

Discussion Items 3 & 4

Water Resource Planning Efforts on the Carmel River and Regionally

Below are brief summaries of several related studies intended to equip agencies and other groups with advanced tools and studies to inform management of the water resources in both the Monterey Peninsula region and the Salinas River watershed in Monterey and San Luis Obispo Counties. These efforts build on recently updated Integrated Regional Water Management planning studies and water projects throughout the planning regions.

Monterey Peninsula Region

Instream Flow Incremental Method (IFIM) Study of the Carmel River

Lead Agency: MPWMD

Cooperating Agencies: California Department of Fish and Wildlife (Robert Holmes, Diane Haas); National Marine Fisheries Service (David Hines, Erin Seghesio); State Water Resources Control Board (Daniel Schultz)

Consultants: Normandeau Environmental Consultants, Balance Hydrologics

Approximate Cost: \$246,000 (development only)

Funder(s): MPWMD

Completion Date: Q4, 2017

Summary: Due to the presence of threatened steelhead, the California Department of Fish and Wildlife listed the Carmel River as a Priority Stream for an Instream Flow Assessment on August 8, 2008. The National Marine Fisheries Service proposed the current instream flow recommendations for the river in 2002, based on older PHABSIM (Physical Habitat Simulation System) work completed in the 1980s and on flow records through 1999. When the study began in 2013, the reach of primary interest was located between the ocean and the site of the former San Clemente Dam at River Mile 18.6 (RM, measured from the ocean). However, after removal of San Clemente Dam in 2015 and a developing interest in the long-term plan for Los Padres Dam at RM 24.8, the interdam reach is also included. The focus of the study is to better understand flow requirements for steelhead migration, spawning, and rearing and to use the hydraulic and habitat models to determine the effects to steelhead of various water resource management strategies concerning diversions from the Carmel River.

Habitat typing was completed by Normandeau/MPWMD in 2015 and transects were selected in cooperation with CDFW in early 2016. Flow measurements were completed in the spring and early summer of 2016. A 2-D daily time step hydraulic model to simulate passage in critical riffles in the lower river has been calibrated. Big Sur River Habitat Suitability Curves were validated for use in a 1-D daily

time step habitat simulation model for the middle and upper portions of the river. Data on steelhead abundance in the lower river obtained in the spring of 2017 confirmed that Big Sur River HSC will also be used for the lowest portion of the river. A draft report for review was completed in December 2016 with the final report expected by the end of 2017. Results of the work are intended to support a variety of studies and efforts in connection with managing the lagoon, evaluating options for the future of Los Padres Dam, evaluating operational changes due to proposed water supply projects that replace Carmel River diversions, and future development projects associated with MPWMD's appropriative water rights.

Carmel River Basin Hydrologic Model (CRBHM)

Lead Agency: MPWMD

Cooperating Agencies: United States Geological Survey (Rich Niswonger)

Consultants: Huntington Hydrologic and Right-on-Q Hydrogeology

Approximate Cost: \$178,000 (development only)

Funder(s): MPWMD

Completion Date: Q4, 2017

Summary: The model addresses freshwater availability in the Carmel River watershed, documents water-storage capabilities of surface water storage facilities (Los Padres Reservoir) and storage in the aquifer system, and refines and develops surface water/groundwater models to help better understand the aquifer system. CRBHM is based on the USGS coupled groundwater and surface-water flow model GSFLOW, which uses the Precipitation Runoff Model Simulation integrated with MODFLOW to simulate total water system availability. Climate data consisting of measured or estimated precipitation, air temperature, and solar radiation, as well as groundwater stresses (such as withdrawals) and boundary conditions are the driving factors for a GSFLOW simulation. Almost 100 years of daily rainfall data, up to about 60 years of monthly and annual well production and monitoring data, 57 years of daily runoff data, and available temperature and evaporation data were reviewed and standardized for the model. The USGS agreed to calibrate the model and is expected to complete work in the fall of 2017.

The model will be used to estimate daily water availability in the Carmel River with various demands, operational changes, and water supply alternatives scenarios. An additional \$100,000 of work is planned for Fiscal Year 2017-18 to develop these scenarios.

Monterey Peninsula Region Stormwater Resource Plan

Lead Agency: One Water Monterey

Cooperating Agencies: MPWMD, City of Monterey, Monterey Regional Stormwater Management Program (MRSWMP)

Consultants: Geosyntec

Approximate Cost: \$716,000

Funder(s): MPWMD, One Water Monterey, City of Monterey, Department of Water Resources

Completion Date: Q4, 2018 (tentative)

Summary: The MRSWMP group received a \$358,000 grant from the Department of Water Resources in 2017 to develop a collaborative regional Stormwater Resource Plan for the Monterey Peninsula, Carmel Bay, and South Monterey Bay Integrated Regional Water Management planning region. The Monterey Peninsula region is 347 square miles, including six coastal cities and portions of unincorporated Monterey County. The region includes two Areas of Special Biological Significance and all runoff from coastal streams empties into the Monterey Bay National Marine Sanctuary. The main watershed is the Carmel River Basin, which contains a DWR groundwater basin, and the region includes the Adjudicated Seaside Groundwater Basin. The Stormwater Resource Plan will identify new water supply sources for the region and provide additional water quality and environmental multi-benefits. Replacement water supply sources are critical following a SWRCB cease and desist order issued on unauthorized Carmel River diversions and the adjudication of the Seaside Groundwater Basin, which together have resulted in a significant reduction of the region's legal water supplies. The study will explore many possibilities for sources, including the capture of runoff at the Peninsula's major drainages, capture and diversion of waters that flow into the Pacific Grove ASBS, as well as the possible integration of all sources to optimize yield. The study will also focus on how best to transport, treat, and store the captured water.

Los Padres Dam Fish Passage Feasibility Study

Lead Agencies: Cal Am and MPWMD

Cooperating Agencies: CDFW (Marcin Whitman, Dennis Michniuk, Dave Highland); NMFS (Joel Casagrande, Richard Wantuck, Erin Seghesio)

Consultants: HDR Engineers, R2 Resource Consultants, AECOM

Approximate Cost: \$282,000

Funder(s): Cal Am, MPWMD

Completion Date: Q2, 2018

Summary: Los Padres Dam forms a 148-foot high barrier along the Carmel River, which is considered a high head dam for fish passage. The dam has been a known fish passage impediment for both upstream and downstream migrating S-CCC [South-Central California Coast] steelhead. As a first step towards protecting S-CCC steelhead, the National Marine Fisheries Service has strongly encouraged California American Water, the dam owner, to resolve the fish passage and other potential take issues at LPD by completing a thorough feasibility study on the merits of either: 1) entirely removing the dam and restoring the reservoir area to its original environs; or 2) improving the dam with appropriate permanent fish passage modifications that allow for unimpeded, safe and effective, upstream and downstream migration of all life stages of S-CCC steelhead. HDR is coordinating a study of volitional and other fish passage improvements that will help inform the long-term management of LPD and the decision of whether to introduce improvements that would allow upstream volitional passage or improve the existing trap and truck program.

As of mid-2017, feasible alternatives being pursued include a fishway, the WHOOSH! Transport system, and an improved trap and truck operation for upstream passages. For downstream passage, variations on an improved Floating Surface Collector and head of reservoir collector are being considered.

Los Padres Dam and Reservoir Alternatives Study

Lead Agencies: Cal Am and MPWMD

Cooperating Agencies: CDFW (Marcin Whitman, Dennis Michniuk); NMFS (Joel Casagrande, Richard Wantuck, Erin Seghesio, Brian Cluer), State Coastal Conservancy (Trish Chapman)

Consultants: AECOM, HDR

Approximate Cost: \$560,000

Funder(s): Cal Am, MPWMD

Completion Date: Q2, 2018

Summary: Los Padres Dam forms a 148-foot high earth fill barrier along the river 25 miles upstream of the ocean and includes a 600-foot long concrete spillway with an apron before dropping into the river. It has been a known fish passage impediment for both upstream and downstream migrating South-Central California Coast (S-CCC) steelhead, and impacts downstream habitat for steelhead by blocking the natural sediment supply.

Due to episodic flows and the highly erosive nature of the contributing watershed, reservoir storage has shrunk about 40% from 3,030 acre-feet (AF) to about 1,665 AF at the spillway level. Usable storage is estimated at about 1,450 AF or about 48% of original storage capacity. In 1995, the State Water Resources Control Board (SWRCB) reduced Cal-Am's water right associated with the dam to 2,179 AF, due to siltation. The long-term siltation rate at the reservoir is estimated at 10 to 20 AFY (the range in the estimate is heavily influenced by a single year's worth of siltation in 1978). The reservoir has not been dredged since it was built. A bathymetric study completed in Spring 2017 shows that the Soberanes fire of 2016 resulted in a 4% loss of original capacity in a single season. More loss due to siltation can be expected over the next few winters.

Downstream of the dam, there is significant armoring of the streambed and incision into floodplain deposits along the lower 16-mile alluvial portion of Carmel Valley as a result of sediment retention at both LPD and at the former site of the San Clemente Dam at RM 18.6, which began construction in the winter of 1920 and was completed in the spring of 1921. San Clemente Dam was removed in 2015, which has improved steelhead passage and allows sediment from the 80 square-mile watershed between the dams to flow downstream.

During dry periods (normally from about June through November), releases from Los Padres Reservoir can be the majority of flow in the river downstream of LPD, where significant numbers of threatened steelhead can be found in some years. While LPD and the associated reservoir currently has value as a water supply facility to meet municipal demand and enhance summer flow in the river, the reservoir is small relative to annual flow and does not provide flood protection to downstream reaches. The dam is routinely inspected by the California Division of Safety of Dams and is in satisfactory condition (i.e., it is safe in a maximum credible earthquake and can pass a probable maximum flood estimated at 36,000 cfs).

The National Marine Fisheries Service (NMFS) has strongly encouraged Cal-Am to resolve the steelhead passage issues and other potential take issues involved with LPD. NMFS has also suggested that removal of LPD should be considered; however, NMFS recognized in the South-Central California Steelhead Recovery Plan that LPD is part of the regional water supply and studies are required in order to come to a conclusion about the future of the dam. In 2013, a Cal-Am consultant evaluated dredging of reservoir sediments to recover storage; however, due to the high projected cost (up to \$90 million), this alternative has not been pursued.

AECOM has been selected to study five alternatives for long-term management of the dam and reservoir including:

1) No Action Alternative – no action would be taken at the reservoir.

2) Dam removal – remove the dam and appurtenances, restore the reservoir and its environs to a natural condition. Removal analysis should consider: 1) whether a phased removal is feasible; and 2) whether some or all of the sediment in the reservoir could be left behind to erode naturally or can be stabilized. All dams in California higher than 25 feet above the natural bed of a stream are under the Division of Safety of Dams jurisdiction. The LPD safely passes a probable maximum flood (PMF) of 36,000 cfs through the concrete spillway without overtopping the dam. A phased dam removal should take into consideration passage of the PMF. It is intended that a dam removal alternative be carried through to the end of the study and presented as an alternative for consideration.

3) Dredging – A 2013 study by Cal-Am proposed to dredge reservoir sediments and haul the material to areas within Cal-Am property that drain directly to the main stem. These areas are characterized by

steep terrain and the benefit-cost analysis of the alternatives was considered to be high. AECOM has determined that placing dredged material upstream of the reservoir is not feasible; however, a site downstream of the reservoir on Cal-Am owned property is large enough to accommodate dredged material.

4) Reservoir storage expansion – expand surface storage with a rubber dam, small dam raise at the existing dam, or build a new dam downstream that would inundate the existing dam at a new level to be determined, or expand surface storage with a combination of methods.

5) Sediment management – for alternatives involving retention or expansion of LPD, a sediment management program needs to be evaluated. The focus of this task will be an evaluation of alternatives that would result in a sustaining long-term surface storage while minimizing downstream impacts on aquatic habitat. Alternatives could include storage maintenance dredging (i.e., passing the natural incoming sediment flow) and dredging and passing more than natural sediment flow (e.g., natural flow plus an increment) with the goal of creating additional storage within the existing reservoir area.

Additional Carmel River Steelhead Conservation Measures

Lead Agency: Cal Am

Cooperating Agencies: CDFW; NMFS; MPWMD

Consultants:

Approximate Cost: \$2.5 million

Funder(s): Cal Am

Completion Date: Q4, 2021

Summary: Cal Am agreed as part of the negotiations with the SWRCB to extend a Cease-and-Desist Order on unauthorized Carmel River diversions and the company will implement an additional \$2.5 million of projects to improve fish passage and habitat during the four years following adoption of this Order, as follows: improvements to the existing upstream fish passage ladder and trap at Los Padres Dam (\$0.2 million); installation of a fish screen at the lower outlet pipe on Los Padres Dam (\$0.8 million); a pit tagging program (\$1.0 million); and a through-reservoir survival study for Los Padres Reservoir (\$0.5 million). If the above projects are not implemented according to plans developed in coordination with the California Department of Fish and Wildlife and the National Oceanic and Atmospheric

Administration, the State Water Board may revisit the Order to determine whether to make further adjustments to protect public trust resources in the Carmel River.

Cal-am also provided a total of \$11.1 million for steelhead enhancement projects between 2009 and 2016 under a Settlement Agreement with NMFS. In mid-2017, Cal-Am and NMFS began negotiations over an extension of the Settlement Agreement to 2022.

Regional Efforts

Salinas and Carmel Rivers Basin Study (Basin Study)

Lead Agency: US Bureau of Reclamation (Reclamation)

Cooperating Agencies: MPWMD, Monterey Regional Water Pollution Control Agency (MRWPCA), Monterey County Water Resources Agency (MCWRA), San Luis Obispo County Public Works Department (SLO County PWD)

Consultants: USGS and others to be determined

Approximate Cost: \$2.4 million

Funder(s): Reclamation, MPWMD, MRWPCA, MCWRA, SLO County PWD

Completion Date: Q3, 2020

Summary: The Basin Study includes the Carmel River watershed, urban areas of the Monterey Peninsula and north Monterey County, and the Salinas River watershed south through San Luis Obispo County. It will include:

- 1) Projections of future water supply and demand to year 2100;
- 2) Analysis of how existing water and power infrastructure and operations will perform given any current imbalances between water supply and demand, and in the face of changing water realities due to climate change (including extreme events such as floods and droughts) and population growth;
- 3) Development of appropriate adaptation and mitigation strategies to meet current and future municipal, agricultural, and environmental water demands;
- 4) Quantitative or qualitative trade-off analysis of identified adaptation and mitigation strategies.

Five climate change scenarios will be evaluated ranging from the 10% hottest and 10% driest to the 10% wettest and 10% coolest along with the central tendency. Several scenarios combining projected climate change, demographics, and socio-economic factors will be modeled. Five surface and groundwater watershed models will be coordinated in an area spanning more than 3,500 square miles. g., the CRBHM and models for the Monterey Peninsula, Salinas Valley Groundwater Basin, and a portion of San Luis Obispo County in the Salinas River watershed).

North Monterey County Drought Contingency Plan (DCP)

Lead Agency: US Bureau of Reclamation (Reclamation)

Cooperating Agencies: MPWMD, Monterey Regional Water Pollution Control Agency (MRWPCA),

Consultants: Brown and Caldwell, Data Instincts, Carollo Engineers

Approximate Cost: \$470,000

Funder(s): Reclamation, MPWMD, MRWPCA

Completion Date: Q4, 2019 (tentative)

Summary: Northern Monterey County is subject to periodic sustained droughts that result in significant impacts to local supplies and the environment. The Plan Area is the northern portion of Monterey County including a part of the Salinas Valley from the southern edge of the City of Salinas to the Pacific Ocean, the western portion of Carmel Valley, and the urbanized Monterey Peninsula area between the two valleys. There is a long-term water supply to demand imbalance as demonstrated by State orders to cut use of existing surface and groundwater resources, and over 80-years of documented seawater intrusion and groundwater level declines in local aquifers. The region is not served by a state or federal water project and all domestic, industrial, and agricultural supply is dependent on local surface and groundwater sources. Climate change is projected to make resolving the water supply and demand imbalance even more challenging. No current regional drought plan exists. Development of a DCP is being coordinated with the Reclamation-funded Basin Study.