Post Project Appraisal of Village Creek Restoration, Albany, CA

Melissa Asher
Dept. of Civil and Environmental Engineering
University of California, Berkeley

Kaumudi Atapattu
Dept. of Environmental and Civil Engineering
University of California, Berkeley

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Dr. Mathias Kondolf
University of California, Berkeley

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ABSTRACT

Village Creek, located in Albany, California, is the lower tributary of Marin Creek. In 1998, the University of California at Berkeley daylighted a 900-foot stretch of the Creek and restored it to an 1,125 feet long open channel flanked by 0.77 acres of riparian and aquatic habitat. The objective of the project was to increase aquatic habitat, provide conveyance for a 100-year flood, and recreate the natural stream dimensions for a bankfull channel, floodplain, and upper bank. This appraisal evaluates the current hydraulic and geomorphological conditions to determine the change from initial implementation and design. The study of the newly formed channel complexity showed changes in gravel and sand bars, as well as pools, riffles, and glides. A comparison between the current state of the creek and the intended design allowed the determination of extent to which the restoration meets the intended goals. Longitudinal and cross-sectional surveys along with channel mapping revealed an increase channel complexity and minor changes in the channel shape. In addition, an evaluation of the vegetation shows significant improvement in the riparian habitat. However, there was no observed development in aquatic habitat in Village Creek.

INTRODUCTION

Village Creek, located in Albany, California, is the lower tributary of Marin Creek (Figure 1). It drains approximately 0.15 square miles (mi^2) and runs from the intersection of Marin Avenue and Peralta Street and discharges into the San Francisco Bay tidal marsh near Golden Gate Fields racetrack. Before restoration in 1998, a 2000-foot culverted portion of Village Creek ran underneath University Village. The 1998 restoration of the creek was sponsored by the University of California as part of the housing redevelopment project and advance mitigation for impacts it expected to make to the Codornices Creek bypass channel on the western end of the site (K. H, Lichten, San Francisco Bay Regional Water Quality Control Board, personal communication, December 2005). The University planned to daylight a 900-foot section of the culvert into a creek fenced in between the University Village housing and a local school, and restore it into a 1,125-foot open channel (Figure 2). In addition, the restoration called for the development of 0.77 acres of riparian vegetation and aquatic habitat. This post project appraisal examines the current state of the creek and the extent to which the restoration achieved its goals.

The University of California, Berkeley, undertook the restoration project in order to obtain advance mitigation credit for impacts to the Codornices Creek bypass at the western end of the University Village housing construction site (K. H. Lichten, San Francisco Bay Regional Water Quality Board, personal communication, December 2005). The goals of the project included recreating the natural stream dimensions for a bankfull channel, floodplain, and upper bank and providing flood protection for a 100-year flood (A.L. Riley, Waterways Restoration Institute, personal communication, November 2005). Other goals included increasing riparian and aquatic habitat.

In order to recreate the natural stream dimensions, using the 700-foot reach between San Pablo and Jackson Streets and regional channel geometry for the East Bay as a reference, the University and Waterways Restoration Institute decided on a ‘stable’ equilibrium channel that is 5 feet wide, 1-foot deep, with an 18-25 foot floodplain (Waterways Restoration Institute,1998). The design of the floodplain allowed for a sinuosity of 1.6, i.e. a channel length of 160 feet for every 100 feet of straight-line distance along the narrow creek corridor, with an optimum meander width of 20 feet. The grade from the floodplain to the upper bank was 2.3:1 (Waterways Restoration Institute, 1998). The channel map shows the as-built design (Figure B.1-3).

The restoration of riparian vegetation and habitat included the strategic planting of several different native species along the floodplain, bankfull channel, and upper bank slope (Table B.1). The Waterways Restoration Institute planted big leaf maple, buckeye, and bay on the upper bank slope, willow, cottonwood, and alder on the bankfull channel canopy, and dogwood, ninebark, and snowberry on the floodplain. The bank of the channel had willow and cottonwood installed to secure the channels shape and stability and provide shade for the stream. Use of small quantities of snowberry and other herbaceous plants intended to increase plant diversity, while the big leaf maple, bay, and buckeye added at 20-foot intervals provided a riparian canopy.

Given the design parameters and the post-project state of Village creek, the purpose of this post project appraisal is to evaluate how Village Creek has evolved since its daylighting in 1998. This appraisal hopes to answer the following questions:

- How has the channel shape changed from the initial design and implementation?
- How has aquatic habitat and vegetation evolved since the initial implementation?

- Does the current state of the creek meet expectations set in the initial design and were project goals met?

In answering these questions, we will determine overall project success.

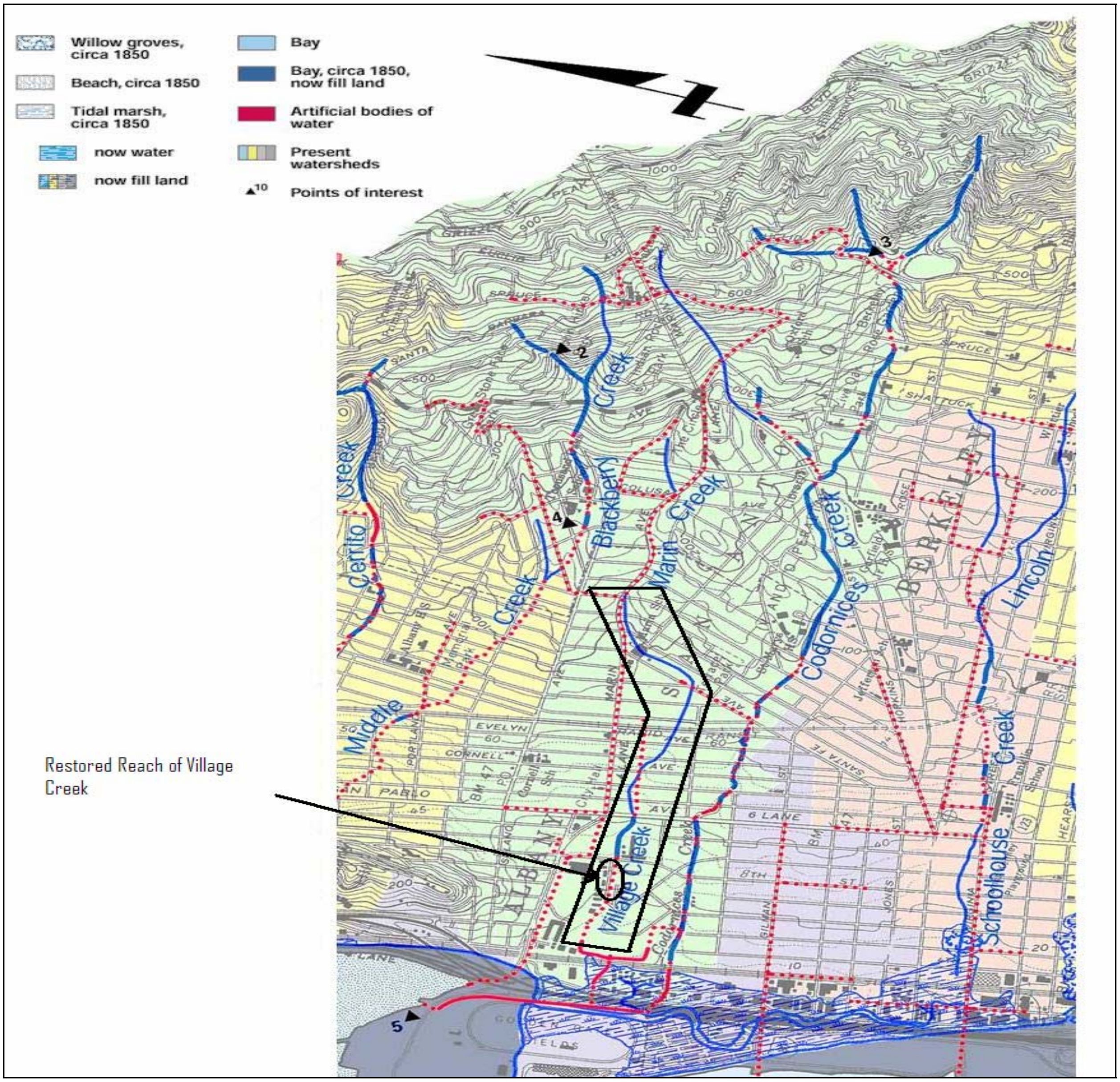

Figure 1. Layout of East bay creeks. Location of Village Creek is marked by the boxed in area. The circled portion was restored and is the focus of this study. Source: The Oakland Museum of California Creek and Watershed Information

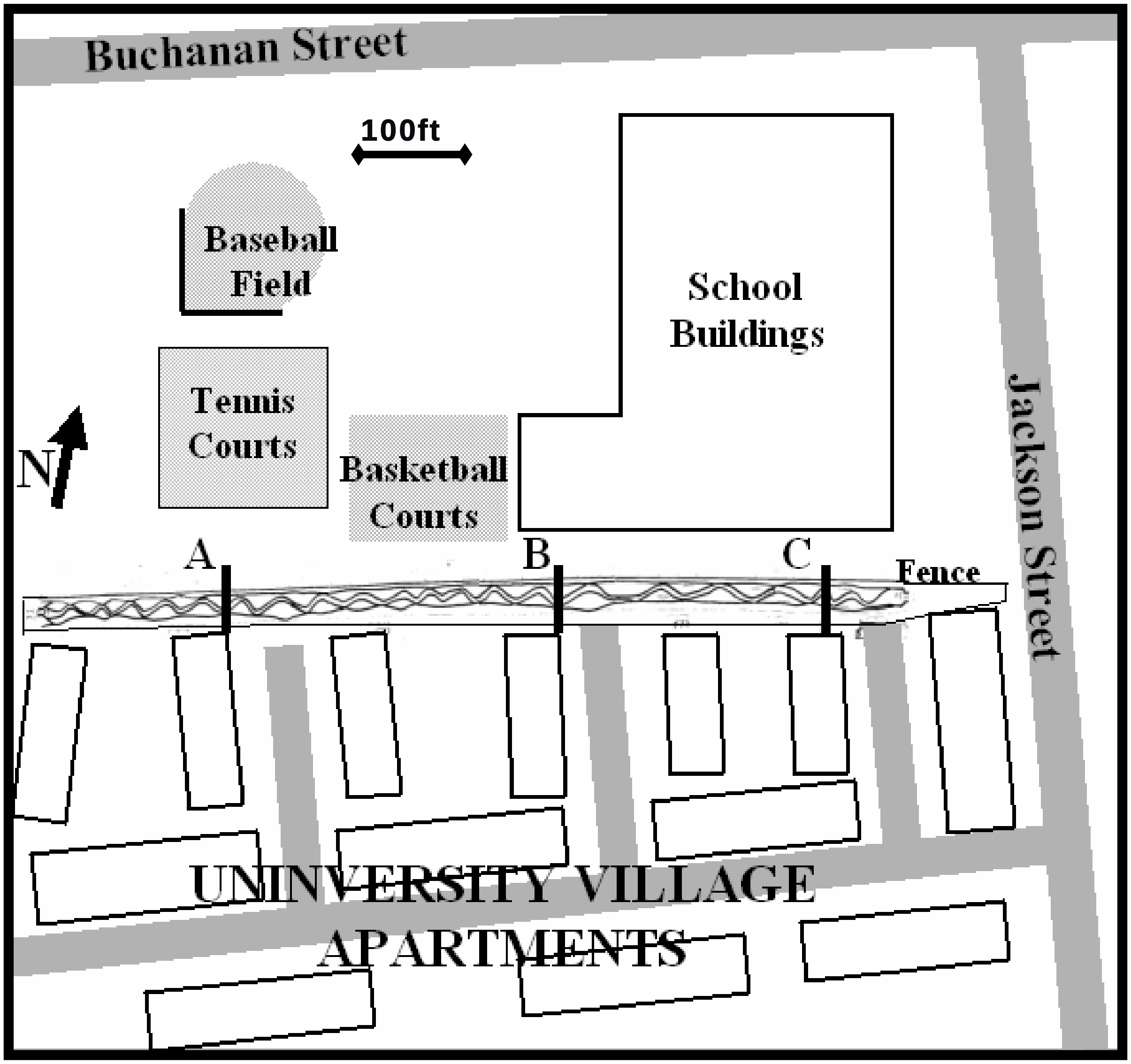

Figure 2. Site map

METHODS

To evaluate how the channel shape has changed since restoration in 1998 we examined the slopes of the channel floodplain, banks, and bed, the thalweg, and the sinuosity of the channel by collecting cross-sectional, longitudinal, and channel map data. The evaluation of channel shape helped to study the development of the channel form since restoration and the change in aquatic habitat, while vegetation surveys allowed study of the growth in Village Creek's riparian vegetation. Figure 3 provides a schematic of the creek.

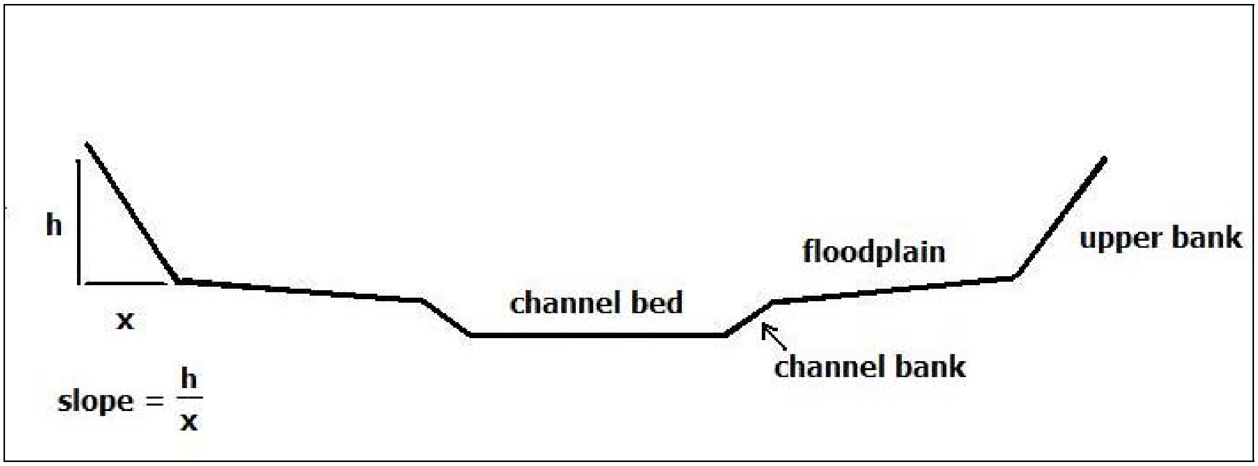

Figure 3. Schematic of creek

Cross-sections and Longitudinal Profiles

The University hired J. R. Roberts Corporation, to complete three perpendicular and two angled cross-sections (Figures B.4-8) and a longitudinal profile after the initial construction in 1998 (Figure B.9). For comparison, we measured current cross-sections and longitudinal profile. J.R. Roberts based the original cross-sections and profile elevations off a benchmark located at the South East top corner of the upstream culvert wing wall. We used the same benchmark for the current longitudinal profile. We could not locate the rebar used as benchmarks for the original cross-sections, so we surveyed cross-sections at the same linear distances from the upstream culvert as the original cross-sections, taking the elevation from the benchmark for the longitudinal profile. For completeness of study, we noted vegetation types along the cross-section. From the surveyed cross-sections, we determined current upper bank slopes, floodplain size and riparian vegetation. From the longitudinal profile, we determined changes in the pool/riffle structure.

We surveyed with an automatic level and metric tape, running the tape along the centerline and the thalweg for the long profile, measuring water depth in the standing pools with the rod. We marked turning points as necessary and closed the survey at the end of the long profile measurement.

Channel Mapping

In this appraisal, we constructed a simple channel map showing bed material and floodplain shape, which we compared to a 1998 as-built channel map. Both maps used distance downstream from the upstream culvert as measure of distance, allowing us to compare the as-built sinusoidal channel with the current channel.

Vegetation Survey

Using the California Native Plant Society-Vegetation Rapid Assessment method, we surveyed the vegetation along the creek and compared it to the list of planted vegetation on the floodplain and bank.

RESULTS AND DISCUSSION

Longitudinal Profile Survey

As seen from the longitudinal profile data (Tables A.1-2), the thalweg distance of the channel from the upstream culvert to the downstream culvert is 860 feet. This distance is 120 feet longer than the 740-foot distance given as the longitudinal length in the as-built data (Table B.3) and 265 feet shorter than the expected 1,125 feet initially given as the restored channel length. We measured the straight-line distance from the upstream to downstream culvert as 740 feet. Clearly, the 740 feet given in the as-built profile is the straight-line distance and not the channel length. Since we conducted the longitudinal profile along the thalweg, as is standard practice, we scaled this data to linear feet from the upstream culvert by assuming a linear relationship between linear and longitudinal distance from the upstream culvert. Even though, this is not an accurate representation of the thalweg measured off the linear distance, it does give a rough comparison of how the bed has developed.

The channel has become more complex since its first construction in 1998 (Figure 4). The elevation of the creek in the mid-section, from approximately 100 feet to 500 feet from the upstream culvert, has eroded resulting in a less uniform channel slope than the as-built channel.

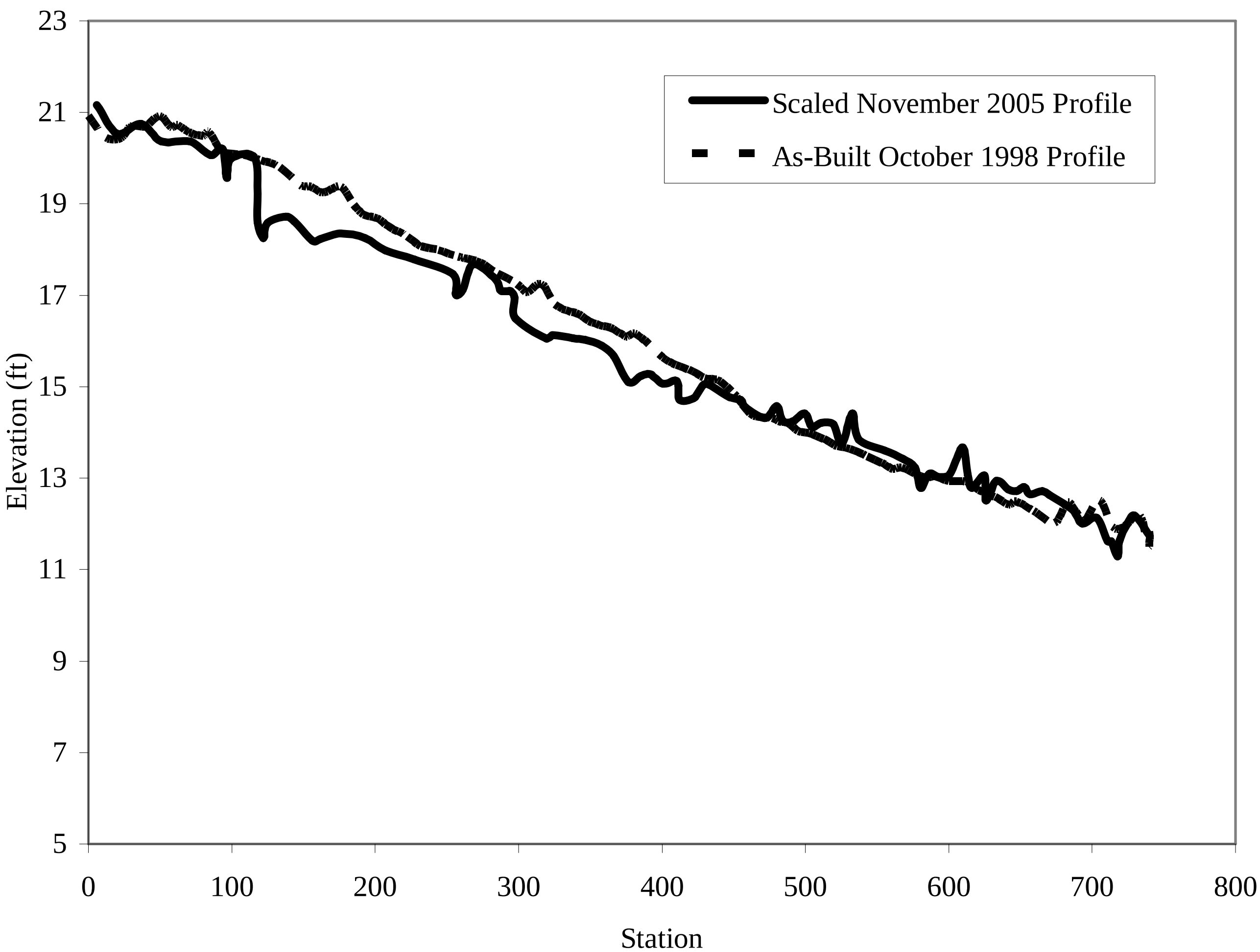

Figure 4: Scaled Long Profile Comparison

Some areas of the channel have scoured to form small pool areas, increasing the possibility of aquatic habitat in the creek. However, the lack of base flow eliminates the possibility of sustainable aquatic habitat year round, while only providing habitat for birds and insects during the rainy season.

A graph of the longitudinal profile reveals that the channel ranges from an elevation of 21.16 at the upstream culvert to an elevation of 11.74 at the downstream culvert. The pool and riffle structure of the channel currently consists of a mostly dry bed with several small pools of standing water with the largest pool at around 830 feet from the upstream culvert and a large,

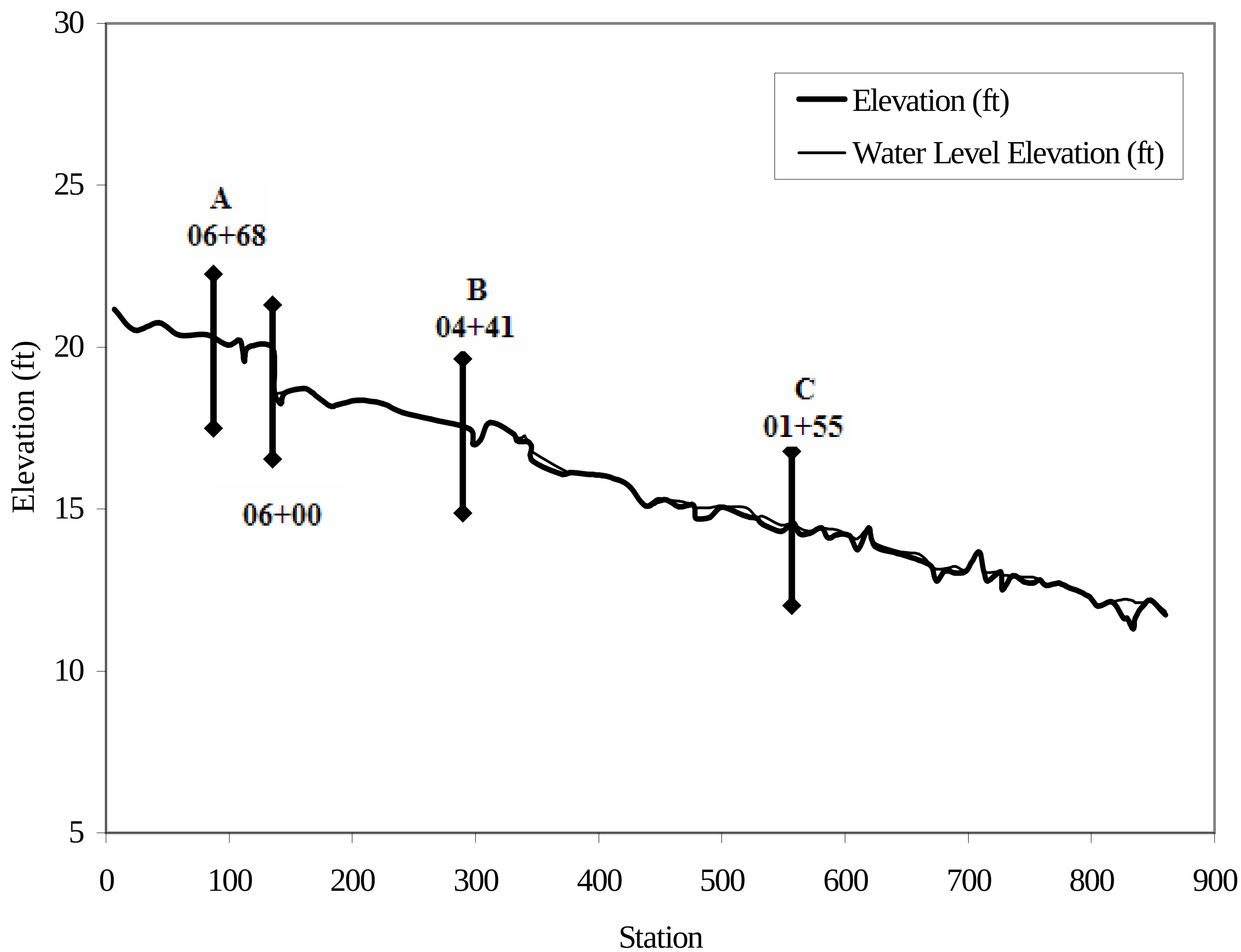

Figure 5: Longitudinal Profile with Water Depth (November 2005)

scour pool around at Station 06+00 (Figure 5). The thalweg of the channel is approximately 860 feet long, thus the average channel slope is 0.011 feet/feet, same as that of the as-built slope (Table A.2). It is evident therefore that even though the average channel slope is the same as the as-built slope, the complexity of the channel's thalweg has changed.

In attempting to resolve the discrepancy between the 1,125 feet channel length shown on design documents with our actual measured length of 860 feet, we were told that the University of California had illegally filled the downstream 265 feet (Figure B.3). We also observed storm drains discharging into this reach of the creek at station 04+55 and station 01+70. These do not appear on the original creek design. The Regional Water Quality Board cited the University for both violations (A.L. Riley, Waterways Restoration Institute, personal communication, November 2005 and K.H. Lichten, San Francisco Bay Regional Water Quality Control Board, personal communication, December 2005, Appendix C).

Cross-sectional Surveys

The three completed cross-section surveys showed slight changes in channel form. Cross-Section A at station 06+68 (Figure 6) shows the current ground elevation, water level elevation and the as-built ground elevation. As seen from the figure, there was a slight change in the channel bed. Due to both deposition in channel bed and erosion along channel bank, the left bank is now less distinct. The current left upper bank slope has a grade of 1.5 and the right slope a grade of 2.4. The as-built slopes were at a grade of 1.57 and 2.56 for the left and right upper banks, respectively. Since we are unlikely to be at the exact same location as the original cross-section, these slight changes do not conclusively indicate change in slope. The incision of the channel bed has resulted in the formation of a stagnant pool in this area with 0.09 feet of water, which has no noticeable aquatic life.

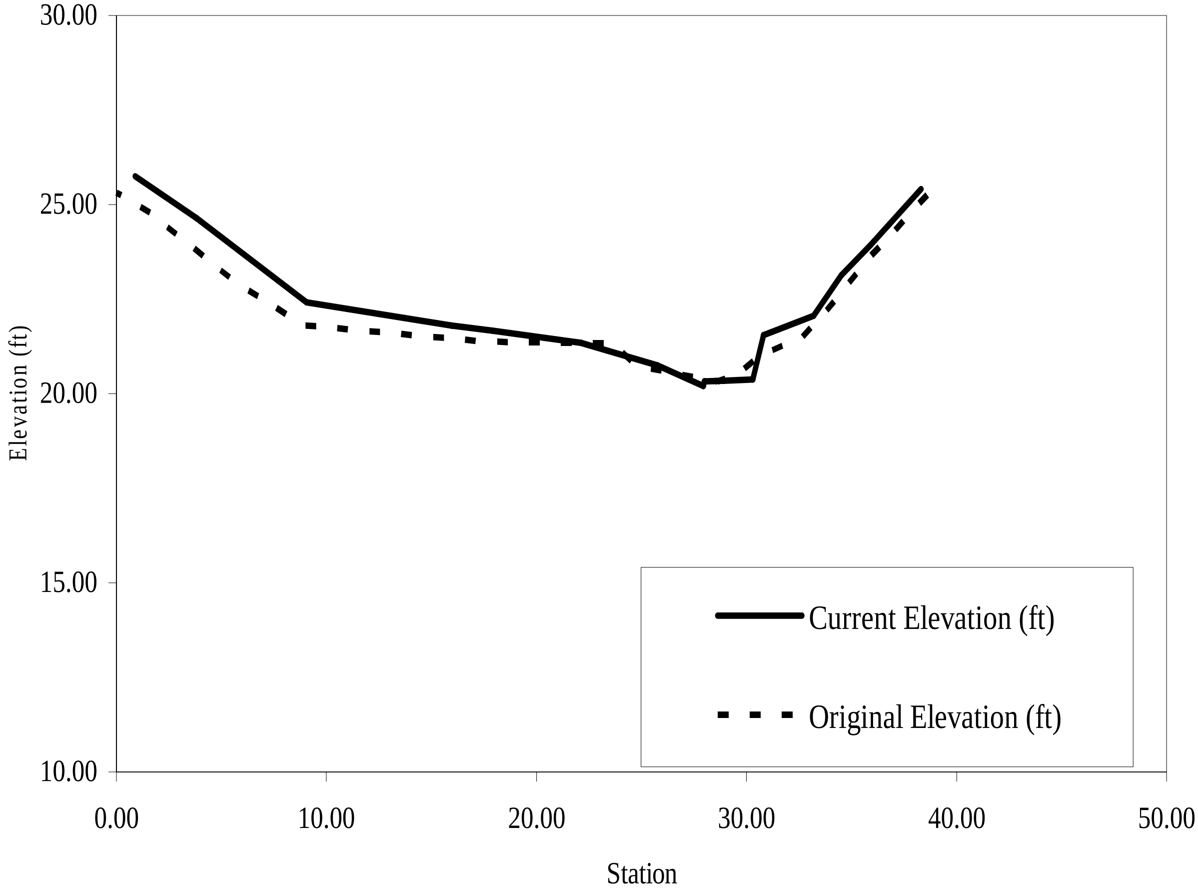

Figure 6. Cross-section A (06+68) - Looking Downstream

In Cross-Section B at station 04+41 (Figure 7), it is evident that there is significant scour of the channel bed. The originally designed channel bed was at an elevation of 17.1 feet above Mean Sea Level, while the new elevation of the bed is at 16.07 feet, implying almost 1 foot of scour. There is also some erosion of the right and left bank due to this incision. The as-built slopes were at a grade of 1.59 and 2.4 for the left and right upper banks respectively. The current upper bank slopes have a grade of 1.66 and 2.67, indicating little change in upper bank slope.

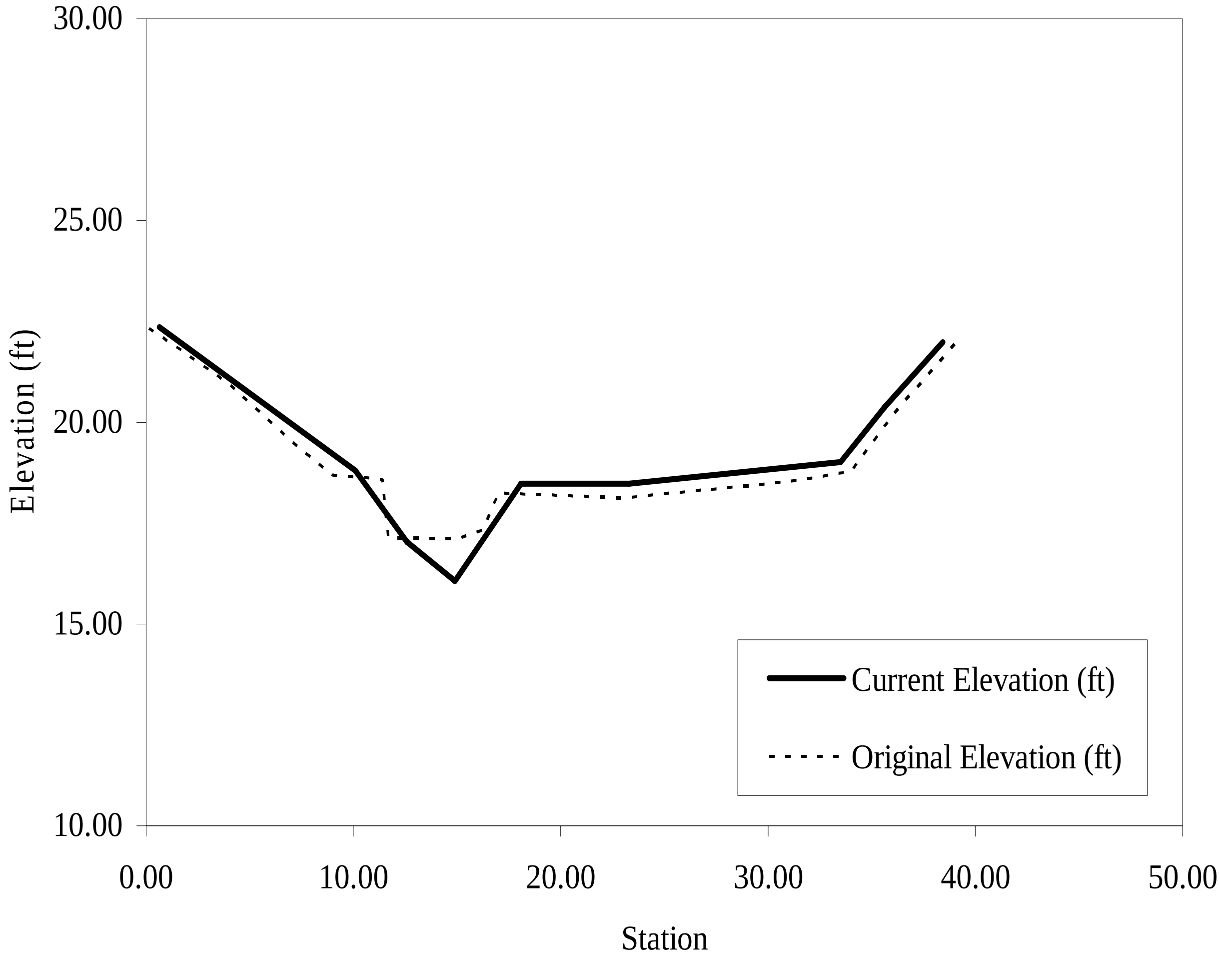

Figure 7. Cross Section B (04+41) - Looking upstream

Cross-Section C at station 01+55 is located at the apex of a meander bend (Figures A1-3) and its cross-section (Figure 8) shows significant deposition on the right, inside bank with no significant change in upper bank slope. The as-built left and right upper bank slopes had a grade of 1.9 and 1.13 respectively, while the current slopes were had grade of 1.88 and 1.16. This figure also shows deposition of sediment on the left, outside bank of the channel bed. This type of bed evolution is congruous with the fact that the cross-section is a turning point in the meander, where velocities on the inside of the channel curve are significantly less than those on the outside of the channel. However, in this case, the area of sediment erosion is less than the area of sediment deposition. Therefore there has been more deposition on the inside bank than erosion on the outside bank, resulting in a reduction of the bed flow capacity.

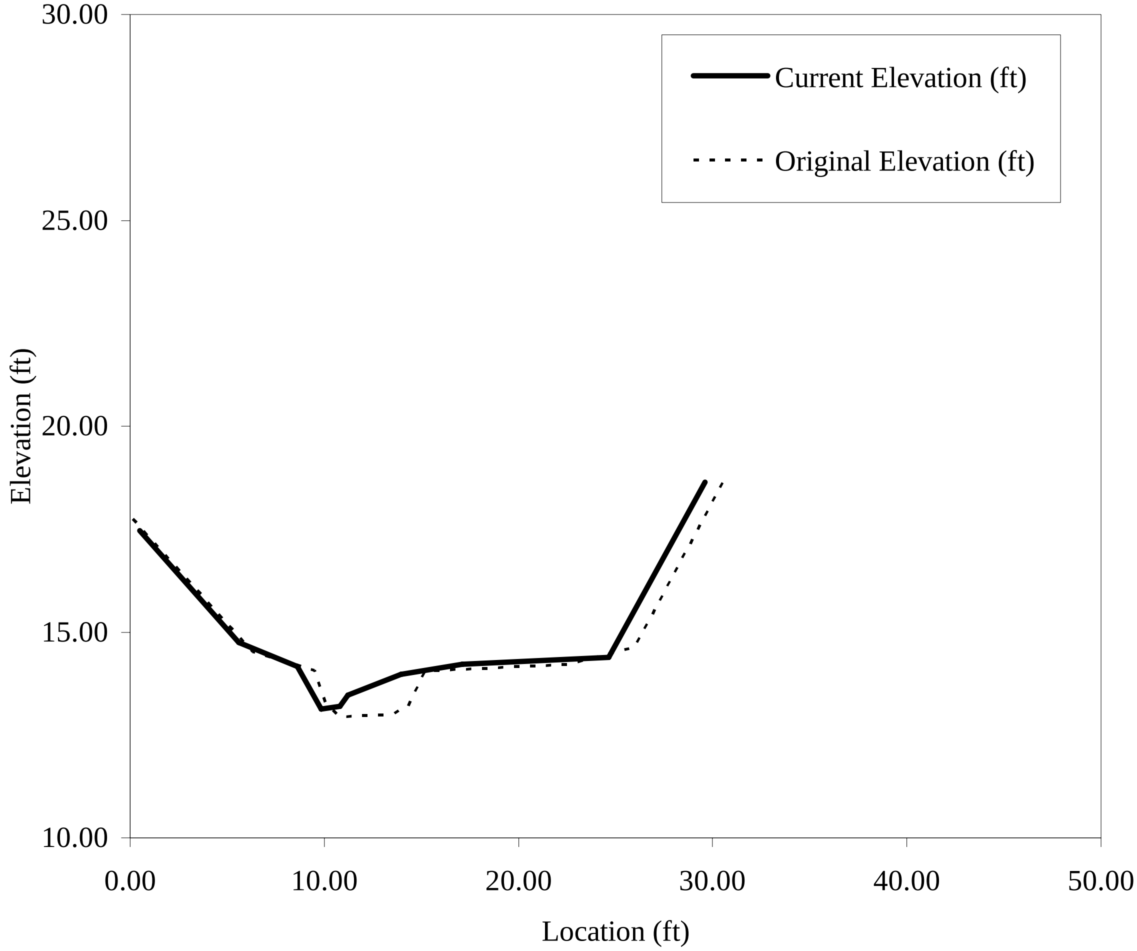

Figure 8. Cross Section C (1+55) - Looking upstream

Vegetation Survey

The vegetation survey conducted concurrently with the cross-sectional surveys (Tables A.4-6) and the Vegetation Rapid Assessment (Table 1), indicate presence of dense riparian habitat with nearly 100% canopy cover. There are also small shrub and herbaceous cover present. For a complete vegetation assessment, please refer to Table A.7.

Table 1: Vegetation Rapid Assessment of Native Species. The assessment was conducted using the protocol of the California Native Plant Society. Stratum categories: L=low, M=medium, and T=tall.

Species:			
Strata	**Species**	**Common Name**	**% Cover**
L	*Acer Macrophyllum*	Big leaf maple	<19%
M	*Salix sp.*	Willow	15-25%
M	*Baccharis pilularis*	Coyote bush	<10%
L	*Misc. forbs/grasses*	-	10-30%
M	*Cornus stolinifera*	Red stem dogwood	<1%
L	*Ribes sanguineum*	Pink flowering currant	<5%
L	*Symphoricarpos albus var. laevigatus*	Snowberry	<1%
T	*Alnus rhombifolia*	White alder	<5%
M	*Typha latifolia*	Cattail	<1%
L	*Rubus ursinus*	Pacific blackberry	<1%

The daylighting included planting of extensive riparian vegetation including alders, willows, and cottonwoods for channel canopy, snowberry, ninebark and dogwood for bank stability and maple, buckeye and bay as upper bank canopy. Of these, the alders and willows thrived while the snowberry was partially successful in providing floodplain stability. Of the three species used for upper bank canopy, only the maple survived. The dominant tree present was *Alnus rhoraifolia* (Alder) and the dominant shrub was *Salix sp.* (willow). The site contained the coyote bush, currant, and blackberry species, which were not originally planted (WRI 1998). The only non-native species found was the *Acacia macradenia*.

Of the species found, the hardwoods fell within the height class 01 (1 meter or less) and 05 (5-10 meters). The maximum observed tree height was approximately twenty-five feet with a trunk diameter of 6 inches. We also found numerous miscellaneous grasses on the floodplain and upper bank as well as many areas absent of groundcover, which could increase bank erosion.

Channel Mapping

The channel map shows the evolution of the channel bed since 1998. The general shape of the channel has not significantly changed except for slight movement in some meanders (Figures A.1-3 and B.1-3). One significant difference is that the current channel bed changes directions 41 times during the 740 feet between the two culverts, while the as-built channel shape included 42 changes. The bend located at approximately 250 feet from the upstream culvert (04+90) has straightened since the restoration. We found that there is 860 feet of meander for the 740 linear foot reach. This results in approximately 116 feet of meander per 100 linear feet. Although we do not know the as-built meander length, the design called for 160 feet of meander per 100 linear feet. Therefore, the current channel contains about 324 feet less meander than the original design. Considering the channel shape has not changed significantly, except for the loss of one meander bend, the as-built meander length could not have been the design length of 160 feet per 100 linear feet. It would have been slightly larger than the current ratio of 116 feet of meander to 100 linear feet.

CONCLUSION

The longitudinal profile, cross-sections, channel map and vegetation survey gave insight regarding the evolution of the creek since restoration in 1998. Overall, the Village Creek restoration reached its goal of daylighting and improving riparian habitat. However, it fell short on the improvements to aquatic habitat and in creating a sustainable creek.

Study of the vegetation mapping shows that most of the species used for channel canopy survived while those used for floodplain and upper bank canopy and stabilization failed to thrive. High flows may have washed out some of the floodplain species, while some of the upper bank canopy species did not survive due to competition from the channel species, such as willow and alder. It is also possible that the dry season groundwater table is too low for vegetation establishment. The creek may provide habitat for macro-invertebrates during the wet season, drawing native birds to the area that may nest in the riparian vegetation. However, there was no flow during our study, so we could not assess potential habitat. It is very unlikely that there will be any fish supported in this stream year-round since it dries up during the summer season and it is culverted at both ends in this reach as well as most of the remaining length and.

Scour pools along the channel and changes in the cross-sections show evidence of sediment erosion and deposition along the channel banks. The longitudinal profile and the channel map show a headcut, approximately 140 feet from the upstream culvert (station 06+00), that forms the largest pond in this channel. Considering the Waterways Restoration Institute designed the channel length to be approximately 1180 feet (160 channel feet per 100 linear feet) and the actual channel length is significantly less at approximately 860 feet (116 channel feet per 100 linear feet), the slope of the channel along this reach is too steep for this reach. We believe that this steep slope contributed to the formation of this headcut, which will likely move upstream creating even further erosion along the upstream channel bed. Since the upstream end of the channel is culverted, there is no sediment supply for the creek, resulting in the continued erosion of sediment in the upstream end and deposition in the downstream bed and culvert. If this pattern of upstream erosion continues, the current headcut will progress up the channel, eventually leading to undercutting of the culvert, while the downstream region will continue to build-up sediment, causing a decrease in the bed capacity and a decrease in the overall channel slope. The build up of sediment on the downstream end can result in flooding of this portion of the creek during high flows while the increased capacity of the scouring pool in the middle portion of the creek can lead to flooding near the upstream culvert. In the future, sediment augmentation may become necessary to replenish the lost sediment in the middle reach. We recommend installation of rock or log weirs to minimize channel erosion as well as close monitoring of the headcut.

The project was an overall success and accomplished two of its three goals by daylighting the creek and improving riparian vegetation. However, Village Creek has further potential for success by allowing community access to the site. Although the original goals did not include community involvement, this urban creek could become a living classroom and a play area for the border school and University Village community in future years.

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APPENDIX A: Post Project Appraisal Data

Table A.1: Longitudinal Profile- Raw Data

November 3, 2005
Surveyed by Melissa Asher and Kaumudi Atapattu

Station (meters from upstream culvert)	Back Shot (m)	Front Shot (m)	Water Level (m)	Elevation (m)	Waterlevel Elevation (m)	Notes
SE Base of Culvert	1.56					
Culvert Height						1.5
SE Top of Culvert				8.05		
Bottom Rebar #1		0.36364				
Top Rebar #1	0.095			8.11		
Bottom Rebar #1	0.37			7.74		
2		1.7	0	6.41	6.41	
7		1.89	0	6.22	6.22	
13		1.825	0	6.29	6.29	
18		1.94	0	6.17	6.17	
25		1.94	0	6.17	6.17	
30		2.03	0	6.08	6.08	
TP 1	1.45					
33		1.41	0	6.12	6.12	
34		1.605	0	5.93	5.93	small pool
35		1.475	0	6.06	6.06	small pool
41		1.48	0	6.05	6.05	standing pond
41.5		1.895	0.01	5.64	5.65	standing pond
43		2	0.1	5.53	5.63	standing pond
44		1.9	0.01	5.63	5.64	standing pond
48.5		1.86	0	5.67	5.67	near sand bar- scoured
50.5		1.89	0	5.64	5.64	near sand bar- scoured
TP 2	1.33					
55		1.46	0	5.51	5.51	
57		1.45	0	5.52	5.52	gravel bar
62		1.41	0	5.56	5.56	
68		1.44	0	5.53	5.53	
73		1.525	0	5.45	5.45	
TP 3	1.01					
80		1.07	0	5.39	5.39	
89.5		1.165	0	5.29	5.29	
90.3		1.305	0	5.15	5.15	
92		1.27	0	5.19	5.19	
94.5		1.1	0	5.36	5.36	
100		1.2	0	5.26	5.26	illegal storm drain entrance
TP 4	1.22					
101		1.29	0.03	5.19	5.22	edge of water
102		1.3	0.03	5.18	5.21	
103		1.3	0.05	5.18	5.23	
103.7		1.3	0	5.18	5.18	water ends
104.7		1.34	0	5.14	5.14	pool begins

104.9		1.48	0.08	5.00	5.08	
112.3		1.61	0.05	4.87	4.92	
114.1		1.59	0	4.89	4.89	
119		1.61	0	4.87	4.87	
TP 5	1.28					
122		1.29	0	4.86	4.86	
126		1.33	0	4.82	4.82	
129		1.4	0	4.75	4.75	
132.6		1.57	0.01	4.58	4.59	
135.8		1.53	0.03	4.62	4.65	
138		1.52	0	4.63	4.63	
141		1.58	0.05	4.57	4.62	
TP 6	1.21					
144.2		1.19	0	4.59	4.59	
144.9		1.225	0	4.55	4.55	big pool
145.2		1.32	0.1	4.46	4.56	
148.6		1.31	0.09	4.47	4.56	
151		1.22	0.02	4.56	4.58	
152.5		1.22	0.01	4.56	4.57	
157.5		1.3	0.08	4.48	4.56	slightly braided
160.2		1.32	0.01	4.46	4.47	slightly braided
161.5		1.37	0.07	4.41	4.48	
166.2		1.44	0.06	4.34	4.40	
169		1.36	0	4.42	4.42	
TP 7	0.8					
170.6		0.9	0.05	4.32	4.37	
173		0.9	0.02	4.32	4.34	
176		0.85	0	4.37	4.37	
177.8		0.94	0.08	4.28	4.36	
180		0.91	0.04	4.31	4.35	
183		0.92	0	4.30	4.30	
185		1.05	0.1	4.17	4.27	
187.6		0.85	0	4.37	4.37	
189.2		1.02	0.03	4.20	4.23	
195.5		1.095	0.02	4.12	4.14	
200		1.15	0.055	4.07	4.12	2.5 feet from tree with green ribbon
TP 8	1.105					
203		1.165	0.01	4.01	4.02	
204.35		1.3	0.11	3.87	3.98	
206.5		1.205	0.02	3.97	3.99	
209		1.225	0.06	3.95	4.01	
211.6		1.205	0.01	3.97	3.98	
214.7		1.03	0	4.14	4.14	
216		1.21	0	3.96	3.96	
217		1.3	0.08	3.87	3.95	
220.1		1.215	0	3.96	3.96	
220.5		1.38	0.14	3.79	3.93	
223		1.25	0	3.92	3.92	
226		1.31	0.05	3.86	3.91	
228		1.32	0.06	3.85	3.91	
229.8		1.29	0	3.88	3.88	

231.2		1.34	0.01	3.83	3.84	
234.25		1.32	0.01	3.85	3.86	
236		1.345	0	3.83	3.83	
241.6		1.44	0	3.73	3.73	
TP 9	1.295					
244		1.39	0	3.64	3.64	
247.6		1.35	0	3.68	3.68	
250.3		1.505	0.18	3.52	3.70	
251.25		1.505	0.18	3.52	3.70	
252.7		1.605	0.265	3.42	3.69	
253.3		1.5	0.145	3.53	3.67	
255		1.395	0.04	3.63	3.67	
257		1.335	0	3.69	3.69	
260.7		1.47	0.03	3.56	3.59	Downstream culvert

Table A.2: Longitudinal Profile- Calculated Elevations

November 3, 2005

Data Processed by Melissa Asher and Kaumudi Atapattu

Station (ft)	Elevation (ft)	Water Level Elevation (ft)
6.6	21.161	21.161
23.1	20.534	20.534
42.9	20.7485	20.7485
59.4	20.369	20.369
82.5	20.369	20.369
99	20.072	20.072
108.9	20.204	20.204
112.2	19.5605	19.5605
115.5	19.9895	19.9895
135.3	19.973	19.973
136.95	18.6035	18.6365
141.9	18.257	18.587
145.2	18.587	18.62
160.05	18.719	18.719
166.65	18.62	18.62
181.5	18.191	18.191
188.1	18.224	18.224
204.6	18.356	18.356
224.4	18.257	18.257
240.9	17.9765	17.9765
264	17.7785	17.7785
295.35	17.465	17.465
297.99	17.003	17.003
303.6	17.1185	17.1185
311.85	17.6795	17.6795
330	17.3495	17.3495
333.3	17.1185	17.2175
336.6	17.0855	17.1845
339.9	17.0855	17.2505
342.21	17.0855	17.0855
345.51	16.9535	16.9535
346.17	16.4915	16.7555
370.59	16.0625	16.2275
376.53	16.1285	16.1285
392.7	16.0625	16.0625
402.6	16.0295	16.0295
415.8	15.8975	15.8975
425.7	15.6665	15.6665
437.58	15.1055	15.1385
448.14	15.2375	15.3365
455.4	15.2705	15.2705
465.3	15.0725	15.2375
475.86	15.1385	15.1385
478.17	15.023	15.023

479.16	14.7095	15.0395
490.38	14.7425	15.0395
498.3	15.0395	15.1055
503.25	15.0395	15.0725
519.75	14.7755	15.0395
528.66	14.7095	14.7425
532.95	14.5445	14.7755
548.46	14.3135	14.5115
557.7	14.5775	14.5775
562.98	14.2475	14.4125
570.9	14.2475	14.3135
580.8	14.4125	14.4125
586.74	14.1155	14.3795
594	14.2145	14.3465
603.9	14.1815	14.1815
610.5	13.7525	14.0825
619.08	14.4125	14.4125
624.36	13.8515	13.9505
645.15	13.604	13.67
660	13.4225	13.604
669.9	13.2245	13.2575
674.355	12.779	13.142
681.45	13.0925	13.1585
689.7	13.0265	13.2245
698.28	13.0925	13.1255
708.51	13.67	13.67
712.8	13.076	13.076
716.1	12.779	13.043
726.33	13.0595	13.0595
727.65	12.515	12.977
735.9	12.944	12.944
745.8	12.746	12.911
752.4	12.713	12.911
758.34	12.812	12.812
762.96	12.647	12.68
773.025	12.713	12.746
778.8	12.6305	12.6305
797.28	12.317	12.317
805.2	12.0035	12.0035
817.08	12.1355	12.1355
825.99	11.624	12.218
829.125	11.624	12.218
833.91	11.294	12.1685
835.89	11.6405	12.119
841.5	11.987	12.119
848.1	12.185	12.185
860.31	11.7395	11.8385

Avg Channel Slope	0.011

Table A.4: Cross Section A- Data and Vegetation List

Location: 72 ft from upstream culvert
Surveyed by Melissa Asher and Kaumudi Atapattu
November 17, 2005
Data Measured from Right Bank

Location	BS	FS	Elevation (ft)	Water Depth (ft)	Notes/Vegetation
Base of Rebar #1	1.1		25.55		
0.90		1.24	25.41	0.00	Toyon
3.30		2.72	23.93	0.00	Toyon & Misc. grasses
4.70		3.52	23.13	0.00	Grasses & acacia (non-native)
6.00		4.60	22.05	0.00	Toe of slope
8.40		5.10	21.55	0.00	Scilix (willow), edge of terrace
8.90		6.28	20.37	0.00	Willow, baccaris, coyote bush (pilularius)
10.30		6.31	20.34	0.00	Beginning of channel
11.20		6.32	20.33	0.00	Edge of water, sage
11.25		6.44	20.21	0.09	Thalweg
13.45		5.91	20.74	0.00	Beginning of terrace, grasses
17.10		5.30	21.35	0.00	Exposed soil, grasses
21.30		4.99	21.66	0.00	Soil
23.25		4.84	21.81	0.00	Alder, d=4", h=25'
30.15		4.24	22.41	0.00	Edge of terrace, acacia
35.40		2.00	24.65	0.00	Acacia
38.30		0.90	25.75	0.00	Top, acacia

	Left Slope	Right Left
Grade	1.5	2.4
Design Grade	2	2

Table A.5: Cross Section B- Data and Vegetation List

Location: 299 ft from upstream culvert
Surveyed by Melissa Asher and Kaumudi Atapattu
November 17, 2005
Data Measured from Right Bank

Location	BS	FS	Elevation (ft)	Water Depth (ft)	Notes
Base of Rebar #1			25.55		
111 ft to rebar	1.6				
111 ft to TP		3.78			
299ft to TP	3.52		26.89		
0.65		4.90	21.99	0.00	Top of bank, grasses
3.45		6.51	20.38	0.00	Grasses & acacia (non-native)
5.60		7.88	19.01	0.00	Beginning of floodplain, grasses
15.80		8.42	18.47	0.00	Willow
21.00		8.41	18.48	0.00	Edge of floodplain, grasses
24.20		10.82	16.07	0.00	Edge of channel, soil
26.50		9.86	17.03	0.00	In channel, thalweg
29.00		8.08	18.81	0.00	No vegetation
38.45		4.54	22.35	0.00	Rives, grasses, willow, bare soil

	Left	Right
Grade	1.66	2.67
As Built Grade	2.0 - 2.5	2.0-2.3

Table A.6: Cross Section C- Data and Vegetation List

Location: 299 ft from upstream culvert
Surveyed by Melissa Asher and Kaumudi Atapattu
November 17, 2005

Data Measured from Right Bank

Location	BS	FS	Elevation (ft)	Water Depth (ft)	Notes
			26.89		
		6.92			
	1.79		21.76		
0.50		3.12	18.64	0.00	willow/grasses
5.45		7.38	14.38	0.00	Grasses
13.00		7.54	14.22	0.00	alder 25 ft tall, 6" in diameter
16.15		7.79	13.97	0.00	grasses and soil
18.90		8.29	13.47	0.00	Edge
19.30		8.56	13.20	0.00	edge of channel
20.25		8.63	13.13	0.00	Thalweg
21.50		7.60	14.16	0.00	Exposed soil, bank bottom
24.50		7.01	14.75	0.00	Willow, rives
29.60		4.30	17.46	0.00	end, grasses, rives

Table A.7: California Native Plant Society - Vegetation Rapid Assessment

VEGETATION DESCRIPTION						
Size of stand:	< 1 acre					
Tree:	T1 (<1" dbh)	T2 (1-6" dbh)	T3 (6-11" dbh)			
Dominant Type:	*Alnus rhoraifolia* (Alder)					
Herbacious:	H1 (<12" plant ht.)					
% Overstory Conifer/Hardwood Tree cover:		90-100%	**Shrub cover:**	<5%	**Herbaceous cover:**	25-50%
Overstory Conifer/Hardwood height:		20-25'	**Tall Shrub/Low Shrub height:**	1'	**Herbaceous height:**	<1'
Height Class:		05		01		01
Species:						
Strata	**Species**	**Common Name**	**% Cover**			
L	*Acer Macrophyllum*	Big leaf maple	<19%			
M	*Salix sp.*	Willow	15-25%			
M	*Baccharis pilularis*	Coyote bush	<10%			
L	*Misc. forbs/grasses*	-	10-30%			
M	*Cornus stolinifera*	Red stem dogwood	<1%			
L	*Ribes sanguineum*	Pink flowering currant	<5%			
L	*Symphoricarpos albus var. laevigatus*	Snowberry	<1%			
T	*Alnus rhombifolia*	White alder	<5%			
M	*Typha latifolia*	Cattail	<1%			
L	*Rubus ursinus*	Pacific blackberry	<1%			
Major non-native species - with % cover: Acacia, misc. grasses						

CALIFORNIA NATIVE PLANT SOCIETY - VEGETATION RAPID ASSESSMENT FIELD FORM

(Revised Sept. 20, 2004)

For Office Use:	Final database #:	Final vegetation type name:	Alliance ____ Association ____

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION

Polygon/Stand #:	Air photo #:	Date: 11/17/05	Name(s) of surveyors:

GPS waypoint #: ______ **GPS name:** ______ **GPS datum: (NAD 27)** ______ **Is GPS within stand?** Yes / No

If No, cite from GPS point to stand, the distance ______ **(in meters) and bearing** ______ **(in degrees) GPS Error: ±** ______ **ft / m**

UTM field reading: UTME ______ **UTMN** ______ **UTM zone:** ______

Elevation: ______ **ft / m Photograph #'s:** ______

Topography: convex___ **flat**___ **concave**___ **undulating**___ | **top**___ **upper**___ **mid**___ **lower**___ **bottom**___

Geology: ______ **Soil Texture:** ______ **Rock: %Large**___ **%Small**___ **%Bare/Fine:**___ **%Litter:**___ **%BA Stems:**___

Slope exposure (circle one and/or enter actual °): **NE**___ **NW**___ **SE**___ **SW**___ **Flat**___ **Variable**___

Slope steepness (circle one and enter actual °): **0°**___ **1-5°**___ **5-25°**___ **> 25°**___ **Upland** or **Wetland/Riparian** (circle one)

Site history, stand age, and comments: ______

Type/ Level of disturbance (*use codes*): ___/___ ___/___ ___/___ ___/___ ___/___ ___/___ ___/___ ___/___

II. VEGETATION DESCRIPTION

Field-assessed vegetation alliance name: ______

Field-assessed association name (optional): ______

Size of stand: <1 acre ✓ **1-5 acres**___ **>5 acres**___ **Adjacent alliances:** ______

Tree: T1 (<1" dbh), (T2) (1-6" dbh), (T3) (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

If Tree, list 1-3 dominant overstory spp.: Alnus rhombifolia (alder)

Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), S3 mature (1-25% dead), S4 decadent (>25% dead)

Herbaceous: (H1) (<12" plant ht.), H2 (>12" ht.) **Desert Palm/Joshua Tree:** 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

% Overstory Conifer/Hardwood Tree cover: ___/ 90–100% **Shrub cover:** <5% **Herbaceous cover:** 25–50% **Total Veg cover:** ______

Overstory Conifer/Hardwood height: ___/ 20–25' **Tall Shrub/Low Shrub height:** ___/___ **Herbaceous height:** <1'

Height classes: 01=<1/2m 02=1/2-1m 03=1-2m 04=2-5m 05=5-10m 06=10-15m 07=15-20m 08=20-35m 09=35-50m 10=>50m

Species (List up to 12 major species), Stratum, and Approximate % cover: (Jepson Manual nomenclature please)

Stratum categories: T=tall, M=medium, L=low; *% cover intervals for reference*: <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Strata	Species	% cover	Strata	Species	% cover
L	Acer macrophyllum (Big leaved maple)	<1%	L	Symphoricarpos albus var. laevigatus (snowberry)	<1%
M	Salix sp. (willow)	15-25%			
M	Baccharis pilularis (coyote bush)	<10%	T	Alnus rhombifolia (alder)	<5%
L	Misc. forbs/grasses	10-30%	M	Typha latifolia (cattail)	<1%
M	Cornus stolonifera (red stem dogwood)	<1%	L	Rubus ursinus (CA blackberry	<1%
L	Ribes sanguineum (pink flowering currant)	<5%			

Major non-native species - With % cover: Acacia (checking on species), misc grasses

Unusual species: ______

III. PROBLEMS WITH INTERPRETATION

Confidence in identification: (L, M, H) ______ **Explain** ______

Other identification problems (describe): ______

Polygon is more than one type: (Yes, No) ______ (Note: type with greatest coverage in polygon should be entered in above section)

Other types: ______

Has the vegetation changed since air photo taken? (Yes, No) ______ **If Yes, how? What has changed** (write N/A if so)? ______

Figure A.8: Vegetation Rapid Assessment Form (Completed by Shannah Anderson, Department of Landscape Architecture, University of California, Berkeley. Source-California Native Plant Society)

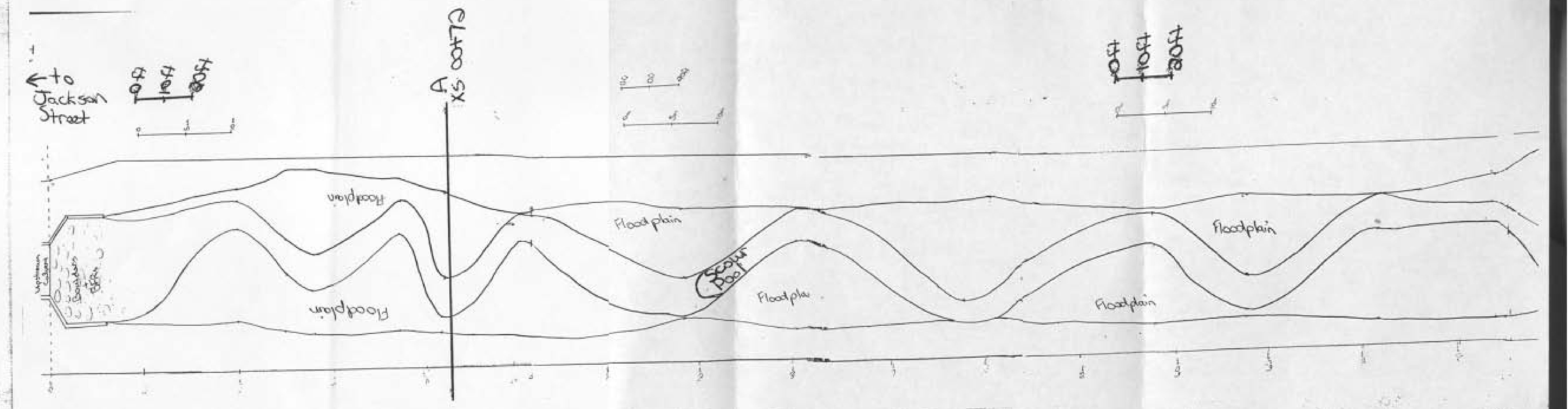

Figure A.1: Channel Map – Section 1

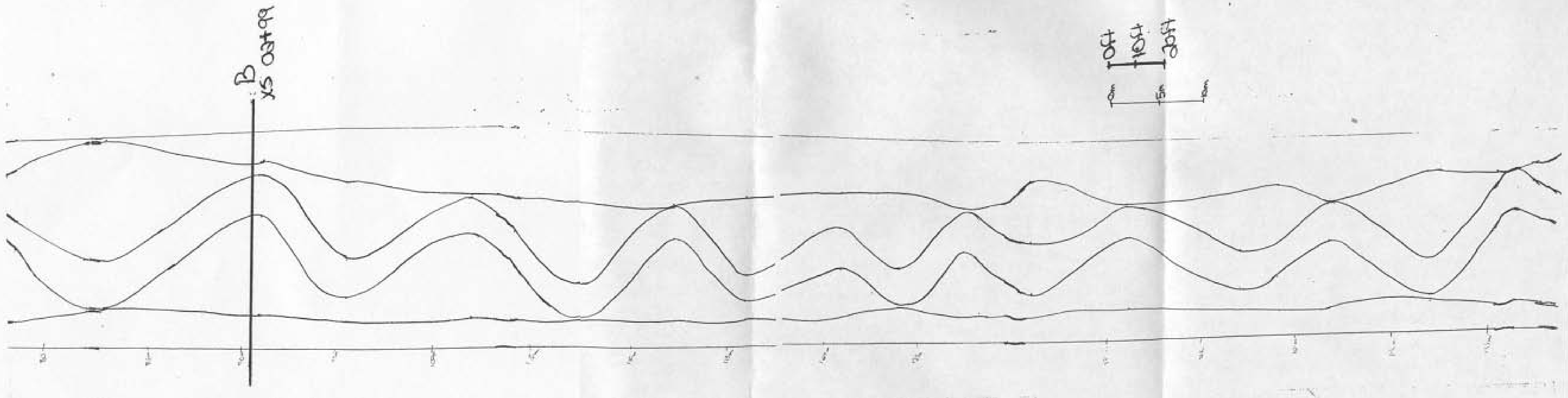

Figure A.2: Channel Map – Section 2

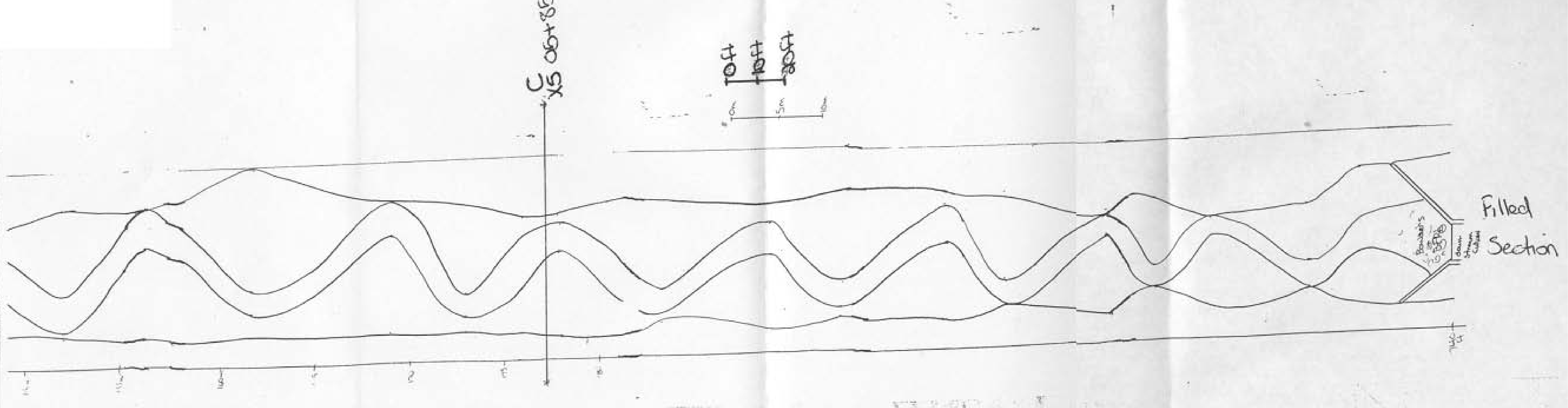

Figure A.3: Channel Map – Section 3

APPENDIX B: Design Plans and As-Built Data

Table B.1: Village Creek Vegetation used on the terrace, channel and floodplain during desing

Terrace Slope Canopy	Bankfull Channel Canopy	Floodplain Species
Big Leaf Maple	Willow	Dogwood
Buckeye	Cottonwood	Ninebark
Bay	Alder	Snowberry

Table B.2: Village Creek as-built cross-section data

Cross Section A	
BM	25.39
38.60	25.26
35.60	23.46
33.60	22.07
32.60	21.50
30.60	21.01
29.60	20.51
28.60	20.33
24.80	20.73
23.60	21.33
17.60	21.37
9.00	21.80
5.60	22.97
1.60	24.80
0.00	25.32

Cross Section B	
BM	21.94
39.0	21.9
36.0	20.2
34.0	18.8
31.0	18.5
23.0	18.1
17.0	18.3
16.2	17.3
15.0	17.1
11.7	17.1
11.4	18.6
9.0	18.7
7.0	19.5
4.0	21.0
0.0	22.4

Cross Section C	
BM	18.78
30.5	18.6
26.0	14.7
22.5	14.2
15.2	14.1
14.3	13.2
13.5	13.0
10.8	13.0
10.1	13.3
9.5	14.1
6.3	14.5
0.0	17.8

Terrace Slopes

LB	1.57	LF	1.59	LB	1.91
RB	2.56	RB	2.44	RB	1.13

Table B.3: As Built Longitudinal Profile Data

Based off Linear Distance From Upstream Culvert

Station (ft)	Thalweg Elevation (ft)
0.0	20.92
12.0	20.44
23.0	20.44
30.0	20.70
40.0	20.69
49.5	20.92
57.6	20.67
62.3	20.73
67.0	20.61
71.8	20.55
80.0	20.48
84.0	20.57
93.4	20.15
108.0	20.07
120.0	19.95
133.3	19.80
148.0	19.41
155.0	19.37
164.0	19.25
175.8	19.37
185.0	18.98
191.5	18.76
201.0	18.68
209.5	18.50
222.0	18.29
232.0	18.07
244.0	17.99
257.8	17.84
262.0	17.81
273.0	17.72
285.0	17.48
299.0	17.25
306.0	17.07
315.7	17.25
325.0	16.80
335.0	16.65
342.0	16.58
349.0	16.44
359.0	16.32
366.0	16.26
375.0	16.09
382.0	16.15
398.0	15.71
407.0	15.51
418.4	15.37
429.7	15.19
439.0	15.13
450.0	14.84
456.0	14.62
464.0	14.36
477.0	14.31
482.0	14.23
488.0	14.20
495.0	14.03
505.0	13.96
515.0	13.82
522.0	13.70
531.0	13.64
543.0	13.48
553.0	13.33
561.0	13.20
567.0	13.23
576.0	13.09
584.0	13.01
590.5	13.03
600.0	12.93
612.0	12.92
621.0	12.74
632.0	12.59
642.0	12.42
647.0	12.49
659.0	12.28
674.0	12.02
683.0	12.46
694.0	12.06
705.0	12.51
714.0	11.94
722.0	11.93
733.0	12.18
739.6	11.49
739.8	12.22

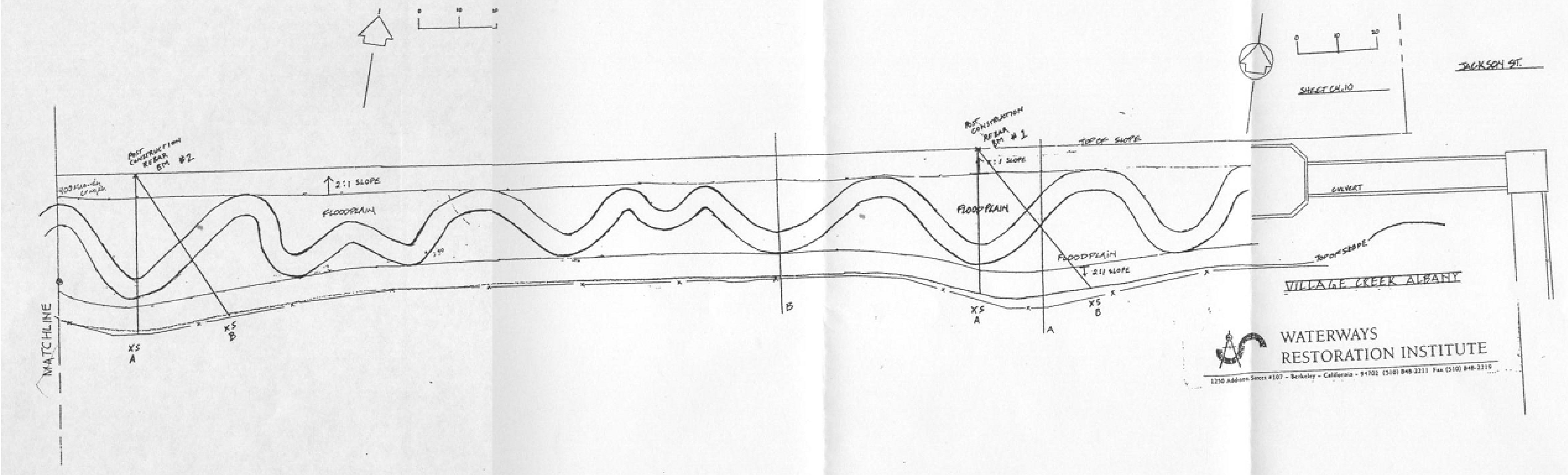

Figure B.1: As-built facies map of Village Creek – Section 1

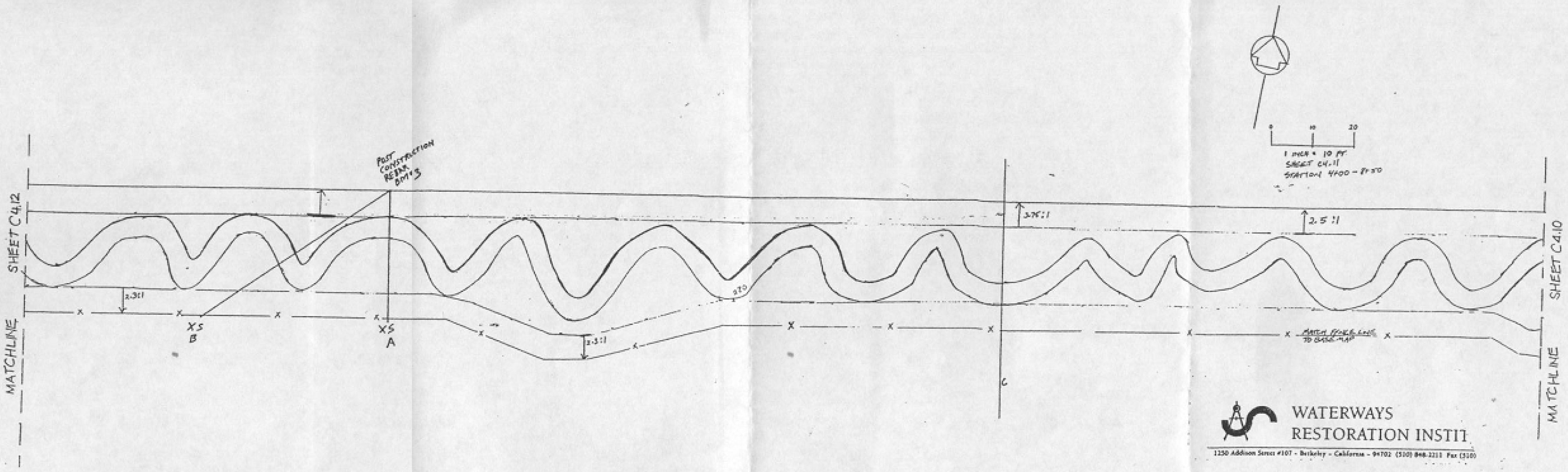

Figure B.2: As-built facies map of Village Creek – Section 2

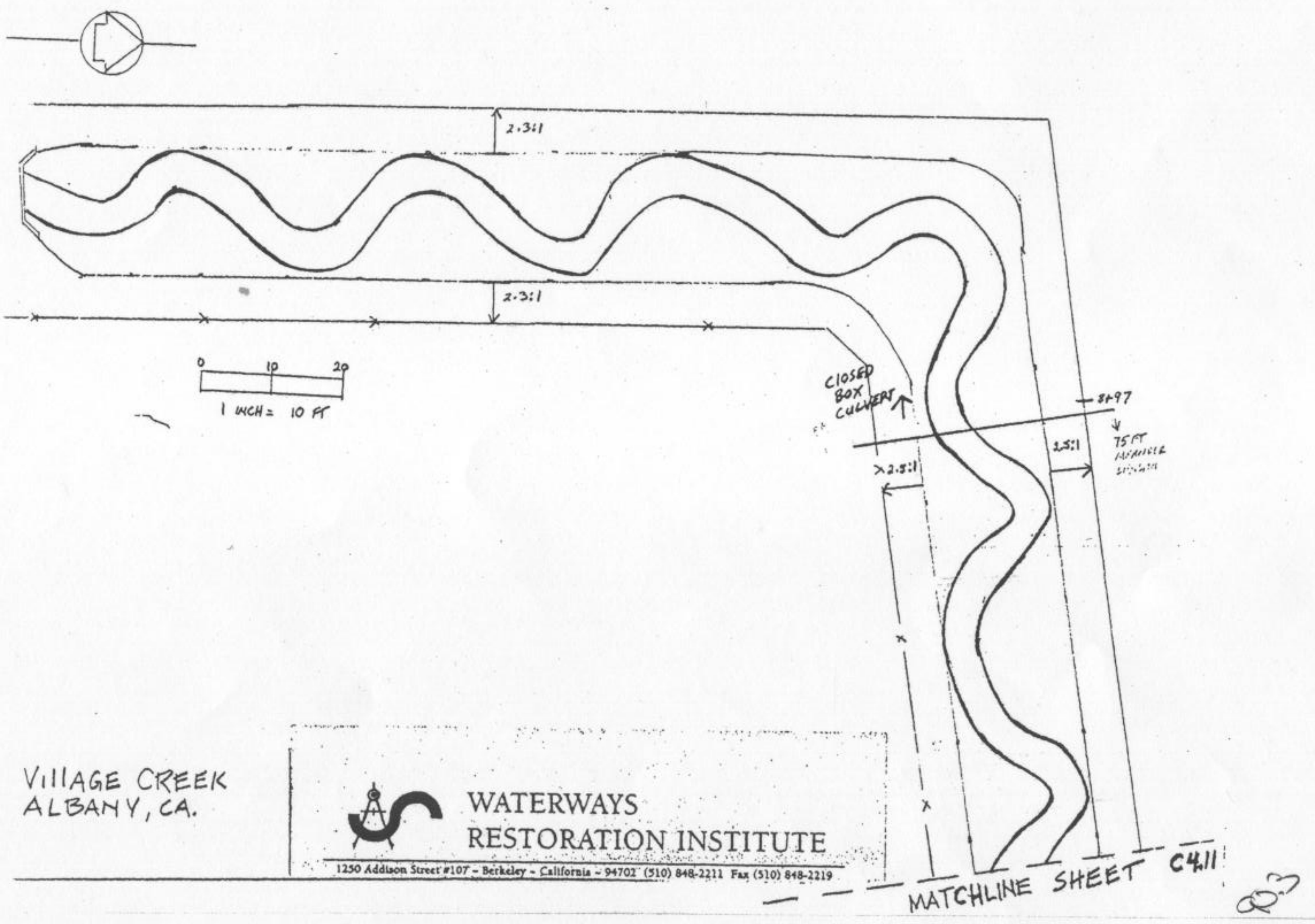

Figure B.3: As-built facies map of Village Creek – Section 3

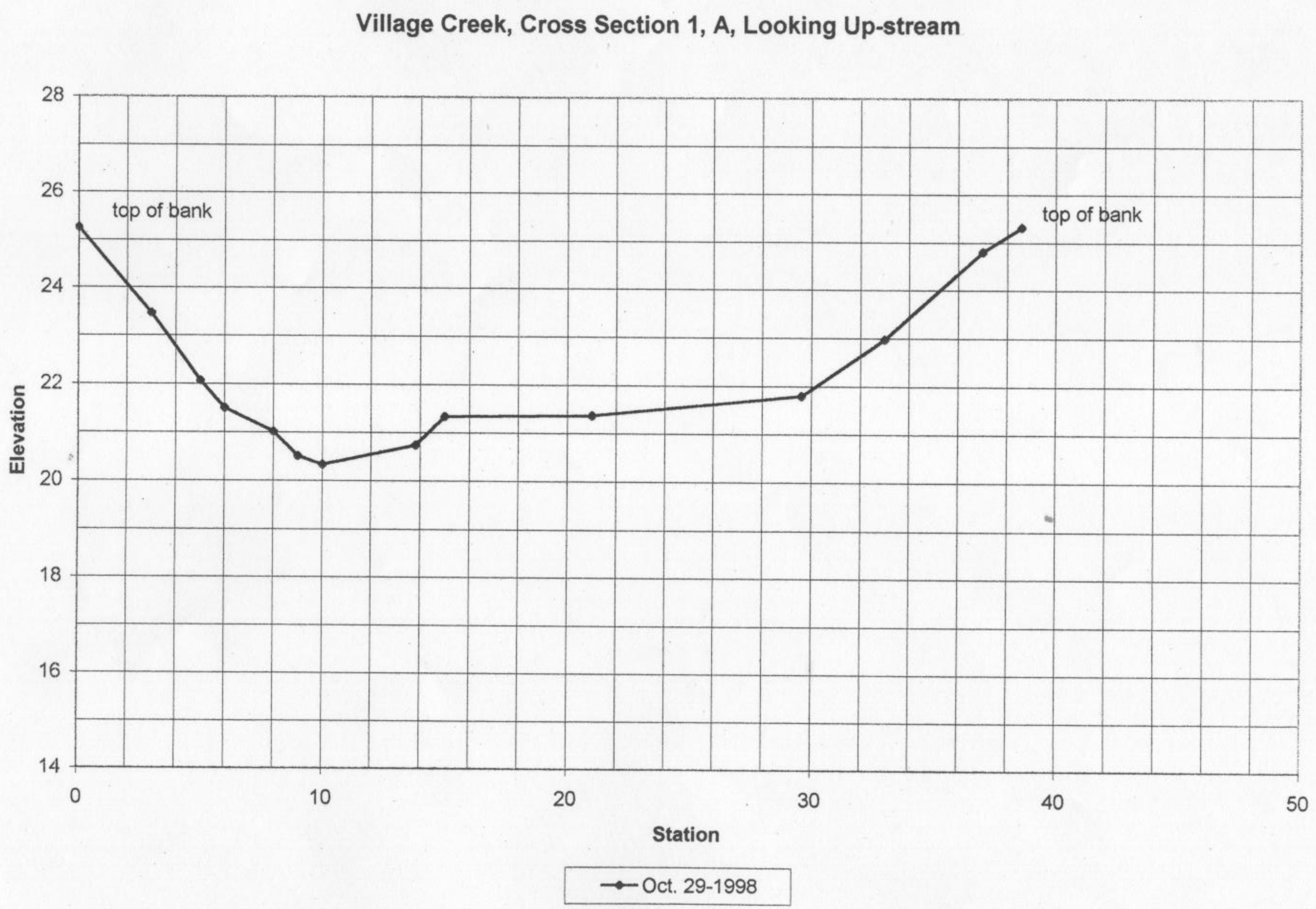

Figure B.4: As-built cross-section A (perpendicular) – Village Creek

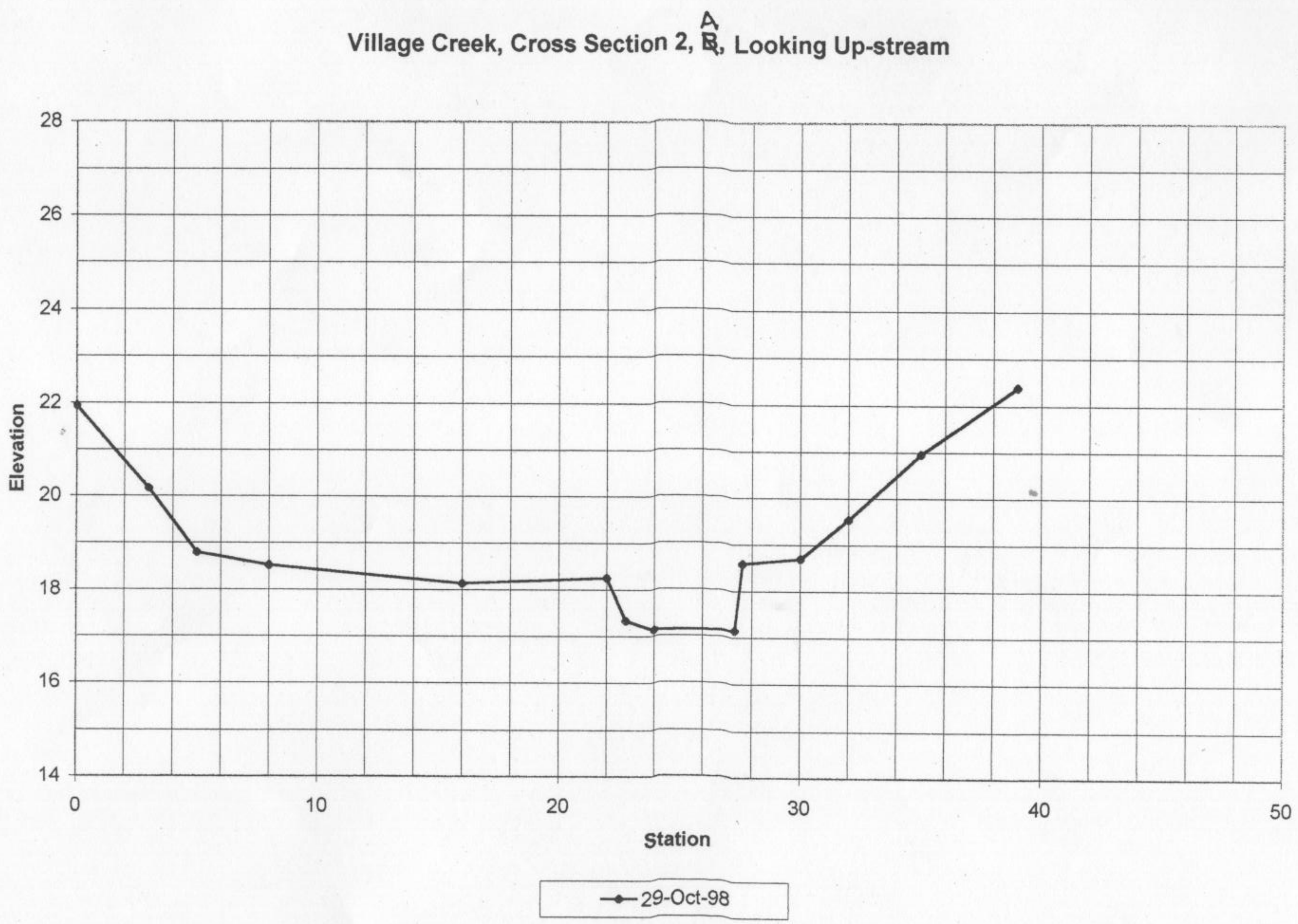

Figure B.5: As-built cross-section B (perpendicular) – Village Creek

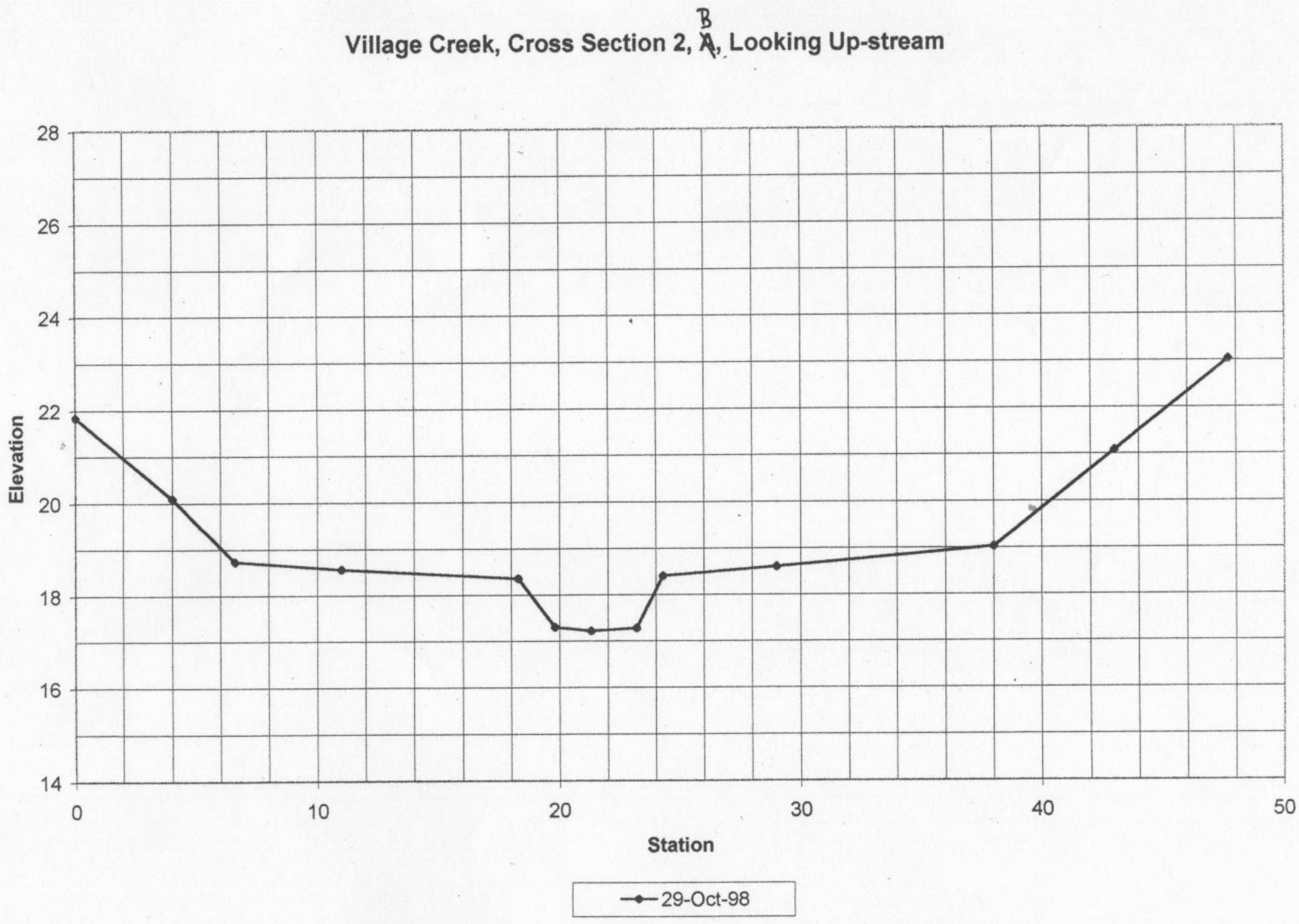

Figure B.6: As-built cross-section B (angled) – Village Creek

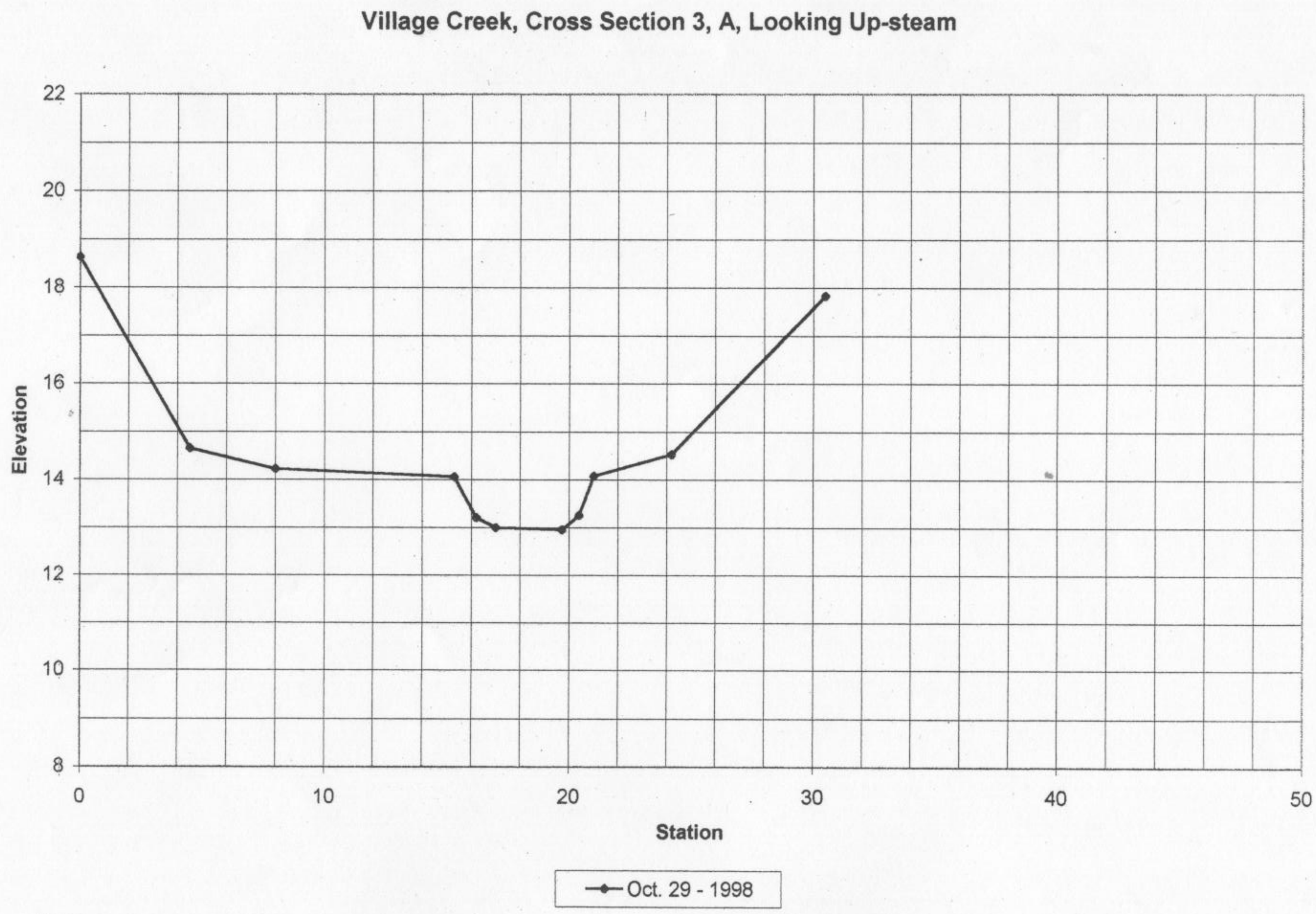

Figure B.7: As-built cross-section C (perpendicular) –Village Creek

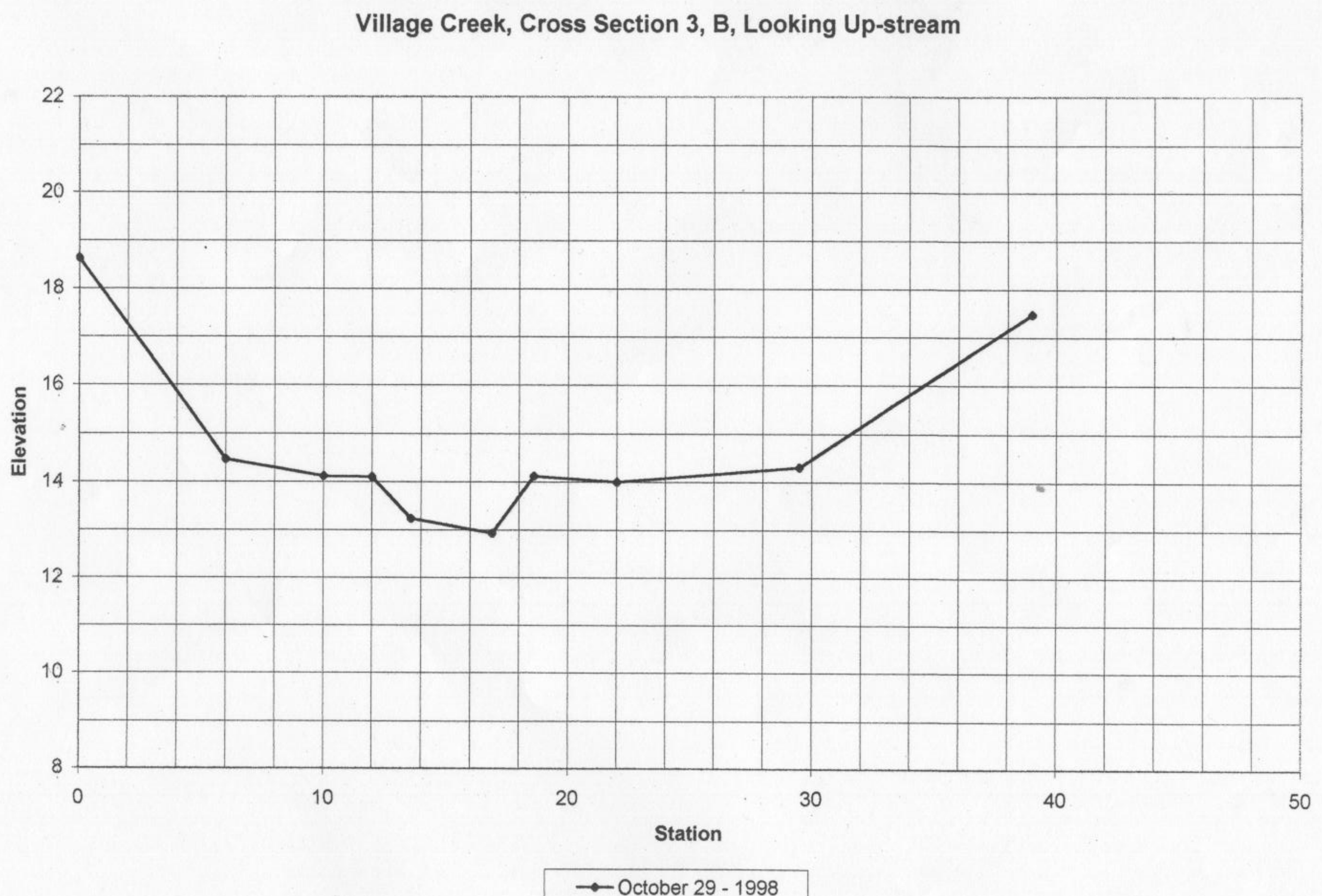

Figure B.8: As-built cross-section C (angled) – Village Creek

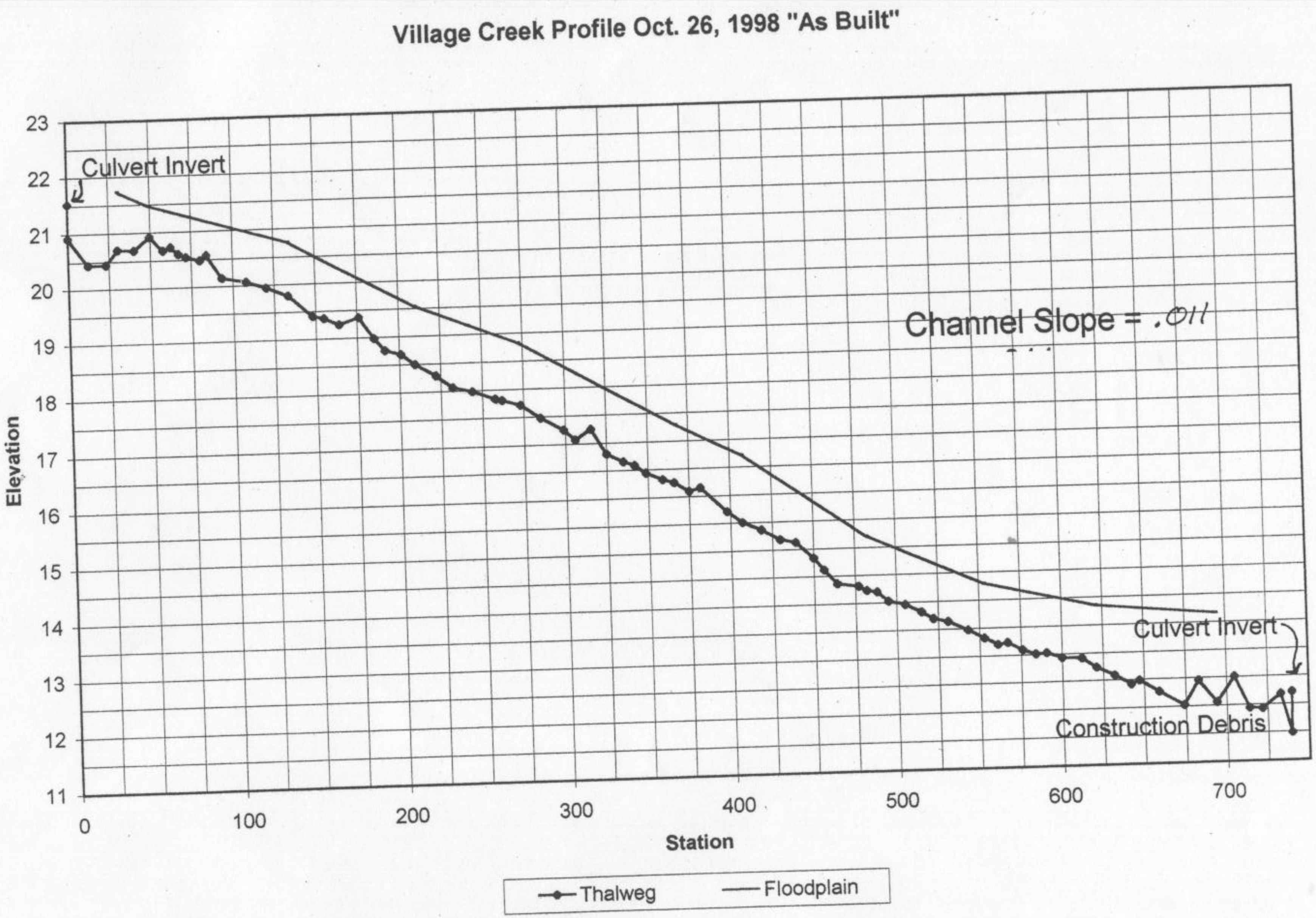

Figure B.9: As-built longitudinal profile (along linear distance from upstream to downstream culvert) – Village Creek

APPENDIX C: Memos and Correspondence

Village Creek Restoration Inbox

Atapattu, Kaumudi to ALRiley, melasher

Hide options

Nov 9 (6 days ago)

From: **Atapattu, Kaumudi <katapatt@calmail.berkeley.edu>**
To: **ALRiley@waterboards.ca.gov**
Cc: **melasher@berkeley.edu**
Date: **Nov 9, 2005 5:05 PM**
Subject: **Village Creek Restoration**
Reply | Reply to all | Forward | Print | Add sender to Contacts list | Trash this message | Report phishing | Show original | Message text garbled?

Dear Ms. Riley,

As part of our River and Stream Restoration term project (Instructor-Matt Kondolf), UC-Berkeley),
we are doing a post project appraisal on Village Creek. We have read the documents you sent to
the Water Resources Archive and have a few questions concerning the project.

After a site visit, we noticed that the daylighted reach is not as long as it was originally
designed to be. We were wondering if there was a reason why the entire design was not
constructed. Also, we are trying to resurvey the as built cross-sections and were unable to
locate the rebar's/benchmarks marking the cross-section locations. Do you know if those were
rebars were left or taken out?

Were there other project objectives other than daylighting this reach of the creek? If so, could
you possibly elaborate on these? Are there any other informational documents that were not part
of the archived material that could be of help to us?

We would really appreciate any help you could give us. Thank you,

Kaumudi Atapattu
Melissa Asher
Dept. of Civil & Environmental Engineering
University of California- Berkeley

From: **Atapattu, Kaumudi <katapatt@calmail.berkeley.edu>**
To: **melasher@berkeley.edu**
Date: **Nov 10, 2005 1:27 PM**
Subject: **Fwd: Village Creek Restoration**
Reply | Reply to all | Forward | Print | Add sender to Contacts list | Trash this message |
Report phishing | Show original | Message text garbled?

---------- Forwarded message ----------
From: "A. L. Riley" <ALRiley@waterboards.ca.gov>
To: <katapatt@calmail.berkeley.edu>
Date: Thu, 10 Nov 2005 12:29:24 -0800
Subject: Re: Village Creek Restoration
Question #1
The University of Calif illegallly fillled part of the project with a culvert at the downstream end. The University was cited with a violation by the Water Quality Control Board . The University was also cited for placing illegal stormwater outfalls into the creek. Those remain as part of the project . The case handler for this at the San Francisco Water Board was Keith Lichten.
Question #2 No one removed the rebar to my knowledge.
Question #3 The project needed to attain one in 1oo year flood protection for the surrounding development.
Quetstion #4 The records in the file show that the orgiinal plan was to just put in a trapezoidal flood control channel. The Non-profit Waterways Restoration Institute suggested that it was feasible to do a restoration project instead. The Universtiy of Calif development construction contractor was directed to subcontract with the WRI to design and help construct the restoration alternative.WRI did accomplish the restoration project on a very low budget. H.R.Roberts Associates, a contractor with the University of Calif is in possesion of the construction drawings.

A.L.Riley

A. L Riley
Watershed and River Restoration Advisor
San Francisco Bay Region Water Quality Contol Board
1515 Clay Street, Suite 1400
Oakland,Ca. 94612
510-622-2420

Re: Village Creek Restoration

File Edit View Tools Message Help

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From: Kaumudi Atapattu
Date: Sunday, November 20, 2005 11:28 PM
To: A. L. Riley; katapatt@calmail.berkeley.edu
Cc: Keith Lichten; Melissa Asher
Subject: Re: Village Creek Restoration

Dear Ms. Riley,

Thank you for your reply to our questions. As we are conducting our PPA, we have come across several other questions that we were hoping you might be able to answer.

1) We have found that the as built longitudinal profile was conducted along the linear distance from the upstream to downstream culvert and not along the thalweg/channel. We understand that you may not have directly been involved in the as built study but do you have any ideas as to why they conducted the profile this way?

2) Facies mapping of the creek has shown that 42 meanders were incorporated into the creek over a distance of 740 linear ft. This change in direction approximately every 17 ft seemed a bit excessive. Would you be able to elaborate further on what the rationale behind this channel design was?

Thank you for your reply,

Kaumudi Atapattu
Melissa Asher

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From: "A. L. Riley" <ALRiley@waterboards.ca.gov>
Subject: Re: Village Creek Restoration
Date: Mon, 28 Nov 2005 18:38:38 -0800
To: <katapatt@berkeley.edu>

Kaumudi
The survey plan was conducted by Drew Goetting who was interested in recording any change in meander patterns and plan form. Presumably the lowest elevation channel points represent the thalweg elevations and these correspond to a distance station, so that changes in profile elevations can be picked up. To contact him directly email drew@rdgmail.com

The sinuosity copied the sinuosity found in historic maps for the creek before it was culverted. This section of creek is on an extremely flat valley slope . A sinuosity of 1.5 to 1.6 is common for creeks in a more natural condition as they enter the bay(based on a study of historic maps for the East Bay).The marsh-wetlands- bay used to be located right below the Union Pacific rail road tracks- a short distance downstream from the end of this creek project.
Based on the stability of this Village Creek project, the recently constructed lower Codornices Creek project to the south, which essentially shares the same floodplain valley, was also designed with the same sinuosity.
hope this helps
A.Riley

A. L Riley
Watershed and River Restoration Advisor
San Francisco Bay Region Water Quality Contol Board
1515 Clay Street, Suite 1400
Oakland,Ca. 94612
510-622-2420

From: "Keith Lichten" <KLichten@waterboards.ca.gov>
Subject: Re: Village Creek Restoration
Date: Thu, 01 Dec 2005 09:55:42 -0800
To: <katapatt@berkeley.edu>

Kamudi,

Thanks for your email, and sorry for the delay in responding--I see you are scheduled to present your work on Saturday.

Village Creek is an interesting case, in that UC Berkeley first obtained a permit to restore a significant reach of the creek, but then actually, as you are aware, only restored the currently open portion, and opted to put the last stretch in a culvert.

The interesting thing is that if they had come in with a request simply to do the restoration work that they wound up doing, we would have approved it. We would have done so because we would have looked at any restoration project as being a good thing.

So, if we would have accepted the smaller project anyway, why did we issue a Notice of Violation to the University when they built it? Really, four reasons. First, the University's project manager apparently determined that she did not need to contact the regulatory agencies to request the change in her project. Instead, she let us discover the change on our own. As you can imagine, as a regulatory agency, we believe in dischargers asking permission, rather than asking forgiveness.

Second, it was not really clear that the section that had been culverted had to be culverted. So we *probably* would have accepted the smaller design, but we certainly would not have done so without a thorough discussion with the University prior to allowing the change. This may not have been on a time scale comfortable for the project manager.

Third, we had required that the project incorporate appropriate means to treat its storm water runoff prior to discharge to the creek. However, because the University told us it was a design-build project, we had deferred approval of those methods until after we issued the conditional restoration permit. Rather than follow the required approach--developing a plan, submitting it to us for approval, and then constructing what was in the approved plan--the University and its contractor simply built the project. This had the added problem that--as I'm sure you saw in your visits to the site--the contractor placed storm drain outfall rock energy dissipation into the narrow creek corridor, rather than setting it back just a few feet (e.g., putting the energy dissipation on the outside edge of the creek corridor). As an aside, the contractor had done a generally very poor job on construction site pollution prevention (i.e., erosion control and site/materials management). This did not further endear the contractor or University to us.

Finally, the University was doing this restoration partly to get advance mitigation credit for impacts it expected to make to the Cordonices Creek bypass channel on the western end of the site. Since our original permit had specified a certain amount of length of Village Creek was being restored, we had to correct that, and also to note the other problems, that in our view decreased the mitigation value of the restoration project.

The project manager subsequently (and quite shortly thereafter) left the University (or at least left a job in which she interacted with us). Frankly, given her dishonesty, it was good to see someone else on the project.

The result is that we accepted the mitigation, as constructed--which we probably would have done in the first place, if asked. Also, there was not a whole lot that could be done on stormwater, but we required (as I recall--I may be mistaken on this point) that the University install hydrodynamic "swirl" separators to at least remove trash and large sediment from stormwater runoff prior to its discharge to the creek.

I have to say that, to the University's credit (and thanks to Ann Riley's efforts), they subsequently took a much more progressive approach with the remainder of the project, including bringing in outside consultants known for their progressive stormwater work. As a result , the later phases of the project have a much better stormwater design--determined in advance of letting the contract for their construction--and we are looking forward to their construction.

Please let me know if you have any further questions or comments. Also, if it is possible to receive a copy of your paper, I would welcome the chance to read it.

>>> "Kaumudi Atapattu" <katapatt@berkeley.edu> 11/16/2005 7:37 PM >>>

Dear Mr. Lichten,

We are currently conducting a post-project appraisal of Village Creek located in Albany, CA, part of which we have been informed was illegally filled by UCB. We have been in contact with Ann Riley, and she suggested we contact you.

We were wondering if you may be able to give us a brief overview of the situation (i.e. which section was illegally filled, when was it filled, what is the current status?).

Thank you,

Kaumudi Atapattu
Melissa Asher