Marin County Flood Control and Water Conservation District

Marin County Stream Maintenance Manual



MARIN COUNTY STREAM MAINTENANCE MANUAL

Developed by the:

Marin County Flood Control and Water Conservation District

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MCFCWCD is a Special District administered by the County of Marin Public Works Department 3501 Civic Center Drive, Rm 304 San Rafael, CA 94903 (415) 473-6528

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ACRONYMS

AMM	Avoidance and Minimization Measure
BASMAA	Bay Area Stormwater Management Agencies Association
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CCNB	Conservation Corps of the North Bay
CDFW	California Department of Fish and Wildlife
CNDDB	Californian Natural Diversity Database (CDFW)
CWA	Clean Water Act
DBH	diameter at breast height
DPW	County of Marin Department of Public Works
ECC	Environmental Compliance Coordinator
FCZ	Flood Control Zone
FEMA	Federal Emergency Management Agency
FishNet 4C	Fishery Network of the Central California Coastal Counties
GAMM	General Avoidance and Minimization Measure
LWD	Large Woody Debris
MCSTOPPP	Marin County Stormwater Pollution Prevention Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Association
OHWM	Ordinary High Water Mark
RWQCB	Regional Water Quality Control Board
SMHM	Salt marsh harvest mouse
SMP	Stream Maintenance Program
STRAW	Students and Teachers Restoring a Watershed
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

GLOSSARY

Active Channel	The cross-sectional area of a creek, stream, or river channel which is formed by flows with a recurrence interval (Q) of approximately 2.2 years.		
Biologist	A biologist is a person who has a combination of academic training and professional experience in the biological sciences.		
Bioengineering	Bioengineering is the application of principles of engineering and natural sciences to flood control maintenance. Applications from both fields, such as installation of willow walls and/or brush mattresses, may be used in the field of flood control engineering to reduce the impacts on the natural and urban environment.		
District environmental staff	Refers to the Marin County personnel who will oversee the implementation of the SMP, including preparation of pre-notification lists, scheduling pre-construction surveys, conducting trainings, and writing annual reports.		
Eco-uplift	Work done to compensate for temporary impacts from vegetation maintenance. Usually will entail invasive/non-native plant and trash removal.		
Emergency Project	As defined in the State Fish and Wildlife 1600 code.		
Environmental Compliance Coordinator	(ECC) refers to the Marin County personnel who will ensure the implementation of general conditions and prohibitions, AMMs, and BMPs associated with all maintenance activities.		
Flood Control Channel	Engineered channels that have been designed or constructed for drainage or flood control purposes.		
Flood Control Structure	Levee, dams, and artificially constricted channels for flood control purposes.		
Floodplain	Floodplains are land areas adjacent to rivers and streams that are subject to recurring inundation.		

Low Flow Channel	The physical path within the channel of a river or creek where water flows through during seasonal low flow periods.		
Maintenance Supervisor	Refers to the lead supervisor, crew chief, foreman, or other lead personnel of the District, County Roads crews, CCNB, STRAW, and/or private contractors.		
Natural Channel	Streams or watercourses that have not been engineered for drainage or flood control purposes; may include natural bottom channels with erosion control structures, such as riprap, on their banks.		
Pond	Includes any natural or man-made stock pond, detention basin, or sediment basin.		
Program Area	Each <i>program area</i> is defined as the maintenance activities completed within an individual Flood Control Zone or County Service Area. For the purposes of this SMP, there are seven program areas (Flood Control Zones 1, 3, 4, 5, 7 and 9, and County Service Area 13).		
Project Area	Includes a creek, or tributaries to a creek that have similar habitat and species composition, where vegetation maintenance occurs, usually within a small portion of that area. Can also include a Zone if the vegetation maintenance is minimal (i.e. a small section of linear feet).		
Riparian Area	The area located along the edge of a channel, generally on the floodplain, characterized by access to and influence of the channel, but not in it. A riparian zone or riparian area is the interface between land and a river or stream.		
Site Fact Sheet	A one-page sheet prepared for each of the distinct sites; the fact sheet will contain the site ID and location, the habitats and land uses on site, special status species that may occur at the site, and AMMs and BMPs to employ at the site to avoid and minimize environmental impacts.		
Structure	Storm drain outfalls, tide gates, slide gates, culverts, revetments, bank protection, energy		

	dissipaters, grade control structures, sediment basins, weirs, diversion structures, trash racks, stream gauge structures, fish ladders, fish screens, utility lines, crossings, bridge piers and pump stations.
Site	Sections of a project area that are further divided by habitat type, species, or section of creek the District maintains or sediment, and pump station sites. A site is also a sediment removal area or a pump station.
Terrace	Between the top of bank of the creek and the valley wall, the higher elevation levels or flats are abandoned floodplains called terraces. It is only the lower level near the stream that is the modern or present day floodplain.
Top of Bank	The first major change or break in slope of the incline from the ordinary high water level of a water body moving up the bank. A major change is a change of ten degrees or more.
Upland Area	Area above the normal reach of a creek, stream or river, characterized by non-wetland or riparian vegetation.

1.0 PROGRAM OVERVIEW

1.1 Introduction

The Marin County Flood Control and Water Conservation District (District) was formed in 1955 by an act of the California State Legislature with the primary purpose of controlling flood and storm waters of streams which flow within and into the county. The Marin County Board of Supervisors sits as its board and the District is staffed by the County of Marin Department of Public Works (DPW). While the boundaries of the District are contiguous with those of the county, the District can only do work in eight flood control zones that have been established to address specific issues related to flooding within individual watersheds. Flood zones cover only a minority of the county. Even within the flood zones, the District can only do work where it has property or permission from property owners.

The District holds legal title to thousands of acres of flood control lands (mostly along channels and in the Novato Baylands) and holds easements on many additional channels. It maintains 37 miles of stream channels, several basins, and numerous flood control facilities (17 permanent and 3 portable pump stations; 10 miles of levees; tide gates, and other facilities) to ensure flood conveyance, the proper functioning of flood control facilities, and access to streams, channels, and facilities.

1.2 Historical Context of Flood Management in Marin County

The Marin County Flood Control and Water Conservation District has a long history of being on the cutting edge of environmentally-sensitive flood control work. The District hired its first Creek Naturalist in 1972 to inspect creeks and direct District work within the creeks with habitat preservation and species protection as goals. The District has worked with the Conservation Corps since 1983 to implement creek maintenance projects, and District staff regularly inspects many of our creeks and enforce various local and other regulations which protect them. The District has implemented the Marin County Watershed Program since 2008; the program focuses on watersheds within established County flood zones to integrate flood protection, creek and wetland restoration, fish passage and water quality improvements with public and private partners. In addition, the District works closely with the Marin County Stormwater Pollution Prevention Program (MCSTOPPP), which is a joint effort by the cities and County of Marin to reduce pollutants in stormwater runoff. District staff also implements the County's Fish Passage Program, established by the County Board of Supervisors in 2005, that prioritizes and removes migration barriers to spawning salmon to the upper reaches of Marin's creeks.

As was the norm for 1960's flood control efforts, the U. S. Army Corps of Engineers (USACE) considered three concrete channel flood control projects in Marin County: Coyote Creek from the mouth to Maple Street in Tamalpais Valley; Corte Madera Creek from Larkspur to Fairfax in Ross Valley; and Novato Creek from the mouth to Grant Avenue. Only the first was built in its entirety: the Coyote Creek project was completed in 1967; the Corte Madera Creek channel was stopped at the College of Marin in 1971 (with one more portion

in the works to be completed from College of Marin to the Sir Francis Drake Blvd. bridge just before the Ross/San Anselmo line, and with San Anselmo and Fairfax permanently opting out of the project); and the Novato project was not built at all.

Instead, the Novato Flood Control Zone 1 Advisory Board developed an innovative eightphased program of projects in 1985 following passage of a voter approved bond measure. Projects included raising the Stafford Lake dam, increasing capacities of Novato, Warner and Arroyo Avichi creeks, constructing a bypass at Arroyo Avichi, and constructing a storm water detention pond at Deer Island, stabilizing eroded banks and restoring riparian function.

In many cases, the District maintains storm water pipes and/or flood control facilities that were constructed well before the era of environmental regulation. Nonetheless, it continues to limit its scope of activities to minimize additional impacts to the environment. Within Marin communities, progressive city councils and community members showed an early desire and willingness to acquire lands and prioritize protection of native riparian corridors and wetlands.

While creeks in Marin County have been impacted by to development, in general they remain largely above ground and functional. Marin's engaged and environmentally focused community has a long history of supporting stream side protection during development. This stewardship combined with Marin County's commitment to conducting flood control maintenance work in an environmentally sensitive manner has resulted in many of our creeks and adjacent native riparian corridors and lands supporting habitat for endangered species including steelhead (*Oncorhynchus mykiss irideus*), California Ridgway's rail (*Rallus obsoletus obsoletus*), and salt marsh harvest mouse (*Reithrodontomy raviventris*).

We are proud of our communities' history of habitat conservation and continue to balance their flood management needs with the needs of our many creek inhabitants in the most sensitive way possible.

1.3 Manual Organization

This document contains several chapters, tables, figures and maps, and data sheets within the main chapters and appendices.

Chapter 1 introduces the program and describes the program activities, partners and contractors, and foundation documents. Chapter 2 describes the environmental and geomorphic settings of the project works areas. Chapter 3 details the impact avoidance and minimization measures built into the project. Chapter 4 provides an overview of the different maintenance activities, and Chapters 5-9 detail each activity type, listing the program activities, activity-specific maintenance goals, triggers, and conditions, activity scope, timing and frequency, and contractor details. Chapter 10 outlines how the program is managed, describes the annual work cycle, and explains the data collection and management procedures. Finally, Chapter 11 discusses the regulatory framework pertaining to the program.

Appendix A contains the Master List of Program Areas and Sites. Each site is described as to its location, municipal partners, maintenance activities, habitat types, and potentiallyoccurring special status species. Appendix A.1 contains the Vegetation Project Areas that combine sites into projects. Appendix B lists all sediment removal sites with detailed information including work footprints, types of equipment used, equipment location, and whether USACE jurisdiction is indicated. Regulatory agencies have requested that Appendices A and B also list larger District projects that, while not included in the Stream Maintenance Program (SMP), may also be performed within the Project Areas; these projects are listed but are noted as not being included in the SMP. Appendix C contains the maps of site locations and maintenance activities. Appendix D contains Site Fact Sheets for each site, which provides relevant site-specific information including habitats, likely specialstatus species, and appropriate Avoidance and Minimization Measures (AMMs) and Best Management Practices (BMPs). Appendix E contains the Biological Assessment and all its appendices. Appendix F contains the BMPs from the California Stormwater Quality Association (CASQA) and Fishery Network of the Central California Coast Counties (FishNet 4C). Appendix G contains the California Environmental Quality Act (CEQA) documents completed in support of the SMP. Appendix H contains the Pre-Work Biological Survey data sheet; Appendix I contains the fields of data collected during site assessment and maintenance; and Appendix J contains the Pre-Project Notification Form for Sediment Removal Sites. Appendix K lists the Site Specific Triggers that cause vegetation maintenance to occur for each site. Appendix L is the Large Wood Debris Management Plan Recommendations for Fairfax Creek at Sunnyside Flood Diversion and Storage (FDS) Facility.

1.4 Program Purpose and Objectives

Since 1972, the District has implemented a prescribed stream maintenance program based on best available science in order to maintain flood conveyance in District-maintained creeks and channels. The program is led by a creek naturalist who directs local conservation crews, road maintenance staff and private contractors to carry out environmentally sensitive vegetation management, sediment removal, and biotechnical slope stabilization activities along with the maintenance of pump stations, levees and other flood control facilities. District staff who implement the maintenance activities have expertise and training in natural resource management, sediment control, and erosion control measures. The SMP includes strong protections for wildlife, habitats, and water quality.

The SMP manual defines the types and scope of the District's common maintenance activities conducted in and around flood control channels and facilities. It establishes programmatic guidance to conduct these activities for flood control purposes while avoiding and minimizing environmental and habitat impacts. The SMP manual provides the organizational framework for flood control staff and managers to oversee maintenance crews and their activities and to ensure that their work complies with the terms and conditions of regional, state, and federal regulations while ensuring the protection of special status species and wetland and riparian habitats.

1.5 Summary of Maintenance Activities

The SMP includes five types of maintenance activities listed below. Detailed descriptions of each of these activities and the environmental protections that are incorporated into the implementation of these activities can be found in Chapters 3-9.

- Vegetation management in-stream
- In-stream sediment and debris removal
- Erosion control
- Facilities maintenance and repair of flood control structures in channels
- Levee maintenance like gopher control and drivable resurfacing

The District's SMP manual has been developed to define the maintenance of streams and flood control facilities, establish programmatic guidance to conduct maintenance activities, and to ensure that the program complies with the terms and conditions of its permits from regional, state, and federal agencies.

To minimize impacts to water quality, wildlife, and native habitat, the SMP specifies appropriate general and activity-specific conditions, sensitive species-specific avoidance and minimization measures (AMMs), and best management practices (BMPs) to be employed as part of program implementation (Chapter 3).

The SMP does not include projects requiring individual CWA Section 401 Certification or Waste Discharge Requirements, such as larger capital improvement projects (e.g., building a new pump station), large sediment removal projects (e.g., mainstem of Novato Creek), or new bank stabilization projects using rock rip-rap.

1.6 Program Areas, Project Areas, and Sites

The geographic extent of the SMP includes seven program areas: one each for six flood control zones and one County Service Area (Figure 1-1):

- Flood Control Zone 1 Novato
- Flood Control Zone 3 Richardson Bay
- Flood Control Zone 4 Bel Aire and Strawberry Circle
- Flood Control Zone 5 Stinson Beach
- Flood Control Zone 7 Santa Venetia
- Flood Control Zone 9 Ross Valley
- County Service Area 13 Upper Lucas Valley

Each of the program areas are in suburban eastern Marin County, except for Flood Control Zone 5 which is located in Stinson Beach in West Marin (Figure 1-1). Within each program area, sections of creek(s) were combined to create project areas where vegetation maintenance occurred. Each project area includes portions of a creek, or several creeks that are connected (i.e., tributaries), where selective vegetation maintenance occurs. Project areas usually include areas with similar habitats and species. Vegetation maintenance occurs within select areas or a small portion of the project area, with most project areas maintaining less than 500 linear feet (LF) of vegetation maintenance. Three zones are also considered project areas, since the amount of vegetation that is maintained in each zone is minimal (usually less than 200 LF).

Each project area includes one or more sites. Sites go into more detail about the vegetation type, species present, whether they are tidally-influenced or not, and the section of creek the District maintains. The Biological Assessment goes into detail about the five different habitat types: California annual grassland, northern coastal salt marsh, diked baylands, north coast riparian forest/scrubland, and mixed evergreen forest. The list of sites and project areas can be found in Appendix A and Appendix A.1.

Maintenance work occurs on lands where the County and/or its municipal partners own the land outright in fee title or hold legal easements. In a limited number of sites, vegetation maintenance activities may occur on private parcels for which the District and/or its municipal partners annually receive written landowner rights-to-enter permissions in order to perform maintenance activities (3-REED-1; 3-REED-2; 3-SUT-5; 4-EAST-2, 5-EAS-1, 5-EAS-2, 5-EAS-3, 7-GAL, 9-LAR-2, 9-MAG-1, 9-MAG-2, and 9-MAG-3). No aspect of the SMP will be implemented in areas where the County or its municipal partners do not have direct legal jurisdiction or landowner permission.

FLOOD CONTROL ZONE 1- NOVATO

Flood Control Zone 1 encompasses the 36,500-acre watershed tributary to Novato and Rush Creeks, which includes the entire city of Novato plus a large part of the unincorporated area around the City. The zone was formed in 1970 to address flooding issues in downtown Novato and surrounding areas. Novato Creek is a substantial perennial stream that extends approximately 17 miles from its mouth at San Pablo Bay to its headwaters above Stafford Lake. Tributaries include Arroyo Avichi, Vineyard Creek, Warner Creek, and Wilson Creek. Ongoing maintenance includes regular servicing of four pump stations, trash racks, tidegates, levees, and drainages, and an annual vegetation maintenance program.

FLOOD CONTROL ZONE 3 – RICHARDSON BAY

Flood Control Zone 3 encompasses 8,535 acres in Southern Marin draining to Richardson Bay, including the City of Mill Valley and the unincorporated communities of Almonte, Alto, Homestead Valley, Sutton Manor, Tamalpais Valley, and portions of Strawberry Point. The zone was formed in 1956 to address vulnerability to flooding from creek and tidal action within the area adjacent to Richardson Bay. The zone includes Richardson Bay and the many drainage areas tributary to the Bay including Coyote Creek, Arroyo Corte Madera del Presidio, and Warner Canyon Creek. Maintenance activities include regular servicing of five pump stations, trash racks, tidegates, levees and drainage ditches, and an annual vegetation maintenance program.

FLOOD CONTROL ZONE 4 – BEL AIRE AND STRAWBERRY CIRCLE

Flood Control Zone 4 is located on the Tiburon Peninsula. It encompasses 550 acres and includes portions of the City of Tiburon and the unincorporated communities of Bel Aire and Strawberry. The zone was created in 1957 to alleviate chronic flooding in what was the Bel Aire subdivision and adjacent undeveloped lands. The boundaries of the zone were later amended to include the area of Strawberry Circle. The zone currently maintains existing facilities including three pump stations and performs an annual vegetation maintenance program.

FLOOD CONTROL ZONE 5 – STINSON BEACH

Flood Control Zone 5 encompasses 1,500 acres within the Easkoot Creek watershed. The zone was created in 1961 to address the flooding in Stinson Beach caused by overflows of Easkoot Creek, a small perennial stream that flows through the community into the southeastern arm of Bolinas Lagoon. The creek supports steelhead; coho (likely stragglers) have been documented in the lower reaches (see the Biological Assessment for more information); and California red-legged frogs have been documented in a small brackish pond on the east side of Highway 1 at the north end of the Bolinas Lagoon. Common maintenance activities include removal of sediment and debris jams at bridges and vegetation maintenance along the creek corridor.

FLOOD CONTROL ZONE 7 – SANTA VENETIA

Flood Control Zone 7 extends over approximately 260 acres in the unincorporated community of Santa Venetia, east of Highway 101 along N. San Pedro Road. This community was one of the first developments in Marin County to be constructed on fill over bay mud and was built in an era before the County had the authority to regulate or control development. Due to the low initial elevation of the fill and the compressible nature of the underlying bay mud, the area has subsided and is now below the high tide level. To protect themselves from tidal flooding of Gallinas Creek, the residents of Santa Venetia formed Flood Control Zone 7 in 1962. Maintenance activities include regular servicing of five permanent and three portable pump stations, tide gates, levees and drainage ditches, and an annual vegetation maintenance program.

FLOOD CONTROL ZONE 9 – ROSS VALLEY

This large zone encompasses the 18,600-acre watershed drained by Corte Madera Creek and its tributaries. The towns of Fairfax, San Anselmo, Ross and Larkspur as well as the unincorporated communities of San Anselmo, Fairfax, Kentfield, and Greenbrae are located within this zone. Flood Control Zone 9 was established in 1966 to act as a sponsoring agency for the U.S. Army Corps of Engineers Corte Madera Creek Flood Control Project. In January 2007, the flood zone boundaries were amended to include all territories within the incorporated areas of the towns of San Anselmo and Fairfax. This change was undertaken in response to the flood of December 30, 2005 and the subsequent creation of the Ross Valley Flood Control and Watershed Program. The zone maintains the Corte Madera Creek flood control channel from just downstream of the Ross Post Office to the outfall of the creek in Larkspur. Typical maintenance activities include an annual vegetation and debris cleaning of the creeks.

COUNTY SERVICE AREA 13 - UPPER LUCAS VALLEY County Service Area 13 (Upper Lucas Valley) is located within the 5,950-acre Miller Creek watershed and is managed by Marin County Parks. Parks requested that the District's help in maintaining the flow capacity of the creek. Activities include vegetation maintenance, removal of non-native plant species, and re-vegetation with native species. Students and Teachers Restoring a Watershed (STRAW) is an important partner in this watershed.



Figure 1-1. Areas with streams covered by the Marin County Flood Control District.

1.7 Responsible Parties and Program Partners

Marin County Flood Control and Water Conservation District

The District is the primary proponent for the SMP, which utilizes the labor and expertise of the County of Marin Department of Public Works flood control staff and road maintenance crews, Conservation Corps North Bay, STRAW, and private contractors to manage and implement prescribed maintenance activities.

The District will designate environmental staff who will provide day-to-day oversight of the SMP including: 1) project planning; 2) pre-project notifications to applicable resource agencies; 3) project implementation including scheduling appropriate site surveys and conducting crew trainings; and 4) annual reporting. The District will also designate Environmental Compliance Coordinators (ECC) to oversee the biological aspects of the SMP. The ECCs shall understand biological resources, missions of regulatory agencies and regulations as they may affect listed species, and knowledge of the nature of the maintenance activities. The ECCs will coordinate activities with input and review from Public Works biologists.

During project implementation, the ECCs will ensure that all precautions are taken to avoid impacts to the environment including adherence to general conditions and prohibitions as well as activity-specific conditions for each type of activity. The ECCs will also ensure that AMMs are employed as prescribed in Chapter 5, depending on the location and nature of the activity.

Department of Public Works Roads and Building Maintenance

DPW road maintenance crews perform vegetation management, sediment removal, and maintenance of tide gates and other facilities for the District. DPW building maintenance crews undertake pump station maintenance activities.

Conservation Corps North Bay

Conservation Corps North Bay (CCNB) is a non-profit job training and educational organization which has been operating in Marin County since 1982. CCNB will be the primary active partner and contractor with the District for many of the activities included in the SMP. CCNB Maintenance Supervisors and staff will be trained annually by District staff to incorporate the general and activity-specific conditions, AMMs, and BMPs required for each activity at each site to protect water quality, habitat, and special status species.

Marin County Parks

The District coordinates with Marin County Parks to perform vegetation maintenance activities on lands under their jurisdiction, including County Service Area 13 and the Santa Venetia Marsh Preserve.

Municipal Partners

In addition to the work it oversees directly, the District has formal Memoranda of Understanding with the cities of Larkspur, Mill Valley, and San Rafael and the towns of Fairfax, Ross, and San Anselmo to conduct channel maintenance activities on properties within their jurisdictions. Municipal partners are identified in Appendix A.

Students and Teachers Restoring a Watershed

The District partners with the Marin County Stormwater Pollution Prevention Program (MCSTOPPP) and Point Blue Conservation Science's (formerly the Point Reyes Bird Observatory) Students and Teachers Restoring a Watershed (STRAW) Project to perform restoration work in eastern Marin County. Activities consist primarily of removal of invasive plants and planting of native species by groups of teachers and students organized by STRAW.

The STRAW Project provides an integrated program of classroom and hands-on watershed restoration education, centered on involving students in professionally designed, creek and wetland restoration to improve creek and wetland habitats. Restoration experiences are complemented with classroom and field studies throughout the school year. These educational activities create a meaningful context for the restoration work and a greater understanding of watershed ecology.

1.8 Foundation Documents for the SMP Manual

The SMP Manual is largely based on work previously performed by the Bay Area Stormwater Management Agencies Association (BASMAA). The District, as a member of MCSTOPPP, has been an active member of BASMAA since 1989. BASMAA is a consortium of 90 Bay Area county and city governments, local water and sanitation districts, and state agencies and was formed in response to the National Pollutant Discharge Elimination System (NPDES) permitting program to promote regional consistency.

In 1998, BASMAA formed an Operational Permit Committee which worked for several years to develop a Regional General Permit with the USACE to cover prescribed maintenance activities in flood control channels within BASMAA's jurisdictional areas. Although a Regional General Permit was not obtained, the Operational Permit Committee produced several documents which have been used by several BASMAA members to obtain individual permits. The District is also utilizing these documents to support programmatic permit applications for the SMP program, including:

- Minimal Threat Channel and Basin Maintenance Activities. October 2009. This document describes prescribed flood control maintenance activities.
- Minimal Threat Flood Control Routine Maintenance Activities: Regional Biological Assessment. October 2006. This document describes the environmental setting, special status species within the BASMAA jurisdictional area, the extent and scope of proposed activities, and a suite of AMMs and BMPs.

Additional supporting documents include the Biological Assessment of the proposed SMP (Appendix E) which identified possible sensitive species and habitats that could be impacted by the project and several sources for BMPs (Appendix F).

2.0 ENVIRONMENTAL SETTING AND PROJECT AREAS

2.1 Physical Description

Marin's watersheds share the same general anatomy: the ridge-tops and upper slopes of the watersheds are in generally undisturbed open areas, the valley floors are densely developed, and the lower reaches are tidally-influenced and quite flat.

The uplands encompass the hilly, often steep, terrain from the top of the ridges down to where the valleys flatten out. They are dominated by mixed evergreen forest and oak-bay woodlands, interspersed with open annual grasslands, chaparral, and coastal scrub. Much of the upland habitats in Marin County are protected as public and municipal open space.

The valley floors, where most of the District's SMP sites are located, contain dense residential and commercial developments, often located next to, and sometimes over the creek channels. The road network is also dense, with many bridges and culverts spanning the creeks. In many cases, urbanization has led to channel straightening, building structures that restrict flow and an expansion of invasive plant species.

Creeks on the valley floor are often incised and largely separated from their floodplains by urban land uses. Their channels are often narrower than would be expected given the size of their contributing watersheds. Urbanization has likely increased the timing and magnitude of peak runoff events such that more water flows to the creek at a quicker rate. This can lead to channel down cutting and bank hardening which reduces available riparian habitat.

The lower reaches of creeks have very little topographic relief and are either tidally influenced and support tidal marsh or are cut off from their surrounding marsh lands by levees. These areas often have altered hydrology and are constrained by roads, levees, and other development. Freshwater seasonal wetlands have become established in areas that were historically baylands and then subsequently diked for agriculture. These seasonal wetlands provide habitat for migratory waterfowl and shorebirds.

2.2 Geomorphic Setting

Urbanization has greatly impacted the transport and storage of sediment through Marin's creek systems. Over time, these reaches likely stored sediment in the channel, distributing and depositing it along alluvial fans and or channel floodplain surfaces. The historic geomorphic system was altered by land use practices and the resulting infrastructure developed in the 19th and 20th centuries. Grazing, agriculture, urbanization, road development, flood protection and other land use changes combined to alter the channel system and patterns of sediment deposition.

Many of the streams maintained by the District have been channelized and engineered for flood control purposes. Streams that previously migrated and deposited their sediment across a broad alluvial fan or floodplain are now constrained to linear channels where sediment accumulates.

Stream channel incision is another geomorphic legacy that affects many of the channels maintained by the District. Incising channels are actively eroding and down-cutting their channel bed and banks. There are several possible causes for channel incision including hydro-modification effects (due to land use changes) whereby runoff and stream flows are more erosive due to higher peak volumes and velocities. Sometimes channels incise because the "base" or "trunk" stream into which they flow has itself "sunk" or incised, and therefore the tributary follows this lead by incising to meet the elevation of the downstream receiving water. Alternatively, sometimes channels incise because there is an active "headward migrating knickpoint" that moves upstream through a system eroding and lowering the channel bed as it moves upstream Incised channels are typically at greater risk for bank destabilization and in need of repair.

Novato Creek Watershed

The Novato Creek watershed, located at the northwestern extent of San Pablo Bay, is the largest watershed in eastern Marin County. Its creeks flow eastward through oak and bay forests, grasslands, the City of Novato, and into San Pablo Bay near the mouth of the Petaluma River. Novato Creek is joined by six major tributaries along its 17 mile length: Leveroni, Bowman Canyon, Warner, Arroyo Avichi, Arroyo de San Jose, and Simmonds Slough.

The channel network has been altered from its historic natural conditions. Many of the channels are actively in transition to a more stable configuration with the majority of the channels narrower than expected for the watershed size and rainfall. Urbanization has likely increased the timing and magnitude of peak runoff events such that more water flows to the creek at a quicker rate.

Extensive bank erosion indicates that the channels are in a widening phase. Sediment production in the watershed occurs due to upslope processes such as landslides and gully development, as well as channel bed incision and bank erosion. The Novato Creek mainstem of Novato Creek and its major tributaries are all highly entrenched within the city limits and are constrained by development on the banks. Channels in the upper watershed are still incising and are expanding headward into hillside swales.

The stream channels in the lower reaches of the watershed are managed for flood conveyance and navigation and their ability to transport sediment is reduced by levees and urbanization. The levees limit the tidal prism available to scour and move sediment. Sediment accumulates in the lower reaches of the mainstem creek where levees have cut off the channel's access to the marsh lands.

Richardson Bay Watersheds

The Stream Maintenance Program area in Southern Marin County contains several subwatersheds that drain into Richardson Bay including Arroyo Corte Madera del Presidio and its tributaries (Cascade, Old Mill, Reed and Warner Creeks), Coyote Creek, Ryan Creek, Marin City and Bel Aire (West and East Creek).

Arroyo Corte Madera del Presidio drains the ridges of the eastern slope of Mount Tamalpais and the Corte Madera Ridge as they flow eastward to Richardson Bay through the Town of Mill Valley. The upper slopes and ridges are largely owned by Marin County Open Space, Marin Municipal Water District, and state and federal park agencies; these lands provide habitat connectivity between adjoining watersheds. The upper channels are steep with boulders and bedrock cascades as they flow through forested v-shaped valleys. Urbanization has altered the form and habitat function of the creeks in the middle and lower reaches of the watershed. Mill Valley land use is mostly medium to low density residential with clusters of commercial areas on the valley floors. Concrete and rock bank stabilization is found throughout much of Arroyo Corte Madera del Presidio and its tributaries; Old Mill Creek, Warner Creek, and Reed Creek. Sections of these creeks have been concrete lined and put into culverts under roads and buildings. Pools are limited to shallow scour pools associated with bank erosion or debris (Rich 1995, and Reedy 2005). Arroyo Corte Madera del Presidio transitions to a tidal slough downstream of La Goma Street.

The Coyote Creek watershed is bounded by Bothin Marsh and Richardson Bay to the east and the Arroyo Corte Madera del Presidio subwatershed to the north. The ridges to the south and west are protected as part of the Golden Gate National Recreation Area. The Coyote Creek subwatershed includes the unincorporated communities of Tamalpais Valley, Tamalpais Valley Junction (Tam Junction), Manzanita, and Almonte. Most of the development is single-family residential, with limited commercial development and services. The upper watershed is mostly rural and semi-rural, while the lower watershed is developed with greater densities near Bothin Marsh. Commercial development is largely concentrated in a small area at the junction of Highway 1 and Almonte Road.

Ryan Creek watershed, only 0.31 square miles lies immediately to the north and east of Arroyo Corte Madera del Presidio watershed. Ryan Creek is ephemeral in nature and water only flows in the creek during and immediately after storm events. Marin City watershed, just to the south of Coyote Creek covers 0.64 square miles and has both have a mix of residential and commercial areas. The upper hillsides are almost entirely residential and there is a substantial houseboat residential area at along the bay front. The Bel Aire, located on the Tiburon Peninsula on the northeastern shores of Richardson Bay, measures 0.78 square miles in area. Three pump stations and annual clearing of vegetation from channels, helps to decrease risk of flooding in this low-lying area of Southern Marin.

Easkoot Creek Watershed

Easkoot Creek originates in the steep, west-facing slopes of Bolinas Ridge. Three tributaries (Fitzhenry, Laurel, and Black Rock Creeks), join to form Easkoot Creek just upstream of Shoreline Highway in Stinson Beach. After exiting the uplands, the creek turns northwest and flows behind the coastal dune until it enters the south arm of Bolinas Lagoon. It has been debated whether the creek historically flowed to the Lagoon or went straight out to

the ocean. Recent research indicates that the current channel location very closely matches its historic location, and that only during high flow events would the creek change its course and flow directly to the ocean across the beach (Van Kirk 2002, Tetra Tech 2001).

The stretch of Easkoot Creek through the town of Stinson Beach has been hardened with riprap, sacrete, gabions, or retaining walls to stabilize its banks. This reach of creek also exhibited markedly low amounts of large wood and no viable pools.

During medium to large storm events, an active slide on Mt. Tam releases enough hillside material to fill in the creek, even if it has recently been dredged. The essentially flat reach from Arenal to Bolinas Lagoon creates a slower moving creek and a natural area for sediment to settle and deposit. The private bridges along the residential streets known collectively as the "Calles" have limited to no clearance from the creek during storms, which may contribute to flooding. The County and Flood Control Zone 5 has spent significant funds to perform limited sediment removal at the Calle bridges that is typically effective for only one to two seasons and requires dewatering the channel and relocating Steelhead trout. A sediment basin on Park Service property, downstream of Arenal Avenue, has been constructed to capture sediment in one location to the reduce the frequency of sediment removal at the Calles bridges, thus reducing impacts to Steelhead and other aquatic life. Constructed in 2013, annual monitoring has shown that it is working well and its effectiveness in capturing sediment has allowed for a decrease of sediment removal at the six bridge crossings, thus avoiding impacts in more sensitive creek habitat.

Gallinas Creek Watershed

The Gallinas Creek watershed is in east Marin between the Miller Creek and San Rafael Creek watersheds. The North Fork is the larger of the two drainages and flows from the Terra Linda/Sleepy Hollow ridgeline through Santa Margarita Valley and the community of Terra Linda to its confluence with South Gallinas Slough near McInnis Park. South Gallinas Slough is fed by several small tributaries that originate in the San Rafael Hills and San Pedro Ridge and flow through the highly urbanized communities of San Rafael Meadows and Santa Venetia.

Prior to urbanization and the tidal wetland reclamation practices of the early 1900s, Gallinas Creek had an extensive tidal slough system fed by intermittent streams originating above Santa Margarita Valley and the headlands surrounding South Gallinas slough. By the 1920s, levees around Santa Venetia had already been constructed, and since the 1940s, the main tidal sloughs were leveed and the smaller channels and interior tidal marshes drained and filled for agriculture, creating the channel configuration present today.

During the construction of the Terra Linda housing development in the 1950s, upper sections of Gallinas Creek and its tributaries were channelized along Del Ganado Road and Freitas Parkway, following the historic creek alignment. Although the creeks that drain the southern portion of the Gallinas watershed still have natural creek bottoms many have been engineered and realigned and their banks heavily armored.

Corte Madera Creek Watershed/Ross Valley Watershed

The Corte Madera watershed includes 44 miles of stream channels. Ross Creek drains the northern slope of Mt. Tamalpais; San Anselmo Creek and its tributaries drain the northwestern portion of the watershed. The two channels join to form Corte Madera Creek, which continues through more than a mile of concrete-lined channel past the confluences of Larkspur and Tamalpais Creeks and into the salt marsh at the mouth.

Corte Madera Creek and its tributaries responded to the intensive timber harvesting and livestock grazing of the 1800s by incising into the Holocene valley fill. Large trees growing within the channel banks are approximately 50 years old and were likely established immediately after the 1955 flood, which formed high gravel bars. Although the channels are still responding to the 1800s land use and subsequent urbanization, the effects are slowing and less dramatic. As stated by Stetson (2000), ongoing channel responses include headward advance of 1st order tributaries, reduced bed incision and bank erosion in the upper alluvial channel network, and slowing of channel aggradation in the lower reaches of the watershed.

Exposed bedrock outcrops and constructed grade-control structures throughout the channel network have slowed channel incision while accelerating channel widening. Nearly 50% of the banks have been stabilized with rock or concrete to stabilize banks. Geomorphic recovery processes are ongoing, with inset floodplains occurring in areas where the channel was not restricted from widening and pool/riffle sequences forming in the stable bed. Dense urbanization up to the top of streambanks and unnaturally narrow channels restrict instream habitat recovery and limit channel capacity.

The tidal reaches of the system are heavily impacted and have been modified for flood management. In the 1960s, the Army Corps of Engineers designed and constructed an earthen trapezoidal channel on the lower 4.5 miles of creek through the towns of Corte Madera, Larkspur, Kentfield, and Ross. Lower Corte Madera Creek has been widened and straightened. These lower reaches are sediment aggradation and storage zones for upland and tidally-derived sediment.

Sediment is delivered to the channels from upland sources such as gully development, overland flow, and landslides, as well as from channel bed and bank erosion. It is estimated that the latter accounts for only 9% of the annual bedload transported in the system, while the upland sources account for 91% (Stetson 2000). Together the San Anselmo Creek and Sleepy Hollow Creek subwatersheds generate 55% of the total annual bedload, while Ross Creek and Fairfax Creek subwatersheds only generate about 10% of the bedload each. These differences are due to variations in geology, topography, vegetation types, and land use.

Miller Creek Watershed

Miller Creek and its tributaries drain a 7,440-acre watershed. Historically, the mainstem channel did not extend all the way to San Pablo Bay. It apparently dissipated most years

into a willow grove and wetland complex just south of the present location of St. Vincent's School

Miller Creek and its tributaries have been significantly altered by land use practices since Euro-American contact. Heavy cattle grazing, the conversion from native perennial to nonnative annual grasslands, urbanization, ditching and the construction of storm drains have all increased the amount and depth of runoff during storms. The increased runoff has caused channels in the upper watershed and in the upstream reaches of the valleys to incise, leading to local bank failure and loss of riparian vegetation. The eroded sediments have accumulated upstream of some bridges and culverts that act like sediment dams, and along the lower limits of the mainstem channel near the baylands. The accumulation of sediment in the mainstem channel has raised its bed and increased the risk of flooding. Flood control levees have been added in some places.

Miller Creek's drainage network consists of a mainstem channel and its tributaries. The lower reaches downstream of Lucas Valley Estates are perennial, while upstream reaches are intermittent or ephemeral. The headwater reaches are largely ephemeral. Mainstem Miller Creek supports a small but viable steelhead fishery.

2.3 Biological Resources

The District prepared a Biological Assessment (BA; Appendix E) of the project area to evaluate the potential for the occurrence of special-status species or sensitive vegetation communities within the project area (See Appendix E). Most of the vegetation maintenance and sediment removal work occurs in eastern Marin creeks draining from Novato Creek in the north to Coyote Creek in the south. There are only three project sites in western Marin County on Easkoot Creek in Stinson Beach (Zone 5), draining to the Pacific Ocean. Most of the maintenance activities occur within urbanized, residential, and commercial land uses. Some of the lower reaches include tidally-influenced land preserved for wildlife and flood control purposes. Most of the land in the upper reaches is largely undeveloped open space or grazing lands.

Vegetation communities present within and adjacent to the project area include California annual grassland, northern coastal salt marsh, diked baylands, north coast riparian scrub/forest, and mixed evergreen forest.

2.4 Special Status Plant and Wildlife Species

A list of special status plant and wildlife species that could potentially occur at the proposed SMP project sites was created. The list is based on biological resources within five USGS quads (Bolinas, Petaluma Point, Novato, San Rafael, and San Quentin), literature and database reviews, and familiarity with the biological resources within the project region. Altogether, the BA identified 113 species, of which 41 are listed or candidates for listing, and 72 are federal or state species of concern (see Appendix A in the Biological Assessment for the list of Special Status Species Reported or Potentially Occurring at the Project Sites).

For plants, there are 12 listed species in the selected USGS quadrangles and 21 species of concern. Based on the data available, none of the listed species and four of the species of concern is likely or somewhat likely to occur in the project sites.

Similarly, for animals, there are 29 listed species in the selected quads and 46 species of concern. Based on the data available, eight of the listed species and six of the species of concern are likely or somewhat likely to occur in the project sites.

The following special status species may possibly be found at sites where maintenance activities occur: Point Reyes bird's beak (*Cordylanthus maritimus spp. palustris*), congested-headed hayfield tarweed (*Hemizonia congesta spp. congesta*), marsh microseris (*Microseris paludosa*), Marin knotweed (*Polygonum marinense*), Coho salmon (*Oncorhynchus kisutch*), steelhead trout, California red-legged frog (*Rana draytonii*), western pond turtle (*Emys marmorata*), California Ridgway's rail, California black rail (*Laterallus jamaicensis coturniculus*), northern spotted owl (*Strix occidentalis caurina*), salt marsh harvest mouse, and several bat species.

The BA documented vegetation communities present within or adjacent to work sites include California annual grassland, northern coastal salt marsh, north coast riparian scrub/forest, and mixed evergreen forest.

Stream Maintenance Manual Sections that Address Special Status Species Protection

The BA recommends several actions for avoiding and minimizing impacts on biological resources and special status species and these recommendations have been incorporated into the SMP, including:

- Work within recognized species work windows.
- Adhere to a list of species-specific Avoidance and Minimization Measures. Numerous AMMs to protect special status species and their habitat were identified within the Biological Assessment completed for this program. These AMMs have been incorporated into the SMP and can be found in Chapter 3.6 Avoidance and Minimization Measures for Fish.
- Best Management Practices (BMPs) from the FishNet 4C Manual: County Road Maintenance Guidelines for Protecting Aquatic Habitat and Salmon Fisheries (2004) were incorporated into the SMP manual and are applied in the field as standard operations. FishNet 4C is a multi-county program on the Central California Coast which helped Coastal Counties implement salmon protection and restoration efforts. The FishNet 4C Roads Manual was developed to assist County maintenance crews conduct their work in the most sensitive manner as possible to protect anadromous salmonid fish.
- Fact sheets for each individual project site were developed for the SMP and can be found in Appendix D. The fact sheets note whether salmonids presence is presumed

and list appropriate AMMs and BMPs to be employed at each site to protect and enhance salmonid habitat.

- Designate Environmental Compliance Coordinators (ECCs) to provide natural resource expertise to the SMP.
- Training of Conservation Crews and County maintenance workers on AMMs and BMPs to be applied in the field during all operations and during crew training sessions.

2.5 Salmonid Conservation

Within the project areas, steelhead trout are known to occur in Novato, Vineyard, Miller, Corte Madera, San Anselmo, Fairfax, Sleepy Hollow, Ross, Arroyo Corte Madera del Presidio, Warner Canyon, Old Mill, Reed, and Easkoot Creeks in Marin County, however current abundance is thought to be a small fraction of historical levels. Historically, coho salmon occupied the Arroyo Corte Madera del Presidio and the Ross Valley Watersheds, but there are no current runs into San Francisco Bay. In the Western Marin project area, coho salmon have been observed in the lower reaches of Easkoot Creek, but those observations were made in 2002 and were likely strays from adjacent coastal watersheds. Easkoot Creek is not known to support a run of coho salmon. Chinook salmon (*Oncorhynchus tshawytscha*) has been observed sporadically in lower Novato Creek watershed.

Marin County Department of Public Works maintains a salmonid presence stream layer in GIS format. The layer has attribute data for stream hydrograph (natural stream, ditch, embankment, artificial path), channel type (natural, engineered, pipeline), and documented presence of steelhead, coho, and Chinook. Because the County has never been exhaustively surveyed for salmonids, data for presence is not complete for the County, nor is there a consistent base year. The data are often used to denote historic presence. The salmonid presence layer is used for development planning countywide however the layer does not contain fine scale data, such as on spawning areas or migration corridors. Written reports from California Department of Fish and Wildlife (CDFW) habitat surveys note these types of fine scale habitat features such as pools and riffles, but CDFW does not provide these data in GIS formats.



Figure 2-1. Anadromous streams within the project areas (Marin County GIS) and fish passage barriers identified by Ross Taylor and Associates (2003).

Program Area	Project Area (Veg)	Site	Creek
Zone 1	Novato Creek	1-NOV-1	Novato Creek
Zone 1	Upper Novato		
	Creek Area	1-NOV-2	Novato Creek
Zone 1	Upper Novato		
201101	Creek Area	1-NOV-3	Novato Creek
Zone 1	Novato Creek		
201101	Tributaries	1-VIN	Vineyard Creek
Zone 1	Novato Creek		
201101	Tributaries	1-WAR-1	Warner Creek
Zone 1	Novato Creek		
2010 1	Tributaries	1-WAR-2	Warner Creek
Zone 3	Zone 3	3-REED-1	Reed Creek
Zone 5	Zone 5	5-EAS-1	Easkoot Creek
Zone 5	Zone 5	5-EAS-2	Easkoot Creek
Zone 5	Zone 5	5-EAS-3	Easkoot Creek
Zone 9	-	9-CMC-1	Corte Madera Creek
Zone 9	Lower Corte		
	Madera Creek		
	Complex	9-CMC-2	Corte Madera Creek
Zone 9	Lower Corte		
	Madera Creek		
	Complex	9-CMC-3	Corte Madera Creek
Zone 9	Fairfax Creek	9-FAIR	Fairfax Creek
Zone 9	-	9-LAR-2	Larkspur Creek
	Upper Corte		·
7000 Q	Madera Creek		
2016.9	Complex	9-SHC-2	Sleepy Hollow Creek
Zone 9	-	9-SHC-4	Sleepy Hollow Creek
Zone 9	-	9-SHC-5	Sleepy Hollow Creek
Zone 9	-	9-SHC-6	Sleepy Hollow Creek
CSA 13	CSA 13	CSA-13-MC	Miller Creek

Table 2-1. SMP sites located on or near anadromous streams.

Over-Arching Principles for Protecting and Enhancing Salmonid Habitat

Marin County Flood Control District has decades of experience working in or near streams that support populations of threatened or endangered salmonids and their habitat. In 1998, Marin County initiated the FishNet 4C program, a multi-County program designed to help County governments develop programs and protocols for protection of listed salmonids and their habitat. In 2004 the County adopted the FishNet 4C County Road Maintenance Manual: Guidelines for Protecting Aquatic Habitat and Salmon Fisheries. Since then, the County has conducted semi-annual trainings on the content of the manual.

Best Management Practices spelled out in the manual are routinely implemented in the field during maintenance activities and are referenced in this manual as well.

When working in or near salmonid streams, the following management strategies will be applied wherever possible:

- Maintain Low-Flow Channel: During sediment removal activities the District will provide low flow channels for habitat and fish passage wherever feasible. The District does construct a low flow channel on larger sediment removal projects not included in this manual. On perennial streams, a low flow channel will be established if the County has available the right of way to perform the work.
- 2) Maintain Vegetation on Lower Streambanks: Manage stream side vegetation to support aquatic life and salmonids by maintaining overhanging vegetation above and next to the water surface. Vegetation trimming will target mid to upper limbs to allow for debris passage. Thus, the roughness is controlled nearer the top of the cross-section rather than at the bottom where the critical functions of the plants, as habitat are, most needed.
- 3) Maintain and Enhance Instream Habitat Complexity: A complex instream and channel bed environment provides habitat heterogeneity, cover, and refugia during a range of flow conditions. In coordination with other maintenance activities, District managers will evaluate channels and maintenance sites for opportunities to maintain or enhance complex habitat features. Examples of instream complexity features include:
 - Overhanging vegetation
 - Undercut banks
 - Large Woody Debris features that provide cover and refugia during high flow events as well as channel diversity in lower flow events.
 - Deep channel pools that provide rearing habitat and refugia during high flow events as well as habitat during extreme low water times.
 - Cobble/gravel bars and benches that provide spawning and rearing habitats for fish, refugia during higher flow events, and areas suitable for good invertebrate drift.
 - Instream geomorphic features that increase channel bedforms, increase the range of channel velocities, and increase the overall range of habitat conditions.
- 4) **Management of Large Woody Debris (LWD):** Under District guidelines, large woody debris (LWD) is defined as stumps (alive or dead), root-wads, or logs having a minimum diameter of 12 inches and a length of 10 feet or longer. Typically, LWD left in place would be a hardwood (e.g. oak, redwood), as softwoods (e.g. alder) tend to float and/or rot quickly. Hardwood LWD creates essential habitat for salmonids, including pools and shelter from predators, which are required at specific life stages. To the greatest extent possible, the District will work to preserve

and protect LWD on salmon streams (see Table 2-1). When LWD is encountered in salmon stream channels during pre-project assessment, the following management practices should be enacted:

- All large wood in the channel will be inspected during pre-project surveys. If there is doubt about how to manage the LWD, a CDFW biologist should be consulted.
- Removal of LWD on salmon streams (as opposed to modification) should only occur where accumulation of woody debris poses a threat to road stability, culverts, bridges or other instream structures and could cause potential flooding due to diminished channel capacity. See LWD Management Decision Tree below.
- Whenever possible the District will preserve enough roots and branches on the downed wood to provide complexity needed for habitat or reposition the wood intact.
- When modifying log jams, the District will leave logs, root-wads and stumps in the longest lengths and diameters practicable for removal and hauling. Off logs must be cut from fallen trees leave as much as possible on the main trunk, and attached to the root-wad if possible. Only branches obstructing flow should be cut.
- Whenever possible and depending on the species of wood, the District will incorporate LWD removed from channels into stream restoration projects at a nearby location and/or transport any removed LWD to the County Corporation Yard for storage for future restoration projects.
- During the pre-project notification, each site with chronic and recurring removal of LWD shall be assessed for potential adjustment to the maintenance activities or inclusion in the CIP program, in order to achieve a more permanent solution to the problem.

If a particular LWD is not well-anchored (naturally or through modification), a buoyancy calculation is conducted:

$$\mathbf{F}b = \mathbf{p}f.\mathbf{a}g.\mathbf{V}s$$

Where **F** is the buoyant force, **p** is the density of fluid (62.4 lbs/ft³), g is the gravitation acceleration, and **V** is the volume of the fluid displaced.

The District typically only does maintenance work where there is a history of and high risk for flooding. These are portions of creek that tend to have been developed very close to

the top of bank and within the floodplain (the District has no authority over development). Bank erosion and flash flooding threaten nearby structures, making them unforgiving systems in which to experiment with leaving LWD in place.

A site where we sometimes do have the opportunity to preserve LWD is a reach of 1-NOV-3 where the Novato Creek Flood Control Phase VIII project was constructed in 2006. The Phase VIII project was designed to stabilize creekbanks through the (less than 1-mile) reach, lay back banks to keep a 50-year design flow within the banks, and improve habitat and reduce erosion through native plantings and placement of rock J-vanes. The J-vanes concentrate flows to the middle of the creek, reducing erosive forces on the bank, and encourage scouring of pools. Native sedges, trees and other vegetation was planted to improve the habitat around the pools. Mature native trees were preserved and generate LWD within the reach. Often the LWD has (or has potential with modification) hydraulic and habitat effects consistent with the rock vanes and vegetation that were incorporated or preserved as part of the original design. Each year, when LWD is discovered in this reach, a memo will be provided with the annual notification to agencies, or with the annual report if the tree or branch falls after May 1.

Following is a LWD management decision tree that outlines the process of evaluating LWD.



Large Wood (LW) Flood Risk (FR) to Beneficial (B) Checklist

Considerations for Removal of LW

Maintenance crews will record the code of outcomes for LWD encountered in creek assessments (e.g., 6FR, 4B, etc.), including explaining the justification for the code. Documentation of the inventory of target-size large wood pieces identified and piece size reduction work performed during each maintenance work session (preproject annual dry season, and as-need post-storm wet season) will be included in the annual SMP report.

San Anselmo Flood Risk Reduction Project Flood Detention and Storage Basin has other considerations around LWD management. See Appendix L for Large Woody Debris Plan specific to this facility. At this time LWD management in site 9-FAIR is in the process of getting permitted through the San Anselmo Flood Risk Reduction project rather than the SMP. In the future, 9-FAIR will be incorporated into the SMP permits.

3.0 SELF MITIGATING APPROACH OF PROGRAM

This chapter describes how the implementation of the SMP ensures that maintenance projects are conducted in an environmentally sensitive manner and that impacts are avoided and minimized to the maximum extent possible. Each site has been coded as to the sensitive species potential and sensitive habitats, and for each sensitive species, Avoidance and Minimization Measures (AMMs) have been identified. Further, general conditions and BMPs have been identified for each maintenance activity. Taken together, these efforts assure protections for sensitive species and habitats within the maintenance project sites.

3.1 Mitigation Strategies

The SMP is structured such that its activities are temporal in nature and would not result in any permanent environmental impacts. An Initial Study for West Marin, pursuant to CEQA, was completed September 2007, and a Notice of Determination for a Negative Declaration was filed on October 22, 2007 (State Clearinghouse No. 2007-092065). An Initial Study for East Marin, pursuant to CEQA, was completed February 14, 2012, and a Notice of Determination for a Negative Declaration was filed on June 6, 2012 (State Clearinghouse No. 2012-022053). Mitigation measures were outlined in the Initial Study to address the temporary impacts associated with the maintenance activities included in this manual. Maintenance activities that would result in permanent impacts to the creek channel or infrastructure are not included in the SMP program.

The SMP's extensive species-specific Avoidance and Minimization Measures, General and Activity-Specific Conditions, and specified Best Management Practices limit the program's impacts. Temporary impacts from stream maintenance activities are avoided or minimized utilizing the measures described above. In addition, environmental enhancements such as native willow staking, planting of native riparian vegetation, removal of trash and removal of non-native, invasive plant species are carried out as part of the course of work, and temporary impacts are typically self-mitigated by these actions.

Where specific mitigation actions are indicated for temporary impacts, the first course of action should be to attempt to mitigate onsite where impacts occur, with "like for like"; i.e., if riparian vegetation is removed completely, the mitigation would be to plant riparian vegetation locally where applicable. Where onsite mitigation is not available or feasible, the second choice of action should be to mitigate at another County location within the watershed or program area. Where neither of the above two courses of action is available or feasible, mitigation would occur offsite, such as at a STRAW site in the same or adjoining watershed.

3.2 Mitigation for Impacts to Anadromous Salmonids

In streams that support salmon or steelhead, impacts to waters of the U.S. or Waters of the State, and/or impacts to riparian habitat, would be mitigated by actions that benefit anadromous salmonids. Mitigation for the loss of instream complexity features will be

determined by site assessments conducted prior to project implementation. The site assessments will also be conducted prior to sediment removal and bank stabilization projects to determine the presence and extent of coarse substrate and instream complexity features. This assessment will inform project and mitigation planning and design.

3.3 Proposed Mitigations by Activity Type

Vegetation Management

Most of the District's vegetation management consists of limbing and trimming of trees and shrubs to maintain the bankfull flow This select trimming helps maintain shading from the remaining canopy, stabilizes the banks with roots of the remaining trees and shrubs, and maintains understory plants. Therefore, these impacts are minor temporary. On rare occasions, mature trees are removed and would be considered a permanent impact.

In addition, the related activities of trash removal, non-native plant removal, planting native species, and/or leaving LWD in the creeks will mitigate for any temporary impacts caused by normal vegetation management. If tree removal is indicated, each tree more than 6-inches diameter at breast height (DBH) will be replaced with a minimum of three (3) native trees and monitored for five (5) years. If the survival rate is less than 80% after five years, replanting and additional monitoring to achieve the survival rate will be required.

Sediment and Debris Removal

The sediment removal projects covered by this SMP are small in scale and do not typically result in permanent impacts. Channel function is often improved after accumulated sediment is removed. Salmonid passage and migratory routes for other aquatic species are often impeded by culverts which become clogged to the point where these species cannot pass up or downstream through the channel. Typically, sediment removal from outfalls into tidal areas results in improved tidal flow and action benefitting upstream marsh vegetation. Additionally, sediment removal from clogged culverts will help to keep them in good working order and minimize catastrophic failure, which brings with it far greater environmental impacts.

Trash removal, non-native plant removal, planting native species, and/or modification of LWD instead of removal, serves to mitigate for temporary impacts caused by normal sediment removal activities. The District's first priority in disposing of sediments is to reuse them on other District properties. Often, sediments can be re-used within the same watershed. Uses include adding height to levees to bring levee up to original height and no higher, adding to levee slopes, and road maintenance. Other uses include wetland restoration, mitigation for sea level rise in transition zones and instream gravel use in restoration projects such as fish passage.

Erosion control

No specific erosion control projects have been identified at this time. If an erosion control project comes up, the project will most likely be self-mitigating and utilize biotechnical bank stabilization techniques. District erosion control projects have a goal of reducing
suspended sediment in the waterway, through such things as installing native plants/seeds that stabilize stream bank soil. All proposed projects will be explained in the prenotification report to the regulatory agencies.

Facilities Maintenance and Repair of Flood Control Structures

Facilities maintenance activities, conducted using best management practices, will have no permanent impacts and only minor temporary impacts. Trash removal and non-native plant removal next to facilities will provide an eco-uplift for any temporary impacts caused by facilities maintenance activities. Regular facilities maintenance in creeks and wetlands is generally limited to cleaning, maintaining, and repairing flow gates (flap gates, rubber check valves, etc.) without the use of construction equipment in creeks. Special cases include (1) the occasional need to trim cattails in front of Lynwood Pump (1-LYS) station to facilitate preventive maintenance access and (2) managing cattails within the pond at the intake of Santa Venetia Pump Station 4 (7-PS-2). In the case of Pump Station 4, there is not enough pumping capacity to meet flood protection goals, so every bit of potential flood storage in this pond is critical.

Levee Maintenance

Levee maintenance activities, conducted using best management practices, will have no permanent and very minor temporal impacts. Typical enhancement consists of the removal of non-native plant species which are removed for access and inspection purposes, in addition to trash removal.

3.4 Avoidance and Minimization Measures In General

General Avoidance and Minimization Measures (GAMMs) are included in the manual which apply to all sites. Avoidance and Minimization Measures per species (AMMs) were developed for this program based on the findings and recommendations in the Biological Assessment completed for this program. GAMMs and AMMs are described in detail in the following section.

General AMMs Applied to All Projects

Avoidance and Minimization Measures apply to all projects at all sites, regardless of maintenance activity type or type of special status species that may be present.

GAMM-1: Environmental Compliance Coordinator, Buffers and Work Stoppages

- Before commencement of a maintenance activity, The District shall designate an Environmental Compliance Coordinator (ECC). The ECC will be trained by a qualified biologist every year on species that could be present, how to identify potential species, updates to environmental laws, and updates on protection measures. The ECC will determine the appropriate AMMs to implement during operations, based on the site fact sheets and any new updates from the qualified biologist.
- The ECC shall distribute a work order to maintenance staff and contractors with a list of the AMMs and BMPs applicable to each site. The work order must be completed in a timely manner to allow time for pre-construction surveys by a qualified biologist or a trained ECC.
- The ECC shall assess field conditions at the start of each work day. If any special status species or nesting birds are observed, the ECC shall establish buffers areas, if sufficient, or stop any activity the ECC deems may result in take or destruction of habitat. Stopped work shall not be allowed to resume until appropriate corrective measures have been completed or it has been determined that nesting is complete. The ECC shall immediately report any unauthorized impacts to the appropriate trustee agency (i.e., USFWS, NMFS, USACE, and/or CDFW). The ECC shall coordinate with Maintenance Supervisors to stop any activity the ECC or agencies deems may cause take of a listed species or their habitat. Work shall not be allowed to resume until appropriate corrective measures have been completed.
- All on-site maintenance activity personnel shall receive instruction regarding the presence of listed species and the importance of avoiding impacts to these species and their habitat before the start of work.

GAMM-2: Site Preparation/Wildlife Reconnaissance

The ECC shall walk the site each day before maintenance activities commence to locate wildlife; if any special status wildlife species are noted, work will not commence until all individuals have left the work site on their own and/or it has been determined that they are not nesting within the project site.

When maintenance activities require dewatering, a qualified fisheries biologist with appropriate permits shall be on-site to move fish.

All habitat improvements on salmon and steelhead streams shall be done in accordance with techniques in the California Salmonid Stream Habitat Restoration Manual (CDFW 2010).

GAMM-3: Work Windows

To avoid impacts to special status species, the maintenance activities carried out shall typically occur during the summer low flow season. In addition, species-specific work windows shall be followed to avoid impacts. Table below shows the work windows for

species that may be impacted by the proposed maintenance activities. Additional information can be found within the species-specific AMMS.

GAMM-4: Trash Removal

During all activities at project sites, all construction trash that may attract predators shall be properly contained, removed from the work site, and disposed of regularly. Following maintenance activities, all construction trash and maintenance debris shall be removed from work sites and disposed of properly.

GAMM-5: Equipment Staging

Staging/storage areas for equipment, materials, fuels, lubricants, and solvents, shall be located outside of the stream's high water channel and associated riparian area. Stationary equipment such as motors, pumps, generators, compressors, and welders located within the dry portion of the steam channel or adjacent to the stream, shall be positioned over drip-pans. Equipment shall be moved out of the normal high water area of the stream prior to refueling and lubricating. The ECC or Maintenance Supervisor shall ensure that contamination of habitat does not occur during such operations. Best Management Practices covering Chemical Use (Spill Prevention and Control); contained in the BASMAA Flood Control Facility Maintenance Best Management Practices Manual (BAASMA 2000) shall be followed. These BMPs are designed to prevent the discharge of chemicals to flood control channels and storm drain systems and allow prompt and effective response to any accidental spills. All workers shall be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur.

The number of access routes, number and size of staging areas, and the total area of the work site activity shall be limited to the minimum necessary to complete the proposed activity.

Table 3-1. Work windows.

									SMF	Work Win	dow _		
		January	rebruary	March	April	May	June	July	August	Septembe	October	Notember	December
General	In-stream - no salmonids			8	15-Apr						15-Oct		
	In-stream - salmonids						16-Jun				15-Oct		
Invertebrate	Monarch butterfly				1-Apr				31-Aug				
Fish	Salmonids						16-Jun				15-Oct		
Amphibian	CA red-legged frog					16-May						14-Nov	
Bird	Black and Ridgway's rails	31-Jan								1-Sep			
	Northern spotted owl	31-Jan							1-Aug				
	Raptors and wading birds					() ()			1-Aug				
	Landbirds		28-Feb										
	Burrowing owl		1-Feb						31-Aug				
Mammal	Salt marsh harvest mouse		28-Feb										1-Dec
	Bats			1-Mar	15-Apr				0	1-Sep	15-Oct		

Species work windows

GAMM-6: Invasive Species

The ECC shall ensure that the spread or introduction of invasive exotic plants shall be avoided to the maximum extent possible. When practicable, invasive exotic plants at the work site shall be removed.

For all activities in creeks and bay, all gear exposed to water shall be allowed to dry for three days before being used again. Some disinfectants are OK to use per CDFW and USFWS (users should check with those agencies). As a precaution against invasive quagga, New Zealand mud snails (*Potamopyrgus antipodarum*), and zebra mussels (*Dreissena polymorpha*), if kayaks or any other vessels are used in maintenance activities, crew will wash and dry them off-site prior to using them in another creek or tributary. This is especially important after working in creeks with known New Zealand mud snails: Novato Creek and San Anselmo Creek by Marin Town and Country Club. See the USGS map of Nonindigenous Aquatic Species at

https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=1008.

GAMM-7: Open Trenches

All holes or trenches must be covered overnight, or a ramp put in place to allow wildlife to exit the hole or trench. If covering the hole, be sure to make the seal tight so lizards and mice cannot get through.

SPECIES SPECIFIC AVOIDANCE AND MINIMIZATION MEASURES

3.5 Avoidance and Minimization Measures for Special Status Plants

PLA-1: Special Status Plants

At sites where vegetation may be modified (such as clearing or ground-breaking), and where special status plant species may potentially occur, a qualified biologist shall conduct a habitat assessment during blooming periods to determine the presence of suitable habitat. If no potentially suitable habitat is identified during the habitat assessment, then avoidance has been accomplished and no further actions are necessary.

If suitable habitat is determined to be present within the maintenance site, botanical surveys shall be conducted before activities commence to determine whether any special status plant species are present. Rare plant surveys, if necessary, for state listed species shall be conducted following the Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities (CDFW 2018) and the California Native Plant Society Botanical Survey Guidelines (CNPS 2001). For federally listed species, the rare plan surveys shall also follow the Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants (USFWS 2000).

Surveys shall be conducted in the field when species are both evident and identifiable, normally during flowering or fruiting. Multiple visits to a site may be necessary to capture the floristic diversity present at the site.

If listed species are observed or presumed present, then the ECC shall take such action as is necessary to protect the plants, using fencing, buffers, etc. If possible and practicable, the activity shall be planned to avoid listed plant species.

For all observed special status species, the ECC shall complete and submit a California Native Species (or Community) Field Survey Form to the CNDDB documenting the species and location.

The ECC shall ensure that the Project Supervisor is aware of these site-specific conditions, and will inspect the work site before, during, and after completion of the maintenance activities.

3.6 Avoidance and Minimization Measures for Fish

The AMM described below is designed to protect fishery resources. Coho may potentially be found in Easkoot Creek in West Marin, although they aren't known to be breeding there. Steelhead trout are known to occur within Novato Creek, Ross Valley, Miller Creek and Richardson Bay, and these measures will also protect other fish species such as Chinook salmon, sturgeon, lampreys, and Sacramento splittail.

FISH-1: Salmonids

If steelhead and/or coho salmon are known to be absent from the project site based on CEMAR/CDFW surveys and there are long-standing natural or artificial downstream barriers sufficient to prevent upstream migration, then avoidance has been accomplished and no further actions are necessary.

If Coho salmon are observed in the project area during winter months or during preconstruction fish capture and relocation activities, all project activities shall cease and CDFW and NMFS shall immediately be notified.

If steelhead are determined or presumed to be present in the project site, then the following Avoidance and Minimization Measures shall be implemented:

• All in-stream maintenance activities will be restricted to the low-flow period of June 15th through October 15th. Work above the top of bank or outside of the channel will not be subject to this modified work period.

- To minimize turbidity and stress to special status species, personnel shall avoid walking through stream pools and the thalweg of the channel and shall instead walk across riffles or outside of the stream bed to access a project site.
- No equipment is to be operated from within the active stream channel unless the stream has been dewatered and fish have been relocated by a qualified and permitted biologist.
- If anadromous salmonids are present, a fisheries biologist with appropriate licenses and equipment (buckets, aerators, etc.) must be on-site to catch and move fish downstream as dewatering proceeds.
- Captured fish shall be handled with extreme care and kept in water to the maximum extent possible during relocation activities. All captured fish shall be kept in cool, shaded, aerated water protected from excessive noise, jostling, or overcrowding any time they are not in the stream and fish shall not be removed from this water except when released. To avoid predation, the biologist shall have at least two containers and segregate young-of-year fish from larger age-classes and other potential aquatic predators. Captured salmonids will be relocated, as soon as possible, to a suitable instream location in which habitat condition are present to allow for adequate survival of transported fish and fish already present. Cofferdams used to divert water shall be constructed with clean river gravel or sand bags and sealed with sheet plastic.
- If any salmonids are found dead or injured, the biologist shall contact NMFS biologist Bob Coey by phone immediately at (707) 575-6090 or the NMFS Santa Rosa Office at (707) 387-0737. The purpose of the contact is to review the activities resulting in take and to determine if additional' protective measures are required. All salmonid mortalities shall be retained, placed in an appropriately-sized sealable plastic bag, labeled with the date and location of collection, fork length measured, and frozen as soon as possible. Frozen samples shall be retained by the biologist until specific instructions are provided by NMFS. The biologist may not transfer biological samples to anyone other than the NMFS North Central Coast Office without obtaining prior written approval from the North Central Coast Office, Supervisor of the Protected Resources Division. Any such transfer will be subject to such conditions as NMFS deems appropriate.
- Intakes and outlets shall be designed to minimize turbidity and the potential to wash contaminants into the stream.
- If a work site is to be temporarily dewatered by pumping, intakes shall be completely screened with wire mesh not larger than 5 millimeters to prevent amphibians from

entering the pump system. On salmonid streams, the intake pipe shall be fitted with fish screens meeting CDFW and NOAA Fisheries' criteria to prevent entrainment or impingement of small fish (NMFS 1997).

- A filtration/settling system must be included to reduce downstream turbidity (i.e., filter fabric, turbidity curtain). The selection of an appropriate system is based on the rate of discharge. If feasible, water that is pumped into a pipe shall discharge onto the top of bank into a densely vegetated area, which may require extra hose length.
- Once the project work is complete, water shall be slowly released back into the work area to prevent erosion and increased turbidity.
- The channel and soil surface shall be restored to its original or design configuration after the work is complete. Any material added to the channel or basin to provide support for the work approved under this provision shall be removed unless required for erosion control or habitat enhancement and/or restoration.
- For minor actions where the disturbance to construct cofferdams to isolate the work site would be greater than that which would occur in completing the proposed action, measures will be put in place immediately downstream of the work site to capture suspended sediment. This may include installation of silt catchment fences across the drainage or placement of a straw wattle or filter berm of clean river gravel. Silt fences and other non-native materials will be removed from the stream following completion of the activity. Gravel berms may be left in place after breaching, provided they do not impede the stream flow.

3.7 Avoidance and Minimization Measures for Invertebrates

INV-1: Monarch Butterfly

Only one project area, Zone 5, is known to have a nearby overwintering site for monarch butterflies (*Danaus plexippus*). The specific sites are along Easkoot Creek and include sites, 5-EAS-2, 5-EAS-2, and 5-EAS-3.

Avoidance will be accomplished if maintenance activities are scheduled for April 1st through August 31st.

If work occurs during the butterfly overwintering season (October through March), the ECC should walk the area of proposed activity each day before maintenance activities begin to determine if monarchs are present within the immediate work area. If none are observed, avoidance can be assumed, and work can proceed. If monarchs are observed within the site, work should not commence until all individuals have left the work site on their own.

If areas to plant arise, plants will be chosen based on their ability to support monarch butterflies, including blue dicks (*Dichelostemma capitatum*), California goldenbush (*Ericameria ericoides*), goldenrod (*Soidago* spp.), Oregon gumweed (*Grindelia stricta*), seaside fleabane (*Erigeron glaucus*), western goldentop (*Euthamia occidentalis*), and willow species (*Salix* spp.). See the Xerces Society List of Monarch Nectar Plants – California for more plant options (Xerces 2019).

3.8 Avoidance and Minimization Measures for Amphibians

AMPH-1: California Red-legged Frog (CRLF)

CRLF may be present at site 1-SRC, within program area Zone 1 and project area Upper Novato Creek Area. There have been sightings of CRLF on Mount Burdell Open Space Preserve and a breeding pond, specifically for CRLF, was created in 2018 (MCP 2021). CRLF also have potential to be within project area Zone 5.

For vegetation maintenance occurring in sites that have potential habitat for CRLF, a qualified biologist will conduct a survey prior to maintenance. The survey will determine and identify any potential breeding and/or foraging areas. These areas will be marked off and avoided.

If any ground disturbing activities will be conducted, the following the protocol outlined in the Revised Guidelines on Site Assessments and Field Surveys for the California Red-legged Frog (USFWS 2005) will be followed:

- At least 15 days prior to the onset of activities, the applicant or project proponent shall submit the name(s) and credentials of biologists who would conduct activities specified in the following measures. No project activities shall begin until proponents have received written approval from the Service that the biologist(s) is qualified to conduct the work.
- A Service-approved biologist shall survey the work site two weeks before the onset of activities. If California red-legged frogs, tadpoles, or eggs are found, the approved biologist shall contact the Service to determine if moving any of these life-stages is appropriate. In making this determination the Service shall consider if an appropriate relocation site exists. If the Service approves moving animals, the approved biologist shall be allowed sufficient time to move California red-legged frogs from the work site before work activities begin. Only Service-approved biologists shall participate in activities associated with the capture, handling, and monitoring of California red-legged frogs.

- Before any construction activities begin on a project, a Service-approved biologist shall conduct a training session for all construction personnel. At a minimum, the training shall include a description of the California red-legged frog and its habitat, the importance of the California red-legged frog and its habitat, the importance of the California red-legged frog and its habitat, the general measures that are being implemented to conserve the California red-legged frog as they relate to the project, and the boundaries within which the project may be accomplished. Brochures, books, and briefings may be used in the training session provided that a qualified person is on hand to answer any questions.
- A Service-approved biologist shall be present at the work site until such time as all removal of California red-legged frogs, instruction of workers, and habitat disturbance have been completed. After this time, the contractor or permittee shall designate a person to monitor on-site compliance with all minimization measures. The Service-approved biologist shall ensure that this individual receives training outlined above in measure 3 and in the identification of California red-legged frogs. The monitor and the Service- approved biologist shall have the authority to halt any action that might result in impacts that exceed the levels anticipated by the Corps and Service during review of the proposed action. If work is stopped. The Corps and Service shall be notified immediately by the Service-approved biologist or on-site biological monitor.
- Pre-construction surveys should consist of two separate daytime and nighttime surveys extending 300 ft. upstream and downstream (where feasible) of the proposed work sites. If special-status species are found, CDFW and/or USFWS should be contacted to determine what actions are to be taken. The 2005 Guidance recommends a total of up to eight (8) surveys to determine the presence of CRLF at or near a project site. Two (2) day surveys and four (4) night surveys are recommended during the breeding season; one (1) day and one (1) night survey is recommended during the non-breeding season. Each survey must take place at least seven (7) days apart. At least one survey must be conducted prior to August 15th. The survey period must be over a minimum period of 6 weeks (i.e., the time between the first and last survey must be at least 6 weeks). Throughout the species' range, the non-breeding season is defined as between July 1st and September 30th.
- If a maintenance activity site is to be temporarily dewatered by pumping, intakes shall be completely screened with wire mesh no larger than five millimeters to prevent CRLF from entering the pump system.

3.9 Avoidance and Minimization Measures for Reptiles

REP-1: Western Pond Turtle

Several sites may contain suitable habitat for western pond turtle, and they have been known to occur at sites 1-ASJ-1, 1-LYC, and 1-WAR-2

Pre-construction surveys for western pond turtle shall be conducted by a qualified biologist. The creek shall be surveyed for presence of turtles and the creek banks surveyed for presence of burrows; all locations of observed turtles and burrows should be noted.

Each day, before maintenance activities begin, the ECC shall make a quick survey for turtles, paying close attention to areas where turtles or burrows had been noted during the pre-construction survey. If turtles are observed, work will stop, and a qualified biologist can be called to move the turtle to a safe location outside of the work area. All applicable CDFW regulations and permits will also be followed. If a biologist is not available, the ECC shall use any means necessary to avoid "take" of these species, including removing vegetation by hand, installation of fencing, or other measures. If a western pond turtle is found, CDFW will be notified within 48 hours and the sighting will be uploaded to CNDDB.

All staging areas for all heavy equipment, storage of materials, and any maintenance/fueling of heavy equipment shall be clearly identified on the grading and building plans, to minimize impacts to upland habitats outside the project site.

Training sessions shall be given to all workers to inform them of protective measures, instruct them in identification of western pond turtles, their upland and aquatic habitat requirements, and inform them of when work needs to be stopped and appropriate officials informed of species presence.

3.10 Avoidance and Minimization Measures for Birds

Following are avoidance and minimization measures for birds. Some of these relate directly to listed species with the potential to occur within one or more project sites (the rails, northern spotted owl); however, others relate more generally to a class of species, such as raptors and wading birds and land birds.

BIRD-1: California Ridgway's Rail and California Black Rail

Several of the sites are within (5-10 sites) or immediately adjacent (15-20 sites) to suitable habitat for the California Ridgway's rail (formally the California clapper rail) and California black rails. The following measures apply to all sites in or near salt or brackish marshland and will also serve to protect other tidal-marsh dependent species such as saltmarsh common yellowthroat and San Pablo song sparrow.

When working within 250 ft. of salt or brackish marshland during the period February 1st through August 31st, presence for either rail species shall be assumed.

For all maintenance activities except for mowing of levees:

- Maintenance activities shall be scheduled to occur between September 1st and January 31st to avoid the rail breeding season.
- Work shall be scheduled to occur between 8:00 AM and 4:00 PM in order to avoid early morning and late afternoon/evening hours when rails are most active.
- Work shall be scheduled to avoid periods of high tides, as the high water reduces the amount of refugial habitat for the rails. No work shall occur near salt marsh habitats within two hours before or after predicted extreme high tides of 6.5 ft. above the National Geodetic Vertical Datum, as measured at the Golden Gate Bridge, and adjusted to the timing of local extreme high tide events at the project sites.
- Activities shall proceed as quickly as possible to reduce disturbance from noise, dust, etc.
- Removal or disturbance of emergent tidal marsh vegetation shall be avoided, and removal or disturbance of vegetation at the tidal marsh/upland interface shall be avoided to provide a buffer of refugial habitat within as wide a swath as possible (3 meter minimum) from the Mean Higher High Water line. If removal is necessary, the work shall be scheduled outside of the breeding season (February 1st August 31st); all vegetation shall be removed by hand and shall be salvaged and retained for replacement after work is completed.
- If, for any reason other than fire fuel reduction levee mowing, the District must perform maintenance activities within 250 ft. of salt or brackish marshland during the rail breeding season, the District shall retain a qualified biologist to conduct California Ridgway's rail surveys following the USFWS Clapper Rail Survey Protocol (USFWS 2015).

BIRD-2: Northern Spotted Owl

Per the "Protocol for Surveying Proposed Management Activities that May Affect Northern Spotted Owls" (USFWS 2012), project sites for activities that do not modify spotted owl habitat but may cause disturbance to spotted owls (such as noise from weed-whackers) are defined as 0.25 mi buffers of project footprints. Several of the work sites are within 0.25 mi (1320 ft.) of known locations of northern spotted owl activity centers on Old Mill Creek, Cascade Creek, Warner Canyon Creek, Bothin Creek, Larkspur Creek, and Ross Creek (sites 3-CAS; 3-WAR; 9-BOTH; 9-LAR-2; and 9-ROS). To avoid impacts to breeding northern spotted owls, maintenance activities at sites adjacent to habitat for northern spotted owl should follow a limited operating period with no vegetation maintenance scheduled from February 1st through July 31st. Several other agencies (e.g., Marin County Parks, Marin Municipal Water District, National Park Service) perform protocol level surveys to determine if any northern spotted owls are nesting within specific areas. If surveys coincide with the SMP project area and it is determined that there are no nesting northern spotted owls, work can be conducted before July 31st. If northern spotted owls are found to be nesting within 0.25 miles of the project area, disturbance can be minimized by using non-motorized hand tools. No work shall occur within 40 meters of an occupied nest.

If a biological evaluation determines that vegetation projects are unlikely to result in breeding disturbance considering their intensity, duration, timing and specific location, or where a biological evaluation determines that topographic features may shield nest sites, the limited operating period may be waived or the buffer distance modified.

BIRD-3: Raptors and Wading Birds

Several of the sites are adjacent to suitable habitat for raptors and wading birds. Although none of these species are listed under the Federal or State Endangered Species Act, they are protected by the Migratory Bird Act and other laws/regulations, so impacts to them shall be minimized. Several species are also listed as Birds of Conservation Concern (USFWS) or California Species of Special Concern.

The nesting season for most raptors and wading birds occurs between January 1st and August 31st. During this time period, a qualified biologist or an ECC who has been trained in conducting bird nesting surveys, shall conduct bird nesting surveys one to seven days prior to work. If no active nests are found, work can proceed as usually. If an active nest is found, an appropriately sized buffer of no-work shall be placed around the nest. Buffer size will vary by species and/or guild and Table 3-2 offers guidance for the buffer size. A qualified biologist can reduce or increase the buffers based on the location of the nest, work to be conducted, and impacts to the nest. Buffers will be removed once the young have left the nest or if the nest is abandoned.

Table 3-2. Recommended Bird Nesting Buffers by Species or Guild

Species/Guild	Recommended Buffer					
	(meters/feet)					
Diurnal Raptors	76 m (250 ft)					
Owls (except northern spotted owl)	50 m (160 ft)					
Northern Spotted Owls	402 m (1320 ft or ¹ / ₄ mile)					
Double-crested Cormorant	50 m (160 ft)					
Herons/Egrets/Bitterns	100 m (330 ft)					
Waterfowl (Ducks, geese, swans	30 m (100 ft)					
Larger passerines: Corvids (crows/jays), Thrushes	20 m (65 ft)					
Most Songbirds	10 m (30 ft)					
Hummingbirds	10 m (30 ft)					
Woodpeckers	15 m (50 ft)					
Pigeons/Doves (except BTPI)	20 m (65 ft)					
Band-tailed Pigeon (BTPI)	30 m (100 ft)					
Species of Special Concern (olive-sided flycatcher,	22 m (75 ft)					
Blackbirds (tri-colored and red-winged)	30 m (100 ft)					
Killdeer	22 m (75 ft)					
Western Meadowlark	30 m (100 ft)					
California Quail	20 m (65 ft)					
Turkeys and Starlings	6 m (20 ft)					

If work is scheduled to take place outside of the nesting season (August 31st – December 31st), then a bird nesting survey is not required. However, some species of birds may have double clutches and some birds have altered their breeding patterns due to climate change. Therefore, the ECC shall walk the site before work occurs to check for nests and the presence of birds. If the ECC is unsure if a bird is nesting, a qualified biologist will be called to confirm.

Western burrowing owls (*Athene cunicularia*), a federal bird of conservation concern and state species of special concern, no longer nest within Marin County (Klute Et. Al. 2003). Burrowing owls can be found overwintering within Marin County and some overwintering sites are protected. There are no know occurrences of burrowing owls within the project areas. Surveys for active burrows during the overwinter season (September 1st – January 31st) will be conducted in suitable habitat prior to work. Most of the project areas consist of non-suitable habitat types, with only California annual grassland potentially providing overwintering habitat. If active burrows are found during a survey, a buffer of no-work will be placed around the active burrow. Other measures, such as using hand tools, could also be used to reduce stress to the animals.

BIRD-4: Landbirds

Many of the sites are along riparian corridors that potentially support many passerine and non-passerine birds, some of which are seasonal and some of which are year-round residents. These sites include: 1-NOV-3, 3-NYH-2, 5-EAS-2, 9-CMC-4, and many more.

Any removal of trees or shrubs, or maintenance activities in the vicinity of active bird nests, could result in nest abandonment, nest failure, or premature fledging. Destruction or disturbance of active nests violates the federal Migratory Bird Treaty Act and California Department of Fish and Game Code.

Avoidance will be achieved if maintenance activities are scheduled for August 1st to December 31st to avoid the nesting season (January 1st to July 31st). However, some species of birds may have double clutches and some birds have altered their breeding patterns due to climate change. Therefore, the ECC shall walk the site during the non-nesting season before work occurs to check for nests and the presence of birds. If the ECC is unsure if a bird is nesting, a qualified biologist will be called to confirm.

If maintenance activities are scheduled during the nesting season, then the following AMMs should be followed:

- The removal of any trees or shrubs should occur (if possible) between August and December, outside the nesting season. If removal of trees or shrubs occurs, or maintenance begins between January 1st and July 31st (bird nesting season), a nesting bird survey shall be performed within seven (7) days prior to the removal or disturbance of potential nesting trees or shrubs. Bird nesting surveys shall be conducted by a qualified biologist or an ECC trained in conducting bird nesting surveys. Keep in mind that other restrictions to tree removal, including the presence of bats, may also impact tree removal schedules.
- In addition to surveying trees and shrubs for nesting birds, surveys shall be conducted for ground nesting birds by walking narrow transects through the grassland adjacent to the project site within seven (7) days prior to the commencement of project related activities. Surveys will also include all staging areas and areas where equipment will turn around.
- All active nests shall have a non-disturbance buffer zone established, or the site shall be avoided until it has been determined that the young have fledged (i.e., left the nest). Buffer zones will be determined by the species and follow guidelines in Table 3-2. A qualified biologist can modify the buffers if necessary. Active nests shall be monitored to determine when the young have fledged and the area is clear to have work continue.

• Training sessions shall be given to all workers to inform them of protective measures, instruct them in identification of sensitive habitat and bird species, and inform them of when work needs to be stopped and appropriate officials informed of species presence.

3.11 Avoidance and Minimization Measures for Mammals

There is only one listed mammal in the project quad maps; and the mammals on the species of concern list are all bat species. AMMs for mammals are below.

MAMM-1: Salt Marsh Harvest Mouse (SMHM)

Most of the sites are not in, nor adjacent to, salt marsh harvest mouse habitat; avoidance has been achieved for those sites. Approximately 15-20 sites are adjacent to suitable habitat for salt marsh harvest mouse; and about half of those sites include work which may require impact to salt marsh harvest mouse habitat by removal of pickleweed. For these sites, the following AMMS shall be followed:

- When implementing maintenance activities in uplands adjacent to salt or brackish marshland, vehicles will be confined to existing roads where possible, and disturbed areas shall be re-vegetated with locally native brackish marsh species. Crews shall use matting, pontoon boards or other comparable methods whenever feasible to minimize impacts to the existing vegetation. The placement of mats will be approved by CDFW before their placement. Crews shall work exclusively from mat boards and boardwalks to minimize trampling of vegetation.
- If maintenance activities are conducted outside the breeding season, in coordination with USFWS and CDFW, pre-construction surveys shall be conducted within five (5) days of the start of maintenance activities to check for presence of mice within the project sites. In addition, the ECC shall be present during maintenance-related activities along and adjacent to all suitable nesting habitat areas to ensure that salt marsh harvest mice are not present.
- Work shall be scheduled to avoid periods of high tides, as the high water reduces the amount of refugial habitat for SMHM. Generally, work should not be scheduled to occur between two hours before high tide and two hours after high tide.
- Removal or disturbance of emergent tidal marsh vegetation shall be avoided, and removal or disturbance of vegetation at the tidal marsh/upland interface shall be avoided to provide a buffer of refugial habitat within as wide a swath as possible.

- Training sessions shall be given to all workers to inform them of protective measures, instruct them in identification of the salt marsh harvest mouse and its habitat requirements, and inform them of when work needs to be stopped and appropriate officials informed of species presence.
- For project sites where work will intrude into tidal marsh habitat, the ECC shall survey the site prior to beginning work in order to determine the presence/absence of SMHM, and the following measures shall be implemented:
- Under the supervision of the ECC, vegetation shall be removed only with nonmechanized hand tools; no motorized equipment shall be used. Vegetation removal may begin only when no mice are observed, or with CDFW approval, and shall start at the edge farthest from the salt marsh and work its way towards the salt marsh. If a mouse of any species is observed within the areas being removed of vegetation, work shall stop and CDFW shall be notified. Unless otherwise approved by CDFW, the mouse shall be allowed to leave on its own volition. Removal of pickleweed will generally follow Zedler (2001).
- If trenching takes place within 50 ft. of pickleweed areas, visqueen fencing shall be installed around worksites within pickleweed before excavation activities begin. CDFW will approve the size and placement of fencing. An escape ramp shall be placed in any open trench at the end of the day to allow any entrapped animals to escape.
- The ECC shall be on-site and shall halt project activities if necessary to comply with these terms.

MAMM-2: Roosting Bats

There is a known roosting site, containing several species of bats, under the bridge at Novato Boulevard and Warner Creek. Bats have been observed there during the maternity season, so it is assumed that this is a maternity roost. Other sites may be within or adjacent to suitable habitat for roosting bats. During pre-project inspection and project implementation the following AMMs will be implemented to protect all bat species:

• Pre-construction surveys will consist of evaluating the habitat for roosting bats and will be concurrent with nesting land bird surveys. Only qualified biologists will conduct these surveys. The *Bat Roosting Survey Decision Matrix* (see below) created by Wildlife Research Associates will be used to evaluate the habitat for roosting bats. Other signs, such as bat droppings, will also be used to determine if bats are using the area. Bat droppings are small (4-8 mm long), black/brown, and crumble

into a powder when crushed, due to the insectivore diet of bats. Mouse droppings are similar in size and color but are sticky when fresh and hard when old.



Bat Roost Survey Decision Matrix Rev. 4- 1/9/2014

Wildlife Research Associates 1119 Burbank Ave., Santa Rosa, CA 95407 707-544-6273

- If trees will be removed or other vegetation/structures that could have roosting bats will be removed/are nearby, a daytime bat roosting evaluation form will be filled out to determine if a nighttime survey is required. Nighttime surveys consist of watching the tree (or other vegetation/structure) 30 minutes before and 30 minutes after sunset, to see if anything leaves the vegetation or structure.
- If no signs of bats are detected during the pre-construction surveys, avoidance has been achieved and maintenance activities can proceed.
- If bats are detected, work should be re-scheduled to occur within these dates: March 1st – April 15th and/or September 1st – October 15th in order to avoid the maternity season and winter hibernation/torpor. If a maternity or winter roost is found within the project site, a 100-foot buffer of no work around the roost will be created to protect the bats. In addition, the California Department of Fish and Wildlife will be consulted if there are any questions or doubts on how to protect roosting bats.

- Removal of vegetation where bats have been known to roost shall follow the twophased removal system: Day 1, a qualified biologist will identify limbs and branches that will be removed by a tree cutter using chainsaws only. Limbs with cavities, crevices, or deep bark fissures will be avoided, and only branches or limbs with those features will be removed. Day 2: the entire tree will be removed.
- Training sessions shall be given to all workers during bat breeding season to inform them of protective measures, details about the two-phase tree removal protocol, and inform them of when work needs to be stopped and appropriate officials informed of species presence.

3.12 Mitigation Monitoring

Monitoring will be used to determine compliance with success criteria and to assist in the evaluation of specific mitigation methods. Monitoring reports will be provided to the resource agencies in the Annual Summary Report. Changed site conditions that affect the ability to meet monitoring requirements will be described in the monitoring reports. The following process will be implemented to monitor mitigation measures:

- Tree and shrub planting sites will be monitored by a qualified biologist to evaluate the survival and successful establishment of the plantings. Monitoring will be conducted over a 5-year period with assessments performed in Years 1, 3, and 5 following planting. The data collected during monitoring visits will be used to determine if success criteria are met and to recommend management modifications or the implementation of contingency measures, as necessary, to help meet the final success criteria. Site performance and final success will be evaluated through both quantitative and qualitative monitoring. If the final success criteria are not met by Year 5, remedial measures will be implemented and monitoring will continue annually or as otherwise stipulated in writing until the success criteria are achieved.
- Baseline site conditions at the time of plant installation will be documented in the field. At the time of planting the number, location, and species of trees and shrubs planted and the square footage of the area planted will be recorded. Baseline photographs will be taken at fixed, pre-designated photo points immediately following initial plant installation.
- Planting areas will not be impacted for a minimum of 10 years after planting. If there are impacts to a tree and shrub planting mitigation area, the impacted mitigation area will be replaced in-kind and the monitoring clock will be reset for those areas for another five (5) years.

Success Criteria and Remedial Actions

- <u>Plant Survival</u>: Plant survival will be monitored in Years 1, 3 and 5. Plant survival will be assessed in upland areas, which are defined by the Stream Maintenance Program as the areas above the normal reach of streams or rivers and characterized by non-wetland vegetation.
- Percent cover: Percent cover of all native woody vegetation will be assessed in • Years 3 and 5 in riparian areas, which are located along the water's edge. As defined in the Stream Maintenance Program, "riparian" is the area located along the edge of a channel, generally on the floodplain, characterized by access to and influence of the channel, but not in it. A riparian zone or riparian area is the interface between land and a river or stream. The success criterion for absolute percent cover in riparian areas is 30% in Year 3 and 75% in Year 5. There are no percent cover related success criteria in riparian areas for Year 1 as it is assumed the mitigation plantings will be in the early stages of development. Percent cover of all native woody vegetation will be assessed in Year 5 in upland areas. The success criterion for percent cover in upland areas is 30% in Year 5. There are no percent cover related success criteria for upland areas in Years 1 and 3 as it is assumed the mitigation plantings will be in the early stages of development. If the success criterion is not met in Year 5, remedial measures will be discussed with the permitting agencies.

4.0 MAINTENANCE ACTIVITIES

4.1 Overview

The SMP encompasses five types of maintenance activities:

- 1) In-stream vegetation management
- 2) In-stream sediment and debris removal
- 3) Erosion control
- 4) Maintenance and repair of flood control structures in channels
- 5) Levee maintenance gopher control like grouting burrows or cutoff, and adding drivable surfacing

Most in-stream maintenance activities occur during the dry season from June 15th to October 15th. However, timing may be affected by weather. Work prior to June 15th is typically limited to fire fuel reduction and non-native seed reduction. Unless expressly stated in the frequency and timing sections below, if work is scheduled outside the June 15th to October 15th dates, the District will notify CDFW of its intentions.

The following chapters describe the various components, frequency and timing, and contractor details for each type of maintenance activity. At the end of each section is a list of activity-specific conditions that are to be followed when conducting these activities.

In addition to the activity-specific conditions, the SMP is subject to General Conditions for all activities.

4.2 General Conditions for all Activities

- **GACT-1** The District shall designate an ECC to oversee the implementation of the SMP in the field. Before commencement of a maintenance activity, the ECC shall review the Site Fact Sheet (Appendix D) for specific information on the type, location and extent of the activity and associated areas of disturbance and determine the Avoidance and Minimization Measures to implement prior to the maintenance activity for protection of water quality and special status species (*endangered, threatened, rare, and candidate species*) and their habitat. If any changes are observed at the site, the Fact Sheet shall be updated and submitted to CDFW. The ECC shall distribute the Site Fact Sheet to the Maintenance Supervisor five days before beginning the maintenance activity.
- **GACT-2** Avoidance and Minimization Measures (AMMs), as prescribed in the Biological Assessment for the SMP Program (Appendix E), shall be implemented during prescribed maintenance activities to ensure that

Special Status Species and their habitat are not adversely impacted by maintenance activities.

- **GACT-3** Existing stream and riparian habitat conditions such as pools, riffles and wetlands shall be protected to the maximum extent. Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations.
- **GACT-4** If a maintenance activity may cause the introduction of sediments into the stream, no phase of the activity shall be started unless all equipment and materials are able to be removed from the channel at least 12 hours prior to the onset of precipitation. Seventy-two hour weather forecasts from the National Weather Service shall be consulted prior to the startup of any phase of the project that may result in sediment run-off to the stream. All associated erosion control measures must be kept on-site and be in place prior to the onset of precipitation. After any storm event, the ECC shall inspect all sites under construction and all sites scheduled to begin construction within the next 72 hours, for erosion and sedimentation problems and take corrective action as needed.
- **GACT-5** Appropriate BMPs shall be incorporated into each project to minimize the re-suspension and discharge of sediments and other pollutants downstream and to prevent channel or streambank erosion or destabilization once the activity has been completed. BMPs to be implemented for each type of activity are referenced in Appendix F.
- **GACT-6** No heavy equipment shall be operated within stream channels where there is flowing or standing water.
- **GACT-7** There shall be no permanent loss or significant temporal loss of wetland or riparian habitat in terms of acreage, function, or value.
- **GACT-8** No debris, soil, silt, sand, cement, concrete, or washings thereof, or other construction related materials or wastes, oil or petroleum products or other organic or earthen material shall be allowed to enter into or be placed where it may be washed by rainfall or runoff into waters of the State. When operations are completed, any excess material shall be removed from the work area where such material may be washed into waters of the State.
- **GACT-9** Activities shall not result in any permanent barriers to upstream or downstream migration of anadromous fish.

5.0 VEGETATION MANAGEMENT

Selective vegetation trimming and removal of instream vegetation is the most common maintenance activity and is conducted in order to maintain flow conveyance and to maintain access to District facilities. The District typically only does maintenance work where there is a history of and/or high risk for flooding. These are portions of a creek that typically have been developed very close to the top of bank and within the floodplain. Bank erosion and flash flooding threaten nearby structures, making them unforgiving systems in which to experiment with maintenance practices.

Currently the goal of the District's maintenance work isn't to try to change channel roughness. Doing so is likely to change the aesthetic character and habitat value which are high priorities in most of our communities. The District strives to strike a balance between these interests and the expectations of flood protection - which are already often not met in areas where the District conducts maintenance; i.e., frequently residents expect 100-year protection but many channels have portions with only 5-year capacity. The primary goal is to remove obstructions which is difficult to boil down into a quantitative trigger. Therefore, we use pictograms to generally describe to maintenance crews how to manage vegetation. Site specific information and considerations for maintenance triggers are summarized in Appendix K.

5.1 Maintenance Goals and Triggers

Vegetation management activities are implemented to achieve these main goals:

- maintain or improve stream channel flow capacity to reduce risk of flooding
- maintain access to streams, channels, and flood control facilities
- restore creek habitat by removing invasive nonnative plants and encouraging the establishment of native plants particularly in the understory
- remove trees that are hazardous to life and neighboring properties
- maintain stable streambank conditions, and where possible enhance instream ecologic conditions through:
 - o reducing and removing exotic and invasive species
 - \circ $\,$ encouraging the growth and presence of native vegetation
 - o developing a mature and complex riparian canopy of native species
 - o managing and enhancing bank vegetation to improve streambank stability
 - o managing emergent vegetation in the channel

Meeting these goals requires a balance between flood protection needs and habitat stewardship. In general, vegetation maintenance is triggered when one or more of the following conditions occur in areas of creeks with the District has ownership or

maintenance easements, with areas of District fee title ownership and with a recent history of flooding being higher priority:

- Vegetation growth is significantly decreasing flood conveyance capacity, especially where infrastructure is at risk
- Vegetation growth impedes access to channels and flood control facilities
- Excessive non-native vegetation growth at the top of bank or at critical access points constitutes a fire hazard to surrounding infrastructure
- Nonnative invasive plant species are reducing the success of native vegetation
- Live trees are creating excessive hydraulic roughness, diverting flow or dead/dying trees are reducing stream capacity and/or creating a safety hazard.

The need for vegetation management activities is unlikely if none of these trigger conditions are present. The District is moving away from performing this work on privately owned properties

5.2 Pictograms

The following pictograms give a 2-D picture of what vegetation looks like prior to and after selective removal from typical sites that the District maintains. Work includes removing fallen trees and branches from the channel that could potentially water flow. Other vegetation (such as shrubs and cattails) are thinned and/or trimmed.

1-VIN Downstream of Center Road Bridge



Before Annual Maintenance

After Annual Maintenance

This steelhead stream is the site of a project constructed in 2008 and 2009. A low flow channel and floodplain terrace were created and reinforced with plantable concrete blocks (native vines were planted in spaces). Rock cross vanes were added to concentrate flows to the center of the creek preventing bank erosion and scouring pools downstream as fish habitat. Trees and sedges were planted at the rock vanes to improve habitat and shade. Native shrubs and trees were planted on floodplain terraces and tops of bank. Barriers to fish passage were eliminated through improvements to two bridges in the reach, and the installation of two rock fish ramps.

Example maintenance activities at this site include removing invasive ivy from tree trunks to increase lifespan of the tree, remove downed branch given there is no room in the channel for it, plant new native trees at the top of bank where there is space and appropriate sunlight, prune lower branches in lower floodplain areas to encourage single trunk growth of canopy trees, remove invasive species on bank like French broom.

1-WAR-1 Upstream of the Confluence with Novato Creek



After Annual Maintenance

Before Annual Maintenance

There is very little room in this reach between flood-prone residences. The reach as part of Phase IV of the Novato Creek Flood Control Project in 1991, one side of the bank was excavated back to a gentle vegetated slope and the other side was installed a nearly vertical concrete retaining wall. The goal of the project was to provide a 50-year level of flood protection, however updated modeling shows that the level of protection is now closer to 10-year.

Steelhead are sometimes found in the reach during the quadrennial Novato Creek sediment removal project which includes this part of Warner Creek. Those Steelhead are transported to the Phase VIII reach during the sediment removal.

Annual maintenance however only includes vegetation maintenance and not sediment removal here. Downed branches or trees blocking the active channel are removed and cattails are trimmed down to the water line. The practice of leaving cattail roots in place has caused increased sediment deposition in those areas. There is a tradeoff between minimizing cattail removal and minimizing sediment removal needs. In general, we plant trees on the bank in all reaches where there are recurring flood issues associated with cattail growth, and this shade helps preventing cattails from choking off the full channel cross section. Due to limited funds the District can't do as much tree planting (and associated watering and weeding during first few years) as we would like so we are seeking grants and other funding sources.



1-NOV-3 Novato Creek Downstream of Novato Boulevard

Before Annual Maintenance

After Annual Maintenance

This reach of creek also has residential structures adjacent and no available floodplain. The reach and its Novato Creek Flood Control Project Phase VIII is described in more detail on page 31. The site is maintained to remove debris from the active channel that may obstruct flow, and as noted on page 31 sometimes there are opportunities to retain LWD in the stream. Additionally, a lot of trash is removed from this reach each year.

5.3 Description of Vegetation Maintenance Activities

Maintaining channel capacity is achieved by selectively limbing and trimming trees that directly block flow, cattail cutting, removing invasive vegetation and clearing trash. These activities may occur from the channel bottom to the top of bank with a focus on retaining over hanging, low lying herbaceous vegetation along the edge of channel for habitat

purposes and controlling channel roughness with selective limbing and trimming on the upper banks. The goal is to maintain canopy cover for shade over the water and to shade out invasive non-native plants (Figure 5-1). Low lying vegetation along the edge of the channel remains in place for habitat, while channel conveyance is maintained by selectively trimming vegetation on the upper bank. These activities employ vegetation control methods such as cutting and removing vegetation above the ground by hand or with loppers, hand saws, chainsaws, pole saws, weed eaters and other hand tools. Vegetation management activities do not include ground-disturbing activities. Bladed weed-eaters are used to cut cattails. Entire cattails, including their roots, may be removed as part of sediment removal activities as well. Pesticides and herbicides are not used by the Flood Control District in any form to control vegetation or maintain stream channels.



Figure 5-1. Photo of vegetation management on Warner Creek (Novato) after maintenance was completed.

Tree removal is a rare event. The decision to remove individual trees will be made in the field by District staff familiar with watershed vegetation and creek ecology. Removal of mature, healthy, native trees is only indicated when pruning is insufficient to reduce the

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unacceptably high hydraulic roughness in the channel. For example, an arroyo willow growing on a newly established gravel bar may need to be removed if it threatens to block flow through a structure or its establishment could shift flow dynamics forcing erosive flows against an un-protected residential bank. Annual pre-project notification to the RWQCB and CDFW will include an inventory of any trees of 6-inch diameter or greater that need to be removed for flood control purposes.

Removal of sick, dying, or dead trees is indicated when they reduce channel capacity, increase flood hazard, and/or are a safety hazard to adjacent structures. Tree health and hazard potential will be determined by appropriate environmental staff (arborist and/or biologist). Snags will be left in place to provide habitat for birds and small mammals if they do not otherwise pose a flood or safety hazard. Staff will consult with CDFW whenever possible if tree removal is necessary, and retention of large wood debris in the creeks will follow objectives included in Section 2.5 - Salmonid Conservation. If a small native tree requires removal, it will be evaluated for potential use in another location. Alders, red willow, or yellow willow with a single trunk are most desirable for relocating. If it can be used in another location, the tree will be replanted. Large willows that require pruning may be cut into large sprigs and planted on a bare slope or incorporated into a slope stabilization repair.

Invasive Non-Native Plant Removal

Removal of non-native vegetation takes place as part of maintaining channel capacity but also occurs in a more strictly restoration-type activity, as with STRAW projects. Revegetation activities under the SMP generally occur after other maintenance work has occurred, such as erosion control or emergency repairs, or in conjunction with STRAW. Pesticides and herbicides are never used by the District to control vegetation in creek channels within Marin County.

5.4 Frequency and Timing

Vegetation management activities are scheduled to occur during the dry season from April 15th to October 15th, weather permitting, and may occur on all sites annually. Within that range, specific types of activity occur as follows:

- Vegetation pruning occurs from June 15th to October 15th
- Cattail removal occurs from August 31st to October 15th, so that cattails do not reestablish before winter storms
- Re-vegetation and tree planting and/or relocating may occur throughout the year and depends on the best timing for successful planting

Generally, channels dominated by fast-growing cattails and/or willows will require annual pruning, while channels with a mature riparian canopy generally require less frequent

maintenance to maintain flow capacity. All project sites are inspected annually but not all sites may require maintenance as defined in this manual. Frequency is also affected by weather; wet years may result in more vegetation growth, and years that experience flooding or strong winds may require additional work to clear downed trees or vegetation debris. Annual work plans will reflect current year conditions. The ECC will conduct annual walk-throughs of all sites to determine the upcoming season's list of sites for the pre-project notification list.

5.5 Contractor Details

Vegetation maintenance work is performed by a mix of District staff, CCNB, DPW road crews, and/or private contractors. CCNB is contracted to perform most of the work, with District staff on site most of the time. District staff may perform tasks of a smaller duration and extent that don't require full CCNB crews. Average work duration depends on the site conditions in any given year. For most sites undergoing vegetation maintenance activities, work is completed within 2-3 days using 1-2 CCNB crews. Private contractors are hired for arborist work and specific tasks requiring advanced skills beyond what District staff and CCNB crews hold.

5.6 Conditions for Vegetation Maintenance

- VEG-1 Generally, vegetation management shall be designed and conducted to meet the objectives of design capacity, channel and basin stability and accessibility while maximizing the shade, erosion control, water quality, and habitat functions of the vegetation.
- VEG-2 Removal of trees in bat habitat should follow the two-phased removal system: Day 1, in the afternoon, limbs and branches would be removed by a tree cutter using chainsaws only. Limbs with cavities, crevices, or deep bark fissures would be avoided, and only branches or limbs with those features would be removed. Day 2: the entire tree would be removed.
- VEG-3 Non-native, invasive trees and bushes (e.g., tree of heaven (Ailanthus ssp.), acacia (Acacia ssp.), white poplar (Populus alba), Lombardy poplar (Populus nigra 'Italica'), eucalyptus (Eucalyptus ssp.), London plane tree (Platanus x hybrid), Indian bean (Catalpa sp.), privet, (Ligustrum sp), broom (Cytisus, Genista, Spartium, etc.), red clusterberry (Cotoneaster sp.), and ivy (Hedera sp.), may be cleared from the top-of-bank area or within the channel.
- VEG-5 Vegetation management does not include the use of dozers, loaders, excavators and other heavy tracked or rubber tired equipment, with the exception of mowing equipment.

- VEG-6 Maintaining channel capacity is achieved by selectively limbing and trimming trees that block flow directly, cattail cutting, removing invasive vegetation and clearing trash. These activities may occur from the channel bottom to the top of bank as needed, with a focus on retaining low lying vegetation along the edge of channel for habitat purposes and maintaining canopy cover for shade.
- VEG-7 Typically, mowing occurs from the top of bank all the way to the homeowner's fence line. Brush cutters and weed eaters are used to mow vegetation. Armed mowers may be used in large flat areas such as levees. Riparian and marsh vegetation adjacent to the areas of mowing are protected during mowing activities.
- VEG-8 Areas where non-native vegetation has been removed may be re-vegetated with appropriate California native species and protected using appropriate erosion control methods, to the maximum extent practicable. An erosion control seed mix native to the region shall be used to control erosion where needed and local plant materials and seeds derived from that watershed should be used whenever possible.
- VEG-9 Mulch or tree chips may be used to cover bare soils and if straw is used as mulch it must be seed free straw.
- VEG-10 Vegetation management and replanting measures shall maximize shading of the active channel, stabilization of active channel banks, and quality of instream habitat as described in the Regional Water Board's 2009 Technical Memorandum: "Maintenance, Management, and Monitoring Protocols for Stream Projects That Must Take Flood Risk into Consideration.
- VEG-11 Vegetation management measures shall include incorporation of environmental quality features into concrete or grouted flood control channels to the maximum extent practicable
- VEG-12 Emergent vegetation that impedes channel capacity shall be managed by removing above-ground biomass with manual methods, such as a scythe or weed whacker, in the fall after the bird nesting season is complete and leaving the subsurface rhizomes untouched. SMP sites at the confluence of creeks and up or downstream of culverts or flood control structures where vegetation has grown into the active channel may be approved for full removal of subsurface roots if it is determined to be necessary in order to maintain a low flow channel.

6.0 SEDIMENT AND DEBRIS MANAGEMENT

Sediment management activities are conducted when pipes or other facilities are blocked or interfere with conveyance, and/or sediment is removed from the streambed to maintain capacity at a road crossing or a flood control facility.

6.1 Description of Sediment Removal Activities

Sediment is removed from natural channels and ditches, concrete-lined channels and from engineered sediment basins to maintain flow conveyance and capacity. Sediment removal activities described in this manual are not implemented routinely but as needed to maintain flow conveyance.

Sediment removal is conducted after culverts, channels or other facilities have been inspected by Flood Control Engineers or an Engineering Technician and are found to be blocked by sediment or vegetation to the point of interference with stormwater conveyance that could lead to localized flooding. Each year County Flood Control Engineers review SMP sites within their watershed and use a combination of professional judgment, local knowledge and available data to assess which sites need maintenance in any given year. Sediment removal activities are conducted when pipes or facilities are blocked to the point of interference with stormwater conveyance. At most of the sites included in this manual, sediment accumulates at pinch points in the channel such as at culvert inlets or outfalls, typically creating a localized effect. For larger channel dredging projects such as Novato Creek, which is not included in this manual, the District employs hydraulic modeling or other measures to evaluate channel capacity.

The number of sediment removal projects undertaken annually, and the quantity of sediment removed each year, depend on the frequency and extent of past maintenance activities and the weather and hydrologic conditions during recent years. Sediment removal requirements are generally greater following a wet winter with higher than usual runoff, slope erosion, and sediment delivery compared to an average or dry winter when sediment yields are less.

Debris, including tires, shopping carts, trash, furniture, and other non-sedimentary deposits, is also removed from creek channels, trash racks and culvert openings. Items are removed from the creek and placed at staging areas by hand and hauled out by dump truck to a certified landfill.

Equipment types, equipment locations, crew sizes, and staging areas vary depending on the need of each site. Equipment typically consists of long-reach excavators, loaders, haulers, wheeled front loaders, vactors, and backhoes. Appendix B lists each sediment removal project site; project dimensions, equipment used, location of equipment, and expected duration of work. Equipment includes long-reach excavators, backhoes, haulers, and front loaders. Excavated sediment is placed directly into dump trucks, or is placed in or pushed to staging areas, then lifted into the dump trucks.

An updated Appendix J includes an annual site-specific sediment worksheet for sediment removal.

6.2 Maintenance Goals and Triggers

Sediment Removal Goals- Sediment and debris removal activities are implemented to achieve the main goals listed below. Impacts are minimized by implementing the least intensive activities required to meet these goals.

- Maintain stream/channel capacity and/or flood discharge objectives where available
- Maintain or improve unobstructed flow around structures including bridges, storm drain outlets, and pump stations;
- Identify and prioritize stream locations that require sediment and debris removal and maintenance;
- Understand the underlying geomorphic processes at all of the District's maintenance channels to inform and guide appropriate maintenance actions;
- Develop appropriate maintenance target conditions for sites that balances flood protection needs, economizes maintenance activities, and avoids and minimizes environmental impacts;
- Improve water quality conditions through sediment management, including the removal of fine sediments;
- Conduct maintenance that will enhance stream function while minimizing the need for repeat maintenance.
- Provide for the beneficial reuse of sediments where feasible

Sediment Removal Triggers- In general, sediment or debris removal activities are triggered when one or more of the following conditions occur and depend on the specific site (see Appendix K for details):

- The stream or channel is aggrading such that its capacity is compromised or the flood or discharge objective is compromised (if known).
- Accumulated sediment is covering or blocking culvert outfalls and/or other structures, increasing flooding risk
- Accumulated sediment is allowing for excessive plant growth in the channel flow section, increasing risk of flooding and increasing roughness
- Accumulated sediment is reducing fish passage

At each location where sediment removal is planned, the County will begin with an assessment of the types of sediments, fluvial processes, and habitat in the project area in order to evaluate impacts to bed and bank stability within the site and upstream. Pre-project analysis will include a plan to integrate the excavated reach of creek into the dominant geomorphic conditions in the channel if feasible within the County or municipal road right right-of-way (i.e., drops should not be left in the streambed at the upstream edge of excavation when there is a potential to form headcuts that can migrate upstream). The assessment will also identify sorted sediments, such as gravel bars or fines in tidal areas, and consider them for reuse as spawning gravels or wetland surface material. The assessment will also identify the stream's fluvial processes so that the appropriate stream cross section can be excavated, leaving behind a stable channel that optimizes sediment transport.

Geomorphic Coding for Sediment Removal Sites

The SMP endeavors to identify causes for chronic sedimentation in order to develop effective long-term solutions for these sites. To facilitate the understanding of geomorphic process at each of the sediment removal sites, geomorphic codes were developed that describe the different underlying causes of sedimentation. (Table 6-1)

Table 6-1. Geomorphic Codes were developed which describe geomorphic processes that lead to sedimentation and often trigger sediment removal activities.

	Site is located within an alluvial depositional zone (sudden reduction in channel gradient).
	Human activity (watershed development, channel confinement, etc.) has caused the site
1	to shift from a transport zone to a depositional zone.
	Bridges, culverts, and/or related crossings at a site have dimensions that are smaller than
2	the active channel, leading to velocity changes that cause sediment to drop out.
3	Site is at the fluvial-tidal interface and accretes tidally and fluvially-deposited sediment.
4	Site is located at a channel bend where sediments form a point bar.
5	Site is located downstream of episodic sediment delivery (e.g., landslides).
6	Site is in an area where vegetation slows flows and leads to sediment deposition.
	Site receives sediment from erosion of adjacent channel banks (changes in Width depth
7	ratios).
8	Site is located within an engineered sediment basin.
	Site is located within an alluvial depositional zone (sudden reduction in channel gradient).
	Human activity (watershed development, channel confinement, etc.) has caused the site
9	to shift from a transport zone to a depositional zone.

Project Prioritization to Frequency of Sediment Removal

Understanding and incorporating individual site issues and geomorphic conditions for each site into a programmatic work plan provides the County with a better understanding of the

factors influencing the need to do work at each of these sites. With comprehensive reconnaissance, monitoring, and site condition documentation, the County may be able to eliminate some sites from maintenance status work or identify a project to address the chronic issues, if feasible.

Several of the sediment removal sites have been identified as chronic, largely due to factors which do not allow for comprehensive solutions, such as tidal backwater and/or flat topography. A few chronic sites have been identified for which a capital improvement project may be possible to reduce or eliminate the need for sediment removal. These sites are described below in Table 6-2 below. As part of this program, the District will continue to identify and prioritize sites where chronic sedimentation issues could be improved through infrastructure improvements. Annually, the flood zone engineer will review and recommend sites to be included in either an individual Flood Zone Work Program or integrated into the larger Marin County Public Works Capital Improvement Program (CIP).

Table 6-2. Opportunities to Eliminate or Reduce Sediment Source Contributions and Decrease the Need for Sediment Removal Activities through implementation of a CIP project.

SITE 1-AA/1-BB

A creek bank stabilization project at site 1-AA that was scheduled for 2016 was anticipated to reduce the need for sediment removal downstream at site 1-BB. Though no sediment removal at 1-BB has been needed since 2015, in 2020 continued bank stability issues within 1-AA led to sediment removal within that reach. Hardening the bank in isolated areas could have unintended effects elsewhere in the reach, but it may be that future adjacent property owners decide to initiate such a project in order to save the residential structure. Short of a reach-wide bank stabilization project, which is not likely to ever be funded, there is likely no feasible option to reduce the need for sediment removal. The Flood District's mission is flood control, not bank stabilization, and flood control needs already greatly exceed available funding.

SITE 1-VIN

Installation of a metal baffle may reduce sediment deposition at the Center road outfall downstream of the Center Road Bridge on Vineyard Creek. The Vineyard Creek project was designed and permitted to facilitate sediment removal which typically occurs annually at this location. The fact that sediment accumulates here is partially by design as it historically accumulated in areas that are harder to reach than the bridge. Unfortunately, fish ladders that the District installed downstream have been stripped of smaller gravels so it is hoped that this baffle project will help get the small gravel down to the fish ladders.

SITE 1-NOV-1 (also 1-AA and 1-WAR)

An updated survey and hydraulic model were completed last year to examine whether it is feasible to reduce the sediment removal footprint in this reach (this is done as part of a separate project permit from SMP due to large size). Results showed that sediment removal provides only modest reductions in flood risk. The District will discuss with the advisory board evaluating alternative projects such as pump stations and flood barriers that may provide more benefit than sediment removal (and be done instead of sediment removal). Another project currently being designed is the Deer Island Basin Complex Tidal Restoration Project. While this project would take place downstream of where annual maintenance takes place, it appears this
project may have some minor flood benefits upstream that could supplement local projects to reduce the need for sediment removal.

SITE 1-PAC-3

Repeated flooding at nearby homes in recent years is likely leading to planned 2021 modifications in the inlet structure to an underground piping system. If funding can be secured, the District would look at the feasibility of daylighting the creek here. By daylighting the creek, flow capacity could be less sensitive to debris. Zone 1 funding sources are not enough to cover the cost of daylighting the creek without a grant.

SITE 3-NHY-1

Sediment removal at Enterprise Concourse on Nyhan Creek is necessary almost every year to maintain flow conveyance under the existing bridge. Unfortunately, concepts to raise the bridge in lieu of sediment removal have been dismissed due to inability to tie an elevated road into the surroundings.

The District, Marin County Parks, and many others, are currently partnering to study Bothin Marsh restoration and sea level rise adaptation alternatives. Some of these may have small positive benefit to the upstream Nyhan Creek flood risk potentially reducing the need for sediment removal.

Coyote Creek and Nyhan creek are regularly surveyed and modeled. Based on the updated modeling, while current sediment levels in through these reaches in the earthen channel portion of the creek prevent the creek from accommodating the U.S. Army Corps of Engineers design 20-year flow (which actually corresponds to a higher water surface elevation than our more recent H&H analysis for a 100-year flood) with the standard freeboard, the benefit of major sediment removal there does not outweigh the cost and therefore major sediment removal in the earthen channel is indefinitely postponed.

SITE 5-EAS-1

There is a history of needing to remove sediment at bridge crossings in this reach in order to minimize flooding of buildings nearby. A modified geomorphic channel was constructed in 2013 in the reach upstream (5-EAS-2) on National Park Service land upstream. The intent was to collect sediment in the constructed geomorphic channel where it can be removed with less impact to habitat. Following construction we completed five years of monitoring sediment levels at the crossings which showed the project at 5-EAS-2 to be effective in preventing the need to remove sediment in 5-EAS-1. The result of that monitoring is we are removing sediment removal as an activity in the SMP in this site and will continue to focus sediment removal on 5-EAS-2 where it can be done in a part of the creek that is dry in the summer. The Bolians Lagoon Restoration Project downstream of Easkoot Creek could potentially have a small positive impact on sediment levels and/or flood risk upstream in Easkoot Creek also.

SITE 7-LAP-1

Historically sediment was removed here when its accumulation rendered the rubber check valve at the end of this pipe inoperable. In 2014 a project to slip-line the stormdrain pipe and extend it out to the deeper and more geomorphically stable section of the creek appears to have been effective thus far in preventing the need for sediment maintenance here. Therefore, this site is being removed from the SMP. Two other potential projects in the watershed that may positively impact the sediment levels here include the McInnis Park Restoration Project and the Gallinas Creek Geomorphic Dredge Project.

6.3 Sediment and Debris Disposal and Reuse

Instream gravel and course sediment along a streambed can be a fundamental habitat element to a healthy functioning stream directly supporting life-cycle needs of fish, amphibians and other aquatic wildlife. When evaluating sites for sediment removal, care is taken to avoid beneficial gravels wherever possible. On Marin County Flood Control District's larger flood control sediment removal projects such as Novato Creek (not included in this manual), the District prepares a sediment reuse plan for the dredge spoils. On these larger dredge projects sediment samples are collected and analyzed in accordance with the Beneficial Reuse of Dredged Material: Sediment Screening and Resting Guidelines (RWQCB 2000). Before reuse of sediment at an instream or wetland restoration site, the testing results are submitted to the RWQCB for review and approval.

The quantities of sediment removed at most of the sites included in this manual are much less than the larger dredge projects. The following describes the conditions applied by the RWQCB for the beneficial re-use of sediments removed as part of the SMP:

- a. Excavated sediment may be taken to one of the two Marin County Corporation Yards at Central and West Marin County locations to be re-used as road base in accordance with the following limitations. Sediment re-used for road base shall be placed at least 50 feet away from a surface water body and three feet above groundwater, and then capped with impervious surface to prevent contact with waters of the State.
- b. The District may propose alternate beneficial re-use sites besides road base re-use, if and only if, a Sediment Sampling and Analysis Plan (SAP) is submitted and approved by the Executive Officer prior to sediment removal activities. The Sediment Sampling and Analysis Plan shall consist of sediment testing and an evaluation to determine the suitability for disposal or reuse based on sediment chemistry. Sampling frequency shall follow the Guidelines for Implementing the Inland Testing Manual in the San Francisco Bay Region (DMMO, September 2001). Sediment samples shall be collected and analyzed according to the Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines (SFB-RWQCB 2000), or The Designated Level Methodology for Waste Classification and Cleanup Level Determination (CVRRWQCB, 1989) as appropriate for the proposed disposal or reuse site. Sediment testing results and recommended beneficial re-use site will be submitted to the Regional Water Board for review and approval with the Notification. In general, sediment reuse sites can be characterized into three categories. These categories include (1) onsite reuse, (2) other wetland, channel, or floodplain restoration reuse, and (3) upland agricultural or commercial reuse (dry). The goal is to select disposal options that maximize beneficial reuse of the sediment while minimizing environmental effects.

- c. The District shall dispose of any other sediment at a certified landfill and will test materials in accordance with landfill requirements. Proposed sediment disposal, stockpiling, and/or beneficial re-use sites shall be submitted annually to the Executive Officer for review and approval with the Notification.
- d. Prior to beneficially re-using sediment for any application other than road base improvements, the District must submit a Sediment Sampling and Analysis Plan, acceptable to the Executive Officer.

Trash debris removed from District channels is taken to one of two places depending on if the debris is non-hazardous or hazardous. Non-hazardous material is taken to the Redwood Landfill. If the debris is hazardous in nature, the material is taken to a permitted hazardous waste facility by a permitted and licensed contractor.

6.4 Frequency and Timing

Sediment removal is not a routine activity but rather is implemented solely on an asneeded basis, where determined by annual field evaluation by County Flood Control Engineers. All sediment removal activities are scheduled to occur during the dry season from April 15th to October 15th, weather permitting. In anadromous fish streams all work will occur between June 15-Oct 15th in any given year. At each location where sediment removal is planned, the County will begin with an assessment of the types of sediments, fluvial processes, and habitat in the project area in order to evaluate impacts to bed and bank stability within the site and upstream. Pre-project analysis should include a plan to integrate the excavated reach of creek into the dominant geomorphic conditions in the channel (i.e., drops should not be left in the streambed at the upstream edge of excavation with the potential to become headcuts that can migrate upstream). The assessment will also identify sorted sediments, such as gravel bars or fines in tidal areas, and consider them for reuse as spawning gravels or wetland surface material. The assessment will also identify the stream's fluvial processes so that the appropriate stream cross section can be excavated, leaving behind a stable channel that optimizes sediment transport. Appendix B lists each of the sediment removal sites, along with work duration and interval.

6.5 Contractor Details

Most sediment and debris removal maintenance work is performed by DPW road crews, but some tasks are undertaken by CCNB crews (projects less than 25 yd³), or private contractors. District staff may perform tasks of a smaller duration and extent that don't require full DPW crews. Private contractors are hired for specific tasks requiring skills and/or machinery beyond what District staff and DPW crews possess.

6.6 Conditions for Sediment and Debris Removal

- **SED-1** The work area boundaries, including access, shall be the minimum required to complete the project.
- **SED-2** Access routes and staging areas shall be chosen such that disturbance or removal of vegetation is minimized. Any sediment removal activity which removes vegetation shall comply with all conditions for vegetation management as described above.
- **SED-3** Debris removed from a channel or basin shall be handled, stored and disposed of in accordance with applicable regulatory requirements, and there shall be no discharge of sediment laden water from storage impoundments in violation of applicable water quality standards.
- SED-4 To minimize impacts to natural channels, mechanized equipment (e.g., excavators, backhoes) shall be placed on top of bank whenever possible. Prior to the use of mechanized equipment in natural channels, the ECC shall inform the crew leader of the site access routes and work staging locations for the equipment to ensure the least disturbance practicable. Equipment may only be used within the channel when it is dry naturally or the flow dewatered according to activity-specific conditions for dewatering.
- SED-5 For most sediment removal projects around bridges, culverts, storm drains, diversion inlets, and natural channels, excavators are used from the roadway and/or top-of-bank.
- **SED-6** Sediment and debris removal from a lined concrete channel for the purposes of maintaining the channel's design capacity is limited to 3,000 linear ft. of any watercourse, once per year (BASMAA).
- **SED-7** Sediment and debris removal from an engineered basin is limited to basins less than 2 acres in extent as measured by the area within the basin below the top of bank or, in larger basins, no more than 2 acres in extent of sediment removal (BASMAA).
- **SED-8** All debris removed shall be taken to a permitted disposal site.
- **SED-9** For projects around bridges, culverts, storm drains, diversion inlets, and natural channels where the use of excavators from the top-of-bank is not possible, or would cause major vegetation impacts, equipment may be used within the channel when it is dry naturally or the flow dewatered.

SED-10 Gravels, suitable for spawning, will be identified and marked prior to sediment removal. These sediments will be avoided or gathered and set aside to be reapplied at the site after the bulk of sediments have been removed or removed from the site to be stockpiled at an approved location for beneficial reuse in stream restoration or gravel augmentation projects.

6.7 Conditions for Dewatering and Fish Relocation

When maintenance activities occur in flowing streams or open water, the work site must be dewatered and the following conditions will apply:

DEWAT-1 Any work using equipment within the stream channel shall be performed in isolation from the flowing stream. DEWAT-2 Cofferdams used to divert water shall be constructed with clean river gravel or sand bags and sealed with sheet plastic. **DEWAT-3** If anadromous salmonids are present, a fisheries biologist with appropriate licenses and equipment (buckets, aerators, etc.) must be on-site to catch and move fish downstream as dewatering proceeds. **DEWAT-4** Intakes and outlets shall be designed to minimize turbidity and the potential to wash contaminants into the stream. **DEWAT-5** If a work site is to be temporarily dewatered by pumping, intakes shall be completely screened with wire mesh not larger than 5 millimeters to prevent amphibians from entering the pump system. On salmonid streams, the intake pipe shall be fitted with fish screens meeting CDFW and NOAA Fisheries' criteria to prevent entrainment or impingement of small fish (NMFS 1997). **DEWAT-6** A filtration/settling system shall be included to reduce downstream turbidity (i.e., filter fabric, turbidity curtain). The selection of an appropriate system is based on the rate of discharge. If feasible, water that is pumped into a pipe should discharge onto the top of bank into a densely vegetated area, which may require extra hose length. **DEWAT-7** Once the project work is complete, water shall be slowly released back into the work area to prevent erosion and increased turbidity. **DEWAT-8** The channel and soil surface shall be restored to its original or design configuration after the work is complete. Any material added to the channel or basin to provide support for the work approved under this provision shall

be removed unless required for erosion control or habitat enhancement and/or restoration.

DEWAT-9 For minor actions where the disturbance to construct cofferdams to isolate the work site would be greater than that which would occur in completing the proposed action, measures shall be put in place immediately downstream of the work site to capture suspended sediment. This may include installation of silt catchment fences across the drainage or placement of a straw wattle or filter berm of clean river gravel. Silt fences and other non-native materials shall be removed from the stream following completion of the activity. Gravel berms may be left in place after breaching, provided they do not impede the stream flow.

7.0 EROSION CONTROL

Erosion control activities are conducted when failing slopes have the potential to interfere with flood control activities and goals.

7.1 Maintenance Goals and Triggers

Erosion control activities are implemented to achieve this goal:

• Stabilizing failing earthen creek banks where biotechnical stabilization techniques are appropriate

Meeting this goal requires a balance between flood control protection needs, water quality, and habitat protection. Impacts are minimized by implementing the least intensive activities required to meet these goals.

In general, bank stabilization activities are triggered by:

- Failing earthen banks that are undermining structures and/or utilities
- Failing earthen banks that are causing increased sediment production and habitat loss.

7.2 Description of Activities

Erosion control activities take place only where the District and/or its partners hold fee title to the land. Most erosion control projects are not prescribed and therefore are not covered under this SMP program. Only those projects where the failing banks are composed of earthen materials and where biotechnical stabilization techniques are used, such as brush mattresses and willow walls, fall under this program. Bio-stabilization methods will be based on accepted guidelines such as those developed by the NRCS4 and the Army Corps of Engineers.

Erosion control tasks under the permit will generally be completed in 2-4 days. Equipment typically used for erosion control work can include excavators, haulers, front loaders, and bulldozers.

7.3 Frequency and Timing

Like other activities covered under the SMP program, erosion control projects are scheduled for the dry season from April 15th to October 15th, weather permitting. These projects are determined on an as-needed basis; if a project is needed, it will be added to the pre-project notification list for the year in which maintenance activities are planned.

7.4 Contractor Details

The District contracts with CCNB to undertake erosion control tasks.

7.5 Conditions for Erosion Control

- **EROS-1** Any new erosion control projects must incorporate bioengineering or biotechnical designs and shall be limited to "soft" structures, composed of coir or other biodegradable fabric, and/or willow or other plant materials native to the watershed. Native vegetation shall be incorporated into the design where channel design capacity allows.
- **EROS -2** Length of erosion control activities shall not exceed 150 linear feet.
- **EROS -3** Any new biotechnical erosion repair activity shall be part of a single and discreet project; implementing contiguous projects in series and in a single calendar year is not approvable under this program.

7.6 Conditions for Dewatering

When maintenance activities occur in flowing streams or open water, the work site must be dewatered and the following conditions will apply:

- **DEWAT-1** Any work using equipment within the stream channel shall be performed in isolation from the flowing stream.
- **DEWAT-2** Cofferdams used to divert water shall be constructed with clean river gravel or sand bags and sealed with sheet plastic.
- **DEWAT-3** If anadromous salmonids are present, a fisheries biologist with appropriate licenses and equipment (buckets, aerators, etc.) must be on-site to catch and move fish downstream as dewatering proceeds.
- **DEWAT-4** Intakes and outlets shall be designed to minimize turbidity and the potential to wash contaminants into the stream.
- **DEWAT-5** If a work site is to be temporarily dewatered by pumping, intakes shall be completely screened with wire mesh not larger than 5 millimeters to prevent amphibians from entering the pump system. On salmonid streams, the intake pipe shall be fitted with fish screens meeting CDFW and NOAA Fisheries' criteria to prevent entrainment or impingement of small fish (NMFS 1997).

- **DEWAT-6** A filtration/settling system shall be included to reduce downstream turbidity (i.e., filter fabric, turbidity curtain). The selection of an appropriate system is based on the rate of discharge. If feasible, water that is pumped into a pipe should discharge onto the top of bank into a densely vegetated area, which may require extra hose length.
- **DEWAT-7** Once the project work is complete, water shall be slowly released back into the work area to prevent erosion and increased turbidity.
- **DEWAT-8** The channel and soil surface shall be restored to its original or design configuration after the work is complete. Any material added to the channel or basin to provide support for the work approved under this provision shall be removed unless required for erosion control or habitat enhancement and/or restoration.
- **DEWAT-9** For minor actions where the disturbance to construct cofferdams to isolate the work site would be greater than that which would occur in completing the proposed action, measures shall be put in place immediately downstream of the work site to capture suspended sediment. This may include installation of silt catchment fences across the drainage or placement of a straw wattle or filter berm of clean river gravel. Silt fences and other non-native materials will be removed from the stream following completion of the activity. Gravel berms may be left in place after breaching, provided they do not impede the stream flow.

8.0 FACILITIES MAINTENANCE AND REPAIR OF FLOOD CONTROL STRUCTURES

The District needs to maintain its facilities in order to provide flood protection.

8.1 Maintenance Goals and Triggers

Facilities maintenance and repair activities are implemented to achieve this goal:

• Maintain and/or repair flood control facilities to keep them in working order.

Meeting this goal requires a balance between flood control needs, water quality, and habitat protection. Impacts are minimized by implementing the least intensive activities required to meet these goals.

In general, facilities maintenance and repair activities are triggered when one or more of the following conditions occur:

- Facilities are deteriorating such that their function is impaired
- Facilities' maintenance intervals have been reached

8.2 Description of Activities

Flood control structures are defined to include all structures built or maintained by the District, including, but not limited to, weirs, gates, tidegates, diversion structures, trash racks, stream gauge structures, grade control structures, energy dissipaters, utility line crossings, culverts, outfalls, stormdrain or pump station inlet/outlet structures and similar structures. The maintenance, repair or rehabilitation of flood control structures will not exceed 100 lineal ft. upstream or downstream of each structure. Some vegetation will be cut to maintain facility function and/or allow access to the facility but this only applies to a few locations and not every year. For example, Lynwood pump station is located at the edge of a stormwater detention pond and at the base of a levee. Each of its four pumps is removed for servicing on a 6-year staggered cycle. Before the cranes come to remove each pump, a small amount of cattails growing in front of the pump station is trimmed to allow access.

8.3 Frequency and Timing

Maintenance of flood control structures is scheduled to occur during the dry season from April 15th to October 15th, weather permitting. Some structures, such as tidegates, need annual maintenance; others, such as pump station inlets and outlets, may be maintained on an as-needed basis.

8.4 Contractor Details

Most structure maintenance work is performed by DPW road crews, but some tasks are undertaken by CCNB (such as clearing trash racks) or private contractors. District staff may perform tasks of a smaller duration and extent that don't require full DPW crews. Private contractors are hired for specific tasks requiring advanced skills beyond what District staff and DPW crews hold.

8.5 Conditions for Maintenance of Structures

- MAIN-1 Maintenance activities shall not result in an increase in the facility footprint¹ unless essential to stabilize the channel.
- MAIN-2 This activity covers in-kind replacement of flood control structures with structures of the same dimension, or with minor deviations in dimension, configuration or alignment². Work is not to exceed 100 lineal ft. upstream or downstream of said structure.
- **MAIN-3** When maintaining or repairing an engineered sediment basin, there shall be no discharge of sediment or other pollutants downstream.
- MAIN-4 Maintenance or repair shall only re-establish pre-existing conditions (including as-built conditions); no expansion of capacity is allowed by this program.

When maintenance activities occur in flowing streams or open water, the work site must be dewatered and the following conditions will apply:

- **DEWAT-1** Any work using equipment within the stream channel shall be performed in isolation from the flowing stream.
- **DEWAT-2** Cofferdams used to divert water shall be constructed with clean river gravel in burlap sacks and sealed with sheet plastic.
- **DEWAT-3** If anadromous salmonids are present, a fisheries biologist with appropriate licenses and equipment (buckets, aerators, etc.) must be on-site to catch and move fish downstream as dewatering proceeds.

¹ Facility footprint is defined as the spatial extent of the constructed and artificial elements of the structure and the associated accessway

² Minor deviation is defined as equal to or less than 5% spatial variance from the original structure, e.g. a 500 sq. ft. structure could be replaced by a 525 sq. ft. structure.

- **DEWAT-4** Intakes and outlets shall be designed to minimize turbidity and the potential to wash contaminants into the stream.
- **DEWAT-5** If a work site is to be temporarily dewatered by pumping, intakes shall be completely screened with wire mesh not larger than 5 millimeters to prevent amphibians from entering the pump system. On salmonid streams, the intake pipe shall be fitted with fish screens meeting CDFW and NOAA Fisheries' criteria to prevent entrainment or impingement of small fish (NMFS 1997).
- **DEWAT-6** A filtration/settling system must be included to reduce downstream turbidity (i.e., filter fabric, turbidity curtain). The selection of an appropriate system is based on the rate of discharge. If feasible, water that is pumped into a pipe shall discharge onto the top of bank into a densely vegetated area, which may require extra hose length.
- **DEWAT-7** Once the project work is complete, water shall be slowly released back into the work area to prevent erosion and increased turbidity.
- **DEWAT-8** The channel and soil surface shall be restored to its original or design configuration after the work is complete. Any material added to the channel or basin to provide support for the work approved under this provision shall be removed unless required for erosion control or habitat enhancement and/or restoration.
- **DEWAT-9** For minor actions where the disturbance to construct cofferdams to isolate the work site would be greater than that which would occur in completing the proposed action, measures shall be put in place immediately downstream of the work site to capture suspended sediment. This may include installation of silt catchment fences across the drainage or placement of a straw wattle or filter berm of clean river gravel. Silt fences and other non-native materials will be removed from the stream following completion of the activity. Gravel berms may be left in place after breaching, provided they do not impede the stream flow.

9.0 LEVEE MAINTENANCE AND REPAIR

The District needs to maintain its levees in order to provide flood protection.

9.1 Maintenance Goals and Triggers

Levee maintenance activities are implemented to achieve these main goals:

- Stabilizing levees
- Controlling burrowing rodent populations

Meeting these goals requires a balance between flood control protection needs, water quality, and habitat protection. Impacts to streamside habitat are minimized by implementing the least intensive activities required to meet these goals.

In general, levee maintenance activities are triggered when one or more of the following conditions occur:

- Plant growth on levee roads impedes safe passage to flood control facilities
- Levees are eroding and/or settling, requiring additional fill materials to bring levee up to original height and no higher
- Burrowing mammals are damaging the stability of levees

The need for levee maintenance activities is unlikely if none of these trigger conditions are present.

9.2 Description of Activities

Levee maintenance includes mowing levee tops and banks above the high water line for fuel reduction, stabilizing levees by placing fill on the levee tops, and controlling burrowing rodent populations.

Levee stabilization may occur on any levee maintained by the District; landowner access will be required for activities at site 7-GAL on the Santa Venetia levee, which is private property.

If a gopher infestation occurs, the gophers are trapped and their burrows are filled with an earth/concrete mix or bentonite, following FEMA guidelines (FEMA 2005). The County of Marin does not use rodenticides or other poisons in rodent control for levee maintenance or in any other SMP activity.

9.3 Frequency and Timing

Levee maintenance activities are scheduled to occur during the dry season from April 15th to October 15th, weather permitting. Sites are treated annually for fuel reduction mowing, and on an as-needed basis for stabilization and rodent control.

9.4 Contractor Details

Most levee maintenance and repair work are performed by DPW road crews, but some tasks are undertaken by CCNB or private contractors. District staff may perform tasks of a smaller duration and extent that don't require full DPW crews. Private contractors may be hired for specific tasks requiring advanced skills beyond what District staff and DPW crews hold.

9.5 Conditions for Levee Maintenance

- LEVEE-1 Maintenance activities on levees shall not result in disturbance to the subgrade of the levee banks or top. Bottom and surface disturbance shall be kept to the minimum necessary to complete the work and shall not result in erosion of or additional sedimentation into the channel or adjacent wetland or marsh.
- **LEVEE- 2** No pesticides or rodenticides shall be used in the control of rodents on flood control levees within the SMP project area.
- **LEVEE-3** All traps set for rodent control on levees shall be set near the crown of the levee and never in the adjacent marsh or stream channel. No traps shall be set more than two ft. below the crown on the marsh side of a levee.
- **LEVEE-4** After rodents are trapped and removed, burrows will be filled with an earth/concrete mix, bentonite, or other similar fill material to deter re-infestations.
- LEVEE-5 If the burrow network is extensive, backhoes may be used to uncover the burrows and then repack the earth to eliminate the potential for piping of water through the levees through the burrows.

10.0 PROGRAM MANAGEMENT

This chapter describes the components of the annual work cycle and describes how the District will implement the maintenance program in the field. This section also includes a long term monitoring program that will collect data that can be used to inform maintenance priorities over time and direct projects into the County's Capital Improvement program where applicable.

10.1 Annual Work Cycle

The District will implement the SMP in an annual work cycle, to include project planning, pre-project notification, project implementation, and annual reporting. A Watershed Planner, Natural Resources Planner, Creek Naturalist, or Operations & Maintenance Engineer will oversee the SMP program, including preparing the documents required by the program

Project Planning, Reconnaissance and Site Selection

Maintenance activities included in this manual are never implemented in a simple routine manner, such as on an annual basis. Instead, creek maintenance activities are conducted only when culverts, channels or facilities have been examined by Flood Control Engineers and are found to be blocked by sediment or vegetation to the point of interference with conveyance of stormwater. The number of maintenance projects undertaken annually, and the quantity of sediment and vegetation removed in a given year depend on the frequency and extent of past maintenance activities and the weather and hydrologic conditions during recent years. Channel maintenance requirements are generally greater following a wet winter with higher than usual runoff or at locations where maintenance has not been performed for several years.

In general, vegetation maintenance is triggered when one or more of the conditions listed below occur. The need for vegetation management activities is unlikely if none of these trigger conditions are present.

- Vegetation growth is collecting debris in a matter that is significantly decreasing flood conveyance capacity
- Vegetation growth impedes access to channels and flood control facilities
- Excessive vegetation growth constitutes a fire hazard to District and private property
- Nonnative invasive plant species are reducing the success of native vegetation
- Live trees are creating excessive hydraulic roughness or dead/dying trees are reducing stream capacity and/or creating a safety hazard.

In general, sediment or debris removal activities are triggered when one or more of the following conditions are observed by the Flood Control Engineer in their annual review of potential maintenance sites:

- Accumulated sediment is covering or blocking culvert outfalls and/or other structures, increasing flooding risk
- The stream or channel is aggrading such that capacity is compromised or the flood or discharge objective is compromised (if known).
- Accumulated sediment is allowing for excessive plant growth in the channel, increasing risk of flooding and possibly causing undue roughness
- Accumulated sediment is reducing fish passage

Each year County Flood Control Engineers review SMP sites within the Flood Control Zones within their jurisdiction and use a combination of professional judgment, local knowledge and available data to assess which sites need maintenance in any given year. Data collection which informs this decision includes annual updating of the site assessment worksheets to document localized sediment conditions at points of aggradation such as culvert outfalls, and flow blockages such as log jams. Sediment accumulation is also tracked through the use of the geomorphic coding system, which explains why sediment accumulates in these locations and helps to guide long term solutions for chronic sediment sources (Table 6-2).

The District's larger flood control channel dredging projects are not included in this manual (i.e. Novato Creek). On these larger projects the District does employ analytical tools to evaluate channel capacity relative to flow using stream flow and discharge data. However, at most of the sites included in this manual, sediment accumulates at pinch points in the channel such as at culvert inlets or outfalls, typically creating localized effects that are not reflective of capacity that would be measured by a larger channel modeling exercise using flow and discharge data.

At each location where sediment removal is planned, the County flood control engineers will begin with an assessment of the types of sediments, fluvial processes, and habitat in the project area to evaluate impacts to bed and bank stability within the site and upstream. Pre-project analysis will include a plan to integrate the excavated reach of creek into the dominant geomorphic conditions in the channel (i.e., drops should not be left in the streambed at the upstream edge of excavation with the potential to become headcuts that can migrate upstream). The assessment will also identify sorted sediments, such as gravel bars or fines in tidal areas, and consider them for reuse as spawning gravels or wetland surface material. The assessment will also identify the stream's fluvial processes so that the appropriate stream cross section can be excavated, leaving behind a stable channel that optimizes sediment transport.

Several of the sites have been identified as chronic, often due to factors which do not allow for comprehensive solutions, such as tidal backwater and/or flat topography. A few chronic sites have been identified for which permanent solutions may be possible which could reduce or eliminate the need for sediment removal. These sites are described in Table 6-2. As part of this program, the District will continue to identify and prioritize sites where chronic sedimentation issues could be improved through infrastructure improvements. Where feasible, sites will then be included in either an individual Flood Zone Work Program or integrated into the larger Marin County Public Works Capital Improvement Program (CIP).

By May 1st of each year, the District will provide written pre-project notification of proposed maintenance activities for the upcoming season to the permitting agencies. The notification will be in the form of a list of each project site and area, and type of activity (vegetation management, sediment removal, erosion control, facilities maintenance, and levee maintenance). For sediment sites pre-project notification will also include SMP pre-project worksheets for each SMP site along with pre-project photographs. During the pre-project notification, each site with chronic and recurring removal of LWD, sediment, and/or vegetation shall be assessed for potential adjustment to the maintenance activities or inclusion in the CIP program, to achieve a more permanent solution to the problem. Additional work may be submitted upon discovery if it meets the criteria established for maintenance as described in Chapter 5 and is not located where conditions affecting fish and wildlife resources on the site have substantially changed, or where such resources would be adversely affected by the proposed maintenance activity.

Project Implementation

The general work window for SMP activities extends from April 15th to October 15th, with most of the work being performed between July 1st and October 15th. Exceptions are noted in Chapter 3. Dry years may mean a longer work season; wet weather may halt the work season early.

The SMP is complex; at any one time during the work season, different work activities may be occurring at several sites, with several different contractors. In all cases, all prescribed maintenance activities will be conducted in such a way as to avoid and/or minimize environmental impacts to special status species, sensitive habitats, and water quality.

Work at each site will be scheduled around relevant species' work windows (Table 3-1) whenever possible to avoid impacts, and pre-construction surveys to locate special status species will be conducted before maintenance activities commence. Work at a site may be re-scheduled based on survey findings, and/or may require application of minimization measures. A suite of general and activity-specific conditions and species-specific Avoidance and Minimization Measures (AMMs) apply to the SMP and are described in Chapter 3. In

addition, Best Management Practices (BMPs) are prescribed, depending on activity type, site location, species presumed to be present, work windows, and other conditions. Appendix F contains the BMPs.

Annual Reports No later than February 15th of each year, the District will provide annual reports to the permitting agencies, describing the work completed during the previous season. The annual reports shall include at a minimum:

- A description of maintenance activities and both pre and post work photographs of each SMP site where maintenance activities were conducted during the previous year;
- Description of non-native plants removed
- Mitigation implemented;
- Monitoring results for each project;
- A description of any lessons learned and recommendations to update BMPs identified in the SMP Manual, as needed.

10.2 Data Collection, Management and Program Tracking

Data collection and monitoring efforts are critical to measuring the success of program implementation. The District currently maintains an extensive GIS database from which the maps included in this manual were generated. Both quantitative and observational data is stored in Microsoft Excel and Access tables and databases with links to the GIS database. Data or documentation of the maintenance projects are entered into the database during each cycle of the work plan. The database can be queried to chronicle past maintenance activities or prioritize future actions. The maintenance database is an important tool for the stream maintenance manager and contains technical information to compile the agency notification packages and annual reports. The database will include checklists to ensure all conditions of programmatic permits are met. The regulatory agencies will receive necessary information on maintenance activities based on the permit requirements and the description of activities in this manual. Information saved in the database will also provide insight into future Manual updates.

To properly track the progress of management activities towards achieving the maintenance program's goals and compliance with programmatic permit conditions, these

databases will be upgraded and integrated as the stream maintenance program adapts to best meet the stream maintenance goals.

The following data are collected for the program:

- GIS reach mapping
- BMP tracking
- Pre- and post-project photos
- Channel geomorphic characterizations
- Annual maintenance notes documenting triggers
- Special status species mapping
- Invasive species locations
- Specific data required by permits
- Pre-project notification packages
- Annual reports

Appendix I describes the assessment data fields that are filled out during inspection and maintenance. This data collection app will constitute our primary method for gaining additional field data about the SMP sites. Data collected will be used to quantify the need for maintenance, will monitor and document site conditions over time. Over the initial permit period, the District will monitor the data collected via this app and will make adjustments as necessary to continue to fine tune the District's data collection efforts to support its information needs. The final report will be developed using a combination of pre-project reconnaissance data, pre-project biological data and implementation data including the photo monitoring and final reports.

10.3 Five-Year Program Review

Every five (5) years, the District and the relevant regulatory agencies will review the stream maintenance program for its overall effectiveness. This review will include an assessment of maintenance activities conducted to date, AMMs and BMPs employed, data management, adequacy of adaptive updates and revisions to the manual, and overall program coordination and communication between the District and the regulatory agencies. The stream maintenance manager will collect and organize the above review information and provide a summary report to the regulatory agencies. These findings will be discussed with regulatory agencies as part of the permit renewal process. As a result of these discussions, potential program changes or updates shall be integrated into the Manual through an addendum or revision process. The updated Manual will be redistributed to regulatory agencies and program partners. Program changes or updates made at the 5-year reviews may require additional California Environmental Quality Act (CEQA) review. Manual revisions may also require an updating of permit terms, which

would occur through a collaborative process between the District and the relevant permitting agencies.

10.4 Contractor Training

Proper training of partners and contractors is essential to the success of the SMP in avoiding and minimizing environmental impacts. Training needs vary by contractor and are described below.

DPW Road Crews

- District staff will work with DPW road crews prior to implementing activities covered by the SMP. The ECC will ensure that the Roads Maintenance Supervisors and staff understand their responsibilities for implementing all required general and activity-specific conditions and AMMs. The contractor will be responsible for making sure that the work crews have the materials they need in order to implement all necessary AMMs and BMPs prior to, during and post-construction.
- Maintenance Supervisors and crew members receive periodic training focused on protecting and enhancing aquatic habitats while conducting prescribed road maintenance. Training is based on materials covered in the manual developed by FishNet 4C specifically for county road crews, entitled: Guidelines for Protecting Aquatic Habitat and Salmon Fisheries for County Road Maintenance. Over the past few years, staff have participated in the following FishNet 4C workshops:
- 1) Overview of FishNet 4C Roads Manual (2006)
- 2) Erosion Control & Sediment Management BMPs (2007)
- 3) Ditch Maintenance/Vegetation Management BMPs (2008)
- 4) Biotechnical bank stabilization BMPs (2009/10)

CCNB

- District environmental staff will provide an annual training session for all CCNB staff that describes the type and timing of work that will be implemented; potential special status species, their habitats, and associated AMMs, and BMPs to be implemented.
- Prior to commencement of any maintenance activity, District environmental staff will determine the appropriate measures to implement prior to, during and post-activity. The ECC will work regularly with the CCNB Maintenance Supervisor to review work orders to ensure that the Supervisor and their crews implement the prescribed measures needed at each site and for each type of activity.

- Prior to beginning work at each site, the ECC will meet with the CCNB Maintenance Supervisor on site to review the Site Fact Sheet and to ensure that the Maintenance Supervisor understands and is able to comply with the types of AMMs and BMPs prescribed for that site.
- CCNB provides its corps members one day per week of field and classroom instruction on natural resource and science-based topics related to their work, such as watershed ecology, aquatic resources, and identification of local flora and fauna. Corps members may earn credits toward their GED or High School Equivalent diplomas.

STRAW (Students and Teachers Restoring a Watershed)

- Restoration activities are preceded by classroom presentations given by STRAW in partnership with MCSTOPPP. Students learn about the characteristics of the particular watershed in which they will work; the original habitat of the site and how it has been impacted by development, urban runoff, and invasive plant species; and the benefits of restoration.
- On the day of the restoration project, students, teachers, and parent volunteers are trained for the specific activities at the site. Invasive plant removal includes identification of both the invasive weed and other similar native plants. The best techniques are shared, and students focus on small areas to clear the entire site prior to moving to another site. Planting steps are demonstrated and students are encouraged to request a visual check by staff at several keys steps to ensure plant survival.
- STRAW restorations are designed for an 80% plant survival rate. Plants are maintained by STRAW staff for a three-year establishment period, and the project team adaptively manages project sites by identifying site specific variables that contribute to plant mortality.

Independent Contactors

• District environmental staff will work with outside contractors prior to implementing activities covered by the SMP. The ECC will ensure that the County Maintenance Supervisors and staff understand their responsibility for implementing all required general and activity-specific conditions and AMMs. The ECC will be responsible for ensuring that the contractors understand what materials they need to have in hand in order to implement all necessary AMM's and BMPs prior to, during and post-construction.

• Companies contracting with the County of Marin for SMP activities will be held to standards described in the Specifications that are included in their County contracts.

Municipal Partners

District environmental staff will work with its municipal partners prior to their implementing activities covered by the SMP. The ECC will ensure that Maintenance Supervisors and municipal staff understand their responsibility for implementing all required general and activity-specific conditions and AMMs. The ECC will be responsible for ensuring that municipal staff understand what materials they need to have in hand in order to implement all necessary AMM's and BMPs prior to, during and post-construction.

11.0 REGULATORY COMPLIANCE

This chapter describes the steps that the District has taken to fulfill all California Environmental Quality Act (CEQA) and environmental permitting requirements. In preparation for the completion of CEQA review of the program and permit applications, the District conducted a Biological Assessment (Appendix E) of SMP activities and their potential to impact sensitive resources within the geographic scope of the project. The Biological Assessment (Appendix E) is the guiding document for the Avoidance and Minimization Measures set forth in order to protect important habitat and special status species during the implementation of stream maintenance activities.

11.1 CEQA Compliance

The District is the lead agency for CEQA review of this program. In 2007, the District prepared an Initial Study for West Marin, which was circulated according to CEQA guidelines. The District took comments and filled a Negative Declaration of Environmental Impact. The Notice of Determination (State Clearinghouse # 2007-092065) was filed in October 2007. An Addendum was filed in March 2013, modifying a project site.

In 2012, the District prepared an Initial Study for East Marin, which was circulated according to CEQA guidelines. The District took comments and filed a Mitigated Negative Declaration of Environmental Impact. The Notice of Determination (State Clearinghouse # 2012-022053) was filed in June 2012. In April 2014, the District amended the Mitigated Negative Declaration to add several new sites and change parameters of several other existing sites.

All CEQA documents can be found in Appendix G.

11.2 California Department of Fish and Wildlife

In October 2012, the District entered into a Routine Maintenance Agreement (RMA) (Notification No. 1600-2012-0207-R3) with the California Department of Fish and Wildlife to obtain permitting coverage and terms for the District's most common maintenance needs. The first work season under the permit was 2013, with an expiration date of December 31, 2016. The permit was amended in both 2013 and 2014. The amendments included adding one additional sediment site in 2013 and adding 21 new sites and additional flood control activities to seven existing sites in 2014 (see below for more details). In 2017, the permit was extended to December 31, 2020. The permit was also amended in 2017, which included adding two new sites, adding an additional activity to one site, increasing the length of sediment removal at one site, and expanding one activity (see below for more detail). This District is currently in the process of acquiring a new permit from CDFW.

11.3 Regional Water Quality Control Board

The Regional Board issues 401 Water Quality Certifications and Waste Discharge Requirements for Marin County's flood control maintenance activities. Under the Clean Water Act (CWA Section 401), applicants for a federal 404 US Army Corps of Engineers (USACE) permit to conduct activities that may result in the discharge of dredged and fill materials into surface waters of the United States (including wetlands) must obtain Section 401 Water Quality Certification from the State so that any such discharge will comply with the applicable provisions of the CWA. For sites located outside ACOE jurisdiction of waters of the U.S. but within waters of the State, the Regional Water Quality Control Board issues Waste Discharge Requirements for activities involving sediment or debris removal, large woody debris management, erosion control, and vegetation management within the channels as part of maintenance activities.

In 2017, the District obtained a Waste Discharge Requirements and Water Quality Certification (Order No. R2-2017-0028) from the California Regional Water Quality Control Board – San Francisco Bay Region. The permit will expire on December 31, 2022.

11.4 U.S. Army Corps of Engineers (USACE)

Several of the sediment removal sites are situated below the ordinary high water mark (OHWM) of stream channels that require dewatering for maintenance activities to be implemented or along the SF Bay edge in wetland conditions. These sites fall within the jurisdiction of the U.S. Army Corps of Engineers (USACE) and will require coverage under Clean Water Act 404 Nationwide permits or a Regional General Permit. The District will pursue a permit with USACE when a project falls within USACE jurisdiction.

11.5 Other Agencies

U.S. Fish and Wildlife Service/NOAA-National Marine Fisheries Service

If USACE determines that maintenance at a project site has the potential to affect a threatened or endangered species or critical habitat under Section 7 of the Endangered Species Act, the USACE will initiate consultation with the appropriate federal wildlife agency: U.S. Fish and Wildlife Service (USFWS) for terrestrial species and their habitats; or the National Marine Fisheries Service (NMFS) for protected marine and aquatic fish species and habitats.

The consultation could be formal or informal to address the effects of the project. In some cases, a Biological Opinion with "incidental take" provisions will be distributed from USFWS to USACE for inclusion in the permit.

Bay Conservation and Development Commission (BCDC)

The Bay Conservation and Development Commission (BCDC) regulates placement of fill, dredging activities, and development activities along the bay edge. Some of the sediment removal activities will occur within the jurisdictional areas of BCDC. The District will pursue these permits when a sediment project falls within BCDC jurisdiction.

12.0 REFERENCES

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APPENDIX A

MASTER LIST OF PROJECT

AREAS AND SITES

APPENDIX A.1

SMP VEGETATION MAINTENANCE PROJECTS

APPENDIX B

SEDIMENT REMOVAL SITES

APPENDIX C

МАРВООК
APPENDIX D

SITE FACT SHEETS

APPENDIX E

BIOLOGICAL ASSESSMENT

APPENDIX F

BMP REFERENCES

APPENDIX G

CEQA DOCUMENTS

APPENDIX H

PRE-WORK BIOLOGICAL SURVEY DATA SHEET

APPENDIX I

CREEK ASSESSMENT DATABASE

APPENDIX J

PRE-PROJECT NOTIFICATION FORM

APPENDIX K

SITE SPECIFIC TRIGGERS

APPENDIX L

FDS LWD MANAGEMENT PLAN