Butano Channel Restoration and Resiliency Project
Project Summary

Applicant: San Mateo Resource Conservation District (RCD)

Project Title: Butano Channel Restoration and Resiliency Project

Project Location: Pescadero, California. 37.250195, -122.395778

Category: Habitat Restoration

Requested NOAA Funding:$1,464,715.58.

Proposed non-federal match: $1,166,500.00

Overall project cost: $2,631,215.58

Collaboration: There has been extensive agency collaboration and input to develop the Project, and this input will continue through 100% designs and integration with other ongoing efforts the Pescadero Technical Roundtable described in the Narrative. The Project has broad-based support among elected officials, agencies, NGOs, and community members and is a central component in a multi-faceted watershed scale effort to address the condition of Butano Marsh, including:

- 100 acres of floodplain restoration upstream (RCD, USDA Natural Resources Conservation Service (NRCS), US Fish and Wildlife Service (USFWS), Peninsula Open Space Trust);
- a feasibility analysis of a possible raised road and dredging within the County's right of way to address flooding on Pescadero Creek Road (San Mateo County);
- a number of streamflow enhancement projects that improve water use efficiency and storage to reduce demand on Butano Creek during critical low flow months (RCD, NRCS, Trout Unlimited, American Rivers, landowners and farmers); and
- addressing sediment sources upstream, including improvement of rural roads and stabilizing gullies (RCD, NRCS, landowners, agencies).

The Project is on State Parks property, and they are contributing staff resources and cash match.

Leverage: The project leverages recommendations or strategies developed in a number of studies and planning efforts related to ecosystem and/or community resilience, including:

- recent and ongoing research and analysis to build a collective understanding of the system and to implement priority restoration projects based on the best available science, described in more detail beginning page 13 of the Project Narrative(Regional Water Quality Control Board, NMFS, CA Dept of Fish and Wildlife, USFWS, RCD, State Parks, UC Berkeley, UC Davis, CA State Coastal Conservancy,and more);
- the 2014 report, *Solutions to Flooding on Pescadero Creek Road* (cbec and Stillwater Sciences), an RCD-led effort that garnered broad-based support and identified potential solutions to reduce flooding at Pescadero Creek Road and improve habitat in the marsh and watershed; and
- the 2004 *Pescadero Butano Watershed Assessment* (ESA)

The project leverages existing NOAA and other federal agency resilience investments, including NMFS Central California Coast Coho Salmon ESU Final Recovery Plan (2012), NOAA's Central California Coast Coho Salmon Spotlight Species Five Year Action Plan (2016), NOAA Fisheries Service Volume 1: Recovery Plan for the Evolutionarily Significant Unit of Central California Coast Coho Salmon (2012), NOAA National Marine Fisheries Service, Public Draft Coastal Multispecies Recovery Plan (2015), USFWS-funded Butano Creek Sediment Modeling, USFWS- funded Solutions to Flooding on Pescadero Creek Road (cbec), USFWS- funded Butano Creek Floodplain Restoration Project, USFWS- funded Pescadero Lagoon Qualitative Conceptual Model Development, NOAA-funded Field Data Collection and LiDAR

Assessment for Butano Creek, multiple agency assistance with the Report of Pescadero Lagoon Science Panel (Largier et al. 2015), and NOAA/NMFS active participation in stakeholder and advisory groups for the Pescadero Lagoon over the last decade.

Timeline: August 2017: 60% designs. November 2017: Draft and submit permit applications. February 2018: 90% designs completed.May/June 2018: 100% designs and permit acquisition. June 2018: Release bid package for construction. September 2018: Project implementation. Spring 2019: Final report.

Vulnerability: Sediment accumulation has filled the historic channel of Butano Creek so that connectivity through the marsh to the lagoon no longer exists, resulting 1) the entire Butano Creek Watershed being inaccessible to adult and juvenile salmonids during nearly all flows; 2) stagnant hypoxic water causing significant annual fish-kill events; and 3) impacts to the town of Pescadero due to chronic flooding.

Outcomes and actions: The Project will re-establish 8,000 feet of the historic Butano Creek by removing 45,000 cubic yards of aggraded sediment, beneficially reusing the dredge material to restore 28 acres of degraded marsh enhance habitat for multiple state and federally protected species, and restoring access to 10.1 miles of habitat for steelhead and coho. It will have socioeconomic benefits to the town of Pescadero by lowering water surface elevations by 2.8 feet and 3.6 feet respectively during the 2- or 10-year storm, reducing the frequency, duration, and inundation of flooding.

Recovery of protected resources: The Project will restore fish passage to high quality habitat for Central California Coast Coho salmon, a NOAA Species in the Spotlight, and federally protected steelhead trout. This will also improve resilience for salmonids by providing refuge in drought, flooding, and poor water quality conditions. It will reduce the risk and severity of annual steelhead fish kills by improving the hypoxic water quality conditions in the marsh. Beneficial reuse of the dredge materials to build the marsh plain and restored hydrology will improve habitat for state and federally protected species including California red-legged frog and San Francisco garter snake.

Project Performance Measures and Outcomes: Restore and enhance the longitudinal connectivity of 8,000 feet of the historic Butano Creek channel. Restore access to 10.1 miles of anadromy. Restore 28 acres of degraded marsh habitat to a more natural topography. Reduce water surface elevations by 2.8 feet and 3.6 feet respectively during the 2- or 10- year storm event.

Permits: This project has been identified and designed in consultation with technical advisors from all of the local, state and federal resource agencies that will be permitting or approving the project. None of the permits have been applied for because final designs are not yet completed. The project will likely require a 404 Nationwide Permit through the Army Corps of Engineers, Mitigated Negative Declaration for CEQA, NOAA Restoration Center's Consistency Determination, 401 Certification from the San Francisco Regional Water Quality Control Board, CalTrans Encroachment Permit, San Mateo County Department of Public Works Encroachment Permit. The RCD is committed to quickly providing the necessary information to NOAA in order to analyze the project under NEPA.

Landowner Contact: Chris Spohrer, Santa Cruz District Superintendent, California Department of Parks and Recreation, chris.spohrer@parks.ca.gov. A letter of commitment is included in the Appendix.

Support and Commitment: Included in the appendix are letters from California Department of Parks and Recreation, Congresswoman Anna Eshoo, State Senator Jerry Hill, State Assemblymembers Marc Berman and Kevin Mullin, County Supervisor Don Horsley, California State Coastal Conservancy, Peninsula Open Space Trust, Trout Unlimited, and California Department of Fish and Wildlife.

A. Background

Pescadero Marsh Natural Preserve is a special place with a very high level of community, public agency, and NGO interest in its management. It is the most significant outer coast estuary within 150 miles of coastline between Elkhorn Slough, 61 miles south, and Tomales Bay, 93 miles north and the largest tidal marsh between Elkhorn Slough and San Francisco Bay. It is home to many state and federally listed threatened and endangered species. Resource management for the marsh and lagoon can have direct implications for the adjacent community, which was built in its floodplain in the early 1800s.

Historical land use in Butano Creek watershed has accelerated sedimentation and flooding in the coastal community of Pescadero in rural San Mateo County. The system is listed under the Clean Water Act as impaired by sediment, as an estimated ten times the natural load of sediment is being trapped in this highly modified system (Frucht, 2013). Nearly annual steelhead fish kills and flooding of the main road into Pescadero in light rains- cutting the community off from emergency services and the main access to State Highway 1- garner regular media attention. Among the most critical underlying problems is that the historic channel of lower Butano Creek has completely filled in with sediment to the top of its banks within the marsh, and fish passage is blocked between the marsh and Butano Creek Watershed, impairing connectivity through lower Butano Creek from the lagoon to upstream habitat (Nelson 2012). Vegetation has established on top of this accumulated sediment, acting to stabilize the sediment further and creating a positive feedback loop.

Under current conditions, Butano Creek cannot provide critical refuge for anadromous fish (including threatened steelhead trout and Central California Coast coho salmon, a NOAA Species in the Spotlight) during extreme floods and droughts as well as quality spawning and rearing habitat. If restored, the system has potential to support a self-sustaining run of coho. The community of Pescadero shares the pressing need to address sediment overwhelming the health of the marsh and increase the community's resilience to flood hazard and extreme weather events.

The **Butano Channel Restoration and Resiliency Project** (Project) will restore the connectivity of Butano Creek through Butano Marsh to Pescadero lagoon to re-establish severely impaired fish passage between the marsh and the watershed, also providing an escape route for fish from the lagoon during poor water quality conditions that cause nearly annual fish kills when the lagoon breaches. The Project is designed to reduce the likelihood of the recurring fish kills by enhancing circulation of freshwater and restoring marsh habitat to reduce the quantity of water stagnating in human-made borrow pits from historic activities in the marsh. It will enhance ecological values for multiple federal and state listed species and be an essential component to a multi-faceted watershed scale restoration effort.

Furthermore, the Project will reduce flooding of the main road into town and adjacent properties. It will be a fundamental component of coordinated efforts on the part of the County and others to address the flooding hazard which has increased in frequency and duration and poses real adversity to public safety and economic conditions for Pescadero in even small rain events.

The proposed Project is viewed by agency partners, the landowner, and local citizens as the lynchpin critical path to realizing the larger vision for integrated solutions in the watershed. The Project will re-establish 8,000 feet of the historic Butano Creek channel through Butano Marsh to the Pescadero Lagoon, remove 45,000 cubic yards of sediment that has aggraded in the historic channel, restore access to 10.1 miles of habitat for steelhead and coho, restore 28 acres of degraded marsh, enhance habitat for multiple state and federally protected species, and reduce socio-economic impacts to the community of Pescadero due to flooding and associated road closures. It is difficult to quantify the socioeconomic benefits, as the weather and therefore road closures and flooding impacts cannot be predicted. The

main road into town is currently flooded in very small rain events, stopping much of the commerce in this tourism-fueled community. Even the perception that the road may be closed can cause a drop in commercial activity. Restoring capacity to the historic channel will help alleviate flooding of the road during 2- year storm events and the bridge during 10-year storm events.

Historic land use, including mechanized logging and channelized creeks to transport clear-cut timber, road construction without sediment control design, some grazing practices, agriculture, and development in the watershed (including a town in the floodplain) dramatically increased the volume of sediment entering the Butano Creek and Pescadero Marsh system. Routine dredging of creeks and draining of the marsh historically conducted by local farmers and property owners ended when the State of California acquired the marsh and lagoon in 1974 as a natural preserve, along with increased environmental regulations, including the Endangered Species Act (1973), the Clean Water Act (1977), and the California Coastal Act (1976). Changes from land-use, infrastructure, and natural function of the ecosystem have lessened the ability of the system to move sediment out of the marsh. Continued erosion and accumulation of sediment have overwhelmed the system to such an extent that connectivity from Butano Creek through the marsh to the lagoon no longer exists. In nearly all flows, the entire Butano Creek watershed has become inaccessible to adult and juvenile salmonids.

Moreover, hypoxic waters stagnating in highly organic shallow soils are contributing to significant fish kill events during late fall and early winter lagoon breaching. Hydrogen sulfide and anoxia in the channels of the Butano Marsh have been documented, suggesting that the project area may be a major source of hydrogen sulfide and/or anoxic water circulating in the marsh at the breaching of the sandbar (Sloan, 2006; ESA, 2008). The largest fish kill in recent memory was documented in 2016 with 441 dead and between 500-1,000 moribund steelhead observed immediately after the breach whereas an estimated 1,577 were present pre-breach (Jankovitz, November 2016). Recent studies have confirmed that a major cause of the fish-kills is a result of hypoxic water stagnating in highly organic shallow soils in degraded Butano Marsh. Restoration of perennial freshwater outflow into the lagoon can reduce the risk associated with hypoxia induced kills.

The sediment-filled channel exacerbates flooding at Pescadero Creek Road near the bridge over Butano Creek and the adjacent fire station. Where historically a 14-foot clearance under the bridge existed, aggradation of Butano Creek now causes flooding and closure of the road in minor storm events and creates significant impacts to emergency response and the economic resilience of the community. Project partners are concurrently addressing upstream sediment and conditions at Pescadero Creek Road as a coordinated effort to implement integrated solutions to restore fish habitat and alleviate flooding. As was recently presented at a jointly planned Coastal Resilience Workshop with NOAA, FEMA, San Mateo County and others (1/19/2017) the flood hazard in Pescadero is in the County's Hazard Mitigation Plan. The proposed project will also align with community engagement activities of the County's Butano Creek Bridge Feasibility Study looking at the potential to improve functioning of Pescadero Creek Road and habitat connectivity of Butano Creek.

The chronic flooding impacts to the Pescadero community and concern for protection of the ESA listed populations of coho and steelhead have led to a remarkable level of substantive coordinated action in the Butano-Pescadero watershed. In 2013, the San Mateo Resource Conservation District (RCD) initiated an effort to identify integrated solutions to flooding and habitat restoration with funding from the California Department of Water Resources, County of San Mateo, and US Fish and Wildlife Service. The RCD created an engaged stakeholder process with multiple town hall style meetings and an advisory group including: USDA National Resources Conservation Service, US Fish and Wildlife Service, San Francisco Bay Regional Water Quality Control Board, NOAA National Marine Fisheries Services, CA

Department of Fish and Wildlife (CDFW), San Mateo County, CA State Parks, the CA Coastal Conservancy, Trout Unlimited, Pescadero Municipal Advisory Council (PMAC), and at-large community members. A product of this process was the 2014 report, *Solutions to Flooding on Pescadero Creek Road* (cbec and Stillwater Sciences). This RCD-led effort garnered broad-based support and identified potential solutions to reduce flooding at Pescadero Creek Road and improve habitat in the marsh and watershed.

"The Flood Solutions Report" report, as it is often called, recommended four solutions for an integrated approach: (1) implement upland sediment control activities, (2) reconnect/ restore upstream floodplains to promote sediment deposition and improve habitat, (3) create flow capacity at the road either through dredging or by building a causeway, and (4) restore/ create an open channel in the marsh downstream. The first three solutions are moving forward. The proposed Project would address the fourth solution, the one most desired by the community. The RCD and partners are addressing upstream sediment sources (solution #1) throughout the watershed on public and private lands via projects to prevent and repair gullies and improve rural roads. In 2016, the RCD and Peninsula Open Space Trust with many agency partners reconnected 100 acres of floodplain (solution #2) along a mile of Butano Creek. It will store 500,000 cubic yards of sediment and decrease upstream incision to reduce sediment sources. The RCD is pursuing additional floodplain restoration upstream. For solution #3, the County has begun a feasibility analysis of an elevated road and has been working with the community to explore the potential to remove the fire station from the Butano floodplain. The County also completed permitting and the first year of dredging within their right of way in 2016. The remaining work to be done is solution #4, opening the channel in the marsh, the Project we are proposing.

B. Goals and Objectives and Project Activities

Coho salmon in the Pescadero-Butano Watershed belong to the Central California Coast Evolutionarily Significant Unit, a NOAA Species in the Spotlight listed as endangered under both the federal and California Endangered Species Acts. The Pescadero- Butano is the only independent watershed for coho recovery in San Mateo County and the second largest independent watershed south of the Golden Gate Bridge. Historically, the Pescadero watershed supported robust runs of steelhead and coho salmon, but these species have experienced substantial declines over the past century. Scarce data on coho returns over the past decade exist, though biologists at NMFS referred to the coho population in Pescadero as "nearly extirpated" in the 2012 Final California Central Coast Coho Recovery Plan. Nonetheless, adult coho have been observed in the watershed at a few locations over the past few years and the Butano watershed still contains high quality habitat for both coho and steelhead. The low gradient of the mainstem makes it ideal for coho re-introduction. In 2003, 17,000 hatchery-raised coho smolts were released into Pescadero Creek. Addressing the fish kills and access to Butano are key elements deemed necessary before the NOAA Science Center re-starts reintroduction of coho to this system.

Steelhead in the watershed belong to the Central California Coast Distinct Population Segment, listed as threatened under the federal ESA (NMFS, 2006). Steelhead have been found in surveys throughout the watershed year-round (Ewan & Jackson, 1996), though populations appear to have crashed over the past decade as sediment has gradually blocked the Butano channel and restricted upstream migration for adults and juvenile and smolt migration between the lagoon and riverine habitat. Though individuals sighted appear to be very healthy, recent surveys document extremely low densities of juvenile steelhead in Butano. It is unclear whether these are resident rainbow trout or anadromous steelhead.

Ecosystem resiliency/ habitat restoration goals of the Project are to:

1. Restore fish passage and migration, opening access to 10.1 miles of anadromy.
2. Reduce the flooding of Pescadero Creek Road and affected private properties, improving accessibility to the town, safety, and the town's economy during rain events.
3. Reduce the risk or severity of fish kills.
4. Improve habitat for several protected species (coho salmon, steelhead trout, San Francisco garter snake, California red-legged frog).
5. Provide resilience for salmonids by providing refuge in drought, flooding, and poor water quality conditions.

In support of these goals, the short term objectives of the Project are to:

A. Restore and enhance the longitudinal connectivity of 8,000 feet of the historic Butano Creek channel through the Butano Marsh to the Pescadero Lagoon to re-establish perennial fish passage, provide freshwater flows to "cue" salmonids into the watershed, enable access to habitats essential for supporting salmonids over a range of climatic conditions (from drought to large storms), and to provide an escape route from the lagoon during periods of poor water quality conditions.
    - *Sustainability*: To the extent that it can be predicted in a dynamic system (e.g. beaver dam formation, landslides, El Niño), with current rates of deposition this objective could be met for up to 20 years.

B. Restore 28 acres of degraded marsh habitat to a more natural topography and Improve water quality by (a) reducing the quantity of water entering and stagnating in the marsh by focusing freshwater flows back into the historic channel and (b) beneficially reusing the excavated channel material to fill old borrow pits and other topographic anomalies in the marsh that are considered key contributing factors to the degraded water quality conditions.
    - *Sustainability*: The ecological benefits are expected to last into the foreseeable future. Restoring the existing marsh plain from downstream up will create a topographic buffer to reduce the potential of the surface eroding and likely create conditions for increased aggradation, further benefitting ecological resources over time.

C. Reduce water surface elevations by 2.8 feet and 3.6 feet respectively during the 2- or 10- year storm event to reduce the frequency, duration, and inundation of flooding that impacts Pescadero Creek Road and adjacent properties, risks lives, and economically impacts town commerce. The reduction results in water not overtopping the road during a 2- year event and not overtopping the current bridge during a 10- year event.
    - *Sustainability*: Water surface elevations are affected more rapidly than fish passage and freshwater flows and there is a smaller margin of error for maintaining high level flood risk reduction. Depending on dynamic and variable climatic conditions, the reductions to frequency of flooding could last between five and ten years. The RCD and partners are concurrently seeking opportunities for upstream sediment management, including a sediment basin.

Although they are not yet measurable objectives, much of the discussion in developing this Project has also focused on re-establishing more natural and balanced sediment dynamics for channel evolution and beach replenishment, restoring a more natural tidal prism, and the ability of the ebb flow to transport coarse sediment from channels and the upper marsh into the lagoon and beach.

To accomplish Project goals and objectives, sediment will be dredged from the historic Butano channel from Pescadero Creek Road Bridge to the confluence with Pescadero Creek and beneficially reused in

Butano Marsh. The 30% project designs have been completed by cbec eco-engineering and *Alnus* Ecological with input from the RCD, the County, State Parks, NOAA Fisheries, and CDFW, and with funding from State Parks and the State Coastal Conservancy (See Designs in Supplemental Information). Efforts have just been completed to collect new topographic data in the project area and the County has funded development of a new 2D hydro-dynamic model to further refine the designs. We have funding allocated to ensure that designs are complete to 90% by fall/winter of 2017.

Excavation of the channel will increase conveyance by increasing the cross-sectional area of the channel and by creating a downstream slope along the 8,000 foot project reach. This will be achieved by excavating a uniform bottom width along a continuous slope from the existing bed elevation in the lagoon at the confluence Pescadero Creek up to an elevation of 4.1 feet at the Pescadero Creek Road Bridge, approximately 6 feet below the existing bed elevation at the Pescadero Creek Road Bridge. Not only will this reconnected channel enable perennial ingress and egress for salmonids and other aquatic species, but it will reduce water surface elevations by 2.8 feet and 3.6 feet respectively during the 2- or 10- year modeled event. The reduction results in water not overtopping the road during the 2- year event and flows not overtopping the current bridge during the 10- year event.

The dredged material, approximately 45,000 cubic yards, will be strategically placed in slurry form in the Butano Marsh to fill deeper areas including isolated pools and artificial channels left over from past agricultural efforts and road building. The dredged material will be strategically placed to restore the natural topography of the marsh, starting in the area furthest downstream in the northern Butano Marsh. Recent data indicates that the relic channels and ponds are the source of the anoxic water causing the fish kills. Strategic and focused placement of slurry in this area will help fill areas that hold stagnant water, aggrade the marsh plain so it holds a smaller volume of water, and create a gently sloping earthen high spot at the terminus of the marsh to further reduce the amount and velocity of water flushing into the Lagoon from this area during a breach. Project partners are currently planning to install a barrier between the North Marsh and the historic alignment of the Butano Channel in the summer of 2017 as a short-term solution to reducing the potential for fish kills.

By opening up the historic channel, preliminary modeling by UC Berkeley researchers suggests that if the tidal prism is modestly enhanced through this project, it is likely to result in increased scour potential from the ebb tide. The scour potential, while minor, should be enough to increase transport of sand that is deposited in the lower Butano channel into the lower Pescadero Marsh and lagoon. While our upstream efforts to control erosion and transport of bedload into the reconnected channel will greatly increase its functionality and longevity of this project for fish, water quality and the community, the tidal data suggests an increase in ebb tide scour will both help transport sediment that enters the reconnected channel into the lagoon and help aggrade the lower marsh. Transporting this sediment out of Butano and into the lagoon and lower marsh should increase beach and lagoon aggradation rates, helping keep up with sea level rise and creating a more resilient coastal ecosystem.

If needed, in select areas, banks will be stabilized to control erosion using native herbaceous or native wood vegetation. All seeds and/or stock will be locally sourced from the watershed.

This Project will benefit various protected species including coho salmon, steelhead, California red-legged frog (federally protected), and San Francisco garter snake (state and federally protected). This project will expand habitat for salmonids by opening passage into the Butano watershed. Upstream of the project are areas of critical winter velocity refuge for steelhead and coho as well as rearing habitat. These habitats are essential for supporting salmonids over a range of climactic conditions from the several year drought that just ended to the nearly double precipitation that occurred in winter 2016-17.

This Project will improve water quality for these species. By placing the dredged material in a way that blocks access to portions of the marsh that become anoxic, the salmonids' risk of hypoxia is reduced. Restoring the historic channel will enable more natural hydrology in the marsh to avoid anoxia and create higher quality habitat, higher freshwater inflows into the lagoon from direct connection with Butano Creek, and more rapid freshening of the marsh in fall and winter.

According to the NMFS Central California Coast Coho Salmon ESU Final Recovery Plan, the estuary/lagoon condition is listed as "impaired and nonfunctional." This project will restore the marsh and lagoon, which is necessary for the recovery of coho. The Recovery Plan also calls for "Promot[ing] restoration projects designed to create or restore alcove, backwater channel, ephemeral tributary or seasonal habitats (Priority 1)" and "Implement[ing] restoration actions to benefit listed salmonids in the estuary (Priority 2)." Additionally, this project will address the following recovery actions for restoring habitats: 1.1.1 Increase the extent of estuarine habitat; 1.1.2 Rehabilitate inner estuarine hydrodynamics; 1.1.4: Improve quality and extent of freshwater lagoon habitat; and 9.1.1. Recovery Action: Reduce turbidity and suspended sediment.

The Recovery Plan lists Severe Weather Patterns as a high threat to coho. This project builds resiliency for salmonids, enabling fish to move in and out of the lagoon to find refuge and viable habitat during punctuated storm events and during prolonged drought. San Mateo County just experienced a five-year drought, followed by 180% rainfall during this winter season. Predicted long-term climate change is anticipated to increase the occurrence of extreme weather events that lead to both drought and flooding in a system that is already stressed from flooding, impaired water, and degraded. NOAA Science Center research in the nearby Scotts Creek watershed, described more below, documented the effect of droughts on salmonid movement and found that both steelhead trout and coho salmon need to be able to vacate the estuarine environment during droughts when freshwater inflows are very low and water quality quickly declines.

Even during periods of small amounts of rainfall the town of Pescadero experiences flooding that closes the main access road. In addition to economic impacts of lost business revenue and public safety and access issues, the community's fire station is separated from the urbanized town center by Butano Creek and the stretch of Pescadero Creek Road that is prone to flooding. The reduction of flooding for the town of Pescadero will decrease the associated economic impacts that have plagued the town for decades. As a result of this project and the associated additional integrated solutions that the County and RCD have been pursuing, Pescadero will experience socio-economic benefits, through increased economic activity, enhanced well-being of community members, reduction of safety hazards, and reduced maintenance costs.

California State Parks is committed to providing reasonably expected long-term management and maintenance of the project site such as routine inspections of the channel, ensuring the site is successfully re-vegetated, and post-construction monitoring and reporting. The RCD has long worked in this watershed to achieve resource conservation working with stakeholders and private landowners. We are committed to working over the long-term to provide technical assistance to California State Parks and address the complex problem that has so adversely affected the community of Pescadero. The RCD will continue to address flooding and habitat restoration and work with additional landowners on upstream floodplain restoration. The community will remain invested in this project beyond implementation because the community is invested in having a safe, reliable road into the community that does not flood during minor rain events.

The tasks necessary for completion of this project are as follows:

1) Project Management/Administration

The RCD will develop and manage contracts; finalize the work plan; lead interagency communications and coordination; convene project team meetings among consultants, partners, and stakeholders; prepare reports to funders and permitting agencies; and manage budgets and invoicing. RCD personnel involved will be the Executive Director (Kellyx Nelson), Program Manager (Irina Kogan), and Program Specialist (Adria Arko).

The cost for Project Management/Administration is estimated to cost $55,358.55.

2) Designs and Permitting

Funding from the California State Coastal Conservancy through the Integrated Watershed Restoration Program (IWRP) allowed for the development of 30% designs, which were developed by cbec eco-engineering with input from the RCD, *Alnus* Ecological, California State Parks, and County of San Mateo. 60% designs will be completed by summer/fall 2017, and 90% designs will be completed by fall/winter 2017. 100% designs will be finished by Spring 2018 and will respond to any final concerns or concepts from the regulatory process. The RCD will begin applying for permits in fall 2017 if funds are awarded.

This project has been identified and designed in consultation with technical advisors from local, state and federal resource agencies that will be permitting the project. As such, the designs and budget reflect those pre-submittal discussions. From a federal perspective, we are assuming that the NOAA Restoration Center will function as the federal lead and partner with the applicant as we navigate the federal process. The project may qualify for a 404 Nationwide Permit through the Army Corps of Engineers. If it is deemed to be either too big or complex for a Nationwide Permit, applicants will pursue an Individual Permit. The main difference from an information perspective is that the Individual Permit will require an alternatives analysis, while the Nationwide does not. Both authorizations require a wetland delineation, sediment control, and consultations with NOAA (for steelhead and coho) and USFWS (for San Francisco garter snake, California red-legged frog, and tidewater goby) regarding the Endangered Species Act. Since the proposed excavation will be occurring within a channel that has been historically dredged and the accumulated sediment is of a recent origin (within the past 15 years) we do not expect to need extensive 106/Cultural Resource consultations with SHPO. State Parks' archeologist lead review and consultation needed for federal or state permitting regarding cultural resources. The RCD is committed to quickly providing the necessary information to NOAA for NEPA analysis.

From a state perspective, RCD will be the lead for compliance with the California Environmental Quality Act (CEQA). We expect to develop a Mitigated Negative Declaration for CEQA. We also anticipate utilizing the NOAA Restoration Center's Consistency Determination to meet the requirements of the California Coastal Act. The project will also require a 401 Certification from the San Francisco Regional Water Quality Control Board. If the NOAA Restoration Center is the lead agency for permitting, the project may not require a Streambed Alteration Agreement (SAA), as there is precedent for the CDFW to waive this requirement for projects with a federal lead. Because this is not yet certain, the proposed budget includes the cost of an SAA. We do not expect to trigger the California Endangered Species Act (CESA), as none of the state listed plants or animals are likely to be "taken" during construction. We also do not expect to "take" coho during this project due to the rarity of encountering coho in this watershed, especially in the marsh during the summer. It is possible that the state may deem otherwise and we would plan to use the NOAA Biological Opinion to conduct a Consistency Determination with CESA. The potential presence of San Francisco garter snake will trigger compliance with the State's Fully Protected Statue. This statute pre-dates both the federal ESA and CESA and includes the snake. We have worked extensively with the CDFW to develop a Memorandum of Understanding that allows for limited

take of this species during construction. We have already begun discussions with the Department to work through this authorization.

On a local level, we will need an encroachment permit from Caltrans to lower the dredge into the channel from Highway 1 and we will need an encroachment permit from County Public Works to work in their right of way near the Pescadero Road Bridge.

Designs and permitting for this project is estimated to cost $60,494.39.

3) Bidding, Construction and Monitoring:
   a. *Bidding*: The RCD Program Manager and Program Specialist will work with the engineering design firm, cbec eco-engineering, to develop a request for proposals, which will be sent out in Spring 2018, shortly after the 100% designs are finalized and permits are obtained.

   b. *Preconstruction*: A staging area will be established near the construction site where equipment and materials will be mobilized. Construction staking and layout will be performed by the selected construction contractor and inspected by the consulting engineers (cbec eco engineering). A pre-construction meeting will be held with RCD, consulting engineers, biological consultants, California State Parks, and the construction contractor to walk through the construction schedule and finalize roles and responsibilities. The dredge, tender, boat-based excavator, airboat and barges, and possibly some of the low ground-pressure construction equipment will be placed in the lagoon using a truck crane positioned on the Highway 1 bridge, or another location to be determined. Construction staging area and access points to Butano Marsh will be located along Pescadero Creek Road. Construction equipment, discharge pipe and possibly a mobile construction office (trailer) will be staged at the dirt parking area on the northeast corner of the intersection of Pescadero Creek Road and Highway 1, and potentially in the marsh access area located east of Pescadero Creek Road, approximately 0.45 miles from Highway 1. Access to Butano Marsh for low ground-pressure construction equipment to relocate the dredge discharge pipe to selected fill areas may be gained from Pescadero Creek Road. Access points would be selected to minimize impacts to the road shoulder, bank and marsh.

   c. *Construction*: Construction for the Project includes dredging the existing channel from Pescadero Creek Road bridge to the confluence with Pescadero Creek. Sediment dredged from the channel will be beneficially reused in the Butano Marsh, where it will be strategically placed to fill deeper areas to reduce water quality issues that arise during periods following breaching of the sandbar that forms the lagoon.

      A dredge is a boat-based excavating machine that operates by mixing water with in-situ material and removing the material through suction. The dredge has a boom in the front with cutting teeth that it will use to dig into the creek bed to liberate soil. The liberated soil will be sucked through an 8-inch discharge pipe, along with water, in a suspension of approximately 10% to 20% solids. A water-based excavator will be used to clear the channel of trees and woody debris to make way for the dredge and to allow for more efficient dredging. Low earth-pressure construction equipment will be used to relocate the dredging discharge pipe in the marsh to more precisely introduce fill to pools and swales that are to be restored. Barges will be used in some cases to relocate dredged sediment and woody debris.

      Dredging will generally proceed from the downstream end upstream to ensure a constant and adequate supply of water to the dredge. The dredging operation will begin near a pedestrian

bridge that is located approximately 1,300 feet upstream of the confluence with Pescadero Creek and proceed downstream to the confluence. A schematic describing the construction sequence is provided in Appendix: Designs, Figure 7. The discharge pipe is fused on to the end in sections as dredging progresses, so it will likely be more efficient and result in fewer impacts to work away from the discharge location, adding discharge pipe to the dredge as it progresses, as opposed to working toward the discharge area and pushing a longer discharge pipe into the discharge area. The dredge will then return to the starting point and proceed upstream to the Pescadero Creek Road bridge. At the end of each day, the dredge will be moored in the channel and the crew will be transported to shore via boat or low ground-pressure equipment.

During the dredging operation, the discharge pipe will be relocated to distribute dredged material in selected areas of Butano Marsh. Discharge pipe segments will be strategically located along the berm that runs south and west of Butano Creek so that they can be connected to the dredge as it moves upstream. The intent would be to minimize travel through the marsh to adjust the discharge pipe to redirect dredged material to beneficial use areas.

Upstream of the Triple Junction (Appendix: Designs, Figure 2), the boat-based excavator will be used to clear excessive amounts of sediment, downed trees and woody debris from the channel to allow for more efficient suction dredging. Hand crews will be used to selectively limb or cut trees to provide access for the dredge. The sediment and removed wood will be placed on barges and relocated to areas where it can be transported to the marsh for beneficial use. The dredging will then proceed in the cleared channel to approximately 50 feet upstream of Pescadero Creek Road Bridge.

Water quality control for sediment from dredge discharge materials will be provided at the at the north outlet of Butano Marsh. A water control device will be placed to block the channel and impound water, allowing sediment to settle out in the marsh. A silt curtain will be installed downstream of the water control device to further reduce sediment transport into Butano Creek.

The duration of the project is anticipated to be approximately 50 working days, based on anticipated dredging progress. The dredging operation is estimated to remove up to 900 cubic yards of material per day. Crews will operate over a full construction day, but due to logistics and troubleshooting, actual operating time is expected to be approximately 6 hours each day. Construction will be scheduled to occur when the lagoon is closed and water levels in the Butano Creek channel are highest. This may be necessary to provide enough draft for the dredge and dredging support equipment.

d. *Construction Monitoring*: Due to the variability of materials and sensitive site conditions, this project will require regular construction observation by consultant engineers (cbec inc., eco engineering) and qualified biological handlers and/or approved monitors with *Alnus* Ecological, State Parks and the RCD. Observations by the engineers will help to ensure that the dredging is completed to satisfy the intent of the designs and to address any unique or unforeseen circumstances that arise during construction. The biological and possible water quality monitoring will satisfy the requirements of the various permits for this project and ensure that impacts to the ecosystem and listed species are avoided and/or minimized to the greatest extent practicable. The RCD is working with biological specialists of Alnus Ecological, who are qualified and approved to handle salmonids, listed amphibians, tidewater goby, and Portia

Halbert from State Parks who holds a valid 10(a)(1)(A) permit for the San Francisco garter snake and will be overseeing the State Parks monitoring team. Biological monitoring will also be conducted by RCD Conservation Assistants Ka'ena Meyer and Julian Carroll.

e. *Post-Construction*: This subtask constitutes several important components to the project once completed. All construction fencing, equipment, and materials will be removed from the work and staging areas. After construction, the consultant engineering firm and RCD staff will conduct final inspections. This subtask also includes photo documentation of the project both pre-project and for 2 years post-project at various flow levels to document success of remediating fish passage barriers and sediment transport and deposition. The RCD and/or State Parks will also monitor successful establishment of the site revegetation as called for in the plan during the subsequent six months after construction completion. The RCD and State Parks will install 2-3 camera stations that will take photos on daily intervals for at least 12 months after construction as well as during construction. cbec eco engineering will conduct post-construction as-built surveys that will include a longitudinal survey and representative cross-section of the restored channel as well as cross-sections through the North Marsh and other areas receiving significant slurry.

The cost for Bidding, Construction, and Monitoring is estimated to cost $2,259,532.28.

4) Reporting and Public Outreach

a. *Public outreach*: NOAA and other resource agencies depend upon the San Mateo RCD to be a local restoration presence and outreach mechanism. For this project the RCD will maintain a web page, provide updates in a quarterly electronic newsletter, share information with local media, and provide regular updates during publicly noticed meetings of our Board of Directors. Public comments are welcome during these meetings, regardless of whether or not the Project has been agendized, and three of the six members of the Board reside in Pescadero and are liaisons to the community. In addition, RCD staff maintains an email distribution list of Pescadero residents and agency and NGO stakeholders, an RCD Facebook page, and utilizes social media managed by Pescadero community members ("Nextdoor" and a Google Group) to provide information and notices to the community, and will continue to do so. There are many people in town who are unlikely to access information online, so the RCD periodically posts hard copy printouts in the town post office and local establishments. Local residents also offer to post hard copies of RCD posts to social media. RCD staff also regularly attends meetings of the locally elected Pescadero Municipal Advisory Council (PMAC), which appointed a liaison to the RCD's Solutions to Flooding advisory group. PMAC has also offered to make RCD updates a standing item on their monthly agenda. Utilizing all of these outreach venues, stakeholders will be invited to provide feedback on the 30% and 60% designs before project implementation.

b. *Reporting to Funders*: The RCD will submit regular progress reports with invoices to NOAA as required. A final report will be submitted to NOAA at the end of the project performance period.

C. Milestone Schedule

- November 2016: Project start.
- Spring 2017: 30% Designs, draft sediment disposal plans, draft construction sequence and preliminary permit strategy vetted with state and federal agencies [funding obtained].
- August 2017: 60% designs (value added engineering refinements based on brand new topo, 2D model, etc) [funding obtained].

- November 2017: Draft and submit permit applications. RCD has consulted with agencies regarding permitting requirements and will applying for permits once funding is awarded. RCD is committed to quickly provide information needed by NOAA to analyze project impacts under NEPA.
- February 2018: 90% designs completed.
- May/June 2018: 100% designs and permit acquisition.
- June 2018: Release bid package for construction.
- August/September 2018: Project implementation (within 24 months of award of funds).
- Spring 2019: Project completion/ final report.

D. Evaluation

This Project proposes to use a number of inter-connected metrics and criteria to evaluation short-term and longer-term effectiveness. The evaluation plan is based on recommendations found in *NOAA Restoration Center Implementation Monitoring: Guidance for proposing and conducting "Tier I" Monitoring* and are linked to the measurable objectives articulated in Section B of this proposal. If funded, we look forward to working with NOAA staff to review and possibly adjust the monitoring plan to ensure sufficient and cost-effective implementation. While we anticipate very limited management or maintenance requirements post-project, we will be able to measure short-term and long-term success in meeting project objectives through the following evaluation protocols:

Short-term evaluation criteria will include:

- 100% restoration designs will be prepared and stamped by a licensed professional engineer and the designs will show all relevant existing and proposed elevations and cross sections of the reconnected channel and adjacent marsh. This design effort will also include known pre-project water surface elevation data and post-project expected water surface elevation data.
- Post-construction as-built surveys or drawings will be completed for the reconnected channel and restored marsh to determine whether the restoration efforts met target elevations. The as-built drawings will be prepared by cbec eco-engineering and will show the final elevations, profile and cross sections of lands altered by the project. As-built drawings will be surveyed into a known elevation benchmark and referenced to a standard geodetic datum.
- The RCD and/or State Parks will conduct pre- and post- construction photo documentation of the project site for 2 years post-project at various flow levels to document success of remediating fish passage barriers, reducing sediment deposition and lowering water surface elevations at Pescadero Creek Road. In addition, 2-3 camera stations will also be installed enabling photos on daily intervals for at least 12 months after construction as well as during construction.
- The RCD and/or State Parks will also monitor successful establishment of the site revegetation as called for in the plan during the subsequent six months after construction completion.

Longer-term evaluation criteria after NOAA grant funding ends will likely include:

- Annual spring/summer volunteer kayak trips, including community volunteers, into the Butano Channel to assess passage conditions for adult and juvenile salmonids. Assessment will be visual with photo documentation.
- Work with NOAA and CDFW to include Butano Creek in the annual Pacific States Marine Fisheries Commission annual red surveys to validate salmonid access and spawning.
- County reports on the number of road closures days per year on Pescadero Road at Butano Creek. These data could be translated into metrics on economic impacts from flooding.
- Continued collaboration with NOAA and CDFW to enable summer and fall lagoon fisheries surveys and monitor the extent and frequency of fish-kills resulting from fall and early winter breaches.

- Continue partnership with the SFRWQCB and UC Davis Bodega Marine Labs to monitor water quality conditions in the Butano Marsh and channel to evaluate whether marsh restoration efforts have reduced the production and/or transport of anoxic/hypoxic water into the lagoon.

E. Partnerships

The San Mateo Resource Conservation District has a 77 year history of helping people protect, conserve, and restore natural resources through partnerships and collaboration with land owners and managers, technical advisors, area jurisdictions, government agencies, and others. San Mateo RCD has an excellent track record and reputation for partnership and for accomplishing complex, high priority, multi-stakeholder salmonid restoration projects. At times, the NOAA Restoration Center has prevailed upon the RCD to complete restoration projects that had stalled or been mismanaged by others. The RCD never failed to get them done. RCDs are identified as a partner for recovery in both the coho Recovery Plan (NMFS, 2012) and the steelhead recovery outline (NMFS, 2007). The San Mateo County RCD is identified as a partner for coho recovery in the Project watershed (p. 490). The plan states, "RCDs represent an important vehicle through which… landowners can voluntarily address and correct management practices that impact ESA-listed salmonids and their habitats," (p. 122). RCDs "often serve as a bridge between [other] government agencies and private landowners to assist in navigating the permitting process, assuage fears regarding regulations, and to encourage landowners to implement recovery actions" (p. 241). The RCD will be the project manager, responsible for all project coordination, permitting, oversight, and outreach.

State Parks is the landowner and has been partnering extensively with others for the best management of the property, including co-developing the Pescadero Lagoon Science Panel and breaching the sand bar to prevent fish kills in partnership with NOAA. In addition to access and operational and technical assistance, Parks is contributing cash match, staff expertise for biological and archeological monitoring, and topographic surveys. RCD and Parks staffs are in regular communication and will continue to communicate through project team meetings, site visits, conference calls, and participation on the Pescadero Technical Roundtable, an information-sharing collaboration of agency and NGO technical staff.

San Mateo County and the RCD have partnered extensively on multiple facets of restoring the watershed and reducing impacts from flooding. The RCD and the County will continue to coordinate and leverage efforts, and County Supervisor Don Horsley is requesting $1 million as a cash match. RCD and County staff meet regularly and County staff will be invited to project team meetings.

Although they are not defined partners with a specified role in implementing this Project, the RCD will coordinate closely with agency staff regarding Project permitting and designs and extensive coordination with leveraged work via the Pescadero Technical Roundtable. The proposed Project itself is a result of a high level of collaboration among resource agencies, State Parks, the County, the RCD, and community engagement as part of the Solutions to Flooding project described in "Section A. Background" on page 3 of this proposal.

It is essential to highlight the historical lack of consensus on a restoration approach for the Pescadero marsh and lagoon complex to fully appreciate the significant scientific collaboration and community engagement that has led to the solution proposed in this grant submittal. The Pescadero-Butano estuary has been a hotbed for debate over much of the past two decades and until the transformative events of

the past few years, the lack of consensus and adequate data appeared intractable. Thanks to leadership of staff from NOAA Fisheries, USFWS, CDFW, the SFRWQCB, the State Coastal Conservancy, State Parks, and evolving discussion with local partners working with the RCD, a common set of foundational questions has emerged:

1. What are the physical and biochemical mechanisms driving the fish-kills;
2. Do these fish-kills present a minor or major impact to the steelhead and potential coho fishery;
3. How do extreme climatic conditions affect behavior of steelhead and coho in west coast estuaries;
4. Are the fish-kills, upland land management, historic land management, chronic flooding, and recovery of salmonids in this watershed all connected and if so, how; and
5. What are the short-term and long-term actions that can be implemented to reduce the risk and severity of fish-kills, expedite recovery of listed species and restore the entire estuarine system to a more resilient and functional state?

Working together, partners have made progress to build a collective understanding of the system and to implement priority restoration projects based on the best available science. The following new research has fundamentally changed how the partners view the mechanism and scale of the Butano and Pescadero marsh system's issues:

- San Francisco Bay Regional Water Quality Control Board (SFRWQCB) development of Pescadero-Butano Watershed Sediment TMDL (Frucht, 2013) documents and characterizes the accelerated rates of erosion and sedimentation resulting from natural geologic and climatic processes augmented by human land use practices and identified other factors that may be limiting populations of sensitive species including recruitment and retention of woody debris, water withdrawal during critical low-flow periods, lagoon circulation and management, and water quality.
- Solutions to Flooding on Pescadero Creek Road (2014) used a newly developed 2D hydraulic model and a 1D sediment transport model to understand the mechanisms behind the flooding, develop and evaluate solutions, and provide recommendations on upland and marsh actions to reduce flood risk and provide ecological benefit. This effort provided the regulatory and local community with a common understanding of the mechanisms behind the chronic flooding, and resulted in immediate action to restore over 100 acres of floodplain on Butano Creek, upstream of the marsh.
- Pescadero Lagoon Science Panel Final Report (2015), is the report by a panel of independent scientific experts convened by State Parks and CDFW focused on physical and biogeochemical processes in the open-water habitats of lagoon, with attention centered on the annual fish mortality events with attention to other listed species and other major concerns (e.g., flooding). Findings were that fish and invertebrate mortality events occur in Pescadero Lagoon during low oxygen events that follow the breaching of the lagoon mouth after an extended closure in late summer or fall. Reasons for an increase in mortality events may be due to any of several interrelated factors: (i) more frequent hypoxic events; (ii) more intense hypoxic events; (iii) more persistent hypoxic events; (iv) occurrence of hypoxic events in a more-sensitive season; (v) more spatially extensive hypoxic events; and (vi) inability of organisms to escape life-threatening conditions by migrating to ocean, up-river or into other parts of the lagoon. The panel's chair, Dr. John Largier, has been working with funds from the SFRWQCB to continue to evaluate and refine these interrelated factors.
- Preliminary Results from 2016 Coho Salmon sampling by NOAA's Southwest Fisheries Science Center in Scotts Creek Lagoon (just south of Pescadero-Butano), indicate the importance of lagoon habitat for steelhead. Summer growth and movement in and out of the lagoon may also be critical for coho smolts. They found that juvenile coho were rarely observed in the lagoon during the summer and fall, when central coast lagoons are typically thought to be too warm to sustain coho salmon rearing.

However, recent drought conditions in California have resulted in early sandbar closures at Scott Creek and elsewhere, preventing a substantial number of coho smolts from emigrating. These early closures have provided NOAA staff with an unprecedented opportunity to study the survival, growth, and movement of "trapped" juvenile coho. Preliminary results suggest that juveniles remained in the lagoon throughout summer and fall of 2016, although densities decreased during that period, with the most significant decrease occurring in August. Nevertheless, some of the juveniles moved out of the lagoon and into the freshwater portion of lower Scott Creek, and even suggest some degree of subsequent returns to the lagoon. Additional data analysis is necessary to confirm whether movements out of the lagoon were correlated to variations in water quality, but a reliable hydrologic connection (with adequate passage depths) between the lower creek channel and the lagoon appears to be critically important during extreme climatic events.

- California Department of Fish and Wildlife's Annual Water Quality Monitoring, Fish Sampling, and Fish Kills in Pescadero Creek Lagoon (2016), is set within the context of high densities and growth rates of rearing steelhead in the lagoon being halted during fall/winter sandbar breach fish kills almost annually since 1995. During 2016, fish sampling events and water quality monitoring were conducted throughout the dry season. For the first time, there was significant pre-breach population data for steelhead rearing in the lagoon before a fish kill and hydrologic and water quality conditions during the kill from continuous water quality, water surface elevation and breaching sensors deployed by researchers at UC Davis Bodega Marine Labs, State Parks, and the Department. This work confirmed the population level impact these kills can have on steelhead. Low flows in Pescadero Creek and lack of access into Butano Creek left all the fish in the lagoon with nowhere to hide from the pulse of hypoxic water.

Other efforts are underway to further improve and refine our understanding of the fluvial hydrology, tidal processes, and the sediment and water quality dynamics: (1) development of a new high resolution topographic surface for the Butano Marsh that is funded by State Parks and will build upon County (2005) and NOAA (2010) LIDAR datasets and NOAA-funded cross sections developed in 2012; (2) development of a USFWS funded Qualitative Conceptual Model for understanding and predicting breach events based on an array of tidal, fluvial, and sediment metrics; (3) development of a HEC-RAS 5.0 2D hydrodynamic model for the Butano marsh and channel funded by the County and of a Delft 3D model for the lagoon and estuary funded by the SFRWQCB; (4) implementation of an engineering feasibility analysis for a new causeway at Pescadero Rd, also funded by the County; and (5) deployment of an array of data sensors for both water quality, water surface elevation and sand bar condition to better understand how these dynamics vary over time.

All of this work is being conducted under the auspices of the Pescadero Technical Roundtable, which is convened by the RCD. The findings of these investigations informed development of the proposed Project and will be used to further refine the project during finalization of designs.

The chronic flooding impacts to the Pescadero community and concern for protection of the ESA listed populations of coho and steelhead have led to a remarkable level of substantive coordinated action in the Butano-Pescadero watershed. There are multiple other collaborative efforts in the watershed to improve resilience for fish, farms, and people that integrate with or leverage this project:

- State Parks, NOAA, the RCD, and CDFW are moving forward with various interim measures to prevent fish kills in the lagoon until larger restoration actions solve the problem.
- The Regional Water Quality Control Board is developing a Total Maximum Daily Load for the watershed to address impairment from excessive sedimentation.

- The RCD is working with local farmers, agency partners, domestic water providers, American Rivers, and Trout Unlimited on a number of streamflow enhancement projects that improve water use efficiency and reliability while reducing demand on creeks during the critical low flow months of August through October to improve habitat for salmonids and other aquatic species.
- The RCD and County Parks recently removed the remaining human-made barrier to fish passage in Pescadero Creek, opening 62.5 miles of some of the best spawning habitat in the watershed. The RCD works extensively with landowners to install or manage Large Woody Debris to enhance salmonid habitat complexity.
- San Mateo County's "Sea Change San Mateo County" initiative will complete its sea level rise vulnerability assessment, in which the Pescadero community and its natural resources are a central focus. It is because of this focus on Pescadero that County Supervisor Don Horsley is requesting $1 million from the County Board of Supervisors as a cash match for these requested NOAA grant funds.

F. Public Engagement and Outcomes

There is strong public sentiment and engagement regarding solutions to flooding, particularly after the damage from recent flooding events in January and February 2017. There is vocal support for 1950's-era dredging in the marsh from some long-standing community residents who remember when that was the common practice. Concerted, coordinated effort between the RCD, San Mateo County, and State Parks is now underway and discussions with the community will continue to address how the proposed Project will further the underlying shared concerns for increasing community resilience to coastal flooding hazards, protection of habitat for threatened and endangered species in Pescadero Marsh Natural Preserve, and prudent County planning to improve the road and emergency services.

The RCD will maintain and utilize a project web page, a periodic MailChimp electronic newsletter, an email distribution list of stakeholders, and an RCD Facebook page. We will also utilize listserves managed by Pescadero community members, including "Nextdoor" and a Google Group. There are many people in town who are unlikely to access information online, so the RCD will periodically post hard copy printouts in the local post office and other key local establishments. Local residents also offer to post hard copies of RCD communications. RCD staff will attend meetings of the locally elected Pescadero Municipal Advisory Council (PMAC), which previously appointed a liaison to the Solutions to Flooding advisory group that initiated this Project. PMAC recently also offered to include the RCD as a standing item on their monthly agenda. As appropriate and beneficial, we will share information with local media. The RCD's Board of Directors is another avenue for public engagement. Three of the six-member Board reside in Pescadero and are liaisons to the community, and the Board's meetings serve as a public forum that is publicly noticed monthly.

The RCD already utilizes all of these engagement venues, and NOAA and other resource agencies depend upon us as a local restoration presence and outreach provider. For this Project, we will provide regular updates and specifically solicit stakeholder input on the 30% and 60% designs; address questions and concerns to the extent practicable; and disseminate information on ecosystem resiliency goals and results, sources of funding and partner involvement, and the potential for future resiliency efforts, restoration, and conservation activities. We will also turn to the community for help with post-project monitoring.

Butano Channel Restoration and Resiliency Project
Data Management Plan

The Butano Channel Restoration and Resilience Project, implemented by the San Mateo Resource Conservation District (RCD), will generate and make available environmental data and information as described in this document.

An electronic as-built report with drawings will be prepared by the engineering firm that prepared the designs and will oversee construction activities to ensure that they are to design specifications. The as-built report will be prepared within 3 months after implementation and will include post-project cross-section and profile data for the re-established channel and topography of the new marsh plain where excavated material is deposited, as well as length and alignment of the channel. The data will be collected using commonly accepted methodologies. The as-built designs will be submitted to NOAA with the final report for the grant-funded project as well as being available at the RCD in digital format on the RCD server. The report will be available to anyone upon request immediately after it has been completed. The RCD is a public agency subject to the California Public Records Act (PRA). PRA establishes criteria and timelines for providing information that is requested. The RCD also has Board-approved internal policies regarding making information publicly available. The report will also be provided to the landowner, California Department of Parks and Recreation (State Parks), which is also subject to the PRA. The information will be available indefinitely. All future sub-awardees not identified in this plan will have as a condition of their contract acceptance of this data sharing plan. Any additional data sharing stipulations for future sub-awardees may be outlined at that time and described in their contract.

Six or seven monumented photo locations will be established with GPS coordinates for pre-and post-project photos as well as photos at the same locations during construction if feasible. Also if feasible, mounted stations will be set up for timelapse photography before, during, and after construction. Representative photos taken during the period of the grant will be submitted to NOAA with reports and shared with State Parks as well as being stored digitally on the RCD server. State Parks and RCD are subject to PRA and all photos will be available upon request. Photos may also be used in outreach materials to communicate about the project. This information will be available indefinitely.

Project biologists will upload observations and information about state and federally protected species using the California Natural Diversity Database, an inventory of the status and locations of rare plants and animals in California managed by the California Department of Fish and Wildlife. Biological monitors will prepare reports and daily logs recording observations and relocation activities of protected and special status species. All biological reports will be submitted to State Parks, permitting agencies, and submitted to NOAA with grant reports. The reports will also be available in a digital format on the RCD server and available upon request indefinitely.