CALIFORNIA 1

Caltrans

2014–2015 Detailed Fish Passage Assessment Evaluations

District 4 – Marin and San Mateo Counties | Highway 1

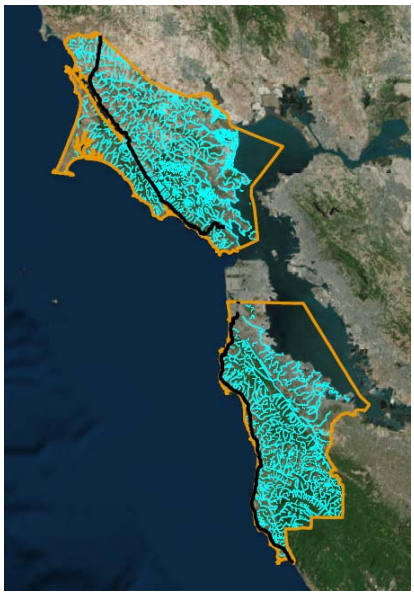
April 2015
Revised May 2016

Prepared For:
California Department of Transportation
Division of Environmental Analysis
Office of Biology and Technical Assistance
Sacramento, CA USA

HDR

2014-2015 Detailed Fish Passage Assessment Evaluations

Highway 1, Marin and San Mateo Counties



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1. Background

A total of 450 Reconnaissance Fish Passage Surveys were conducted on state highways in Marin, San Mateo and Santa Cruz counties. Two hundred and seventy-seven (277) sites were surveyed on Highway 1 in Marin County, 70 sites on Highway 1 in San Mateo County, 63 sites on Highway 9 in Santa Cruz County, 5 sites on Highway 17 in Santa Cruz County, and 35 sites on Highway 236 in Santa Cruz County. The Reconnaissance Surveys were performed in accordance with the California Department of Transportation's (Caltrans') Reconnaissance Fish Passage Assessment Instructions and Procedures manual (Caltrans 2007a).

Surveyed sites that: (1) meet the basic channel width and gradient criteria according to Caltrans' Reconnaissance Fish Passage Assessment Instructions and Procedures manual; (2) potentially constrain fish passage (i.e., not a channel-spanning bridge); and (3) have the potential to have historically or currently support anadromous salmonids, are identified as requiring a Detailed Survey during field and office activities associated with the Reconnaissance Survey.

As described in Caltrans' Detailed Fish Passage Assessment Data Collection Instructions and Procedures manual (Caltrans 2007b), the Detailed Survey primarily consists of a longitudinal profile of the stream channel upstream and downstream of the crossing, a tailwater control (TWC) cross-section downstream of the crossing, and survey locations used to estimate road fill volume at the crossing. The Detailed Survey also may include surveying additional crossing features to the extent that they are present, such as weirs, fishways, aprons, headwalls and wingwalls. Additional quantitative and qualitative data are collected via manual measurements and observations, such as characteristics and dimensions of the culvert and associated features, culvert substrate embeddedness, alignment of the culvert inlet and outlet to the channel, channel width, and substrate size.

A total of 172 (38%) of the 450 Reconnaissance Survey sites were identified as potentially requiring a Detailed Survey (**Table 1**). Generally, it was determined during the Reconnaissance Surveys whether a Detailed Survey was required. However, for some sites, heavy vegetation prevented sufficient access to the stream channel in order to identify whether the channel met the stream width criterion. This applied to 12 sites on Marin Highway 1, eight sites on San Mateo Highway 1, and three sites on Santa Cruz Highway 9. Therefore, these sites were identified as "unknown" as to whether a Detailed Survey was required. However, it was assumed that these sites may potentially require a Detailed Survey, and were surveyed if feasible. Overall, 255 sites were identified as not requiring a Detailed Survey, 172 sites were identified as requiring a Detailed Survey, and 23 sites were identified as unknown whether a Detailed Survey is required.

Table 1. Sites that potentially require a Detailed Survey.

	Detailed Survey Required?		
County & Route	**Yes**	**No**	**Unknown**
Marin 1	85	180	12
San Mateo 1	47	15	8
Santa Cruz 9	26	34	3
Santa Cruz 17	2	3	0
Santa Cruz 236	12	23	0
Totals	*172*	*255*	*23*

2. Detailed Survey Sites

Because a Detailed Survey requires access to the stream channel and banks both upstream and downstream of the crossing, information is collected during and after the Reconnaissance Survey to determine land ownership upstream and downstream of each crossing that requires a Detailed Survey. The Detailed Surveys conducted and discussed in this report only included sites that could be accessed and surveyed within the Caltrans Right of Way (R/W) or on open access public lands. Sites requiring a Detailed Survey that require accessing private lands may be conducted in the future, depending on receiving landowner permission.

Sites requiring a Detailed Survey were evaluated using GIS with public lands GIS data and aerial imagery in order to identify sites with public lands upstream and downstream of each site, or within the Caltrans R/W. Accessible public lands were identified by using GIS to extract public lands identified as "open access" in the California Protected Areas Database (GreenInfo Network 2014). **Figure 1** displays all sites identified as requiring a Detailed Survey overlaid with open access public lands data. **Table 2** displays the resulting sites requiring a Detailed Survey identified as located on public land with open access. Most of the sites on public land are on Highway 1 in Marin County (40 sites), followed by 12 sites on Highway 1 in San Mateo County, and five sites on Highway 9 in Santa Cruz County.

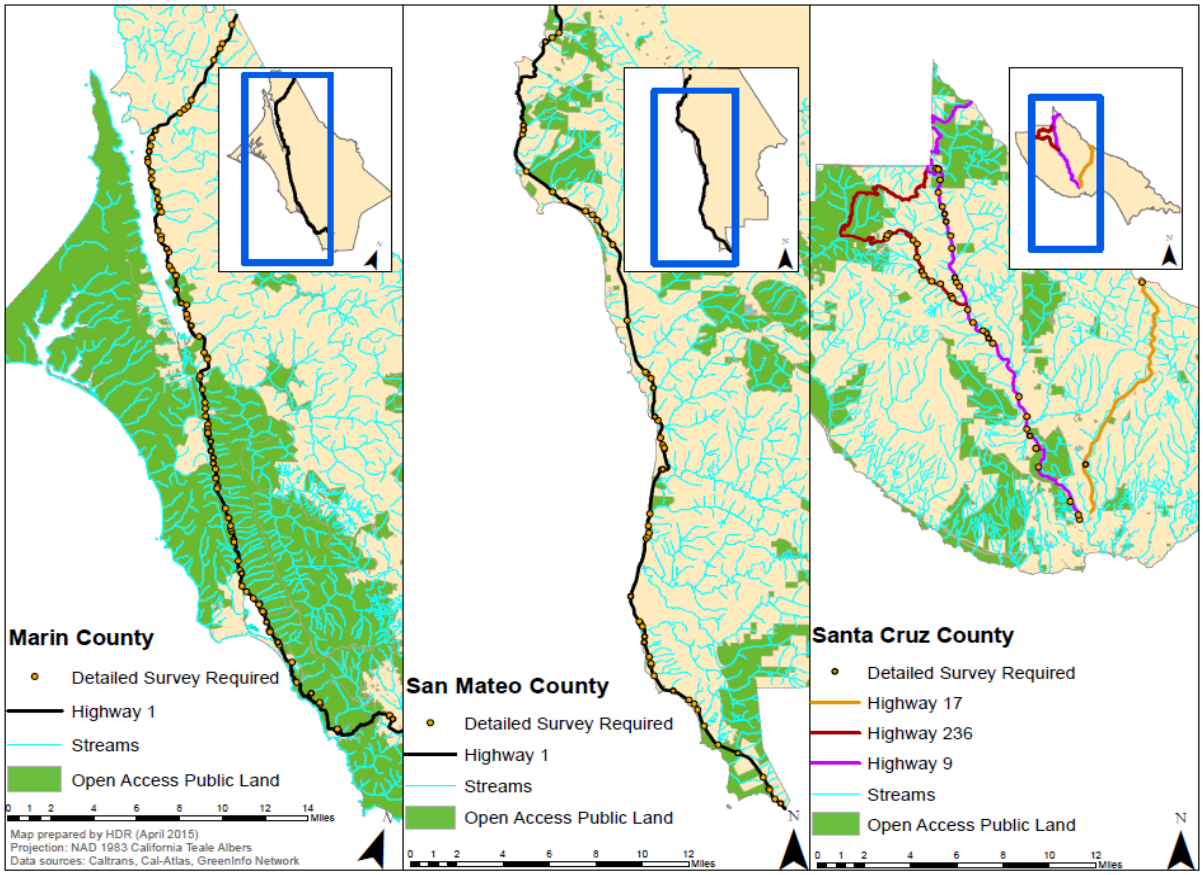

Figure 1. Sites requiring a Detailed Survey and open access public land.

Table 2. Sites requiring a Detailed Survey on open access public land.

County	Route	Postmile	County	Route	Postmile	County	Route	Postmile
MRN	1	8.55	MRN	1	21.06	SCR	9	3.45
MRN	1	8.65	MRN	1	21.59	SCR	9	19.2
MRN	1	9.7	MRN	1	22.67	SCR	9	19.85
MRN	1	11.15	MRN	1	22.78	SCR	9	19.87
MRN	1	13.49	MRN	1	23.2	SCR	9	20.09
MRN	1	13.63	MRN	1	23.26	SM	1	1.12
MRN	1	13.69	MRN	1	23.68	SM	1	1.22
MRN	1	14.31	MRN	1	24	SM	1	9.64
MRN	1	14.34	MRN	1	24.3	SM	1	10.35
MRN	1	14.35	MRN	1	24.67	SM	1	11.07
MRN	1	14.41	MRN	1	25.14	SM	1	15.27
MRN	1	14.86	MRN	1	25.55	SM	1	15.4
MRN	1	16.95	MRN	1	25.57	SM	1	15.56
MRN	1	18.17	MRN	1	25.63	SM	1	16.49
MRN	1	18.69	MRN	1	25.67	SM	1	20.3
MRN	1	19.81	MRN	1	25.81	SM	1	22.9
MRN	1	19.94	MRN	1	27.21	SM	1	37.09
MRN	1	20.33	MRN	1	27.92			
MRN	1	20.53	MRN	1	33.4			
MRN	1	20.66	MRN	1	33.69			

In general, most or all of the sites requiring a Detailed Survey on Highway 1 in San Mateo County and on Highway 9, 17 and 236 in Santa Cruz County are surrounded by private land upstream and/or downstream of the crossings (i.e., 35 out of 47 sites on Highway 1 in San Mateo County, 21 out of 26 sites on Highway 9, two out of three sites on Highway 17, and all 12 sites on Highway 236). By contrast, approximately half of the sites requiring a Detailed Survey on Highway 1 in Marin County (i.e., 40 out of 85) are located on public land. Public land surrounding Highway 1 in Marin County consisted primarily of National Park Service (NPS) lands, including the Golden Gate National Recreation Area (GGNRA) and Point Reyes National Seashore, as well as some California state parks, including Tomales Bay State Park and Mount Tamalpais State Park.

Based on an assessment of accessibility and safety considerations during the Reconnaissance Surveys and in the process of conducting the Detailed Surveys, it was determined on-site that some sites requiring a Detailed Survey on public lands could not be surveyed. Reasons for not conducting a Detailed Survey related primarily to highway safety considerations and excessively think vegetation surrounding a site. **Table 3** displays each site that was identified as requiring a Detailed Survey on public land, but was not surveyed, and the reason(s) why each site was not surveyed. Photographs were taken at each site to assist in identifying remedial measures in order to conduct Detailed Surveys at these sites in the future.

As shown in Table 3, sites in Marin and San Mateo counties were generally skipped due to steep hillsides, heavy vegetation, including poison oak, and hazardous highway conditions. The sites identified on

Highway 9 in Santa Cruz County were not surveyed due to highway safety considerations. Road conditions on Highway 9 were observed to be relatively dangerous due to limited shoulders along most of the highway, numerous blind corners, darkness due to the tree canopy, and relatively fast-driving vehicles. Additional safety precautions should generally be taken while conducting Detailed Surveys on Highway 9 in Santa Cruz County.

Table 3. Sites requiring Detailed Survey on public lands that could not be surveyed (e.g., due to logistical or safety issues).

County	Route	Postmile	Description of Logistical Difficulties and/or Safety Hazards	Remedial Actions?
MRN	1	8.55	Steep hillside and heavy vegetation	Vegetation clearing
MRN	1	8.65	Steep hillside and heavy vegetation	Vegetation clearing
MRN	1	14.35	Culvert could not be located. Culvert was most likely removed.	n/a
MRN	1	20.66	Dense poison oak	Vegetation clearing
MRN	1	21.59	Blind corners on both sides of site	Signage on both sides of site
MRN	1	25.14	Blind corners on both sides of site; Steep hillside and heavy vegetation	Signage on both sides of site; Vegetation clearing
SM	1	1.12	Steep slopes and dense poison oak	Locate alternative access to outlet; vegetation clearing
SM	1	1.22	Steep slopes and dense poison oak	Locate alternative access to outlet; Vegetation clearing
SM	1	9.64	Dense poison oak	Vegetation clearing
SM	1	10.35	Dense poison oak	Vegetation clearing
SM	1	15.27	Steep slopes and dense vegetation	Vegetation clearing
SM	1	15.4	Steep slopes on both sides of road; No safe place to set up total station	Vegetation clearing
SM	1	15.56	Steep slopes prevent access	Locate alternative access route
SM	1	20.3	Excessive vegetation upstream and downstream of the culvert	Vegetation clearing
SM	1	22.9	Steep slopes prevent access	Vegetation clearing; Locate alternative access route

County	Route	Postmile	Description of Logistical Difficulties and/or Safety Hazards	Remedial Actions?
SCR	9	3.45	Road safety issues	Use signage and cones and/or CHP vehicle
SCR	9	19.2	Road safety issues	Use signage and cones and/or CHP vehicle
SCR	9	19.85	Road safety issues	Use signage and cones and/or CHP vehicle
SCR	9	19.87	Road safety issues	Use signage and cones and/or CHP vehicle
SCR	9	20.09	Road safety issues	Use signage and cones and/or CHP vehicle

Detailed Surveys that were able to be conducted on public lands are displayed in **Table 4 and Figure 2**. Thirty-four surveys were conducted on Highway 1 in Marin County, and three surveys were conducted on Highway 1 in San Mateo County.

Table 4. Detailed Surveys conducted on public land in Marin and San Mateo counties.

County	Route	Postmile	County	Route	Postmile
MRN	1	9.70	MRN	1	23.20
MRN	1	11.15	MRN	1	23.26
MRN	1	13.49	MRN	1	23.68
MRN	1	13.63	MRN	1	24.00
MRN	1	13.69	MRN	1	24.30
MRN	1	14.31	MRN	1	24.67
MRN	1	14.34	MRN	1	25.55
MRN	1	14.41	MRN	1	25.57
MRN	1	14.86	MRN	1	25.63
MRN	1	16.95	MRN	1	25.67
MRN	1	18.17	MRN	1	25.81
MRN	1	18.69	MRN	1	27.21
MRN	1	19.81	MRN	1	27.92
MRN	1	19.94	MRN	1	33.40
MRN	1	20.33	MRN	1	33.69
MRN	1	20.53	SM	1	11.07
MRN	1	21.06	SM	1	16.49
MRN	1	22.67	SM	1	37.09
MRN	1	22.78			

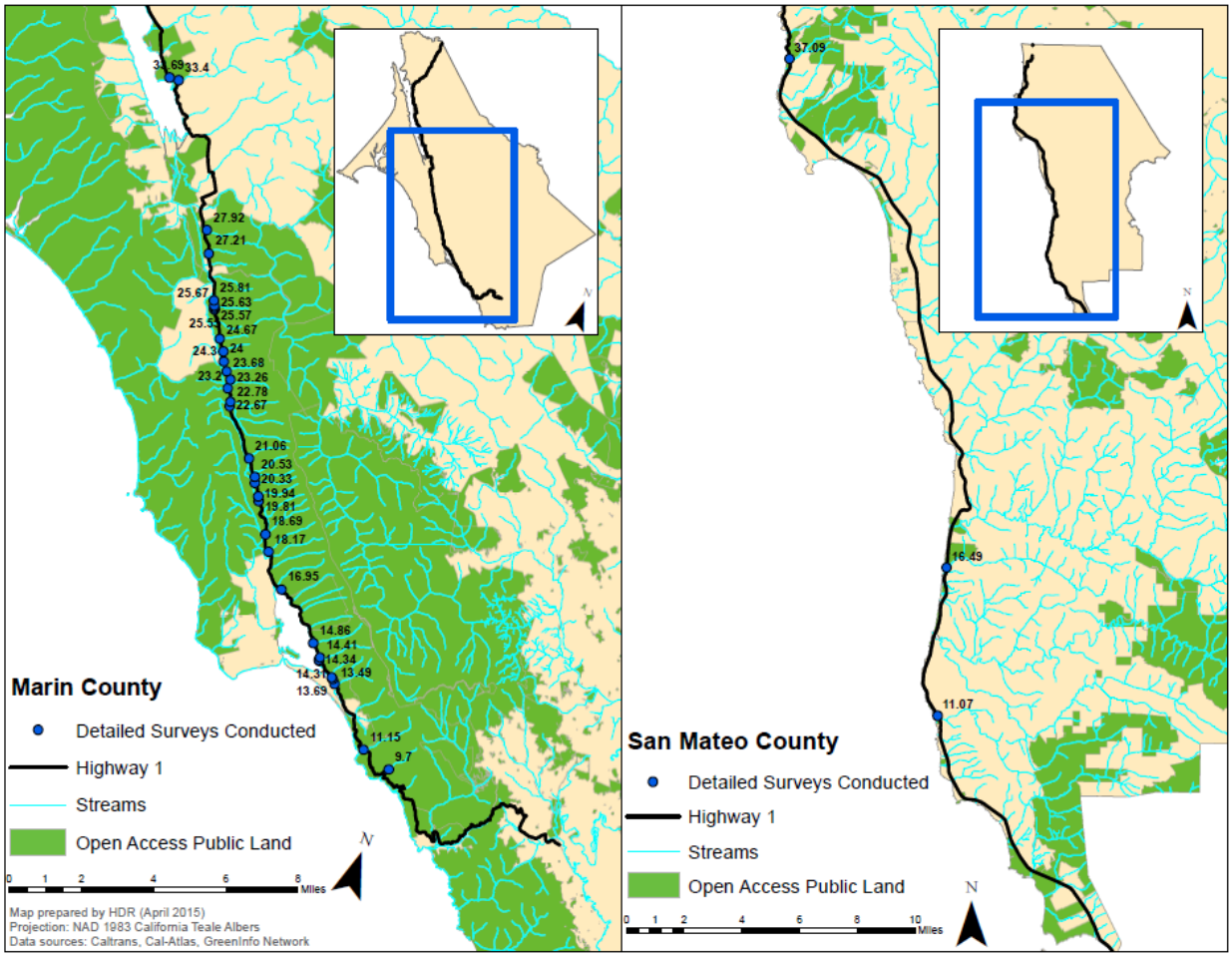

Figure 2. Detailed Surveys conducted on public land in Marin and San Mateo counties.

3. Detailed Survey Data Collection and Post-Processing

In order to evaluate fish passage at the crossings where a Detailed Survey was conducted, the raw survey data collected are first post-processed. As previously mentioned, the survey data primarily include the longitudinal stream profile (i.e., based on survey locations along the stream bottom from upstream of the crossing to downstream of the crossing), the TWC cross-section (i.e., based on survey locations perpendicular to the stream along the downstream TWC), and road fill survey points.

The survey data collected at each site for the longitudinal stream profile, the TWC cross-section, and road fill volume consists of an X, Y and Z (elevation) coordinate for each survey point. The survey point coordinates for each site were converted into relative distance and elevation in Excel, in order to allow for calculation of the following site parameters:

- Upstream channel slope
- Inlet apron slope and length, if applicable
- Culvert slope
- Outlet apron slope and length, if applicable
- Total culvert length

- Downstream channel slope
- Residual inlet depth
- Residual outlet depth
- Road fill volume estimate

If a site includes more than one culvert, then culvert slope and length, and residual inlet and outlet depths are calculated separately for each culvert, to the extent feasible.

Resulting site-specific parameters for each Detailed Survey site are shown in two tables below. **Table 5** displays parameters that are specific to an entire site, while **Table 6** displays parameters that can vary at each site with more than one culvert.

Table 5. Site parameters – upstream channel slope, downstream channel slope, and road fill volume-related calculations.

County	Route	Postmile	Upstream Channel Slope (%)	Downstream Channel Slope (%)	Inlet Fill Volume (ft^3)	Outlet Fill Volume (yd^3)	Road Width (ft)	Road Fill Volume (ft^3)	Total Fill Volume (yd^3)	Elevation of Road Prism (ft)
SM	1	11.07	2.8	-0.6	25,945	18,306	82	68,857	4,189	19
SM	1	16.49	-0.2	-1.1	19,997	14,611	70	63,678	3,640	18
SM	1	37.09	13.3	2.8	126,652	157,547	37	101,793	14,296	45
MRN	1	9.70	6	-0.9	12,611	32,150	75	63,747	4,019	21
MRN	1	11.15	5.2	32.6	26,158	44,993	60	170,200	8,939	45
MRN	1	13.49	6.7	1.1	580	731	25	1,655	110	2
MRN	1	13.63	3.3	0.2	1,864	9,465	26	4,881	600	7
MRN	1	13.69	5.1	3	962	633	31	2,702	159	6
MRN	1	14.31	2.1	6.3	57	201	28	640	33	2
MRN	1	14.34	2.4	3.7	150	312	26	1,030	55	3
MRN	1	14.41	0.5	2.1	813	723	29	3,590	190	6
MRN	1	14.86	-0.2	1.8	1,384	1,764	30	4,015	265	4
MRN	1	16.95	0.6	0	1,788	1,636	27	4,250	284	5
MRN	1	18.17	0.5	0.1	9,082	5,192	38	8,954	860	6
MRN	1	18.69	3.4	2.1	3,655	13,185	62	23,582	1,497	12
MRN	1	19.81	9.4	18.1	1,412	3,060	32	2,855	271	3
MRN	1	19.94	11.4	-5.2	3,625	3,298	35	9,088	593	6
MRN	1	20.33	2.3	0.2	2,500	3,313	31	6,449	454	6
MRN	1	20.53	2.5	0.2	4,085	4,230	30	5,926	527	5
MRN	1	21.06	2.4	4.1	2,944	2,295	27	3,825	336	4
MRN	1	22.67	4.6	0.5	21,729	29,274	33	29,973	2,999	16
MRN	1	22.78	5.8	4.9	7,322	10,255	33	14,847	1,201	11
MRN	1	23.20	2.4	-1.6	1,620	2,562	30	4,620	326	5
MRN	1	23.26	3.2	0.5	1,389	1,486	28	3,340	230	5
MRN	1	23.68	1.4	1.2	4,204	4,202	31	7,384	585	6
MRN	1	24.00	4.7	-3	5,696	7,156	42	11,445	900	8
MRN	1	24.30	4.7	4.9	n/a	n/a	n/a	n/a	n/a	n/a
MRN	1	24.67	3.5	0.7	14,345	15,676	37	38,772	2,548	26
MRN	1	25.55	2.4	0.7	1,855	1,727	38	5,250	327	6
MRN	1	25.57	5.2	10.8	1,359	1,369	47	4,318	261	4
MRN	1	25.63	3.2	11.4	1,052	1,406	28	2,641	189	5
MRN	1	25.67	3.5	13.6	1,677	10,993	26	3,580	602	5
MRN	1	25.81	2.6	2.9	318	987	24	2,408	138	6
MRN	1	27.21	1	-1.9	1,897	1,573	30	2,831	233	3
MRN	1	27.92	2.5	-9.1	7,569	4,414	35	4,218	600	2
MRN	1	33.40	0.1	-0.5	10,970	2,367	49	43,788	2,116	10
MRN	1	33.69	6.3	5.9	2,203	3,146	27	11,402	620	12

Table 6. Site parameters – culvert slope and length, and residual inlet and outlet depths.

County	Route	Postmile	Culvert #	Culvert Slope (%)	Residual Inlet Depth (ft)	Residual Outlet Depth (ft)	Total Culvert Length (ft)
SM	1	11.07	1	-1.2	1.25	0.14	95.93
SM	1	16.49	1	0.1	-0.44	-0.33	104.03
			2	0.2	-0.46	-0.25	103.17
SM	1	37.09	1	2.3	-10.62	-6.97	155.75
MRN	1	9.7	1	6.4	-7.77	1	136.64
MRN	1	11.15	1	2.1	-4.55	-1.91	124.47
MRN	1	13.49	1	-3.2	-0.07	-1.11	31.97
			2	n/a	n/a	n/a	n/a
MRN	1	13.63	1	1.9	0.08	1.02	50.52
MRN	1	13.69	1	5.1	0.25	0.25	46.14
			2	n/a	n/a	n/a	n/a
MRN	1	14.31	1	4.6	-1.43	0.36	38.79
MRN	1	14.34	1	2.3	-0.75	0.14	38.14
MRN	1	14.41	1	1.7	0.01	0.6	33.83
MRN	1	14.86	1	0.5	-0.49	-0.32	35.14
MRN	1	16.95	1	2.2	-0.27	0.42	30.85
MRN	1	18.17	1	3.9	-0.85	0.13	25.15
MRN	1	18.69	1	6.8	-6.75	-2.29	65.27
MRN	1	19.81	1	8.3	-4.09	0.17	51.05
MRN	1	19.94	1	0.8	2.47	2.86	47.39
MRN	1	20.33	1	1.3	0.13	0.79	48.66
MRN	1	20.53	1	2.2	0.01	1.25	55.09
MRN	1	21.06	1	1.1	-0.19	0.12	28.74
MRN	1	22.67	1	1.9	-1.67	-0.7	52.36
MRN	1	22.78	1	1.6	-5.3	-4.44	54.24
MRN	1	23.20	1	0.9	-5.19	-4.92	31.83
MRN	1	23.26	1	0.5	-0.25	-0.09	31.22
MRN	1	23.68	1	0.1	-0.39	-0.36	42.05
			2	1	2	1.64	35.63
MRN	1	24.00	1	4.5	-8.58	-4.85	82.44
MRN	1	24.30	1	1.5	-2.97	-2.34	42.28
MRN	1	24.67	1	6.2	-6.98	-1.92	81.11
			2	6.8	-7.67	-2.09	81.98
MRN	1	25.55	1	1.3	-0.4	0.15	42.24
MRN	1	25.57	1	2.6	-2.28	-0.94	52.22
MRN	1	25.63	1	4.1	-10.2	-8.52	40.41
MRN	1	25.67	1	6.1	-15.83	-12.5	54.89
MRN	1	25.81	1	3.4	-1.58	-0.5	44.81
MRN	1	27.21	1	4.2	-2.64	-1.26	32.45
MRN	1	27.92	1	2.3	1.69	2.45	32.69
MRN	1	33.40	1	2.1	-0.47	0.3	36.03
			2	-1	-1.35	-1.69	35.71
MRN	1	33.69	1	8.4	-4.26	-1.8	29.35

4. Sites Dismissed from Further Evaluation

Upon examination of aerial imagery, conducting site-specific GIS and hydrologic analysis, examination of site photographs, and a literature review of anadromous fish-bearing streams, some sites where a Detailed Survey was conducted was dismissed from further fish passage evaluation due to the determination that the drainage upstream or downstream of a crossing was not capable of supporting anadromous salmonids based on natural conditions. Each site dismissed from further evaluation is discussed below.

MRN 1 9.70 (unnamed stream to Pacific Ocean)

Examination of aerial imagery downstream of the MRN 1 9.70 crossing to the Pacific Ocean (see **Figure 3**) indicated a very steep natural gradient. GIS analysis estimated gradient of up to 25-30% downstream of the crossing, indicating that this drainage did not historically support anadromous salmonids. A literature review also did not indicate historical use of this watershed by anadromous fish. Therefore, this site was not carried forward for further fish passage evaluation.

Figure 3. Aerial view of MRN 1 9.70 downstream to the Pacific Ocean.

MRN 1 11.15 (Webb Creek)

Examination of aerial imagery downstream of the MRN 1 11.15 (Webb Creek) crossing to the Pacific Ocean (see **Figure 4**) indicated a very steep natural gradient. GIS analysis estimated gradient of up to 25-30% downstream of the crossing, indicating that this drainage did not historically support anadromous salmonids. A literature review also did not indicate historical use of this watershed by anadromous fish. Therefore, this site was not carried forward for further fish passage evaluation.

Figure 4. Aerial view of MRN 1 11.15 downstream to the Pacific Ocean.

MRN 1 13.63 (unnamed stream to Bolinas Bay)

Aerial imagery and hydrologic analyses conducted in GIS indicate a lack of a substantive stream channel upstream of the crossing (**Figure 5**). U.S. Geological Survey (USGS) National Hydrography Dataset (NHD) data and the USGS StreamStats web application also does not indicate a stream at this location. The area of the watershed upstream of the crossing was calculated in ArcGIS to be less than 0.1 square miles, preventing a reasonable estimation of fish passage flows required to run FishXing. Examination of site photos in conjunction with aerial imagery indicate that this drainage is unlikely to be capable of supporting anadromous salmonid spawning or rearing. Due to the lack of a definable stream upstream of the crossing, the very small size of the watershed upstream of the crossing, and the lack of suitable anadromous fish habitat in the vicinity of the crossing, this site was not further evaluated for anadromous fish passage.

MRN 1 13.69 (unnamed stream to Bolinas Bay)

Hydrologic GIS analyses indicate that this drainage may have historically crossed through the location of an existing school property, and may have been moved just to the south of the property (**Figure 6 –** purple highlighting indicates the natural stream pathway based on elevation). Site photos indicate grass growing in the vicinity of the inlet and the outlet, and downstream of the outlet, with a lack of a definable channel

downstream of the outlet. It is also difficult to determine whether there is a definable channel upstream of the crossing. The NPS (Fong 2002) conducted a fisheries assessment of tributaries to east Bolinas Bay on NPS-managed land, but did not identify this drainage as a steelhead-bearing stream. Based on aerial imagery and site photos, the crossing appears to drain a swale and not an anadromous fish-bearing stream. Therefore, this crossing was not further evaluated for fish passage.

Figure 5. Aerial view of MRN 1 13.63 and its upstream drainage.

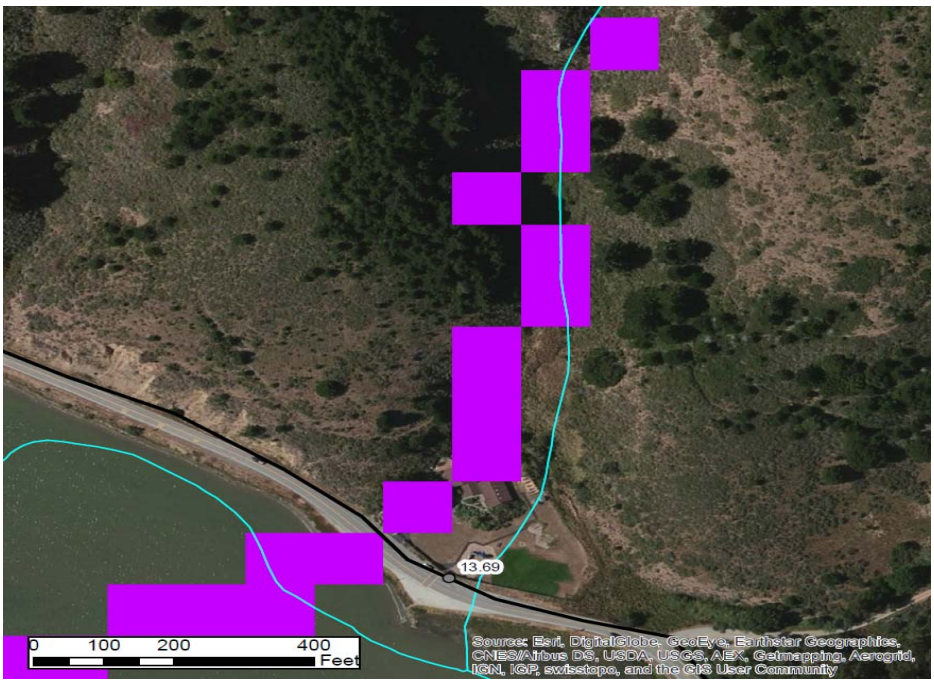

Figure 6. Aerial view of MRN 1 13.69 and its upstream drainage.

MRN 1 19.81 (unnamed stream)

Review of aerial imagery, site photos and hydrologic GIS analysis indicates that very little flow generally passes through this crossing, and the site lacks suitable fisheries habitat. Therefore, this site was not further evaluated for fish passage. An aerial view of the crossing and its upstream drainage is provided in **Figure 7**.

Figure 7. Aerial view of MRN 1 19.81 and its upstream drainage.

MRN 1 25.81 (unnamed stream)

Review of aerial imagery, site photos and hydrologic GIS analysis indicates that very little flow generally passes through this crossing, and the site lacks suitable fisheries habitat. Therefore, this site was not further evaluated for fish passage. An aerial view of the crossing and its upstream drainage is provided in **Figure 8**.

MRN 1 33.69 (unnamed stream)

Review of aerial imagery, site photos and hydrologic GIS analysis indicates that very little flow generally passes through this crossing, and the site lacks suitable fisheries habitat. Therefore, this site was not further evaluated for fish passage. An aerial view of the crossing and its upstream drainage is provided in **Figure 9**.

Figure 8. Aerial view of MRN 1 25.81 and its upstream drainage.

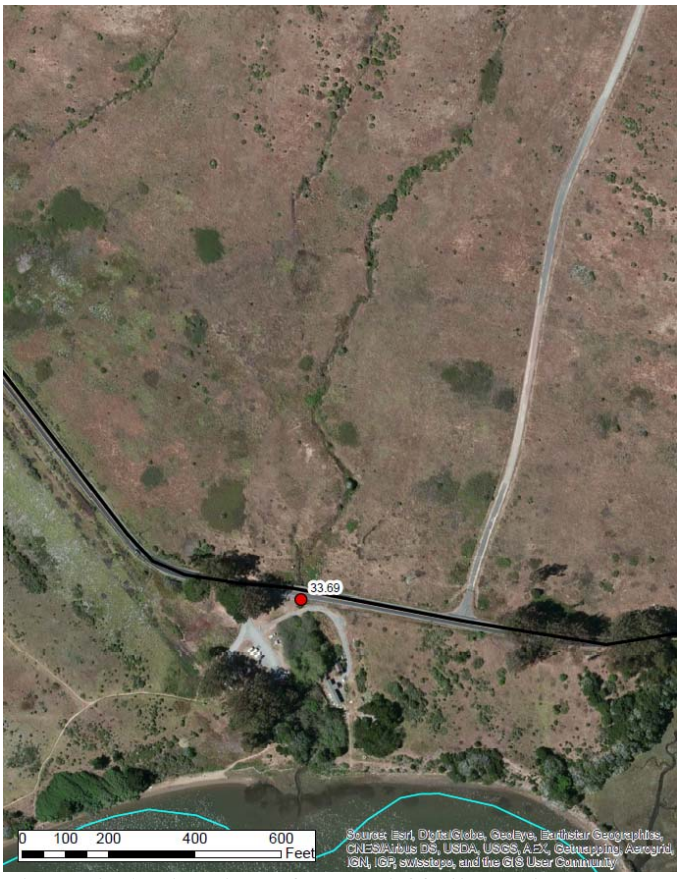

Figure 9. Aerial view of MRN 1 33.69 and its upstream drainage.

5. Initial Evaluation of Detailed Survey Sites

The first step in evaluating fish passage at each highway-stream crossing consists of applying the California Department of Fish and Wildlife (CDFW) Passage Evaluation Filter based on the survey calculations described above. The CDFW Passage Evaluation Filter allows for an initial evaluation of whether a crossing likely provides fish passage at all potential flows (identified as "green"), likely does not provide passage (identified as "red"), or may provide passage at some flows (identified as "gray") (Taylor and Love 2003).

As described by Taylor and Love (2003), in general:

1. If the site provides unrestricted flow, there is no drop at the outlet, and water depth is at least 0.5 feet throughout the facility, then fish passage is provided (Green).
2. If the site restricts flow, there is a drop of > 2 feet or the gradient along the facility is > 3 % (depth < 0.5 feet), the site does not provide fish passage (Red).
3. If the outlet drop is < 2 feet, but the depth is less than 0.5 feet or baffles or weirs are present, the site needs further evaluation (Gray).

Results of applying the CDFW Passage Evaluation Filter, as well as the reason for each site's filter determination, is provided in **Table 7**. For disclosure purposes, filter results for sites that were dismissed from further fish passage evaluation are provided. After identifying the filter result for each evaluated site, site photos were examined to confirm the filter results, particularly for the sites that were identified as providing unrestricted fish passage.

Based on simply applying the filter, four sites were identified as "green", 19 sites were identified as "red", and 14 sites were identified as "gray". However, an asterisk after the filter result in the table indicates that the site was dismissed from further evaluation, and a question mark after the filter result indicates that the filter result may not be representative of actual fish passage conditions, based upon site-specific observations. Site-specific discussions for these sites are provided below.

Table 7. CDFW Fish Passage Evaluation Filter Results

County	Route	PM	Fully Embedded?	Inlet Width > ACW	Residual inlet/outlet depths ≥ .5'	Outlet drop ≥ 2'	Culvert Slope > 3 %	Filter Result	Reason for Filter Result
SM	1	11.07	Yes	No	No	No	No	Gray?	Insufficient inlet width; Insufficient residual outlet depth
SM	1	16.49	Yes	No	No	Yes	No	Red?	Insufficient inlet width; Insufficient residual inlet/outlet depths; Outlet drop ≥ 2'
SM	1	37.09	No	Yes	No	Yes	No	Red	Insufficient residual inlet/outlet depths; Outlet drop ≥ 2'
MRN	1	9.7	No	No	No	No	Yes	Red*	Insufficient residual inlet/outlet depths; Culvert slope > 3%

County	Route	PM	Fully Embedded?	Inlet Width > ACW	Residual inlet/outlet depths ≥ .5'	Outlet drop ≥ 2'	Culvert Slope > 3 %	Filter Result	Reason for Filter Result
MRN	1	11.15	No	Yes	No	Yes	No	Red*	Insufficient residual inlet/outlet depths; Outlet drop ≥ 2'
MRN	1	13.49	No	Yes	No	No	No	Gray	Insufficient residual inlet/outlet depths
MRN	1	13.63	Yes	No	No	No	No	Gray*	Insufficient inlet width; Insufficient residual inlet/outlet depths
MRN	1	13.69	No	No	No	No	No	Gray*	Insufficient residual inlet/outlet depths
MRN	1	14.31	No	No	No	No	Yes	Red	Insufficient residual inlet/outlet depths; Culvert slope > 3%
MRN	1	14.34	No	No	No	No	No	Gray	Insufficient residual inlet/outlet depths
MRN	1	14.41	Yes	Yes	No	No	No	Green	Embedded; inlet width > ACW
MRN	1	14.86	Yes	Yes	No	No	No	Green?	Embedded; inlet width > ACW
MRN	1	16.95	No	No	No	No	No	Gray	Insufficient residual inlet/outlet depths
MRN	1	18.17	No	No	No	No	Yes	Red	Insufficient residual inlet/outlet depths; Culvert slope > 3%
MRN	1	18.69	No	No	No	Yes	Yes	Red	Insufficient residual inlet/outlet depths; Outlet drop ≥ 2'; Culvert slope > 3%
MRN	1	19.81	No	No	No	No	Yes	Red*	Insufficient residual inlet/outlet depths; Culvert slope > 3%
MRN	1	19.94	Yes	Yes	Yes	No	No	Green	Embedded; inlet width > ACW
MRN	1	20.33	No	No	No	No	No	Gray	Insufficient residual inlet depth
MRN	1	20.53	No	No	No	No	No	Gray	Insufficient residual inlet depth
MRN	1	21.06	No	No	No	No	No	Gray	Insufficient residual inlet/outlet depths
MRN	1	22.67	No	No	No	Yes	No	Red	Insufficient residual inlet/outlet depths; Outlet drop ≥ 2'
MRN	1	22.78	No	No	No	Yes	No	Red	Insufficient residual inlet/outlet depths; Outlet drop ≥ 2'
MRN	1	23.2	No	No	No	Yes	No	Red	Insufficient residual inlet/outlet depths; Outlet drop ≥ 2'
MRN	1	23.26	No	No	No	No	No	Gray	Insufficient residual inlet/outlet depths

County	Route	PM	Fully Embedded?	Inlet Width > ACW	Residual inlet/outlet depths ≥ .5'	Outlet drop ≥ 2'	Culvert Slope > 3 %	Filter Result	Reason for Filter Result
MRN	1	23.68	No	No	No	No	No	Gray	Insufficient residual inlet/outlet depths
MRN	1	24	No	No	No	Yes	Yes	Red	Insufficient residual inlet/outlet depths; Outlet drop ≥ 2'; Culvert slope > 3%
MRN	1	24.3	No	No	No	Yes	No	Red	Insufficient residual inlet/outlet depths; Outlet drop ≥ 2'
MRN	1	24.67	No	No	No	Yes	Yes	Red	Insufficient residual inlet/outlet depths; Outlet drop ≥ 2'; Culvert slope > 3%
MRN	1	25.55	No	Yes	No	No	No	Gray	Insufficient residual inlet/outlet depths
MRN	1	25.57	No	Yes	No	No	No	Gray	Insufficient residual inlet/outlet depths
MRN	1	25.63	No	Yes	No	Yes	Yes	Red	Insufficient residual inlet/outlet depths; Outlet drop ≥ 2'; Culvert slope > 3%
MRN	1	25.67	No	Yes	No	Yes	Yes	Red	Insufficient residual inlet/outlet depths; Outlet drop ≥ 2'; Culvert slope > 3%
MRN	1	25.81	No	No	No	No	Yes	Red*	Insufficient residual inlet/outlet depths; Culvert slope > 3%
MRN	1	27.21	No	No	No	No	Yes	Red	Insufficient residual inlet/outlet depths; Culvert slope > 3%
MRN	1	27.92	No	Yes	Yes	No	No	Green?	Residual inlet/outlet depths > .5'
MRN	1	33.69	No	No	No	No	Yes	Red*	Insufficient residual inlet/outlet depths; Culvert slope > 3%
MRN	1	33.40	Yes	No	No	No	No	Gray	Insufficient inlet width; Insufficient residual inlet/outlet depths

Site-Specific CDFW Fish Passage Filter Results Discussion

Below are site-specific discussions for sites that were either dismissed from further fish passage evaluation or if the filter result was not necessarily representative of actual conditions.

SM 1 11.07 – While this site ranked as "gray" due to insufficient inlet width and insufficient residual outlet depth, due to the highly variable sediment dynamics at the crossing, the residual outlet depth is highly variable depending on freshwater outflow and potentially tidal conditions. Although there is currently no spawning habitat upstream of the crossing (further described below), if an adult fish passage

evaluation is desired, additional surveying should be done during the upstream migration season and when sufficient flow is present to allow access to the crossing by adult salmonids, prior to conducting hydraulic modeling and making a fish passage determination for this site.

SM 1 16.49 – This site ranked as "red" due to insufficient residual inlet and outlet depths and an outlet drop > 2 ft. However, this determination is not necessarily appropriate due to tidal hydrodynamics and the filling of the lagoon just downstream of this crossing. Additional surveying of the site, including the lagoon downstream of the crossing, during the steelhead upstream migration season and when sufficient flow is present to allow access to the site by adult salmonids, is suggested prior to conducting hydraulic modeling and making a fish passage determination at this site.

MRN 1 9.7 – As previously discussed, excessive natural stream gradients downstream of site resulted in dismissing this site from further evaluation.

MRN 1 11.15 - As previously discussed, excessive natural stream gradients downstream of site resulted in dismissing this site from further evaluation.

MRN 1 13.63 – As previously discussed, lack of anadromous fish habitat upstream of crossing resulted in dismissing this site from further fish passage evaluation.

MRN 1 13.69 - As previously discussed, lack of anadromous fish habitat upstream of crossing resulted in dismissing this site from further fish passage evaluation.

MRN 1 14.86 – Although this site ranked as "green", unimpeded fish passage is not provided due to the concrete box culvert being nearly full with sediment (**Figure 10**). Sediment excavation is recommended prior to re-surveying the site and making a fish passage determination.

MRN 1 19.81 - As previously discussed, lack of anadromous fish habitat upstream of crossing resulted in dismissing this site from further fish passage evaluation.

MRN 1 25.81 - As previously discussed, lack of anadromous fish habitat upstream of crossing resulted in dismissing this site from further fish passage evaluation.

MRN 1 27.92 – Although this site ranked as "green", unimpeded fish passage is not provided due to the concrete box culvert outlet being nearly full with sediment (**Figure 11**). Sediment excavation is recommended prior to re-surveying the site. In addition, the channel enters the culvert at a 90 degree angle.

MRN 1 33.69 - As previously discussed, lack of anadromous fish habitat upstream of crossing resulted in dismissing this site from further fish passage evaluation.

Figure 10. Sediment accumulation in culvert at MRN 1 14.86. Upstream looking downstream. November 2014.

Figure 11. Sediment accumulation in culvert at MRN 1 27.92. Downstream looking upstream. November 2014.

6. FishXing Evaluation

As previously described, sites ranking as "gray" by the CDFW Passage Evaluation Filter require further evaluation by using FishXing software. Before running the FishXing software, additional analyses were required in order to develop the inputs to the software, particularly related to hydrologic information pertaining to the drainage upstream of each crossing.

FishXing Methodology

Because FishXing requires particular flow values in order to evaluate passage of fish at a range of flows at each stream crossing, and because flow gage data was not readily available for nearby unregulated streams, flood estimator equations developed by the USGS were used to estimate 2-year peak flows (i.e., 50% exceedance flows). The resulting 50% exceedance flows were then multiplied by a particular factor to estimate upper fish passage flows for adult coho salmon and steelhead, and for juvenile salmonids. As identified by CDFG (2002), upper fish passage flows for adult coho salmon and steelhead are calculated by multiplying the 50% exceedance flow by 0.5, and upper fish passage flows for juvenile salmonids are calculated by multiplying the 50% exceedance flow by 0.1. Lower fish passage flows were taken from CDFG (2002) – 3 cfs for adults, and 1 cfs for juveniles.

The USGS flood estimator equations reported by geographic region in California in Taylor and Love (2003) are sourced from Waananen and Crippen (1977). However, updated flood estimation equations for California have since been developed by the USGS and are presented in Gotvald et al. (2012). The updated flood estimator equations require watershed-specific drainage area and mean annual precipitation. For each stream crossing being evaluated, the USGS StreamStats web application was used to retrieve watershed area above each crossing and mean annual precipitation within each delineated watershed. However, the formulas for calculating flood flows had not yet been updated in the StreamStats web application at the time of developing this report. Therefore, the 2-year flood flow (i.e., 50% exceedance flow) was manually calculated for each site in Excel (**Table 8**).

Table 8. Calculation of upper fish passage flows for running FishXing.

County	Route	PM	Drainage Area (mi^2)	Mean Annual Precip. (in)	50% Exceedance Flow	.5*50% Exceedance Probability (Upper Flow for Adults)	.1*50% Exceedance Probability (Upper Flow for Juveniles)
MRN	1	13.49	1	47.6	81.1	40.6	8.1
MRN	1	14.34	0.7	43.2	53.4	26.7	5.3
MRN	1	16.95	0.7	39.4	48.8	24.4	4.9
MRN	1	20.33	0.3	50.1	28.7	14.4	2.9
MRN	1	20.53	0.2	42.2	16.8	8.4	1.7
MRN	1	21.06	0.4	41.7	31.1	15.6	3.1
MRN	1	23.26	0.4	38.8	29.0	14.5	2.9
MRN	1	23.68	0.4	37.7	28.2	14.1	2.8
MRN	1	25.55	0.2	35	14.0	7.0	1.4
MRN	1	25.57	0.4	34.7	26.0	13.0	2.6
MRN	1	33.4	3.5	36.6	194.5	97.2	19.4

Additional inputs required for running FishXing included characteristics of the culvert, culvert embeddedness, downstream channel slope, downstream maximum depth, and results from the TWC

cross-section survey. The swimming ability criteria for prolonged and burst swimming for both adult and juvenile salmonids, and minimum depth requirements, were taken from Marin County (2003), which provided refined swimming ability criteria based on a combination of CDFW criteria and their observations of fish passage at stream crossings in northern California streams.

FishXing Results

Results of the FishXing evaluation for each site are displayed in terms of the percent of flows passable by lifestage (**Table 9**). As shown in the table, types of barriers identified by FishXing for juvenile salmonid passage were often insufficient water depth in the culvert ("Depth"), as well as perched outlet conditions ("Leap"), outlet pool too shallow ("Pool"), excessive velocities in the culvert ("V"), and swimming to exhaustion in burst mode ("EB"). The only type of barrier identified by FishXing for adult passage was insufficient water depth in the culvert. However, there are some known potential limitations associated with FishXing that must be acknowledged, as reported by Marin County (2003) and Ross Taylor and Associates (2009), who reported that after their numerous site visits to culverts during migration flows, the following confounding results were generated by FishXing:

- Adult salmonids having great difficulties entering perched culverts which FishXing suggested were easily within the species' leaping and swimming capabilities.
- Adult salmonids successfully migrating through water depths defined as "too shallow" by current fish passage criteria.

Therefore, to the extent feasible, site-specific observations should be made during the upstream migration periods to assist in evaluating the reliability FishXing results, where such information is not already available or known by local fisheries biologists.

Table 9. Summary of FishXing results for evaluated crossings.

Crossing	Species/ Lifestage	Stream	Low Passage Flow (Q_{LP})	High Passage Flow (Q_{HP})	% of Flows Passable	Barriers at Q_{LP}	Barriers at Q_{HP}
MRN 1 13.49	Juvenile Salmonid	Stinson Gulch	1 cfs	8.1 cfs	0.0%	Leap; Depth; Pool; V	Leap; Depth; V
MRN 1 14.34	Juvenile Salmonid	McKinnon Gulch (former channel)	1 cfs	5.3 cfs	0.0%	Depth; V	V
MRN 1 16.95	Juvenile Salmonid	Wilkins Gulch	1 cfs	4.9 cfs	35.8%	Depth	NONE
MRN 1 20.33	Juvenile Salmonid	Tributary to Olema Creek	1 cfs	2.9 cfs	100.0%	NONE	NONE
MRN 1 20.53	Juvenile Salmonid	Tributary to Olema Creek (South Hagmaier Creek)	1 cfs	1.7 cfs	100.0%	NONE	NONE
MRN 1 21.06	Juvenile Salmonid	Tributary to Olema Creek	1 cfs	3.1 cfs	0.0%	Depth	Depth; V

Crossing	Species/ Lifestage	Stream	Low Passage Flow (Q_{LP})	High Passage Flow (Q_{HP})	% of Flows Passable	Barriers at Q_{LP}	Barriers at Q_{HP}
MRN 1 23.26	Juvenile Salmonid	Horse Camp Gulch	1 cfs	2.9 cfs	0.0%	Depth; EB	Depth; EB
MRN 1 23.68 (Right Bay)	Juvenile Salmonid	Tributary to Olema Creek	1 cfs	2.8 cfs	0.0%	Leap; Depth; EB	Leap; Depth; V
MRN 1 23.68 (Left Bay)	Juvenile Salmonid	Tributary to Olema Creek	1 cfs	2.9 cfs	0.0%	Leap; Depth	Depth; V
MRN 1 25.55	Juvenile Salmonid	Tributary to Olema Creek	1 cfs	1.4 cfs	0.0%	Depth; EB	Depth; EB
MRN 1 25.57	Juvenile Salmonid	Tributary to Olema Creek	1 cfs	2.6 cfs	0.0%	Leap; Depth; Pool; V	Leap; Depth; Pool; V
MRN 1 33.4 (Left Bay)	Juvenile Salmonid	Millerton Gulch	1 cfs	19.4 cfs	0.0%	Leap; Depth; Pool	Leap; Depth; V
MRN 1 33.4 (Right Bay)	Juvenile Salmonid	Millerton Gulch	1 cfs	19.4 cfs	96.7%	Depth	NONE
MRN 1 13.49	Adult coho salmon and steelhead	Stinson Gulch	3 cfs	41 cfs	23.7%	Depth	NONE
MRN 1 14.34	Adult coho salmon and steelhead	McKinnon Gulch (original channel)	3 cfs	27 cfs	29.3%	Depth	EB
MRN 1 16.95	Adult coho salmon and steelhead	Wilkins Gulch	3 cfs	24.4 cfs	82.8%	Depth	NONE
MRN 1 20.33	Adult coho salmon and steelhead	Unknown tributary to Olema Creek	3 cfs	14.4 cfs	100.0%	NONE	NONE
MRN 1 20.53	Adult coho salmon and steelhead	Tributary to Olema Creek (South Hagmaier Creek)	3 cfs	8.4 cfs	100.0%	NONE	NONE

Crossing	Species/ Lifestage	Stream	Low Passage Flow (Q_{LP})	High Passage Flow (Q_{HP})	% of Flows Passable	Barriers at Q_{LP}	Barriers at Q_{HP}
MRN 1 21.06	Adult coho salmon and steelhead	Tributary to Olema Creek	3 cfs	15.6 cfs	0.0%	Depth	Depth
MRN 1 23.26	Adult coho salmon and steelhead	Horse Camp Gulch	3 cfs	14.5 cfs	0.0%	Depth	Depth
MRN 1 23.68 (Right Bay)	Adult coho salmon and steelhead	Tributary to Olema Creek	3 cfs	14.1 cfs	0.0%	Depth	Depth
MRN 1 23.68 (Left Bay)	Adult coho salmon and steelhead	Tributary to Olema Creek	3 cfs	14.1 cfs	0.0%	Depth	Depth
MRN 1 25.55	Adult coho salmon and steelhead	Tributary to Olema Crek	3 cfs	7 cfs	36.7%	Depth	NONE
MRN 1 25.57	Adult coho salmon and steelhead	Tributary to Olema Creek	3 cfs	13 cfs	49.2%	Depth	NONE
MRN 1 33.4 (Left Bay)	Adult coho salmon and steelhead	Millerton Gulch	3 cfs	97.2 cfs	39.1%	Depth	NONE
MRN 1 33.4 (Right Bay)	Adult coho salmon and steelhead	Millerton Gulch	3 cfs	97.2 cfs	98.6%	Depth	NONE

Barrier Code Key: Leap = too high; Pool = outlet pool too shallow; Depth = culvert too shallow; V = excessive velocities within culvert; EB = fish swims to exhaustion in burst mode.

8. Upstream Habitat Availability Evaluation

Sites identified as "gray" and "red" by the CDFW Passage Evaluation Filter were further evaluated in terms of the potential quantity of habitat that could be recovered upstream of a crossing if the crossing was remediated to allow unimpaired fish passage. Information to conduct this evaluation included site-specific habitat information collected during the Reconnaissance and Detailed surveys, quality and quantity of potential habitat upstream of a crossing based on GIS analyses, a literature review of fisheries habitat surveys, previously-conducted fish passage assessments, and priority fish passage barriers for remediation identified by Caltrans and/or CDFW.

Previously conducted road-stream crossing fish passage evaluations estimated the length of habitat potentially available upstream of a crossing based on stream gradient (e.g., Lang 2005; Marin County 2003). Based on a literature review of stream gradient and upstream habitat limits of steelhead, R2 Resource Consultants (2007) reported that a slope of approximately 12%, as discernable over 100 m using digital elevation models (DEMs), would likely limit upstream passage of steelhead (and coho salmon) in northern California coastal streams. This criterion reportedly corresponds to the limiting value used to define intrinsic habitat potential for steelhead in northern California streams by NMFS (Agrawal et al. 2005, as cited in R2 Resource Consultants 2007). Because of the specific application of this recommendation to GIS analysis, the 12% gradient over 100 m was applied in this report.

The steps summarized below describe the GIS methods employed to calculate stream gradient of individual segments for each evaluated stream and its tributaries upstream of a crossing, in order to estimate potential length of anadromous fish habitat upstream of each evaluated crossing.

- Downloaded USGS digital elevation model (DEM) layers (NHD Plus) covering Marin and San Mateo counties. All layers were converted to the NAD 1983 California (Teale) Albers projection. A personal geodatabase was created to store all datasets for this exercise.
- The DEM layer was clipped to the spatial extents of Marin County and San Mateo County.
- The following processing functions within the Hydrology toolset (located in the Spatial Analyst toolbox) were applied to the DEM layer in order to identify natural stream pathways, and delineate an upstream watershed for each site evaluated. For all processes, the cell size of the output raster was set to equal the cell size (i.e., 30 m) of the respective input raster.
    - The Fill tool was run to remove any potential "sinks" in the DEM (i.e., cells that do not have a defined drainage value, and need to be removed from the dataset prior to delineating watersheds and streams).
    - The Flow Direction tool was run on the DEM in order to develop a flow direction grid (i.e., a grid that assigns a value to each cell that indicates the direction of flow).
    - The Flow Accumulation tool was run on the DEM which calculates the accumulated flow into each cell by summing the cells that flow into each downslope cell. The resulting Flow Accumulation raster was symbolized in order to display streams that generally corresponded with the streams from the National Hydrography Dataset (NHD), and set to display cells that received flow from 250 cells or more. The threshold of 250 cells was determined based on: (1) general consistency with the streams displayed in the NHD; and

(2) to delineate potential streams not shown in the NHD that represented drainages of the highway-stream crossings being evaluated.

- Prior to running the next tool required to delineate individual watersheds, "outlet pour points" needed to be specified in order to define the lowermost boundary of each watershed associated with each evaluated crossing. For the purposes of this analysis, the pour points are represented by the highway stream crossing for each site being evaluated. However, upon review of the Accumulation Flow raster and the actual stream locations in the vicinity of each surveyed site, in some cases a stream portrayed by the Accumulation Flow raster diverged somewhat when approaching the surveyed site at Highway 1. Therefore, for the purposes of delineating an upstream watershed, the pour point for some sites was manually moved from its actual location to better align with the intersection of the stream portrayed by the Accumulation Flow raster and Highway 1.
- Ran Snap Pour Point tool using the pour points created in the previous step and the Flow Accumulation raster, to produce an outlet pour point raster, which represents the "outlet" or downstream extent of each watershed being evaluated.
- The Watershed tool was run, which utilizes the Flow Direction raster and the Pour Point raster, to delineate an upstream watershed for each of the evaluated sites. The watersheds raster was converted to a polygon feature class in order to further process and display individual watersheds. **Figures 12** and **13** display each delineated watershed with the NHD streams layer for Marin and San Mateo counties, respectively.

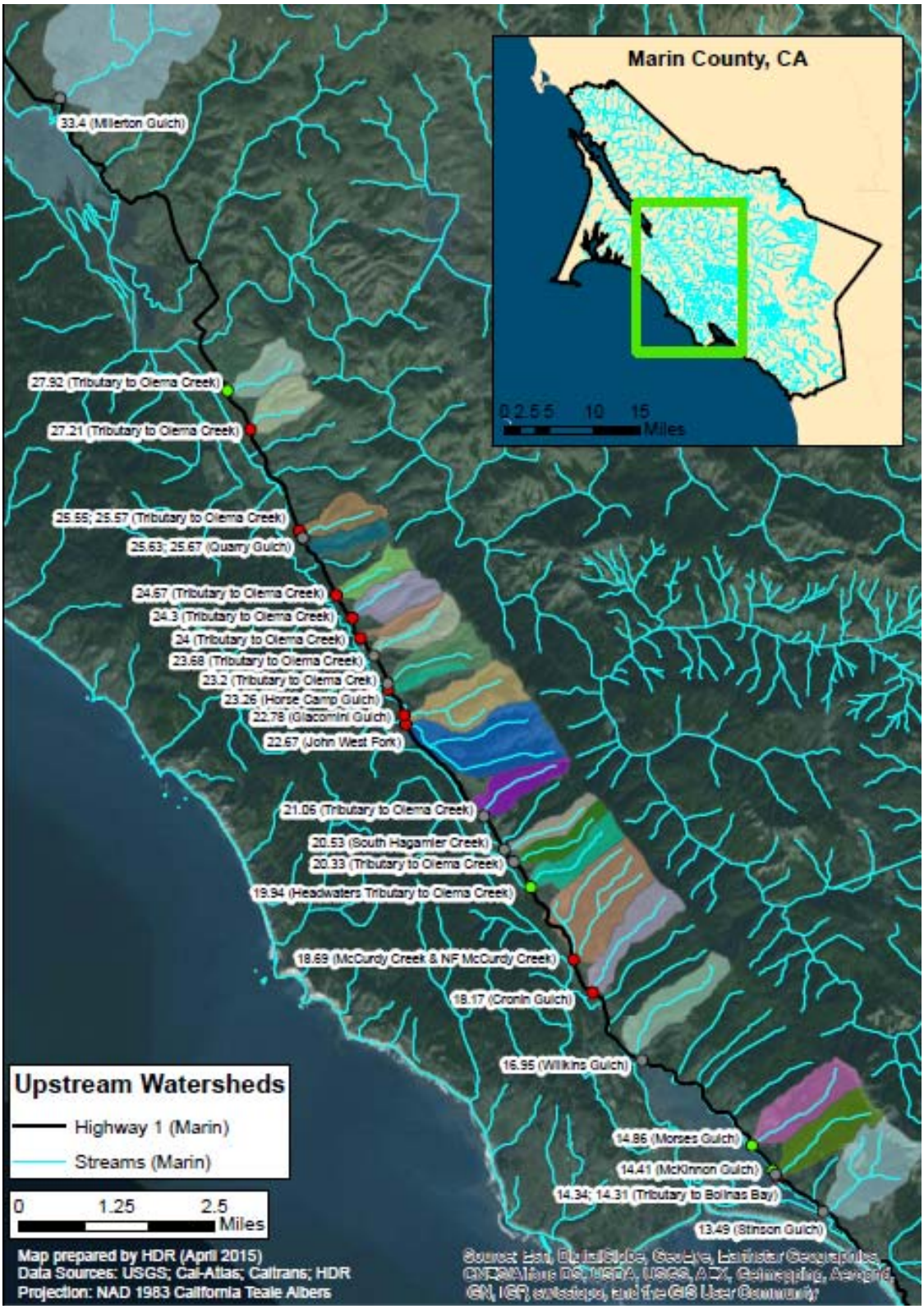

Figure 12. Overview of delineated watersheds upstream of evaluated crossings in Marin County.

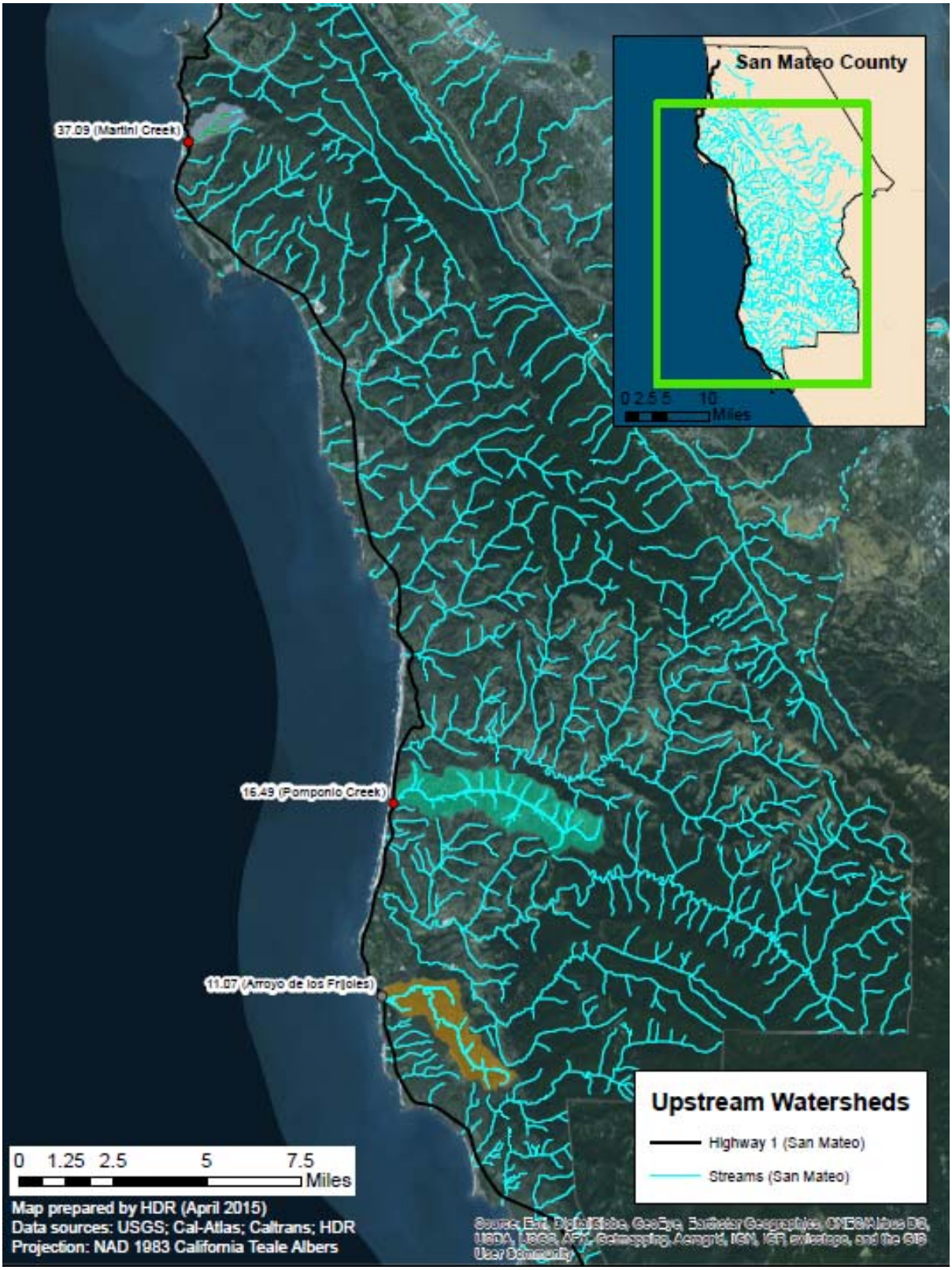

Figure 13. Overview of delineated watersheds upstream of evaluated crossings in San Mateo County.

- Within the Terrain Preprocessing toolset of the Arc Hydro toolbox, ran Stream Definition tool using 250 cells as a threshold for converting the Flow Accumulation raster into a stream "grid" to delineate streams for further processing. The stream grid was then processed with the Stream Segmentation tool to create a stream segments raster (i.e., Stream Link Grid). The Stream Link Grid raster was then converted to features representing the stream network using the Stream to Feature Tool in the Spatial Analyst toolbox. The creation of a stream features layer that is based on the DEM that will be used to calculate stream gradient ensures that the streams layer and the DEM are properly registered (e.g., streams are not flowing uphill).
- Clipped the stream feature class to each individual watershed in order to individually process stream layers within each watershed.
- Stream segments residing within each watershed being evaluated were clipped to their respective watersheds such that the downstream extent of each stream feature generally corresponds with the highway-stream crossing. Ran the Densify tool (Editing toolbox) on the stream features layer to create vertices at a maximum of 100 m intervals.
- Ran the Split Line at Vertices tool (Data Management toolbox) for each stream feature class associated with each watershed to segment each stream reach between vertices in order to eventually calculate slope along each individual segment.
- Ran the Add Surface Information Tool (3D Analyst Toolbox) to generate elevations, slopes and surface lengths for individual stream segments for each stream feature class. Due to the discrepancy between the units in the DEM raster (cm) and the length units of the streams (m), the *z factor* parameter was inputted as .01 to correct for the difference in XY and Z units.
- A unique ID field was added to each of the stream feature classes' attribute table and populated with a Python script.
- Each stream segment within each stream feature class associated with each watershed was symbolized based on its average slope.

Based on the threshold of a 12% or greater slope occurring over approximately 100m or more of stream length, the length of each evaluated stream reach was calculated to estimate potential length of anadromous fish habitat within each evaluated crossing's upstream watershed (**Table 10**). In some cases, known barriers identified in the literature or in the CDFW California Fish Passage Assessment Database (PAD) were used to limit the length of upstream habitat based only on gradient, as specified in the table. It should be emphasized that these are only estimates, and only some of the estimated stream lengths could be corroborated based on reported field observations. Site-specific discussions regarding potential habitat upstream of each crossing, including previously reported fish passage barriers upstream of each crossing, are provided below by county.

Table 10. Estimated length of stream habitat upstream of each evaluated crossing.

County	Route	Postmiles	Stream Name	Species Potentially Present Historically or Currently	Estimated Potential Length of Upstream Habitat (miles)	Factor Limiting Estimated Habitat Besides Gradient
MRN	1	33.4	Millerton Gulch	Steelhead and coho salmon	1 - 1.4	1.4 miles of habitat estimated based on gradient, but barrier identified in PAD ~1 mile upstream of crossing.
MRN	1	27.92	Unnamed (tributary to Olema Creek)	Steelhead and coho salmon	0.6	
MRN	1	27.21	Unnamed (tributary to Olema Creek)	Steelhead and coho salmon	0.5	Estimated upstream habitat was restricted due to habitat fragmentation associated with a residential property.
MRN	1	25.63 and 25.67	Quarry Gulch	Steelhead and coho salmon	1.1	
MRN	1	25.55 and 25.57	Unnamed (tributary to Olema Creek)	Steelhead and coho salmon	0.8	
MRN	1	24.67	Unnamed (tributary to Olema Creek)	Steelhead and coho salmon	0.3	
MRN	1	24.3	Boundary Gulch	Steelhead and coho salmon	0.1	
MRN	1	24	Unnamed (tributary to Olema Creek)	Steelhead and coho salmon	0.1	
MRN	1	23.68	Unnamed (tributary to Olema Creek)	Steelhead and coho salmon	0.3	
MRN	1	21.06	Unnamed (tributary to Olema Creek)	Steelhead and coho salmon	0.5	
MRN	1	22.67	John West Fork	Steelhead and coho salmon	1.5	
MRN	1	22.78	Giacomini Gulch	Steelhead and coho salmon	0.9	
MRN	1	23.2	Unnamed (tributary to Olema Creek)	Steelhead and coho salmon	0.1	
MRN	1	23.26	Horse Camp Creek	Steelhead and coho salmon	0.2	
MRN	1	20.53	South Hagamier Creek	Steelhead and coho salmon	0.2	Upstream habitat limited by South Hagamier Dam as identified in the PAD.

County	Route	Postmiles	Stream Name	Species Potentially Present Historically or Currently	Estimated Potential Length of Upstream Habitat (miles)	Factor Limiting Estimated Habitat Besides Gradient
MRN	1	20.33	Unnamed (tributary to Olema Creek)	Steelhead and coho salmon	0.5	
MRN	1	19.94	Headwaters tributary to Olema Creek	Steelhead and coho salmon	0.3	
MRN	1	18.69	McCurdy Creek and North Fork McCurdy Creek	Steelhead and coho salmon	1.2	
MRN	1	18.17	Cronin Gulch	Steelhead and coho salmon	0.4	
MRN	1	16.95	Wilkins Gulch	Steelhead and coho salmon	0.5 – 0.75	Upstream habitat estimated at 0.5 miles based on gradient; Fong (2002) reported approximately 0.75 miles available up to a natural barrier.
MRN	1	14.86	Morses Gulch	Steelhead and coho salmon	0.4	Upstream habitat estimated at 0.4 miles based on gradient; Fong (2002) reported approximately 0.6 miles available up to a natural barrier.
MRN	1	14.31, 14.34, 14.41	McKinnon Gulch	Steelhead and coho salmon	0.4 - 0.75	Upstream habitat estimated at 0.4 miles based on gradient; Fong (2002) reported approximately 0.75 miles available up to a natural barrier.
MRN	1	13.49	Stinson Gulch	Steelhead and coho salmon	0.4 – 0.6	Upstream habitat estimated at 0.4 miles based on gradient; Fong (2002) reported a minimum of 0.6 miles available.
SM	1	39.07	Martini Creek	Steelhead and coho salmon	0.7	Upstream habitat may be limited to 0.1 miles if barrier reported in the PAD is still present.
SM	1	16.49	Pomponio Creek	Steelhead and coho salmon	1-2	Upstream habitat limited by a known natural barrier as identified in the PAD and other sources. Estimated length of habitat differs among sources and GIS analysis.
SM	1	11.07	Arroyo de los Frijoles	Steelhead and coho salmon	0.2	Upstream habitat limited by Lake Lucerne Dam.
Total					**14.2 – 16.4**	

Marin County

MRN 1 33.4 (Millerton Gulch)

Potential upstream habitat available in Millerton Gulch and its tributaries was estimated to be approximately 1.4 miles, based on the 12% gradient criterion (**Figure 14**). Potential upstream habitat was reduced in part due to a dam and reservoir present near the mouth of one of the stream's tributaries. According to the PAD, a waterfall acts as a barrier on the mainstem of Millerton Gulch. It could not be determined if this barrier is still present based on aerial imagery, and therefore, was not assumed to limit upstream habitat availability.

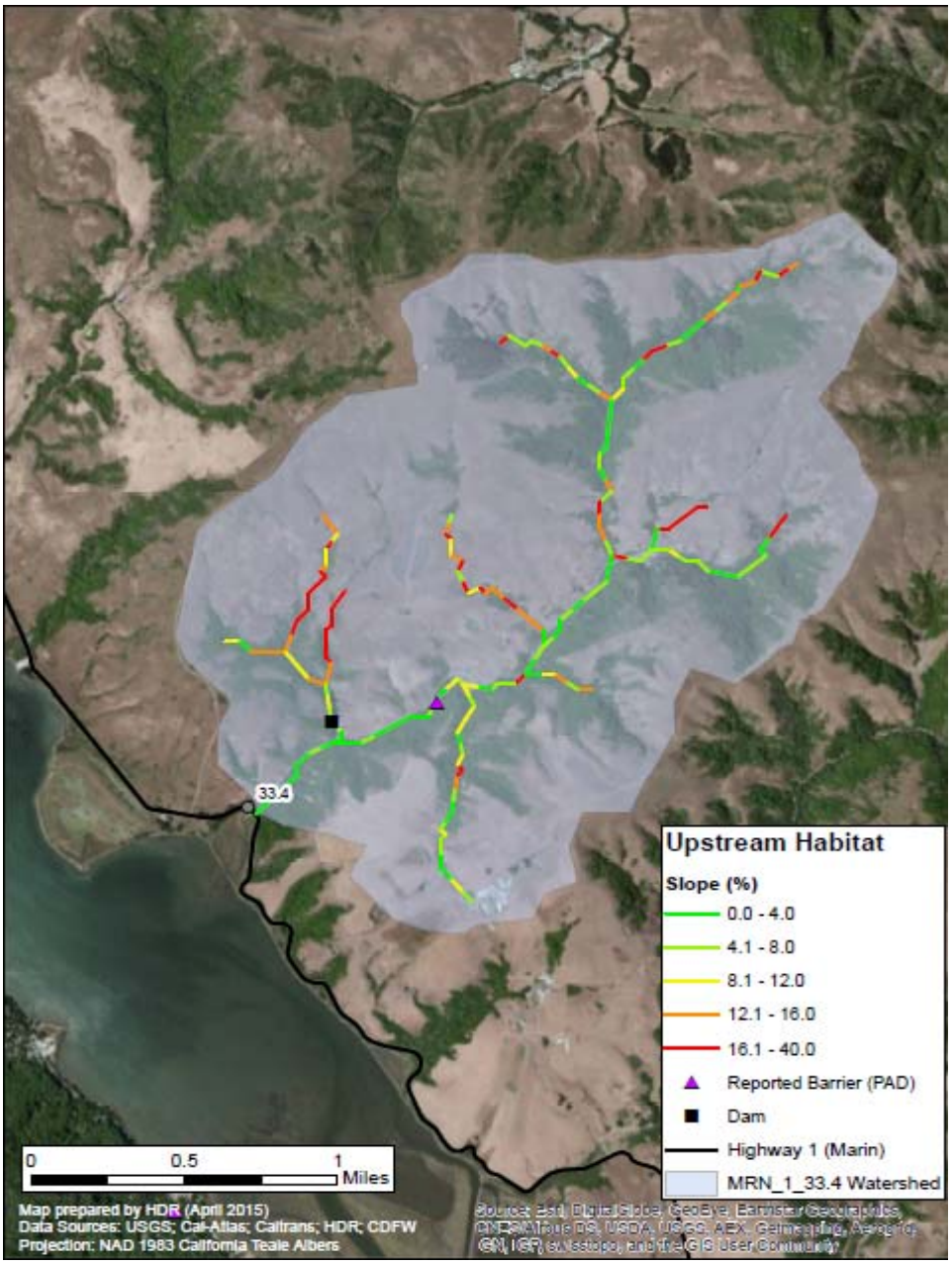

Figure 14. Stream gradient and fish passage barriers upstream of MRN 1 33.4 (Millerton Gulch).

MRN 1 27.92 (Unnamed tributary to Olema Creek)

As previously described, this site was initially identified as "green" according to the CDFW Passage Evaluation Filter, but this determination was ignored due to the culvert being nearly filled with sediment at the downstream end. It is recommended that this site be re-surveyed after the excess sediment is removed from the site. Potential upstream habitat available was estimated at approximately 0.6 miles based on stream gradient (**Figure 15**).

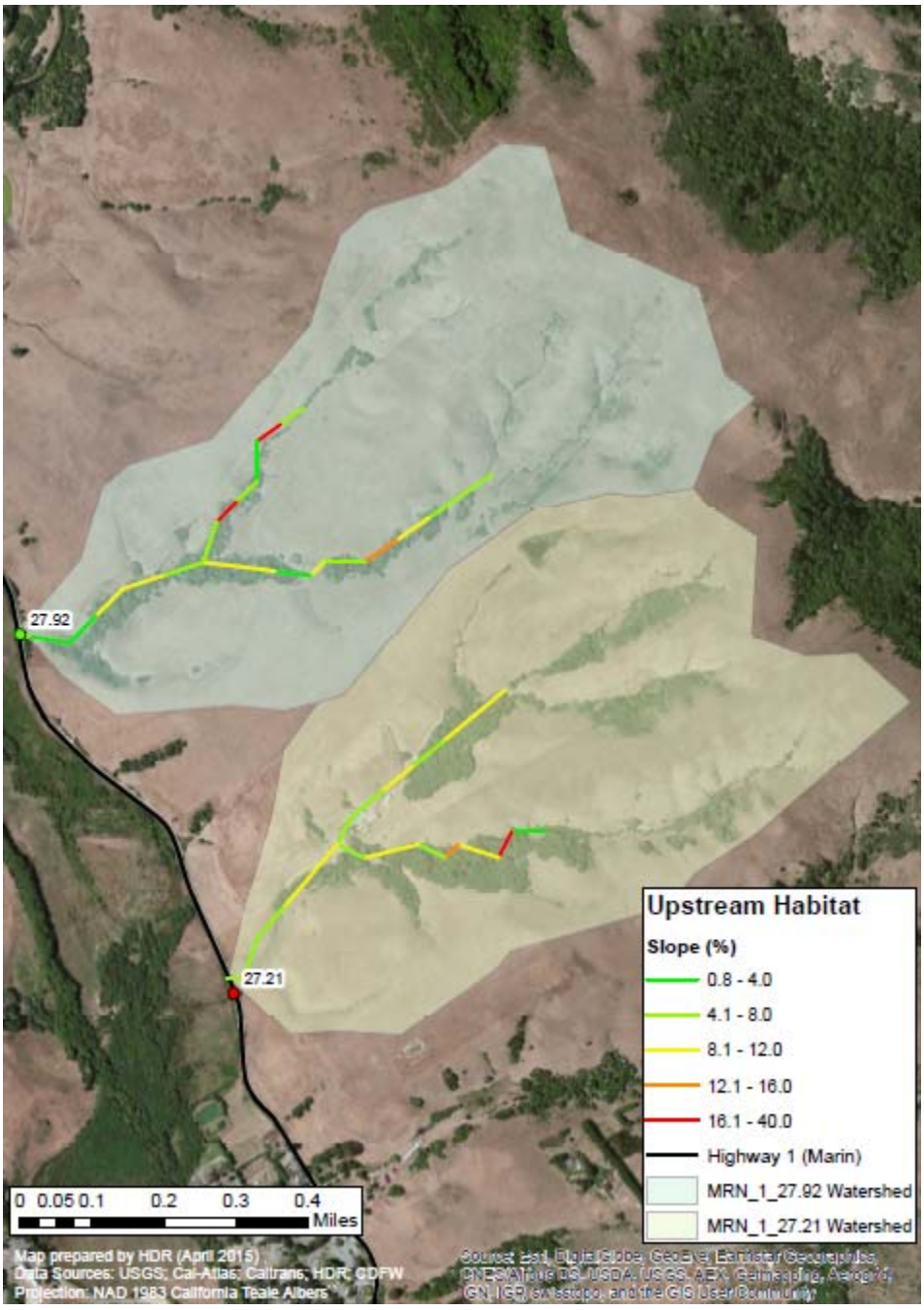

Figure 15. Stream gradient upstream of MRN 1 27.92 and 27.21.

MRN 1 27.21 (Unnamed tributary to Olema Creek)

As previously described, this site was identified as "red" according to the CDFW Passage Evaluation Filter. In addition to stream gradient, estimated upstream habitat also was restricted due to habitat fragmentation associated with a residential property at the mouth of a tributary to this creek. Potential upstream habitat available was estimated at approximately 0.5 miles (Figure 15).

MRN 1 25.63 and 25.67 (Quarry Gulch)

Both MRN 1 25.63 and 25.67 are discussed together because they both appear to potentially pass water from Quarry Gulch under Highway 1. Quarry Gulch initially appears to pass under Highway 1 at postmile 25.67, but also may flow parallel to Highway 1 before flowing under the highway at postmile 25.63. For the purposes of delineating the watershed upstream of these sites, the crossing at postmile 26.63 was used.

Both crossings were identified as "red" by the CDFW Passage Evaluation Filter. The upstream watershed for these two sites was estimated to include approximately 1.1 miles of habitat upstream of the crossings (**Figure 16**). In reaches where excessive gradient was identified but the stream representation was not consistent with the actual stream path based on aerial imagery, the excessive gradient at that segment was ignored. Although not shown on the stream representation for the watershed upstream of these sites, additional habitat length was included based on additional stream channel and riparian corridor shown in the aerial imagery but not represented by the stream network representation based on the DEM, in order to minimize the potential for underestimating possible upstream habitat.

MRN 1 25.57 and 25.55 (Unnamed tributary to Olema Creek)

Both MRN 1 25.55 and 25.57 are discussed together because they both appear to drain the unnamed tributary to Olema Creek just south of Quarry Gulch under Highway 1. For the purposes of delineating the watershed upstream of these sites, the crossing at postmile 25.55 was used.

Both sites were identified as "gray" according to the CDFW Passage Evaluation Filter. Due to discrepancies between the stream network representation based on the DEM in this watershed and the stream channel and riparian corridor shown in the aerial imagery, the potential upstream habitat was not limited to the stream network displayed for this watershed (Figure 16). In addition, two stream segments shown as exceeding the 12% gradient threshold were ignored due to the segments not accurately representing the actual direction of streamflow. In order to avoid underestimating potential upstream habitat, estimated potential habitat included these segments, and was stopped when stream gradient exceeded 16% (symbolized as red), as shown in the figure. Estimated potential habitat upstream of these crossings was estimated to be approximately 0.8 miles.

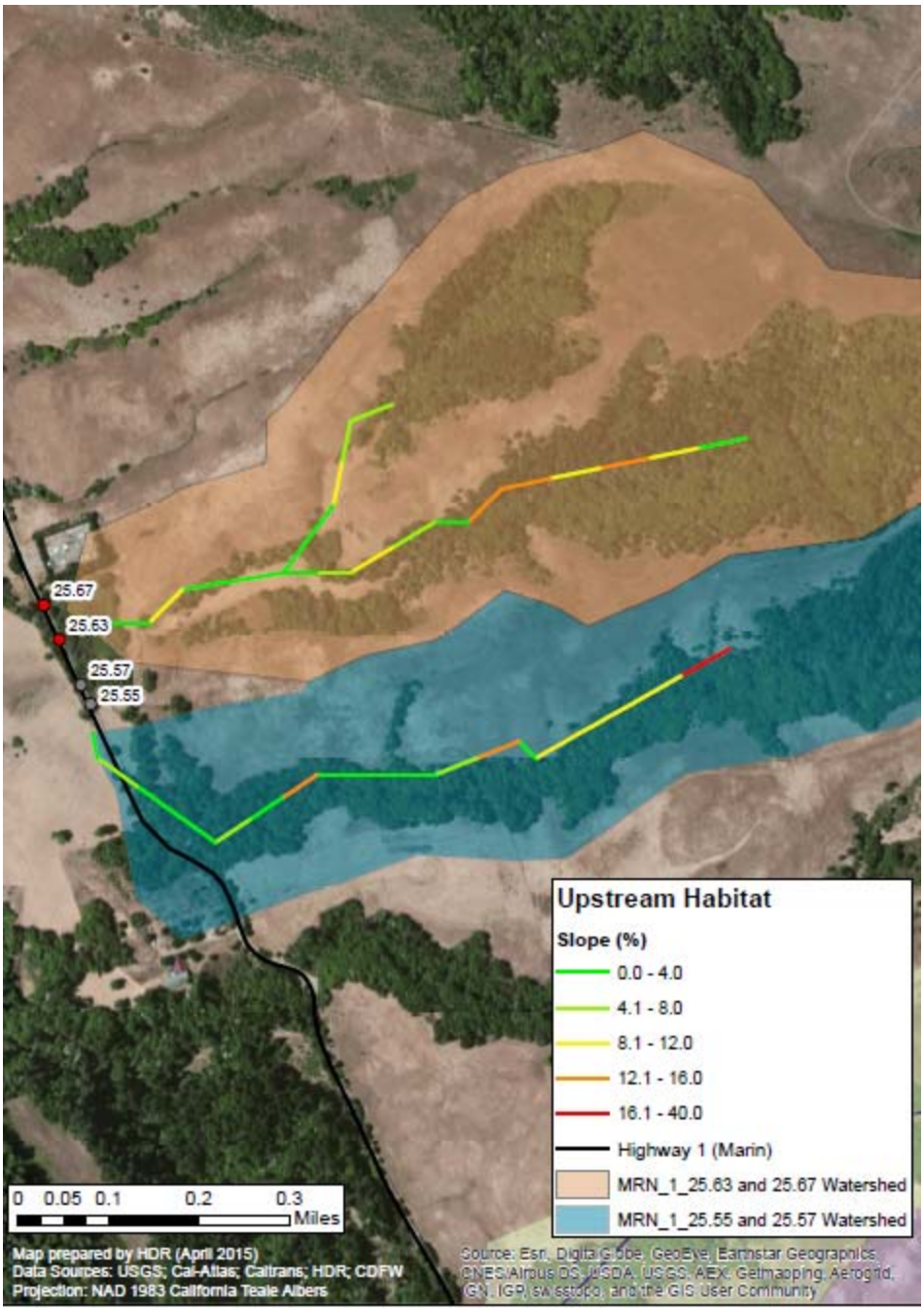

Figure 16. Stream gradient upstream of MRN 1 25.63 and 25.67, and MRN 1 25.55 and 25.57.

MRN 1 24.67 (Unnamed tributary to Olema Creek)

This crossing was identified as "red" by the CDFW Passage Evaluation Filter. Estimated potential habitat upstream of the crossing was estimated to be fairly limited (approximately 0.3 miles) before the stream gradient increased above 12% over more than 100m in stream length (**Figure 17**). Although not shown in the stream representation, the stream is divided into two segments before it enters the crossing upstream, which was accounted for in the estimation of potential length of upstream habitat. In addition, the initial stream pathway based on the stream representation just upstream of the crossing indicated excessive

stream gradient, but was not consistent with the actual stream pathway based on aerial imagery and on-site observation. Therefore, the initial segment indicating excessive gradient upstream of the crossing was ignored.

MRN 1 24.3 (Boundary Gulch)

This crossing was identified as "red" by the CDFW Passage Evaluation Filter. Estimated potential habitat upstream of the crossing was estimated to be fairly limited (approximately 0.1 miles) before the stream gradient increased above 12% over more than 100 m in stream length (Figure 17). Marin County (2003) also reported that potential upstream habitat was limited (800 feet).

MRN 1 24 (Unnamed tributary to Olema Creek)

This crossing was identified as "red" by the CDFW Passage Evaluation Filter. Estimated potential habitat upstream of the crossing was estimated to be fairly limited (approximately 0.1 miles) before the stream gradient increased above 12% over more than 100 m in stream length (Figure 17).

MRN 1 23.68 (Unnamed tributary to Olema Creek)

This crossing was identified as "gray" by the CDFW Passage Evaluation Filter. Estimated potential habitat upstream of the crossing was estimated to be fairly limited (approximately 0.3 miles) before the stream gradient increased above 12% over more than 100 m in stream length (Figure 17).

MRN 1 23.26 (Horse Camp Creek)

This crossing was identified as "gray" by the CDFW Passage Evaluation Filter. Estimated potential habitat upstream of the crossing was fairly limited (approximately 0.2 miles) before the stream gradient increased above 12% over more than 100 m in stream length (**Figure 18**). This is similar to the reported 1,300 feet of available habitat estimated by Marin County (2003).

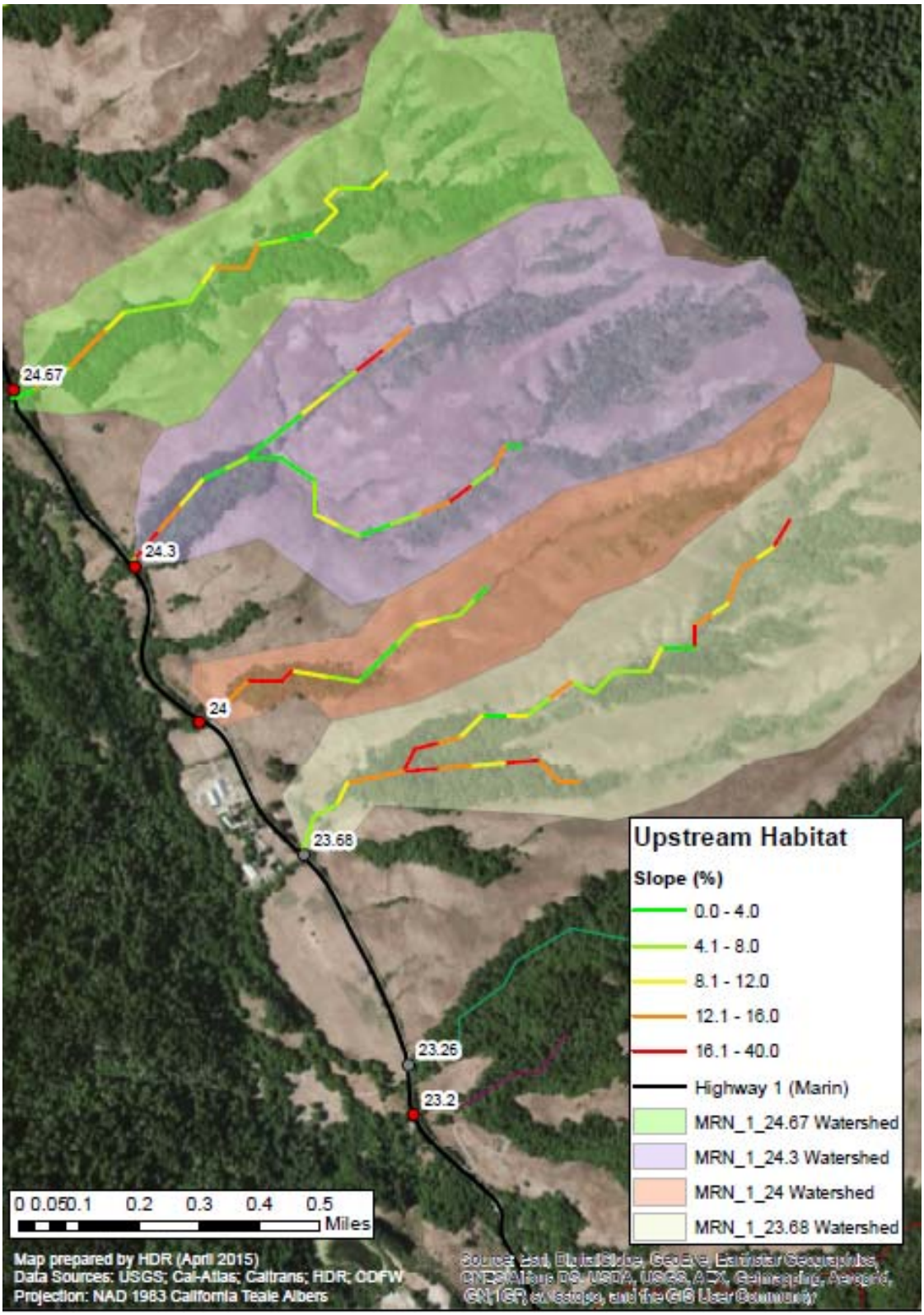

Figure 17. Stream gradient upstream of MRN 1 24.67, 24.3, 24.0 and 23.68.

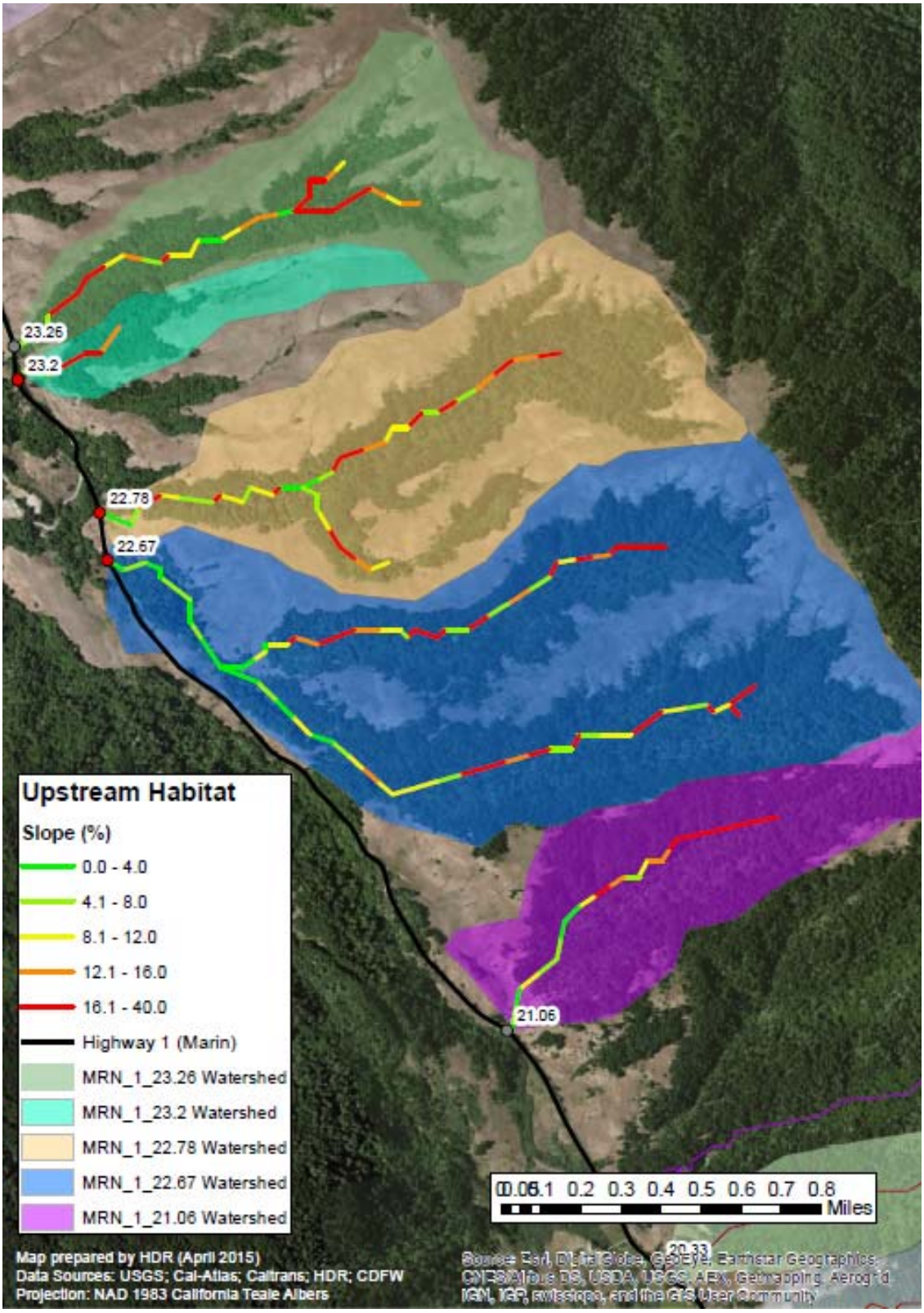

Figure 18. Stream gradient upstream of MRN 1 23.26, 23.2, 22.78, 22.67 and 21.06.

MRN 1 23.2 (Unnamed tributary to Olema Creek)

This crossing was identified as "red" by the CDFW Passage Evaluation Filter. Estimated potential habitat upstream of the crossing was limited (approximately 0.1 miles) before the stream gradient increased above 12% over more than 100m in stream length (Figure 18).

MRN 1 22.78 (Giacomini Gulch)

This crossing was identified as "red" by the CDFW Passage Evaluation Filter. Due to discrepancies between the stream network representation based on the DEM in this watershed and the stream channel and riparian corridor shown in the aerial imagery, the potential upstream habitat was not limited to the stream network displayed for this watershed. Estimated potential habitat upstream of the crossing was approximately 0.9 miles before the stream gradient increased above 12% over more than 100 m in stream length (Figure 18). This is similar, but slightly less than the 6,000 feet of habitat available upstream of the crossing reported by Marin County (2003). Both coho salmon and steelhead juveniles have reportedly been observed downstream of the crossing (Marin County 2003), and coho salmon adults can reportedly migrate through this crossing at high flows (NPS 2011, as cited in the CDFW Passage Assessment Database). Marin County (2003) and Caltrans (2014) identified this site as a high priority barrier.

MRN 1 22.67 (John West Fork)

This crossing was identified as "red" by the CDFW Passage Evaluation Filter. However, Marin County (2003) reported that anadromous fish (including coho salmon) regularly spawn upstream of the crossing, but that the crossing is still a serious impediment to upstream migration. Estimated potential habitat upstream of the crossing was approximately 1.5 miles before the stream gradient increased above 12% over more than 100 m in stream length (Figure 18). This is in agreement with the 7,800 feet of habitat available upstream of the crossing reported by Marin County (2003). Marin County (2003) and Caltrans (2014) identified this site as a high priority barrier.

MRN 1 21.06 (Unnamed tributary to Olema Creek)

This crossing was identified as "gray" by the CDFW Passage Evaluation Filter. Estimated potential habitat upstream of the crossing was approximately 0.5 miles before the stream gradient increased above 12% over more than 100m in stream length (Figure 18).

MRN 1 20.53 (South Hagamier Creek)

This crossing was identified as "gray" by the CDFW Passage Evaluation Filter. Estimated potential habitat upstream of the crossing approximately was 0.2 miles prior to reaching South Hagamier Dam, reported as a total fish passage barrier by the PAD (**Figure 19**).

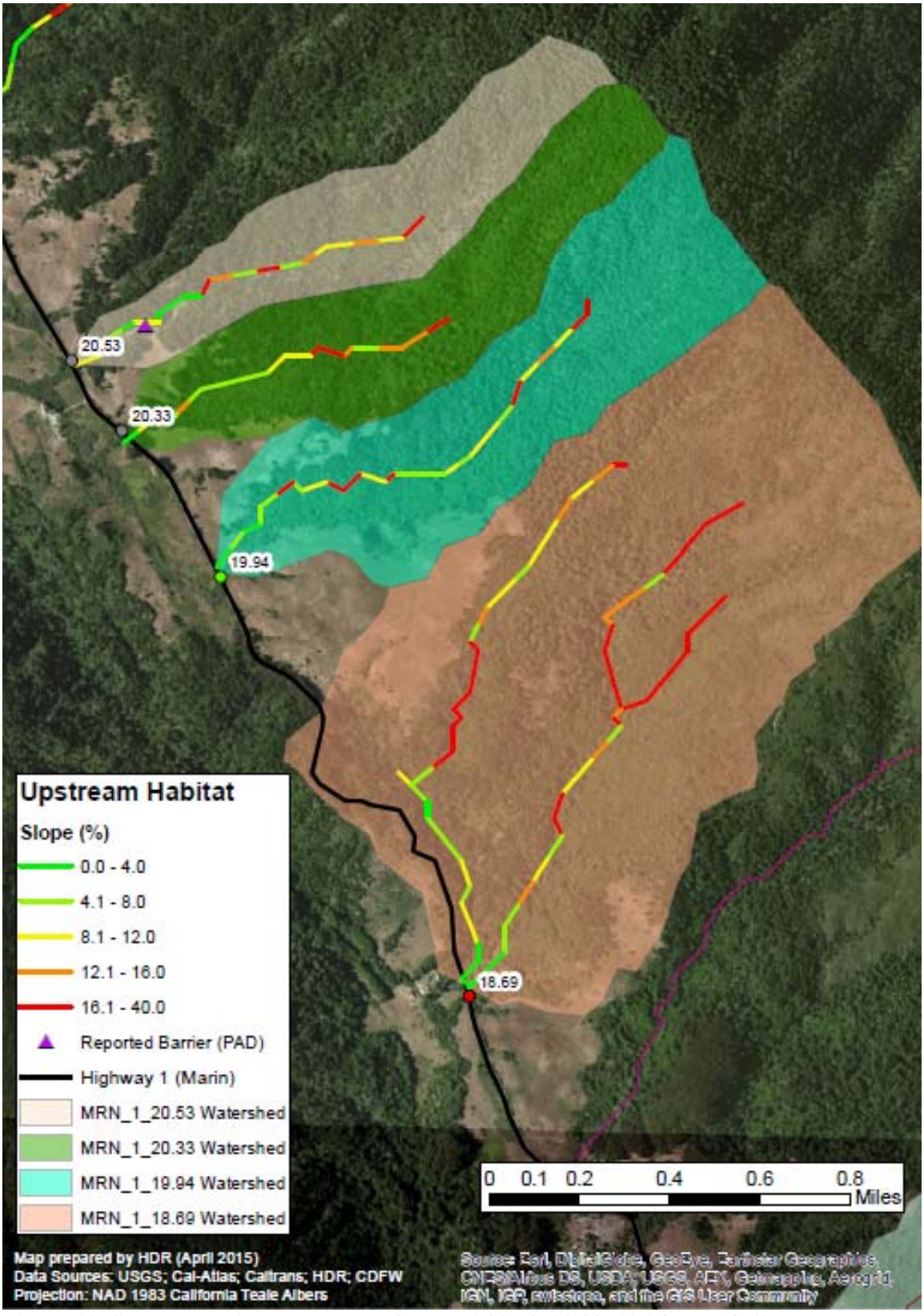

Figure 19. Stream gradient upstream of MRN 1 20.53, 20.33, 19.94 and 18.69.

MRN 1 20.33 (Unnamed tributary to Olema Creek)

This crossing was identified as "gray" by the CDFW Passage Evaluation Filter. Estimated potential habitat upstream of the crossing was approximately 0.5 miles before the stream gradient increased above 12% over more than 100m in stream length (Figure 19).

MRN 1 19.94 (Headwaters tributary to Olema Creek)

This crossing was identified as "green" by the CDFW Passage Evaluation Filter. However, as previously discussed, the culvert was nearly filled with sediment at the outlet. Estimated potential habitat upstream of the crossing was approximately 0.3 miles before the stream gradient increased above 12% over more than 100m in stream length (Figure 19).

MRN 1 18.69 (McCurdy Creek and North Fork McCurdy Creek)

The culvert inlets for McCurdy Creek and North Fork McCurdy Creek join together underneath Highway 1 and discharge through the same outlet. This crossing was identified as "red" by the CDFW Passage Evaluation Filter. Estimated potential habitat upstream of the crossing was approximately 1.2 miles combined for both creeks before the stream gradients increased above 12% over more than 100m in stream length. Marin County (2003) reported about 1 mile of habitat available upstream of this crossing. Marin County (2003) and Caltrans (2014) identified this site as a high priority barrier (Figure 19).

MRN 1 18.17 (Cronin Gulch)

This crossing was identified as "red" by the CDFW Passage Evaluation Filter. Estimated potential habitat upstream of the crossing was approximately 0.4 miles before the stream gradient increased above 12% over more than 100m in stream length (**Figure 20**).

MRN 1 16.95 (Wilkins Gulch)

This crossing was identified as "gray" by the CDFW Passage Evaluation Filter. Estimated potential habitat upstream of the crossing was approximately 0.5 miles before the stream gradient increased above 12% over more than 100 m in stream length (Figure 20). Fong (2002) estimated the length of potential habitat in Wilkins Gulch as approximately 1.2 km (.75 miles), limited by the presence of a 2 m cascade.

MRN 1 14.86 (Morses Gulch)

This crossing was identified as "green" by the CDFW Passage Evaluation Filter, however, this classification was discarded because the culvert was nearly full with sediment. It is recommended that this site be re-surveyed after the excess sediment is removed from the site. The estimated potential habitat upstream of the crossing was approximately 0.4 miles before the stream gradient increased above 12% over more than 100 m in stream length (**Figure 21**). Due to discrepancies between the stream channel and the stream network representation, initial high gradient segments just upstream of the crossing were ignored. Fong (2002) estimated the length of potential habitat in Wilkins Gulch as approximately 1 km (.6 miles), with the upstream extent an 8 m tall waterfall.

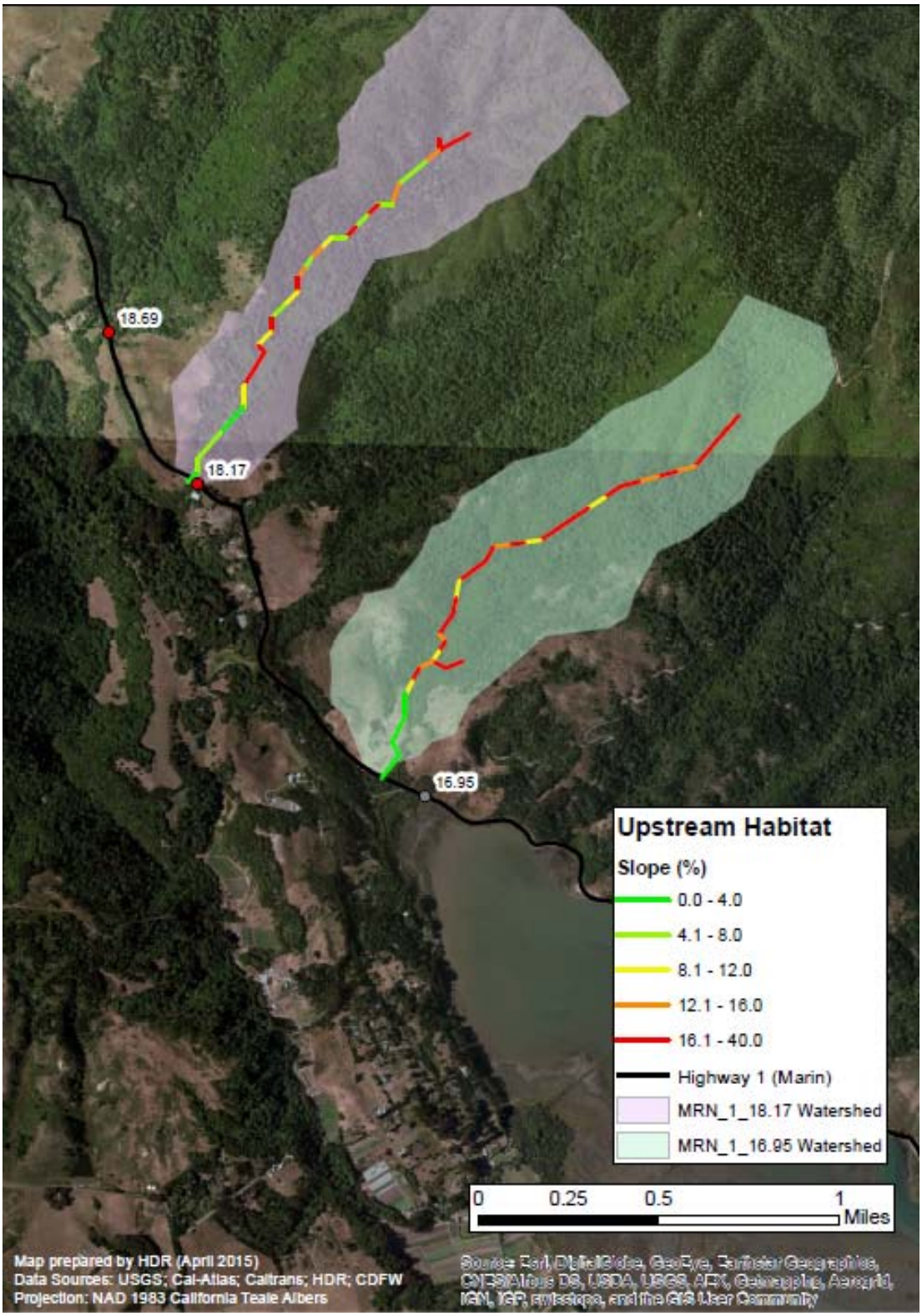

Figure 20. Stream gradient upstream of MRN 1 18.17 and 16.95.

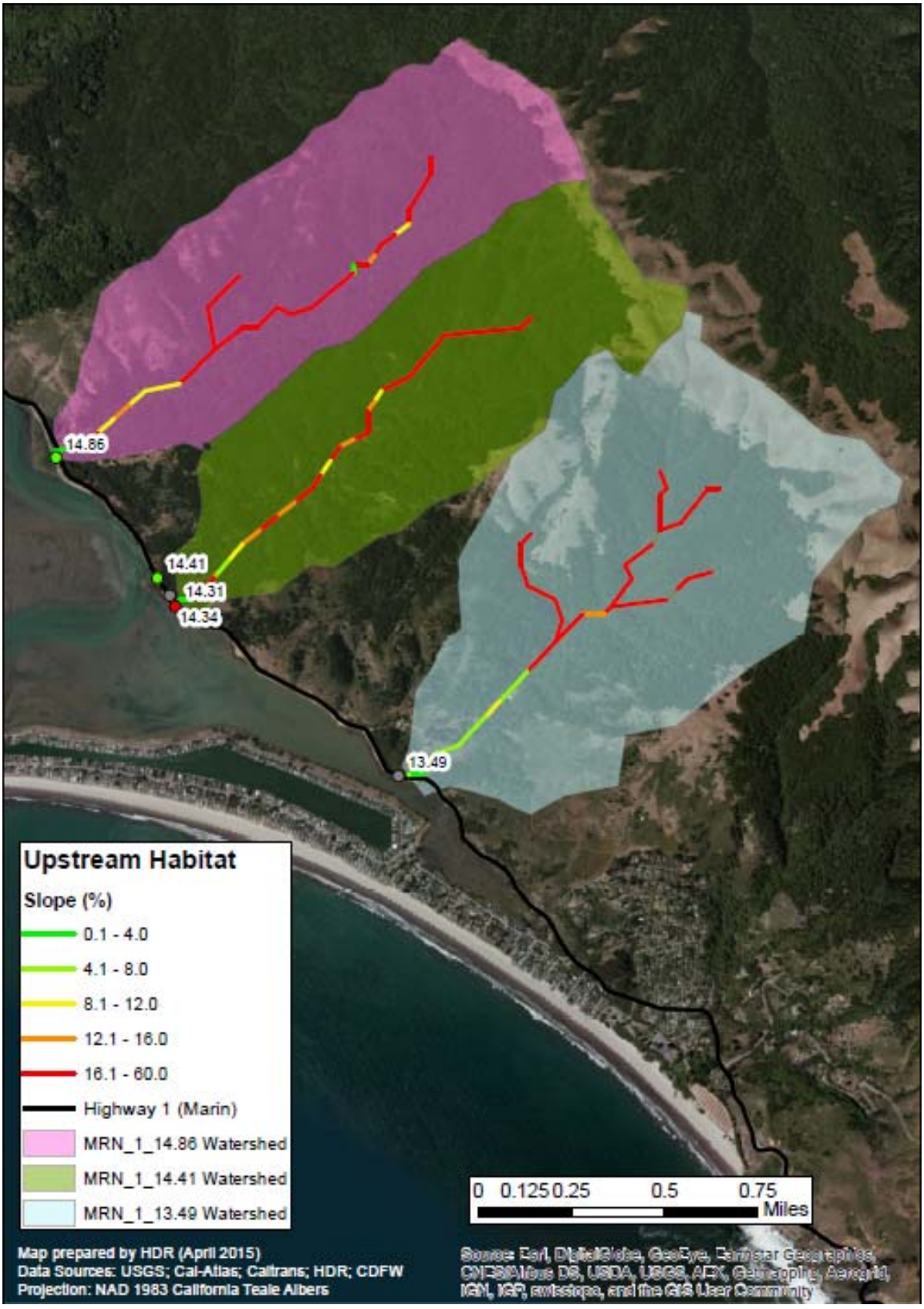

Figure 21. Stream gradient upstream of MRN 1 14.86, 14.41/14.34/14.31 and 13.49.

MRN 1 14.31, 14.34 and 14.41 (McKinnon Gulch)

As previously described, the historical and current channel of McKinnon Gulch has been altered, resulting in the current channel passing through postmile 14.41, but with the historical outlet occurring in the vicinity of postmiles 14.31 and 14.34. This is corroborated by hydrologic GIS analysis, which suggests water would have flowed to the south of postmile 14.41 (**Figure 22)**. Fong (2002) reported that the sites south of postmile 14.41 were not connected to the current main channel, and that the water passing through these sites was from an emergent wetland. Fong (2002) also reported that although the crossing at postmile 14.41 represents the outlet of the existing discharge location of McKinnon Gulch, it is now generally dry upstream of the crossing during most of the year.

Postmile 14.41 was identified as "green", postmile 14.34 was identified as "gray", and postmile 14.31 was identified as "red" by the CDFW Passage Evaluation Filter. Due to discrepancies between the existing stream channel and the stream network representation, initial high gradient segments just upstream of the crossing were ignored. The estimated potential habitat upstream of the main crossing at postmile 14.41 was approximately .4 miles (Figure 21, above). However, Fong (2002) estimated the length of potential habitat in McKinnon Gulch as approximately 1.2 km (.75 miles), limited by the presence of a 2.5 tall m cascade.

MRN 1 13.49 (Stinson Gulch)

This site was identified as "gray" by the CDFW Passage Evaluation Filter. The estimated potential habitat upstream of the crossing was approximately 0.6 miles before the stream gradient increased above 12% over more than 100 m in stream length (Figure 21, above). Due to discrepancies between the existing stream channel and the stream network representation, initial high gradient segments just upstream of the crossing were ignored. Fong (2002) estimated the length of potential habitat in Stinson Gulch as greater than 1 km (.6 miles), with an unknown upstream extent.

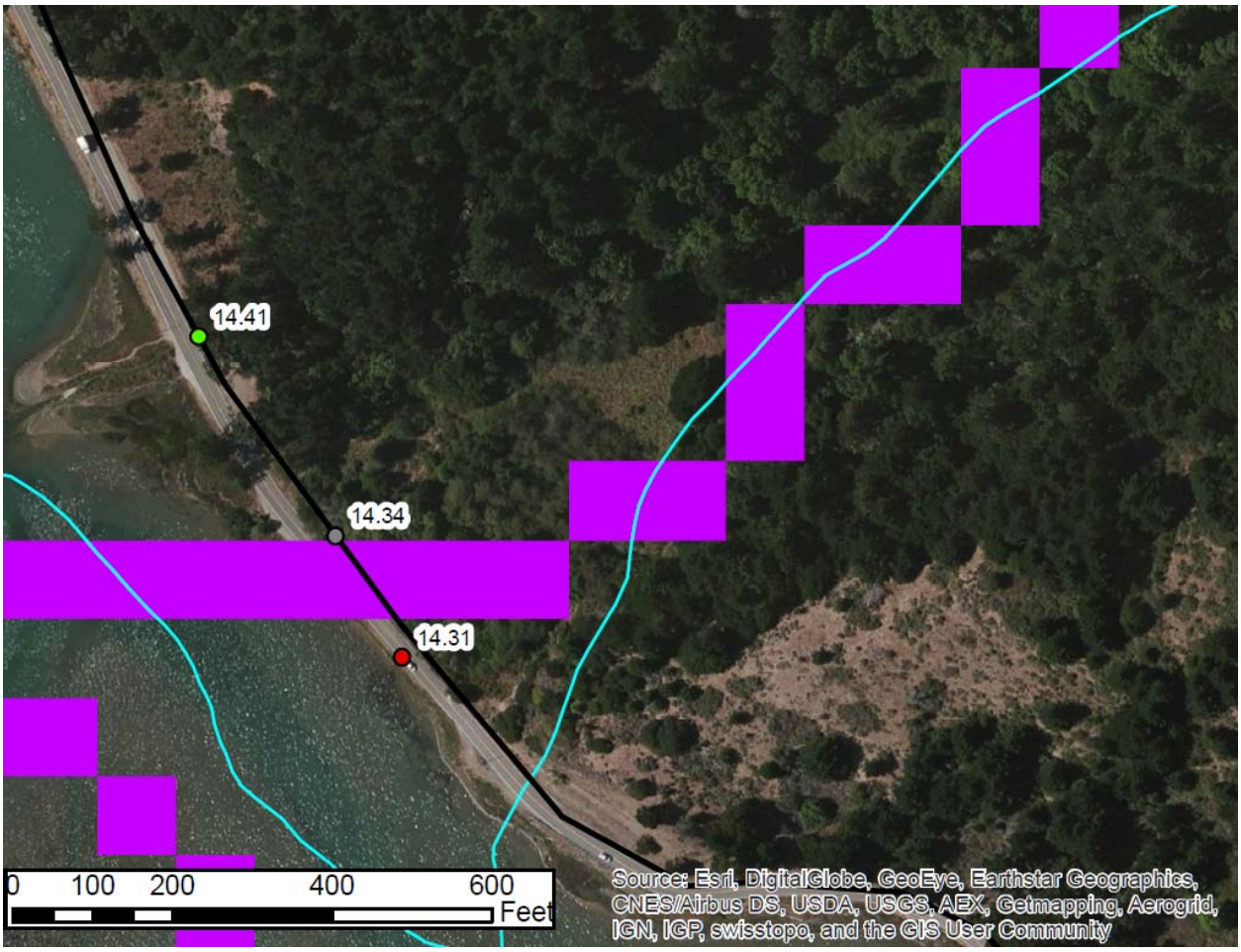

Figure 22. Crossings draining the McKinnon Gulch Watershed (purple highlighting indicates the natural pathway of the stream relative to the existing stream channel discharging at PM 14.41).

San Mateo County

SM 1 39.07 (Martini Creek)

This site was identified as "red" by the CDFW Passage Evaluation Filter. In a 1976 memo regarding Martini Creek, CDFG staff noted that the creek is in a 100 foot long culvert under Highway 1 (CEMAR 2008). The culvert was suspected to be a barrier to upstream passage of steelhead (DFG 1976a, as cited in CEMAR 2008).

The estimated potential habitat upstream of the crossing was approximately 0.7 miles before the stream gradient increased above 12% over more than 100 m in stream length (**Figure 23**). CEMAR (2008) reported that an undated CDFW creek inventory states, "The Highway 1 culvert, which has a four foot drop at both ends, represents an impassable barrier to any migratory fish. Additionally, an instream impoundment blocks the flow approximately 100 yards upstream from highway 1" (DFG ca 1994, as cited in CEMAR 2008). This dam is identified in the PAD and appears to be approximately 0.1 miles upstream from the highway 1 crossing, but its presence could not be confirmed with aerial imagery.

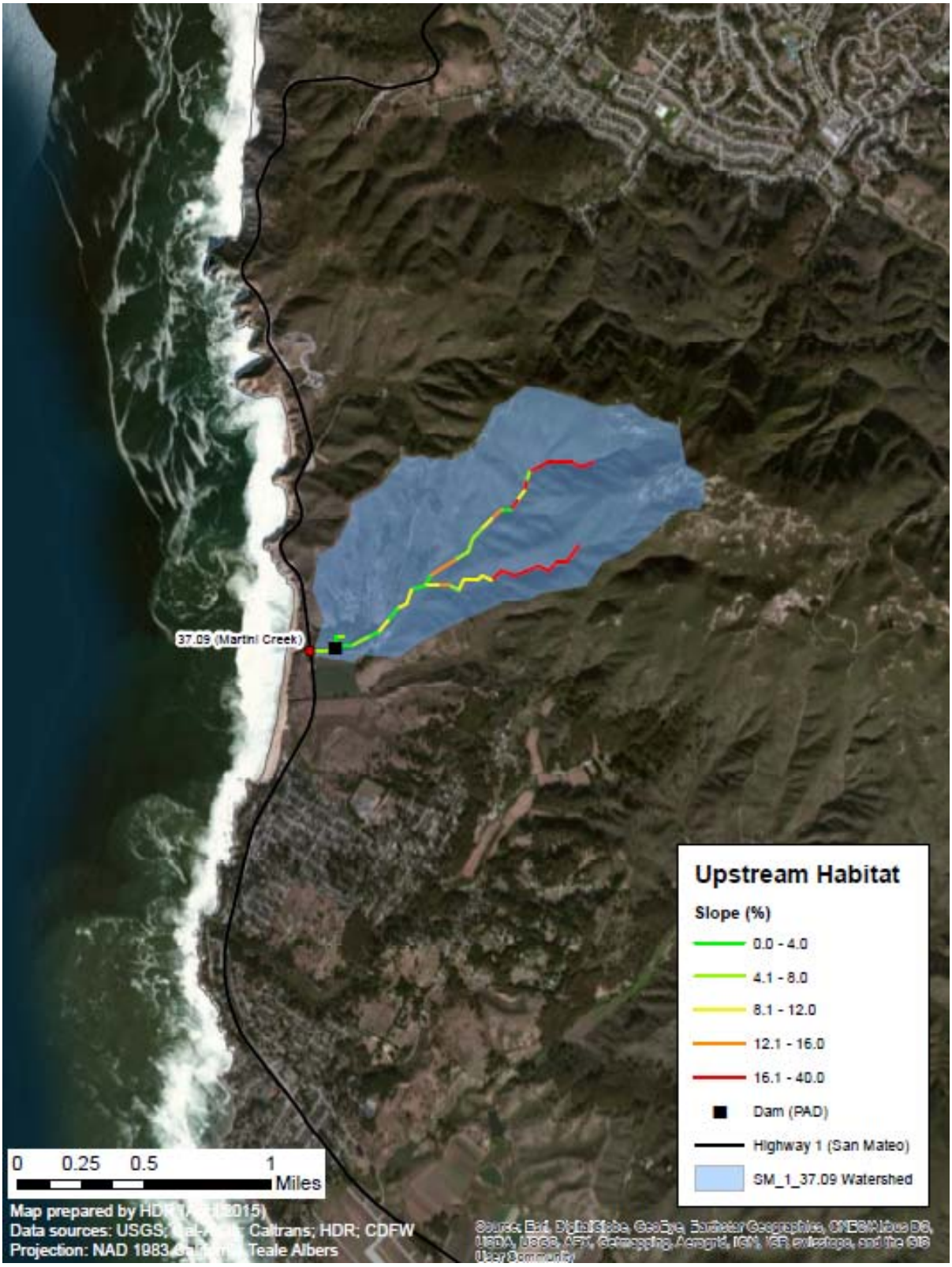

Figure 23. Stream gradient and potential barrier upstream of SM 1 37.09 (Martini Creek).

SM 1 16.45 (Pomponio Creek)

This site was identified as "red" by the CDFW Passage Evaluation Filter. However, as previously discussed, this determination is not necessarily appropriate due to tidal hydrodynamics and the filling of the lagoon just downstream of this crossing (**Figure 24**). Additional surveying of the site, including the lagoon downstream of the crossing, and taking additional measurements not required by the Caltrans survey protocols (e.g. water depth through the crossing at different outflows and tidal conditions) during the steelhead upstream migration season and when sufficient flow is present to allow access to the site by adult salmonids, is suggested prior to conducting hydraulic modeling and making a fish passage determination at this site.

A natural waterfall barrier has been reported to occur within approximately 1-2 miles of the mouth of Pomponio Creek. Titus et al. (in preparation) reported that only the lowermost 1.6 km (~1 mile) of Pomponio Creek has been available to steelhead because of a 7.5 m waterfall at that point, but that steelhead have historically been reported to be present downstream of this barrier. Becker et al. (2010) reported that a 15 foot high bedrock waterfall is located about 2.3 miles upstream from the creek mouth (**Figure 25**). The length of habitat upstream of the highway 1 crossing to the location the waterfall identified in the PAD was approximately 1.8 miles, including a tributary with suitable gradient. During a CDFW survey of Pomponio Creek in 2000, CDFW reportedly noted "adequate" steelhead spawning and rearing habitat downstream of the waterfall (DFG 2000, as cited in Becker et al. 2010).

Figure 24. Lagoon immediately downstream of SM 1 16.49 crossing. December 2014.

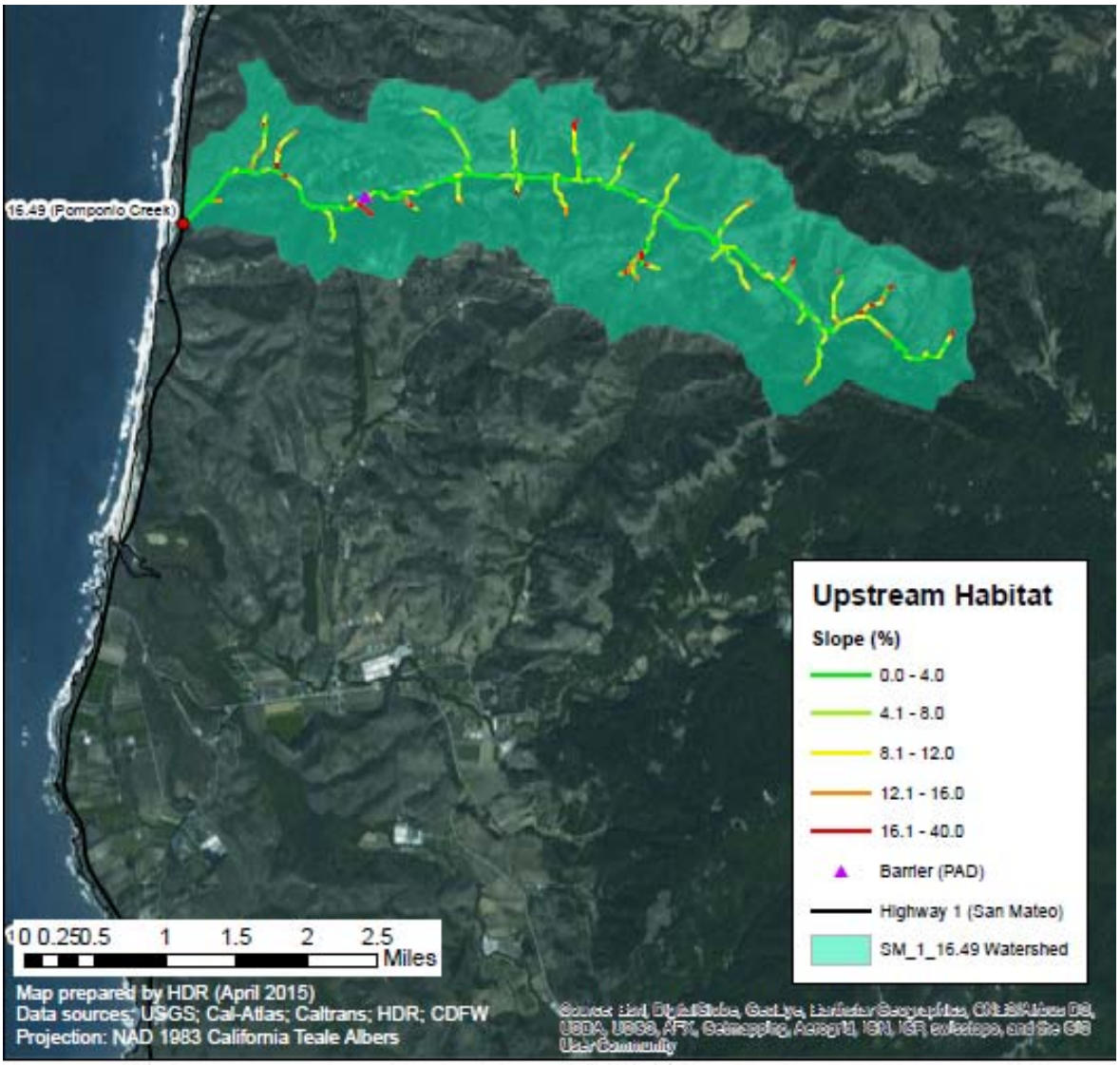

Figure 25. Stream gradient and known barrier upstream of SM 1 16.49 (Pomponio Creek).

SM 1 11.07 (Arroyo de los Frijoles)

This site was identified as "gray" by the CDFW Passage Evaluation Filter. However, as previously discussed, this determination was due to insufficient inlet width and insufficient residual outlet depth. As shown in **Figure 26**, due to the highly variable sediment dynamics at the crossing, the residual outlet depth is highly variable depending on freshwater outflow and potentially tidal conditions. Therefore, it is recommended that this site be surveyed during the upstream migration season and when hydrologic conditions allow for adult salmonid access to the site, and take additional measurements not required by the Caltrans survey protocols (e.g. water depth through the crossing at different outflows and tidal conditions), prior to conducting hydraulic modeling for the site and making a fish passage determination.

Figure 26. Comparison of highly variable sediment conditions at SM 1 11.07.

An impassable dam forming Lake Lucerne is located on Arroyo de los Frijoles about 0.2 miles upstream from the mouth (CEMAR 2008; **Figures 27 and 28**). Therefore, a stream gradient analysis was not performed on the watershed upstream of this crossing. Because no spawning habitat is available to anadromous fish on this creek, it is unclear if any substantive benefits to anadromous fish would be realized if this crossing was remediated to allow unimpeded fish passage (if needed). However, because no upstream spawning habitat is accessible, there are unlikely to be steelhead rearing in the lagoon upstream of the highway 1 crossing. Although it may be conceivable that non-natal juvenile steelhead may enter the lagoon from a nearby lagoon during the spring, no thermal refugia would be accessible to juvenile steelhead upstream of the lagoon as water temperatures warm during the summer. Therefore, it is not expected that the lagoon upstream of the highway 1 crossing currently represents suitable steelhead habitat.

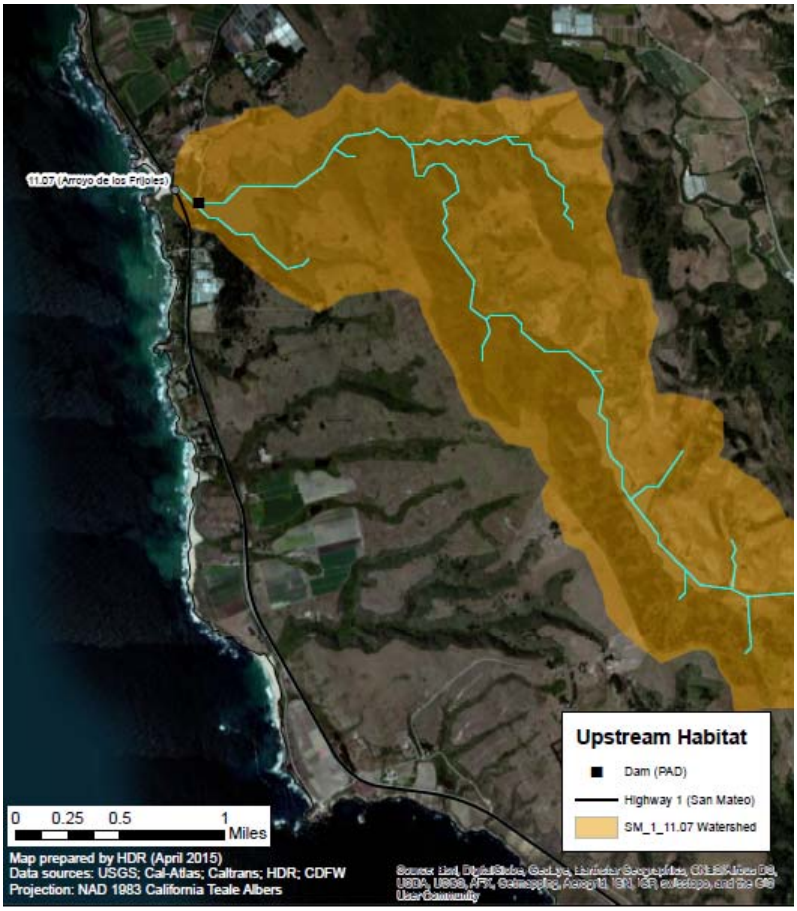

Figure 27. Watershed upstream of SM 1 11.07 (Arroyo de los Frijoles).

Figure 28. Lagoon and Lake Lucerne upstream of SM 1 11.07 (Arroyo de los Frijoles).

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Appendix A - Detailed Fish Passage Assessment Photos (Downstream TWC)

County: Marin Route: 1

Postmile: 9.70*	Postmile: 11.15*
	
Postmile: 13.49	**Postmile: 13.63***
	

* Sites with an asterisk indicate that they were dismissed from further evaluation, as previously discussed in this report.

County: Marin

Route: 1

Postmile: 13.69*	Postmile: 14.31
	
Postmile: 14.41	**Postmile: 14.86**
	

County: Marin

Route: 1

Postmile: 16.95	Postmile: 18.17
	
Postmile: 18.69	**Postmile: 19.81***
	

County: Marin

Route: 1

Postmile: 19.94	Postmile: 20.33
	
Postmile: 20.53	**Postmile: 21.06**
	

County: Marin

Route: 1

Postmile: 22.67	Postmile: 22.78
	
Postmile: 23.20	Postmile: 23.26
	

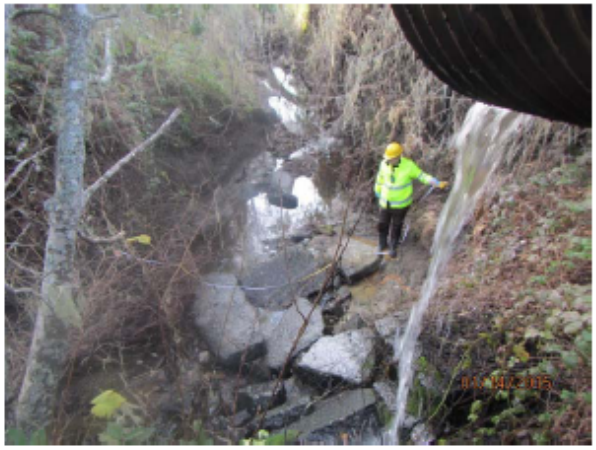
County: Marin

Route: 1

Postmile: 23.68	Postmile: 24.00
	
Postmile: 24.30	Postmile: 24.67
	

County: Marin

Route: 1

Postmile: 25.55	Postmile: 25.57
	
Postmile: 25.63	Postmile: 25.67
	

County: Marin

Route: 1

Postmile: 25.81*	Postmile: 27.21
	
Postmile: 27.92	**Postmile: 33.40**
	

County: Marin

Route: 1

Postmile: 33.69*

County: San Mateo

Route: 1

Postmile: 11.07	Postmile: 16.49
	
Postmile: 37.09	
	

Appendix B - Detailed Fish Passage Assessment Site Sketches

Marin County

MRN-1-9.78

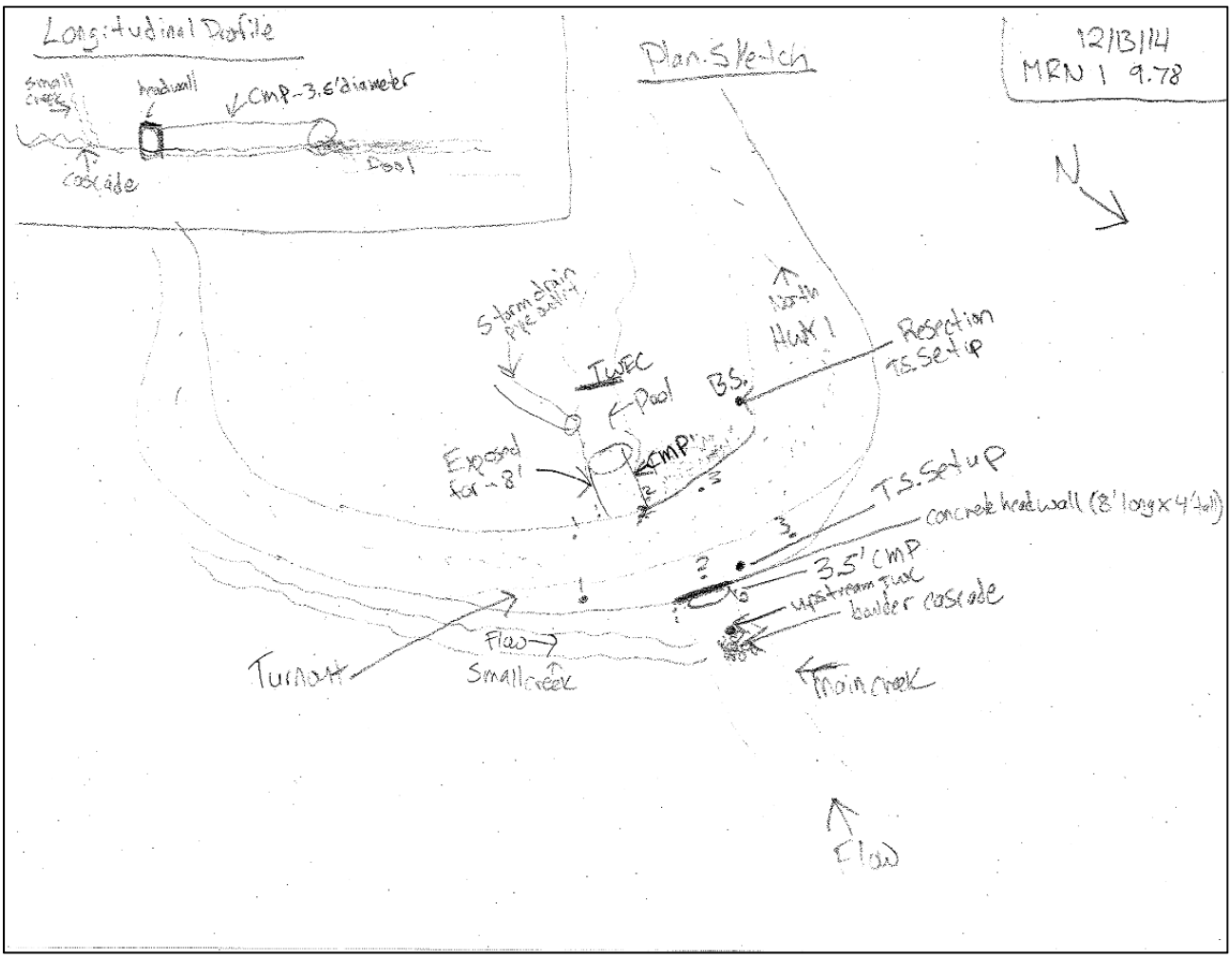


Figure B-1. Site sketch MRN-1-9.78

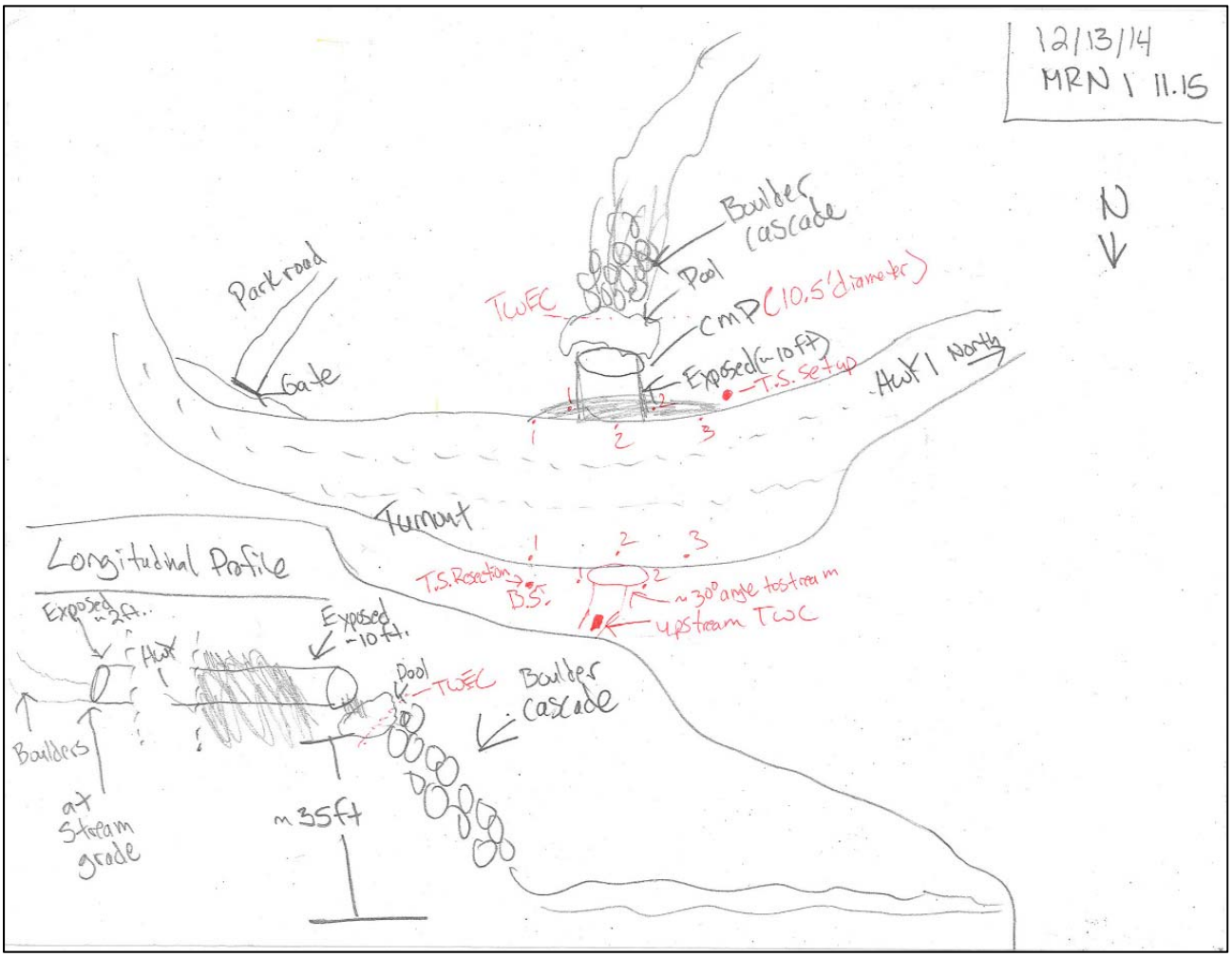


Figure B-2. Site sketch for MRN-1-11.15

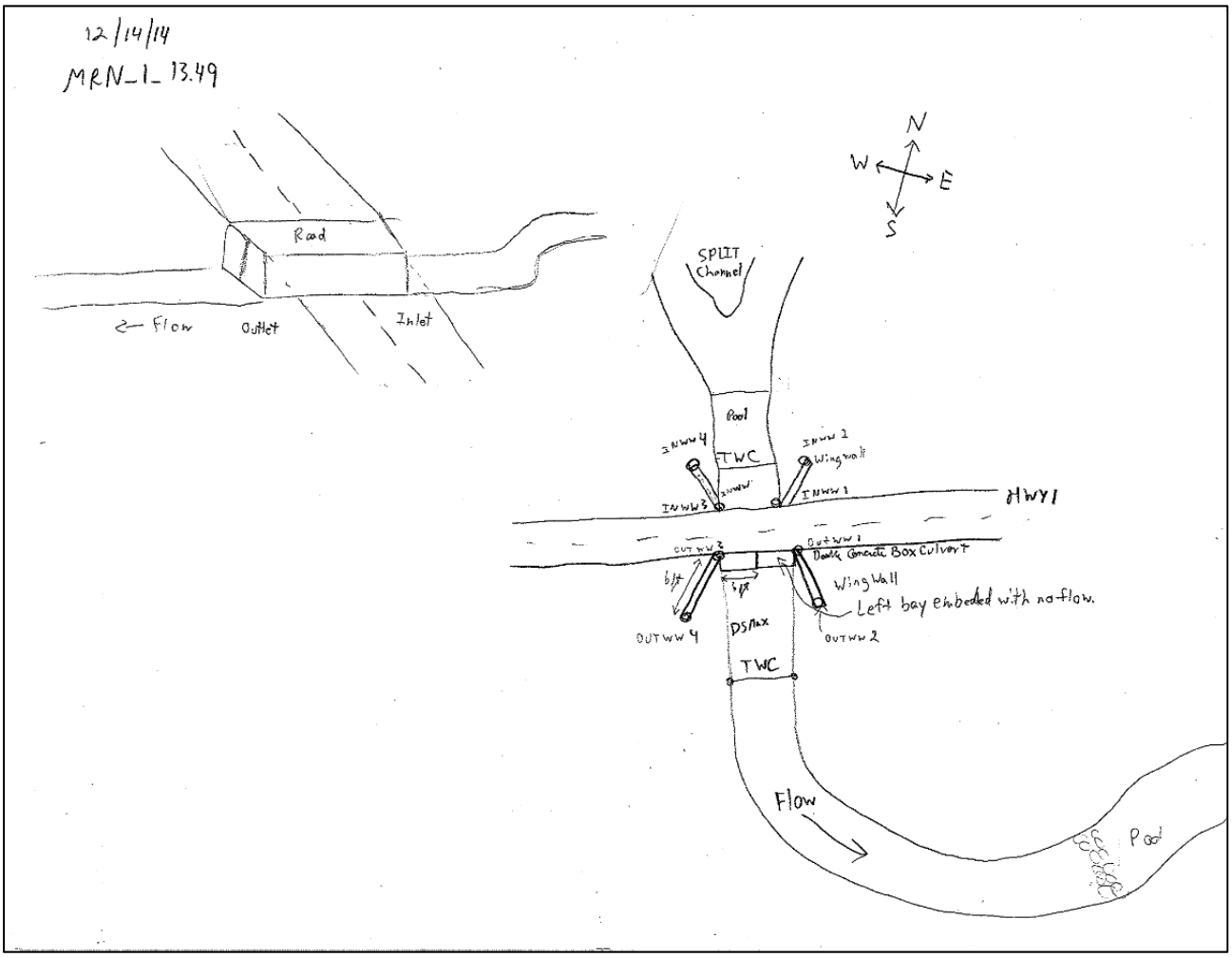


Figure B-3. Site sketch for MRN-1-13.49

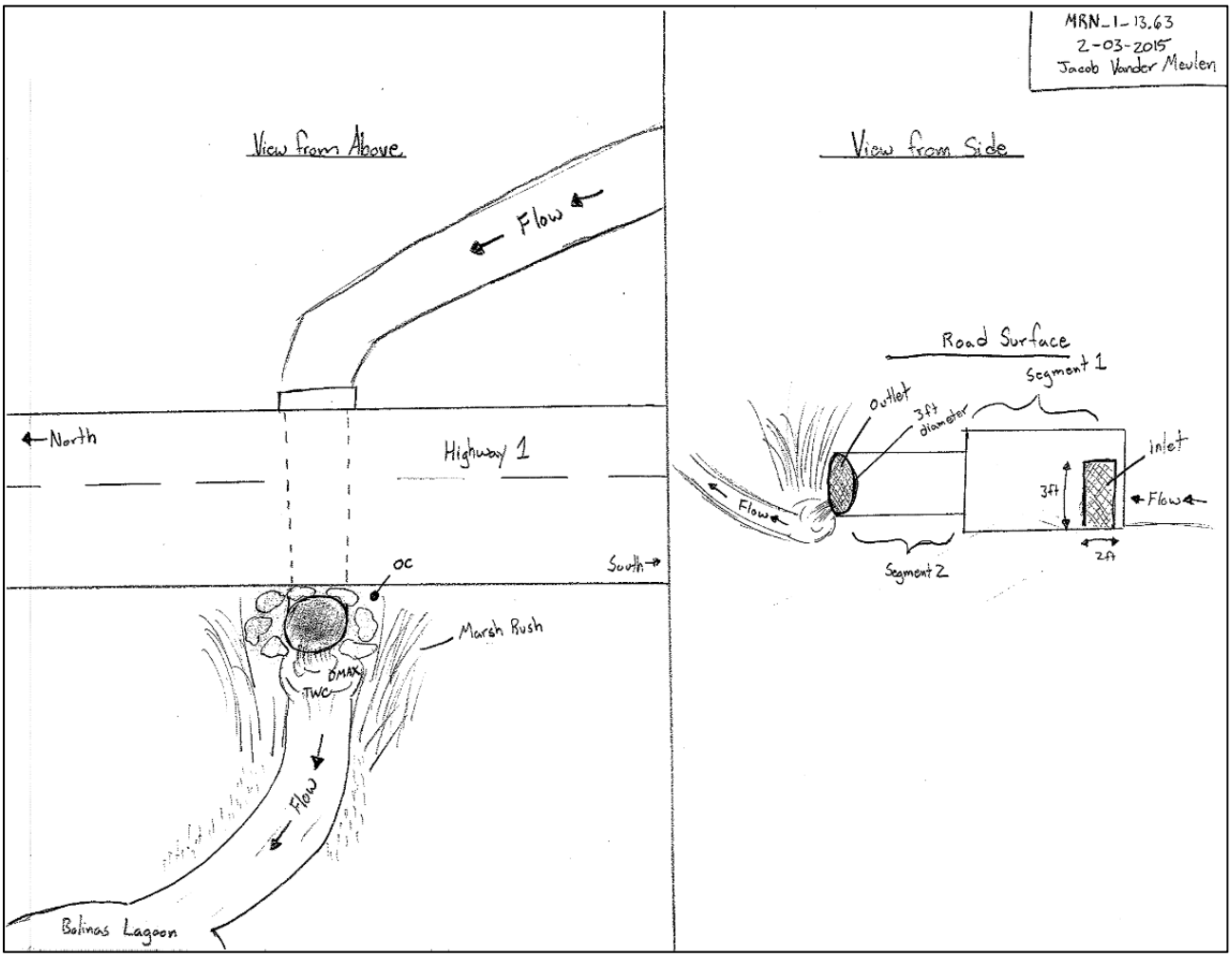


Figure B-4. Site sketch for MRN-1-13.63

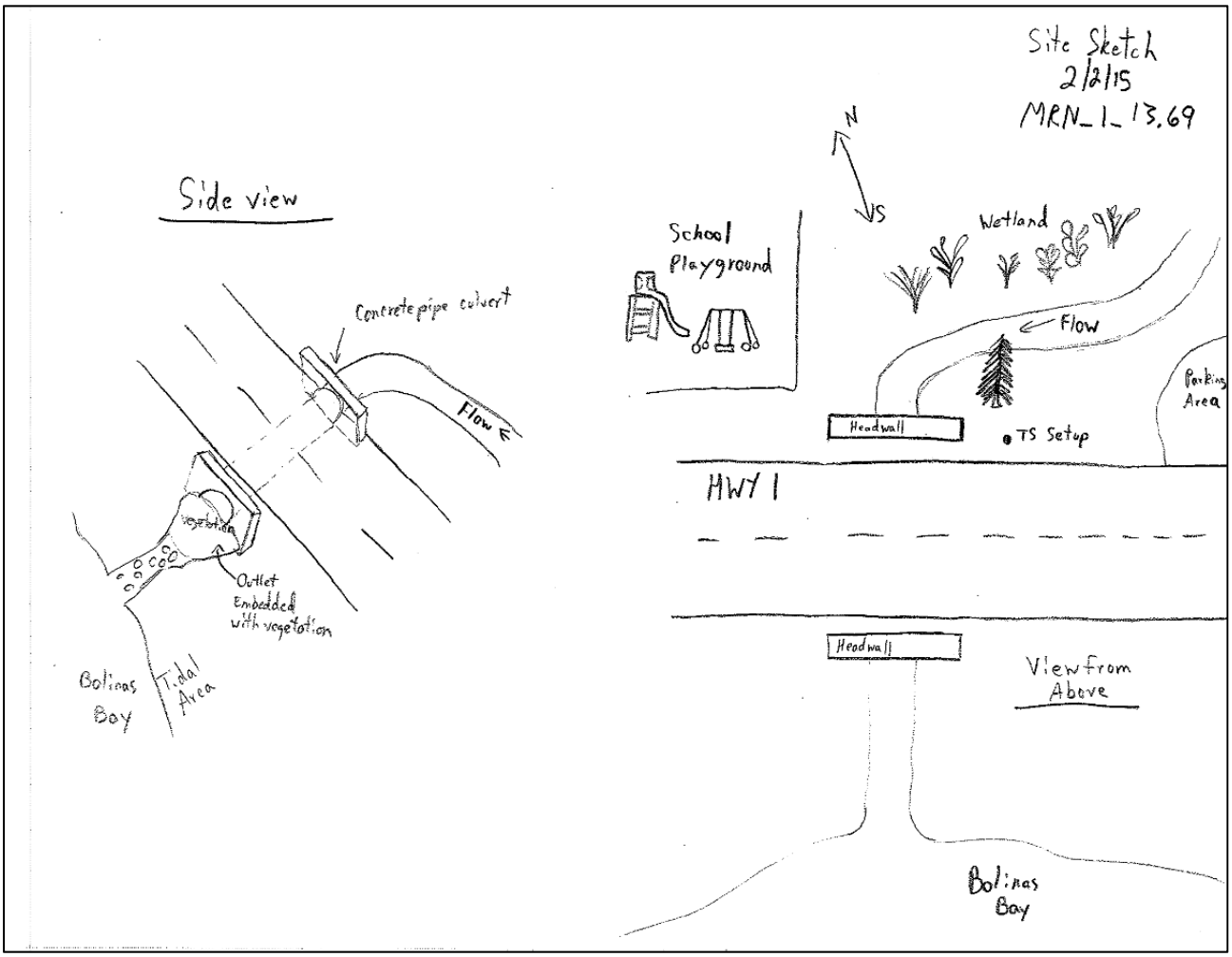


Figure B-5. Site sketch for MRN-1-13.6

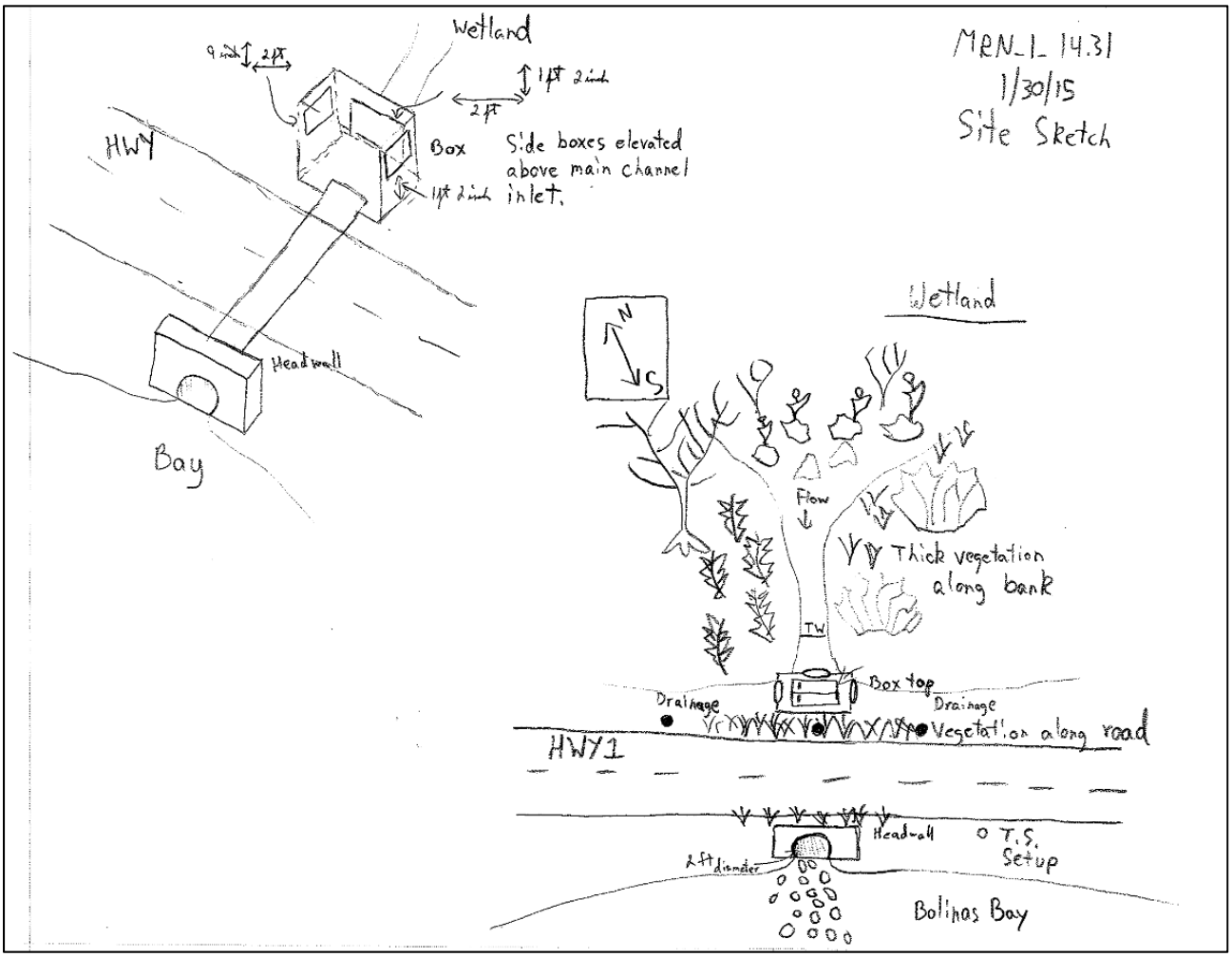


Figure B-6. Site sketch for MRN-1-14.31

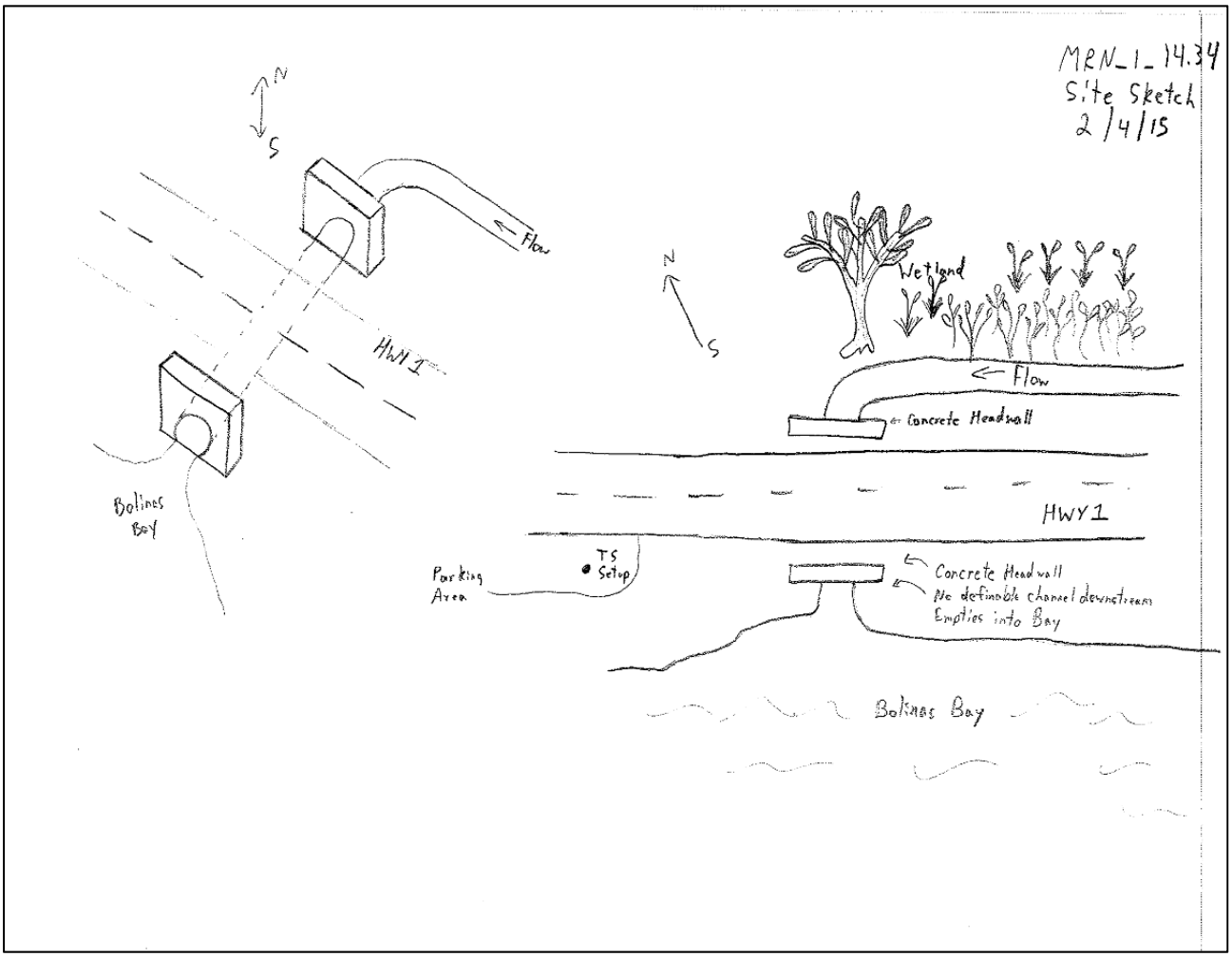


Figure B-7. Site sketch for MRN-1-14.34

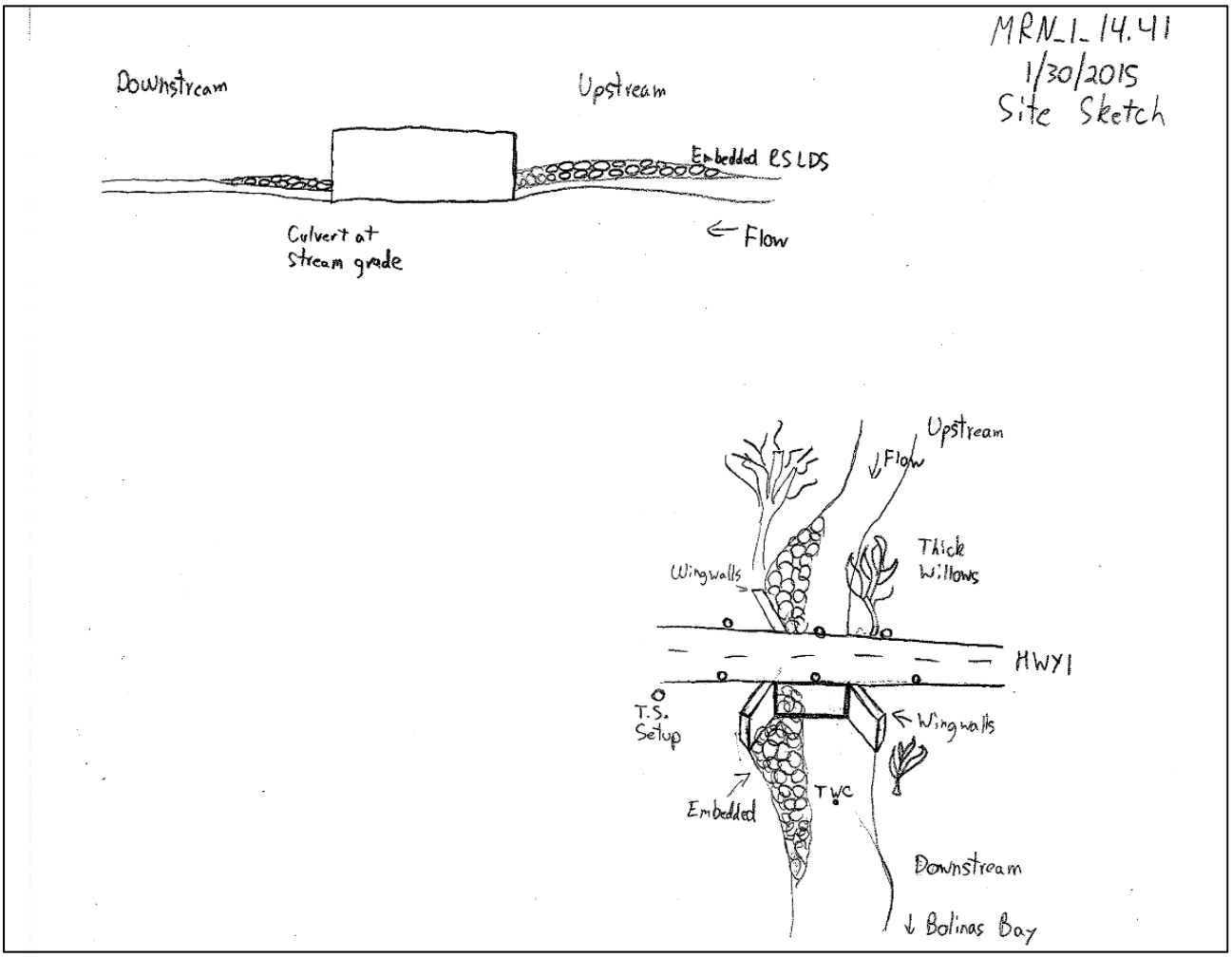


Figure B-8. Site sketch for MRN-1-14.41

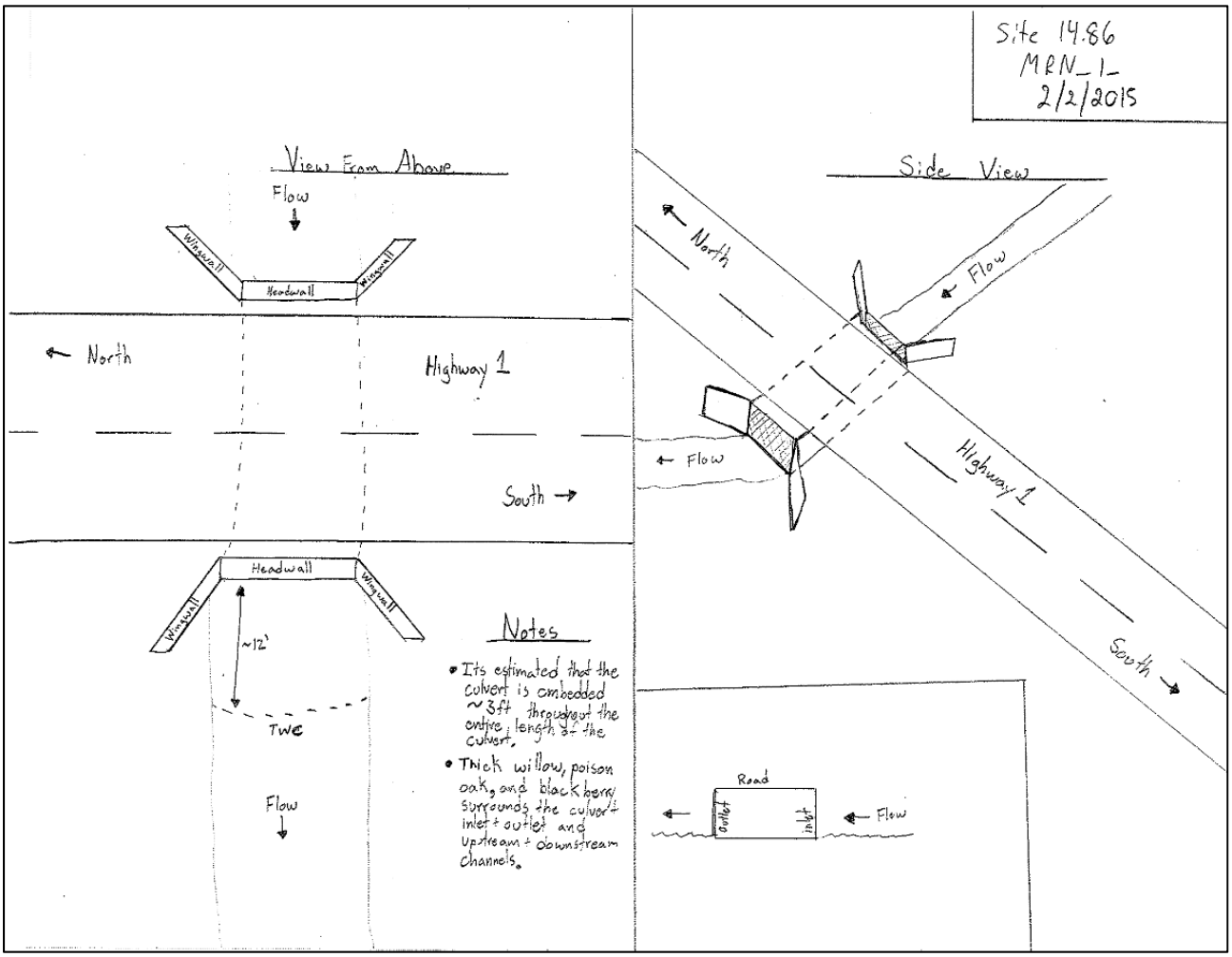


Figure B-9. Site sketch for MRN-1-14.86

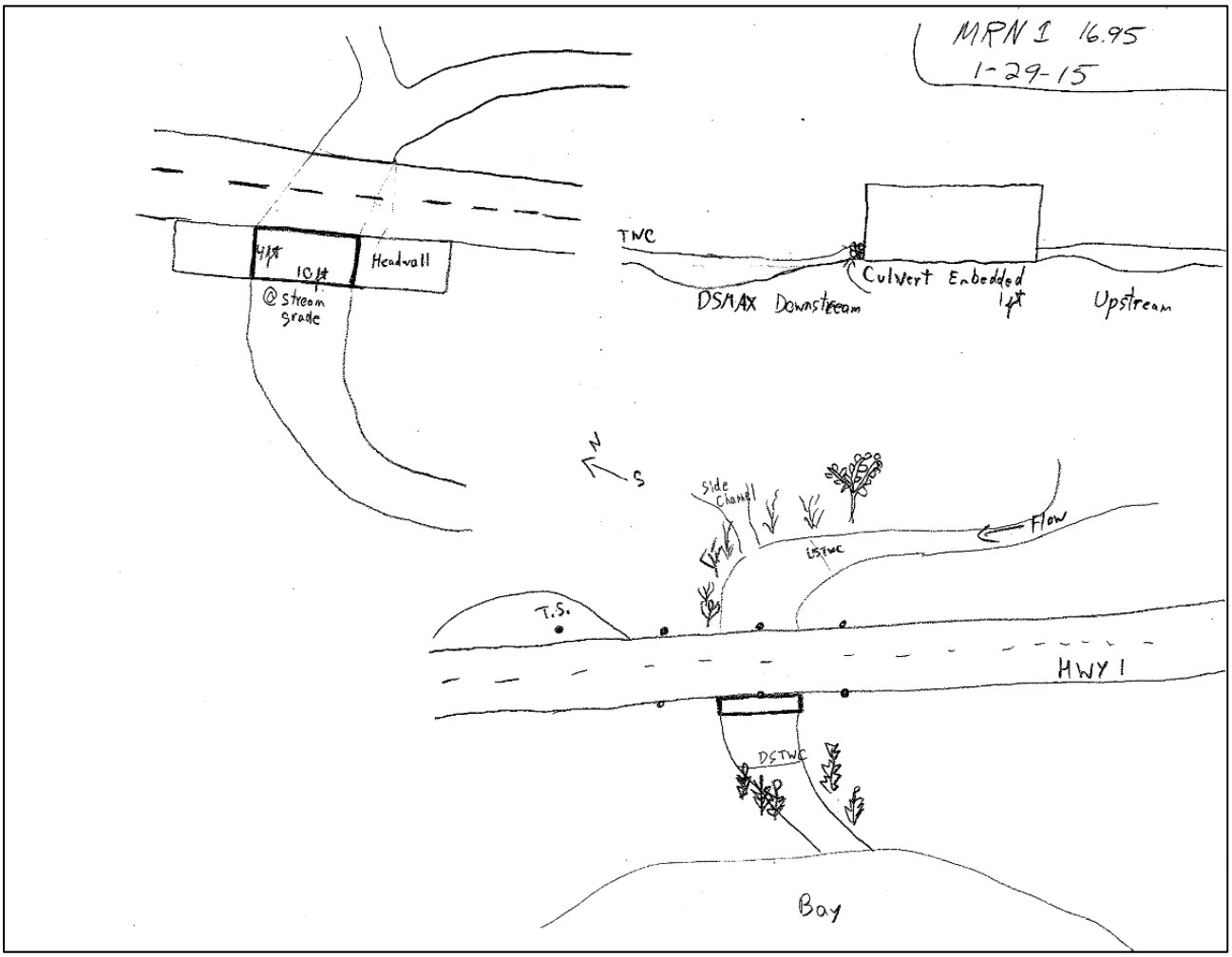


Figure B-100. Site sketch for MRN-1-14.86

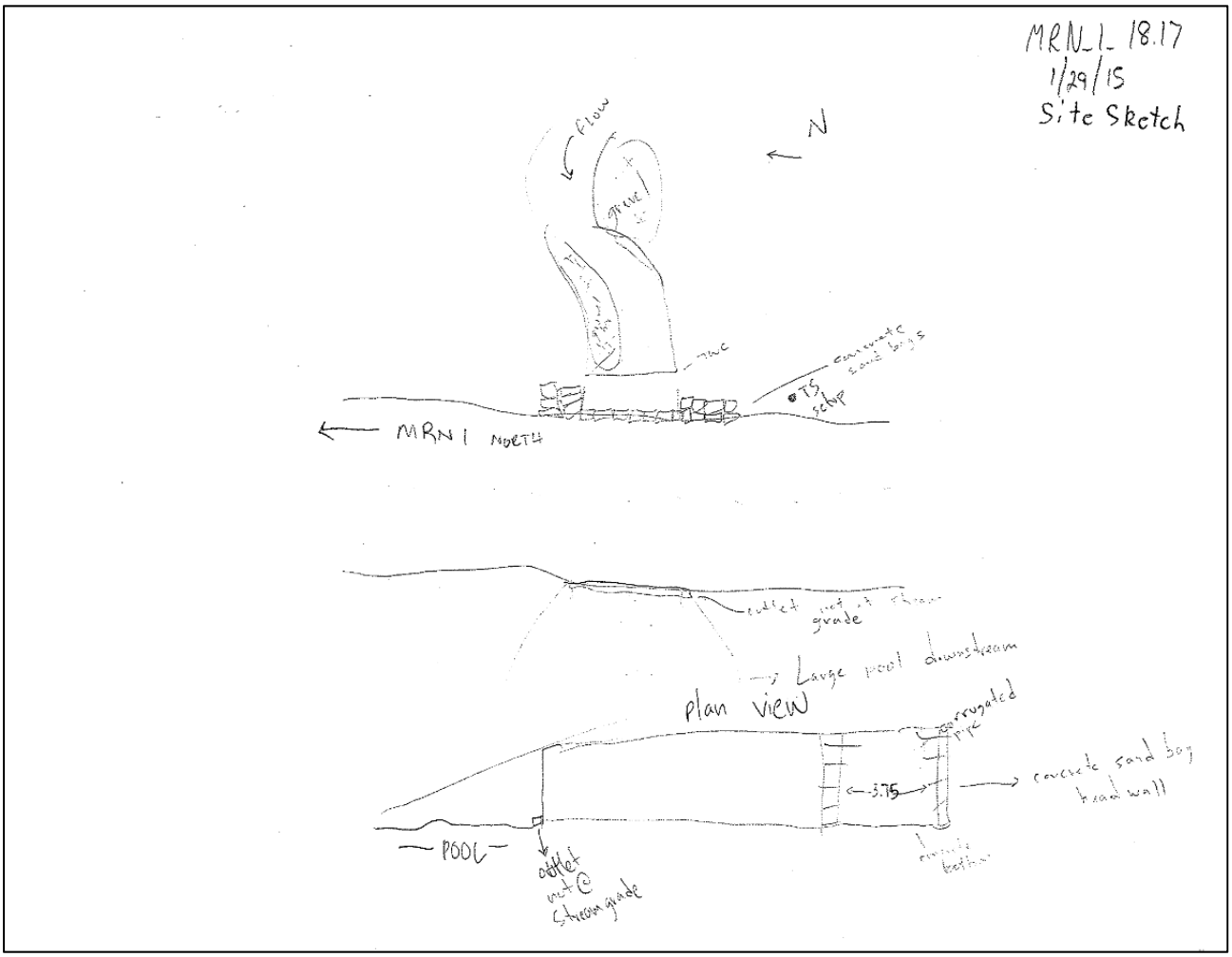


Figure B-111. Site sketch for MRN-1-18.17

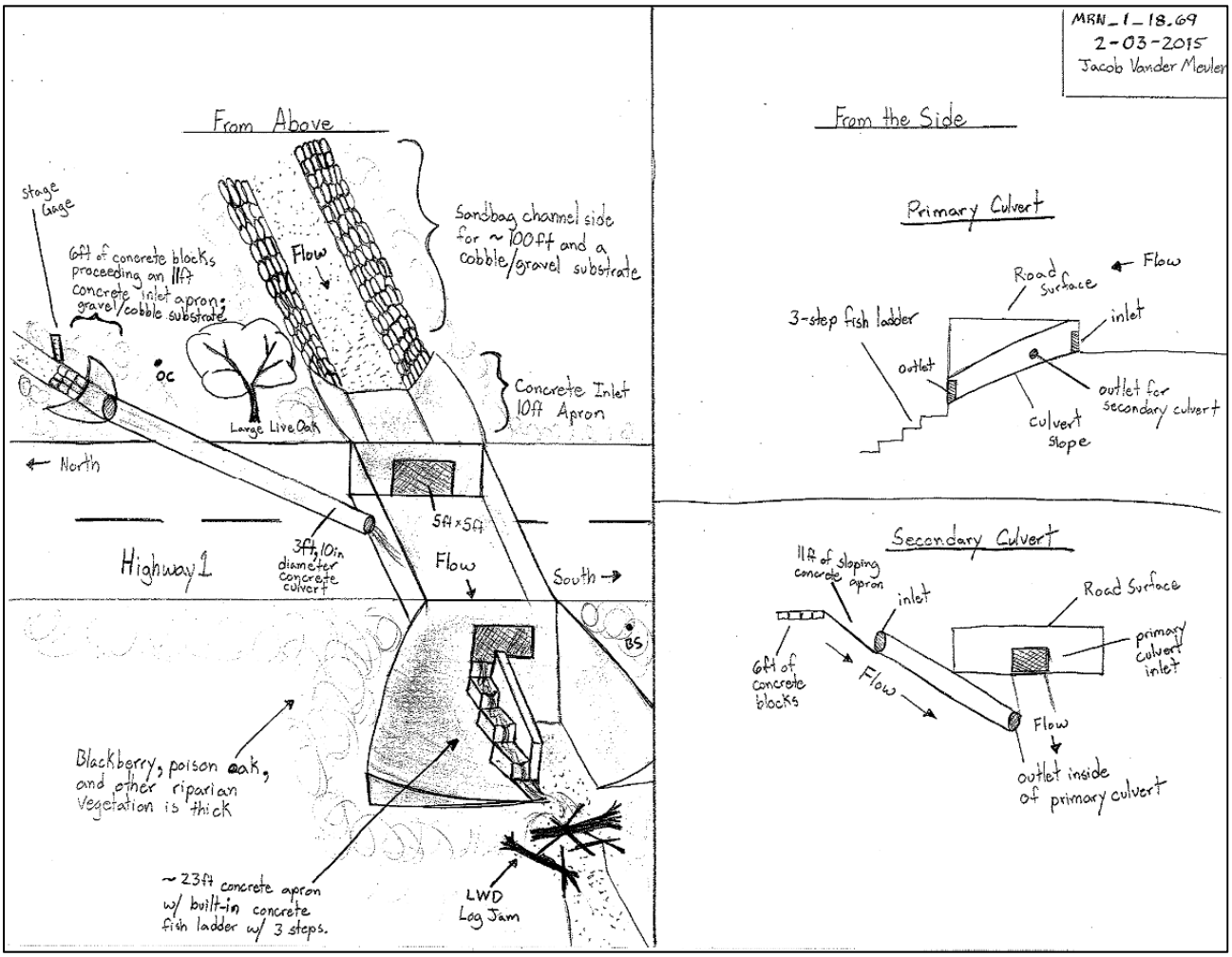


Figure B-122. Site sketch for MRN-1-18.69

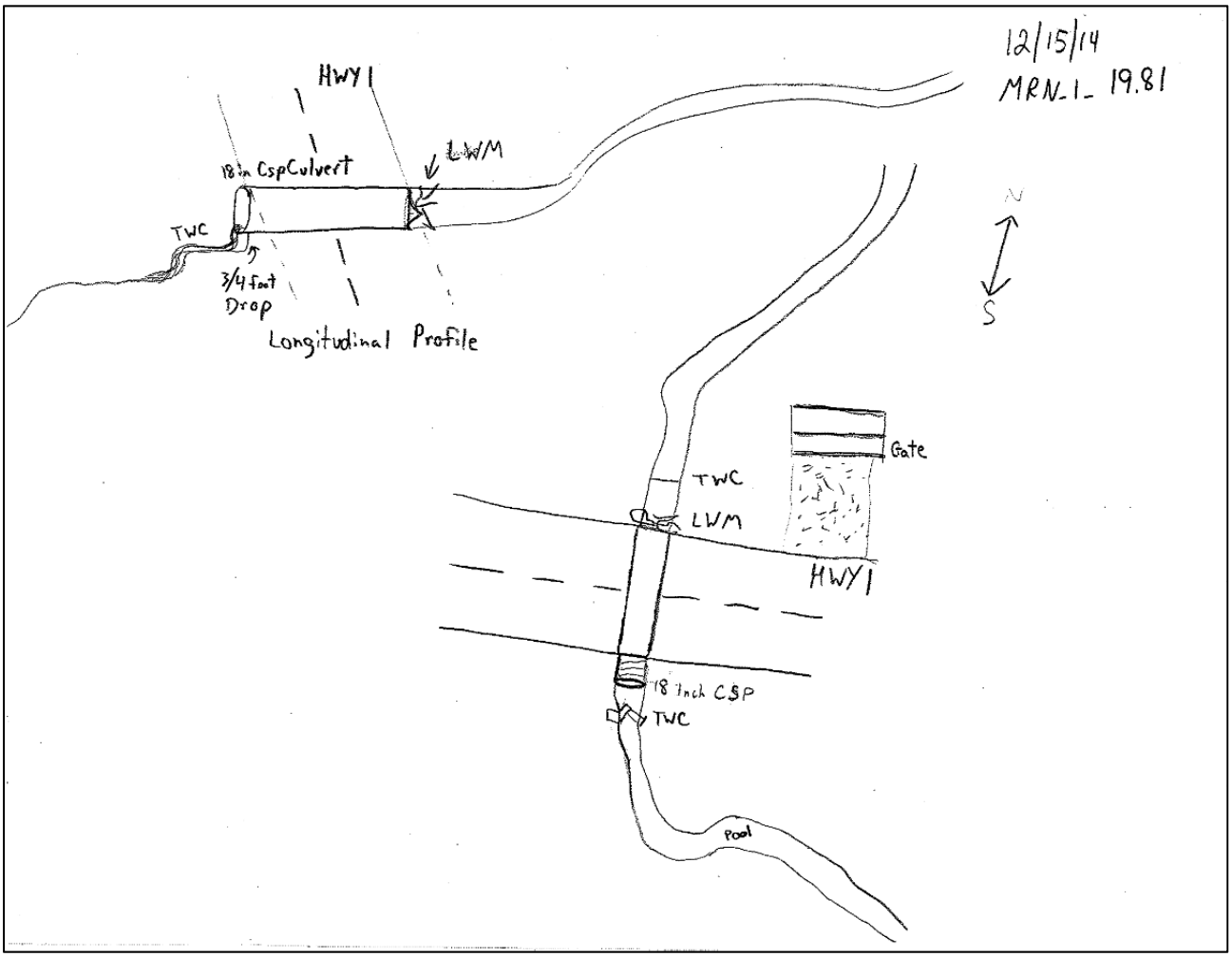


Figure B-133. Site sketch for MRN-1-19.81

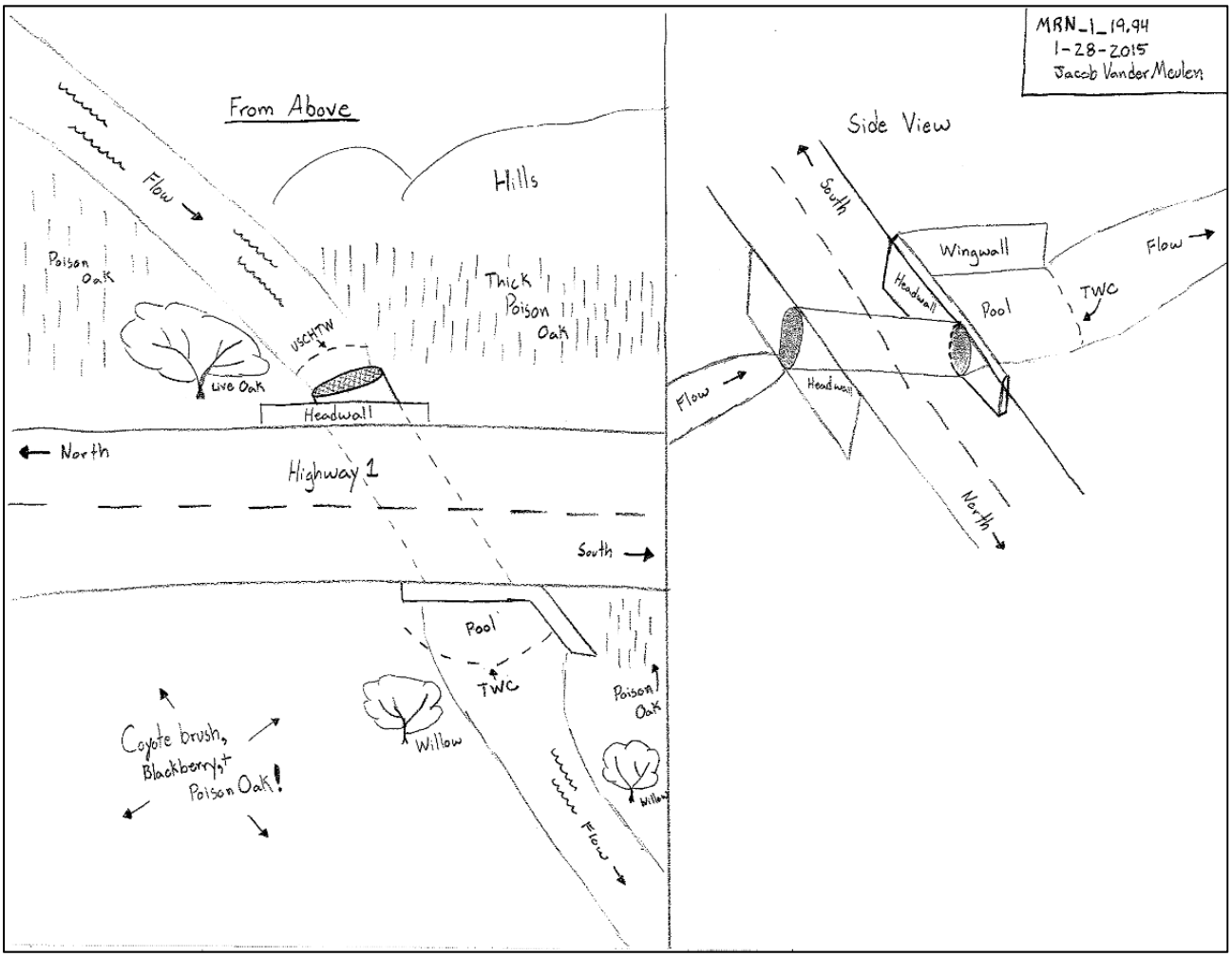


Figure B-144. Site sketch for MRN-1-19.94

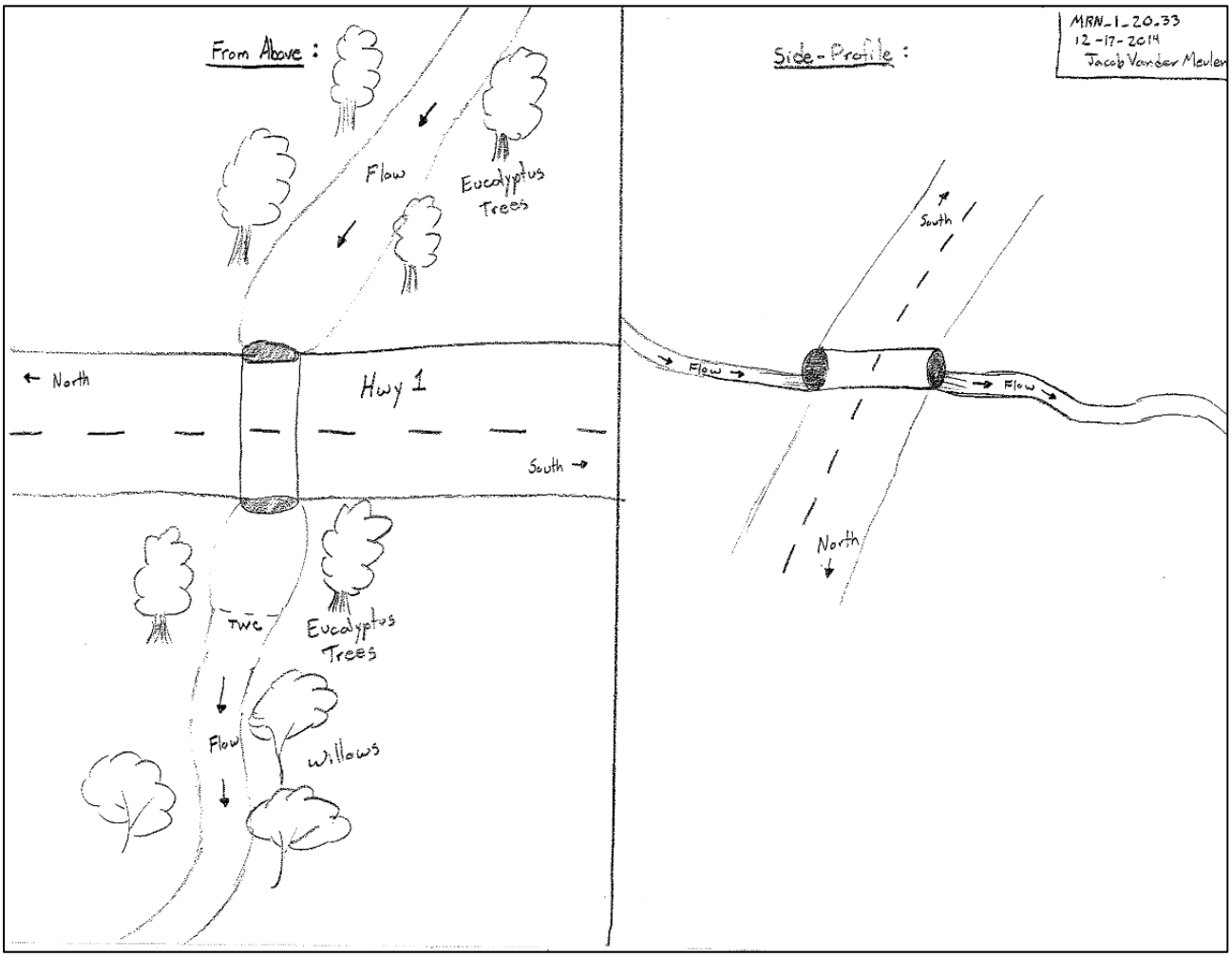


Figure B-155. Site sketch for MRN-1-20.33

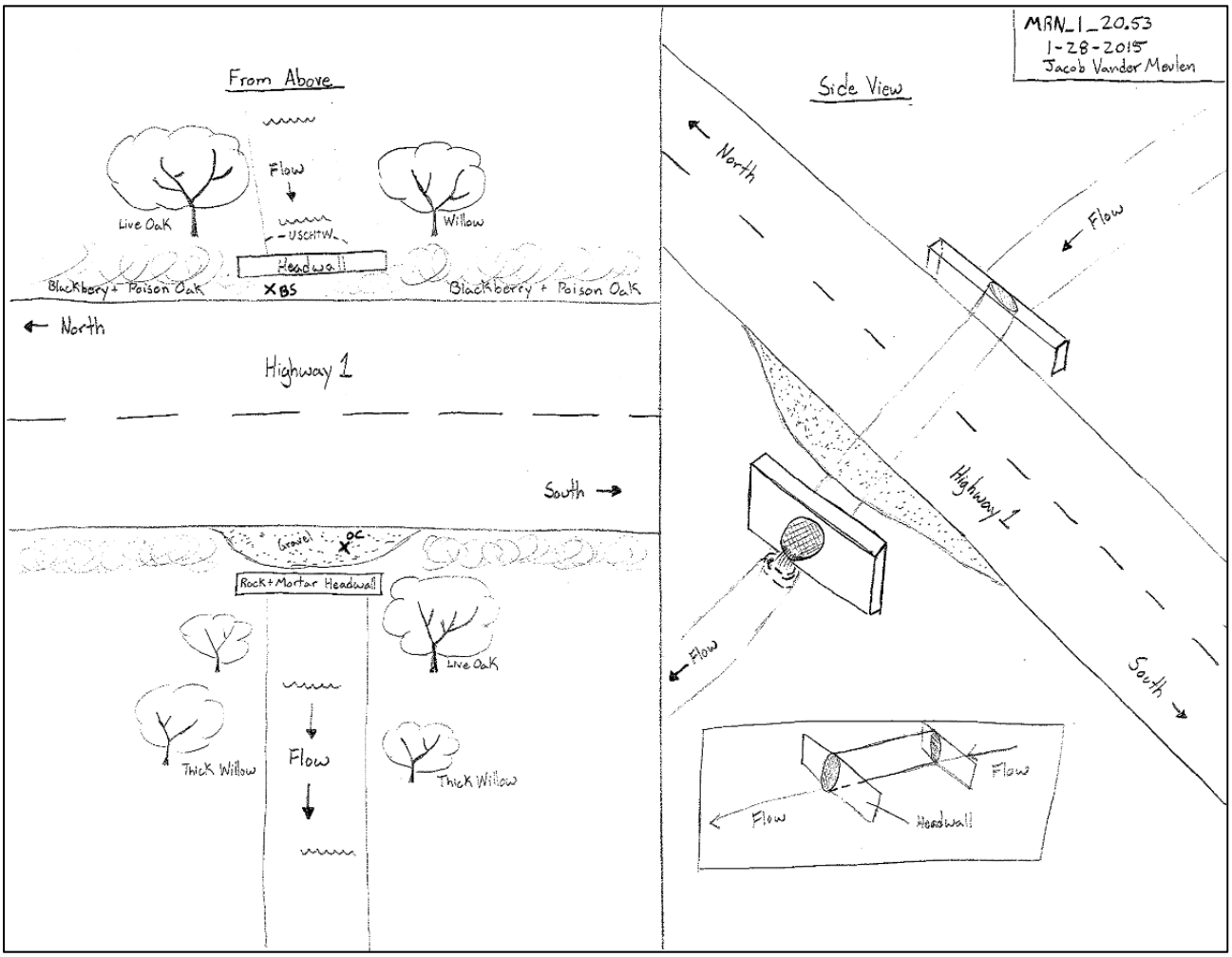


Figure B-166. Site sketch for MRN-1-20.53

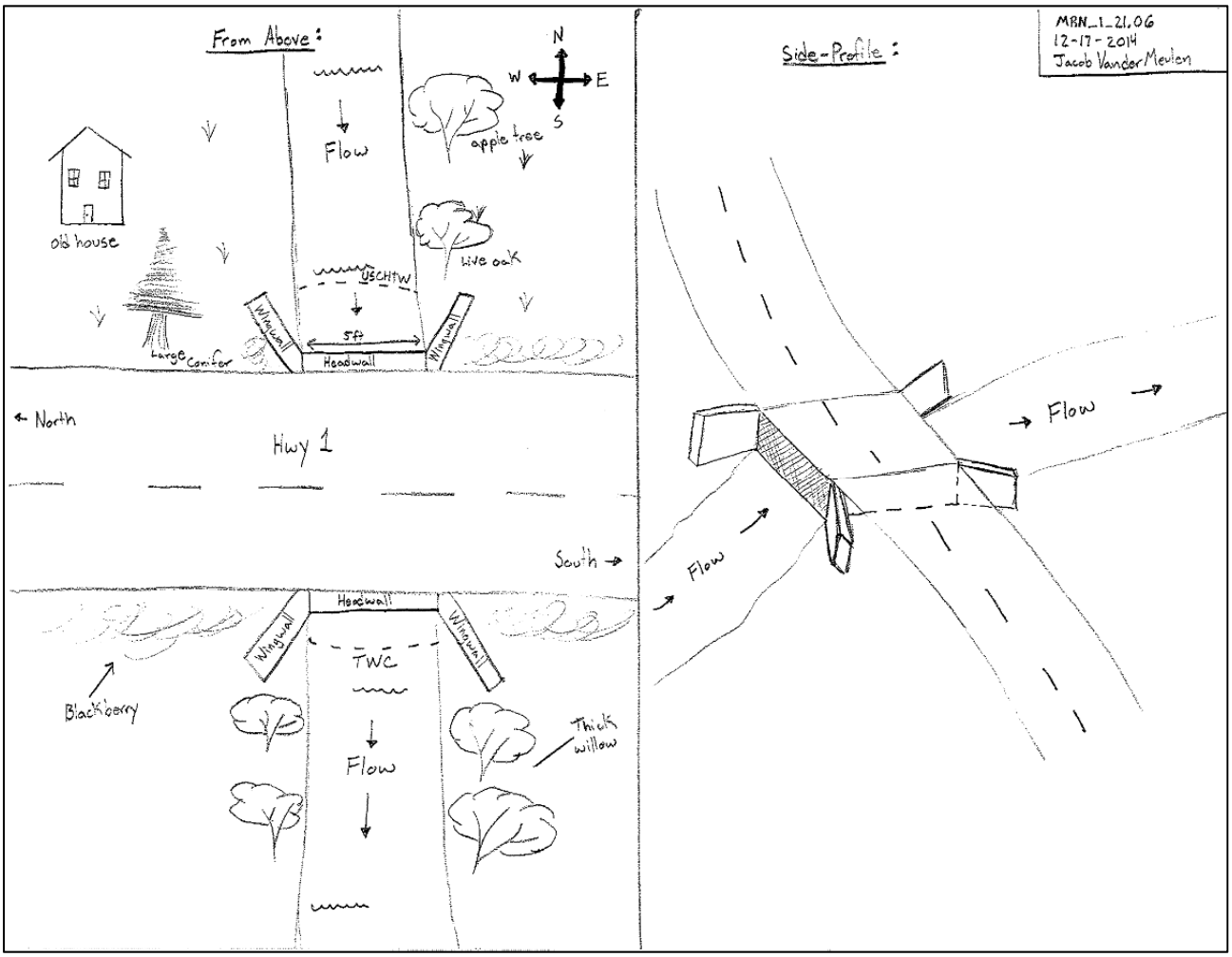


Figure B-177. Site sketch for MRN-1-21.06

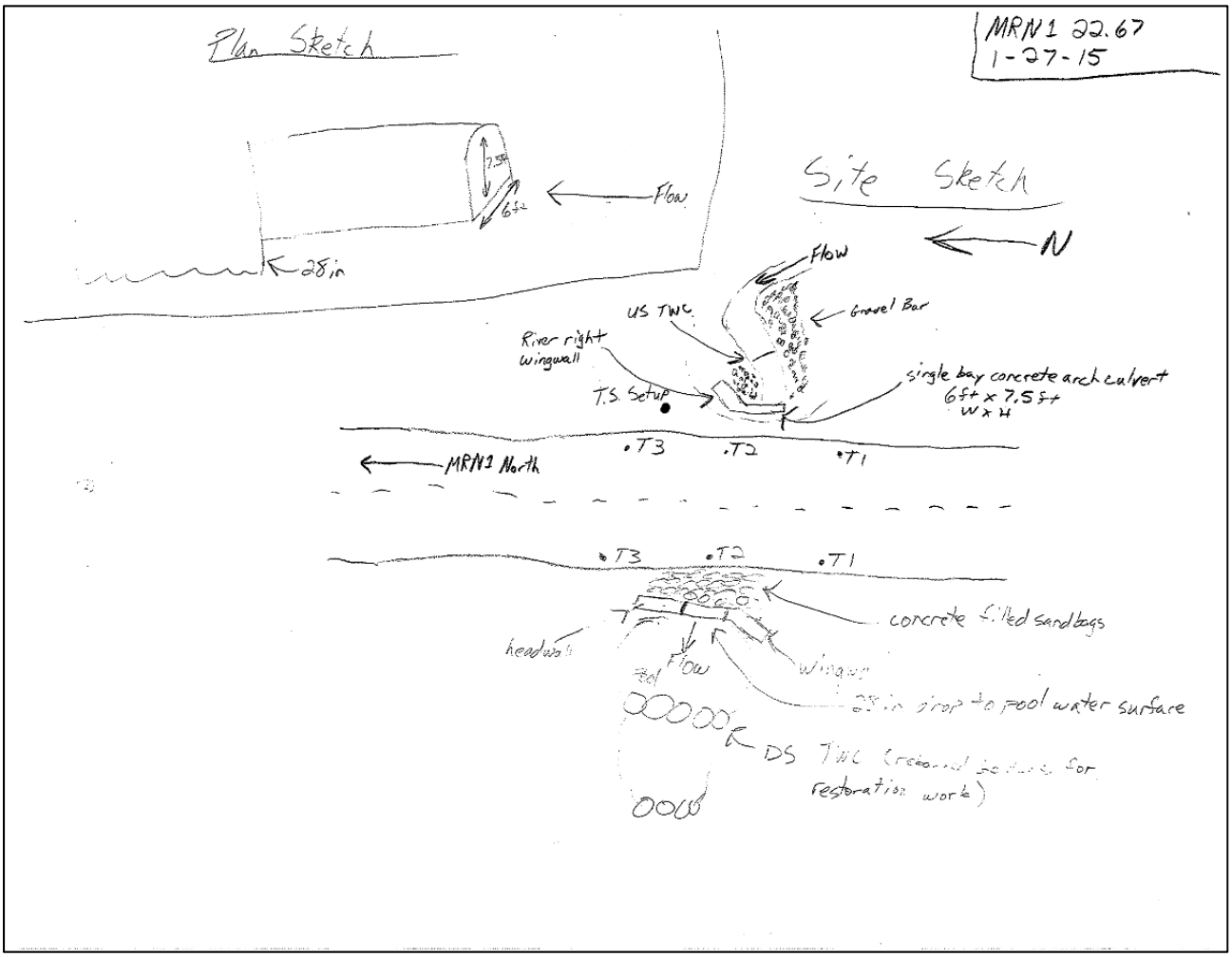


Figure B-188. Site sketch for MRN-1-21.67

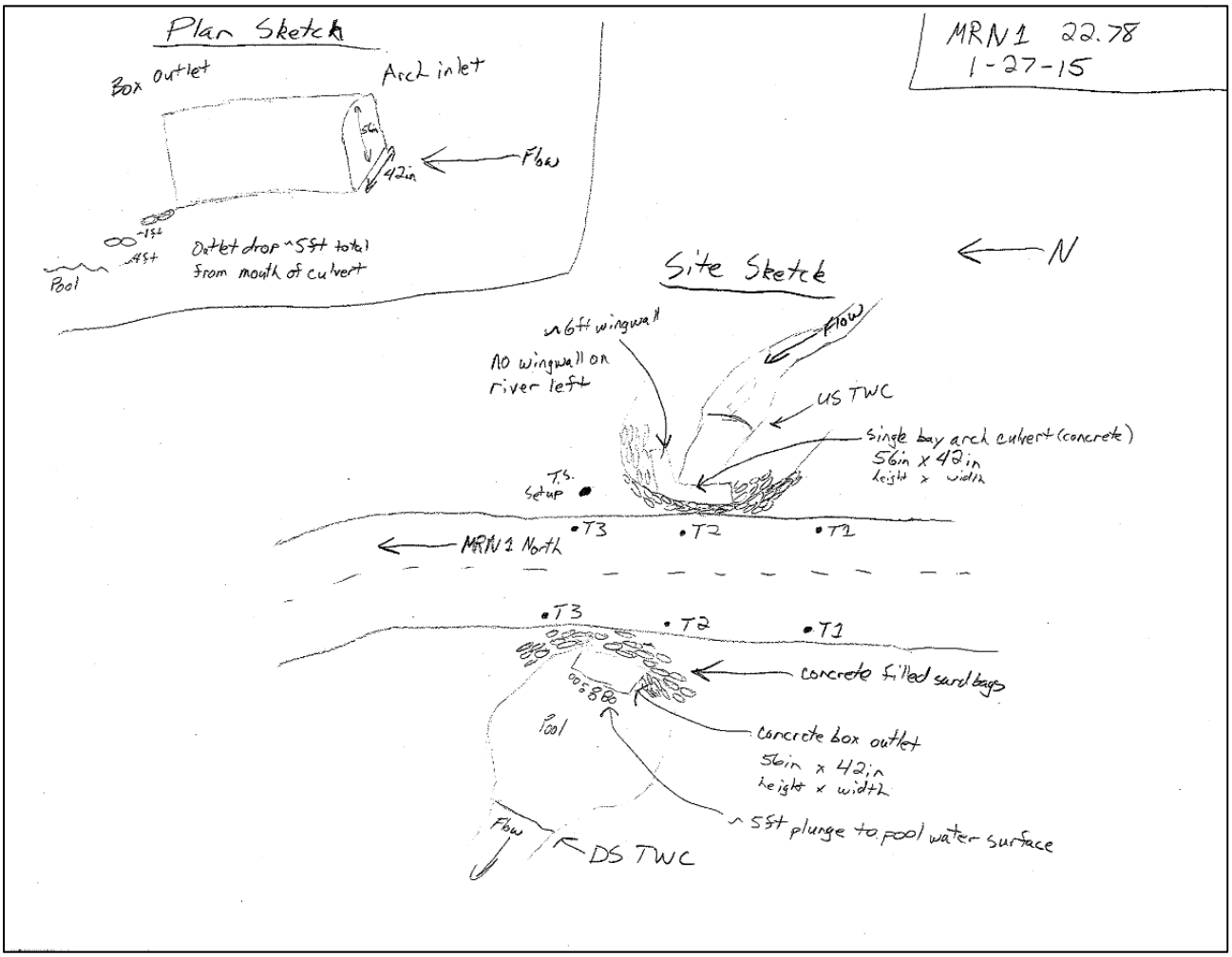


Figure B-199. Site sketch for MRN-1-22.78

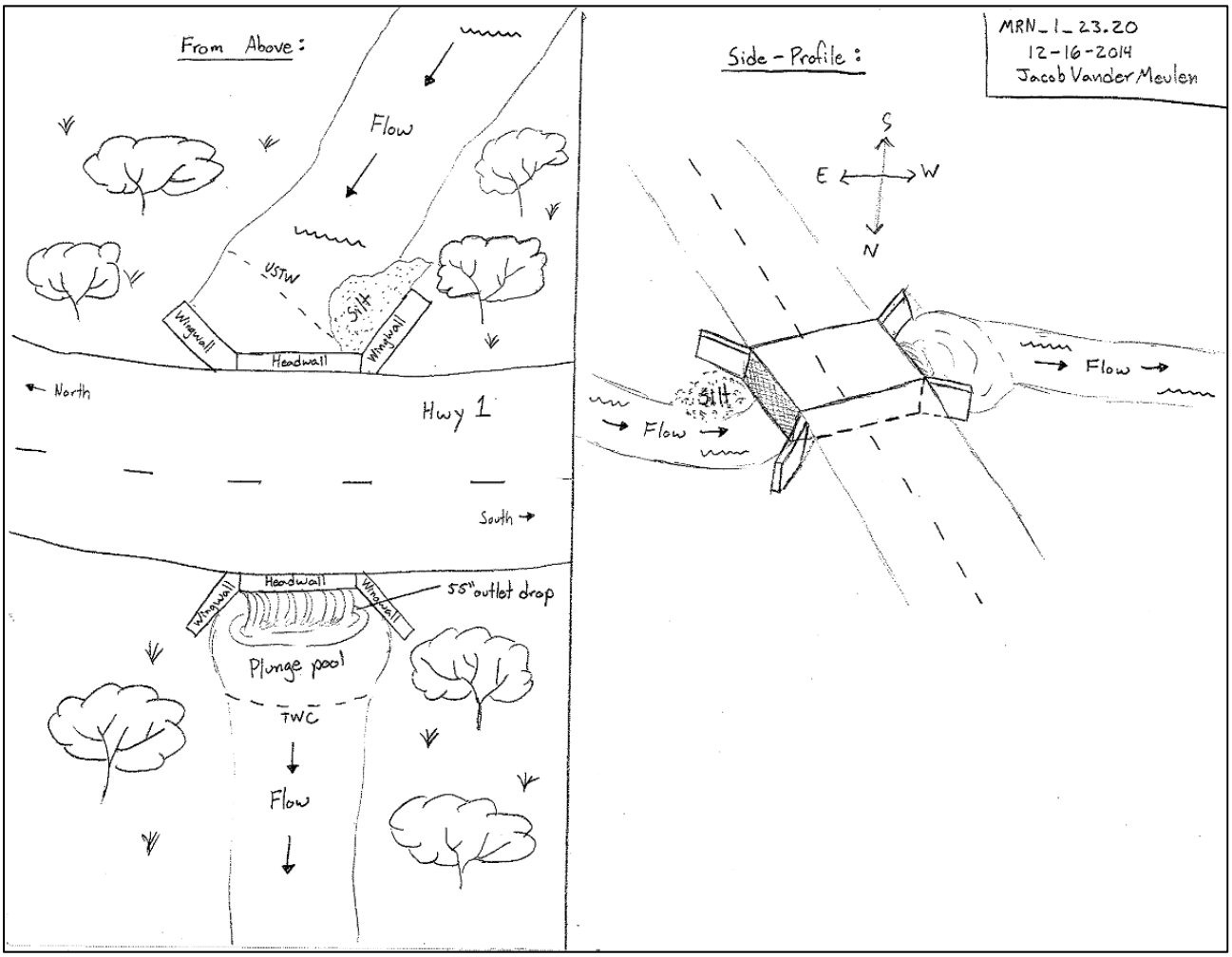


Figure B-20. Site sketch for MRN-1-23.20

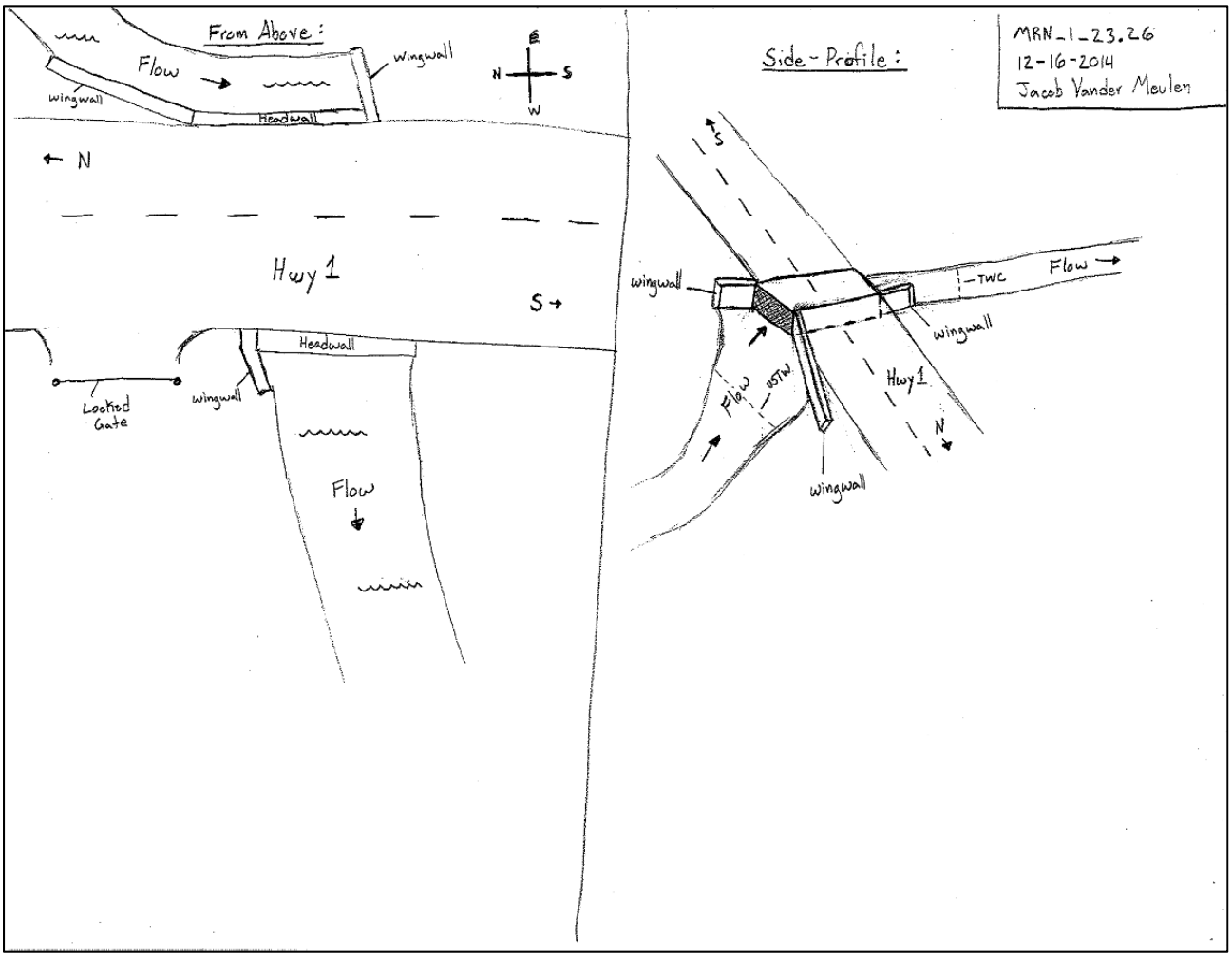


Figure B-20. Site sketch for MRN-1-23.26

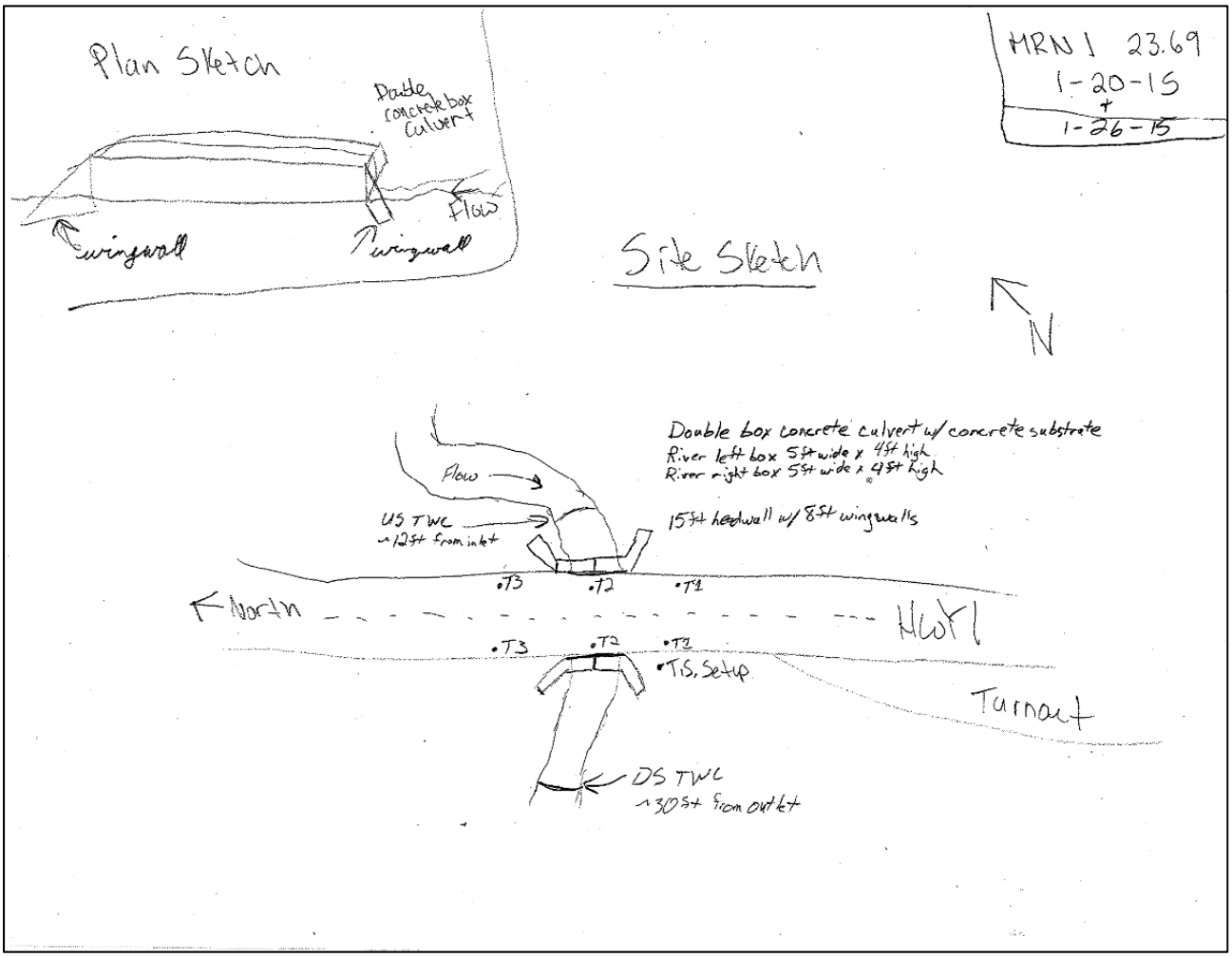


Figure B-21. Site sketch for MRN-1-23.68

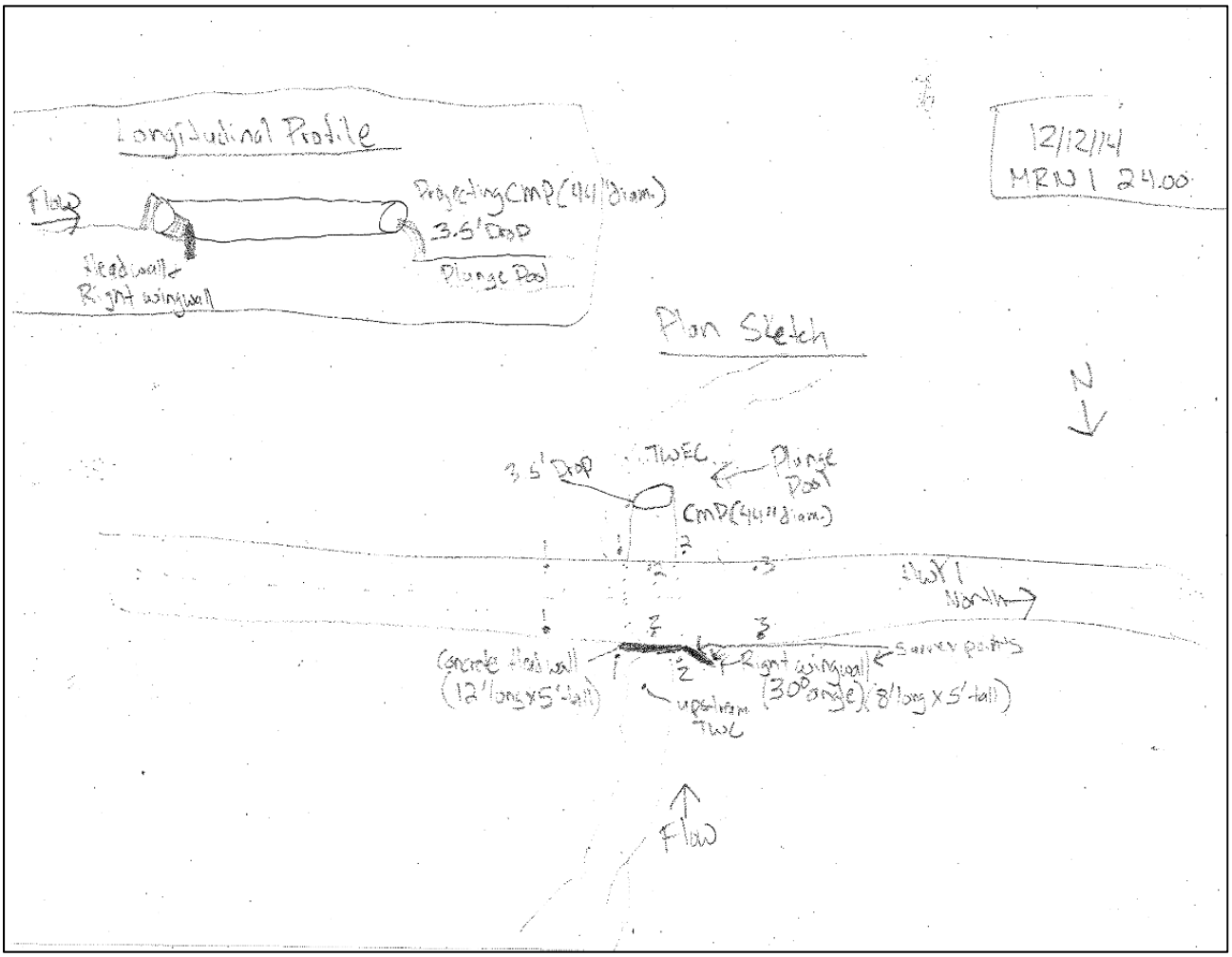


Figure B-23. Site sketch for MRN-1-24.00

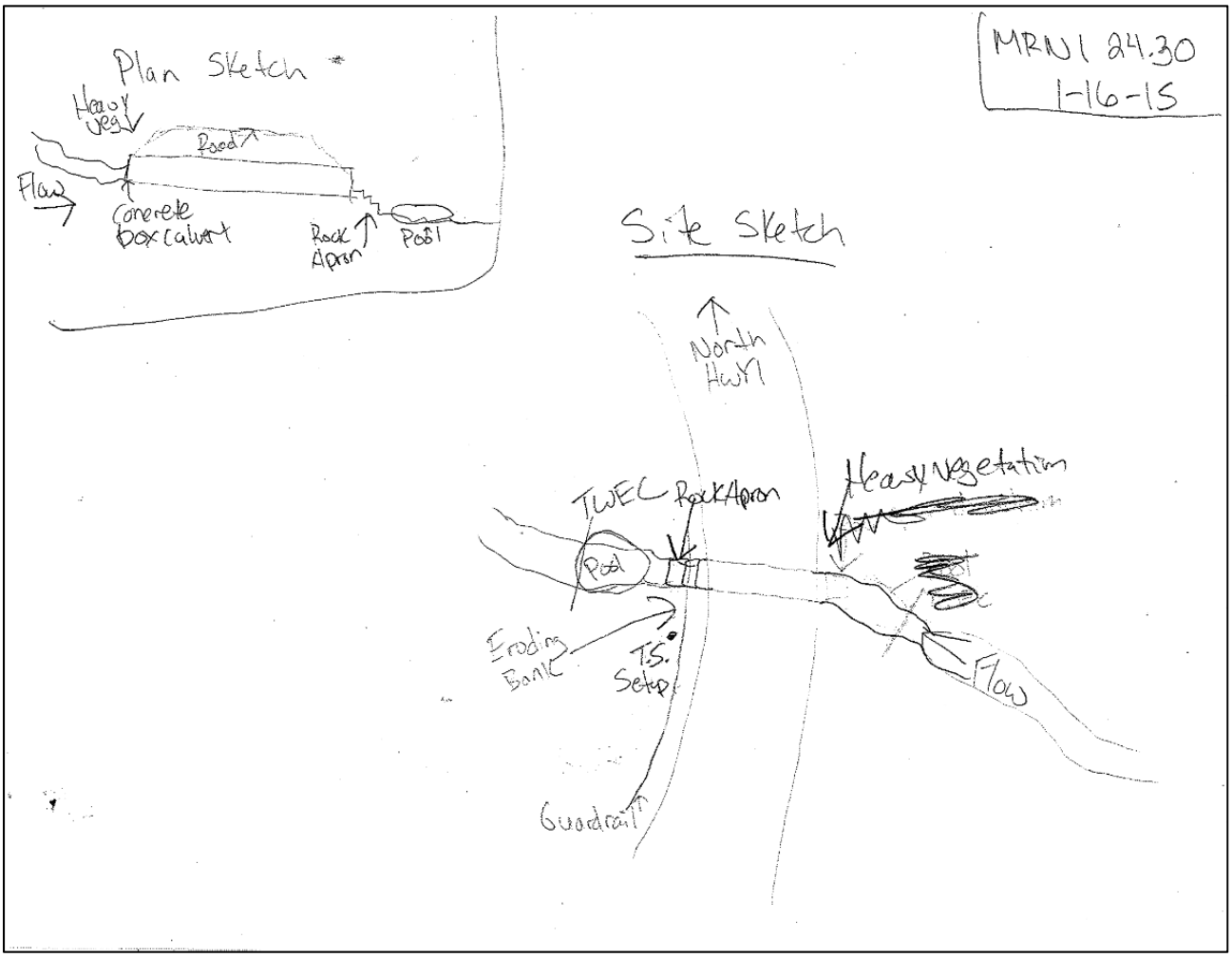


Figure B-24. Site sketch for MRN-1-24.30

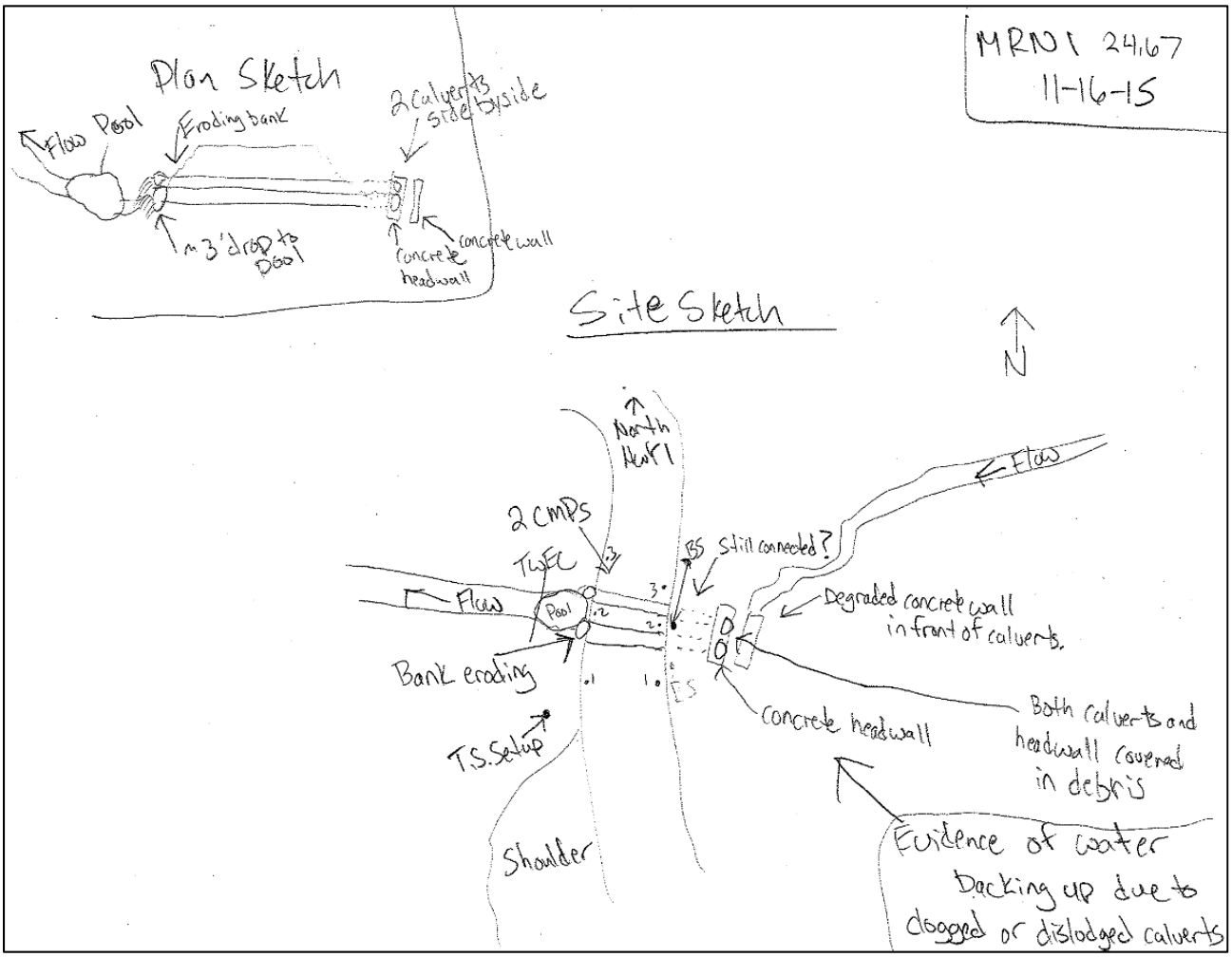


Figure B-25. Site sketch for MRN-1-24.67

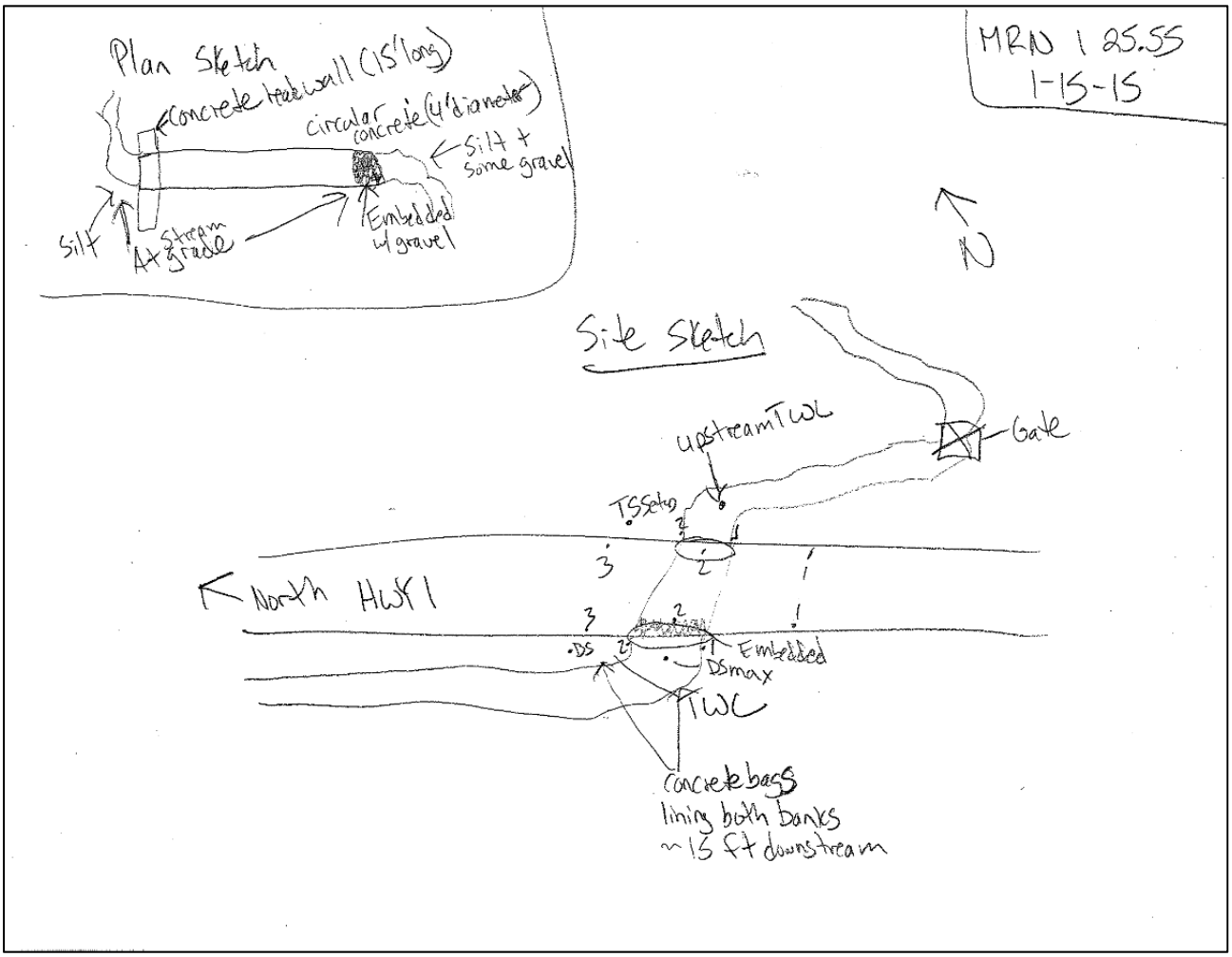


Figure B-26. Site sketch for MRN-1-25.55

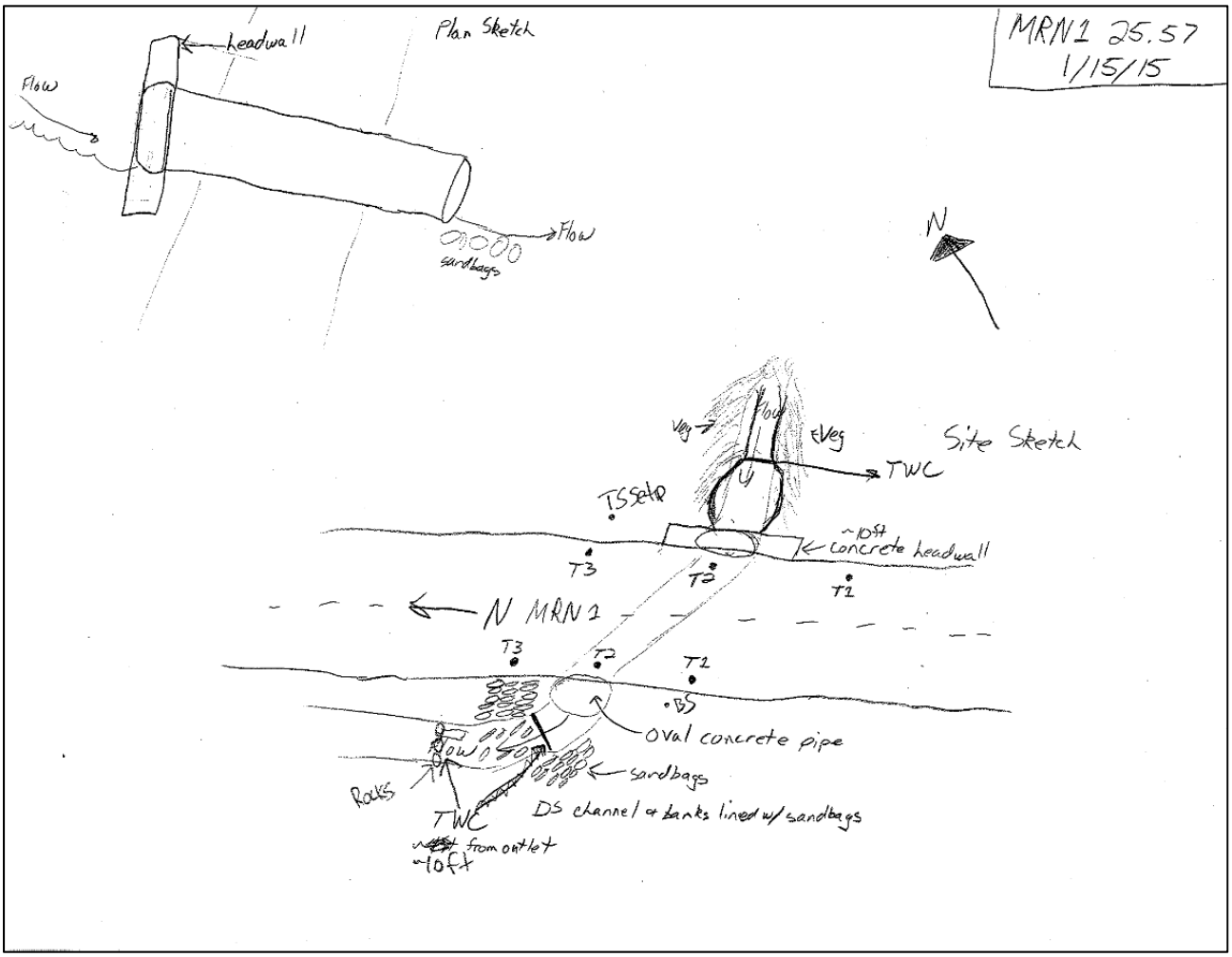


Figure B-27. Site sketch for MRN-1-25.57

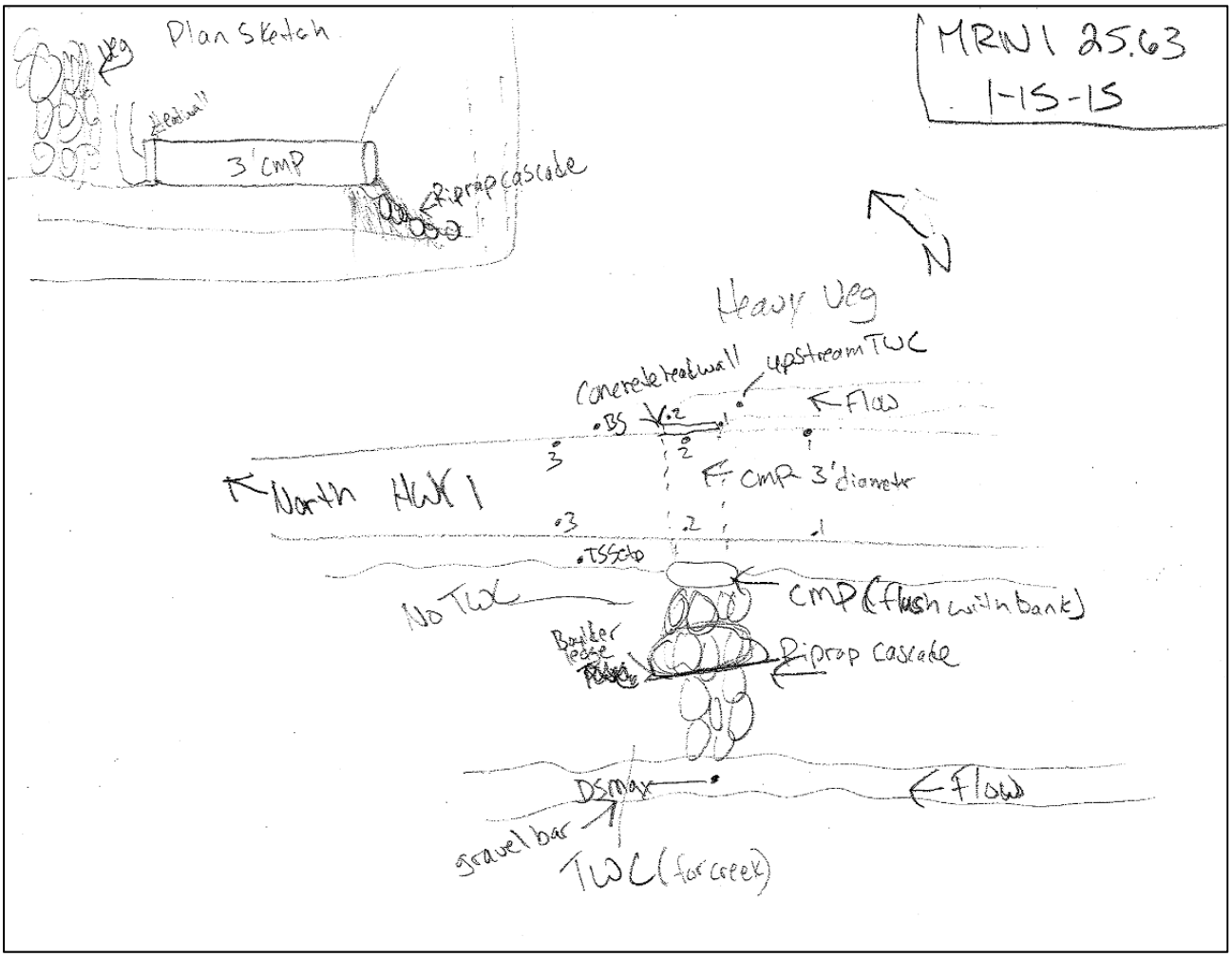


Figure B-28. Site sketch for MRN-1-25.63

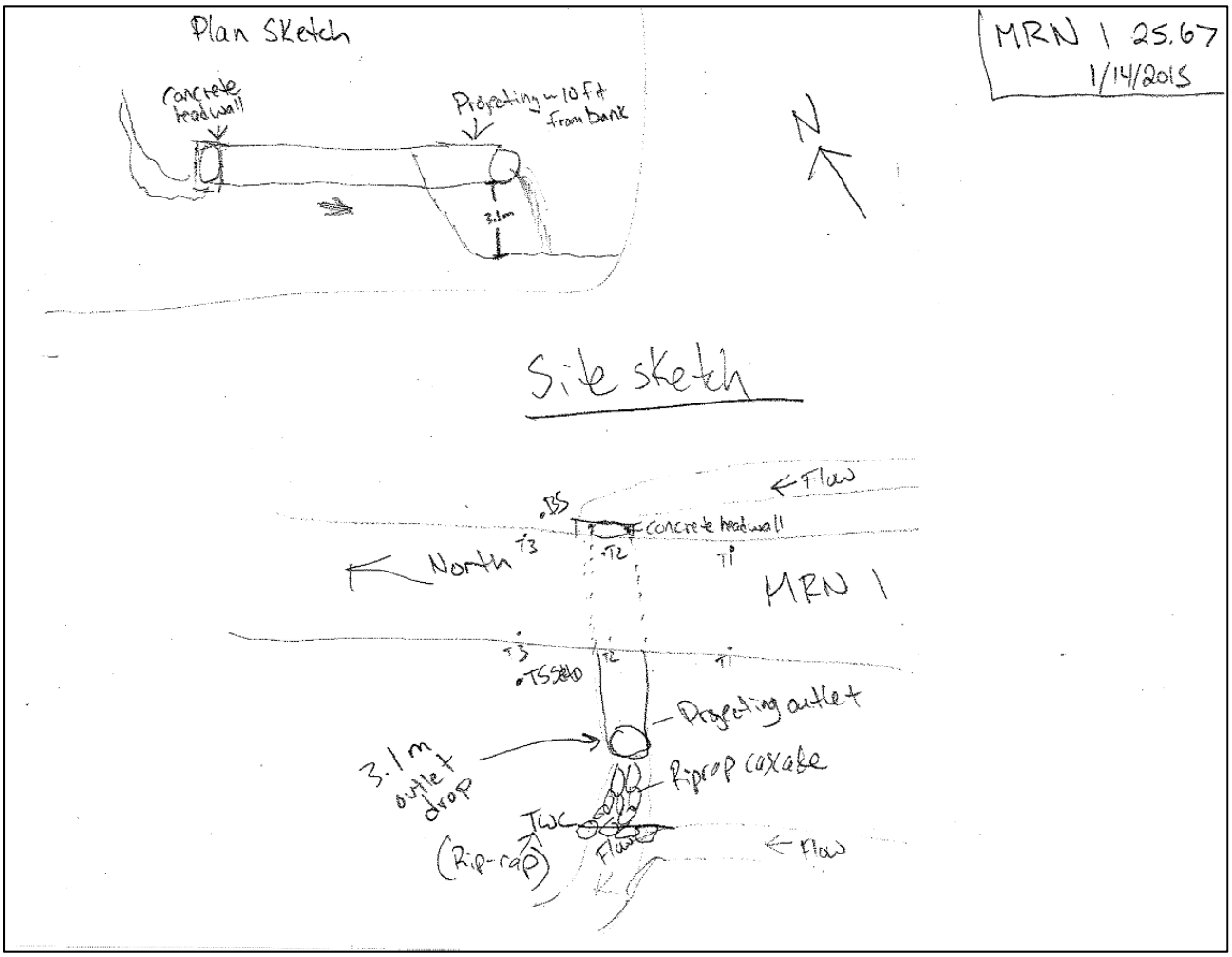


Figure B-29. Site sketch for MRN-1-25.67

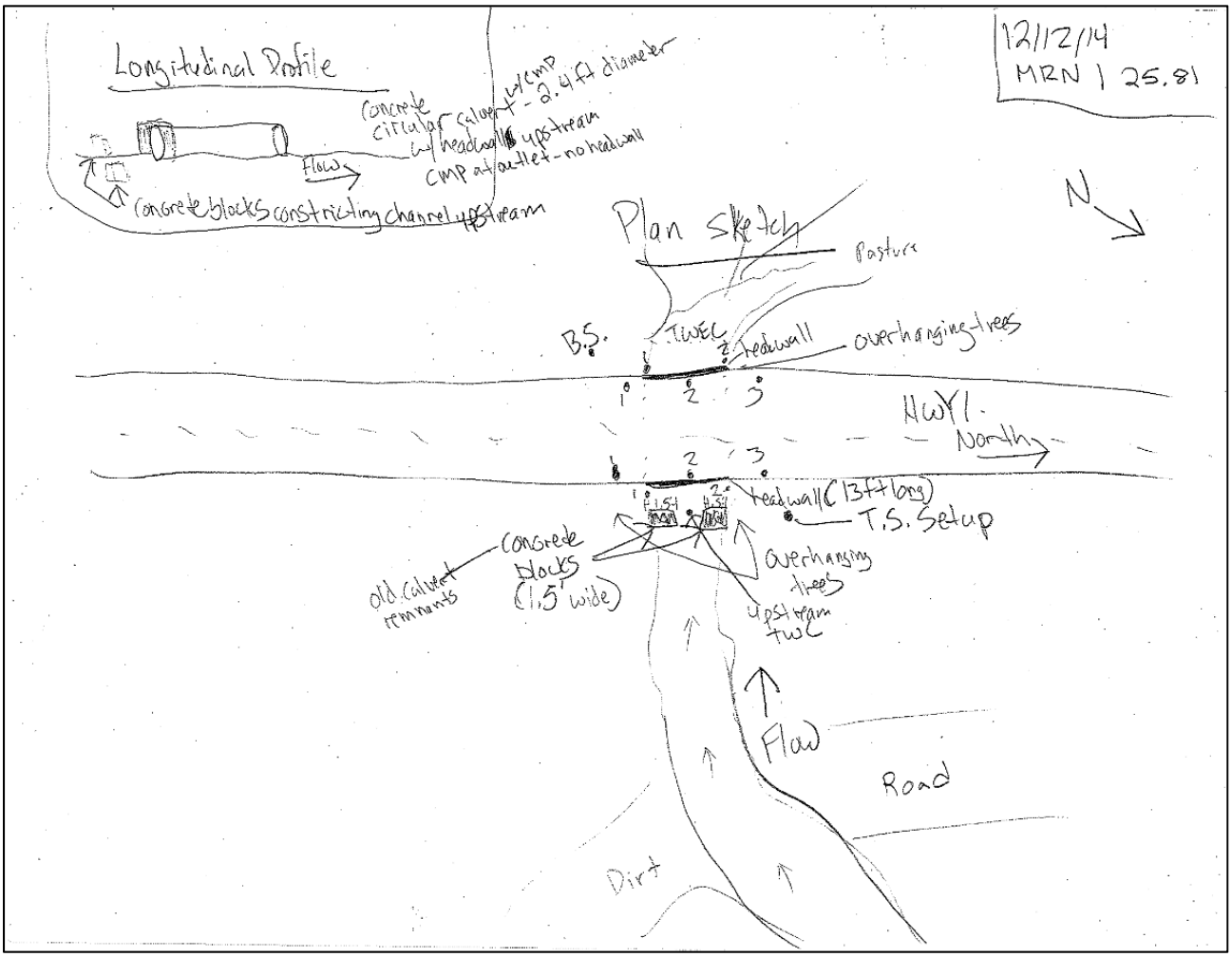


Figure B-30. Site sketch for MRN-1-25.81

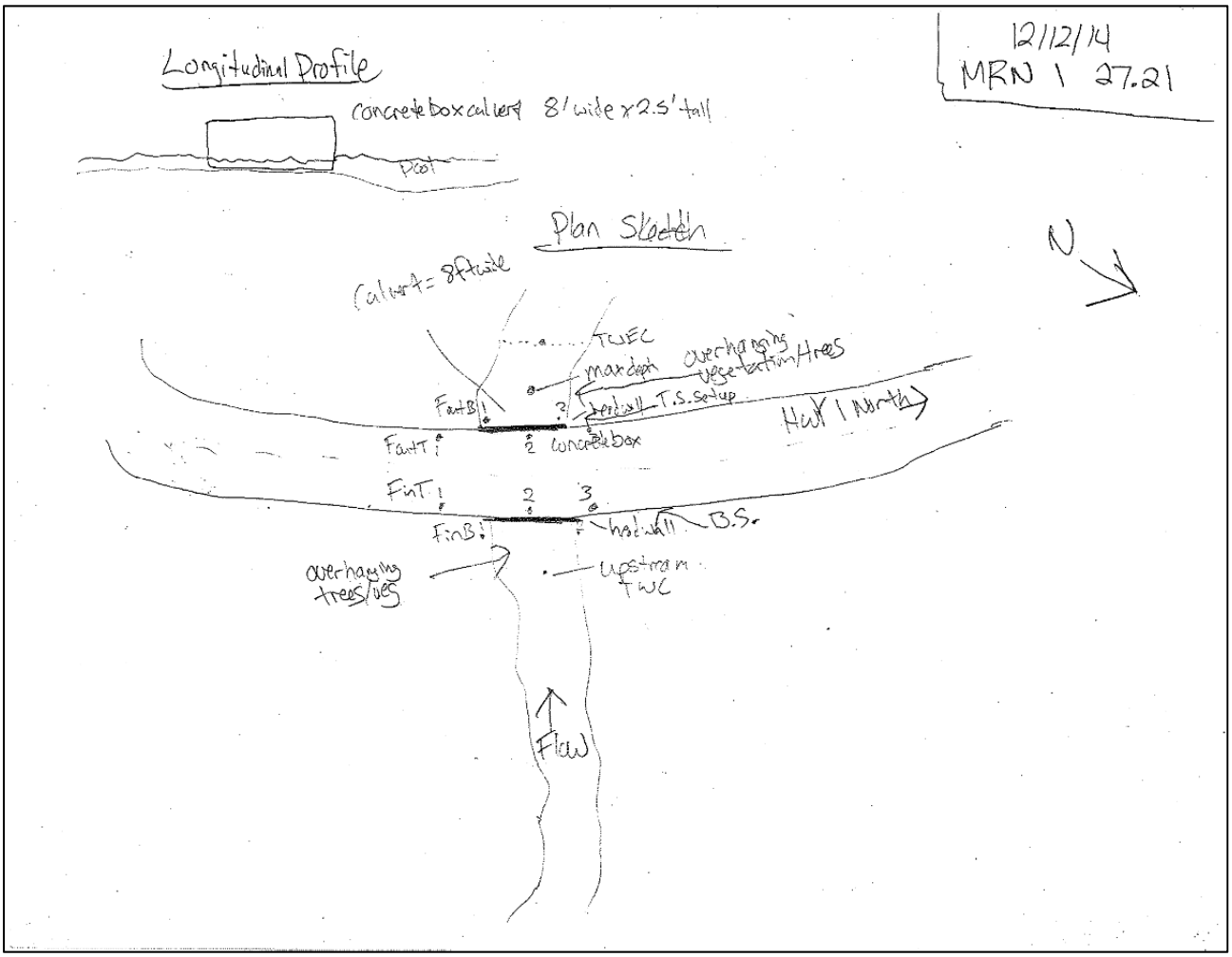


Figure B-31. Site sketch for MRN-1-27.21

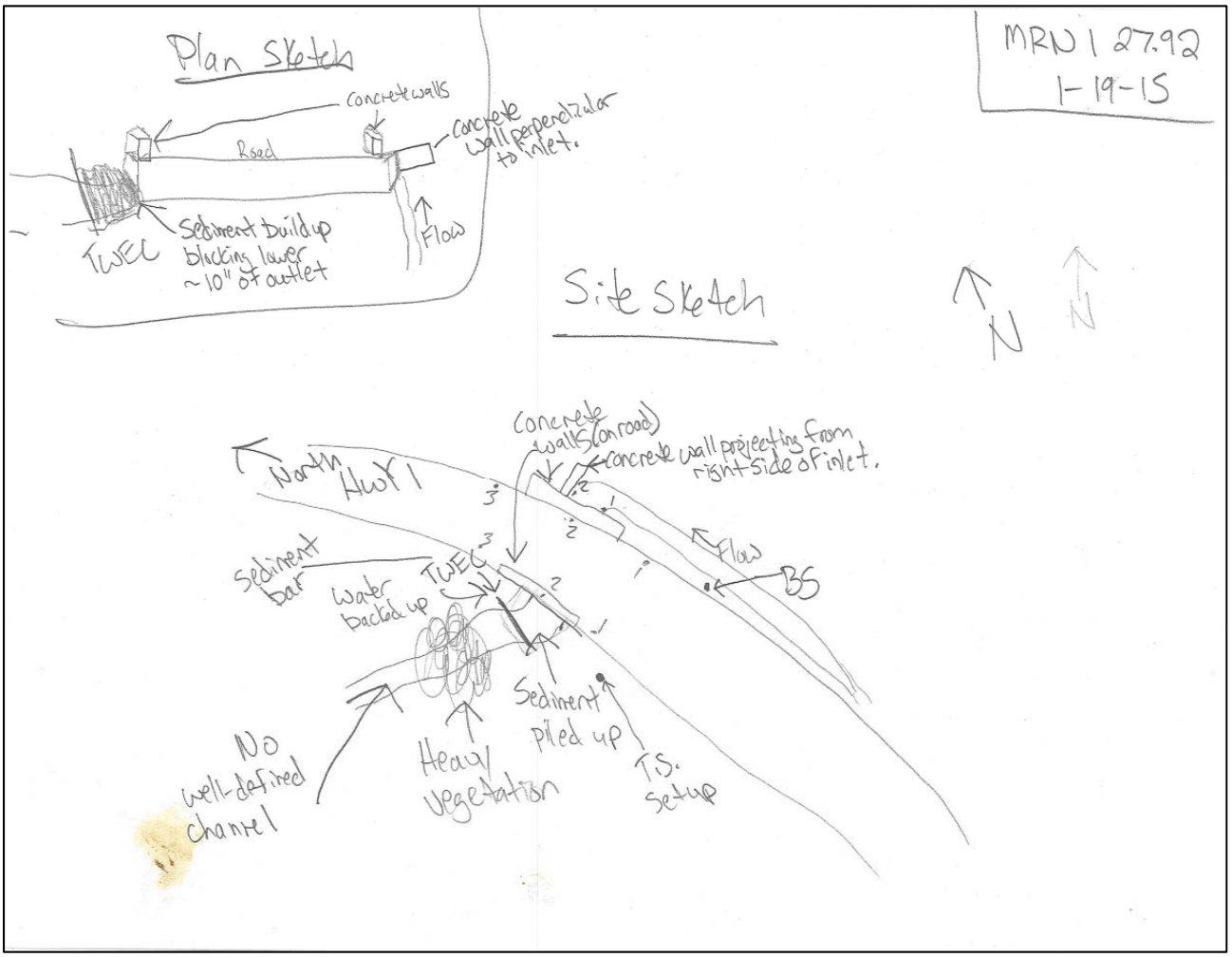


Figure B-32. Site sketch for MRN-1-27.92

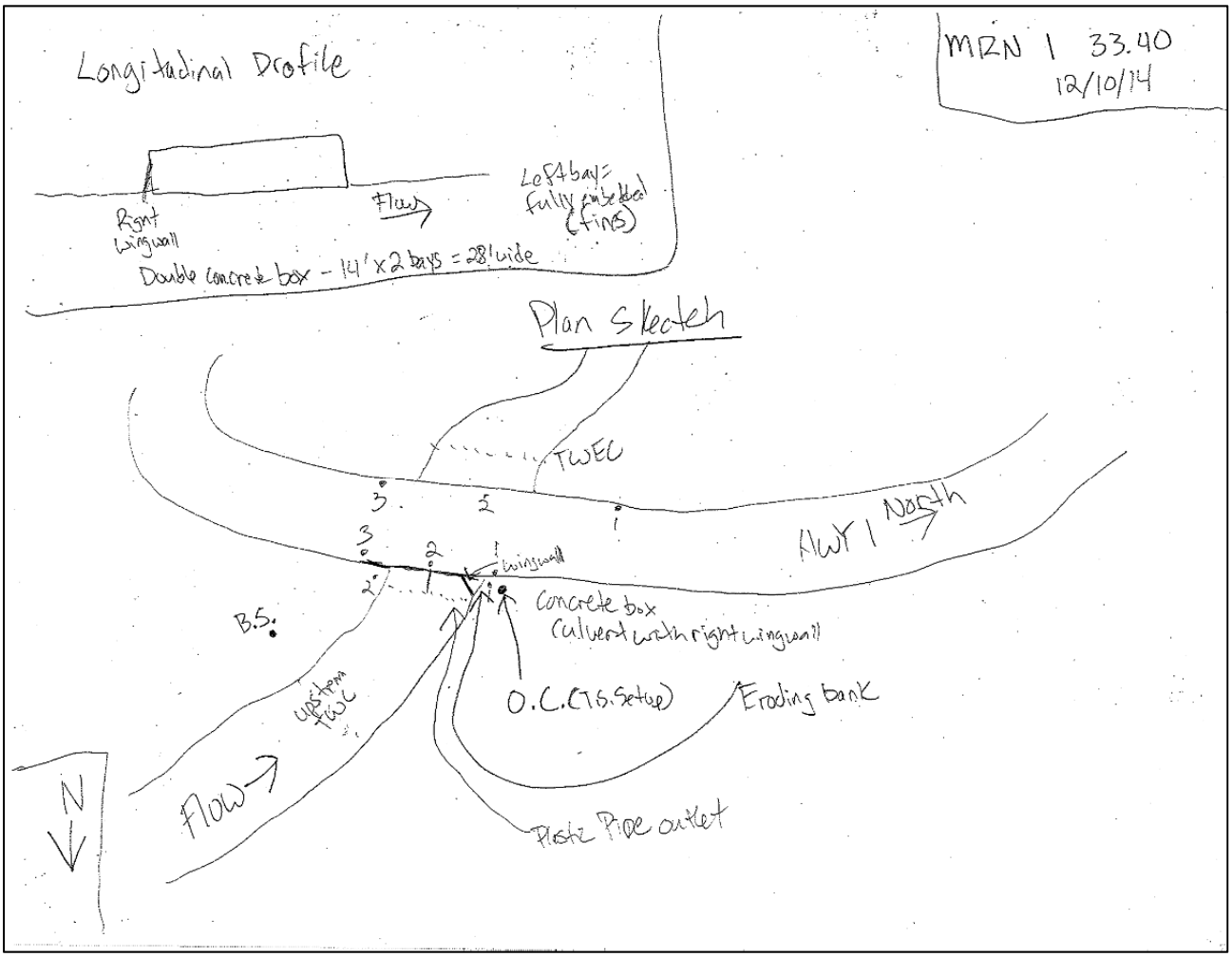


Figure B-33. Site sketch for MRN-1-33.40

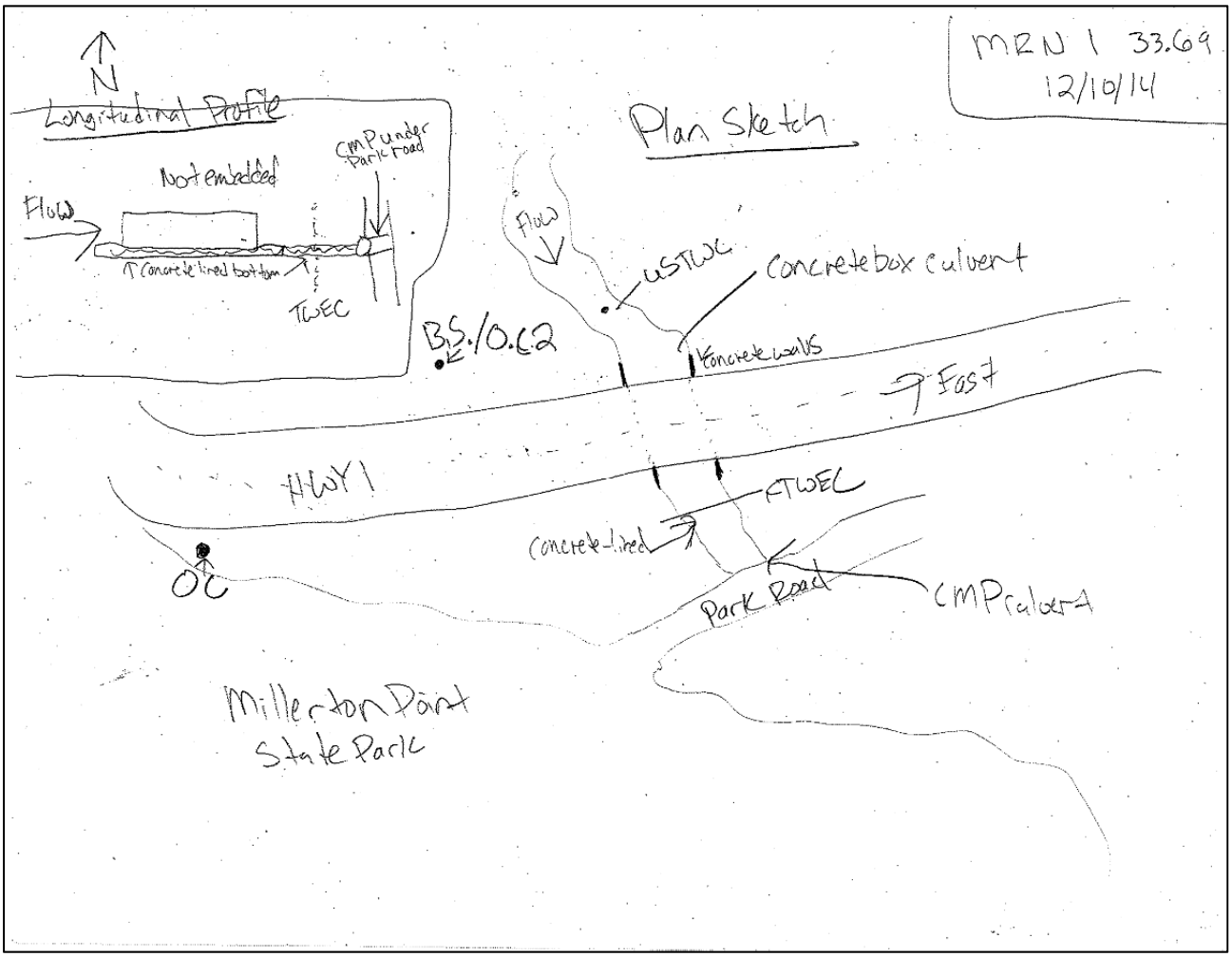


Figure B-34. Site sketch for MRN-1-33.69

San Mateo County

SM-1-11.07

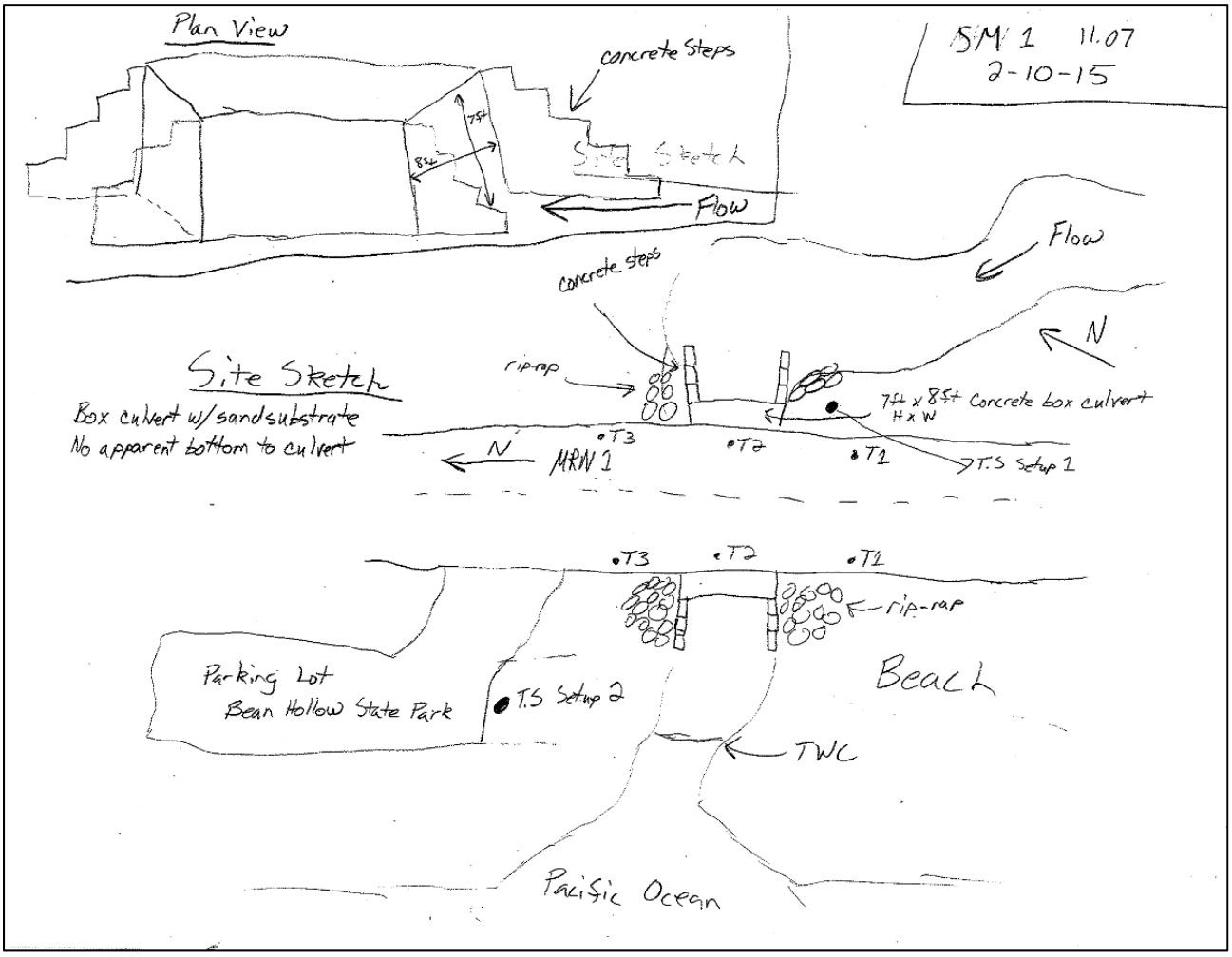


Figure B-35. Site sketch for SM-1-11.07

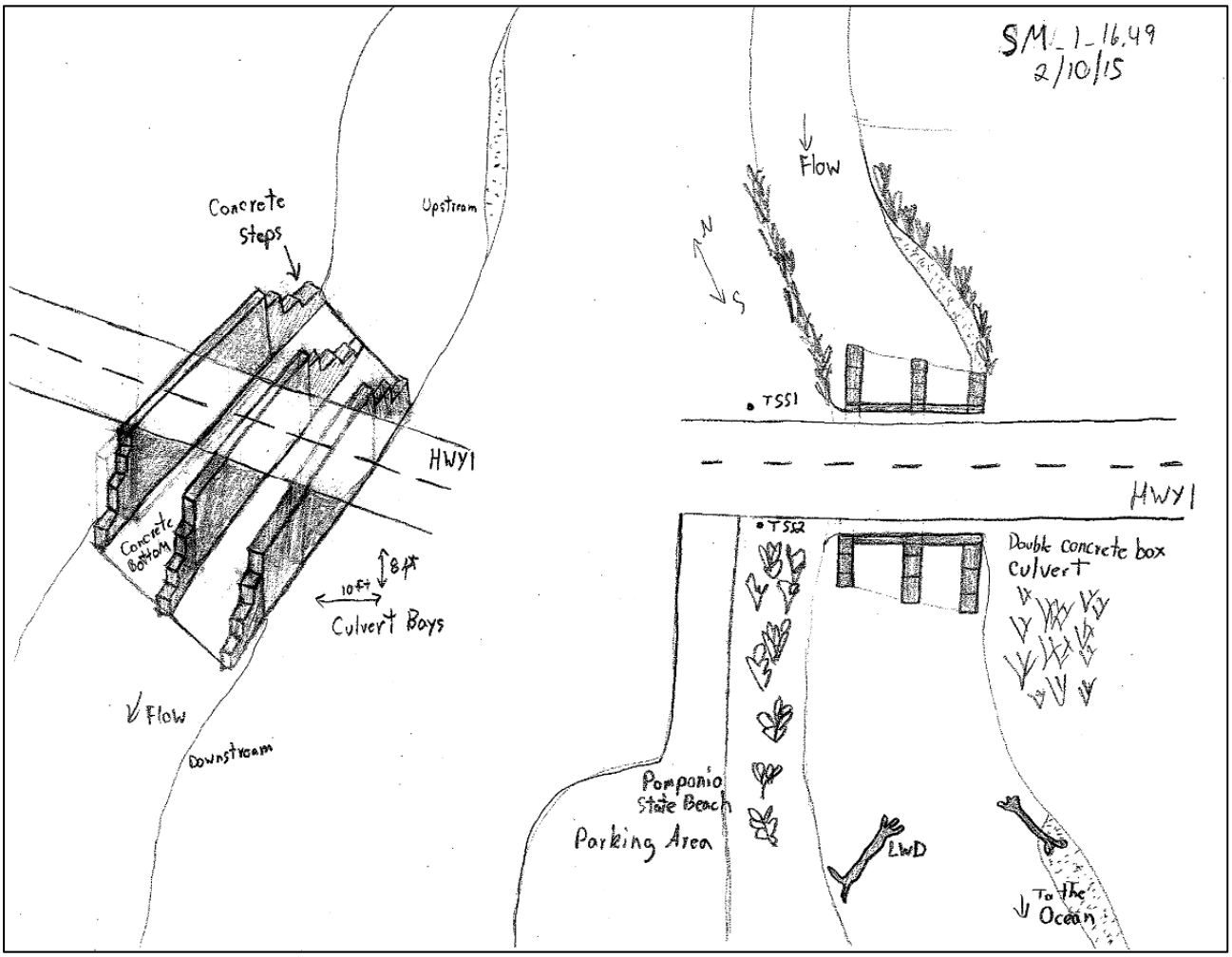


Figure B-36. Site sketch for SM-1-16.49

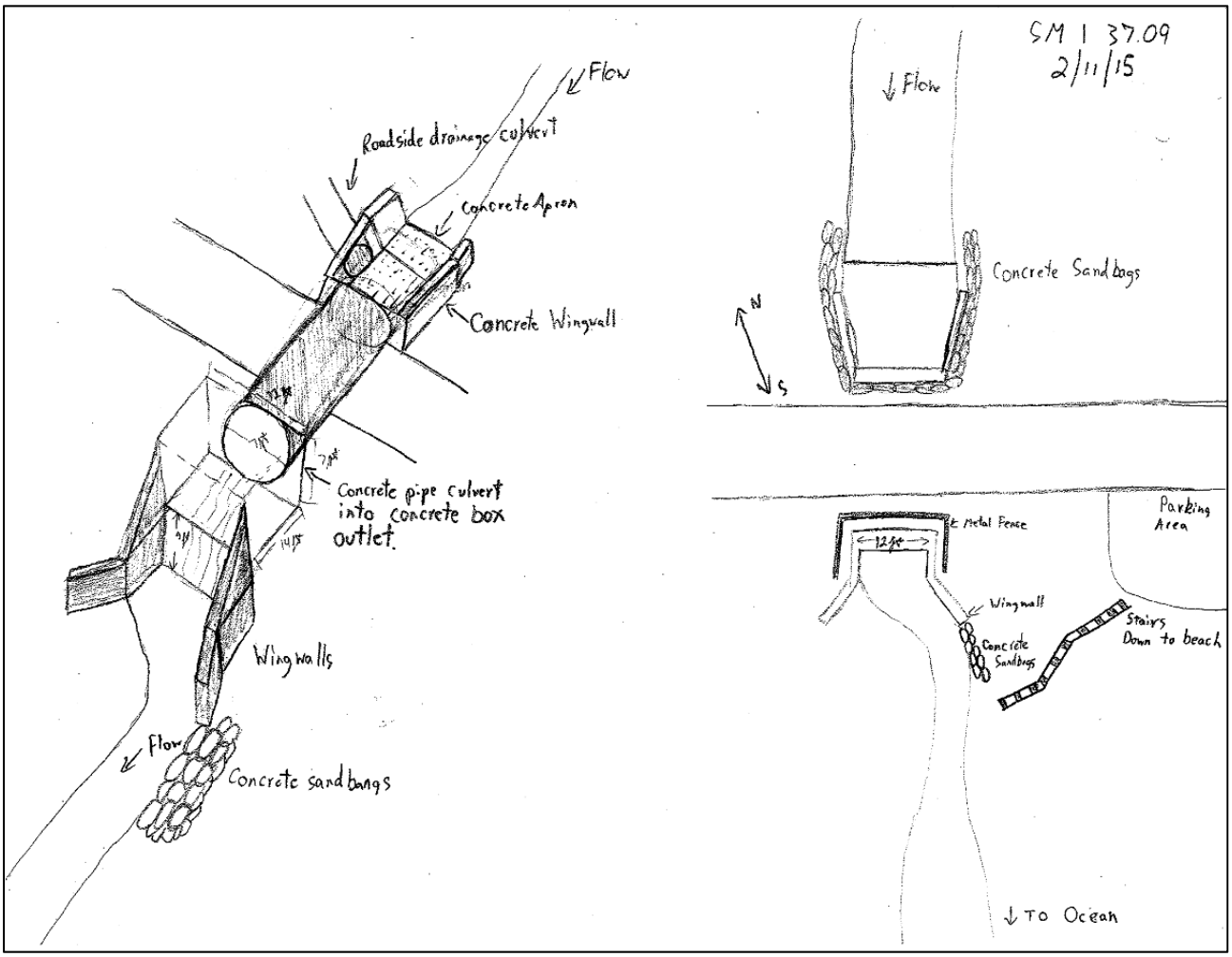


Figure B-37. Site sketch for SM-1-37.09

Appendix C - Detailed Fish Passage Assessment Datasheets

Detailed Survey Information

GIS Number | **MRN** | **1** | **13.49**

7 Surveyor Information

7.1 Date 12/14/2014 **Time** 9:00 **7.2 Agency** HDR

7.3 Scope jv 7.4 Rod no 7.5 Data jv

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 2 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 4.5 (2) 3.75 (3) 5.6

(4) 4.9 (5) 7.3

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Detailed Survey Information

GIS Number	MRN	1	13.49

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate

Detailed Survey Information

GIS Number	MRN	1	13.49

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Box

21.2 Diameter (ft)

21.3 Height/Rise (ft): 4

21.4 Width/Span (ft): 6

21.5 Length (ft)

21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Wingwall

23.2 Alignment (Inlet to Channel): < 30 Deg

23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

23.4 Inlet Apron:

23.5 Inlet Apron Upstream Width (ft)

23.6 Inlet Apron Downstream Width (ft)

23.7 Inlet Apron Length (ft)

23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Wingwall

24.2 Alignment (Outlet to Channel): < 30 Deg

24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

24.4 Outlet Configuration: At stream grade

24.5 Fish ladder: no

24.6 Outlet Apron: No

24.7 Outlet Apron Upstream Width (ft)

24.8 Outlet Apron Downstream Width (ft)

24.9 Outlet Apron Length (ft)

24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good

25.2 Condition Description:

25.3 Side Material Description: Concrete

specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: good

26.2 Condition description:

26.3 Bottom/lining material description: Concrete Box

specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type

27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	13.49

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	5.210	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **14.31**

7 Surveyor Information

7.1 Date 1/30/2015 **Time** 12:00 **7.2 Agency** HDR

7.3 Scope CV 7.4 Rod MA 7.5 Data NO

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 8 (2) 5 (3) 2.4

(4) 3.1 (5) 4

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) No Control Point

11.2 Tailwater Substrate Sand (<0.08")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_14.31 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	14.31

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Partially

17.3 Downstream End Depth (ft.) 0.33 17.3 Upstream End Depth (ft.) 0

17.4 Dominant Substrate Gravel (0.08-2.5")

Detailed Survey Information

GIS Number | **MRN** | **1** | **14.31**

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

Inlet and outlet culvert types were different.

21 SEGMENTShape Information

21.1 Segment Shape: Circular Pipe
21.2 Diameter (ft): 2
21.3 Height/Rise (ft)
21.4 Width/Span (ft)
21.5 Length (ft)
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Unknown
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
Inlet was a concrete box with openings on three sides. See site sketch for drawing.
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
Outlet empties into Bolinas Bay. Culvert was a concrete pipe.
24.4 Outlet Configuration: At stream grade
24.5 Fish ladder: no
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good
25.2 Condition Description:
25.3 Side Material Description: Concrete
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: good
26.2 Condition description:
26.3 Bottom/lining material description: Concrete
specify "other" bottom material:

27 Culvert segment retrofit

Detailed Survey Information

GIS Number	MRN	1	14.31

27.1 Retrofit Type: None

27.2 Condition:

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	4.500	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **14.34**

7 Surveyor Information

7.1 Date 2/4/2015 **Time** 9:00 **7.2 Agency** HDR

7.3 Scope jvm 7.4 Rod cv 7.5 Data no

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 5 (2) 5.3 (3) 5.6

(4) 6.1 (5) 5.7

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) No Control Point

11.2 Tailwater Substrate Silt/Clay

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_14.34 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	14.34

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Partially

17.3 Downstream End Depth (ft.) 0.1 17.3 Upstream End Depth (ft.) 0.1

17.4 Dominant Substrate Silt/Clay

Detailed Survey Information

GIS Number | **MRN** | **1** | **14.34**

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Circular Pipe | 21.2 Diameter (ft): 1.5

21.3 Height/Rise (ft) | 21.4 Width/Span (ft) | 21.5 Length (ft)

21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Headwall | 23.2 Alignment (Inlet to Channel): 30-45 Deg

23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

23.4 Inlet Apron: No | 23.5 Inlet Apron Upstream Width (ft)

23.6 Inlet Apron Downstream Width (ft) | 23.7 Inlet Apron Length (ft)

23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall

24.2 Alignment (Outlet to Channel): < 30 Deg

24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

Outlet empties into Bolinas Bay. No natural tailwater control.

24.4 Outlet Configuration: At stream grade | 24.5 Fish ladder: no

24.6 Outlet Apron: No | 24.7 Outlet Apron Upstream Width (ft)

24.8 Outlet Apron Downstream Width (ft) | 24.9 Outlet Apron Length (ft)

24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good

25.2 Condition Description:

25.3 Side Material Description: Concrete

specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: good

26.2 Condition description:

26.3 Bottom/lining material description: Concrete

specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None

27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	14.34

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	5.540	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **14.41**

7 Surveyor Information

7.1 Date 1/30/2015 **Time** 10:00 **7.2 Agency** HDR

7.3 Scope CV 7.4 Rod no 7.5 Data no

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 3 (2) 5.2 (3) 4.5

(4) 5 (5) 4.7

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_14.41 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	14.41

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Partially

17.3 Downstream End Depth (ft.) 1.5 17.3 Upstream End Depth (ft.) 2

17.4 Dominant Substrate Gravel (0.08-2.5")

Detailed Survey Information

GIS Number	MRN	1	14.41

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Box
21.2 Diameter (ft)
21.3 Height/Rise (ft): 4.5
21.4 Width/Span (ft): 10
21.5 Length (ft)
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft): 0

23 Inlet information

23.1 Type: Wingwall
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Wingwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
24.4 Outlet Configuration: At stream grade
24.5 Fish ladder: No
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good
25.2 Condition Description:
25.3 Side Material Description: Concrete
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: good
26.2 Condition description: Embedded, bottom described as sand and gravel.
26.3 Bottom/lining material description: Concrete
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None
27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	14.41

27.2 Outlet Sill?: No

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	4.480	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number	MRN	1	14.86

7 Surveyor Information

7.1 Date 2/2/2015 **Time** 15:00 **7.2 Agency** HDR

7.3 Scope jvm 7.4 Rod no 7.5 Data no

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 5 (2) 5.25 (3) 5

(4) 5.7 (5) 6.3

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_14.86 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	14.86

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Fully (entire culvert length)

17.3 Downstream End Depth (ft.) 3.5 17.3 Upstream End Depth (ft.) 3.5

17.4 Dominant Substrate Gravel (0.08-2.5")

Detailed Survey Information

GIS Number | **MRN** | **1** | **14.86**

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

Heavily embedded

21 SEGMENTShape Information

21.1 Segment Shape: Box
21.2 Diameter (ft):
21.3 Height/Rise (ft): 4
21.4 Width/Span (ft): 10
21.5 Length (ft): 35
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Wingwall
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Wingwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
24.4 Outlet Configuration: At stream grade
24.5 Fish ladder: no
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good
25.2 Condition Description: good
25.3 Side Material Description: Concrete
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: unknown
26.2 Condition description: embedded
26.3 Bottom/lining material description: Natural Substrate
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None
27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	14.86

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	5.450	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **16.95**

7 Surveyor Information

7.1 Date 1/29/2015 **Time** 14:00 **7.2 Agency** HDR

7.3 Scope cv 7.4 Rod no 7.5 Data no

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 7.5 (2) 7.25 (3) 9.25

(4) 16.5 (5) 18.5

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_16.95 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	16.95

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Fully (entire culvert length)

17.3 Downstream End Depth (ft.) 0.5 17.3 Upstream End Depth (ft.) 0.5

17.4 Dominant Substrate Silt/Clay

Detailed Survey Information

GIS Number | **MRN** | **1** | **16.95**

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Box
21.2 Diameter (ft)
21.3 Height/Rise (ft): 4
21.4 Width/Span (ft): 10
21.5 Length (ft)
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft): 0

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): > 45 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
24.4 Outlet Configuration: At stream grade
24.5 Fish ladder: No
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Fair
25.2 Condition Description:
25.3 Side Material Description: Concrete
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: Fair
26.2 Condition description:
26.3 Bottom/lining material description: Concrete
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None
27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	16.95

27.2 Outlet Sill?: No

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	11.800	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **18.17**

7 Surveyor Information

7.1 Date 1/29/2015 **Time** 10:00 **7.2 Agency** HDR

7.3 Scope cv 7.4 Rod no 7.5 Data no

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 4.75 (2) 6 (3) 8.5

(4) 7.5 (5) 6

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_18.17 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	18.17

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate Unknown

Detailed Survey Information

GIS Number	MRN	1	18.17

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Circular Pipe
21.2 Diameter (ft): 3.75
21.3 Height/Rise (ft)
21.4 Width/Span (ft)
21.5 Length (ft)
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
Concrete sand bag headwall.
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
24.4 Outlet Configuration: Freefall into pool
24.5 Fish ladder: No
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Fair
25.2 Condition Description: Concrete sand bag
25.3 Side Material Description: Concrete
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: Fair
26.2 Condition description: Concrete lining on bottom of culvert.
26.3 Bottom/lining material description: Concrete
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None
27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	18.17

27.2 Outlet Sill?: No

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	6.550	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **18.69**

7 Surveyor Information

7.1 Date 2/3/2015 **Time** 14:10 **7.2 Agency** HDR

7.3 Scope cv 7.4 Rod no 7.5 Data no

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 10 (2) 8 (3) 8.25

(4) 6 (5) 6

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) No Control Point

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_18.69 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	18.69

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate Unknown

Detailed Survey Information

GIS Number | **MRN** | **1** | **18.69**

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

Two inlets meet together under road and share the same outlet (see site sketch).

21 SEGMENTShape Information

21.1 Segment Shape: Box

21.2 Diameter (ft)

21.3 Height/Rise (ft)

21.4 Width/Span (ft): 5

21.5 Length (ft)

21.6 Culvert segment shape description (describe uniqueness of shape)

Cocnrete box 5 by 5 ft at inlet. 5 ft by 7ft wide at outlet.

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Wingwall

23.2 Alignment (Inlet to Channel): < 30 Deg

23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

Concrete sandbags line channel upstream of apron.

23.4 Inlet Apron: Yes

23.5 Inlet Apron Upstream Width (ft): 5

23.6 Inlet Apron Downstream Width (ft): 5

23.7 Inlet Apron Length (ft): 10

23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Wingwall

24.2 Alignment (Outlet to Channel): < 30 Deg

24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

Concrete box outlet.

24.4 Outlet Configuration: Freefall into pool

24.5 Fish ladder: yes

24.6 Outlet Apron: Yes

24.7 Outlet Apron Upstream Width (ft): 7

24.8 Outlet Apron Downstream Width (ft): 16

24.9 Outlet Apron Length (ft): 23

24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Fair

25.2 Condition Description:

25.3 Side Material Description: Concrete

specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: good

26.2 Condition description:

26.3 Bottom/lining material description: Concrete Box

specify "other" bottom material:

27 Culvert segment retrofit

Detailed Survey Information

GIS Number	MRN	1	18.69

27.1 Retrofit Type: Unknown

27.2 Condition:

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	7.650	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **19.94**

7 Surveyor Information

7.1 Date 1/28/2015 **Time** 14:00 **7.2 Agency** HDR

7.3 Scope ma 7.4 Rod no 7.5 Data no

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 2.25 (2) 2.5 (3) 3

(4) 3.25 (5) 4.5

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_19.94 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	19.94

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Fully (entire culvert length)

17.3 Downstream End Depth (ft.) 0.7 17.3 Upstream End Depth (ft.) 0.7

17.4 Dominant Substrate Silt/Clay

Detailed Survey Information

GIS Number	MRN	1	19.94

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Circular Pipe
21.2 Diameter (ft): 3.5
21.3 Height/Rise (ft)
21.4 Width/Span (ft)
21.5 Length (ft)
21.6 Culvert segment shape description (describe uniqueness of shape)

Reinforced concrete pipe

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Projecting
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Wingwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

Rock and mortar wingwall on left side.

24.4 Outlet Configuration: At stream grade
24.5 Fish ladder: no
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Fair
25.2 Condition Description:
25.3 Side Material Description: Grouted Rock
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: fair
26.2 Condition description: Embedded with natural substrate.
26.3 Bottom/lining material description: Concrete Pipe (Pre-cast)
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None

Detailed Survey Information

GIS Number	MRN	1	19.94

27.2 Condition:

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	3.100	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **20.33**

7 Surveyor Information

7.1 Date 12/17/2014 **Time** 13:45 **7.2 Agency** HDR

7.3 Scope jv 7.4 Rod no 7.5 Data jv

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 7 (2) 6.6 (3) 6.6

(4) 7.5 (5) 7

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_20.33 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	20.33

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Partially

17.3 Downstream End Depth (ft.) 1.5 17.3 Upstream End Depth (ft.) 0

17.4 Dominant Substrate Gravel (0.08-2.5")

Detailed Survey Information

GIS Number	MRN	1	20.33

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Circular Pipe
21.2 Diameter (ft): 3.5
21.3 Height/Rise (ft)
21.4 Width/Span (ft)
21.5 Length (ft)
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft): 0

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
24.4 Outlet Configuration: At stream grade
24.5 Fish ladder: No
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Fair
25.2 Condition Description:
25.3 Side Material Description: Steel Pipe, Ungalvanized
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: Fair
26.2 Condition description:
26.3 Bottom/lining material description: Steel Pipe, Ungalvanized
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None
27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	20.33

27.2 Outlet Sill?: No

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	6.940	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **20.53**

7 Surveyor Information

7.1 Date 1/28/2015 **Time** 12:00 **7.2 Agency** HDR

7.3 Scope ma 7.4 Rod no 7.5 Data no

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 10.5 (2) 15.25 (3) 9.25

(4) 7.75 (5) 12.5

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_20.53 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	20.53

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Partially

17.3 Downstream End Depth (ft.) 2 17.3 Upstream End Depth (ft.) 0

17.4 Dominant Substrate Gravel (0.08-2.5")

Detailed Survey Information

GIS Number | **MRN** | **1** | **20.53**

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Circular Pipe
21.2 Diameter (ft): 3.67
21.3 Height/Rise (ft)
21.4 Width/Span (ft)
21.5 Length (ft)
21.6 Culvert segment shape description (describe uniqueness of shape)

CSP culvert in concrete headwall form

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft): 2.5

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

Inlet Not Accessible due to fence

23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

Rock and mortar headwall.

24.4 Outlet Configuration: At stream grade
24.5 Fish ladder: No
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Poor
25.2 Condition Description:
25.3 Side Material Description: Grouted Rock
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: Good
26.2 Condition description: CMP was embedded with natural subsrate.
26.3 Bottom/lining material description: Other: Corrugated metal pipe
specify "other" bottom material:

27 Culvert segment retrofit

Detailed Survey Information

GIS Number	MRN	1	20.53

27.1 Retrofit Type: Unknown

27.2 Condition:

27.2 Outlet Sill?: No

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	11.050	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **21.06**

7 Surveyor Information

7.1 Date 12/17/2014 **Time** 11:23 **7.2 Agency** HDR

7.3 Scope jv 7.4 Rod no 7.5 Data jv

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 8 (2) 7.25 (3) 6

(4) 4.5 (5) 5.25

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_21.06 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	21.06

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Partially

17.3 Downstream End Depth (ft.) 0.5 17.3 Upstream End Depth (ft.) 0.5

17.4 Dominant Substrate Cobble (2.5-10")

Detailed Survey Information

GIS Number | **MRN** | **1** | **21.06**

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

wingwalls on each side of culvert downstream and upstream; concrete sandbags upstream of culvert on left bank looking downstream.

21 SEGMENTShape Information

21.1 Segment Shape: Box

21.2 Diameter (ft)

21.3 Height/Rise (ft): 3.33

21.4 Width/Span (ft): 5

21.5 Length (ft)

21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft): 0

23 Inlet information

23.1 Type: Wingwall

23.2 Alignment (Inlet to Channel): < 30 Deg

23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

concrete sandbags on left side of channel

23.4 Inlet Apron: No

23.5 Inlet Apron Upstream Width (ft)

23.6 Inlet Apron Downstream Width (ft)

23.7 Inlet Apron Length (ft)

23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Wingwall

24.2 Alignment (Outlet to Channel): < 30 Deg

24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

24.4 Outlet Configuration: At stream grade

24.5 Fish ladder: no

24.6 Outlet Apron: No

24.7 Outlet Apron Upstream Width (ft)

24.8 Outlet Apron Downstream Width (ft)

24.9 Outlet Apron Length (ft)

24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good

25.2 Condition Description:

25.3 Side Material Description:

specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: good

26.2 Condition description:

26.3 Bottom/lining material description: Concrete, Natural Substrate

specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type

Detailed Survey Information

GIS Number	MRN	1	21.06

27.2 Condition:

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	6.200	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **22.67**

7 Surveyor Information

7.1 Date 1/27/2015 **Time** 14:00 **7.2 Agency** HDR

7.3 Scope jvm 7.4 Rod no 7.5 Data no

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 8.5 (2) 7 (3) 9

(4) 5.25 (5) 9

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_22.67 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	22.67

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate Unknown

Detailed Survey Information

GIS Number	MRN	1	22.67

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Arch-Top Box
21.2 Diameter (ft):
21.3 Height/Rise (ft): 7.5
21.4 Width/Span (ft): 6
21.5 Length (ft):
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft): 0

23 Inlet information

23.1 Type: Wingwall
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
Wingwall only present on RB LDS.
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft):
23.6 Inlet Apron Downstream Width (ft):
23.7 Inlet Apron Length (ft):
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
There are 3 layers of Rock Boulder cascade in the downstream outlet as a fish ladder for the stream
24.4 Outlet Configuration: Freefall into pool
24.5 Fish ladder: Yes
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft):
24.8 Outlet Apron Downstream Width (ft):
24.9 Outlet Apron Length (ft):
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Fair
25.2 Condition Description:
25.3 Side Material Description: Grouted Rock
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: Fair
26.2 Condition description:
26.3 Bottom/lining material description: Concrete
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None

Detailed Survey Information

GIS Number	MRN	1	22.67

27.2 Condition:

27.2 Outlet Sill?: No

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	7.750	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **22.78**

7 Surveyor Information

7.1 Date 1/27/2015 **Time** 10:00 **7.2 Agency** HDR

7.3 Scope jvm 7.4 Rod no 7.5 Data no

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 2.92 (2) 4.25 (3) 7.92

(4) 7.67 (5) 4.75

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_22.78 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	22.78

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate Unknown

Detailed Survey Information

GIS Number | **MRN** | **1** | **22.78**

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

Concrete sandbags at inlet for bank stabilization.

21 SEGMENTShape Information

21.1 Segment Shape: Arch-Top Box

21.2 Diameter (ft)

21.3 Height/Rise (ft): 4.6

21.4 Width/Span (ft): 3.5

21.5 Length (ft)

21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft): 0

23 Inlet information

23.1 Type: Wingwall

23.2 Alignment (Inlet to Channel): < 30 Deg

23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

Wingwall only on RB LDS.

23.4 Inlet Apron: No

23.5 Inlet Apron Upstream Width (ft)

23.6 Inlet Apron Downstream Width (ft)

23.7 Inlet Apron Length (ft)

23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall

24.2 Alignment (Outlet to Channel): Unknown

24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

Concrete box outlet. 3.5 ft wide and 4.6 ft tall. 5 ft drop to pool.

24.4 Outlet Configuration: Unknown

24.5 Fish ladder: no

24.6 Outlet Apron: No

24.7 Outlet Apron Upstream Width (ft)

24.8 Outlet Apron Downstream Width (ft)

24.9 Outlet Apron Length (ft)

24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Poor

25.2 Condition Description: Concrete sandbags.

25.3 Side Material Description: Concrete

specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: fair

26.2 Condition description:

26.3 Bottom/lining material description: Concrete

specify "other" bottom material:

27 Culvert segment retrofit

Detailed Survey Information

GIS Number	MRN	1	22.78

27.1 Retrofit Type: Unknown

27.2 Condition:

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	5.502	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **23.20**

7 Surveyor Information

7.1 Date 12/16/2014 **Time** 12:40 **7.2 Agency** HDR

7.3 Scope jv 7.4 Rod no 7.5 Data jv

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 6.5 (2) 7.75 (3) 7.75

(4) 7 (5) 6.83

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN-1_23.20 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	23.20

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate Unknown

Detailed Survey Information

GIS Number | **MRN** | **1** | **23.20**

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Box
21.2 Diameter (ft)
21.3 Height/Rise (ft): 4
21.4 Width/Span (ft): 5
21.5 Length (ft)
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft): 0

23 Inlet information

23.1 Type: Wingwall
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
wingwall on both sides of culvert
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Wingwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
55 inch drop from concrete box culvert into pool; wingwalls on each side
24.4 Outlet Configuration: Freefall into pool
24.5 Fish ladder: No
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good
25.2 Condition Description:
25.3 Side Material Description: Concrete
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: Good
26.2 Condition description: Exposed aggregate
26.3 Bottom/lining material description: Concrete
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None

Detailed Survey Information

GIS Number	MRN	1	23.20

27.2 Condition:

27.2 Outlet Sill?: No

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	7.166	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **23.26**

7 Surveyor Information

7.1 Date 12/16/2014 **Time** 11:24 **7.2 Agency** HDR

7.3 Scope jv 7.4 Rod no 7.5 Data jv

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 10 (2) 10.75 (3) 8

(4) 6.5 (5) 9.5

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_23.26 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	23.26

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate Unknown

Detailed Survey Information

GIS Number | **MRN** | **1** | **23.26**

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Box
21.2 Diameter (ft):
21.3 Height/Rise (ft): 3.08
21.4 Width/Span (ft): 8.5
21.5 Length (ft):
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft): 0

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): > 45 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
wingwalls on both sides of culvert
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft):
23.6 Inlet Apron Downstream Width (ft):
23.7 Inlet Apron Length (ft):
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
wingwall on rightbank looking downstream
24.4 Outlet Configuration: At stream grade
24.5 Fish ladder: No
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft):
24.8 Outlet Apron Downstream Width (ft):
24.9 Outlet Apron Length (ft):
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good
25.2 Condition Description:
25.3 Side Material Description: Concrete
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: good
26.2 Condition description:
26.3 Bottom/lining material description: Concrete, Natural Substrate
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None

Detailed Survey Information

GIS Number	MRN	1	23.26

27.2 Condition:

27.2 Outlet Sill?: No

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	8.950	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number	MRN	1	23.68

7 Surveyor Information

7.1 Date 1/26/2015 **Time** 14:00 **7.2 Agency** HDR

7.3 Scope jvm 7.4 Rod no 7.5 Data ma

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 2 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 6.5 (2) 8.75 (3) 11.08

(4) 9.25 (5) 10.67

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Silt/Clay

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_23.69 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	23.68

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded: Fully (entire culvert length)

17.3 Downstream End Depth (ft.) 20 17.3 Upstream End Depth (ft.) 22

17.4 Dominant Substrate Silt/Clay

Detailed Survey Information

GIS Number	MRN	1	23.68

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Box

21.2 Diameter (ft)

21.3 Height/Rise (ft): 4

21.4 Width/Span (ft): 5

21.5 Length (ft)

21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Wingwall

23.2 Alignment (Inlet to Channel): < 30 Deg

23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

23.4 Inlet Apron: No

23.5 Inlet Apron Upstream Width (ft)

23.6 Inlet Apron Downstream Width (ft)

23.7 Inlet Apron Length (ft)

23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Wingwall

24.2 Alignment (Outlet to Channel): < 30 Deg

24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

24.4 Outlet Configuration: At stream grade

24.5 Fish ladder: no

24.6 Outlet Apron: No

24.7 Outlet Apron Upstream Width (ft)

24.8 Outlet Apron Downstream Width (ft)

24.9 Outlet Apron Length (ft)

24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good

25.2 Condition Description:

25.3 Side Material Description: Concrete

specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: good

26.2 Condition description:

26.3 Bottom/lining material description: Concrete

specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type

27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	23.68

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	9.250	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **24.00**

7 Surveyor Information

7.1 Date 12/12/2014 **Time** 14:00 **7.2 Agency** HDR

7.3 Scope jv 7.4 Rod is 7.5 Data mn

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 38 (2) 34 (3) 30

(4) 5.5 (5) 3.5

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Detailed Survey Information

GIS Number	MRN	1	24.00

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded?

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate

Detailed Survey Information

GIS Number	MRN	1	24.00

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Circular Pipe
21.2 Diameter (ft): 3.66
21.3 Height/Rise (ft)
21.4 Width/Span (ft)
21.5 Length (ft)
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft): 0.5

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
24.4 Outlet Configuration:
24.5 Fish ladder: no
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition:
25.2 Condition Description:
25.3 Side Material Description:
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: fair
26.2 Condition description:
26.3 Bottom/lining material description
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type
27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	24.00

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	22.200	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **24.30**

7 Surveyor Information

7.1 Date 1/16/2015 **Time** 14:15 **7.2 Agency** HDR

7.3 Scope JVM 7.4 Rod NO 7.5 Data MN

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 9.1 (2) 8.3 (3) 16.3

(4) 19.25 (5) 16.6

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present)

11.2 Tailwater Substrate

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs: 0

Weir Description

16 Site Pictures

Detailed Survey Information

GIS Number	MRN	1	24.30

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate Unknown

Detailed Survey Information

GIS Number | **MRN** | **1** | **24.30**

Segments

Segment Number: 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Box
21.2 Diameter (ft):
21.3 Height/Rise (ft): 7.5
21.4 Width/Span (ft): 7
21.5 Length (ft): 40
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): Unknown
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
Apron was made of concrete and rock.
24.4 Outlet Configuration: Freefall to Apron
24.5 Fish ladder: no
24.6 Outlet Apron: Yes
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft): 20
24.9 Outlet Apron Length (ft): 8
24.10 Outlet Apron Slope: 0.479

25 Segment side materials

25.1 Condition: Fair
25.2 Condition Description:
25.3 Side Material Description: Unknown
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: fair
26.2 Condition description:
26.3 Bottom/lining material description: Concrete, Natural Substrate
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None
27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	24.30

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	13.910	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **24.67**

7 Surveyor Information

7.1 Date 1/16/2015 **Time** 11:18 **7.2 Agency** HDR

7.3 Scope JVM 7.4 Rod NO 7.5 Data MN

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 2 No.of Segments Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 6.5 (2) 4.5 (3) 5

(4) 8 (5) 4

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_24.67 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	24.67

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.) 17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate

Segments

Culvert Number 2

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded?

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.) 17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate

Detailed Survey Information

GIS Number	MRN	1	24.67

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Circular Pipe
21.2 Diameter (ft): 1.5
21.3 Height/Rise (ft)
21.4 Width/Span (ft)
21.5 Length (ft)
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type:
24.2 Alignment (Outlet to Channel)
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
24.4 Outlet Configuration:
24.5 Fish ladder:
24.6 Outlet Apron:
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition:
25.2 Condition Description:
25.3 Side Material Description:
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition:
26.2 Condition description:
26.3 Bottom/lining material description
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type
27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	24.67

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	5.600	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No
Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	2
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **25.55**

7 Surveyor Information

7.1 Date 1/15/2015 **Time** 14:09 **7.2 Agency** HDR

7.3 Scope JV 7.4 Rod NO 7.5 Data MN

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 4.33 (2) 2.33 (3) 2.33

(4) 2.91 (5) 1.66

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Sand (<0.08")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Detailed Survey Information

GIS Number	MRN	1	25.55

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Partially

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate Sand (<0.08")

Detailed Survey Information

GIS Number	MRN	1	25.55

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Circular Pipe
21.2 Diameter (ft): 4
21.3 Height/Rise (ft)
21.4 Width/Span (ft)
21.5 Length (ft)
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Projecting
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
24.4 Outlet Configuration: At stream grade
24.5 Fish ladder: no
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Poor
25.2 Condition Description: Concrete bags line both banks 15 feet downstream.
25.3 Side Material Description: Concrete
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: fair
26.2 Condition description:
26.3 Bottom/lining material description
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type
27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	25.55

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	2.712	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **25.57**

7 Surveyor Information

7.1 Date 1/15/2015 **Time** 13:04 **7.2 Agency** HDR

7.3 Scope JVM 7.4 Rod NO 7.5 Data MN

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 3.6 (2) 2.5 (3) 3.08

(4) 3.6 (5) 2.4

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Silt/Clay

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Detailed Survey Information

GIS Number	MRN	1	25.57

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate

Detailed Survey Information

GIS Number	MRN	1	25.57

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Elliptical Pipe
21.2 Diameter (ft):
21.3 Height/Rise (ft): 3
21.4 Width/Span (ft): 4
21.5 Length (ft):
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
10 ft long concrete headwall
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Projecting
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
24.4 Outlet Configuration: At stream grade
24.5 Fish ladder: no
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Fair
25.2 Condition Description: Downstream banks lined with concrete sandbags.
25.3 Side Material Description: Concrete
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: poor
26.2 Condition description:
26.3 Bottom/lining material description: Concrete Pipe (Cast-in-place)
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type
27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	25.57

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	3.036	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **25.63**

7 Surveyor Information

7.1 Date 1/15/2015 **Time** 10:15 **7.2 Agency** HDR

7.3 Scope JVM 7.4 Rod NO 7.5 Data MN

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 3 (2) 2.66 (3) 2.75

(4) 2.16 (5) 2.58

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) No Control Point

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Detailed Survey Information

GIS Number	MRN	1	25.63

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate

Detailed Survey Information

GIS Number	MRN	1	25.63

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Circular Pipe
21.2 Diameter (ft): 3
21.3 Height/Rise (ft)
21.4 Width/Span (ft)
21.5 Length (ft)
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): > 45 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Projecting
24.2 Alignment (Outlet to Channel): > 45 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
24.4 Outlet Configuration: Cascade over riprap
24.5 Fish ladder: no
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition:
25.2 Condition Description:
25.3 Side Material Description:
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: fair
26.2 Condition description:
26.3 Bottom/lining material description: Other: Rubber
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type
27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	25.63

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	2.630	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **25.67**

7 Surveyor Information

7.1 Date 1/14/2015 **Time** 15:51 **7.2 Agency** HDR

7.3 Scope JVM 7.4 Rod NO 7.5 Data MN

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 2.66 (2) 2.33 (3) 1.83

(4) 1.58 (5) 2.33

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) No Control Point

11.2 Tailwater Substrate Silt/Clay

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Detailed Survey Information

GIS Number	MRN	1	25.67

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded?

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate

Detailed Survey Information

GIS Number	MRN	1	25.67

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Circular Pipe
21.2 Diameter (ft): 2.916
21.3 Height/Rise (ft):
21.4 Width/Span (ft):
21.5 Length (ft):
21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): > 45 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
Concrete headwalll
23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Projecting
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
3.1 meter oulet drop to riprap
24.4 Outlet Configuration: Cascade over riprap
24.5 Fish ladder: no
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition:
25.2 Condition Description:
25.3 Side Material Description:
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: fair
26.2 Condition description:
26.3 Bottom/lining material description
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type

Detailed Survey Information

GIS Number	MRN	1	25.67

27.2 Condition:

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	2.146	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **27.21**

7 Surveyor Information

7.1 Date 12/12/2014 **Time** 11:00 **7.2 Agency** HDR

7.3 Scope jv 7.4 Rod is 7.5 Data mn

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 11 (2) 10.5 (3) 6

(4) 9 (5) 8.5

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Detailed Survey Information

GIS Number	MRN	1	27.21

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate Unknown

Detailed Survey Information

GIS Number | **MRN** | **1** | **27.21**

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Box
21.2 Diameter (ft)
21.3 Height/Rise (ft): 2.5
21.4 Width/Span (ft): 8
21.5 Length (ft)
21.6 Culvert segment shape description (describe uniqueness of shape)
8' Outlet Box

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft): 0

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
Length of inlet apron 7.5-9.5 feet
23.4 Inlet Apron: Yes
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
24.4 Outlet Configuration: Freefall into pool
24.5 Fish ladder: No
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good
25.2 Condition Description:
25.3 Side Material Description: Concrete
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: Good
26.2 Condition description: clean, layer of algae
26.3 Bottom/lining material description: Concrete
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None

Detailed Survey Information

GIS Number	MRN	1	27.21

27.2 Condition:

27.2 Outlet Sill?: No

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	9.000	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **27.92**

7 Surveyor Information

7.1 Date 1/19/2015 **Time** 14:18 **7.2 Agency** HDR

7.3 Scope JVM 7.4 Rod NO 7.5 Data MN

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 3.2 (2) 4.1 (3) 4

(4) 5.2 (5) 5

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Small Debris

11.2 Tailwater Substrate Silt/Clay

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Detailed Survey Information

GIS Number	MRN	1	27.92

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate Unknown

Detailed Survey Information

GIS Number | **MRN** | **1** | **27.92**

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

Downstream channel not well defined. Sediment constricts downstream opening. Downstream channel is ponded.

21 SEGMENTShape Information

21.1 Segment Shape: Box
21.2 Diameter (ft):
21.3 Height/Rise (ft): 2.75
21.4 Width/Span (ft): 8
21.5 Length (ft):
21.6 Culvert segment shape description (describe uniqueness of shape)

Concrete box culvert.

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Headwall
23.2 Alignment (Inlet to Channel): > 45 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

Wingwall on side on headwall.

23.4 Inlet Apron: No
23.5 Inlet Apron Upstream Width (ft)
23.6 Inlet Apron Downstream Width (ft)
23.7 Inlet Apron Length (ft)
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall
24.2 Alignment (Outlet to Channel): > 45 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

Water ponded at oulet due to sediment in the channel.

24.4 Outlet Configuration: Unknown
24.5 Fish ladder: no
24.6 Outlet Apron: No
24.7 Outlet Apron Upstream Width (ft)
24.8 Outlet Apron Downstream Width (ft)
24.9 Outlet Apron Length (ft)
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition:
25.2 Condition Description:
25.3 Side Material Description: Unknown
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: fair
26.2 Condition description:
26.3 Bottom/lining material description: Concrete, Natural Substrate
specify "other" bottom material:

27 Culvert segment retrofit

Detailed Survey Information

GIS Number	MRN	1	27.92

27.1 Retrofit Type: Unknown

27.2 Condition:

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	4.300	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **33.40**

7 Surveyor Information

7.1 Date 12/10/2014 **Time** 10:00 **7.2 Agency** HDR

7.3 Scope jv 7.4 Rod is 7.5 Data mn

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 2 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 31.7 (2) 33.9 (3) 32

(4) 34.9 (5) 27.1

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID MRN_1_33.40 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	MRN	1	33.40

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Fully (entire culvert length)

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate Silt/Clay

Detailed Survey Information

GIS Number	MRN	1	33.40

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

21 SEGMENTShape Information

21.1 Segment Shape: Box

21.2 Diameter (ft):

21.3 Height/Rise (ft):

21.4 Width/Span (ft): 14

21.5 Length (ft): 36

21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Headwall

23.2 Alignment (Inlet to Channel): < 30 Deg

23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

23.4 Inlet Apron:

23.5 Inlet Apron Upstream Width (ft)

23.6 Inlet Apron Downstream Width (ft)

23.7 Inlet Apron Length (ft)

23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Wingwall

24.2 Alignment (Outlet to Channel): < 30 Deg

24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

24.4 Outlet Configuration: At stream grade

24.5 Fish ladder: no

24.6 Outlet Apron: No

24.7 Outlet Apron Upstream Width (ft)

24.8 Outlet Apron Downstream Width (ft)

24.9 Outlet Apron Length (ft)

24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good

25.2 Condition Description:

25.3 Side Material Description:

specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: good

26.2 Condition description: left bay embedded

26.3 Bottom/lining material description: Concrete Box

specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None

27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	33.40

27.2 Outlet Sill?: No

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	31.920	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **MRN** | **1** | **34.41**

7 Surveyor Information

7.1 Date 12/10/2014 **Time** 12:02 **7.2 Agency** HDR

7.3 Scope JVM 7.4 Rod NO 7.5 Data MN

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 2 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 31.7 (2) 33.9 (3) 32

(4) 34.9 (5) 27.1

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Gravel (0.08-2.5")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Detailed Survey Information

GIS Number	MRN	1	34.41

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate Unknown

Detailed Survey Information

GIS Number | **MRN** | **1** | **34.41**

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

Double concrete box culvert.

21 SEGMENTShape Information

21.1 Segment Shape: Box

21.2 Diameter (ft)

21.3 Height/Rise (ft)

21.4 Width/Span (ft): 14

21.5 Length (ft)

21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft): 0

23 Inlet information

23.1 Type: Unknown

23.2 Alignment (Inlet to Channel): Unknown

23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

23.4 Inlet Apron: No

23.5 Inlet Apron Upstream Width (ft)

23.6 Inlet Apron Downstream Width (ft)

23.7 Inlet Apron Length (ft)

23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Headwall

24.2 Alignment (Outlet to Channel): < 30 Deg

24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

24.4 Outlet Configuration: At stream grade

24.5 Fish ladder:

24.6 Outlet Apron: No

24.7 Outlet Apron Upstream Width (ft)

24.8 Outlet Apron Downstream Width (ft)

24.9 Outlet Apron Length (ft)

24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition:

25.2 Condition Description:

25.3 Side Material Description: Concrete

specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: good

26.2 Condition description:

26.3 Bottom/lining material description: Concrete

specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: Unknown

27.2 Condition:

Detailed Survey Information

GIS Number	MRN	1	34.41

27.2 Outlet Sill?:

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	31.920	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **SM** | **1** | **11.07**

7 Surveyor Information

7.1 Date 2/10/2015 **Time** 10:00 **7.2 Agency** HDR

7.3 Scope JVM 7.4 Rod NO 7.5 Data NO

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 44.5 (2) 44 (3) 36

(4) 33.5 (5) 31

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) No Control Point

11.2 Tailwater Substrate Sand (<0.08")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID SM_1_11.07 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	SM	1	11.07

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Fully

17.3 Downstream End Depth (ft.)

17.3 Upstream End Depth (ft.) 0.25

17.4 Dominant Substrate Sand (<0.08")

Detailed Survey Information

GIS Number	SM	1	11.07

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

Concrete box culvert; embeddedness varies with season and tides.

21 SEGMENTShape Information

21.1 Segment Shape: Box

21.2 Diameter (ft)

21.3 Height/Rise (ft): 7

21.4 Width/Span (ft): 8

21.5 Length (ft)

21.6 Culvert segment shape description (describe uniqueness of shape)

Box

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Wingwall

23.2 Alignment (Inlet to Channel): 30-45 Deg

23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

Concrete step wingwalls.

23.4 Inlet Apron: No

23.5 Inlet Apron Upstream Width (ft)

23.6 Inlet Apron Downstream Width (ft)

23.7 Inlet Apron Length (ft)

23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Wingwall

24.2 Alignment (Outlet to Channel): < 30 Deg

24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

24.4 Outlet Configuration: At stream grade

24.5 Fish ladder: No

24.6 Outlet Apron: No

24.7 Outlet Apron Upstream Width (ft)

24.8 Outlet Apron Downstream Width (ft)

24.9 Outlet Apron Length (ft)

24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good

25.2 Condition Description: Good

25.3 Side Material Description: Rock

specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: Good

26.2 Condition description: Submerged

26.3 Bottom/lining material description: Concrete

specify "other" bottom material:

27 Culvert segment retrofit

Detailed Survey Information

GIS Number	SM	1	11.07

27.1 Retrofit Type: None

27.2 Condition:

27.2 Outlet Sill?:

Survey Results

Upstream Channel Slope	2.80%	Road Width (ft)	95
Downstream Channel Slope	3.00%	Road Fill Volume (cu ft)	80163.000
Inlet Fill Volume (cu ft)	25945	Total Fill Volume (cu yd)	4940.000
Outlet Fill Volume (cu ft)	27279	Elevation of Road Prism (ft)	19.000

CDFG Matrix Site Ranking

Active Channel Width (ft.)	37.800	(mean of 5 field measurements)
Maximum Slope (%)	0.03	(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	Yes

Passage Evaluation For Site

Detailed Survey Information

GIS Number | **SM** | **1** | **16.49**

7 Surveyor Information

7.1 Date 2/10/2015 **Time** 14:00 **7.2 Agency** HDR

7.3 Scope JVM 7.4 Rod MA 7.5 Data NO

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 2 No.of Segments 1 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 20.5 (2) 20 (3) 20.75

(4) 24 (5) 30.5

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Unknown

11.2 Tailwater Substrate Sand (<0.08")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID SM_1_16.49 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	SM	1	16.49

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Fully

17.3 Downstream End Depth (ft.) 0.5 17.3 Upstream End Depth (ft.) 1

17.4 Dominant Substrate Sand (<0.08")

Detailed Survey Information

GIS Number	SM	1	16.49

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

Double concrete box culvert with step mitered inlet and outlet.

21 SEGMENTShape Information

21.1 Segment Shape: Box

21.2 Diameter (ft)

21.3 Height/Rise (ft): 8

21.4 Width/Span (ft): 10

21.5 Length (ft)

21.6 Culvert segment shape description (describe uniqueness of shape)

2- 8'x10' boxes that have identical characteristics

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Mitered

23.2 Alignment (Inlet to Channel): < 30 Deg

23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

23.4 Inlet Apron: Yes

23.5 Inlet Apron Upstream Width (ft): 21

23.6 Inlet Apron Downstream Width (ft): 21

23.7 Inlet Apron Length (ft)

23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Mitered

24.2 Alignment (Outlet to Channel): < 30 Deg

24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

24.4 Outlet Configuration: At stream grade

24.5 Fish ladder: no

24.6 Outlet Apron: Yes

24.7 Outlet Apron Upstream Width (ft): 21

24.8 Outlet Apron Downstream Width (ft): 21

24.9 Outlet Apron Length (ft)

24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good

25.2 Condition Description:

25.3 Side Material Description: Concrete

specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: good

26.2 Condition description:

26.3 Bottom/lining material description: Concrete

specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None

Detailed Survey Information

GIS Number	SM	1	16.49

27.2 Condition:

27.2 Outlet Sill?: No

Culvert Number 2

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? Yes

17.2 If YES, is it embedded: Fully (entire culvert length)

17.3 Downstream End Depth (ft.) 0.5 17.3 Upstream End Depth (ft.) 1

17.4 Dominant Substrate Silt/Clay

Detailed Survey Information

GIS Number	SM	1	16.49

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

Double concrete box culvert with step mitered inlet and outlet.

21 SEGMENTShape Information

21.1 Segment Shape: Box
21.2 Diameter (ft):
21.3 Height/Rise (ft): 8
21.4 Width/Span (ft): 10
21.5 Length (ft): 100
21.6 Culvert segment shape description (describe uniqueness of shape)

2- 8'x10' boxes that have identical characteristics

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Wingwall
23.2 Alignment (Inlet to Channel): < 30 Deg
23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):
23.4 Inlet Apron: Yes
23.5 Inlet Apron Upstream Width (ft): 21
23.6 Inlet Apron Downstream Width (ft): 21
23.7 Inlet Apron Length (ft):
23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Mitered
24.2 Alignment (Outlet to Channel): < 30 Deg
24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):
24.4 Outlet Configuration: At stream grade
24.5 Fish ladder: no
24.6 Outlet Apron: Yes
24.7 Outlet Apron Upstream Width (ft): 21
24.8 Outlet Apron Downstream Width (ft): 21
24.9 Outlet Apron Length (ft): 18
24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good
25.2 Condition Description:
25.3 Side Material Description: Concrete
specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: unknown
26.2 Condition description:
26.3 Bottom/lining material description: Concrete
specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type: None

Detailed Survey Information

GIS Number	SM	1	16.49

27.2 Condition:

27.2 Outlet Sill?: No

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	23.150	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)

Residual Outlet Ddepth (ft.)

Culvert # 1

Substrate Throughout? Yes

Residual Inlet Depth (ft.)

Residual Outlet Ddepth (ft.)

Culvert # 2

Substrate Throughout? No

Passage Evaluation For Site

Fish Crossing Results for Site

Detailed Survey Information

GIS Number | **SM** | **1** | **37.09**

7 Surveyor Information

7.1 Date 2/11/2015 **Time** 11:33 **7.2 Agency** HDR

7.3 Scope jvm 7.4 Rod no 7.5 Data no

8 Crossing Information

Crossing Type Culvert No. of Culverts or Bays 1 No.of Segments 2 Type per Log

9 Active Channel Width

9.1 Upstream Channel Widths: (1) 6.25 (2) 6 (3) 5

(4) 4 (5) 4.5

10 Trash Rack

10.1 Is there a trash rack present at the site? No

10.2 What is the distance upstream of trash rack from crossing?

10.3 Rack condition during survey Unknown

10.4 Flows at which trash rack is being bypassed

10.5 Elevation of the road prism
(assumes culvert inlet invert at 0.0 ft.)

10.6 Road fill volume

11 Tailwater Control Information

11.1 Natural Tailwater Control (downstream of weirs if present) Pool tail out

11.2 Tailwater Substrate Sand (<0.08")

12 Weir Presence and Description

12.1 Downstream weirs? ☐ 12.2 Number of weirs:

Weir Description

16 Site Pictures

Picture ID SM_1_37.09 Comment Type TWEC Transect (required)

Detailed Survey Information

GIS Number	SM	1	37.09

Culverts

Culvert Number 1

17 Embedded culvert (not including open arched culverts)

17.1 Is the culvert embedded? No

17.2 If YES, is it embedded:

17.3 Downstream End Depth (ft.) 17.3 Upstream End Depth (ft.)

17.4 Dominant Substrate Unknown

Detailed Survey Information

GIS Number	SM	1	37.09

Segments

Segment Number 1

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

Concrete box at outlet. Concrete pipe culvert at inlet.

21 SEGMENTShape Information

21.1 Segment Shape

21.2 Diameter (ft)

21.3 Height/Rise (ft) 7

21.4 Width/Span (ft) 12

21.5 Length (ft) 14

21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Segment connection

23.2 Alignment (Inlet to Channel) < 30 Deg

23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

23.4 Inlet Apron:

23.5 Inlet Apron Upstream Width (ft)

23.6 Inlet Apron Downstream Width (ft)

23.7 Inlet Apron Length (ft)

23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Wingwall

24.2 Alignment (Outlet to Channel) < 30 Deg

24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

Severe drop at outlet

24.4 Outlet Configuration: Freefall into pool

24.5 Fish ladder: no

24.6 Outlet Apron: No

24.7 Outlet Apron Upstream Width (ft)

24.8 Outlet Apron Downstream Width (ft)

24.9 Outlet Apron Length (ft)

24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good

25.2 Condition Description:

25.3 Side Material Description: Concrete

specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: Good

26.2 Condition description:

26.3 Bottom/lining material description Concrete

specify "other" bottom material:

27 Culvert segment retrofit

27.1 Retrofit Type None

Detailed Survey Information

GIS Number	SM	1	37.09

27.2 Condition:

27.2 Outlet Sill?: No

Segment Number 2

20 SEGMENT DESCRIPTION (describe any unique features of the segment)

Concrete pipe at inlet.

21 SEGMENTShape Information

21.1 Segment Shape: Circular Pipe

21.2 Diameter (ft): 7

21.3 Height/Rise (ft)

21.4 Width/Span (ft)

21.5 Length (ft): 140

21.6 Culvert segment shape description (describe uniqueness of shape)

22 Mean Low Flow Indicator

22.1 Stain (rust) Line Height (ft)

23 Inlet information

23.1 Type: Wingwall

23.2 Alignment (Inlet to Channel): < 30 Deg

23.3 Inlet description (describe apron type, shape, material and other features influencing fish passage):

4' dia. CMP outlet at 45-degree north and inlet wingwall

23.4 Inlet Apron: Yes

23.5 Inlet Apron Upstream Width (ft): 7

23.6 Inlet Apron Downstream Width (ft): 7

23.7 Inlet Apron Length (ft)

23.8 Inlet Apron Slope (%)

24 Outlet information

24.1 Type: Segment connection

24.2 Alignment (Outlet to Channel)

24.3 Outlet description (describe apron type, shape, material and other features influencing fish passage):

24.4 Outlet Configuration: Unknown

24.5 Fish ladder:

24.6 Outlet Apron:

24.7 Outlet Apron Upstream Width (ft)

24.8 Outlet Apron Downstream Width (ft)

24.9 Outlet Apron Length (ft)

24.10 Outlet Apron Slope

25 Segment side materials

25.1 Condition: Good

25.2 Condition Description:

25.3 Side Material Description: Concrete Pipe (Cast-in-place)

specify "other" side material:

26 Segment bottom/lining material

26.1 Condition: good

26.2 Condition description:

26.3 Bottom/lining material description: Concrete Pipe (Cast-in-place)

specify "other" bottom material:

27 Culvert segment retrofit

Detailed Survey Information

GIS Number	SM	1	37.09

27.1 Retrofit Type: None

27.2 Condition:

27.2 Outlet Sill?: No

Survey Results

CDFG Matrix Site Ranking

Active Channel Width (ft.)	5.150	(mean of 5 field measurements)
Maximum Slope (%)		(max. of collected data)
Baffles/Weirs?	0	

Residual Input/Output

Residual Inlet Depth (ft.)	
Residual Outlet Ddepth (ft.)	
Culvert #	1
Substrate Throughout?	No

Passage Evaluation For Site

Fish Crossing Results for Site