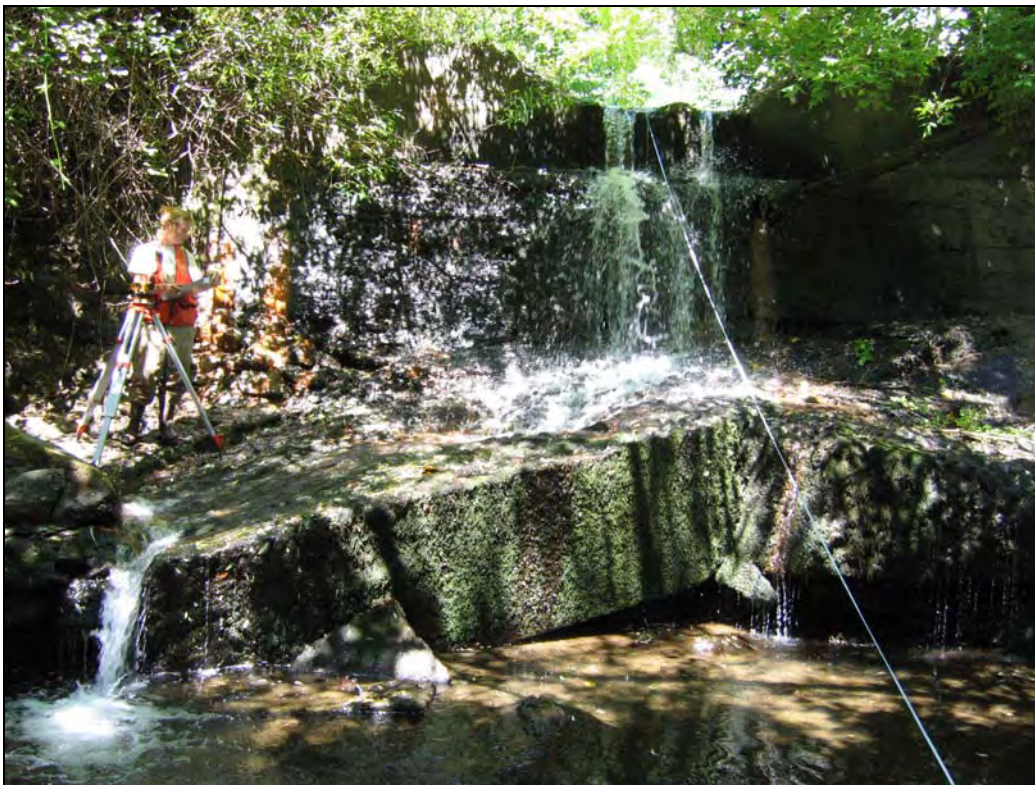


**CATALOG OF STREAM CROSSINGS WITH CULVERTS AND
OTHER MANMADE IMPEDIMENTS TO FISH PASSAGE
LOCATED ON ANADROMOUS STREAM REACHES WITHIN
FAIRFAX CREEK, CORTE MADERA CREEK WATERSHED,
MARIN COUNTY, CA.**

Prepared for Friends of the Corte Madera Creek Watershed

**By
Ross Taylor and Associates**

NOTE: This catalog contains three pages for each stream crossing inventoried. The first page consists of location information, site-specific data, passage assessment, habitat notes, and treatment recommendations. The second page is a copy of the USGS map with the crossing of interest marked in “red” with adjacent sites marked in “blue”. The third page has inlet and outlet photographs, with the inlet photo on the top and the outlet photo on the bottom. The inventoried sites are ordered in an upstream direction, and from lowermost to uppermost road/stream intersection within a watershed. Finally, distances between crossings were measured from digitized USGS maps (Terrain Navigator by MapTech®) to the nearest 50-foot interval along the path of the stream channel.



**Ross Taylor and Associates
1254 Quail Run Court
McKinleyville, CA 95519
(707)-839-5022**

www.rosstaylorandassociates.com

Site ID# FX-01 aka MR-080: Fairfax Creek/Bolinas Ave.; San Anselmo Ck; Corte Madera Creek

Ownership: Town of Fairfax **Ranking Matrix Score** = 21.7 points **Ranking: #6 = High-Priority.**

Location: County Map Sheet #10. USGS Quad: San Rafael. T2N, R7W. Lat/Long: 37° 59' 7.97" 122° 35' 20.78" Milepost: 0.1 miles to Park Road.

Crossing Type: Box culvert, Concrete. **Corrugations:** None. **Dimensions:** 6.35' H x 9.9' W. **Length:** 458.0' **Slope:** 0.94% **Modifications:** None. **Rustline Height:** N/A **Average Active Channel Width:** 11.1' **Fill Estimate:** 3,014 Cubic Yards. **Overall Condition:** Fair– culvert invert worn to rebar. **Sizing:** Extremely Undersized; HW/D = 1 on a storm flow with approximately a six-year recurrence interval. Bolinas Avenue is overtopped on approximately a 29-year storm flow.

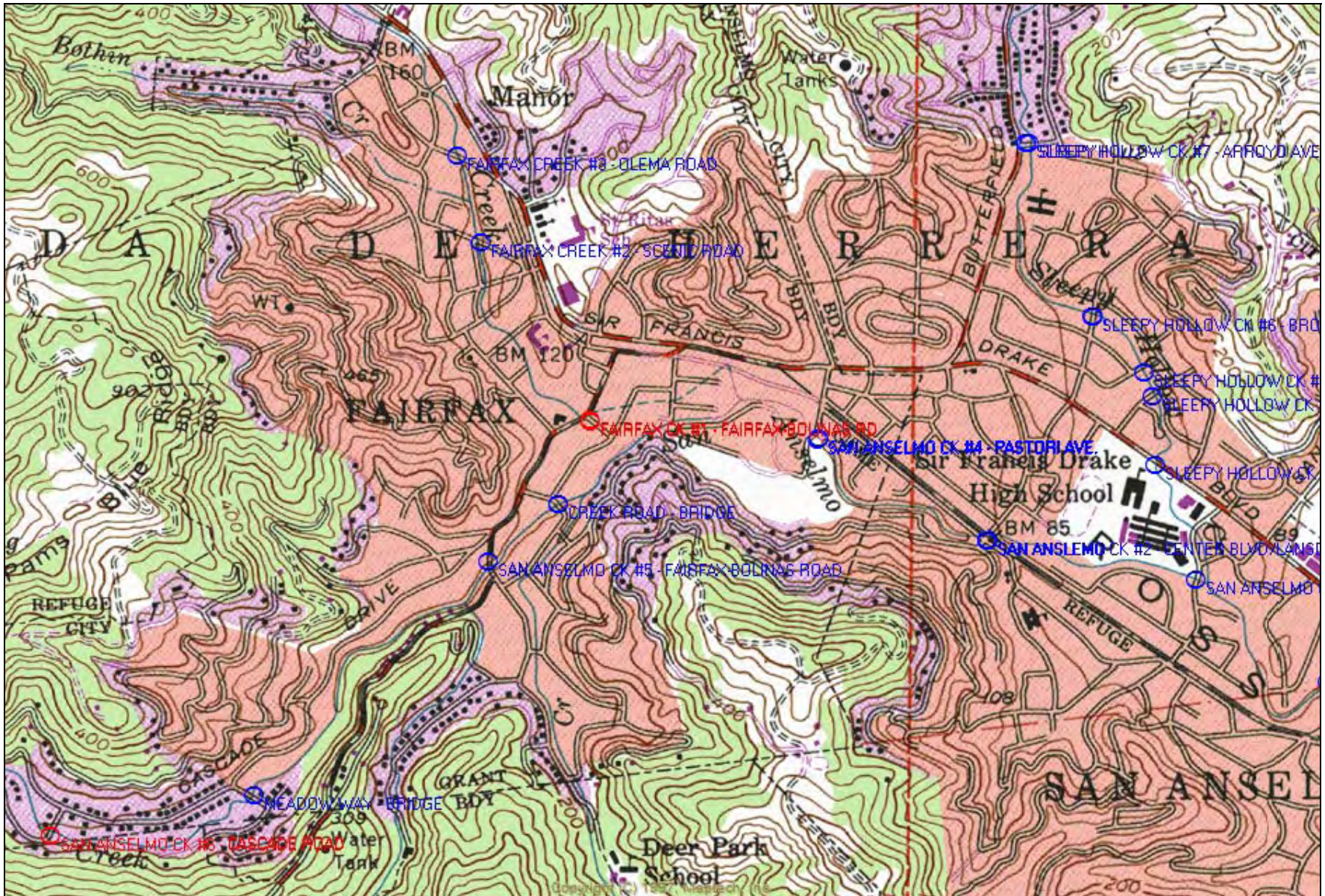
Drainage Area Upstream of Crossing: 3.56 square miles. **Estimated Migration Flows:** anadromous adult salmonids = 3.0–99.1 c.f.s; resident/2+ = 2.0-25.7 c.f.s.; 1+/y-o-y = 1.0-11.2 c.f.s. **Passage Evaluation: RED:** the Green-Gray-Red filter determined this crossing failed to meet passage criteria for all species of adult salmonids and all age classes of juveniles due to a residual drop at the outlet >3.0'. The long (>450') flat concrete floor make it highly unlikely that an adult steelhead could pass through the culvert even if it was able to leap into the culvert.

Additional Stream Crossings: Downstream – (≈25') to confluence with San Anselmo Ck., (≈2,300') to Site ID# SA-04, (≈4,700') to Site ID# SA-03, (≈6,700') to Site ID# SA-02, (≈6,900') to confluence with Sleepy Hollow Ck, (≈15,500') to confluence with Ross Creek, and (≈17,700') to upper end of USACE concrete flood channel. Upstream – (≈1,000') to bridge at Merwin Avenue, (≈1,300') to bridge at Spruce Road, (≈1,600') to bridge at Azalea Avenue, (≈2,000') to Site ID# FX-02, (≈2,800') to Site ID# FX-03, (≈3,450') to bridge at Marin Road, (≈4,200') to bridge at Oak Manor, (≈5,250') to Site ID# FX-04, (≈5,800') to box culvert under apartment slated for treatment in 2006, and (≈7,250') to Site ID# FX-05.

Habitat: Quantity = approximately 10,800' of *potential* fish-bearing habitat upstream of Site ID# FX-01, Olema Dam (≈5,250' upstream) is also a complete barrier. Quality = within the vicinity of the crossing, rated as “poor” for the ranking matrix based on Taylor and Associates survey crew’s field notes and interpretation of previous habitat assessment (Rich, 2000). The crossing was surveyed by Taylor and Associates on 7/24/02 for the County of Marin’s passage inventory and there was continuous flow in the channel. At 2:30PM the air temp = 23°C and the water temp = 18°C. The survey crew noted a channel confined by concrete walls in a residential area, few pools, and a moderately dense riparian zone of hardwoods. The crew noted moderately abundant numbers (10-50 fish) of fish of unknown species downstream of Site ID# FX-01.

Preferred Treatment: Treatment options at this site are problematic because of several factors. A retrofit is probably not feasible because the box culvert is undersized and currently the inlet overtops on less than a 10-year storm flow, thus further reduction of capacity by baffles or weirs is not recommended. The crossing’s outlet is within 25 feet of the confluence of Fairfax Creek and San Anselmo Creek, thus there is insufficient room for a series of downstream weirs to raise tail-water elevation. A full replacement may be cost-prohibitive due to the length of the existing crossing; however flood-flow capacity could be improved with a new crossing. This box culvert has effectively eliminated Fairfax Creek as a steelhead spawning and rearing tributary of Corte Madera Creek.

Site ID# FX-01 aka MR-080: Fairfax Creek/Bolinas Avenue; San Anselmo Creek; Corte Madera Creek



Corte Madera Creek - Stream Crossing Catalog – Fairfax Creek Sites



Site ID# FX-02: Fairfax Creek/Scenic Road; San Anselmo Creek; Corte Madera Creek

Ownership: Town of Fairfax **Ranking Matrix Score** = 7.4 points **Ranking: #21 = Low-Priority**

Location: USGS Quad: San Rafael. T2N, R7W. Lat/Long: 37° 59' 23.3" 122° 35' 32.3"
Milepost: approximately 25' to Arroyo Road.

Crossing Type: Box culvert, concrete. **Corrugations:** None. **Dimensions:** 11.1' H x 14.0' W
Length: 40.0' **Slope:** 0.03% **Modifications:** None. **Rustline Height:** N/A **Average Active Channel Width:** 14.0' **Fill Estimate:** 650 Cubic Yards. **Overall Condition:** Good. **Sizing:** Properly sized; HW/D = 1 on a storm flow with more than a 100-year recurrence interval.

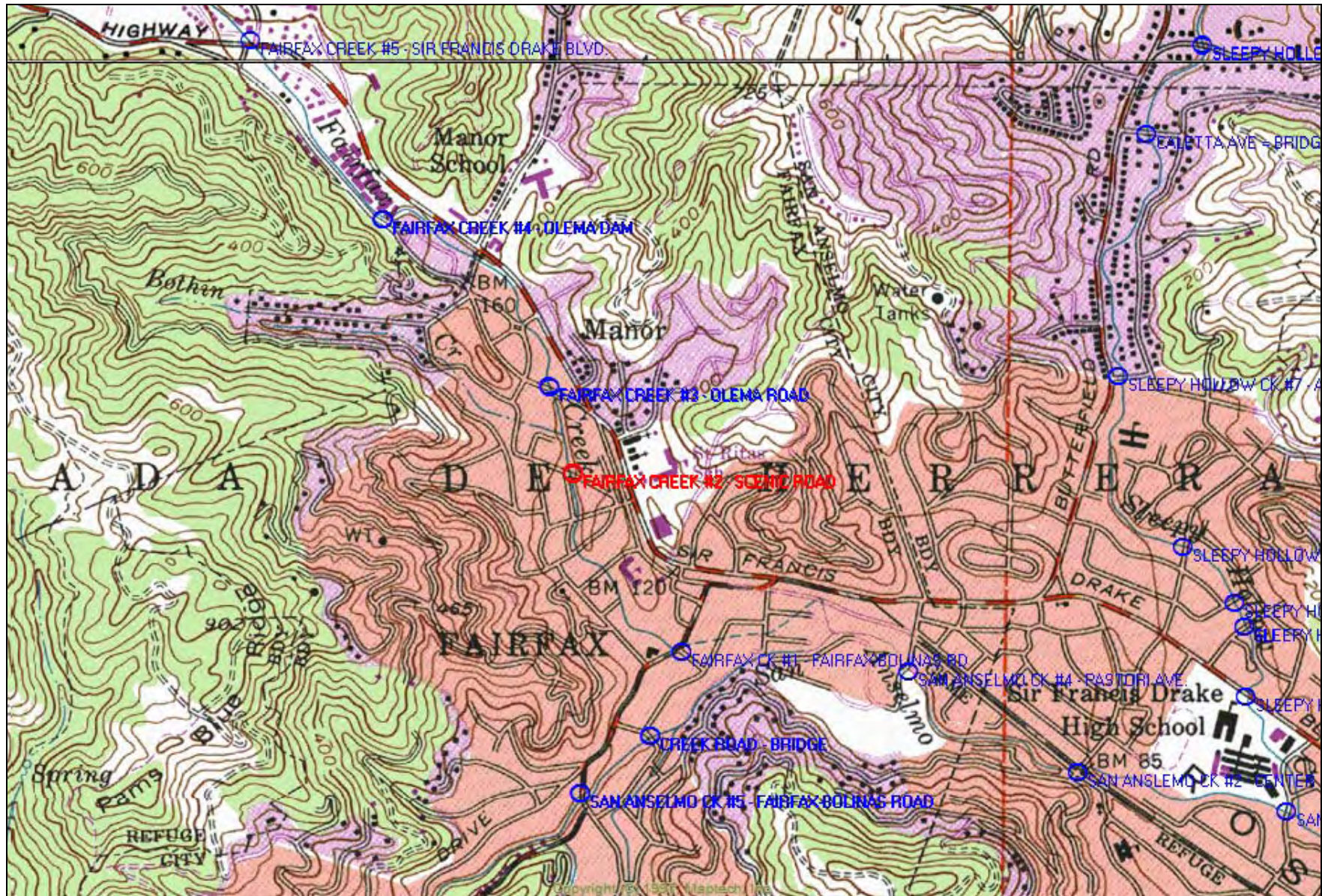
Drainage Area Upstream of Crossing: 3.13 square miles. **Estimated Migration Flows:** anadromous adult salmonids = 3.0–87.2 c.f.s; resident/2+ = 2.0–22.6 c.f.s.; 1+/y-o-y = 1.0–9.8 c.f.s. **Passage Evaluation: GRAY:** as determined by the first-phase evaluation filter due to inadequate residual depths at the culvert inlet and outlet. FishXing estimated that the crossing met the 8-16-16 ft/sec swimming/leaping velocities and 0.5 minimum depth passage criteria for adult anadromous salmonids for 90% of the estimated migration flows (11.8–87.2 c.f.s.), met passage criteria for resident trout/2+ juveniles for 94% of the estimated migration flows (3.2–22.6 c.f.s.) and met passage criteria for 1+/y-o-y juvenile salmonids for 74% of the estimated migration flows (3.2–9.7 c.f.s.).

Additional Stream Crossings: Downstream – (≈400') to bridge at Azalea Avenue, (≈700') to bridge at Spruce Road, (≈1,000') to bridge at Merwin Avenue, (≈2,000') to Site ID# FX-01, (≈2,025') to confluence with San Anselmo Ck., (≈4,300') to Site ID# SA-04, (≈6,700') to Site ID# SA-03, (≈8,700') to Site ID# SA-02, (≈8,900') to confluence with Sleepy Hollow Ck, (≈17,500') to confluence with Ross Creek, and (≈19,700') to upper end of USACE concrete flood channel. Upstream – (≈800') to Site ID# FX-03, (≈1,450') to bridge at Marin Road, (≈2,200') to bridge at Oak Manor, (≈3,250') to Site ID# FX-04, (≈3,800') to box culvert under apartment slated for treatment in 2006, and (≈5,250') to Site ID# FX-05.

Habitat: Quantity = approximately 8,800' of *potential* fish-bearing habitat upstream of Site ID# FX-02, Olema Dam (≈3,250' upstream) is a complete barrier. Quality = rated as “fair” for the ranking matrix based on Taylor and Associates survey crew’s field notes and interpretation of previous habitat assessment (Rich, 2000). The crossing was surveyed by Taylor and Associates on 6/10/05 and there was continuous flow in the channel. At 2:00PM the air temp = 21°C and the water temp = 16°C. The survey crew noted a channel confined by concrete walls in a residential area, several pools, some suitable spawning-sized substrates, and a dense riparian zone of mostly hardwoods. The crew noted abundant numbers (50–100 fish) roach downstream of Site ID# FX-02.

Preferred Treatment: No treatment is recommended at this site because the box culvert currently provides ample passage for all age classes of anadromous salmonids, is properly-sized for storm flow conveyance, and is in good condition. Recommend periodic inspection for maintenance and to ensure that culvert remains back-watered.

Site ID# FX-02: Fairfax Creek/Scenic Road; San Anselmo Creek; Corte Madera Creek



Corte Madera Creek - Stream Crossing Catalog – Fairfax Creek Sites

Site ID# FX-02: Fairfax Creek/Scenic Road; San Anselmo Creek; Corte Madera Creek



Site ID# FX-03: Fairfax Creek/Olema Road; San Anselmo Creek; Corte Madera Creek

Ownership: Town of Fairfax **Ranking Matrix Score** = 17.5 points **Ranking: #16 = Medium-Priority**

Location: USGS Quad: San Rafael. T2N, R7W. Lat/Long: 37° 59' 31.1" 122° 35' 33.9"
Milepost: 0.1 mile to Sir Francis Drake Blvd.

Crossing Type: Box culvert, Concrete. **Corrugations:** None. **Dimensions:** 10.3' H x 14.0' W
Length: 44.0' **Slope:** 0.64% **Modifications:** None. **Rustline Height:** N/A **Average Active Channel Width:** 13.1' **Fill Estimate:** 546 Cubic Yards. **Overall Condition:** Good. **Sizing:** Properly Undersized; HW/D = 1 on a storm flow with more than a 100-year recurrence interval.

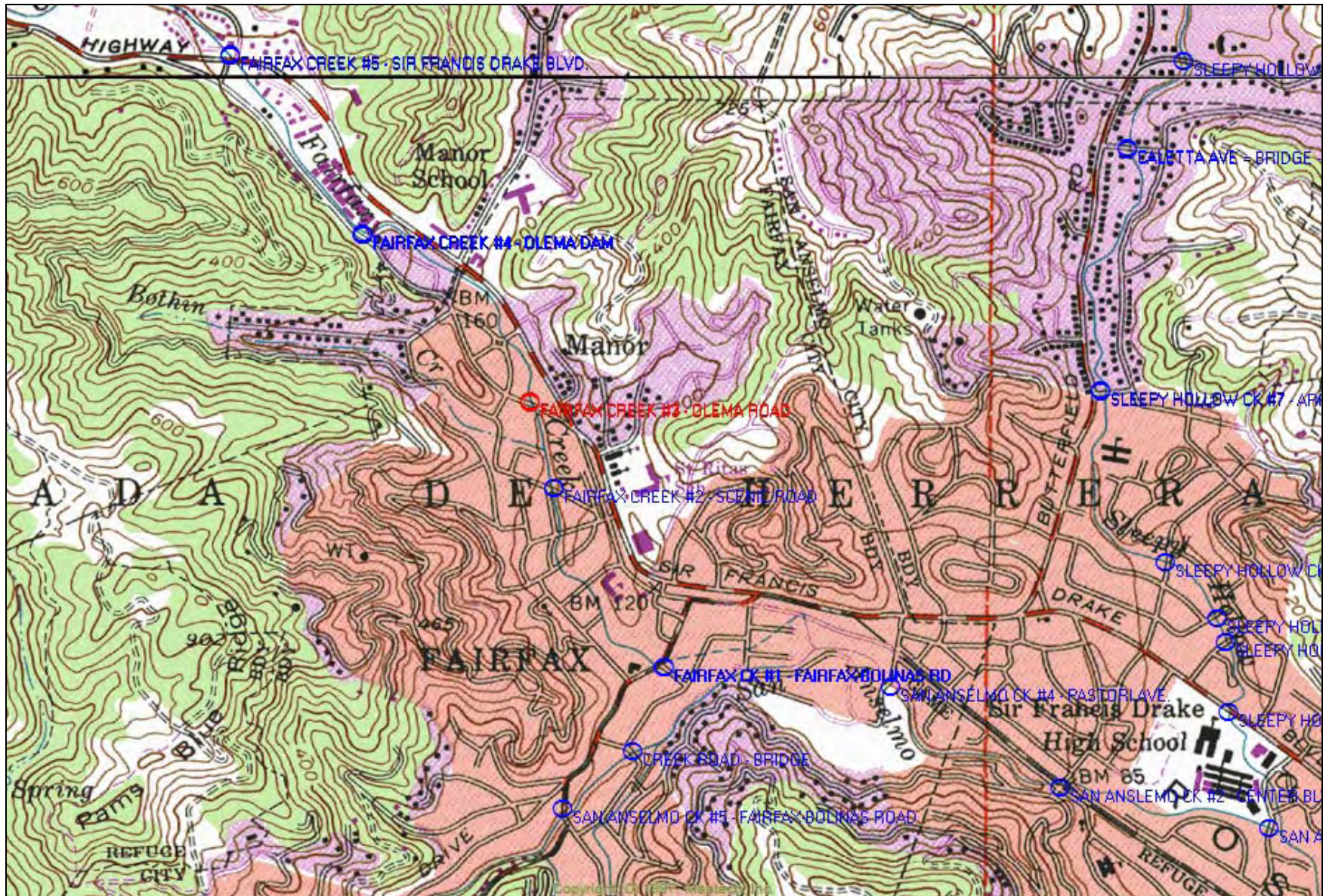
Drainage Area Upstream of Crossing: 2.75 square miles. **Estimated Migration Flows:** anadromous adult salmonids = 3.0–76.6 c.f.s; resident/2+ = 2.0-19.8 c.f.s.; 1+/y-o-y = 1.0-8.6 c.f.s. **Passage Evaluation: GRAY:** as determined by the first-phase evaluation filter due to inadequate residual depths at the culvert inlet and outlet. FishXing estimated that the crossing met the 8-16-16 ft/sec swimming/leaping velocities and 0.5 minimum depth passage criteria for adult anadromous salmonids for 59% of the estimated migration flows (33.5-76.6 c.f.s.), met passage criteria for resident trout/2+ juveniles for 10% of the estimated migration flows (17.9-19.8 c.f.s.) and failed to meet passage criteria for 1+/y-o-y juvenile salmonids due to leap at outlet at lower migration flows and excessive velocities at the upper range of migration flows.

Additional Stream Crossings: Downstream – (≈800') to Site ID# FX-02, (≈1,200') to bridge at Azalea Avenue, (≈1,500') to bridge at Spruce Road, (≈1,800') to bridge at Merwin Avenue, (≈2,800') to Site ID# FX-01, (≈2,825') to confluence with San Anselmo Ck., (≈5,100') to Site ID# SA-04, (≈7,500') to Site ID# SA-03, (≈9,500') to Site ID# SA-02, (≈9,700') to confluence with Sleepy Hollow Ck, (≈18,300') to confluence with Ross Creek, and (≈20,500') to upper end of USACE concrete flood channel. Upstream – (≈650') to bridge at Marin Road, (≈1,400') to bridge at Oak Manor, (≈2,450') to Site ID# FX-04, (≈3,000') to box culvert under apartment slated for treatment in 2006, and (≈4,450') to Site ID# FX-05.

Habitat: Quantity = approximately 8,000' of *potential* fish-bearing habitat upstream of Site ID# FX-03, Olema Dam approximately 2,450' upstream is a complete barrier. Quality = rated as “fair” for the ranking matrix based on Taylor and Associates survey crew’s field notes and interpretation of previous habitat assessment (Rich, 2000). The crossing was surveyed by Taylor and Associates on 6/08/05 and there was continuous flow in the channel. At 4:45PM the air temp = 16°C and the water temp = 16°C. The survey crew noted a channel with sections confined by concrete walls and rip-rap, several pools, some undercut banks, pool-tails and riffles with suitable spawning-sized substrates, and a dense riparian zone of mostly hardwoods with some conifers. The crew noted extremely abundant numbers (>100 fish) roach both upstream and downstream of Site ID# FX-03.

Preferred Treatment: Recommend raising the tail-water elevation with two or three boulder weirs to back-water this box culvert. However, two more serious impediments to fish passage in Fairfax Creek should be treated first (FX-01 and then FX-04).

Site ID# FX-03: Fairfax Creek/Olema Road; San Anselmo Creek; Corte Madera Creek



Corte Madera Creek - Stream Crossing Catalog – Fairfax Creek Sites

Site ID# FX-03: Fairfax Creek/Olema Road; San Anselmo Creek; Corte Madera Creek



Site ID# FX-04: Fairfax Creek/Olema Dam; San Anselmo Creek; Corte Madera Creek

Ownership: Private **Ranking Matrix Score** = 20.3 points **Ranking:** #12 = High-Priority

Location: USGS Quad: San Rafael. T2N, R7W. Lat/Long: 37° 59' 45.8" 122° 35' 52.1"
Milepost: approximately 100' to Westbrae Drive.

Crossing Type: Dam, concrete set on natural bedrock outcrop. **Corrugations:** N/A.
Dimensions: dam spans a 22.0' width and is 2.5' thick. The low-flow notch cut into the dam is approximately nine feet in width. **Length:** 16.0' from upstream edge of dam to downstream edge of bedrock outcrop. **Slope:** N/A **Modifications:** None. **Rustline Height:** N/A **Average Active Channel Width:** 15.8' **Fill Estimate:** Not applicable. **Overall Condition:** Fair, noticeable cracks in dam face and possible slumping. **Sizing:** Not applicable since a dam is an open structure with no top or sides to limit flow.

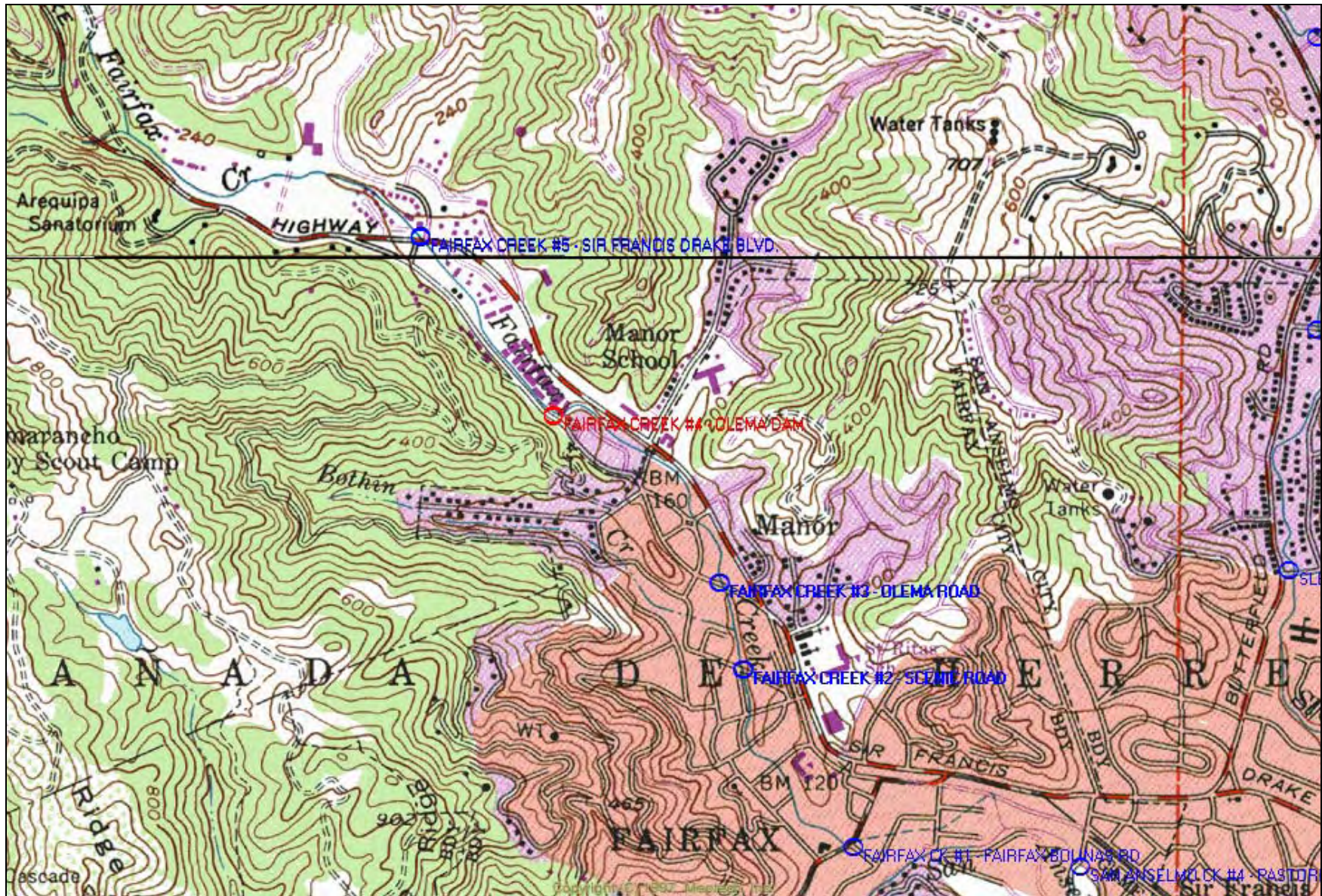
Drainage Area Upstream of Crossing: 2.22 square miles. **Estimated Migration Flows:** anadromous adult salmonids = 3.0–61.8 c.f.s; resident/2+ = 2.0-16.0 c.f.s.; 1+/y-o-y = 1.0-7.0 c.f.s. **Passage Evaluation:** **RED:** as determined by the first-phase evaluation filter for the excessive drop over the dam. FishXing was utilized to assess changes in drop height at varying discharges. At 10 c.f.s. drop = 13.2'; at 30 c.f.s. drop = 12.7'; at 62 c.f.s. drop = 12.3'; at 100 c.f.s. drop = 12.0'; and at 150 c.f.s. drop = 11.8'. Total drop occurs in two stages: flow drops from lip of dam onto bedrock outcrop, length of outcrop is 11 feet (sheet-flow), followed by a final drop into a large downstream pool.

Additional Stream Crossings: Downstream – (≈1,050') to bridge at Oak Manor, (≈1,800') to bridge at Marin Road, (≈2,450') to Site ID# FX-03, (≈3,250') to Site ID# FX-02, (≈3,650') to bridge at Azalea Avenue, (≈3,950') to bridge at Spruce Road, (≈4,250') to bridge at Merwin Avenue, (≈5,250') to Site ID# FX-01, (≈5,275') to confluence with San Anselmo Ck., (≈7,675') to Site ID# SA-04, (≈9,975') to Site ID# SA-03, (≈11,975') to Site ID# SA-02, (≈12,125') to confluence with Sleepy Hollow Ck, (≈20,725') to confluence with Ross Creek, and (≈22,925') to upper end of USACE concrete flood channel. Upstream – (≈550') to box culvert under apartment slated for treatment in 2006 and (≈2,000') to Site ID# FX-05.

Habitat: Quantity = approximately 5,500' of *potential* fish-bearing habitat upstream of Site ID# FX-04. Quality = rated as “fair” for the ranking matrix based on Taylor and Associates survey crew’s field notes and interpretation of previous habitat assessment (Rich, 2000). The crossing was surveyed by Taylor and Associates on 7/09/05 and there was continuous flow in the channel. At 10:15 AM the air temp = 18°C and the water temp = 15°C. The survey crew noted a channel with sections confined by concrete walls, several pools, pool-tails and riffles with suitable spawning-sized substrates, and a dense riparian zone of hardwoods and brush. The right-bank side of the pool downstream of the dam is heavily armored with riprap and a concrete crib wall. The crew noted extremely abundant numbers (>100 fish) roach both upstream and downstream of Site ID# FX-04.

Preferred Treatment: Recommend exploring options for dam removal and channel restoration. However, the culvert at the mouth of Fairfax Creek (FX-01) should first be treated to restore adult steelhead passage up to Olema Dam. Consideration must be made to potential effects of channel re-grade to private properties adjacent to the stream channel as well as upstream crossings.

Site ID# FX-04: Fairfax Creek/Olema Dam; San Anselmo Creek; Corte Madera Creek



Corte Madera Creek - Stream Crossing Catalog – Fairfax Creek Sites

Site ID# FX-04: Fairfax Creek/Olema Dam; San Anselmo Creek; Corte Madera Creek



Site ID# FX-05: Fairfax Creek/Sir Francis Drake Blvd.; San Anselmo Creek; Corte Madera Creek

Ownership: County of Marin **Ranking Matrix Score** = 16.8 points **Ranking: #17 = Medium-Priority**

Location: USGS Quad: San Rafael. T2N, R7W. Lat/Long: 38° 00' 01.5" 122° 36' 08.4"
Milepost: approximately 25' to Glen Drive.

Crossing Type: Circular culvert, SSP, in two sections. **Corrugations:** inlet to station 134.0' = 6" x 2" and from station 134.0' to 174.6' = 2-2/3" x 0.5". **Dimensions:** diameter = 8.0'.

Length: 174.6'. **Slope:** 1.12% **Modifications:** entire invert lined with concrete.

Rustline Height: 1.8'. **Average Active Channel Width:** 15.4' **Fill Estimate:** 1,531 cubic yards. **Overall Condition:** Extremely poor, lower 40.6' has rusted-through invert, some sagging of culvert too. **Sizing:** Undersized, HW/D = 1 on a storm flow between a 10 and 25-year recurrence interval.

Drainage Area Upstream of Crossing: 2.04 square miles. **Estimated Migration Flows:** anadromous adult salmonids = 3.0–56.8 c.f.s; resident/2+ = 2.0-14.7 c.f.s.; 1+/y-o-y = 1.0-6.4 c.f.s. **Passage Evaluation: GRAY:** as determined by the first-phase evaluation filter due to inadequate residual depths at the culvert inlet and outlet. FishXing estimated that the crossing met the 8-16-16 ft/sec swimming/leaping velocities and 0.5 minimum depth passage criteria for adult anadromous salmonids for 78% of the estimated migration flows (5.4-47.3 c.f.s.), met passage criteria for resident trout/2+ juveniles for 34% of the estimated migration flows (2.0-5.7 c.f.s.) and failed to meet passage criteria for 1+/y-o-y juvenile salmonids (leap and velocity). Actual passage conditions may be worse due unfavorable hydraulic conditions created by the damaged outlet and the paved invert.

Additional Stream Crossings: Downstream – (≈1,450') to box culvert under apartment slated for treatment in 2006, and (≈2,000') to Site ID# FX-04, (≈3,050') to bridge at Oak Manor, (≈3,800') to bridge at Marin Road, (≈4,450') to Site ID# FX-04, (≈5,250') to Site ID# FX-02, (≈5,650') to bridge at Azalea Avenue, (≈5,950') to bridge at Spruce Road, (≈6,250') to bridge at Merwin Avenue, (≈7,250') to Site ID# FX-01, (≈7,275') to confluence with San Anselmo Ck., (≈9,675') to Site ID# SA-04, (≈11,975') to Site ID# SA-03, (≈13,975') to Site ID# SA-02, (≈14,125') to confluence with Sleepy Hollow Ck, (≈22,725') to confluence with Ross Creek, and (≈24,925') to upper end of USACE concrete flood channel. Upstream – USGS topographic map indicates two crossings on private road that are probably above limit of anadromy.

Habitat: Quantity = approximately 3,500' of *potential* fish-bearing habitat upstream of Site ID# FX-05. Quality = rated as "fair" for the ranking matrix based on Taylor and Associates survey crew's field notes and interpretation of previous habitat assessment (Rich, 2000). The crossing was surveyed by Taylor and Associates on 7/09/05 and there was continuous flow in the channel. At 1:30 PM the air temp = 22°C and the water temp = 16°C. The survey crew noted a channel with sections confined by rip-rap banks, several pools, pool-tails and riffles with suitable spawning-sized substrates, and a dense riparian zone of hardwoods and brush. No fish were observed in the channel adjacent to Site ID# FX-05.

Preferred Treatment: Due to poor condition and inadequate sizing, recommend replacement with a properly-sized open-bottom arch or an embedded circular SSP culvert. Project should be implemented primarily for maintenance purposes. Poor candidate for treatment with grant funds.

Site ID# FX-05: Fairfax Creek/Sir Francis Drake Blvd.; San Anselmo Creek; Corte Madera Creek

