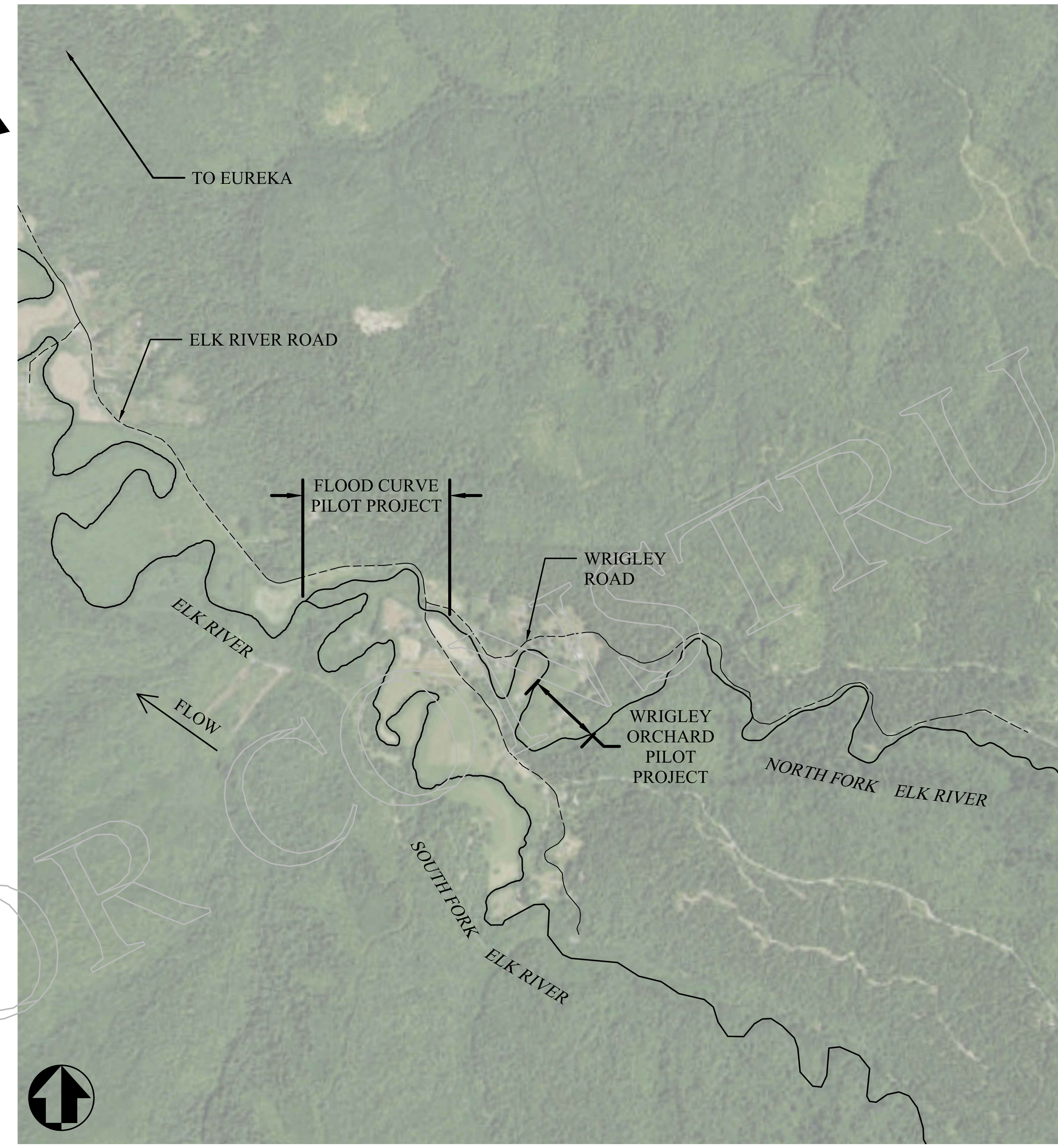
APPENDIX A

65% Engineering Designs

ELK RIVER SEDIMENT REMEDIATION PILOT IMPLEMENTATION PROJECT
HUMBOLDT COUNTY, CALIFORNIA



SHEET INDEX

01/25/2019 65% SUBMITTAL

REGISTERED PROFESSIONAL ENGINEER
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Engineering - Hydrology - Geomorphology - Water Resources
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ELK RIVER PILOT PROJECTS
FLOOD CURVE & WRIGLEY ORCHARD

COUNTY HUMBOLDT
STATE CALIFORNIA

GENERAL NOTES

1. LAND OWNER CONTACT INFORMATION:

   KRISTI WRIGLEY
   2550 WRIGLEY ROAD & 7968 ELK RIVER ROAD
   HOME: (707) 443-1496
   CELL: (707) 497-8769

   PHILIP & SHARYN NICKLAS
   8094 ELK RIVER ROAD
   (707) 442-7617

   SCOTT & SUSAN KEELE
   8080 ELK RIVER ROAD
   (707) 442-1825

   HUMBOLDT REDWOOD COMPANY
   125 MAIN STREET, SCOTIA
   (707) 764-4472

2. THE PROJECT ENGINEER INFORMATION:

   JEFFREY K. ANDERSON, P.E.
   NORTHERN HYDROLOGY & ENGINEERING
   P.O. BOX 2515
   MCKINLEYVILLE, CA 95519
   (707) 839-2195

3. THESE PLANS REPRESENT THE WORK TO BE PERFORMED FOR THE ELK RIVER SEDIMENT REMEDIATION PILOT IMPLEMENTATION PROJECT (ELK RIVER PILOT PROJECTS).

4. ALL IMPROVEMENTS SHALL BE ACCOMPLISHED UNDER THE APPROVAL, INSPECTION AND TO THE SATISFACTION OF THE OWNER OR OWNER'S REPRESENTATIVE, AND PROJECT ENGINEER. ALL OF THE CONSTRUCTION IMPROVEMENTS SHALL COMPLY WITH THESE PLANS, SPECIFICATIONS AND NOTES.

5. SHOULD IT APPEAR THAT THE WORK TO BE DONE, OR ANY MATTER RELATIVE THERETO, IS NOT SUFFICIENTLY DETAILED OR EXPLAINED ON THESE PLANS, THE CONTRACTOR SHALL CONTACT THE PROJECT ENGINEER RESPONSIBLE FOR THE PLAN PREPARATION BEFORE CONDUCTING WORK ON THAT PORTION OF THE PROJECT.

6. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY UNDERGROUND SEARCH ALERT (USA) PRIOR TO THE COMMENCEMENT OF WORK TO VERIFY THE LOCATION OF UNDERGROUND UTILITIES WITHIN THE PROJECT AREA.

7. THE LOCATION OF ANY UTILITIES SHOWN ON THESE PLANS IS APPROXIMATE AND FOR INFORMATION ONLY. THE LOCATION, TYPE, SIZE AND/OR DEPTH INDICATED WERE OBTAINED FROM SOURCES OF VARYING RELIABILITY. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE ACTUAL LOCATION, TYPE, SIZE AND/OR DEPTH PRIOR TO PERFORMING ANY EXCAVATION OR OTHER WORK CLOSE TO ANY UNDERGROUND PIPELINE, CONDUIT, DUCTS, WIRE, STRUCTURE OR OTHER UTILITIES SUBJECT TO CONCERNS FOR SAFETY, DISPLACEMENT, AND/OR DAMAGE BY REASONS OF THEIR OPERATIONS.

8. CONSTRUCTION HOURS SHALL BE MONDAY THROUGH SATURDAY BETWEEN 7:00 A.M. AND 7:00 P.M. UNLESS PRIOR APPROVAL IS RECEIVED FROM THE CONSULTANT TEAM.

9. THE CONTRACTOR SHALL AGREE TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY, AND FURTHER AGREES THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS IN ACCORDANCE WITH THE PROVISIONS OUTLINED BY THE PROJECT CONTRACT.

10. IT IS THE RESPONSIBILITY OF THE CONTRACTOR AND HIS/HER SUBCONTRACTOR(S) TO EXAMINE THE PROJECT SITE PRIOR TO THE COMMENCEMENT OF WORK. THE CONTRACTOR SHALL BECOME FAMILIAR WITH THE CONDITIONS UNDER WHICH THE WORK IS TO BE PERFORMED, SUCH AS THE NATURE AND LOCATION OF THE WORK AND THE GENERAL AND LOCAL CONDITIONS, PARTICULARLY THOSE AFFECTING THE AVAILABILITY OF TRANSPORTATION, ACCESS TO AND FROM THE SITE, THE DISPOSAL, HANDLING, AND STORAGE OF MATERIALS, AVAILABILITY OF LABOR, WATER, ELECTRICITY, ROADS, THE UNCERTAINTIES OF WEATHER, THE CONDITIONS OF THE GROUND SURFACE AND SUBSURFACE MATERIALS, THE EQUIPMENT AND FACILITIES NEEDED PRIMARILY FOR AND DURING THE PERFORMANCE OF THE WORK, AND THE COSTS THEREOF. ANY FAILURE BY THE CONTRACTOR AND SUBCONTRACTOR(S) TO ACQUAINT HIMSELF WITH ALL THE AVAILABLE INFORMATION WILL NOT RELIEVE HIM FROM RESPONSIBILITY FOR PROPERLY ESTIMATING THE DIFFICULTY AND COST OF SUCCESSFULLY PERFORMING THE WORK.

11. THE CONTRACTOR SHALL MAINTAIN A SET OF PLANS ON THE JOB SHOWING "AS-CONSTRUCTED" CHANGES MADE TO DATE. UPON COMPLETION OF THE PROJECT, THE CONTRACTOR SHALL SUPPLY TO THE OWNER, OWNER'S REPRESENTATIVE, OR PROJECT ENGINEER A SET OF PLANS, MARKED UP TO THE SATISFACTION OF THE CONSULTANT TEAM, REFLECTING THE AS-CONSTRUCTED MODIFICATIONS.

12. ALL REVISIONS TO THESE PLANS MUST BE MADE BY THE PROJECT ENGINEER RESPONSIBLE FOR THE PLAN PREPARATION, AND SHALL ACCURATELY BE SHOWN ON REVISED PLANS.

13. COPIES OF ALL ENVIRONMENTAL PERMITS WILL BE PROVIDED TO THE CONTRACTOR, AND MUST BE KEPT ON-SITE AT ALL TIMES DURING CONSTRUCTION. THE CONTRACTOR SHALL OBTAIN AT HIS/HER OWN EXPENSE ALL PERMITS, LICENSES, INSURANCE POLICIES, ETC., NOT ALREADY OBTAINED BY THE CONSULTANT TEAM, AS MAY BE NECESSARY TO COMPLY WITH STATE AND LOCAL LAWS ASSOCIATED WITH THE PERFORMANCE OF THE WORK. CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH ALL PERMITS.

14. UNLESS NOTED OTHERWISE ON THE PLANS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL EXISTING SURVEY MONUMENTS AND OTHER SURVEY MARKERS IDENTIFIED IN THESE PLANS.

15. THE CONTRACTOR SHALL PROVIDE, PLACE, AND MAINTAIN ALL LIGHTS, SIGNS, BARRICADES, FLAG PERSONS, PILOT CAR, OR OTHER DEVICES NECESSARY TO CONTROL TRAFFIC THROUGH THE CONSTRUCTION AREA AND FOR PUBLIC SAFETY IN ACCORDANCE WITH THESE PLANS, THE STANDARD SPECIFICATIONS AND CHAPTER 5 OF THE STATE TRAFFIC MANUAL, "MANUAL OF TRAFFIC CONTROLS."

16. THE CONTRACTOR SHALL USE ONLY DESIGNATED SPECIFIC SITES FOR STORAGE OF EQUIPMENT AND MATERIALS AS SHOWN ON THESE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SECURITY OF ALL EQUIPMENT AND MATERIALS.

17. AT NO TIME SHALL THE CONTRACTOR UNDERTAKE TO CLOSE OFF ANY EXISTING UTILITY LINES OR OPEN VALVES OR TAKE ANY OTHER ACTION WHICH WOULD AFFECT THE OPERATION OF EXISTING WATER OR UTILITY SYSTEMS WITHOUT PRIOR APPROVAL FROM THE OWNER OR OWNER'S REPRESENTATIVE. APPROVAL SHALL BE REQUESTED AT LEAST 48 HOURS IN ADVANCE OF THE TIME THAT THE INTERRUPTION OF THE EXISTING SYSTEM IS REQUIRED. ANY INTERRUPTION OF SERVICE TO UTILITY SERVICES, WHETHER INTENTIONAL OR NOT, MUST BE KEPT TO A MINIMUM TIME PERIOD.

18. THE OWNER, OWNER'S REPRESENTATIVE, OR PROJECT ENGINEER WILL FURNISH THE CONSTRUCTION STAKING TO THE CONTRACTOR.

19. ALL CONTROL STATIONING AND DATA DIMENSIONING ARE REFERENCED TO THE CENTERLINE OF THE DESIGN CHANNEL SHOWN UNLESS OTHERWISE NOTED.

20. THE CONTRACTOR SHALL PRESERVE AND PROTECT ALL EXISTING UTILITIES AND IMPROVEMENTS WITHIN AND OUTSIDE THE LIMITS OF THE PROJECT AREA.

21. EQUIPMENT EXCLUSION AREAS SHALL BE CLEARLY FLAGGED BY THE OWNER OR OWNER'S REPRESENTATIVE PRIOR TO CONSTRUCTION TO SERVE AS A BUFFER FOR SENSITIVE SPECIES AND RESOURCES.

22. NO TREES OR WETLAND VEGETATION SHALL BE REMOVED UNLESS THEY ARE SHOWN AND NOTED TO BE REMOVED ON THE PLANS, OR AS DIRECTLY SPECIFIED ON-SITE BY THE OWNER OR OWNER'S REPRESENTATIVE.

23. IF, DURING CONSTRUCTION, ARCHAEOLOGICAL REMAINS ARE ENCOUNTERED, CONSTRUCTION IN THE VICINITY SHALL BE HALTED, AND THE OWNER, OWNER'S REPRESENTATIVE, OR PROJECT ENGINEER SHALL BE NOTIFIED IMMEDIATELY.

24. THE CONTRACTOR SHALL COORDINATE THE WORK WITH OTHERS AT THE LIMITS OF THE CONSTRUCTION LINES SHOWN IN THESE PLANS.

25. EROSION CONTROL STRUCTURES SHALL CONTAIN AND CONTROL EROSION AND PROVIDE FOR THE SAFE DISCHARGE OF SILT-FREE RUNOFF FROM THE PROJECT SITE INTO RECEIVING WATER BODIES. SUITABLE SUPPLIES FOR MITIGATING SEDIMENT IMPACTS TO ONSITE WATERWAYS SHALL BE MAINTAINED AT THE PROJECT SITE BY THE CONTRACTOR DURING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING ALL TEMPORARY EROSION CONTROL MEASURES. THE EROSION CONTROL MEASURES SHALL BE IN ACCORDANCE WITH THESE PLANS, THE STANDARD SPECIFICATIONS, LOCAL, COUNTY AND STATE ORDINANCES, AND APPLICABLE PERMIT REQUIREMENTS. THE CONTRACTOR SHALL CONTACT THE OWNER, OWNER'S REPRESENTATIVE, OR PROJECT ENGINEER PRIOR TO THE COMMENCEMENT OF WORK FOR A PRE-GRADING INSPECTION OF THE INSTALLED TEMPORARY EROSION CONTROL FACILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE AND PERFORMANCE OF THE TEMPORARY EROSION CONTROL MEASURES THROUGHOUT THE DURATION OF THE PROJECT.

26. THE CONTRACTOR SHALL KEEP ALL AREAS GENERATING DUST WELL WATERED DURING THE TERM OF THIS CONTRACT. THIS INCLUDES, BUT IS NOT LIMITED TO ACCESS RAMPS, ROADS, FILL AREAS AND ANY OTHER AREAS THAT MAY GENERATE DUST AS A RESULT OF THE CONTRACTOR'S OPERATIONS.

27. NONE OF THE NOTES, OR CONSTRUCTION DRAWINGS SHALL PRECLUDE THE CONTRACTOR FROM SUBSTITUTION OF MATERIALS OR PRACTICES NECESSARY TO COMPLETE THE PROJECT IN A TIMELY AND ECONOMICAL MANNER. ANY SUBSTITUTION OR FORGONE INSPECTIONS WITHOUT THE EXPLICIT CONSENT OF THE OWNER, OWNER'S REPRESENTATIVE, OR PROJECT ENGINEER BECOME THE RESPONSIBILITY OF THE CONTRACTOR. WHERE THE SPECIFICATIONS, NOTES, OR CONSTRUCTION DRAWINGS ARE NOT CONSISTENT WITH LOCAL REGULATIONS, AN EXPLICIT RECONSIDERATION OF PLANS AND SPECIFICATIONS BY THE CONSULTANT TEAM IS REQUIRED PRIOR TO ENACTMENT OF ANY CHANGES.

GENERAL GRADING NOTES

1. ALL GRADING SHALL BE PERFORMED IN ACCORDANCE WITH THESE PLANS AND SPECIFICATIONS, AND ALL APPLICABLE LOCAL, COUNTY, AND STATE GRADING ORDINANCES, AND THE STANDARD SPECIFICATIONS, STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, DATED MAY 2006. THE FOLLOWING PLANS, NOTES AND SPECIFICATIONS HAVE BEEN DEVELOPED WITHOUT THE BASIS OF FIELD AND LABORATORY TESTING, AND THUS REFLECT GOOD CONSTRUCTION PRACTICES ONLY.

2. THE CONTRACTOR SHALL CONFORM TO THE RULES AND REGULATIONS OF THE STATE AND LOCAL CONSTRUCTION SAFETY ORDERS PERTAINING TO EXCAVATIONS AND TRENCHES.

3. THE CONTRACTOR IS RESPONSIBLE FOR ALL QUANTITIES AND LANDFORMS. EARTHWORK QUANTITIES SHOWN ON THESE PLANS ARE BASED

GENERAL GRADING NOTES CONTINUED

ON RAW, UNADJUSTED CUT AND FILL VOLUMES AND ARE FURNISHED FOR THE CONTRACTOR'S INFORMATION ONLY. THE ACTUAL AMOUNT OF MATERIAL MOVED WILL VARY DEPENDING ON CONDITIONS IN THE FIELD INCLUDING BUT NOT LIMITED TO COMPACTION AND CONSOLIDATION, BULKING, AND THE CONTRACTOR'S METHOD OF OPERATION.

4. EXISTING VEGETATION THAT EXISTS OUTSIDE OF CUT AND FILL AREAS SHALL BE PROTECTED AND LEFT UNDISTURBED AS MUCH AS PRACTICAL.

5. THE CONTRACTOR SHALL MAKE EVERY EFFORT TO MINIMIZE VEHICLE MOVEMENT, SPECIFICALLY WHEELED VEHICLES, WITHIN THE CONSTRUCTION AREA. EFFORT SHOULD BE GIVEN TO MAINTAIN SINGLE TRAFFIC ROUTES FOR HAULING OF MATERIAL BETWEEN CUT AND FILL SITES.

6. UPON COMPLETION OF THE GRADING WORK ANY VEHICLE COMPACTED AREAS, SUCH AS TRAVEL AND HAUL ROUTES, STAGING AREAS, ETC. SHALL BE SCARIFIED TO A DEPTH OF 6 TO 12 INCHES.

7. SITE PREPARATION SHALL BEGIN WITH THE REMOVAL OF WOODY VEGETATION AND NON-SOIL MATERIALS AS NEEDED WITHIN THE AREA TO BE GRADED.

8. ALL SURFACES TO RECEIVE FILL SHOULD BE CLEARED OF EXISTING WOODY VEGETATION, OLD FILL, DEBRIS, AND OTHER UNSUITABLE MATERIALS, AND SCARIFIED TO A DEPTH OF 6 TO 12 INCHES.

9. EXCAVATED CUT AND FILL FINISHED GRADES SHALL BE PLUS OR MINUS 0.1 FEET FROM THE GRADES SHOWN ON THESE PLANS.

10. ALL CUT AND FILL SLOPES SHALL BE ROUNDED TO MEET EXISTING GRADES AND BLEND WITH SURROUNDING TOPOGRAPHY. WHEREVER FEASIBLE, GRADING WITHIN OPEN SPACE LANDS SHALL BE CONTOUR-ROUNDED TO MIMIC NATURAL TERRAIN FEATURES AND MANTLE WITH TOPSOIL. ALL GRADED AREAS WILL BE REVEGETATED BY THE OWNER OR OWNER'S REPRESENTATIVE.

11. ALL SLOPES SHALL BE CONSTRUCTED PER THE MAXIMUM GRADIENTS INDICATED ON THE GRADING PLAN. ALL GRADIENTS EXCEEDING THESE MAXIMUM SLOPES SHALL BE CONSTRUCTED UTILIZING SUPPLEMENTAL SLOPE STABILIZATION TECHNIQUES AS RECOMMEND BY THE OWNER, OWNER'S REPRESENTATIVE, OR PROJECT ENGINEER AND IN AREAS AS INDICATED ON THE GRADING PLANS.

12. THE SITE SHALL BE MAINTAINED IN AN ORDERLY FASHION. FOLLOWING THE CESSATION OF CONSTRUCTION ACTIVITY, ALL CONSTRUCTION DEBRIS SHALL BE REMOVED FROM THE SITE OR PLACED ON-SITE AS DIRECTED BY THE CONSULTING TEAM.

13. CONTRACTOR IS RESPONSIBLE FOR DISPOSAL OF UNSUITABLE MATERIAL EXCAVATED ON SITE. UNSUITABLE EXCAVATED MATERIAL SHALL BE REMOVED AND DISPOSED OF FROM SITE IN A MANNER CONSISTENT WITH APPLICABLE LOCAL, COUNTY, AND STATE ORDINANCES.

14. ALL DIRT, SAND, MUD OR DEBRIS DEPOSITED OR SPILLED UPON PUBLIC ROADWAYS DURING GRADING, HAULING OR EXPORTING OPERATION SHALL BE IMMEDIATELY CLEANED UP BY THE CONTRACTOR, SUBCONTRACTOR OR AGENTS. FAILURE TO DO SO WILL BE CAUSE FOR STOPPING OF SUCH GRADING, HAULING OR EXPORT WORK UNTIL SUCH TIME AS THE ROADWAYS ARE CLEANED.

15. THE CONTRACTOR SHALL REMOVE ANY TEMPORARY CONFORMS AND CONSTRUCT OTHER IMPROVEMENTS TO THE GRADES SHOWN ON THESE PLANS.

TOPOGRAPHY NOTES

1. BEARINGS, DISTANCES AND COORDINATES FOR THESE PLANS ARE BASED ON THE CALIFORNIA STATE PLANE ZONE 1 NORTH AMERICAN DATUM OF 1983 (NAD83 [2007]), US FOOT.

2. VERTICAL DISTANCE FOR THESE PLANS IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1988 (NAVD88), US FOOT.

3. TOPOGRAPHY FOR THESE PLANS WAS A COMBINATION OF:
   * 2005 LIDAR (SANBORN, 2005)
   * 2002, and 2011-2017 CHANNEL CROSS-SECTIONS AND TOPOGRAPHY SURVEYED BY NHE
   * 2012 LONGITUDINAL PROFILE WAS SURVEYED BY REDWOOD COMMUNITY ACTION AGENCY.

4. ALL CONTOURS ILLUSTRATED IN THESE PLANS ARE AT AN INTERVAL OF 2.0 FEET.

DISCLAIMERS

1. THE PROJECT ENGINEER RESPONSIBLE FOR PREPARATION OF THESE PLANS AND SPECIFICATIONS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PROJECT ENGINEER RESPONSIBLE FOR PREPARATION OF THESE PLANS.

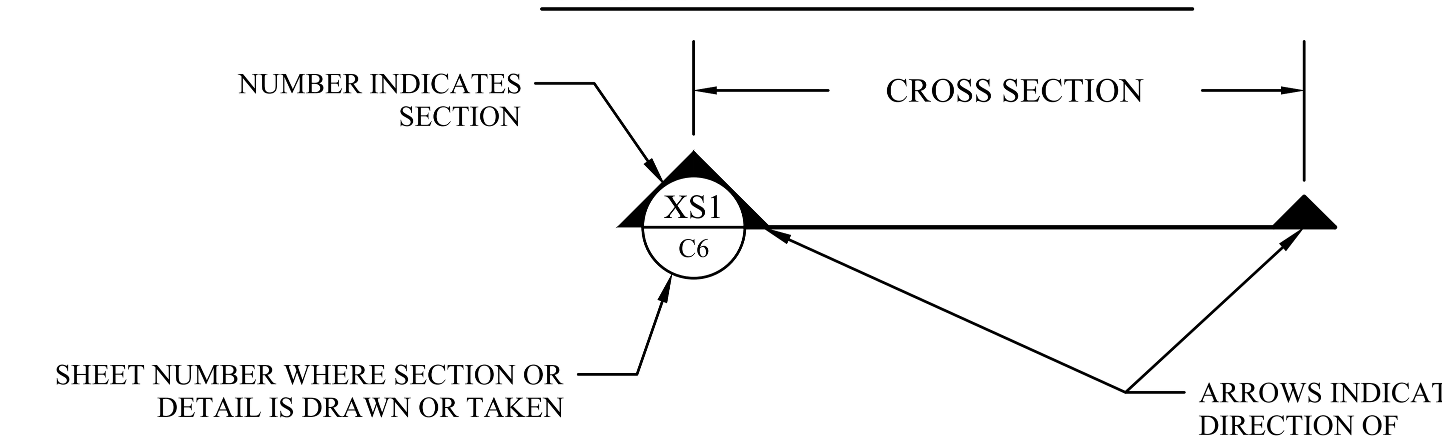
PROJECT TOTAL CUT/FILL VOLUMES AND AREAS

LOCATION (FLOOD CURVE)	PROPERTY OWNER	GRADING AREA (AC)	CUT (CY)	FILL (CY)
CH_1	WRIGLEY	1.0	6,600	0
CH_2	KEELE	1.2	7,300	0
CH_3	NICKLAS	0.2	2,100	0
FP_1	WRIGLEY	0.7	2,000	0
FP_2	KEELE	0.03	100	0
FP_3	NICKLAS	0.4	1,100	0
SP_1	WRIGLEY	0.9	0	1,600
SP_2	KEELE	0.9	0	3,300
SP_3	NICKLAS	0.3	0	1,300
SP_4	NICKLAS	0.5	0	3,700
TOTAL FLOOD CURVE CHANNEL		2.4	16,000	0
TOTAL FLOOD CURVE FLOODPLAIN		1.1	3,200	0
TOTAL FLOOD CURVE SPOILS AREA		2.6	0	9,900
TOTAL FLOOD CURVE		**6.1**	**19,200**	**9,900**

LOCATION (ORCHARD)	PROPERTY OWNER	GRADING AREA (AC)	CUT (CY)	FILL (CY)
CH_4	WRIGLEY	0.1	700	0
FP_4	WRIGLEY	0.6	2,100	0
SP_5	WRIGLEY	1.3	0	10,100
SP_6	WRIGLEY	0.7	0	2,000
TOTAL ORCHARD CHANNEL		0.1	700	0
TOTAL ORCHARD FLOODPLAIN		0.6	2,100	0
TOTAL ORCHARD SPOILS AREA		2.0	0	12,100
TOTAL ORCHARD		**2.7**	**2,800**	**12,100**

LOCATION (PROJECT)	PROPERTY OWNER	GRADING AREA (AC)	CUT (CY)	FILL (CY)
TOTAL PROJECT CHANNEL	--	2.5	16,700	0
TOTAL PROJECT FLOODPLAIN	--	1.7	5,300	0
TOTAL PROJECT SPOILS AREA	--	4.6	0	22,000
PROJECT GRAND TOTAL		**8.8**	**22,000**	**22,000**

CROSS-REFERENCE LEGEND



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DESIGNED: JRP, BSP, JKA	SUB SHEET NO.	NOTES	SHEET
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DATE: 01/25/2019			

LEGEND

- EXISTING CONTOURS (2FT) (2005 LiDAR)
- RIVER CENTERLINE
- DESIGN BOUNDARY
- APPROXIMATE ROAD CENTERLINE
- CONSTRUCTION ACCESS
- APPROXIMATE HUMBOLDT COUNTY EASEMENT (25' OFFSET FROM ROAD CENTERLINE)
- APPROXIMATE PARCEL BOUNDARY
- STAGING AREA
- FILL SITE
- APPROXIMATE BUILDING LOCATION

150 0 150 300
SCALE OF FEET

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TECH. REVIEW:	JKA
DATE:	01/25/2019

SUB SHEET NO. G3

PROPERTY OWNERSHIP
OVERVIEW
ELK RIVER PILOT PROJECTS

SHEET 3 OF 14

LEGEND

EXISTING CONTOURS (2FT) (2005 LiDAR)	APPROXIMATE HUMBOLDT COUNTY EASEMENT (25' OFFSET FROM ROAD CENTERLINE)
RIVER CENTERLINE	STAGING AREA
DESIGN BOUNDARY	FILL SITE
APPROXIMATE ROAD CENTERLINE	APPROXIMATE BUILDING LOCATION
CONSTRUCTION ACCESS	

150 0 150 300
SCALE OF FEET

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LEGEND

- DESIGN CONTOURS (2FT)
- EXISTING CONTOURS (2FT) (2005 LiDAR)
- RIVER CENTERLINE
- LIMITS OF GRADING
- CONSTRUCTION ACCESS
- APPROXIMATE HUMBOLDT COUNTY EASEMENT (25' OFFSET FROM ROAD CENTERLINE)
- APPROXIMATE BUILDING LOCATION
- HABITAT WOOD STRUCTURE
- STAGING AREA

50 0 50 100
SCALE OF FEET

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C2

SITE PLAN I
FLOOD CURVE
ELK RIVER PILOT PROJECTS

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OF
14

LEGEND

- DESIGN CONTOURS (2FT)
- EXISTING CONTOURS (2FT) (2005 LiDAR)
- RIVER CENTERLINE
- LIMITS OF GRADING
- CONSTRUCTION ACCESS
- APPROXIMATE HUMBOLDT COUNTY EASEMENT (25' OFFSET FROM ROAD CENTERLINE)
- APPROXIMATE BUILDING LOCATION
- HABITAT WOOD STRUCTURE
- STAGING AREA

50 0 50 100
SCALE OF FEET

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LEGEND

- DESIGN CONTOURS (2FT)
- EXISTING CONTOURS (2FT) (2005 LiDAR)
- RIVER CENTERLINE
- LIMITS OF GRADING
- CONSTRUCTION ACCESS
- APPROXIMATE HUMBOLDT COUNTY EASEMENT (25' OFFSET FROM ROAD CENTERLINE)
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- STAGING AREA

50 0 50 100
SCALE OF FEET

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DRAFTED: CEP, CP	C4	WRIGLEY ORCHARD	7
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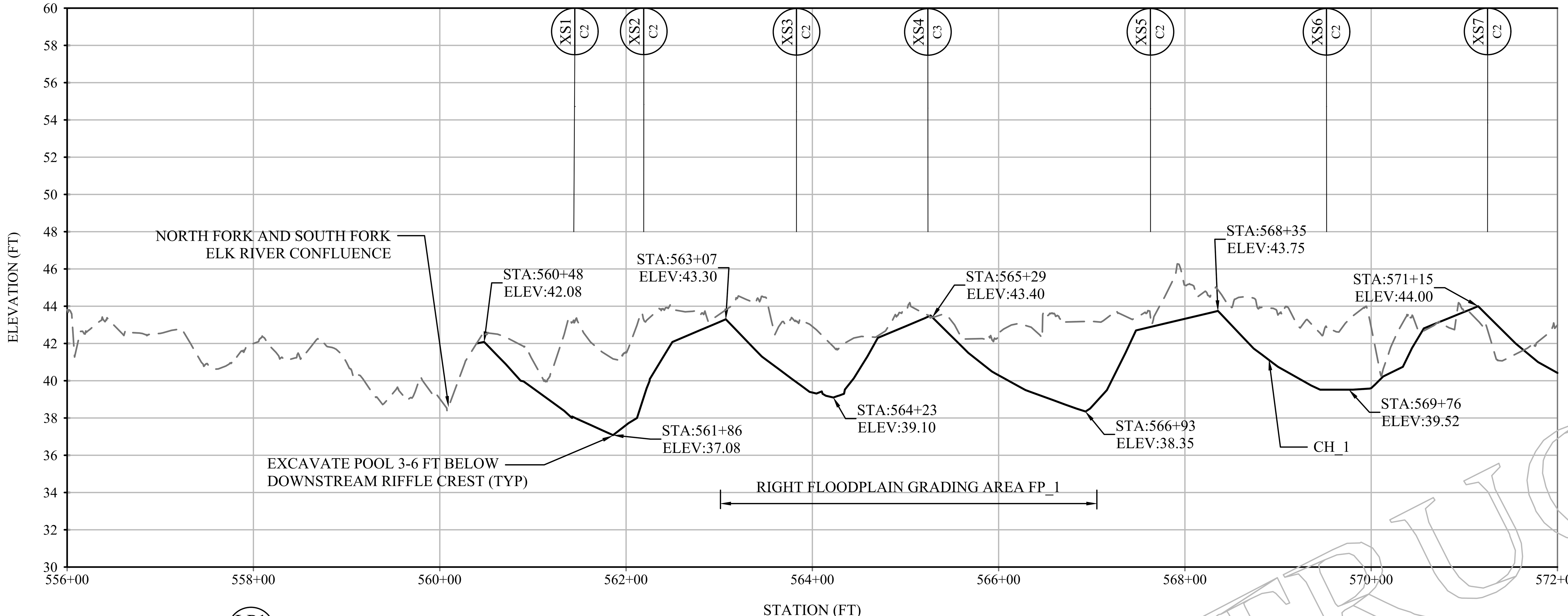
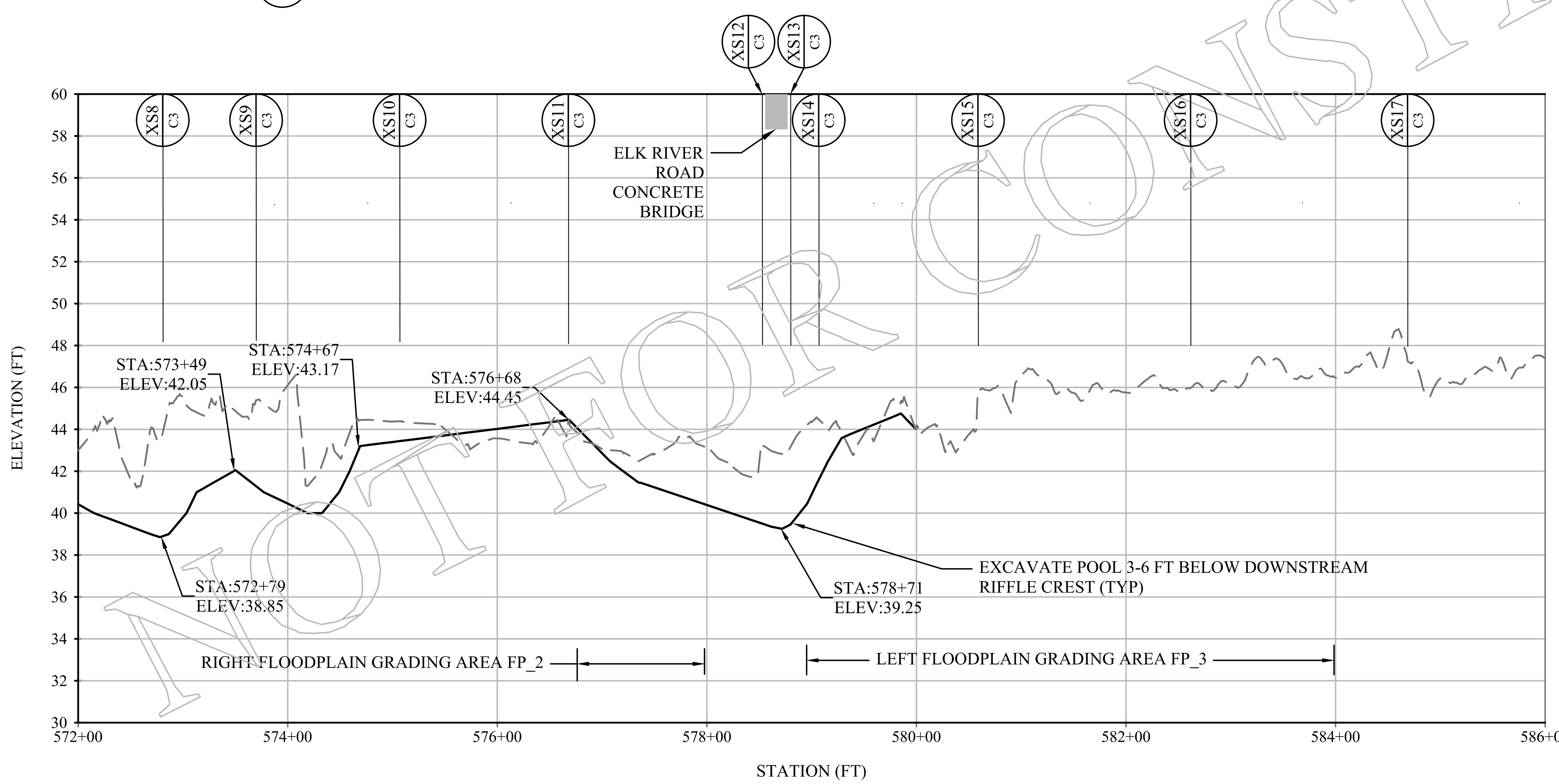


LP1 / C1 ELK RIVER LONGITUDINAL PROFILE (EXISTING ALIGNMENT)



LP1 / C1 ELK RIVER LONGITUDINAL PROFILE CONTINUED (EXISTING ALIGNMENT)

NOTE:
ALL GRADING EXTENTS
ARE APPROXIMATE

LEGEND

— — — EXISTING GROUND

——— DESIGN GROUND

1 FT HORIZONTAL = 20 FT VERTICAL

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DESIGNED: JRP, BSP, JKA	SUB SHEET NO.	LONGITUDINAL PROFILE	SHEET
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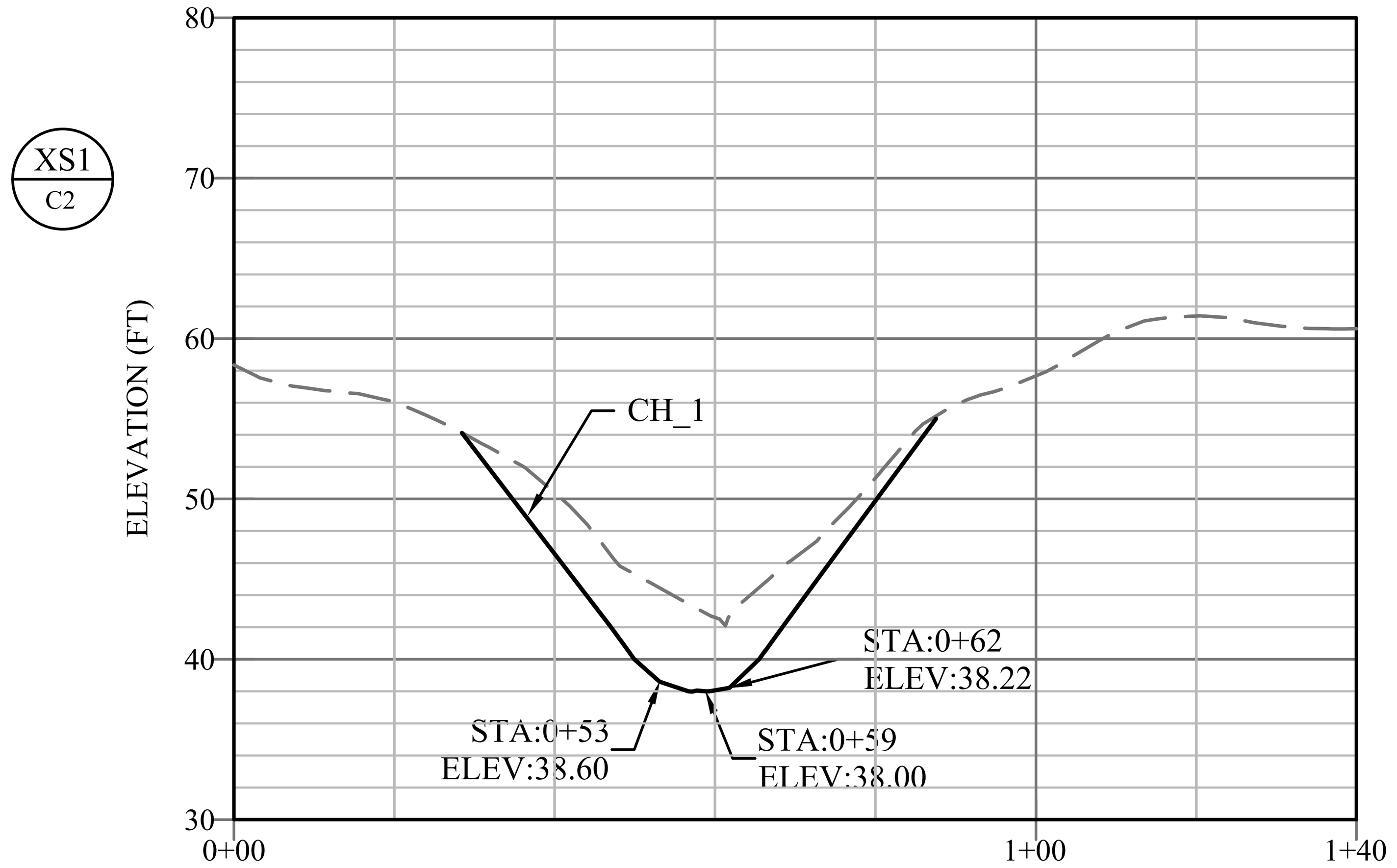
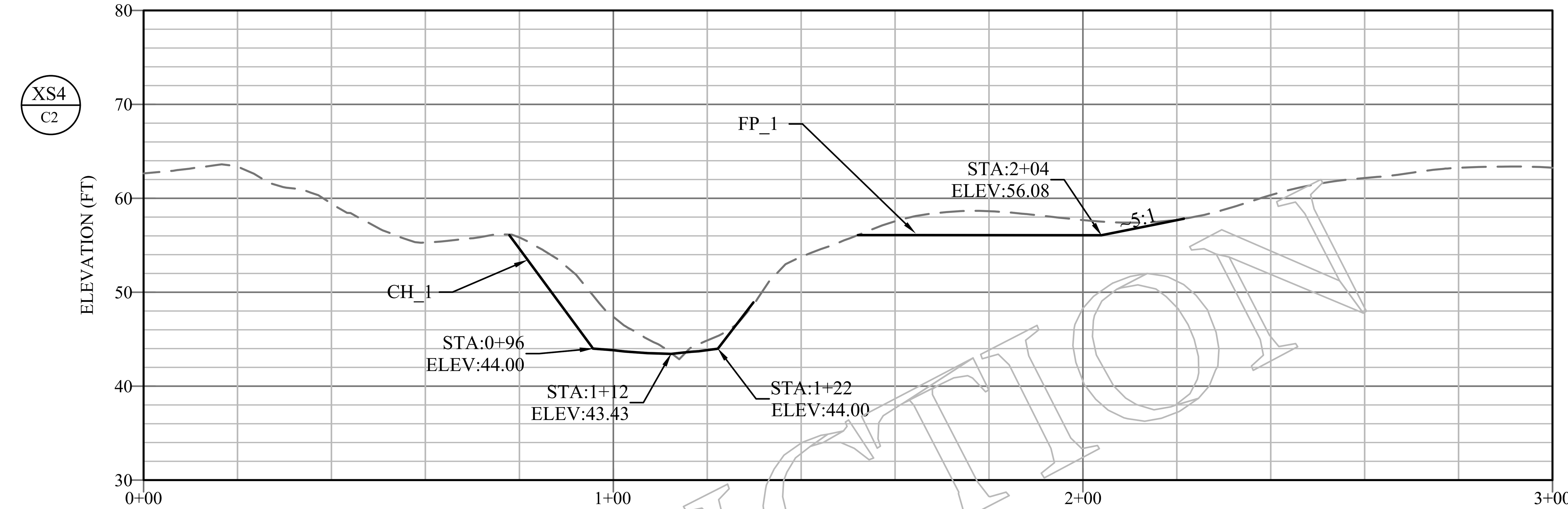
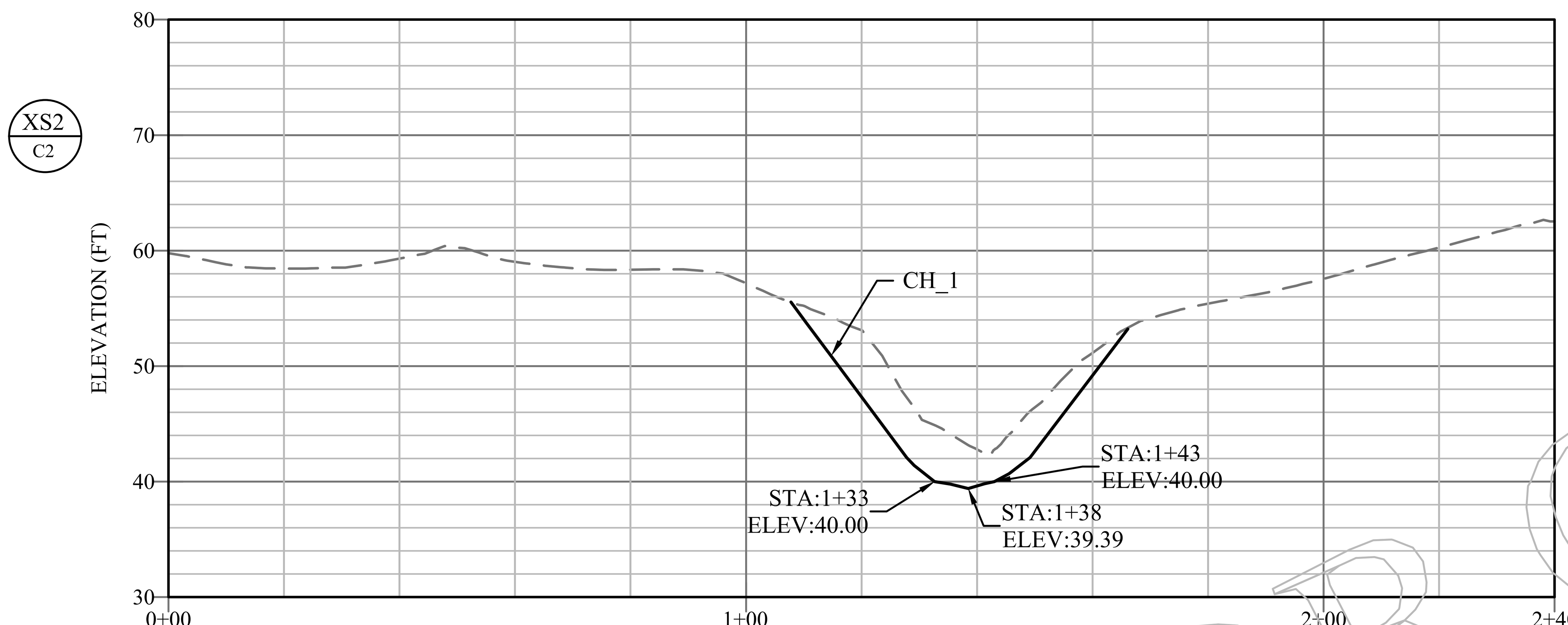
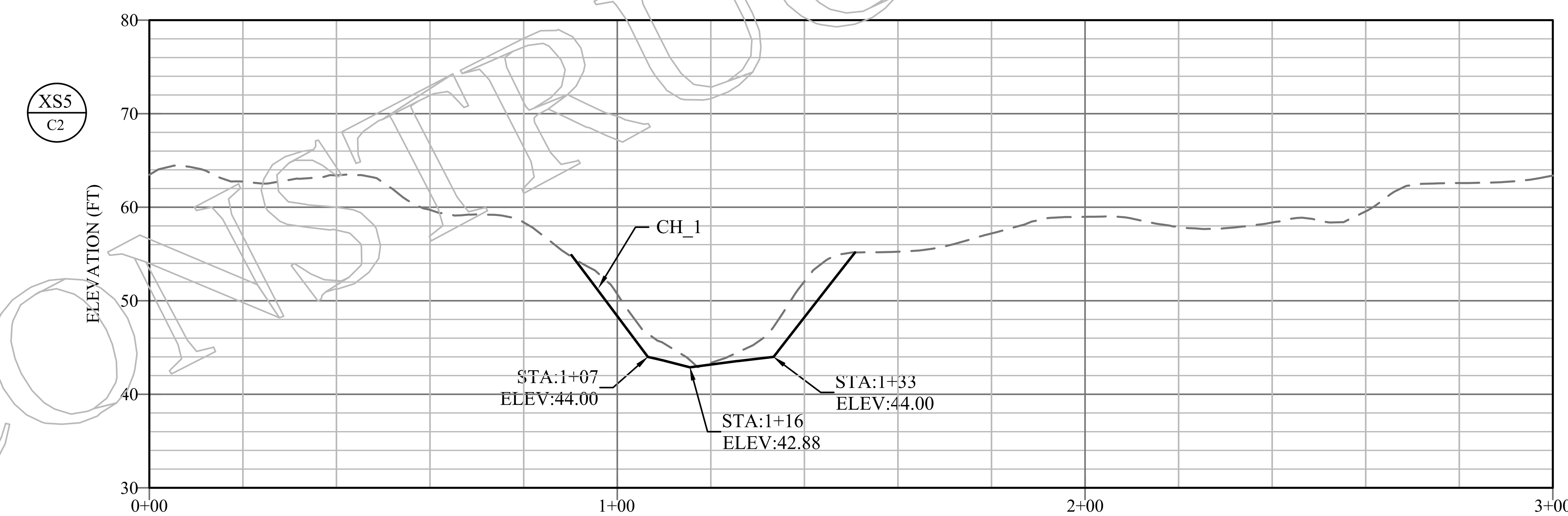
DATE: 01/25/2019			

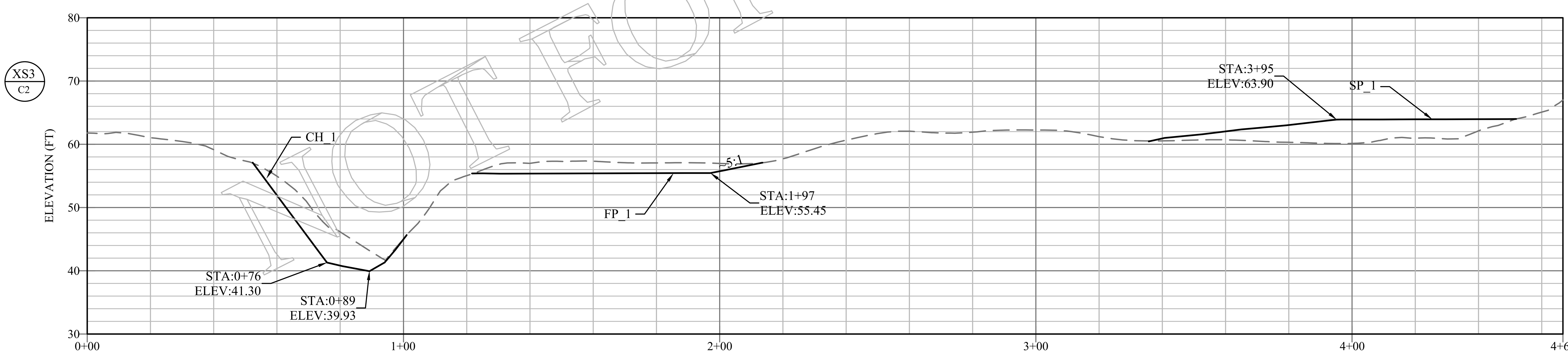


NOTE:
ALL CHANNEL SIDE SLOPES ARE 1.5 HORIZONTAL : 1 VERTICAL









SECTIONS ARE VERTICALLY EXAGGERATED: 1 FT HORIZONTAL = 2 FT VERTICAL

LEGEND

DESIGN GROUND

EXISTING GROUND
(SURVEY & 2005 LiDAR)

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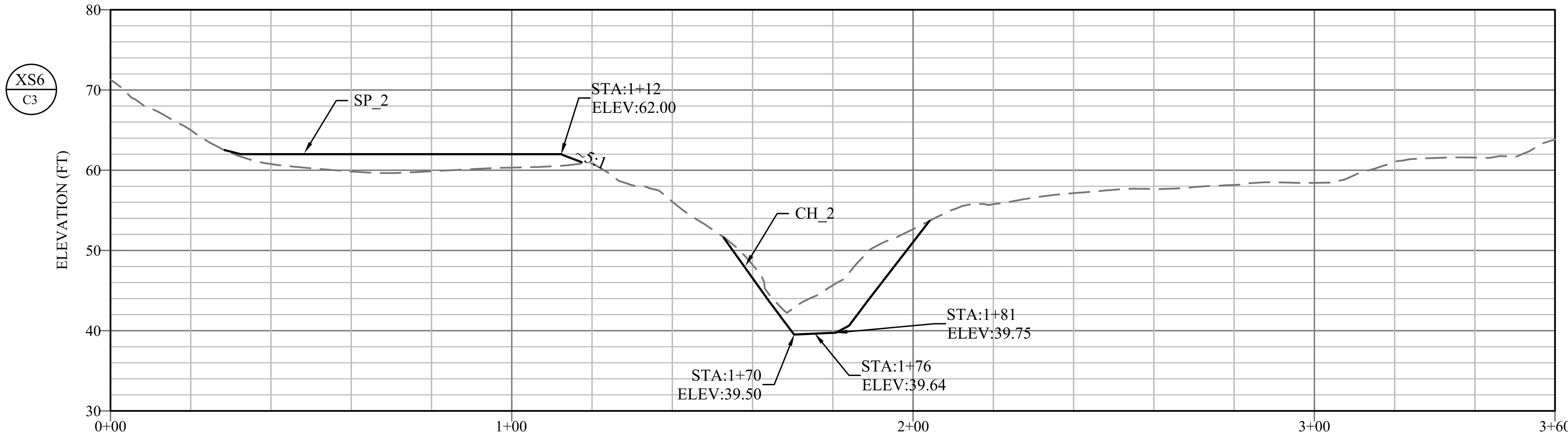
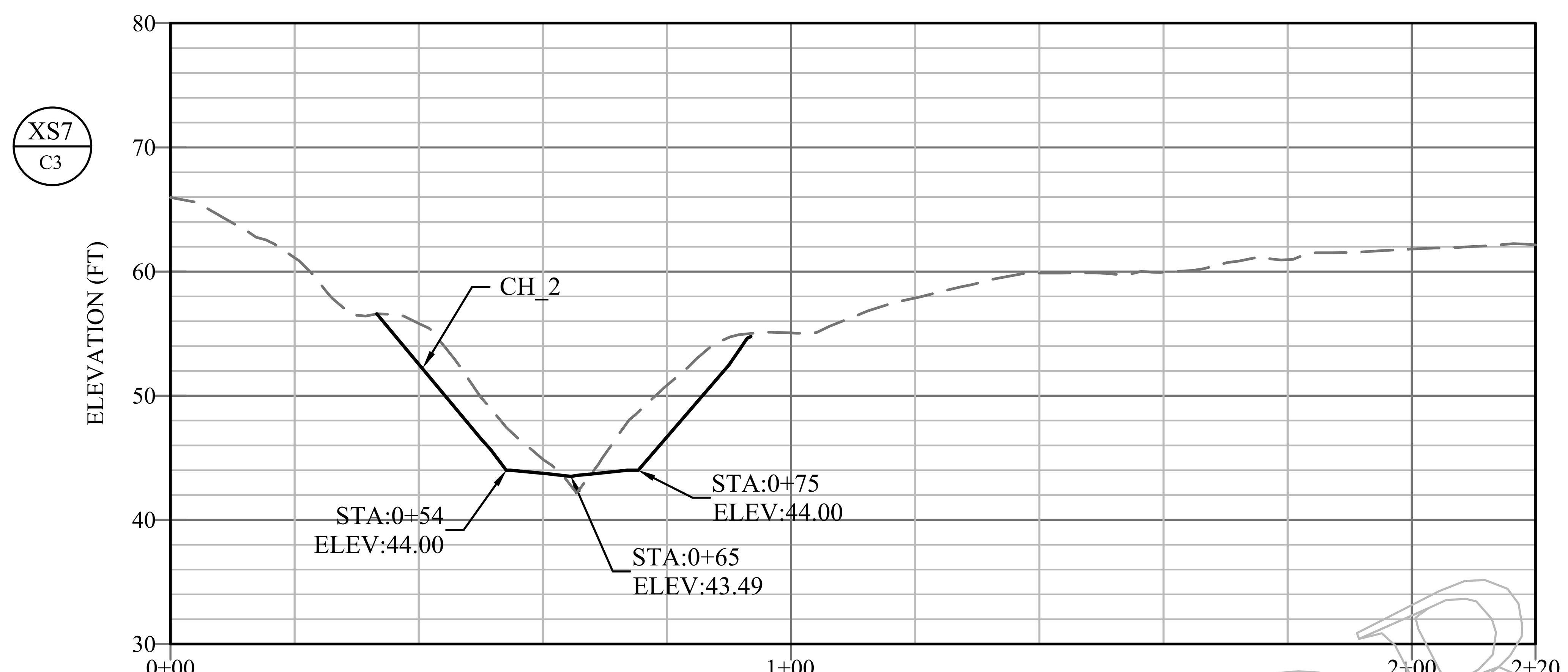
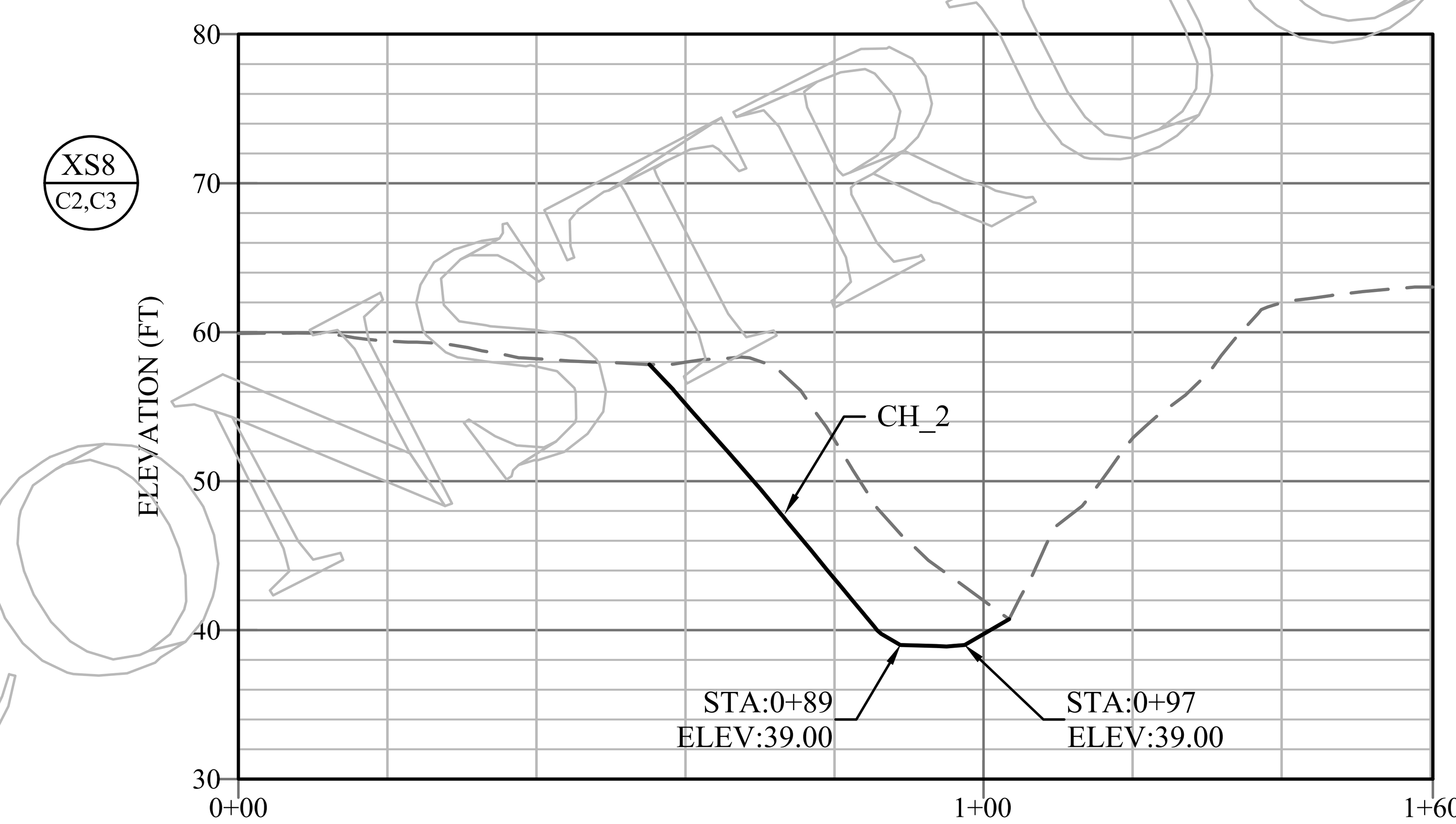
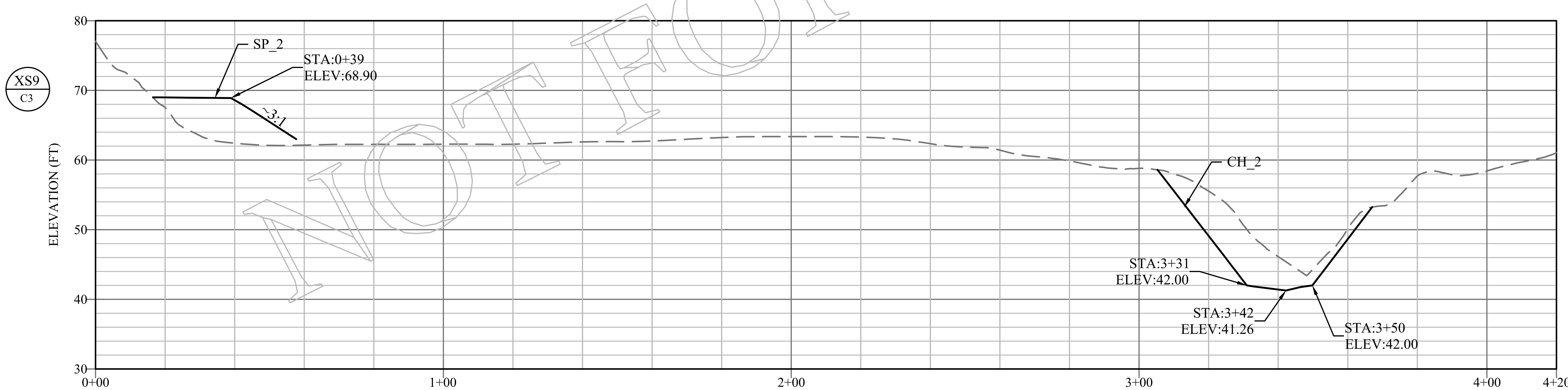
DESIGNED: JRP, BSP, JKA DRAFTED: CEP, CP TECH. REVIEW: JKA DATE: 01/25/2019	SUB SHEET NO. C6	CROSS SECTIONS I FLOOD CURVE ELK RIVER PILOT PROJECTS	SHEET 9 OF 14

NOTE:
ALL CHANNEL SIDE SLOPES ARE 1.5 HORIZONTAL : 1 VERTICAL









SECTIONS ARE VERTICALLY EXAGGERATED: 1 FT HORIZONTAL = 2 FT VERTICAL

LEGEND

DESIGN GROUND

EXISTING GROUND (SURVEY & 2005 LiDAR)

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CIVIL
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Northern Hydrology & Engineering

DESIGNED: JRP, BSP, JKA	SUB SHEET NO.	CROSS SECTIONS II	SHEET
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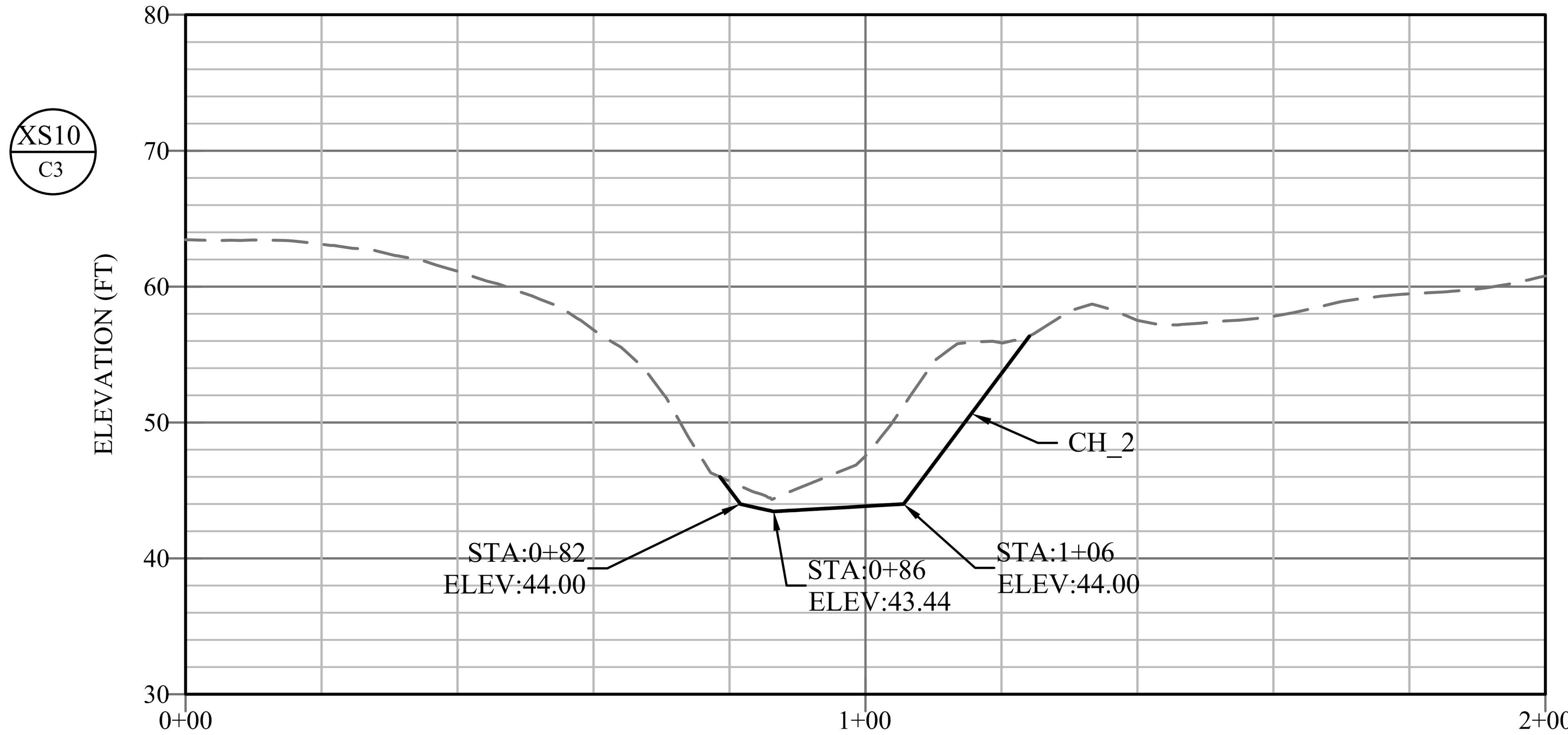
DATE: 01/25/2019			14



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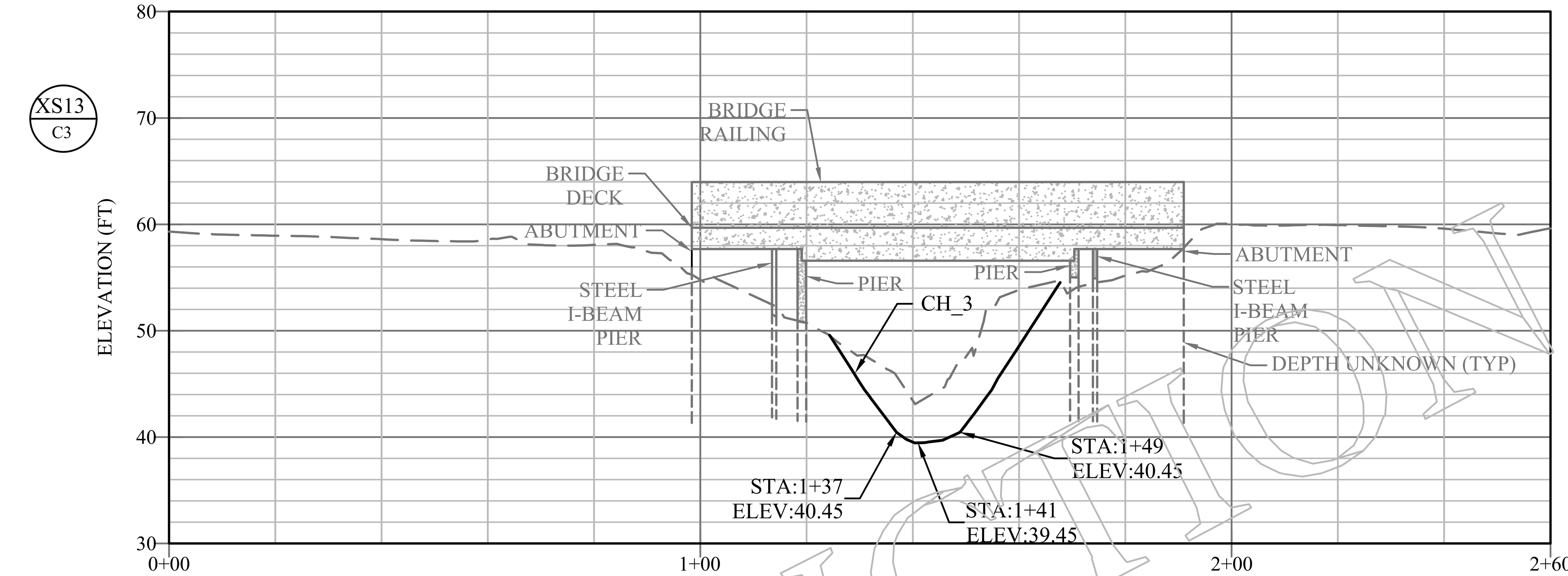

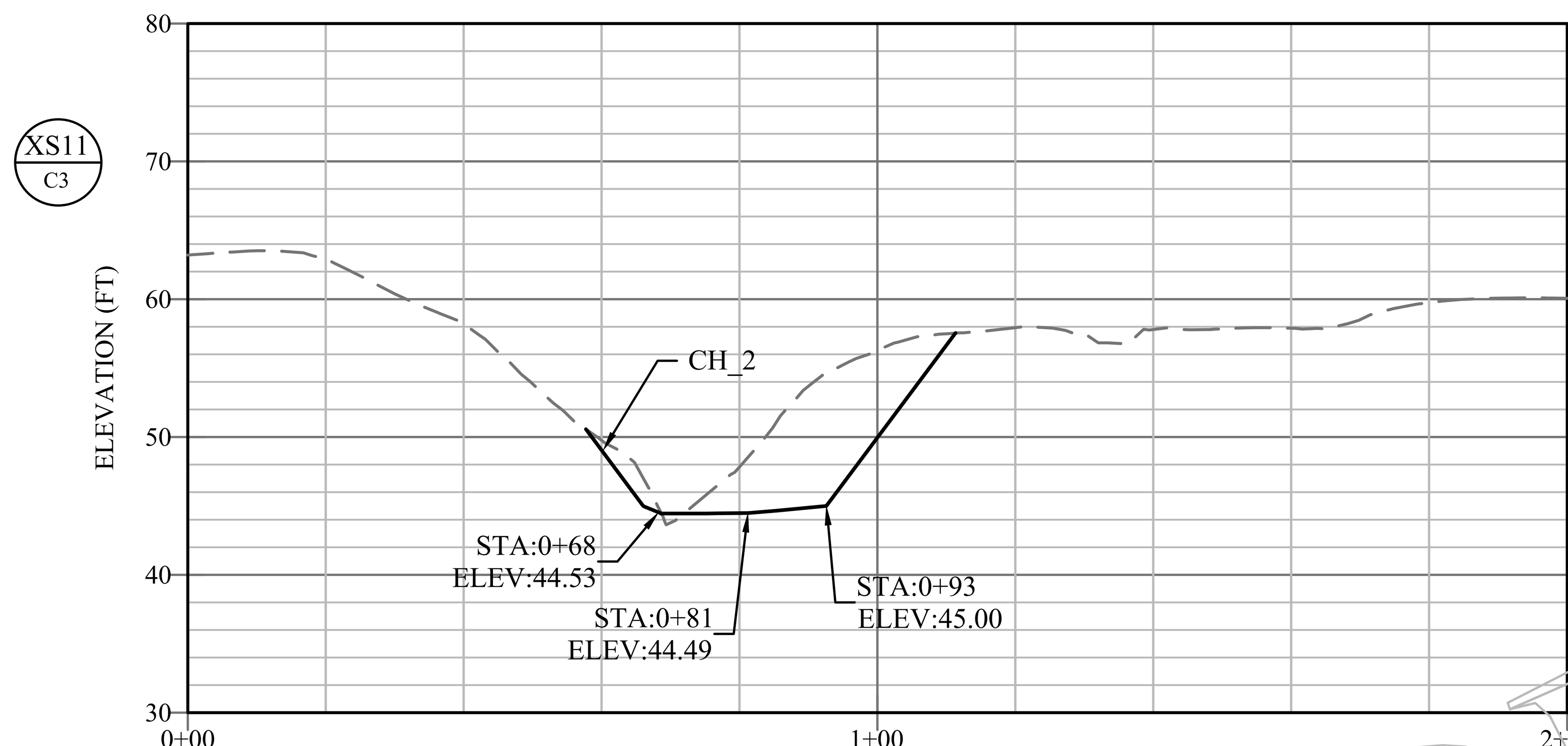

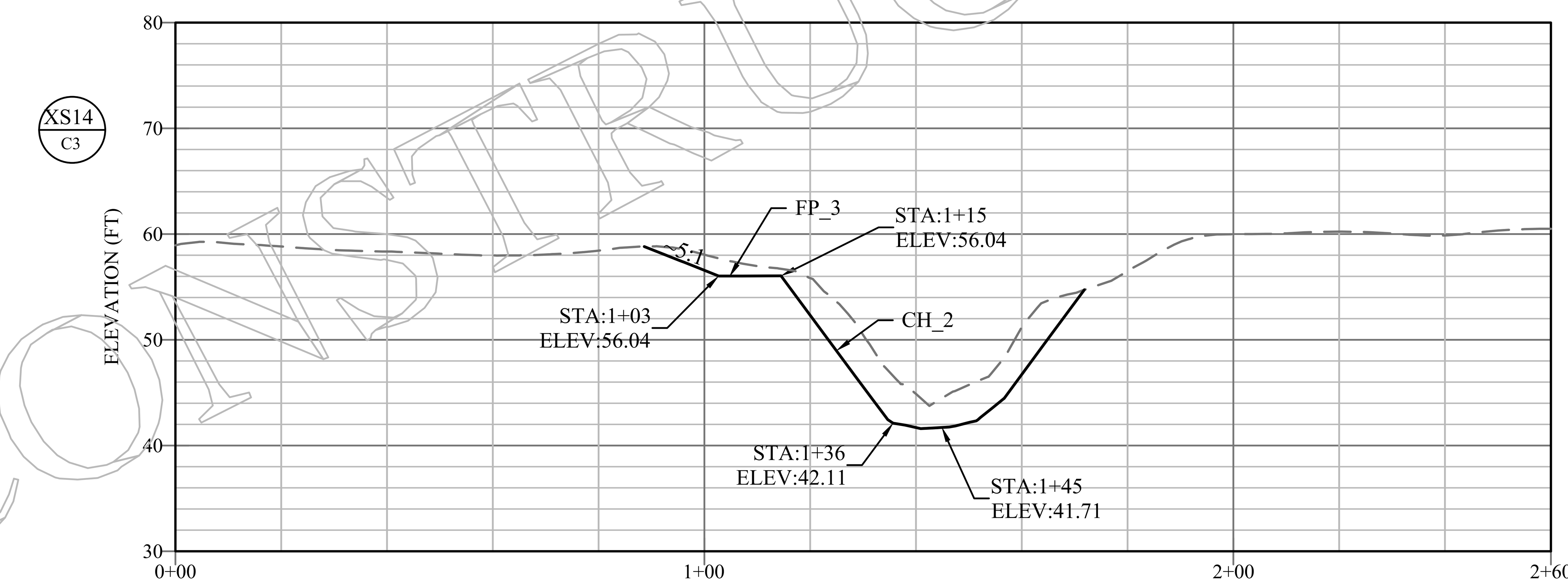

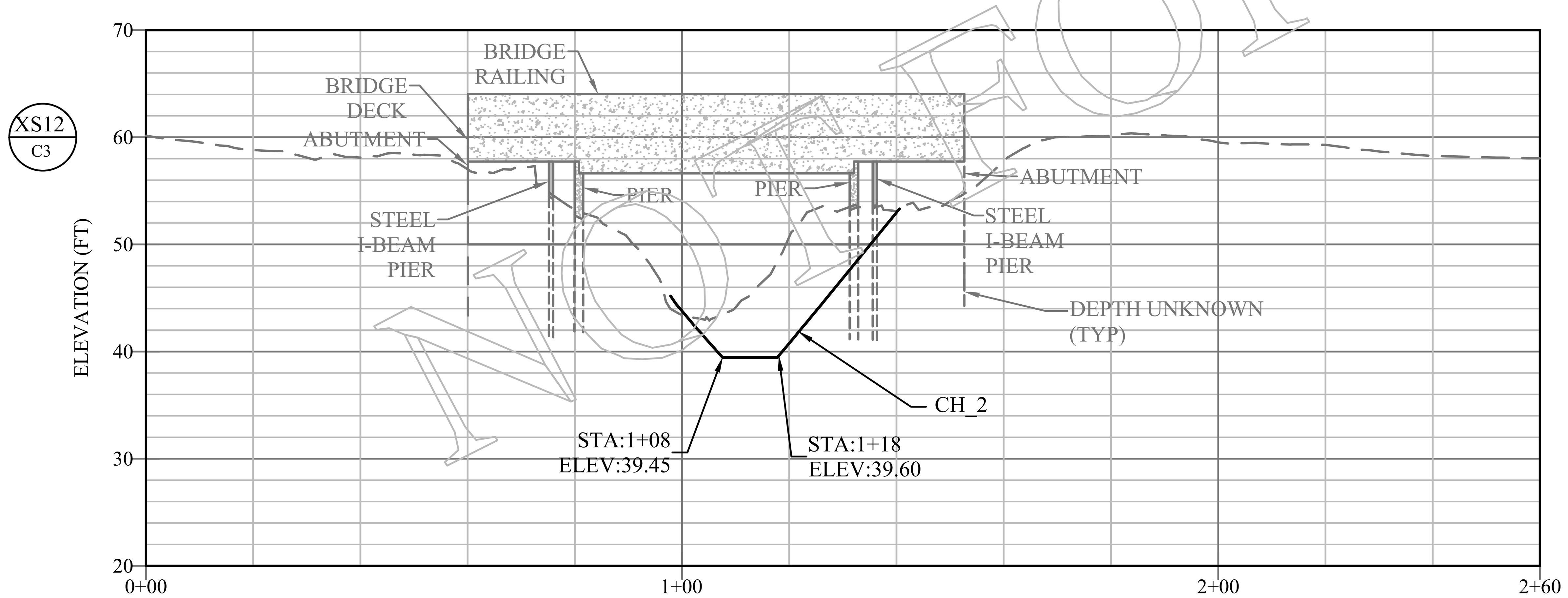

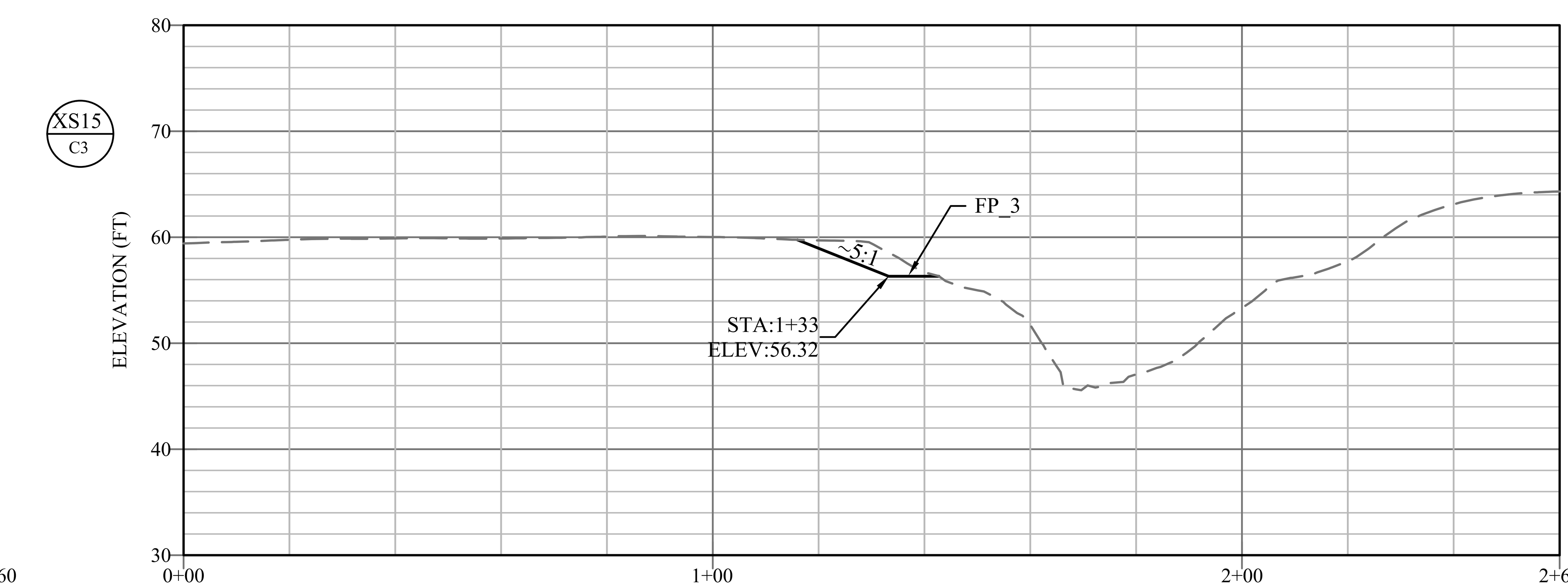

SECTIONS ARE VERTICALLY EXAGGERATED: 1 FT HORIZONTAL = 2 FT VERTICAL

LEGEND

DESIGN GROUND

EXISTING GROUND (SURVEY & 2005 LiDAR)

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DESIGNED: JRP, BSP, JKA	SUB SHEET NO.	CROSS SECTIONS III	SHEET
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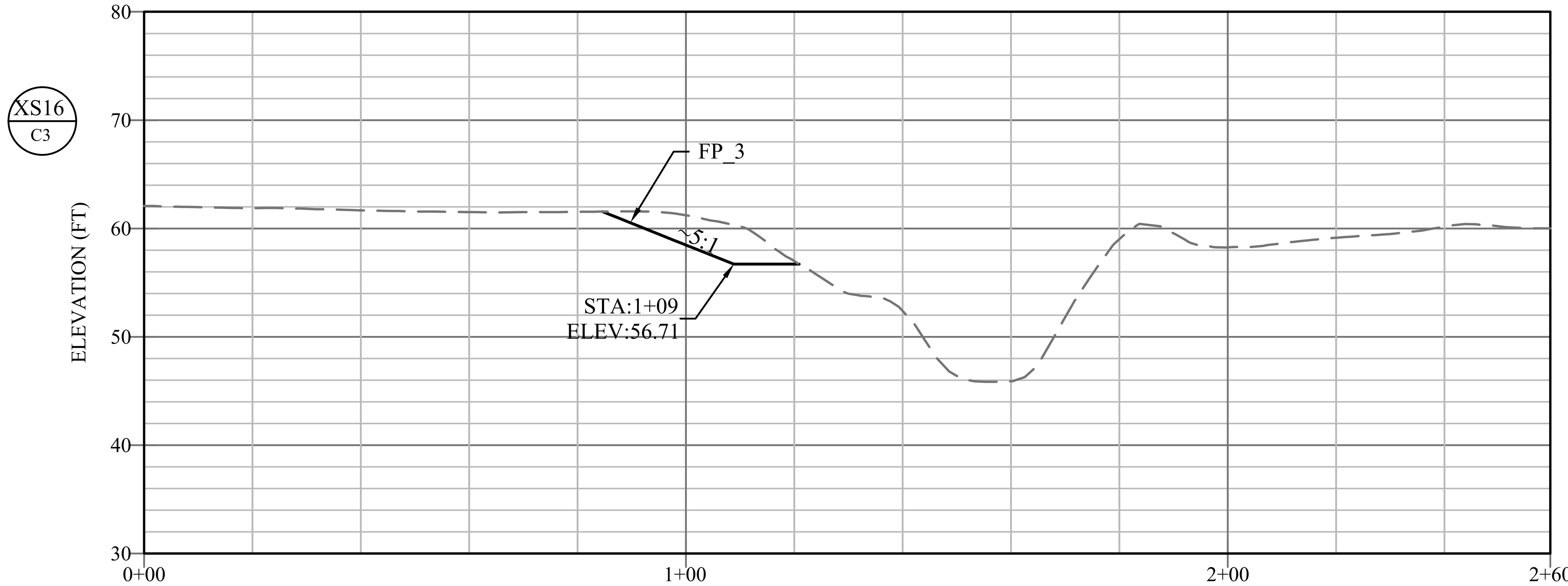
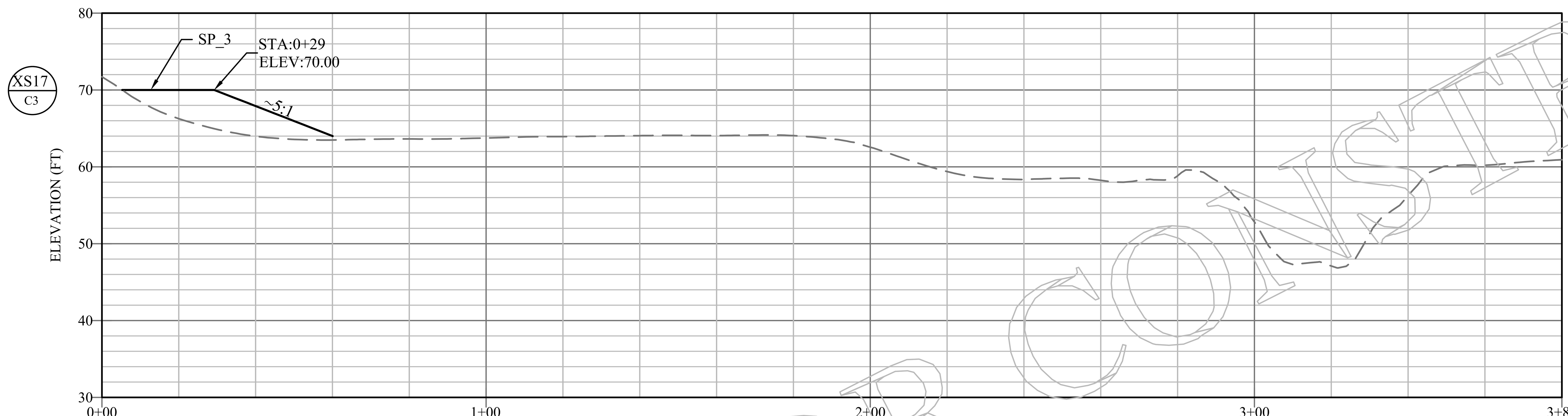
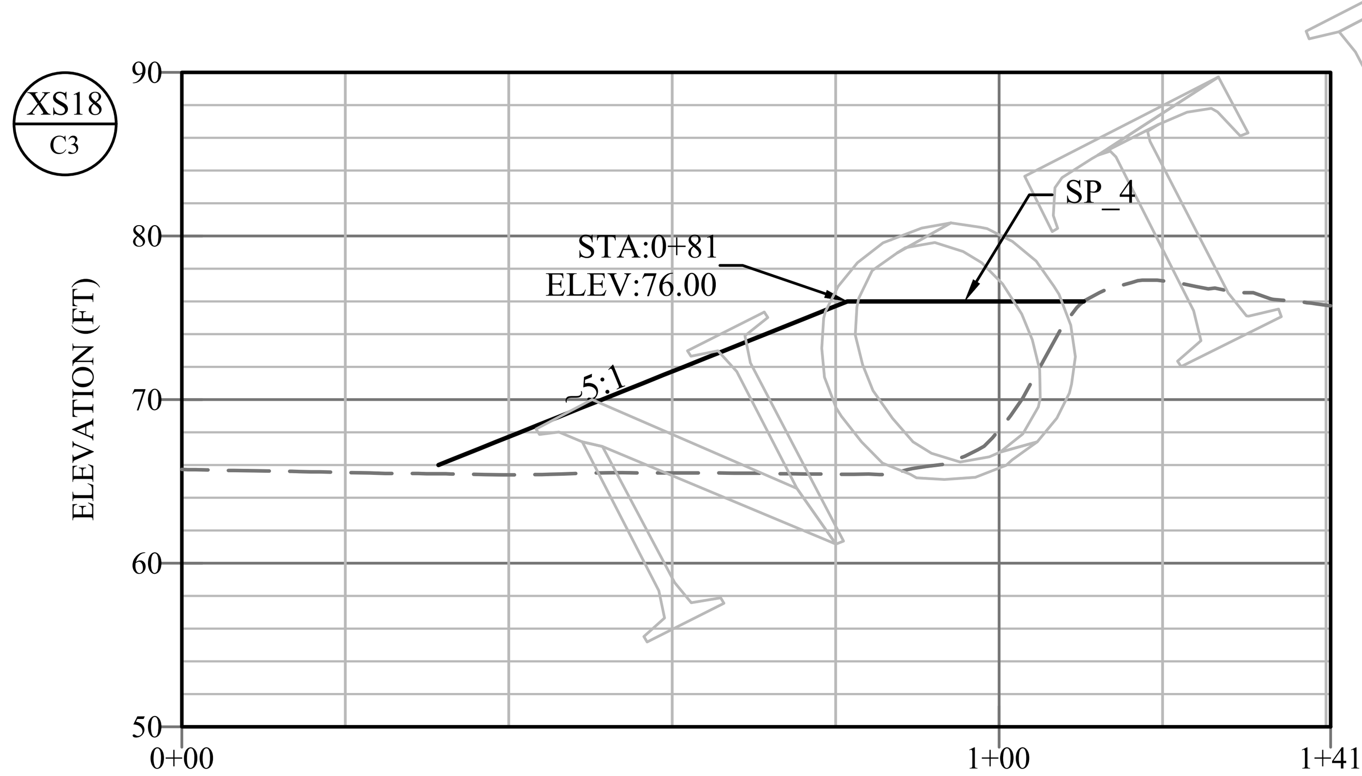


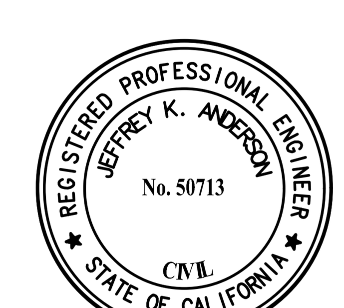




SECTIONS ARE VERTICALLY EXAGGERATED: 1 FT HORIZONTAL = 2 FT VERTICAL

LEGEND

- DESIGN GROUND
- EXISTING GROUND (SURVEY & 2005 LiDAR)



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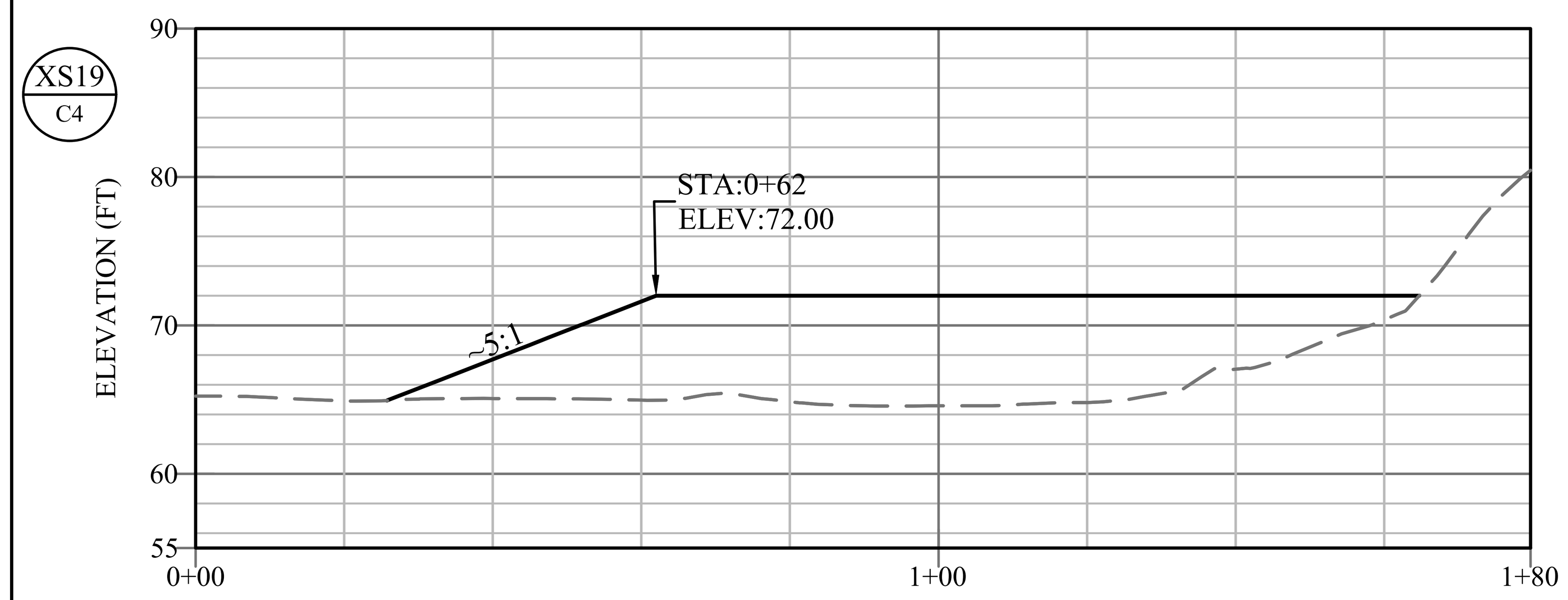

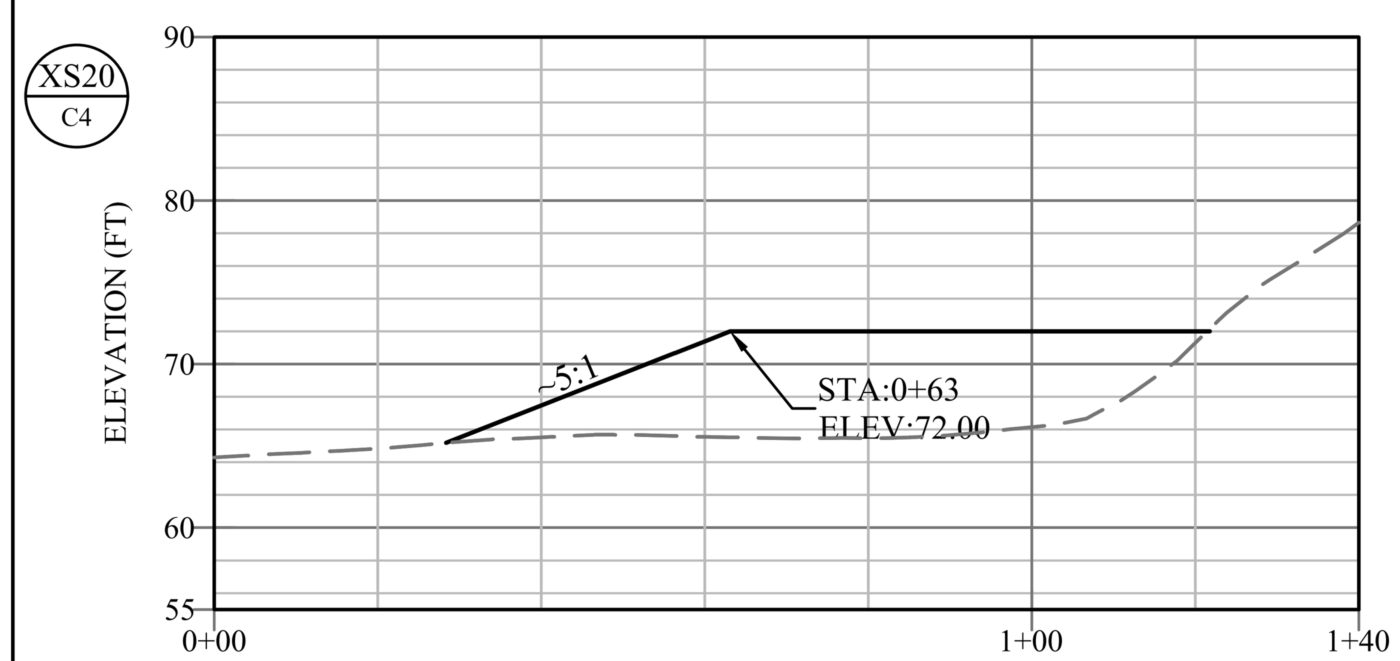

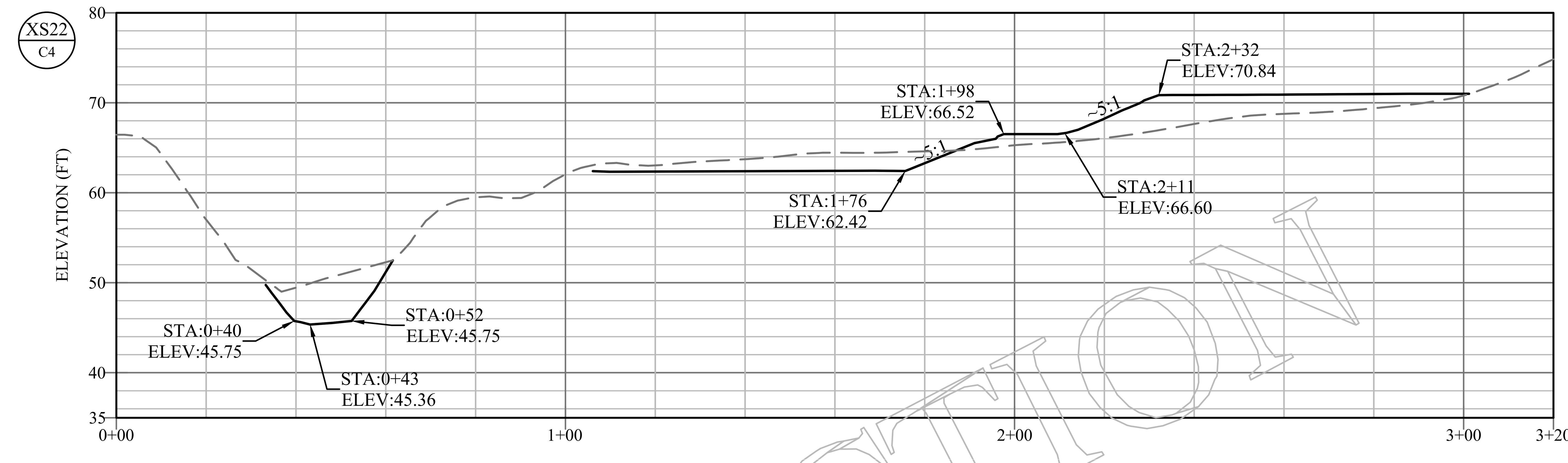

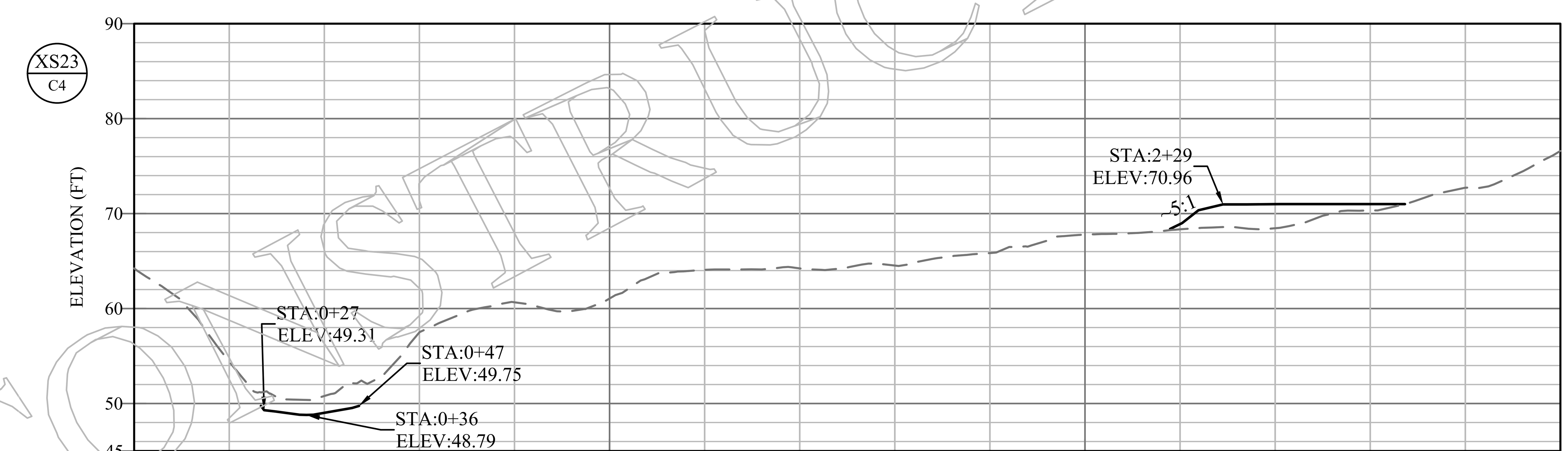

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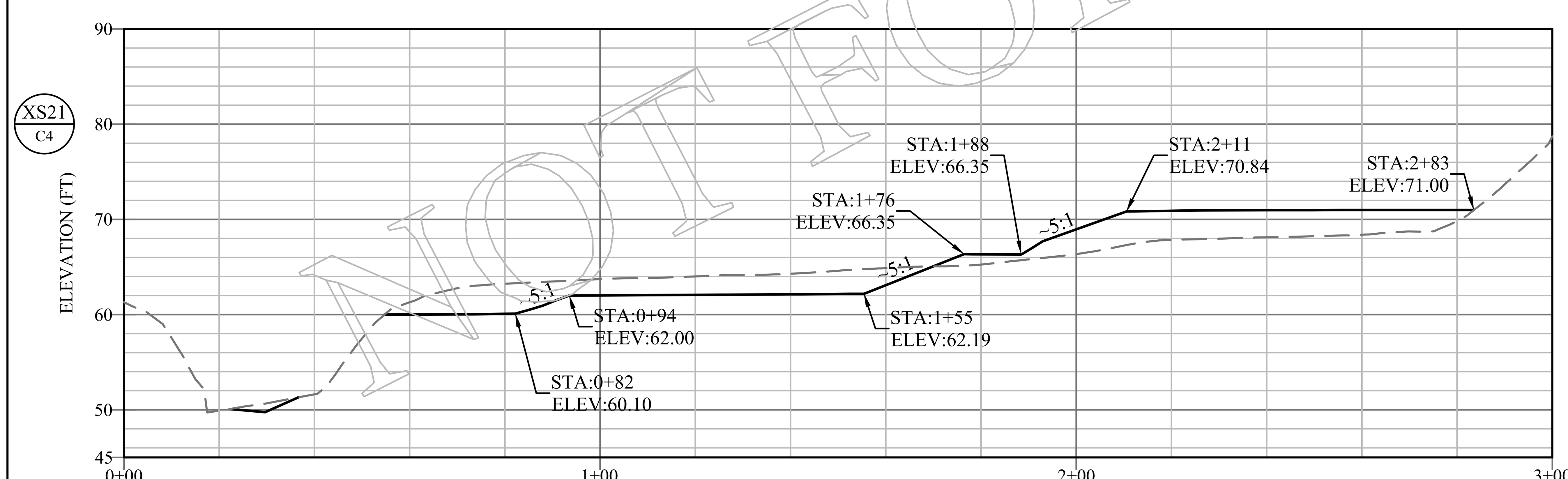

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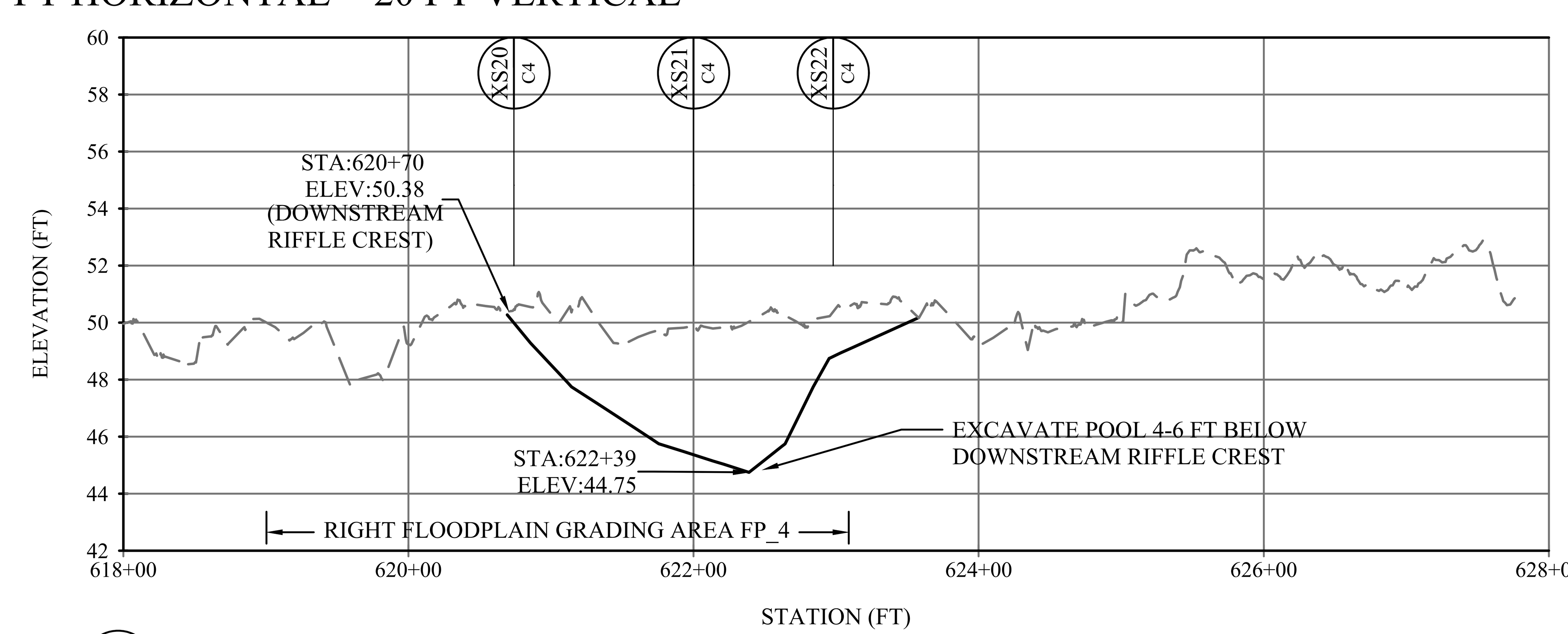

LP1
C1
NORTH FORK ELK RIVER LONGITUDINAL PROFILE (EXISTING ALIGNMENT)

LEGEND
DESIGN GROUND
EXISTING GROUND (SURVEY & 2005 LiDAR)

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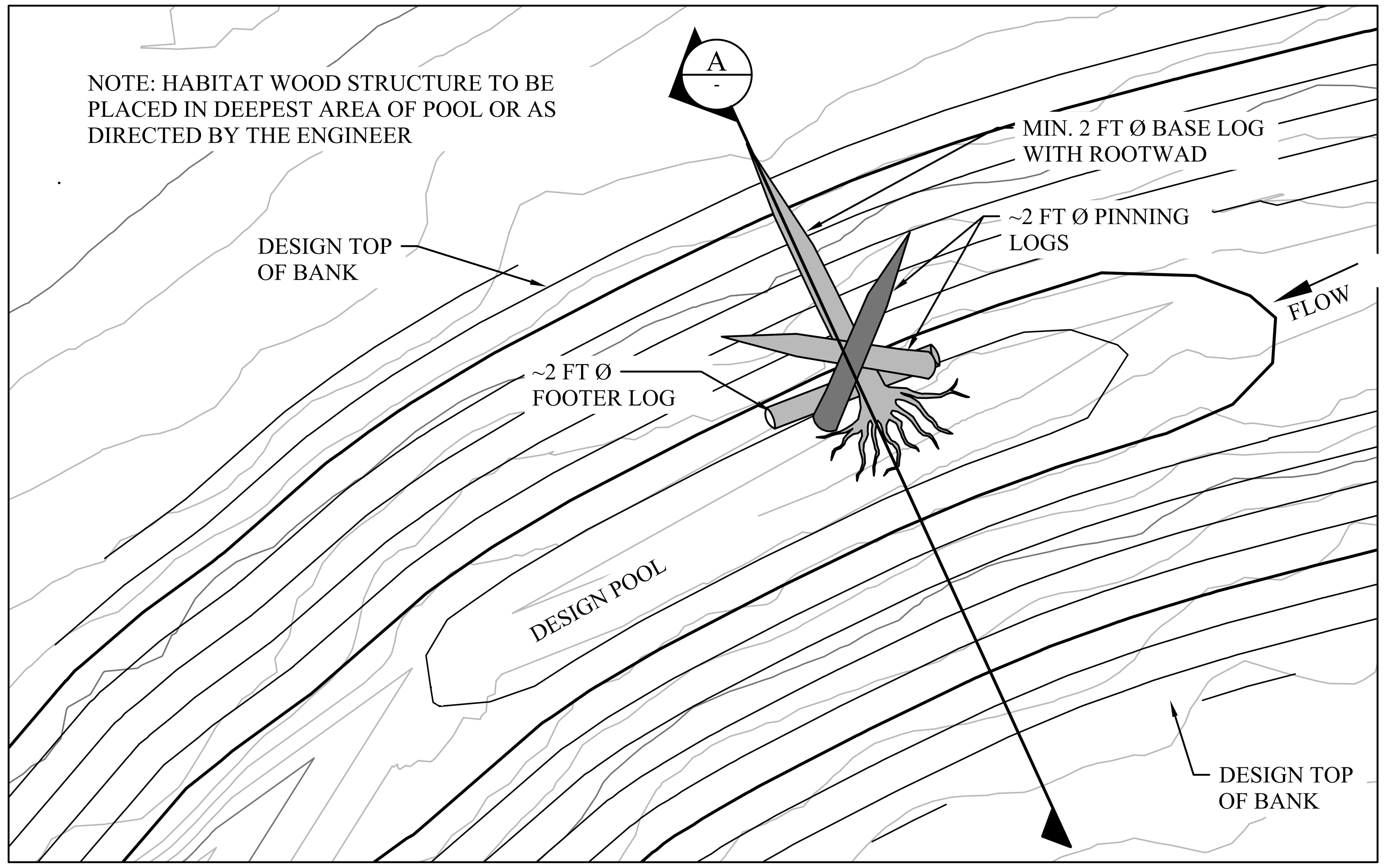
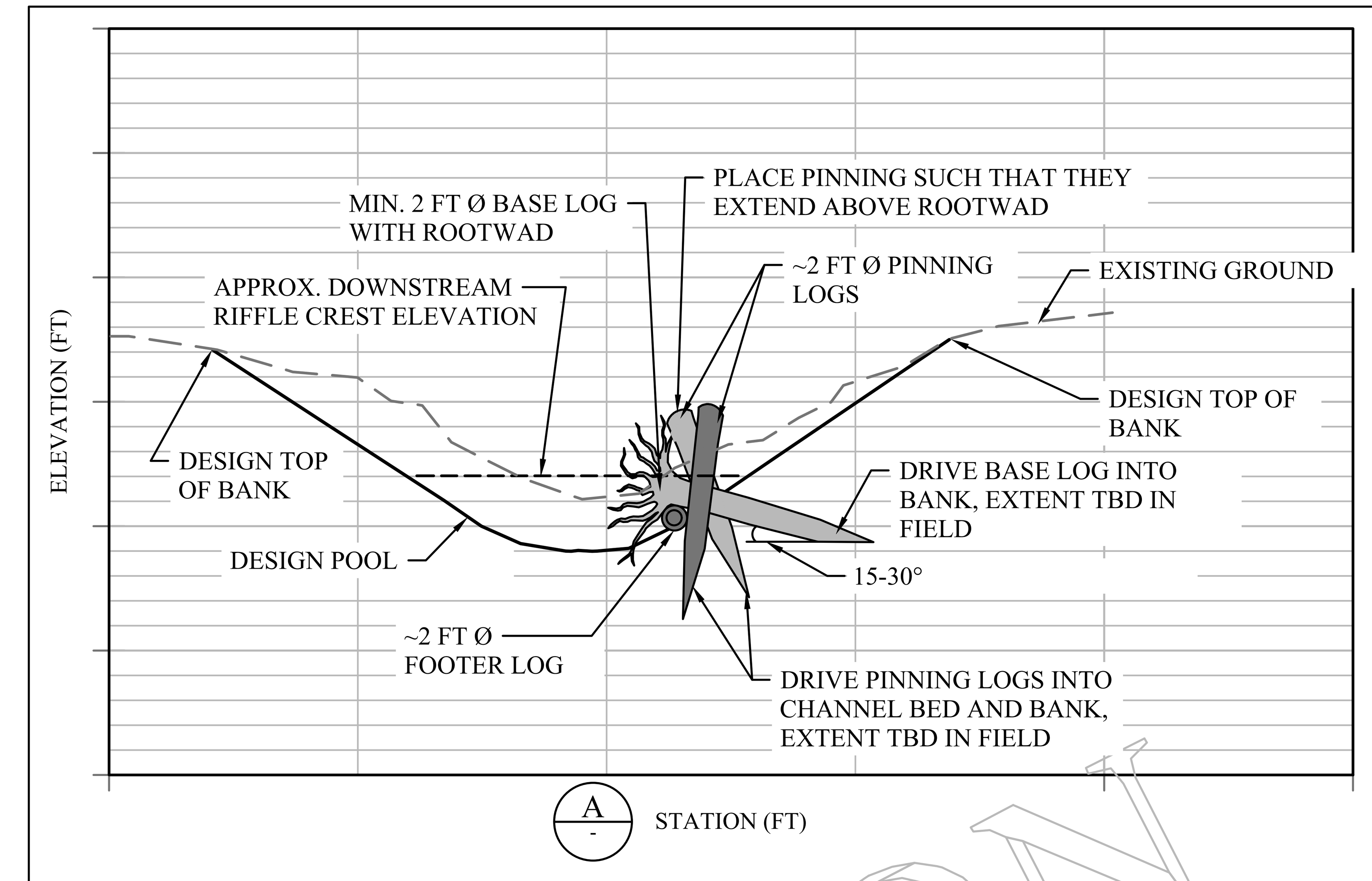
Northern Hydrology & Engineering

DESIGNED: JRP, BSP, JKA	SUB SHEET NO.	CROSS SECTIONS V & LP	SHEET
DRAFTED: CEP, CP	C10	WRIGLEY ORCHARD	13
TECH. REVIEW: JKA		ELK RIVER PILOT PROJECTS	OF
DATE: 01/25/2019			14

DETAIL 1: HABITAT WOOD STRUCTURE DETAIL



DETAIL 1A: HABITAT WOOD STRUCTURE PLAN VIEW



DETAIL 1B: HABITAT WOOD STRUCTURE SECTION VIEW

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DRAFTED: CEP, CP	C11	ELK RIVER PILOT PROJECTS	14 OF 14
TECH. REVIEW: JKA			
DATE: 01/25/2019			

APPENDIX B

Draft Biological Assessment

BIOLOGICAL ASSESSMENT

Elk River Sediment Remediation And Habitat Rehabilitation Pilot Implementation Project

Wrigley Orchard and Elk River Flood Curve Reaches

Prepared for:
U.S. Army Corps of Engineers
National Marine Fisheries Service
United States Fish and Wildlife Service
California Department of Fish and Wildlife

Prepared by:
CALIFORNIA TROUT

April 2019

CALIFORNIA
Water Boards

Funding for this project has been provided through an agreement with the State Water Resources Control Board

California Trout. Elk River Sediment Remediation and Habitat Rehabilitation Pilot Implementation Project—Biological Assessment. April 2019. Humboldt County, CA

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1 INTRODUCTION

The North Coast Regional Water Quality Control Board (RWQCB) and California Trout (CalTrout) propose to implement a pilot sediment remediation and channel reconfiguration project along the lower North Fork of the Elk River in Humboldt County, California. **The Elk River Sediment Remediation and Habitat Rehabilitation Pilot Implementation Project (Proposed Project or Project)** has been funded by the State Water Resources Control Board (SWRCB) Timber Regulation and Forest Restoration Fund, Agreement No. D1513103. California Trout (CalTrout) is the grant recipient and will serve as the permit applicant (landowner Duly Authorized Agent).

According to the Grant Agreement, California Trout will implement a pilot sediment remediation project on the North Fork of the Elk River to test key assumptions of the Elk River Recovery Assessment (ERRA), a technical feasibility study of instream sediment remediation options completed by CalTrout and our technical partners in November 2018 (https://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/elk_river/pdf/181203/ERRA%20Framework%20with%20appendices_181202%20(large).pdf). A co-equal objective of the Pilot Project is to rehabilitate the currently heavily degraded juvenile salmonid rearing habitat to benefit Chinook Salmon (*Oncorhynchus Tshawytscha*), Coho Salmon (*O. kisutch*), and Steelhead Trout (*O. mykiss*) which are listed as Threatened under the Federal Endangered Species Act. Other species such as Coastal Cutthroat Trout (*O. Clarkii*) and Pacific Lamprey (*Entosphenus tridentatus*) will also benefit from habitat remediation in this reach.

The project is located on six privately owned properties along the lower-most 6,200 ft of the North Fork Elk River, the Wrigley Orchard Reach and the Elk River Flood Curve Reach (**Figure 1**). The project will treat approximately 2,375 linear feet to remove up to 22,000 cubic yards of excess fine sediment from the streambed and banks of the North Fork Elk River and reconstruct the channel with several large wood habitat features. Note that the Project targets a minimum 18,000 cubic yards of material to be removed; however as currently designed the Proposed Project would remove 22,00 cubic yards of fine sediment, achieving equal amounts of cut and fill on-site. The actual amount of sediment to be removed will depend on the construction budget but would not be more than 22,000 cubic yards.

In 2017, CalTrout subcontracted with Northern Hydrology & Engineering (NHE) and Stillwater Sciences to develop engineering designs for the Proposed Project. A first draft of the 65% engineering designs was completed in December 2017 and was presented to permitting agencies for review. CalTrout hosted several pre-consultation meetings and conducted a site visit with the California Department of Fish and Wildlife (CDFW), National Marine Fisheries

Service (NMFS), US Army Corps of Engineers (USACE), and RWQCB, during which our design team received substantial constructive comments related to take of listed salmonid species, impacts to riparian vegetation, and opportunities for habitat rehabilitation in the Project reaches.

In response to ESA Section 7 Pre-consultation discussion, the first draft 65% engineering designs were substantially revised to <u>minimize and mitigate</u> impacts to riparian vegetation, <u>minimize</u> impacts to listed salmonid species, emphasize salmonid habitat benefits while still meeting the Project objectives, and propose <u>mitigation</u> for remaining impacts at a level that is acceptable to reviewing agencies. Changes to project elements included in the original draft 65% designs made in response to agency review, include:

- Elimination of five originally proposed riparian floodplain bench excavation areas (labeled as FP-1, FP-2, FP-3, FP-4 and FP-7 in the original draft 65% engineering designs); four floodplain excavation areas remain in the revised project design
- Reduction of the extent of in-channel excavation, eliminating two segments (labeled CH-3 and CH-5 in the original draft 65% engineering designs) totaling approximately 900 ft; four channel excavation areas remain in the revised project design

  Elimination of three sediment disposal areas or "fill sites" (labeled as SP-1, SP-6 and SP-19 in the original draft 65% engineering designs); six sediment reuse or spoil sites remain in the revised project design.

The revised Elk River Sediment Remediation Pilot Implementation Project: Flood Curve and Wrigley Orchard Draft 65% Engineering Designs (01-25-2019) are in **Attachment A**. The Wrigley Orchard and Flood Curve project reaches are proposed as one permitting and construction phase, targeting late-summer 2019 for implementation. Henceforth the Proposed Project refers to the revised/modified and re-engineered Project. The RWQCB and CalTrout are simultaneously preparing an Initial Study/Mitigated Negative Declaration (IS/MND) that evaluates potential environmental effects of the Proposed Project that is anticipated to be released for public review in March-2019.

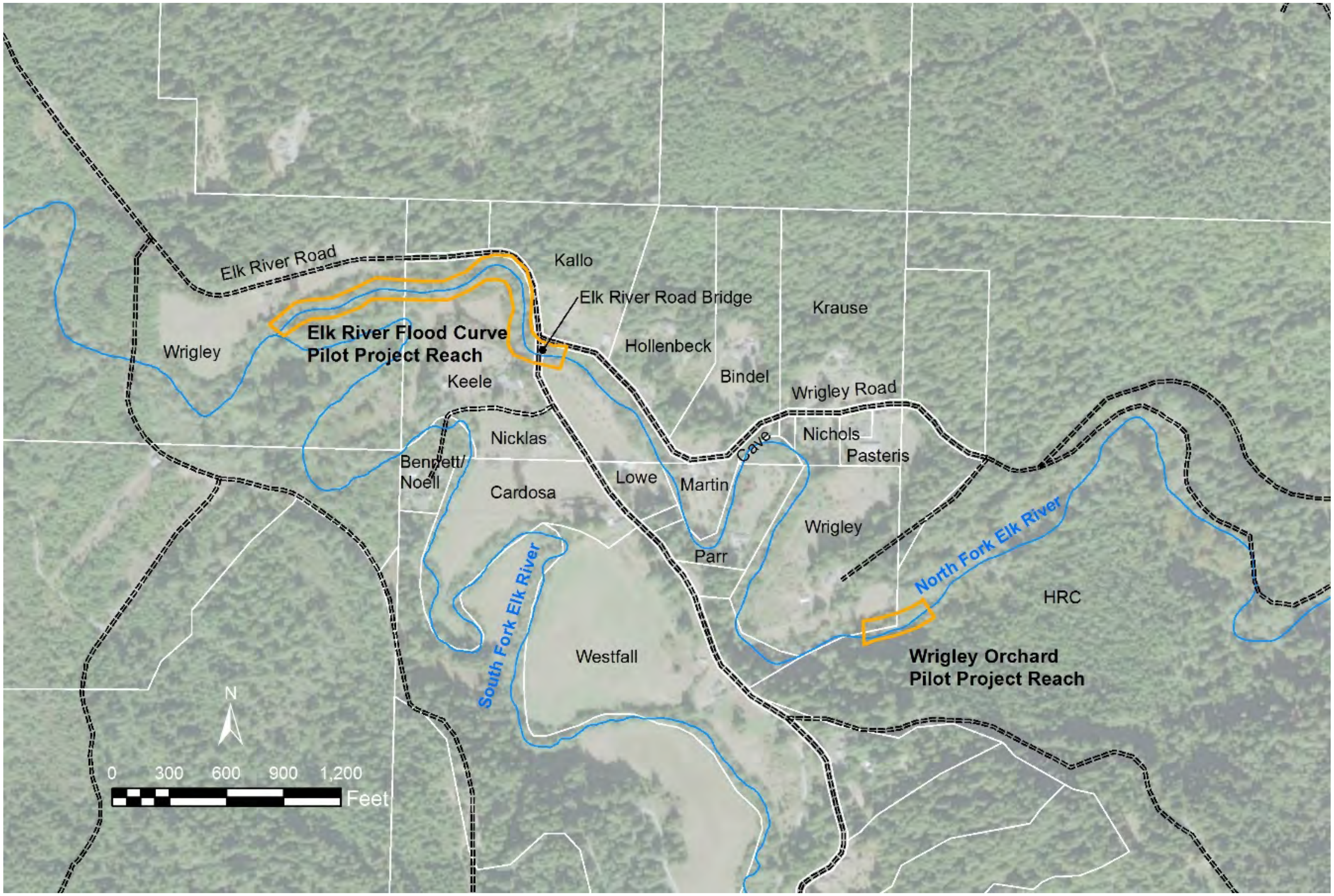

Figure 1. *Location of the Elk River Sediment Remediation and Habitat Rehabilitation Pilot Implementation Project including Wrigley Orchard and Elk River Flood Curve Project reaches.*

2 BACKGROUND AND REGULATORY SETTING

2.1 Watershed Condition and Impairment

The Elk River watershed has undergone several extensive anthropogenic disturbances over the last century and a half. Commercial timber harvest operations beginning in the late 1800s severely altered natural hillslope erosional processes and significantly changed sediment supply, transport, and depositional processes in stream channels and on floodplains. Stream channels were historically maintained relatively clean of large wood to facilitate transporting logs downstream. Timber harvesting and consequent management-related sediment loading markedly increased from 1988 to 2000 when Maxxam Corporation (Maxxam) owned and managed Pacific Lumber Company (PALCO). During this time, PALCO adopted more aggressive road building and silvicultural practices, accelerating the annual average harvest rate by approximately five times the previous long-term average (Regional Water Board 2013). During this period of accelerated harvest, Elk River experienced several water years with higher than average rainfall. Significant rainfall events that occurred across the highly erodible and recently disturbed landscape during these years resulted in numerous large landslides, historically unprecedented sediment delivery to the upper Elk River and its tributaries, and significant sedimentation in lower-gradient channel reaches. Elevated sediment loading and channel sedimentation continued through the last decade of the twentieth century. Humboldt Redwood Company is the current owner of these former PALCO lands and is working to mitigate controllable sediment sources.

Changes in floodplain land uses in Lower Elk River, primarily for livestock and dairy operations, have also affected stream channel, riparian vegetation, and salmonid habitat conditions. Estuarine and tidal wetlands were diked and drained to reclaim these lands for agricultural use, reducing the extent and effects of tidal influence in lower reaches of Elk River. Although land development and infrastructure are relatively limited in Elk River, numerous roads and bridges, rural residential developments, and other infrastructure have also altered watershed conditions. Although other causative mechanisms may have influenced the rate of sediment deposition in the Elk River, such as an erodible geology, tectonic uplift, inter-seismic subsidence, the contribution of these mechanisms on the system's ability to transport sediment were the subject of multiple studies throughout TMDL development. For the relative contribution of other causative sources refer to the TMDL Technical Analysis for Sediment (Tetra Tech 2015) and the Action Plan for the Upper Elk River Sediment TMDL (RWB 2016). Per the Action Plan for the Upper Elk River Sediment TMDL, "pilot remediation projects will be implemented as part of the Elk River Recovery Assessment, including effectiveness monitoring to assess which techniques should be brought full-scale". This Biological Assessment accepts the findings of the TMDL (adopted by USEPA in April 2018) related to sediment source analysis and is intended to move from the evaluation phase into sediment remediation actions intended to put the Elk River system on a trajectory toward the recovery of beneficial uses (not to recreate historical conditions).

Discharges of sediment and organic debris to watercourses have aggraded stream channels in the low gradient reaches of Elk River, significantly reducing channel capacity. Prior analysis of available North Fork Elk River, South Fork Elk River, and Mainstem Elk River cross-section data indicated there is approximately 640,000 cubic yards (yd^3) of excess stored sediment impairing the Elk River channel: more than 280,000 yd^3 in the lower North Fork Elk River, nearly 100,000 yd^3 in the lower South Fork Elk River, and nearly 260,000 yd^3 in the upper Mainstem Elk River (Regional Water Board 2013). Uncertainty surrounding these prior estimates prompted additional data collection and modeling studies to refine the estimate.

Channel conditions do not currently meet water quality objectives (i.e., for sediment, suspended material, settleable matter, turbidity, and dissolved oxygen) and adversely impact multiple beneficial uses of water (i.e., municipal [MUN] and agricultural [AGR] water supplies, cold freshwater habitat [COLD], rare, threatened and endangered species [RARE], migration of aquatic organisms [MIGR], spawning, reproduction, and/or early development [SPWN], and water contact recreation [REC-1]). Severe stream channel aggradation has increased the incidence of nuisance flooding, affecting the use of, and access to property, and increasing the risk to human health and welfare. Fields, roadways, driveways, homes, and septic systems are frequently inundated. Overbank flooding onto roads and private properties in some locations in Elk River now occur several times a year, depending on the frequency, intensity, and duration of storm events. The impacted reach, as defined by the North Coast Regional Water Quality Control Board, extends from the confluence of Brown's Gulch on the North Fork Elk River and Tom's Gulch on the South Fork Elk River to Berta Road on the Mainstem Elk River (Regional Water Board 2016).

The Project area is located in a geomorphic reach referred to as the confined upper Mainstem Elk River and lower Forks. The channel in this reach is narrow and entrenched with steep banks and is characterized by a transition from predominantly gravel bed to predominantly sand bed marking the downstream extent of salmonid spawning habitat. Anecdotal evidence describes spawning as far downstream as the as the North Fork South Fork confluence. The lower North Fork Elk River and confined mainstem historically provided high quality and abundant year-round, non-natal rearing habitat for young-of-year and juvenile salmonids and was important during spring outmigration as juveniles and pre-smolts emigrated from upper forks and tributary rearing areas. Large wood recruited to the channel from adjacent floodplains was likely abundant as pieces and jams that provided complex habitat with deep pools, dense cover, coarse substrate, cold water, and abundant food resources. Juvenile salmonids rearing in these reaches during the winter may have been less dependent on high flow refugia in off channel floodplain areas due to low in-channel flow velocities resulting from the low-gradient reaches (NHE and SWS 2013).

Current habitat conditions in the lower North Fork Elk is characterized by sediment aggradation. Fine sediment accumulation has significantly impacted water quality, channel morphology, and adult holding and juvenile rearing habitat for salmonids in the confined upper Mainstem Elk River and lower forks. Although NMFS (2014, 2016) identifies Intrinsic Potential for salmonid production in these reaches, CDFW does not conduct spawning surveys downstream of the North Fork Elk River and South Fork Elk River confluence (Anderson and Ward 2015) due to the lack of spawning habitat. Salmonid rearing habitat is also currently heavily degraded by numerous factors with different effects during different rearing seasons. In summer, the effects of sediment aggradation and channel simplification have had pronounced detrimental effects on juvenile salmonid rearing habitat. Fine sediment aggradation has buried or embedded riffle substrates, likely reducing benthic invertebrate productivity (in overall biomass and abundance) and diminishing food resources during critical spring and summer rearing seasons. While benthic invertebrate data have not been collected in Elk River, we can surmise low benthic invertebrate productivity based on research reported in the literature. For example, Cover (et al. 2008) found that fine sediment caused an overall reduction in prey availability for salmonids. NMFS (2016) concluded that epibenthic grazer and predator taxa of benthic macroinvertebrates, an important food source for salmonids, were limited or non-existent in channels with high levels of sedimentation. Suttle (et al. 2004) found that increasing concentrations of deposited fine sediment decreased growth and survival of juvenile steelhead trout. Pool depths and volumes are also significantly reduced, diminishing the overall habitat carrying capacity and habitat quality.

The volume of large in-channel wood has been significantly reduced in the confined upper Mainstem and lower Forks with smaller and less-persistent hardwood species, with willow and alder providing the majority of the current volume, significantly diminishing habitat complexity. A large proportion of the current wood volume is deposited above the winter baseflow water surface and does not provide habitat benefits. In addition, much of the in-channel sediment deposits are colonized and anchored in place by dense beds of slough sedge (*Carex obnupta*), possibly obstructing juvenile fish passage between shallow pool units.

Juvenile salmonids were observed rearing in the lower North Fork in these conditions in summer 2018, in apparently good condition (i.e., good length to weight ratio) (**Attachment B**). It is unknown if these summer juveniles continue to successfully rear in these reaches during winter, or if juvenile growth rates in spring and summer are adequate to eventually allow recruitment to the adult population. Winter rearing habitat is considered the likeliest limiting habitat in Elk River, especially for juvenile coho salmon (S. Ricker, CDFW, pers. comm. 2018). The upper Mainstem Elk River and lower forks once provided high quality and abundant winter rearing habitat that is currently heavily aggraded by fine sediment and provides very poor winter rearing conditions. Pool volumes are low, large wood is scarce, and natural channel confinement limits access to floodplain rearing refugia. In addition, more frequent flooding across road surfaces and pastures may contribute to stranding mortality. During the winter rearing season, poor water quality resulting from acute and chronic high suspended sediment concentrations and turbidity levels can be assumed to impair fish health and feeding success.

Salmonid redd surveys and monitoring reports in recent years indicate that Elk River currently supports severely impaired populations of coho salmon and steelhead at very low population abundances, likely in the range of 5-10% of historical abundance.

- There are no recent adult coho salmon abundance estimates available for Elk River, but the trend in Freshwater Creek adult abundance estimates indicates adult escapement has declined since 2002–2003, ranging from a high of 1,807 in 2002–2003 to a low of 89 in 2009–2010 (Moore and Ricker 2012). According to Williams et al. (2008), at least 191 coho salmon must spawn in Humboldt Bay tributaries each year to avoid [genetic] effects of extremely low population sizes (NMFS 2014). The Humboldt Bay tributaries redd abundance estimate was 194 redds in 2009–2010. NMFS (2014) concludes that the juvenile life stage is most limited, primarily due to reductions in the quality and quantity of summer and winter rearing habitat. The Coho Recovery Plan (NMFS 2014) lists "lack of floodplain and channel structure" and "altered sediment supply" as very high stresses.
- The numbers of spawning adult Chinook salmon are low in the Humboldt Bay population relative to historic numbers and recovery targets (NMFS 2016) and counts of adults at the Freshwater Creek weir from 1994 through 2014 indicate the population has dramatically declined (Ricker and Anderson 2014). Ricker and Anderson (2014) raised concerns over depensatory population effects in Freshwater Creek, and similar trends can be inferred in Elk River.
- Adult steelhead numbers for the Humboldt Bay population are low relative to historic numbers and recovery targets (NMFS 2016). In Freshwater Creek, there is no statistically significant trend in adult steelhead returns from 2000 through 2014 (Ricker and Anderson 2014, as cited in NMFS 2016), suggesting the steelhead populations in Freshwater Creek and other Humboldt Bay tributaries like Elk River are not recovering.

2.2 Elk River Regulatory Program

2.2.1 The Elk River Total Maximum Daily Load (TMDL)

The North Coast Regional Water Quality Control Board (Regional Water Board) and the U.S. Environmental Protection Agency (USEPA) listed the Elk River watershed as a sediment-impaired waterbody in 1998 under the Clean Water Act Section 303(d). In response to a 2004 petition from residents to dredge the Elk River, the Regional Water Board convened a Technical Advisory Committee (TAC) to guide discussions and identify information needed to understand the effectiveness and potential environmental consequences of dredging, among other sediment remediation alternatives. Based on TAC recommendations, the Regional Water Board concluded that: (1) a better understanding of existing channel conditions and physical processes was necessary to evaluate the potential effects of sediment remediation measures and other direct actions designed to hasten recovery of beneficial uses of water in Elk River, and (2) development of appropriate and effective measures would require an integrated, system-wide, and scientifically-based planning effort informed by predictive modeling of hydraulic and geomorphic responses to potential treatment alternatives.

The Regional Water Board released for public review a staff report for a sediment Total Maximum Daily Load (TMDL) for the Upper Elk River in 2013 (Regional Water Board 2013). After additional technical reports and a lengthy public process of amending the Water Quality Control Plan for the North Coast Region (Basin Plain), the Regional Water Board adopted the Action Plan for the Upper Elk River Sediment TMDL (TMDL Action Plan) (Regional Water Board 2016). In the subsequent two years, the State Water Resources Control Board (State Water Board) and Office of Administrative Law approved the Basin Plan amendment and the Elk River Sediment TMDL became state law under California Code of Regulations Section 3909.6. Likewise, the USEPA approved the Elk River TMDL pursuant to Clean Water Act section 303(d) and implementing regulations.

The TMDL Action Plan addresses impairments in the 44.2 square mile (28,3 acre) Upper Elk River Watershed. The Program of Implementation (associated with the Elk River Sediment TMDL) includes non-regulatory actions that are designed to address sedimentation throughout the watershed but does not establish sediment load allocations for land use in the Martin Slough or Lower Elk River westerly sub-watersheds, nor for activities in the Lower Elk River sub-watershed downstream of Berta Road. The goal of the TMDL Action Plan is to achieve sediment related water quality standards, including the protection of the beneficial uses of water in the upper watershed and prevention of nuisance conditions. The TMDL Action Plan establishes the sediment load consistent with current conditions in the impacted reaches, identifies a process for assessing and implementing necessary and feasible remediation and restoration actions, and describes a program of implementation to be considered and incorporated into regulatory and non-regulatory actions of the Regional Water Board and other stewardship partners in the watershed.

2.2.2 Water Quality Indicators

The Elk River Sediment TMDL Program of Implementation identifies a combination of regulatory and non-regulatory actions that will lead to the attainment of water quality objectives, recovery of beneficial uses, protection of high-quality waters, and prevention of nuisance conditions. Water quality indicators and associated numeric targets are designed to measure progress towards attaining water quality objectives for suspended material, settleable material, turbidity, and sediment. The following instream water quality indicators (**Table 1**) are designed to help assess the overall effectiveness of the TMDL Program of Implementation and confirm progress toward the attainment of water quality standards.

Table 1. *Elk River Instream Water Quality Indicators and Numeric Targets (from TetraTech 2015; Page 34).*

Instream Indicator	Instream Goal	Numeric Target	Associated Area
Bankfull Channel Capacity	FLOOD	▪ Channel cross-sectional area sufficient to contain the historic bankfull discharges. Normal sediment and water transport occur when 1.5-2-year flood events are contained within the bankfull stream channel). ▪ Upper Mainstem=2,250 cfs (for drainage area of 43 mi^2) ▪ Lower North Fork=1,170 cfs (for drainage area of 22.5 mi^2)	Impacted reaches near the confluence of North and South Forks Elk River, with target discharge scaled to drainage area at measurement location
Chronic Turbidity[1]	SALMON; SUPPLY	Clearing of turbidity between storms to a level sufficient for salmonid feeding and surface water pumping for domestic and agricultural water supplies.	Salmonid feeding: Watershed-wide historic range of salmonids Water supplies: Impacted reaches

Key for Instream Goals:
SALMON: Support salmonids throughout their historical range in Elk River
SUPPLY: Support the use of surface water for domestic drinking water and agricultural water supplies
FLOOD: Contain flood flows within the channel bankfull discharge

2.2.3 The Elk River Recovery Assessment

In 2013, in part to address the TAC recommendations described above (e.g., better understanding of existing conditions, and a system-wide planning effort), the Regional Water

[1] The water quality objective for turbidity also applies. The instream water quality indicator target condition focuses specifically on turbidity values between storms.

Board received funding from the State Water Board Cleanup and Abatement Account to conduct the Elk River Recovery Assessment (Recovery Assessment or ERRA) and Sediment Remediation Pilot Implementation Project. The goal of the Recovery Assessment, recently completed in October 2018, was to test the response of the system to a suite of direct recovery actions. Identified potential recovery actions include mechanical sediment remediation; new channel construction; on-channel or off-channel detention basins; levee construction or modification; vegetation management; infrastructure improvements; creation of floodplain benches, high flow channels, and placement of in-stream large wood habitat structures. The Recovery Assessment has resulted in Final Report, which is intended to satisfy the Regional Water Board's need for a feasibility study for sediment remediation.

2.2.4 The Elk River Watershed Stewardship Program

To accompany the Regional Water Board's regulatory program (TMDL Action Plan and Waste Discharge Requirements [WDRs]) and the Recovery Assessment's technical feasibility studies, the Regional Water Board is also supporting the Elk River Watershed Stewardship Program. The intent of the Stewardship Program is to coordinate private landowner, resource agency, and other stakeholder participation in recovery planning and implementation.

The Stewardship Program will:

1. Coordinate directly with watershed residents, state and federal resource agency staff, and other stakeholders to solicit input and transmit information on recovery program activities that are ongoing throughout the watershed.
2. Provide a broad umbrella under which specific working groups form to coordinate resource management issues in a collaborative and transparent way.
3. Seek to build partnerships, interpret technical studies for stakeholders, landowners, and the public, and identify pilot projects and future remediation actions that are feasible, fundable, and broadly supported by stakeholders.

The Stewardship Program will host community meetings, working group meetings, one-on-one meetings with individual landowners, a website, and occasional newsletters to disseminate information. The Program will facilitate two working groups to focus on Sediment Remediation and Community Health & Safety (i.e., drinking water and road flooding). The Sediment workgroup will identify (1) potential remediation strategies and actions to reduce impacts from sediment and water quality impairment, including mechanical sediment trapping or removal, riparian vegetation management, and salmonid habitat enhancement, and (2) potential remediation areas, project types, and individual projects. The Health & Safety workgroup will identify potential actions to (3) address drinking water and agricultural water needs where water supply is challenged, and (4) to reduce impacts from nuisance flooding on Elk River Road, Wrigley Road, Elk River Courts, Berta Road, and Zanes Road.

The outcome of the Stewardship Program will result in an *Action Plan for the Recovery of Beneficial Uses of Water in Elk River.* The action plan will provide a detailed and formal project description to be used in developing a Programmatic Environmental Impact Report/Environmental Impact Statement required by CEQA and NEPA respectively and during federal Endangered Species Act consultation.

2.3 Need for a Biological Assessment

Section 7 of the federal Endangered Species Act (FESA) (16 U.S.C 1531 et seq.) requires the preparation of a biological assessment if a federal action (including authorization of a proposed project) is likely to affect any federally-listed endangered or threatened species, or if critical habitat is present in the action area (USFWS/MNFS 1998). The Federal Action associated with the Proposed Project is issuance of a permit by the US Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act. Section 7 consultation with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) is required prior to issuance of the Section 404 permit. Therefore, the following Biological Assessment has been prepared to determine if federally-listed rare, threatened, or endangered species or critical habitat are located within the action area of the Proposed Project, and if so, the extent to which these species and their critical habitat are likely to be adversely affected by actions and impacts associated with the Proposed Project. The Biological Assessment is based on field surveys and assessments of the project area (NHE and Stillwater 2017, Kalt 2017, Loya 2017, Slauson 2017, and CalTrout 2018) and includes sufficient technical detail to determine the extent to which each species is affected in order to inform decisions regarding project permitting, including incidental take.

This Biological Assessment finds that there are federally-listed threatened fish species and critical habitat present within the action area (**Table 2**) that were historically abundant but are currently federally-listed—Southern Oregon/Northern California Coast coho salmon (*Oncorhynchus kisutch*), California Coastal Chinook salmon (*Oncorhynchus tshawytscha*), and Northern California steelhead (Oncorhynchus *mykiss*). All three species are currently listed as threatened under the Federal Endangered Species Act (FESA), and coho salmon are listed under the California Endangered Species Act (CESA). The project area is not critical habitat for other federally listed fish species in the region, [including Tidewater goby (*Eucyclogobius newberryi*) (FE), Eulachon (*Thaleichthys pacificus)* (FT), Green Sturgeon (*Acipenser medirostris)*

(FT), or Longfin Smelt (*Spirinchus thaleichthys*) (FC)], nor are these species present in the project area.

Table 2. *Anadromous species under the jurisdiction of the National Marine Fisheries Service (NMFS) with the potential to occur in the Project area during the construction window (August 15 through October 15, or October 31 if no rain is forecast).*

Scientific Name	Common Name	Federal Listing	Critical Habitat	Potential to Occur
Thaleichthys pacificus	Eulachon	Threatened	N	None
Spirinchus thaleichthys	Longfin smelt	Proposed	NA	None
Acipenser medirostris	Green sturgeon	Threatened	N	None
Eucyclogobius newberryi	Tidewater goby	Endangered	N	None
Oncorhynchus kisutch	Southern OR/Northern CA coho salmon	Threatened	Y	Present
Oncorhynchus mykiss	Northern California steelhead	Threatened	Y	Present
Oncorhynchus tshawytscha	California Coastal Chinook salmon	Threatened	Y	Low

The Tidewater Goby has no potential to occur within the action area because there is no tidal influence or saline water in the Project reach. The upper extent of the fluvial-tidal transition is RM 4.7 in the approximate location of Showers Road (Recovery Framework, pg. 47). The Eulachon, Longfin smelt, and Green sturgeon have not been observed in the Elk River. Chinook salmon are known to occur in the Project area (based on CNDDB search) but are assumed to have out-migrated prior to the construction season as there are no documented occurrences in freshwater after June 17 (Seth Ricker, Personal Communication, 2019).

The federally protected species with the highest potential to occur in the Project area during the construction season include the SONCC coho salmon and Northern California steelhead, and are therefore the focus of this Biological Assessment. The specific component of the Proposed Project with the potential to affect listed salmonid species and their habitat is the capture and relocation of fish and dewatering of the Elk River channel necessary to conduct the in-channel sediment remediation and habitat rehabilitation actions.

Federally-listed terrestrial species under the jurisdiction of the US Fish and Wildlife Service (USFWS) with the potential to occur in the Project area are listed in **Table 3** below:

Table 3. *Terrestrial species under the jurisdiction of USFWS with the potential to occur in the Project area.*

Species	Listing Status	Potential to Occur
Western snowy plover	Federally threatened	Low
Yellow-billed Cuckoo, Western DPS	Federally threatened	Low
Marbled Murrelet	Federally threatened	Moderate
Northern spotted owl	Federally threatened	Low

The Western snowy plover, Western yellow-billed cuckoo, and Northern spotted owl have a low potential to occur within the action area, due to a lack of suitable habitat. The Marbled Murrelet has a moderate potential to occur but likely only traverses the area when commuting between nest areas in the Headwaters forest upstream and the estuary in the lower watershed.

There are no federally-listed plant, amphibian, reptile, or mammal species present in the project area. There are two federal candidate mammal species: Humboldt marten (F-CE) and Pacific fisher (F-CT) but suitable habitat for these species is not present in the project area (Slauson 2017). Based on the findings of plant (Kalt 2017 and Loya 2017) and wildlife (Slauson 2017) surveys of the project area, USFWS staff concurred that consultation was not necessary (Personal Communication, John Peters, December 2017). This BA will therefore focus only on the three federally protected fish species—Southern Oregon/Northern California Coast Coho Salmon (*Oncorhynchus kisutch*), California Coastal Chinook salmon (*Oncorhynchus tshawytscha*), and Northern California Coast steelhead (Oncorhynchus *mykiss*).

2.4 Agency Pre-Consultation Activities

Early coordination and pre-consultation with USACE, NMFS, USFWS, and CDFW related to the Proposed Project was conducted during a series of meetings and phone conversations, including:

- December 19, 2017: Meeting at McBain & Associates on Arcata, CA on with USACE, USFWS, NMFS, and CDFW, to present project overview and draft 65% engineering designs.
- February 16, 2018: Meeting at NMFS office with USACE, NMFS, USFWS, and CDFW to present an overview of the Regional Water Board's Elk River Recovery Programs.
- March 23, 2018: Meeting at NMFS office with USACE, NMFS, and CDFW fish biologists to discuss juvenile salmonid abundance, fish removal methods, and fish take.
- April 10, 2018: Meeting at NMFS office with USACE, NMFS, and CDFW to discuss the Proposed Project and associated take and mitigation requirements.

- June 13, 2018: Field tour to NF Elk River with USACE, NMFS, and CDFW to tour project reaches.
- September 5, 2018: Juvenile salmonid and water quality sampling at Flood Curve reach with CDFW biologists.
- September 13, 2018: Meeting at NMFS office with NMFS biologists to discuss revised project designs.
- February 7, 2019: NMFS comments on 12-05-2018 DRAFT Elk River Sediment Remediation BA.
- March 7, 2019: CDFW combined comments on 12-05-2018 DRAFT Elk River Sediment Remediation BA.

2.5 Project Location

Elk River drains a 58.3 square mile (mi^2) watershed in Humboldt County, California. The basin drains westward across the seaward slope of the outer Coast Range to the coastal plain and into Humboldt Bay, near the city of Eureka (**Figure 2**). The basin can be divided into four main areas: (1) North Fork Elk River (58.2 km^2), (2) South Fork Elk River (50.4 km^2), (3) Mainstem Elk River downstream of the North Fork Elk River and South Fork Elk River confluence (26.9 km^2), and (4) Martin Slough (15.3 km^2) (**Figure 2**).

The Proposed Project is located in the Lower North Fork Elk River Subbasin within the Upper Elk River waterbody. The Project area is located in the McWhinney Creek and Fields Landing USGS quadrangles (T4N, R1W, Sections 25 and 26). The North Fork Elk River's legal description at the confluence with the Elk River is T04N R01W S26. Its location is 40,7025 degrees north latitude and 124.1511 degrees west longitude, LLID number 1241512407026.

The Elk River watershed has a maritime coastal climate with mild wet winters and a prolonged summer dry season. Mean air temperatures at the coast fluctuate from 48° F in January to 55° F in June. Mean annual precipitation ranges from 39 inches on the coast near Eureka to 60 inches near Kneeland, located 2,657 feet above sea level and approximately 12 miles inland. Roughly 90 percent of the annual precipitation occurs as rainfall between October and April.

Intense rainfall over steep topography composed of erodible parent materials results in high sediment yields. Storm events with rainfall intensity exceeding 3 to 4 inches a day are considered capable of initiating landslides (PALCO 2004). Rainfall exceeding 5 inches per day occurred three times between 1941 and 1998 (water years 1950, 1959, and 1997). The 24-hour rainfall total of 6.8 inches on December 27, 2002 caused widespread landslides and flooding (Tetra Tech 2015).

The majority (82%) of the mountainous upper third of the watershed is zoned as timber production zone (TPZ). Humboldt Redwood Company (HRC) and Green Diamond Resource Company (GDRC) own and manage 75% and 7% of the Upper Elk River watershed, respectively. The remaining portions of the Upper Elk River watershed (13%) comprise the Bureau of Land Management's (BLM) Headwaters Forest Reserve (established in 1999) and a combination of non-industrial timberlands, private residences, and agricultural land uses (5%). The Lower Elk River watershed is primarily under grazing and rural residential uses. Martin Slough and the Ridgewood Heights areas are urbanizing, and additional residential development is anticipated in the coming decades.

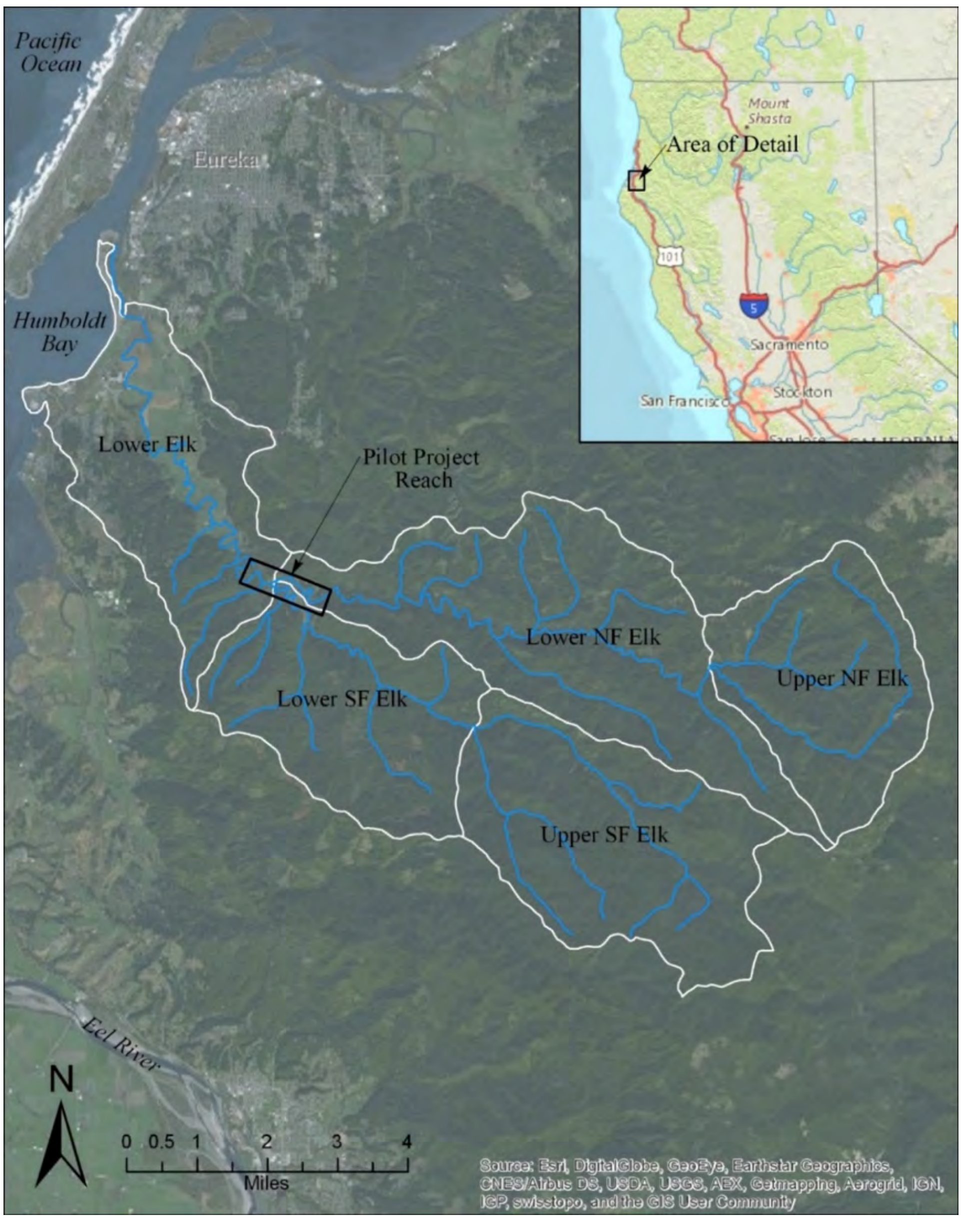

Figure 2. *Project location overview map.*

2.6 Current Geomorphic, Water Quality, and Salmonid Habitat Conditions in the NF Elk River Project Reach

The Proposed Project location, along the lowermost 1.2 mi of the North Fork Elk River, has become heavily degraded by fine sediments as a result of timber harvest activities in the upper watershed coupled with naturally erosive geology and large storm events which occurred during the period 1988 to 2000. These conditions caused unprecedented discharges of sediment and organic debris and resulted in major geomorphic changes. The large volume of stored sediment was deposited in the channel and on the streambanks and has not flushed out of the system. Within the "impacted reach" of Elk River (**Figure 3**) numerous studies have now documented high suspended sediment concentrations (SSC) and turbidity, increased frequency of nuisance flooding, sediment impacts to pool and riffle habitats, and impacts to properties and domestic water supplies (Klein et al., 2011, Lewis 2013 and 2017, RWB 2013, TetraTech 2015, CalTrout et al., 2018).

Suspended sediment concentrations (SSC) and turbidity remain high during winter storm events. Klein et al. (2008, 2011) assembled annual turbidity data for three water years from 28 streams in the north coast of California, to examine the cumulative effects of turbidity on salmonid populations. Of the 28 streams studied, two Elk River stations (including Salmon Forever's "KRW" station at the NF Elk River Wrigley Orchard reach) had the highest turbidity durations (hours above selected turbidity levels) recorded in two of the three water years analyzed (WYs 2004 and 2005). Klein et al. (2008) predicted reduced growth rates resulting from chronic turbidity.

According to NMFS (2016):

> "Increased suspended sediment concentration, and resultant increased turbidity, can cause avoidance responses, and physical damage to gills of juveniles, smolts and adults, as well as reduced feeding and growth rates of juveniles and smolts. High levels of fine sediment and embeddedness can also reduce the feeding success, and ultimately growth of 0+ and 1+ fish, because extended periods of high turbidity reduce visibility of prey as well as the type of invertebrate prey available. Epibenthic grazer and predator taxa of benthic macro-invertebrates, an important food source for salmonids, are limited or non-existent in channels with high levels of sedimentation."

Newcombe and Jensen (1996) developed a "severity of ill effects" index (SEV) describing the effects associated with excess suspended sediment. Data analyzed from the NF Elk River monitoring stations from water years (WY) 2003 to 2013 indicate the potential for a suite of sub-lethal effects ranging from 0–90 percent of the time (Lewis 2013, Tetra Tech 2015).

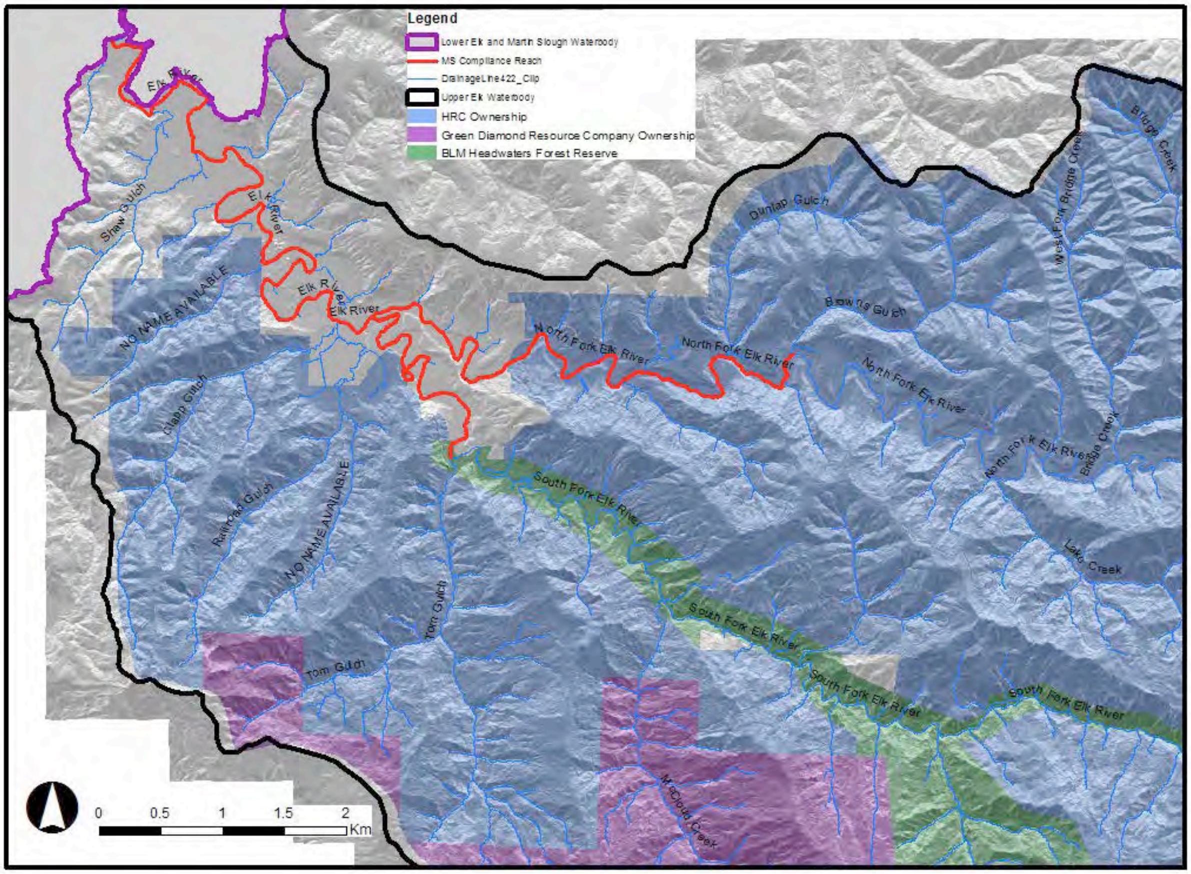

Figure 3. *Elk River watershed showing the "impacted or impaired reach" (in red). Approximately 18 miles of Elk River are currently impaired by excessive sediment aggradation in the North Fork, South Fork, and Mainstem Elk River.*

According to Lewis (2013):

> "Suspended sediment's harshest effects are on the most sensitive but abundant life stages: salmonid eggs and larvae. Severities above 12 occurred in… 3 of 8 years at KRW. A severity of 12 is defined as a lethal effect with 40–60% mortality. A severity of 11, associated with 20–40% mortality, was exceeded at … KRW in all years."

Salmonid rearing habitat in these reaches is currently heavily degraded by numerous factors. The effects of habitat impairment are different during different rearing seasons. In summer, the effects of sediment aggradation and channel simplification have had pronounced detrimental effects on juvenile salmonid rearing habitat. Fine sediment aggradation has buried or embedded riffle substrates, likely reducing benthic invertebrate productivity (in overall biomass and abundance) and diminishing food resources during critical spring and summer rearing seasons. Pool depths and volumes are also significantly reduced, diminishing the overall habitat carrying capacity and habitat quality. The volume of large in-channel wood has been reduced throughout these reaches, with smaller and less-persistent hardwood species (willow and alder) providing the majority of the current volume (**Figure 4**). As a consequence, habitat complexity is significantly diminished. In addition, a large proportion of the current wood volume is deposited above the winter baseflow water surface and does not provide habitat benefits. Much of the in-channel sediment deposits are colonized by dense beds of slough sedge (*Carex obnupta*), possibly obstructing juvenile fish passage between shallow pool units. Juvenile salmonids have recently been observed rearing in these conditions in NFR1 and MSR5 in summer, with apparently good condition factor (i.e., length to weight ratio). It is unknown if these summer juveniles remain in this habitat and successfully rear in these reaches during winter.

Winter rearing habitat is considered the likeliest limiting habitat in Elk River, especially for juvenile coho salmon (S. Ricker, CDFW, pers. comm. 2018). These confined reaches of Elk River are heavily aggraded by fine sediment and provide very poor winter rearing conditions. Pool volumes are low, large wood providing complex habitat features is scarce, and the natural channel confinement in these reaches reduces access to floodplain rearing refugia. More frequent flooding across road surfaces and pastures may also contribute to stranding mortality.

In summary, current conditions in the lower North Fork Elk River are heavily degraded, do not meet water quality beneficial uses, and do not provide conditions adequate for the recovery of listed salmonid species. Suspended sediment and turbidity conditions may contribute to direct mortality of several life stages of salmonids, and significantly diminish winter rearing habitat, the likely limiting factor for salmonid abundance in Elk River.

Figure 4. *Photograph of the NF Elk River in the Flood Curve Project reach. Photo taken on June 6, 2017. Note the steep banks and constricted channel, lack of large wood pieces, and thick slough sedge growing on the surface of riffles.*

2.7 Project Objectives

The goal of the Proposed Project is to begin to remediate excessive fine sediment, nuisance flooding, loss of water quality beneficial uses, and degraded juvenile salmonid rearing habitat uses by excavating up to 22,000 cubic yards of sediment from the bed and banks of the North Fork Elk River within the Project area to re-create a more natural channel form and salmonid habitat.

Attendant to the Project goal, the objectives of the Elk River Sediment Remediation and Habitat Rehabilitation Pilot Implementation Project are to:

- Reduce the frequency and duration of nuisance flooding by increasing the hydraulic conveyance capacity of the channel in the North Fork Elk River;
- Reconstruct a natural channel morphology of riffle-pool sequences, with deep pools (>3-6 ft deep), fine gravel-bedded riffles, and abundant large wood habitat structures;
- Enhance winter and summer juvenile salmonid habitat by expanding rearing habitat area and increasing winter habitat refugia related to large wood structures and off-channel areas;
- Increase the sediment transport capacity during winter storms;

- Monitor annual rates and volumes of sediment aggradation in re-constructed channels, and the persistence and utilization of rehabilitated habitat features;
- Improve low Dissolved Oxygen (DO) concentrations during the summer low-flow rearing season;
- Maintain existing riparian habitat and enhance riparian understory and canopy species diversity;
- Avoid short-term and long-term impacts to private property and public infrastructure; and
- Determine the regulatory compliance pathways for addressing construction-related impacts from Project implementation, including environmental constraints, CEQA compliance, regulatory permit conditions, sediment disposal options, construction logistics, and cost details.

The results of the Proposed Project will contribute to:

- Evaluating the feasibility of mechanical sediment remediation as a treatment approach along the impacted reaches of the Elk River, including methods, logistics, cost-effectiveness, and outcomes;
- Testing the predictive ability of a Hydrodynamic Sediment Transport (HST) Model developed as part of the Elk River Recovery Assessment (ERRA).
- Planning for a next-phase, large-scale program to address nuisance conditions and restore beneficial uses in the lower Elk River.
- Demonstrating to the local community the process for project design, regulatory compliance, and implementation that will be required to implement a larger-scale restoration program throughout the entire "impacted reach."

3 DESCRIPTION OF ACTION AREA AND PROPOSED ACTIONS

3.1 Overview of Proposed Project and Action Area

The Proposed Project is located on several private, rural-residential parcels from river mile 10.6 to 11.8 of the Elk River, immediately downstream of the large industrial timberlands owned and managed by Humboldt Redwood Company (HRC). This downstream-most reach of the North Fork Elk River was selected for implementation because of the highly aggraded channel conditions, the heightened impact to local residents from frequent nuisance flooding that blocks access to-and-from residential properties, and because of the high potential for juvenile salmonid habitat rehabilitation in this reach.

The Proposed Project is located entirely on private property traversing six separate parcels: the Wrigley and HRC properties at the Wrigley Orchard reach, and the Nicklas, Keele, and Wrigley properties at the Flood Curve reach. An additional four privately owned parcels not involved in the Project separate the Wrigley Orchard reach and Flood Curve reach. Private landowners were consulted throughout development of the Proposed Project at each stage of engineering design (30% and 65% engineering design milestones).

3.1.1 Action Area

Per 50 CFR §402.12(f), Action Area is defined as all areas that may be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. It encompasses the geographic extent of environmental changes (i.e., the physical, chemical, and biotic effects) that will result directly and indirectly from the action. The action area for a proposed activity is established in order to accurately describe which listed species (and critical habitat) are present or not present, and to define the extent of all of the effects of the project (beneficial and otherwise).

The Action Area for the Proposed Project (**Table 4**) encompasses:

(1) Sediment remediation areas including approximately 2,375 linear feet of stream channel (extending from 623+75 to 560+00) and 1.9 acres of floodplain adjacent to the North Fork Elk River (**Figure 5**), extending from Stn 623+75 (upstream extent of Project area) to Stn 560+00 (downstream extent of Project area)

(2) All construction access and staging areas (including both existing driveways and proposed/constructed access);

(3) (All sediment disposal sites (generally located directly adjacent to the channel and floodplain remediation sites);

(4) Public roads which will be used to haul sediment between sediment remediation areas and disposal sites;

(5) Proposed fish relocation sites including two 5,280-foot reaches, one in the North Fork Elk River below Brown's Creek (HRC property) and one in the South Fork Elk River above Tom's Gulch (BLM property),

(6) The distance between each dewatering segment and fish relocation areas (includes constructed access and public and private roads)

(7) A 500-foot buffer to account for noise and other potential project-related impacts, including:

  - The required buffer for potential nesting raptors and owls; and
  - The downstream extent of any sediment plume generated by the Proposed Project (the anticipated extent of which is described in more detail below).

  This is believed to represent a conservative buffer which would be more than adequate to contain all Project construction and operational impacts.

The Project Area generally extends from just below the North Fork/South Fork confluence at Stn 560+00 (location of downstream coffer dam) approximately 1.22 miles upstream to Stn 623+75 (location of upstream coffer dam). Two segments will be dewatered within these 6,425 linear feet of channel, one associated with each Project reach. The Wrigley Orchard dewatering segment extends 375 linear feet between 620+00 and 623+75. The Elk River Flood Curve dewatering segment extends 2,000 linear feet between 560+00 and 580+00. Approximately 4,050 linear feet of stream channel will not be dewatered between the two dewatering segments, extending from 580+00 to 620+00 (limiting the dewatered area to two segments comprising a total of 2,375 linear feet).

Earth moving activities associated with the Proposed Project would occur between August 15 and October 15 when stream flows are below 3 cfs and a lack of continuous streamflow frequently causes pools to become isolated from one another (**Figure 7**). Downstream flows would be temporarily reduced when the dewatering system is set-up. The installation of cofferdams and bypass system is described in Section 3.3.2. The Project action is determined to have minimal effect on downstream flow (particularly as it related to salmonid migration) for the following reasons:

- Low summer baseflows currently prevent migration under existing conditions as the summer flow rate is less than 3 cfs and pools are frequently isolated from one another.
- Any impacts associated with the loss of downstream flow caused by temporary diversion would be negligible because would only occur for as long as it takes to fill the off-channel storage tanks such that diverted water can travel through the bypass pipe and be discharged back into the channel below the isolated work area. The rate of

diversion and discharge rate back into the channel will be controlled to minimize impacts.

- The South Fork Elk River enters the channel just below the downstream end of the Elk River Flood Curve reach and would attenuate the temporary reduction in flows necessary between filling the off-channel storage tanks and utilizing the bypass system.

Dewatering of the stream channel could temporarily increase downstream turbidity if not properly managed, particularly during the initial diversion and when the raw channel is rewatered following construction. Best Management Practices to control erosion and potential associated turbidity during diversion and rewatering of the stream channel is described in Section 3.2.2. Diversion and rewatering activities are determined to have no effect on downstream turbidity for the following reasons:

- During rewatering, the newly excavated pools will fill first, beginning with the upstream pools and proceeding downstream. Pools will act as detention basins allowing sediment to drop out of the water column before flowing over the riffle crest into the next downstream pool.
- Although in-channel vegetation would be removed within the construction footprint under the Proposed action, in-channel vegetation would remain in place in the unaffected segments located immediately downstream. Downstream in-channel vegetation would attenuate the remaining effects of turbidity associated with rewatering, as it currently does (contributing to the aggradation problem).
- During dewatering activities, coffer dams will be installed at the upstream and downstream riffle crests at 560+00 (Elk River Flood Curve reach) and 620+00 (Wrigley Orchard reach).

Temporary flow reductions and turbidity immediately downstream of each coffer dam will be monitored during construction and following re-watering but is expected to be undistinguishable from turbidity entering the mainstem from the South Fork under high flow conditions

Portions of Project area are located within Humboldt County's designated 100-year flood zone, as depicted in **Figure 6**.

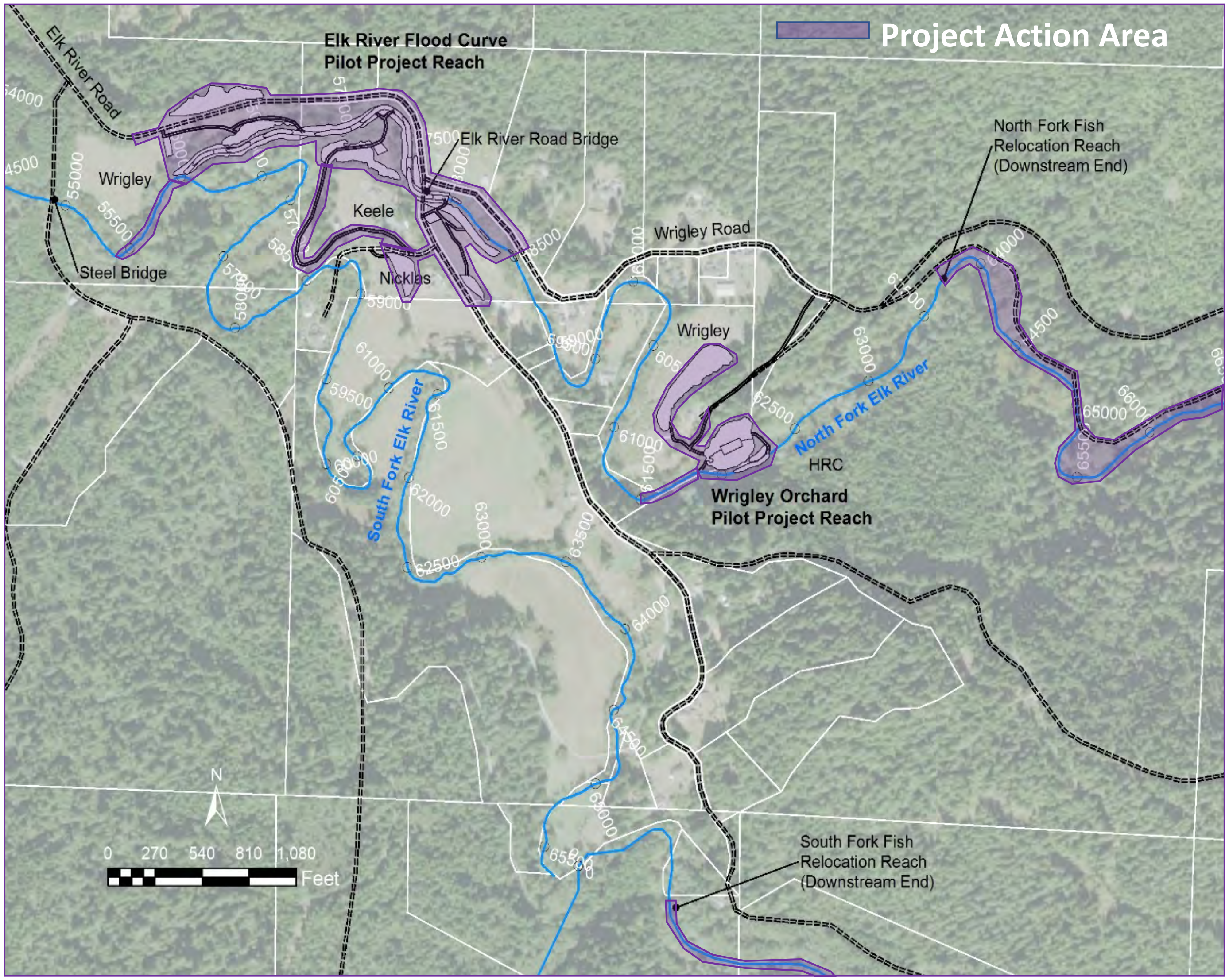

Figure 5. *Action Area of the Proposed Project.*

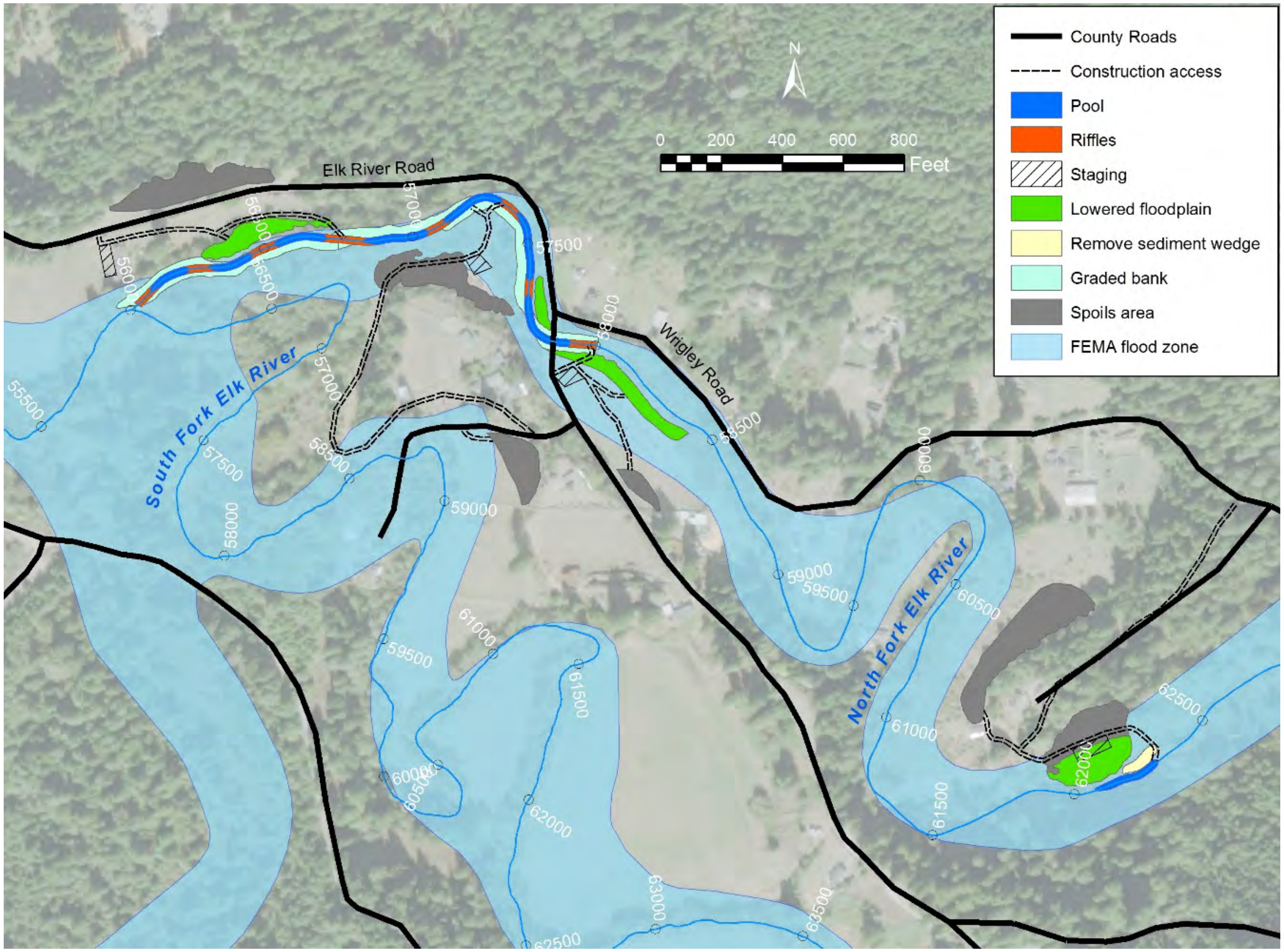

Figure 6. *FEMA's 100-Year Flood Zone overlaid on the Wrigley Orchard and Flood Curve Project reaches.*

In general, the Proposed Project will (1) create staging areas on private properties adjacent to the North Fork Elk River channel for material stockpiling and heavy equipment storage/maintenance, (2) construct temporary ramps to allow heavy equipment to access the stream channel, (3) install fish exclusion screens and temporary coffer dams at the upstream and downstream boundaries of the project reaches that allow fish removal and relocation to other reaches of the North Fork and South Fork Elk River, and allow the streamflow to be pumped or gravity bypassed around the project reaches to temporarily dewater the channel during construction, (4) use excavators, dump trucks, and other heavy equipment to remove large wood pieces and live vegetation from the channel bed and banks, then excavate excess sediment from the channel bed and banks to meet engineering design contours (e.g., cross section dimensions, bank slopes, channel gradients, riffle crest elevations) for a recontoured channel, and haul away sediment to designated re-use areas, (5) reconstruct a natural pool and riffle morphology with large wood habitat structures, and (6) install erosion control features and replant riparian vegetation in floodplain disturbance areas.

The following sections provide a detailed description of the Proposed Project actions at the Wrigley Orchard reach and the Elk River Flood Curve reach.

Table 4. *Project Reach extents (stationing in feet from Humboldt Bay) in the Wrigley Orchard and Flood Curve Project reaches.*

Upstream Station	Downstream Station	Length (ft)	Feature or Note
623+75	620+00	375	Total extent of Wrigley Orchard Project Reach
623+75			Location of upstream fish screen and coffer dam
623+00	621+00	200	Proposed Sediment Remediation and Pool Enhancement
621+00	620+50	50	Proposed Sediment Remediation and Riffle Enhancement
	620+00		Location of downstream fish screen and coffer dam
620+00	615+00	500	Extent of downstream effects of Proposed Project
620+00	580+00	4,000	Private Properties between Proposed Project Reaches
580+00	560+00	2,000	Total extent of Flood Curve Project Reach
580+00			Location of upstream fish screen and coffer dam
579+50	560+50	1,900	Proposed Sediment Remediation and Riffle-Pool Habitat Enhancement
	560+00		Location of downstream fish screen and coffer dam
560+00	555+00	500	Extent of downstream effects of Proposed Project

3.1.2 Ordinary High Water Mark

Ordinary High Water Mark (OHWM) is used by the United States Army Corps of Engineers (USACE) , the United States Environmental Protection Agency, and other federal agencies to determine the geographical extent of their regulatory programs. Federal regulations(§33 CFR 328.3(e)) define OHWM as "that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.“

As previously discussed, the Elk River channel within the project area has experienced excessive aggradation due to naturally erosive geology, historic logging practices, and legacy sediment pollution previously described. Due to aggradation, OHWM characteristics caused by fluvial processes are indiscernible within the Project area under current conditions. Given the highly altered conditions of the Project area, effectively all of the channel and floodplain excavation sites are interpreted to be below OHW elevation, and within US Army Corps of Engineers jurisdiction. The basis of this assumption is that, due to upslope sedimentation which has aggraded the channel over time, top of bank is the approximate OHWM line (although the actual OHWM line is not known).

3.1.3 Floodplain

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) indicate portions of the project area and adjacent lands lie within Zone A designated Floodplains. Zone A is defined as “*Areas of 100-year flood; Base Flood Elevations and flood hazard factors not determined.*” FEMA maps showing floodplains in relation to the Project area can be viewed at http://msc.fema.gov/webapp/. The California State Reclamation Board defines a designated floodway to mean either: (1) the channel of the stream and that portion of the adjoining floodplain reasonably required to provide passage of a base flood or (2) the floodway between existing levees as adopted by the California State Board or the Legislature. The Elk River channel within the Project area is designated as a Zone A Floodplain.

3.1.4 Winter and Summer Baseflows and Peak Flow Estimates

Winter (December 1 through April 30) and summer (August 1 through September 30) flow duration curves were developed with limited gage data spanning WY 1958 through WY 1967, which includes streamflow for both the North Fork and South Fork Elk River. During both summer and winter baseflow periods for the ten-year gaged record, streamflows of 2 cfs or less were common. More than 95% of observed streamflows during the summer baseflow period were less than 3 cfs. Observed streamflows of 1 cfs or less were also observed in all but one of the ten gaged water years. A lack of continuous streamflow has been observed during summer periods (**Figure 7**) when baseflows are at their minimum.

Peak flow estimates at the project site range from 2,500 cfs to nearly 3,800 cfs (for recurrence intervals spanning 1.5-year to 25-year return periods). These peak flow estimates were developed by Tetra Tech (2015) to support the NCRWQCB's TMDL-related analyses using ten years of historic gaging data. The 100-year flood threshold developed at this location is 4,119 cfs (Patenaude 2004).

Figure 7. *Disconnected channel bed of the North Fork Elk River in August 2014.*

3.2 Existing Geomorphic, Hydraulic, and Biological Conditions and Project Reach Objectives

3.2.1 Wrigley Orchard Reach

The Proposed Wrigley Orchard Project Reach involves two property owners—Kristy Wrigley and Humboldt Redwood Company who owns the property on the left bank to the center line of the channel. The Wrigley Orchard Project site will be accessed through a private driveway off Wrigley Road, down to the right bank floodplain (existing access road to the apple drying barn). The project reach (**Figure 8**) is heavily aggraded with fine sediment, which constricts the low-flow channel, limits sediment transport capacity, and results in frequent out-of-bank nuisance flooding and occasional damage to private property. Flooding regularly inundates the lower portion of the Wrigley Orchard (which is now defunct) and the Wrigley Orchard driveway. An analysis conducted by Reid indicated that the decrease in channel area due to aggradation increased the stage of what was once the bankfull flow by more than three feet in the Wrigley Orchard reach (Reid, 1999).

Vegetation along the channel banks and floodplain at the Wrigley Orchard Project site is a narrow ~40 ft strip of red alder and arroyo willow riparian forest cover types, with a dense and tangled understory of mixed willow species, blackberries, stinging nettle, and elderberry. No conifer species are present along the channel banks in this reach.

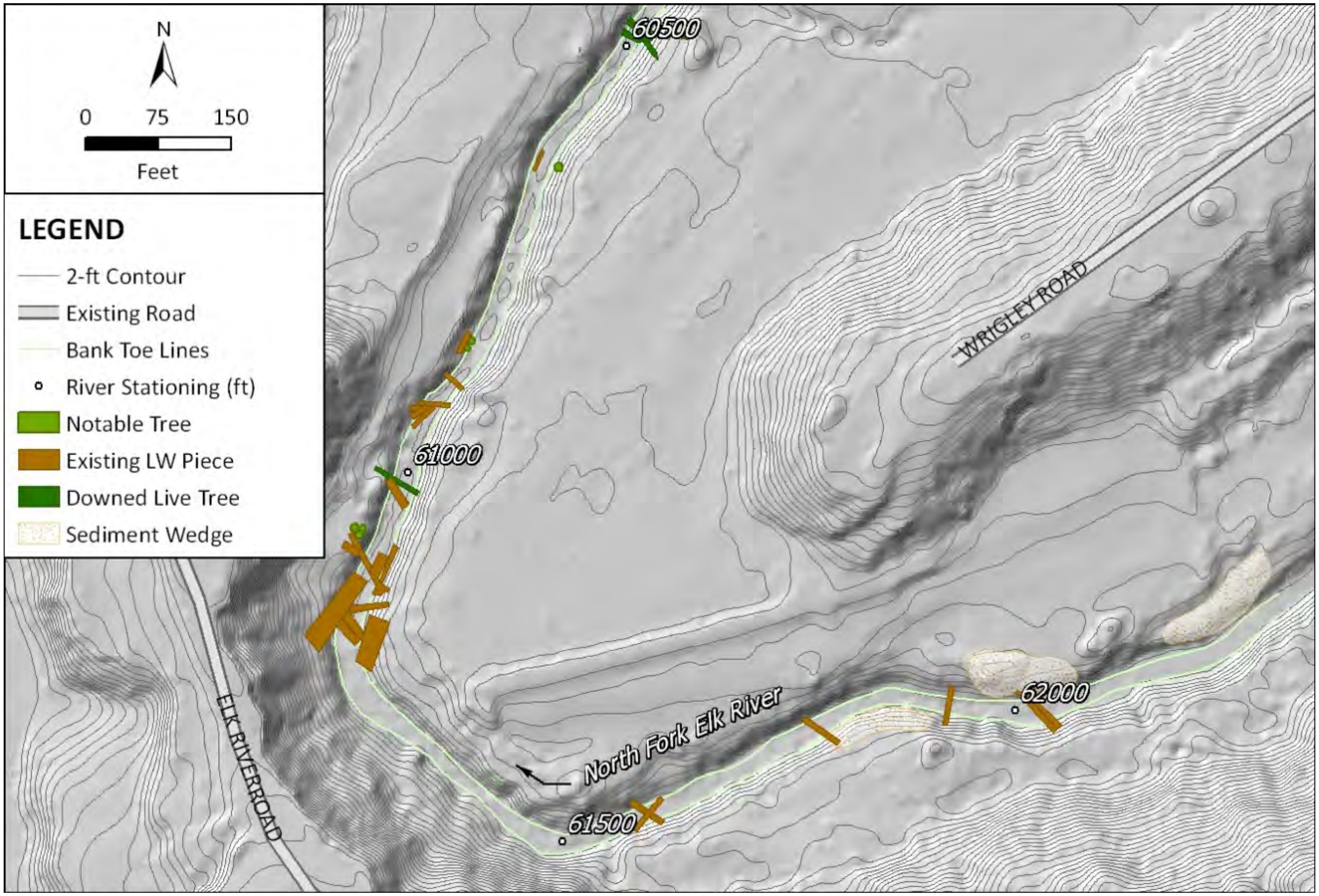

Figure 8. *Geomorphic map of the entire Wrigley Orchard reach, with the Project reach located upstream of Stn 62000. Large Wood (LW) is defined as a large piece of relatively stable woody material having a diameter greater than 30 cm (12 inches) and a length greater than 2 m (6 feet) that intrudes into the stream channel.*

Salmonid habitat in this reach is of poor quality. The channel is narrow and confined, with maximum pool depth at winter baseflow of approximately 2-3 ft, and with very low volume of large wood (**Table 5**) providing winter habitat refugia. Suspended sediment concentrations and turbidity are quite high in this reach in winter. The 12-15 ft wide winter wetted channel shrinks to 3-5 ft wide during the summer low-flow period, leaving exposed sand bars and aggraded riffles that become heavily overgrown with dense patches of slough sedge. The water surface in summer is colonized by a dense surface film of duckweed and has very little surface water velocity (i.e., stagnant conditions). DO concentrations in this reach were very low in September 2018, with diurnal fluctuations ranging below 2-3 mg/L during extended periods (days).

Table 5. *Existing large wood pieces from Wrigley Orchard and Flood Curve Project reaches. Large wood inventory was conducted in 2017 by Stillwater Sciences. All existing wood material at the Wrigley Orchard reach will remain undisturbed. The Wrigley "Total Reach" wood inventory volume is included to demonstrate the substantial wood loads downstream, while acknowledging there is no large wood in the Wrigley Orchard Project reach.*

	Length (ft)				
	3-10ft	10-25ft	25-50ft*	50-75ft	total
Wrigley Total Reach (2,050 ft)	142	115	24	3	284
Wrigley Project Reach (375 ft)	0	0	0	0	0
Flood Curve (2,800 ft)	3	10	1	0	14
Flood Curve (2,800 ft) (Live Pieces)	6	7	0	0	13

* key pieces (RWB 2006)

The Wrigley Orchard Reach Phase will test sediment remediation approaches including minor dredging (removal of in-channel sediment deposits), vegetation management (removal of brushy vegetation, targeting willows and blackberry), and creation of inset floodplains (lowering terraces and benches along banks) to provide winter high-flow refugia. In addition, the project will integrate large wood habitat features that provide suitable summer and winter rearing habitat for salmonids, primarily targeting coho salmon habitat requirements.

The Pilot Project objectives in this reach are:

- Enhance winter and summer juvenile salmonid rearing habitat functions by reconstructing one riffle-pool sequence, with a deep pool (>4-5 ft deep) and gravel-bedded riffle, and installing one large wood habitat structure;
- Test the efficacy of an enlarged channel to transport sediment during winter storms to significantly reduce aggradation rates and to maintain an approximate sediment supply/transport equilibrium in the rehabilitated reach;
- Improve low Dissolved Oxygen (DO) concentrations during the summer low-flow rearing season;

- Monitor annual rates and volumes of sediment aggradation in re-constructed channels, and the persistence and utilization of rehabilitated habitat features.

3.2.2 Flood Curve Reach

The Proposed Flood Curve Project Reach (**Figure 10**) involves three property owners—Phil and Sharyn Nicklas, Scott and Susan Keele, and Kristy Wrigley. Vehicle access to the Project site is from several locations along the 2,000 ft Project reach: at a cattle-gate entry onto the Nicklas pasture off Elk River Road south of the Concrete Bridge, through the Keele's private driveway off Elk River Road south of Concrete Bridge, and through a private driveway off Elk River Road to Wrigley's "Red House" on the north side of the NF Elk River.

The Elk River Flood Curve project reach is heavily aggraded with fine sediment, which constricts the low-flow channel, limits sediment transport capacity, and results in frequent out-of-bank nuisance flooding and occasional damage to private property. The channel capacity under the Elk River Road Concrete Bridge is severely aggraded, with ~40% of the cross section area blocked by sediment deposition (**Figure 9**).

Figure 9. *The North Fork Elk River at the location of the Concrete Bridge at the intersection of Elk River Road and Wrigley Road.*

Road flooding typically occurs first, and most often, within the approximate 200-foot section of road within the Elk River Flood Curve project area. The road is located within a few feet from the main channel and flooded approximately 50 times between 2010-2014. Winter flooding occurs between 0-9 times per year (**Table 6**) with the duration of events with water on the road surface ranging from less than an hour to as long as three days. Flood flows inundate the entire Elk River Road roadway and bridge, and often preventing vehicle traffic into and out of the upstream residential areas. Although not all flooding events in this section of Elk River Road make this section of Elk River Road impassible, this episodic flooding is a nuisance to residents and a safety concern. The entire Project reach, from ~100 ft upstream of the Elk River Road Concrete Bridge downstream to the confluence of the North Fork and South Fork has lost any semblance of a natural channel morphology: sediment loading in this reach is massive, there are no riffle-pool sequences, riffle crests providing hydraulic control, sediment sorting and storage in bar features, or off-channel low-elevation floodplain benches. Only a few functional large wood structures persist in this reach.

Table 6. *Summary of flooding events defined by water on the road surface between 2003-2012.*

Hydrologic Year	Number of flooding events	Number of Rainfall Days			Annual Rainfall (inches)	Maximum Daily Rainfall (inches)
		>3 inches	>2 inches	>1 inch		
2003	8	1	3	12	54.00	6.79
2004	7	0	0	9	37.57	1.89
2005	2	0	0	13	43.45	1.77
2006	9*	0	1	16	58.67	2.04
2007	5	0	1	4	36.86	2.32
2008	4	0	0	9	33.06	1.99
2009	0	0	0	5	30.30	1.74
2010	3	0	0	12	44.96	1.76
2011	4	0	1	10	44.11	2.05
2012	8	0	2	11	39.72	2.26

*HY2006 was not measures, flooding estimated from exceedance of minimum flow (695 cfs)

The channel capacity within the Elk River Flood Curve is estimated to be approximately 60% of the expected bankfull capacity for a stream of this size, causing flooding events at stream flows in excess of 695 cfs (Sullivan and Dhakal, 2005). Several factors contribute to increased flood frequency in the Elk River Flood Curve, particularly increased channel roughness in the form of abundant bank vegetation and woody debris accumulation which reduce stream velocity and entrap sediments (as observed at the Concrete Bridge). Reduced bankfull capacity has affected the extended flood plain, as flows that are pushed out of the channel drop sediment and provide a fertile environment for the growth of shrubs, willows, and conifers. This increasing out of channel vegetative roughness affects stream flow velocities and flood plain carrying capacity, resulting in flows being pushed further out from the channel than would otherwise occur if the flood plains were less vegetated.

Channel roughness (and associated aggradation) will continue to increase without proactive channel and stream bank vegetation maintenance (Sullivan and Dhakal, 2005).

Riparian forest biohabitats in the Flood Curve Project reach are diverse and well-developed, especially near the confluence of the North Fork and South Fork Elk River. Red alder and arroyo willow are the most common riparian forest cover types, with mature tree canopies over 50 ft tall. Pacific willow (*Salix lasiandra*) patches were most extensive near the confluence but extended upstream to the concrete bridge. Other riparian forest biohabitats included mixed willow, red alder–elderberry (*Sambucus racemosa*), and red alder–mixed willow. The understory of riparian forest biohabitats was generally dense and tangled with various willow species, blackberries, stinging nettle (*Urtica dioica*), and elderberry.

Salmonid habitat in this reach is of poor quality, similar to the Wrigley Orchard reach. The channel is narrow and confined, with maximum pool depths at winter baseflow of approximately 2-3 ft, with only 3 pools exceeding 3 ft deep in this reach. There is a moderate volume of large wood (**Table 5**) providing some low-quality winter habitat refugia, but most wood pieces are "punky" (rotting and of low value) and suspended above the winter baseflow water surface and thus not accessible to provide functional habitat in-channel. Redwood or other large conifer key pieces are lacking. Suspended sediment concentrations and turbidity are quite high in this reach in winter. The 12-15 ft wide winter wetted channel shrinks to 3-5 ft wide during the summer low-flow period, leaving exposed sand bars and aggraded riffles that become heavily overgrown with dense patches of slough sedge. The water surface in summer is colonized by a dense surface film of duckweed and has very little surface water velocity (i.e., stagnant conditions). Dissolved Oxygen concentrations in this reach were very low in September 2018, with anecdotal measurements ranging below 2-3 mg/L during extended periods (days).

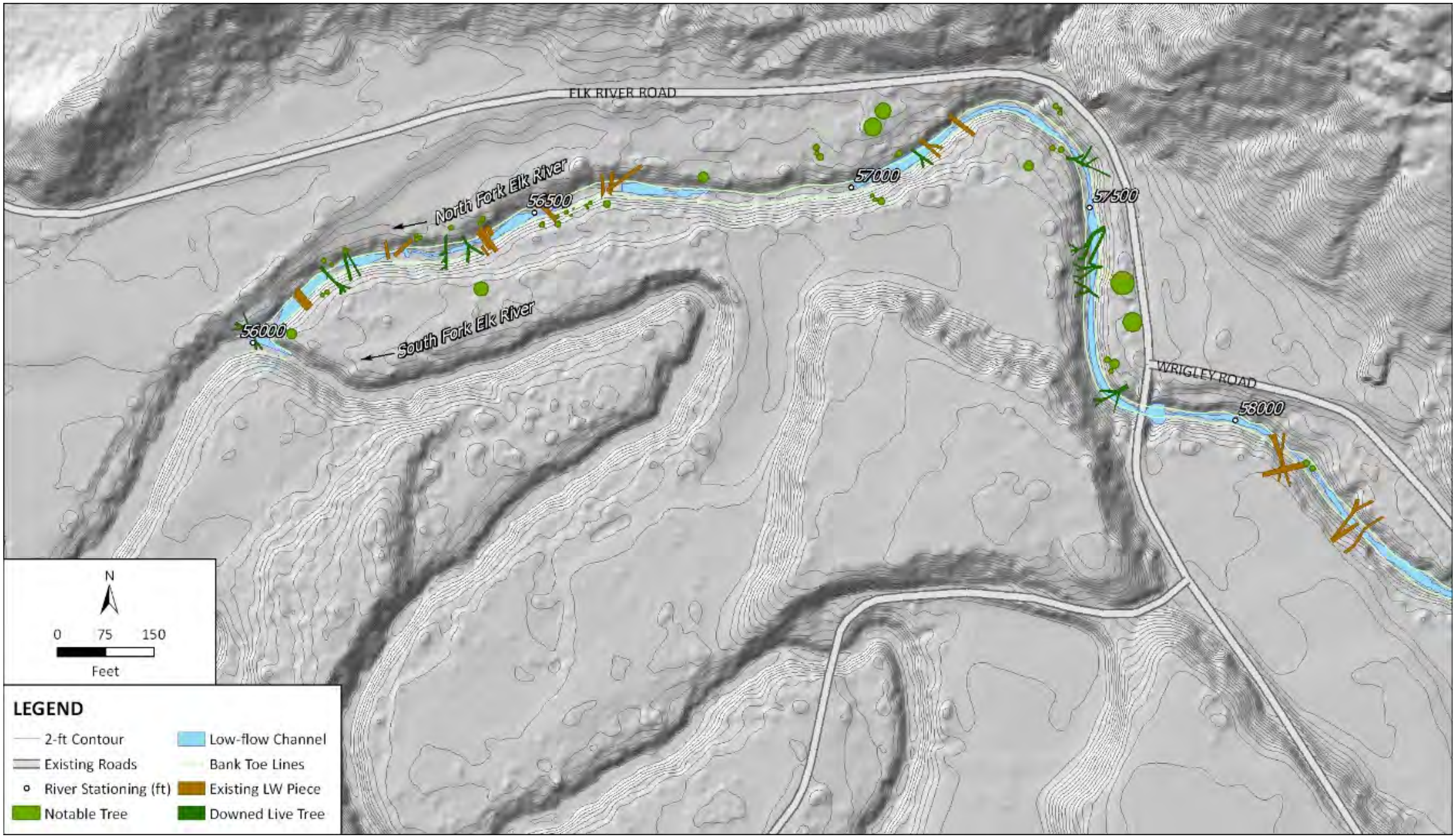

Figure 10. *Map of existing geomorphic condition and large wood distribution in the Elk River Flood Curve reach.*

The Pilot Project objectives in this reach are:

- Enhance winter and summer juvenile salmonid rearing habitat functions by reconstructing seven riffle-pool sequence, each with deep pools (>4-5 ft deep) and gravel-bedded riffles, and installing seven large wood habitat structures to provide low/zero velocity winter refugia habitat for juvenile salmonids
- Increase the sediment transport capacity during winter storms, in order to significantly reduce aggradation rates and maintain an approximate sediment supply/transport equilibrium in the rehabilitated reach;
- Reduce the frequency and duration of nuisance flooding by increasing the hydraulic conveyance capacity of the channel in the NF Elk River;
- Improve low Dissolved Oxygen (DO) concentrations during the summer low-flow rearing season;
- Monitor annual rates and volumes of sediment aggradation in re-constructed channels, and the persistence and utilization of rehabilitated habitat features.

3.3 Proposed Project Actions

3.3.1 Construction Schedule and General Sequence

Construction activities with the potential to generate sediment will be implemented in the 2019 construction season, between August 15 and October 15. The work window may be extended to October 31 contingent on dry weather predictions. Heavy equipment operating within the wetted channel will be limited to August 15 through October 15. The Wrigley Orchard segment will be constructed first, followed by the Elk River Flood Curve segment, in order to apply construction methods learned in the smaller reach to the larger reach. The order of construction has been determined in consultation with a construction contractor and generally organized to limit disturbance.

3.3.2 Site Access, Construction Staging, and Riparian Vegetation Avoidance/Removal Measures

To initiate construction of the project, site access and construction staging areas will be prepared. Access for construction equipment will be required to reach the channel excavation and floodplain excavation areas. There are four designated construction staging areas, one per each private property (Wrigley, Nicklas, Keele, Wrigley), each of which is approximately a 100 x 100 ft polygon located on open, flat pasture surface outside of the riparian zone. Staging areas will be used for heavy equipment and vehicle parking, refueling, and material stockpiling (e.g., erosion control materials, large wood, imported gravel, etc.). Site conditions will dictate BMP design to control spills and runoff from staging areas but are expected to include construction of a temporary dike constructed of compacted soil, covered hazardous materials storage area, confined equipment re-fueling and maintenance area, and fiber rolls.

Approximately 800 feet of temporary access roads and temporary staging areas not exceeding 1 acre will be constructed. For the Wrigley Orchard site, primary access will be via the driveway of the Wrigley Parcel (APN 311-041-006). For the Nicklas site, primary access will be via the cattle gate off Elk River Road (APN 311-242-001). For the Keele site, primary access will be via the Keele driveway (APN 311-243-001). For the Wrigley Red House site, primary access will be via the Wrigley driveway (APN 311-021-011). Additional access roads as depicted in **Figure 5** will be required to allow heavy equipment to access the excavation sites by using the dewatered channel bed. For construction activities conducted in-channel, temporary ramps will be constructed.

Vegetation will need to be cleared to provide equipment access to the two channel and two floodplain excavation sites, and to provide access between excavation and sediment reuse areas. Access roads are typically 16-20 feet to accommodate heavy equipment but may vary based on access restrictions and the size of equipment being utilized. Actions associated with the Proposed Project will affect 2.5 acres of channel, 1.6 acres of floodplain, and 4.5 acres of upland pasture (not including access and staging) (**Figure 11**).

Willow and blackberry species that have become rooted in the channel and serve to trap sediment and impede conveyance will not be replanted. However, newly created floodplain slopes (from bank excavation) will become part of the wetted channel under high flow conditions and will be regraded and replanted with locally grown native species. Riparian understory will be replanted with native species at a density representative of existing conditions. Removal of over-story trees will be avoided whenever feasible but will be replanted at a ratio of 3:1 when removal is unavoidable, replaced with higher-value conifers to the extent possible, and monitored to ensure 80% survivability three years after implementation of the Proposed Project.

Vegetation that is cleared from the channel and floodplain may be temporarily stockpiled in floodplain clearings before being transported to designated areas where it will be chipped for use as mulch. All stockpiles will be removed by the end of the construction season (October 15 or October 31 if no rain is forecast).

Revegetation plans include hydroseed to be placed on 4.5 acres of spoil areas, and chipped mulch to be placed on access roads (800 feet) and staging areas (1 acre).

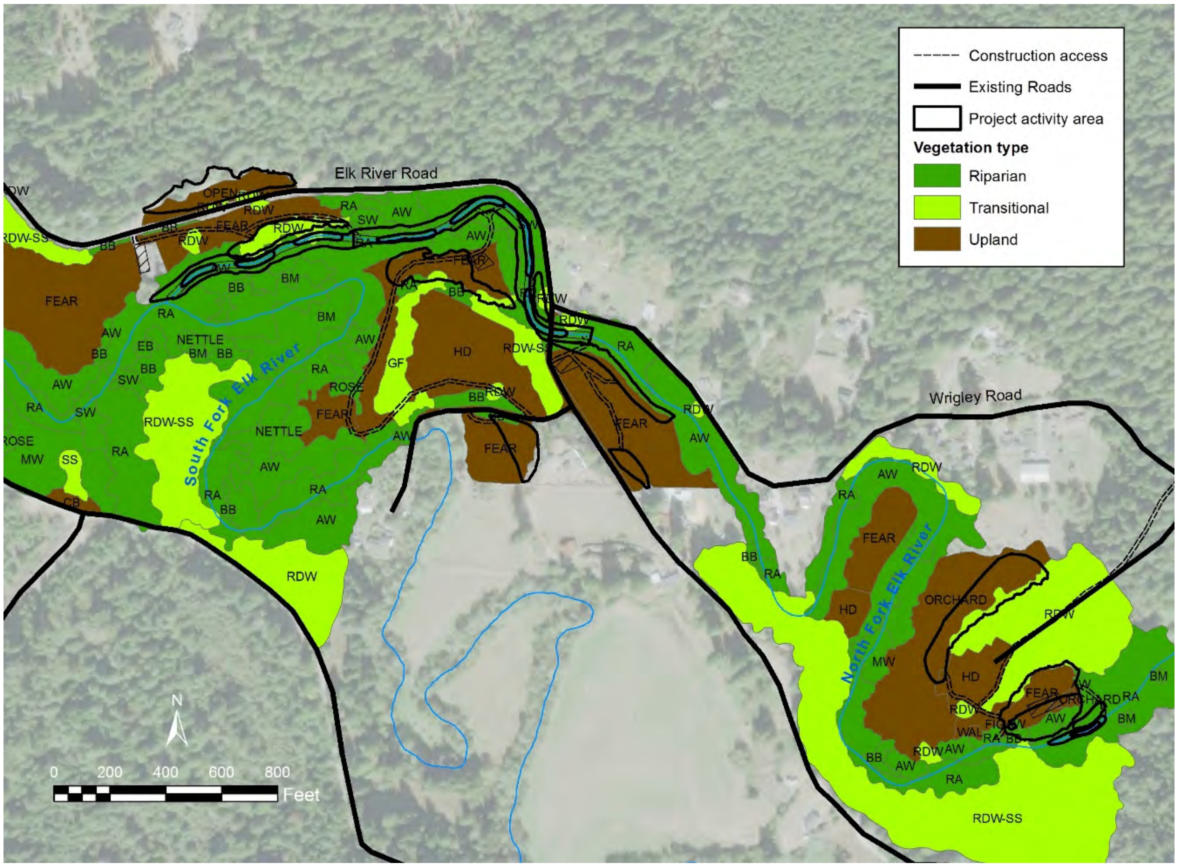

Figure 11. *Vegetation mapping results overlaid with project action areas. Incongruities between the Project boundaries and vegetation layer boundaries result from the method of mapping of vegetation boundaries on aerial images, in which the visible canopy is used to delineate vegetation boundaries.*

3.3.3 Fish Removal/Relocation, Channel Dewatering, and Small Wood Removal

Fish relocation will involve multiple rounds of fish and other aquatic organism removal, beginning with the least intrusive methods (minnow trapping, seining), and progressing to more intrusive method (electrofishing, flow diversion). The exact steps to be employed are outlined below.

1. *Pre-construction fish survey*

During a pre-construction site visit in early July 2019, we will survey the Project reaches visually, or via snorkel or seining, to observe the relative density of juvenile salmonids (high, med, low). Water year type and the prior winter's adult abundance will be considered when assessing juvenile salmonid density and overall abundance within the Project reach.

2. *Install fish screens at Stations 623+75, 620+00, 580+00, and 560+00*

In late July, approximately three weeks prior to initiation of Project construction activities, fish relocation activities will be initiated. Fish screens will be installed at riffle crests upstream and downstream of the Project reaches to be dewatered, at stations 623+75 and 620+00 at the Wrigley Orchard reach, and at 580+00 and 560+00 at the Flood Curve reach (**Figure 5**). This represents the minimum practical area which can be dewatered for construction activities. Fish screens are necessary to prevent fish from entering or re-entering the project area. Installation of the downstream block nets/coffer dams will be delayed/placed last to allow sufficient time for volitional movement of fish downstream.

3. *Deploy minnow traps until few/no fish are captured*

The first fish removal step will employ minnow traps – the least harmful method available for the capture of fish. A field crew of one or two qualified fisheries biologists will conduct this fish removal phase. Standard size minnow traps will be baited with salmon roe and spaced approximately every 100 feet along the Project reaches. Traps will be deployed from the stream banks to minimize disturbing and avoid trampling fish in-channel. Traps will be checked every 20 minutes, then emptied and re-baited as needed. Traps will be replaced in new locations with each re-deployment (e.g., 10-20 ft upstream or downstream) to maximize fish exposure to the traps. As fish are removed from traps and placed in buckets, they will be relocated as soon as possible, within 15-30 minutes of their capture. If fish are captured faster than they can be transported to relocation sites, trapping will be halted until fish relocation is completed. In addition to the biologists deploying/emptying traps, one or two additional field technicians will be available with vehicles to relocate fish.

We will transport captured salmonids (coho, steelhead, cutthroat trout, chinook if any) to the North Fork Elk River along the Humboldt Redwood Company road below Brown's Creek (less than a ten-minute drive time) and to the South Fork Elk River on BLM property above Tom's Gulch (less than five-minute drive time). Fish will be relocated to numerous sites spaced along approximately one mile of each fish relocation reach to avoid overcrowding the destination habitat. We will relocate non-salmonid fish and amphibians to the same locations to expedite the relocation process. A CDFW and/or NMFS biologist will be invited to be on-site during fish handling and during de-watering.

Fish will be relocated using 5-gallon buckets equipped with secure screened lids and aeration devices. If water temperatures are above 63°F, ice blocks will be used to cool the transport water. Standard precautions will be used when handling captured fish in buckets. Overcrowding will be prevented: no more than 3 fish over 12 inches (age 2+) will be placed in a single bucket. No more than 20 fish over 2 inches (age 1+) or 50 fish over 0.2 inches (age 0+) will be placed in a single bucket. Age classes / fish sizes will not be mixed in a single bucket to prevent predation. Large sculpins and/or pacific giant salamanders will not be mixed in buckets with smaller fishes/amphibians to discourage predation. Fish will be released near areas of cover by gently submerging the top of bucket and allowing fish to swim out on their own.

Minnow trapping will be conducted for several consecutive days (e.g., 3-4 days or longer if needed) until fish captures diminish significantly and approach no captures. All captured and relocated fish will be counted and tabulated and reported to permitting agencies in real-time.

4. *Remove small in-channel wood debris to simplify channel and facilitate seine netting*

Following minnow trapping and fish removal/relocation to reduce fish densities reach-wide, we will remove small wood debris (<4 inches diameter, <6 ft in length), loose vegetation, and other material in-stream to facilitate fish capture and removal via seining (and later e-fishing). Care will be taken to minimize walking in-channel to avoid disturbing fish and habitat; materials removed from the channel will be stockpiled on adjacent floodplain for later disposal or re-use in the Project construction phase.

5. *Seine and Electrofish through reach (downstream to upstream) until few/no fish are captured*

We will use appropriately sized (approximately 20' x 5') seine nets constructed of 2.8 mm (3/32 inch) mesh to safely seine net and capture the smallest age 0+ salmonids. Seine nets will be stretched across the entire channel and pulled downstream to trap all fishes present in a confined area. Once fish are confined with the seine net, they will be removed by hand with dip nets. This process will be repeated until few or no fish are captured. Between rounds of seining, we will allow sediment to settle and the water column to clear. We anticipate one or two seining passes along the entire stream reach, conducted in an upstream direction to avoid working in turbid waters.

As fish are captured by seining and placed in buckets, they will be relocated as soon as possible within 15-30 minutes of their capture. If fish are captured faster than they can be transported to relocation sites, trapping will be halted until fish relocation is completed. In addition to the two persons deploying/emptying traps, one or two additional field technicians will be available with vehicle to relocate fish. The same precautions for capture and transport of fish will be followed as described above. If more fish are corralled/confined than staff are immediately able to transport to new habitat, fish will be left in-stream with clean flowing water, rather than left in buckets.

Following the last pass with seine nets, we will conduct at least one electrofishing pass using 2 backpack units set to straight (non-pulsed) DC @ 200v (S. Ricker Personal Communication).

6. *Install cofferdams and water bypass system*

Dewatering will be required where in-stream construction activities are proposed. A temporary diversion system will be used to isolate a discreet area to create dry, workable conditions and prevent sediment delivery and turbidity in adjacent areas of the river. The temporary diversion system will use a silt fence/coffer dam to capture and retain clean water upstream of the work area. Water will be diverted around the project site via a trash pump, storage tank, and gravity fed flexible bypass pipe to a point just downstream of the work area, where diverted water would be allowed to flow back into the channel. Gradual dewatering and flow diversion will be staged in conjunction with fish capture and removal, depending on the flow rate and the amount of fish present, and will dictate the size of the pumps utilized.

The inlet/intake of the diversion system will be located above the upstream fish screen/coffer dam to prevent fish from entering the work area. Water which begins to pond above the upstream coffer dam will be diverted at a 10% diversion rate utilizing riparian water rights into a storage tank where any sediment would drop out. Stored water will be metered and diverted around the work area through the gravity fed bypass system which will run down the floodplain adjacent to the channel and discharged back into the waterbody below the downstream coffer dam. Measures to comply with energy dissipation, sediment control, and temperature control requirements will be employed as diverted water is discharged back into the channel. Flows shall be gradually reintroduced into the isolated work area, so as to prevent channel bed or bank instability, excessive scour, or turbidity and sedimentation. The supervising biologist will inspect the downstream reach to ensure no fish are stranded or in distress following the reintroduction of flows. If conditions causing or contributing to fish stress and/or injury are observed, the supervising biologist will take remedial actions directed at lessening these sources of stress. This may include a more gradual reintroduction of flow, so as to reduce resulting turbidity and sedimentation. If increases in turbidity are observed, the RWQCB will be alerted as turbidity measurements may be required.

The use of trash pumps will be required to dewater the work area. To prevent fish entrainment and impingement, pumps will be covered with a multi-filter/screen system consisting of a 2.8 mm (3/32 inch) screen inside a 4x4x4 foot box covered with a 6.3 mm (1/4 inch) screen.

A second coffer dam will be constructed at the downstream end of the project reach, upstream of the fish screen, to capture turbid seepage water that emanates from the construction area and prevent it from flowing downstream. Turbid water will be pumped out of channel and discharged into the flat orchard pasture adjacent to the work site. Instream coffer dams and discharge basins will be built from sandbags filled with clean sand and gravel to reduce siltation or turbidity. No earthen fill will be used to construct the coffer dam or discharge basins. Plastic sheeting will be placed over sandbags to prevent water seepage into the activity area. The plastic sheets will be firmly anchored to the streambed to minimize water seepage. The footing of the cofferdam will be keyed into the channel bed at an appropriate depth to capture the majority of the subsurface flow needed to dewater the streambed.

Silt fencing or settling basins will be deployed as necessary to ensure that the turbidity of discharged water is not visibly more turbid than in the channel upstream of the Project site. If increases in turbidity are observed, additional measures will be implemented such as a larger settling basin or additional filtration. If increases in turbidity persist, the RWQCB will be alerted as turbidity measurements may be required.

7. *Decrease streamflow*

We will install the upstream coffer dam and bypass pipe just downstream of the upstream fish screen. As it is installed, water will be allowed to bypass the coffer dam until flow diversion is initiated. To implement stream dewatering, we will seal the cofferdam and begin pumping into the bypass pipe. Streamflow diversion will begin slowly, to allow any remaining fish in the Project area to remain in the dewatering thalweg where they can be collected with dipnets. Streamflows adequate to prevent fish or vertebrate stranding will be maintained at all times during dewatering activities.

8. *Seine and net remaining fish and amphibians with reduced pool volume (**)*

The same seining procedures will be used as outlined above; but pool volume will be gradually smaller. De-watering will proceed slowly, with ample time for any disturbed sediment to settle. Special care will be taken to rescue lamprey ammocetes which may emigrate from sediment deposits as flows are reduced.

We will employ an experimental technique to aid in ammocete translocation. According to USFWS, there is evidence to suggest that if straw bales are placed in habitats where ammocetes are present, they will move into the straw as dewatering occurs and can be safely removed the following day. If successful, we will document this method and provide this information to the US Fish and Wildlife Service.

9. *Electrofish remaining fish and amphibians with reduced pool volume (if needed)*

This step may not be necessary if no fish are detected after streamflow is reduced. If required, we will use two shockers, set for DC-100 volts, and multiple size dip nets as needed. A higher voltage setting of 200 volts DC may be needed if smaller size fish are showing little response to the field. In addition to two people operating the electrofishers, two more persons will be present to net fish/amphibians and carry buckets. After one pass with the electrofisher through the confined area, all captured fish will be immediately relocated, and any disturbed sediment will be allowed to settle before another pass. Electrofishing activities will cease at any time when three consecutive passes with the electrofisher or seine net yielded zero fish.

10. *De-water segment, remove any remaining fish and amphibians*

Once as many fish/amphibians as possible are removed as outlined above, we will install and close off the downstream cofferdam. The downstream cofferdam will be constructed on a dry riffle crest, just upstream of the downstream fish-screen. We will then dewater the residual pool with appropriately-sized pump(s) and have people on-site to capture any remaining animals as the pool volume dwindles. Once the pool volume is at its lowest, three consecutive passes with no captured fish/amphibians will indicate that the area is ready for construction.

Once the excavation is done, we will halt all dewatering maintenance pumping and dismantle the downstream cofferdam. We will then slowly close the bypass pipe inlet, dismantle the upstream cofferdam, and allow for rewatering of the newly completed excavation area. The area disturbed by flow bypass mechanisms will be restored at the completion of the project. This may include, but is not limited to, recontouring the area and planting or riparian vegetation.

11. *De-water isolated work segments*

After fish removal and stream dewatering is complete, the isolated construction segment will be continuously dewatered to maintain a dry work area. Beginning upstream and proceeding downstream between the two coffer dams, turbid water will be pumped out of the channel and discharged into the flat orchard pasture areas adjacent to the work site.

12. *Documentation*

- All work area isolation, and fish capture and handling shall be documented in a log book with the following information: project location, date, methods, personnel, water temperature, conductivity, visibility, electrofishing equipment settings, and other comments.
- All fish captures or handled shall be documented: species, number of each species, age/size class estimate, condition at release, and location of release.
- If at any time fish are observed in distress a fish kill occurs, or water quality problems develop (i.e. turbidity over the 20% threshold, gas spills, or equipment leaks) the supervising biologist shall immediately notify CalTrout who will provide immediate notification to CDFW and NMFS consistent with permit provisions. Notification shall consist of a phone call or voicemail message.
- Any ESA-listed species incidentally killed as a result of fish capture and removal operation shall be documented and provided to CDFW and NMFS within two working days. Initial notifications shall consist of a phone call or voice mail message. Initial notification shall be followed by a second notification in writing. All notifications shall

provide at a minimum the following: date, time, point of contact (supervising biologist), project name (and CDFW or NMFS tracking number if provided), precise location of any incidentally killed or injured and unrecovered fish, number of specimens and species, and cause of death or unrecoverable injury. If the limits on incidental take are exceeded (harm or harassment), the written notification shall also include an explanation of the circumstances causing or contributing to observed levels of take.

- The final condition of the isolated work area (including the bypass system) shall be documented in qualitative terms, including any obvious signs of channel ed or ack instability resulting from the work, and any additional actions taken to correct channel instability.

3.3.4 Large Wood Removal, Channel and Floodplain Excavation, and Sediment Remediation

With the Project site access and construction staging areas established, with the minimal necessary vegetation removal completed, and with fish removal and channel dewatering completed, the channel and floodplain sediment remediation and habitat rehabilitation activities can begin. Construction approach and techniques will be similar along the entire Project reaches at both the Wrigley Orchard site, and along the Flood Curve reach. Temporary ramps will be constructed from the access routes to allow a track excavator and track dump truck down into the channel. Excavators will begin removing and stockpiling all salvageable large wood pieces, then begin excavating sediment from the banks and loading into dump trucks. Track dumps can articulate 180 degrees, and thus will follow excavators up or down the channel, receiving a 10-yard load and driving back out to dump the load for transport to a sediment re-use site. In general, excavator and track dump will work their way up the channel in one direction, removing large wood and sediment to attain the approximate “rough dimensions”, then reverse direction and work back toward the exit ramp, excavating to the final channel dimensions, and contouring the channel bed and banks while replacing and/or constructing large wood habitat structures (described in detail in next section).

3.3.4.1 *Wrigley Orchard Reach*

The Wrigley Orchard Project reach is a straight channel segment defined predominantly by alternating large sand deposits accreted to the top of channel and bank margins. The sandy bank margin deposits are characteristically convex shaped and support dense sedge and other herbaceous vegetation on their flanks and crest. The average channel gradient through the Wrigley Orchard project reach is 0.0015. Average bankfull channel width is 58 feet (ranging from approximately 56-59 feet), and average bank toe width is 23 feet (ranging from approximately 22 to 24 feet). Bed material is predominantly fine sand and silty sand with highly localized small sand and gravel deposits (D50 = 4 millimeters [mm]) associated with channel roughness elements (e.g., large wood pieces and jams) and planform channel curvature. No large wood pieces occur within this reach. Two channel spanning logs (>18 in diameter, 20-25 ft long) are located at the downstream end of the reach, at Stn 620+00 (**Figure 8**).

The Project proposes to excavate approximately 600 cubic yards (yd3) of sediment from 200 ft of channel (**Table 7**) extending from Stn 623+00 to Stn 621+00 to re-create a 200 ft long deep pool, and excavate approximately 2,100 cubic yards (yd3) of sediment to re-create a small right bank floodplain adjacent to the channel reach. The spoil material from both the channel and floodplain excavation will be placed on the back side of the right bank floodplain.
At least one or two large wood habitat structures will be constructed within the low-flow channel in the reconstructed pool, each using approximately 4-6 redwood logs, including one log with intact root-wad and several pinning logs. A portion of the root-wad log will be buried in the streambank to anchor the structure, and smaller logs will be positioned to pin the larger logs in place. The completed log structure will be enhanced with smaller salvage wood to recreate more complex structural characteristics.

Table 7. *Wrigley Orchard Project Reach extent (stationing in feet from Humboldt Bay)*

Upstream Station	Downstream Station	Length (ft)	Feature or Note
623+75	620+00	375	Total extent of Wrigley Orchard Project Reach
623+75			Location of upstream fish screen and coffer dam
623+00	621+00	200	Proposed Sediment Remediation and Pool Enhancement
621+00	620+50	50	Proposed Sediment Remediation and Riffle Enhancement
	620+00		Location of downstream fish screen and coffer dam

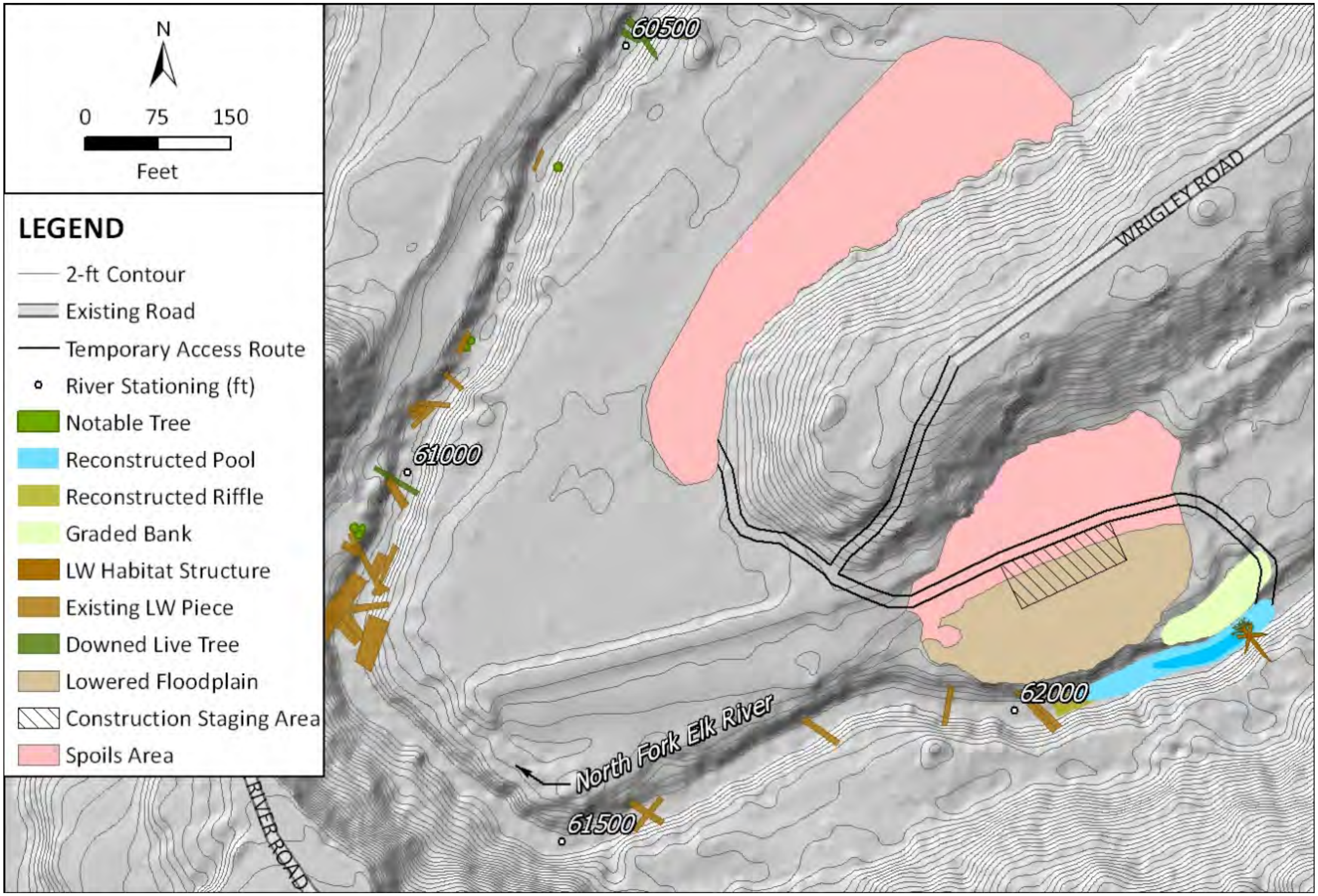

Figure 12. *Proposed Conceptual Remediation and Habitat Enhancement design for the Wrigley Orchard Project reach.*

3.3.4.2 *The Flood Curve Reach*

The Flood Curve project reach is a slightly sinuous channel reach, extending under the Elk River Road bridge, curving to the north, then around a gradually sweeping bend to the west and then slightly curving in a straight direction toward the North Fork-South Fork confluence. This segment of channel is defined by alternating large sand deposits accreted to the top of channel and bank margins. The sandy bank margin deposits are characteristically convex shaped and support dense sedge and other herbaceous vegetation on their flanks and crest. The average channel gradient through the Flood Curve project reach is 0.0015. Average bankfull channel width is 58 feet (ranging from approximately 56-59 feet), and average bank toe width is 23 feet (ranging from approximately 22 to 24 feet). Bed material is predominantly fine sand and silty sand with highly localized small sand and gravel deposits (D50 = 4 millimeters [mm]) associated with channel roughness elements (e.g., large wood pieces and jams) and planform channel curvature. A moderate volume of large wood pieces occurs within this reach (**Table 5**).

The Project proposes to excavate approximately 14,800-17,300 cubic yards (yd3) of sediment from 1,900 ft of channel (**Table 8**) extending from Stn 579+50 to Stn 560+50 to re-create seven riffle-pool units, and excavate approximately 3,100 cubic yards (yd3) of sediment to re-create a small right bank floodplain adjacent to the channel reach directly downstream of the Elk River Road bridge. The average design pool length is approximately 192 ft and the average riffle length is 93 ft. The small right bank excavated floodplain will inundate at the annual flood discharge.

Table 8. *Elk River Flood Curve Reach extent (stationing in feet from Humboldt Bay)*

Upstream Station	Downstream Station	Length (ft)	Feature or Note
580+00	560+00	2,000	Total extent of Flood Curve Project Reach
580+00			Location of upstream fish screen and coffer dam
580+00	579+50	50	Upstream buffer zone
579+50	560+50	1,900	Proposed Sediment Remediation and Riffle-Pool Habitat Enhancement
560+50	560+00	50	Downstream buffer zone
	560+00		Location of downstream fish screen and coffer dam

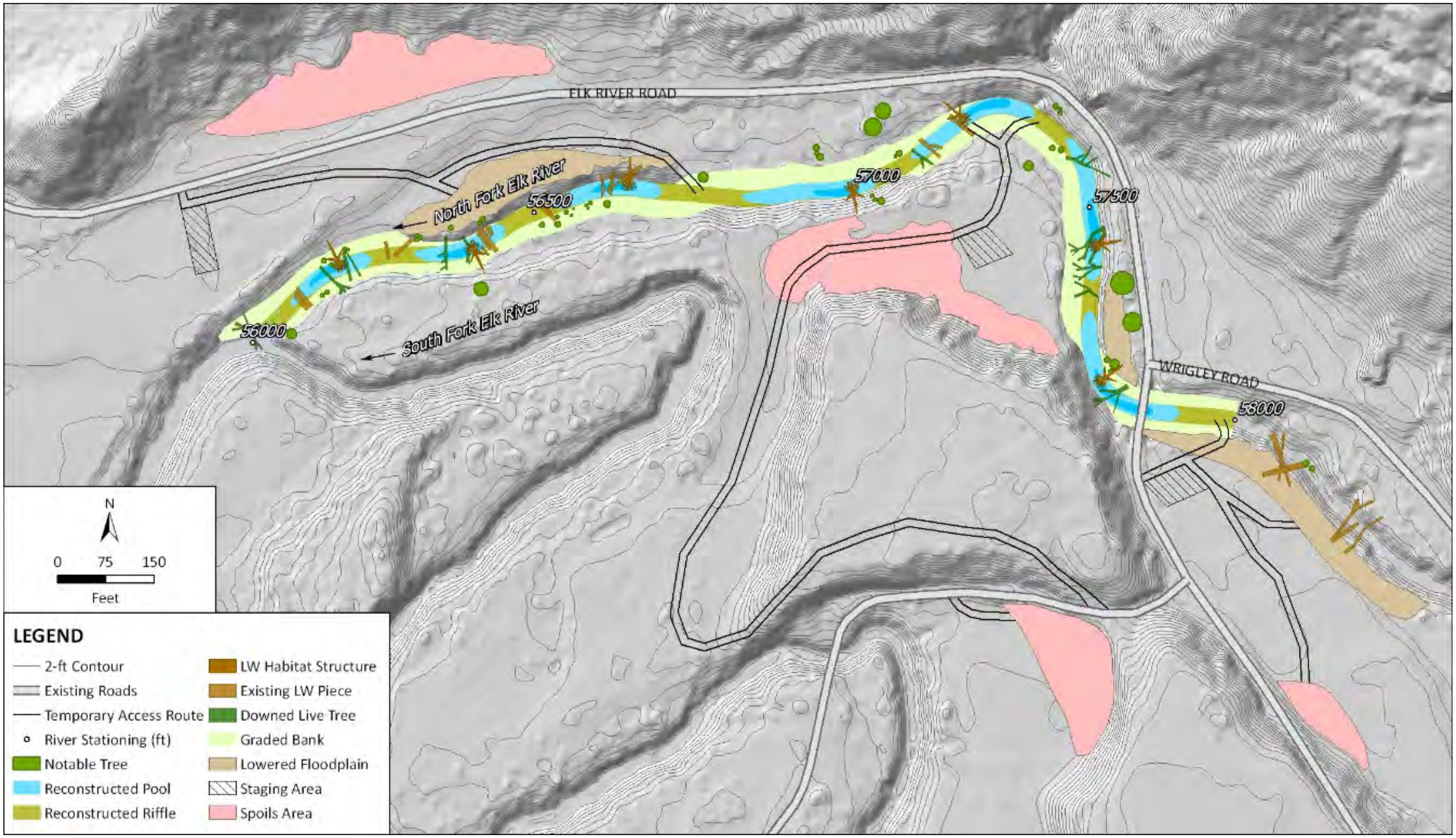

Figure 13. *Proposed Conceptual Remediation and Habitat Enhancement design for the Elk River Flood Curve Project reach.*

The current large wood supply (number of pieces, key pieces, and volume) in the North Fork Elk River and within the Flood Curve reach does not meet large wood targets prescribed by the RWQCB (2006) or prescribed in HRC's Habitat Conservation Plan (HRC 2015). A wood inventory conducted by Stillwater Sciences found one key piece greater than 24 in diameter and 24 ft long, and 14 total wood pieces greater than 6 in diameter and 3 ft long (**Table 9**). The project will increase the in-channel supply of large wood pieces and wood volume by (1) maintaining/replacing all existing wood pieces currently within the bankfull channel, and (2) constructing 7 new large wood habitat features, 1 per each re-constructed pool (**Table 10**).

Table 9. *Large wood inventory in the Elk River Flood Curve Reach. Refer to Figure 10 for location and orientation of each wood piece.*

Piece ID	L (ft)	D (in)	V (m3)	Key Piece
1	20	28	2.42	N
2	15	12	0.33	N
3	15	14	0.45	N
4	6	28	0.73	N
5	25	24	2.22	N
6	25	18	1.25	N
7	12	12	0.27	N
8	18	20	1.11	N
9	12	24	1.07	N
10	25	24	2.22	N
11	10	18	0.50	N
12	25	24	2.22	N
13	45	28	5.45	Y
14	35	14	1.06	N

Table 10. *Summary of proposed channel excavation, pool habitat enhancement, and sediment spoil areas in the Wrigley Orchard and Flood Curve Project reaches.*

Project Reach /Feature	Excavation Area (Acres)	Sediment Volume (CY)
Elk River Flood Curve		
Channel	2.4	16,000
Floodplain	1.1	3,200
Spoil Sites	2.6	9,900
Wrigley Orchard		
Channel	0.1	700
Floodplains	0.6	2,100
Spoil Sites	2.0	12,100

3.3.5 Channel and Floodplain Recontouring, Installation of Large Wood Habitat Structures, Riffle Reconstruction

With the bulk of excess sediment removed from the channel bed and banks, the next step in the construction process will entail refining the bed and bank contours to the design dimensions, including re-sloping of the temporary ramps into the channel.

The following design parameters will be followed:

- Channel banks will conform to side-slopes not to exceed 1.5:1 ratio;
- The toe of bank cross section width will be approximately 25 ft (narrower in some locations to avoid features including large trees or road easements);
- Floodplain benches within the inner channel will be approximately 11 feet above the channel bed to inundate annually (e.g. at the annual flood), if not more frequently. The intent of floodplain excavation is to increase conveyance during high flow events and would therefore flood seasonally during high flow events with associated benefits to salmonids.
- The average channel gradient will target 0.1% with a total elevation change of approximately 1.94 ft distributed along the entire Flood Curve reach (approximately 2,000 stream feet); Note that channel bed gradients are controlled by existing bed elevations upstream and downstream of the project.

3.3.5.1 *Reference Targets for Large Wood Pieces and Volumes*

The design of instream Large Wood (LW) structures, and the size and volume of wood pieces, is an important consideration for our channel rehabilitation design, especially since the addition of wood is an important component of our Project's mitigation. Numerous literature sources were consulted to determine the best approach for adding large wood into the NF Elk River. Wood loading targets for number of key pieces, number of total pieces, and total wood volume (per 100 m or 328 ft of channel length) established by the North Coast RWQCB, Humboldt Redwood Company, Carroll and Robison (2007) for Prairie Creek, and The Nature Conservancy (2006), Foster (2001), and Kier Associates and National Marine Fisheries Service for the SONCC Coho Recovery Plan were compared (**Table 11**). Note that the NCRWQCB target adopted a modified version of LWD reference values from undisturbed forests in Washington and Oregon (originally published by Shuett-Hames et al. 1999, and Fox, 2001) and are intended targets for wood pieces >0.3 ft diameter (much smaller pieces than proposed in the Elk River). The NCRWQCB (2006) LW targets are thus not comparable to our Project objectives. The 2015 targets from Humboldt Redwood Company are based on their *Aquatic Properly Functioning Condition* (APFC) established as part of the 1999 HRC Habitat Conservation Plan (HCP) used to evaluate if salmonid habitat conditions are trending toward APFC. These targets are tailored specifically to Elk River, including two monitoring sites on the North Fork Elk River upstream of our Project sites. Large wood targets for key pieces, number of pieces, and wood volume for ATM Site 14 and Site 214 are presented in **Table 11** (HRC, 2015; pg. 32). Large wood characteristics in Prairie Creek (Carroll and Robison, 2007) are representative of large wood in an old growth forest and are less applicable to the semi-urban stream setting in the Project area, where channel encroachment and nuisance flooding are important considerations. Large wood characteristics established by The Nature Conservancy (2006) and Kier Associates and National Marine Fisheries Service (2008) were established as reference values used as part of the SONCC Recovery Plan to define wood targets for an entire region or ESA. These values appear to be very low as targets for large wood pieces and are not applicable to Elk River.

Our Project design relied on the HRC ATM Site 214 (2015) APFC targets as the best reference values to guide development and comparison of suitable large wood volume and piece targets for the NF Elk River. Our Project is not obligated to exceed the HRC Large Wood targets.

3.3.5.1 *Function of Large Wood Structures, Number of Pieces, and Volume*

In addition to referencing published regional targets to determine large wood targets, and based on NMFS and CDFW direction, CalTrout and NHE assessed the Elk River Project reaches and Project objectives to identify the intended functions of the large wood features, identify the key piece size based on the channel width and expected water velocities during the targeted winter rearing season, and identified the volume/frequency of wood placements.

Large Wood Function

The intended function of the large wood structures is to provide hydraulic complexity, physical structure, and velocity refugia within pools inhabited by young-of-year Chinook salmon, and young-of-year and juvenile coho salmon and steelhead, during winter, spring, and summer rearing seasons. Wood structures should be constructed in a manner that allows for the connectivity of zero velocity refugia up through a rising stream stage to top of bank and continue up through stages where the floodplain can be accessed by fish. A secondary function is to promote pool scour and reduce sediment aggradation in the pool surrounding the wood structures.

Based on these intended functions, Large Wood habitat structures will be installed in each of the eight reconstructed pools. Wood pieces salvaged from the reach during construction and additional redwood logs will be used to construct habitat features. The installation of wood structures will target creation of low/zero velocity winter refugia areas within re-constructed pools and along the channel margins

Table 11. *Large Wood target values* for number of key pieces, number of pieces, and total wood volume. Elk River channel top width = ~60 ft.

Metric	Source	Criteria		Target Frequency and Volume (To Exceed)
		Diameter (ft)	Length (ft)	
Key Pieces				
	Foster et al. (2001)	2	33	3/100 m
	Shuett-Hames et al. (1999; based on 60 ft bankfull width)	2	105	
	Fox (2001; based on 60 ft bankfull width)			4 pieces/100 m
	HRC NF Elk Site #14	1.6*	25.4*	0.5 pieces/CW (= 2.7 pieces/100 m)
	HRC NF Elk Site #214	2.0*	34.6*	0.5 pieces/CW (= 2.7 pieces/100 m)
Total Pieces				
	Nature Conservancy (2006); Kier Associates and NMFS (2008) based on a wetted width > 30 ft	1	25	60 pieces/mile (= 3.7 pieces/100 m)
	Shuett-Hames et al. (1999)	0.3	6.6	
	Fox (2001; based on 60 ft bankfull width)			63 pieces/100 m
	Carroll and Robison (2007; in Prairie Creek)	0.3	6.6	24 pieces/100 m
	HRC NF Elk Site #14	1.6	25.4	25.6 pieces/100 m
	HRC NF Elk Site #214	2.0	34.6	15.5 pieces/100 m
Total Volume (m^3)	Fox (2001; based on 60 ft bankfull width)			99 m^3/100 m
	HRC NF Elk Site #14			32.6 m^3/100 m
	HRC NF Elk Site #214			38.6 m^3/100 m

* criteria for all large woody debris pieces, not specifically for key pieces.

Constructed Large Wood Habitat Features.

The wood structures will target wood sizes, number of pieces, and number of key pieces provided in the HRC APFC. New log structures will be placed in newly excavated pools to provide low/zero velocity winter refugia habitat for juvenile salmonids and to initiate long-term channel complexity through the initiation of scour, deposition, and sediment sorting. One log structure will be constructed in each of the seven enhanced pools at the Flood Curve, and one enhanced pool at the Wrigley Orchard reach, for a total of eight log structures (**Figures 12 and**

13). The structures will be placed at an appropriate location within the pools to encourage pool scour during high winter flows and to provide suitable water velocities to enhance juvenile salmonid rearing habitat, with connectivity of zero velocity refugia through a rising stream stage and up through stages where the floodplain can be accessed by fish. Each structure will be constructed with one key piece (18-24 inch diameter by 20-30 ft long log) preferably with rootwad placed into the pool, one equally sized footer log, two anchor logs 12-18 inches diameter, and two smaller pinning logs with minimum 12 inch diameter, for a total of 6 wood pieces (**Table 11**). Logs will be anchored into the bank without ballast rocks. The anchor and pinning logs will be used to hold the larger diameter rootwad and footer log in place and will not require artificial anchors (bolts and cables, etc.) to be placed in stream. The structures will be embedded into the banks within the winter baseflow channel and will not extend more than half-way into the cross section to maintain a low profile and not collect excessive debris. The location of large wood in relation to the enhanced pools is depicted in **Figures 12 and 13**. The Log Structures are also described in the Draft 65% Engineering Designs (**Attachment A)**. In addition to the 21 m3 of salvaged material that will be replaced, the total volume of new wood material to be placed in the channel is approximately 8 m^3 per structure, for a net increase of 64 m^3 (8 structures) of permanent fill of wood material (per USACE).

Salvaged Wood Pieces
The 14 existing wood pieces enumerated in the Flood Curve reach larger than 6 inches diameter and 3 ft long (**Table 5**) and approximately 13 live trees spanning the channel and obstructing construction equipment access will be salvaged from the Flood Curve reach during the channel excavation phase and stockpiled near the location of their removal. There are no large wood pieces to be removed at the Wrigley Orchard reach. During channel recontouring, the ~27 salvaged logs will either be placed back into the channel (if the wood material is competent) or replaced with redwood logs of comparable size or larger. These logs may be placed individually and anchored naturally into the bank without ballast rocks, or reconstructed as a multiple-log habitat feature, depending on the availability of material. Three of the 10 pieces are under 10 ft long (**Table** 5) and would not likely stay in the channel during high (bank full) flow. At least these three small pieces will be replaced with more competent redwood buried in the bank to secure position. The net result will be the equivalent number of log pieces as are found in the existing channel configuration, but with the existing less durable hardwood pieces upgraded to redwood logs.

Table 12. *Wood material to be used to construct pool habitat structures. Log dimensions are minimum sized and larger materials may be used if available.*

No. of Logs	Diameter (in)	Length (ft)	Volume (ft^3)	Type	Description
1	18-24	20-30	94.2	Key Piece	Base piece with (preferably) or without a root-ball. Embedded 10-20 ft into the bank.
1	18-24	20-30	94.2	Footer	Large wood underlying base piece at the toe of the channel bank.
2	12-18	12-20	35.3 x 2 =70.6	Anchor	Pair of large logs crossed over to anchor base piece. Embedded 5-7 ft into channel bed or bank.
0-2	12	15	11.8 x 2 =23.6	Pin	Small wood pieces pinning base piece. Embedded vertically 10 ft into channel bed.
		Maximum Volume = 283 ft^3 (8 m^3) per structure			

3.3.5.2 *Riffle Crest Reconstruction*

The crest of the riffle, controlling water elevation of the upstream pool, is a critically important feature in the final reconstructed channel morphology. Riffles will be either left in place as they were prior to construction or reconstructed using on-site sediment material. In the final shaping of the inner channel, riffles and pools will span the low-flow channel width, and micro-topographic contouring will not be attempted. A mix of fine gravel and coarse sand appropriate for the North Fork Elk River reach will be placed on the riffle surface to attain the final riffle crest hydraulic control and water surface elevation. A 6-12 inch layer of pea gravel (3/8" rock) will be placed on the portion of the riffle exposed above the summer low-flow water surface (i.e., not backwatered by the pool). Pea gravel will be sourced from Eureka Ready Mix Concrete Company, Inc. Gravel used for riffle augmentation will be washed with water off-site as part of the processing process prior to delivery. Gravel will be shaped and contoured to maintain interstitial spaces and encourage invertebrate colonization and production. This is an experimental component of the design to monitor the persistence of non-embedded gravel facies.

Table 13. *Current LWD supply, targets for 375 ft of channel, and estimate of LWD supply after project enhancement of one pool is complete for the 375 ft long* ***Wrigley Orchard*** *project reach.*

LWD criterion	HRC (2015) APFC Target	Wrigley Reach current supply	Wrigley Reach after enhancement
Key Piece (#)	3	0	1
LWD Piece (#)	17	0	6
Total Volume (m^3)	37	0	8

Table 14. *Current LWD supply, targets for 2000 ft of channel and estimate of LWD supply after project enhancements are complete for the 2000 ft long* ***Flood Curve*** *project reach.*

LWD criterion	HRC (2015) APFC Target	Flood Curve Reach current supply	Flood Curve Reach after enhancement
Key Piece	17	1	1+6=7
LWD Piece (#)	94	27 [1]	27+42=69
Total Volume (m^3)	198	21	21+56=77

[1] 27 includes 14 dead and 13 live pieces

3.3.6 Sediment Disposal

The sediment excavated from the channel bed and banks will be hauled out of the channel via track dump truck and placed at the pre-designated upland area used for sediment disposal. Sediment disposal areas are located in close proximity to the excavation sites, are outside streamside management areas and riparian habitat, and are flat pasture surfaces with perennial grass cover.

Excavated sediment will be placed at the sediment re-use sites, and rough-graded to expose large organic material (wood pieces) on the surface of the graded sediment. Those materials will be removed and stockpiled separately for later disposal via wood chipper or grinder or hauled to an appropriate recycling center. Wood materials will not be burned. Once the surface of the placed sediment is clean of all organic material, and the pre-designated volume of sediment has been placed at the site, the area will be fine-graded to achieve the final design contours. The sediment disposal areas will later be re-seeded in perennial grass at the appropriate season.

3.3.7 Channel Rewatering, Erosion Control, Revegetation

3.3.7.1 *Channel Rewatering*

Once the channel excavation, large wood habitat installation, and channel recontouring is complete, the diverted streamflow will be restored to the channel. Re-watering will be done in stages to prevent turbid water from passing downstream of the downstream fish screens and coffer dams. To initiate re-watering, a portion (half) of the total diverted streamflow will be allowed to bypass the upstream coffer dam and flow into the reconstructed channel. This flow will slowly refill pools until eventually streamflow reaches the downstream project boundary. This streamflow will continue to be pumped out of the channel and disposed in the upland settling basin to remove the first-flush of turbid water. Once the re-watered streamflow has cleared of most/all turbidity, the downstream coffer dam will be removed, and streamflow will be allowed to reconnect to the undisturbed downstream reaches. We will then slowly close the bypass pipe inlet, dismantle the upstream cofferdam, and allow for rewatering of the newly completed excavation area. The area disturbed by flow bypass mechanisms will be restored at the completion of the project. This may include, but is not limited to, recontouring the area and planting or riparian vegetation.

3.3.7.2 *Erosion Control*

Following completion of excavation, placement of fill, and grading, all disturbed ground surfaces (including access roads and channel ingress/egress areas after the temporary ramps are removed) will be treated for erosion. The newly excavated stream bed and bank areas intended to become part of the wetted channel will not be treated for erosion as these areas are intended to become part of the wetted channel. Construction areas and sediment disposal areas will be treated for immediate erosion control using a native grass seed mix with coverage equivalent to 100 pounds per acre of barley seed and mulched with at least 2-4 inches of certified weed-free straw mulch, wheat or other straw for riparian and wetland areas, and rice straw for upland areas. No annual (Italian) ryegrass (*Lolium multiflorum*) will be used. Areas designated to become riparian vegetation will be replanted at the appropriate season. Areas within the bank full channel will not be treated with erosion control.

The following BMPs (California Storm Water Quality Association Storm Water Best Management Practice (BMP) Handbook for Construction 2003) will be implemented to prevent entry of storm water runoff into the excavation site, the entrainment of excavated contaminated materials leaving the site, and to prevent the entry of polluted storm water runoff into the adjacent stream channel:

> EC-2 Preservation of Existing Vegetation. The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and

redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site. To the extent feasible, and consistent with the project's design, goals, and objectives, some existing vegetation will be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade and erosion control (CSWQA 2003).

EC-6 Straw Mulch. Straw mulch is suitable for soil disturbed areas requiring temporary protection until permanent stabilization is established. Where appropriate, weed-free straw mulch will be used for erosion control on disturbed areas until soils can be prepared for permanent vegetation. Straw mulch is also used in combination with temporary and/or permanent seeding strategies to enhance plant establishment (CSWQA 2003).

EC-8 Wood Mulching. Wood mulching is suitable for disturbed soil areas requiring temporary protection until permanent stabilization is established. The primary function of wood mulching is to reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff (CSWQA 2003). Vegetation removed during construction will be chipped on-site and reused as erosion control mulch where feasible and appropriate.
Riparian Enhancement

SE-1 Silt Fences. Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. Where appropriate, they will be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion. Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls (CSWQA 2003).

3.3.7.3 *Revegetation Plan*

The Project area has patchy vegetation growth along the channel which includes a mix of native and non-native species that have become rooted in aggraded fine sediments. Throughout the majority of the project reaches, overly dense stands of vegetation impair the hydraulic function of the channel, disrupt habitat-forming physical processes, impede establishment of native riparian vegetation, and cause sediment to accumulate in the channel.

In-channel Vegetation and Riparian Understory Clearing

Within the Project area, native vegetation such as willows generally less than four inches in diameter and stands of blackberry generally occur on low floodplain benches and at the toe of the streambank. Clearing will involve the removal of species rooted in the channel (including channel banks) and floodplain within the sediment removal construction footprint. Vegetation clearing activities will be completed following dewatering but before grading commences.

Vegetation clearing will be implemented using mechanized equipment, track mounted bobcats, and mini-excavators as well as hand tools including shovels, rakes, and chainsaws. Only physical removal techniques will be employed, no herbicides will be used. Removed vegetation will be chipped and used as mulch or provided to landowners as firewood. Vegetation that is removed may be temporarily stacked at top of bank before being transported to a location where it will be chipped and used as mulch.

Riparian Revegetation

The Project action will create newly excavated floodplain surfaces above the top of bank which will be replanted with native species appropriate for local conditions (i.e. the low flow channel below OHWM and newly created streambanks will not be revegetated as these areas are intended to become part of the wetted channel under high flow conditions). Native riparian trees and shrubs *above the top of banks* will be replanted at a mitigation ratio of 3:1, with a mix of hardwoods and conifer species to result in a higher diversity of native vegetation. This diverse mix of riparian hardwoods and conifers will ultimately develop into a riparian corridor that is more complex and representative of natural conditions than that which exists currently and will provide better aquatic habitat value including better shading, improvements in water temperature, protection from avian predators, and the contribution of large wood to the channel in the future. The proposed mitigation ratio is based on the count of trees removed and not the area disturbed, such that for each tree larger than 4 inches DBH that is removed, three trees will be replanted either within the disturbed areas or within undisturbed areas to promote greater tree species diversity.

A revegetation plan using a master planting list (**Table 15**) and based on site specific conditions will be developed in consultation with CDFW concurrently with development of the 100% engineering designs. The revegetation plan will include estimated quantities, type (container size, live cuttings, salvaged plants), spacing, and planting location for each species. All materials would be locally-harvested cuttings or container stock native to the Elk River corridor. Container stock will be obtained from certified native plant nurseries nearby.

The objective of revegetation is to quickly establish canopy cover and an ecologically self-sustaining mosaic of habitats to replace and enhance habitat for fish, birds, amphibians, and other wildlife using terrestrial riparian areas while providing shading, sources of organic matter and coarse woody debris, and water quality benefits to aquatic species. All graded and disturbed areas will be revegetated with species appropriate for the target habitat type for each disturbance site. Reference sites within the excavation area will be used to identify revegetation planning, based on the composition of species identified in **Table 15**. Revegetated sites will be monitored to ensure that a complex and diverse riparian plant community is established over time, which is similar to the species composition identified at reference sites. Site preparation for planting would rely on hand techniques.

Planting activities will take place at the end of the construction season in late-October 2019, allowing the establishment of new plantings during the subsequent winter. Plantings will be monitored to ensure 80% survivability three years after implementation of the Proposed Project. Because of the naturally moist climate, it is expected that plantings will establish without the need for irrigation.

Table 15. *Riparian Replanting Palette*

Riparian Species		Coniferous Forest Species	
Salix lasiandra	Pacific willow	*Sequoia sempervirens*	Redwood
Salix lasiolepis	Arroyo willow	*Picea sitchenis*	Sitka spruce
Alnus Rubra	Red Alder	*Abeis grandis*	Grand fir
Myrica Californica	California Wax Myrtle	*Thujaplicata*	Western red cedar
Understory			
Sambucus racemose	Elderberry	*Polystichum munitum*	Sword fern
Rosa californica	California rose	*Salix scouleri*	Scouler's willow
Urtica dioica	Stinging nettle	*Lonicera involucrate*	Twinberry
R. ursinus	CA blackberry	*Rubus spectabilis*	Salmonberry

Non-native Himalaya blackberry (*Rubus armeniacus*) occurs throughout the Project area and will not be replanted

3.3.8 As-Built and Performance Monitoring

As-built and performance monitoring will take place for at least three years following the completion of construction activities. This span of monitoring will include post-construction as-built surveys, winter monitoring of water surface elevations and channel cross section responses to winter high flow events, and monitoring of salmonid habitat conditions through the spring recession into the summer low-flow period.

3.3.8.1 *Post construction as-built surveys and photo-monitoring*

Following completion of construction activities, as-built monitoring will be conducted to assess the following project components:

- The constructed channel topography conforms with the engineering design drawings.

- The constructed floodplain topography conforms with the engineering design drawings.
- The BMPs for erosion control were implemented adequately to prevent sediment entrainment and turbidity runoff from the project site.
- The planted riparian vegetation is the correct species and sizes according to the revegetation design specifications.
- The planted riparian vegetation is located and planted in accordance with the revegetation design specifications.
- Photo-monitoring points are monumented adequately to allow relocation for periodic photo-monitoring.

3.3.8.2 *Monitor geomorphic and sediment responses*

Monitoring will be conducted for the Project reaches for one winter and spring season following construction, to document the following channel geomorphology and sediment conditions and using monitoring protocols established in the Elk River Recovery Assessment (CalTrout et al. 2018):

- Longitudinal profile surveys of the entire reconstructed project reaches, capturing riffle crest elevations and maximum pool depths; average point density should be approximately 1 bankfull channel width apart, but may be more or less dense depending on the local complexity in channel morphology;
- Cross section surveys of approximately 8-12 existing cross sections in the Flood Curve reach and 2-3 cross sections in the Wrigley Orchard reach, capturing all breaks in slope, with a minimum of the top of bank, toe of bank, thalweg, and water edge.
- Water surface elevation during 1 or 2 storm events, marking and surveying high water marks along the Project reaches during winter storm events, accompanied with a discharge estimate, and comparison to the hydrodynamic model predicted (design) flood elevations;
- Sediment facies mapping using ocular estimates of sediment size classes, noting initiation of sediment sorting associated with large wood structures;
- Mapping and inventory of wood structures noting stability, persistence through winter storm events, and mobilized pieces (if any).

3.3.8.3 *Monitor juvenile salmonid habitat conditions and large wood habitat structures*

Juvenile salmonid habitat will be monitored during the spring recession and summer low-flow season following construction. We will monitor the following conditions:

- Pool depths relative to as-built conditions to measure aggradation rates

- Water temperature and dissolved oxygen concentrations, emphasizing conditions during July through October low-flow summer rearing;
- Mapping and inventory of each constructed wood structures, noting wood racking, channel scour and habitat quality related to each feature;
- Persistence of placed riffle gravel, and gravel sorting and particle size distribution associated with other segments of the reconstructed channel.

3.3.8.1 *Riparian Monitoring*

After field adjusting the construction footprint to avoid vegetation impacts to the extent possible and counting necessary tree removals, CalTrout will finalize the revegetation management plan including the replanting palette in consultation with CDFW by July 1 (prior to in-stream vegetation removal to be conducted in late-July). Under the proposed action, CalTrout will monitor and adaptively manage revegetated areas for at least three years to ensure 80% survivability per CDFW requirements.

Revegetated species will be flagged such that reestablishment success can be independently reviewed by regulatory agency staff. Revegetation monitoring will be conducted in late spring three years after Project construction, to ensure that replanting and reestablishment may occur and be documented within CDFW's required window. A monitoring report will be prepared defining the proposed vegetation management work plan to be conducted in the summer and early fall (such that replanting will be in the ground and benefit from the winter rains). The work plan will incorporate field notes and maps to define the actions that will be carried out in subsequent years. Issues addressed in the work plan will include areas where replantings will occur, densities, including weed and invasive species management if appropriate to achieve reestablishment.

All monitoring data and results will be presented in a Final Project Monitoring Report upon completion of all monitoring tasks.

4 LISTED SPECIES AND CRITICAL HABITAT IN THE ACTION AREA

4.1 Species List

Special status species that may occur in or adjacent to the Proposed Project area were identified through queries of the California Natural Diversity Database (CNDDB), the Biogeographic Information Observation System (BIOS), and the northern spotted owl database (Gould 1997) for the project region, identified as the McWhinney Creek and Fields Landing USGS quadrangles (T4N, R1W, Sections 26 and 26). The CNDDB and BIOS were queried in November 2018, and a current list of federally endangered, threatened, or candidate species was obtained from the USFWS in November 2018. This list includes 16 federally-listed species (two mammals, four birds, seven fish, and three plants) as indicated in **Table 16**, below.

Table 16. *Federally-Listed Threatened, Endangered, and Proposed Species for the Species identified within the McWhinney Creek and Fields Landing USGS quadrangles*

Scientific Name	Common Name	Federal Listing	Critical Habitat in Action Area	Potential to Occur in the Project area during the construction window
Plants				
Erysimum menziesii	Menzies wallflower	Endangered	N	None
Layia carnosa	beach layia	Endangered	N	None
Lilium occidentale	western lily	Endangered	N	None
Fish				
Thaleichthys pacificus	Eulachon	Threatened	Y	None
Spirinchus thaleichthys	Longfin smelt	Proposed	N	None
Acipenser medirostris	Green sturgeon	Threatened	N	None
Eucyclogobius newberryi	Tidewater goby	Threatened	Y	None
Oncorhynchus kisutch	Southern Oregon/Northern California coho salmon	Threatened	Y	Present
Oncorhynchus mykiss	Northern California steelhead	Threatened	Y	Present

Scientific Name	Common Name	Federal Listing	Critical Habitat in Action Area	Potential to Occur in the Project area during the construction window
Oncorhynchus tshawytscha	California Coastal Chinook salmon	Threatened	Y	Very Low
Birds				
Brachyramphus marmoratus	Marbled murrelet	Threatened	Y	Low
Charadrius nivosus	Western snowy plover	Threatened	Designated, but outside of Project area	Low
Coccyzus americanus	Western yellow-billed cuckoo	Threatened	N	Low
Strix occidentalis caurina	Northern spotted owl	Threatened	Y	Moderate
Mammals				
Martes caurina humboldtensis	Humboldt Marten	Candidate Endangered	N	Low
Pekania pennanti	Pacific Fisher	Candidate Threatened	N	Low

The USFWS list includes special-status fish species under the jurisdiction of National Marine Fisheries Service (NMFS) as indicated in **Table 17**. The potential of these species to occur in the Project area during the construction period is established in Section 2.3 and discussed in Section 4.3.

Table 17. *Federally-Listed Salmonid Species with Potential to Occur in the Project Area*

Common Name	Scientific Name	Status	Critical habitat in Action Area	Potential to be disturbed by Project
Coho salmon, Southern Oregon/Northern California ESU	*Oncorhynchus kisutch*	Threatened	Y	High
Steelhead, Northern California DPS	*Oncorhynchus mykiss*	Threatened	Y	High
Chinook salmon, California Coastal ESU	*Oncorhynchus tshawytscha*	Threatened	Y	Very Low

KEY:
Federally Endangered - Listed in the Federal Register as being in danger of extinction

Federally Threatened - Listed as likely to become endangered within the foreseeable future
Critical habitat - Y = Designated, P = Proposed, N = None Designated

4.2 Species Excluded from Further Consideration

The following species identified in **Table 16** are unlikely to be present in or near the Project area and therefore would not be impacted by the Proposed Project. A brief discussion of these species and the rational for eliminating them from further discussion is provided below.

4.2.1 Plant Species Excluded

Menzies' wallflower (*Erysimum menziesii*)
Federal Status: Endangered
Critical Habitat: None designated in the Project area

No Special Status plants were encountered in the project areas surveyed to date.

Beach lavia (*Lavia carnosa*)
Federal Status: Endangered
Critical Habitat: None designated in the Project area

No Special Status plants were encountered in the project areas surveyed to date.

Western lily (*Lilium occidentale*)
Federal Status: Endangered
Critical Habitat: None designated in the Project area

No Special Status plants were encountered in the project areas surveyed to date.

4.2.2 Bird Species Excluded

Marbled Murrelet (*Brachyramphus marmoratus*)
Federal Status: Threatened
Critical Habitat: Designated within the Project area

The federally threatened Marbled Murrelet is a small seabird that nests in coastal, old-growth forests of North America. The species is a year-round resident along the coast from the Alaskan Aleutian islands to Big Sur in California. Critical Habitat was designated for the marbled murrelet, effective June 24, 1996 (61 FR 26256). The Marbled Murrelet has low potential to occur in the Project area. There is no suitable nesting habitat in or near the Project area. The possibility of Murrelets flying over the Project area to/from nesting and foraging sites cannot be completely ruled out. No night work/construction activities will occur at the Project site during any of the construction phases. This eliminates the possibility of light disturbance to Murrelets during their dawn and dusk foraging periods. Since no suitable habitat exists for the Marbled Murrelet in the immediate Project area and the Murrelet is highly mobile, no impacts are expected to occur to this species.

Northern Spotted Owl	(*Strix occidentalis caurina*)
Federal Status:	Threatened
Critical Habitat:	Designated within the Project area

The Northern Spotted Owl is the northwestern-most dwelling subspecies of the Spotted Owl (Strix occidentalis) in North America. It is federally threatened and state threatened in California (55 FR 26114 26194). Critical Habitat was designated for the northern spotted owl, effective February 14, 1992 (57 FR 1796). The preferred habitat type of the Northern Spotted Owl consists of old growth forests with moderate to high canopy closure, a multi-species canopy with large over-story trees, large trees with numerous decadence features (i.e. broken tops, cavities, and snags), and a significant amount of open space beneath the canopy. Since no suitable habitat exists for the Northern Spotted Owl in the immediate Project area and the owl is highly mobile, no impacts are expected to occur to this species.

Western Snowy Plover	(*Charadrius nivosus*)
Federal Status:	Threatened
Critical Habitat:	Designated but not within the Project area

Two distinct breeding populations of snowy plovers are known: the Pacific coast population, and an interior population. The Pacific coast population nests in coastal areas of California, Mexico, Oregon, and Washington (FWS, 2007; 2010b). It prefers nests on sand spits, dune-backed beaches, un-vegetated beach strands, and open areas near river mouths and estuaries, where vegetation and driftwood are sparse or absent. Coastal populations of the Snowy Plover were listed as threatened in 1993 (58 FR 12864). USFWS designated critical habitat for the coastal population of the Western Snowy Plover throughout its range on the Pacific Coast of the United States in 2012 (77 FR 36727 36869). Critical habitat components essential for the primary biological needs of foraging, nesting, rearing of young, roosting, and dispersal, or the capacity to develop those habitat components. The primary constituent elements exist in areas that support or have the potential to support intertidal beaches (between mean low and mean high tide), associated dune systems, and river estuaries. No suitable habitat for snowy plover is found in the project area.

Yellow-billed Cuckoo	(*Coccyzus americanus*) Western DPS
Federal Status:	Threatened
Critical Habitat:	None designated

The Western Yellow-billed Cuckoo is listed as a threatened species, effective November 3, 2014 (79 FR 59991 60038). As a neotropical migrant, the Yellow-billed Cuckoo breeds in North America and winters in South America east of the Andes. The species breeds and nests in open deciduous woodlands and riparian (cottonwood and willow) woodlands, while preferring to nest 3-10 feet above ground in a dense understory. They may also nest in orchards and thickets and forage in forests, woodland, or scrub habitats. The USFWS proposed 546,335 acres of Critical habitat for the western DPS of the Yellow-billed Cuckoo throughout its range in the United States on August 15, 2014 (79 FR 48547 48652). There are no sufficient patch sizes of suitable riparian habitat in the Project area.

4.2.3 <u>Mammal Species Excluded</u>

Pacific Fisher, West Coast DPS	*(Martes pennant)*
Federal Status:	Candidate
Critical Habitat:	None designated

The fisher is a terrestrial, forest-dwelling mammal of the weasel family. Fishers live primarily in late-successional coniferous or mixed conifer-deciduous forests with a dense overstory. They prefer large interior areas of forests, and generally do not use areas with little forest cover or where humans have caused major disturbance. Fishers are often found in riparian areas, which are protected from logging and have more complex forest structure with more snags and large woody debris. Fallen logs, snags and large hollow trees (dbh < 20 in.) appear to be important habitat components for fishers, as they use these areas as den sites, and may use younger forests that provides similar habitat structure. Fishers are known to occur in the Elk River watershed but are not likely to utilize habitat imbedded in a developed matrix of human habitation. Therefore the potential for Pacific Fisher to occur in the Project area or be adversely affected by the Proposed Project is low.

Humboldt Marten	*(Martes caurina humboldtensis)*
Federal Status:	Candidate
Critical Habitat:	None designated

The Marten utilizes large patches of late-successional mixed conifer forestsm primarily within fog-influenced forest habitat within 20 km of the coast. They prefer a dense shrub layer composed of a mix of ericaceous species. Suitable habitat is not present in the Project area. Therefore, the potential for Humboldt Marten to occur in the Project area or be adversely affected by the Proposed Project is low.

4.2.4 Aquatic Species Excluded

Eulachon, southern DPS	(*Thaleichthys pacificus*)
Federal Status:	Threatened
Critical Habitat:	Designated within the Project area

The southern eulachon DPS was listed as a threatened species by the federal government, effective May 17, 2010 (75 FR 13012). Critical habitat was designated for this species effective December 19, 2011 (76 FR 65323). This small, anadromous smelt currently occurs in certain locations from Monterey Bay, California to south-central Alaska. The nearest designated Critical habitat is the lower portion of the Mad River. Eulachon are unlikely to be present within the Action Area, thus the proposed Project will have no effect on this species.

Longfin Smelt	(*Spirinchus thaleichthys*)
Federal Status:	Proposed
Critical Habitat:	No critical habitat designated

The Longfin Smelt was listed as threatened under the California Endangered Species Act in 2009 (CDFG 2009). The U.S. Fish and Wildlife Service has found the San Francisco Bay-Delta Distinct Population Segment of Longfin Smelt warrants protection under the federal Endangered Species Act, however the listing was precluded (due to higher listing priorities). Longfin Smelt is historically found in the San Francisco Estuary and the Sacramento/San Joaquin Delta (Bay-Delta), Humboldt Bay, and the estuaries of the Eel River and Klamath River. Longfin smelt are anadromous and euryhaline and use a variety of habitats from nearshore waters, to estuaries and lower portions of freshwater streams (Garwood 2017). Because the Longfin Smelt is not currently federally listed, critical habitat has not been designated. Important habitat for this species includes spawning and rearing grounds with appropriate substrate, salinity and prey species.

Green Sturgeon (*Acipenser medirostris*)
Federal Status: Threatened
Critical Habitat: None designated within the Project area

The green sturgeon Southern Distinct Population Segment (DPS) was listed as threatened on April 7, 2006 (71 FR 17757). Tagging or genetics data are needed to identify an individual fish to DPS (NMFS, 2005). Critical habitat was designated for the green sturgeon southern DPS, effective November 9, 2009 (74 FR 52300). Critical habitat for this ESU includes coastal waters north of Monterey Bay, California and certain coastal bays and estuaries, including Humboldt Bay. It is an anadromous, demersal species that primarily occurs in the marine environment and only enters freshwater to spawn (70 FR 17386, Moyle 2002). The Southern DPS is known to breed only in the upper Sacramento River. According to NMFS (2005), "the principal threat to this DPS comes from the reduction of green sturgeon spawning area to a single population in the Sacramento River." The majority of Green sturgeon detections in Humboldt Bay are of the Southern DPS from the Sacramento River (Pinnix, 2010). Since the southern DPS is not known to spawn in Humboldt Bay tributaries (or other, larger north coast rivers), it is presumed that adult Southern DPS green sturgeon will not be present within the Project area.

Tidewater Goby (*Eucyclogobius newberryi*)
Federal Status: Threatened
Critical Habitat: Designated within the Project area

The tidewater goby is listed as a threatened species in 1994 (59 FR 5494 5499) and critical habitat was designated in 2008 (73 FR 5920). Humboldt Bay is included within the area designated as Critical Habitat. Tidewater gobies are not present in the Action Area since the species only inhabits shallow water areas of coastal lagoons or estuaries that are periodically connected to marine environments as a result of breaching events.

California Coastal Chinook Salmon (*Oncorhynchus tshawytscha*)
Federal Status: Threatened
Critical Habitat: Designated within the Project area

The California Coastal Chinook salmon (California Coastal ESU) was listed as threatened in 1999 (64 FR 50394) and reaffirmed in 2005 (70 FR 37160). California Coastal Chinook salmon are a distinct population of Chinook salmon that reside from Redwood Creek in Humboldt County, south through the Russian River in Sonoma County. Critical Habitat was designated for the California coastal chinook salmon in 2000 (65 FR 7764).

California Coastal Chinook salmon spawn and rear in coastal and interior rivers in Northern California and Southern Oregon. Ocean-type Chinook (fall run) salmon rear for less than one year in freshwater, while stream-type Chinook (spring run) salmon remain in freshwater for one year or more before emigrating to forage in coastal and marine zones of California and Oregon for two to five years (Healey 1991). Currently, only fall-run Chinook salmon appear to be extant in the ESU, and typically migrate to the ocean within their first year from April through July. The latest documented occurrence of Chinook salmon in the mainstem Elk River was June 17 (Seth Ricker Personal Communication, 2018). Fish removal activities associated with the Proposed Project would occur in late-July, well after the last observed occurrence of Chinook in the mainstem Elk River. Chinook salmon are assumed to have outmigrated from the action area by the construction window of August 15 through October 15. However, the impact of the Proposed action on critical habitat for California Coastal Chinook salmon is evaluated in Section 5.2.

4.3 Species Considered/Potentially Impacted by the Project Action

Two federally-listed threatened species under the jurisdiction of the National Marine Fisheries Service (NMFS) that are likely to be present within the action area during defishing activities in late-July and throughout the construction window (August 15 through October 15 or October 31 if no rain is forecast) include Southern Oregon/Northern California Coast Coho salmon and Northern California Steelhead Trout. The following section describes the life history, biological requirements, limiting factors, local abundance, and distribution of these species.

Southern Oregon/Northern California Coast Coho Salmon ESU (***Oncorhynchus kisutch***)
The Southern Oregon/Northern California Coast coho salmon Evolutionary Significant Unit (ESU) was listed as threatened by NOAA in 1997 (62 FR 33038), reaffirmed in 2005 (70 FR 37160), and critical habitat was designated in 1999 (64 FR 24049). This ESU is defined as all coho salmon naturally produced in streams between Punta Gorda in northern California, Humboldt County and Cape Blanco in southern Oregon. All accessible areas of the Elk River,

including estuaries and tributaries, are included in the area designated as Critical habitat for this ESU.

Coho salmon were the first of three species in Elk River to be listed as threatened in 1997. Evidence from CDFW activities in Elk River at the time suggest a substantial population of coho salmon (Hallock et al. 1952). Although the population has declined, it is still likely above the depensation level. Below the depensation level, populations may be at heightened risk of extinction by stochastic events, such as having all adults eaten by predators before they reproduce, or adults being unable to find a mate. The NMFS coho spawner abundance target for all Humboldt Bay tributaries is 5,700 adults (NMFS 2014). In the past five years, estimates of returning adults in Humboldt Bay have ranged from 1,200 to 3,400 adult coho (Ward et al. 2015, Ricker et al. 2012).

Life History

Humboldt Bay coho salmon spawning activity typically peaks during January or February, with fish observed from November through March (CDFW 2011, 2014). Eggs incubate for 1 to 1 ½ months during winter. Fry emerge and occupy shallow areas with vegetative cover. Three basic life-history strategies of coho salmon have been reported for Humboldt Bay tributaries: 1) young-of-the-year fish arrive in spring and reside mostly in mainstem channel habitat in summer and early fall; 2) age 1+ fish arrive after the first large stream flow event in fall and reside extensively in smaller tributary and off-channel habitat during winter and spring; and 3) stream-reared age 1+ coho salmon emigrate through the stream-estuary ecotone quickly during the following spring (Wallace et al. 2015). Estuaries serve as a transition area for juvenile coho salmon during their migration from freshwater to the ocean (Wallace et al. 2015). Adults typically spend the next two years in the ocean before returning to their home streams to spawn (NMFS 2014). Coho salmon in the stream-estuary ecotone grow larger than their cohorts that reared farther upstream, suggesting that the stream/estuary ecotone is important overwintering and rearing habitat (Wallace et al. 2015).

Biological Requirements

When coho salmon first enter salt water they feed primarily on marine invertebrates, such as copepods, euphausids, amphipods, and crab larvae. As coho salmon mature, fish represent an increasing proportion of their diet (Moyle 2002). Freshwater habitat requirements for juvenile coho salmon include cool water temperatures, clear water, riparian vegetation that provides shade, clean silt-free gravel for spawning, in-stream large woody debris, availability of food (invertebrates), and overwintering habitat consisting of large off-channel pools with complex cover or small spring-fed tributary streams (Moyle 2002). The stream-estuary ecotone (defined as side channels, off-channel ponds, tidal channels, and fringing marsh habitats accessible to fish for at least some portion of the tidal cycle) also provides high-quality rearing habitat, particularly overwintering habitat, for juvenile coho salmon (Wallace et al. 2015).

Limiting Factors

Population declines and extirpations in individual streams and tributaries occurred due to widespread degradation of freshwater habitats from activities such as timber harvest, road building, grazing and mining activities, urbanization, stream channelization, dam construction, wetland filling or draining, beaver trapping, and water withdrawals and diversions for irrigation (NMFS 2014). These activities resulted in changes in channel morphology and substrate, loss and degradation of estuaries, wetlands, and riparian areas, declines in water quality, altered stream flows, and fish passage impediments. The NMFS analyzed threats and stresses to Humboldt Bay coho salmon in their 2014 species recovery plan; summarized in **Table 18**.

Table 18. *Stresses and Threats to Humboldt Bay coho salmon, analyzed and compiled in the 2014 NMFS recovery strategy. Only factors of high and very high concern are shown.*

	Life History Stage					
Coho salmon	egg	fry	juvenile	smolt	adult	overall
Stresses						
Floodplain/structure		very high	very high	high		very high
Estuary/mainstem function		high	very high	high		
Sediment	very high	high	high	high		very high
Water quality		high	high	high		
Barriers			high	high		
Threats						
Roads	very high	very high	very high	very high		very high
Channelization/diking			very high	very high		very high
Agriculture			high	high		high
Development		high	high	high		high
Timber harvest	high	high	high	high		high
Climate change			high	high		high

Local Abundance and Distribution

In the past five years, estimates of returning adults in Humboldt Bay have ranged from 1,200 to 3,400 adult coho (Ward et al. 2015, Ricker et al. 2012). The lower North Fork of the Elk River reach historically provided spawning habitat for coho salmon (CalTrout et al. 2018). However, spawning habitat quality in these reaches is currently heavily degraded by fine sediment, with little recent spawning activity recorded. The lower North Fork reach also historically provided high quality and abundant juvenile salmonid rearing habitat year-round and was especially important during juvenile and pre-smolt outmigration in the springtime (**Table 19**). Currently, juvenile salmonid rearing habitat is heavily degraded (NMFS 2014), yet regularly populated by juvenile coho salmon (HRC 2012).

Table 19. *Predicted Seasonal Presence of coho salmon in the North Fork Elk River Project Area.* *Dark shading indicated months of peak activity for a particular life stage, lighter shading indicates months of lesser activity.*

	Month											
Life Stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Adult migration /spawning												
Rearing												
Juvenile Outmigration												

<u>Northern California Steelhead DPS</u> (*Oncorhynchus mykiss*),

The Northern California steelhead (Northern California DPS) was listed as a federally-threatened species in 2000 (65 FR 36074) and critical habitat was designated in 2000 (65 FR 7764 7787) and revised in 2005 (70 FR 52488 52627). This coastal steelhead DPS occupies river basins from Redwood Creek in Humboldt County to the Gualala River (near the Mendocino/Sonoma County line). All accessible estuaries, rivers and tributaries within this DPS's range, including the Elk River, are included within the area designated as Critical habitat for this DPS.

Life History

Steelhead is the anadromous form of rainbow trout, although steelhead is more similar to Pacific salmon than trout in their ecological requirements. The Northern California DPS includes both winter and summer steelhead. However, summer steelhead populations are not present in Humboldt Bay tributaries. Unlike salmon, steelhead do not necessarily die after spawning. Eggs are deposited in redds constructed in gravel, and hatch after about 90 days. Alevins emerge from the gravel after an additional two to five weeks. During the egg and alevin stages, survival depends in part on the presence of clean, well-oxygenated gravel. Excessive siltation contributes to mortality at these stages (Barnhart 1991, Stillwater Sciences 2006). Juveniles remain in fresh water for one or two years before returning to saltwater, with emigration typically occurring from March through June.

Biological Requirements

Juvenile steelhead use a variety of in-stream habitats depending on age and size. Smaller juveniles inhabit shallow, slow moving margins of streams or other open situations. Larger juveniles move to deeper water with more cover and vegetation. Juvenile steelhead from Humboldt Bay tributaries that reared in the estuary grow larger than their cohorts that reared farther upstream, suggesting that the stream/estuary ecotone is important rearing habitat (Wallace and Allen 2015). For upstream migration, steelhead require a minimum depth of at least seven inches and a maximum stream velocity of 8 ft/s (Smith 1973). Spawning requires a minimum of 1-3 ft/s velocity, clean substrate, and temperatures of 39 - 49°F (Smith 1973).

Limiting Factors

In the Northern California DPS, the decline of steelhead has been attributed to watershed disturbances including: logging on steep slopes, grazing, road building, water diversions, and severe habitat degradation caused by timber harvest and intensive agricultural practices. These watershed impacts have resulted in decreased flows, loss of riparian habitat, channel widening, and increased siltation and water temperatures. Despite this decline in habitat quality, North Coast rivers and streams have the greatest amount of steelhead habitat in California. The most abundant populations of steelhead are in the Klamath-Trinity River system (Barnhart 1991, Stillwater Sciences 2006).

Local Abundance and Distribution

Steelhead abundance in the Elk River and Humboldt Bay also low relative to historic adult returns and recovery targets. Low numbers of juveniles suggest that the watershed is not functioning properly (NMFS 2016). "The current spatial distribution of juvenile steelhead is believed to be less than 50 percent of historic distribution" (NMFS 2016). Upriver migration peaks in February and March (**Table 20**), with some adults returning to the ocean post-spawning. As an index of spawner abundance in the region, Freshwater Creek adult steelhead show no statistical trend from 2000-2014, with 51 to 432 adults returning annually. The NMFS steelhead spawner abundance target for Humboldt Bay is 4,100 adults.

Table 20. ***Predicted Seasonal Presence of steelhead in the North Fork Elk River Project Area.*** *Dark shading indicated months of peak activity for a particular life stage, lighter shading indicates months of lesser activity.*

	Month											
Life Stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Adult migration /spawning												
Rearing												
Juvenile Outmigration												

5 EFFECTS OF THE ACTION

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR 402.02). Direct effects are defined as the direct or immediate effects of the project on the species or its habitat, and typically involve direct harm, such as causing injury to an individual during construction. Direct effects may also occur when individuals of the species are present at the time habitat modification occurs and when the habitat modification is such that it reduces the suitability of the habitat or the ability of individuals to use the habitat. Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the area or season directly affected by the action. The Project design includes enhancement features and this Biological Assessment incorporates mitigation measures (Section 5.3) to prevent or minimize the potential for adverse effects to impact federally listed species as a result of Project activities.

The applicable standard to find that a proposed action is not likely to adversely affect listed species or critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur.

The following sections include an analysis of the direct and indirect effects of the proposed action on salmonid habitat in general and on federally-listed fish species and their designated critical habitats. The analysis includes:

- A *response and risk assessment* for the effects of the proposed action on **individual fish** (the conditions that cause negative impacts to individual fish and a quantification of the amount and extent of negative impacts expected).
- A *risk assessment* of the impacts of the proposed action to **critical habitat** (the response of the habitat elements to potential stressors and any impacts to the function of primary constituent elements of the critical habitat in the action area).

Factors considered in the analysis include the spatial extent, duration, magnitude, and frequency of occurrence considered in light of the direct and indirect effects/stressors on individual fish and critical habitat in the action area.

Mitigation measures have been included in the design and planning of the Proposed Project to prevent or minimize the potential for adverse effects to federally-listed species as a result of Project activities, included as Section 5.3.

5.1 Coho Salmon and Steelhead

The Proposed Project has the potential to adversely affect SONCC coho salmon and Northern California Steelhead directly through disturbance of habitat and incidental take during the construction period. The Proposed Project has the potential to adversely affect SONCC coho salmon, Northern California Steelhead, and California Coastal Chinook salmon indirectly through the alteration of critical habitat.

5.1.1 Direct Effects

Direct effects of the Proposed Project on aquatic species and their habitats are primarily construction related and therefore temporary in nature. SONCC coho salmon and Northern California steelhead are expected to occur in the Project area during the construction window. Chinook salmon are assumed to have emigrated by late-June. Construction-related direct effects on coho and steelhead are related to dewatering and rewatering activities necessary to prepare the work area, water quality effects, and habitat loss between vegetation removal and reestablishment. Vegetation removal and dewatering activities have the potential to result in incidental take of listed fish species by temporarily reducing the amount of habitat available for summer rearing in the construction segment, temporarily harassing rearing behaviors, and mortality associated with dewatering and fish removal activities. Essential features of juvenile salmonid rearing habitat that could be negatively (or positively) impacted by the Proposed Project include adequate water quality, temperature, food source, water depth, and vegetative cover.

5.1.1.1 *Construction-Related Water Quality Effects*

Water quality forms a major component of salmonid habitat and affects feeding and breeding success rates, disease levels, growth rates, and predation rates. Potential construction-related stressors on major elements of water quality critical to salmon habitat include turbidity, dissolved oxygen, and pollution.

Turbidity and Suspended Sediment

Turbidity is a measure of water clarity and is often used as a surrogate for suspended sediment concentration. As the magnitude and timing of sediment transport is altered, so is the turbidity. Turbidity exposure levels and duration can affect fish health (Newcomb and

MacDonald 1991; Newcomb and Jensen 1996). Low turbidity conditions between storms provide important windows of opportunity for fish feeding.

The North Fork Elk River currently exceeds water quality objectives for turbidity. Per Section 3.4.17 of the Basin Plan, turbidity shall not be increased more than 20% above naturally occurring background levels. This turbidity threshold is associated with beneficial uses related to salmonid habitat including cold freshwater habitat (COLD); migration of aquatic organisms (MIGR); rare, threatened or endangered species (RARE); and spawning, reproduction, and/or early development (SPWN). The instream water quality indicator for turbidity also applies and focuses specifically on turbidity values between storms with a target of clearing of turbidity between storms to a level sufficient for salmonid feeding. Turbidity levels significantly above naturally occurring background conditions currently occur throughout the Elk River basin, indicating exceedance of the turbidity water quality objective. California Trout collected DWO measurements at locations within the Project area throughout September 2018 which ranged from 1.7 mg/L to 3.7 mg/L. Data related to fish size at outmigration is unavailable, therefore establishing a correlation between turbidity and fish growth and survival is not possible at this time.

Suspended sediment discharge from the two dewatered segments is expected to dissipate within 500 feet downstream of the project activities. Suspended sediment discharge from each of the two dewatered segments may last up to 24 hours during after channel re-watering. Our calculation of suspended sediment discharge involves the following assumptions: suspended sediment concentration of the water leaving construction areas is 100 mg/L, the duration of discharge will not exceed 24 hours, the rate of flow is approximately 3 cubic foot per second (estimated median summer low-flow), and the density of the suspended sediment is 2650 kg/m^3. Using these values, we estimate up to 0.3 m^3 (0.36 yd^3) of suspended sediment (fines, silt) will be discharged and settle out of the water column within approximately 500 ft downstream of the project reach. Periodic (past years) discharge of suspended sediment in these reaches of Elk River is not uncommon, even during the summer low-flow period.

All Project activities including vegetation removal, heavy equipment operation, grading, truck traffic, and dewatering/rewatering have the potential to increase turbidity if not properly controlled, resulting in mortality, illness, or injury of SONCC coho salmon and Northern California steelhead juveniles likely to be present in the Project area during construction.

Erosion and sedimentation will be minimized by scheduling earthwork activities during the low-flow, summer construction season (August 15 through October 15, or October 31 if no rain is forecast) and through the implementation of BMPs as described in Section 5.3. Humboldt County requires a grading permit for all grading in excess of 5,000 CY. Compliance with the grading permit will help ensure that grading activities will not pose a risk of soil erosion or top soil loss by establishing criteria for cut/fill slopes, setbacks, drainage, on-site soil management, and other parameters. The Proposed Project will also be required to obtain a water quality certification from the North Coast Regional Water Quality Control Board, which will further protect Waters of the State from potential soil erosion impacts.

On-site grading, erosion management, and sediment control will be consistent with the guidelines and regulations established in Humboldt County's grading ordinance as well as permit conditions associated with the project's RWQCB water quality certification. Implementation of Mitigation Measures and BMPs as defined in Section 5.3 will reduce temporary erosion and sedimentation associated with Project implementation to a level that is less than significant.

<u>Dissolved oxygen</u>

Dissolved oxygen within the Action area is below established threshold requirements. Levels below 5 mg/L trigger avoidance behavior in salmonids and mortality occurs below 3 mg/L (Carter 2005, Washington State Department of Ecology 2002). California Trout collected DO measurements at locations within the Project area throughout September 2018 which ranged from 1.7 mg/L to 3.7 mg/L. Dissolved oxygen levels below 6.0 mg/L do not meet water quality objectives for cold water fish (NCRWQCB 2018). Documentation of salmonids surviving in low DO conditions in the Elk River would seem to contradict existing literature and may warrant further investigation (CalTrout Field Note, 2018). Data related to fish size at outmigration is unavailable, therefore establishing a correlation between dissolved oxygen and fish growth and survival is not possible at this time.

<u>Pollution</u>

Construction activities could accidentally introduce small amounts of contaminants (fuel, oil, grease) to the Action Area. These substances are known to be toxic to fish and prolonged exposure can cause morphological, behavioral, physiological, and biochemical abnormalities (Sindermann et al. 1982). The risk of this disturbance would be low due to the implementation of pollution prevention BMPs as described in Section 5.3 In addition, a Storm Water Pollution Prevention Plan (SWPPP) including pollution prevention best management practices will be developed and implemented for the Proposed Project as part of RWQCB 401 water quality certification.

5.1.1.2 *Take of Listed SONCC Coho salmon, Northern California Steelhead, and CA Coastal Chinook salmon*

The Proposed Project has the potential to harm or "take" listed coho salmon, steelhead, and Chinook salmon prior to construction. The federal definition of "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Specifically, juvenile coho salmon and steelhead will need to be captured and relocated from the Project area prior to dewatering activities that will be necessary to conduct in-channel work. In this section, we present our estimate of "take."

Estimation of coho salmon and steelhead take and mitigation for take for the Elk River Pilot Projects requires at least two primary pieces of information: (1) estimation of the number of coho salmon and steelhead abundance in the project reach along with a percent mortality and injury resulting from fish removal and relocation, and (2) quantification of project habitat benefits that could potentially offset take and partially or fully mitigate the proposed take. Other measures will be required if habitat benefits do not fully mitigate take. Habitat benefits may be derived from (a) enhanced in-channel habitat, (b) expanded and enhanced floodplain habitat, (c) increased habitat complexity through installation of large wood habitat structures, (d) enhancement of riffle substrate producing food resources, and (e) improvement in water quality (DO). Quantifying habitat enhancement in terms of take of coho salmon and steelhead will require concurrence by NMFS and CDFW.

The general approach to estimating take of listed coho salmon and steelhead, and mitigation for take, is as follows:

- Estimate the **Area Disturbed**, defined as the entire de-watered reach of the North Fork Elk River, and any areas downstream of the de-watered reach affected by Project activities;
- Estimate the **Density** of coho salmon and steelhead inhabiting the disturbed area when the Fish Removal/Relocation and Channel Dewatering Project task is conducted;
- **Abundance** of fish in the dewatered reach is derived from an estimate of the EXISTING disturbed area (in ft2), and an estimate of density (fish per unit area); **Take (Juvenile Fish Abundance) = Area Disturbed (ft2) x Density (fish/ft2)**

<u>Area Disturbed</u>
A total of 2,375 linear feet of the North Fork Elk River will be dewatered during construction activities (**Figure 8**). This total includes 375 ft at the Wrigley Orchard reach and 2,000 ft at the Flood Curve reach. Fish removal and channel dewatering for construction activities will occur over a 2-3 week period, throughout this entire reach as described in Section 3.3.2 above). We assume that during the low-flow period beginning in late July, only a portion of the total surface area of disturbed stream channel provides stream depths adequate to support rearing salmonids. This area of habitat was estimated by computing the total length of pool habitat exceeding 1 ft deep from the existing bed topography and channel profile, and assuming an average channel width of 15 ft. This estimate is conservative, i.e., on the high side, because many segments of pool are less than 15 ft wide. The existing pool habitat exceeding 1 ft deep in

the Wrigley Orchard reach and the Flood Curve reach has a total length of **897+50=947 ft**, and assuming a 15 ft average width, a total area of **14,200 ft2**.

Juvenile Coho Salmon and Steelhead Density and Abundance in Disturbed Area

Site specific information on the density of rearing juvenile salmonids is not available for the Project reach, and was thus estimated from available HRC and CDFW data, and compared with information from the scientific literature. The best available data, i.e., most recent and in closest proximity to the Project site, is from HRC (2015) Aquatic Trend Monitoring in Elk River (**Table 21**). HRC's coho density estimates are reported as fish per unit volume (#fish/m3); we assumed fish density per pool volume (m3) is equivalent to surface area (m2) and used this HRC data as fish per unit area (fish/m2). The North Fork Elk fish density estimates range from 0.95 to 1.60 coho/m2. This range of summer-rearing juvenile coho density compares favorably to those reported in Lestelle (2007) for pool habitat types in Oregon coastal streams (**Figure 14**). The HRC **ATM Site #14** – **with a coho density of 1.6 coho/m2 (0.15 coho/ft2)** – was used as the best estimate of coho density to represent our Pilot Project reaches. This value is a conservatively high estimate of coho abundance that could be expected in our project reaches. Riffle habitats in our project reaches are considered uninhabitable by coho and steelhead due to very shallow depths that persist during the summer low-flow period.

To estimate juvenile steelhead (0+ and 1+) rearing density for our project site, CDFW data from Freshwater Creek LCM were used to estimate an approximate ratio of coho to steelhead abundance from 7 years of electrofishing sampling data (**Table 21**). Juvenile steelhead abundance averaged approximately 80% of coho abundance over 7 years of monitoring. An estimate of **1.28 steelhead/m2 (0.12 steelhead/ft2)** was used for steelhead density. Recent seining conducted by CDFW and CalTrout in the North Fork Elk River (CalTrout 2018) provides anecdotal confirmation that coho salmon were more abundant than steelhead in the North Fork Elk River Project reaches during 2018 summer rearing.

Using the estimated disturbed area of 14,200 ft2 and density estimates of 0.15 coho/ft2 and 0.12 steelhead/ft2 results in the following estimates of total fish abundance for our Project reaches:

Coho Abundance = 14,200 ft2 x 0.15 coho/ft2= 2,123 coho
Steelhead Abundance = 14,200 ft2 x 0.12 steelhead/ft2= 1,699 steelhead

The CDFW Freshwater Creek LCM data (**Table 22**) was also used to compute an independent estimate of coho and steelhead abundance in the 2,375 ft North Fork Elk River Project reach, based on the estimated number of fish per linear length of channel (in Freshwater Creek):

Coho Abundance = 1.45 coho/m (0.44 coho/ft) x 2,375 ft = 1,050 coho

Steelhead Abundance = 1.21 steelhead/m (0.37 steelhead/ft) x 2,375 ft = 876 steelhead

These estimates may represent a minimum or average fish abundance, and not necessarily a maximum potential abundance that could be encountered in our Project reaches.

Table 21. *Juvenile coho salmon data from HRC (2015) Aquatic Trend Monitoring (ATM) sites in Elk River. Sites highlighted in gray are closest in proximity to the North Fork (NF) Elk River Pilot Project site.*

ATM Site	Site Name	Average Density (#fish/pool)	Average Pool Volume (m3)	Average Pool Surface Area (m2)	Fish Density (Fish/m3 or Fish/m2)
217	Upper SF Elk River	0	31	31	0.00
175	Lower SF Elk River	36.5	30.8	30.8	1.19
104	SB NF Elk River	0.2	5.2	5.2	0.04
90	Upper NF Elk River	19.5	17.4	17.4	1.12
91	NB NF Elk River	22.6	18.5	18.5	1.22
167	Upper Middle NF Elk River	20	12.7	12.7	1.57
162	Middle NF Elk River	76.9	62.9	62.9	1.22
214	**Lower Middle NF Elk River**	**109.8**	**116.1**	**116.1**	**0.95**
14	Lower NF Elk River	74	46.3	46.3	1.60
166	Mainstem Elk River	26.3	39.4	39.4	0.67

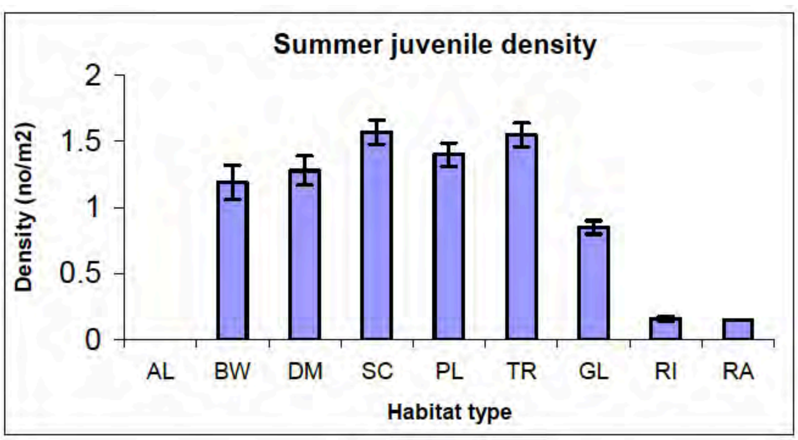

Figure 14. *Mean density (+/- SE) of juvenile coho salmon by habitat type during summer reported for Oregon coastal streams. AL=alcove; BW=backwater pool; DM=dammed pool; SC=scour pool; PL=plunge pool; TR=trench pool; GL=glide; RI=riffle; RA=rapid. Figure from Lestelle (2007) adapted from Nickelson et al. 1992).*

Table 22. *Juvenile coho salmon and steelhead density estimates (fish/m) from CDFW Freshwater Creek life cycle monitoring station (Ricker and Anderson 2011).*

Year	Species	Age	Abundance	Fish/m
2001	Coho	0+	64520	3.06
2002	Coho	0+	65153	3.09
2003	Coho	0+	19472	0.92
2004	Coho	0+	25854	1.23
2005	Coho	0+	14150	0.67
2006	Coho	0+	17147	0.81
2008	Coho	0+	7500	0.36
			AVERAGE	**1.45**
2001	Trout	0+	11692	0.56
2002	Trout	0+	225489	10.71
2003	Trout	0+	14346	0.68
2004	Trout	0+	27038	1.28
2005	Trout	0+	7047	0.33
2006	Trout	0+	22012	1.05
2008	Trout	0+	13271	0.63
2001	Trout	1+	5571	0.26
2002	Trout	1+	5322	0.25
2003	Trout	1+	4808	0.23
2004	Trout	1+	4697	0.22
2005	Trout	1+	7103	0.34
2006	Trout	1+	3872	0.18
2008	Trout	1+	4996	0.24
			AVERAGE	**1.21**

<u>Estimate of Coho Salmon and Steelhead Take and Mortality Associated with Project Actions</u>
The higher of the two estimates of abundance (2,123 coho and 1,699 steelhead) is suggested as a conservative (high) estimate of Take expected to occur in the North Fork Elk River Project reaches as a result of the proposed fish relocation and channel dewatering activity.

E-fishing and seining activities could harm fish. During construction dewatering, fish will be captured and relocated. Fish could become stranded or entrained into pumps, or eventually become crushed by equipment or debris during construction if their presence is not detected and they are not relocated. Mortality rates are generally estimated below 3% for salmonid relocation efforts (Collins 2004, NMFS 2012). Typical mortality rates for fish capture techniques are around 2%. Taken together, the two sources of injury will not likely exceed 5%. With preparation and care, it's possible that NO fish will be injured or killed. However, a mortality of 5% is acknowledged as a potential outcome of the fish relocation and channel dewatering effort.

Using a maximum 5% total mortality rate from capture and transport of fish, we estimate that up to 106 of 2,123 juvenile coho salmon could be killed or injured during fish relocation activities, and up to 85 of 1,699 juvenile steelhead could be killed or injured during fish relocation activities. The disturbed length and area of existing stream channel in the Project reaches, and coho and steelhead abundance estimates are summarized in **Table 22**.

Although it is unlikely that CC Chinook would be present in the work sites, "stream" type Chinook who over-summer nearby in Lawrence Creek (Eel/Van Duzen) are observed on an annual (frequent) basis. We assume a very low number of Chinook may be present in the Project reaches, and result in take of no more than five (5) CC Chinook total. Captured Chinook salmon will be relocated to the same sites on the NF and SF Elk River as for coho salmon.

5.1.1.3 *Mitigation for Take of Coho Salmon and Steelhead (Measures to Compensate for Impacts)*

This Project has been modified considerably from the initial draft 65% engineering design, in order to incorporate measures to compensate for impacts (Take) of coho salmon and steelhead. The current Project proposes to utilize a combination of conservation measures that are expected to avoid, minimize, and mitigate to the maximum extent practicable, the impacts of Take of coho salmon and steelhead described in the previous section. We believe the habitat rehabilitation will fully mitigate for the incidental take of coho salmon and steelhead.

<u>Minimization</u>

The overall Project footprint was reduced from the original 4,000 ft reach extent to the current 2,375 ft project extent, resulting in the elimination of 1,625 ft or 40% of the Project. This results in the minimization of Take because these areas excluded from the Project will not have to be de-watered for Project activities. The overall Project will minimize take in several ways. The Project will be constructed during the summer low-flow season when fish capture and relocation can be done with the least possible harm to juvenile salmonids. Water quality during this time period is adequate to allow minnow trapping and seining to safely capture and relocate fish with minimal or no mortality. The stream channel will have shrunk to the smallest seasonal area, facilitating complete coverage of the Project area for fish capture and relocation. In addition, there is abundant freshwater habitat nearby to which the captured fish can be safely relocated, to ensure their survival and rearing success. Finally, the project proposes a detailed and careful plan to employ minnow traps, seine nets, and if needed, electrofishing in a methodical way to reduce harm to listed salmonids.

Mitigation

The Project has incorporated numerous Project elements to enhance habitat for listed coho salmon and steelhead, especially targeting winter rearing habitat conditions which are considered a key limiting factor for these populations in the Elk River.

Enlarged Pool Habitat supporting improved winter rearing

The project will significantly expand low-velocity winter rearing habitat refugia in 1 pool unit at the Wrigley Orchard reach and 7 pool units at the Elk River Flood Curve reach. The current winter rearing habitat is heavily impaired by fine sediment deposition in pools and by the lack of large wood structures. Using the same methodology employed above to estimate the juvenile salmonid abundance under existing conditions, we estimated the potential abundance under rehabilitated habitat conditions. The area of pool habitat exceeding 1 ft deep would increase in the Project reaches from 14,200 ft2 to approximately 31,271 ft2, a net increase of more than 200%. Maximum pool depths would range from 4 to 6 ft deep. Based just on this expanded pool habitat area, we estimate that coho and steelhead abundance could increase in the project reach from 2,123 to 4,676 coho, and 1,699 to 3,741 steelhead. This expansion in habitat could thus support a significantly higher abundance of fish in summer and winter and could result in higher survival rates of rearing salmonids. The length and area of proposed reconstructed stream channel in the Project reaches, and coho and steelhead mitigation estimates are summarized in **Table 23**.

Expanded access to off-channel rearing habitat refugia at four lowered floodplain locations.

The Project will create and enhance off-channel rearing habitat refugia at four floodplain areas affecting 1.9 acres by lowering the elevation of these surfaces and allowing them to inundate more frequently at lower streamflows. These off-channel areas could provide low-velocity winter habitat refugia and areas where better water quality may persist in winter due to the settling of suspended sediment onto these surfaces. This type of low-elevation floodplain habitat is currently limited in this reach. Enhancement of this habitat could result in higher winter rearing growth and survival. We do not suggest a quantitative increase in juvenile salmonid abundance resulting from this Project action; however, there could be a considerable net benefit in habitat quality.

Increase in large wood pieces, habitat structures, wood volume and orientation.

The Project proposes to significantly increase the amount of large wood in the 2,375 ft project reach. During construction, the ~27 salvaged logs removed from the Project reach will either be placed back into the channel (if the wood material is competent) or replaced with redwood logs of comparable size or larger. Eight new log structures, one per reconstructed pool, and each with 4-6 logs, will be placed into the newly excavated pools to provide low velocity winter habitat for juvenile salmonids. One log structure will be constructed in each of the seven enhanced pools at the Flood Curve, and one enhanced pool at the Wrigley Orchard reach. The structures will be embedded into the banks within the winter baseflow channel, in contrast to most existing large wood which is suspended above the winter water surface and not functioning as salmonid habitat. The Project will increase "key pieces" from a total of 1 to 8, and the total number of large wood pieces (greater than 12" diameter) from 27 to 74 total pieces. Incorporation of this large quantity of wood into the Project reach represents the maximum amount of wood that can be included and still meet the project objective of increasing channel conveyance and reducing nuisance flooding. Incorporation of large wood pieces and structures into the project design could result in higher juvenile rearing densities and winter rearing survival.

Increase in quality of riffle habitat through gravel augmentation
The Project will remove slough sedge from riffle habitat and place appropriately sized fine gravel onto riffle surfaces. This project feature will provide substrate for benthic invertebrate production and could result in higher salmonid growth rates during summer rearing season. Fish passage during the summer low-flow season could also be improved by removal of thick vegetation colonizing the channel bed. We do not suggest a quantitative increase in juvenile salmonid abundance resulting from this Project action; however, there could be a considerable net benefit in habitat quality.

Improved water quality conditions throughout the Project reaches
The Project will remove 22,000 yd^3 of fine sediment currently deposited in the stream channel that may be contributing to an elevated Biological Oxygen Demand (BOD) and causing unnaturally low Dissolved Oxygen (DO) concentrations observed in Elk River during the summer low-flow season (CalTrout et al. 2018). While it currently appears that the low DO in the North Fork Elk River may not be causing direct juvenile mortality or emigration from this reach (based on 2018 observations), annual chronic low DO concentration represents a significant risk to listed juvenile salmonids and could significantly reduce rearing densities, growth rates, and/or survival in the Project reach. Removal of the excess sediment could reduce or eliminate this risk entirely. We do not suggest a quantitative increase in juvenile salmonid abundance resulting from this Project action; however, there could be a considerable net benefit in habitat quality.

Table 23. *Summary of salmonid habitat area and abundance estimates for existing and proposed project conditions in the Project reaches.*

	Wrigley Orchard	Flood Curve	Project Total
Existing			
Length (ft) of Pool >1ft	50	897	947
Area (ft2) of Pool >1 ft	750	13450	14200

Proposed			
Length (ft) of Pool >1ft	200	1346	1546
Area (ft2) of Pool >1 ft	3000	28271	31271
Coho Density (#/ft2)	0.44	0.44	0.44
Steelhead Density (#/ft2)	0.37	0.37	0.37
Existing Abundance (Take Estimate)			
Coho	112	2011	2123
Steelhead	90	1609	1699
Proposed Abundance (Mitigation Estimate)			
Coho	449	4228	4676
Steelhead	359	3382	3741

Mitigation for take of CC Chinook would be provided by the same habitat rehabilitation and enhancement actions described above for coho salmon and steelhead.

5.1.1.4 *Vegetation Removal*

In order to create access and work in the dewatered channel, both temporary and permanent impacts to riparian and transitional vegetation types are anticipated (**Table 24**). As defined by the USACE, a "permanent" riparian impact is defined as requiring more than one year to recover to pre-Project conditions (KC Sirkin, Personal Communication, 1/29/2019).

Table 24. *Summary of temporary and permanent impacts to riparian and transitional vegetation types*

Vegetation Type	Access, Staging, and Spoil Sites (permanent impacts)	Floodplains (permanent impacts)	Graded Banks (permanent impacts)	TOTAL
Wrigley Orchard				
Riparian	0.06	0.35	0.10	0.51
Coniferous Forest (Transitional)	0.12	.00	0.0	0.12
Orchard and Agriculture/Upland	1.81	0.21	0.0	2.02
Elk River Flood Curve				
Riparian	0.15	0.38	1.24	1.77
Coniferous Forest (Transitional)	0.07	0.41	0.04	0.52
Agriculture/Upland	0.95	0	0	0.95
Total				

Total Riparian	0.21	0.73	1.34	2.28
Total Coniferous	0.19 (avoid)	0.41	0.04	0.64
Total Orchard/Ag/Upland	2.76	0.45	0	2.97
Grand Total	3.16	1.35	1.38	5.89

A Grant Total of approximately 5.89 acres of vegetated areas will be affected by the Proposed Project. Of this amount, 1.38 acres would be permanently impacted through excavation of aggraded channel banks, 1.35 acres would be permanently impacted through floodplain excavation (followed by replanting), and 3.16 acres would be impacted by the creation of temporary access and staging areas, the majority of which (2.76 acres) is upland pasture that is seasonally used for agricultural purposes.

A total of 2.92 acres of riparian and coniferous vegetation currently within the riparian corridor along the North Fork Elk River would be potentially impacted by the Proposed Project. Within the actual impact area, individual trees will be avoided to the extent possible. The majority (2.52 acres, shaded cells in **Table 24**) of the impacts result from excavation of sediment from the channel banks (1.38 acres) and floodplains (1.14 acres). The majority of the channel and floodplain excavation areas are currently covered by understory plant species, but some riparian hardwood species which have become rooted in accreted fine sediments would be impacted, including arroyo willow, red alder, and blackberry species. As previously described, this in-channel vegetation contributes to flooding problems by adding roughness, trapping sediment, and slowing water velocity (creating a negative feedback loop). Within the bankfull channel, disturbed understory vegetation would not be replanted as doing so would run counter to the Project objective of increasing flow conveyance. All prominent trees, including hardwood and conifer species labeled "Notable Trees[2]" in **Figures 8 and 10** would be avoided (Note that **Figures 8 and 10** do not represent an inventory of all trees which are present or would be retained in the noted reaches). To the extent practicable, hardwood and conifer trees larger than 4 inches DBH will be avoided; therefore the majority of trees removed will be less than 4 inches DBH and would consist primarily of willows and alders which are expected to easily reestablish on their own over time. Note that the vegetation impacts are estimated by the vegetation mapping which is a very broad-brush estimate based on acreages and does not account for the ability to avoid impacts to trees during construction staking. It is estimated that not more than 20 trees per acre would be removed.

[2] "Notable tree" defined as large, mature trees over 20 inch DBH that represent a potentially important component of the riparian overstory canopy.

All trees larger than 4 inches DBH that cannot be avoided and that would be removed under the Proposed Project will be marked prior to operations in consultation with CDFW, and will be replaced at a 3:1 ratio, following the revegetation plan described in Section 3.3.6 and based on the Master Planting List to be developed in consultation with CDFW. To the extent possible, riparian species will be replanted with conifer and hardwood species to enhancing tree species diversity within the riparian corridor and the future recruitment of wood into the channel. Replanting will occur within the 1.35 acres of temporarily disturbed riparian floodplain areas, as well as within adjacent undisturbed riparian floodplain areas as determined in consultation with CDFW. The proposed mitigation ratio is based on the count of trees removed and not the area disturbed, such that for each tree larger than 4 inches DBH that is removed, three trees will be replanted either within the disturbed areas or within undisturbed areas to promote greater tree species diversity.

The *Temporary Access and Staging* areas will be seeded and mulched with pasture grass. Approximately 0.64 acres of coniferous vegetation will be affected by the Proposed action. Of the 0.64 acres of coniferous vegetation affected, 0.19 acres would be impacted through the construction of access and staging areas, approximately 0.41 acres would be affected through floodplain excavation, and 0.04 acres would be affected through channel excavation. All impacts to coniferous vegetation would be considered permanent impacts because disturbed areas would take more than one year to recover to pre-project conditions. Conifer trees within floodplain excavation areas and impacted through the construction of access and staging would be reduced to the extent practicable through "field adjusting" the construction footprint during construction staking in order to reduce impacts. All conifer and hardwood trees planned to be removed will be marked prior to operations in consultation with CDFW. However, the 0.04 acres impact area associated with channel excavation may not be avoidable. This 0.04 acres, plus the 0.6 acres of floodplain and access/staging impacts to coniferous vegetation which cannot be avoided would be mitigated at a 3:1 ratio with a combination of the redwood, Sitka spruce, western red cedar, grand fir, sword fern, willow, twinberry, and salmonberry. Replanting of up to 0.64 acres of coniferous vegetation will occur in the newly excavated floodplain areas or in undisturbed adjacent floodplain locations. Of this amount, 0.41 acres would be impacted through floodplain excavation, and 0.19 acres would be impacted through the creation of access and staging areas. All conifer trees within the lowered floodplain areas and within the construction access and staging areas will be avoided. 0.04 acres of coniferous vegetation would be permanently impacted through excavation of the new channel banks. Coniferous forest within the Project area consists of redwood (*Sequoia sempervirens*), Sitka spruce (*Picea sitchensis*), western red cedar (*Thuja plicata*), and grand fir (*Abies grandis*). Coniferous forest understory consists of sword fern (*Polystichum munitum*), willow (*Salix scouleri*), Himalaya blackberry (*Rubus armeniacus*), twinberry (*Lonicera involucrate*), and salmonberry (*Rubus spectabilis*)]. Impacts to coniferous forest and understory will be replanted at a 3:1 ratio following the revegetation plan described in Section 3.3.6 and based on the Master Planting List to be developed in consultation with CDFW.

5.1.1.5 *Temporal reduction of salmonid critical habitat*

Reduction of instream flows would occur between dewatering (when the bypass is installed) and rewatering activities. In-stream habitat would be temporarily unavailable and fragmented in the two dewatering segments, one 375-foot segment within the Wrigley Orchard reach (Stn 623+75 to Stn 620+00) and one 2,000-foot segment within the Elk River Flood Curve reach (Stn 580+00 to Stn 560+00). Fish screens and coffer dams will be installed at the upstream and downstream extents of each dewatering segment (e.g. Stn 623+75, Stn 620+00, Stn 580+00, and Stn 560+00). Per the Project Description, fish removal and relocation would be conducted in late-July therefore two discrete sections of the channel, the 375 ft Wrigley Orchard Reach and the 2000-foot Elk River Flood Curve reach, will be unavailable as salmonid habitat for up to three months (between late-July and October 15th when the channel is rewatered). Associated impacts to salmonids from the temporary loss of in channel habitat are anticipated to be less than significant because the approximately 2,123 coho and 1,699 steelhead which inhabit the dewatered channel sections would be relocated to Brown's Creek (HRC property on North Fork) Tom's Gulch (BLM property on South Fork). Summer rearing habitat within the construction footprint is assumed to be at carrying capacity (e.g. no more room for additional fish), therefore no additional fish would be impacted (e.g. no additional fish would have utilized the habitat within the Project area under existing conditions).

5.1.1.6 *Temporal reduction in salmonid migratory opportunities*

Reduction of instream flows associated with dewatering activities could temporarily reduce upstream and downstream migratory opportunities for special -status fish species expected to be in the Project area during the construction period (e.g. SONCC coho salmon and Northern California Steelhead).

5.1.2 Indirect Effects

Indirect effects are those impacts from a project that are likely to occur but later in time. Indirect impacts can be short-term or long-term or both.

5.1.2.1 *Post-construction Weather-related Turbidity*

Increased turbidity and suspended sediments in the Elk River may occur from the loss of topsoil dislodged during the first rains after construction. Although small increases in turbidity are anticipated immediately after construction, the impact would be negligible considering baseline turbidity already exceeds the 20% background threshold established by the Basin Plan.

The gradient within the Project area is relatively flat and soils are wet year-round such that weather-related erosion is not a predominant concern. However, post project weather-related erosion would be controlled through the implementation of BMPs as described in Section 5.3 to a level that is less than significant.

5.1.2.2 *Increased competition from fish relocation*

As described in Section 3.3.2 and depicted in **Figure 5**, captured salmonids will be relocated to an approximately one-mile length of channel on the North Fork Elk River below Brown's Creek (utilizing Humboldt Redwood Company property and access) and within an approximately one mile of channel on the South Fork Elk River above Tom's Gulch (utilizing BLM property and access). Short-term risks to listed fish species could include translocated fish displacing fish already present at the new sites or reducing their growth through increased competition. If the habitat at the relocation sites is already at carrying capacity, additional fish may not survive.

Increased competition from fish relocation is expected to be reduced to a level that is less than significant through the implementation of BMPs defined in state and federal permits and in Section 5.3. As described in Section 3.3.2, we will take steps to avoid predation and "overcrowding" destination habitat. Prior to relocating fish, the most appropriate release location(s) shall be determined, including temperature (water temperature shall be similar as the capture location) and habitat (there shall be ample habitat for the captured fish). Fish relocation will be conducted by a qualified fisheries biologist in accordance with the provisions of all state and federal permits. Captured fish shall be moved to the nearest appropriate site outside of the work area. A record shall be maintained of all fish removed and moved. The record shall include the date of capture and relocation, the method of capture, the location of the relocation site in relation to the Project site, and the number and species of fish captured and relocated. The record shall be provided to CDFW and NMFS within two weeks of the completion of the work, season or project, whichever comes first (see section 3.3.6 Documentation).

5.1.2.3 *Increased water temperatures from removal of riparian vegetation*

During clearing and grubbing activities, the channel will be cleared of thick vegetation which has become rooted in fine sediments accumulated in the channel bed and riparian vegetation within the construction footprint of the three floodplain excavation areas. A potential direct effect of the Proposed action on listed fish species and their critical habitat is temporary loss of habitat between construction and the re-establishment of vegetation. Stream temperatures can be altered by removal of streambank vegetation, resulting in localized, short term effects until vegetation is reestablished.

Salmonids are cold water fish with definite temperature requirements during rearing. Growth is reduced at high temperatures because most or all food must be used for maintenance. Water temperatures within the project reach are monitored annually by the Humboldt Redwood Company and consistently meet the maximum weekly average water temperatures (MWAT) of <16.8 °C, which is indicative of the high degree of riparian shade and the coastal climate of the watershed (HRC 2014). Water temperatures are not expected to increase following rewatering and would be positively affected by increases in the number and depth of pools under the Proposed action.

5.1.2.4 *Reduced food supply from removal of riparian vegetation and/or construction-related turbidity*

Rearing salmonids require an adequate food supply for growth and survival of young fish. Aquatic insects that serve as the major sources of food inhabit the part of the streambed that requires a perennial flow of cool, highly oxygenated water. Overhanging vegetation is an important habitat feature because it serves to provide a source of food (falling invertebrates), stabilize banks (which reduces sedimentation), and provide shade (which helps to maintain cool water).

Short-term riparian impacts are necessary to achieve the long-term Project objective of increasing velocity within the channel during high flow events, to enable the channel to begin routing upstream sediment while scouring stored sediment located in the Project reach.

Impacts to riparian vegetation that are expected to occur as a result of the Proposed Project are described in Section 5.1.1.3. Removal of riparian and coniferous forest could impact the abundance of terrestrial-derived invertebrates as both habitat types are important contributors of invertebrate biomass. Approximately 2.93 acres of riparian habitat and 0.496 of coniferous forest habitat would be impacted under the Proposed action. Of this amount, 2.284 acres would be permanently impacted because in-channel vegetation a below the high flow water surface elevation will not be replanted. The remaining 1.146 acres of disturbed habitat located above the high flow channel will be replanted at a 3:1 ratio. Of this amount, approximately 0.731 acres are willow and alder-dominated riparian areas that will be replaced with higher quality conifer species as described in section 3.3.6.

Over the long-term, short-term impacts on aquatic food sources would be offset by the construction of a channel that is more stable and a riparian corridor that is more complex, representative of natural conditions, and sustainable than existing conditions.

Construction-related turbidity that is not controlled could result in a suspended sediment plume which could lead to a reduction in photosynthesis and indirectly affect EFH productivity.

The reduced photosynthesis could result in a disruption to food source and feeding habits for fish that utilize the essential fish habitat.

Turbidity issues would be addressed by through compliance with the Humboldt County Grading Ordinance, by securing a Water Quality Certification from the RWQCB, and through the implementation of BMPs as described in Section 5.3.

5.2 Effects on Critical Habitat

Critical habitats are areas considered essential for the conservation of a species listed as endangered or threatened under the federal Endangered Species Act (FESA). Critical habitats are specific geographic areas that contain features essential for the conservation of listed species that may require special management and protection. Critical habitat can include an area not currently used by an endangered or threatened species, but that could be needed for species recovery. Projects involving a federal agency or federal funding are required to consult with USFWS to ensure that Project actions do not destroy or adversely modify critical habitat.

5.2.1 Salmonid Critical Habitat

This Biological Assessment finds that there are federally-listed threatened fish species and critical habitat present within the action area (**Table 1**). The Elk River provides critical habitat for three species of historically abundant anadromous salmonids—Southern Oregon/Northern California Coast coho salmon (Oncorhynchus kisutch), California Coastal Chinook salmon (Oncorhynchus tshawytscha), and Northern California steelhead (Oncorhynchus mykiss). All three species are currently listed as threatened under the Federal Endangered Species Act (FESA), and coho salmon are listed as threatened under the California Endangered Species Act (CESA). Project activities would have nearly identical effects *on critical habitat* for all three salmonid species, therefore critical habitat for all three species is treated together in this section. The following risk assessment describes the current status of critical habitat in the Project area, the response of habitat elements to potential stressors associated with the Proposed Project, and linkages between potential impacts and the function of primary constituent elements (PCE's) of critical habitat in the action area.

The Action Area for the Proposed Project is not critical habitat for other federally listed fish species in the region, [including Tidewater goby (*Eucyclogobius newberryi*) (FE), Eulachon (*Thaleichthys pacificus*) (FT), Green Sturgeon (*Acipenser medirostris*) (FT), or Longfin Smelt (*Spirinchus thaleichthys*) (FC)], nor are these species present in the project area.

5.2.1.1 *Current Status of Critical Habitat*

This section describes the existing condition of critical habitat in the Project area for SONCC coho salmon (64 FR 24049, May 5, 1999), California Coastal Chinook salmon (70 FR 52488, September 2, 2005), and Northern California steelhead (70 FR 52488, September 2, 2005) in order to establish baseline conditions against which Project effects can be compared. Critical habitat is defined in the ESA as the specific areas within the geographical areas occupied by the species, at the time it is listed, on which are found those physical and biological features essential to the conservation of the species and which may require special management considerations or protection, or specific areas outside the geographical area occupied by the species at the time it is listed when the Secretary determines that such areas are essential for the conservation of listed species.

<u>California Coastal Chinook Salmon and Northern California Steelhead</u>

The action area includes designated critical habitat for California Coastal Chinook Salmon and Northern California Steelhead. Designated critical habitat for California Coastal Chinook Salmon and Northern California Steelhead includes the stream channels up to the ordinary high water line (50 CFR Part 226.211). Pursuant to 50 CFR Part 226.211, in areas where the ordinary high water line is not defined, the lateral extent is defined by the bankfull elevation.

The designation of critical habitat is focused on the known primary constituent elements (PCEs) essential for the conservation of the species. PCEs for California Coastal Chinook Salmon and Northern California Steelhead are those sites and habitat components that support one or more life stages, including: (1) freshwater spawning, (2) freshwater rearing, (3) freshwater migration, (4) estuarine areas, (5) nearshore marine areas, and (6) offshore marine areas. Within the PCEs, essential elements of California Coastal Chinook Salmon and Northern California Steelhead critical habitats include adequate (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, (10) safe passage conditions, and (11) salinity conditions (70 FR 52488, September 2, 2005).

Upon emerging from the gravel, steelhead fry rear in edgewater habitats and move gradually into pools and riffles as they grow larger; older juveniles establish and defend territories (Humboldt County and Stillwater Sciences 2011). Cover is an important habitat component for juvenile steelhead, both as velocity refuge and as a means of avoiding predation (Shirvell 1990, Meehan and Bjornn 1991). Summer rearing steelhead tend to use riffles and other habitats not strongly associated with cover more than other salmonids (Humboldt County and Stillwater Sciences 2011), but winter rearing juvenile steelhead become inactive and hide in any available cover, including large substrate or woody debris (Humboldt County and Stillwater Sciences 2011).

SONCC Coho Salmon

The action area includes designated critical habitat for SONCC coho salmon. Critical habitat for the SONCC coho salmon ESU encompasses accessible reaches of all rivers (including estuarine areas and tributaries) between Cape Blanco, Oregon and Punta Gorda, California (64 FR 24049, May 5, 1999). Excluded are: (1) areas above specific dams identified in the Federal Register notice, (2) areas above longstanding natural impassible barriers (*i.e.*, natural waterfalls in existence for at least several hundred years), and (3) tribal lands. The area described in the final rule represented the current freshwater and estuarine range of coho salmon.

The designation of critical habitat for SONCC coho salmon is separated into five essential habitat types of the species life cycle. The five essential habitat types include: (1) juvenile summer and winter rearing areas; (2) juvenile migration corridors; (3) areas for growth and development to adulthood; (4) adult migration corridors; and (5) spawning areas. PCEs for SONCC coho salmon are those sites and habitat components that support one or more life stages, including: (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, (10) safe passage conditions, and (11) salinity conditions (64 FR 24049, May 5, 1999).

SONCC coho salmon are dependent upon complex, low gradient habitats for winter rearing, and will express diversity by overwintering in low-gradient, off-channel and estuarine habitats when they are available. The lack of complex aquatic habitat, and much decreased access to floodplains and low gradient tributaries are common features of current critical habitat conditions within the SONCC coho salmon ESU (NMFS 2014). The SONCC coho Recovery Plan describes land use activities (e.g., timber harvest, road building, etc.) that occur upstream of low gradient streams, which affect the habitat within low gradient streams by reducing the amount of large wood and shade available and by increasing the amount of sediment that routes through the valley bottom habitats.

5.2.1.2 *Conservation Value of Critical Habitat*

Destruction and adverse modification determinations are made by examining the effects of proposed project actions on the conservation value of the designated critical habitat, e.g. the value of the critical habitat for the conservation of threatened or endangered species. The condition of critical habitat for Northern California Steelhead, Coastal California Chinook Salmon, and SONCC Coho Salmon has been degraded from conditions known to support viable salmonid populations. Logging and associated road building in the upper watershed, and agriculture, agricultural and mining activities, urbanization, stream channelization, and freshwater and estuarine wetland loss continue to result in habitat degradation including the reduction of spawning and rearing habitats. The results of these continued land management practices have limited reproductive success, reduced rearing habitat quantity and quality, and caused migration barriers to both juveniles and adults salmonids. All of these factors were identified when the species were listed as threatened under the ESA as limiting the conservation value of designated critical habitat within freshwater habitats at the ESU/DPS scale, specifically the ability of critical habitat to contribute to the conservation of the species.

5.2.1.3 *Description of Habitat in the Action Area*

Based on the Federal Register notices describing critical habitat for all three listed salmonid species, habitat conditions within the Project area are degraded relative to conditions that would support healthy salmonid populations. Aggradation has severely reduced habitat complexity in the Elk River watershed and most of the essential habitat types for winter and summer juvenile rearing areas are reduced in size and severely degraded. One of the key findings of the associated Elk River Recovery Assessment is that aggradation within the lower north fork of the Elk River will not resolve through natural geomorphic processes within a period of less than 300 years. Mechanical intervention to reduce aggradation will restore habitat complexity and associated salmonid habitat, particularly summer and winter rearing habitat and the health of salmonid populations.

5.2.1.4 *Salmonid Habitat Value Assessment*

Salmonid habitat value assessment criteria for physical in-stream habitat conditions are addressed in **Table 25** and **Table 26** and provide the basis for analysis of baseline and Proposed habitat value for SONCC coho salmon, Northern California steelhead, and Coastal California Chinook salmon. Humboldt Redwood Company monitoring data from 2011 was used to assign species-specific habitat values based on Aquatic Properly Functioning Condition (APFC) targets, scientific literature, regional value comparison, and professional judgement. Metrics use pool, LWD, and temperature parameters to assign habitat value as "poor", "fair" or "good.

Table 25. *Salmonid Habitat Value Assessment Criteria—Summer Rearing Pool Depth/Complexity/Temperature*[1]

Fish Species	Residual Pool Depth (meters)	Pool Spacing/Channel Width	Total LWD piece per 100 feet (% of PFC target)	Temperature (MWAT °C)
	Poor			
Coho	< 0.3	> 10	<60%	>16.8
Steelhead	< 0.1	NA	<60%	>16.8
	Fair			
Coho	0.3 to 0.9	6 to 10	61 to 100%	14.1 to 16.7
Steelhead	0.1 to 0.3	NA	61 to 100%	14.1 to 16.7
	Good			

Coho	> 0.9	< 6	>100%	<14
Steelhead	> 0.3	NA	>100%	<14

[1] *PFC Matrix Criteria, Cannata et al. (1983), and Ricker and Anderson (2011)*

Table 26. *Salmonid Habitat Value Assessment Criteria—Winter Rearing Pool Depth and Complexity*[1]

Fish Species	Residual Pool Depth (meters)	Pool Spacing/Channel Width	Total LWD piece per 100 feet (% of PFC target)	Average Stream Gradient	Off Channel Rearing Habitat Present
	Poor				
Coho	< 0.3	> 10	<60%	>4%	None
Steelhead	< 0.1	NA	<60%	>4%	None
	Fair				
Coho	0.3 to 0.9	6 to 10	61 to 100%	3%	Moderate
Steelhead	0.1 to 0.3	NA	61 to 100%	3%	Moderate
	Good				
Coho	> 0.9	< 6	>100%	<2%	High
Steelhead	> 0.3	NA	>100%	<2%	High

[1] *PFC Matrix Criteria, Bilby and Ward (1994), Platts (1983), and Cannata et al. (2006)*

These criteria were considered in the development of **Table 27** which summarizes the quality of spawning and summer and winter SONCC coho salmon, Coastal California Chinook salmon, and Northern California steelhead habitat. Note that the assessment criteria for physical in-stream habitat conditions represented in **Table 25** and **Table 26** will also be used for monitoring of habitat improvement in the Project area.

In support of this Biological Assessment and in order to determine the impact of the Proposed Project on critical habitat, a habitat assessment was conducted for the Proposed Project (California Trout 2018, Stillwater Sciences). The assessment focuses on summer and winter rearing habitat as this is the habitat value expected to be both temporarily negatively impacted and positively affected by the Proposed action.

Table 27 characterizes SONCC coho salmon, California Coastal Chinook salmon, and steelhead/cutthroat trout habitat value within the action area (existing conditions), at ATM site 14 which was the reference location used to calculate fish density and associated take and project benefit/mitigation credit.

Table 27. *Habitat Ratings and Trends in Elk River*

Deposition Zone Reach	Species	Spawning Habitat Condition	Summer Rearing Condition	Winter Rearing Condition
Project Area	SONCC coho	None	Poor	Poor
	NC Chinook	None	Poor	Poor
	Steelhead Trout	None	Poor	Poor
ATM 14	SONCC coho	Poor	Fair	Fair
	NC Chinook	Fair	NA	NA
	Steelhead Trout	Poor	Fair	Fair

Despite the presence of juvenile SONCC coho salmon and Northern California steelhead in the Project area, the quality of critical habitat throughout the Project area is considered to be poor due to a lack of suitable winter and summer rearing habitat due to the aggraded condition of the channel. Lack of summer and winter rearing habitat is considered to be a limiting factor for juveniles in the Project reach (CalTrout et. Al, 2018). The channel lacks the water quality conditions, silt-free gravels, and large in-stream woody debris that salmonids require to grow to the size necessary to support outmigration. Juvenile salmonid size at ocean entry is directly related to survival to maturity (Bilton *et. al*. 1982), however data related to fish size at outmigration is unavailable. Therefore, establishing a correlation between the lack of rearing habitat and survivability, or between turbidity and fish survival, is not possible at this time.

Based on the trends data above, salmonid habitat conditions for all key like stages at the index reach ATM 14 are in fair condition. Salmonid spawning habitat condition is poor within all three index reaches from a lack of suitable spawning substrate but is considered to be fair to good in all major reaches upstream of the depositional zone. However, implementation of the Proposed action would increase the quality of winter and summer rearing habitat from poor to fair or good for all species.

Summer rearing habitat is currently very limited in the lower North Fork Elk River due to the loss of channel capacity from sediment aggradation. Summer rearing habitat within the two dewatering segments will result in a temporary impact on any SONCC coho salmon or Northern California Steelhead that may be present. Temporary loss of 14,200 ft2 of summer rearing habitat (existing pool area) associated with dewatering activities would have a direct impact to SONCC coho salmon and Northern California Steelhead that is potentially significant. Mitigations Measures as defined in Section 5.3 would reduce direct impacts to SONCC coho salmon or Northern California Steelhead to a level that is less than significant by relocating fish from each dewatering segment.

Permanent impacts to summer rearing habitat for SONCC coho salmon or Northern California Steelhead would be offset by restoration activities. Pool enhancement associated with the

Proposed Project will increase summer rearing capacity since the constructed pools will be deeper and wider than the present pools. Estimated pool volumes and expected capacity for juvenile steelhead and coho salmon summer rearing before and after the Proposed Project are depicted in **Table 28**.

Table 28. *Summer rearing habitat impacts and habitat remediation areas. Pools are defined as the depth > 1 ft below the downstream riffle crest elevation. All pools will be excavated approximately 3-6 feet below the riffle crest.*

Site	Temporary Summer Habitat Impact Assessment (from dewatering)	After Project (Proposed Restoration)	Net Increase
Wrigley Orchard Pool	750 ft^2	3,000 ft^2	2,250 ft^2
Elk River Flood Curve Pools	13,450 ft^2	28,271 ft^2	14,821 ft^2

As previously described, the Proposed Project is intended to address sediment impairment of beneficial uses, including aquatic habitat value. Potential direct effects of the Proposed action on listed fish species are related to dewatering/defishing, construction-related water quality effects, and habitat loss between vegetation removal and reestablishment. Each of these activities have the potential to result in incidental take of listed fish species.

Temporary construction-related impacts to summer rearing habitat for SONCC coho salmon or Northern California Steelhead would be offset by restoration activities. Habitat benefits may be derived from (a) enhanced in-channel habitat, (b) expanded and enhanced floodplain habitat, (c) increased habitat complexity through installation of large wood habitat structures, (d) enhancement of riffle substrate producing food resources, and (e) improvement in water quality (DO).

Overall the Proposed action is expected to improve quality rearing habitat year-round for juveniles of both coho salmon and steelhead in Elk River. Summer rearing habitat will improve via increased pool size, while winter fish habitat will be improved via more abundant low-velocity habitat created by large-wood habitat structures. The improvements may slightly favor coho over steelhead, since coho have shown preference for pool habitat.

5.2.2 <u>Critical Habitat Determinations</u>

The project is likely to adversely affect critical habitat for the following fish species:

- Southern Oregon/Northern California Coast Coho salmon
- Northern California steelhead
- California Coastal Chinook salmon

The project will have no effect to critical habitat for the following fish species:

- Green sturgeon, Southern DPS
- Eulachon, Southern DPS
- Longfin smelt

Removal of riparian vegetation could impact nesting sites for listed birds. The project will have no effect to critical habitat for the following bird species, since they occur outside of the Action Area:

- Marbled Murrelet
- Eastern Snowy Plover
- Western Yellow-Billed Cuckoo
- Northern Spotted Owl

Environmental Commitments related to Biological Resources including pre-project surveys and revegetation are included in Section 5.3.

5.3 Best Management Practices

Environmental Commitments or Best Management Practices (BMPs) developed to avoid and minimize adverse effects of the Proposed Project are described in **Table 29**, below.

Table 29. *Proposed Project Environmental Commitments Table*

Number	Title	Environmental Commitment Description
General Environmental Commitments *These Environmental Commitments will be implemented by the RWQCB, California Trout, and its contractors, as appropriate, for all activities associated with the Proposed Project. These Environmental Commitments are grouped according to use of general construction practices, public safety, and reporting procedures. The majority of these Environmental Commitments are implemented prior to and during construction.*		
EC1-GEN	Work Windows	All ground-disturbing (e.g. clearing, grubbing, grading, bank stabilization) and in-stream activities (channel and floodplain excavation) will take place between August 15 and October 15 (or October 31 if no rain is forecast).
EC2-GEN	Minimize the Area of Disturbance	To minimize impacts to natural resources, soil disturbance will be kept to the minimum footprint necessary to complete the restoration action.
EC3-GEN	Erosion and Sediment Control Measures	A. All soils disturbed or exposed during construction activities will be stabilized. The channel bed and areas below the Ordinary High Water Mark are exempt from this Environmental Commitment. B. Erosion control fabrics will consist of natural fibers that will biodegrade over time. No plastic or other non-porous material will be used as part of a permanent erosion control approach. Plastic sheeting may be used to temporarily protect a slope from runoff. C. Erosion control measures will be installed according to manufacturer's specifications. D. Appropriate measures include, but are not limited to, the following: • Silt fences • Straw bale barriers • Brush or rock filters • Storm drain inlet protection • Sediment traps • Sediment basins • Erosion Control blankets and mats

		• Soil stabilization (i.e., tackified straw with seed, jute or geotextile blankets, broadcast hydroseeding, etc.) E. All temporary construction-related erosion control methods (e.g., silt fences) shall be removed at the completion of each construction season, or as directed by a certified erosion control specialist.
EC4-GEN	Staging and Stockpiling of Materials	A. To the extent feasible, staging will occur on access roads or other disturbed areas that are already compacted. Similarly, all maintenance equipment and materials (e.g. road rock, and project spoil materials) will be contained within the existing paved or compacted roads or other pre-determined staging areas. Staging areas for equipment, personnel, vehicle parking, and material storage will be sited as far as possible from roadways. B. Stockpiling of materials, including portable equipment, vehicles and supplies (e.g., chemicals), will be restricted to the designated construction staging areas. C. No runoff from the staging areas may be allowed to enter waterways, including the river channel, tributaries, or drainage ditches, without being subjected to adequate filtration (e.g., vegetated buffer, hay wattles or bales, silt screens). The discharge of decant water to waterways from any on-site temporary sediment stockpile or storage areas is prohibited. D. During the dry season, if stockpiled soils will remain exposed and unworked for more than seven days, then erosion control measures will be utilized. During the wet season, n stockpiled soils will remain exposed, unless surrounded by properly installed and maintained silt fencing or other means of erosion control.
EC5-GEN	River Access	Construction access points will be developed in a manner that minimizes impacts according to the following guidelines: A. Prior to conducting in-channel work, Humboldt County will identify the limits of the required access routes and encroachment into the stream. The County will restrict access routes and encroachment into the stream to the maximum extent while still allowing for necessary activities to be completed. B. Access points will be constructed as close to the work area as possible to minimize equipment transport. C. Disturbed areas will be revegetated or filled with compacted soil, seeded, and stabilized with erosion control fabric immediately to prevent future erosion.

		D. Personnel will use the appropriate equipment for the job that minimizes impacts. Appropriately-tired vehicles, either tracked or wheeled, will be used depending on the site and activity to be conducted.
EC6-GEN	On-Site Hazardous Materials Management	A. An inventory of all hazardous materials used (and/or expected to be used) at the worksite and the end products that are produced (and/or expected to be produced) after their use will be maintained by the worksite manager. B. As appropriate, containers will be properly labeled with a "Hazardous Waste" label and hazardous waste will be properly recycled or disposed of off-site. C. Contact of chemicals with precipitation will be minimized by storing chemicals in watertight containers or in a storage shed (completely enclosed), with appropriate secondary containment to prevent any spillage or leakage. D. Petroleum products, chemicals, fuels, lubricants, and non-storm drainage water or water contaminated with the aforementioned materials will not contact soil and not be allowed to enter surface waters or drainage ditches. E. All toxic materials, including waste disposal containers, will be covered when they are not in use, and located as far away as possible from a surface water. F. All trash that is brought to a project site during construction and maintenance activities (e.g., plastic water bottles, plastic bags, cigarettes) will be removed from the site daily.
EC7-GEN	Existing Hazardous Materials	If hazardous materials are encountered, the construction contractor will carefully remove and dispose of them according to the *Spill Prevention and Response Plan* (see measure EC8-GEN). The construction contractor will wear proper protective gear and store the waste in appropriate hazardous waste containers until it can be disposed of at a hazardous waste facility.
EC8-GEN	Spill Prevention and Response	The construction contractor will prevent the accidental release of chemicals, fuels, lubricants, and non-storm drainage water into channels following these measures: A. All field personnel will be appropriately trained in spill prevention, hazardous material control, and cleanup of accidental spills. B. Equipment and materials for cleanup of spills will be available on site and spill s and leaks will be cleaned up immediately and disposed of according to guidelines stated in the *Spill Prevention and Response Plan* (developed by the Contractor and approved by the RWQCB).

		C. Field personnel will ensure that hazardous materials are properly handled and natural resources are protected by all reasonable means. D. Spill prevention kits will always be in close proximity when using hazardous materials (e.g., at crew trucks and other logical locations). All field personnel will be advised of these locations. E. County staff will routinely inspect the work site to verify that spill prevention and response measures are properly implemented and maintained. <u>Spill Response Measures:</u> For small spills on impervious surfaces, absorbent materials will be used to remove the spill, rather than hosing it down with water. For small spills on pervious surfaces such as soil, the spill will be excavated and properly disposed of rather than burying it. Absorbent materials will be collected and disposed of properly and promptly.
EC8-GEN	Vehicle and Equipment Maintenance	A. All vehicles and equipment will be kept clean. Excessive build-up of oil and grease will not be accepted. B. All equipment used for in-channel work will be inspected for leaks each day prior to initiation of work. Action will be taken to prevent or repair leaks, prior to use. C. Incoming equipment will be checked for leaking oil and fluids. Leaking equipment will not be allowed onsite. D. No heavy equipment will operate in a live channel. E. No equipment servicing will be done in the channel or immediate floodplain, unless equipment stationed in these locations cannot be readily relocated (i.e., pumps and generators). F. If necessary, all servicing of equipment done at the job site will be conducted in a designated, protected area to reduce threats to water quality from vehicle fluid spills. Designated areas will not directly connect to the ground, surface water, or the storm drain system. The service area will be clearly designated with berms, sandbags, or other barriers. Secondary containment, such as a drain pan, to catch spills or leaks will be used when removing or changing fluids. Fluids will be stored in appropriate containers with covers, and properly recycled or disposed of offsite. G. If emergency repairs are required in the field, only those repairs necessary to move equipment to a more secure location will be conducted in the channel or floodplain. H. Equipment will be cleaned of any sediment or vegetation before entering the work area to avoid spreading pathogens or exotic/invasive species.

		I. Vehicle and equipment washing can occur onsite only as needed to prevent the spread of sediment, pathogens, or exotic/invasive species. No runoff from vehicle or equipment washing is allowed to enter water bodies, including the channel and drainage ditches, without being subjected to adequate filtration (e.g., vegetated buffers, straw wattles, hay bales, and silt screens).
EC9-GEN	Vehicle and Equipment Fueling	A. No fueling will be done in the channel (top-of-bank to top-of-bank) or immediate floodplain unless equipment stationed in these locations cannot be readily relocated (e.g., pumps and generators). For stationary equipment, secondary containment, such as a drain pan or drop cloth, will be used to prevent accidental spills of fuels from reaching the soil, surface water, or drainage ditches. B. All non-stationary equipment fueling will be done in staging areas equipped with secondary containment and avoid a direct connection to soil, surface water, or the storm drainage system.
EC10-GEN	Dewatering Measures	<u>Design</u>: A. The channel will be dewatered and streamflow will be diverted around the work area for Project activities that involve in-channel grading and installation of in-stream features. B. Pre-construction surveys for special status amphibians will be conducted at least five days before the start of construction by a CDFW-approved biologist. The CDFW-approved biologist will remain onsite for the entire dewatering period to capture, handle, and relocate special status amphibians, if necessary. After the pre-construction surveys and dewatering is complete, the CDFW-approved biologist will train an Environmental Mentor and the entire construction crew on proper identification procedures for special status amphibians. The environmental monitor will then conduct daily monitoring of the worksite and have the authority to halt work if needed to protect detected species. C. Downstream flows adequate to prevent fish or vertebrate stranding will be maintained at all times during dewatering activities. D. Prior to dewatering, the best means to bypass flow through the work area will be determined to minimize disturbance to the channel and avoid direct mortality of fish and other aquatic vertebrates. The contractor will be required to submit a dewatering plan which will be subject to review and approval by the RWQCB, CDFW, USFWS, and NMFS. E. The area to be dewatered will encompass the minimum area necessary to perform the restoration activity.

		F. The period of dewatering will extend only for the minimum amount of time needed to perform the necessary construction activity. <u>Construction</u>: A. Where feasible and appropriate, dewatering will occur via gravity driven systems. B. Construction of cofferdams will begin in the upstream area and continue in a downstream direction, and the flow will be diverted only when construction of the dam is completed. C. Coffer dams will be installed both upstream and downstream not more than 100 feet from the extent of the work areas. D. Instream cofferdams will only be built from materials such as sandbags, clean gravel, or rubber bladders which will cause little or no siltation or turbidity. No earthen fill will be used to construct the cofferdam. Plastic sheeting will be placed over sandbags to minimize water seepage into the activity area. The plastic sheets will be firmly anchored to the streambed to minimize water seepage. In necessary, the footing of the cofferdam will be keyed into the channel bed at an appropriate depth to capture the majority of the subsurface flow needed to dewater the streambed. E. Stream flows will be allowed to gravity flow around or through the work site using temporary bypass pipes or culverts. Bypass pipe diameter will be sized to accommodate, at a minimum, twice the volume of the summer baseflow. F. When use of gravity-fed dewatering is not feasible and pumping is necessary to dewater a work site, a temporary siltation basin and/or use of silt bags may be required to prevent sediment from re-entering the wetted channel. <u>Implementation</u>: A. A qualified biologist will be present to ensure that state or federally listed fish and other aquatic vertebrates are not stranded during construction and implementation of channel dewatering. Prior to dewatering, the affected area will be surveyed by a qualified biologist, and if necessary, relocation procedures will be implemented to ensure that state and federally listed fish and other aquatic invertebrates are not adversely affected. B. Diverted and stored water will be protected from project activity-related pollutants, such as soils, equipment lubricants and fuels.

		C. A multi-filter/screen system consisting of a 2.8 mm (3/32 inch) screen inside a 4x4x4 foot box covered with a 6.3 mm (1/4 inch) screen will be installed at pump intakes to prevent impingement/entrainment of fish and amphibians. D. If necessary, discharged water will pass over some form of energy dissipating device to prevent erosion of the downstream channel. Silt bags will be equipped to the end of discharge hoses and pipes to remove sediment from discharged water. E. For full channel dewatering, filtration devices or settling basins will be provided as necessary to ensure that the turbidity of discharged water is not visibly more turbid than in the channel upstream of the maintenance site. If increases in turbidity are observed, additional measures will be implemented such as a larger settling basin or additional filtration. If increases in turbidity persist, the RWQCB will be alerted as turbidity measurements may be required. <u>Deconstruction:</u> A. When maintenance is completed, the flow diversion structure will be removed as soon as possible but no more than 48 hours after work is completed. Impounded water will be released at a reduced velocity to minimize erosion, turbidity, or harm to downstream habitat. Cofferdams will be removed such that surface elevations of water impounded above the cofferdam are lowered at a rate greater than one inch per hour. B. When diversion structures are removed, to the extent practicable, the ponded flows will be directed into the low-flow channel within the work site to minimize downstream water quality impacts. C. The area disturbed by flow bypass mechanisms will be restored at the completion of the project. This may include, but is not limited to, recontouring the area and planting or riparian vegetation.
EC11-GEN	Dewatering Pump/Generator Operations and Maintenance	When needed to assist in channel dewatering, pumps and generators will be maintained and operated in a manner that minimizes impacts to water quality and aquatic species. A. Pumps and generators will be maintained according to manufacturer's specifications to regulate flows to prevent dryback or washout conditions. B. Pumps will be operated and monitored to prevent low water conditions, which could pump muddy bottom water, or high water conditions, which creates ponding.

		C. A multi-filter/screen system consisting of 2.289 mm (3.32 inch) screen inside a 4x4x4 foot box covered with a 6.3 mm (1/4 inch) screen will be installed at pump intakes to prevent impingement/entrainment of fish and amphibians. D. Pumping machinery will be placed in a temporary containment structure (plastic basin, plastic-lined pit, etc.) designed to contained accidental hydrocarbon (gasoline, diesel, hydraulic fluid) spills.
EC12-GEN	Planning for Traffic Flow and Safety Measures	A. Work will be staged and conducted in a manner that maintains two-way traffic flow on public roadways in the vicinity of the work site. If temporary lane closures are necessary, they will be coordinated with the appropriate jurisdictional agency and coordinated with local emergency service providers as necessary to ensure that emergency vehicle access and response is not impeded. Any lane closures will include advance warning signage and flaggers in both directions. B. Access to driveways and private roads will be maintained. If brief periods of project activity would temporarily block access, property owners will be notified prior to the project activity.
EC13-GEN	Public Safety Measures	The contractor will implement safety measures during construction as follows: A. Signs will be posted on public roadways warning the public of construction work and to exercise caution. B. If needed, a lane of the public roadway may be temporarily closed to allow for trucks to pull into and out of access points to the work site.
EC14-GEN	Minimize Noise Disturbances to Residential Areas	The contractor will implement practices that minimize disturbances to adjacent residences surrounding work sites. A. Advanced notification will be provided one week prior to the start of construction to properties that are within 400 feet of a proposed construction site where heavy equipment will be used. B. Powered equipment (vehicles, heavy equipment, and hand equipment such as chainsaws) will be equipped with adequate mufflers. C. Excessive idling of vehicles will be prohibited beyond five minutes.
EC15-GEN	Work Site Housekeeping	A. The contractor will maintain the work site in neat and orderly condition on a daily basis, and will leave the site in a neat, clean, and orderly condition when work is complete. Slash, sawdust, cuttings, etc. will be removed to clear the site of vegetative debris. As needed, paved access roads will be swept and cleared

		of any residual vegetation or dirt resulting from the maintenance activity. All lunch trash will be properly disposed of. B. Materials or equipment left on the site overnight will be stored as inconspicuously as possible and will be neatly arranged.
Biological Resource Environmental Commitments *These Environmental Commitments will be implemented as appropriate to avoid and minimize impacts on special-status species and other biological resources. These Environmental Commitments may be modified during project permitting and agency approvals of project activities.*		
EC16-BIO	Protection of fish and other aquatic species during instream construction activities or channel dewatering	Before a work area is dewatered (as identified in EC10-GEN and EC11-GEN) or instream activities commence, state and federally listed fish and aquatic invertebrates will be captured and relocated to avoid injury and mortality and minimize disturbance. The following guidelines will apply. A. Prior to instream construction (i.e. channel and floodplain construction and placement of large wood), fish enclosures will be installed using silt fencing, silt curtains, block nets, or similar material to isolate the work area. For any areas to be dewatered, a coffer dam will be installed. B. During dewatering activities, downstream flows adequate to prevent fish or vertebrate stranding will be maintained at all times during dewatering activities. Pump intakes will be covered by 2.289 mm (3.32 inch) mesh and placed inside a 4.4.4. foot box covered with a 6.3 mm (1/4 inch) screen to prevent entrainment of fish and amphibians and will be checked periodically for impingement of fish and amphibians. C. Before instream construction commences or a work area is dewatered, the affected area will be surveyed by a qualified fisheries biologist who has a current CDFW scientific collecting permit and NMFS recovery permit and is experienced with capture and handling protocols for state or federally listed fish and aquatic invertebrates. Any state and federally listed fish and aquatic invertebrates such that are encountered will be captured and relocated to avoid injury and mortality and minimize disturbance. D. During dewatering activities, the channel will be blocked by placing fine-meshed nets or screens above and below the work area to prevent state or federally listed fish and aquatic invertebrates from reentering the work area. To minimize entanglement, mesh diameter will not exceed 1/8 inch. The bottom edge of the net or screen will be secured to the channel bed to minimize impingement. Screens will be checked periodically and cleaned of debris to permit free flow of water.

		E. Before removal and relocation begins, a qualified fisheries biologist will identify the most appropriate release location(s). Release locations should have water temperatures similar to (.2ºC difference) the capture location and offer ample habitat (e.g. depth, velocity, cover, connectivity) for released fish and aquatic invertebrates, and should be selected to minimize the likelihood of reentering the work area or becoming impinged on exclusion nets or screens. F. The means of capture will depend on the nature of the work site, and will be selected by a qualified fisheries biologist. Complex stream habitat may require the use of electrofishing equipment, whereas in outlet pools, aquatic invertebrates and invertebrates may be captured by pushing down the pool and then seining or dip netting. Electrofishing will only be sued as a last resort. IF electrofishing is necessary, it will be conducted only by properly trained personnel following the NMFS Guidelines dated June 2000. G. When feasible, initial fish relocation efforts will be performed several days prior to the scheduled start of construction. To the extent feasible, dewatering and species relocation will be performed during morning periods. The fisheries biologist will survey the enclosures or cofferdams throughout the dewatering effort to verify that no state or federally listed fish or aquatic invertebrates are present. Afternoon pumping activities should generally not occur and pumping should be limited to days when ambient air temperatures are not high. Air and water temperatures will be measured periodically, and dewatering and species relocation activities will be suspended if temperatures exceed the limits allowed by NMFS guidelines. H. Handling of fish and aquatic invertebrates will be minimized. When handling is necessary, personnel will wet hands or nets before touching them. I. Prior to translocation, and state or federally listed species that are collected during surveys will be temporarily held in cool, aerated, shaded water using a 5-gallon container with a lid. Overcrowding in containers will be avoided; no more than xx fish will be kept in each container. Aeration will be provided with a battery-powered external bubbler. Fish will be protected from jostling and noise, and will not be removed from the container until the time of release. A thermometer will be placed in each holding container and partial water changes will be conducted as necessary to maintain a stable water temperature. Special-status fish and other special-status aquatic species will not be held more

		than 30 minutes. If water temperature reaches or exceeds NMFS limits, the fish and other aquatic species will be released and relocation operations will cease. J. If state or federally listed fish or aquatic invertebrates are abundant, capture will cease periodically to allow release and minimize the time fish spend in holding containers. K. Fish and aquatic invertebrates will not be anesthetized or measured. However, they will be visually identified to species level, and year classes will be estimated and recorded. L. Reports on fish relocation activities will be submitted to CDFW, USFWS, and NMFS in a timely fashion. M. If mortality during relocation exceeds 5%, relocation will cease and CDFW, USFWS, and NMFS will be contacted immediately or as soon as feasible. N. Relocation sites for any captured fish will be identified prior to initiating removal activities.
Geology and Soils Environmental Commitments *These Environmental Commitments will be implemented by the RWQCB, California Trout, and its contractors, as appropriate, for all activities within the Proposed Project.*		
EC17-GEO	Site Preparation	Prior to the start of work, the contractor will locate and mark all active subsurface utilities in the general vicinity of the site. The contractor will protect all utilities that are to remain in and surrounding the site during onsite excavation and construction activities.
EC18-GEO	Fill Placement	Immediately prior to fill placement, spoils/sediment reuse sites will be scarified to a depth of 6 inches. All fill will be spread in lifts not exceeding four feet and compacted by mechanical means.

6 EFFECTS ON ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires Federal agencies to consult with NMFS on activities that may adversely affect Essential Fish Habitat (EFH). EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Waters include aquatic areas and their associated physical, chemical, and biological properties. Substrate includes sediment underlying the waters. Necessary means the habitat required to support a sustainable fishery and the managed species contribution to a healthy ecosystem. Spawning, breeding, feeding, or growth to maturity covers all habitat types utilized by a species throughout its life cycle.

The objective of this EFH assessment is to determine whether or not the proposed action "*may* adversely affect" designated EFH for relevant commercially, federally managed fisheries species within the proposed action area. It also describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the proposed action.

The Elk River supports EFH for species regulated under the Federal Pacific Coast Salmon Fishery Management Plan. In particular, the North Fork Elk River within the action area is associated with Essential Fish Habitat for coho salmon and Chinook salmon.

Per the Pacific Coast Salmon Fishery Management Plan, EFH for the Pacific coast salmon fishery means those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem. To achieve that level of production, EFH must include all those streams, lakes, ponds, wetlands, and other currently viable water bodies, and most of the habitat historically accessible to salmon in Washington, Oregon, Idaho, and California. In the estuarine and marine areas, salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the Exclusive Economic Zone offshore of Washington, Oregon, and California north of Point Conception. Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the Pacific Fishery Management Council [PFMC]), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years).

6.1 Potential Adverse Effects of the Proposed Project

The definition for EFH "adverse effects" states that an adverse effect is any impact which reduces quality and/or quantity of essential fish habitat, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Essential fish habitat for SONCC coho salmon, Coastal California Chinook salmon, and Northern California steelhead occurs in the action area. Vegetation removal, dewatering, defishing, fish relocation, excavation, and rewatering activities have the potential to result in fish take and to contribute sediment or cause temporary turbidity in the lower north fork Elk River. Actions associated with the Proposed Project may have a temporary minor adverse effect on EFH of two species managed under PFMC Fishery Management Plans—SONCC coho salmon and Northern California Steelhead. A detailed description of the potential adverse effects of the proposed action on these species can be found in Section 5 of this BA.

6.2 EFH Conservation Measures

Implementation of the Proposed Project will be required to comply with the State Water Resources Control Board's Construction General Permit to implement standard water quality BMPs during construction of all project features. These are effective erosion and pollution control measures that would avoid and minimize the potential for adverse impacts to essential fish habitat from construction activities. The contractor will be required to develop and implement site-specific best management practices and emergency spill controls in accordance with a Storm Water Pollution Prevention Plan developed per the requirements of the SWRCB Construction General Permit. Examples of standard BMPs and measures to protect fish during dewatering are described in Section 5.3 of this BA.

6.3 Essential Fish Habitat Conclusion

The Proposed Project may adversely affect essential fish habitat for species managed under the Pacific Coast Salmon Fishery Management Plans. Any effects of the Proposed Project to EFH would be negligible for the following reasons:

- Temporary loss of summer rearing habitat would be offset by net increases in the amount of long-term summer rearing and wintering refuge habitat through increases in pool area and low velocity areas (through the construction of large wood habitat structures).

- Removal of riparian overstory and understory vegetation necessary to achieve Project objectives would be minimal and would be replanted in accordance with the revegetation plan and ratios described in Section 3.3.6. (except for in-channel areas and newly excavated banks below the high flow surface water elevation where replanting would oppose the Project objectives by slowing velocities and contributing to sediment aggradation).
- The project would be implemented in accordance with a dewatering plan developed in consultation with regulatory agencies.
- Construction would take place during the dry, summer months.
- Standard water quality best management practices would be implemented.

All water quality impacts would be construction-related and temporary in nature. Overall, project features would create new rearing habitat by providing additional pool volume and wood structures to provide resting, rearing, and refugia habitats. No long-term adverse effects on fish abundance, health, or long-term sustainability of salmon fisheries are expected to result from the Proposed Project. To the contrary, the Proposed Project is both designed and anticipated to improve salmonid habitat conditions over the long-term.

7 CUMULATIVE EFFECTS

Cumulative effects are non-federal activities that are reasonably certain to occur within the action area combined with activities outside the action area that together may cause adverse effects to state and federally listed fish and plant species or protected habitats. There are several activities in the watershed that may have a cumulative effect on federally-listed SONCC coho and Northern California steelhead. These activities include an Lake and Streambed Alteration Agreement (Jesse Noell: for riparian clearing in the Elk River Flood Curve reach, restoration of the Westfall property to be implemented by Save the Redwoods League, ongoing logging in the upper watershed as regulated under existing Timber Harvest Plans and waste discharge requirements, and associated impaired water quality as regulated under the Elk River Sediment Total Maximum Daily Load (TMDL), and new sources of runoff from urbanization.

The Project actions proposed herein do not have impacts that are individually limited, but cumulatively considerable. The project is a pilot project along an approximately 2,375 linear foot section of channel along the North Fork Elk River. If the pilot project shows that mechanical sediment remediation is feasible and cost-effective for increasing channel conveyance, additional lower portions of the Elk River may undergo similar sediment remediation and channel recontouring. Additional environmental documentation would be prepared for any future phases involving additional sediment remediation. The intent of the proposed project is to evaluate whether the treatments employed are effective in order to evaluate whether future sediment remediation projects in the Elk River would be cumulatively beneficial for flood mitigation as well as for rare and threatened fish populations.

Cumulative impacts are thus determined to be less than significant, assuming implementation of the Environmental Commitments identified in Section 7.2 which will ensure there would be no significant adverse impacts on the environment.

Reasonably-expected related projects with the potential to impact federally-listed anadromous species in the Elk River Watershed are listed below:

<u>Jesse Noell Lake and Streambed Alteration Agreement</u>
A 5-year Lake and Streambed Alteration Agreement was approved by CDFW in 2016 for blackberry and willow removal to increase velocities under the Concrete Bridge abutments in order to mobilize aggraded sediment on the banks. The permit area includes a three-mile reach extending upstream from Elk River Courts to Kristi Wrigley's property on the North Fork, and Jesse Noell's property on the South Fork). Under the LSAA agreement, willows extending into the channel from the banks may be pruned and cut, with all willow within three feet

(vertical) of the active channel preserved. Under the LSAA, instream overstory canopy is to be preserved to keep stream temperatures cold while inhibiting any new growth of sedge or bunch grasses within the channel.

> *Potential Impacts of Planned Activities (similar to the Proposed Project):* Similar short-term impact on fish habitat from removal of in-channel vegetation.

City of Eureka Elk River Estuary/Inter-Tidal Wetlands Enhancement and Coastal Access Project

The Elk River Estuary/Inter-Tidal Wetlands Enhancement and Coastal Access Project (State Clearinghouse No. 2017082048) proposes to restore and enhance estuary and inter-tidal wetland habitats on approximately 114 acres adjacent to the Elk River. The project would enhance and restore approximately 78 acres of salt marsh, 13 acres of riparian habitat, and 13 acres of inter-tidal channels. The project may also create approximately 2.8 miles of navigable channels connected to Elk River Slough. In addition, the project proposes to enhance public access to Elk River and Humboldt Bay through an approximately one-mile extension of the Waterfront Trail and other amenities including a boat launch, viewing platforms, and parking area.

> *Potential Impacts of Planned Activities (similar to the Proposed Project):* Similar short-term, construction-related impacts with potential adverse impacts on fish, wildlife, and habitat quality associated with vegetation removal, and construction-related disturbance if not properly mitigated.

Elk River Stewardship Program

The Elk River Watershed Stewardship Program is supported by a Clean Water Act Section 319(h) grant and is designed to engage community and institutional stakeholders of the Elk River watershed in the planning and design of restoration alternatives to regain beneficial uses of the Elk River. The Stewardship Program will assess the technical, social, regulatory, and economic feasibility of the projects identified through the Elk River Recovery Assessment (ERRA) to address instream legacy sediment. Future remediation implementation will require a regulatory compliance strategy and a finance plan to attain CEQA compliance, permits, and adequate funding resources. The Stewardship Program will work iteratively with the ERRA technical team, agencies, and landowners to reach consensus on direct recovery actions and develop a community-supported strategy for moving into subsequent implementation phases. The study area of the ERRA and Elk River Watershed Stewardship Program extends from the mouth of the Elk River at Humboldt Bay all the way up into the North Fork to Tom's Gulch, and up into the South Fork Elk River at Bridge Creek.

> *Potential Impacts of Planned Activities (similar to the Proposed Project):* None, no implementation projects are currently funded.

Save the Redwoods League Westfall Restoration

In 2016, Save the Redwoods League purchased the 77-acre Westfall Ranch which buffers the Headwaters Forest Preserve and is located above the Project area on the South Fork Elk River. According to the League's web site, "The League plans to restore the Elk River's salmon habitat on the Westfall property. Decades of large-scale industrial clear-cut logging in the region resulted in sediment flowing into the once free-running Elk River, which originates in Headwaters. Gone are the deep, clear pools and side channels that coho salmon need to survive. Now, the river is choked with silt. A habitat assessment will be conducted to determine the best approach to restoring the watershed. Recommended actions likely will include removal of sediment to improve water quality and strategic placement of large fallen trees back into the stream system to help re-establish pools, shade and cover for coho and other imperiled fish in the salmon family." (https://www.savetheredwoods.org/project/westfall-ranch/). Associated Project elements include public access to Headwaters Forest Reserve including hiking trails. Ultimately, the League plans to transfer the property to the Bureau of Land Management, depending on public funding.

> *Potential Impacts of Planned Activities (similar to the Proposed Project):* Similar short-term, construction-related impacts with potential adverse impacts on fish, wildlife, and habitat quality associated with vegetation removal, and construction-related disturbance if not properly mitigated.

Elk River Recovery Assessment

The Elk River Recovery Assessment was initiated by the State Water Resources Control Board in 2014 to investigate feasible actions to abate nuisance flooding and recover water quality conditions necessary to restore ecosystem functions in the North Fork Elk River.

The Recovery Assessment includes the construction, calibration, and validation of a hydraulic/hydrodynamic and sediment transport models (HST model) suitable for assessing the effects of a range of actions individually, collectively, and under a range of flows, sediment loads, and time frames. The Recovery Assessment will assess and identify recovery actions which will be outlined in a peer-reviewed sediment reduction implementation framework that is scientifically defensible and has the highest probability of reducing sediment loads in order to restore a sustainable stream reach capable of supporting beneficial uses and abating the current nuisance flooding conditions in the Middle Reach. The goals of the Recovery Assessment are to:

- Contain the 1.5-2 year recurrence interval flows (1.5-2 year flood) within the banks of the Middle Reach of Elk River;
- Support beneficial uses of water by attaining sediment-related water quality objectives as defined in the Water Quality Control Plan for the North Coast Region (Basin Plan).

The Recovery Assessment will result in a list of technical recommendations for sediment reduction implementation, supported by the appropriate modeling, data analyses, and peer review. Potential recovery actions include dredging, new channel construction, on-channel or off-channel detention basins, levee construction or modification, vegetation management, infrastructure improvements, creation of inset floodplains, high flow channels, and placement of instream large woody debris.

The Recovery Assessment is funded by the State Water Resources Control Board Cleanup and Abatement Account with matching funds provided by the California Coastal Conservancy and Humboldt Redwood Company. The program is being directed by the Regional Water Quality Control Board, California Trout, a team of technical scientists, and a technical advisory committee. Project Partners include area landowners, California Trout, Northern Hydrology & Engineering, Stillwater Sciences, and Trinity Associates.

The Proposed Project described herein is intended to demonstrate implementation capacity and inform the ERRA of sediment remediation effectiveness, implementation costs, logistics (e.g. sediment reuse), and environmental compliance considerations.

> *Potential Impacts of Planned Activities Similar to the Proposed Project:* None, no implementation projects are currently funded.

<u>Timber Harvest Plans and Waste Discharge Requirements</u>

Land use and ownership within the Upper Elk River Watershed (immediately above the project area) is predominantly commercial timberlands owned and managed by Humboldt Redwood Company (HRC) and were previously owned by Pacific Lumber Company (PALCO). On the South Fork, Green Diamond Resource Company owns the McCloud Creek sub-basin, which is managed for timber harvest. HRC owns most of the remaining land in the South Fork basin.

Management of upper watershed lands for commercial timber production is expected to continue under California State Forest Practice Rules and waste discharge requirements (WDRs) which is the primary regulatory mechanism utilized by the RWQCB to control the nonpoint source pollution resulting from past and ongoing timber harvesting activities. WDRs for the timberland owners are currently being revised to ensure that they are consistent with the Elk River Sediment TMDL zero load allocation, through the application of a comprehensive prevention and minimization program, in combination with beneficial use enhancement projects. of the Elk River Sediment TMDL (because the Elk River has a zero capacity for additional sediment loading). load-allocations established by the recently adopted Elk River Sediment Total Maximum Daily Load. Impacts associated with timber harvest include changes to the hydrograph (timing, magnitude, and duration of runoff), increases in sediment supply, increases in suspended sediment/turbidity, decrease in shading of aquatic surfaces, and an increase in water temperature.

Timber harvest activities are regulated by the California Department of Forestry and Fire under Timber Harvest Plans (THPs), by the RWQCB under Waste Discharge Requirements (WDRs), and by the CDFW under Habitat Conservation Plans (HCPs). Despite adherence to WDRs and other regulatory approaches, "previously set harvest limitations and clean-up and abatement orders requirements have not resulted in substantially improving downstream conditions relative to domestic water supply and flooding, despite being in place for eight years and demonstrably effective in sediment control (HRC, Letter to RWQCB re Peer Review Draft Staff Report to Support the Technical Sediment TMDL for the Upper Elk River, 2013)".

Because of sediment aggradation, there is currently a zero loading capacity for additional sediment within the impacted reach. This observation is based on (1) sediment inflows to the impacted reach that exceed outflows, (2) continued aggradation in the impacted reach, (3) continued exceedances of sediment-related water quality standards, and (4) a delay before sediment and channel restoration can be accomplished in the impacted reach. The zero sediment load regulatory cap will be maintained until the impacted reach's physical assimilative capacity has been expanded through sediment remediation and channel restoration during Phase 1 implementation. (TetraTech, Pg. 74). The RWQCB will develop WDRs which translate the zero load allocation into permit conditions.

Potential Impacts of Planned Activities (similar to the Proposed Project): Legacy levels of sediment loading associated with industrial timber harvest in the upper watershed and landslides associates with logging and the upper watershed's soft Wildcat geology is accounted for in the TMDL's zero load allocation. WDRs reflecting the zero load allocation will have a positive impact on sediment loading if property implemented, and will reflect an additional source of sediment loading if not.

<u>Urbanization</u>
Residential uses in the Elk River watershed include the land along the river corridor, Elk River Road, Ridgewood Heights, and Humboldt Hill. Lands along Elk River Road, from the edge of Eureka to the northwest above the confluence of the North and South Forks, are in rural residential use. Ridgewood Heights and Humboldt Hill are the two major residential areas in

the Elk River watershed besides the Elk River neighborhood, which lies along the river corridor along Elk River Road. The Ridgewood Heights neighborhood is characterized by both urban and rural land uses. Humboldt Hill is primarily residential in character. Both of these areas expect to see an increase in residential development in the coming years, particularly because of the neighborhood's close proximity to the City of Eureka and the scarcity of land within the City suitable for new residential development.

Potential Impacts of Planned Activities Similar to the Proposed Project: Urban development of this neighborhood has the potential to increase the area of impervious surface and potentially generate erosion that could alter the hydrograph and/or deliver more sediment to the Elk River.

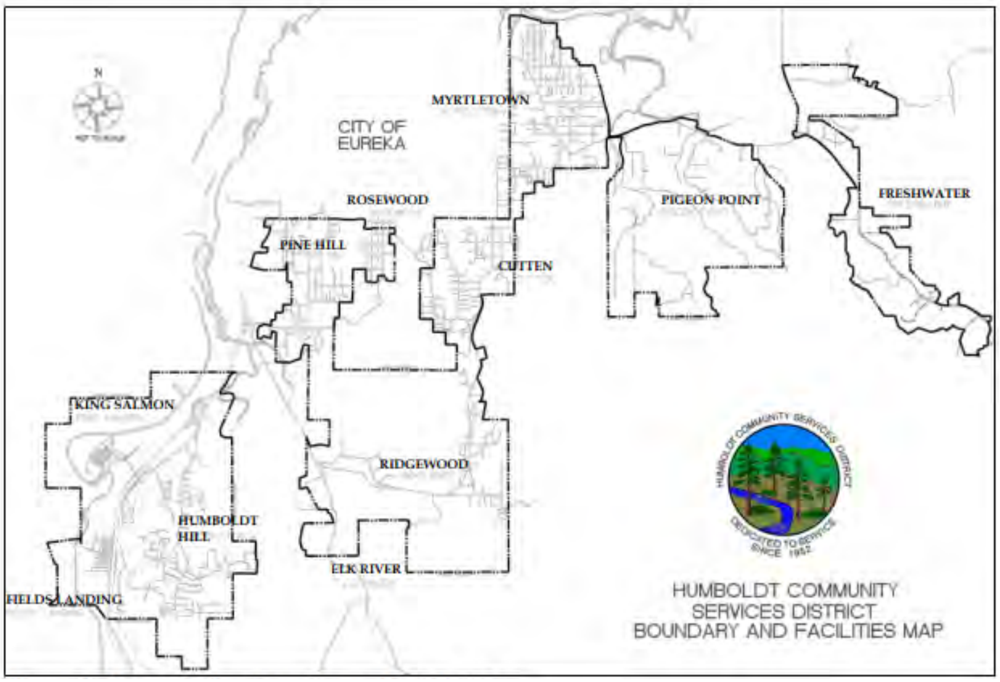

Figure 15. *Humboldt Community Services District Boundary and Facilities Map showing proximity of Ridgewood Heights and Martin Slough neighborhoods to the Elk River*

http://humboldtlafco.org/wp-content/uploads/Humboldt-1-FPD-Adopted-MSR-Sept-19-2008.pdf).

8 CONCLUSION

The Elk River Sediment Remediation and Habitat Rehabilitation Pilot Implementation Project proposes to excavate aggraded sediment from the bed and banks of the Elk River to an elevation that improves the river's ability to move sediment more effectively through the Project area in order to reduce nuisance flooding in the Project area and address impaired beneficial uses, including aquatic habitat. The Proposed Project would excavate approximately 22,000 cubic yards of sediment from jurisdictional waters of the US, affecting 4.1 acres. Total waters of the US fill associated with large wood habitat structures is approximately 0.12 acres.

Rearing SONCC coho and Northern California Steelhead would be directly impacted by the Proposed Project action due to their heavy reliance on summer rearing locations within the channel excavation areas, despite the fact that existing aquatic habitat is low-quality due to aggradation. Construction activities below ordinary high water have the potential to directly impact rearing SONCC coho salmon and Northern California steelhead and their critical habitat. Chinook salmon are assumed to have emigrated by the construction period but could also be adversely affected by modification of critical habitat.

Dewatering and fish removal/relocation activities have the greatest potential to "take" federally-listed SONCC coho and Northern California Steelhead likely to be present in the Project area during the construction period. A total of 2,375 linear feet of aquatic habitat will be dewatered during construction activities (**Figure 13**). Improper handling of SONCC coho salmon and Northern California steelhead juveniles present during the construction period or improper transport or relocation to unsuitable habitat could result in mortality or injury. Best management practices associated with fish removal and relocation to prevent injury and overcrowding are defined in Section 2.4.2 and Section 5.3.

In order to calculate potential fish take associated with the Proposed Project, CalTrout estimated the area of existing habitat and applied established fish density estimates to determine the densities of juvenile coho and steelhead likely to be present in the dewatered channel segment during the construction period. CalTrout then applied the federal definition of take which includes all fish pursued, harassed, captured, harmed, injured, or killed (i.e. all fish in the Project area) to determine a maximum anticipated take of 2,123 juvenile coho salmon and 1,699 juvenile steelhead. The Proposed Project includes design elements to mitigate for direct impacts to SONCC coho and Northern California steelhead including pool enhancement (8 pools, included in quantification of Project benefit), construction of large wood habitat features (8 structures, not included in quantification of Project benefit), and gravel augmentation on riffles (7 locations, not included in quantification of Project benefit). Utilizing the same methodology employed to estimate juvenile fish density and anticipated take, CalTrout estimated the increase in habitat that would be achieved through the pool enhancement component of the Proposed Project and identified an increase in pool area (**Table 28**) that would provide year-round rearing habitat for coho salmon and steelhead juveniles. This analysis resulted in an additional 2,553 coho juveniles and an additional 2,042 steelhead juveniles. In addition, CalTrout is proposing to place a significant volume of large wood in the Proposed Project reaches, resulting in much higher quality of juvenile winter rearing habitat, as well as providing a mechanism for habitat self-maintenance through the scouring of pools.

As depicted in **Table 30**, the Proposed Project would result in the creation of far more habitat than would be impacted by Project construction, with a ratio of over 2.2:1 of habitat creation to impact (habitat loss). Take of SONCC coho and Northern California steelhead would be adequately offset by beneficial effects of improved habitat and water quality on juvenile survival.

Table 30. *Effects of Proposed Actions on Individuals and Critical Habitat*

Effects – Wrigley Orchard and Elk River Flood Curve	
Potential Fish Occurrence	
SONCC coho salmon	2,123
No. CA Steelhead	1,699
Impacts to Habitat	
Loss of habitat (direct/indirect)	Riparian Habitat (2.28 acres) *replanted at 3:1 ratio* Permanent impact (1.34 acres) Temporary impact (.73 acres) s Coniferous Forest Habitat (0.64 acres) *replanted at 3:1 ratio* Permanent impact (.04 acres) Temporary impact (.41 acres)
Physical barriers to migration	▪ Beneficial effect from removal of in-channel vegetation, removal of sediment from the impacted reach, and improved geomorphological processes over time.
Fragmentation	N/A
Impacts to Individuals	
Incidental take (Harm, harass)	SONCC coho: 2,123 No. CA Steelhead: 1,699
Mortality from dewatering (2%) and defishing (3%)	SONCC coho: 106.15 No. CA Steelhead: 84.95
Net benefit to Individuals post-Project (mitigation credit)	SONCC coho: 2,553 No. CA Steelhead: 2,042
Water Quality	
Temperature	▪ Potential decrease associated with greater pool volumes
Dissolved Oxygen	▪ Potential increase from riffle construction and greater pool depths

Turbidity	▪ Potential short-term increase from grading and erosion potential, however turbidity already exceeds established threshold ▪ Potential long-term benefit from greater pool volumes and better geomorphological process associated with the placement of large wood.
SSC	No long-term change due to upper watershed contributions
Elements of Critical Habitat*	
Pool quality or frequency (refugia)	Positive impact through creation of additional 17,071 square feet of pool area (8 pools)
Substrate	▪ Improvement in availability of clean, silt-free gravel for spawning. ▪ Clean, well-oxygenated gravel will benefit steelhead egg/alevin survival.
Off-channel habitat	Creation of 8 low/zero velocity pools with associated benefit in year-round rearing (particularly important for juvenile and pre-smolt outmigration in spring)
Floodplain connectivity	▪ Benefits to habitat diversity, water quality, and nutrient transfer from increased connectivity between low flow channel and newly excavated high flow floodplain areas ▪ Improvement to diversity and productivity of invertebrate assemblages and the higher trophic levels that depend on them (Benke, 2001) through placement of large wood habitat structures and enhancement of riparian corridor with conifers.
Watershed condition	N/A
Cumulative Effects	
Interrelated or interdependent effects	Logging and restoration in the upper watershed, and urbanization in the lower watershed may increase the hydrograph, increasing sediment delivery to the Elk River.
Cumulative Effects (state and private actions)	▪ Jesse Noell Lake and Streambed Alteration Agreement ▪ City of Eureka Elk River Estuary/Inter-Tidal Wetlands Enhancement and Coastal Access Project ▪ Elk River Stewardship Program ▪ Save the Redwoods League Westfall Restoration ▪ Elk River Recovery Assessment ▪ Timber Harvest Plans and Waste Discharge Requirements ▪ Ridgewood Heights Urbanization

In addition to impacts associated with the dewatering phase, federally-listed coho and steelhead have the potential to be impacted by construction-related water quality effects, such as turbidity. These impacts would be minimized through the implementation of general construction best management practices (summarized in Section 5.3) that will be required to obtain other regulatory approvals including a RWQCB water quality certification, Humboldt County Grading Permit, and CDFW Lake and Streambed Alteration Agreement.

The Project action will excavate sediment from the bed and banks of the Elk River channel and create new floodplain surfaces in strategic locations in strategic locations in order to increase conveyance through the Project reach. Disturbed areas above the top of bank which will be replanted with native species appropriate for local conditions. An indirect effect of the Proposed Project is deterioration in the quality of rearing habitat from vegetation removal. The low flow channel below OHWM and newly created streambanks will not be revegetated as these areas are intended to become part of the wetted channel under high flow conditions, resulting in permanent impacts to 1.38 acres of riparian and coniferous forest habitat. Riparian and conifer trees above the high flow water surface elevation will be replanted at a mitigation ratio of 3:1, with riparian and conifer tree species, to increase the native riparian species diversity within the riparian zone of the NF Elk River.

Over the long term, restoring geomorphic functions through the Project reach would have many positive impacts, including:

- Increased velocity within the channel during high flow events to enable the channel to more effectively move and transport sediment out of the channel;
- Reduced nuisance flooding. Channel and bank excavations associated with the Proposed Project will add significantly to the floodwater capacity and reduce the potential water surface elevation
- Associated benefits on aquatic habitat quality that are not possible to quantify at this time.

Taking no action to remove the embedded load in the Project area would have many potential negative impacts including worsening beneficial use impairments and nuisance conditions, loss of biodiversity, and continued degradation of the surrounding environment. One of the key findings of the associated Elk River Recovery Assessment is that aggradation within the lower north fork of the Elk River will not resolve through natural geomorphic processes within a period of less than 300 years.

The longevity of habitat features (enhanced pools, large wood habitat structures, placed gravel) will be monitored to inform future recovery actions in the Elk River watershed. Regular hydraulic surveys and analysis to monitor the performance of the Proposed Project action against the as-built plans.

With the incorporation of mitigation measures into the Project design and adherence to BMPs as defined in Section 5.3 and included in State and Federal permits, incidental take is not expected to jeopardize the continued existence of federally-listed SOMCC coho salmon, Northern California Steelhead, or California Coastal Chinook salmon or their recovery.

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APPENDIX C

Special Status Species with Potential to Occur in the Vicinity of the Project Area per CNDDB

CNDDB Quad Species List 58 records.

Element Type	Scientific Name	Common Name	Element Code	Federal Status	State Status	CDFW Status	CA Rare Plant Rank	Quad Code	Quad Name	Data Status	Taxonomic Sort
Animals - Amphibians	Ascaphus truei	Pacific tailed frog	AAABA01010	None	None	SSC	-	4012462	Fields Landing	Mapped	Animals - Amphibians - Ascaphidae - Ascaphus truei
Animals - Amphibians	Rana aurora	northern red-legged frog	AAABH01021	None	None	SSC	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Amphibians - Ranidae - Rana aurora
Animals - Amphibians	Rana boylii	foothill yellow-legged frog	AAABH01050	None	Candidate Threatened	SSC	-	4012462	Fields Landing	Mapped	Animals - Amphibians - Ranidae - Rana boylii
Animals - Birds	Accipiter cooperii	Cooper's hawk	ABNKC12040	None	None	WL	-	4012462	Fields Landing	Unprocessed	Animals - Birds - Accipitridae - Accipiter cooperii
Animals - Birds	Accipiter striatus	sharp-shinned hawk	ABNKC12020	None	None	WL	-	4012462	Fields Landing	Mapped	Animals - Birds - Accipitridae - Accipiter striatus
Animals - Birds	Haliaeetus leucocephalus	bald eagle	ABNKC10010	Delisted	Endangered	FP	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Birds - Accipitridae - Haliaeetus leucocephalus
Animals - Birds	Ardea alba	great egret	ABNGA04040	None	None	-	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Birds - Ardeidae - Ardea alba
Animals - Birds	Ardea herodias	great blue heron	ABNGA04010	None	None	-	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Birds - Ardeidae - Ardea herodias
Animals - Birds	Egretta thula	snowy egret	ABNGA06030	None	None	-	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Birds - Ardeidae - Egretta thula
Animals - Birds	Nycticorax nycticorax	black-crowned night heron	ABNGA11010	None	None	-	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Birds - Ardeidae - Nycticorax nycticorax
Animals - Birds	Charadrius alexandrinus nivosus	western snowy plover	ABNNB03031	Threatened	None	SSC	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Birds - Charadriidae - Charadrius alexandrinus nivosus
Animals - Birds	Charadrius montanus	mountain plover	ABNNB03100	None	None	SSC	-	4012462	Fields Landing	Mapped	Animals - Birds - Charadriidae - Charadrius montanus
Animals - Birds	Falco peregrinus anatum	American peregrine falcon	ABNKD06071	Delisted	Delisted	FP	-	4012462	Fields Landing	Unprocessed	Animals - Birds - Falconidae - Falco peregrinus anatum
Animals - Birds	Pandion haliaetus	osprey	ABNKC01010	None	None	WL	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Birds - Pandionidae - Pandion haliaetus
Animals - Birds	Pelecanus occidentalis californicus	California brown pelican	ABNFC01021	Delisted	Delisted	FP	-	4012462	Fields Landing	Unprocessed	Animals - Birds - Pelecanidae - Pelecanus occidentalis californicus
Animals - Birds	Phalacrocorax auritus	double-crested cormorant	ABNFD01020	None	None	WL	-	4012462	Fields Landing	Unprocessed	Animals - Birds - Phalacrocoracidae - Phalacrocorax auritus
Animals - Fish	Acipenser medirostris	green sturgeon	AFCAA01030	Threatened	None	SSC	-	4012462	Fields Landing	Mapped	Animals - Fish - Acipenseridae - Acipenser medirostris
Animals - Fish	Eucyclogobius newberryi	tidewater goby	AFCQN04010	Endangered	None	SSC	-	4012462	Fields Landing	Mapped	Animals - Fish - Gobiidae - Eucyclogobius newberryi
Animals - Fish	Spirinchus thaleichthys	longfin smelt	AFCHB03010	Candidate	Threatened	SSC	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Fish - Osmeridae - Spirinchus thaleichthys

Animals - Fish	Thaleichthys pacificus	eulachon	AFCHB04010	Threatened	None	-	-	4012462	Fields Landing	Mapped	Animals - Fish - Osmeridae - Thaleichthys pacificus
Animals - Fish	Entosphenus tridentatus	Pacific lamprey	AFBAA02100	None	None	SSC	-	4012462	Fields Landing	Mapped	Animals - Fish - Petromyzontidae - Entosphenus tridentatus
Animals - Fish	Oncorhynchus clarkii clarkii	coast cutthroat trout	AFCHA0208A	None	None	SSC	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Fish - Salmonidae - Oncorhynchus clarkii clarkii
Animals - Fish	Oncorhynchus kisutch pop. 2	coho salmon - southern Oregon / northern California ESU	AFCHA02032	Threatened	Threatened	-	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Fish - Salmonidae - Oncorhynchus kisutch pop. 2
Animals - Fish	Oncorhynchus mykiss irideus pop. 16	steelhead - northern California DPS	AFCHA0209Q	Threatened	None	-	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Fish - Salmonidae - Oncorhynchus mykiss irideus pop. 16
Animals - Fish	Oncorhynchus tshawytscha pop. 17	chinook salmon - California coastal ESU	AFCHA0205S	Threatened	None	-	-	4012462	Fields Landing	Unprocessed	Animals - Fish - Salmonidae - Oncorhynchus tshawytscha pop. 17
Animals - Insects	Bombus caliginosus	obscure bumble bee	IIHYM24380	None	None	-	-	4012462	Fields Landing	Mapped	Animals - Insects - Apidae - Bombus caliginosus
Animals - Insects	Bombus occidentalis	western bumble bee	IIHYM24250	None	None	-	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Insects - Apidae - Bombus occidentalis
Animals - Mammals	Aplodontia rufa humboldtiana	Humboldt mountain beaver	AMAFA01017	None	None	-	-	4012462	Fields Landing	Mapped	Animals - Mammals - Aplodontiidae - Aplodontia rufa humboldtiana
Animals - Mammals	Erethizon dorsatum	North American porcupine	AMAFJ01010	None	None	-	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Mammals - Erethizontidae - Erethizon dorsatum
Animals - Mammals	Arborimus pomo	Sonoma tree vole	AMAFF23030	None	None	SSC	-	4012462	Fields Landing	Mapped	Animals - Mammals - Muridae - Arborimus pomo
Animals - Mammals	Corynorhinus townsendii	Townsend's big-eared bat	AMACC08010	None	None	SSC	-	4012462	Fields Landing	Mapped	Animals - Mammals - Vespertilionidae - Corynorhinus townsendii
Animals - Mollusks	Margaritifera falcata	western pearlshell	IMBIV27020	None	None	-	-	4012462	Fields Landing	Mapped	Animals - Mollusks - Margaritiferidae - Margaritifera falcata
Animals - Mollusks	Anodonta californiensis	California floater	IMBIV04020	None	None	-	-	4012462	Fields Landing	Mapped and Unprocessed	Animals - Mollusks - Unionidae - Anodonta californiensis
Animals - Reptiles	Emys marmorata	western pond turtle	ARAAD02030	None	None	SSC	-	4012462	Fields Landing	Mapped	Animals - Reptiles - Emydidae - Emys marmorata
Community - Terrestrial	Northern Coastal Salt Marsh	Northern Coastal Salt Marsh	CTT52110CA	None	None	-	-	4012462	Fields Landing	Mapped	Community - Terrestrial - Northern Coastal Salt Marsh
Plants - Vascular	Angelica lucida	sea-watch	PDAPI070G0	None	None	-	4.2	4012462	Fields Landing	Unprocessed	Plants - Vascular - Apiaceae - Angelica lucida
Plants - Vascular	Glehnia littoralis ssp. leiocarpa	American glehnia	PDAPI13011	None	None	-	4.2	4012462	Fields Landing	Unprocessed	Plants - Vascular - Apiaceae - Glehnia littoralis ssp. leiocarpa
Plants - Vascular	Layia carnosa	beach layia	PDAST5N010	Endangered	Endangered	-	1B.1	4012462	Fields Landing	Mapped	Plants - Vascular - Asteraceae - Layia carnosa

Plants - Vascular	Spergularia canadensis var. occidentalis	western sand-spurrey	PDCAR0W032	None	None	-	2B.1	4012462	Fields Landing	Mapped	Plants - Vascular - Caryophyllaceae - Spergularia canadensis var. occidentalis
Plants - Vascular	Carex leptalea	bristle-stalked sedge	PMCYP037E0	None	None	-	2B.2	4012462	Fields Landing	Mapped	Plants - Vascular - Cyperaceae - Carex leptalea
Plants - Vascular	Hosackia gracilis	harlequin lotus	PDFAB2A0D0	None	None	-	4.2	4012462	Fields Landing	Unprocessed	Plants - Vascular - Fabaceae - Hosackia gracilis
Plants - Vascular	Ribes laxiflorum	trailing black currant	PDGRO020V0	None	None	-	4.3	4012462	Fields Landing	Unprocessed	Plants - Vascular - Grossulariaceae - Ribes laxiflorum
Plants - Vascular	Lilium occidentale	western lily	PMLIL1A0G0	Endangered	Endangered	-	1B.1	4012462	Fields Landing	Mapped	Plants - Vascular - Liliaceae - Lilium occidentale
Plants - Vascular	Lycopodium clavatum	running-pine	PPLYC01080	None	None	-	4.1	4012462	Fields Landing	Unprocessed	Plants - Vascular - Lycopodiaceae - Lycopodium clavatum
Plants - Vascular	Sidalcea malachroides	maple-leaved checkerbloom	PDMAL110E0	None	None	-	4.2	4012462	Fields Landing	Mapped and Unprocessed	Plants - Vascular - Malvaceae - Sidalcea malachroides
Plants - Vascular	Sidalcea malviflora ssp. patula	Siskiyou checkerbloom	PDMAL110F9	None	None	-	1B.2	4012462	Fields Landing	Mapped	Plants - Vascular - Malvaceae - Sidalcea malviflora ssp. patula
Plants - Vascular	Sidalcea oregana ssp. eximia	coast checkerbloom	PDMAL110K9	None	None	-	1B.2	4012462	Fields Landing	Mapped	Plants - Vascular - Malvaceae - Sidalcea oregana ssp. eximia
Plants - Vascular	Pityopus californicus	California pinefoot	PDMON05010	None	None	-	4.2	4012462	Fields Landing	Unprocessed	Plants - Vascular - Monotropaceae - Pityopus californicus
Plants - Vascular	Montia howellii	Howell's montia	PDPOR05070	None	None	-	2B.2	4012462	Fields Landing	Mapped	Plants - Vascular - Montiaceae - Montia howellii
Plants - Vascular	Abronia umbellata var. breviflora	pink sand-verbena	PDNYC010N4	None	None	-	1B.1	4012462	Fields Landing	Mapped	Plants - Vascular - Nyctaginaceae - Abronia umbellata var. breviflora
Plants - Vascular	Listera cordata	heart-leaved twayblade	PMORC1N060	None	None	-	4.2	4012462	Fields Landing	Unprocessed	Plants - Vascular - Orchidaceae - Listera cordata
Plants - Vascular	Castilleja ambigua var. humboldtiensis	Humboldt Bay owl's-clover	PDSCR0D402	None	None	-	1B.2	4012462	Fields Landing	Mapped	Plants - Vascular - Orobanchaceae - Castilleja ambigua var. humboldtiensis
Plants - Vascular	Castilleja litoralis	Oregon coast paintbrush	PDSCR0D012	None	None	-	2B.2	4012462	Fields Landing	Mapped	Plants - Vascular - Orobanchaceae - Castilleja litoralis
Plants - Vascular	Chloropyron maritimum ssp. palustre	Point Reyes salty bird's-beak	PDSCR0J0C3	None	None	-	1B.2	4012462	Fields Landing	Mapped	Plants - Vascular - Orobanchaceae - Chloropyron maritimum ssp. palustre
Plants - Vascular	Pleuropogon refractus	nodding semaphore grass	PMPOA4Y080	None	None	-	4.2	4012462	Fields Landing	Unprocessed	Plants - Vascular - Poaceae - Pleuropogon refractus
Plants - Vascular	Gilia millefoliata	dark-eyed gilia	PDPLM04130	None	None	-	1B.2	4012462	Fields Landing	Mapped	Plants - Vascular - Polemoniaceae - Gilia millefoliata
Plants - Vascular	Chrysosplenium glechomifolium	Pacific golden saxifrage	PDSAX07020	None	None	-	4.3	4012462	Fields Landing	Unprocessed	Plants - Vascular - Saxifragaceae - Chrysosplenium glechomifolium
Plants - Vascular	Mitellastra caulescens	leafy-stemmed mitrewort	PDSAX0N020	None	None	-	4.2	4012462	Fields Landing	Unprocessed	Plants - Vascular - Saxifragaceae - Mitellastra caulescens

CNDDB Quad Species List 34 records.

Element Type	Scientific Name	Common Name	Element Code	Federal Status	State Status	CDFW Status	CA Rare Plant Rank	Quad Code	Quad Name	Data Status	Taxonomic Sort
Animals - Amphibians	Ascaphus truei	Pacific tailed frog	AAABA01010	None	None	SSC	-	4012461	McWhinney Creek	Mapped	Animals - Amphibians - Ascaphidae - Ascaphus truei
Animals - Amphibians	Rana aurora	northern red-legged frog	AAABH01021	None	None	SSC	-	4012461	McWhinney Creek	Mapped	Animals - Amphibians - Ranidae - Rana aurora
Animals - Amphibians	Rana boylii	foothill yellow-legged frog	AAABH01050	None	Candidate Threatened	SSC	-	4012461	McWhinney Creek	Mapped	Animals - Amphibians - Ranidae - Rana boylii
Animals - Amphibians	Rhyacotriton variegatus	southern torrent salamander	AAAAJ01020	None	None	SSC	-	4012461	McWhinney Creek	Mapped	Animals - Amphibians - Rhyacotritonidae - Rhyacotriton variegatus
Animals - Birds	Accipiter cooperii	Cooper's hawk	ABNKC12040	None	None	WL	-	4012461	McWhinney Creek	Unprocessed	Animals - Birds - Accipitridae - Accipiter cooperii
Animals - Birds	Brachyramphus marmoratus	marbled murrelet	ABNNN06010	Threatened	Endangered	-	-	4012461	McWhinney Creek	Mapped and Unprocessed	Animals - Birds - Alcidae - Brachyramphus marmoratus
Animals - Birds	Falco peregrinus anatum	American peregrine falcon	ABNKD06071	Delisted	Delisted	FP	-	4012461	McWhinney Creek	Unprocessed	Animals - Birds - Falconidae - Falco peregrinus anatum
Animals - Birds	Pandion haliaetus	osprey	ABNKC01010	None	None	WL	-	4012461	McWhinney Creek	Mapped and Unprocessed	Animals - Birds - Pandionidae - Pandion haliaetus
Animals - Fish	Entosphenus tridentatus	Pacific lamprey	AFBAA02100	None	None	SSC	-	4012461	McWhinney Creek	Mapped and Unprocessed	Animals - Fish - Petromyzontidae - Entosphenus tridentatus
Animals - Fish	Oncorhynchus clarkii clarkii	coast cutthroat trout	AFCHA0208A	None	None	SSC	-	4012461	McWhinney Creek	Mapped and Unprocessed	Animals - Fish - Salmonidae - Oncorhynchus clarkii clarkii
Animals - Fish	Oncorhynchus kisutch pop. 2	coho salmon - southern Oregon / northern California ESU	AFCHA02032	Threatened	Threatened	-	-	4012461	McWhinney Creek	Mapped and Unprocessed	Animals - Fish - Salmonidae - Oncorhynchus kisutch pop. 2
Animals - Fish	Oncorhynchus mykiss irideus pop. 16	steelhead - northern California DPS	AFCHA0209Q	Threatened	None	-	-	4012461	McWhinney Creek	Mapped and Unprocessed	Animals - Fish - Salmonidae - Oncorhynchus mykiss irideus pop. 16
Animals - Fish	Oncorhynchus tshawytscha pop. 17	chinook salmon - California coastal ESU	AFCHA0205S	Threatened	None	-	-	4012461	McWhinney Creek	Unprocessed	Animals - Fish - Salmonidae - Oncorhynchus tshawytscha pop. 17
Animals - Insects	Bombus caliginosus	obscure bumble bee	IIHYM24380	None	None	-	-	4012461	McWhinney Creek	Mapped	Animals - Insects - Apidae - Bombus caliginosus
Animals - Insects	Bombus occidentalis	western bumble bee	IIHYM24250	None	None	-	-	4012461	McWhinney Creek	Mapped	Animals - Insects - Apidae - Bombus occidentalis
Animals - Mammals	Aplodontia rufa humboldtiana	Humboldt mountain beaver	AMAFA01017	None	None	-	-	4012461	McWhinney Creek	Mapped	Animals - Mammals - Aplodontiidae - Aplodontia rufa humboldtiana
Animals - Mammals	Erethizon dorsatum	North American porcupine	AMAFJ01010	None	None	-	-	4012461	McWhinney Creek	Mapped and Unprocessed	Animals - Mammals - Erethizontidae - Erethizon dorsatum

Animals - Mammals	Arborimus pomo	Sonoma tree vole	AMAFF23030	None	None	SSC	-	4012461	McWhinney Creek	Mapped	Animals - Mammals - Muridae - Arborimus pomo
Animals - Mammals	Martes caurina humboldtensis	Humboldt marten	AMAJF01012	None	Candidate Endangered	SSC	-	4012461	McWhinney Creek	Mapped	Animals - Mammals - Mustelidae - Martes caurina humboldtensis
Animals - Mammals	Corynorhinus townsendii	Townsend's big-eared bat	AMACC08010	None	None	SSC	-	4012461	McWhinney Creek	Mapped	Animals - Mammals - Vespertilionidae - Corynorhinus townsendii
Animals - Mollusks	Margaritifera falcata	western pearlshell	IMBIV27020	None	None	-	-	4012461	McWhinney Creek	Mapped	Animals - Mollusks - Margaritiferidae - Margaritifera falcata
Animals - Mollusks	Anodonta californiensis	California floater	IMBIV04020	None	None	-	-	4012461	McWhinney Creek	Mapped	Animals - Mollusks - Unionidae - Anodonta californiensis
Animals - Reptiles	Emys marmorata	western pond turtle	ARAAD02030	None	None	SSC	-	4012461	McWhinney Creek	Mapped	Animals - Reptiles - Emydidae - Emys marmorata
Plants - Lichens	Usnea longissima	Methuselah's beard lichen	NLLEC5P420	None	None	-	4.2	4012461	McWhinney Creek	Mapped and Unprocessed	Plants - Lichens - Parmeliaceae - Usnea longissima
Plants - Vascular	Cardamine angulata	seaside bittercress	PDBRA0K010	None	None	-	2B.1	4012461	McWhinney Creek	Mapped	Plants - Vascular - Brassicaceae - Cardamine angulata
Plants - Vascular	Lilium kelloggii	Kellogg's lily	PMLIL1A0A0	None	None	-	4.3	4012461	McWhinney Creek	Unprocessed	Plants - Vascular - Liliaceae - Lilium kelloggii
Plants - Vascular	Lycopodium clavatum	running-pine	PPLYC01080	None	None	-	4.1	4012461	McWhinney Creek	Mapped and Unprocessed	Plants - Vascular - Lycopodiaceae - Lycopodium clavatum
Plants - Vascular	Sidalcea malachroides	maple-leaved checkerbloom	PDMAL110E0	None	None	-	4.2	4012461	McWhinney Creek	Mapped and Unprocessed	Plants - Vascular - Malvaceae - Sidalcea malachroides
Plants - Vascular	Pityopus californicus	California pinefoot	PDMON05010	None	None	-	4.2	4012461	McWhinney Creek	Unprocessed	Plants - Vascular - Monotropaceae - Pityopus californicus
Plants - Vascular	Montia howellii	Howell's montia	PDPOR05070	None	None	-	2B.2	4012461	McWhinney Creek	Mapped	Plants - Vascular - Montiaceae - Montia howellii
Plants - Vascular	Listera cordata	heart-leaved twayblade	PMORC1N060	None	None	-	4.2	4012461	McWhinney Creek	Unprocessed	Plants - Vascular - Orchidaceae - Listera cordata
Plants - Vascular	Pleuropogon refractus	nodding semaphore grass	PMPOA4Y080	None	None	-	4.2	4012461	McWhinney Creek	Unprocessed	Plants - Vascular - Poaceae - Pleuropogon refractus
Plants - Vascular	Chrysosplenium glechomifolium	Pacific golden saxifrage	PDSAX07020	None	None	-	4.3	4012461	McWhinney Creek	Unprocessed	Plants - Vascular - Saxifragaceae - Chrysosplenium glechomifolium
Plants - Vascular	Mitellastra caulescens	leafy-stemmed mitrewort	PDSAX0N020	None	None	-	4.2	4012461	McWhinney Creek	Unprocessed	Plants - Vascular - Saxifragaceae - Mitellastra caulescens

APPENDIX D

Vegetation Mapping at Elk River

December 21, 2017

VEGETATION MAPPING AT ELK RIVER, HUMBOLDT COUNTY, CALIFORNIA

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1 INTRODUCTION

The Elk River Sediment Removal Pilot Implementation Project (project) is located south of Eureka on the Elk River, tributary to Humboldt Bay, in Humboldt County, California (Figure 1). The project reach starts on the mainstem just below the confluence of the North and South forks of the Elk River and extends approximately 1 mile upstream on the North Fork. There is an additional spoils site located on Zane's Rd., approximately 1.3 linear miles downstream of the project. The project reach is commonly referred to as the "impaired reach" of Elk River because channel aggradation has caused severe flooding conditions. The purpose of the project is to address the adverse effects of flooding and to demonstrate the feasibility of small-scale sediment removal efforts. The project is needed to evaluate the effectiveness of sediment removal designs before implementing larger-scale sediment removal along the full stretch of the Elk River. The project is still in the design phase, and 65% engineering designs have been developed. Describing vegetation in the project area is an integral part of the project's impact analysis. This technical memorandum describes the results of vegetation mapping in the riparian corridor within the project reach. Although no project activities have been proposed for the South Fork Elk River, vegetation along the South Fork was included in the vegetation mapping due to close proximity of the forks and the contiguous and dense nature of the vegetation.

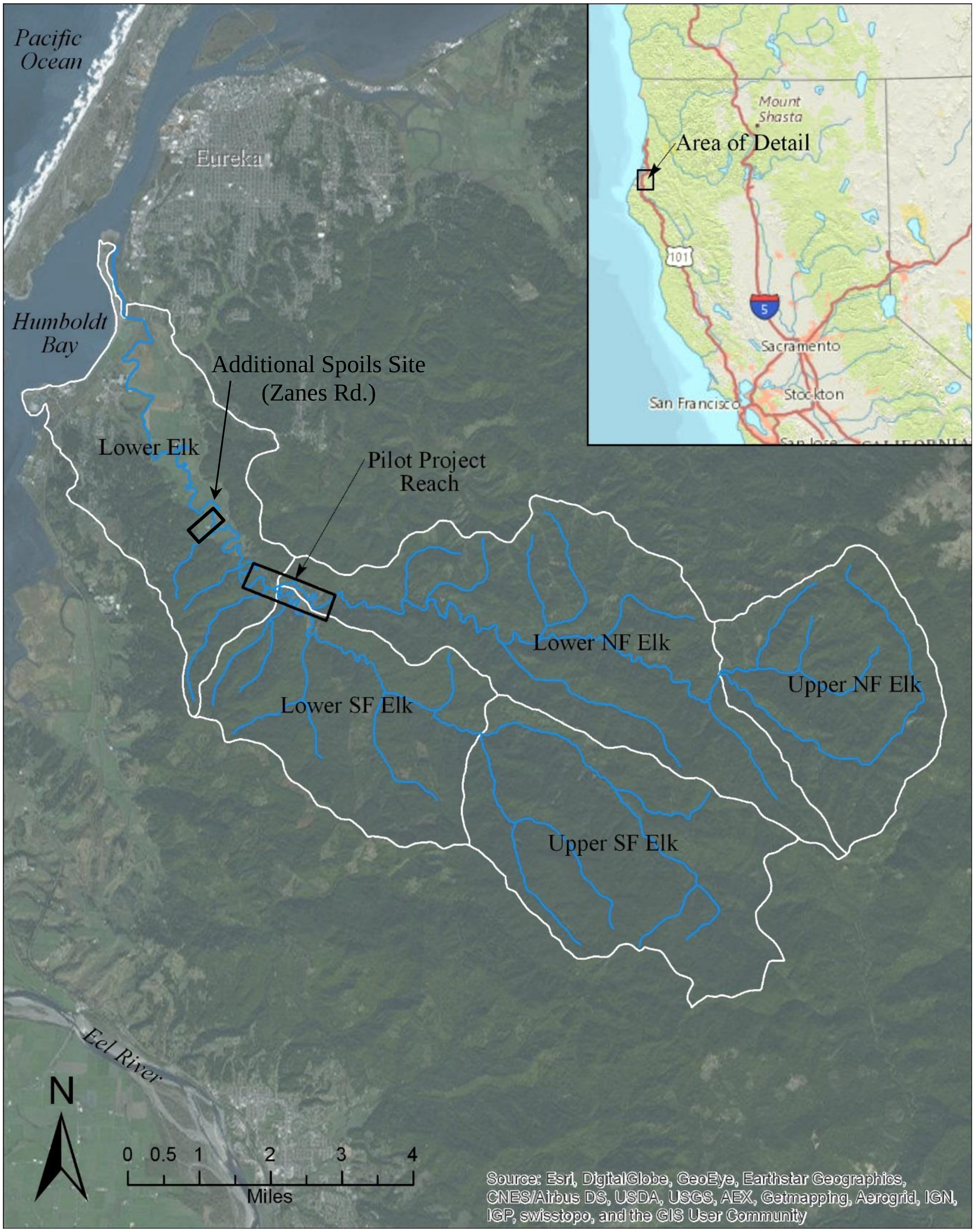

Figure 1. Elk River Sediment Removal Pilot Implementation Project area. Vegetation mapping occurred in October 2017 in the project reach and at the additional spoils site on Zanes Rd.

2 METHODS

Vegetation within the project reach was mapped on October 12 and 18, 2017. Vegetation includes all the plant species in a region, and usually appears as a mosaic of numerous, definable plant cover types (Sawyer et al. 2009). The dominant plant species in the canopy defined the cover type. A botanist conducted the field survey by walking the entire site and visiting each distinct cover type. The field-based vegetation survey ensured a highly detailed and accurate vegetation map. Polygon boundaries were hand-drawn onto aerial photographs, scaled to 1 inch = 150 feet, around discrete cover types, and a cover attribute was assigned following the Manual of California Vegetation (Sawyer et al. 2009) alliances. Vegetation units mapped were no smaller than 100 ft^2. Unvegetated polygons were assigned a cover type based on visible substrate and level of human disturbance. Hand-drawn polygons were entered into a GIS in the office. Cover type acreages were calculated based on vegetation mapping. To estimate the potential impacts of the sediment removal project on existing riparian vegetation, the 65% design project activity polygons were overlaid on the digitized vegetation maps and acreages were calculated.

There are numerous vegetation classifications that have been developed for California vegetation. Classifications can be broad or specific, depending on the reason for describing the vegetation. It can be useful to compare the same vegetation using different classification systems, as they each yield a unique understanding of the vegetation. For instance, MCV alliances are the most recent and botanically rigorous classification in widespread use in California, although the naming system can be inaccessible to non-botanists (Table 1). Holland types (Holland 1986) tend to be broader and form the foundation upon which the more recent MCV descriptions are based; and the naming system is more user friendly. California Wildlife Habitat Relationships (CWHR) specifically relate to the habitats occupied by the birds, mammals, reptiles, and amphibians of California (Mayer and Laudenslayer 1988). A project-specific classification system of biological land cover types (hereafter “biohabitats”) was developed based on overall growth form (woody/shrubby, herbaceous), water requirements, and land use (grazed, ungrazed). The biohabitats were further simplified into four broad categories: wetland, riparian, transitional, and upland. The National Wetland Plant List (Lichvar et al. 2016) was used to determine the wetland indicator status of the dominant plant species in each mapped cover type, which formed the basis of the broad category designations.

A crosswalk of the mapped alliances and their corresponding Holland, CWHR, and biohabitat classes can be found in Table 1. Descriptions for the nine biohabitats developed for the Elk River Sediment Removal Pilot Implementation Project can be found below.

<u>Coniferous Forest Biohabitats</u>

Coniferous forest biohabitats consisted mostly of redwood (*Sequoia sempervirens*) and redwood–Sitka spruce (*Picea sitchensis*) forests, with one small patch of grand fir (*Abies grandis*) forest. Coniferous forests were most common in the project area on upper slopes adjacent to the riparian corridor of Elk River, although some legacy trees remain on the floodplain near the confluence of the North and South forks of the Elk River. The tall tree canopy was dominated by redwood, Sitka spruce, western redcedar (*Thuja plicata*), and grand fir. The understory in coniferous forest biohabitats ranged from being dominated by sword fern (*Polystichum munitum*) to being thick and shrubby, with Scouler’s willow (*Salix scouleri*), Himalaya blackberry (*Rubus armeniacus*), twinberry (*Lonicera involucrate*), and salmonberry (*Rubus spectabilis*).

<u>Riparian Forest Biohabitats</u>

Riparian forest biohabitats in the project reach were diverse and well-developed, especially near the confluence of the North and South forks of the Elk River. Red alder and arroyo willow were the most common riparian forest cover types, with mature tree canopies over 50 ft tall. Pacific willow (*Salix lasiandra*) patches were most extensive near the confluence but extended upstream to the concrete bridge. Other riparian forest biohabitats included mixed willow, red alder–elderberry (*Sambucus racemosa*), and red alder–mixed willow. The understory of riparian forest biohabitats was generally dense and tangled with various willow species, blackberries, stinging nettle (*Urtica dioica*), and elderberry.

Riparian Scrub

Riparian scrub consisted of mostly shrub-dominated cover types adjacent to the river. Patches of elderberry, mixed willow, California rose (*Rosa californica*), and stinging nettle were interspersed throughout the riparian area. The primary difference between riparian forests and riparian scrub was the absence of tree willows and alders in the canopy of riparian scrub biohabitats.

Coastal Scrub Biohabitats

Coastal scrub biohabitats consisted largely of blackberry patches, coyote brush (*Baccharis pilularis*), and rose brambles. The blackberry patches contained both the non-native Himalaya berry (*Rubus armeniacus*) and the native California blackberry (*R. ursinus*). Coyote brush biohabitat was only encountered along the logging road accessed via the steel bridge just downstream from the Red House. While rose was a strong component of the understory throughout the project reach, it occurred in distinct biohabitats just upstream of the steel bridge and just downstream of the concrete bridge.

Pasture

Pasture biohabitats were composed primarily of tall fescue (*Festuca arundinacea*). Because they were actively grazed and/or recently mowed, a complete description of species occurring in pastures was not possible. However, commonly encountered species included velvet grass (*Holcus lanatus*), narrowleaf plantain (*Plantago lanceolata*), oxeye daisy (*Leucanthemum occidentalis*), Queen Anne's lace (*Daucus carota*), dandelion (*Taraxacum officinale*), and self-heal (*Prunella vulgaris*).

Wet Pasture

The wet pasture biohabitat was similar to pastures except that it occurred in a single location at the base of a wet slope and had abundant, though scattered, patches of hydrophytic plants. Common rush (*Juncus effusus*) and spreading rush (*Juncus patens*) grew intermittently throughout the wet pasture and also amongst willows in a wet, seepy area on the western side of the pasture. *Juncus* patches were especially abundant near the top of the wet pasture and at the northwestern (bottom) edge of the pasture. The central portion of the wet pasture was higher than the surrounding areas, suggesting that it may have been built up over time to facilitate grazing on a naturally wet site. A small drainage flowed along a northern course near the western edge of the wet pasture such that surface water was flowing in a small ditch beginning approximately half way down the pasture. No hydrological or soils investigations were conducted as part of the vegetation mapping. The wet pasture was actively grazed and because of this, a complete description of wet pasture species was not possible.

Human Disturbance Biohabitats

The human disturbance biohabitats were associated with buildings and their access roads, trails, and outbuildings. Additionally, the human disturbance biohabitat at the Red House included large landscape trees.

Orchard

Orchard biohabitats were present in the upstream portion of the project reach and consisted of mature apple trees.

Open Biohabitats

Open biohabitats were unvegetated ground associated mostly with spoils piles from previous projects. The open biohabitat near the Red House is proposed as a spoils area for the project.

3 RESULTS AND DISCUSSION

Twenty-two cover types covering 106.1 acres were mapped in the project reach (Table 1, Table 2, Figure 2) and classified into alliances, Holland types, and WHR classes (Table 1). Agriculture cover types were perennial pastures and covered the most area in the project reach, 22.7 acres (Table 2). The most abundant natural cover types were red alder (20.1 acres), arroyo willow (12.4 acres), and bigleaf maple (3.1 acres). When grouped into biohabitats, riparian forest was the most abundant biohabitat in the project reach, covering 36.8 acres (Figure 3). Coniferous forest was the second most abundant biohabitat, covering 28.0 acres, and pasture was the third most abundant, covering 22.7 acres. The remaining six biohabitats each covered 5.0 acres or less (Figure 3). Within the proposed project impact areas, riparian forest and pasture biohabitats would experience the highest impacts (Table 3).

Table 1. Crosswalk between cover types mapped in the Elk River Sediment Removal Pilot Implementation Project area and other vegetation classification systems. "Biohabitat" definitions are specific to this project.

Mapped Cover Type	MCV Alliance	Biohabitat	Holland Type	WHR Class
Blackberry	*Rubus armeniacus* Semi-Natural Shrubland Alliance	coastal scrub	Great Valley riparian scrub	valley foothill riparian
Elderberry	No corresponding alliance	riparian scrub	Elderberry savanna	fresh emergent wetland
Redwood	*Sequoia sempervirens* Forest Alliance	coniferous forest	North Coast alluvial redwood forest	redwood forest
Redwood–Sitka spruce	*Sequoia sempervirens* Forest Alliance	coniferous forest	North Coast alluvial redwood forest	redwood forest
Redwood (planted)	*Sequoia sempervirens* Forest Alliance	plantation	North Coast alluvial redwood forest	redwood forest
Red alder	*Alnus rubra* Forest Alliance	riparian forest	red alder riparian forest	montane hardwood–conifer
Bigleaf maple	*Acer macrophyllum* Forest Alliance	riparian forest	North Coast riparian forest	montane hardwood–conifer
Nettle	No corresponding alliance	riparian scrub	North Coast riparian scrub	fresh emergent wetland
Arroyo willow	*Salix lasiolepis* Shrubland Alliance	riparian forest	North Coast riparian scrub	fresh emergent wetland
Shiny willow	*Salix lucida* Woodland Alliance	riparian forest	Freshwater swamp	valley foothill riparian
Grand fir	*Abies grandis* Forest Alliance	coniferous forest	Sitka spruce–grand fir forest	redwood forest
Sitka spruce	*Picea sitchensis* Forest Alliance	coniferous forest	Sitka spruce–grand fir forest	redwood forest
Landscape plant	No corresponding alliance	human disturbance		urban

Mapped Cover Type	MCV Alliance	Biohabitat	Holland Type	WHR Class
Open	No corresponding alliance	open		barren
Rose	*Rosa californica* Shrubland Alliance	riparian scrub	Great Valley riparian scrub	valley foothill riparian
Red alder–mixed willow	*Alnus rubra* Forest Alliance	riparian forest	red alder riparian forest	montane hardwood–conifer
Redwood–Sitka spruce	*Sequoia sempervirens* Forest Alliance	coniferous forest	North Coast alluvial redwood forest	redwood forest
Orchard	No corresponding alliance	orchard		orchard
Mixed willow	Several corresponding alliances	riparian scrub	North Coast riparian scrub	montane hardwood–conifer
Walnut	No corresponding alliance	human disturbance		urban
Coyote brush	*Baccharis pilularis* Shrubland Alliance	coastal scrub	Northern (Franciscan) coastal bluff scrub	coastal scrub
Human disturbance	none	Human disturbance		urban
Juncus	*Juncus effusus* Herbaceous Alliance	Wet pasture	freshwater seep	fresh emergent wetland
Open water	none	Open water	river	riverine
Open	none	Open		barren
Lonicera	No corresponding alliance	coastal scrub	Northern (Franciscan) coastal bluff scrub	coastal scrub
Agriculture	*Agrostis (stolonifera, gigantea)–Festuca arundinacea* Semi-Natural Stands	pasture	Coastal terrace prairie	pasture

Table 2. Twenty-two cover types mapped in the project reach of the Elk River, California in October 2017.

Mapping Code	Mapped Cover Type	Acres
ag	Agriculture	22.7
RA	Red alder	20.1
Rdw-SS	Redwood–Sitka spruce	15.3
AW	Arroyo willow	12.4
RdW	Redwood	11.3
HD	Human disturbance	4.9
Orchard	Orchard	4.3
BM	Bigleaf maple	3.1
Juncus	Juncus	2.6
MW	Mixed willow	2.4
BB	Blackberry	2.0
SW	Pacific willow	1.2
GF	Grand fir	1.1
Open	Open	0.8
Rose	Rose	0.7
Nettle	Nettle	0.5
SS	Sitka spruce	0.3
CB	Coyote brush	0.2
EB	Elderberry	0.1
Wal	Walnut	<0.1
Lon	twinberry	<0.1
Fig	Fig	<0.1
	Grand Total	**106.1**

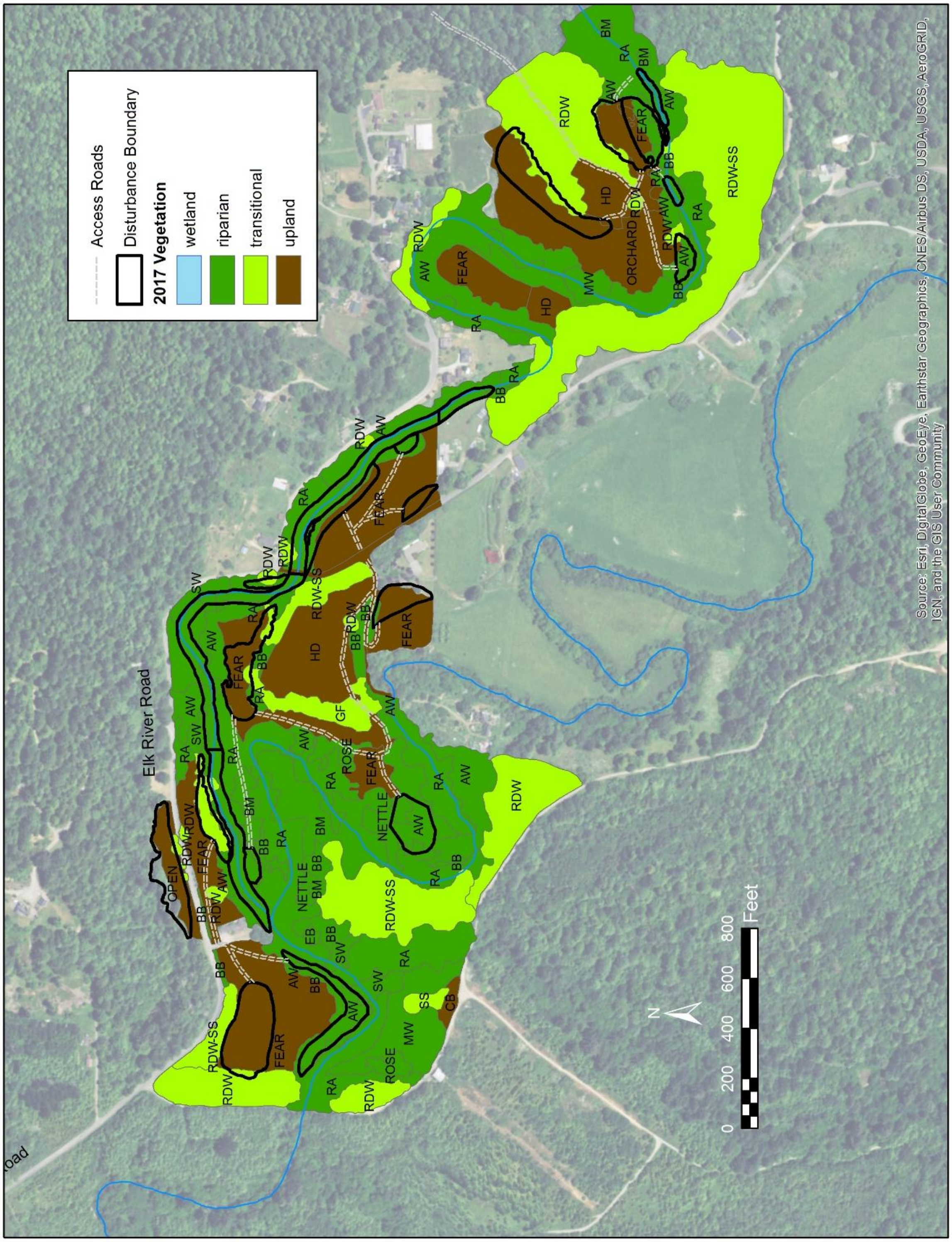

Figure 2. Twenty-two cover types (defined in Table 2) mapped in the project reach of the Elk River, California, in October 2017, grouped into broad categories for permitting requirements, and showing proposed disturbance boundaries of the proposed 65% design project.

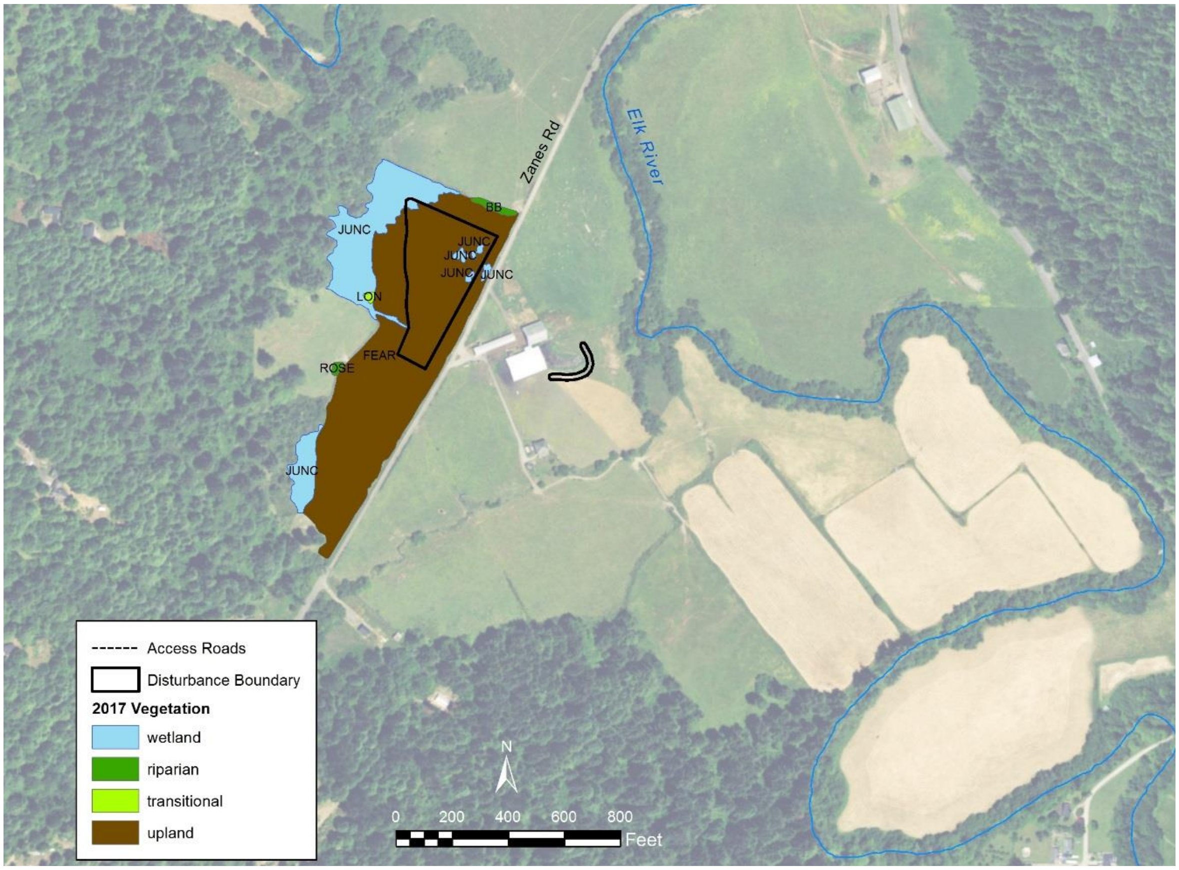

Figure 3. Cover types (defined in Table 2) mapped in the additional spoils area on Zanes Rd. along the Elk River, California, in October 2017, grouped into broad categories for permitting requirements, and showing proposed disturbance boundaries of the proposed 65% design project. The wetland land cover types consisted of Juncus *patches, a facultative wetland plant species.*

Table 3. Area of biohabitats mapped in the Elk River Sediment Removal Pilot Implementation Project.

Biohabitat	Total Area (acres)	Proposed Project Impact Area (acres)
Coastal scrub	2.2	0.2
Coniferous forest	28.0	1.7
Human disturbance	5.0	3.5
Open	0.8	0.6
Orchard	4.3	1.1
Pasture	22.7	8.5
Riparian forest	36.8	8.6
Riparian scrub	3.7	0.1
Wet pasture	2.6	0.1
Grand Total	**106.1**	**24.6**

When biohabitats were simplified into broad categories for permitting requirements, there were 2.6 acres of wetlands, 33.0 acres of upland, 42.5 acres of riparian, and 28.1 acres of transitional cover types in the project reach (Table 4). Areas of potential impact to existing vegetation from the proposed project were calculated using broad category designations (Table 4). If the project was implemented according to the 65% designs, a total of 24.6 acres, or 23.2%, of the existing vegetation would be impacted (Table 4). One-fifth of the existing riparian vegetation would be removed or impacted in some way, and over 40% of the upland vegetation would be impacted.

Cover types included within each of these broad categories may differ from cover types found elsewhere, specifically the redwood and redwood–Sitka spruce cover types. Redwood is an upland species, and Sitka spruce is a facultative wetland species, meaning it is just as likely to grow in wetlands as in uplands. In other locations in California, they may have been grouped as upland. Both of these coniferous forest types were grouped into the transitional category based on their site-specific ecology in the Elk River project reach. Both cover types occurred adjacent to the river and on the floodplain, on sites that were intermediate, or transitional, between riparian and upland sites.

Table 4. Broad cover categories based on vegetation cover types used for permitting requirements in the Elk River Sediment Removal Pilot Implementation Project. Categories were defined using the designated wetland indicator status (Lichvar et al. 2016) of dominant species in the canopy and professional judgment in the project reach.

Broad Cover Category	Total Area (acres)	Potential Acres Impacted	Percent Impacted in Project Reach
Wetlands	2.6	0.1	3.8%
Riparian	42.5	8.9	20.9%
Transitional	28.1	1.7	6.0%
Upland	33.0	13.9	42.1%
Total	**106.1**	**24.6**	**23.2%**

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APPENDIX E

Special Status Plant Survey Results

Special Status Plant Survey Results

ELK RIVER SEDIMENT REMOVAL PILOT IMPLEMENTATION PROJECT

HUMBOLDT COUNTY, CA

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December 10, 2017

1.0 INTRODUCTION

This report presents the results of Special Status plant and natural community surveys conducted for the Elk River Sediment Removal Pilot Implementation Project on the Elk River in Humboldt County, California. The purpose of the surveys was to identify Special Status plants and natural communities that could be impacted by the project activities.

The goal of the proposed project is to test alternative sediment removal approaches that are considered potentially viable in a next-phase, larger-scale implementation program. The proposed project will remove approximately 28,900 cubic yards of sediment from approximately 4,000 linear feet of river channel. The impact area encompasses 5.8 acres of channel and floodplain and 8.2 acres of upland areas currently used primarily for grazing livestock. Project activities consist of sediment removal from the bankfull channel (7 sites) and floodplain (7 sites) of Elk River, creation of in-channel sediment retention basins, and the reuse of excavated sediment in upland areas (10 sites).

No Special Status plants or natural communities were encountered within the project area. Two spoils stockpile areas (SP9 and SP10) were added after botanical surveys were conducted; therefore, additional field surveys are recommended for these areas during the appropriate time of year (May/June) before project activities commence.

2.0 SPECIAL STATUS PLANT AND NATURAL COMMUNITY DEFINITIONS

Special Status plants are rare, threatened or endangered species as defined by the Federal and California Endangered Species Acts, as well as non-listed species that require consideration under 14 Cal. Code Reg. §15380.

Special Status plants include species that meet one or more of the following criteria:

- Plants listed or proposed for listing as threatened or endangered under the federal Endangered Species Act or California Endangered Species Act.
- Plants on the California Rare Plant Ranking (CRPR) Lists 1A, 1B, and 2.

The primary sources for information on the status of Special Status plant species and natural communities are the California Native Plant Society and the California Natural Diversity Database (CNDDB). The CNPS Inventory of Rare and Endangered Plants of California is a comprehensive list with five categories that are summarized below.

Plants on lists 1A, 1B and 2 are considered Special Status species as described in the California Environmental Quality Act (14 Cal. Code Reg. §15380) and are therefore the focus of this report.

- 1A: Plants presumed extinct in California
- 1B: Plants rare, threatened, or endangered in California and elsewhere
- 2: Plants rare, threatened, or endangered in California but more common elsewhere
- 3: Plants about which we need more information - a review list
- 4: Plants of limited distribution – a watch list

A Threat Code extension follows the California Rare Plant Rank (e.g. 1B.1, 2.2 etc.) such that the lower the number, the higher the corresponding threat level:

- .1 - Seriously endangered in California
- .2 – Fairly endangered in California
- .3 – Not very endangered in California

The California Department of Fish and Wildlife (CDFW) has a similar list of Special Vascular Plants, Bryophytes, and Lichens published by the California Natural Diversity Database (CNDDB). The Special Plants List includes the CNPS Inventory, as well as species considered sensitive by other governmental agencies (e.g., Bureau of Land Management, U.S. Fish and Wildlife Service, and U.S. Forest Service).

Special Status natural communities are communities with limited distribution that may be vulnerable to environmental impacts. The Global (G) and State (S) rarity rankings for currently recognized vegetation alliances are provided on the most recent CDFW *Natural Communities List* (CDFW 2010).

3.0 ENVIRONMENTAL SETTING

3.1. Project Location

The project is located on the McWhinney Creek and Fields Landing USGS quadrangles (T4N, R1W, Sections 25 and 26) in the Elk River watershed in Humboldt County, California. The elevation of the project site ranges from approximately 75 to 150 feet above sea level.

3.2. Vegetation

The project site includes the Elk River, its streambed and streambanks, access roads, and areas for stockpiling spoils. It is located primarily within a riparian area within a landscape dominated by the redwood series (Sawyer and Keeler-Wolf, 1995). The forest canopy is dominated by willows, red alder, and coast redwood. Dominant understory species include California blackberry (*Rubus ursinus*), Himalayan blackberry (*Rubus armeniacus*), stinkcurrant (*Ribes bracteosu*m), stinging nettle (*Urtica devoice*), and sword fern (*Polystichum minimum*). Vegetated areas of streambed are dominated by small-flowered bulrush (*Scirpus micropcarpus*) and bur-reed (*Sparganium* sp.). Areas designated for stockpiling spoils are livestock pastures dominated by non-native grasses and ox-eye daisy (*Leucanthemum vulgare)*.

4.0 METHODS

4.1. Scoping

In order to meet California Environmental Quality Act (CEQA) requirements, scoping for potential presence of Special Status plant species and natural communities was conducted to determine whether the proposed project would have significant negative impacts on such resources.

Prior to field surveys, a list of Special Status plants that could potentially occur in the project area was generated by consulting the *California Natural Diversity Database* (CDFW 2017) and the CNPS *Inventory of Rare and Endangered Plants* (CNPS 2017). The list also includes other species for which the site supports suitable habitat if the site is within or near the known range of the species (Table 1). The scoping list was used to determine seasonally-appropriate survey dates for floristic surveys.

The assessment area was defined as the USGS 7.5’ quadrangle in which the project is located (McWhinney Creek and Fields Landing Quads), as well as the adjacent quadrangles (Eureka, Arcata South, Corbel, Iaqua Buttes, Owl Creek, Hydesville, Fortuna, Ferndale, and Cannibal Island). The most up-to-date CNDDB Quick Viewer (2017) and CNPS (2017) were used to query known occurrences of California Rare Plant Rank (CRPR) List 1 and 2 species within the assessment area. The CNPS Inventory was also queried for CRPR List 3 and 4 species known to occur within the county, although those species lists are not presented here. The queries yielded 41 Special Status plant species previously documented in the assessment area (Table 1). Three Special Status plant communities are documented from this assessment area (Table 2). Though suitable habitat for some of the species in the scoping list was not present within the project area, the complete scoping list is present in Table 1.

Table 1. Elk River Assessment Area: Predicted Sensitive Plant Species and California Rare Plant Rankings.

Scientific Name	CRPR	Blooming Season
Abronia umbellata var. *breviflora*	List 1B.1	Jun-Oct
Astragalus pycnostachyus var. *pycnostachyus*	List 1B.2	Apr-Oct
Bryoria spiralifera	List 1B.1	
Cardamine angulata	List 2B.1	(Jan), Mar-Jul

Carex arcta	List 2B.2	Jun-Sep
Carex leptalea	List 2B.2	Mar-Jul
Carex lyngbyei	List 2B.2	Apr-Aug
Carex praticola	List 2B.2	May-Jul
Castilleja litoralis	List 2B.2	Jun
Chloropyron maritimum ssp. *palustre*	List 1B.2	Jun-Oct
Clarkia amoena ssp. *whitneyi*	List 1B.1	Jun-Aug
Collinsia corymbosa	List 1B.2	Apr-Jun
Epilobium oreganum	List 1B.2	Jun-Sep
Erysimum menziesii	List 1B.1	Mar-Sep
Erythronium oregonum	List 2B.2	Mar-Jun (Jul)
Erythronium revolutum	List 2B.2	Mar-Jul (Aug)
Fissidens pauperculus	List 1B.2	
Gilia capitata ssp. *pacifica*	List 1B.2	Apr-Aug
Gilia millefoliata	List 1B.2	Apr-Jul
Hesperevax sparsiflora var. *brevifolia*	List 1B.2	Mar-Jun
Hesperolinon adenophyllum	List 1B.2	May-Aug
Lasthenia californica ssp. *macrantha*	List 1B.2	Jan-Nov
Lathyrus japonicus	List 2B.1	May-Aug
Lathyrus palustris	List 2B.2	Mar-Aug
Layia carnosa	List 1B.1	Mar-Jul
Lilium occidentale	List 1B.1	Jun-Jul
Monotropa uniflora	List 2B.2	Jun-Aug (Sep)
Montia howellii	List 2B.2	(Feb), Mar-May
Noccaea fendleri ssp. *californica*	List 1B.1	May-Jun
Oenothera wolfii	List 1B.1	May-Oct
Packera bolanderi var. *bolanderi*	List 2B.2	(Jan), (Feb), (Apr), May-Jul (Aug)
Piperia candida	List 1B.2	(Mar), May-Sep
Polemonium carneum	List 2B.2	Apr-Sep
Puccinellia pumila	List 2B.2	Jul
Sidalcea malviflora ssp. *patula*	List 1B.2	May-Aug
Sidalcea oregana ssp. *eximia*	List 1B.2	Jun-Aug
Spergularia canadensis var. *occidentalis*	List 2B.1	Jun-Aug
Viola palustris	List 2B.2	Mar-Aug

Table 2. Elk River Assessment Area: Special Status Plant Communities.

Coastal Terrace Prairie
Northern Coastal Salt Marsh
Sitka Spruce Forest

4.2. Special Status Plant Surveys

In keeping with survey guidelines established by both CNPS (2001) and CDFW (2009), field surveys were floristic in nature. All plants encountered during the surveys were identified to the taxonomic level necessary to determine whether or not they are sensitive. Taxonomy follows the Jepson Manual (Baldwin et al. 2012).

Jennifer Kalt conducted the pre-field scoping, field surveys, and plant identification. Kalt is a professional botanist with a Bachelor of Science degree in Botany and a Master of Arts degree in Biology from Humboldt State University, with more than fifteen years of experience conducting sensitive plants surveys in northern California. Surveys were conducted on July 1, 2015; April 2, 2016; and June 6, 2017, with 12 field-person hours spent surveying the project area. A survey route map is provided in Appendix A.

5.0 RESULTS

5.1 Special Status Plants

No Special Status plants were encountered in the project areas surveyed to date. However, two new spoils stockpile areas – SP9 and SP10 – were added after the field surveys were conducted (Figure 4a). A list of all plant species encountered is provided in Appendix B. All plants encountered during the surveys were identified to the taxonomic level necessary to determine whether they are special status (Baldwin et al. 2012).

5.2 Special Status Natural Communities

No special status natural communities were encountered.

6.0 RECOMMENDATIONS

Seasonally-appropriate botanical surveys are recommended in Area SP 9 and Area SP10 (Figure 4a) prior to any ground-disturbing activities in these areas.

If any special status plant species are identified, one or more of the following protective measures shall be implemented before work can proceed:

- i. Fencing to prevent accidental disturbance of rare plants during construction,
- ii. On-site monitoring by a qualified biologist during construction to assure that rare plants are not disturbed, or
- iii. Redesign of proposed work to avoid disturbance of rare plants.

No other botanical surveys are required prior to project activities.

7.0 REFERENCES

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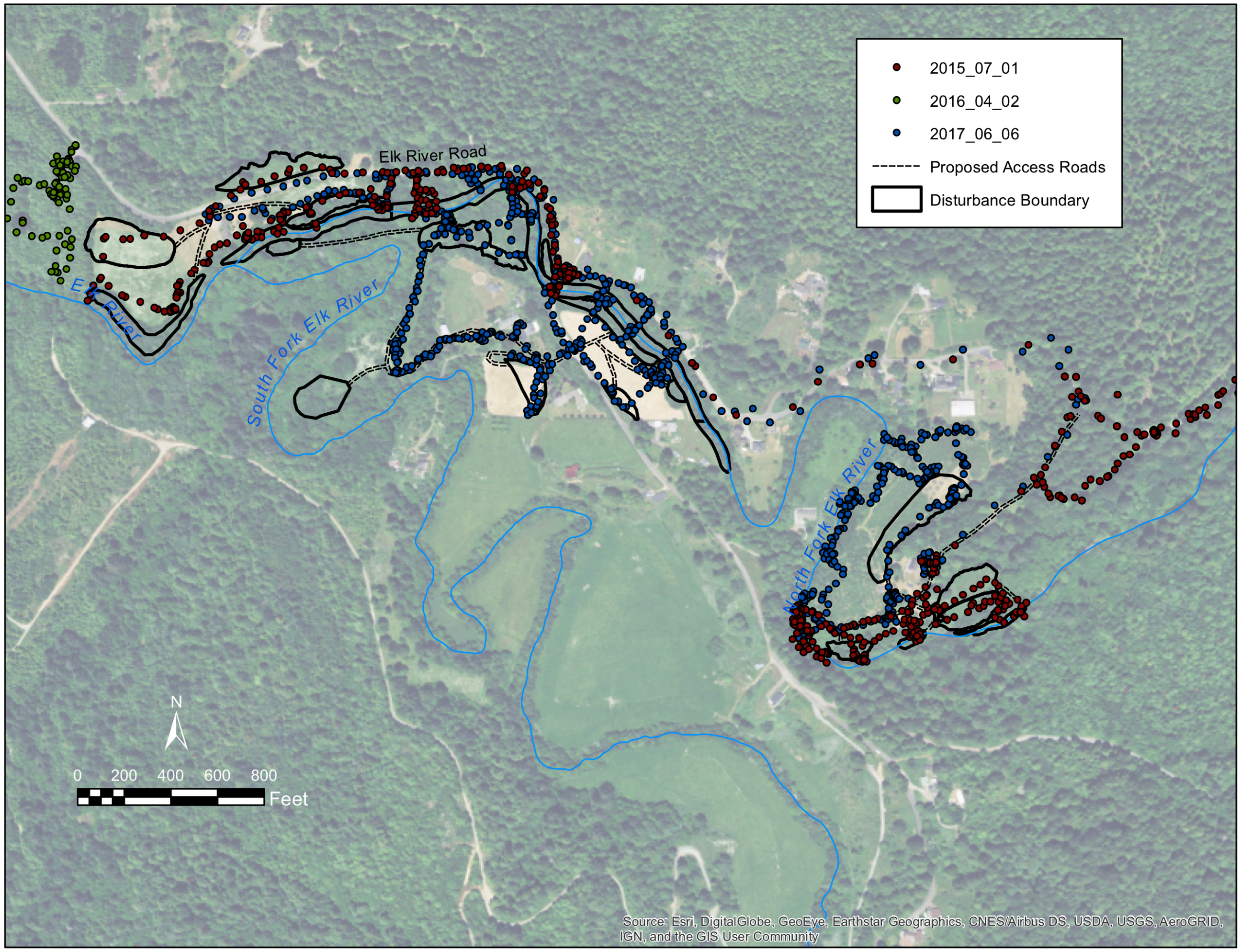
Appendix A. Survey route map, Elk River Sediment Removal Pilot Implementation Project, Humboldt County, CA.



Appendix B. List of plant species present within the Elk River Sediment Removal Pilot Implementation Project.

Scientific Name	Common Name
Trees	
Abies grandis	grand fir
Acer macrophyllum	bigleaf maple
Alnus rubra	red alder
Juglans regia	English walnut
Malus sp.	apple
Picea sitchensis	Sitka spruce
Pinus muricata x P. attenuata	Monterey/knobcone pine cross
Pseudotsuga menziesii var. *menziesii*	Douglas-fir
Salix lucida ssp. *lasiandra*	shining willow
Salix sp.	willow
Sequoia sempervirens	coast redwood
Thuja plicata	western red cedar
Shrubs	
Baccharis pilularis	coyote brush
Cotoneaster pannosa	cotoneaster
Cytisus scoparius	Scotch broom
Frangula purshiana	cascara
Gaultheria shallon	salal
Holodiscus discolor	ocean spray
Lonicera involucrata	twinberry
Morella californica	wax myrtle
Oemleria cerasiformis	osoberry
Prunus sp.	plum or cherry
Ribes bracteosum	stink currant
Ribes menziesii	canyon gooseberry
Ribes sanguineum var. *glutinosum*	pink-flowering currant
Rosa sp.	rose
Rubus armeniacus	Himalayan blackberry
Rubus leucodermis	white-stemmed raspberry
Rubus parviflorus	thimbleberry
Rubus spectabilis	salmonberry
Rubus ursinus	California blackberry
Salix sp.	willow

Sambucus racemosa	red elderberry
Ulex europaeus	gorse
Vaccinium ovatum	evergreen huckleberry
Vaccinium parvifolium	red huckleberry

Herbs

Achillea millefolium	common yarrow
Adiantum aleuticum	five-fingered fern
Agrostis sp.	bent grass
Alopecurus pratensis	meadow foxtail
Anaphalis margaritacea	pearly everlasting
Anthoxanthum odoratum	sweet vernal grass
Asarum caudatum	wild ginger
Athyrium filix-femina	lady fern
Bellis perennis	English daisy
Briza maxima	large rattlesnake grass
Briza minor	small rattlesnake grass
Bromus carinatus	California brome
Bromus hordeaceus	soft chess
Bromus inermis	awnless brome
Cardamine oligosperma	western bittercress
Carduus pycnocephalus	Italian thistle
Carex leptopoda	short-scaled sedge
Carex obnupta	slough sedge
Carex subfusca?	rusty sedge
Cerastium arvense	field chickweed
Cichorium intybus	chicory
Cirsium sp.	thistle
Conium maculatum	poison hemlock
Convolvulus arvensis	field bindweed
Cortaderia jubata	pampas grass
Crepis capillaris	hawksbeard
Crocosmia sp.	crocosmia
Cynosurus echinatus	hedgehog dogtail grass
Dactylis glomerata	orchard grass
Daucus carota	wild carrot or Queen Anne's lace
Digitalis purpurea	foxglove
Dipsacus sp.	teasel
Eleocharis macrostachya	creeping spike-rush
Elymus glaucus	blue wildrye

Epilobium ciliatum	northern willowherb
Equisetum hyemale ssp. *affine*	common scouring rush
Equisetum telmateia ssp. *braunii*	giant horsetail
Festuca arundinacea	tall fescue
Festuca perennis	Italian ryegrass
Foeniculum vulgare	fennel
Galium aparine	goose grass
Galium sp.	bedstraw
Geranium dissectum	cut-leaved geranium
Geum macrophyllum	large-leaved avens
Hedera helix	English ivy
Heracleum maximum	cow parsnip
Holcus lanatus	common velvet grass
Hydrophyllum tenuipes	Pacific waterleaf
Hypochaeris radicata	hairy cat's-ear
Juncus bufonius	common toad rush
Juncus effusus	common rush
Juncus patens	spreading rush
Lapsana communis	nipplewort
Lemna sp.	duckweed
Leucanthemum vulgare	ox-eye daisy
Linum bienne	western blue flax
Lotus corniculatus	birdfoot trefoil
Lupinus rivularis	riverbank lupine
Marah sp.	wild cucumber
Mentha pulegium	pennyroyal
Myosotis discolor	yellow and blue scorpion grass
Oenanthe sarmentosa	Pacific water-parsley
Oxalis oregana	redwood sorrel
Petasites frigidus var. *palmatus*	western coltsfoot
Phleum pratense	cultivated timothy grass
Plantago lanceolata	English plantain
Plantago major	common plantain
Poa annua	annual bluegrass
Poa sp.	bluegrass
Polypodium glycyrrhiza	licorice fern
Polystichum munitum	sword fern
Prunella vulgaris	self-heal
Pteridium aquilinum var. *pubescens*	western bracken fern
Ranunculus repens	creeping buttercup

Rumex acetosella	sheep sorrel
Rumex sp.	dock
Sanicula crassicaulis	Pacific snakeroot
Scirpus microcarpus	small-flowered bulrush
Scrophularia californica	coast figwort
Solanum sp.	nightshade
Sonchus sp.	sow thistle
Sparganium sp.	bur-reed
Stachys chamissonis	Chamisso's hedge nettle
Symphyotrichum chilense	common California aster
Taraxacum officinale	dandelion
Tolmiea diplomenziesii	youth-on-age
Torreyochloa pallida var. *pauciflora*	weak mannagrass
Trifolium dubium	shamrock clover
Trifolium repens	white clover
Trillium ovatum	western trillium
Urtica dioica	stinging nettle
Vancouveria sp.	inside-out flower
Veronica americana	American brooklime
Vicia spp.	vetch
Viola glabella	smooth violet
Viola sempervirens	evergreen violet

APPENDIX F

Wildlife Assessment

Elk River Sediment Remediation

Pilot Implementation Project

Wildlife Assessment

February 2, 2018

Final

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List of Figures

Introduction

Slauson Wildlife performed a wildlife habitat assessment for the proposed Elk River Sediment Remediation Pilot Implementation Project sites (California Trout 2018). The following document is designed to assist in identifying wildlife resources of conservation concern that may occur in the proposed project areas, provide recommendations for pre-construction surveys, and propose appropriate mitigation measures that may be necessary to avoid or reduce the potential for adverse impacts due to the activities of the proposed project. This report includes queries of state databases on the occurrence of species of conservation concern and a synthesis of pertinent literature and existing habitat conditions to identify a complete suite of species of conservation concern that may occur in or near the proposed project areas.

Environmental Setting

The Elk River Sediment Remediation Pilot Implementation Project sites are located south of Eureka, in the lower section of the Elk River watershed, a tributary of Humboldt Bay in Humboldt County, California (Figure 1). The proposed project areas occur along Elk River, beginning on the main stem, just downstream of the North and South Fork Elk River confluence, extending approximately 1 mile upstream along the North Fork. The project reach is commonly referred to as the "impaired reach" of Elk River because channel aggradation has caused severe flooding conditions (California Trout 2018). The purpose of the project is to address the adverse effects of flooding and to demonstrate the feasibility of small-scale sediment remediation efforts. The proposed project is needed to evaluate the effectiveness of different small-scale sediment remediation actions before implementing a larger-scale sediment remediation project along the full stretch of Elk River (California Trout 2018).

The proposed project occurs on 7 private property parcels distributed across the overall project area. The proposed project consists of: sediment removal from the bank-full channel (7 sites) and floodplain (7 sites) of Elk River, creation of two in-channel sediment detention basins, and the reuse of excavated sediment in upland (spoil) areas (10 sites; California Trout 2018; Figure 1, Figure 2). The proposed project activities will involve approximately 4,000 linear feet of the river and grading 5.8 acres of channel and floodplain, and 8.2 acres of upland areas. The project includes grading activities in the Elk River channel that would affect 2.8 acres, and on the Elk River floodplain that would affect 3.0 acres, and fill that would cover 8.2 acres (California Trout 2018).

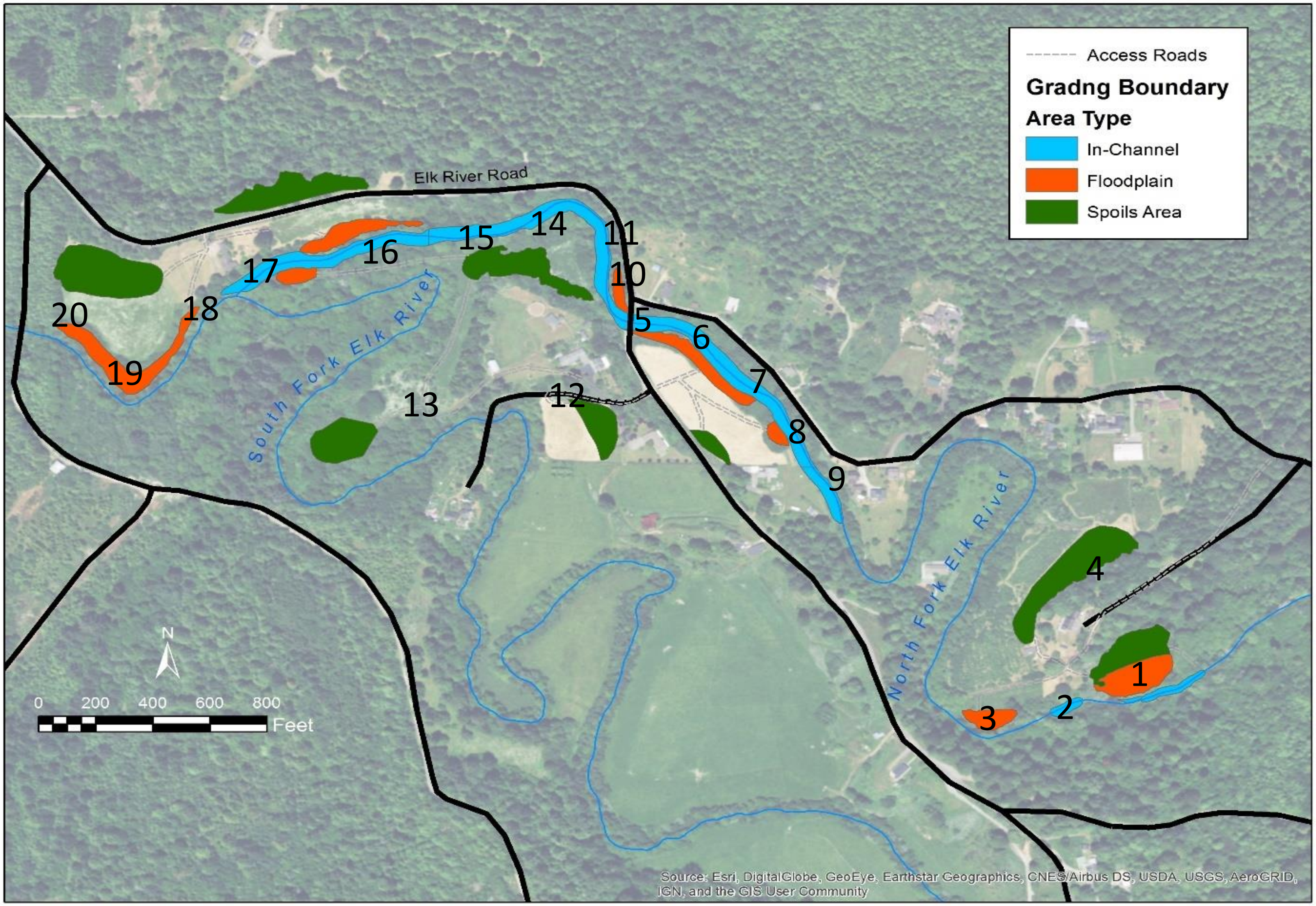

Figure 1. Proposed project areas map (California Trout 2018) with 20 wildlife assessment locations visited on December 15th, 2017.

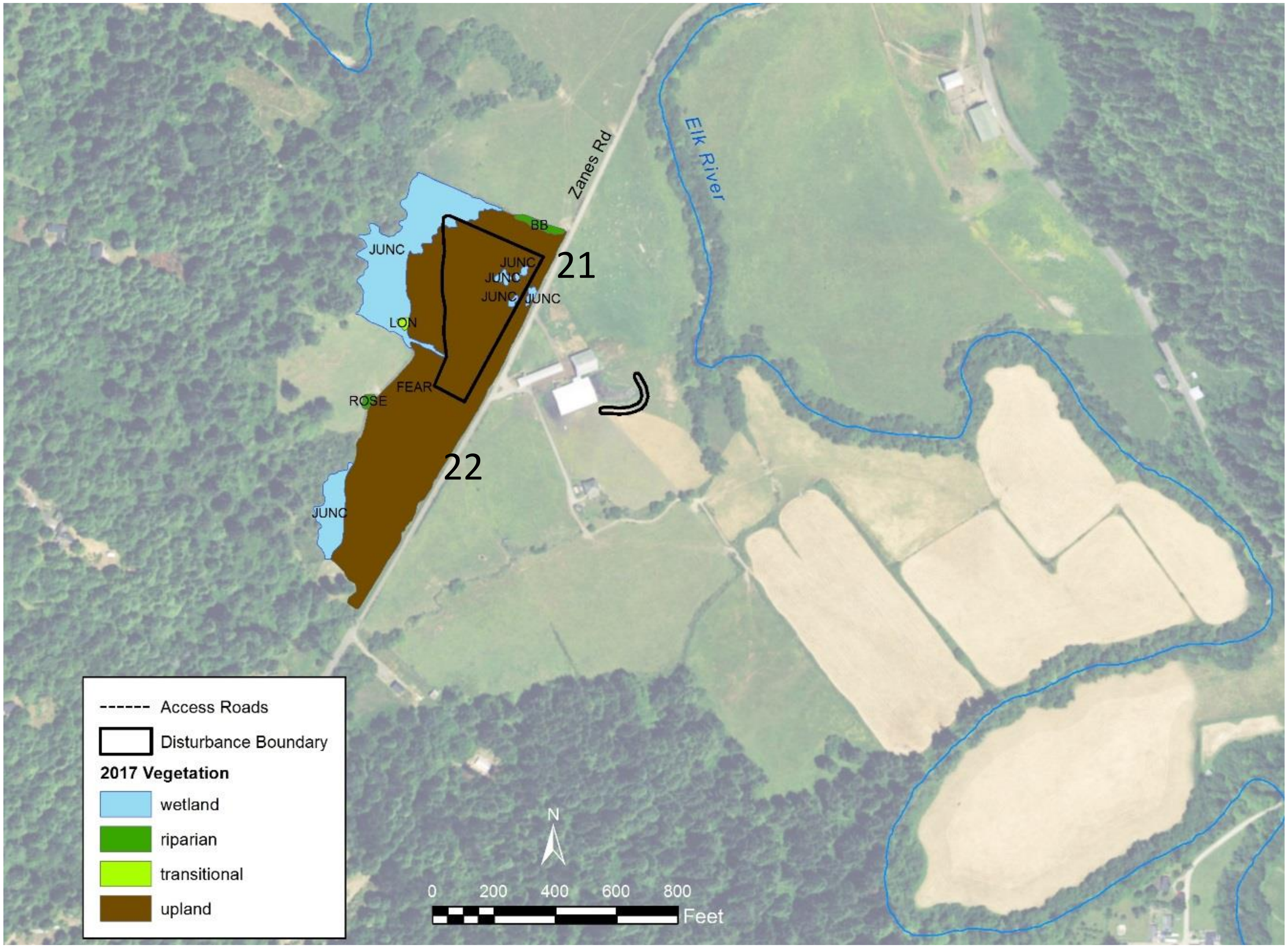

Figure 2. Proposed project area map with mapped cover types (Loya 2017) and 2 wildlife assessment locations visited on December 15th, 2017.

The proposed project activities would potentially affect wildlife species and/or habitat in the following ways: 1) limited removal of riparian vegetation for floodplain grading, river channel widening, and creating/enhancing access roads to the river channel and to soil deposition sites 2) dewatering and excavation and/or widening of the portions of an active river channel 3) deposition of removed sediment onto existing vegetation 4) noise and visual disturbance due to the presence and activities of machinery during construction and sediment transportation activities.

Proposed construction activities in or near the Elk River channel would occur from August 15 through October 15 during low summer flows. The project would be constructed in two phases starting at upriver sites (points 1-5, Figure 1) during the 2018 construction season and downriver sites during 2019 (points 6-22, Figures 1-2).

The proposed project site and immediate adjacent areas (106.1 acres) are composed primarily (82.4%) of three cover types: 1) riparian forest (36.8 acres; California Wildlife Habitat Relationships System habitat types [Mayer and Laudenslayer 1988], here after 'CWHR types'= valley foothill riparian, montane hardwood conifer), 2) coniferous forest (28.0 acres; CWHR type = redwood forest, 3) agricultural cover types (22.7 acres; CWHR type = pasture; Loya 2017, Figure 3). The remaining acreage (17.6%) is composed of 6 CWHR habitat types, each covering ≤ 5 acres: urban, plantation, orchard, barren, riverine, and fresh emergent wetland (Loya 2017; Figure 3). Proposed project activities resulting in removal of vegetation would occur primarily in riparian habitat types (Figure 3). Proposed project activities resulting in deposition of removed sediment onto existing vegetation would occur primarily in upland pasture and orchard habitat types (Figure 3). Proposed project activities resulting in the removal of vegetation and disturbance from roads would occur primarily in upland habitats, with limited occurrence in riparian habitats (Figure 3).

Wildlife Assessment Methods

Species addressed in this assessment include all species legally protected pursuant to the California and Federal Endangered Species Acts (CESA and FESA, respectively), California's "Fully Protected Species" statutes (California Department of Fish and Game (CDFG) codes 3503.5, 3505, 3511, 4700, 5050 and 5515), and the California Environmental Quality Act (CEQA).
This assessment is utilizes three elements: 1) queries of state and federal agency databases for species occurrence in the proposed project region 2) an assessment of current habitat conditions to support species of conservation concern in the proposed project region and 3) a site visit to the proposed project areas to evaluate habitat conditions and detect species

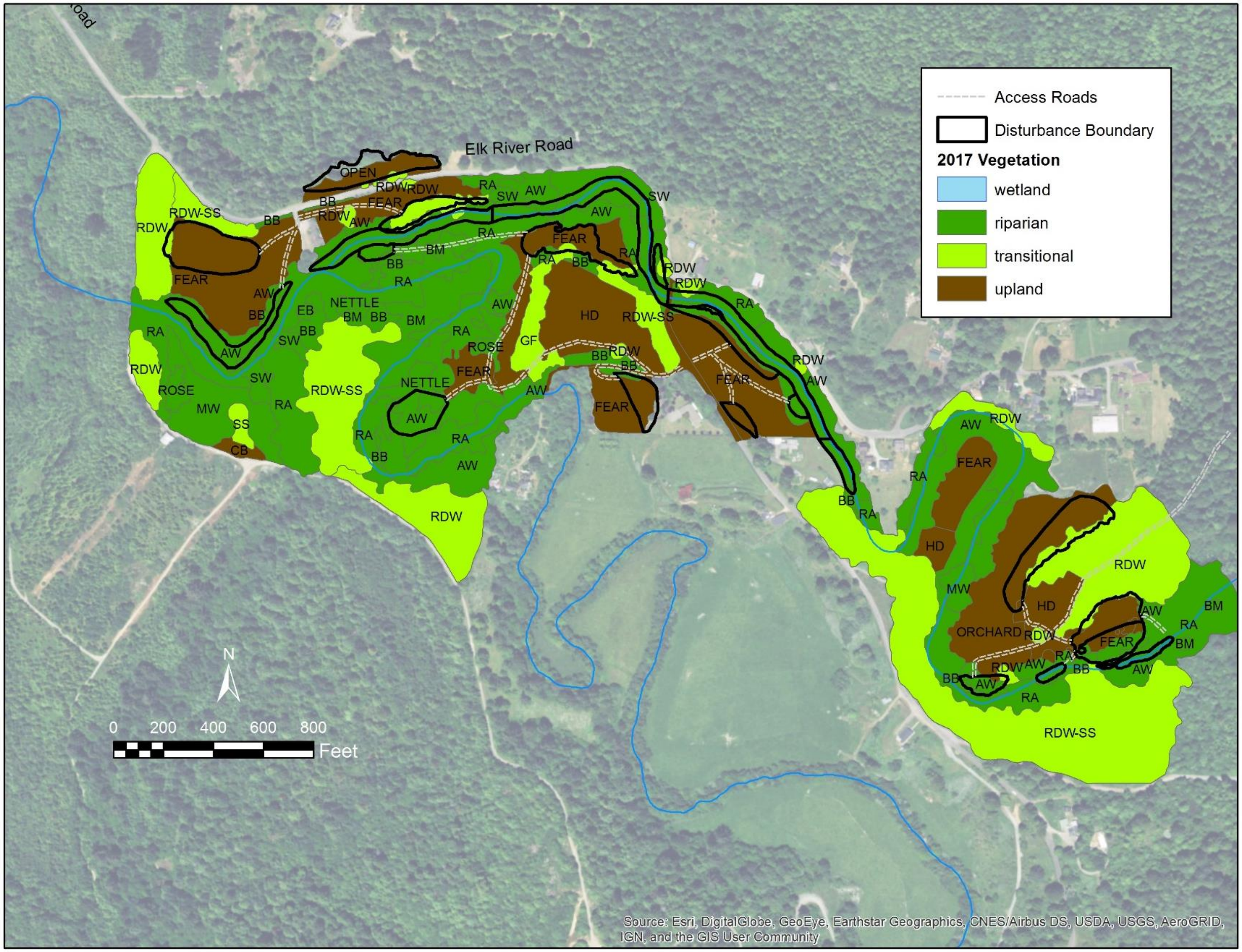

Figure 3. Proposed project area map with proposed project disturbance boundaries overlaid onto the mapped cover types (Loya 2017).

present during the site visit. The California Natural Diversity Database (CNDDB), the Biogeographic Information Observation System (BIOS), and the northern spotted owl database (Gould 1997) for the project region were queried for the occurrence of species of conservation concern in the proposed project region. The proposed project region is defined as the 9-quadrangle area centered on the Fields Landing quadrangle and also includes: Arcata South, Cannibal Island, Eureka, Ferndale, Fortuna, Hydesville, and McWhinney Creek. The northwest-most quadrangle was entirely offshore, therefore only 8 quadrangles are listed. The CNDDB and BIOS were queried in December of 2017, and a current official list of federally threatened, endangered, or candidate species for the proposed project region was obtained in December of 2017. Finally, this assessment also considered any other species listed on the California Department of Wildlife's (CDFW) special animals list (CDFW 2017) that are known to occur in the project region, based on additional literature and/or habitat conditions, that were not identified by during the database queries. All species of conservation concern identified in these queries, habitat assessments, and during site visits are included in Appendix 1.

On the 15th of December, 2017 I visited the proposed project site and evaluated the habitat conditions for terrestrial and aquatic wildlife species at 22 point locations across the proposed project sites (Figures 1-2). A site visit narrative for each point is listed in Appendix 2 and a list of the species observed during the site visit is listed in Appendix 3. At 15 of 15 (100%) points visited with views of the river channel, the channel was composed of nearly entirely silt with some small coarse woody debris. No cobble or bedrock was observed and the only location where any gravel was observed was at the direct outflow of the South Fork of the Elk River into the main stem, where a small pile of pea-sized gravel had recently been deposited. Therefore, the proposed project reach likely supports little suitable habitat for amphibians that require cobble substrates to support one of more life stages for reproduction. The conditions of the channel resembled those of a pond and given the low flow may be most suitable for breeding by red-legged frogs.

The riparian habitats present spanned from dense, young and recently established willow thickets, to early-mature stages of alder-willow, to mosaics of age/size classes that included some large-diameter cottonwoods. These conditions are likely to support the typical assemblage of riparian-associated bird species found along the lower rivers and major creeks around Humboldt Bay, including yellow warbler, yellow-breasted chat, and black-capped chickadee. Notably, the riparian habitat conditions and channel state at multiple points (Appendix 2) had features resembling those where willow flycatchers have recently been detected during the breeding season along the lower Eel and Mad River.

Wildlife Species of Conservation Concern

Amphibians and Reptiles

Four species of amphibians and one species of reptiles of conservation concern are considered (Appendix 1): Pacific tailed frog, northern red-legged frog, foothill yellow-legged frog, southern torrent salamander, and western pond turtle. Of these species, all 4 amphibians are known to occur or suitable habitat is known to be present in the Elk River watershed, however suitable breeding habitat in the proposed project area is suspected only for the northern red-legged frog due to the heavily silted condition of the river channel. Conditions suitable for egg mass attachment for the foothill yellow-legged frog (cobble) appear absent, although it is unknown if any non-breeding individuals occur in the project reach. Although records for western pond turtle occur in nearby river systems (e.g., Mad River, Eel River) the project reach of Elk River appears to lack suitable basking sites due to the largely dense riparian over story and may have limited escape habitat from predators due to the low channel depth during the summer and fall. Furthermore, typical ambient temperature ranges and presence of temperature-mediating summer fog may put the project reach beyond the thermoregulatory range typically suitable for sustained occupancy by western pond turtles. The foothill yellow-legged frog is designated by CDFW as a "Candidate Threatened Species" and the remaining 3 amphibians and the one reptile are designated as "Species of Special Concern" pursuant to CEQA (Appendix 1).

Birds

Forty-three species of birds of conservation concern are considered (Appendix 1), including those with fully protected status by the CDFW. Fully protected species likely to occur in the proposed project region include ruffed grouse, all potentially occurring species in the family Ardeidae (bitterns, herons and egrets) and birds of prey in the orders Falconiformes (diurnal raptors) and Strigiformes (owls) (CDFG Code Sections 3503 and 3503.5). Of the species likely to occur in the proposed project Region, 4 species are listed as either threatened or endangered under the FESA (Northern spotted owl, Western snowy plover, Marbled murrelet, Western yellow-billed cuckoo) and 5 under CESA (Northern spotted owl, Marbled murrelet, Western yellow-billed cuckoo, Bank swallow, Little willow flycatcher), and 5 are designated "Species of Special Concern" pursuant to CEQA. With regard to federally listed species, critical habitat occurs within the project region for western snowy plover (re-designated June 12, 2012; USFWS 2012a) marbled murrelet (designated May 24, 1996 and revised Aug 4, 2016; USFWS 2016), and northern spotted owl (revised Dec 4, 2012b; USFWS 2008). Critical habitat either does not occur or has not been designated for the remaining federally listed or candidate species.

Mammals

Twelve species of mammals of conservation concern are considered (Appendix 1): Pallid bat, Townsend's big-eared bat, Silver-haired bat, Hoary bat, Fringed myotis, Long-eared myotis, Yuma myotis, Sonoma tree vole, Humboldt mountain beaver, North American porcupine, Humboldt marten, and Pacific fisher. Of these, none are listed as threatened or endangered pursuant to FESA or CESA, although 2 (Humboldt marten and Pacific fisher) are candidates for both federal and state listing status. Five species are designated "Species of Special Concern" pursuant to CEQA and none are USFWS "Species of Concern". Of these twelve mammal species considered, only several of the bat species have the potential to occur in the project area.

Recommendations

The following mitigation measures are recommended in order to avoid potential adverse impacts to the species of conservation concern that are known to or may occur in or adjacent to the proposed project site:

Amphibians and Reptiles

- Best Management Practices (BMP's) should be implemented to control project generated storm-water runoff, avoid increased turbidity in wetlands, ponds, and streams, and ensure soil stabilization.

- In-channel work should not occur during the breeding (January-May) and metamorphosis (June-September) periods for sensitive amphibians and reptiles. Should the project proponent wish to avoid seasonal restrictions; clearance surveys for potentially breeding amphibians or reptiles should be conducted in suitable habitat prior to the initiation of in-stream work (see below).

- If any in-channel work will occur prior to hatching/metamorphosis for any potentially occurring larvae of the amphibians considered in this document (Appendix 1), a pre-construction survey for the larvae and/or eggs of potentially affected species should be conducted by a qualified biologist. These surveys would need to be conducted within the proposed construction boundary no more than 2 weeks prior to the start of in-stream activities. If larvae or eggs are detected, the biologist will relocate them to a suitable location outside of the proposed construction boundary (Trinity River Restoration Program 2009).

- Either a qualified biologist should be present or electrofishing crew members should be adequately trained to identify and remove sensitive amphibians encountered during all initial electrofishing conducted prior to dewatering activities. All species captured during electrofishing should be moved to an appropriate, pre-determined relocation site, either upstream or downstream from the project construction footprint. Monitoring should continue throughout the electrofishing and dewatering operations and any amphibians missed during the initial search should also be relocated.

- ❖ Immediately prior (1-3 days) to initiation of construction activities all dewatered channels and adjacent habitat that will have vegetation removed or impacted by project activities should be surveyed by a qualified biologist to detect and re-locate any amphibians that have entered (dewatered channel) or reside (riparian vegetation) in these areas in the proposed construction boundary. All species observed should be moved to an appropriate, pre-determined relocation site, either upstream or downstream from the footprint of the proposed construction area.

- ❖ Should construction activities cease for a period > 2 days during damp periods, when amphibians may be moving greater distances, the construction site should be surveyed by a qualified biologist to detect and move amphibians to an appropriate, pre-determined relocation site, either upstream or downstream from the footprint of the proposed construction area.

❖ In the event that a yellow-legged or northern red-legged frog is observed within the Construction boundary during construction activities, in-stream work should be temporarily halted until the frog has been moved to a safe location with suitable habitat outside of the construction area footprint (Trinity River Restoration Program 2009).

❖ All disturbed amphibian and/or reptile habitat should be re-planted with plant species native to the project area.

Birds

❖ No riparian or coniferous forest habitat should be degraded or removed during the general breeding period (February 1st through August 15th) for bird species likely to nest in the proposed project area. Breeding Periods for individual species are presented in Appendix 1.

❖ No project activities resulting in noise disturbance should be conducted during the general breeding period for birds (February 1st through August 15th) that may potentially occur in or adjacent to the proposed project site. Noise disturbing activities are defined as those resulting in volumes significantly greater than current ambient levels.

❖ Should these seasonal restrictions to construction activities be unfeasible to the project proponent, clearance surveys for potentially nesting birds should be conducted by a qualified biologist to survey habitat that will be directly impacted by construction activities, including a 1000-foot radius buffer.

❖ It is also recommended that should riparian vegetation removal be proposed to occur between August 15th and August 31st, a minimum of one visit by a qualified biologist should occur to detect any late-season active nesting birds immediately prior to vegetation removal activities. This recommendation is based on recent evidence from elsewhere in the proposed project region that native nesting birds, primarily residents (e.g., song sparrow) often double brood near the coast and may have active nests beyond August 15th.

❖ Willow flycatcher surveys, using the recommended survey protocol by CDFW during the June and June-July survey periods, should be conducted by a qualified biologist prior to the initiation of construction activities to identify occupied nesting habitat. Because Willow flycatchers are amongst the latest of the migratory species to arrive and initiate nesting activities in Humboldt County, there is the potential that nesting territories may remain active beyond August 15th. Should one or more occupied Willow flycatcher nesting territories be located during these surveys, consultation with CDFW will be necessary to evaluate appropriate mitigation measures to minimize degradation of each nesting territory from proposed project activities that may degrade or remove riparian habitat.

❖ To the extent possible, minimize removal of large-diameter (≥12 inch DBH) riparian trees and any trees with visible cavities capable of supporting breeding birds and bats.

❖ All disturbed riparian habitat should be re-planted with plant species native to the project area.

Mammals

❖ If any construction activities are planned prior to September, a minimum of one survey should be conducted by a qualified biologist prior to initiation of any construction activities, in June-July, to determine if any structures, such as bridges, buildings, or large-diameter trees with basal hollows, exfoliating bark, or woodpecker holes, are occupied by either day roosting bats or potential maternal colonies of bats in or immediately adjacent to the construction area footprint. Should any maternal roost or maternal colony sites be located, species-specific seasonal and disturbance distance restrictions should be developed in consultation with the CDFW.

Conclusions

The overall conclusion of this wildlife assessment is that the Elk River Sedimentation Remediation Pilot Projects are not expected to have any adverse effects to any special-status wildlife species, nor their habitat, considered herein as long as the mitigation measures identified above are attended to by the project proponents. This conclusion of no adverse effects includes all 4 species listed under the FESA and all 5 species listed under the CESA.

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Appendix 1. List of species of conservation concern. Conservation status codes: F-E (Federally endangered), F-T (Federally threatened), F-CE (Federally candidate endangered), F-CT (Federally candidate threatened), C-E (State endangered), C-T (State threatened), C-CE (State candidate endangered), C-CT (State candidate threatened), C-SC (State species of special concern), C-FP (State fully protected), C-WL (State watch list), WBWG-X (Western bat working group H = High, M = Moderate, LM = Low-moderate).

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Amphibians					
Pacific tailed-frog (*Ascaphus truei*)	CA-SC	Occurs locally in montane hardwood-conifer, redwood and Douglas-fir habitats. Restricted to perennial streams. Tadpoles require water below 15 degrees C (CNDDB 2017).	Late fall, summer (Bebler and King 1979). Larvae require 2-3 years to metamorphose (Morey 2000).	Low: river substrate likely unsuitable due to lack of coble for larvae to attach to, low flow gradient, and high summer temperatures.	Not likely to be adversely affected.
Northern red-legged frog (*Rana aurora*)	CA-SC	Occurs in humid forests, woodlands, grasslands and stream sides in northwestern California, usually near dense riparian cover. Generally near permanent water, but can be found far from water in damp woods and meadows during the non-breeding season (CNDDB 2017).	January to March (Bebler and King 1979). Metamorphosis is attained in June through July (Storm 1960).	High. Suitable habitat occurs in the project area and the species is know from the greater project region. Pools in channel may be suitable for egg laying.	Not likely to adversely affect with the incorporation of mitigation measures.

Common Name (*Scientific Name*)	Status	Habitat	Breeding Period	Potential to Occur	Potential Effect
Foothill yellow-legged frog (*Rana boylii*)	CA-CT	Occupies partly-shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. Requires at least some cobble-sized substrates for egg-laying. Need at least 15 weeks to attain metamorphosis (CNDDB 2017).	March to May (Bebler and King 1979). Metamorphosis is attained 3-4 months after hatching (June-September) (Ashton et al. 1998).	Low: river substrate likely unsuitable due to lack of coble for attaching egg masses to.	Not likely to adversely affect with the incorporation of mitigation measures.
Southern torrent salamander (*Rhyacotriton variegatus*)	CA-SC	Inhabits coastal redwood, Douglas-fir, mixed conifer, montane riparian and montane hardwood-conifer habitats. Associated with old-growth forest and cold, well-shaded, permanent streams and seepages, or areas within the splash zone or on moss-covered rock within trickling water (CNDDB 2017).	February through October. Prolonged larval period lasts 2-2.5 years (Tait and Diller 2006).	Low: extreme sedimentation of the river channel and adjacent areas has likely buried any suitable habitat.	Not likely to be adversely affected.
Reptiles					
Western pond turtle (*Emys marmorata*)	CA-SC	Associated with permanent or nearly permanent water in a variety of habitats. Requires basking sites. Nest sites may be found up to 0.5 km from water. Known to burrow in soil and fallen log debris (CNDDB 2017).	April to August (Bebler and King).	Low: lack of basking sites due to closed riparian canopy and incised channel.	Not likely to be adversely affected.

Common Name (*Scientific Name*)	Status	Habitat	Breeding Period	Potential to Occur	Potential Effect
Birds					
Ruffed grouse (*Bonasa umbellus*)	CA-WL	Occurs in extreme northern humid coastal strip, in Del Norte, Humboldt and Siskiyou Counties. Inhabits dense canyon-bottom or stream-side growths, usually of mixed deciduous and coniferous trees (CNDDB 2009).	April through September (Rusch et al. 2000).	Low: Suitable habitat is not present in the proposed project site.	Not likely to be adversely affected.
California brown pelican (*Pelecanus occidentalis californicus*)	CA-SC	Post breeding migration out of the Gulf of California begins in Jun–Jul, earlier if nesting is unsuccessful (Anderson and Anderson 1976). Most migrants cross the Baja peninsula at its narrowest parts, then move northward along the Pacific coast as far as s. British Columbia. In Humboldt County this species forages along the shoreline and into Humboldt Bay.	Species does not breed in California.	Low: Suitable habitat is not present in the project area.	Not likely to be adversely affected.
Double-crested cormorant (*Phalacrocorax auritus*)	CA-WL	Colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state. Nests along the coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins (CNDDB 2017).	April through August (Hatch and Weseloh 1999).	Low: width and depth of channel likely unsuitable to serve as foraging habitat.	Not likely to be adversely affected.
Great egret (*Ardea alba*) *Rookery Sites	CA-FP	Colonial nesting species, nesting in larger trees. Rookery sites located near marshes, tide flats, irrigated pastures and margins of rivers and lakes (CNDDB 2017).	March through July (McCrimmon et al. 2001).	Low: Species is known to use the project area for foraging. No known nesting colonies occur near the project site.	Not likely to be adversely affected.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Great blue heron (*Ardea herodias*) *Rookery Sites	CA-FP	Colonial nesting species in tall trees, cliff sides, and sequestered spots on marshes. Rookery sites in close proximity to foraging areas. Marshes, Lake margins, tide flats, rivers, streams, and wet meadows (CNDDB 2017).	March through August (Butler 1992).	Low: Species is known to use the project area for foraging. No known nesting coloines occur near the project site.	Not likely to be adversely affected.
Snowy egret (Egretta thula) *Rookery Sites	CA-FP	Forages in marshes, ponds, lagoons, and shallow coastal habitats. Nests in trees or shrubs near water or, occasionally, on ground or in marsh vegetation (CNDDB 2017).	March to early August (Parsons and Master 2000).	Low: The project area is unlikely to be used as foraging or nesting habitat.	Not likely to be adversely affected.
Black-crowned night-heron (*Nycticorax nycticorax*)	CA-FP	Colonial nester, usually in trees, occasionally in tule patches. Rookery sites located adjacent to foraging areas: lake margins, mud-bordered bays, marshy spots (CNDDB 2017).	Mid-late November through August (Davis, Jr. 1993).	Low: The project area is unlikely to be used as foraging or nesting habitat.	Not likely to be adversely affected.
Cooper's hawk (*Accipiter cooperii*)	CA-WL	Occurs in woodlands, primarily of the open, interrupted or marginal type. Nest sites are mainly in riparian growths of deciduous trees, as in canyon bottoms on river flood plains and in live oaks (CNDDB 2017).	Late March through July (Curtis el al. 2006).	Moderate: suitable habitat for foraging present.	Not likely to adversely affect with the incorporation of mitigation measures.
Sharp-shinned hawk (*Accipiter striatus*)	CA-WL	Prefers coniferous or mixed forests for nesting. Prefers riparian areas. Require north-facing slopes with plucking perches. Nesting typically occurs within 275 feet of water (CNDDB 2017).	April through August (Bildstein and Meyer 2000).	Moderate: suitable habitat for foraging present.	Not likely to adversely affect with incorporation of mitigation measures.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Northern harrier (*Circus cyaneus*)	CA-SC	Inhabits coastal salt and freshwater marshes. Forages in grasslands and nests on the ground in shrubby vegetation, usually at marsh edge. Nests are large mounds built of sticks in wet areas (CNDDB 2017).	April through September (MacWhirter and Bildstein 1996).	Low: only the open pasture portion of the project area has the potential to support foraging habitat.	Not likely to be adversely affected.
White-tailed kite (*Elanus leucurus*)	CA-FP	Inhabits rolling foothills and valley margins with scattered oaks and river bottomlands or marshes next to deciduous woodland. Foraging habitat includes open grasslands, meadows or marshes close to isolated, dense-topped trees for nesting and perching (CNDDB 2017).	February through early August (Dunk 1995).	Low: only the open pasture portion of the project area has the potential to support foraging habitat.	Not likely to be adversely affected.
Red-shouldered hawk (*buteo lineatus*)	CA-FP	Nests primarily in riparian oak woodland. During migration it is still associated with woodlands although often occurs in smaller woodland patches or more fragmented landscapes. It winters in lowland areas near water such as swamps, marshes and river valleys (Dykstra et al. 2008).	Late March through July (Dykstra and Hays 2008).	High: Species observed in the project area during site visit and exhibiting territorial behavior. Suitable nesting, roosting, and foraging habitat present.	Not likely to adversely affect with the incorporation of mitigation measures.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Golden eagle (*Aquila chrysaetos*) *Nesting and wintering	CA-FP	Occurs locally in rolling foothills and mountain areas, nesting in cliff-walled canyons throughout most of its range and also in large trees in open areas (CNDDB 2017).	Late March through August (Kochert et al 2002).	Low: Species has been detected in coastal lowlands of Humboldt Bay in recent years associated with concentration of waterfowl (K. Slauson pers obs).	Not likely to be adversely affected.
Bald eagle (*Haliaeetus leucocephalus*)	CA-FP	Nests in large trees near rivers, lakes, marshes, etc. Winter near open water, which can attract sufficient food and evening roost sites (CNDDB 2017).	Late March through September (Buehler 2000).	Low: Species breeds in the project region, but stream reaches in project areas unlikely to support suitable sized prey nor provide access to hunting due to dense riparian overstory.	Not likely to be adversely affected.
Osprey (*Pandion haliaetus*) (Nesting)	CA-WL	Primarily along rivers, lakes, bays, and seacoasts. Nests in dead snags, living trees, utility poles, etc. usually near or above water (CNDDB 2017).	April through early September (Poole et al. 2002).	Low: Species breeds in the project region, but stream reaches in project areas unlikely to support suitable sized prey nor provide access to hunting due to dense riparian overstory.	Not likely to be adversely affected.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Merlin (*Falco columbarius*)	CA-FP	Inhabits the seacoast, tidal estuaries, open woodlands, savannahs, edged of grasslands and deserts, farms and ranches. Clumps of trees or other windbreaks are required for roosting in open country (CNDDB 2017).	March through September (Warkentin et al. 2005).	Low: Merlins only occur in the project region during winter and migration.	Not likely to be adversely affected.
American peregrine falcon (*Falco peregrinus anatum*)	CA-FP	Inhabits dry, open terrain. Breeding sites are located on cliffs. Forages far afield, even to marshland and ocean shores (CNDDB 2017).	February through August (White et al. 2002).	Low: Peregrines are resident in the project region but are unlikely to use the project site for foraging or nesting habitat.	Not likely to be adversely affected.
Yellow rail (*Coturnicops noveboracensis*)	CA-SC	In winter, Yellow Rails appear to prefer drier portions of Spartina stands in coastal marshes (Anderson 1977a). In Texas, wintering birds were primarily associated with dense, low undergrowth dominated by *Distichlis stricta* and *Spartina spartina* (Grace et al. 2005).	Species does not breed in Humboldt County.	Low: Suitable habitat is not present in the proposed project site.	Not likely to be adversely affected.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
California Ridgway's rail (*Rallus obsoletus obsoletus*)	CA-E	Principal habitats are low portions of coastal wetlands dominated by cordgrass (*Spartina* sp.), and pickleweed (Salicornia spp.; Rush et al. 2012). Nesting habitat in San Francisco Bay, CA, characterized by presence of tidal sloughs; abundant invertebrate populations; pickleweed coverage with extensive cordgrass coverage in lower zone; and tall pickleweed, gum plant (Grindelia cuneifolia), and wrack in upper zone (Harvey 1988).	Nesting in San Francisco Bay, CA, begins in late Mar; peaks in late Apr–mid-May (Degroot 1927, Harvey 1988).	Low: Historical status in Humboldt Bay questionable. Suitable habitat is not present in the proposed project site.	Not likely to be adversely affected.
Western snowy plover (*Charadrius alexandrinus nivosus*)	F-T CA-SC	Sandy beaches, salt pond levees, shores of large alkali lakes (CNDDB 2017) and gravel bars.	March through September (Page et al. 1995).	Low: No suitable habitat occurs in the project area.	Not likely to be adversely affected.
Mountain plover (*Charadrius montanus*)	CA-SC	Winter habitat: Most birds winter in California, where they spend about 75% of their time on tilled fields, but prefer heavily grazed annual grasslands or burned fields (Knopf and Rupert 1995). Little current use of California coastal plains (Wunder et al. 2003).	Species does not breed in Humboldt County.	Low: Species rarely winters in Humboldt County and is not likely to occur in the proposed project site.	Not likely to be adversely affected.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Long-billed curlew (*Numenius americanus*) (Nesting)	CA-WL	Winter habitat: Of 10 habitats in Humboldt Bay, regularly occurred in only tidal mudflat (27% of surveys) and salt marsh (37%; Gerstenberg 1979). Individuals aggregated within intertidal habitats; found more frequently in areas with high tidal-channel abundance and at higher elevation sites within the bay (Danufsky 2000). Abundance on Humboldt Bay declined Oct–Feb with the onset of winter rains; use of pastures surrounding the bay increased (Mathis 2000).	Species does not breed in Humboldt County.	Low: Suitable nesting habitat is not present in the proposed project site.	Not likely to be adversely affected.
Marbled murelet (*Brachyramphus marmoratus*)	F-T CA-E	Feeds near-shore and nests inland along the coast from Eureka, Humboldt County to the Oregon border and from Half Moon Bay, San Francisco County to Santa Cruz, Santa Cruz County. It nests in old-growth redwood-dominated forests, typically not more than 6 miles inland, often in Douglas-fir (CNDDB 2017).	March through October (Nelson 1997).	Moderate: Species breeds in the Headwaters forest and likely commutes to and from nest sites to ocean foraging areas over the project site. However, due to slope position of project area at the bottom of the watershed, potential disturbances to commuting birds is likely to be minimal.	Not likely to adversely affect with the incorporation of mitigation measures.

Common Name (*Scientific Name*)	Status	Habitat	Breeding Period	Potential to Occur	Potential Effect
Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)	F-T CA-E	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems (CNDDB 2017).	March-early October (Hughes 1999).	Low-Suitable riparian habitat for western yellow-billed cuckoo occurs in the Eel River valley to the south, however sufficient patch sizes of suitable riparian habitat are lacking in the proposed project area.	Not likely to be adversely affected.
Barn owl (*Tyto alba*)	CA-FP	Inhabits open habitats including grasslands, chaparral, riparian and other wetlands. Often associated with human communities (Zeiner et al. 1988-1990).	Year-round (Marti et al. 2005).	Moderate: Species likely forages in lower portions of proposed project site.	Not likely to be adversely affected.
Short-eared owl (*Asio flammeus*) (Nesting)	CA-FP	Found in swamp lands, both fresh and salt and lowland meadows. Tule patches and tall grass are needed for nesting/daytime seclusion. Nests on dry ground in depressions concealed in vegetation (CNDDB 2017).	March through July (Wiggins et al. 2006).	Low: Species winters nearby but unlikely to utilize proposed project site for winter foraging habitat.	Not likely to be adversely affected.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Great horned owl (*Bubo virginianus*)	CA-FP	Occurs in a variety of forest habitats with meadows and other openings including mixed coniferous forest. Commonly forages and breeds in riparian and coniferous habitats (Zeiner et al. 1988-1990).	May through September (Houston et al. 1998).	High: Species breeds in the project region and roosting, and foraging habitat present.	Not likely to adversely affect with the incorporation of mitigation measures.
Northern spotted owl (Strix occidentalis caurina)	F-T CA-T	Old-growth forests or mixed stands of old-growth and mature trees. Occasionally in younger forests with patches of big trees.	February through August (USFWS 1992).	Low: Nearest known territory is 0.6 miles away and species unlikely to make significant use of habitat embedded in human development.	Not likely to adversely affect with the incorporation of mitigation measures.
Barred owl (*Strix varia*)	CA-FP	This species' range expansion into California occurred in the late 1980's. It now inhabits coniferous and mixed deciduous forest and competes with northern spotted owl for habitat where they co-occur.	December through September (Mazur and James 2000).	Present. Barred owl is known to occur in the project region and is taking over many historic northern spotted owl activity centers in nearby timberlands.	Not likely to adversely affect with the incorporation of mitigation measures.

Common Name (*Scientific Name*)	Status	Habitat	Breeding Period	Potential to Occur	Potential Effect
Northern saw-whet owl (*Aegolius acadicus*)	CA-FP	Inhabit mature riparian and oak habitats with intermediate canopy cover. Requires natural tree cavities or woodpecker excavations (especially those of northern flicker) for nesting.	March through July (Rasmussen et al. 2008).	Moderate: Species breeds in the project region and potential roosting, and foraging habitat present.	Not likely to adversely affect with the incorporation of mitigation measures.
Western screech owl (*Megascops kennicottii*)	CA-FP	Inhabits riparian, redwood and mixed conifer habitats locally. As an obligate secondary cavity nester, requires abandoned woodpecker excavation or other cavity in snag, hollow tree, log, stump, etc. Occasionally uses nest boxes (Zeiner et al. 1988-1990).	March through July (Cannings and Angell 2001).	High: Species breeds in the project region and roosting, and foraging habitat present.	Not likely to adversely affect with the incorporation of mitigation measures.
Northern pygmy owl (*Glaucidium gnoma*)	CA-FP	Occurs within most forest types in California. Most commonly found at edges near meadows, streams, lakes and other openings (Zeiner et al. 1988-1990).	April-June (Holt and Peterson 2000).	High. Suitable habitat occurs within the project region.	Not likely to adversely affect with the incorporation of mitigation measures.

Common Name (*Scientific Name*)	Status	Habitat	Breeding Period	Potential to Occur	Potential Effect
Vaux's swift (*Chaetura vauxi*) (Nesting)	CA-SC	Nesting habitat: Roosts trees (n = 18) were in grand fir (94%) and ponderosa pine (6%), and 56% were live trees (Bull and Blumton 1997). Average diameter at breast height and tree height were 77 cm (47-110 cm) and 26 m (9-40 m); hole height averaged 17 m (9-33 m). Entrance to the roost created by Pileated Woodpecker holes at 45%, smaller woodpecker holes at 33%, and broken off trunk at 22% (Bull et al. 2007).	Observed from 3–23 Jun in ne. Oregon (Bull and Collins 1993a); May in w. Oregon (Thompson 1977a).	Low: Species occurs in the project area and likely forages over the project site but no suitable nesting locations were found in or adjacent to the proposed project site.	Not likely to adversely affect with the incorporation of mitigation measures.
Red-breasted sapsucker (*Sphyrapicus ruber*) (Nesting)	CA-WL	Nesting habitat: Nest cavities made in dead trees or dead portions of live trees. In nw. California, 46 of 49 nests were in snags or dead portions of live trees (Raphael and White 1984). Tree species used include big leaf maple, Douglas-fir, western hemlock, cottonwood, white fir, lodgepole pine, Douglas-fir, and Pacific madrone (Raphael 1987, Raphael and White 1984).	Excavation begins in late Apr–early May but presumably occurs earlier (prior to 25 Apr, date of earliest nests) elsewhere in British Columbia (Campbell et al. 1990)	High: Species detected during site visit. Suitable nesting habitat occurs in the proposed project site.	Not likely to adversely affect with the incorporation of mitigation measures.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Olive-sided flycatcher (*Contopus cooperi*) (Nesting)	CA-SC	Nesting habitat: Most often associated with forest openings, forest edges near natural openings (e.g., meadows, canyons, rivers) or human-made openings (e.g., harvest units), or open to semi-open forest stands, including recently burned forest. Presence in early successional forest appears dependent on availability of snags or residual live trees for foraging and singing perches. In Douglas-fir (*Pseudotsuga menziesii*) forests of nw. California, Olive-sided Flycatcher is the only common species detected more often at forest edges than in forest interior (Rosenberg and Raphael 1986).	In nw. Oregon, most nest-building begins during first week of Jun; earliest date 20 May, latest 19 Jul (Altman 1999b).	Moderate: Species breeds in the project region. Potentially suitable nesting habitat may occur in the proposed project area.	Not likely to adversely affect with the incorporation of mitigation measures.
Little willow flycatcher (*Empidonax traillii brewsteri*) (Nesting)	CA-E	Nesting habitat is deciduous thickets, especially willows and often near water. In Humboldt County nesting locations have occurred on the Eel, Elk, and Mad Rivers, and rarely in upland young regenerating forest (Hunter et al. 2005). Nesting habitat appears to be riparian habitat adjacent to slow moving or stagnant water sources, such as off-channel pools (Eel and Mad Rivers) or human-created analogs such as stagnant ponds (Blue Lake Waste Water Treatment Plant) or channels (Mad River Fisher Hatchery)	Begins early to mid-Jun in Oregon and Colorado, mid- to late May farther south (s. California, s. Arizona).	High: Suitable nesting habitat occurs in the proposed project site	Not likely to adversely affect with the incorporation of mitigation measures.

Common Name (*Scientific Name*)	Status	Habitat	Breeding Period	Potential to Occur	Potential Effect
Purple martin (*Progne subis*) (Nesting)	CA-SC	Nesting habitat: Montane forest or Pacific lowlands, restricted to areas with dead snags containing woodpecker holes; generally patchy and local in occurrence (Brown et al. 2013). Burned-over forest and logged areas with dead snags left standing are often used.	April to July (Hunter et al. 2005).	Moderate: Suitable nesting sites may occur in or near the proposed project site.	Not likely to adversely affect with the incorporation of mitigation measures.
Bank swallow (*Riparia riparia*) (Nesting)	CA-T	Bank swallows establish colonies along eroded, vertical banks within river systems with friable alluvial soils (Garrison et al. 1987). Dynamic river processes create these conditions as rivers meander and expose fresh soil most typically on the outside bends of meanders. The three known colonies along the lower Van Duzen and Eel rivers all occur in these types of locations where recent high-flow winter events have caused maintained vertical banks and exposed new soil via erosion. In coastal areas wave or wind action can erode banks or bluffs and create suitable colony locations. The Mad River overlook colony occurs in such a wind-eroded coastal bluff. Burrows are often destroyed by erosional processes from year to year, exposing fresh soil that the swallows will use to construct new burrows (BANS-TAC 2013).	The nesting season for Bank swallows in California is from 1 April through 31 August and includes the time of first arrival of individuals at colony sites, completion of egg laying and fledging of young, and ending with dispersal of juveniles from the nesting colony site (Garrison 1998)	Low: This species has been recently expanding its breeding range on the Eel River and Mad Rivers (Slauson 2017), however suitable nesting habitat is not present in the proposed project site.	Not likely to be adversely affected.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Black-capped chickadee (*Poecile atricapillus*)	CA-WL	Inhabits riparian woodlands in Humboldt County. Primarily found in deciduous tree types, especially willows and alders along large or small watercourses (CNDDB 2017).	April through July (Smith 1993).	High: Species was detected during site visit and suitable nesting and foraging habitat occurs in the project site.	Not likely to adversely affect with the incorporation of mitigation measures.
Yellow-breasted chat (*Icteria virens*) (Nesting)	CA-SC	Nesting habitat: In the arid West, largely confined to riparian and shrubby habitats; a generalist compared with other species in its use of available nesting habitat (Brown and Trosset 1989).	April-July (Hunter et al. 2005).	Moderate: Species nests in the project region and suitable habitat may occur in the proposed project site.	Not likely to adversely affect with the incorporation of mitigation measures.
Yellow warbler (*Setophaga petechia*)	CA-SC	Riparian species, occurring in willows, cottonwoods, aspens, sycamores, and alders for nesting and foraging. Also nests in montane shrubbery in open coniferous forests (CNDDB 2017).	May to early August (Lowther et al. 1999).	High: Suitable nesting and foraging habitat occurs in the proposed project site.	Not likely to adversely affect with the incorporation of mitigation measures.
Grasshopper sparrow (*Ammodramus savannarum*)	CA-SC	Nesting habitat: Generally prefers moderately open grasslands and prairies with patchy bare ground; selects different components of vegetation, depending on grassland ecosystem. Occupies lusher areas with shrub cover in arid grasslands of Southwest and West (Vickery 1996).	Nesting generally beginning in May and continuing until July at latest (Vickery 1996).	Low: Suitable habitat is not present in the proposed project site.	Not likely to be adversely affected.

Common Name (*Scientific Name*)	Status	Habitat	Breeding Period	Potential to Occur	Potential Effect
Tricolored blackbird (*Agelaius tricolor*)	CA-CE	Highly colonial species in marsh habitats during breeding season, but also can utilize open cultivated lands and pastures (non-breeding) (CNDDB 2017).	Late February through mid-August (Beedy and Hamilton III 1999).	Low: Breeding has been documented to the south of Fortuna (Hunter et al. 2005), however suitable habitat to support nesting colonies is not present in the project area.	Not likely to be adversely affected.
Mammals					
Pallid bat (*Antrozous pallidus*)	CA-SC	Roosts in rocky areas in open, dry habitats. Nearest occurrence is in Ferndale approximately 5 miles southwest southwest of the project site.	April-August (Zeiner et al. 1988-1990).	Low: Suitable habitat is not present in the proposed project site.	Not likely to be adversely affected.
Silver-haired bat (*Lasionycteris noctivagans*)	WBWG-M	Primarily a coastal and montane forest dweller feeding over streams, ponds and open brushy areas. Roosts in hollow trees, beneath exfoliating bark, abandoned woodpecker holes and rarely under rocks. Needs drinking water (CNDDB 2017).	Fertilization is delayed until Spring. Gestation is 50-60 days. Young are able to forage alone at 21 to 36 days old (Naumannn 1999, Whitaker, Jr. 1980)	Low: Species is known to occur in the project region but suitable roosting habitat is not likely present in the proposed project site.	Not likely to be adversely affected.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Hoary bat (Lasiurus cinereus)	WBWG-M	Species normally roosts alone on trees, hidden in the foliage, but on occasion has been seen in caves with other bats. It prefers woodland, mainly coniferous forests, but hunts over open areas or lakes. It hunts alone and its main food source is moths.	The reproductive cycle of the hoary bat is not yet fully documented, but it is thought that they mate in August with birth occurring in June of the following year.	Low: Species is known to occur in the project region but suitable roosting habitat is not likely present in the proposed project site.	Not likely to be adversely affected.
Fringed myotis (Myotis thysanodes)	WBWG-H	Occurs in a wide variety of habitats, locally hardwood-conifer habitats are optimal. Uses caves, mines, buildings or crevices for maternity colonies and roosts (CNDDB 2017).	Courtship and mating occur in the Fall. Fertilization is delayed until late April-mid-May. Gestation is 50-60 days. Young are able to forage alone at about 20 days old (Keinath 2004, Whitaker, Jr. 1980)	Moderate: Suitable habitat may occur the project region, but suitable roosting and colony sites are not likely present in the proposed project site.	Not likely to be adversely affected.
Long-eared myotis (*Myotis evotis*)	WBWG-M	Species known to occur in semiarid shrublands, shortgrass prairie, and subalpine forests, with habitats ranging from sea level to 2,830 meters (Solick et al. 2006). They roost in a variety of places, including tree cavities, rock crevices, caves, and even abandoned buildings. They seem to prefer rock crevices	Likely June-August. Reproducing females generally roost in small, 2-centimeter wide crevices that are typically vertically oriented.	Moderate: Suitable habitat may occur the project region, but suitable roosting and colony sites are not likely present in the proposed project site.	Not likely to be adversely affected.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Yuma myotis (*Myotis yumanensis*)	WBWG-LM	Optimal habitats are open forests and woodlands with sources of water over which to feed. Distribution is closely tied to bodies of water. Maternity colonies in caves, mines, buildings or crevices (CNDDB 2009).	Courtship and mating occur in the Fall. Fertilization is delayed until Spring. Young are born in between May and June. Young are able to forage alone when approximately a month old (Sims 2000, Whitaker, Jr. 1980)	Moderate: Suitable habitat may occur the project region, but suitable roosting and colony sites are not likely present in the proposed project site.	Not likely to be adversely affected.
Humboldt marten (*Martes caurina humboldtensis*)	F-CE CA-CE	Large patches of late-successional mixed conifer forests, primarily within fog-influenced forest habitat within 20-km of the coast. Shrub layer dense and composed of a mix or ericaceous species (Slauson et al. 2007, Slauson et al. 2018).	April-August (Slauson et al. 2018)	Low: Suitable habitat is not present in the proposed project site.	Not likely to be adversely affected.
Pacific fisher (*Pekania pennanti pacifica*)	F-CT CA-CT	Forages in a variety of seral stages near the coast, but rests and dens in large-diameter live and dead woody structures (Lofroth et al. 2010).	March-October (Powell 1993, Green 2017)	Low: Species is known to occur in the project watershed but is not likely to utilize habitat imbedded in a developed matrix of human habitations.	Not likely to be adversely affected.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Humboldt mountain beaver (*Aplodontia rufa humboldtiana*)	G5TNR SNR	In conifer forests and shrubby headland habitats in Humboldt County. In conifer forest often in moist headwater creek locations with ample herbaceous (e.g., sword fern) vegetation which is their primary food (K. Slauson pers. obs).	The breeding season is between January and March, with two or three young born February to April.	Low: Suitable habitat occurs in the project region but does not occur in the proposed project site.	Not likely to be adversely affected.
North American Porcupine (*Erethizon dorsatum*)	G5 S3	Throughout it's range this species is commonly found in coniferous and mixed forested areas, however in Humboldt county the few contemporary records occur in shore pine and serpentine habitats (K. Slauson pers. obs.)	Females give birth to a single young in spring and mating occurs in fall.	Low: Suitable habitat is not present in the proposed project site.	Not likely to be adversely affected.
Sonoma tree vole (*Arborimus pomo*)	CA-SC	The species' habitat consists of mixed evergreen forests; optimum habitat appears to be wet and mesic old-growth Douglas-fir forest, but this species also occurs in younger forests (e.g., Douglas-fir 47 years old).	Nests in trees, 2-50 m above ground; it may use old nests of birds, squirrels, or woodrats. Nests usually are in Douglas-fir trees but sometimes may be in other conifers or in Pacific madrone (Meiselman, 1996, Vrieze, 1998).	Low: Few suitable conifers area present in or near the proposed project site.	Not likely to be adversely affected.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Insects					
Western bumblebee (*Bombus occidentalis*)	CA-WL	Western bumblebees are generalist foragers. Because they do not depend on any one flower type, they are considered to be excellent pollinators.	A new colony typically starts in the early spring by a solitary queen.	Low: Species likely occurs in the project area but is not likely to be adversely affected due to the proposed project activities.	Not likely to be adversely affected.
Obscure bumblebee (*Bombus caliginosus*)	CA-WL	The workers are most often seen on Fabaceae, the legume family, while queens are most often seen on Ericaceae, the heath family, and males have been noted most often on Asteraceae, the aster family. Common plants visited by the workers in a sample included *Ceanothus*, thistles, sweet peas, lupines, rhododendrons, *Rubus*, willows, and clovers.	A new colony typically starts in the early spring by a solitary queen.	Low: Species likely occurs in the project area but is not likely to be adversely affected due to the proposed project activities.	Not likely to be adversely affected.
Hairy-necked Tiger beetle (*Cicindela hircollis gravida*)	CA-WL	Found in moist sand near the ocean, for example in swales behind dunes or upper beaches beyond normal high tides.	Spring	Low: Species is unlikely to occur in the project area.	Not likely to be adversely affected.

Common Name (*Scientific Name*)	**Status**	**Habitat**	**Breeding Period**	**Potential to Occur**	**Potential Effect**
Mollusks					
Western pearlshell (*Margaritifera falcata*)	CA_WL	Preferentially inhabits boulder and gravel substrates; commonly occupied stable bank edges (Westover 2010).	Unknown	Low: Suitable habitat not likely present in project area.	Not likely to be adversely affected.
California floater (*Amdonta californiensis*)	CA_WL	Occur in lakes, slow rivers (Taylor 1981), and some reservoirs (Nedeau et al. 2009) with mud or sand substrates (Clarke 1981) and are typically found at low elevations (Frest and Johannes 1995). The distribution of freshwater mussels within a water body is probably dependent on the size and geology of the water body and patterns of host fish distribution during the mussel's reproductive period (Watters 1992).	Unknown	Low: Suitable habitat not likely present in project area.	Not likely to be adversely affected.
Western ridged muscle (*Gonidea angulata*)	CA_WL	Inhabits boulder and cobble; commonly occupies stable bank edges (Westover 2010).	Unknown	Low: Suitable habitat not likely present in project area.	Not likely to be adversely affected.

Appendix 2. Site visit notes from 22 point locations at the proposed project site visited on the 15th of December 2017. See Figures 1-2 for mapped locations of each point.

<u>Point 1</u>: Channel view of pool excavation site. Steep-banked channel with fine-grained sediment and small diameter wood comprising the base to the channel. Open riparian overstory with a few large-diameter alders and cottonwoods in vicinity.

<u>Point 2</u>: Channel view and floodplain grading site. Channel with fine-grained sediment and small diameter wood comprising the base to the channel. Open riparian canopy with predominantly blackberry in understory.

<u>Point 3</u>: Channel view and floodplain grading site. Steep-banked channel with fine-grained sediment and small diameter wood comprising the base to the channel. Open riparian canopy with predominantly blackberry in understory and a few large-diameter alders and cottonwoods.

<u>Point 4</u>: Sediment deposition area. Apple orchard and pasture habitat bordering redwood forest.

<u>Point 5</u>: Channel view, floodplain grading site, and sediment deposition area. Steep-banked channel with fine-grained sediment and small diameter wood comprising the base to the channel. Floodplain grading site with some small-diameter trees and dense understory.

<u>Point 6</u>: Channel view and floodplain grading site. Channel with fine-grained sediment and small diameter wood comprising the base to the channel.

Point 7: Channel view, channel excavation, and floodplain grading site. Channel with fine-grained sediment and small diameter wood comprising the base to the channel.

Point 8: Channel view and channel excavation site. Channel with fine-grained sediment and small diameter wood comprising the base to the channel. Habitat conditions here resemble those where Willow flycatchers have nested recently in Humboldt County.

Point 9 (picture below): Channel view and channel excavation site. Channel base composed entirely of silt, some small-diameter wood in channel. Dense willow-alder dominated riparian overstory and understory.

Point 10 (picture below): Channel view, channel excavation site, and floodplain grading site. Channel base composed entirely of silt, some small-diameter wood in channel. Dense willow-alder dominated riparian overstory and understory. Habitat conditions here resemble those where Willow flycatchers have nested recently in Humboldt County (e.g., Mar River Fish Hatchery site).

Point 11: Soil deposition site, pasture.

Point 12: Soil deposition site and staging area, scrubby old orchard with some willow.

Point 13: Soil deposition site, pasture bordering riparian habitat.

Point 14 (picture below): Channel excavation site. Channel base composed entirely of silt, some small-diameter wood in channel. Dense alder overstory, channel flow stagnant here in long pool. Dense willow-alder dominated riparian overstory and understory. Habitat conditions here resemble those where Willow flycatchers have nested recently in Humboldt County (e.g., Mar River Fish Hatchery site).

Point 15: Channel excavation site. Channel base composed entirely of silt, some small-diameter wood in channel.

Point 16 (picture below): Channel excavation site. Channel base composed entirely of silt, some small-diameter wood in channel. Channel flow stagnant, pond-like. Small amount of pea-sized gravel in channel coming from South Fork Elk River here. Dense alder overstory with some large-diameter cottonwoods on south bank. Dense willow-alder dominated riparian overstory and understory. Habitat conditions here resemble those where Willow flycatchers have nested recently in Humboldt County (e.g., Mar River Fish Hatchery site).

Point 17: Floodplain grading site. Channel base composed entirely of silt, some small-diameter wood in channel. Channel flow stagnant, pond-like. Predominantly dense willow.

Point 18: Floodplain grading site. Channel base composed entirely of silt, some small-diameter wood in channel. Channel flow stagnant, pond-like. Predominantly dense willow.

Point 19: Sediment deposition site, pasture-like open area.

Point 20: Sediment deposition site, pasture-like open area.

Point 21: Sediment deposition site, pasture with some *Juncus* clumps.

Point 22: Sediment deposition site, pasture.

Appendix 3. Species detected during the site visit at 22 point locations in the proposed project areas, visited on the 15th of December 2017.

Class	Common Name	Scientific Name	Status
Amphibia	Pacific chorus frog	*Pseudacris regilla*	None
Aves	Red-shouldered hawk	*Buteo linneatus*	CA-FP (nesting)
	Red-tailed hawk	*Buteo jamicensis*	CA-FP (nesting)
	American kestrel	*Falco sparverius*	CA-FP (nesting)
	Hairy woodpecker	*Leuconotopicus villosus*	None
	Downy woodpecker	*Dryobates pubescens*	None
	Northern flicker	*Colaptes auratus*	None
	Red-breasted sapsucker	*Sphyrapicus ruber*	CA-WL
	Wilson's snipe	*Gallinago delicata*	None
	Anna's hummingbird	*Calypte anna*	None
	Black phoebe	*Sayornis nigricans*	None
	Steller's jay	*Cyanocitta stelleri*	None
	Gray jay	*Perisoreus canadensis*	None
	Common Raven	*Corvus corax*	None
	Brown creeper	*Certhia americana*	None
	Chectnut-backed chickadee	*Poecile rufescens*	None
	Black-capped chickadee	*Poecile atricapillus*	CA-WL
	Golden-crowned kinglet	*Regulus satrapa*	None
	Ruby-crowned kinglet	*Regulus calendula*	None
	Varied thrush	*Ixoreus naevius*	None
	American robin	*Turdus migratorius*	None
	Hermit thrush	*Catharus guttatus*	None
	Pacific wren	*Troglodytes pacificus*	None
	Orange-crowned warbler	*Oreothlypis celata*	None
	Yellow-rumped warbler	*Setophaga coronata*	None
	Savanna sparrow	*Passerculus sandwichensis*	None
	White-crowned sparrow	*Zonotrichia leucophrys*	None
	Golden-crowned sparrow	*Zonotrichia atricapilla*	None
	Song sparrow	*Melospiza melodia*	None
	Fox sparrow	*Passerella iliaca*	None
	Dark-eyed junco	*Junco hyemalis*	None
	Spotted towhee	*Pipilo maculatus*	None
	Western meadowlark	*Sturnella neglecta*	None
	Brewer's blackbird	*Euphagus cyanocephalus*	None
	Red-winged blackbird	*Agelaius phoeniceus*	None
	House finch	*Haemorhous mexicanus*	None
	Red crossbill	*Loxia curvirostra*	None
Mammalia	Black -tailed deer	*Odocoileus hemionus*	None
	Allen's chipmunk	*Neotamias senex*	None

Appendix 4. Proposed pre-construction surveys and during-construction monitoring schedule and estimated budget.

Dates for Surveying and Monitoring	Tasks	Hours	Cost
As Directed by Project (Estimated July-Aug)	In-stream survey and removal of adult or larval amphibians prior to de-watering activities. Note: this could be done by electro-shocking crews if they are properly trained.	16	$800
As Directed by Project (Estimated Aug)	Pre-disturbance clearance surveys for de-watered channels to re-locate any adult amphibians that have moved in these areas prior to ground disturbing activities.	16	$800
As Needed (Estimated Aug-Oct)	Spot clearance survey as needed to clear areas when ground disturbing activities will resume after > 2 days of inactivity	4/ survey	$200/ survey
As Needed (Estimated July/Aug)	Nest search if project activities are desired prior to Aug 15th.	24	$1,200
As Needed (Aug 15-31)	Nest search if project activities that disturb vegetation are desired between Aug 15-31.	12	$600
June-July	Protocol Willow flycatcher surveys across entire project area during period 2 and 3.	20	$1,000
As Directed by Project (Estimated Aug)	Surveys at all potential bat roost sites in the project area to determine occupancy and state of use.	10	$500
	Minimum Estimate of Survey and Monitoring Budget **Does not include all "As Needed" surveys*		$3,100
	Maximum Estimate of Survey and Monitoring Budget **Includes all "As Needed" surveys*		$5,700

APPENDIX G

Cultural Resources Investigation

A Cultural Resources Investigation for The Elk River Sediment Removal Pilot Implementation Project Humboldt County, California

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CONFIDENTIAL INFORMATION

Information regarding the location, character or ownership of a historic resource is exempt from the Freedom of Information Act pursuant to 16 U.S.C. 470w-3 (National Historic Preservation Act) and 16 U.S.C. § 470hh (Archaeological Resources Protection Act) and California State Government Code, Section 6254.10. This document may contain sensitive information regarding the nature and location of archaeological sites that should not be disclosed to unauthorized persons.

Cover photo: View to the north (downstream) on November 9, 2017 of the North Fork Elk River proposed for sediment removal, near the Elk River Road Bridge on parcel number 311-243-001.

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1.0 INVESTIGATION SUMMARY

During the Fall of 2017, California Trout (CalTrout) contracted with William Rich and Associates (WRA) to complete a cultural resources survey of several privately-owned parcels proposed for a floodplain restoration project along lower North Fork Elk River at the confluence of the South Fork Elk River, about six miles southeast of Eureka in Humboldt County, California. CalTrout proposes to improve habitat for anadromous fish and other wildlife by excavating accumulated flood sediments from river-banks and create pools containing woody structures for fish habitat.

The purpose of this investigation is to document whether significant cultural resources are present within the proposed project area. The methods detailed in the investigation included a review of the confidential files at the Northwest Information Center (NWIC) and other historical reports and published literature pertinent to the project area. Correspondence was conducted with the Native American Heritage Commission (NAHC), tribal representatives, and other knowledgeable individuals. A comprehensive field survey covering approximately 35 acres was performed over the entire project area in November of 2017.

The proposed project will occur on eleven Assessor Parcel Numbers (APN): 311-021-013, 311-041-003, 311-041-006, 311-041-007, 311-041-008, 311-041-017, 311-041-018, 311-051-002, 311-242-001, 311-243-001, and 311-243-002, between Elk River Road/Wrigley Road and the North Fork Elk River.

Ethnographic and historical research identified the project area within the traditional territory of the Wiyot Tribe. Numerous ancestral Wiyot village sites are located along the historical margins of nearby Humboldt Bay; fewer are known for the Elk River Valley. Historically, the project area was settled upon by Euro-Americans by 1860, initially by Colonel William Hagans and his associate Jefferson Thomson. Other landowners in the vicinity of the project area included Oscar J. Gates, George W. Armbaugh, Thomas L. Barnes, the Dolbeer & Carson & Central Trust Company, M.T. Bell, Wharton, J.R. Hanify & Albert C. Hooper, Sherman Stockhoff, the Elk River Mill & Lumber Company, George E. Wrigley and his two sons Irving Wrigley and Winfield Wrigley, M.M. Mazzucchi and Jess Butterfield.

The Tribal Historic Preservation Officer’s (THPO) of the Wiyot Tribe, Blue Lake Rancheria and the Bear River Band of the Rohnerville Rancheria were contacted during the course of this investigation. This was initiated with the NAHC who were asked to provide a current list of Native American individuals to contact for this portion of Humboldt County. William Rich corresponded with THPOs Ted Hernandez, Erika Cooper and Janet Eidsness via written letter and email. As a result of correspondence with local Wiyot Tribe representatives, it appears that no specific tribal cultural resources are known.

According to the NWIC, the project area has not been included in any previous cultural resource surveys; however a total of 16 surveys have been conducted within ½-mile of the project area. In addition to other historic sites outside the study area, these 16 surveys cumulatively resulted in the identification of two historic-period railroad lines, one of which, the Dolbeer & Carson Lumber Company Railroad line (P-12-000055), passes through the project area at APN 311-041-006. The other railroad grade, the Bucksport & Elk River Railroad Grade (P-12-002061/CA-HUM-1313H), is recorded about 400 feet south of the project area at APN 311-021-013.

Conditions during the field survey were excellent in much of the project area, as mineral soil exposures were present throughout the majority of the survey area; which is almost entirely within the flood plain of the North Fork Elk River. In areas where ground surface visibility was obscured, a long-handled shovel was used to clear surface vegetation and leaf-litter to expose mineral soil.

The field survey resulted in the identification of the early 20th-century ranch and apple farm of George Wrigley and his son Irving, and a new segment of the previously recorded (P-12-00055) 1930s-era Dolbeer & Carson Lumber Company Railroad grade. Both of these historical sites are located within the project area. Additionally, the now vacant 1950s-era residential home of Winfield Wrigley is located adjacent to the project area and was also identified as part of this investigation

It is recommended that the section of the Dolbeer & Carson Lumber Company Railroad grade, identified in a portion of this project area, not be considered individually eligible to the California Register of Historical Resources (CRHR). This grade feature, would however, have the potential to contribute to a larger, as-yet unrecorded, district of Dolbeer & Carson railroad features in the Elk River Valley and should be avoided for this reason. The George and Irving Wrigley Ranch, containing buildings, orchards, roads, and other small scale elements, appears to retain requisite integrity to qualify as an historical resource for the purposes of CEQA, for its local association with early-20th century apple production and the associated small-scale, family-run commercial business operations of the Elk River Valley. The site elements that contribute to its significance should be avoided during project implementation. The Winfield Wrigley home, located immediately adjacent to the project area does not appear to be an historical resource for the purposes of CEQA.

Historical resources from the early 20th century are present in the proposed project area, however there appears to be few potential impacts. With implementation of avoidance measures outlined in Section 7.1, the proposed project will not cause a significant impact.

Although this report suggests that it would be unlikely to encounter significant buried archaeological materials during implementation of the project permit, it does provide brief guidance in the instance archaeological materials are unearthed during project implementation.

2.0 PROJECT DESCRIPTION

The proposed project is located along approximately 1.5 miles of stream channel of primarily the North Fork Elk River about five miles southeast of Eureka in Humboldt County, California (Figure 1). Specifically, the project area occurs on private lands in the north half and the NE ¼ of the SE ¼ of Section 26, Township 4 North, Range 1 West (Humboldt Meridian), as shown on the 1972 7.5' USGS Topographic Quadrangle Map, Fields Landing, California (Figure 2).

Figure 1. Project vicinity map showing the location of the project.

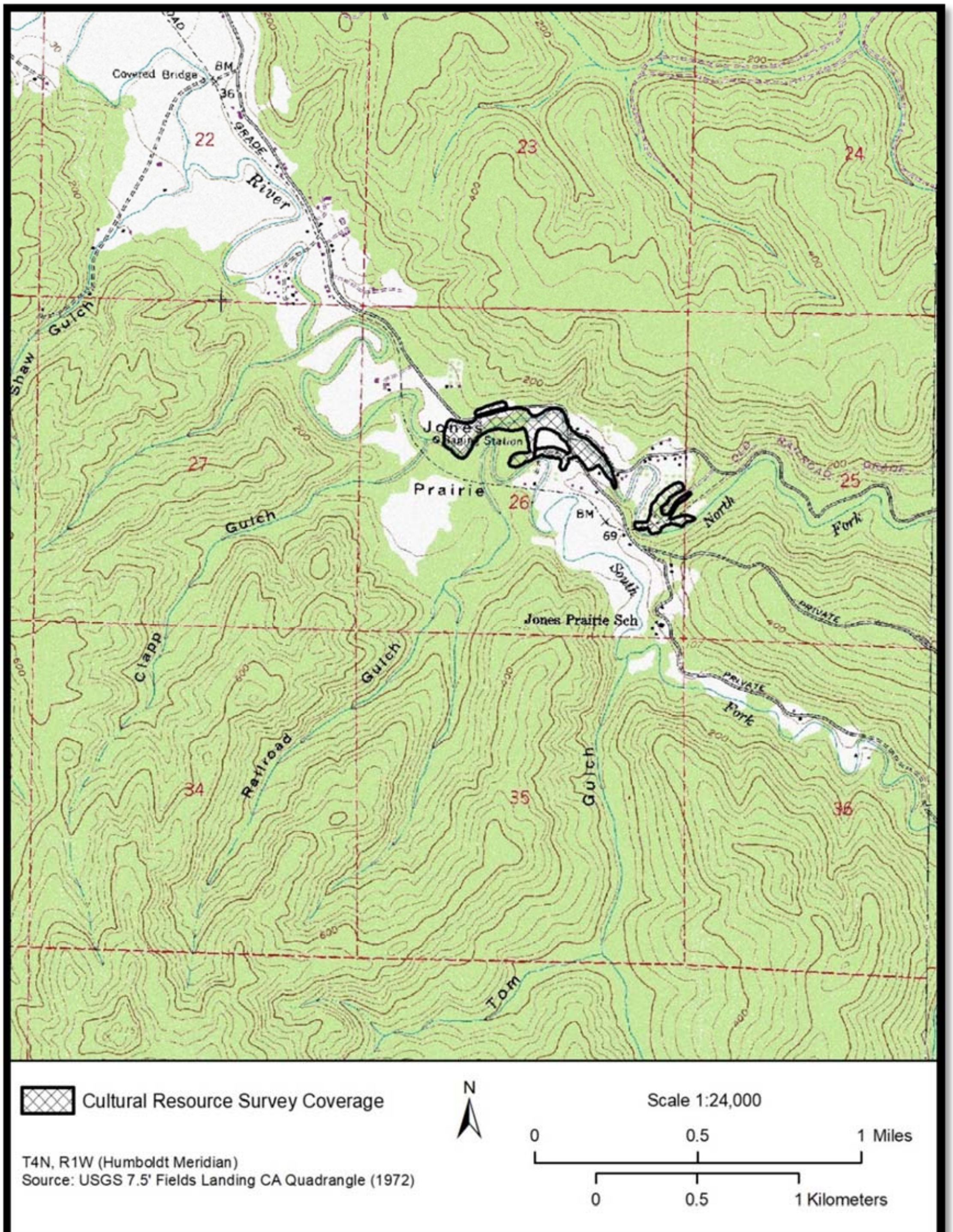

Figure 2. Cultural resource survey coverage map.

The proposed project includes sediment removal from seven in-channel locations and seven floodplain locations, creation of in-channel sediment detention basins (pools), and the reuse of excavated sediment spoils in ten nearby areas (Figure 3). Large wood structures will be built using logs in the excavated pools, in order to create scour pools which will also function as fish habitat. Floodplain areas adjacent to the excavated channel reaches will be lowered, to remove accumulated sediment and enhance floodplain dynamics. All but one of these locations are within the 100-year flood zone of the lower North Fork Elk River and a short reach of Elk River. The project is designed to increase the channel width and capacity of the lower North Fork Elk River, resulting in enhanced fish habitat, and will provide data on the effectiveness of various sediment remediation techniques.

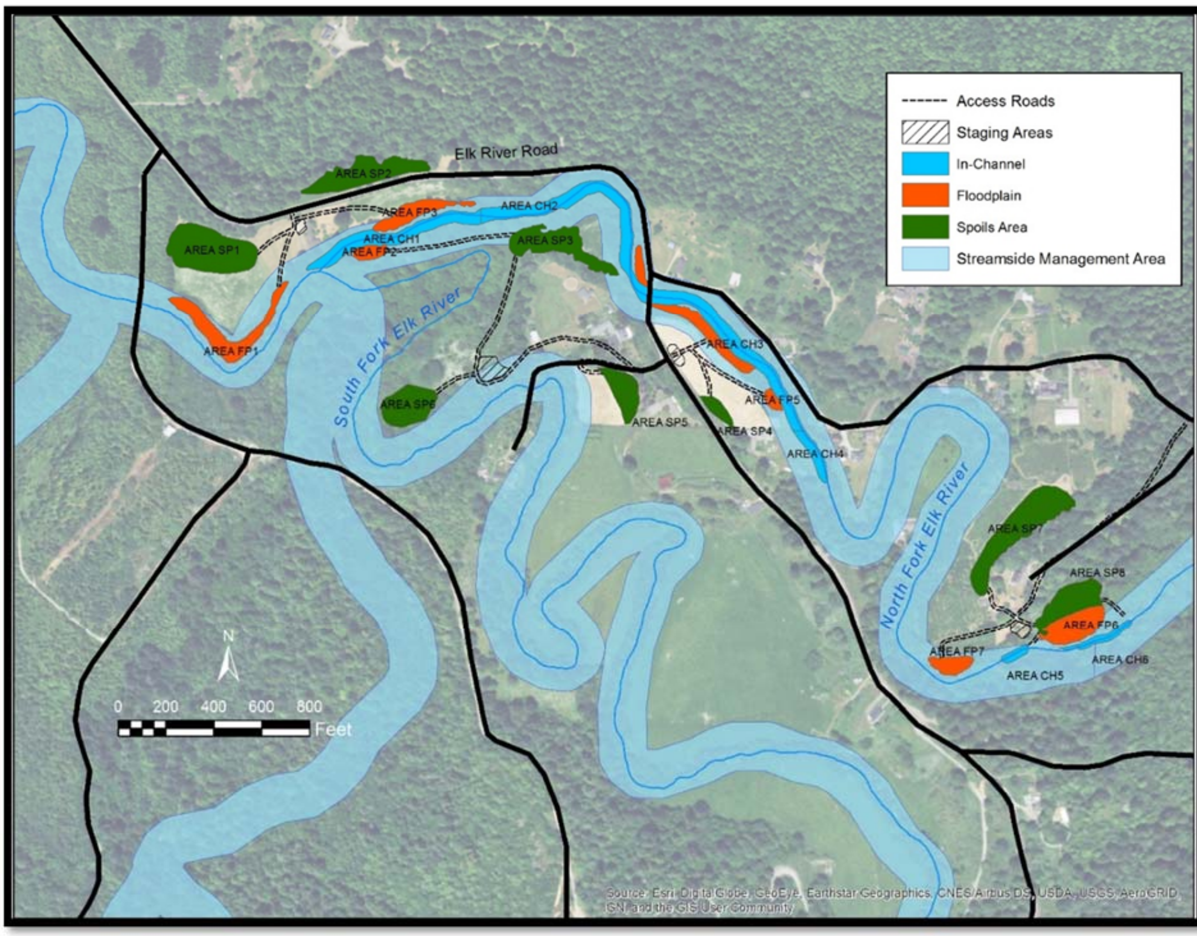

Figure 3. Map of the project area, courtesy of California Trout, Arcata, CA.

3.0 REGULATORY FRAMEWORK

3.1 California Environmental Quality Act

The California Environmental Quality Act (CEQA) requires a Lead Agency to consider the possible adverse effects a project could have to historical resources (Public Resources Code (PRC) Sections 21084 and 21084.1). CEQA's intent ensures that government decision makers consider the potential significant environmental effects of proposed projects before taking action. CEQA applies to all discretionary projects and equates a substantial adverse change in the significance of a historical resource with a significant effect on the environment (PRC 21084.1). The Lead Agency is responsible for determining whether adverse change will occur and whether it can be mitigated to a level considered less than significant. Where evidence indicates that a significant adverse effect will occur, the Lead Agency shall prepare an Environmental Impact Report which discusses the potential impacts and feasible means of avoiding or reducing it. Where adverse effects can be mitigated to a level of insignificant through changes in the project or other requirements, a mitigated negative declaration can be prepared.

Section 15064.5(a) of the CEQA Guidelines defines "historical resource" as the following:

> *(1) A resource listed in or determined to be eligible for listing in, the California Register of Historical Resources*
>
> *(2) A resource included in a local register of historical resources, as defined in section 5020.1(k) of the Public Resources Code, or identified as significant in an historical resource survey meeting the requirements of Section 5024.1(g) of the Public Resources Code, shall be presumed to be historically or culturally significant. Lead agencies must treat any such resource as significant unless a preponderance of the evidence demonstrates otherwise*
>
> *(3) Any object, building, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be an historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing on the California Register of Historical Resources (PRC 5024.1, Title 14 CCR, Section 4852) including the following:*
>
> > *(A) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;*
> > *(B) Is associated with the lives of persons important in our past;*
> > *(C) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or*
> > *(D) Has yielded, or may be likely to yield, information important in prehistory or history.*

(4) The fact that a resource is not listed in, or determined to be eligible for listing in the California Register of Historical Resources, not included in a local register of historical resources, or identified in an historical resources survey does not preclude a lead agency from determining that the resource may be an historical resource as defined in Public Resources Code sections 5020.1(j) or 5024.1."

Based on Section 15064.5(b)(2), a project would have a significant adverse effect on historic resources if the project causes a substantial adverse change in the significance of a historical resource. This includes demolishing or altering the physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register of Historical Resources or a local historic register, or by disturbing any human remains including those interred outside of formal cemeteries.

Section 15064.5(c) applies to effects on archaeological sites as follows:

(1) When a project will impact an archaeological site, a lead agency shall first determine whether the site is an historical resource, as defined in subsection (a).

(2) If a lead agency determines that the archaeological site is an historical resource, it shall refer to the provisions of this section and Section 15126.4 of the Guidelines.

In addition, the CEQA Guidelines (Section 15064.5(c) (3), and (4)) provide tests for significance for archaeological resources, as summarized below:

(1) If the site does not meet the criteria [for a historical resource] (a), but does meet the definition of a unique archaeological resource in Section 21083.2 of the Public Resources Code, the site shall be treated in accordance with the provisions of section 21083.2.

(2) If an archaeological resource is neither a unique archaeological nor an historical resource, the effects of the project on those resources shall not be considered a significant effect on the environment.

In addition to meeting one or more of the above criteria, the resources must be at least 50 years of age. A resource less than 50 years of age may qualify if it is exceptionally important to understanding our more recent history.

4.0 ARCHAEOLOGICAL SETTING AND CULTURAL CHRONOLOGY

The prehistory of the Northwest California region has a prehistoric record reaching to the early Holocene Period. Archaeological research in this general region has hypothesized a continuous prehistoric cultural chronology for the last 7,100 years before present. Oldest is the Borax Lake Pattern (8,000 to 3,000 B.P.) attributed to the earliest known prehistoric occupation for this portion of northwest California. These remains are thought to represent the activities of small, highly mobile family groups who ranged over wide areas (Fitzgerald and Hildebrandt 2001). The Middle Period (5,000 to 2,500 B.P.) is represented by the Mendocino Pattern, an adaptive orientation toward the use of low elevations, located along salmon bearing streams near acorn crops and which could be occupied by larger concentrations of people during the winter months (Bickel 1979; Hildebrandt and Hayes 1983, 1984). Archaeological sites associated with middle period assemblages have been located in the coastal hills adjacent to Humboldt Bay and at bay margin sites in Arcata, about three miles north of the project area (Eidsness 1993). The late period Tuluwat (formerly Gunther) Pattern is generally dated after 1,100 years ago and presumed to represent a continuation of the Middle Archaic Period with a particular focus on coastal resources (Fredrickson 1984; Kroeber 1925; Loud 1918). Sites dating to this time are found throughout the western North Coast Ranges in moderate density.

Late period sites have recently been investigated on the Samoa Peninsula, across Humboldt Bay from the project area. Site CA-HUM-321, located about 3.6 miles northwest of the current project area, was first identified by French and Stratford (1976), and was the subject of a limited excavation in July 2010 (Tushingham et al. 2016). This excavation was important in its identification of the first evidence on California’s north coast of mass-harvesting of fish (particularly smelt) and shellfish, and of site components which exceed in age by several hundred years those at the Wiyot village of Tuluwat (CA-HUM-67) on Indian Island, about four miles west of the project area, which was excavated by L.L. Loud in 1913 (Loud 1918; Tushingham et al. 2016). The site was found to contain an intact, stratified midden deposit up to a depth of 205 centimeters.

Site CA-HUM-23 (P-12-000081), located half a mile northwest of Samoa on the east side of the peninsula, about 4.7 miles west of the project area, is the ethnographic Wiyot site of Wikti (Loud 1918:231, 274-275). The ceremonial village site was first documented by Loud (1918) and subsequently by Nomland and Kroeber (1936), Tamez (1975), Merriam (1976) and Benson (1977) (Tushingham et al. 2016). The excavation of a single 1x1 meter unit at this site revealed an assemblage “consistent with those recovered at other shell middens around Humboldt Bay” (Roscoe 2016:10).

All three of these archaeological sites contain intact midden deposits capable of yielding data which would make them eligible for inclusion on the NRHP under Criterion D. The Samoa site (CA-HUM-23) was an important ceremonial site for the Wiyot people in historic and ethnographic times and is also likely eligible under Criterion A for being associated with important events (the occurrence of ceremonial dances significant to the Wiyot people).

5.0 ETHNOGRAPHIC AND HISTORIC PERIOD OVERVIEW

5.1 Ethnogeography

The project area lies within the traditional territory of the Wiyot Tribe. The closest known ethnographic village was *Chwanochkok*, which was located along Elk River near the site of Elk River School; "it was used as a camping place where salmon, caught in the river, were dried." It was "chiefly of interest because of myths connected with the place" (Loud 1918:273, 286, Map 1). It is situated about two miles northwest of the project area.

Closer at hand was an important Wiyot travel corridor. It began at the "head of canoe navigation" and continued as a trail ascended the ridge north of the North Fork Elk River to Kneeland Prairie (Loud 1918:231, Map 1). This description places the trail a few hundred yards north of the project areas along the ridge north of Elk River. It probably started about 0.2 mile north of the westernmost project area.

The project areas are closely related to a series of incidents that directly affected the Wiyot tribe. In 1860, the land at the forks of Elk River was owned by William B. Hagans, one of the leaders in the plot to massacre the inhabitants of more than a dozen Wiyot villages, including Dulawat at Indian Island. Hagan's ranch also included part of the pack train trail to the Humboldt County interior, which ranchers who were aggrieved by the conflict traveled upon. Some of them stopped at Hagan's place and helped plan the massacres there (Rohde 2010). The Hagans ranch was subsequently attacked and looted in 1864 (Rohde 2012:25).

5.2 History

There is little specific historical information about the North Fork Elk River during the early years following the arrival of Euro-Americans. The government survey map for the area, completed in 1855, shows the "Eureka and Trinity Trail," following a northerly course from the vicinity of the river confluence, apparently emanating from Eureka and then passing along the ridge east of Elk River to Kneeland's Prairie (Surveyor General 1855). The variously named trail was apparently built by the merchants of Humboldt City, who were the first on the bay to cut a trail to the Trinity mines, "the route passing up Elk River to Kneeland Prairie" and then heading east (Coy 1982:69). The first official county map, from 1865, shows the route as the "Old Humboldt Trail."

The first European-American landowners in the area were the notorious Indian-killer, Colonel William Hagans, and his associate Jefferson Thomson. The two filed a claim to 160 acres including the south ½ of the NW 14/ and the NW ¼ of the NW ¼ of Section 26, T4N, R1W, along with 40 acres to the west in Section 27, in November 1860 (BLM 2017a). The land was granted under 1855 Scrip Warrant Act, which provided for the issuance of land or other payment ("scrip") for military service.

Four years later, in 1864, the year the Hagans' ranch was attacked by Indians, Oscar J. Gates and George W. Armbaugh were issued 160 acres, also under the Scip Warrant Act. This property consisted of the S ½ of the NW ¼, the NW ¼ of the NE ¼ and the NE ¼ of the NW ¼ of Section

26 (BLM 2017b). In March 1866, 120 acres was issued to Thomas L. Barnes, of the Captain Orr's Company Indiana Militia, which consisted of the NE ¼ of the SE ¼ and the W ½ of the SE ¼ of Section 26 (BLM 2017c).

In 1882, the Elk River Mill and Lumber Company and the Elk River Rail Road (ERRR) were incorporated by Noah Falk and several associates to harvest and transport timber from their holdings in the Elk River valley (Carranco and Sorensen 1988). The following year, the California Redwood Company and the Dolbeer & Carson Lumber Company were incorporated; and following logistic and financial trouble, the two companies re-organized the ERRR as the Bucksport and Elk River Railroad Company (B&ERRRC), and the standard-gauge railroad was built from Bucksport up the river to the confluence and on into the South Fork. The railroad appeared on maps beginning with the 1886 county map, which shows the whole of Section 26 as part of the expansive property of the Dolbeer & Carson Central Trust Co. (Forbes 1886). The 1886 map also shows the name M.T. Bell on the south ½ of the NE ¼ and the NE ¼ of the NW ¼ of Section 26; and the name Wharton on the SE ¼ of the section.

In 1892 Dolbeer & Carson wanted to build a spur line off of the main B&ERRRC line that would go up the North Fork Elk River to reach their timber holdings there. Other co-owners of the rail line sued to prevent the construction of this spur line. The trial court ruled in favor of the plaintiffs (*Federal Reporter* 1895:974-976). Dolbeer & Carson appealed, and anxious to continue cutting timber while the case was still in the courts, they shifted the logging operations to Lindsay Creek and the South Fork Little River, near Fieldbrook north of Arcata (Carranco and Sorensen 1988:36-37; Forbes 1886; Melendy 1959:67). Dolbeer & Carson eventually won a reversal on appeal, but they were busy with their new logging operation in the Fieldbrook area for decades (*Federal Reporter* 1895:972, 979). Only in the 1930s did they again turn their interest to the North Fork Elk.

The 1911 county map and 1922 county atlas both show the former Dolbeer & Carson lands in the ownership of Hanify & Hooper (Belcher 1922:6; Denny 1911) (Figure 4). J.R. Hanify and Albert C. Hooper, of San Francisco, had been securing interests in the Elk River timberlands for several years, and by 1922 Section 26 formed the northeast corner of a four-square mile area under their ownership (Carranco and Sorensen 1988:99). Hanify also acquired the California Redwood Company and the Elk River Mill and Lumber Company around that time.

Figure 4. Detail of the 1922 county atlas, showing the properties of Hanify & Hooper, Sherman Stockhoff, George Wrigley, and Mazzucchi (Belcher Abstract and Title Co. 1922:6).

The 1922 county atlas also shows that M.T. Bell's former 120-acre parcel had been transferred to Sherman Stockhoff, and two new names appear around the river confluence: Mazzucchi on most of the SE ¼, and Wrigley on the NE ¼ of the SE ¼ of the section (Belcher 1922:6).

George Wrigley was born in New Brunswick in 1858 and came to Humboldt County at the age of 28 with his wife Mary, via a passenger train and then a ship to Eureka. After settling in the Elk River valley, he went to work at Noah Falk's mill on the South Fork, where he assumed the responsibility of being Falk's first blacksmith (Gates 1983:39; Irvine 1915:1150). After the mill at Falk burned down in 1900, Wrigley assisted in reconstruction and served as head blacksmith. He planted and maintained extensive fruit orchards, and provided beef to Noah Falk for use in the Falk cookhouse. His brother James Wrigley served as superintendent of the Bucksport & Elk River Railroad for 18 years, until he died.

George Wrigley's farm was described by Leigh Irvine in 1915, who reported that Wrigley was "attending to the cultivation of his fruit orchard, whereupon he raises many varieties of apples, such as such as Duchess, Wealthy, Red Astrachan, Gravenstein, King and Greenings, his fruit having received two blue ribbon prizes at the Watsonville exhibition of apples" (Irvine 1915:1150) (Figures 5 and 6). George and Mary had nine children, the last of whom, Irving Edwin Wrigley, eventually took over the family farm, as shown on the 1949 county atlas (Metsker 1949:19). Irving's daughter Kristi Wrigley now runs the ranch.

Figure 5. Aerial photo of the Wrigley Ranch, December 13, 1940, showing the original ranch house at center and the fruit orchard. The Dolbeer and Carson Lumber Company railroad sweeps from upper right, through the orchard and under the Elk River Ridge Road under a through-cut west of the Wrigley orchard.

Figure 6. Aerial photo of the Wrigley Ranch, September 13, 1956, showing the ranch house and fruit stand near center and an expanded fruit orchard along both sides of the railroad, which had been abandoned only four years earlier.

In February 1931, the first spike was driven on the long-awaited railroad extension up the North Fork (*Humboldt Standard* 1931). The first phase took the road two-and-a-half miles up the drainage (*Humboldt Times* 1931). At the same time, the company began rehabilitating the existing line from Wrigley's property around the project area to the Holmes-Eureka Lumber Company mill in Bucksport (*Humboldt Standard* 1931). Then, in 1932 the Bucksport & Elk River Railway was incorporated to replace the B&ERRRC. The Dolbeer & Carson Lumber Co. was the new company's sole owner (Carranco and Sorensen 1988:100, 102). Building the line up the North Fork cost an estimated $500,000; the work also included extending the Bucksport end of the rail line northward to a location "about 1,000 feet south of the foot of Murray Street" (now West Del Norte Street), where a new Dolbeer-Carson log dump was installed. From there, the logs were rafted to the Dolbeer-Carson mill farther up the bay (*Humboldt Standard* 1933).

Dolbeer & Carson located their headquarters camp ("Carson's Camp") on the North Fork Elk at Brown's Flat, near Brown's Gulch, a couple of miles east of the project area. By April 1934, the Dolbeer-Carson logging operation was running full blast, with their logging train making two round trips daily between Camp Carson and the log dump near Murray Street (*Humboldt Standard* 1934). By then the Elk River Mill & Lumber Company, located just over the ridge at Falk, had been closed for over three years (Gates 1983:131). It was the midst of the Great Depression, and local loggers must have flocked to the employment office of Dolbeer & Carson.

The 1949 county atlas shows that the Hanify & Hooper property had finally been transferred to the Elk River Mill and Lumber Company (Metsker 1949:19). Wrigley's property in the NE ¼ of the SE ¼ of Section 26 was then owned by his youngest son, Irving Edwin Wrigley. Sherman Stockhoff is still shown on the same parcel; Mazzucchi was replaced by "M. & M. Muzzuchi", and Jess Butterfield is shown on the SE ¼ of the NE ¼ of Section 26. The following year, the property encompassing the western part of the project area in the SE ¼ of the NW ¼ was bought by Winfield Wrigley, Irving's older brother.

Winfield Wrigley bought this property from the Reed family in 1950 and built the house and likely the waterpower, on the north side of the river, a few years later (Figure 7). In 1954, to protect the new house from the adjacent North Fork Elk River, Mr. Wrigley built the earthen berm in back of the house; the following year the river flooded but the berm protected the house. Over the coming few decades, the flooding continued to get worse, as logging operations upriver intensified (Easthouse 2002; Kristi Wrigley, personal communication 10 Nov. 2017). The 1964 flood was intense, and flooded the house, as did flood events in 1997 and other years. After Winfield passed away, the home has sat unoccupied although the home and grounds have been maintained by the family since that time. The property is now owned by Winfield Wrigley's niece, Kristi Wrigley.

Figure 7. Aerial photo from September 13, 1956 of the Winfield Wrigley house (center) and surroundings, on the south side of Elk River Road.

In 1950 the Bucksport & Elk River Railway was purchased by The Pacific Lumber Company; two years later the company took over Carson's Camp on the North Fork, shut it down and removed the Railway rolling stock from the North Fork to the South Fork, on the other side of the ridge (Carranco and Sorensen 1988:105). This marked the beginning of the era of truck transportation, bypassing the railroad lines which had served the logging industry for close to 80 years.

6.0 INVESTIGATION METHODS AND RESULTS

6.1 Background Archival Research

Background archival research was aimed at obtaining information pertinent to the pre-contact era and historical uses of the project's vicinity to generate specific geographic information about relevant archaeological and historic-era sites. Background research also provided an understanding of the types of cultural resources that were likely to be encountered in the project vicinity. Ethnohistoric research included an examination of historical maps, records and published and unpublished ethnographic documents at the Humboldt State University (HSU) Library, as well as, the author's personal libraries.

Also searched were the directories of the National Register of Historic Places for Humboldt County and the list of determined Eligible Properties, listing for the California Register of Historical Resources, local California Points of Historical Interest, and the listing of the California Historical Landmarks. This research indicated that the project location is not associated with or located near an historic district, historical landmark, locally registered historic resource, or nationally registered historic property.

Northwest Information Center Records Search

Background research for this project included an examination of the archaeological site records and survey reports at the California Historical Resources Information System's regional Northwest Information Center (NWIC) in Rohnert Park, California. On July 24, 2017 Research Associate, Melinda Salisbury B.A. conducted the record search under IC File #17-0656. Following completion of this cultural resources study, a copy of this report will be filed with the NWIC, per the access agreement.

The objectives of the record search were to: 1) review cultural resource survey reports that either included the project area or were conducted within ½ mile of the project area; 2) to review pertinent regional archaeological, ethnographic, and historical overview documents; and 3) determine if cultural or historical resources have been recorded within the project area or within ½ mile of the project area. This ½-mile buffer, including the project area, is defined as the study area (SA).

The records search at the NWIC revealed that the project area has not been included in any previous cultural resource surveys, and that a total of 16 surveys have been conducted within the ½-mile study area buffer (Table 1). In addition to other historic sites outside the study area, these 16 surveys cumulatively resulted in the identification of two historic-period railroad lines, one of which, the Dolbeer & Carson Lumber Company Railroad line (P-12-000055), passes through the project area at APN 311-041-006. The other railroad grade, the Bucksport & Elk River Railroad Grade (P-12-002061 / CA-HUM-1313H), is recorded about 400 feet south of the project area at APN 311-021-013.

Table 1. Previous studies within ½ mile of the project area

Survey Number	Title	Author/ Date	Results
S-000886	Archaeological Reconnaissance of the Humboldt Bay Area	James Benson 1977	No resources were identified in the study area.
S-013576	Confidential Archaeological and Historical Resources Survey and Impact Assessment - A Supplemental Report for a Timber Harvesting Plan, Railroad Gulch THP	William E. Kliener 1992	No resources were identified.
S-013606	Confidential Archaeological and Historical Resources Survey and Impact Assessment - A Supplemental Report for a Timber Harvesting Plan, X-Line THP #1-92-049 HUM	Steve Langager and Mitch Hunt 1992	No resources were identified.
S-015551	Confidential Archaeological and Historical Resources Survey and Impact Assessment - A Supplemental Report for a Timber Harvesting Plan, Gidding/Lemm THP	Mike Rosan 1993	No resources were identified.
S-018987	Archaeological and Historical Resources Survey and Impact Assessment, Archery Club THP	Stephen W. Dale 1996	Segment of the Dolbeer & Carson Co. railroad (P-12-000055), adjacent to the project area.
S-040739	Confidential Archaeological Addendum for Timber Operations on Non-Federal Lands in California, R-13-4 STCO #19-0003, THP #1-00-272 HUM	Gregory J. Templeton 2000	No resources were identified.
S-040803	Confidential Archaeological Addendum for Timber Operations on Non-Federal Lands in California, Turkey Foot THP #1-00-259 HUM	Merritt Lindgren 2000	Falk Mill and Townsite (P-12-000026), outside the current study area.
S-041236	Confidential Archaeological Addendum for Timber Operations on Non-Federal Lands in California, Corrigan 2 THP #1-00-452 HUM	Merritt Lindgren 2000	2 historic sites (P-12-001347 and -1348), outside the study area.
S-041479	Confidential Archaeological Addendum for Timber Operations on Non-Federal Lands in California, Casey Jones THP #1-02-217 HUM	Wayne Rice 2002	Site P-12-002028 was recorded, outside the current study area.
S-041620	Confidential Archaeological Addendum, Lawrence Family Forest, 1-02NTMP-034 HUM	Robert MacMullin 2002	No resources were identified.
S-041942	A Cultural Resources Investigation of the South Fork Elk River Road Decommissioning Project Located in Humboldt County, CA Department of Fish & Game Project #R1-69	K. Raskin and James Roscoe 2010	No resources were identified.

Survey Number	Title	Author/ Date	Results
S-042753	Confidential Archaeological Addendum for Timber Operations on Non-Federal Lands in California, Archers THP	Jason D. Cushman 2002	Dolbeer & Carson Lumber Co. Railroad line (P-12-000055); portions outside project area
S-043105	An Archaeological Survey Report for the Tom Collins Timber Harvesting Plan, Humboldt County, California, THP #1-07-189 HUM	Brian Griesbach 2008	Bucksport & Elk River Railroad Grade (P-12-002061)
S-044738	Headwaters Forest Reserve Evaluation of Heritage Resources for Proposed Construction Projects within the Historic Falk Complex, Humboldt County, California	Eric W. Ritter 2007	Falk Mill and Townsite (P-12-000026), outside the current study area.
S-045536	An Archaeological Survey Report for the Moss Elk Timber Harvesting Plan, Humboldt County, California	Todd Truesdell 2008	Dolbeer & Carson Lumber Co. Railroad line (P-12-000055); portions outside project area
S-048089	An Archaeological Survey Report for the Bridge Too Far Timber Harvesting Plan, Humboldt County, California THP #1-16-056 HUM	Jason Wells 2016	Dolbeer & Carson Lumber Co. Railroad line (P-12-000055); portions outside project area

6.2 Correspondence with Native American Tribal Representatives and Others

On October 5, 2017, WRA sent a letter to the Native American Heritage Commission (NAHC) requesting a search of the Sacred Lands Inventory File and a current list of Native Americans who might have knowledge of cultural resources in the project area (Appendix A). The NAHC responded on October 10, 2017 with negative results of the Sacred Lands search and provided a suggested list of Native American individuals to contact for this portion of Humboldt County. WRA contacted the Tribal Historic Preservation Officers (THPOs) of the Wiyot Tribe, the Bear River Band of the Rohnerville Rancheria and the Blue Lake Rancheria by email on December 7, 2017, providing a brief project description and map (Appendix A). Ms. Eidsness, THPO for Blue Lake Rancheria responded on December 11, 2017, that the location was outside of the Tribes' area of concern. Erika Cooper, THPO for the Bear River Band of the Rohnerville Rancheria responded with a request for information about findings. William Rich followed up with Ms. Cooper via email on December 14, 2017. Wiyot Tribe, THPO and Chairperson, Ted Hernandez responded with no concerns (Appendix A). No other inquiries or responses were received.

Property owner Kristi Wrigley was present for a small portion of the survey, and provided information about the history of the properties at the western and eastern ends of the project area.

6.3 Survey Methods and Results

6.3.1 Survey Expectations

A background literature search and geospatial terrain analysis for the project area vicinity generally indicated a low potential for Native American archaeological sites, isolated features and/or artifacts. The project is occurring almost entirely within the 100-year flood zone of lower North Fork Elk River, around the confluence with the South Fork Elk. However adjacent areas could still contain Native American archaeological site indicators including stone tools of chert and obsidian, stone tool manufacturing and maintenance debitage, ground stone implements, fire affected rocks, milling stone features, locally darkened midden soils, possibly shell and/or bone debris, petroglyphs or other carved stone features, pit features and rock alignments.

Historic period cultural resources associated with homesteading, ranching or transportation known to have occurred in this region generally could include sections of historic-period roads or trails, ditches, refuse deposits, fruit orchards or agricultural crops fencelines, and standing or ruined buildings. Archaeological sites would be marked by ruined buildings, abandoned farming equipment, or ceramic, glass or metal artifacts.

6.3.2 Field Investigation Methods and Results

On November 9 and 10, 2017, Research Associate Matthew Steele, B.A. assisted by Jarrett Lowery, B.A. conducted a pedestrian field survey of the entire project area, including each of the areas proposed for sediment removal and floodplain excavation, instream scour-pool creation, sediment spoil areas, heavy equipment access corridors and equipment staging areas. Property owner Kristi Wrigley was present during a small portion of the survey, and pointed out various historic features at APN 311-021-013 and 311-041-006.

The field survey included systematic parallel and zig-zag transects over the entirety of the project area and some adjacent areas, less than ten meters apart, while visually scanning the ground surface for mineral sediment exposures. Accessibility to mineral sediment was abundant throughout much of the project area, as large areas had recently been cleared of riparian vegetation, exposing ample opportunities to investigate for buried archaeological deposits (Figure 8). Other areas, mainly adjacent to the stream-channel, were covered in dense riparian vegetation, however these areas also contained mineral soil exposures in the form of stream-cut banks and rodent burrow tailings (see Cover Photo). Some areas were covered in low turf-grass. In these areas where vegetation or leaf litter obscured mineral soil, a long-handled shovel was used to expose soils in an effort to identify cultural resources. The field survey encompassed 35.1 acres, shown on the 1972 USGS 7.5’ Fields Landing quadrangle (see Figure 2).

Figure 8. View to the northwest of the central part of APN 311-242-001 proposed for bank-sediment removal, with the North Fork Elk River at right, November 9, 2017.

The field survey resulted in the identification of two historic-period properties within the project area, each containing a house and other structures; and one segment of the historic-period Dolbeer & Carson Lumber Company Railroad grade, which is part of a larger linear feature, previously recorded as P-12-000055 (Figures 9 and 10). This latter feature adjoins a 0.3 mile-long segment of the railroad recorded by S. Dale in 1996.

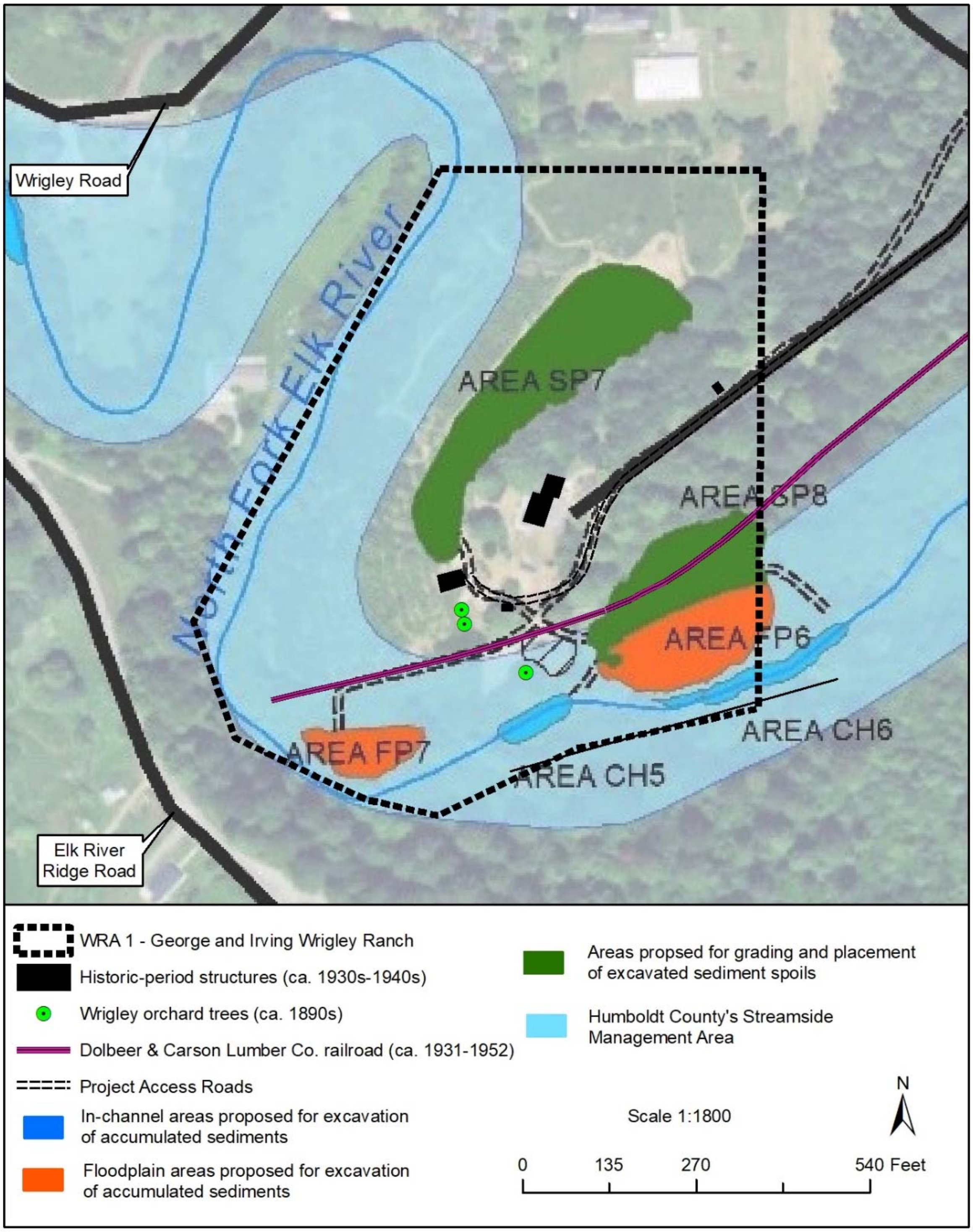

Figure 9. Project map showing proposed work at the Wrigley Ranch and in vicinity of Dolbeer & Carson Lumber Co. Railroad.

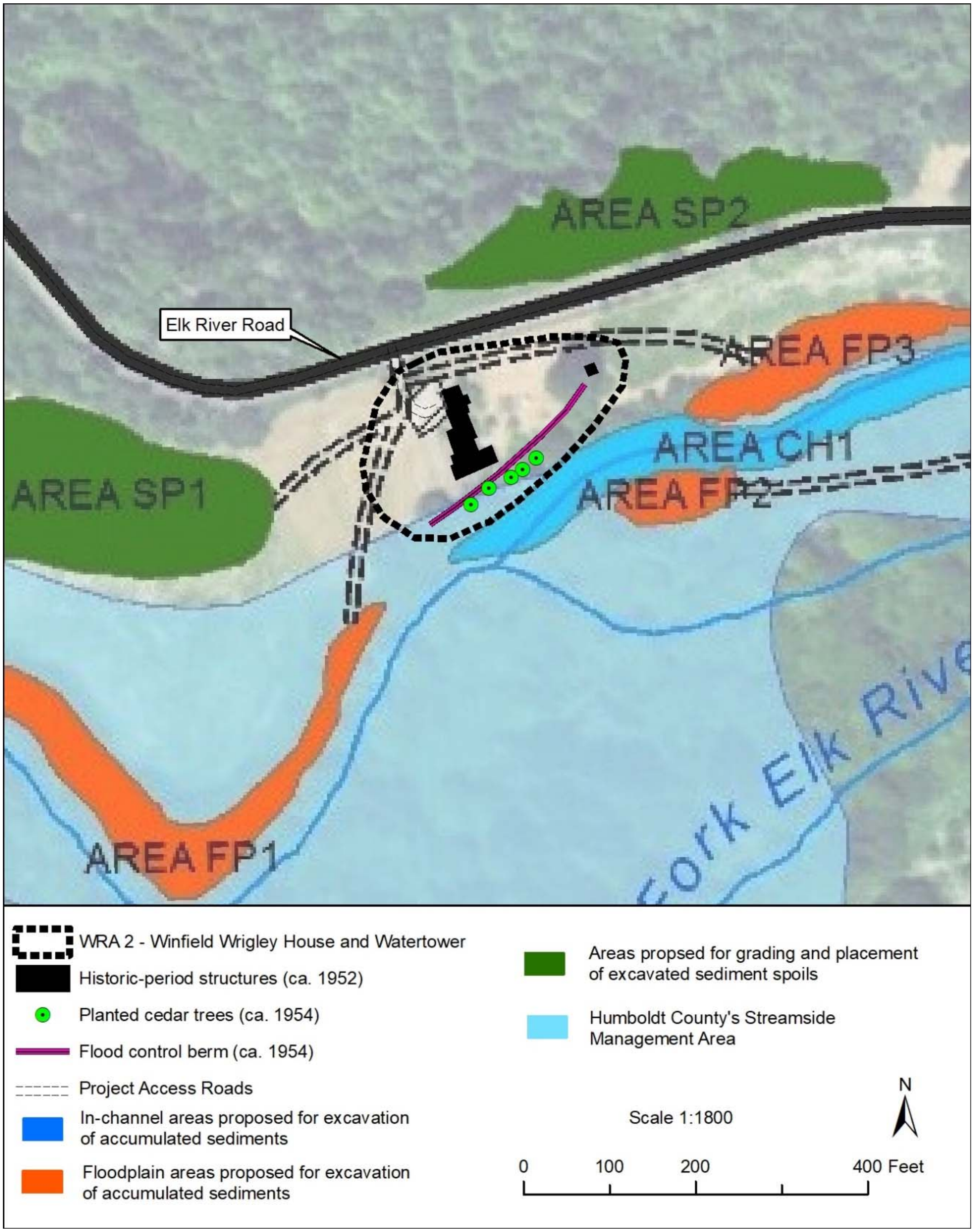

Figure 10. Close-up of project map showing proposed work at downstream reach near the Winfield Wrigley house.

6.3.3 Findings

<u>P-12-000055, the Dolbeer & Carson Lumber Company Railroad</u>

A 538 foot-long segment of the railroad grade was recorded during this investigation within the project area on the Kristi Wrigley property at APN 311-041-006. The segment recorded herein extends the previously identified segment recorded by Dale (1996), westerly through the project area on the Wrigley property, to the former crossing at the North Fork Elk River (Figure 11).

Figure 11. View to the northeast of the railroad grade berm on the Wrigley property, with the North Fork Elk River out of the picture to right.

This reach of the grade is now a raised berm running at a bearing of 255 degrees on the north side of the North Fork Elk River. The railroad berm appears to terminate at the river, as there is no grade beyond the river at this point. The through-cut which once permitted the passage of the railroad through the low hill on the west side of the river collapsed some years ago and was subsequently filled in, and is now gone (Kristi Wrigley, personal communication 9 Nov. 2017). The small timber bridge which carried the railroad over the river was destroyed in the winter floods of 1955 and 1964, and there are no longer any timbers, hardware or other signs of a wooden trestle bridge (Kristi Wrigley, personal communication 9 Nov. 2017). As the former through-cut across the river was filled in and is now forested, the grade appears to simply stop at the riverbank. The current landowner, Kristi Wrigley, who is the granddaughter of George E. Wrigley, who owned the property when the railroad was active in the early 20th century, stated that this section of the berm was formerly much taller as it approached the river crossing and through-cut opposite, and that the family salvaged much of the gravel aggregate used in the berm for use around the ranch in the intervening years after the railroad ceased operations in 1952.

The berm now is about 16-20 feet wide across the top and three feet tall, and about 23-26 feet wide across the base. However, as the berm was formerly taller, its original top width and height are unknown but were probably slightly less than what they are currently. This segment of railroad was recorded as an update to the existing P-12-000055 site record (Appendix B).

<u>George and Irving Wrigley Ranch</u>

The current property of Kristi Wrigley, at the east end of the project area, was recorded during this investigation on DPR 523-series forms under the field-name "WRA 1- George and Irving Wrigley Ranch" (Appendix B). The Wrigley Ranch was originally owned by George Wrigley and later managed by his son Irving Wrigley, and by its current owner, Irving's daughter Kristi Wrigley. The property encompasses 15.3 acres on the north side of the North Fork Elk River, 0.5 air-miles upriver from the confluence with the South Fork Elk. Extant historic-period structures include the Wrigley residence, a fruit stand-which is still in operation, an apple-drying shed, an equipment shed, three of the original orchard trees, and a segment of the berm of the Dolbeer and Carson Lumber Company railroad grade (P-12-000055), previously described, which bisects the southern part of the property.

The fruit stand appears on aerial photos from 1940, and likely dates to the Great Depression or earlier (Figure 12). It is a gable roof building on a post-and-pier foundation, on the eastern edge of the fruit orchard, at the end of the Wrigley's driveway. It measures about 36' x 22' and is open at the east end to accommodate the front sales counter and storage area. A 4.5' extension is apparent on the north side of the building, and a roof vent is present at the peak. One horizontal sliding window is present on the south side of the building, next to a chalk-board menu displaying available produce and other farm products. Exterior siding is horizontal V-rustic boards which appear to have been salvaged from another building.

Figure 12. View to the west of the front of the Wrigley fruit stand with the young apple orchard behind and surrounding the structure.

The apple-drying shed is a small, low, gabled structure southeast of the fruit stand, beneath the shady north side of a second-growth redwood tree. The lower walls are poured concrete; vertically-hung boards form the siding above. The roof is wood shingle. It measures about 17’ x 9’.

The residential house is a two story, side-facing gable house with an asphalt-shingle roof and concrete foundation, in the Minimal Traditional style popular from the 1930s through the 1950s (McAlester and McAlester 1996:477) (Figure 13). The house appears in aerial photos from 1956; an earlier photo from 1940 shows a house of a similar footprint but in a slightly different position; thus it appears the present house was built over that time. Windows are vinyl-framed and include horizontal sliders and 1-over-1 vertical casement windows. External siding is manufactured, cut wood shingle. A brick chimney with three square or rectangular chimney pots protrudes from approximately the middle of the house, on the back (west) side of the gable peak. The house has been remodeled with modern materials on the exterior and has a modern appearance. A one story, one-bay garage is attached to the house on the north side, by an enclosed breezeway.

Figure 13. View of the front (east) side of the Wrigley house, with garage at right.

A small, high-gabled equipment shed is located northeast of the house, along the west side of the driveway. The structure measures about 16’ x 20’ and has a wood shingle roof. A large sliding door is present on the front; and a regular hinged door opens into a shed-roofed attachment on the northeast side. One wood-framed, single-pane window is present on the front of the attachment, next to the hinged door. External siding includes vertically hung boards on the lower part of the structure and horizontal boards on the gable.

Of the original orchard planted around the turn of the century by George Wrigley, only three trees remain: two apples and a walnut (Figure 14). The apples are on the north side of the railroad grade, south of the fruit stand; the walnut is south of the railroad grade and is noticeably much healthier than the two apple trees. The landowner reports that the walnut was the first of the orchard trees to be planted on the property.

Figure 14. View of two of the three remaining orchard trees (apple) left from the original Wrigley orchard.

Winfield Wrigley House and Watertower

Near the western, downstream, end of the project area, a 1950s-era home and water storage tower were recorded during this investigation on DPR 523-series forms under the field-name "WRA 2 – Winfield Wrigley House and Watertower" (Appendix B). The home is a Ranch style house which has been unoccupied for several decades. A wooden watertower base, an earthen berm, built next to the house as flood-control, five cedar trees planted along the berm, and a concrete spring-box were also recorded.

The house was built between 1952 and 1954; the wooden watertower was built around the same time (Figure 15). The water storage tank which once stood atop the tower is gone, leaving only the wooden base structure. This property was purchased from the Reed family by Winfield Wrigley in 1950; the house was built within a few years (Kristi Wrigley, personal communication, 10 Nov. 2017). Mr. Wrigley used heavy equipment to construct a low berm on the property, between the house and the river, in 1954; the river flooded the following year, in 1955, and again in 1964. Following these floods, the home was abandoned and although the family has kept up the house and the surrounding grounds over the years, the house has sat unoccupied and remains so.

Figure 15. View to the southwest of the watertower and residence.

The Ranch style house is a one-story home with a side-facing, cross-gable plan and stud framing on a flat concrete foundation. The roof is split wood shingle; a rectangular brick chimney with a metal-covered vent protrudes from near the middle of the home, on the east side of the gable peak. Attic vents are present at the gable-ends. There are two entrances on the front (west) side; both feature a small, covered, stacked-brick patio. A third entrance is near the south end of the back (east) side of the house. Windows include a large, fixed-pane bay window on the front; 1-over-1 vertical wooden casement windows, single- and double-paired and double-hung wooden sash windows. External siding is a combination of horizontal lapped boards and vertically hung wooden pressboard. An attached two-bay garage is on the north, street-facing side of the house; the house and garage together occupy approximately 3,260 square feet. The wooden watertower platform is about 140 feet east of the house.

The earthen flood-control berm (ca. 1954) is approximately 244 feet long, and is most pronounced on the river-side of the house, where it reaches a maximum height of about four feet. The berm becomes less distinct between the house and the watertower.

6.4 Determination of Eligibility for Identified Resources

P-12-000055, the Dolbeer and Carson Lumber Company Railroad Line

It is recommended that the 538-foot long railroad feature is not individually eligible to the CRHR. However, as part of a larger, as-yet unrecorded district of railroad features in the Elk River Valley; which would include the Dolbeer & Carson Railroad grade and the main Bucksport & Elk River Railroad grade (P-12-002061), this feature may be a contributing element. The railroad was in operation from 1931 until about 1952, serving Carson's Camp and loggers of the North Fork Elk River valley under the Dolbeer & Carson Lumber Company, until it was bought by the Pacific Lumber Company in 1950.

This railroad grade segment is a part of this larger network of logging railroads, which itself may be eligible for the CRHR under Criterion A, for being associated with historical old-growth redwood logging to serve domestic and international markets. As such, it is recommended that the 538-foot long segment of railroad grade recorded herein is eligible for inclusion on the CRHR under Criterion A, as a possible contributing element to an as-yet unrecorded district of historical railroad grades in the Elk River valley of central Humboldt County.

WRA 1 – George and Irving Wrigley Ranch

The George and Irving Wrigley Ranch appears to be an historical resource for the purposes of CEQA, therefore, it is eligible for inclusion on the CRHR under Criterion A, for its association with early-19th century apple farming and processing, and small-scale, family-run commercial produce business operations. This is significant on a local level as part of the historic context of the north coast of California.

The Wrigley Ranch retains integrity of association, locating, materials, design, setting feeling. Some of the external material elements of the Wrigley residence have been updated, and the apple orchard planted by George Wrigley has been replaced with younger apple trees, but this would be expected for a property of such age.

The Dolbeer & Carson Lumber Company railroad (P-12-000055) which once bisected the apple orchard is now abandoned and reduced to a low berm. The railroad was only in operation for a short time (ca. 1931-1952) relative to the occupation of the ranch, as an apple farm by the Wrigley family, which spans over a century. All other structures on the ranch visible on historic-period aerial photos are still existing at the property, with the exception of a barn visible on the 1956 aerial photo but not on the 1940 aerial or the 1972.

The property has been in the Wrigley family for over a hundred years, and has been an active apple farm with a small, family-run produce stand in operation for much of that time. The site thus retains excellent integrity of feeling and association. The farm is still active as such today, although the orchard is scheduled to be replaced due to problems with floodwaters from the North Fork Elk River, which caused the death of much of the original Wrigley orchard (Easthouse 2002; Kristi Wrigley, personal communication 11 Nov. 2017). Between 1956 and 1972, aerial photos show that much of the central part of the orchard had been replaced, and since that time the rest of it was replaced; this is considered a normal part of the life of an active farm and not an adverse effect to its integrity.

WRA 2 – Winfield Wrigley House and Watertower

The Winfield Wrigley House and Watertower site does not appear to be an historical resource for the purposes of CEQA, therefore, it is not eligible for inclusion on the CRHR. The original boundaries of the parcel purchased by Winfield Wrigley in 1950 were not researched; it was likely limited to a smaller area than the current parcel area of 122 acres. The site is not demonstrably associated with any important past events. The home was only occupied for a short period of time, as winter flood events on the nearby North Fork Elk River reportedly increased dramatically around the time the house was built, due to intensive logging operations upriver

(Easthouse 2002; Kristi Wrigley, personal communication 10 Nov. 2017). Aside from the 1955 and 1964 flood events themselves, this property is not clearly associated with any events that have made a significant contribution to our history. This site is not associated with any significant past persons. The property was developed and occupied for a relatively short time by Winfield Wrigley, son of George and Mary Wrigley, and is now owned by Winfield's niece Kristi Wrigley. The residence and watertower, as well as, the low earthen berm and the rest of the site recorded herein, are not architecturally distinct or unique, are not the work of a master, do not possess high artistic values and are not particularly representative of a type or method of construction.

Finally, this site is not likely to yield information important in history or prehistory, beyond that presented in this site record. No prehistoric or Native American artifacts or deposits were identified on the property during the field survey; nor were any historic-period refuse deposits or other archaeological features which could help answer important research questions. This entire site lies within the flood plain of the North Fork Elk River, and is covered in a layer of young flood silt and fine sediments of unknown depth.

7.0 RECOMMENDATIONS AND CONCLUSIONS

The project area on the lower North Fork Elk River is not located within proximity of any reported Native American ethnographic or archaeological sites. In the historic period, homesteading of this area began in 1860 with Colonel William Hagans, who was affiliated with the massacre that year at Indian Island on Humboldt Bay; his ranch was attacked and looted by Native Americans in 1864. Other early settlers and historic-era landowners included Hagans' associate Jefferson Thomson, Oscar J. Gates, George W. Armbaugh, Thomas L. Barnes, the Dolbeer & Carson & Central Trust Company, M.T. Bell, Wharton, J.R. Hanify & Albert C. Hooper, Sherman Stockhoff, the Elk River Mill & Lumber Company, George E. Wrigley and his two sons Irving Wrigley and Winfield Wrigley, M.M. Mazzucchi and Jess Butterfield.

The early 20th-century ranch and apple farm of George Wrigley and his son Irving was identified and recorded near the eastern end of the project area during this investigation, and the 1950s-era home and other features associated with Winfield Wrigley were identified and recorded near the western end of the project area. Additionally, a segment of the 1930s-era Dolbeer & Carson Lumber Company railroad (P-12-000055) was recorded near the eastern end of the project area, as an update to the existing site record (Appendix B).

7.1 Recommendations for Identified Historical Resources

P-12-000055, the Dolbeer & Carson Lumber Company Railroad Line
Although there are no plans in the proposed project to disturb this historical feature, it is nevertheless recommended that the project avoid damaging effects to the Dolbeer & Carson Lumber Company railroad grade identified at APN 311-041-006. The railroad grade may be accessed by project equipment, under the condition that no disturbances to the overall dimension or physical character of the earthen feature occur.

WRA 1 – George and Irving Wrigley Ranch
Although there are no plans in the proposed project to disturb any of the features recorded as part of this site, it is nevertheless recommended that the project avoid damaging effects to the Fruit Stand, Apple-drying Shed and other features recorded as part of the WRA 1 - George and Irving Wrigley Ranch site.

No further recommendations are needed.

7.2 Conclusions

This investigation finds that historical resources are present in and adjacent to the project area, but with application and enforcement of avoidance measures, the project will not cause a substantial adverse change to the identified historical resources.

It is the opinion of WRA that the background research and field survey methods employed during this investigation were adequately matched to identify cultural resources at this project location. This report concludes that no significant archaeological or historic-period cultural resources that, for the purposes of CEQA, would be considered an historical resource, exist in the limits of the project area. Additionally, tribal cultural resources do not appear to be present within the direct project area. At this time, no further archaeological studies are recommended for the project, as it is currently proposed.

7.3 Protocols for Inadvertent Discoveries

Although discovery of cultural resources during project construction is not anticipated, the following pages offer recommendations to follow in this event. These recommendations are designed to ensure that potential project impacts on inadvertently discovered cultural resources are eliminated or reduced to less than significant levels.

Inadvertent Discovery of Cultural Resources

If cultural resources are encountered during construction activities, all onsite work shall cease in the immediate area and within a 50 foot buffer of the discovery location. A qualified archaeologist will be retained to evaluate and assess the significance of the discovery, and develop and implement an avoidance or mitigation plan, as appropriate. For discoveries known or likely to be associated with Native American heritage (prehistoric sites and select historic period sites), the Tribal Historic Preservation Officer's (THPO) for the Bear River Band of the Rohnerville Rancheria and the Wiyot Tribe shall also be contacted immediately to evaluate the discovery and, in consultation with the project proponent, the County, and consulting archaeologist, develop a treatment plan in any instance where significant impacts cannot be avoided. Prehistoric materials which could be encountered include obsidian and chert debitage or formal tools, grinding implements, (e.g., pestles, handstones, bowl mortars, slabs), locally darkened midden, deposits of shell, faunal remains, and human burials. Historic archaeological discoveries may include nineteenth century building foundations, structural remains, or concentrations of artifacts made of glass, ceramics, metal or other materials found in buried pits, wells or privies.

8.0 PROFESSIONAL QUALIFICATIONS

This investigation was completed by William Rich, M.A, RPA. Mr. Rich has over 16 years of professional experience in northwest California and meets the Secretary of Interior's Professional Qualifications Standards for Archaeology (Title 36 Code of Federal Regulations Part 61, and 48 Federal Regulation 44716). Mr. Jerry Rohde, M.A. and Mr. Matthew Steele, B.A. provided information regarding the ethnogeography and history of the project vicinity.

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APPENDIX A

Native American Correspondence

FAX COVER SHEET

DATE: October 5, 2017

TO: Native American Heritage Commission

FAX: 916-373-5471

FROM: William Rich, M.A., RPA

SUBJECT: Sacred Lands Database Search: **Elk River Restoration Project**

PAGES: 2 (cover and 1 map)

Dear NAHC,

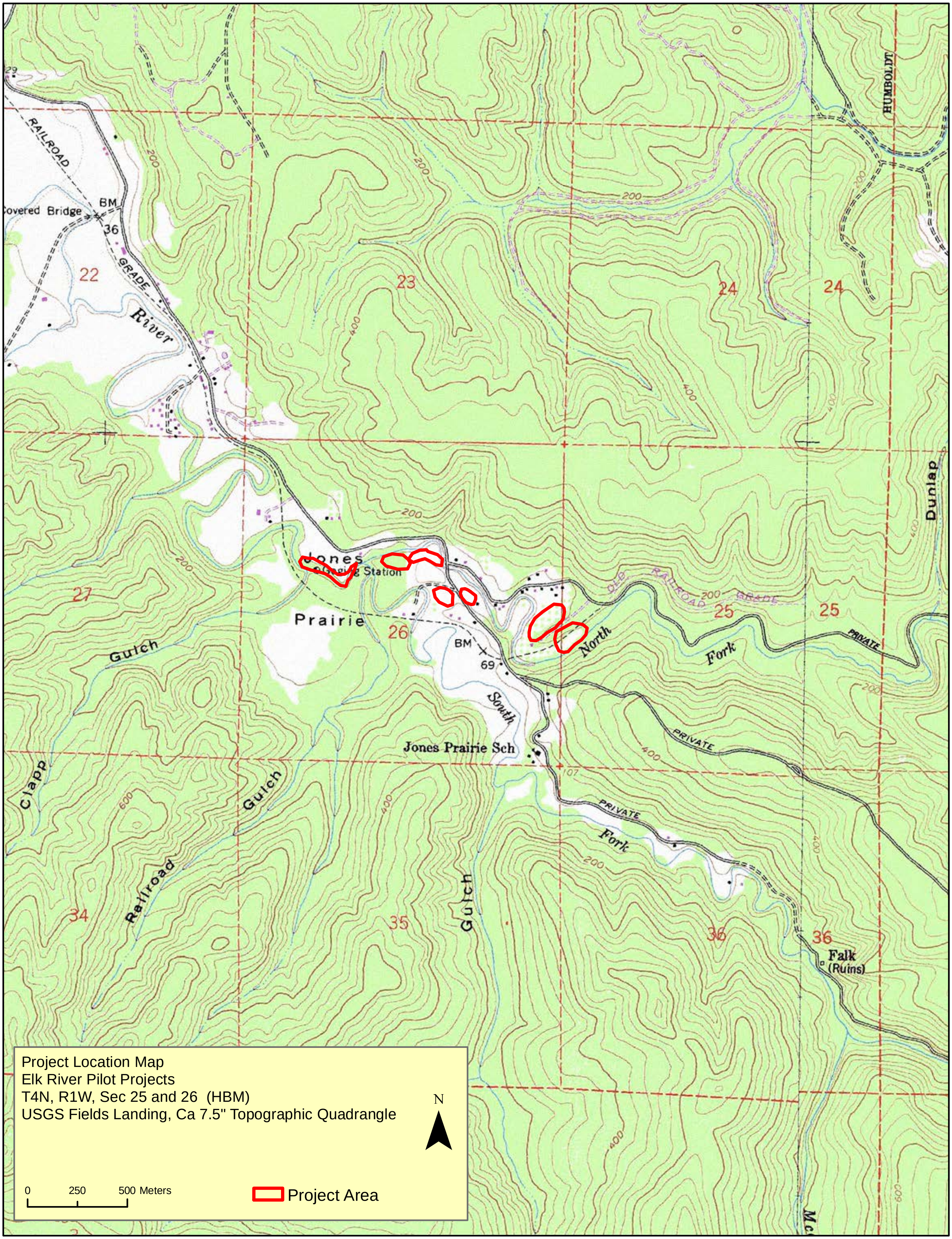
William Rich and Associates have been retained to conduct a cultural resources investigation for a restoration portion near the community of Elk River, Humboldt County, California. Specifically, the project is located in Section 25 and 26, T4N, R1W, as shown on the USGS 7.5' Fields Landing, CA Topographic Quadrangle. The project area is indicated on the accompanying map.

I would greatly appreciate a list of Native American contacts and the results of a search of the sacred lands database for previously identified sites of concern within the project area or a one-half mile radius.

Many thanks in advance for your assistance.

Sincerely,

William Rich, M.A., RPA
Principal Investigator
William Rich and Associates
P.O. Box 184
Bayside, CA 95524
(707) 834-5347
wcr@williamrichandassociates.com



Project Location Map
Elk River Pilot Projects
T4N, R1W, Sec 25 and 26 (HBM)
USGS Fields Landing, Ca 7.5" Topographic Quadrangle
N
0 250 500 Meters
Project Area
Covered Bridge
RAILROAD
GRADE
River
BM
36
22
23
24
24
25
25
26
27
34
35
36
36
Jones
Logging Station
Prairie
Gulch
Clapp
Gulch
Railroad
Gulch
South
Fork
North
Fork
OLD RAILROAD GRADE
PRIVATE
PRIVATE
PRIVATE
Jones Prairie Sch
Falk
(Ruins)
Dunlap
HUMBOLDT
200
400
600
69

NATIVE AMERICAN HERITAGE COMMISSION
Environmental and Cultural Department
1550 Harbor Blvd., ROOM 100
West SACRAMENTO, CA 95691
(916) 373-3710
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October 10, 2017

William Rich
William Rich and Associates

Email to: wcr@williamrichandassociates.com

RE: Elk River Restoration Project, Humboldt County

Dear Mr. Rich,

A record search of the Native American Heritage Commission (NAHC) Sacred Lands File (SLF) was completed for the information you have submitted for the above referenced project. The results were negative. However, the absence of specific site information in the SLF does not preclude the presence of cultural resources in any project area. Other sources for cultural resources should also be contacted for information regarding known and/or recorded sites.

Enclosed is a list of Native Americans tribes who may have knowledge of cultural resources in the project area. I suggest you contact all of those indicated, if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from any of these tribes, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact me at frank.lienert@nahc.ca.gov.

Sincerely,

Frank Lienert
Associate Governmental Program Analyst

Native American Heritage Commission
Native American Contacts
10/10/2017

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(530) 493-5322 - Fax
Karuk / Karok

Bear River Band of the Rohnerville Rancheria
Barry Brenard, Chairperson
266 Keisner Road
Loleta , CA 95551
(707) 733-1900
(707) 733-1727 Fax
Wiyot
Mattole

Round Valley Indian Tribes of the Round Valley Reservation
James Russ, President
77826 Covelo Road
Covelo , CA 95428
tribalcouncil@rvit.org
(707) 983-6126
(707) 983-6128 Fax
Yuki ; Nomlaki
Pit River
Pomo
Concow
Wailaki: Wintun

Wiyot Tribe
Ted Hernandez, Chairperson
1000 Wiyot Drive
Loleta , CA 95551
ted@wiyot.us
(707) 733-5055
(707) 733-5601 Fax
Wiyot

Cher-Ae Heights Indian Community of the Trinidad Rancheria
Garth Sundberg Sr., Chairperson
P.O. Box 630
Trinidad , CA 95570
gsundberg@TrinidadRancheria.com
(707) 677-0211 Office
(707) 677-3921 Fax
Yurok
Karuk
Tolowa
Wiyot

Yurok Tribe of the Yurok Reservation
Thomas O'Rourke, Chairperson
PO Box 1027
Klamath , CA 95548
torouroke@yuroktribe.nsn.us
(707) 482-1350
(707) 482-1377
Yurok

Yurok Tribe of the Yurok Reservation
Robert McConnell, THPO
HC 67 P.O. Box 196, Highwa
Hoopa , CA 95546
rmcconnell@yuroktribe.nsn.us
(707) 498-2536
(530) 625-4130 x1629
(707) 482-1377 Fax
Yurok

This list is current only as of the date of this document and is based on the information available to the Commission on the date it was produced.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources assessments for the proposed
Elk River Restoration Project, Humboldt County

Native American Heritage Commission
Native American Contacts
10/10/2017

Tsnungwe Council
Paul Ammon, Chairperson
P.O. Box 373 — Southern Hoopa
Salyer , CA 95563
530-629-4758
(530) 629-3356 FAX

Blue Lake Rancheria
Janet Eidsness, Historic Preservation Officer
P.O. Box 428 — Wiyot
Blue Lake , CA 95525 — Yurok
jeidsness@bluelakerancheria-nsn.gov — Tolowa
(707) 668-5101
(530) 623-0663 - Cell
707-668-4272 - Fax

Yurok Tribe of the Yurok Reservation
NAGPRA Coordinator
P.O. Box 1027 — Yurok
Klamath , CA 95548
(707) 482-1350
(707) 954-5355
(707) 482-1377

This list is current only as of the date of this document and is based on the information available to the Commission on the date it was produced.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources assessments for the proposed Elk River Restoration Project, Humboldt County

December 7, 2017

1. Bear River Band of the Rohnerville Rancheria –Erika Cooper, THPO
2. Wiyot Tribe – Ted Hernandez, Chairman and THPO
3. Blue Lake Rancheria – Janet Eidsness, THPO

Dear Tribal Representative,

William Rich and Associates is conducting cultural resource investigations for the **Elk River Sediment Removal Pilot Implementation Project** in the community of Elk River, Humboldt County, California. The project is being implemented by the North Coast Regional Water Quality Control Board and CalTrout. The attached map identifies the private property where the project will take place in Sections 25 and 26, Township 4N, Range 1 West (HBM), USGS Fields Landing, CA 7.5' Topographic Quadrangle.

Background research and the field survey are ongoing, at this time. We would greatly appreciate any information that would help identify cultural resources in the project area. Any culturally sensitive information that you may disclose to WRA will be held under strict confidentiality and will not be made available to the public. All cultural sites will be documented in accordance to the guidelines established by the State Office of Historic Preservation. A copy of the final report and any completed archaeological site records will be submitted to the California Historical Resources Information System's regional Northwest Information Center.

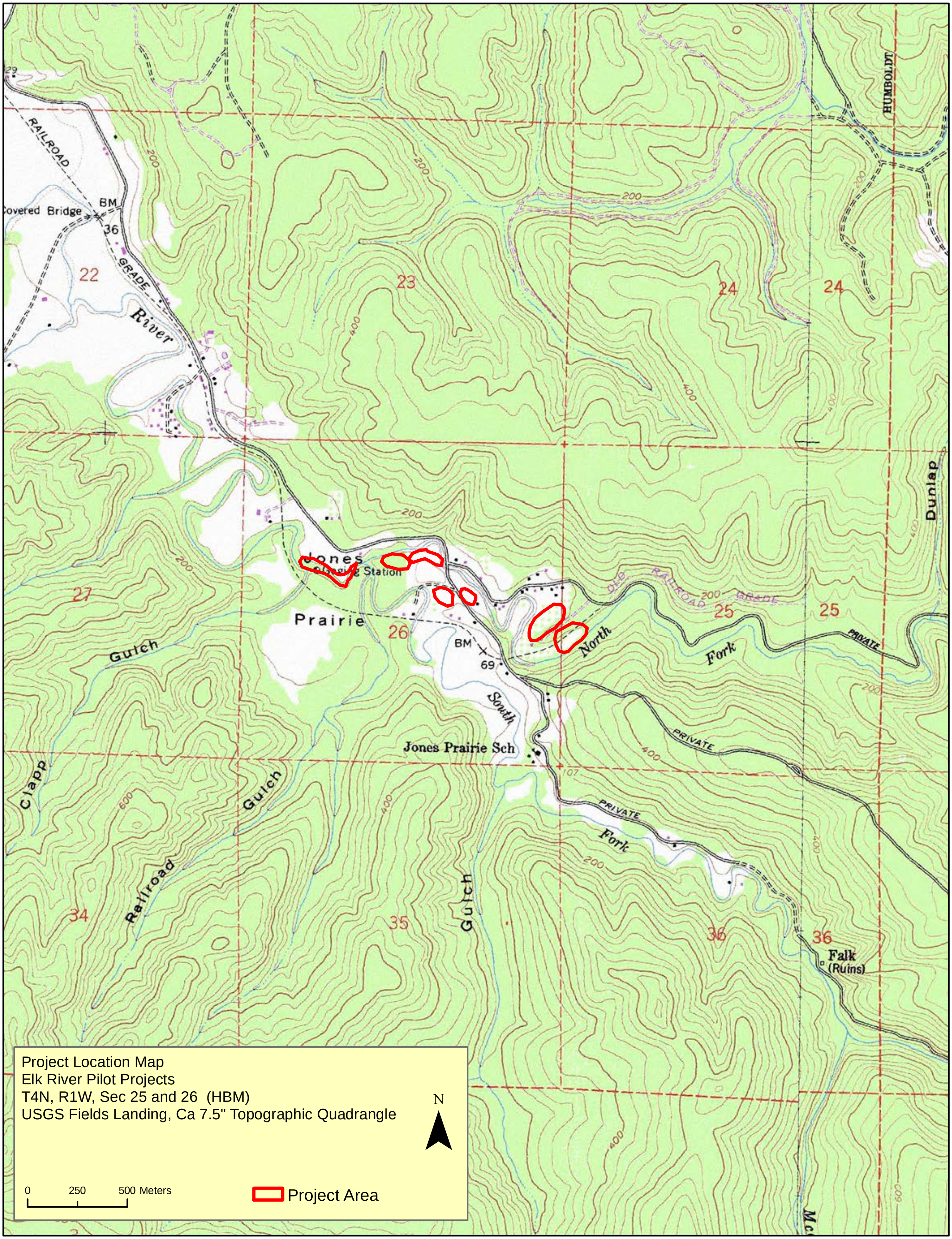
Additionally, the tribe has likely been formally contacted by the North Coast RWQCB (Lead Agency) pursuant to AB 52. If you have any questions regarding that communication, please contact: Charles.striplen@waterboards.ca.gov
or by mail at:
Chuck Striplen, PhD
Environmental Scientist−Adaptive Management Unit
North Coast Regional Water Quality Control Board
5550 Skylane Boulevard, Suite A, Santa Rosa, CA 95403

Thank you,

William Rich

William Rich, M.A., RPA
William Rich and Associates
P.O. Box 184
Bayside, CA 95524
wcr@williamrichandassociates.com

Enclosures (1)


Project Location Map
Elk River Pilot Projects
T4N, R1W, Sec 25 and 26 (HBM)
USGS Fields Landing, Ca 7.5" Topographic Quadrangle
N
0
250
500 Meters
Project Area
RAILROAD
GRADE
Covered Bridge
BM
36
River
Jones
Logging Station
Prairie
Gulch
Clapp
Railroad
Gulch
South
Fork
North
Fork
OLD RAILROAD GRADE
PRIVATE
Jones Prairie Sch
Falk
(Ruins)
Dunlap
HUMBOLDT
22
23
24
25
26
27
34
35
36
200
400
600

Gmail by Google

William Rich <wcr@williamrichandassociates.com>

Cultural Resources Investigation - Elk River Sediment Reduction Pilot Project

6 messages

William Rich <wcr@williamrichandassociates.com> Thu, Dec 7, 2017 at 10:15 AM
To: Janet Eidsness <jpeidsness@yahoo.com>, Janet Eidsness <jeidsness@bluelakerancheria-nsn.gov>, Erika Cooper <erikacooper@brb-nsn.gov>, Ted Hernandez <ted@wiyot.us>

Hello Everyone,

Attached is a letter regarding a sediment reduction project in the Elk River. Feel free to contact me if you have any information to share or any questions.

Thank you!
Bill

--
William C. Rich, M.A., RPA
Principal Investigator
William Rich and Associates
Cultural Resource Consultants
P.O. Box 184
Bayside, CA 95524
(707) 834-5347

Humboldt_ElkRiverSedimentRemoval_WRA_12_7_2017.pdf
3528K

Janet Eidsness <JEidsness@bluelakerancheria-nsn.gov> Mon, Dec 11, 2017 at 3:08 PM
To: William Rich <wcr@williamrichandassociates.com>, Janet Eidsness <jpeidsness@yahoo.com>, Erika Cooper <erikacooper@brb-nsn.gov>, Ted Hernandez <ted@wiyot.us>

Bill,

The Elk River project is outside Blue lake Rancheria's mapped area of concern.

Janet P. Eidsness, M.A.

Tribal Heritage Preservation Officer (THPO)

Blue Lake Rancheria

P.O. Box 428 (428 Chartin Road)

Blue Lake, CA 95525

Office (707) 668-5101 ext. 1037

Fax (707) 668-4272

jeidsness@bluelakerancheria-nsn.gov

cell (530) 623-0663 jpeidsness@yahoo.com

From: William Rich [mailto:wcr@williamrichandassociates.com]
Sent: Thursday, December 07, 2017 10:16 AM
To: Janet Eidsness; Janet Eidsness; Erika Cooper; Ted Hernandez
Subject: Cultural Resources Investigation - Elk River Sediment Reduction Pilot Project

[Quoted text hidden]

Erika Cooper <erikacooper@brb-nsn.gov> Thu, Dec 14, 2017 at 2:10 PM
To: Janet Eidsness <JEidsness@bluelakerancheria-nsn.gov>
Cc: William Rich <wcr@williamrichandassociates.com>, Janet Eidsness <jpeidsness@yahoo.com>, Ted Hernandez <ted@wiyot.us>

Hi Bill,

Thank you for sending notice of this project. Please let me know the results of the survey.

Thanks.

Erika Cooper, M.A.
Tribal Historic Preservation Officer
Bear River Band of the Rohnerville Rancheria
266 Keisner Road
Loleta, CA 95551
707-733-1900 x233 Office
707-502-5233 Cell
707-733-1727 Fax
erikacooper@brb-nsn.gov

[Quoted text hidden]

William Rich <wcr@williamrichandassociates.com> Thu, Dec 14, 2017 at 2:58 PM
To: Erika Cooper <erikacooper@brb-nsn.gov>
Cc: Janet Eidsness <JEidsness@bluelakerancheria-nsn.gov>, Janet Eidsness <jpeidsness@yahoo.com>, Ted Hernandez <ted@wiyot.us>

Hi Erika,
We completed the field work for this one. historical logging railroad grades are present. Spent a lot of time talking with Kristy Wrigley about the project location. To her knowledge no archaeological resources have been found by her family or others in the project area. There is an old military trail mapped in the vicinity that I am researching now.

I am aware, however, of artifacts from the Mazzuchi property, which I think was recently purchased by a land trust or conservancy. BLM interp ranger Julie Clark knows about this site also. She was interviewing Paul Mazzuchi up until his death a few years ago. This is, however, outside of the current project footprint.

Holler at me if you have any other thoughts or questions. Working on this report over the next couple of weeks and will send a copy to you and other THPOs when done.

Bill

[Quoted text hidden]

Erika Cooper <erikacooper@brb-nsn.gov> Fri, Dec 15, 2017 at 8:26 AM
To: William Rich <wcr@williamrichandassociates.com>
Cc: Janet Eidsness <JEidsness@bluelakerancheria-nsn.gov>, Janet Eidsness <jpeidsness@yahoo.com>, Ted Hernandez <ted@wiyot.us>

That sounds good, thank you for the update.

Erika Cooper, M.A.
Tribal Historic Preservation Officer
Bear River Band of the Rohnerville Rancheria
266 Keisner Road
Loleta, CA 95551
707-733-1900 x233 Office
707-502-5233 Cell
707-733-1727 Fax
erikacooper@brb-nsn.gov

[Quoted text hidden]

Ted Hernandez <ted@wiyot.us> Fri, Dec 15, 2017 at 8:15 PM
To: William Rich <wcr@williamrichandassociates.com>
Cc: Janet Eidsness <jpeidsness@yahoo.com>, Janet Eidsness <jeidsness@bluelakerancheria-nsn.gov>, Erika Cooper <erikacooper@brb-nsn.gov>

Thanks Bill I will look them over if I have any questions I will contact you.

Juwaksh
Ted Hernandez
Cultural Director
Wiyot Tribe
1000 Wiyot Dr
Loleta, Ca 95551
(707)733-5055
ted@wiyot.us
Web: www.wiyot.us
Lhatsik Houmoulu'l

Table Bluff Reservation - Wiyot Tribe

APPENDIX B

CONFIDENTIAL Archaeological Site Records:

WRA 1 – George and Irving Wrigley Ranch
WRA 2 – Winfield Wrigley House and Watertower
Update to Site Record P-12-000055, the Dolbeer & Carson Lumber Company Railroad

State of California The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # ______
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code   Reviewer   Date

 ***Resource Name or #:** WRA 1 - George and Irving Wrigley Ranch
P1. Other Identifier: N/A

***P2. Location:** ■ **Not for Publication** ☐ **Unrestricted**
***a. County** Humboldt **and**
***b. USGS 7.5' Quad** Fields Landing **Date** 1972 **T** 4N; **R** 1W; NE ¼ **of** SE ¼ **of Sec** 26; Humboldt **B.M.**
c. Address 2550 Wrigley Road City Eureka Zip 95503
d. UTM: NAD-83, Zone 10N, 403,529 mE/ 4,505,947 mN (northeast corner of the apple drying shed)
e. Other Locational Data: This site consists of Humboldt APN 311-041-006, just southeast of the intersection of Elk River Road and Wrigley Road southeast of Eureka. The site datum (apple drying shed) is at the bottom of the driveway, past the house on the left (south) side of the driveway.

***P3a. Description:** This site record describes the Wrigley Ranch, originally owned by George Wrigley and later managed by his son Irving Wrigley, and by its current owner, Irving's daughter Kristi Wrigley. The property encompasses 15.3 acres on the north side of the North Fork Elk River, 0.5 air-miles upriver from the confluence with the South Fork Elk. Extant historic-period structures include the Wrigley residence, a fruit stand-which is still in operation, an apple-drying shed, an equipment shed, three of the original orchard trees, and a segment of the berm of the Dolbeer and Carson Lumber Company railroad grade (P-12-000055) which bisects the southern part of the property. The fruit stand appears on aerial photos from 1940, and probably dates to the Great Depression or earlier. It is a gable roof building on a post-and-pier foundation, on the eastern edge of the fruit orchard, at the end of the Wrigley's driveway. It measures about 36' x 22' and is open at the east end to accommodate the front sales counter and storage area. A 4.5' extension is apparent on the north side of the building, and a roof vent is present at the peak. One horizontal sliding window is present on the south side of the building, next to a chalk-board menu displaying available produce and other farm products. Exterior siding is horizontal V-rustic boards which appear to have been salvaged from another building.
The apple-drying shed is a small, low, gabled structure southeast of the fruit stand, beneath the shady north side of a second-growth redwood tree. The lower walls are poured concrete; vertically-hung boards form the siding above. The roof is wood shingle. It measures about 17' x 9'. *Continued on Form 523L, Continuation sheet.*
***P3b. Resource Attributes:** HP2- Single family property; HP6- 1 story commercial building; HP18- train; HP33- farm/ranch
***P4. Resources Present:** ☐ Building ■ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)
P5b. Description of Photo: View to the northeast of the fruit stand (left) and Wrigley house (top-center), taken from the railroad grade on 11/9/2017.

P5a. Photograph

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both: No prehistoric features or artifacts were observed.
***P7. Owner and Address:** Kristi Wrigley, 2550 Wrigley Road, Eureka CA 95503

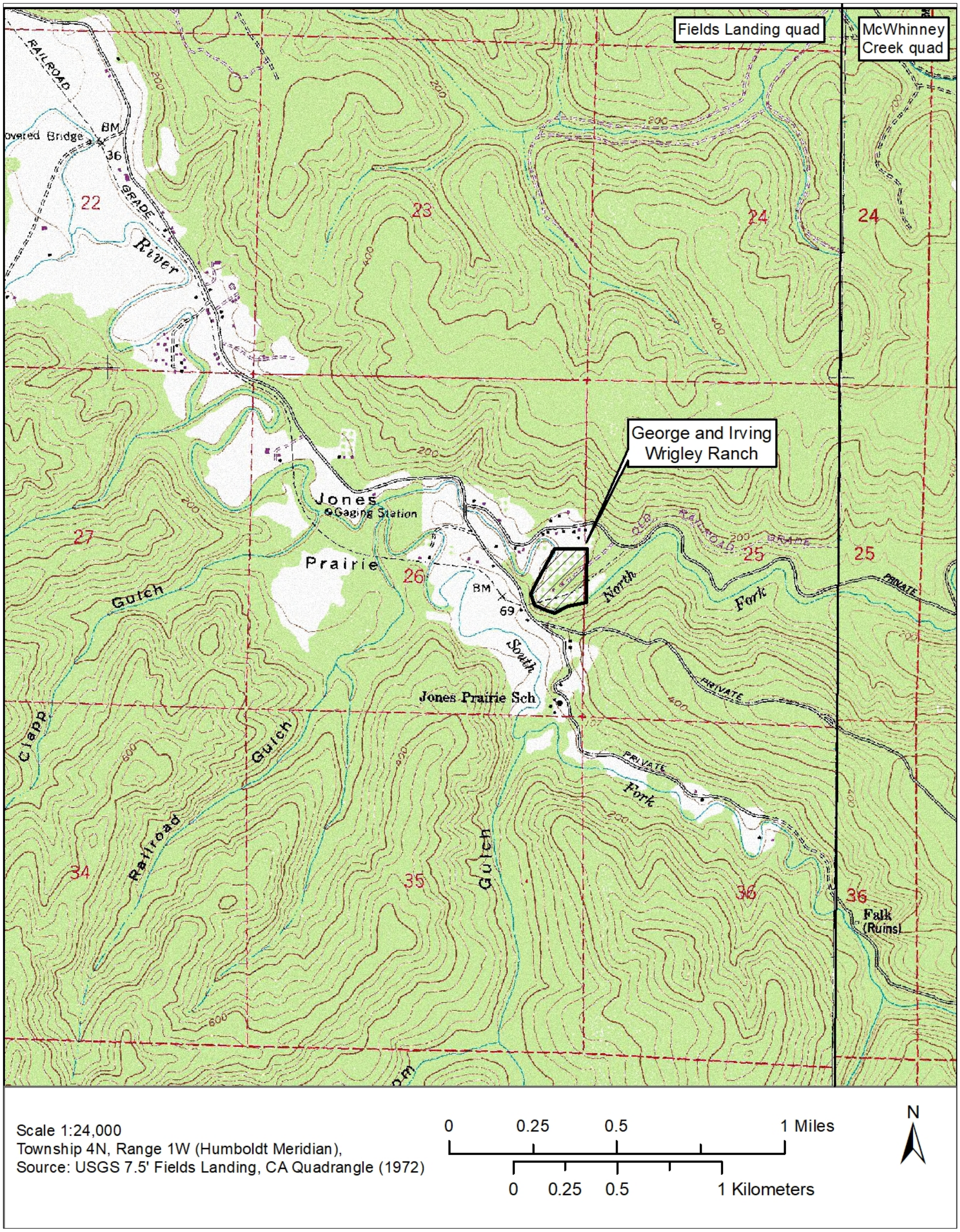
***P8. Recorded by:** Matthew Steele, B.A. and Jarrett Lowery, B.A. William Rich, M.A., R.P.A. William Rich and Associates, Cultural Resources Consultants. P.O. Box 184, Bayside, CA 95524.
***P9. Date Recorded:** 11/9/2017
***P10. Survey Type:** Pedestrian survey for a floodplain rehabilitation project on North Fork Elk River
***P11. Report Citation**: William Rich 2018. A Cultural Resources Investigation for the Elk River Sediment Removal Pilot Implementation Project, Humboldt County, California

***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ■ Other (List): 523K: Sketch Map.

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI#
Trinomial

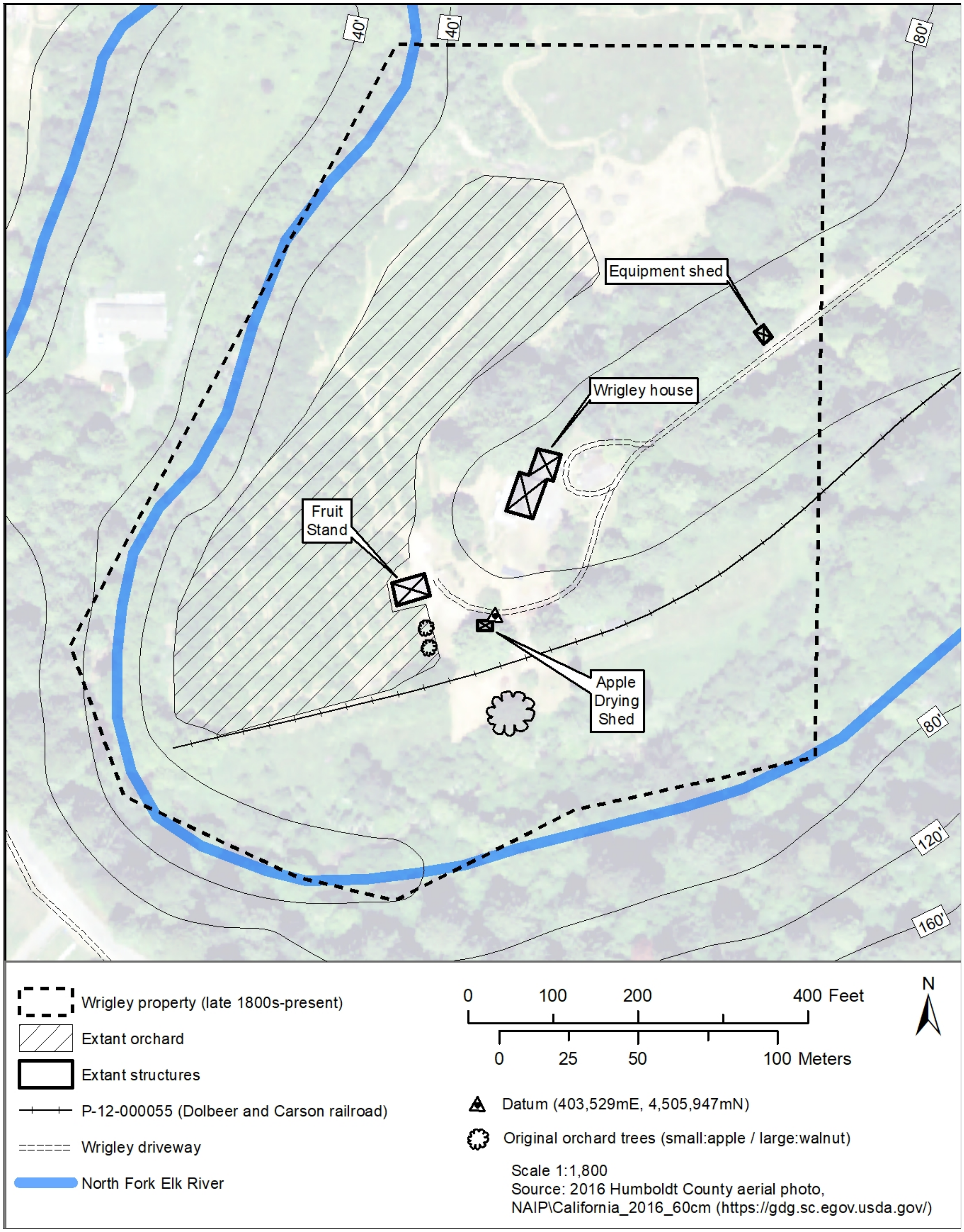
Page 2 **of** 12 ***Resource Name or #** WRA 1 - George and Irving Wrigley Ranch
***Map Name:** USGS 7.5' Fields Landing quadrangle ***Scale:** 1:24,000 ***Date of map:** 1972



State of California ☐The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #
HRI#
Trinomial

 *Resource Name or # WRA 1 - George and Irving Wrigley Ranch
*Drawn by: Matthew Steele, B.A. *Date of map: November 9, 2017



CONTINUATION SHEET

Property Name: WRA 1- George and Irving Wrigley Ranch
Page 4 of 12

Photo 1. View to the west of the front of the Wrigley fruit stand with the young apple orchard behind and surrounding the structure, 11/9/2017.

Photo 2. Close-up view of the Wrigley fruit stand, 11/9/2017.

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

Primary#
HRI #
Trinomial

CONTINUATION SHEET

Property Name: WRA 1- George and Irving Wrigley Ranch

Photo 3. View of the interior of the front of the Wrigley fruit stand, 11/9/2017.


Photo 4. View of the south side of the Wrigley fruit stand, 11/9/2017.

Photo 5. View of the back (west) side of the Wrigley fruit stand, 11/9/2017.

Photo 6. View of the north side of the apple drying shed, beneath a redwood tree, 11/9/2017.


Photo 7. View of the front (east) side of the Wrigley house, with garage at right, 11/9/2017.


Photo 8. View of the front (southeast) side of the equipment shed, 11/9/2017.

CONTINUATION SHEET

Photo 9. View of the northeast side of the equipment shed (right) and gabled covering (left), 11/9/2017.

Photo 10. View of two of the three remaining orchard trees (apple) left from the original Wrigley orchard, 11/9/2017.

Photo 11. View to the south of the third remaining orchard tree, a walnut reported to be the first on the property to have been planted, 11/9/2017.

Detail of the 1922 Belcher Atlas of Humboldt County (Map 6), showing Section 26, with the Wrigley property in the crook of the North Fork Elk River at right.

Aerial photo of the Wrigley Ranch, December 13, 1940, showing the original ranch house at center and the fruit orchard. The Dolbeer and Carson Lumber Company railroad sweeps from upper right, through the orchard and under the Elk River Ridge Road under a through-cut west of the Wrigley orchard.

Aerial photo of the Wrigley Ranch, September 13, 1956, showing the ranch house and fruit stand near center and an expanded fruit orchard along both sides of the railroad, which had been abandoned only four years earlier.

Continued from Form 523A, Line P3a, Description:

The house is a two story, side-facing gable house with an asphalt-shingle roof and concrete foundation, in the Minimal Traditional style popular from the 1930s through the 1950s (McAlester and McAlester 1996:477). The house appears in aerial photos from 1956; an earlier photo from 1940 shows a house of a similar footprint but in a slightly different position; thus it appears the present house was built over that time. Windows are vinyl-framed and include horizontal sliders and 1-over-1 vertical casement windows. External siding is manufactured, cut wood shingle. A brick chimney with three square or rectangular chimney pots protrudes from approximately the middle of the house, on the back (west) side of the gable peak. The house has been remodeled with modern materials on the exterior and has a modern appearance. A one story, one-bay garage is attached to the house on the north side, by an enclosed breezeway.

A small, high-gabled equipment shed is located northeast of the house, along the west side of the driveway. The structure measures about 16’ x 20’ and has a wood shingle roof. A large sliding door is present on the front; and a regular hinged door opens into a shed-roofed attachment on the northeast side. One wood-framed, single-pane window is present on the front of the attachment, next to the hinged door. External siding includes vertically hung boards on the lower part of the structure and horizontal boards on the gable.

Of the original orchard planted around the turn of the century by George Wrigley, only three trees remain: two apples and a walnut. The apples are on the north side of the railroad grade, south of the fruit stand; the walnut is south of the railroad grade and is noticeably much healthier than the two apple trees. The landowner reports that the walnut was the first of the orchard trees to be planted on the property.

History: George E. Wrigley was born in New Brunswick in 1858 and came to Humboldt County at the age of 28 with his wife Mary, via a passenger train and then a ship to Eureka. After settling in the Elk River valley, he went to work at Noah Falk’s mill on the South Fork, where he assumed the responsibility of being Falk’s first blacksmith (Gates 1983:39; Irvine 1915:1150). After the mill at Falk burned down in 1900, Wrigley assisted in reconstruction and served as head blacksmith. He planted and maintained extensive fruit orchards, and provided beef to Noah Falk for use in the Falk cookhouse. His brother James Wrigley served as superintendent of the Bucksport & Elk River Railroad for 18 years, until he died. George Wrigley’s farm was described by Leigh Irvine in 1915, who reported that Wrigley was “attending to the cultivation of his fruit orchard, whereupon he raises many varieties of apples, such as such as Duchess, Wealthy, Red Astrachan, Gravenstein, King and Greenings, his fruit having received two blue ribbon prizes at the Watsonville exhibition of apples” (Irvine 1915:1150). George and Mary had nine children, the last of whom, Irving Edwin Wrigley, eventually took over the family farm, as shown on the 1949 county atlas (Metsker 1949:19). Irving’s daughter Kristi Wrigley now runs the ranch.

Significance and Integrity Considerations: It is recommended that this property is eligible for the California Register of Historical Resources, under Criterion A, for being associated with early-19th century apple farming and processing, and small-scale, family-run commercial produce business operations. This is significant on a local level as part of the historic context of the north coast of California.

The Wrigley Ranch retains all seven aspects of integrity. Some of the external material elements of the Wrigley house have been replaced, and the apple orchard planted by George Wrigley has been replaced with younger apple trees; however this latter alteration is considered deferred maintenance and is not a detriment to the integrity of the site. The Dolbeer and Carson Lumber Company railroad which once bisected the apple orchard is now abandoned and reduced to a low berm, but the railroad was only in operation for a short time (ca. 1931-1952) relative to the occupation of the ranch as an apple farm by the Wrigley family, which spans over a century. All other structures on the ranch visible on historic-period aerial photos are still in place, with the exception of a barn visible on the 1956 aerial photo but not on the 1940 aerial or the 1972 photos (www.earthexplorer.usgs.gov).

The property has been in the Wrigley family for over a hundred years, and has been an active apple farm with a small, family-run produce stand in operation for much of that time. The site thus retains excellent integrity of feeling and association. The farm is still active as such today, although the orchard is scheduled to be replaced due to problems with floodwaters from the North Fork Elk River, which caused the death of much of the original Wrigley orchard (Easthouse 2002; Kristi Wrigley, personal communication 11 Nov. 2017). Between 1956 and 1972, aerial photos show that much of the central part of the orchard had been replaced, and since that time the rest of it was replaced; this is considered a normal part of the life of an active farm and not an adverse effect to its integrity.

CONTINUATION SHEET

Property Name: WRA 1- George and Irving Wrigley Ranch

References:

Gates, Jon Humboldt 1983. *Falk's Claim – The Life and Death of a Redwood Lumber Town*. Pioneer Graphics, Eureka.

Irvine, Leigh H. 1915. *History of Humboldt County, California with Biographical Sketches of the Leading Men and Women who have been Identified with its Growth and Development from the Early Years to the Present.* pp. 1150. Historic Record Company, Los Angeles.

McAlester, Virginia and Lee McAlester 1996. *A Field Guide to American Houses.* pp. 477. Alfred A. Knopf, New York.

Metsker, Charles F. 1949. *Metsker's Atlas of Humboldt County, California.* Map 19. Charles F. Metsker, Seattle, Washington.

Continued from Form 523B, Line B12, References:

Gates, Jon Humboldt 1983. *Falk's Claim – The Life and Death of a Redwood Lumber Town*. Pioneer Graphics, Eureka.

Greenmantle Nursery 2005. *The Ettersburg Apple Legacies*. Greenmantle Nursery website, http://www.greenmantlenursery.com/fruit/etter-apples.htm. Garberville.

Irvine, Leigh H. 1915. *History of Humboldt County, California with Biographical Sketches of the Leading Men and Women who have been Identified with its Growth and Development from the Early Years to the Present.* pp. 1150. Historic Record Company, Los Angeles.

State of California ☐The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code

Other Listings
Review Code Reviewer Date

 ***Resource Name or #:** WRA 2 - Winfield Wrigley House and Watertower
P1. Other Identifier: N/A

***P2. Location:** ■ **Not for Publication** ☐ **Unrestricted**
***a. County** Humboldt **and**
***b. USGS 7.5' Quad** Fields Landing **Date** 1972 **T** 4N; **R** 1W; SE ¼ **of** NW ¼ **of Sec** 26; Humboldt **B.M.**
c. Address 7968 Wrigley Road City Eureka Zip 95503
d. UTM: NAD-83, Zone 10N, 402,630 mE/ 4,506,432 mN (northwest corner of the house)
e. Other Locational Data: This site is the southeast part of APN 311-021-013, on the south side of Elk River Road, 4.5 miles from the intersection with Herrick Road and Highway 101.

***P3a. Description:** This site record describes a house and water storage tower on the north side of lower North Fork Elk River. The house was built between 1952 and 1954; the wooden watertower was built around the same time. The water storage tank which once stood atop the tower is gone, leaving only the wooden base. This property was purchased from the Reed family by Winfield Wrigley in 1950; the house was built within a few years (Kristi Wrigley, personal communication, 10 Nov. 2017). Mr. Wrigley used heavy equipment to construct a low berm on the property, between the house and the river, in 1954; the river flooded the following year, in 1955, and again in 1964. Following these floods, the home was abandoned and although the family has kept up the house and the surrounding grounds over the years, the house has sat unoccupied and remains so.

The Ranch style house is a one-story home with a side-facing, cross-gable plan and stud framing on a flat concrete foundation. The roof is split wood shingle; a rectangular brick chimney with a metal-covered vent protrudes from near the middle of the home, on the east side of the gable peak. Attic vents are present at the gable-ends. There are two entrances on the front (west) side; both feature a small, covered, stacked-brick patio. A third entrance is near the south end of the back (east) side of the house. Windows include a large, fixed-pane bay window on the front; 1-over-1 vertical wooden casement windows, single- and double-paired and double-hung wooden sash windows. External siding is a combination of horizontal lapped boards and vertically hung wooden pressboard. An attached two-bay garage is on the north, street-facing side of the house; the house and garage together occupy approximately 3,260 square feet. *Continued on Form 523L, Continuation sheet.*

***P3b. Resource Attributes:** HP2- Single family property; HP30- Trees / vegetation
***P4. Resources Present:** ☐ Building ■ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5a. Photograph

P5b. Description of Photo: View to the southwest of the watertower (left) and house (right), 11/10/2017.

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both: No prehistoric features or artifacts were observed.

***P7. Owner and Address:** Kristi Wrigley, 2550 Wrigley Road, Eureka CA 95503

***P8. Recorded by:** Matthew Steele, B.A. and Jarrett Lowery, B.A. William Rich, M.A., R.P.A. William Rich and Associates, Cultural Resources Consultants. P.O. Box 184, Bayside, CA 95524.

***P9. Date Recorded:** 11/10/2017

***P10. Survey Type:** Pedestrian survey for a floodplain rehabilitation project on North Fork Elk River

***P11. Report Citation**: William Rich 2018. A Cultural Resources Investigation for the Elk River Sediment Removal Pilot Implementation Project, Humboldt County, California

***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ■ Other (List): 523K: Sketch Map.

BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** WRA 2 - Winfield Wrigley House and Watertower ***NRHP Status Code** 6Z

B1. Historic Name: Winfield Wrigley house B2. Common Name: same
B3. Original Use: Occupied by the Winfield Wrigley family B4. Present Use: none (abandoned)
***B5. Architectural Style:** Ranch style

***B6. Construction History:** The house was built between 1952 and 1954 and has not been altered since that time. As river flooding increased as a result of intensive logging upriver after the house was built, the house was abandoned and has sat unoccupied, although kept up and maintained for appearances, for several decades.

***B7. Moved?** ■**No** □**Yes** □**Unknown** **Date:** N/A **Original Location:** N/A

***B8. Related Features:** Water storage tower; flood control berm, river-side line of cedar trees.

B9a. Architect: unknown b. Builder: unknown; original occupant Winfield Wrigley

***B10. Significance: Theme** Residential architecture **Area** Elk River Valley, Humboldt County
Period of Significance 1952 – late 1960s **Property Type** Rural residential home
Applicable Criteria: It is recommended that this house is not eligible for the California Register of Historical Resources. It does not appear to meet any of the four requisite criteria for such a consideration. The house is not associated with any important events or people; it is not architecturally unique or interesting, and it is not likely to yield information important to the study of history or prehistory. By the time this house was built in the early 1950s, Ranch style homes were common particularly in California, where they had become ubiquitous in many neighborhoods over the previous two decades (McAlester and McAlester 1996:477). This home is not particularly remarkable in that regard, and does not display any unique characteristics. Additionally, it does not appear to contribute to the historical significance of any larger historic sites or districts.

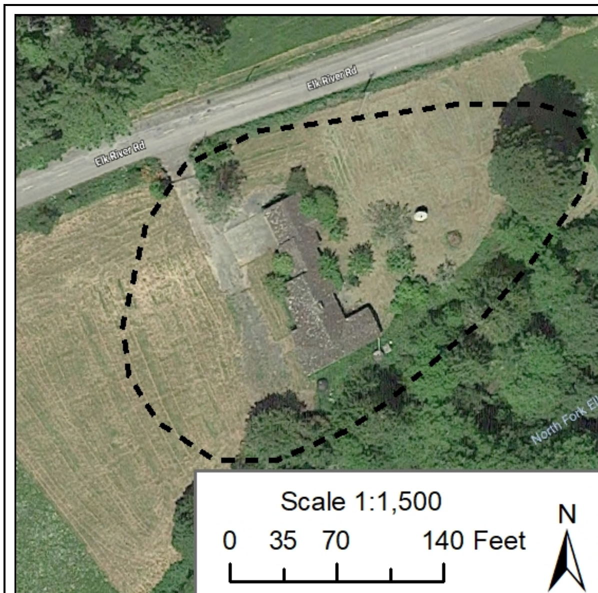
B11. Additional Resource Attributes: HP30- Trees / vegetation

***B12. References:** McAlester, Virginia and Lee McAlester 1996. *A Field Guide to American Houses.* pp. 477. Alfred A. Knopf, New York.

B13. Remarks: The sketch at right shows the house on the 2016 Humboldt County aerial photo, NAIP\California_2016_60cm (https://gdg.sc.egov.usda.gov/) with the site boundary as the dashed black line.

***B14. Evaluator:** Matthew Steele, B.A.
***Date of Evaluation:** November 10, 2017

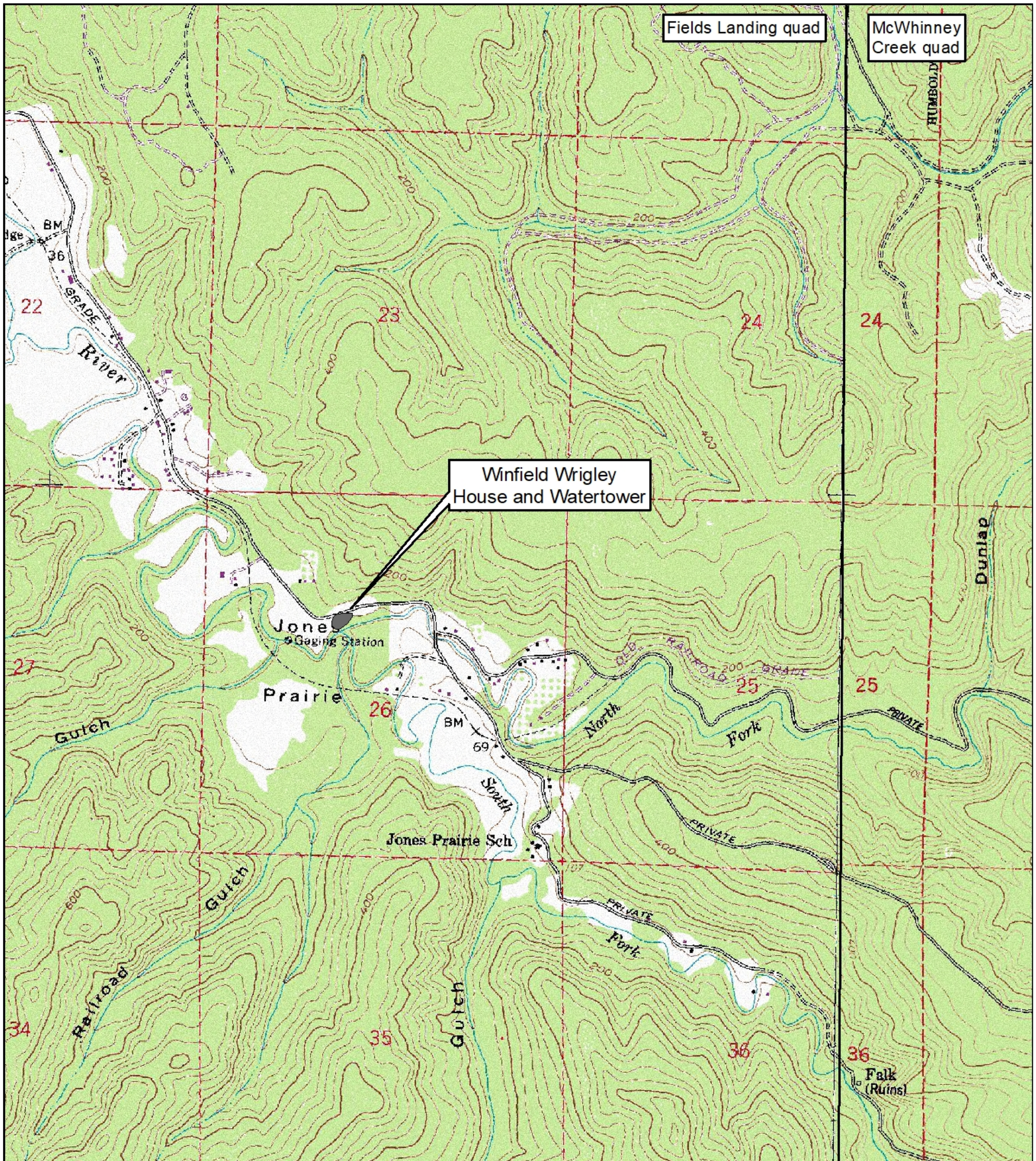
(This space reserved for official comments.)



State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI#
Trinomial

Page 3 **of** 12 ***Resource Name or #** WRA 2 - Winfield Wrigley House and Watertower
***Map Name:** USGS 7.5' Fields Landing quadrangle ***Scale:** 1:24,000 ***Date of map:** 1972



Scale 1:24,000
Township 4N, Range 1W (Humboldt Meridian),
Source: USGS 7.5' Fields Landing and
McWhinney Creek, CA Quadrangles (1972)

0 0.25 0.5 1 Miles
0 0.25 0.5 1 Kilometers
N

State of California □The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #
HRI#
Trinomial

Page 4 **of** 12 ***Resource Name or #** WRA 2 - Winfield Wrigley House and Watertower
***Drawn by:** Matthew Steele, B.A. ***Date of map:** November 9, 2017

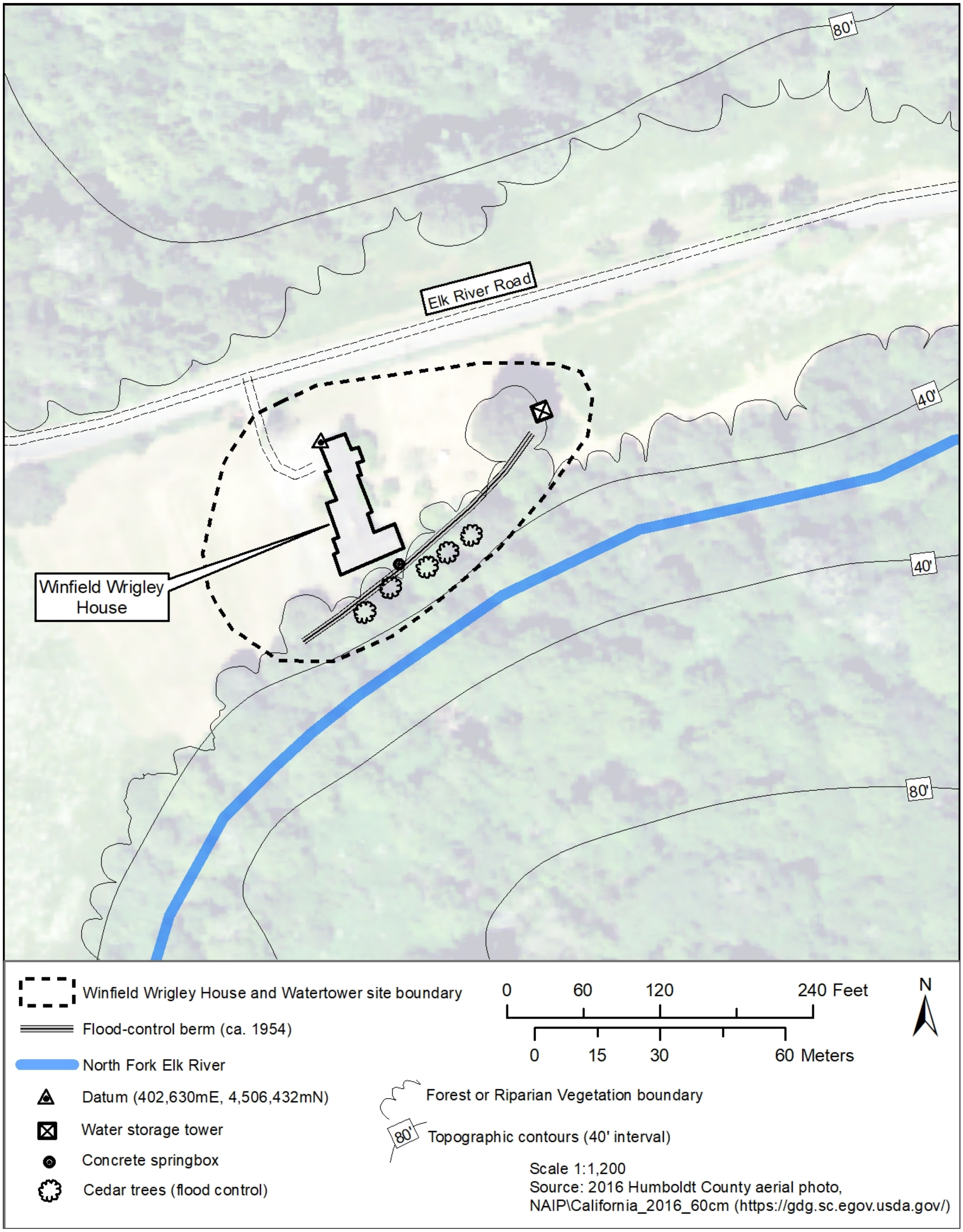


Photo 1. View to the southeast of the front of the Winfield Wrigley house, viewed from the Elk River Road entrance to the driveway, 11/10/2017.

Photo 2. View of the front (west) side of the Wrigley house, with Elk River Road at left and the North Fork Elk River at right, 11/10/2017.

CONTINUATION SHEET

Property Name: WRA 2 - Winfield Wrigley House and Watertower

Photo 3. View of the bay window at the north end of the front of the house, 11/10/2017.

Photo 4. View of the covered entranceway on the south side of the front of the house, 11/10/2017.

CONTINUATION SHEET

Property Name: WRA 2 - Winfield Wrigley House and Watertower

Photo 5. View of the north side of the Wrigley house which faces Elk River Road, 11/10/2017.

Photo 6. View of the back (east) side of the house, with one of the cedar trees visible at upper left, 11/10/2017.

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Primary#
HRI #
Trinomial

CONTINUATION SHEET

Property Name: WRA 2 - Winfield Wrigley House and Watertower
Page 8 of 12

Photo 7. View of the spring-box on the south side of the house, on the berm facing the river, 11/10/2017.

Photo 8. Closer view of the concrete springbox, stamped “HILFIKER”, 11/10/2017.

CONTINUATION SHEET

Property Name: WRA 2 - Winfield Wrigley House and Watertower

Photo 9. View of the east side of the watertower, 11/10/2017.

Photo 10. View of north side of the watertower, which faces Elk River Road, with North Fork Elk River in the background, 11/10/2017.

Photo 11. View to the west of the watertower, with Elk River Road at right, 11/10/2017.

Photo 12. View to the east of three of the cedar trees planted on the river-side of the house, with North Fork Elk River at right, 11/10/2017.

Aerial photo from September 13, 1956 of the Winfield Wrigley house (center) and surroundings, on the south side of Elk River Road.

Continued from Form 523A, Line P3a, Description:
The wooden watertower platform is about 140 feet east of the house.

The earthen flood-control berm (ca. 1954) is approximately 244 feet long, and is most pronounced on the river-side of the house, where it reaches a maximum height of about four feet. The berm becomes less distinct between the house and the watertower.

History: Winfield Wrigley was one of nine children of George and Mary Wrigley, and was raised at their home less than a mile up the river. George E. Wrigley was born in New Brunswick in 1858 and came to Humboldt County at the age of 28 with his wife Mary, via a passenger train and then a ship to Eureka. After settling in the Elk River valley, he went to work at Noah Falk's mill on the South Fork, where he assumed the responsibility of being Falk's first blacksmith (Gates 1983:39; Irvine 1915:1150). After the mill at Falk burned down in 1900, Wrigley assisted in reconstruction and served as head blacksmith. He planted and maintained extensive fruit orchards, and provided beef to Noah Falk for use in the Falk cookhouse. His brother James Wrigley served as superintendent of the Bucksport & Elk River Railroad for 18 years, until he died. George Wrigley's farm was described by Leigh Irvine in 1915, who reported that Wrigley was "attending to the cultivation of his fruit orchard, whereupon he raises many varieties of apples, such as such as Duchess, Wealthy, Red Astrachan, Gravenstein, King and Greenings, his fruit having received two blue ribbon prizes at the Watsonville exhibition of apples" (Irvine 1915:1150). George and Mary had nine children, the last of whom, Irving Edwin Wrigley, eventually took over the family farm; Irving's daughter Kristi Wrigley now runs the ranch as well as the house and property described in this site record (Metsker 1949:19).

Winfield Wrigley bought this property from the Reed family in 1950 and built the house, and probably the watertower, a few years later. In 1954, to protect the new house from the adjacent North Fork Elk River, Mr. Wrigley built the earthen berm in back of the house; the following year the river flooded but the berm protected the house. Over the coming few decades, the flooding continued to get worse, as logging operations upriver intensified (Easthouse 2002; Kristi Wrigley, personal communication 10 Nov. 2017). The 1964 flood was worse, and flooded the house, as did flood events in 1997 and other years; and after Winfield passed away, the home has sat unoccupied although the home and grounds have been maintained by the family since that time. The property is now owned by Winfield Wrigley's niece, Kristi Wrigley.

Significance and Integrity Considerations: This property does not appear to meet any of the requisite criteria for inclusion on the California Register of Historical Resources. The original boundaries of the parcel purchased by Winfield Wrigley in 1950 were not researched; it was likely limited to a smaller area than the current parcel area of 122 acres. Regarding this particular house and features described herein, it is recommended that the site does not qualify as an historical resource for the purposes of the California Environmental Quality Act. The site is not demonstrably associated with any important past events. The home was only occupied for a short period of time, as winter flood events on the nearby North Fork Elk River reportedly increased dramatically around the time the house was built, due to intensive logging operations upriver (Easthouse 2002; Kristi Wrigley, personal communication 10 Nov. 2017). Aside from the 1955 and 1964 flood events themselves, this property is not clearly associated with any events that have made a significant contribution to our history.

This site is likewise not associated with any significant past persons. The property was developed and occupied for a relatively short time by Winfield Wrigley, son of George and Mary Wrigley, and has latterly been owned by Winfield's niece Kristi Wrigley.

The house and watertower, as well as the low earthen berm and the rest of the site recorded herein, are not architecturally distinct or unique, are not the work of a master, do not possess high artistic values and are not particularly representative of a type or method of construction.

Finally, this site is not likely to yield information important in history or prehistory, beyond that presented in this site record. No prehistoric or Native American artifacts or deposits were identified on the property during the field survey; nor were any historic-period refuse deposits or other archaeological features which could help answer important research questions. This entire site lies within the flood plain of the North Fork Elk River, and is covered in a layer of young flood silt and fine sediments of unknown depth.

For these reasons, it is recommended that this site should not be considered an historical resource eligible for inclusion on the California Register of Historical Resources or the National Register of Historic Places.

References:

Easthouse, Keith 2002. Kristi Wrigley's long fight. *North Coast Journal*, 17 October 2002. Electronic document accessed at the *Journal* website, 11 January 2017, at https://www.northcoastjournal.com/101702/news1017.html#anchor878068. Eureka.

Gates, Jon Humboldt 1983. *Falk's Claim – The Life and Death of a Redwood Lumber Town*. Pioneer Graphics, Eureka.

Irvine, Leigh H. 1915. *History of Humboldt County, California with Biographical Sketches of the Leading Men and Women who have been Identified with its Growth and Development from the Early Years to the Present.* pp. 1150. Historic Record Company, Los Angeles.

Metsker, Charles F. 1949. *Metsker's Atlas of Humboldt County, California.* Map 19. Charles F. Metsker, Seattle, Washington.

Location: ■ **Not for Publication** □ **Unrestricted**

***a. County** Humboldt **and**

***b. USGS 7.5' Quad** Fields Landing **Date** 1972 **T** 4N; **R** 1W; NE ¼ **of** SE ¼ **of Sec** 26; Humboldt **B.M.**

c. Address 2550 Wrigley Road City Eureka Zip 95503

d. UTM: NAD-83, Zone 10N, 403,572 mE/ 4,505,944 mN (east point, at end of segment recorded by Stephen Dale);
403,414 mE/ 4,505,901 mN (west point, at edge of North Fork Elk River)

e. Other Locational Data: This feature is on APN 311-041-006. From the intersection of Elk River Road and State Highway 101 on the south end of Eureka, drive south on Elk River Road for 2.5 miles and bear right at the intersection with Ridgewood Drive to continue on Elk River Road. Proceed another 3.3 miles and turn left onto Wrigley Road. After 0.52 miles, turn right onto the Wrigley property driveway. Drive down the driveway to the bottom of the hill, another 0.21 miles. The railroad grade appears as a berm traversing the south side of the Wrigley property.

Owner and Address: Kristi Wrigley, 2550 Wrigley Road, Eureka CA 95503

Recorded by: Matthew Steele, B.A. and Jarrett Lowery, B.A.. William Rich and Associates, Cultural Resources Consultants. P.O. Box 184, Bayside, CA 95524.

Date Recorded: November 9, 2017

Survey Type: Pedestrian survey for a floodplain rehabilitation project on North Fork Elk River

Report Citation: William Rich 2018. A Cultural Resources Investigation for the Elk River Sediment Removal Pilot Implementation Project, Humboldt County, California

Description: This site record update for the Dolbeer and Carson Lumber Company railroad line is to include a 538 foot-long reach of the railroad grade adjoining a 0.3-mile reach of the railroad grade recorded by Stephen W. Dale (1996). This reach of the grade is now a raised berm running at a bearing of 255 degrees on the north side of the North Fork Elk River. The railroad berm appears to terminate at the river, as there is no grade beyond the river at this point: the through-cut which once permitted the passage of the railroad through the low hill on the west side of the river collapsed some years ago and was subsequently filled in, and is now gone (Kristi Wrigley, personal communication 9 Nov. 2017). The small timber bridge which carried the railroad over the river was blown-out in the winter floods of 1955 and 1964, and there are no longer any timbers, hardware or other signs of a wooden bridge at this point. As the former through-cut across the river was filled in and is now forested, the grade appears to simply stop at the riverbank. The current landowner, Kristi Wrigley, who is the grand-daughter of George E. Wrigley who owned the property when the railroad was active in the early 20th century, stated that this section of the berm was formerly much taller as it approached the river crossing and through-cut opposite, and that the family salvaged much of the aggregate used in the berm for use around the ranch in the intervening years after the railroad ceased operations in 1952.

The berm now is about 16-20 feet wide across the top and three feet tall, and about 23-26 feet wide across the base. However as the berm was formerly taller, its original top width and height are unknown but were probably slightly less than what they are currently.

Significance and Integrity Considerations: It is recommended that this 538-foot long railroad feature, by itself, is not eligible for the California Register of Historical Resources. However, as part of a larger, as-yet unrecorded district of railroad features in the Elk River Valley which would include the Dolbeer & Carson railroad grade and the main Bucksport & Elk River Railroad grade (P-12-002061), this feature may be a contributing element. The railroad was in operation from 1931 until about 1952, serving Carson's Camp and the woods of the North Fork Elk River valley under the Dolbeer and Carson Lumber Company, until it was bought by The Pacific Lumber Company in 1950.

This railroad grade segment is a part of this larger network of logging railroads, which itself may be eligible for the California Register of Historical Resources under Criterion A, for being associated with historical old-growth redwood logging to serve domestic and international markets. As such, it is recommended that the 538-foot long segment of railroad grade recorded herein is eligible for inclusion on the CRHR under Criterion A, as a possible contributing element to an as-yet unrecorded district of historical railroad grades in the Elk River valley of central Humboldt County.

History: The railroad was not built into the North Fork Elk River valley until 1931, but that event was four decades after the railroad was initially planned by John Dolbeer and William Carson who wanted the railroad to reach their timber holdings up the North Fork canyon. The line was to be a spur of the existing Bucksport & Elk River Railroad Company (B&ERRRC), which in 1883 was built as the Elk River Rail Road by Noah Falk and several associates to reach Falk's new namesake mill town on the South Fork Elk River (Carranco and Sorensen 1988). The Elk River Rail Road was re-organized as the B&ERRRC by the California Redwood Company and the Dolbeer & Carson Lumber Company, both of which were incorporated in 1883.

In 1892, when the North Fork railroad spur was being planned, other co-owners of the rail line sued to prevent its construction. The trial court ruled in favor of the plaintiffs (*Federal Reporter* 1895:974-976). Dolbeer & Carson appealed, and anxious to continue cutting timber while the case was still in the courts, they shifted the logging operations to Lindsay Creek and the South Fork Little River, near Fieldbrook north of Arcata (Carranco and Sorensen 1988:36-37; Forbes 1886; Melendy 1959:67). Dolbeer & Carson eventually won a reversal on appeal, but they were busy with their new logging operation in the Fieldbrook area for decades (*Federal Reporter* 1895:972, 979). Only in the 1930s did they again turn their interest to the North Fork Elk.

In February 1931, the first spike was driven on the long-awaited railroad extension up the North Fork (*Humboldt Standard* 1931). The first phase took the route two-and-a-half miles up the drainage (*Humboldt Times* 1931). At the same time, the company began rehabilitating the existing line from Wrigley's property around the project area to the Holmes-Eureka Lumber Company mill in Bucksport (*Humboldt Standard* 1931). Then, in 1932 the Bucksport & Elk River Railway was incorporated to replace the B&ERRRC. The Dolbeer & Carson Lumber Co. was the new company's sole owner (Carranco and Sorensen 1988:100, 102). Building the line up the North Fork cost an estimated $500,000; the work also included extending the Bucksport end of the rail line northward to a location "about 1,000 feet south of the foot of Murray Street" (now West Del Norte Street), where a new Dolbeer-Carson log dump was installed. From there, the logs were rafted to the Dolbeer-Carson mill farther up the bay (*Humboldt Standard* 1933).

Dolbeer & Carson located their headquarters camp ("Carson's Camp") on the North Fork Elk at Brown's Flat, near Brown's Gulch, a couple of miles east of the reach of railroad recorded herein. By April 1934, the Dolbeer-Carson logging operation was running full blast, with their logging train making two round trips daily between Camp Carson and the log dump near Murray Street (*Humboldt Standard* 1934). By then the Elk River Mill & Lumber Company, located just over the ridge at Falk, had been closed for over three years (Gates 1983:131). It was the midst of the Great Depression, and local loggers must have flocked to the employment office of Dolbeer & Carson.

In 1950 the Bucksport & Elk River Railway was purchased by The Pacific Lumber Company; two years later the company took over Carson's Camp on the North Fork, shut it down and removed the Railway rolling stock from the North Fork to the South Fork, on the other side of the ridge (Carranco and Sorensen 1988:105). This marked the beginning of the era of truck transportation, bypassing the railroad lines which had served the logging industry for close to 80 years.

References:

Carranco, Lynwood and Henry L. Sorenson 1988. *Steam in the Redwoods.* pp. 36-37, 100, 102, 105. Caxton Printers Ltd., Caldwell, Idaho.

Dale, Stephen W. 1996. Archery Club THP Historical Feature Site B. Archaeological site record, subsumed into site P-12-000055, the Dolbeer and Carson Lumber Company Railroad line, on file at the Northwest Information Center in Rohnert Park, California.

Federal Reporter 1895. Cases Argued and Determined in the Circuit Courts of Appeals and Circuit and District Courts of the United States. *Federal Reporter*, vol. 68. West Publishing Company, St. Paul, Minnesota.

Forbes, Stanly 1886. *Official Map of Humboldt County.* Stanly Forbes, San Francisco.

Gates, Jon Humboldt 1983 *Falk's Claim – The Life and Death of a Redwood Lumber Town*. pp. 131. Pioneer Graphics, Eureka.

Humboldt Standard 1931. Work Progresses on New Spur of Elk River Line. *Humboldt Standard* 4 February 1931. Eureka.

Humboldt Times 1931. Rebuilding of Elk River Road Started; 70 at Work. *Humboldt Times* 25 January 1931. Eureka.

Melendy, Howard Brett 1959. Two Men and a Mill: John Dolbeer, William Carson, and the Redwood Lumber Industry in California. *California Historical Society Quarterly* 38(1):59-71.

Photo 1. View to the southwest (bearing 255 degrees) of the railroad grade berm approaching the North Fork Elk River crossing, which is no longer present. The former through-cut was opposite the river at this point but is also no longer present. November 9, 2017.

Photo 2. View to the northeast (bearing 165 degrees) of the railroad grade berm on the Wrigley property, with the North Fork Elk River out of the picture at right. November 9, 2017.

CONTINUATION SHEET

Property Name: Dolbeer & Carson Lumber Company railroad line

Photo 3. View to the northeast of the railroad grade berm, November 9, 2017. The small shed at right-center is on the grade and marks the endpoint of the railroad section recorded by Stephen Dale (1996)

Aerial photo from December 13, 1940 showing the reach of railroad recorded herein as the red line at center. The intersection with the Bucksport & Elk River Railroad is at the inverted "Y" at left-center.

Detail of the same 1940 photo, showing the railroad through-cut as the shadow at center, through which the railroad runs and over which the Elk River Ridge Road has been built (shown as the white line passing on a southerly course through the center of the photo). George Wrigley's fruit orchard is visible on both sides of the railroad east of the through-cut.

Aerial photo from September 13, 1956 showing the recently-abandoned railroad, with the abandoned and collapsed through-cut visible at center. The Elk River Ridge Road crosses the former railroad through-cut and was modified between 1940 and 1956 to accommodate larger logging trucks after the railroad was abandoned.

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # P-12-000055 UPDATE
HRI#
Trinomial

Page 6 **of** 6 ***Resource Name or #** Dolbeer & Carson Lumber Company railroad line
***Map Name:** USGS 7.5' Fields Landing ***Scale:** 1:24,000 ***Date of map:** 1972