CALIFORNIA FISH PASSAGE ADVISORY COMMITTEE

Connectivity Case Studies

www.cafishpac.org

PRESENTERS

Dunn Creek Bridge

Kristine Pepper, P.E. – Caltrans – North Region District 1 – Eureka

Deer Creek Irrigation Dam

Benjamin Cook, Project Coordinator – Trout Unlimited

Amiana McEwen, Water Resources Engineer – Northwest Hydraulic Consultants

DUNN CREEK BRIDGE

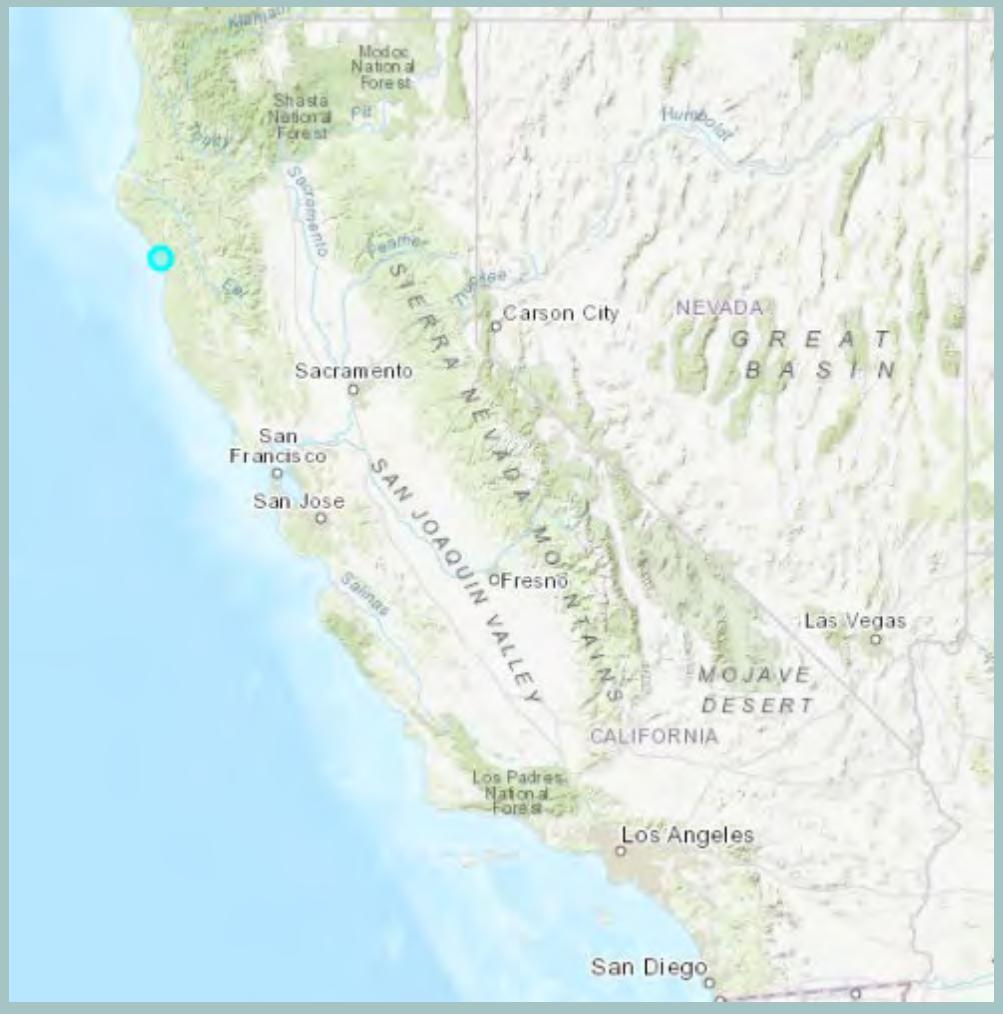
State Route 1, PM 92.8
Mendocino County, CA

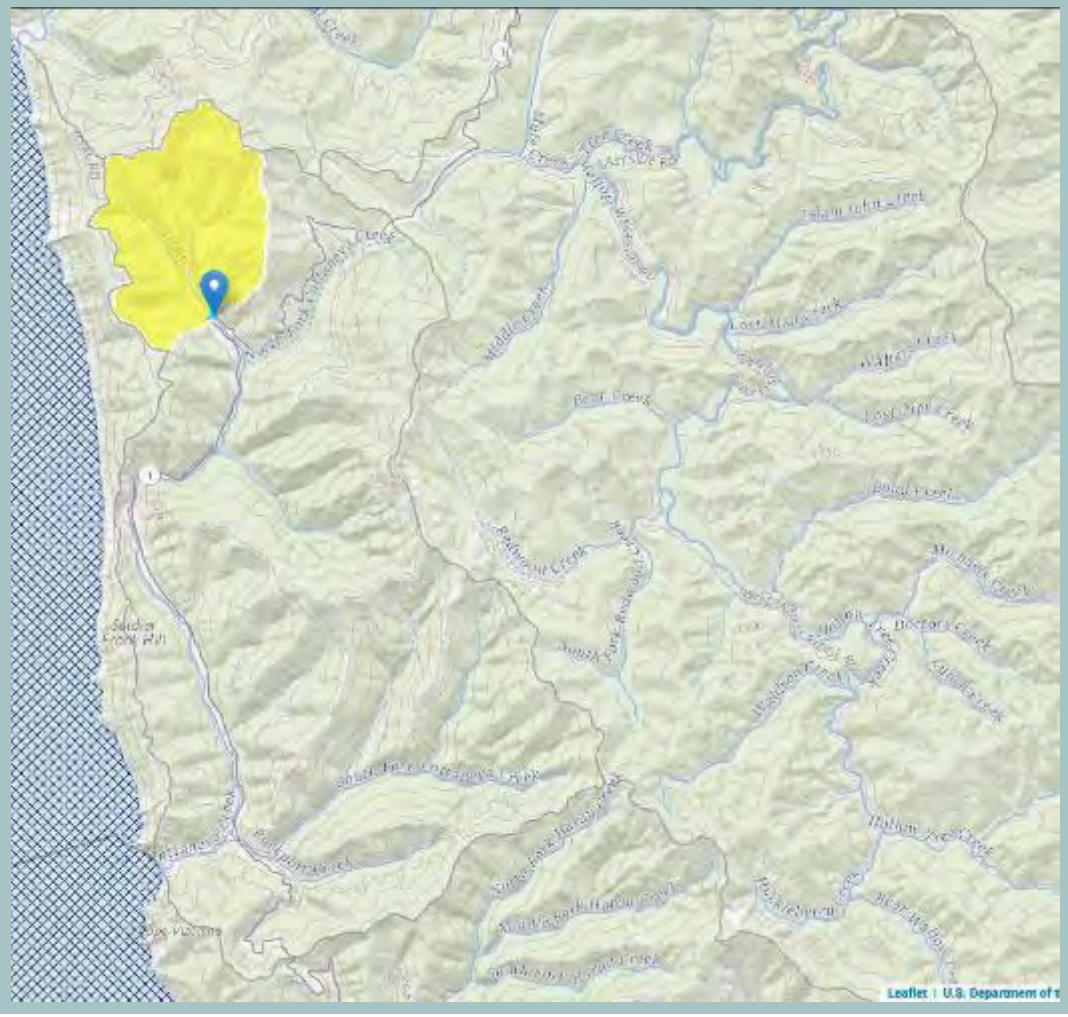
BACKGROUND

- Mitigation for Ten Mile Bridge replacement project
- Improve fish passage by removal downstream barrier
- Coho salmon (Oncorhynchus kisutch) and Anadromous Steelhead trout (Oncorhynchus mykiss)
- Remove 9-ft x 86-ft culvert
- Construct bridge
- Restore channel

Dunn Creek at State Route 1 | *April 2007*

LOCATION

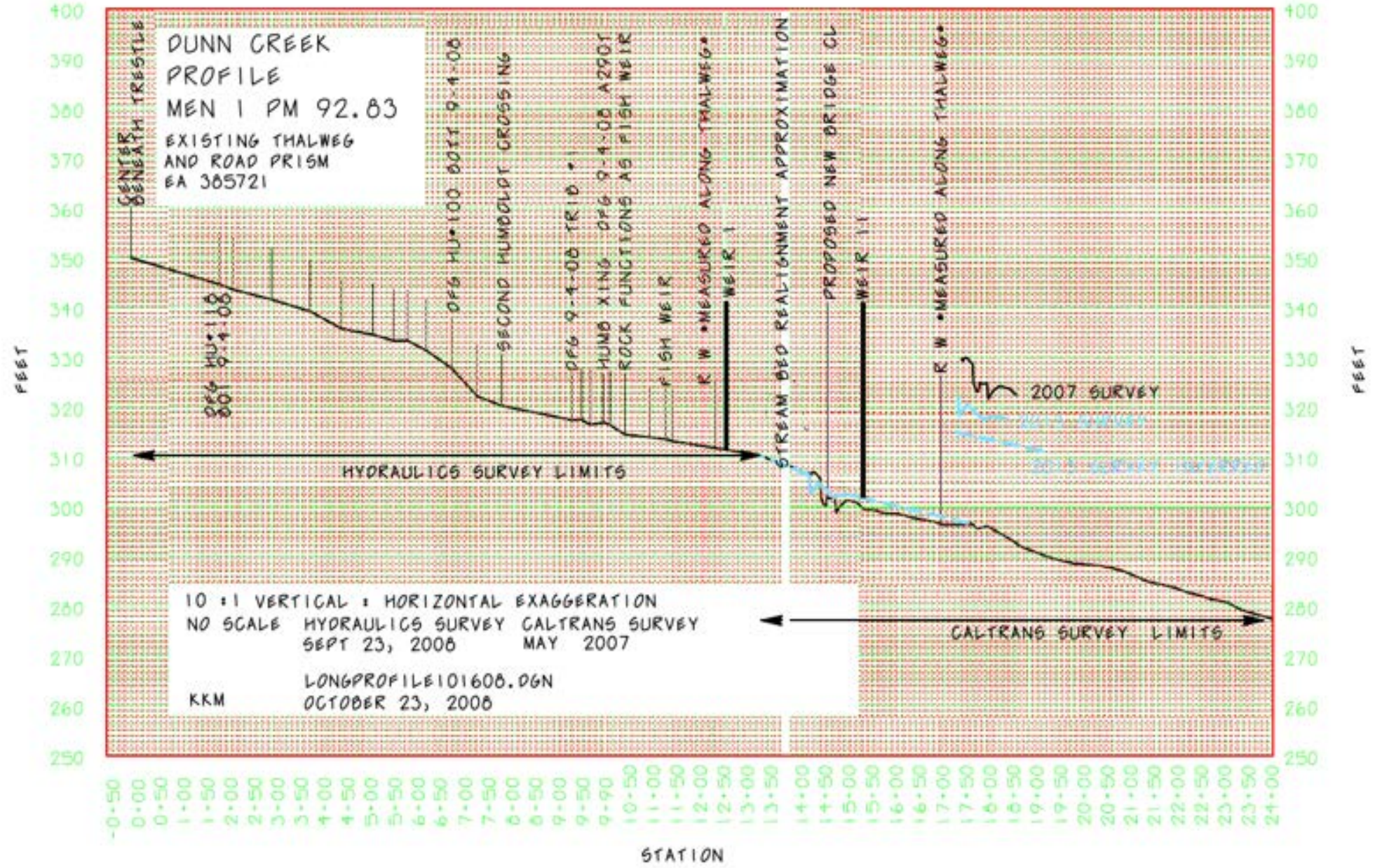

Modoc National Forest
Shasta National Forest
Humboldt
Sacramento
Feather
Tahoe
SIERRA NEVADA MOUNTAINS
Carson City
NEVADA
GREAT BASIN
Sacramento
San Francisco
San Jose
SAN JOAQUIN VALLEY
Fresno
Las Vegas
MOJAVE DESERT
CALIFORNIA
Los Padres National Forest
Los Angeles
San Diego


Leaflet | U.S. Department of

DESIGN

April 13, 2010

DESIGN



DUNN CREEK
PROFILE
MEN 1 PM 92.83
EXISTING THALWEG
AND ROAD PRISM
EA 385721
CENTER BENEATH TRESTLE
DFG HU•118 BOT 9-4-08
DFG HU•100 BOTT 9-4-08
SECOND HUMBOLDT CROSSING
DFG 9-4-08 TRIB •1
HUMB XING DFG 9-4-08 A290T
ROCK FUNCTIONS AS FISH WEIR
FISH WEIR
R W •MEASURED ALONG THALWEG•
WEIR 1
STREAM BED REALIGNMENT APPROXIMATION
PROPOSED NEW BRIDGE CL
WEIR 11
R W •MEASURED ALONG THALWEG•
2007 SURVEY
HYDRAULICS SURVEY LIMITS
CALTRANS SURVEY LIMITS
10 :1 VERTICAL : HORIZONTAL EXAGGERATION
NO SCALE HYDRAULICS SURVEY CALTRANS SURVEY
SEPT 23, 2008 MAY 2007
LONGPROFILE101608.DGN
KKM OCTOBER 23, 2008
FEET
STATION

SITE CHARACTERISTICS

Precipitation = 66 in/year

Watershed 1.89sqmi

Elevation ranges from 300 to 2000 ft

Managed timberlands –Douglas fir and redwood

Q2 =260 cfs

Q10=525 cfs

Q100=920cfs

Downstream slope =1.7%

Upstream slope 2.5%

Upstream channel has several small instream fish passage structures

Close to 10,000 feet of suitable habitat upstream

Average active channel = 14.3 ft

Average bankfull width = 24.4ft

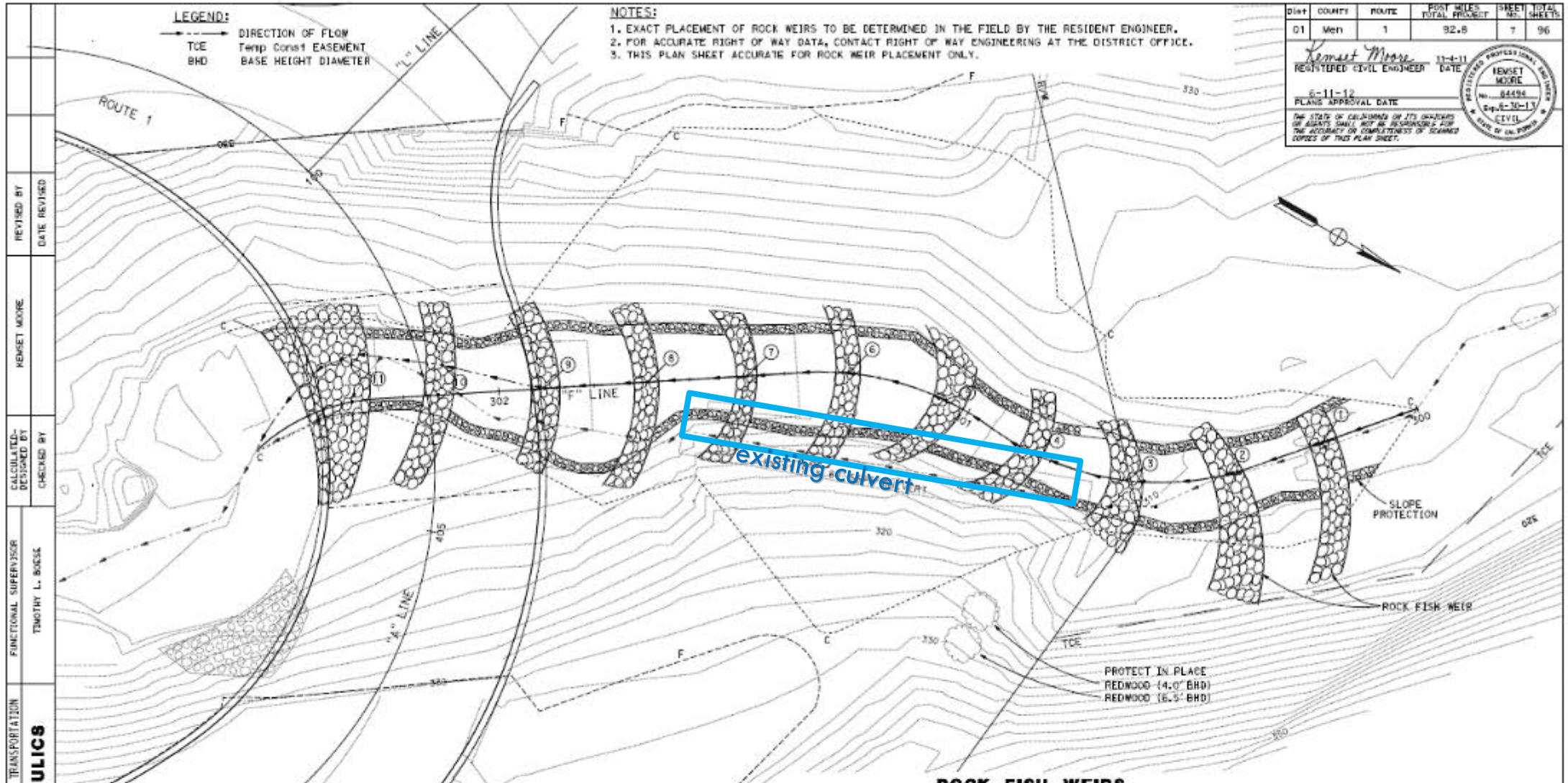
AGENCY CONSULTATIONS

Design Technical guidance & feedback

- CDFW
  - Fisheries biologist
  - Stream restoration specialist
  - Fisheries engineer
  - Fluvial geomorphologist
- NOAA
  - Fisheries biologist
  - Fisheries Engineers
- Caltrans – HQ Hydraulic Design
  - Hydraulic engineers
- USFWS

DESIGN

- Fish passage is for adult and juvenile salmonids.
- Channel appears to be degrading downstream of the existing Caltrans culvert.
- Headcutting should not proceed upstream
- The existing culvert is to be removed.
- Design to mitigate 11.7 feet **total** vertical drop over approximately 250 feet of channel (~4.7% slope).
- Traffic interruptions will be minimized.
- Environmental Construction work windows will be in place.
- Complete construction of channel and bridge in one construction season.



Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
01	Men	1	92.8	7	96

Kenset Moore 11-4-11
REGISTERED CIVIL ENGINEER DATE

6-11-12
PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

KENSET MOORE No. 64494 Exp. 6-30-13 CIVIL STATE OF CALIFORNIA

ROCK FISH WEIRS

WEIR No.	WEIR DIMENSIONS (FT) LENGTH Lt	LENGTH Rt	BASE WIDTH Lt	BASE WIDTH Rt	ROCK FISH WEIR: ROCK SLOPE PROTECTION (N) (2T, METHOD A)	(1T, METHOD A)	(1½T, METHOD A)	GABION ROCK (N)	COARSE AGGREGATE (N)	SLOPE PROTECTION: GABION ROCK (N)
					CY					
①	30	7	6	6	3.7	7.3	8.6	2.4	3.6	7.2
②	26	11	11	6	5.3	10.7	12.4	3.6	5.6	7.2
③	16	18	11	6	4.8	9.6	11.1	3.2	5.0	7.2
④	18	16	6	6	3.6	7.1	8.3	2.4	3.6	10.0
⑤	21	20	6	13	6.1	12.2	14.3	4.1	6.4	10.0
⑥	21	14	6	6	4.4	8.9	10.4	3.0	4.6	10.0
⑦	17	14	6	6	4.4	8.7	10.1	2.9	4.5	10.0
⑧	23	17	6	6	5.3	10.7	12.4	3.6	5.6	7.2
⑨	18	18	6	6	4.4	8.9	10.4	3.0	4.6	7.2
⑩	20	19	6	6	4.4	8.9	10.4	3.0	4.6	7.2
⑪	20	20	6	21	5.6	11.2	13.1	3.7	5.7	7.2
			TOTAL		52.1	104.1	121.5	34.7	53.8	90.4

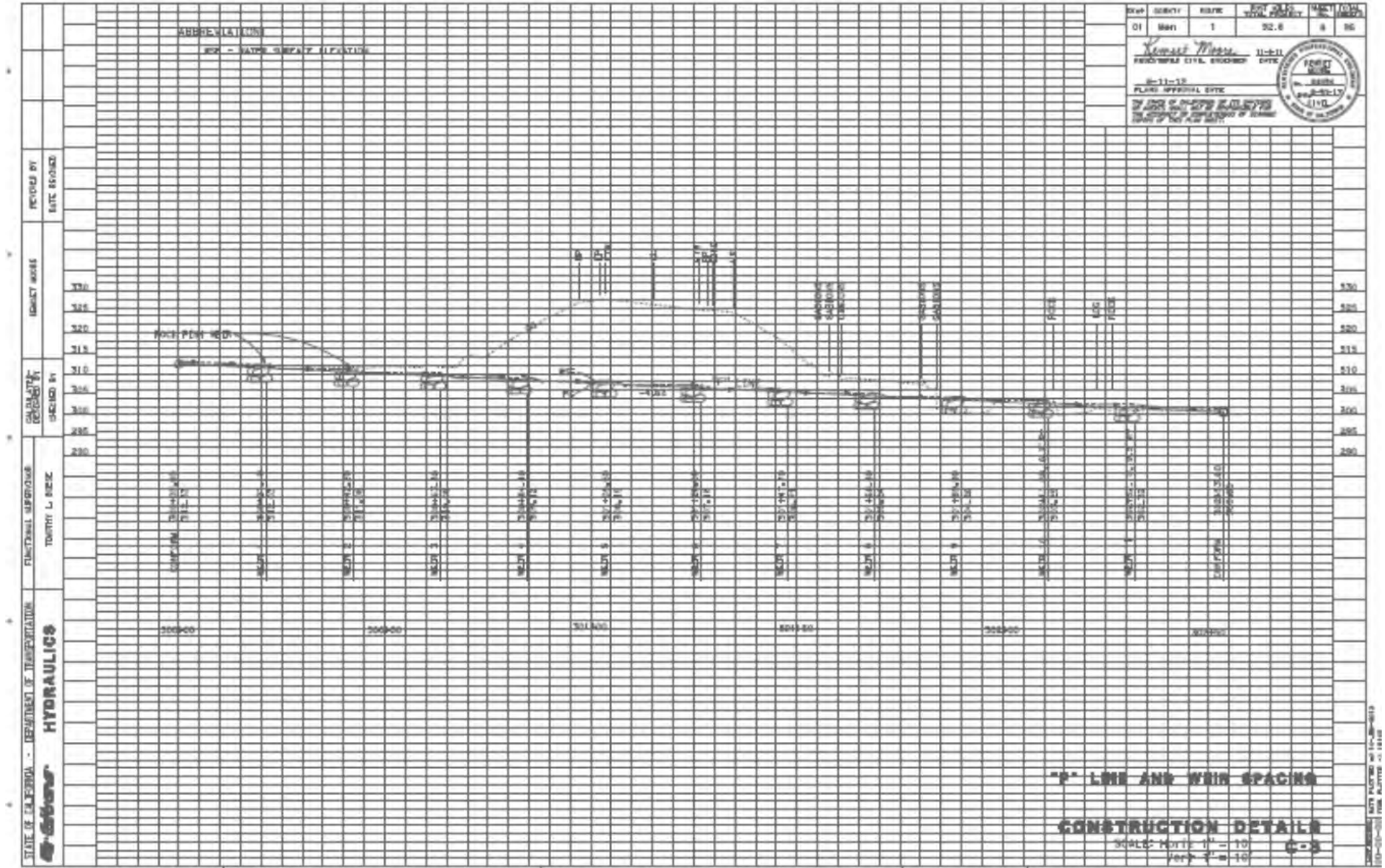
(N) = NOT A SEPARATE PAY ITEM, FOR INFORMATION ONLY.

CONSTRUCTION DETAILS

SCALE: 1" = 10' **C-2**

STATE OF CALIFORNIA — DEPARTMENT OF TRANSPORTATION — HYDRAULICS
FUNCTIONAL SUPERVISOR: TIMOTHY L. BOSSE
CALCULATED-DESIGNED BY: KENSET MOORE
CHECKED BY
REVISED BY
DATE REVISED
DATE PLOTTED = 14-JUN-2012
TIME PLOTTED = 15:42
LAST REVISED 00-00-00

BORDER LAST REVISED 7/2/2010 | USERNAME => s128845 | RELATIVE BORDER SCALE 0 1 2 3 | UNIT 0360 | PROJECT NUMBER & PHASE 01000001431



ABBREVIATIONS
WSE - WATER SURFACE ELEVATION
ROCK FISH WEIR
330
325
320
315
310
305
300
295
290
"P" LINE AND WEIR SPACING
CONSTRUCTION DETAILS
SCALE: Horiz 1" = 10'
Vert 1" = 10'
C-3
STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
HYDRAULICS
FUNCTIONAL SUPERVISOR
TOMMY L. BIESE
CALCULATED-DESIGNED BY
CHECKED BY
REVISED BY
DATE REVISED
SHEET NO.
01
Men
1
92.6
PROJECT NUMBER & PHASE
01000001451

AGENCY REQUIREMENTS

Permits Required

- US Army Corps 404 Permit
- North Coast RWQCB Section 401
  - Water Quality Certification
  - Statewide Water Permit
- CDFW 1602
  - Streambed Alteration Agreement
- RWQCB NPDES
  - General Permit

ADJACENT PROJECT

Private timberlands upstream – Soper-Wheeler Co. LLC

Completed in late 2011

Photos: Soper-Wheeler Co. LLC

FEBRUARY 26, 2013

Post tree removal

CONSTRUCTION

CONSTRUCTION

10/17/2013 10:55

04/29/2014 12:38

POST CONSTRUCTION MONITORING

Channel

Revegetation

7/23/2014

CALIFORNIA CONSERVATION CORPS

October 21, 2014

10/17/2013 12:39

01/30/2015 13:50

11/14/2018

11/14/2018

8/15/2019

1/29/2020

INSIGHT GAINED

- Design vs on the ground
- Experienced Construction Inspection
- Project footprint vs channel slope
- Rock source is important
- One season ?

Deer Creek Irrigation District Dam Fish Passage Improvement Project

FishPAC Connectivity Case Study

Amiana McEwen (Northwest Hydraulic Consultants)
Ben Cook (Trout Unlimited)

July 15th, 2020

1. Introduction

- Location:
  - Deer Creek, trib to Sacramento River
  - 8 mi. east of Los Molinos (Tehama Co.)
- Purpose
  - Low-head dam + flashboards partial barrier
  - Restore full fish passage at DCID diversion dam
- Need
  - Historically 1-2M CS in Central Valley + tribs
  - Collapse of SR fishery
  - SR CS persist only Butte, Mill, Deer
- Desired long-term outcomes
  - Improve fish passage through Lower Deer Creek migration corridor

Species/Life Stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spring-run Chinook Salmon												
Adult SRCS[3,4,5]												
Juvenile SRCS[6,7]												
Fall-run Chinook Salmon												
Adult FRCS[3,4,5]												
Juvenile FRCS[6,7]												
Late Fall-run Chinook Salmon												
Adult LFRCS[3,4]												
Juvenile LFRCS[6,7]												
Steelhead												
Adult steelhead[3,4]												
Juvenile steelhead[6,7]												

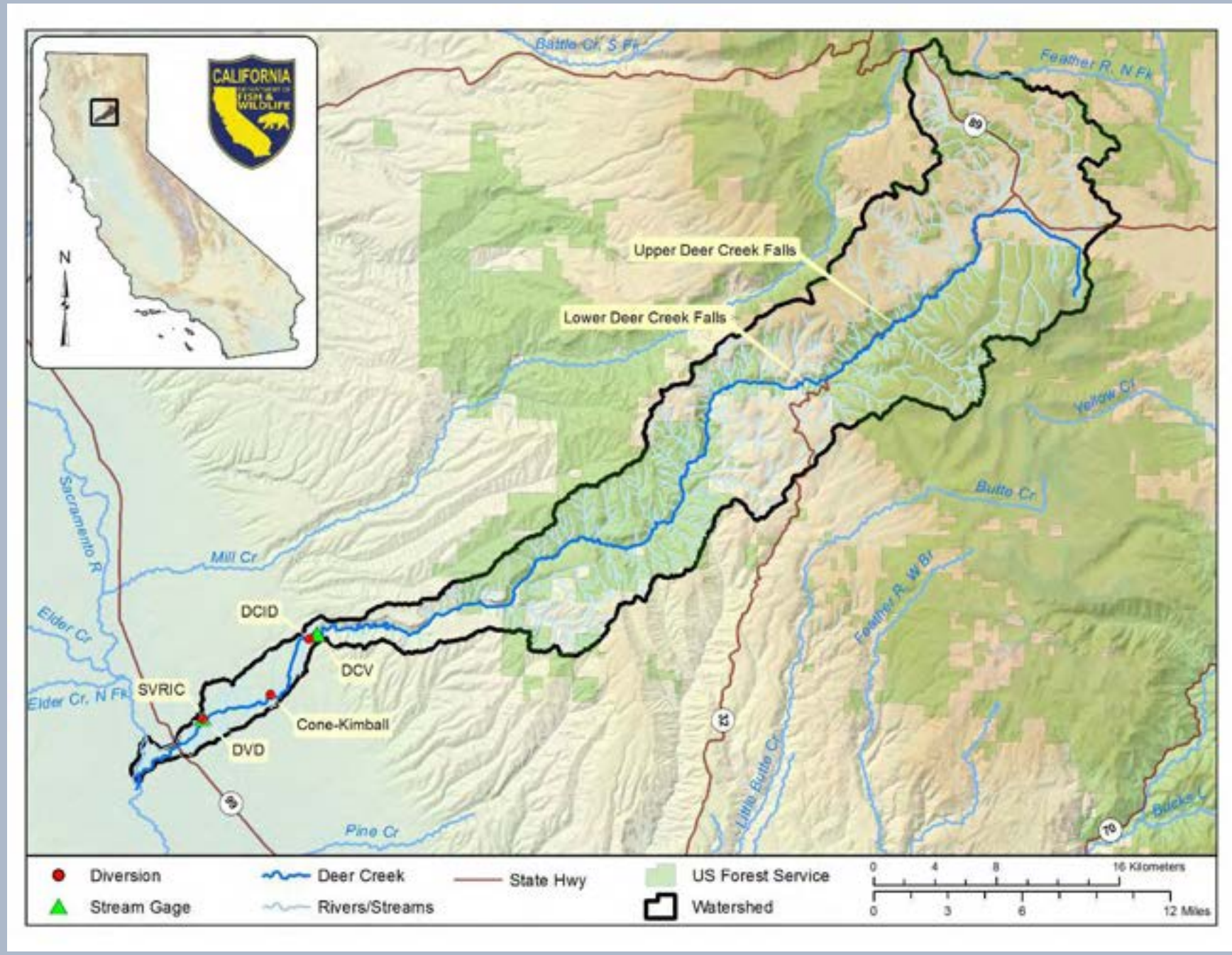
2. Project Partners

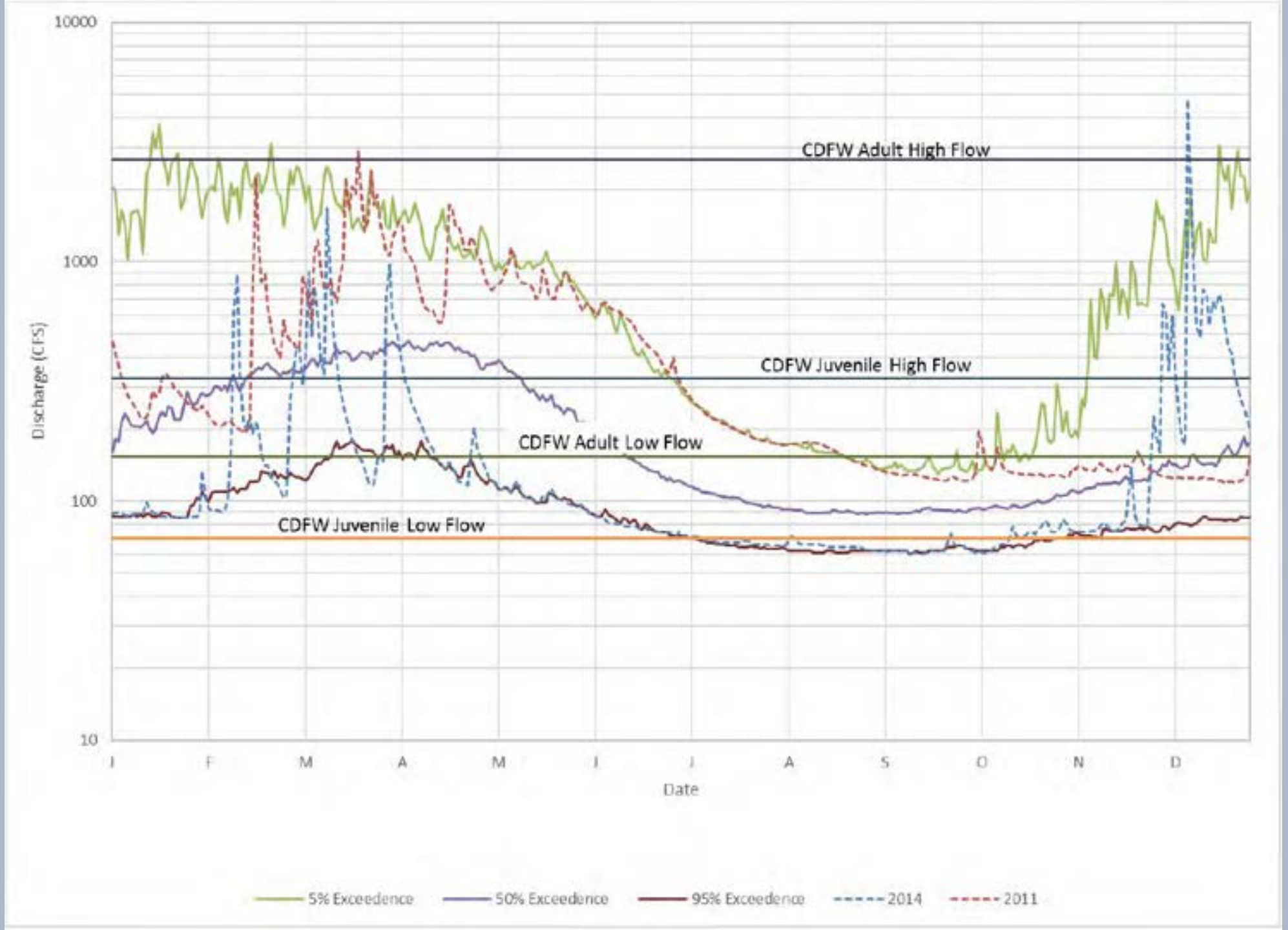
- Funders:
- Deer Creek Irrigation District and District Members/Landowners
- Science and Data: CDFW/USFWS/NMFS
- Environmental Compliance: Tehama Environmental Services
- Permit Agencies: CDFW, NMFS, USFWS, USACE, SWRCB/RWQCB, CVFPB
- Engineering: NHC, DWR
- Construction: NHC/Meyers Earthwork
- Post-project monitoring: CDFW, TES

3. Science & Data

- T&E Species:
  - FR & SR CS
  - Steelhead
  - Pacific Lamprey

- Connectivity:
  - LDC migration corridor
  - SVRIC
  - DCID
  - LDCF



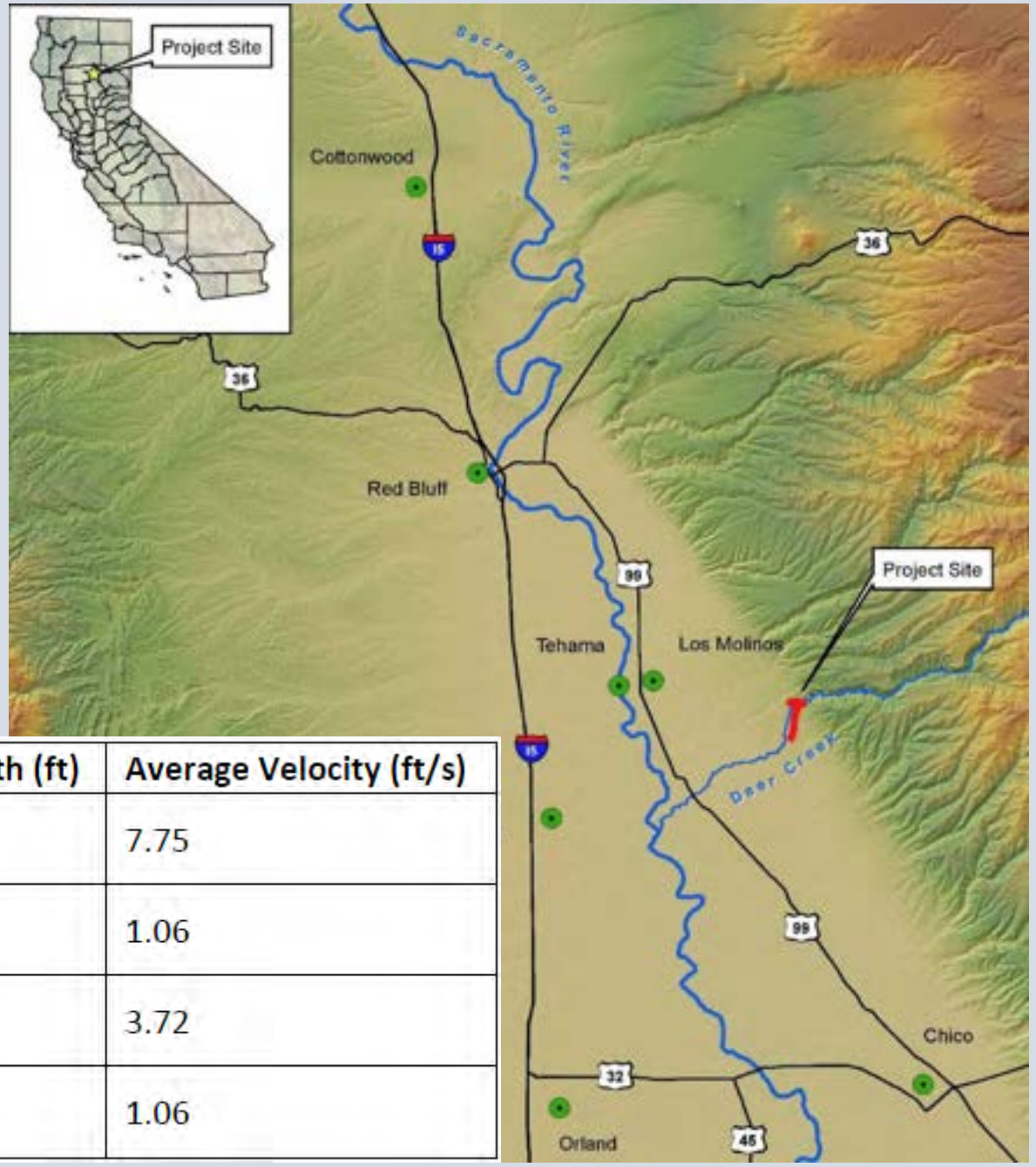

10000
1000
100
10
Discharge (CFS)
CDFW Adult High Flow
CDFW Juvenile High Flow
CDFW Adult Low Flow
CDFW Juvenile Low Flow
J
F
M
A
M
J
J
A
S
O
N
D
Date
5% Exceedence
50% Exceedence
95% Exceedence
2014
2011

4. Planning and Project Delivery

- DWR completed 50% designs
- NHC completed 100% designs and coordinated TAC with funding from USFWS
- In 2017 TU/NHC submitted CDFW Prop 1 grant application for
  - Environmental compliance (subcontractor TES)
  - Construction plan
  - Construction
  - Post-project monitoring
- Prop 1 grant awarded in 2018
- USFWS stepped in with two rounds of additional funds in consecutive years to bridge implementation budget gaps

5. Engineering

- Location: Deer Creek (Tehama County)
- Goals: Fish passage & fish screening
- Initial design (up to 50%) – Department of Water Resources
- NHC completed 65% - 100% designs
  - Worked with Trout Unlimited
  - Environmental assessments
  - Construction documents and permitting



Event	Design Flow (cfs)	Water Surface Depth (ft)	Average Velocity (ft/s)
Design Flow High - Adult Anadromous Salmonid	2,680	4.26	7.75
Design Flow Low - Adult Anadromous Salmonid	32	1.04	1.06
Design Flow High - Juvenile Anadromous Salmonid	325	1.76	3.72
Design Flow Low - Juvenile Anadromous Salmonid	32	1.04	1.06

Table 4.2: Calculated Stable Material for Roughened Rock Ramp

Method	Percent Smaller	Diameter (ft)
Abt & Johnson (1991)	D_{50}	2.59
Ullmann (2000)	D_{50}	1.60
Ferro (1999)	D_{50}	2.84
Robinson et al (1998)	D_{50}	0.98
USACE (1991) Bed	**D_{50}**	**2.62**

Table 4.3: Calculated Streambed Gradations

Percent Smaller	2-year Diameter (in)	100-year Diameter (in)
D_{16}	1.1	2.1
D_{50}	3.5	6.6
D_{84}	8.6	16.4
D_{100}	21.6	41.0

Table 4.4: Proposed Streambed Sediment Gradation

Sieve Size	Percent Passing*
2 1/2"	99-100
2"	65-95
1"	50-85
No. 4	26-44
No. 40	16 max.
No. 200	5.0-9.0

*Percent Passing is measured by weight

Table 4.5: Proposed Streambed Cobbles 12 In. Gradation

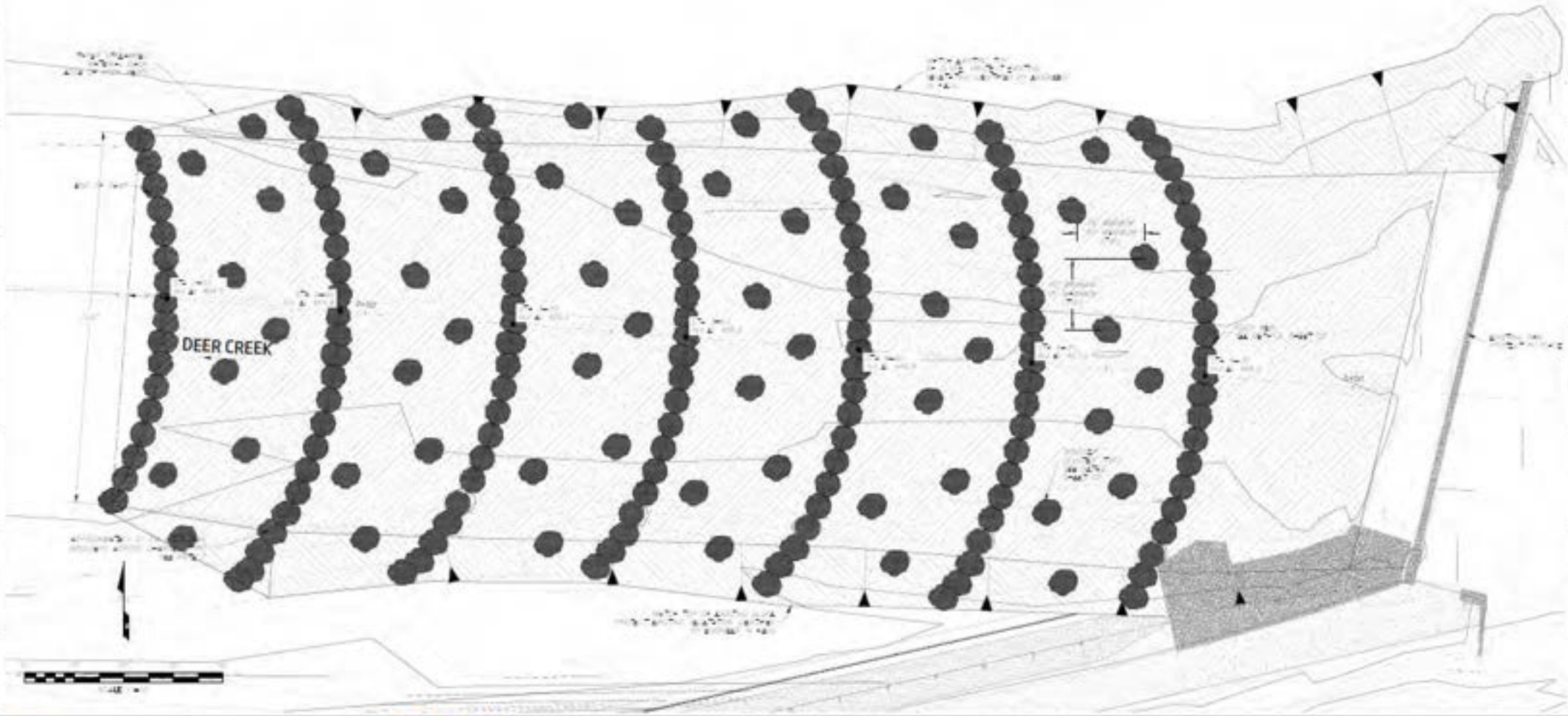
Approximate Size (in)	Percent Passing*
12	99-100
10	70-90
5	30-60
3/4	10 max.

*Percent Passing is measured by size

Table 4.6: Proposed Streambed Boulders Gradation

Material	Approximate Size (in)*
One Man	12 - 18

*Percent Passing is measured by size



U.S. Fish & Wildlife Service
Red Bluff Fish & Wildlife Service
10950 Tyler Road
Red Bluff, California 96080
www.fws.gov/redbluff

nhc
northwest hydraulic consultants

Revisions

No.	Date	Description

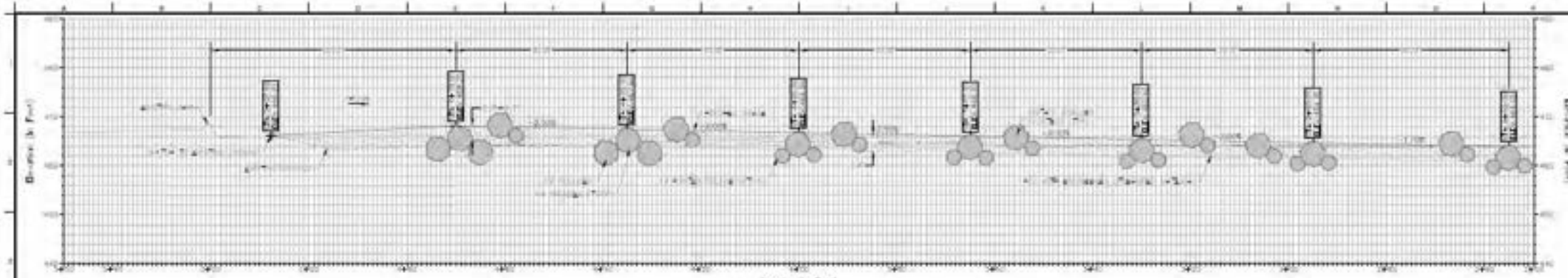
Drawing Information

Date	27 September 2017 08:34
Status	100% Submittal
Designer	
Drafter	
Checked	
File Name	DCID
Plotted Scale	

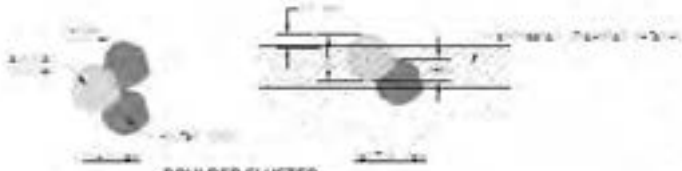
Deer Creek DCID Dam
Fish Passage Project

Rock Ramp Plan Sheet

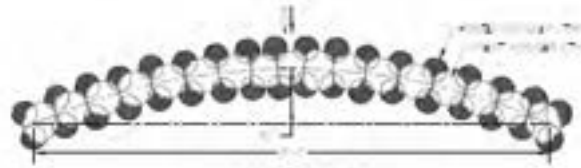
Job Number
Sheet Number
C1



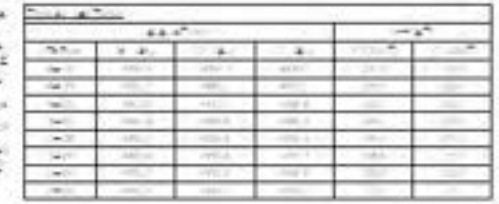
ROCK RAMP PROFILE



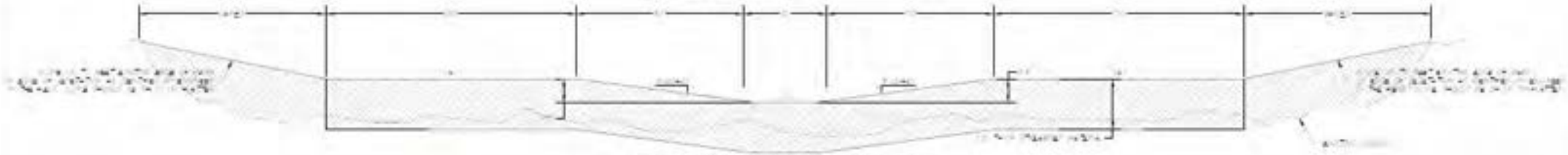
BOULDER CLUSTER



ROCK WEIR PLAN VIEW



TYPICAL ROCK RAMP SECTION - (At Weirs)



TYPICAL ROCK RAMP SECTION - (Between Weirs)

U.S. Fish & Wildlife Service
Red Bluff Fish & Wildlife Service
10950 Tyler Road
Red Bluff, California 96080
www.fws.gov/redbluff

nhc
northwest hydraulic consultants

Revisions		
No.	Date	Description

Drawing Information	
Date	27 September 2017 08:34
Status	100% Submittal
Designer	bjw
Drafter	bjw
Checked	bjw
File Name	DCID
Plotted Scale	

Deer Creek DCID Dam
Fish Passage Project

Rock Ramp Profile & Section Sheet

Job Number
600-00

Sheet Number
C2

Sheet 4 of 26

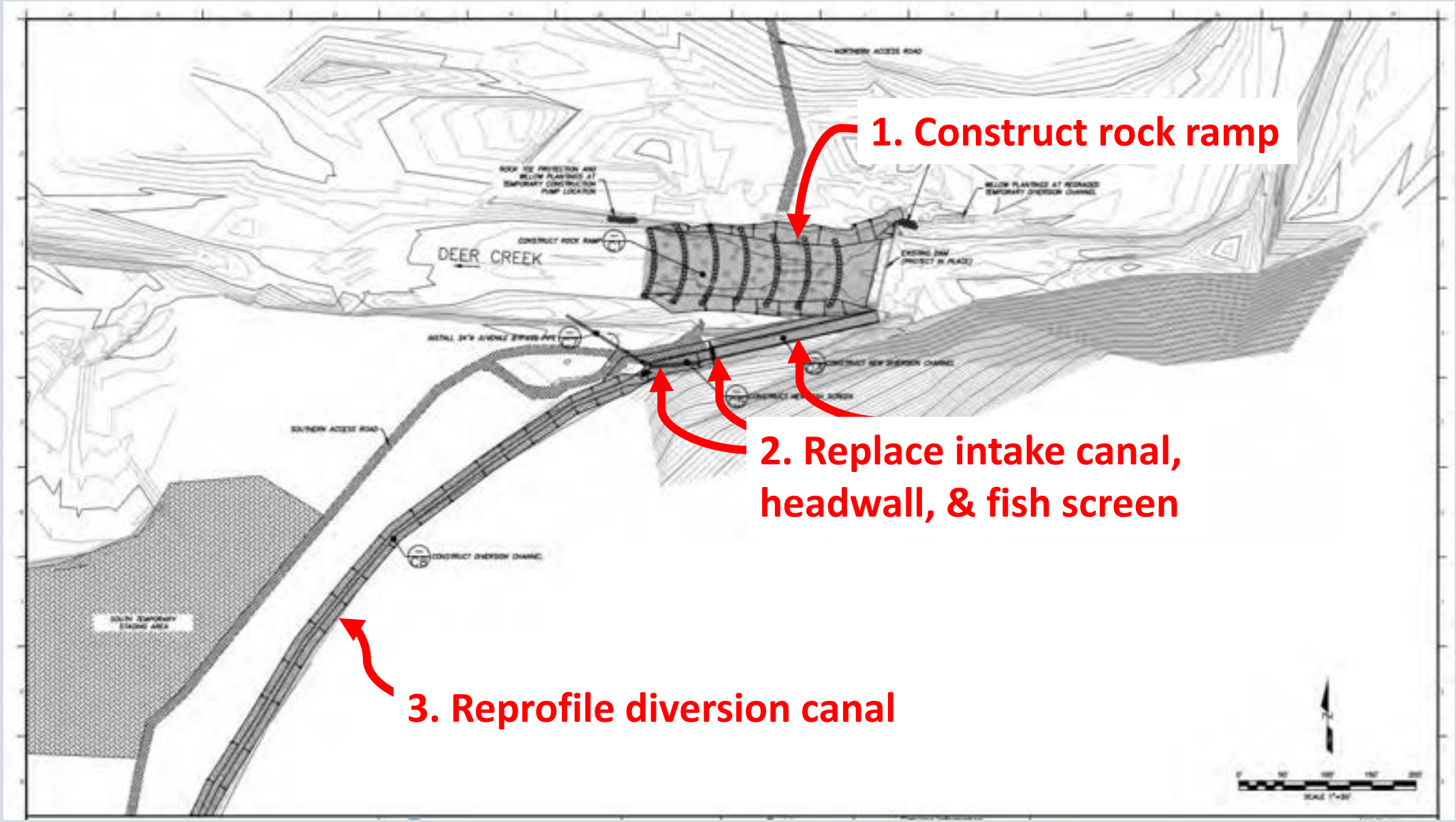
6. Permitting

- Environmental Compliance lead by TES & agencies
- CEQA BA/MND & NEPA EA/FONSI
- CDFW LSAA
- CWA 404
- USFWS & NMFS Biological Opinions
- RWQCB 401
- SWPPP
- CVFPB
- Lessons learned: Hands-on approach by agency PMs was key to success

7. Funding

- CDFW Prop 1 Watershed Restoration Grants Program: $2.4M
- USFWS Anadromous Fish Restoration Program: $850K
- DWR (designs)
- DCID participation
- Total project costs: $3.2M+

8. Construction



Pre-construction

- Cultural resource protection/avoidance measures
- Pre-construction snorkel surveys and fish rescue
- Control of water included diversion of stream flow and dewatering of work area

Construction

- Rocks from quarry (~1 mile away)
- Continuous grade checks/verification
- Engineer and biologist on site

725
CAT

CAT

Fish Screen Improvements

Diversion canal improvements

9. Post-project monitoring and reporting

- Post-project longitudinal profiles
- Fish distribution studies ongoing
- Revegetation maintenance and monitoring

10. Lessons Learned

- Project benefits:
  - CDFW is doing surveys to understand fish distribution above/below dam
- Challenges
  - Cost increases in interval between proposal and construction
  - Permitting delays
  - Dewatering, dewatering, dewatering
- Lessons learned
  - Budget for cost increases + contingencies
  - Hands-on approach on part of agencies was key to all phases of project
  - Dewatering approach
  - Budget for fish biologists

CALIFORNIA FISH PASSAGE ADVISORY COMMITTEE

Connectivity Case Studies

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