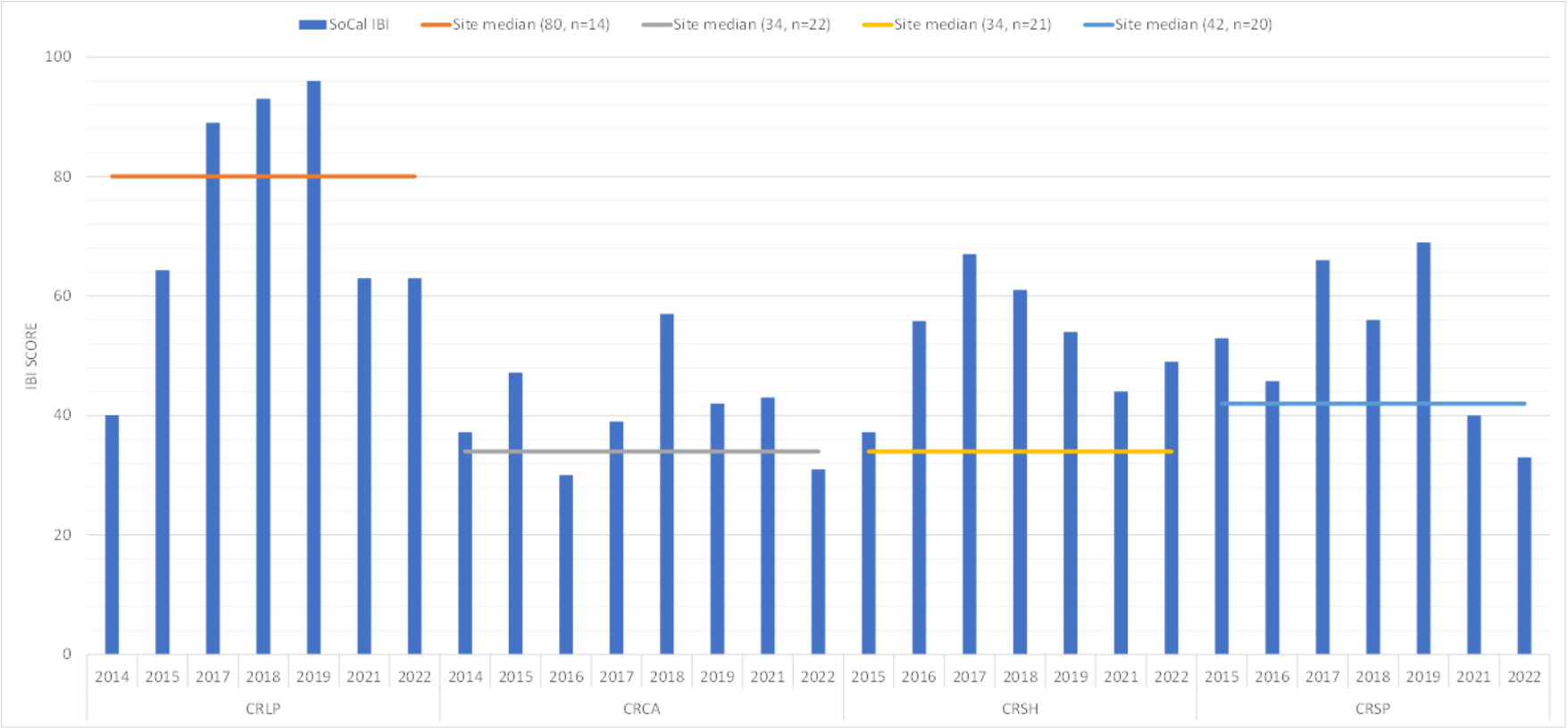

Carmel River - Juvenile Steelhead Population Density
1973 - 2022
Annual Average Density - Wetted Front to Los Padres Dam
Number of Fish per 100 feet of Stream
Year
------ 3-year moving average
Source: CDFG files (1973-1987)

Figure XV1-7



Index of biotic integrity scores for Carmel River sites from 2014 through 2022 where samples were collected using the reach-wide benthic procedure. Scores can range from 0 (poor) to 100 (very good). Site median values incorporate historic data from years 2000 to 2010.

Table XVI-1

Number of Steelhead Rescued in the Carmel River Watershed by age group and general location, Rescue Year 2022.

Age Group	Mainstem	Tributaries
YOY	13,334	0
1+	777	39
Smolts	0	0
Kelt	2	0
Mortalities	99 (0.69%)	0
Total	**14,212**	**39**

Table XVI-2

Transplant Locations of (non-smolt) Steelhead Rescued in the Carmel River Watershed, Rescue Year 2022.

Rescue location	Release Location	River Mile	Number Released
Carmel River	Stewarts Cove/Pacific Ocean	0	1
Carmel River	West Garzas Well	12.1	989
Carmel River	Lower Circle	14.9	727
Carmel River	SHSRF	17.2	12,397
Garzas Creek	West Garzas Well	12.1	39
TOTAL			**14,153**

NOTE: River miles are approximate

Table XVI-3
Sleepy Hollow Steelhead Rearing Facility
Facility Summary: June 1, 2022 - January 11, 2023

Rearing Location	Size/Age (at stocking)	# Stocked	# Morts **	#Unaccounted for Morts	Total # Released	% Survival*	Release Location
Quarantine (RT)*	Mixed	12,397	1752		10645	85.9	Stocked in RC
Holding tank jumpers from RC10/11/12**	Lg		123				
RC 1	X-Lg (2+)	23	0	0	23	100.0	Sleepy Hollow (SH)***
RC 2	Lg (2+)	83	17	0	66	79.5	Rancho San Carlos (RSC) / SH
RC 3	Med. YOY	994	61	31	902	90.7	Robinson Canyon Br. / SH
RC 4	Med. YOY	968	64	65	839	86.7	Robinson Canyon Br. / SH
RC 8	Med. YOY	1554	121	184	1249	80.4	Robinson Canyon Br. / SH
RC 9	Sm. YOY	1634	121	338	1175	71.9	Scarlett Well (SC) / Red Rock(RR) / SH
RC 10	Sm. 1+	266	17	16	233	87.6	RSC
RC 11	Lg. 1+	152	3	5	144	94.7	RSC
RC 12	Med. 1+	193	43	0	150	77.7	RSC / SH
RC 13	Lg. YOY	872	139	1	732	83.9	SW / RR / RSC / SH
RC 14	Sm. YOY	2029	260	0	1769	87.0	SW / RR / SH
RC 15	Sm. YOY	1877	236	232	1414	75.3	SW / RR / SH
Rearing Channel Results		**10,645**	**1082**	**872**	**8696**	**81.7%**	
Overall Facility Results		**12,397**	**2957**	**872**	**8573**	**70.1%**	
RC = Rearing Channel bay number			**23.9%**	**7.0%**			

Tagging: ~ 1,581 fish (1387 YOY / 264 1+) were PIT tagged before release

* Due to the drought conditions in 2022, ~90% of the 12,397 incoming rescued fish were very small fry. These fish were held in quarantine tanks for up to a month before growing large enough to stock in the rearing channel. Appoximately 14% of these fry died from rescue handling stress before they were large enough to stock in the RC. (overall facility survival 70.1%)

** An additional 123 fish from RC 10/11/12 died after jumping out of a holding tank during a severe wind and rain storm in December.

*** Due to a series of severe storms in late December and January that risked loss of the Facility, the access road, and injury to staff, after January 6 all fish from the RC were released in the river at Sleepy Hollow.

Table XVI-4

Summary of Resistance-Board Weir Operations - 2022.
Life Cycle Monitoring – Adult Steelhead

	December	January	February	March	April	May	**Total**
# Adults Captured	0	38	14	19	1	0	**72**
# Tagged	0	37	13	6	1	0	**57**
# Recaptured	0	1	1	1	0	0	**3**
Male : Female	0	24:14	5:9	10:6	0:1	0	**39:30**

Table XVI-5

Carmel River Juvenile Steelhead Annual Population Survey [1]

Lineal Population Density at Survey Stations (numbers per foot of stream) [2, 3]

	Valley Greens Br.	Red Rock (Mid Valley)	Scarlett Narrows	Garland Park	Boronda	DeDamp Park	Stonepine Resort	Sleepy Hollow	SCR Lower Delta	SCR Upper Delta	Los Compadres	Cachagua	**Overall Annual Average**	
YEAR	RM 4.8	RM 7.7	RM 8.7	RM 10.8	RM 12.7	RM 13.7	RM 15.8	RM 17.5	RM 19.0	RM 19.6	RM 20.7	RM 24.7	**(nos./ft)**	**(nos./mi)**
1990					ND		0.50	0.27			0.26	0.22	**0.31**	**1,650**
1991					0.12		0.74	0.39			0.09	0.62	**0.39**	**2,070**
1992				0.67	0.36		0.96	0.30			0.40	0.83	**0.59**	**3,098**
1993			0.62	0.91	0.92	0.82	0.84	0.52			1.22	1.84	**0.96**	**5,075**
1994		ND	0.44	0.23	0.43	ND	0.50	0.29			1.51	0.71	**0.59**	**3,100**
1995		0.49	0.65	1.01	1.61	ND	1.42	0.69			0.50	1.63	**1.00**	**5,281**
1996		0.24	1.52	0.82	1.05	**2.03**	1.22	0.29			0.95	1.92	**1.12**	**5,890**
1997		0.02	0.22	1.02	1.74	1.15	0.50	0.22			1.15	1.41	**0.83**	**4,359**
1998		0.19	0.30	0.67	0.34	1.50	0.27	0.60			0.54	**2.24**	**0.74**	**3,901**
1999		0.17	0.26	0.50	0.32	0.62	1.67	0.45			0.46	1.35	**0.64**	**3,403**
2000		0.91	1.03	0.64	1.38	**5.66**	1.71	1.46			1.41	**2.30**	**1.83**	**9,680**
2001		ND	0.48	0.35	0.63	0.68	1.08	0.32			0.47	1.62	**0.70**	**3,716**
2002		ND	0.68	0.85	1.67	0.83	1.07	0.50	0.33	0.68	1.52	**2.73**	**1.09**	**5,734**
2003		1.53	0.82	**2.16**	1.86	1.45	1.55	1.23	0.58	1.09	1.69	**2.16**	**1.47**	**7,738**
2004		0.25	0.46	0.78	1.21	0.43	1.24	0.55	0.21	0.41	0.45	0.89	**0.63**	**3,302**
2005		1.23	0.60	1.34	1.16	0.91	1.62	1.63	0.21	0.85	0.98	**2.10**	**1.15**	**6,062**
2006		1.13	0.64	0.86	0.87	0.47	0.37	0.95	1.65	0.28	0.82	1.00	**0.82**	**4,339**
2007		ND	0.15	0.50	0.77	0.06	0.33	0.16	0.36	0.25	0.49	0.50	**0.36**	**1,885**
2008		ND	0.90	**2.61**	**3.64**	1.11	1.19	1.38	0.17	0.71	1.13	1.56	**1.44**	**7,603**
2009		0.24	ND	0.25	ND	0.27	ND	0.48	ND	ND	ND	0.72	**0.39**	**2,070**

Continued next page:

Table XVI-5 continued

Carmel River Juvenile Steelhead Annual Population Survey (page 2, continued)

Lineal Population Density at Survey Stations (numbers per foot of stream) [2, 3]

	Valley Greens Br.	Red Rock (Mid Valley)	Scarlett Narrows	Garland Park	Boronda	DeDamp Park	Stonepine Resort	Sleepy Hollow	SCR Lower Delta	SCR Upper Delta	Los Compadres	Cachagua	Overall Annual Average	
YEAR	RM 4.8	RM 7.7	RM 8.7	RM 10.8	RM 12.7	RM 13.7	RM 15.8	RM 17.5	RM 19.0	RM 19.6	RM 20.7	RM 24.7	(nos./ft)	(nos./mi)
2010	0.19	0.06	ND	0.30	0.38	0.17	0.31	0.32	0.26	0.11	0.60	0.78	**0.33**	**1,737**
2011	0.11	0.17	ND	0.36	ND	ND	ND	1.07	ND	ND	ND	0.27	**0.40**	**2,091**
2012	ND	0.67	0.47	1.01	1.58	0.35	0.59	0.37	**1.31**	0.74	0.82	0.83	**0.79**	**4,195**
2013	ND	ND	0.41	ND	ND	ND	ND	ND	ND	ND	0.40	0.48	**0.43**	**2,270**
2014	ND	ND	0.07	0.14	ND	ND	0.18	0.12	ND	0.24	0.30	0.17	**0.17**	**920**
2015	ND	ND	ND	0.10	ND	ND	0.19	0.30	ND	0.30	0.38	0.46	**0.29**	**1,522**
2016	ND	ND	0.07	0.15	0.14	0.19	0.13	0.24	site removed	0.34	0.40	0.31	**0.22**	**1,156**
2017	0.01	0.07	0.41	0.17	0.36	0.20	0.35	0.25		0.24	0.71	0.74	**0.32**	**1,690**
2018	ND	0.23	0.50	0.46	0.41	0.47	0.36	0.28		0.32	0.44	0.45	**0.39**	**2,070**
2019	**0.46**	**1.26**	**1.30**	1.50	1.13	0.64	0.68	1.12		0.71	0.67	0.74	**0.93**	**4,901**
2020	ND	0.81	**1.28**	**1.91**	1.31	0.87	0.66	1.63		ND	ND	0.51	**1.12**	**5,927**
2021	ND	ND	0.91	1.50	1.59	ND	0.52	1.04		0.60	0.33	0.90	**0.92**	**4,877**
2022	ND	ND	1.32	1.62	0.63	ND	0.86	1.36			0.84	0.72	1.05	5,544
Station Ave (#/ft)	**0.19**	**0.54**	**0.64**	**0.85**	**1.02**	**0.95**	**0.79**	**0.65**	**0.56**	**0.49**	**0.73**	**1.08**	**0.74**	**3905**
Station Ave (#/mile)	**1,016**	**2,837**	**3,353**	**4,469**	**5,399**	**5,011**	**4,155**	**3,429**	**2,980**	**2,597**	**3,860**	**5,714**		
Overall Station Averages (1990 to present):													**0.71**	**3,735**

[1] Surveys completed in October and results based on repetitive 3-pass removal method using an electrofisher. Green = Excellent year Red = very poor year (yellow = preliminary)

[2] RM; indicates miles from rivermouth

[3] ND indicates stream was dry at sampling station or that site was not sampled that year. Blanks = site not added yet. 2009 - huge storm mid-Oct and river got too high to sample. 2013 - much of river dry. SCR under construction.

u/beverly/excel/popsurvey/stat linial density1990_2022 updated 0223

U:\Beverly\word\mitannualrpt\2022\2022 Sec_XVI

XVII. RIPARIAN HABITAT MITIGATION MEASURES

The Findings of Adoption of the 1990 Water Allocation Program Final EIR identified four mitigation measures to reduce impacts to the Carmel River riparian corridor, which includes wildlife that is dependent on streamside habitat (Finding Nos. 389-A through D, and 391). The measures are: (a) conservation and water-distribution management to retain water in the river; (b) prepare and oversee a Riparian Corridor Management Plan; (c) implement the Riparian Corridor Management Program; and (d) expand the existing monitoring program for soil moisture and vegetative stress.

Since 2007, the Monterey Peninsula Water Management District (MPWMD or District) has been the lead agency in developing and implementing the Integrated Regional Water Management Plan (IRWM Plan) for the Monterey Peninsula region.

The IRWM region consists of coastal watershed areas in Carmel Bay and south Monterey Bay between Pt. Lobos on the south and the Fort Ord Dunes State Park on the north – a 38.3-mile stretch of the Pacific coast. The area encompasses the six Monterey Peninsula cities of Carmel-by-the Sea, Del Rey Oaks, Monterey, Pacific Grove, Sand City, Seaside, and extends into portions of the unincorporated area of Monterey County in the Carmel Highlands, Pebble Beach and the inland areas of Carmel Valley and the Laguna Seca area.

A funds sharing agreement for the Central Coast funding area consisting of coastal watersheds from Santa Cruz County to Santa Barbara County was executed in 2016 that will allow the Monterey Peninsula region to plan for receiving $4.6 million in IRWM grant funding. Additional information is contained at the end of this chapter.

A. Conservation and Water Distribution Management to Retain Water in the Carmel River

The purpose of this measure is to reduce pumping impacts on riparian vegetation, particularly in the region of Aquifer Subunit 2 (Scarlett Narrows to Carmel Valley Village). Activities to further this goal during 2021-2022 are summarized above in **Section II** (Hydrologic Monitoring), **Section V** (Annual Low Flow MOA), **Section VI** (Quarterly Budget), and **Section VIII** (Water Efficiency and Conservation).

B. Oversee Riparian Corridor Management Program

Riparian habitat mitigation measures proposed in the Water Allocation Program Final EIR have formed the basis for riparian corridor management activities undertaken since the Board of Directors certified the EIR in November 1990. The Riparian Corridor Management Program (RCMP) integrates the District's many riparian mitigation and management activities into one program. Components of the RCMP include the Carmel River Erosion Protection and Restoration Program; continued irrigation around Cal-Am production wells in the lower Carmel Valley and around existing District restoration projects; in-channel vegetation management; public education; enforcement of District rules and regulations; and monitoring of wildlife, vegetation and soil.

C. Implement Riparian Corridor Management Program

The goal of the Riparian Corridor Management Program is the rehabilitation, restoration, enhancement and preservation of the streamside corridor along the Carmel River. As described below, several major sub-programs are carried out to achieve this goal.

Implementation and Activities During 2021-2022

During FY 2021-2022, MPWMD accomplished the following:

- continued revegetation efforts at exposed banks with little or no vegetation located in Aquifer Subunits 2 and 3 (Via Mallorca Rd. to Esquiline Rd.);
- operated under a Routine Maintenance Agreement with California Department of Fish and Wildlife and a Regional General Permit with the U.S. Army Corps of Engineers for maintenance activities associated with vegetation encroachment and restoration projects;
-
- diversified restoration projects and experimented with planting techniques that allow trees to mature more quickly and depend less on irrigation;
- continued long-term monitoring of physical and biological processes along the river in order to evaluate the District's river management activities;
- continued the annual inspections of the Carmel River from the upstream end of the lagoon at River Mile (RM) 0.5 to Camp Steffani at RM 15.5 (staff members responsible for vegetation management and erosion prevention annually inspect the river to observe and record erosion damage, conditions that could cause erosion [e.g., in-channel vegetation or debris], riparian ordinance infractions, presence of deleterious material, and the overall condition of the riparian corridor);
- carried out vegetation management activities at these sites in the summer of 2022 (Highway One Area, San Carlos Bridge, Valley Greens Bridge, RV Park, and Boronda Bridge);

The following sections describe MPWMD's work in more detail.

● Carmel River Erosion Protection and Restoration

Lower San Carlos Restoration Project: The two-mile reach between the lower end of the Rancho Cañada golf course and Rancho San Carlos Road Bridge has historically been unstable and has eroded at various locations during high flows in 1969, 1978-1983, 1995, 1998, 2006, 2007, 2011, and 2017. Floodplain development and frequent seasonal Carmel River dewatering are the primary causes of this periodic instability, with continued channel degradation also a factor.

During the spring of 2011, additional erosion of the north streambank occurred immediately downstream of the Rancho San Carlos Road Bridge. MPWMD staff have subsequently inspected the site annually. High flows in January and February 2017 removed up 50 feet of the left streambank and resulted in the loss of several large cottonwoods and a portion of Santa Barbara sedge, which is used by Native Americans for making basketry. The District retained Balance

Hydrologics, Inc. to develop a restoration plan. Construction of a cribwall for approximately 160 lineal feet was carried out on the left bank and some root wads combined with boulders for the right bank took place in the summer of 2018.

The plantings at the project are doing well and the District is looking forward to seeing the young trees mature. As the vegetation matures the project will help provide stability to this reach.

Riparian Ordinance Enforcement Action: MPWMD continues to work with private property owners on how to protect the riparian corridor. Typical actions included helping property owners plant native streamside vegetation on their property to prevent erosion.

Monitoring San Clemente Dam Removal and Carmel River Reroute: MPWMD engaged in efforts with state, local, and federal scientists interested in pre- and post-construction monitoring of the Carmel River. This included providing funding to the School of Natural Sciences at California State University Monterey Bay to carry out topographic, sediment, and large wood survey work.

- **Vegetation Restoration --** Various techniques for vegetation installation were employed at District restoration projects. Planting techniques involved either rooted seedlings or cuttings sustained by irrigation, or deeper plantings set to tap summer groundwater without supplemental water applications. The District continued to diversify streambanks by planting with willows, black cottonwoods, and sycamores.

The primary objectives of the District's restoration planting effort are to stabilize eroded stream banks with native vegetation and to enhance habitat values near the stream, on adjacent floodplains, and terrace areas. One of the goals of the habitat enhancement program is to diversify restoration plantings by identifying microhabitat areas and revegetating them with species typical of those riparian habitat sites. District staff provided riparian plants to several private property owners. Rooted seedlings are obtained from cuttings and seeds collected from along the Carmel River and propagated by a local nursery.

- **Irrigation Program --** Established riparian vegetation has proven to be an effective deterrent to stream erosion; the mat-like roots of most riparian species bind together loose channel banks and foliage tends to slow the velocity of high river flows. The District selectively irrigates mature streamside vegetation and newly established restoration plantings in order to maintain a healthy, vigorous riparian corridor both for erosion protection and habitat enhancement.

Table XVII-1 and **Figure XVII-1** shows water use at various restoration and riparian mitigation sites for calendar year 2022. A total of 2.62 acre-feet (AF) of water were applied in 2022. In calendar year 2021, 2.99 AF were used to irrigate riparian vegetation. The irrigation season typically begins in April and continues through the end of November.

- **Vegetation Management --** Since Fall 1990, the District has carried out annual vegetation management projects along portions of the Carmel River to reduce potential obstructions to river flow and to reduce the potential for bank erosion. In the past, the District has removed downed trees and vegetation that could deflect high water onto adjacent stream banks, thereby inducing

erosion and degrading streamside habitat.

Carmel River Inspection - Annually, staff assesses the lower 15.5 miles from the lagoon to Camp Steffani in order to determine if and where clearing should occur. At sites where debris and/or live vegetation is judged to be a potential hazard, staff balances the goals of conserving aquatic and streamside habitat with reducing the potential for erosion of private and public property and infrastructure. Only woody plant material representing a bank erosion threat is treated by notching or partially cutting through the trunk and large limbs.

During the fall of 2022, five areas with vegetation encroachment, debris piles, and downed trees in the channel bottom were selected for vegetation management:

1. Highway One Area (downed tree and encroachment): at approximately River Mile (RM) 0.5 a willow tree that had fallen downstream opposite of the Carmel Area Wastewater District, was cut in two sections and left in place for large wood habitat. In addition, at approximately RM 0.9 a willow tree encroaching into the main channel was trimmed back.

2. San Carlos Bridge Area (downed trees): at approximately RM 3.7 downstream of Rancho San Carlos Bridge, multiple trees had fallen into the active channel. These trees had their crown branches trimmed off and the trunk cut in several sections to prevent debris dams or hazards associated with large mobile trees.

3. Valley Greens Bridge (downed tree): at RM 4.9 a downed cottonwood was cut in two places and left in place for large wood habitat.

4. RV Park Area (downed tree): at RM 5.7 a downed cottonwood had its crown branches removed and was cut in two sections and left in place for large wood habitat.

5. Boronda Bridge Area (downed tree): at RM 12.6 downstream of Boronda Bridge, a downed willow tree had its crown branches trimmed off and the trunk was cut in three places and left in the channel for large wood habitat.

In addition to erosion hazard reduction, vegetation management objectives include removing trash and inorganic debris from the river channel. During FY 2021-2022, trash such as plastic, paper, cans, bottles and car parts were removed from the channel and disposed by the District.

In general, the health of the riparian corridor along the lower 15.5 miles of the river appeared to be good with continued development of naturally recruited species, such as black cottonwoods, willows, and sycamores, on some of the engineered floodplains as well as natural gravel bars. While most of the stream channel remained clear of major obstructions, District staff believes that continued selective trimming of encroaching vegetation and breaking up of debris piles will be necessary during the summer of 2023. Without such a program, it is possible that unauthorized vegetation removal by property owners along the river may increase and lead to a decline in the health and stability of the riparian corridor.

- **Public Information and Partnerships**

MPWMD continued its outreach program by participating in Carmel River Task Force meetings and meeting with property owners to evaluate the stability of their streambank.

D. Expand Monitoring Programs for Soil Moisture and Vegetative Stress

This mitigation measure involves implementing a groundwater and vegetation monitoring program to better assess plant water stress and related irrigation needs in the riparian zone. Data from soil-moisture and plant water-stress tests facilitate the identification and location of impacts resulting from the prolonged depression or rapid drawdown of the water table. Soil and plant monitoring also documents the beneficial results of riparian mitigations, and provides a statistical foundation for determining trends in conditions over time.

In calendar year 2021, staff collected bi-monthly canopy ratings of individual trees at four study sites in mid and lower Carmel Valley (Palo Corona, San Carlos, Schulte Restoration Project, and the Valley Hills Restoration Project). Canopy ratings are used to determine the amount of defoliation that is occurring in riparian trees due to moisture stress associated with a falling water table. **Figure XVII-2** shows average canopy ratings for both willows and cottonwoods. Results showed that willows and cottonwoods showed some signs of moisture stress because of a Dry rainfall year that was impacted by groundwater extraction. It should be noted that many trees are irrigated in the vicinity of large production wells to offset impacts associated with water extraction. Monitoring results help District staff determine irrigation requirements for portions of the riparian corridor that are under the influence of groundwater extraction. Photo documentation and measurements of foliage volume occurs in other areas as well, depending on river flow conditions and depth to groundwater.

In addition to vegetation and groundwater monitoring, avian (bird) species diversity monitoring has been carried out annually from 1992 to the summer of 2010 and then on a periodic basis starting in 2015. Data collected by Dr. David Mullen,Big Sur Ornithology Lab, and Ventana Wildlife Society since 1992 compares habitat values at permanent monitoring stations and provides an indication of changing patterns of avian use in District restoration projects. The information collected on avian species diversity has helped document the response of populations to habitat enhancements implemented by the District. Since 1992, the avian monitoring work has shown healthy avian species diversity along river reaches where the District has implemented restoration projects, while diversity-index readings in control sites with established riparian vegetation seem to fluctuate depending on the presence of flow in the river channel, the quality of the habitat, and off site conditions during migration. The most recent avian point counts were conduction in 2018.

OBSERVED TRENDS, CONCLUSIONS AND/OR RECOMMENDATIONS:

With the exception of the Rancho Cañada to Rancho San Carlos Road Bridge reach, the Carmel River streamside corridor has stabilized in nearly all reaches that were affected by a combination of increased groundwater extraction, extreme drought and flood events that occurred during the 1970s, 1980s and 1990s. Prior to the 2016-17 winter high flows, a complex channel had developed

in the lower 16 miles of the river with improved steelhead spawning substrate, diverse habitat, and a richer riparian community. Areas with perennial or near perennial flow (upstream of Schulte Bridge) or a high groundwater table, such as downstream of Highway 1, experienced vigorous natural recruitment in the channel bottom, which has helped to stabilize streambanks and diversify aquatic habitat. Areas that continue to be dewatered annually have less significant growth.

The recovery of streamside areas subjected to annual dewatering requires monitoring. Plant stress in the late summer and fall is evident in portions of the river that go dry. In these areas, streambanks can exhibit unstable characteristics during high flows, such as sudden bank collapse, because of the lack of healthy vegetation that would ordinarily provide stability. The drought that began with Water Year 2013 (beginning October 2012) and ended in Water Year 2016 is an ongoing concern because of the past history of channel erosion and bank instability after severe droughts in 1976-77 and 1987-1991. Impacts to streamside vegetation can manifest themselves for several years even after the end of a drought.

Based on annual cross-section work by CSUMB, several areas have experienced a filling in of pools with sand. Absent high flows like those that occurred in 2017, it is likely that the sand will be winnowed out and sent downstream over the next several years. When river flows drop in late spring or early summer of 2023, District staff will investigate the overall scour and deposition of the streambed and report on this in next year's mitigation report. Current results still show many of the pools are still filled with sand.

Restoration project areas sponsored by MPWMD since 1984 continue to mature and 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, riffles, and cut banks.

As cited in previous reports, the most significant trends continue to include the following:

- increased natural recruitment of vegetation into the active channel of the Carmel River,
- effects to areas with groundwater extraction downstream of Schulte Road,
- channel changes and erosion due to new supply of sediment from upstream associated with high flows, San Clemente Dam removal, and the Soberanes Fire in Water Year 2017,
- healthy avian species diversity, and
- maturing of previous restoration projects.

Carmel River Erosion Protection and Restoration

With the exception of the channel area between the Via Mallorca Road bridge and the Rancho San Carlos Road bridge, streambanks in the main stem appear to be relatively stable during average water years with "frequent flow" storm events (flows with a return magnitude of less than five years). The program begun by MPWMD in 1984 (and later subsumed into the Mitigation Program) to stabilize streambanks appears to be achieving the goals that were initially set out, i.e., to reduce

bank erosion during high flow events up to a 10-year return flow, restore vegetation along the streamside, and improve fisheries habitat.

Consistent with previous reports, it is likely that the following trends will continue:

- Local, State and Federal agencies consider the Carmel River watershed to be a high priority area for restoration, as evidenced by the interest in addressing water supply issues, the removal of San Clemente Dam, proposed projects in the lower Carmel River, and continued oversight with the management of threatened species. Stringent avoidance and mitigation requirements will continue to 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, have come under increasing scrutiny and now require significant mitigation offsets. Approximately 35% to 40% of the streambanks downstream of Carmel Valley Village have been altered or hardened since the late 1950s. Activities that increase the amount of habitat or restore natural stream functions are more likely to be approved or funded through State and Federal grant programs.
- Additional work to add instream features (such as large logs for steelhead refuge or backwater channel areas for frogs) can restore and diversify aquatic habitat.
- Major restoration projects completed between 1987 and 1999 have had extensive and successful work to diversify plantings. However, maintenance of irrigation systems is ongoing and requires extensive work in water years classified as below normal, dry and critically dry.
- The channel will change due to a new supply of sediment coming from upstream of the old San Clemente Dam and additional sources of sediment associated with the Soberanes Fire of 2016.

In the spring of 2011, the river migrated into the north streambank downstream of the Rancho San Carlos Road Bridge (see **Figure XVII-3**). In the winter of 2017, during a series of high flows, erosion started taking place on the south side of the river. This reach became unstable and the District began construction on a restoration project that stabilized the streambanks in the summer of 2018. It is likely that additional erosion would occur if these streambanks were left alone.

Eventually, without corrective measures to balance the sediment load with the flow of water or to mitigate for the effect of the downcutting, streambanks will begin to collapse and the integrity of bridges and other infrastructure in the active channel of the river may be threatened.

Vegetation Restoration and Irrigation

To the maximum extent possible, MPWMD-sponsored river restoration projects incorporate a functional floodplain that is intended to 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.

Channel Vegetation Management

Another notable trend relating to the District's vegetation management program was the widening of the channel after floods in 1995 and 1998. With relatively normal years following these floods, the channel has narrowed as vegetation recruits on the channel bottom and gravel bars. Current Federal regulations such as the Endangered Species Act (ESA) "Section 4(d)" rules promulgated by NOAA Fisheries to protect steelhead significantly restrict vegetation management activities. Because of these restrictions, the District can carry out activities only on the most critical channel restrictions and erosion hazards in the lower 15 miles of the river. 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

In 2018, MPWMD renewed its long-term permits with the U.S. Army Corps of Engineers and the California Regional Water Quality Control Board for routine maintenance and restoration work. In 2014, the District also renewed a long-term Routine Maintenance Agreement (RMA) with the California Department of Fish and Wildlife to conduct regular maintenance and restoration activities in the Carmel River.

Monitoring Program

Vegetative moisture stress fluctuates depending on the rainfall, proximate stream flow, depth to groundwater, 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 the soil is moist and the river is flowing. As the river begins to dry up in lower Carmel Valley (normally around June) and temperatures begin to increase, an overall increase in vegetative moisture stress occurs. The District irrigates around large production wells to help mitigate impacts from groundwater extraction. However, many recruiting trees experience high levels of stress or mortality in dry years 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. Since 1998, species diversity recovered and now fluctuates depending on habitat conditions. Values from 2018 avian point count surveys indicate that the District's mitigation program is preserving and improving riparian habitat.

Strategies for the future

A comprehensive long-term solution to overall environmental degradation requires a significant increase in dry-season water flows in the lower river, a reversal of the incision process, and reestablishment of a natural meander pattern. Of these, MPWMD has made progress on increasing

summer low flows and groundwater levels by aggressively pursuing a water conservation program, implementing the first and second phases of the Seaside Groundwater Basin Aquifer Storage and Recovery Project, and recommending an increase in summer releases from Los Padres Reservoir.

Reversal, or at least a slowing, of channel incision may be possible if the supply of sediment is brought into better balance with the sediment transport forces. Additional sediment from the tributary watersheds between San Clemente Dam and Los Padres Dam will pass into the lower river in the foreseeable future now that San Clemente Dam has been removed. District staff are already seeing signs of additional sediment in the Carmel River below Esquiline Road Bridge.

However, reestablishing a natural supply of sediment and restoring the natural river meander pattern through the lower 15.5 miles of the Carmel Valley presents significant political, environmental, and fiscal challenges, and is not currently being considered as part of the Mitigation Program.

Integrated Regional Water Management (IRWM) Grant Program

The IRWM program promoted by the California DWR encourages planning and management of water resources on a regional scale and promotes projects that incorporate multiple objectives and strategies. In addition, the IRWM process brings stakeholders together and encourages cooperation among agencies in developing mutually beneficial solutions to resource problems.

MPWMD adopted the 2019 Update to the IRWM Plan for a region encompassing Monterey Peninsula areas within the District boundary, the area in the Carmel River watershed outside of the MPWMD boundary, Carmel Bay and the Southern Monterey Bay. The IRWM Plan combines strategies to improve and manage potable water supply, water conservation, stormwater runoff, floodwaters, wastewater, water recycling, habitat for wildlife, and public recreation.

Funding from the IRWM grant program and other programs requiring an adopted IRWM Plan provide the incentive to undertake a set of projects that would continue to improve the Carmel River environment and engage a larger number of organizations in helping to develop and implement a comprehensive solution to water resource problems in the planning region. The Monterey Peninsula region is expecting to take advantage of about $4.3 million from Proposition 1 IRWM funds over the next several years. In 2018, $252,693 was awarded to the region as a part of the Disadvantaged Community Involvement grant. In 2020, $2,238,904 was awarded to the region as a part of the Implementation Round 1 grant. MPWMD prepared an IRWM Implementation Round 2 Grant application for the Monterey Peninsula region in the amount of $1,488,961 which was submitted in January, 2023.

More information about the IRWM Plan and the group of stakeholders in the planning region can be found at the following web site:
https://www.mpwmd.net/environmental-stewardship/irwm-program/

Table XVII-1

Quarterly Irrigation Water Use During 2022

(Values in Acre-Feet)

Project Site	Jan-Mar	April-June	July-Sept	Oct-Dec		Total
Begonia	0.016	0.058	0.523	0.026		**0.623**
deDampierre	0.029	0.194	0.196	0.100		**0.519**
Reimers	0.011	0.051	0.072	0.018		**0.152**
San Carlos Prj.	0.023	0.111	0.079	0.029		**0.242**
Trail and Saddle	0.118	0.287	0.319	0.145		**0.869**
Cypress			0.193	0.018		**0.211**
						Year
Total	**0.20**	**0.70**	**1.38**	**0.34**		**2.62**

Figure XVII-1

Riparian Irrigation Totals

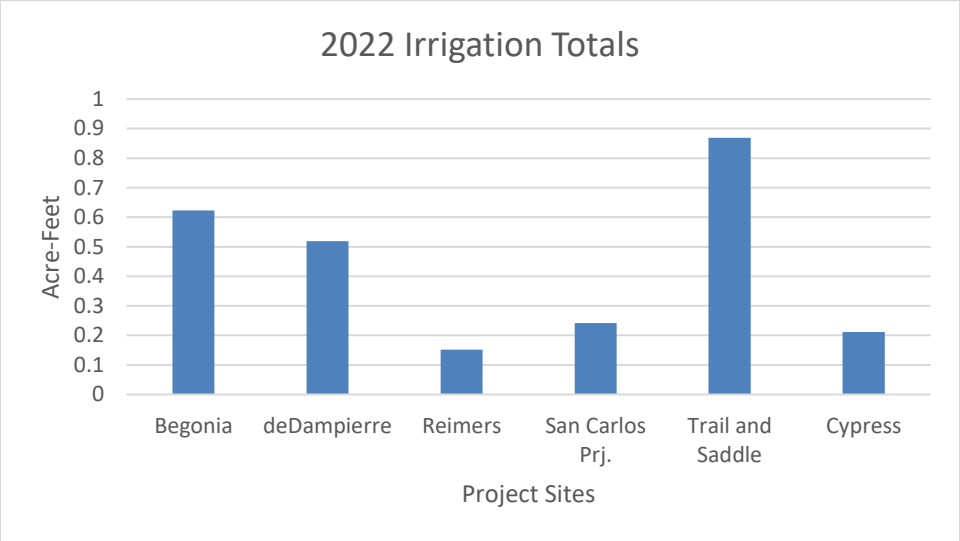
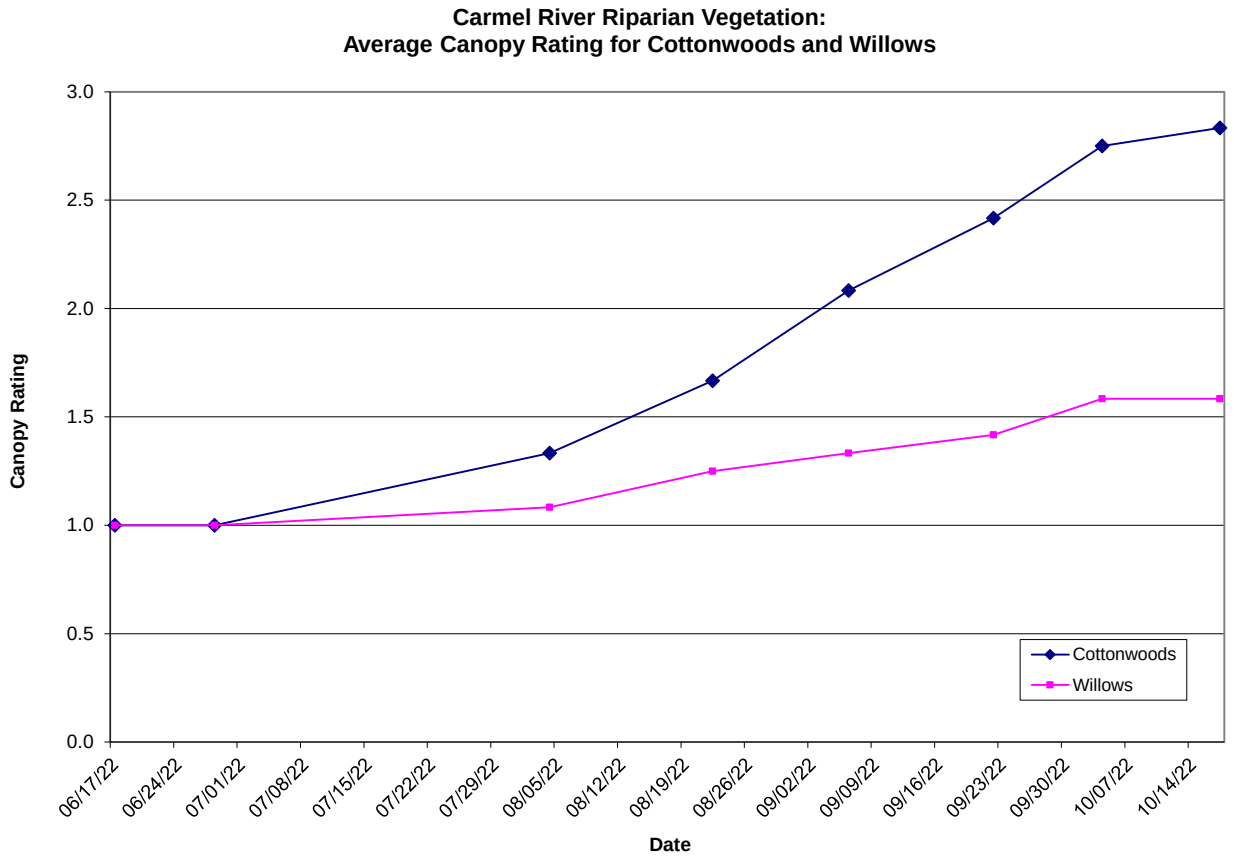


Figure XVII-2

2022 Average Canopy Rating for Cottonwoods and Willows



Canopy Rating Scale		Stress Level
1=	Green, obviously vigorous	none, no irrigation required
2=	Some visible yellowing	low, occasional irrigation required
3=	Leaves mostly yellowing	moderate, regular irrigation required
4=	< 10% Defoliated	moderate, regular irrigation required
5=	Defoliated 10% to 30%	moderate, regular irrigation required
6=	Defoliated 30% to 50%	moderate to high, additional measures required
7=	Defoliated 50% to 70%	high stress, risk of mortality or canopy dieback
8=	Defoliated 70% to 90%	high stress, risk of mortality or canopy dieback
9=	> 90% Defoliated	high stress, risk of mortality or canopy dieback
10=	Dead	consider replanting

Figure XVII-3

Streambank Erosion at Rancho San Carlos Road Bridge, Carmel River

Left Bank Looking Downstream before Bank Stabilization (Spring 2017)

Left Bank Looking Downstream after Bank Stabilization (October 2022)

XVIII. LAGOON HABITAT MITIGATION MEASURES

The Findings for Adoption of the Water Allocation Program Final EIR identified three mitigation measures to reduce impacts to the Carmel River Lagoon, including wildlife that is dependent on it (Finding Nos. 390-A through C, and 392). They include: (a) assist with lagoon enhancement plan investigations, (b) expand long-term monitoring program, and (c) identify feasible alternatives to maintain adequate lagoon volume. This section briefly describes the purpose of these three programs and summarizes the mitigation activities from July 1, 2021 through June 30, 2022, referred to as the Reporting Year (RY).

A. Assist with Lagoon Enhancement Plan Investigations

Description and Purpose

The Monterey Peninsula Water Management District (MPWMD or District), Monterey County Water Resources Agency (MCWRA), California Department of Parks and Recreation (CDPR), and the California Coastal Conservancy (Conservancy) co-funded the Carmel River Lagoon Enhancement Plan, which was prepared by Philip Williams & Associates. A key aspect of the Lagoon Enhancement Plan was to identify alternative means to restore and enhance the lagoon environment. District staff participated on a plan review committee, which met on an as-needed basis, and contributed staff expertise for enhancement plan investigations. District staff reviewed and provided comments on the Draft Lagoon Enhancement Plan document. These comments, as well as comments from other reviewing agencies, were incorporated into the Final Plan dated December 1992.

Implementation and Activities during 2021-2022

During this period, the CDPR continued their native riparian plant re-vegetation efforts at a reduced level within the 100-acre portion of the "Odello West" property that is now part of the Carmel River State Beach. The re-vegetation work is ongoing, though the formal monitoring program and its reporting ended after five years in 2009.

District staff monitored receiving water quality and continued to provide expertise to representatives from numerous state, federal and local agencies, as well as members of the public. The lagoon water-quality data for both surface and subsurface profiles are presented in Section III. During many months in the summer and fall, there is usually no natural surface flow to the lagoon, and the lagoon has historically experienced poor water quality and low water levels that could contribute to poor growth or fish mortality.

No water was pumped from the CDPR "Cal-Trans" well or the CDPR "Highway 1" well in WY2022. No water was applied to the CDPR riparian restoration areas adjacent to the south arm of the lagoon in WY2022. No water was added into the South arm of the Lagoon during the last seven RYs.

During April of RY 2014-2015, the District began to report and graph lagoon levels in both NGVD 1929 and the newer sea level topographic datum, NAVD 1988, that was adopted by the USGS in

1991. Most government agencies are shifting to the use of this newer datum. Lagoon elevation summaries starting last RY will be given in NAVD 1988. The difference between these older and newer sea level datums at this location along the California coast is +2.74 feet.

District staff participates in technical meetings with Monterey County Housing and Community Development and Monterey County Public Works for the management of the sandbar that forms each year between the lagoon and the ocean. The old Carmel River Lagoon Technical Advisory Committee remains operational in concept, but no further meetings were held since 2011. Lagoon water levels can fall to less than five feet elevation (NAVD 1988, measured in the south arm) when the beach breaches in the middle. NMFS and CDFW have indicated that an elevation from four to ten feet at NGVD 1929 (equivalent to approximately seven to thirteen feet at NAVD 1988), depending on the time of year and life cycle needs of steelhead, would be an optimal management target to benefit steelhead rearing.

Monterey County Housing and Community Development is now pursuing separate long-term State and Federal permit applications for lagoon breaching by Public Works. Currently Monterey County takes the lead in annual lagoon breaching activities.

B. Expand Long-Term Monitoring Program

Description and Purpose

Long-term monitoring of the lagoon and its associated plant communities provides data that can be used to evaluate the wetlands' response to groundwater pumping. The purpose of the monitoring is to: (1) determine if changes in hydrology or plant species distribution and coverage are occurring due to the removal of groundwater upstream, and (2) implement additional mitigations if pumping-induced changes to hydrologic characteristics or vegetation are identified. The Mitigation Program calls for extensive studies such as vegetation mapping and soil surveys to occur every five years. In practice, lagoon vegetation has been monitored annually from 1995 through 2005, and nearly every other year thereafter, except 2011 and 2016 when lagoon water levels were too high in summer to do so. This monitoring resumed in 2017. Saturation-paste conductivity of soils in the vicinity of the vegetation-monitoring stations was measured annually from 1995 through 2004. Wildlife surveys have not been conducted since 2018. Bathymetric surveys continue to be conducted each year.

Implementation and Activities during 2021-2022

The District has historically conducted three types of long-term lagoon monitoring activities, only two of which were completed this RY:

- Vegetation Surveys [completed in 2022]
- Topographic Surveys and hydrology [completed in 2022]
- Wildlife Surveys [last completed in 2018]

- **Vegetation Monitoring –** The same monitoring stations that were established in 1995 were sampled annually between 1995 and 2005, and then generally every other year until 2009, as the Allocation EIR only called for this monitoring to occur every two years. On occasion, as in 2019, water levels were too high in the lagoon during July and August to conduct the monitoring. In August of 2022 staff was able to monitor all of the stations established in 1995. The more frequent higher water levels during the monitoring season are in part attributable to the implementation of an adaptive management plan for the beach berm by Monterey County Public Works (MCPW) beginning in 2007. Implementation of the plan is required as a Condition of a permit from the National Marine Fisheries designed to mitigate for impacts to steelhead that result from opening the sandbar to avoid flooding. By maintaining more water in the lagoon for a longer period, MCPW enhances habitat for steelhead by providing more refuge from predators and better water quality, but occasionally prevents access and timely monitoring of wetland vegetation by District staff.

The report, *Biologic Assessment of the Carmel River Lagoon Wetlands*, prepared for the District by the Habitat Restoration Group in 1995, provides a detailed description of the methodology employed. Ten pairs of quadrats were intentionally located along transects at lower elevations of the wetlands because it was anticipated that changes in the vegetative community would first become apparent in these habitat types. The north side was emphasized because of disturbances on the south side associated with the creation of the Cal-Trans Carmel River Mitigation Bank and subsequent restoration of the former Odello artichoke field.

A more detailed discussion of the results of past vegetation monitoring is presented in the 2005 Mitigation Program Report. Data gathered thus far suggest that factors favoring freshwater species over salt tolerant species may be occurring. Determining whether changes are attributable to water management practices upstream as opposed to the timing of monitoring, beach breaching, variation in hydrologic regimes or global weather dynamics are more complex questions. Review of the available data has not identified significant changes from one monitoring event to the next. Nor have strong relationships between species composition or distribution and water management practices been identified. Staff anticipates continued monitoring of the wetlands every other year in the future to provide evaluation of long-term trends.

- **Topographic Surveys and Hydrologic Monitoring –** During the period covered in this report, District staff surveyed four cross sections to track the movement of sediment in the lagoon, continued to maintain a water-level recorder and support an Automated Local Evaluation in Real Time (ALERT) station at the south arm, and measured groundwater elevations in three wetland piezometers that were installed in May 1996. There is a good correlation between surface-water elevation and water elevation in the piezometers. Staff also continues to track surface discharge into the lagoon at the Highway 1 gaging station, and water production upstream of the lagoon.

- **Wildlife Monitoring –** Birds are often used as indicators of the suitability of an area for wildlife because they tend to be easier to identify and count than other creatures. By tracking the species diversity index at a specific location over time, scientists are able to infer if changes have occurred that may affect the area's dependent wildlife. In the past, District staff contracted with the Ventana Wilderness Society and Big Sur Ornithology Lab (BSOL) to conduct avian point count surveys in the riparian corridor of the Carmel River at sites from Carmel Valley Village to

a point just upstream of the lagoon. The District carried out this program from 1992 through 2010 on a regular basis. However, due to budget constraints, the avian point counts are carried out less frequently, with the last two occurring in 2015 and 2018.

Avian monitoring specific to the lagoon was last carried out by the District at sites near the lagoon at the mouth of the Carmel River in the summer of 2004. Sampling in the vicinity of the lagoon was subsequently carried out by the CDPR from 2005-2008, when monitoring ceased due to ongoing budget constraints.

Special Studies During 2021-2022

- **Steelhead Population Monitoring**

MPWMD applied for and acquired ESA Section 7 coverage starting in 2009 to conduct a mark-recapture study as part of its semi-annual renewal of staff Scientific Collecting Permits from CDFW. These have been replaced by the agency's triennial "entity" permit good through 2020. A summer population census was conducted in July of 2019, with the first day allowing for tagging of many steelhead. However, no steelhead were recaptured on subsequent days, so these data did not allow us to estimate the population. High lagoon levels and thick shoreline vegetation, all of which are very beneficial to fish and wildlife, are making it difficult to sample the lagoon for steelhead in many RYs.

C. Identify Feasible Alternatives to Maintain Adequate Lagoon Volume

Description and Purpose

The purpose of this mitigation measure is to determine the volume required to keep the lagoon in a stable condition that can adequately support plants and wildlife. It is envisioned that alternative means to achieve and maintain the desired volume will be compared, and the most cost-effective means selected. One alternative that may achieve these goals is the development of a water supply project that can reliably provide more water to the Monterey Peninsula and result in reduced diversions from the Carmel River; however, few other feasible alternatives have materialized in spite of extensive evaluation. MPWMD staff previously estimated that approximately 8 cfs, or about 16 acre feet per day (AFD), can percolate through the barrier beach when the outlet is closed and lagoon water levels are stable at relatively high elevations (8 – 9 feet). This seepage rate was determined utilizing continuous streamflow data from the Carmel River at Highway 1 Bridge gaging station and the 1997 lagoon stage volume relationship over the 1991-2005 period. However, in May and June 2009, following the manual lagoon mouth closure on May 18, 2009, streamflow and lagoon storage data showed that 12 cfs or 24 AFD percolated through the beach berm and into the surrounding wetlands (based on an updated 2007 lagoon storage table). It is postulated that increased infiltration capacity of the lagoon may be due to a combination of the excavation of an outlet channel to the south, the two South Arm excavations in 2004 and 2007,

and that the manual lagoon mouth closure results in a higher water surface elevation than was typical of the 1991-2005 period. A higher water surface elevation likely results in flow through the outlet channel that then percolates into the beach. This volume of water passing through the beach is significant, and is equivalent to about two-thirds of the daily Carmel River diversions historically needed to meet a portion of the municipal demand of the Monterey Peninsula during the summer. No treated water from the CAWD was added to the lagoon in this RY. There were concerns about the effects the recycled CAWD water might have on water quality in the lagoon, which might affect both juvenile steelhead and red-legged frog habitat values, so the action ceased until impact evaluations could be completed. Those studies have been suspended indefinitely (see **Section XVIII-A** above). No water from an existing agricultural well was added to the lagoon in this RY. Determination of desirable lagoon volume will be conducted in conjunction with the monitoring studies noted above and the findings of the Lagoon Enhancement Plan. Development of feasible alternative means to provide adequate volume to sustain healthy lagoon habitat throughout the dry season continues to be sought by the District.

Implementation and Activities During 2021-2022

District staff continued the annual survey of four key lagoon cross sections (**Figure XVIII-1**) to track changes in the volume of sand in the active portion of the lagoon over time. An initial survey of the four cross sections was conducted in January 1988. Subsequent annual surveys have been conducted beginning in September 1994 through the present. Sedimentation in the lagoon is a concern because the Carmel River as a whole has taken on an increased load of sand from Tularcitos Creek and other drainages following the El Niño winter of 1998. Additional sedimentation concerns include the combined effects of the 2015 San Clemente Dam (SCD) removal, 2016 Soberanes Fire, and the extremely wet Water Years 2017 and 2019 that moved significant sediment into the Lower Carmel River (LCR). In regards to the El Nino winter 1998, it appears at this time, the majority of the sediment deposited along the Carmel River in 1998 has washed through the Carmel River system and lagoon, and has subsequently reached the ocean. The more recent sedimentation factors described above (beginning with the 2015 SCD removal) so far have resulted in significant sand deposition along the LCR, with no major impact on lagoon sand supply within the cross sections. Existing and future surveys at these four key cross sections provide a quantitative means to evaluate whether or not lagoon volume is changing significantly over time. The dynamic nature of the lagoon substrate is evident in **Figures XVIII-2-5**, which shows the results of the annual surveys conducted since 1994.

In August 2022, staff completed the annual surveys of cross sections (XS) 1-4. In Water Year 2022, approximately 21,310 acre-feet (AF) of streamflow passed through the lagoon as measured at the District's CR at Highway 1 Bridge (HWY 1) gage, and classified as a "dry" year. The highest peak streamflow of WY 2022 in the Lower Carmel River was 957 cfs on December 23, 2021, recorded at the District's HWY 1 gage. A continued pattern of light sand deposition is evident at all of the cross-section locations between September 2021 and August 2022, with the exception of XS1, which shows almost no change from the previous year. No major changes were observed.

Review of the entire cross sectional data set shows an overall trend of sand loss within the zone of the established cross sections. However, recent substrate data suggest a possible reversal of this

trend as substrate elevation is now well above historic lows. It is possible that the newer trend of sand deposition is related to the 2015 San Clemente Dam removal, the 2016 Soberanes Fire, and the 2020 Carmel Fire , three events capable of releasing significant sediment into the Carmel River system.

OBSERVED TRENDS, CONCLUSIONS AND/OR RECOMMENDATIONS:

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. The District continues to work with various agencies and landowners to implement ongoing restoration of the Odello West property and future restoration of the Odello East property across the highway. 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 also continue to meet and discuss with other agencies the potential use of an existing CDPR agricultural well.

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 change 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, 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 the 28-year period to date, there have been four ***Extremely Wet*** (1995, 1998, 2017, and 2019), two ***Wet*** (2005, 2006), five ***Above Normal*** (1996, 1997, 2000, 2010, and 2011), six ***Normal*** (1999, 2001, 2003, 2008, 2009 and 2020), three ***Below Normal*** (2004, 2016, and 2018), six ***Dry*** (2002, 2012, 2013, 2015, 2021, and 2022), and two ***Critically Dry*** (2007 and 2014) Water Year types in terms of total annual runoff. Thus, the hydrology of the watershed has been at least normal or better 61% of the time during that 28 year period. However, monitoring in 2014 occurred during a Critically Dry Water Year that followed two consecutive Dry Water Years, and 2015 was the first time a fourth year of drought was ever monitored. 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 production drawdown effects on wetland dynamics. It is recommended that the current vegetation, 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 during the dry season since 1994. These data are useful in assessing changes in the sand supply within the main body of the lagoon and are necessary to answer questions concerning whether or not the lagoon is filling up with sand, thus losing valuable habitat. As indicated in the survey plots, the sandy bed of the lagoon can vary significantly from year to year. Substrate elevations at cross sections 1 through 4 mostly show light sand accumulation between the 2021 and 2022 water year. In the recent “Critically Dry” years of WY 2007 and 2014 and “Dry” years

of WY 2012 and 2013, no significant changes were documented compared to the respective prior years. The "Extremely Wet" WY 2019 resulted in no significant changes at the cross sections even though 155,000 AF of runoff (measured at the HWY1 gage) passed through the lagoon. This is inconsistent with WY 2017, the last "Extremely Wet" year when significant scour was observed at the cross sections. Although data suggests that substrate elevations at the cross sections generally remain stable in low-flow years, data are now somewhat inconclusive regarding the effects of high flow years on lagoon sand supply. WY 2023 will be a good opportunity to further study the effect of high flows on lagoon bathymetry as it is shaping up to be an extremely wet year.

Figure XVIII-1
Map of Monitoring Transects and Stations at Carmel River Lagoon.

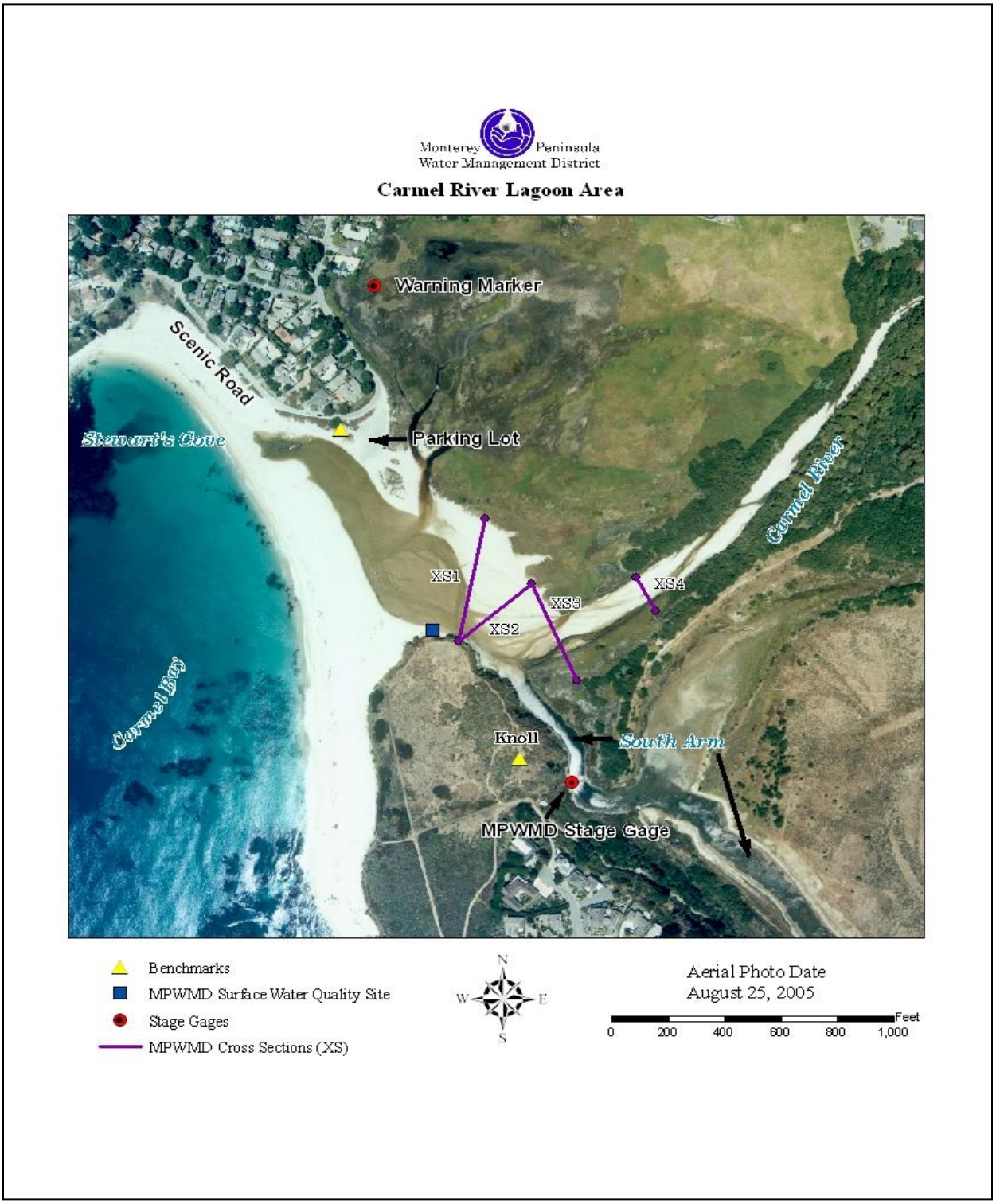


Figure XVIII-2
Carmel River Lagoon Cross Sections 1 through 4, based on Annual Surveys 1994-2022

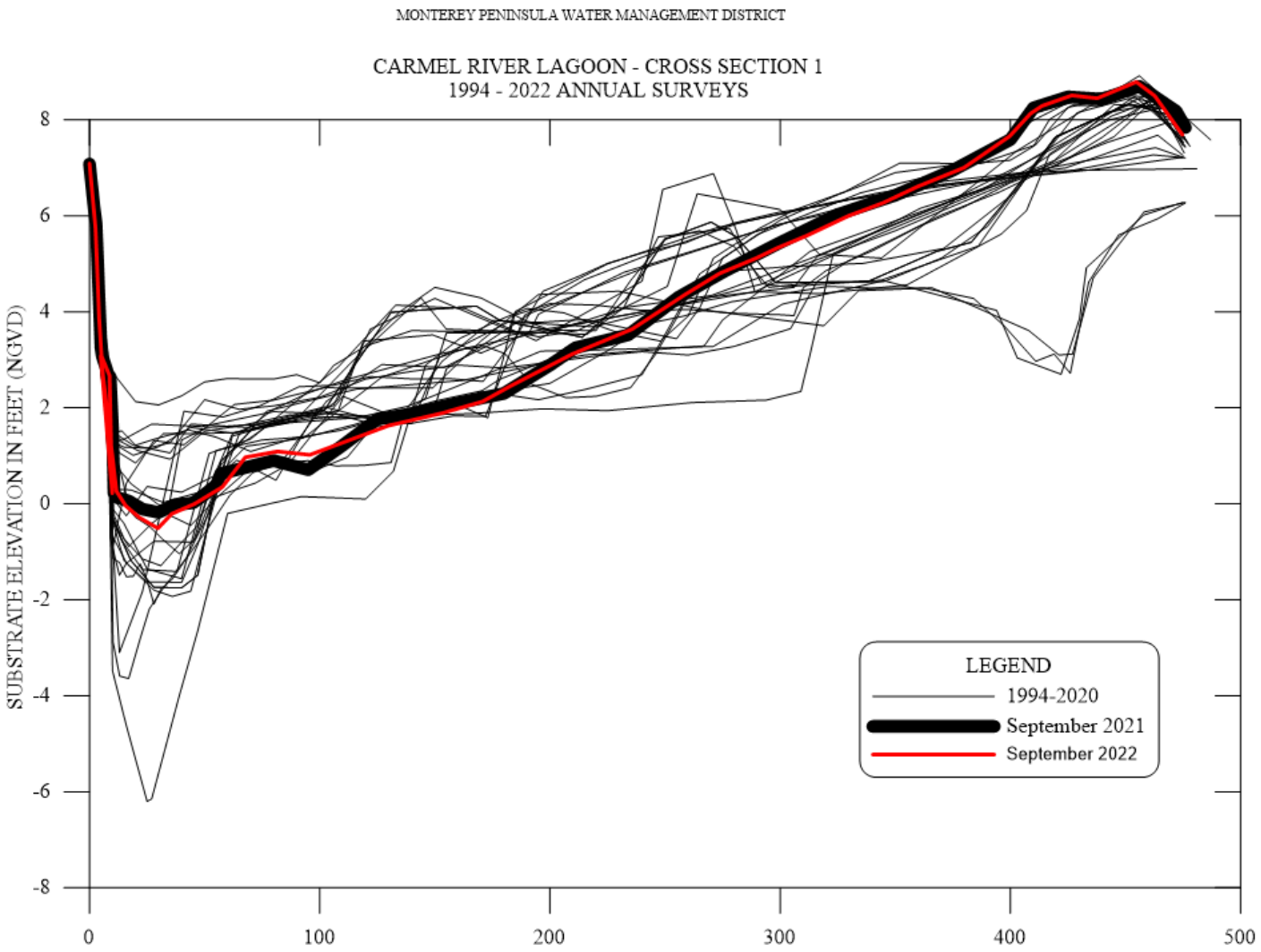


Figure XVIII-3
MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

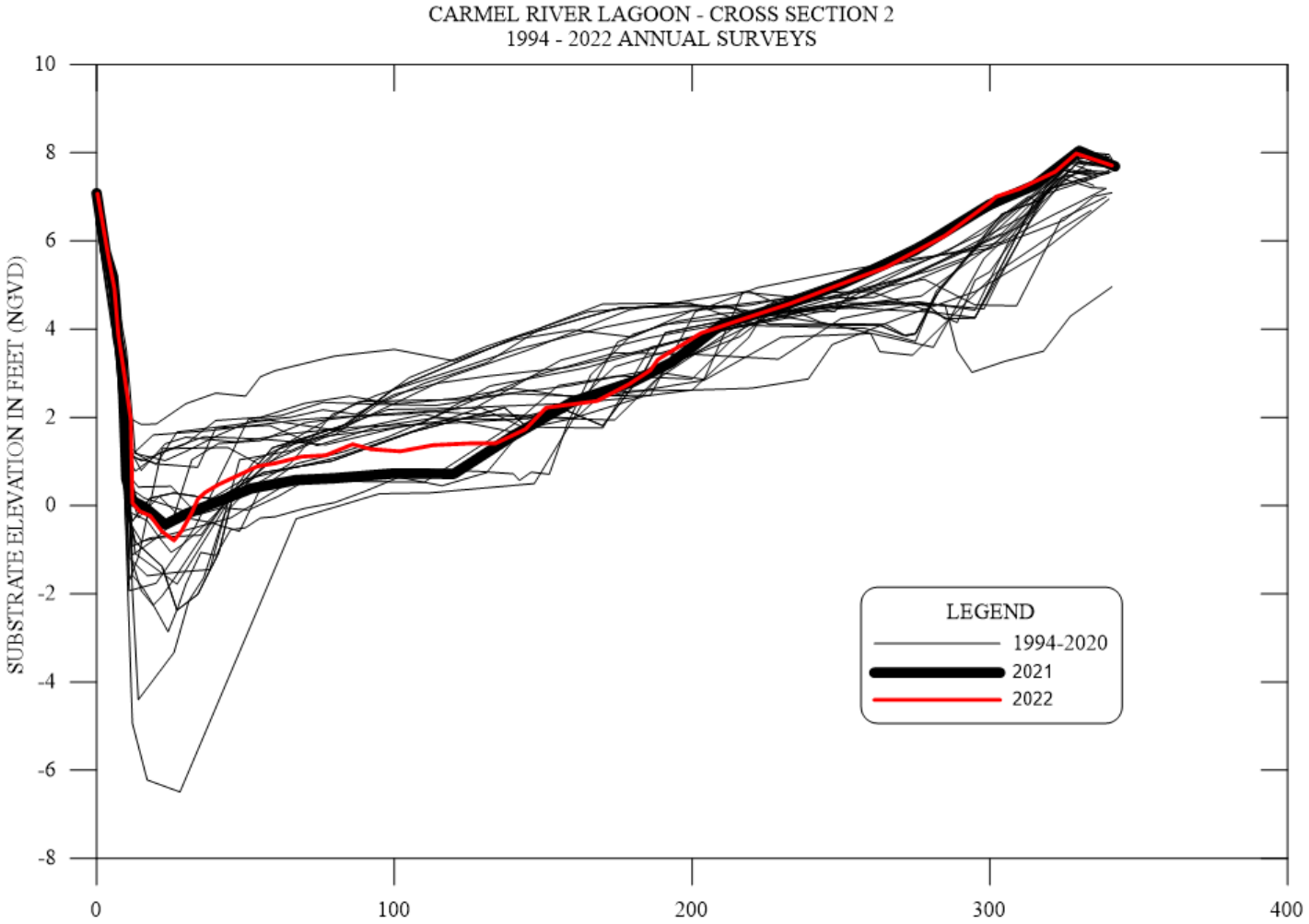


Figure XVIII-4
MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

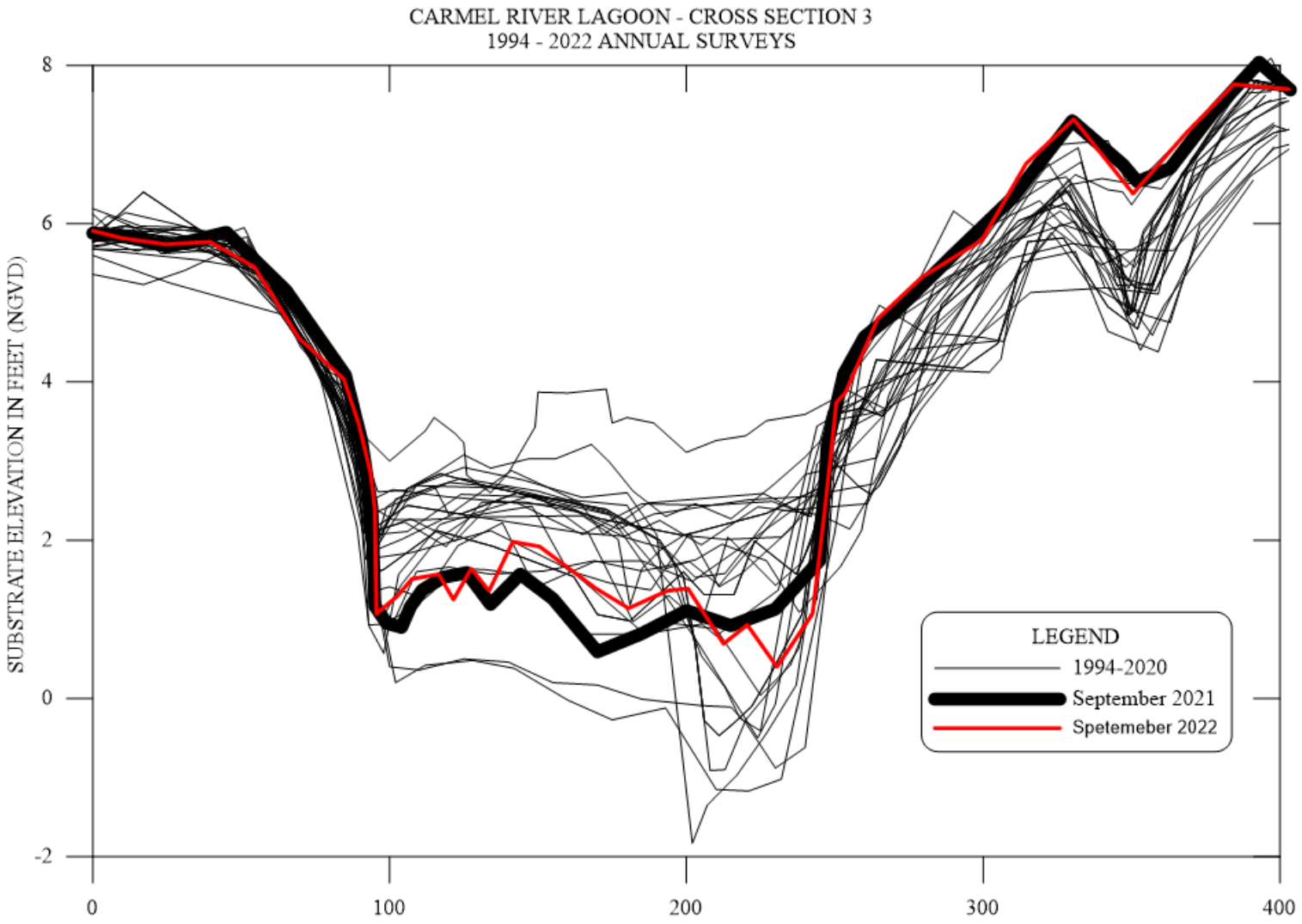
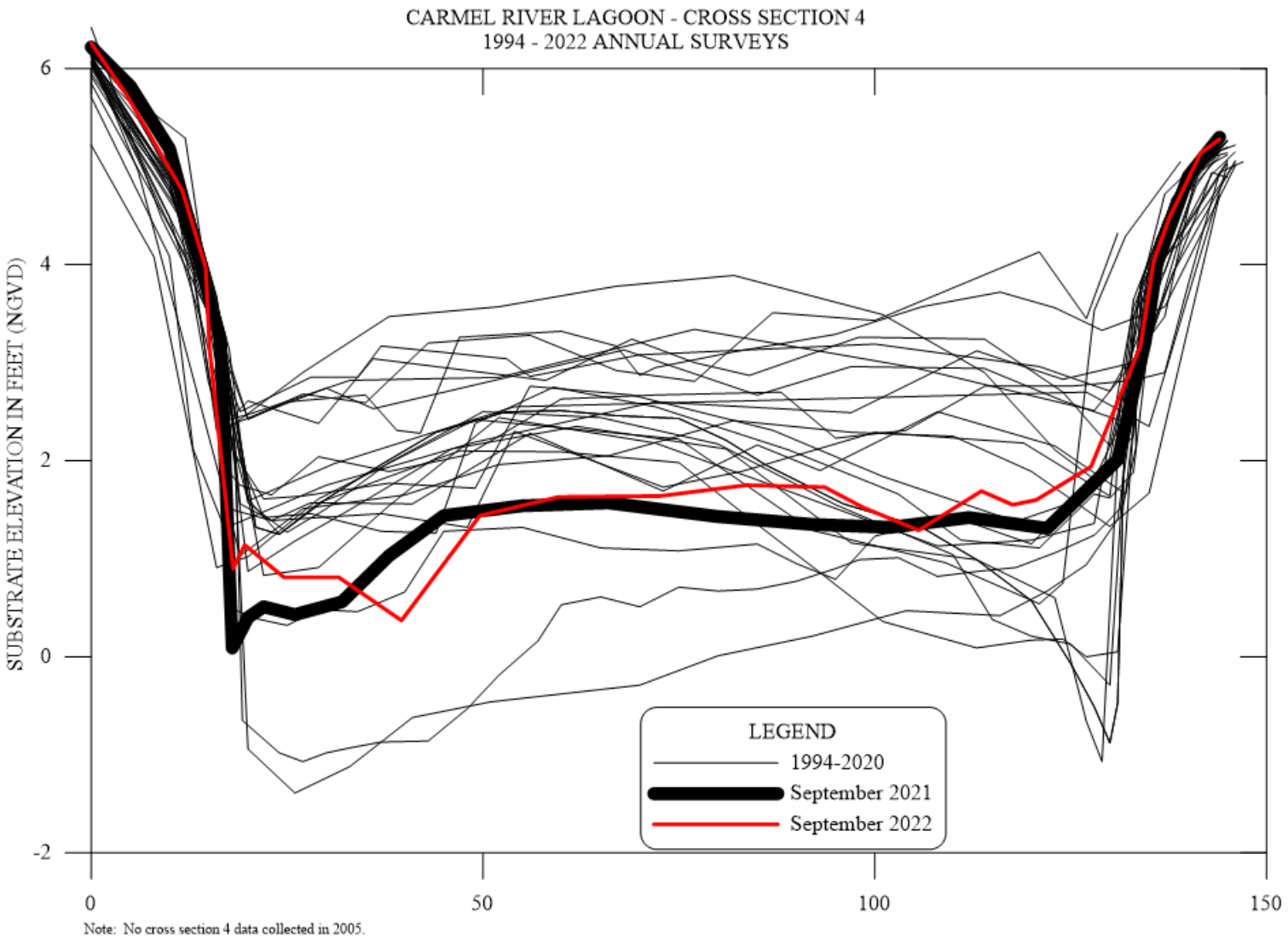


Figure XVIII-5
MONTEREY PENINSULA WATER MANAGEMENT DISTRICT



XIX. AESTHETIC MITIGATION MEASURES

The Findings for Adoption of the Water Allocation Program Final EIR identified one mitigation measure to reduce aesthetic impacts along the Carmel River associated with riparian vegetation – that is, to implement the riparian habitat mitigation measures described above in Finding No. 393. Accordingly, please refer to **Section XVII** for information on riparian mitigation activities during the period from July 2021 through June 2022.

XX. SUMMARY OF COSTS FOR MITIGATION PROGRAM, JULY 1, 2021 THROUGH JUNE 30, 2022

Mitigation Program costs for FY 2021-2022 totaled approximately $3.46 million including direct personnel expenses, operating costs, project expenditures, capital equipment, and fixed asset purchases (**Table XX-1**). The annual cost of mitigation efforts varies because several mitigation measures are weather dependent. Expenditures in FY 2021-2022 were $0.813 million higher than the prior fiscal year due to increase in Mitigation Program costs related to projects that were completed during the current fiscal year. However, the overall costs have remained constant (average of $3.254 million per year) for last five years. In the past, expenditures had trended upward due to expenditures for the Aquifer Storage Recovery (ASR) Project. ASR Project costs are no longer captured under Mitigation Program Costs. FY 2019-2020 expenditures were $3.19 million; and FY 2020-2021 expenditures were $2.65 million.

During FY 2021-2022, revenues totaled $4.13 million including user fees, grant receipts, investment income, project reimbursements, and miscellaneous revenues. The Mitigation Program Fund Balance as of June 30, 2022, was $6.953 million.

Table XX-1

Mitigation Program Cost Breakdown for the Period July 2021 through June 2022

EXPENDITURES	Data Collection	Riparian	Fish	Lagoon	Water Supply	IRGWMP	Admin	Total
Personnel Costs	$277,118	$310,344	$353,727	$112,935	$174,497	$10,292	$291,710	$1,530,623
Operating Expenses	95,809	107,297	122,296	39,045	60,329	3,558	100,854	529,189
Project Expenses	10,012	9,821	725,674	787	415,490	0	156,589	1,318,373
Fixed Asset Acquisitions	14,794	16,568	18,884	6,029	9,316	549	15,573	81,715
TOTAL EXPENDITURES	**$397,734**	**$444,031**	**$1,220,581**	**$158,796**	**$659,632**	**$14,400**	**$564,726**	**$3,459,900**
REVENUES								
Permit Fees								$50
Mitigation Revenue								0
User Fees								3,729,780
Tax Revenues								0
Grant Receipts								469,183
Investment Income								(79,905)
Project Reimbursements								0
Miscellaneous								7,557
TOTAL REVENUE								**$4,126,665**
REVENUE OVER EXPENDITURES								**$666,765**

XXI. REFERENCES

The following selected references provide additional information about the subjects described in this Annual Report. References are organized by section.

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Section XX. Summary of Costs

(Annual Audit Reports on file at District office)

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