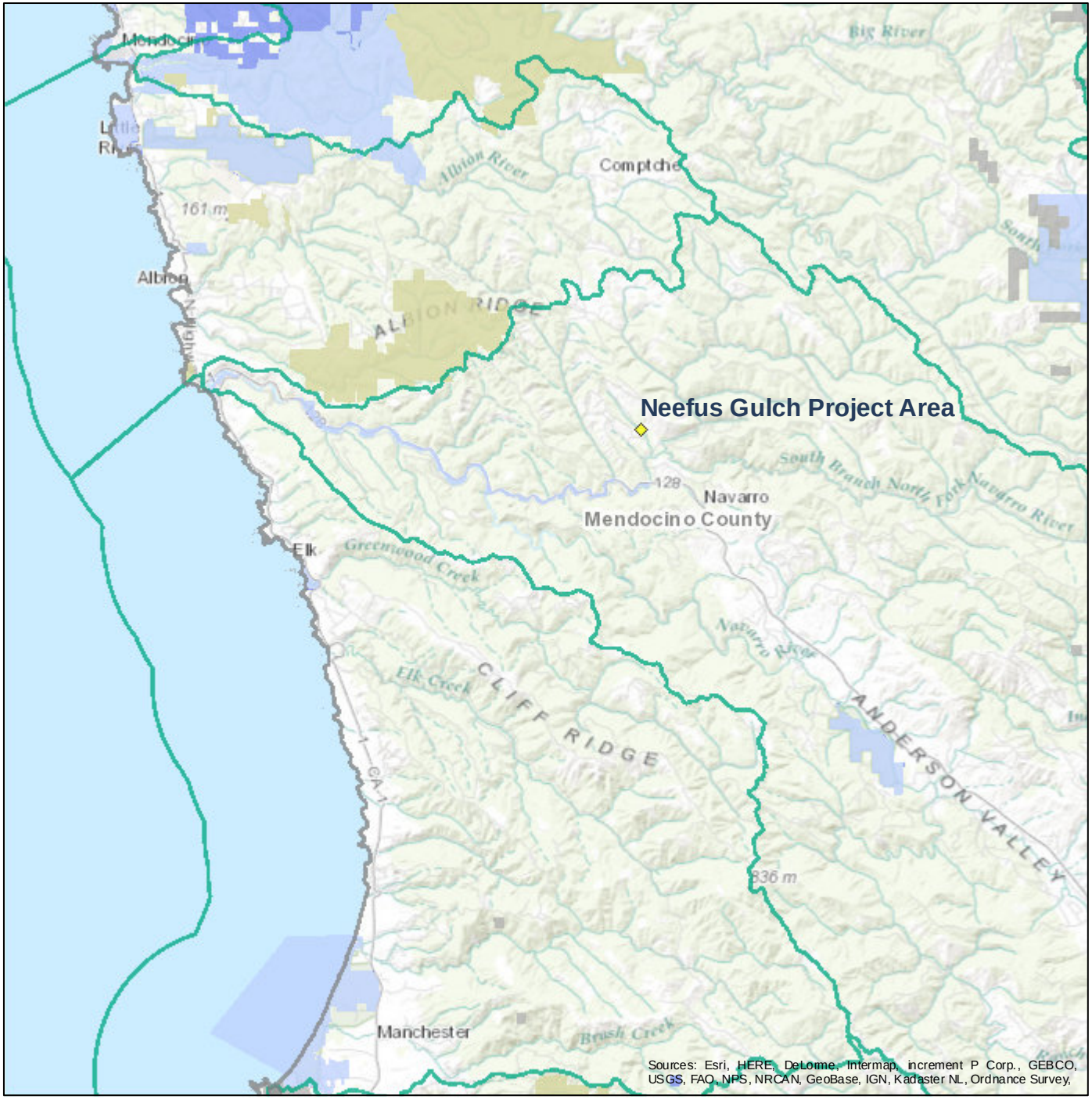
Exhibit 1: Project Location Map

North Coast

Coastal Conservancy

Exhibit 1: Project Location Map

Neefus Gulch Coho Salmon Barrier Removal Project Design - Regional Map



Colored polygons indicate California Protected Areas Database (CPAD) Holdings

N

1:288,895

0 2.5 5 10 mi

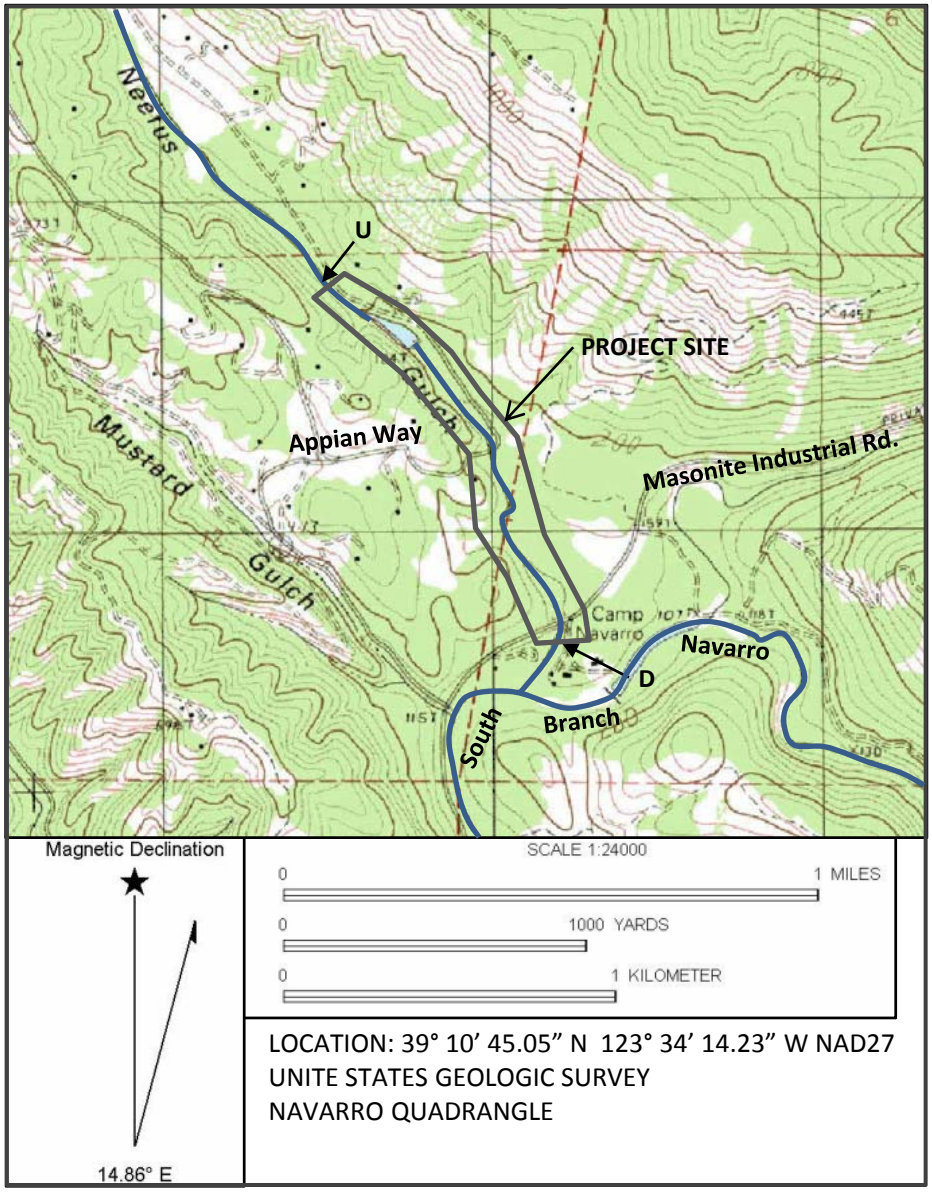
0 4 8 16 km

December 30, 2015

Author: L.Bolton

Printed from http://bios.dfg.ca.gov

Exhibit 1: Project Location Map

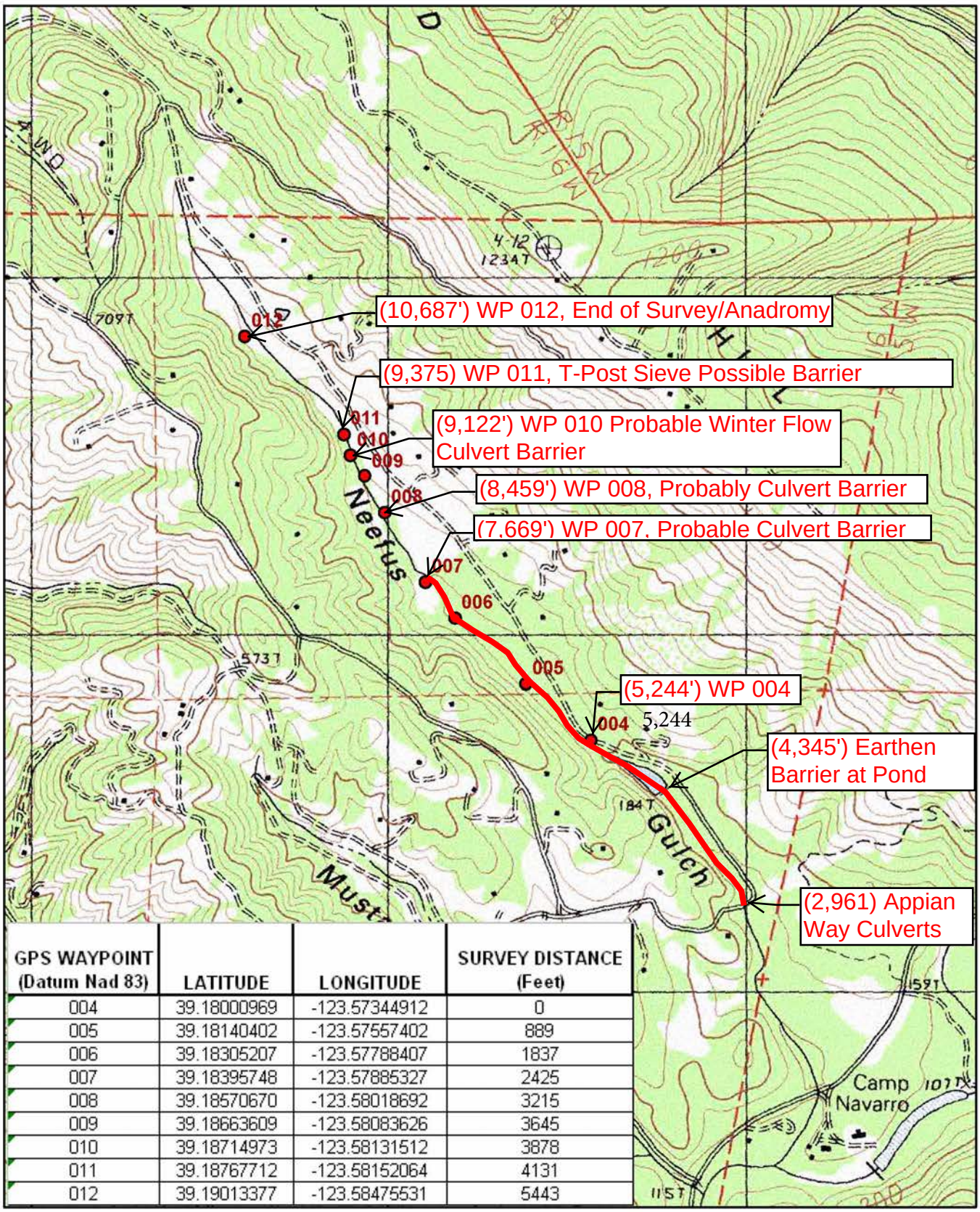


NEEFUS GULCH COHO SALMON BARRIER REMOVAL PROJECT DESIGN
TROUT UNLIMITED
TOPO MAP

Exhibit 1: Project Location Map

Map 2

Neefus Gulch



GPS WAYPOINT (Datum Nad 83)	LATITUDE	LONGITUDE	SURVEY DISTANCE (Feet)
004	39.18000969	-123.57344912	0
005	39.18140402	-123.57557402	889
006	39.18305207	-123.57788407	1837
007	39.18395748	-123.57885327	2425
008	39.18570670	-123.58018692	3215
009	39.18663609	-123.58083626	3645
010	39.18714973	-123.58131512	3878
011	39.18767712	-123.58152064	4131
012	39.19013377	-123.58475531	5443

Base map with Waypoints from
CDFW 2013 Neefus Gulch Field Note, A. Renger.
[Note: (Distances) indicate distance from mouth of Neefus Gulch.]

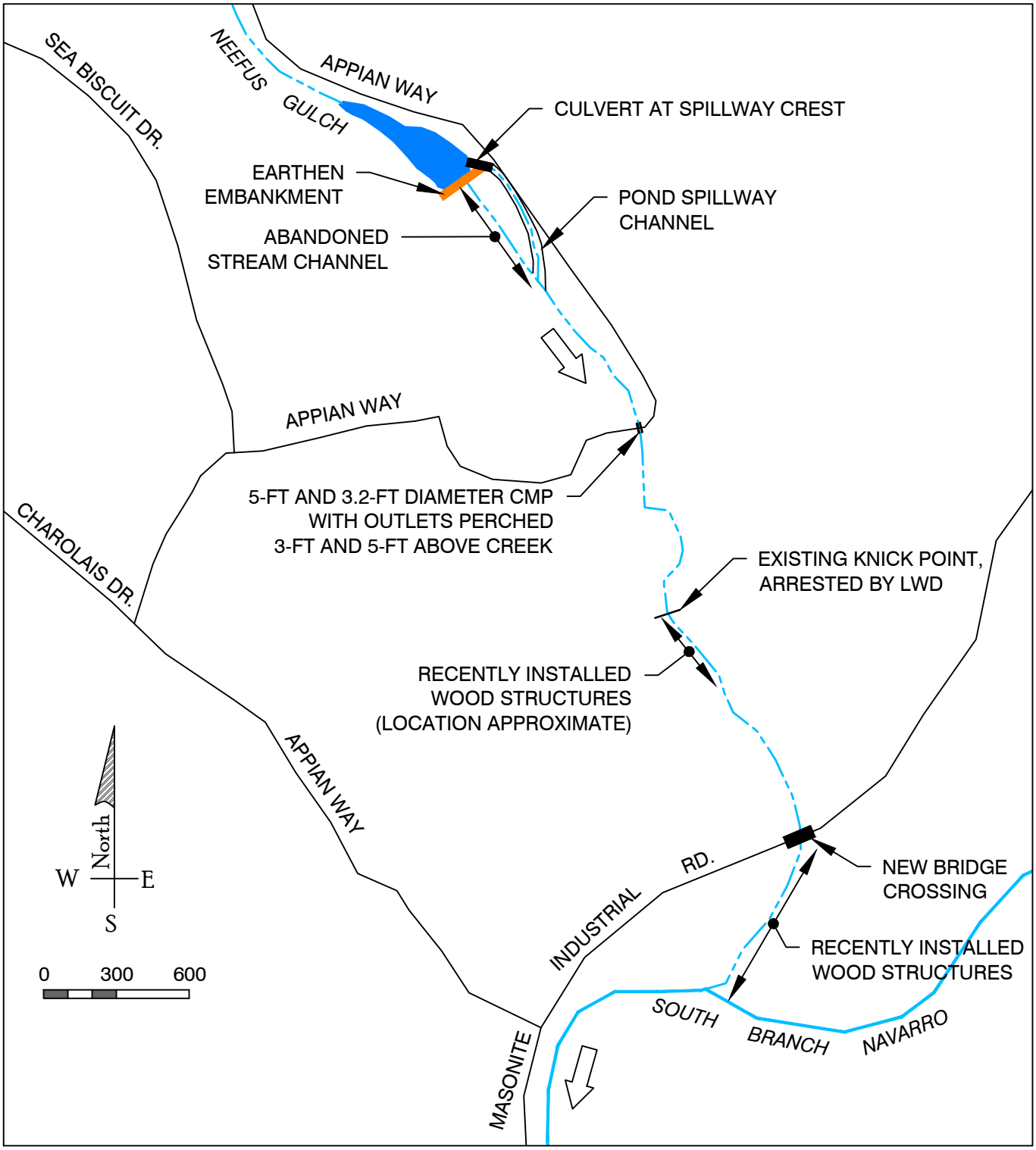
N

0 125 250 500 750 1,000 Meters

Legend

- Waypoints 4-12
- Stream opened by proposed designs

Exhibit 1: Project Location Map



NEEFUS GULCH COHO SALMON BARRIER REMOVAL PROJECT DESIGN

TROUT UNLIMITED

EXISTING CONDITIONS MAP

Neefus Gulch culverts on Appian Way, Rancho Navarro

Project: Neefus

Crossing Location Information

Crossing Name: Neefus Gulch culverts on Appian Way
Stream Name: Neefus Gulch
Road: Appian Way

Comments:
Adult Salmonid Passage Criteria

Biological Data

Fish Length: 24 in
Minimum Water Depth: 1 ft
Prolonged Swimming Speed: 6.1 ft/s
Prolonged Time to Exhaustion: 30 min
Prolonged Notes:
Coho salmon
Oncorhynchus kisutch
Length: 1.6 to 5.32 in
Temp: 13 to 15 Deg C
Fish Body Depth: 0.48 ft
Fish Metrics Calculated

Burst Swimming Speed: 7.6 ft/s
Burst Time to Exhaustion: 10 s
Burst Notes:
Coho salmon
Oncorhynchus kisutch
Length: 14.02 to 24.02 in
Temp: 10 to 19 Deg C
Swim Time: 2.6 - 12.5 s
Fish Body Depth: 0.48 ft
Fish Metrics Calculated

Leaping Speed: 33.7 ft/s
Velocity Reduction Factors:
Inlet: 1.00
Barrel: 1.00
Outlet: 1.00

Crossing Installation Data

Culvert Number 1

Culvert Type: 5 ft Circular
Construction: Concrete
Installation: Not Embedded
Culvert Length: 30 ft
Culvert Slope: 2.40%
Culvert Roughness Coefficient: 0.013
Inlet Invert Elevation: 93.73 ft
Outlet Invert Elevation: 93.01 ft
Inlet Headloss Coefficient (Ke): 0

Culvert Number 2

Culvert Type: 3 ft Circular
Construction: Helical 1.50 x 1/4 inch
Installation: Not Embedded
Culvert Length: 30 ft
Culvert Slope: 2.40%
Culvert Roughness Coefficient: 0.024
Inlet Invert Elevation: 93.73 ft
Outlet Invert Elevation: -99 ft
Inlet Headloss Coefficient (Ke): 0

Design Flows

Low Passage Flow: 3 cfs
High Passage Flow: 240 cfs

Tailwater Information

Tailwater Option: Constant Tailwater
Constant Tailwater Elevation: 90.33 ft
Outlet-Pool Bottom Elevation: 88 ft

Table 1. Fish Passage Summary.

Fish Passage Summary	
Low Passage Design Flow	3.00 cfs
High Passage Design Flow	240.00 cfs
Percent of Flows Passable	0.0 %
Passable Flow Range	None
Depth Barrier	3.00 to 82.73 cfs
Leap Barriers	None
Velocity Barrier	4.46 cfs to 240.00 cfs
Pool Depth Barrier	None

Table 2. Culvert Summary for 3.00 cfs.

Summary for Q = 3.00 cfs	
Normal Depth (ft)	0.31
Critical Depth (ft)	0.47
Headwater Depth (ft)	0.57
HW/D	0.19
Inlet Velocity (ft/s)	5.83
Tailwater Depth (ft)	-2.68
Outlet Water Surface Drop...	2.99
Prolonged Swim Time (min)	0.93
Burst Swim Time (s)	0.00
Barrier Code	Depth

Table 3. Culvert Profiles for 3.00 cfs.

	Profiles for Q = 3.00 cfs						
Dist Down Culvert (ft)	Depth (ft)	Velocity Average (ft/s)	Wetted Area (ft2)	Wetted Perimeter (ft)	Top Width (ft)	Hydraulic Radius (ft)	Hydraulic Depth (ft)
0	0.57	0.00	1.24	3.44	3.18	0.36	0.39
2	0.39	5.83	0.71	2.83	2.68	0.25	0.26
3	0.38	4.43	0.68	2.78	2.64	0.24	0.26
4	0.37	4.59	0.65	2.75	2.61	0.24	0.25
5	0.36	4.73	0.63	2.72	2.59	0.23	0.24
6	0.36	4.85	0.62	2.70	2.57	0.23	0.24
7	0.35	4.95	0.60	2.68	2.55	0.23	0.24
8	0.35	5.04	0.59	2.66	2.54	0.22	0.23
9	0.34	5.13	0.58	2.65	2.52	0.22	0.23
10	0.34	5.20	0.57	2.63	2.51	0.22	0.23
11	0.34	5.27	0.57	2.62	2.50	0.22	0.23
12	0.33	5.33	0.56	2.61	2.49	0.21	0.23
13	0.33	5.39	0.56	2.60	2.48	0.21	0.22
14	0.33	5.44	0.55	2.59	2.48	0.21	0.22
15	0.33	5.48	0.55	2.58	2.47	0.21	0.22
16	0.32	5.53	0.54	2.58	2.46	0.21	0.22
17	0.32	5.56	0.54	2.57	2.46	0.21	0.22
18	0.32	5.60	0.53	2.57	2.45	0.21	0.22
19	0.32	5.63	0.53	2.56	2.45	0.21	0.22
20	0.32	5.66	0.53	2.56	2.45	0.21	0.22
21	0.32	5.69	0.53	2.55	2.44	0.21	0.22
22	0.32	5.72	0.52	2.55	2.44	0.21	0.21
23	0.32	5.74	0.52	2.54	2.44	0.20	0.21
24	0.32	5.76	0.52	2.54	2.43	0.20	0.21
25	0.32	5.78	0.52	2.54	2.43	0.20	0.21
26	0.31	5.80	0.52	2.53	2.43	0.20	0.21
27	0.31	5.82	0.51	2.53	2.43	0.20	0.21
28	0.31	5.84	0.51	2.53	2.42	0.20	0.21
29	0.31	5.85	0.51	2.53	2.42	0.20	0.21
30	0.31	5.86	0.51	2.53	2.42	0.20	0.21

Exhibit 1: Project Location Map

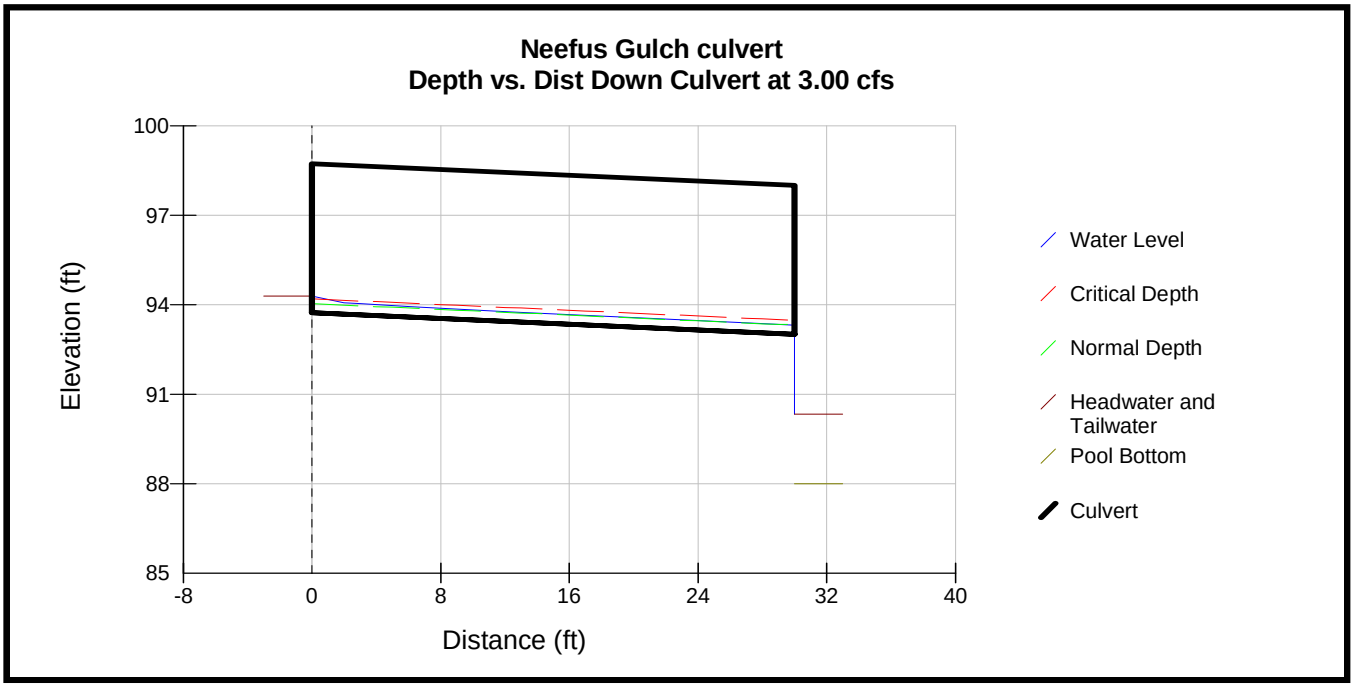


Figure 1. Water Surface Profile at 3 cfs

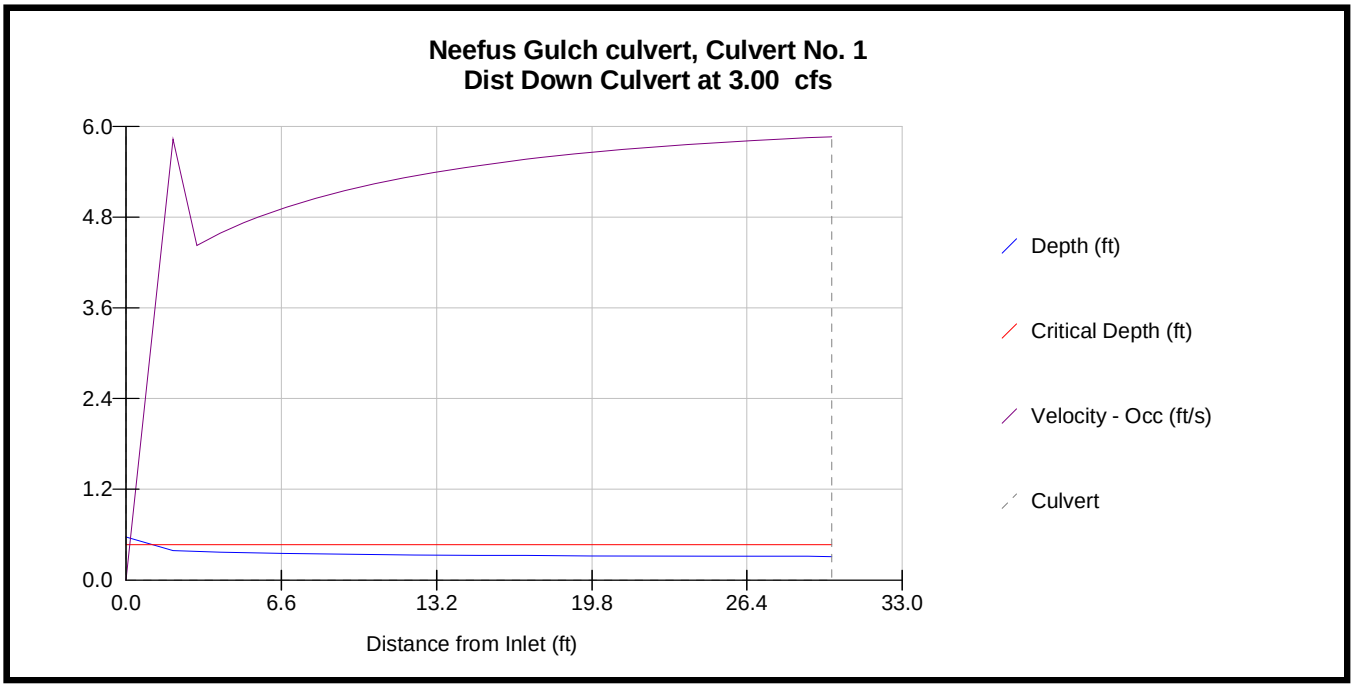


Figure 2. Culvert Profiles at 3 cfs

Table 4. Culvert Summary for 240 cfs.

Summary for Q = 240.00 cfs	
Normal Depth (ft)	2.77
Critical Depth (ft)	4.36
Headwater Depth (ft)	8.13
HW/D	2.71
Inlet Velocity (ft/s)	19.41
Tailwater Depth (ft)	-2.68
Outlet Water Surface Drop...	6.27
Prolonged Swim Time (min)	0.00
Burst Swim Time (s)	0.00
Barrier Code	V

Table 5. Culvert Profiles for 240 cfs.

	Profiles for Q = 240.00 cfs						
Dist Down Culvert (ft)	Depth (ft)	Velocity Average (ft/s)	Wetted Area (ft2)	Wetted Perimeter (ft)	Top Width (ft)	Hydraulic Radius (ft)	Hydraulic Depth (ft)
0	8.13	0.00	19.63	15.71	0.00	1.25	NA
2	4.05	19.41	17.04	11.20	3.92	1.52	4.34
3	4.02	14.20	16.90	11.11	3.98	1.52	4.25
4	3.99	14.30	16.78	11.04	4.02	1.52	4.17
5	3.96	14.40	16.67	10.97	4.06	1.52	4.10
6	3.93	14.49	16.57	10.90	4.10	1.52	4.04
7	3.91	14.57	16.47	10.85	4.13	1.52	3.99
8	3.89	14.65	16.38	10.80	4.16	1.52	3.94
9	3.87	14.73	16.30	10.75	4.19	1.52	3.89
10	3.85	14.80	16.21	10.70	4.21	1.52	3.85
11	3.83	14.87	16.14	10.66	4.23	1.51	3.81
12	3.81	14.94	16.06	10.62	4.26	1.51	3.77
13	3.80	15.01	15.99	10.58	4.28	1.51	3.74
14	3.78	15.07	15.92	10.54	4.30	1.51	3.71
15	3.76	15.13	15.86	10.51	4.31	1.51	3.68
16	3.75	15.19	15.79	10.47	4.33	1.51	3.65
17	3.74	15.25	15.73	10.44	4.35	1.51	3.62
18	3.72	15.31	15.67	10.41	4.36	1.51	3.59
19	3.71	15.37	15.62	10.38	4.38	1.50	3.57
20	3.70	15.42	15.56	10.35	4.39	1.50	3.54
21	3.68	15.47	15.51	10.32	4.40	1.50	3.52
22	3.67	15.53	15.46	10.29	4.42	1.50	3.50
23	3.66	15.58	15.41	10.27	4.43	1.50	3.48
24	3.65	15.63	15.36	10.24	4.44	1.50	3.46
25	3.64	15.68	15.31	10.22	4.45	1.50	3.44
26	3.63	15.73	15.26	10.20	4.46	1.50	3.42
27	3.62	15.77	15.21	10.17	4.47	1.50	3.40
28	3.61	15.82	15.17	10.15	4.48	1.49	3.38
29	3.60	15.87	15.13	10.13	4.49	1.49	3.37
30	3.59	15.91	15.08	10.11	4.50	1.49	3.35

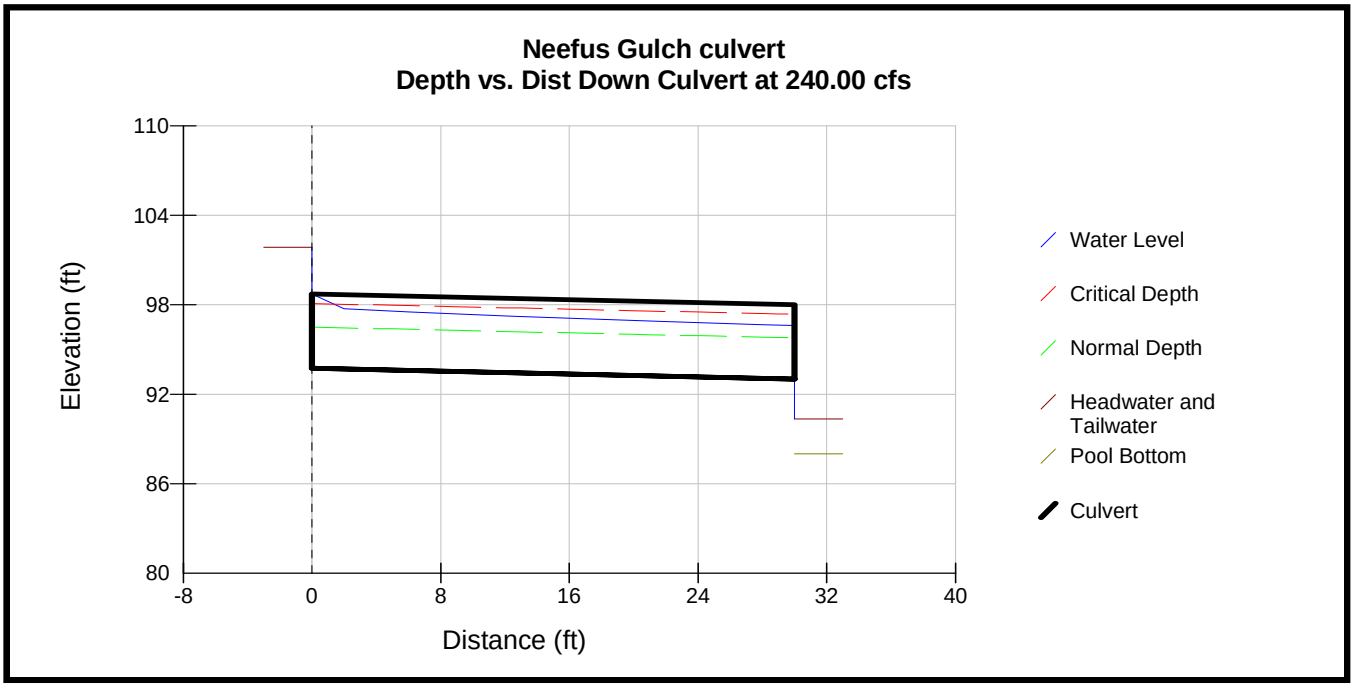


Figure 3. Water Surface Profile at 240 cfs

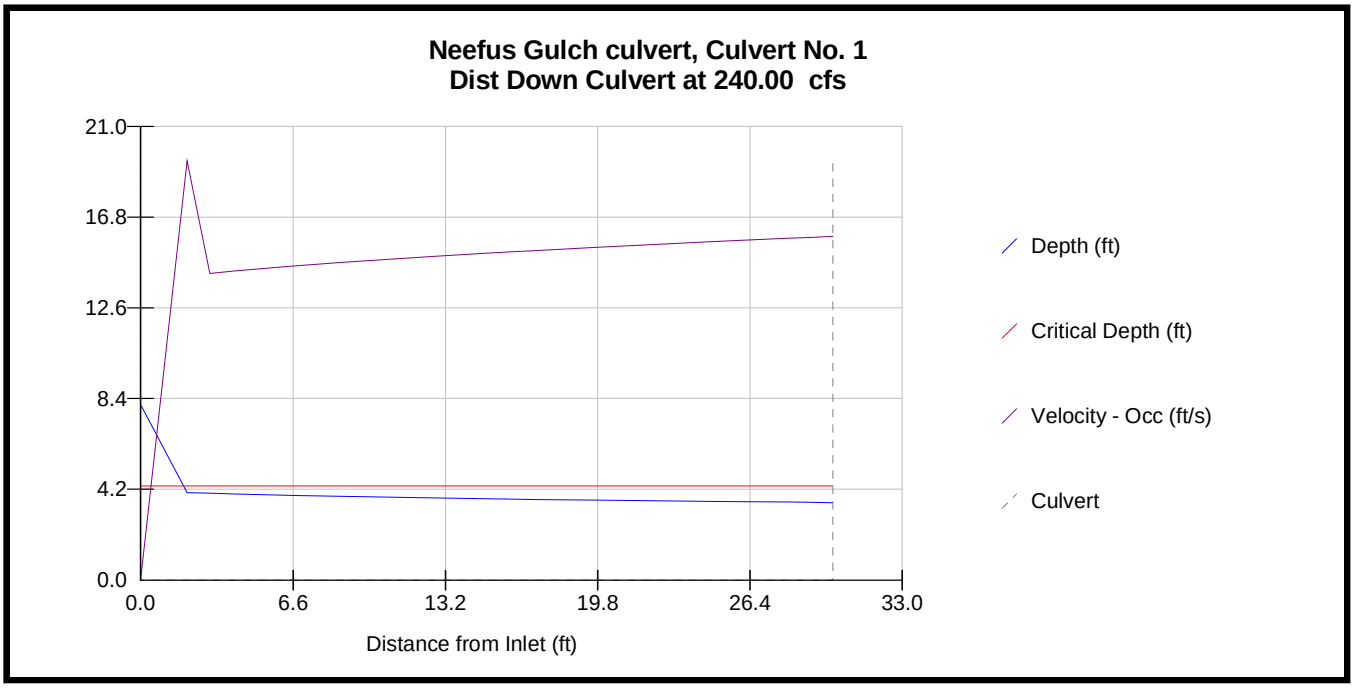


Figure 4. Culvert Profiles at 240 cfs

Table 6. Culvert Rating Table.

Q total (cfs)	Q (analysis) (cfs)	% Q total (cfs)	Depth Min (ft)	V(occ) Max (ft/s)	Depth TW (ft)	Outlet WS Drop (ft)	Depth Pool (ft)	Barrier Type
0	0.00	0.00	0.00	0.00	-2.68	2.68	2.33	Depth
3.00	2.99	100.00	0.31	5.86	-2.68	2.99	2.33	Depth
24	23.99	100.00	0.95	9.24	-2.68	3.63	2.33	Depth; V
36	35.99	100.00	1.19	10.14	-2.68	3.87	2.33	V
48	14.82	13.37	0.73	8.41	-2.68	3.41	2.33	Depth; V
60	18.69	13.48	0.83	8.80	-2.68	3.51	2.33	Depth; V
72	22.65	13.59	0.92	9.14	-2.68	3.60	2.33	Depth; V
84	26.72	13.72	1.01	9.43	-2.68	3.69	2.33	V
96	30.86	13.85	1.09	9.77	-2.68	3.77	2.33	V
108	35.06	13.97	1.18	10.08	-2.68	3.86	2.33	V
120	39.36	14.09	1.26	10.38	-2.68	3.94	2.33	V
132	43.77	14.22	1.34	10.66	-2.68	4.02	2.33	V
144	48.30	14.36	1.41	10.94	-2.68	4.09	2.33	V
156	52.90	14.50	1.49	11.20	-2.68	4.17	2.33	V
168	59.12	14.96	1.59	11.54	-2.68	4.27	2.33	V
180	63.79	15.05	1.66	11.79	-2.68	4.34	2.33	V
192	69.57	15.34	1.75	12.07	-2.68	4.43	2.33	V
204	77.38	15.94	1.86	12.45	-2.68	4.54	2.33	V
216	215.99	100.00	3.38	18.27	-2.68	6.06	2.33	V
228	227.99	100.00	3.49	18.83	-2.68	6.17	2.33	V
240.00	239.99	100.00	3.59	19.41	-2.68	6.27	2.33	V
252	251.99	100.00	3.68	20.02	-2.68	6.36	2.33	V
264	263.99	100.00	3.78	20.64	-2.68	6.46	2.33	V
276	275.99	100.00	3.86	21.30	-2.68	6.54	2.33	V
288	287.99	100.00	3.95	21.97	-2.68	6.63	2.33	V
300	299.99	100.00	4.03	22.66	-2.68	6.71	2.33	V
312	311.99	100.00	4.14	22.92	-2.68	6.82	2.33	V
324	323.99	100.00	4.21	23.61	-2.68	6.89	2.33	V
336	335.99	100.00	4.29	24.35	-2.68	6.97	2.33	V
348	347.99	100.00	4.35	25.12	-2.68	7.03	2.33	V
360	359.99	100.00	4.42	25.91	-2.68	7.10	2.33	V

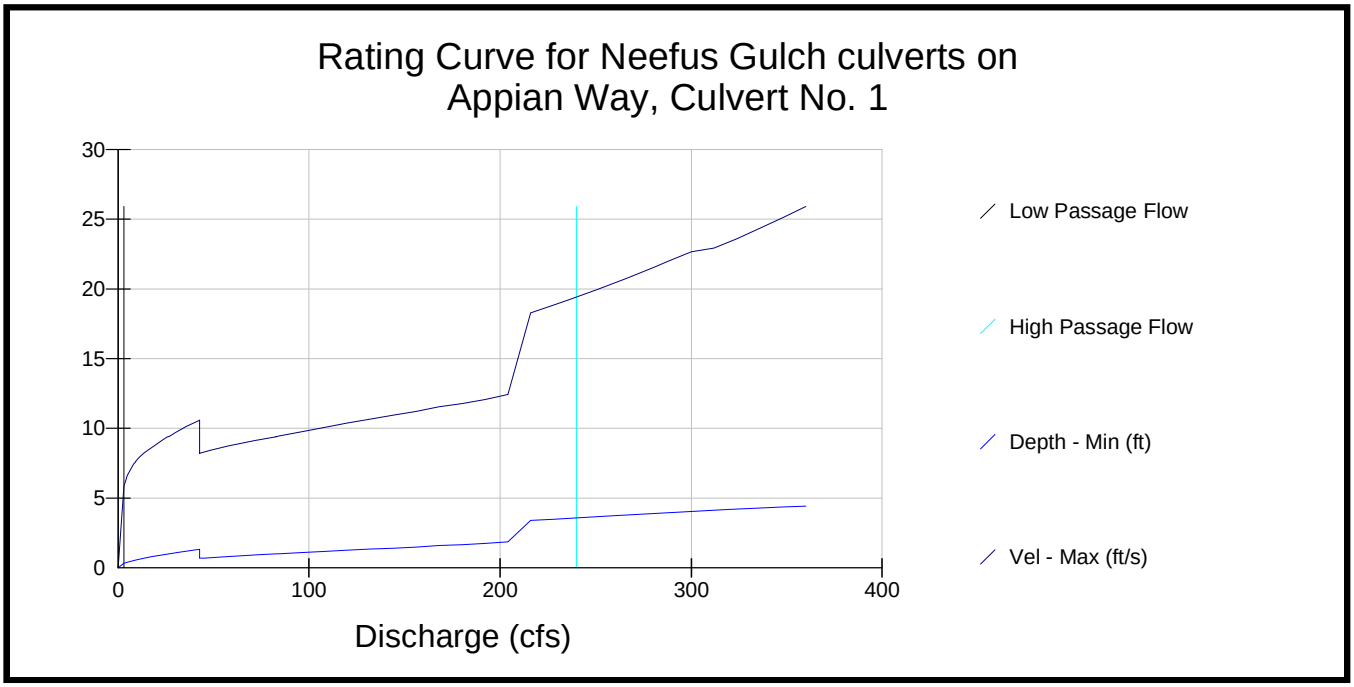


Figure 5. Culvert Rating Curve

<u>Barrier Codes</u>

V = Strict Velocity Barrier
EB = Fish Exhausted at Burst Speed
Long = Fish Exhausted at Prolonged Speed
Leap = Excessive leap at outlet
Drop = Excessive drop at outlet
Depth = Too shallow for substantial distance
Pool = Leap Pool too shallow
NONE = Not a barrier