2 Project Description

2.1 Introduction

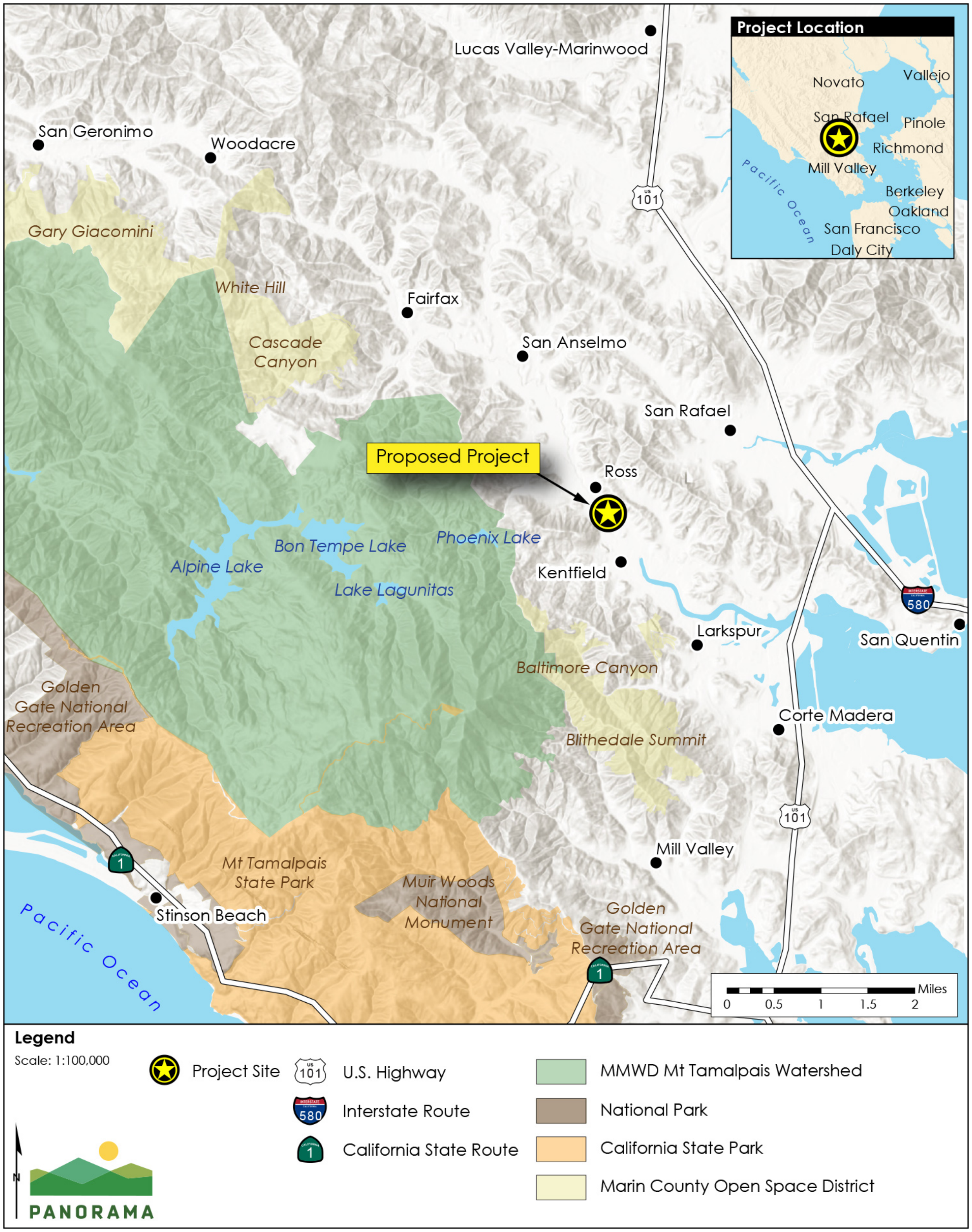
The Marin County Flood Control and Water Conservation District (District) is proposing the Corte Madera Creek Flood Risk Management Project, Phase 1 (project). The project is proposed as an element of the District's larger flood control program. The program is being implemented over many phases and multiple creeks throughout the District. Other flood control projects that are proposed for Corte Madera Creek, including Phase 2 of the Corte Madera Creek Flood Risk Management Project, are described in Section 4.3 Cumulative Impacts of this EIR. The District is the California Environmental Quality Act (CEQA) Lead Agency responsible for preparation of this Environmental Impact Report (EIR). The proposed project includes improvements to the concrete Corte Madera Creek flood-control channel constructed by the U.S. Army Corps of Engineers (USACE) in the 1960s and 1970s. The project improvements would be located within the Town of Ross and unincorporated Kentfield. The proposed channel improvements would improve fish passage and provide 25-year flood-risk reduction to residents and businesses within the Town of Ross and Kentfield.

2.2 Project Location

The project is located within the Corte Madera Creek watershed within the Town of Ross and unincorporated Kentfield, in Marin County, as shown in Figure 2.2-1. The project area is divided into three units, Unit 4, Unit 3, and Unit 2, which are based on the original USACE project units, as described in Table 2.2-1 and shown in Figure 2.2-2. Corte Madera Creek within the project area is concrete lined in Unit 3 and Unit 2 and currently has a natural bottom in Unit 4. The project area is approximately 1.4 miles long.

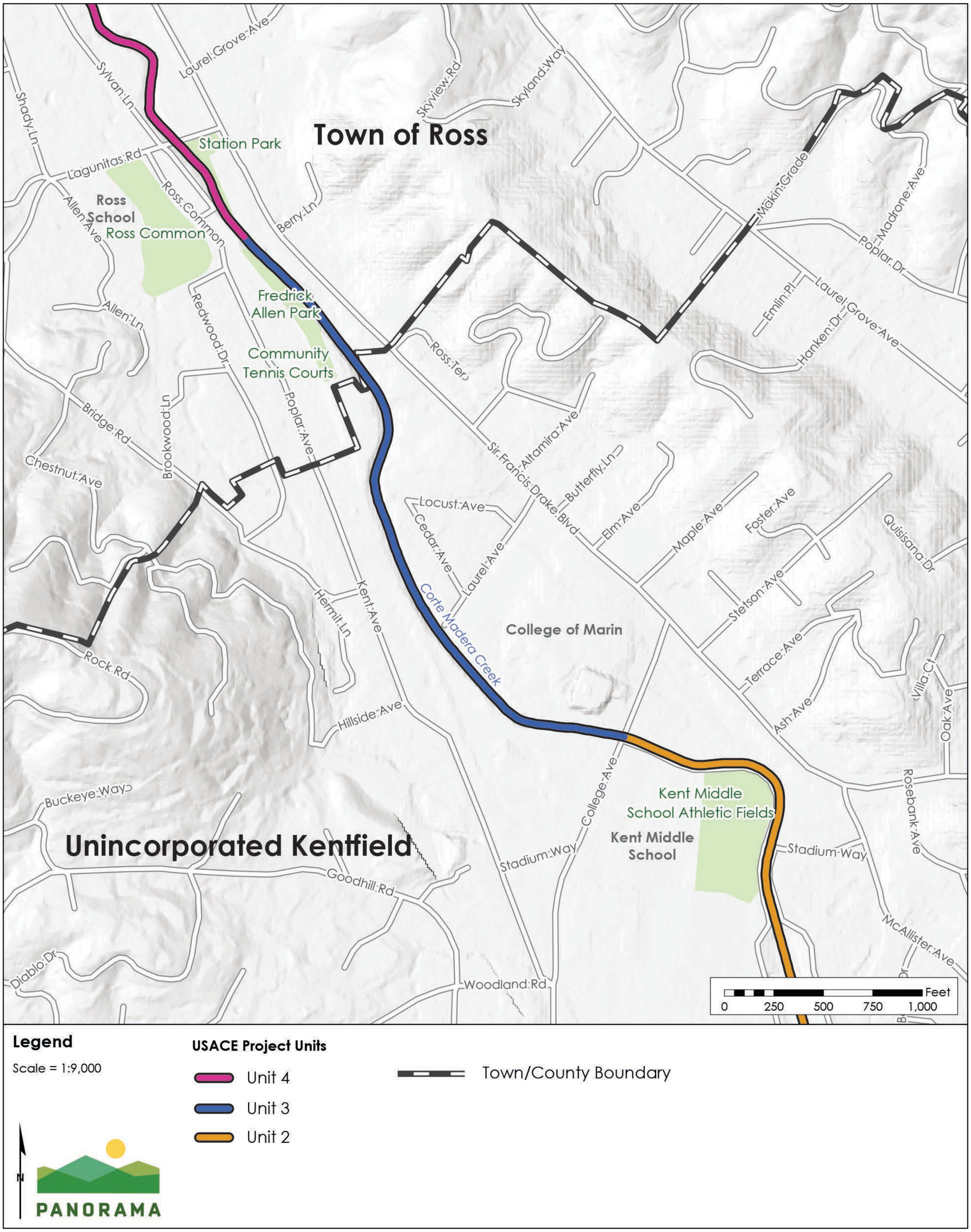
The Corte Madera Creek watershed contains 42 linear miles of stream channels and covers approximately 28 square miles, including areas of unincorporated Marin County and the towns of Corte Madera, Larkspur, Ross, San Anselmo, and Fairfax. Corte Madera Creek discharges into San Francisco Bay, 9 miles north of the Golden Gate Bridge. The Corte Madera Creek watershed's western boundary is a steep, forested ridge. Numerous creeks that drain steep upland areas onto relatively steep and laterally confined alluvial valley flats combine as San Anselmo Creek in Ross Valley at San Anselmo. San Anselmo Creek then flows southeast through Ross Valley. San Anselmo Creek and Ross Creek merge to form Corte Madera Creek west of the Lagunitas Road Bridge ~~flows into Corte Madera Creek west of Greenbrae at the confluence with Ross Creek~~. Upper reaches within the watershed support relatively natural stream channels. The lower ridges and valley areas of the watershed, including areas adjacent to Corte Madera Creek, are highly developed suburban residential and commercial areas. Within the project area, the creek is channelized with a combination of narrow, incised banks and a concrete-lined channel.

Figure 2.2-1 Project Location



Sources: (U.S. Geological Survey, 2013; U.S. Geological Survey, 2016; Tele Atlas North America, Inc., 2020; Bay Area Open Space Council, 2011)

Figure 2.2-2 USACE Creek Units



Sources: (Tele Atlas North America, Inc., 2019; GHD, 2020h; USGS, 2019; U.S. Geological Survey, 2013)

Table 2.2-1 Corte Madera Creek Units within the Project Area

Unit [a]	Length (miles)	Description of Reach
Unit 4	0.2	Unit 4 extends approximately 0.4 mile downstream from Sir Francis Drake Boulevard and continues approximately 600 feet downstream of the Lagunitas Road Bridge before terminating at the wooden fish ladder. The project segment of Unit 4 starts just upstream of Lagunitas Road Bridge and extends approximately 1,100 feet downstream to the wooden fish ladder.
Unit 3	0.67	Unit 3 begins at the wooden fish ladder at the upstream end of the concrete channel and continues for approximately 0.67 mile to the College Avenue Bridge.
Unit 2	0.57	Unit 2 begins at the College Avenue Bridge and extends downstream beyond the end of the concrete channel, ending near the Tamalpais Creek culvert. The upper and middle (henceforth for the purposes of this project referred to as lower College of Marin concrete channel removal or lower Unit 2) portions of Unit 2 consist of an approximately 0.33-mile concrete channel that extends from the College Avenue Bridge to downstream of Stadium Way. The lowest portion of Unit 2, which is not a part of the project area, extends downstream into the earthen channel to Bon Air Road bridge.

Note:

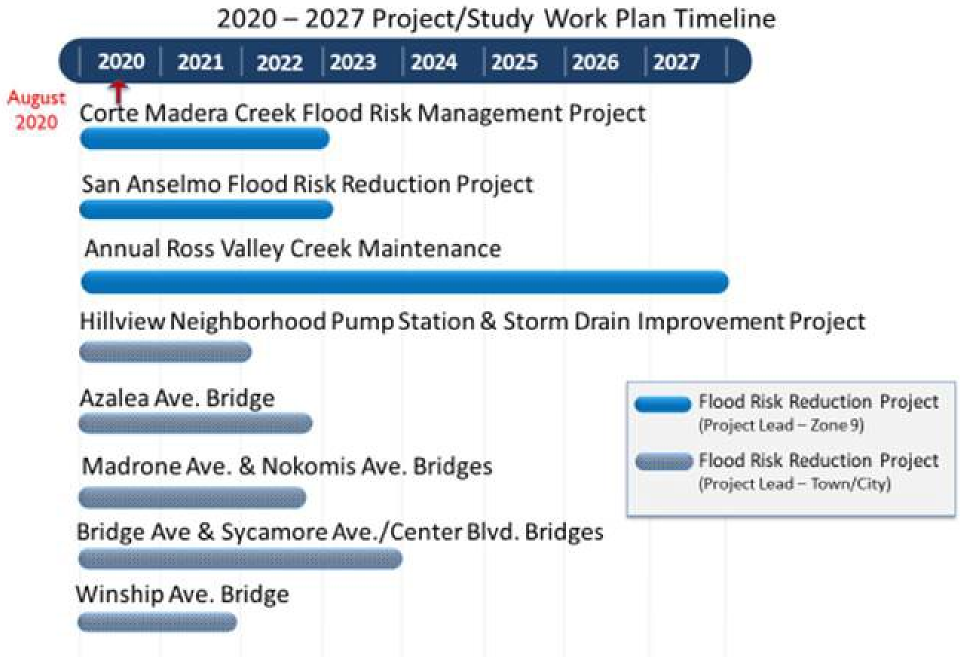
[a] Units are ordered from upstream (Unit 4) to downstream (Unit 2)

2.3 Background

2.3.1 Ross Valley Flood Protection and Watershed Program Summary

Ross Valley has been inundated by flooding over the years, including significant winter storm events in 1956, 1982, 2005, and 2017, causing tens of millions of dollars in damages. The most recent major flood occurred on December 31, 2005. The flood resulted in substantial property damage within the Ross Valley. In January 2006, the Ross Valley Watershed Flood Protection and Watershed Program (Program) was initiated by Marin County Board of Supervisors. The Program was intended to create a comprehensive flood control strategy for the Ross Valley watershed. The Program, which is managed by the District, strives to improve public safety and protect property in the 28-square-mile watershed. The proposed project is one of several flood-risk reduction projects that are currently being planned by the District in the watershed. The work plan for the Ross Valley Flood Protection and Watershed Program is provided in Figure 2.3-1.

Figure 2.3-1 Ross Valley Flood Protection and Watershed Project Study Work Plan Timeline



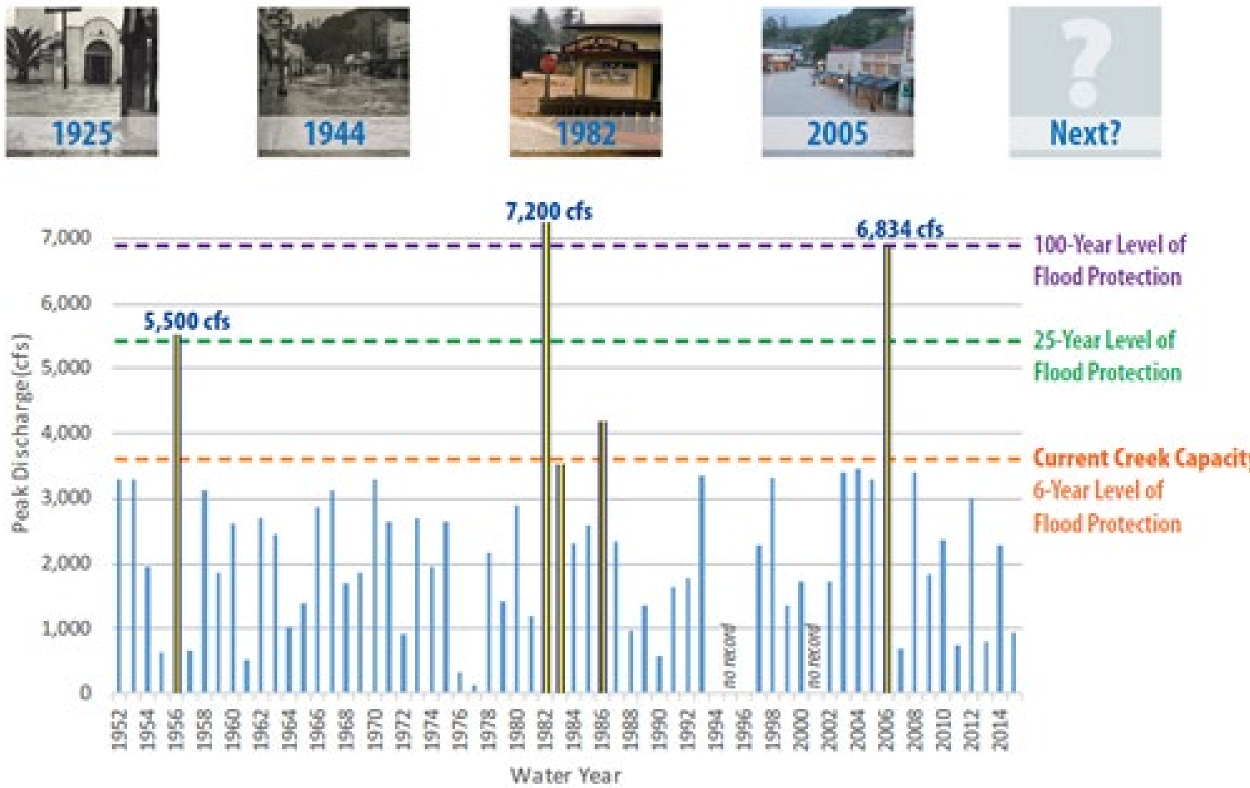
Source: (Marin County Flood Control and Water Conservation District, 2020)

2.3.2 History of Flooding and Flood Control in Ross Valley and the Corte Madera Creek Watershed

Several times in recent history, Ross Valley has been flooded by Corte Madera Creek and its upstream tributaries. Flooding was reported as far back as the 1860s and in calendar years 1914, 1925, 1937, 1940, and 1942 prior to establishment in 1951 of the United States Geological Survey (USGS) streamflow gage in Ross. Corte Madera Creek has flooded the project vicinity numerous times over the past 70 years, causing loss of human life and major damage in nearby communities of San Anselmo, Ross, Kentfield, and Larkspur. Since 1951, flood events have been recorded in calendar years 1951, 1952, 1958, 1967, 1969, 1970, 1982, 1983, 1986, 1993, 2005 and 2017. Of these, the two most severe floods occurred in 1982 and 2005, with peak discharges of approximately 7,200 cubic feet per second (cfs) and 6,834 cfs, respectively.

The percent-annual-chances (i.e., probabilities) of these floods were approximately 0.6 percent and one percent (translating to a 100- to 200-year flood event and a 100-year flood event, respectively) (Figure 2.3-2) (Stetson Engineers, Inc., 2011). Historical flooding has caused extensive property damage and economic hardship to residents, businesses, and local governments. In the 2005 flood, losses to the public and private sector totaled $94,836,880 in 2006 dollars (Marin County, 2012). Following the 1956 flood, Congress directed the USACE to evaluate possible solutions to flooding in the vicinity of Corte Madera Creek under Section 11 of the Flood Control Act of 1944. The Corte Madera Creek Flood Control Project (USACE Flood Control Project) was authorized by Congress in the Flood Control Act of 1962.

Figure 2.3-2 Corte Madera Creek Historical Annual Peak Discharges



Source: (Marin County Flood Control and Water Conservation District, 2020)

The USACE Flood Control Project was originally conceived to consist of six units with a concrete-lined channel extending approximately 6.5 miles from the San Francisco Bay upstream into Fairfax. The USACE began construction of Units 1, 2, and 3 of the USACE Flood Control Project in 1969. Construction at the downstream end (Units 1 and 2) created a trapezoidal earthen channel and, further upstream, a concrete-lined channel part-way through the Town of Ross (Unit 3). Construction of Unit 4 as a concrete-lined channel was originally scheduled to begin in 1972, but further implementation of the USACE Flood Control Project beyond Units 1, 2, and 3 was stopped by litigation and environmental concerns from the surrounding community.

2.3.3 Previous Environmental Review

The USACE, through a local partnership with the District, reinitiated study and design of the USACE Flood Control Project and began preparation of an Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Corte Madera Creek Flood Risk Management Project in 2015. The primary goal of the Corte Madera Creek Flood Risk Management Project was to manage flood risk from Corte Madera Creek associated with Unit 4 and to address any potential induced flooding as a result in Units 2 and 3. The USACE published the Draft EIS/EIR in October 2018 and received substantial comments from agencies and the public that indicated there were unresolved environmental issues and a lack of local support for elements of the project design.

Upon review of the public comments on the Draft EIS/EIR, the District recognized that additional analysis of the project alternatives would be necessary to ensure that public and agency comments were adequately addressed in compliance with CEQA. The additional work would require supplemental funding and time beyond the congressionally-approved budget and schedule authorized for the project feasibility study and as established in the agreement for the "General Reevaluation Report for Corte Madera Creek" (February 19, 2014) between the USACE and the District. The District Board of Supervisors decided to terminate the agreement with USACE as of December 31, 2019 and transition the project to a locally-managed project.

Since project planning shifted from the USACE to local District leadership and management, the project has been substantially redesigned to reduce the scope of activities and address many of the concerns raised by the public in the 2018 Draft EIS/EIR, including omission of a proposed bypass pipeline along Sir Francis Drake Boulevard. The current project has been designed in coordination with two stakeholders: Town of Ross and Friends of Corte Madera Creek Watershed. The project is designed to provide 25-year flood risk reduction to residents and businesses within the Town of Ross and Kentfield. The project includes improvements to the Corte Madera Creek flood control channel within Unit 4, Unit 3, and Unit 2. Additional flood control and stream restoration elements, including additional restoration on College of Marin campus, are being considered for a Phase 2 project on Corte Madera Creek. Separate CEQA documentation and analysis will be required prior to implementation any Phase 2 project components. While Phase 2 has not been fully defined, potential Phase 2 components are described and considered in Section 4.3 Cumulative Impacts of this EIR.

2.4 Project Objectives

CEQA requires EIRs to include a clearly written statement of objectives that succinctly describes the underlying purpose of the project being evaluated. The objectives serve to guide the development and evaluation of a reasonable range of alternatives to evaluate in the EIR and support the decision-making process.

The objectives of the project include the following:

1. **Flood-Risk Reduction.** Reduce overall flood inundation extent and depth in the Town of Ross and Kentfield areas.
2. **Environmental Benefits.** Improve fish passage, natural creek processes, and fish and riparian habitat adjacent to the creek.
3. **Public Access and Recreational Quality.** Maintain public access along the creek via the multi-use path and enhance the recreational experience and amenities along the creek corridor to meet Town of Ross and Kentfield area community needs.

4. **Operational Reliability.** Improve operational reliability and reduce long-term maintenance costs through improving channel stability and protecting existing utilities.
5. **Regulatory Compliance.** Comply with local, state, and federal environmental laws and regulations.
6. **Fiscally Responsible.** Implement a flood-risk reduction project that can be accomplished with local and reasonably foreseeable grant-funding opportunities.

The primary drivers for the project are reduction in flood risk and improvement in ecological functions, including fish passage. Implementing the project would reduce the frequency of flooding in the Town of Ross and Kentfield and reduce the severity of flooding by reducing the total area of inundation adjacent to Corte Madera Creek. The flood risk reduction benefits of the project are demonstrated in the hydraulic modeling results for the change between existing conditions and proposed-project condition modeling. Hydraulic modeling results for the 10-, 25-, and 100-year flood events are presented in detail in Section 3.9 Hydrology and Water Quality.

2.5 Project Elements and Design

2.5.1 Proposed Project Element Types

The proposed project includes project elements that would increase flow conveyance capacity, provide flood protection, and/or enhance habitat within Corte Madera Creek. The project elements and their general purpose and function are described below. The proposed project elements are shown on Figure 2.5-1 through Figure 2.5-3.

Increase Creek Flow Conveyance Capacity

Project elements that increase creek capacity allow a greater volume of water to flow in-channel rather than overflowing along the streets and floodplains and flooding adjacent areas. Maximizing the in-channel flood-flow capacity is accomplished by widening and/or deepening certain sections of creeks in the watershed, creating and/or restoring functional floodplains, and modifying, removing, or replacing structures, including bank protection, that encroach into the creek. Capacity-increasing project elements that would be constructed as part of the proposed project include the following:

- Removal of the concrete channel and widening the channel within Frederick Allen Park
- Removal of the fish ladder at the upstream limit of Unit 3
- Regrading and lowering the channel in Unit 4
- Installation of new grade control and slope protection in Unit 4 and Frederick Allen Park
- Floodplain expansion and partial concrete channel wall removal in Unit 2 at the downstream of Stadium Way bridge.

Figure 2.5-1 Project Elements (Map 1 of 3)

Source: (GHD, 2020a) (Stetson Engineers, Inc., 2020) (geomorphDESIGN, 2020a) (Tele Atlas North America, Inc., 2019) (Golden Gate National Parks Conservancy, 2018)

Figure 2.5-2 Project Elements (Map 2 of 3)

Source: (GHD, 2020a) (Stetson Engineers, Inc., 2020) (Tele Atlas North America, Inc., 2019) (Golden Gate National Parks Conservancy, 2018)

Figure 2.5-3 Project Elements (Map 3 of 3)

Source: (GHD, 2020a) (geomorphDESIGN, 2020b) (Stetson Engineers, Inc., 2020) (Tele Atlas North America, Inc., 2020) (Golden Gate National Parks Conservancy, 2018)

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Flood Protection Elements

Flood-protection elements are structures that play an essential role in diverting water away from communities or reducing flooding within communities that occur adjacent to the creek. Flood-protection elements, such as short floodwalls, protect communities within the floodplain by maintaining flow in the creek. Flood-protection elements that would be constructed as part of the proposed project include the following:

- New/modified short floodwalls (approximately 2 to 4 feet tall) in Unit 3 and Unit 2
- Stormwater pump station with backup power in Granton Park

Elements that Enhance Creek Habitat

Creek habitat enhancement involves increasing natural conditions both in the channel and adjacent to the creek by removing concrete and structures that restrict flow, obstruct fish passage, or block natural vegetation establishment. Corte Madera Creek provides important habitat for threatened and endangered species including but not limited to salmonids, particularly resident rainbow trout and steelhead trout, as well as the Ridgway's rail and the salt marsh harvest mouse, which occupy the tidal marshes downstream of the project area. The tidal marsh, freshwater aquatic, and creek riparian habitats have all been reduced and degraded by human activities. Salmonids returning from the ocean to spawn in Corte Madera Creek must first enter the downstream outlet of the concrete flood control channel near the College of Marin and pass upstream through the channel to enter the still largely natural creek corridor behind the Ross Post Office. The Denil fish ladder and the existing concrete channel have been identified as impediments to fish passage because typical natural flows during the migration season produce shallow, high-velocity flows on the smooth concrete bed, there are insufficient resting pools for fish passage, and there is no pool below the fish ladder to accommodate fish attempting to jump up the ladder.

Habitat enhancement elements included in the proposed project would create conditions that promote fish habitat and passage and restore tidal, wetland, and riparian habitat along the creek. Habitat-enhancing project elements included in the proposed project include the following:

- Removal of the Denil fish ladder
- Riparian vegetation plantings in Frederick Allen Park
- New and enlarged fish pools within the concrete channel in Unit 3
- Removal of a portion of the concrete channel and restoration of tidal wetland and transitional habitat in Unit 2.

2.5.2 Project Design

Project elements proposed within Unit 4, Unit 3, and Unit 2 of Corte Madera Creek are summarized in Table 2.5-1 and shown on Figure 2.2-2. A detailed description of the elements within each unit is provided following the table.

Table 2.5-1 Proposed Project Elements by Creek Unit

Unit	Description of Project Element
Unit 4	• **Capacity-increasing elements.** The grade of the channel would be lowered, the channel would be widened, and the channel elevation and banks would be stabilized through installation of grade-control structures and bank stabilization. • **Habitat-enhancing elements.** The Denil fish ladder would be removed, and riparian vegetation would be planted along the creek banks to increase vegetation and water interaction within the creek.
Upper Unit 3 (Frederick Allen Park)	• **Capacity-increasing elements.** The concrete channel would be removed, and a new, wider earthen channel and floodplain would be constructed within the existing channel and Frederick Allen Park. • **Flood-protection elements.** New floodwalls would be installed along the park to protect adjacent private property. • **Habitat-enhancing elements.** Habitats in and around the creek would be enhanced within the park by removing the concrete channel and planting vegetation along the creek banks to provide increased shade and interaction between water and vegetation, thereby providing more natural creek conditions.
Unit 3	• **Flood-protection elements.** New and modified floodwalls would be installed within the Granton Park neighborhood. A new stormwater pump station would also be constructed. • **Habitat-enhancing elements.** New and enlarged fish pools would be constructed within the concrete channel in Unit 3.
Unit 2	• **Flood-protection elements.** A new floodwall would be constructed along the upper reach of Unit 2. • **Habitat-enhancing elements.** Creek habitat would be enhanced by replacing the concrete channel with an earthen channel and vegetation downstream of Stadium Way ~~Avenue~~. • **Improvement elements.** Replacement of existing storm drains. Improvements to the existing multi-use path and creation of an adjacent vest pocket park.

2.5.3 Project Features Within Each Unit

Unit 4

The proposed work within Unit 4 would occur within the lower reach of the unit from the upstream end of the existing concrete channel to approximately 150 feet upstream of the Lagunitas Road Bridge. Proposed project activities include removal of the existing fish ladder, grading within the channel and banks to maintain channel geomorphic stability and increase hydraulic capacity, transition structure from the natural channel to the concrete channel, and channel stabilization measures including planted rock, vegetated soil lifts, erosion-control fabric, and engineered streambed material.[1] The improvements also include installation of

[1] Engineered streambed material is a well-graded rock material that includes a gradation of boulders, cobbles, gravel, and sand.

riprap and short cast-in-place concrete walls adjacent to existing concrete walls to reinforce those walls. Unit 4 elements are described below and shown on Figure 2.5-1.

Fish Ladder Removal and Transition Element

The Denil fish ladder would be replaced with a combination of natural bed material and biotechnical bank stabilization or stone protection treatments to eliminate the hydraulic jump and create a smooth transition between Unit 3 and Unit 4. The transition element would extend approximately 80 feet upstream from the existing concrete channel inlet and would involve grading the channel and banks to provide a hydraulically gradual and smooth transition from the upstream natural channel with sloping banks to the downstream Unit 3 channel at Frederick Allen Park with vertical retaining walls. Concrete or riprap aprons would be constructed to extend vertically up the creek banks and meet the existing concrete channel downstream of the transition element. New concrete retaining walls up to 10 feet tall and matching the downstream retaining wall height at Frederick Allen Park would be constructed at the top of the concrete apron. The existing wooden retaining walls would be abandoned.

Channel Stabilization, Grade Control and Reinforcement

As a result of removing the fish ladder, channel modifications would be necessary to accommodate the change in flow dynamics. This would also create the need to modify and lower the channel floor elevations to allow for a smooth transition and geomorphologically stable channel bed. The channel bed modification would extend from the fish ladder to approximately 150 feet upstream of Lagunitas Road Bridge. Approximately 115 feet of the natural channel between Lagunitas Road Bridge and the fish ladder would be widened to increase hydraulic conveyance capacity.

Site-specific creek-bank toe protection and bank stabilization would be installed. Toe protection may include a new buried rock keyway, bioengineered stabilization using willows and other native planting, and reinforced concrete wall. Additional channel stabilization and reinforcement would include installation of erosion-control fabric and engineered streambed material. While most of the anticipated improvements would be completed within property owned by the District, some of the toe protection work would occur along the bottom of the creek banks within the adjacent private properties. Each stabilization and reinforcement technique is described below and shown in Figure 2.5-1.

- **Buried rock keyway.** Large rock (half ton) would be installed ("planted") directly upstream of the proposed transition element and further upstream. Approximately 130 to 140 square feet of rock would be installed on each creekbank to protect the proposed transition element from scour. Approximately 1,385 square feet (265 linear feet) of planted rock would also be installed along the Unit 4 left[2] bank adjacent to private property to protect the creek bank and existing gabion basket

[2] Project features are identified as located on the right or left bank of the creek as viewed when facing downstream.

wall from scour. Along the right creekbank, approximately 790 square feet (105 linear feet) of planted rock would be installed along the creekbank near the Ross Post Office.

- **Biotechnical stabilization.** Biotechnical stabilization would occur through the installation of vegetated soil lifts[3]. Approximately 530 square feet of vegetated soil would be installed along the creekbank adjacent to the Ross Post Office. The vegetated soil would be installed upslope of the planted rock.
- **Erosion-control fabric**. A double layer of erosion-control fabric would be installed along creekbank upstream of the transition element and along the creekbank near the Ross Post Office, above the installed vegetated soil lift.
- **Engineered streambed material.** Approximately 660 square feet of engineered streambed material would be installed directly upstream of the transition element.
- **Reinforced concrete sister wall** A new reinforced concrete sister wall would be constructed adjacent to an existing concrete retaining wall to reinforce the toe of the existing wall. The reinforced concrete sister wall would extend 75 linear feet on the left bank adjacent to private property at 27 Sir Francis Drake Blvd.

Frederick Allen Park

Project elements proposed within Frederick Allen Park would occur within the park boundary owned by the Town of Ross and on District property (i.e., within the existing concrete channel) in the upper reach of Unit 3. The Frederick Allen Park improvements include removal of the concrete channel, construction of concrete floodwalls, removal of trees (see Section 2.6.2), and excavation and grading within the channel and park to provide creek corridor widening and natural floodplain benches and banks connecting to Frederick Allen Park. The improvements also include new landscaping and a pedestrian path within the park. Elements proposed within Frederick Allen Park are described below and shown on Figure 2.5-1 and Figure 2.5-4. The tree removal and planting plan is provided in Appendix B.

Short Floodwalls

New short, cast-in-place floodwalls, would be constructed along the western and eastern edge of the Frederick Allen Park area with a height of up to 2 feet above grade. The western floodwall would begin approximately 330 feet downstream of the existing fish ladder, and would extend 80 linear feet along the western edge of the park boundary. The eastern floodwall would be approximately 2-feet high and would extend 240 linear feet. The eastern floodwall would be located on District property, adjacent to 11 and 3 Sir Francis Drake Boulevard on the eastern (left) bank of the creek.

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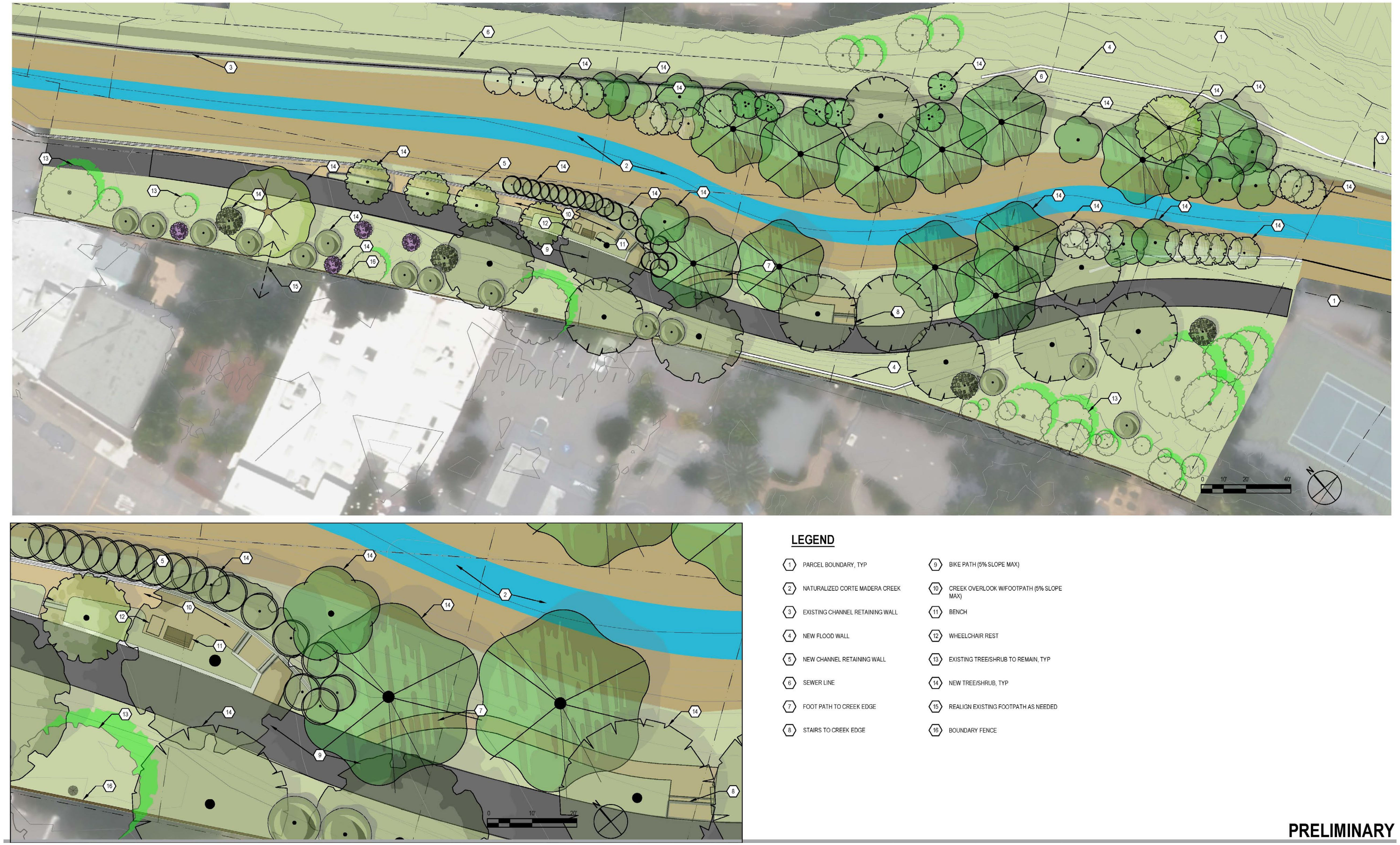
[3] A vegetated soil lift consists of soil encapsulated or wrapped in a facing element or fabric such as a rolled erosion-control product, or a combination of erosion-control products, that also act as a reinforcing element.

Figure 2.5-4 Frederick Allen Park Site Plan



Source: (GHD, 2020g)

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Channel Improvements
Upstream of the Kentfield Hospital Bridge within Frederick Allen Park, Corte Madera Creek would be restored to a more natural appearing and functioning stream. The existing concrete channel and walls between the fish ladder and approximately 200 feet upstream of Kentfield Hospital Bridge would be removed and replaced with natural substrate. The channel corridor in Frederick Allen Park would include a natural geomorphic channel with channel meander and connected riparian floodplain. The change in channel conditions would be created by widening and re-grading the channel along the left and right banks. The left bank would be sloped, and the top of the channel would shift approximately 10 to 15 feet to the east within the District's property. The channel meander would create a low bar or bench on the left bank, which would be inundated frequently by floods. The channel would be widened on the right bank, on District and Town of Ross property. Frederick Allen Park would be re-graded and re-designed to provide a new, small floodplain bench by lowering a portion of the existing park. The floodplain bench would be approximately 8 feet lower than the existing ground elevation within the park and would be hydraulically connected to Corte Madera Creek, with the intent that this area would flood during high water events. The floodplain on both sides of the creek would be revegetated with willows and other riparian vegetation to establish riparian habitat adjacent to the creek. Short floodwall segments, approximately 2 feet tall, would be installed on the left and right banks and are incorporated into the landscape design for the park.

Park Improvements
Park improvements would include construction of a new pedestrian path and tree planting adjacent to the path to shade the realigned pathway. The existing multi-use path in the park would be relocated along the western edge of the park to allow additional room for the floodplain and natural channel. Resting areas with seating and educational signage would be constructed along the realigned pathway. The pathway would gently lower in grade by less than five percent along this newly realigned length from the tennis courts to the park entrance. From the low point in the pathway, boulders would provide areas for seating and access to the natural creek channel. A retaining wall would be installed at the entrance to the park, and benches would be provided at an overlook area. A short wall or fence would be installed at the top of the retaining wall and any areas with steep drops for safety. A split rail fence would also be installed along the length of the new top of the channel to prevent encroachment into habitat areas. The split-rail fence could be removed after the habitat is established. Trash receptacles would be placed at seating areas. Graphics showing the proposed park improvements at the time of construction, five years after construction, and 10 years after construction are provided in Section 3.1 Aesthetics.

Unit 3
The proposed work within the lower reach of Unit 3 includes the construction of floodwalls, a storm drain pump station at Laurel Avenue, adjacent to the channel's left bank, and up to 16 fish pools within the channel. Elements proposed within the lower reach of Unit 3 are described below and shown on Figure 2.5-2.

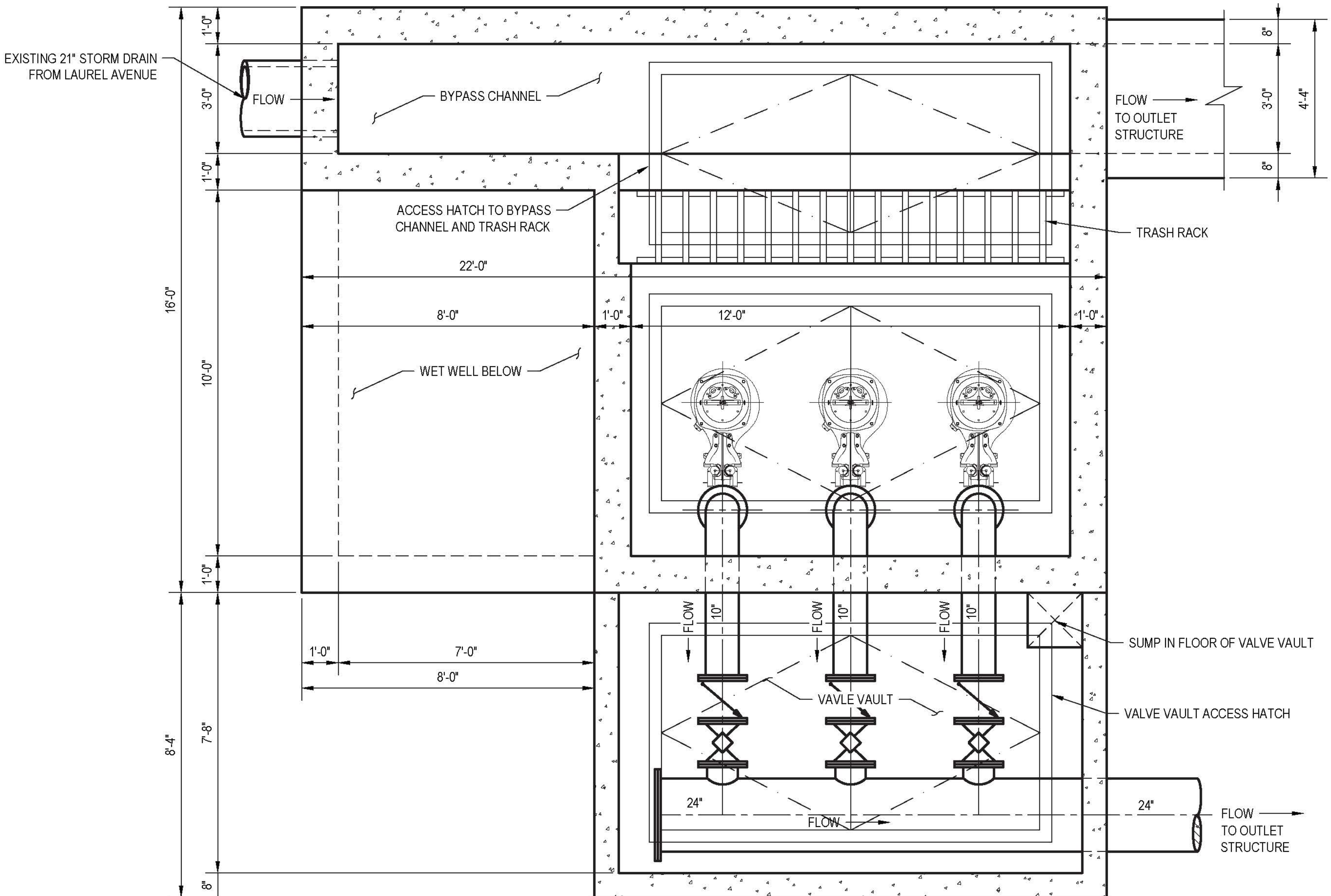
Floodwalls
Two floodwall segments would be constructed in the lower reach of Unit 3. A new floodwall would be constructed along the left bank on the upstream side of the College Avenue bridge. Approximately 60 feet of new floodwall would be constructed and designed to function as a wing wall to divert channel flow to Corte Madera Creek at the College Avenue bridge crossing. The floodwall would be 2 to 4 feet tall with the exception of small low-lying areas where the wall could be up to6 feet in height.

The existing concrete channel floodwall, which currently extends to grade, would be extended vertically along the left bank of Unit 3, upstream of the College of Marin Science-Math-Nursing building (SMN) Bridge. The addition to the existing concrete floodwall would extend along approximately 1,075 feet of the concrete channel, would be one foot wide, and 2 to 4 feet high above the existing concrete channel. The floodwall would be constructed on top of the existing concrete channel wall as a structural extension of the existing channel structure or would be set back a few feet from the existing wall to provide additional flood control. If constructed on top of the existing wall, a fence would be installed as needed for public safety.

Stormwater Pump Station and Backup Power
A new stormwater pump station would be constructed adjacent to the left bank of the concrete channel, approximately 250 feet upstream of the SMN Bridge. The pump station would be located within the District's property at Laurel Avenue. The pump station would convey runoff from the Granton Park neighborhood and the tributary area to the east of Sir Francis Drake Boulevard into Corte Madera Creek. The pump station would supplement the two existing storm drain pipelines in the area that currently discharge water to the channel via gravity flow. The pump station would run only during high channel water levels concurrent with a storm event, when water backs up to the storm drainpipes along Laurel Avenue. The pump station would be designed with 25-year storm capacity when the largest pump in the pump station is off and 100-year-storm maximum capacity.

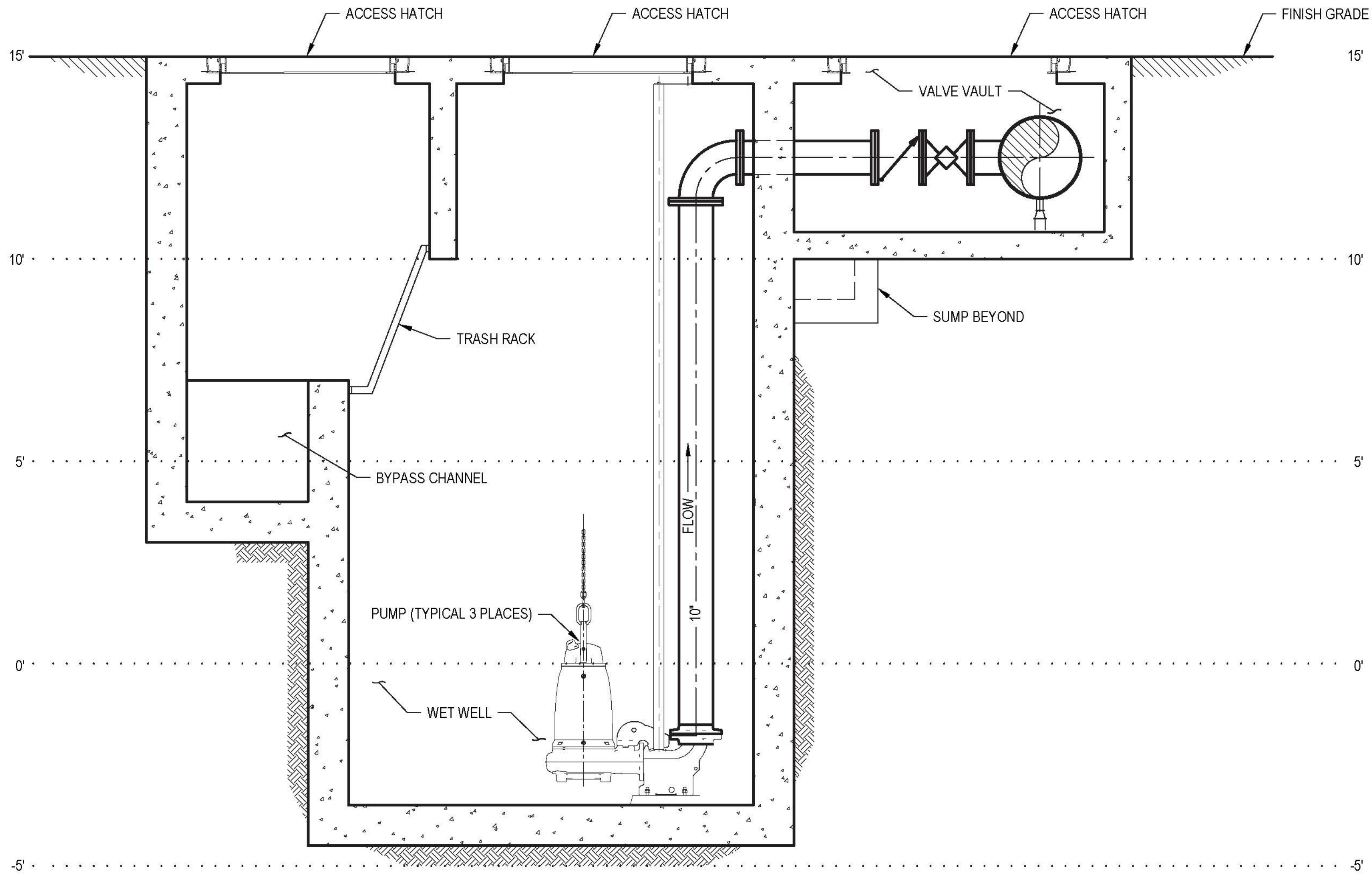
Most of the pump station components would be underground in order to minimize visual impacts to the surrounding community. The underground components would include a 90-cubic-yard concrete vault for the wet well, bypass channel, valve vault, and two new backflow preventers at the existing storm drainpipe outfalls to the channel. The aboveground component would include an 80-square-foot concrete pad with a mounted 150-kilowatt (kW) backup power generator and a mounted motor control center. The backup generator would be powered by biodiesel, if possible, or regular diesel if necessary, and would have a self-contained enclosure with fuel storage. The project would not include storm drain pipeline improvements for flow conveyance to the pump station. The pump station would be designed assuming no upstream restriction of flow conveyance to the wet well. See Figure 2.5-5 and Figure 2.5-6 for details of the belowground pump station components.

Figure 2.5-5 Stormwater Pump Station Plan View



Source: (GHD, 2019)

Figure 2.5-6 Stormwater Pump Station Cross-Section View



Source: (GHD, 2019)

Fish Pools

The project would involve the addition of up to 16 new fish resting pool structures in the concrete channel within Unit 3. The upper 1,900 feet of Unit 3 currently contains 28 small concrete fish pools (4 feet wide and 13 feet long) placed in the center of the stream, spaced approximately 64 feet apart. The new fish pools are intended to provide more efficient resting locations for upstream migrating steelhead and potentially for Coho salmon, which formerly inhabited Corte Madera Creek. The proposed new fish pools would be 1.5 to 3 feet deep and spaced approximately 150 feet apart in the channel. The design of the proposed new fish pools is shown in Figure 2.5-7.

Unit 2

The proposed work within Unit 2 includes the construction of a floodwall on the east side of the existing flood channel adjacent to the College of Marin, and removal of the concrete channel downstream of Stadium Way to restore natural creek function and create tidal and wetland habitat. The Unit 2 project elements are shown on Figure 2.5-3 and Figure 2.5-8.

Floodwall

The floodwall within Unit 2 would be located along the left bank from approximately College Avenue to approximately 200 feet upstream of the Stadium Way pedestrian bridge. The floodwall would be 2 to 4 feet tall, one -foot wide, and approximately 945 feet long, but could extend up to 6 feet high in low lying areas. The floodwall would be built on top of the existing concrete channel wall as a structural extension of the existing structure or set back from the existing wall. The purpose of the floodwall in this section is to avoid increased flood inundation in areas adjacent to Unit 2, including the residential and commercial area between Corte Madera Creek and Sir Francis Drake Boulevard.

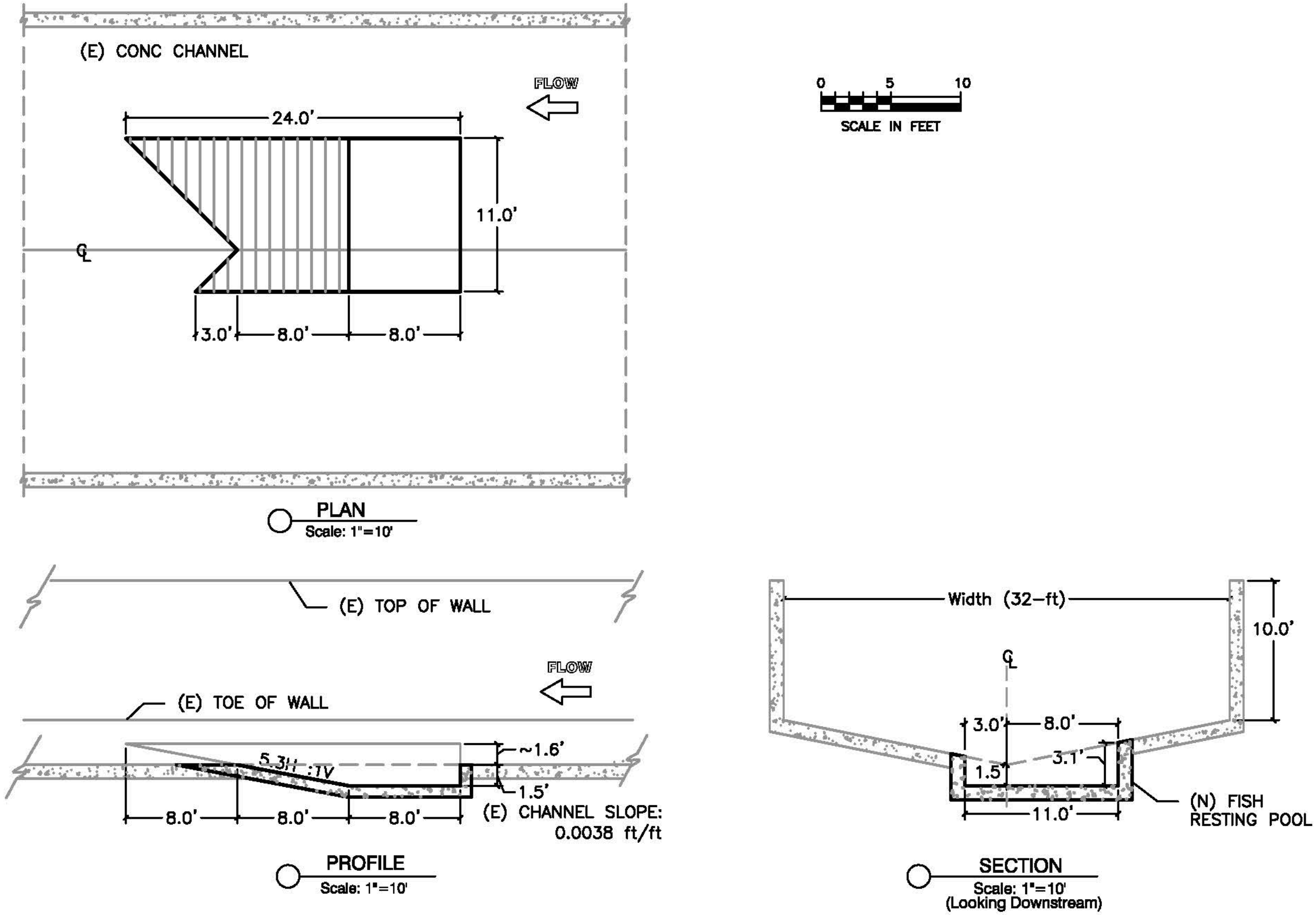
Channel Improvements

The Unit 2 lower College of Marin concrete channel removal would create approximately 0.35 acre of tidal and wetland habitat and 0.46 acre of upland transitional habitat by removing or lowering approximately 625 linear feet of concrete flood channel wall. Habitat created in the earthen channel area would be planted with native vegetation at elevations that would accommodate sea-level rise so that the vegetation and habitat would be resilient to climate change. The habitats that would be created by the lower College of Marin concrete removal are shown on Figure 2.5-8. Rock and fill energy dissipators, a vegetated bioretention basin, and boulder-lined bioswales would be installed within the newly created ~~channel~~ habitats, including the transition zone. The new vegetated bioretention basins and bio-swales would be constructed to handle stormwater run-off. The existing concrete storm drains would be removed.

Park and Path Improvements

A vest-pocket park ~~would be created~~ adjacent to the existing multi-use path would be enhanced~~. The upland habitat around the pocket park would be enhanced~~ by planting native ~~understory~~ vegetation ~~beneath the existing trees~~. The two existing trees in the area would be preserved.

Figure 2.5-7 Proposed Fish Pool Design



Source: (Mike Love & Associates and Jeff Anderson & Associates, 2007)

Figure 2.5-8 Lower College of Marin Concrete Channel Removal Habitat Creation

Sources: (Prunuske Chatham, Inc., 2020; Golden Gate National Parks Conservancy, 2018; Tele Atlas North America, Inc., 2020)

2.6 Project Construction

2.6.1 Summary of Temporary Work Area and Permanent Modifications

Project construction would require temporary work areas and would result in permanent modifications along the Corte Madera Creek channel. The temporary work area for each construction activity is identified in Table 2.6-1. Temporary work areas are shown on Figure 2.6-1.

Table 2.6-1 Temporary Work Area and Permanent Modifications by Element

Unit	Element	Temporary (sf)	Permanent (sf)	Total (sf)
Unit 4	Fish ladder removal and Unit 4 grading	6,375	3,625	10,000
Unit 3	Frederick Allen Park	0	60,000 [a]	60,000
	Fish pools	0	5,000	5,000
	Floodwall (segment #3)	5,400	1,100	6,500
	Stormwater pump station	1,380	520	1,900
	Floodwall (segment #2)	325	65	390
Unit 2	Floodwall (segment #1)	4,750	950	5,700
	Lower College of Marin concrete channel removal	0	80,419 ~~86,250~~ [a, b]	80,419 ~~86,250~~
N/A	Staging areas	52,700	0	52,700
	Total	**70,930**	**157,510**	**228,440**

Notes:

sf = square feet

a Total work area from concrete removal in Unit 2 and Frederick Allen Park are counted as permanent modification where the concrete channel will be replaced with wetland and riparian habitats.

b Based on the 65 percent design plan the area of permanent modifications may be smaller.

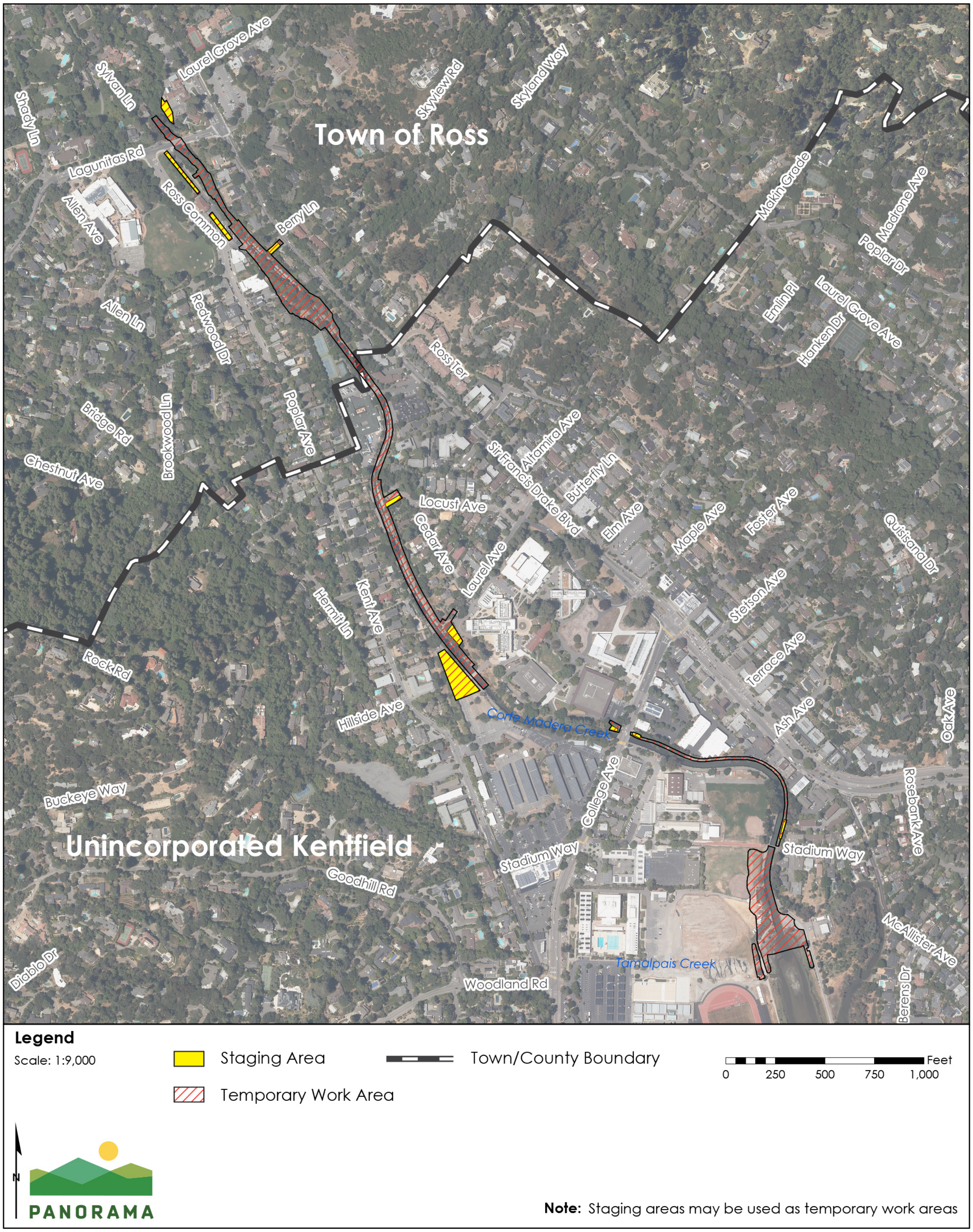
Source: (GHD, 2020b; geomorphDESIGN, 2020c)

2.6.2 Site Preparation

Staging and Stockpiling

Proposed staging and stockpiling areas are shown on Figure 2.6-1 and have been limited to properties owned by or easements granted to the District as well as some properties owned by the Town or Ross or College of Marin. In addition to defined staging and stockpiling areas, project work areas could be used for staging, stockpiling, and storage as needed. Vegetation within the staging and stockpiling areas would be trimmed and removed, and the limits of the work area would be fenced at the start of construction. The contractor may lay aggregate base in unpaved staging areas if needed for stabilization. Any imported aggregate base would be removed at the completion of project staging and stockpiling activities.

Figure 2.6-1 Staging, Stockpile, and Temporary Work Areas



Sources: (GHD, 2020d; Golden Gate National Parks Conservancy, 2018; Tele Atlas North America, Inc., 2019)

Vegetation Removal and Fencing

Each construction phase would begin with site preparation activities, which would include vegetation removal, tree removal, and fencing the construction site. Vegetation and trees within the project work areas would be removed to avoid conflicts between existing vegetation and proposed project elements. The maximum number of trees that would be removed during construction from Units 4, 3, and 2 are listed in Table 2.6-2 and shown on Figure 2.6-2 through Figure 2.6-5. Refer to Appendix B for details on the trees proposed for removal including information on species, size, health, and whether the tree is classified as protected, significant, or heritage by local regulations for each tree that would be removed in each project area. The maximum estimate of tree removal includes all trees that may be removed to address Section 408 requirements for a 15-foot setback from floodwalls. The actual number of trees that would be removed along the proposed floodwalls in Segments 2 and 3 would be determined during the Section 408 authorization process and may be substantially less than the maximum estimate included in the table and figures below. USACE could require removal of any trees located within 15 feet of the existing floodwall based on USACE guidance. The trees located within 15 feet of the existing floodwall are shown as a separate category of tree removal on Figure 2.6-2 through Figure 2.6-5 to indicate that some trees could need to be removed under existing conditions. The figures show all trees within 15 feet of the existing concrete channel, including those that are not proposed for removal by the proposed project.

Table 2.6-2 Tree Removal by Unit

Unit	Element	Number of Trees to be Removed[a]
Unit 4	Fish ladder removal and Unit 4 grading	21
Unit 3	Frederick Allen Park [b]	144
	Fish pools	0
	Floodwall (segment #2)	3
	Floodwall (segment #3)	83
	Stormwater pump station	8
Unit 2	Floodwall (segment #1)	71
	Lower College of Marin concrete channel removal	39

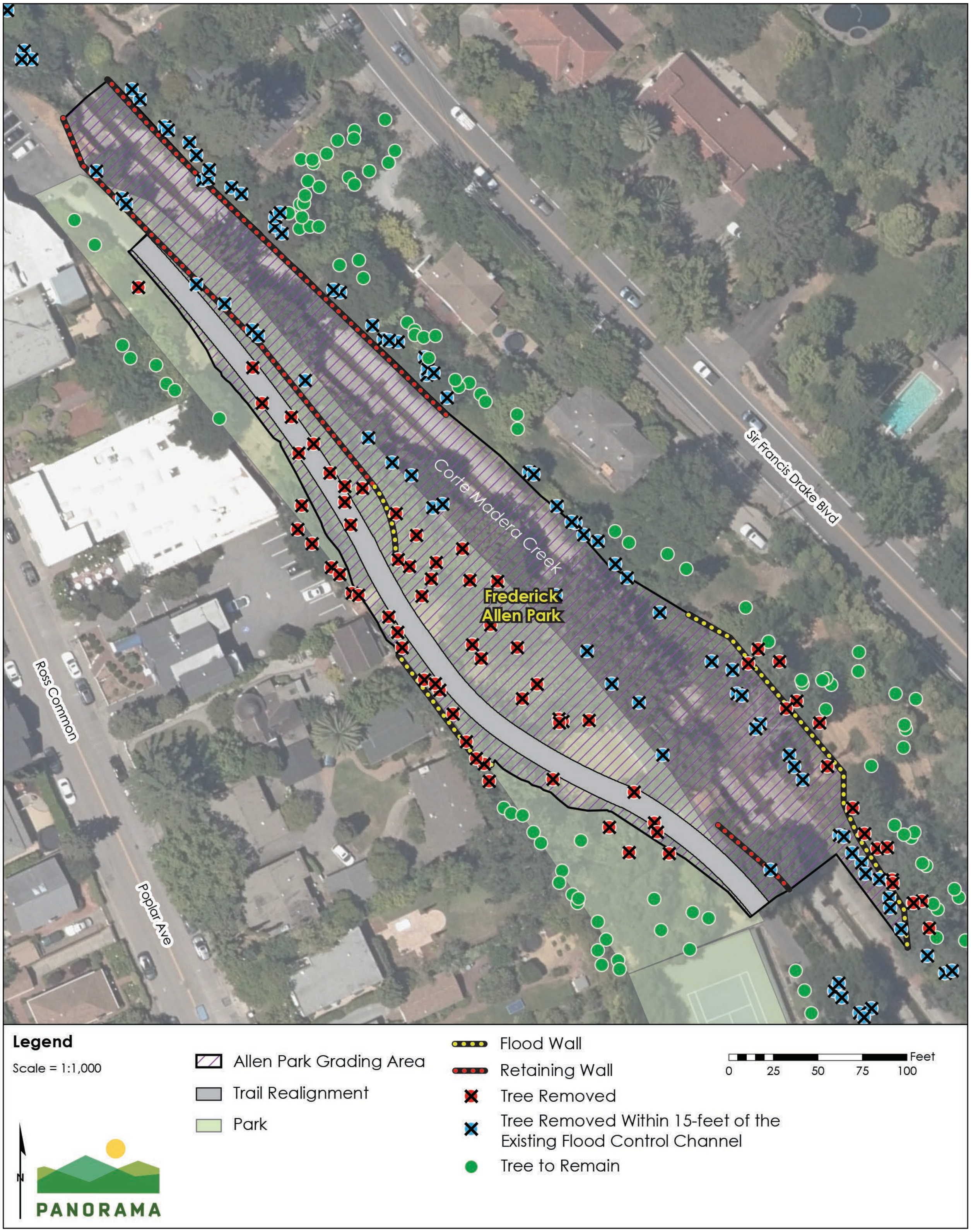
Notes

a Of the trees proposed for removal, 184 trees would need to be removed if the USACE requires a 15-foot setback from the existing channel including 18 trees from Unit 4, 71 trees from Frederick Allen Park, 88 trees from the floodwalls, 6 trees from the Stormwater pump station, and 1 tree from the Lower College of Marin concrete channel removal.

b 144 trees would need to be removed for Frederick Allen Park grading if the USACE requires a 15-foot setback from the new floodwalls. 113 trees would be removed if a setback is not required. It is the District's intention to apply for a variance to the 15-foot vegetation buffer along the floodwall, which will be approved at the discretion of the USACE.

Source: (GHD, 2020c)

Figure 2.6-2 Tree Removal Unit 4 and Frederick Allen Park



Sources: (GHD, 2020e; Golden Gate National Parks Conservancy, 2018)

Figure 2.6-3 Tree Removal Unit 3

Sources: (GHD, 2020e; Golden Gate National Parks Conservancy, 2018)

Figure 2.6-4 Tree Removal Unit 2

Sources: (GHD, 2020e; Golden Gate National Parks Conservancy, 2018)

Figure 2.6-5 Tree Removal Lower College of Marin Concrete Channel Removal Unit 2

Sources: (Golden Gate National Parks Conservancy, 2018; geomorphDESIGN, 2020c)

Following removal of vegetation from construction sites, temporary construction fencing would be installed to secure the site. Temporary construction fencing would consist of chain link or cyclone fencing or other similar fencing material. Any existing fence material that occurs in the work sites, such as along the top of the concrete channel wall, would be removed from the channel wall and hauled off site for disposal at a properly permitted landfill.

2.6.3 Diversion and Dewatering

Work within the creek channel would require creek diversion and fish rescue and relocation. Work within areas of shallow groundwater will require dewatering.

Channel Dewatering and Diversion

Dewatering of the channel can be accomplished either by dewatering the entire reach where work will be performed or localized dewatering at each work area. Dewatering of the entire reach can be accomplished by installing a temporary dam at the upstream end of the Unit 4 improvements and diverting the channel flow around the entire work area. The temporary dam would consist of sandbags or another structure with an impermeable outside lining. A screened pump or gravity intake pipe would be installed above the temporary dam and would be used to divert water around the work area in a flexible pipe that would discharge into the channel downstream of the work area and downstream dam. A similar technique can be used to provide localized dewatering by placing the temporary dam upstream of the work area and discharging the diverted water into the channel downstream of the work area.

There are several storm drain outfalls into the channel along the work area. These outfalls can be connected to the diversion pipe to bypass any discharge from them around the work area. Water that is discharged from the diversion pipe would flow in the channel until it reaches either a downstream tidal barrier dam or the Unit 2 work area. A temporary dam and pump would need to be installed upstream of the Unit 2 work area (upstream of the Tamalpais/Murphy culverts) to capture the diverted channel flow from upstream and pump it around the work area into the earthen channel downstream of the temporary sheet pile dam that will be in place to protect the Unit 2 work area from tidal inundation. If the Unit 2 construction is conducted after 2022, temporary sheet piling would not be installed in Unit 2 for the instream work in Unit 3. In the absence of a temporary sheet pile wall in Unit 2, a super sack[4] dam could be installed at the lower limits of instream work for the fish pool construction to restrict tidal influence from the work area. Access to construct the floodwalls in Unit 2 would be from land and would not require dewatering of the channel.

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[4] Super sacks are large bags filled with sand or gravel that are used to construct a temporary cofferdam and dewater work areas.

The sheet pile wall for dewatering in lower Unit 2 will be installed using a silent piler[5]. A biologist with proper USFWS and CDFW qualifications and permits would be retained to monitor dewatering operations and channel being dewatered for the presence of aquatic species. If aquatic species are present, the biologist would relocate the species to a designated relocation area in accordance with federal and state permit requirements and approved Fish Capture and Relocation Plan. At a minimum, a block net would be installed at the upper end of the intertidal reach of the creek to allow for separation of freshwater fish from estuarine fish species. Fish would be relocated into appropriate habitat depending on their location at the time of capture.

Groundwater Dewatering

Groundwater dewatering would be completed using sumps for groundwater collection and submersible pumps within the sumps to pump the groundwater around the work areas. Temporary localized groundwater dewatering would be installed around the exterior portions of the excavated work area at the fish pools. A groundwater diversion box plate with walls made of fiberglass, steel, concrete, or other material would be installed to limit the groundwater in the work area to flow only through the exterior portions of the excavated area. Groundwater would be discharged into upland areas or storage tanks in accordance with federal and state water quality regulations and permit requirements.

2.6.4 Grading

Project construction would require grading within the Corte Madera Creek channel and Frederick Allen Park. Areas of channel lowering (Unit 4) and concrete channel removal would be excavated (cut). In addition to earthen fill in some locations, rock placement would be needed for channel stability and to protect utilities. A concrete apron or half-ton rock would be installed where the fish ladder would be removed in Unit 4, to stabilize sediment and soils. Concrete would be used for the short floodwalls, for retaining walls, and to seal the excavated fish pools. Excavation and fill quantities for each project element are identified in Table 2.6-3.

[5] A silent piler uses a hydraulic press to install piles into the ground using static energy in order to minimize noise and vibration.

Table 2.6-3 Estimated Cut and Fill Volumes

Unit	Element	Total Volume Cut Generated (cy)	Total Volume Fill - Native Soil (cy)	Total Volume Fill - Rock (cy)	Total Volume Fill - Concrete (cy)
Unit 4	Fish ladder removal and Unit 4 grading	1,500	750	450	225
Unit 3	Frederick Allen Park	8,900	1,350	0	650
	Fish pools	650	0	100	350
	Floodwall (segment #3)	420	160	80	180
	Stormwater pump station	2,800	1,400	20	110
	Floodwall (segment #2)	25	10	5	11
Unit 2	Floodwall (segment #1)	370	150	70	160
	Lower College of Marin concrete channel removal	7,250 [a]	0	1,025 [b]	0
	Total	**21,915**	**3,820**	**1,750**	**1,686**

Notes:

cy = cubic yard

[a] The volume of cut generated is the net cut and includes the volume of rock that would be used as fill.

[b] ,

[c] All rock that would be used in lower channel concrete removal currently occurs in the area and would be reused in the construction process.

Source: (GHD, 2020b; geomorphDESIGN, 2020c)

2.6.5 Floodwalls

Concrete floodwalls would be constructed using a cast-in-place method. The top of existing channel walls would be roughened using hydro-blasting where floodwalls would be constructed to extend the height of existing channel walls. Floodwall forms would be installed along the creek side of the channel using a catwalk along the channel wall. A bucket truck with a boom may also be used to install floodwall forms where vehicle access from across the channel is available via existing bicycle path. The forms, and catwalk if used, would be attached to the channel wall with temporary anchors drilled into the wall that would be removed and holes patched upon completion of the floodwall construction.

After the forms are installed on the creek side of the channel, rebar would be installed by drilling holes into the existing channel and inserting reinforced steel rods into the drilled holes. Forms would be completed by installing the form on the land side of the floodwall.

Concrete would be pumped into the forms using line pumps located at access points at each end of the floodwall. The concrete would be allowed to cure for five days prior to removing the forms and inspection of the finished floodwall. The catwalk and any other temporary access infrastructure would be removed.

2.6.6 Fish Pools

To construct the fish pool, a rectangular portion of the channel approximately 3 feet wider and 3 feet longer than the overall proposed dimensions of the fish pool concept design (11 feet wide and 24 feet long) would be sawcut and demolished. The existing subgrade would be over-excavated and replaced with large diameter aggregate. An appropriate concrete mix design that allows for placement in a submerged environment to seal the work area would be placed in all areas between the sawcut concrete channel and the diversion box or other areas that experience hydraulic groundwater pressures. A base concrete layer would be placed to create a rectangular-shaped box with coated reinforcing steel to establish a working platform and sealed concrete joints with the existing sawcut concrete channel. The concrete surface would be finished with a very rough textured trowel finish to allow for another layer for finished concrete cap. The final concrete cap would be placed with contoured finish to meet the intended design geometry. The minimum concrete thickness would be three inches to avoid future spalling. Each fish pool would require 14 to 18 cubic yards of concrete. High-strength and long-life joint sealant would be installed to allow for thermal expansion but prevent groundwater intrusion or contamination with channel flows. Finally, the water diversion and pump would be removed and relocated to the next upstream fish pool to repeat this process for all fish pools constructed.

2.6.7 Streambed Stabilization

Some of the project elements require imported rip-rap material for channel stabilization. Existing on-site rip-rap would be used at Unit 2 and to the extent possible at Unit 4. Other channel stabilization measures would be installed in accordance with engineering specifications including planted rock, vegetated soil lifts, fabric, and engineered streambed material. Short cast-in-place concrete walls would also be installed adjacent to existing concrete walls in Unit 4.

2.6.8 Paving

The relocated and realigned pathway through Frederick Allen Park would be paved using aggregate base overtopped with asphalt concrete. Typical paving equipment would be used, including dump trucks, a paver, and compaction rollers to compact the aggregate base and asphalt. Access on the Frederick Allen Park pathway would reopen to the public after construction of the park has been completed.

2.6.9 Vegetation/Planting

All native riparian trees removed within the location of floodwalls and project components in upper Unit 2, Unit 3, and outside of Frederick Allen Park would be replaced within proximity to the removal location. A minimum of 89 trees and up to 125 trees would be planted within Frederick Allen Park. The exact number and location of trees would be determined during the USACE Section 408 review process. Trees would be located along the channel margin to provide shade over the channel after development of the tree canopy. A few mature trees would be planted along the walkway in Frederick Allen Park to provide shade during the vegetation establishment period. Areas of temporary construction containing grasses and bushes would be reseeded with a native seed mix.

Trees would be removed within lower Unit 2 (downstream of Stadium Way) in order to restore tidal wetland habitat. Trees would be planted in an upland area near the new College of Marin maintenance and operations building. The proposed tree planting areas was previously a baseball field and is now completely bare.

A list of tree species that would be planted within Frederick Allen Park and the lower College of Marin concrete channel removal project area is provided in Table 2.6-4. A planting plan including proposed shrubs and understory vegetation is provided in Appendix B.

Table 2.6-4 Tree Planting List

Common Name	Species Name	Size
Frederick Allen Park		
Big leaf maple	*Acer macrophyllum*	15 gallons
Box elder	*Acer negundo*	15 gallons
White alder	*Alnus rhombifolia*	15 gallons
Western flowering dogwood	*Cornus nuttallii*	8-foot trunk height
Red twig dogwood	*Cornus sericea*	5 gallons
Pacific ninebark	*Physocarpus capitatus*	5 gallons
Coast live oak	*Quercus agrifolia*	36-inch box[a]
Valley oak	*Quercus lobata*	24-inch box[a]
Coyote willow	*Salix exigua*	Stakes
Pacific willow	*Salix lasiandra*	1 gallon
Arroyo willow	*Salix lasiolepis*	Stakes
Sitka willow	*Salix sitchensis*	Stakes
Bay laurel	*Umbellularia californica*	8-foot trunk height
Lower College of Marin Concrete Channel Removal		
Box elder	*Acer negundo*	Treepot 4 [ab]
Buckeye	*Aesculus californicus*	Treepot 4 [ab]
Coast live oak	*Quercus agrifolia*	Treepot 4 [ab]
Valley oak	*Quercus lobata*	Treepot 4 [ab]
Arroyo willow	*Salix lasiolepis*	Cutting

[a] A 36-inch box tree would be approximately 10 to 20 feet in height and a 24-inch box tree would be approximately 8 to 15 feet height

[ab] The sizes indicated are minimum size requirements. Treepot 4 is a 4-inch square by 14-inch-deep pot.

Sources: (Prunuske Chatham, Inc., 2020; GHD , 2020i)

2.6.10 Workforce and Equipment

Construction is anticipated to start in April 2022 and would last approximately seven months. The in-channel construction would occur between June 15 and October 15. General construction timeframes and crew size estimated for project implementation are shown in Table 2.6-5. Construction activities would occur on weekdays between the hours of 8:00 a.m. and 5:00 p.m. No nighttime construction activities would occur as part of the project.

Table 2.6-5 Construction Schedule

Unit	Project Element	Estimated Construction Duration and Timing [a]	Estimated Construction Crew Size per Day
Unit 4	Fish ladder removal and Unit 4 grading	55 days; June – August 2022	8
Unit 3	Frederick Allen Park	105 days; June – October 2022	10
	Fish pools	85 days; June – October 2022	8
	Floodwall (segment #3)	75 days; April – July 2022	10
	Stormwater pump station	40 days; April – May 2022	10
	Floodwall (segment #2)	35 days; July – August 2022	10
Unit 2	Floodwall (segment #1)	70 days; April – July 2022	10
	Lower College of Marin concrete channel removal	72 days; August – October [a] December [b] 2022	10

Notes:

a Construction durations include planting activities.

b Work for the lower College of Marin concrete removal prior to September 1 would be conducted with hand tools only; heavy equipment use would start after September 1 to avoid the Ridgway's rail breeding season.

Source: (GHD, 2020b)

Equipment usage would depend on the individual needs of each project element as well as the discretion of individual contractors. The following presents a list of equipment types that would likely be used during implementation of the project.

- Boom truck/cherry picker
- Baker tanks (for water storage)
- Concrete truck and boom pump
- Concrete saw
- Crane
- Dump trucks
- Drill
- Excavator (small and medium)
- Flatbed trucks
- Generators and air compressors
- Grader
- Jackhammer
- Loader
- Pickup trucks (small and large)
- Pump
- Roller/compactor
- Paver
- Silent piler

2.6.11 Construction Access

Sir Francis Drake Boulevard would provide the main access from U.S. Highway 101 to all of the project work areas. Access along Corte Madera Creek would be provided via existing roads and recreation paths, including the Corte Madera Creek Pathway. An existing Flood Control District easement would be used to access the concrete channel removal area in lower Unit 2. Proposed project access routes are shown on Figure 2.6-6. Construction of the project would involve the temporary closure of Frederick Allen Park, including the bicycle and pedestrian path through

Frederick Allen Park, for up to seven months. Where the pathway is closed within Frederick Allen Park, a detour would be established to divert bicyclists onto Kent/Poplar Avenue from the College of Marin parking lot to Ross Common. The tennis courts and pedestrian access to the tennis courts at Frederick Allen Park would remain open throughout the duration of construction. Access along Bike Route 20 through Frederick Allen Park would be restored to the realigned pathway once construction of Frederick Allen Park is complete.

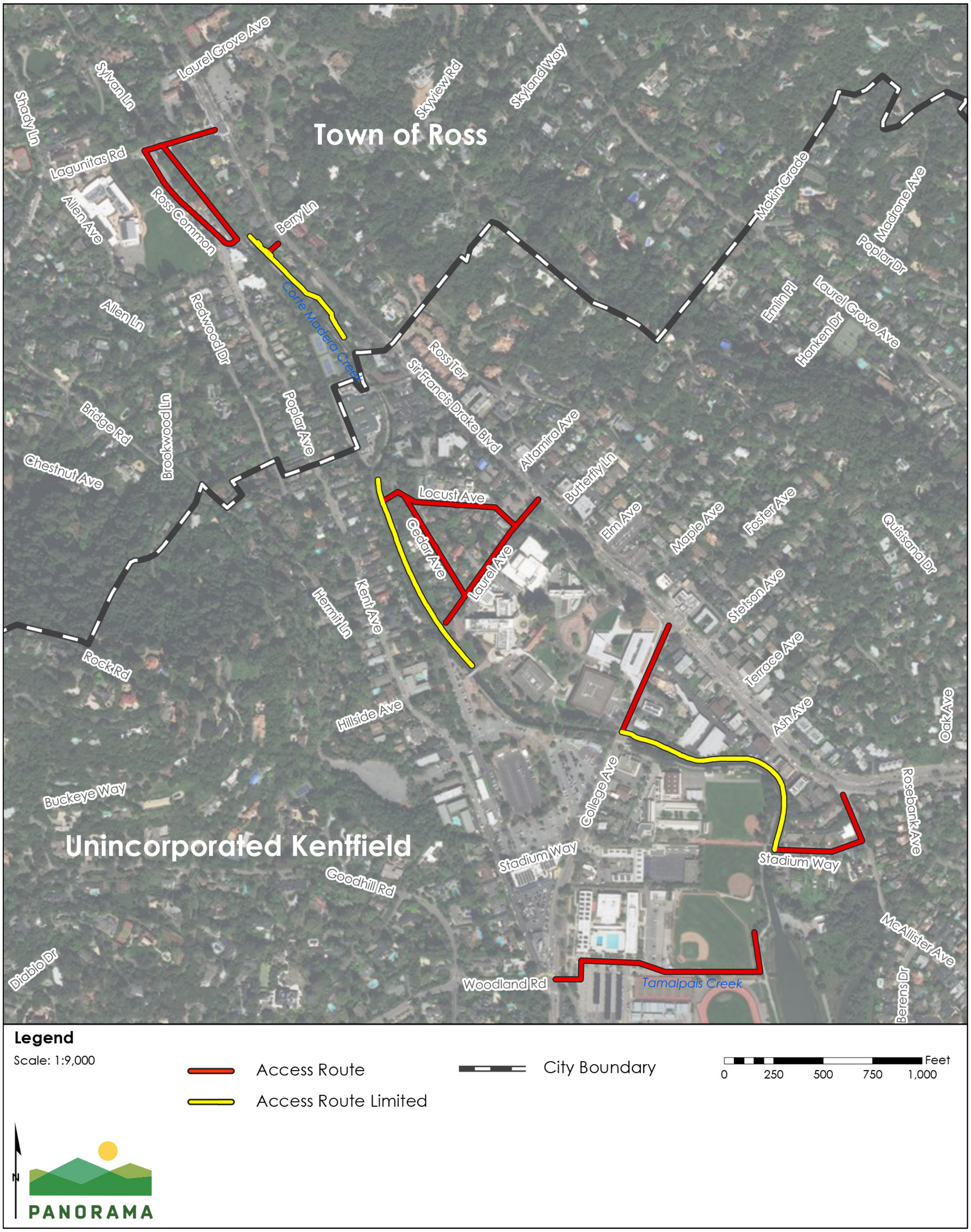
Construction activities could result in temporary lane closure on College Avenue during installation of dewatering infrastructure. Temporary lane closure on College Avenue would last one day each during installation and removal of the cofferdam (two days total). The end of Laurel Avenue, south of Cedar Avenue, may be closed for up to one month during construction of the stormwater pump station.

A new permanent concrete access ramp to the Corte Madera Creek flood control channel is planned for completion in 2021 as a separate project. The ramp would be located within the District's property, at the intersection of Locust Avenue and Cedar Avenue. With the timing of ramp completion scheduled in 2021, it is expected the ramp would be available for vehicular and equipment access into the channel for project construction in 2022 and for future Corte Madera Creek maintenance. The access ramp is not a part of the project, but is discussed in more detail in Section 4.0 Growth-Inducing and Cumulative Effects.

2.6.12 Material Hauling and Vehicle Trips

Table 2.6-6 identifies the truck trips associated with project construction. It is expected that all of the project elements will generate a net excess of excavated material resulting in export from the site for each element. Demolition and total project earthwork would generate approximately 27,000 cubic yards of demolition debris and soil. Of the 22,300 cubic yards of soil that is excavated, approximately 3,800 cubic yards may be beneficially reused in the project as fill material. The excess excavated soil materials (18,500 cubic yards) would be removed from the site. The demolition debris and soil, including the concrete, is anticipated to be recycled at the Marin Resource Recovery Center. After demolition and excavation, materials would be delivered to the project area using dump trucks. Some of the project elements require imported rip-rap material for channel stabilization. Existing on-site riprap will be re-used at Unit 2 and to the extent possible at Unit 4. Imported rip-rap will also be necessary, and potential sources include the following: Lunny Quarry in Nicasio, San Rafael Rock Quarry in San Rafael, Stony Point Quarry in Petaluma, and Syar Quarry in Napa.

Figure 2.6-6 Project Access



Source: (GHD, 2020f)

Table 2.6-6 Project Truck Trip Estimates

Unit	Project Element	Total One-Way Truck Trips	Average Daily One-Way Truck Trips
Unit 4	Fish ladder removal and Unit 4 grading	346	7
Unit 3	Frederick Allen Park	2,002	24
	Fish pools	364	5
	Floodwall (segment #3)	188	3
	Stormwater pump station	290	8
	Floodwall (segment #2)	36	1
Unit 2	Floodwall (segment #1)	170	3
	Lower College of Marin channel concrete removal	1,288	33
	Total	**4,684**	--

Source: (GHD, 2020b)

Fish pool construction and activities at Frederick Allen Park would generate the greatest number of medium- and heavy-duty truck trips of all phases, with up to 93 one-way trips per day. Several phases have overlapping construction time periods that could result in a higher number of peak daily truck trips of up to approximately 417 one-way trips accessing the project area but would average around 28 one-way truck trips throughout the construction period. In addition, worker travel to and from the construction site would account for an average of 18 one-way light vehicle trips per day, with the number of worker trips estimated on the assumption that each worker travels to the project site in their own vehicle. Accounting for overlap of phases, peak one-way worker trips could be up to 92 per day.

2.6.13 Construction Water

Project construction would require water for the purpose of dust control and soil stabilization. Water trucks would apply water to the site as necessary to control dust. Table 2.7-1 identifies the anticipated amount of water that would be required during construction of each project element.

2.7 Project Operation and Maintenance

2.7.1 Operation

The stormwater pump station is the only operable project element that would be installed as part of the project. The stormwater pump station would operate during storm events and would normally be powered through an electrical connection to the grid. A 150-kW generator would provide backup power in the case of electrical failure. Testing and maintenance of the backup generator would occur for up to 50 hours annually.

Table 2.7-1 Construction Water Requirements

Unit	Element	Required Water (gallons)
Unit 4	Fish ladder removal and Unit 4 grading	36,398
Unit 3	Frederick Allen Park	311,982
	Fish pools	12,999
	Floodwall (segment #3)	6,760
	Stormwater pump station	1,976
	Floodwall (segment #2)	203
Unit 2	Floodwall (segment #1)	2,964
	Lower College of Marin channel concrete removal	269,085
	Total	**642,366**

Source: (GHD, 2020b)

2.7.2 Maintenance

Once constructed, the project would require ongoing maintenance activities. Maintenance would be similar to existing District maintenance on Corte Madera Creek; however, the newly constructed habitat would require additional landscape maintenance and vegetation management during the establishment period. Maintenance activities would include the following:

1. Vegetation management
2. Sediment and debris removal
3. Stormwater pump station maintenance
4. Annual floodwall and structure inspection and maintenance

Most maintenance activities would occur during the dry season from April 15 to October 15. The Town of Ross would need to grant an easement to the District for maintenance of project elements on Town property, specifically in Frederick Allen Park. As a part of the easement approval process, the District would enter into a maintenance agreement with the Town of Ross that would specify the District's and Town's responsibilities for maintenance of project elements in Frederick Allen Park.

Vegetation Management

Vegetation-management activities are employed to achieve three main goals:

1. Maintain channel flow capacity.
2. Reduce fire fuels.
3. Restore creek habitat by removing invasive nonnative plants and revegetating with native plants.

Vegetation management activities would not include ground-disturbing activities. These activities employ vegetation control methods such as cutting and removing invasive vegetation above the ground by hand or with loppers, hand saws, chainsaws, pole saws, weed eaters, and other hand tools. Removal of nonnative vegetation, tree removal, and thinning employ a mix of tools including chainsaws, loppers, hand saws, pole saws, hedge trimmers, and other hand tools. Vegetation management also would include maintenance of replacement trees planted in Frederick Allen Park, including monitoring the establishment of trees after planting.

Lower College of Marin Concrete Channel Removal

The lower College of Marin concrete channel removal and restoration is being designed to be a natural, self-maintaining creek ecosystem, resilient to sea-level rise and climate change. No routine maintenance is anticipated. In the event unforeseen maintenance is required, such as to address storm flow debris, washed up boats, or other man-made debris in the area that affects the natural function of the habitat or flood conveyance capacity, the District would remove the debris.

Sediment and Debris Removal from Fish Pools

Timely removal of debris from fish pools is necessary to avoid or minimize any delay in fish migration that would typically be associated with rainfall-runoff events. Debris (woody debris or urban debris) within the fish pools would be removed by a hand crew if it were large enough to be disrupting flow patterns within the pool in such a way that could reduce resting areas or cause sedimentation. It is anticipated that debris removal would occur approximately once per year but could be more frequent depending on observed conditions. Debris removal would take place as soon as flows recede to a safe level between storm events.

Accumulated sediment would also be removed from the fish pools if the amount of sediment is affecting their intended functioning. Sediment would be removed using a Vactor truck that would access the channel via the permanent access ramp scheduled for completion in 2021. Alternatively, sediment could be removed by a hand crew. Sediment removal would occur on an as-needed basis.

Stormwater Pump Station

During the dry season, the pump station would be inspected once a month. Routine maintenance would be performed annually on the motors and generator. Debris collected in the wet well and outlet structure would be removed, and the facilities would be cleaned with a Vactor truck at least once every wet season. Annual tests would be conducted on the electrical and mechanical systems. Load bank tests would be performed on the generators every three years, and periodic maintenance would be performed on the pump systems every six years.

Floodwall Inspections and Maintenance

Floodwalls would be maintained in accordance with the USACE Interim Operation and Maintenance Manual for Units 1 through 3. Visual floodwall inspections would be conducted just before the beginning of the flood season, immediately after each major high-water period, and at intervals not exceeding 90 days. In addition, inspections are to be made after every earthquake that occurs within 200 miles and has a Richter magnitude of 5 or above. Inspections would also be required after smaller earthquakes if specific reports of damage are received. Eroded concrete would be repaired when reinforcing steel is exposed or erosion approaches 2 inches in depth. Normally, eroded concrete is repaired by sandblasting the eroded area and filling with Portland cement mortar. The channel walls would be maintained and cleaned as necessary, removing all barnacles and any other matter that may deteriorate the channel.

2.8 Permits and Approvals

The project will require permits and approvals from federal, state and local agencies. The anticipated permits and approvals needed for implementation of the project are listed in Table 2.8-1.

Table 2.8-1 Required Permits or Approvals for the Project

Agency	Approval or Permit
Federal	
U.S. Army Corps of Engineers	Clean Water Act Section 404 Permits Clean Water Act Section 408 Permit
U.S. Fish and Wildlife Service	Section 7 Consultation
National Marine Fisheries Service	Endangered Species Act (ESA) Section 7 Biological Opinion
Federal Emergency Management Agency	Conditional Letter of Map Revision
State	
State Office of Historic Preservation	National Historic Preservation Act Section 106 Consultation
California Department of Fish and Wildlife	Fish and Game Code Section 1602 Lake and Streambed Alteration Agreement
San Francisco Bay Regional Water Quality Control Board	NPDES Construction Stormwater Permit Clean Water Act Section 401 Water Quality Certification
State Lands Commission	Lease agreement for work within State Lands jurisdiction
Local	
Marin County Flood Control and Water Conservation District	Lead local agency (CEQA)
Town of Ross	Tree permit Easement and MOU for construction and maintenance within Frederick Allen Park (Town of Ross property) Design review
College of Marin	Potential easement modification for work within College of Marin property

2.9 Distinction Between Review of Environmental Issues and Project Merits

Often during review of an EIR, the public raises issues that relate to the attributes or wisdom of the project or issues such as the project's community benefits or community consequences (referred to here as "project merits") rather than the scope or substance of the environmental analyses in the EIR. Lead Agency review of environmental issues and project merits are both important in the decision of what action to take on a project, and both are considered in the decision-making process for a project. However, a Lead Agency in its CEQA review is required only to address environmental issues that are raised. Certifying an EIR (i.e., finding that it was completed in compliance with CEQA) and taking action on the project are procedurally distinct processes and result in separate decisions made by the Lead Agency. Nonetheless, the EIR must be certified by the Lead Agency before the Lead Agency can take approval actions on the project.

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