



## DESIGN MEMORANDUM

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**Date:** March 3, 2021  
**To:** Hal Hannula, City of San Luis Obispo – Development Review  
**CC:**  
**From:** Ken Chacon, PE - Chacon Associates, LLC (805-610-1714)  
**Subject:** Preliminary Hydrology Summary - ARCH-0040-2021 (841 Patricia)

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These preliminary calculations are presented to support the bridge height clearance at the creek crossing for the project at 841 Patricia.

The watershed for The City of San Luis Obispo has been studied in detail by previous Engineering Firms. The results are included in the City's adopted Drainage Design Manual-Appendix A. The following flow depth analysis is based on the watersheds and calculations presented in the referenced manual.

The watersheds contributing to the creek at the 841 Patricia residence are summarized below and shown in Attachment A.

Watersheds	area (sm)	Area (ac)	2 yr (cms)	100-yr (cms)	2 yr(cfs)	100-yr (cfs)
22	34717	8.58	0.0917	0.3342	3.24	11.80
30	1679	0.41	0.0044	0.0162	0.16	0.57
31	14274	3.53	0.0377	0.1374	1.33	4.85
32	6182	1.53	0.0163	0.0595	0.58	2.10
34	196581	48.58	0.5194	1.8924	18.34	66.83
35	34271	8.47	0.0906	0.3299	3.20	11.65
36	30857	7.62	0.0815	0.2971	2.88	10.49
<b>Total</b>	<b>318561</b>	<b>78.72</b>	<b>0.84</b>	<b>3.07</b>	<b>29.72</b>	<b>108.30</b>

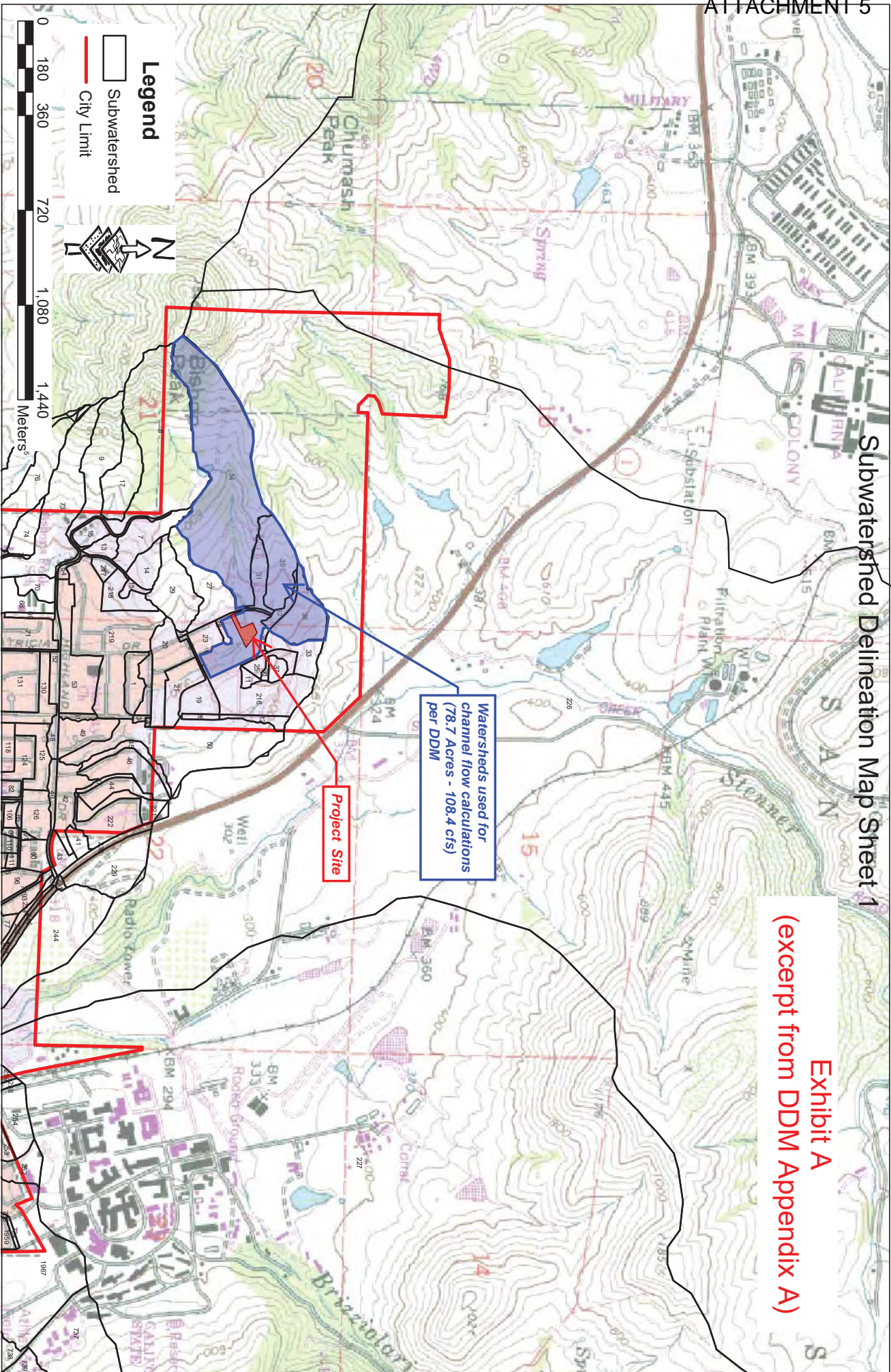
Using the 100-yr cfs totaled above, and the site-specific topographic survey, the creek channel was analyzed using Manning's equation for channel flow. The expected depth of flow at the bridge crossing was determined to be 0.54 feet. The channel calculation is included in Attachment B.

It is the recommendation of this office that the proposed bridge height clearance be a minimum of 2.5 feet above the creek bottom. This will provide the 100-year depth of flow plus 2 feet of freeboard.

# Attachment A

Subwatershed Delineation Map Sheet 1

Exhibit A  
(excerpt from DDM Appendix A)



Subwatershed ID	Storm Size	Portion of Questa Engineering Watershed	Questa Engineering Watershed Size In Square Meters	Subwatershed Area in Square Meters	2 Year Event in Cubic Meters per Second	10 Year Event in Cubic Meters per Second	25 Year Event in Cubic Meters per Second	50 Year Event in Cubic Meters per Second	100 Year Event in Cubic Meters per Second
1	A	Lower Stenner Creek	6441443.393	14991.123	0.0396	0.0793	0.106	0.128	0.143
2	A	Lower Stenner Creek	6441443.393	9384.97	0.0248	0.0497	0.0663	0.0801	0.0903
3	A	Lower Stenner Creek	6441443.393	1379.391	0.0036	0.0073	0.0097	0.0118	0.0133
4	A	Lower Stenner Creek	6441443.393	678.156	0.0018	0.0036	0.0048	0.0058	0.0065
5	A	Lower Stenner Creek	6441443.393	2603.028	0.0069	0.0138	0.0184	0.0222	0.0251
6	A	Lower Stenner Creek	6441443.393	1818.302	0.0048	0.0096	0.0129	0.0155	0.0175
7	A	Lower Stenner Creek	6441443.393	26703.461	0.0708	0.1418	0.1894	0.2287	0.2579
8	A	Lower Stenner Creek	6441443.393	142311.142	0.376	0.7529	1.0099	1.2147	1.37
9	A	Lower Stenner Creek	6441443.393	47798.976	0.1283	0.2529	0.3379	0.408	0.4601
10	A	Lower Stenner Creek	6441443.393	785.802	0.0021	0.0042	0.0056	0.0067	0.0076
11	A	Lower Stenner Creek	6441443.393	3574.125	0.0094	0.0189	0.0253	0.0304	0.0344
12	A	Lower Stenner Creek	6441443.393	6776.056	0.0179	0.0359	0.0479	0.0578	0.0652
13	A	Lower Stenner Creek	6441443.393	7763.434	0.0205	0.0411	0.0549	0.0663	0.0747
14	A	Lower Stenner Creek	6441443.393	15222.834	0.0402	0.0805	0.1076	0.1299	0.1465
15	A	Lower Stenner Creek	6441443.393	3704.564	0.0098	0.0196	0.0262	0.0316	0.0357
16	A	Lower Stenner Creek	6441443.393	9439.279	0.0249	0.0499	0.0667	0.0806	0.0909
17	A	Lower Stenner Creek	6441443.393	34069.429	0.09	0.1803	0.2408	0.2908	0.328
18	A	Lower Stenner Creek	6441443.393	1434.287	0.0038	0.0076	0.0101	0.0122	0.0138
19	A	Lower Stenner Creek	6441443.393	15790.803	0.0417	0.0835	0.1116	0.1348	0.152
20	A	Lower Stenner Creek	6441443.393	32367.324	0.0855	0.1712	0.2288	0.2763	0.3116
21	A	Lower Stenner Creek	6441443.393	20589.103	0.0544	0.1089	0.1454	0.1757	0.1982
22	A	Lower Stenner Creek	6441443.393	34716.929	0.0917	0.1837	0.2454	0.2963	0.3342
23	A	Lower Stenner Creek	6441443.393	11282.641	0.0298	0.0597	0.0797	0.0963	0.1086
24	A	Lower Stenner Creek	6441443.393	1125.782	0.003	0.006	0.008	0.0096	0.0108
25	A	Lower Stenner Creek	6441443.393	9799.98	0.0259	0.0518	0.0693	0.0836	0.0943
26	A	Lower Stenner Creek	6441443.393	2948.952	0.0078	0.0156	0.0208	0.0252	0.0284
27	A	Lower Stenner Creek	6441443.393	34711.011	0.0917	0.1836	0.2453	0.2963	0.3342
28	A	Lower Stenner Creek	6441443.393	3816.843	0.0101	0.0202	0.027	0.0367	0.0467
29	A	Lower Stenner Creek	6441443.393	38072.527	0.1006	0.2014	0.2691	0.326	0.3665
30	A	Lower Stenner Creek	6441443.393	1678.998	0.0044	0.0089	0.0119	0.0143	0.0162
31	A	Lower Stenner Creek	6441443.393	14274.379	0.0375	0.0755	0.1009	0.1218	0.1374
32	A	Lower Stenner Creek	6441443.393	6182.399	0.0163	0.0327	0.0437	0.0528	0.0596
33	A	Lower Stenner Creek	6441443.393	17650.161	0.0466	0.0934	0.1248	0.1507	0.1699
34	A	Lower Stenner Creek	6441443.393	196580.7	0.5194	1.0401	1.3895	1.6779	1.8824
35	A	Lower Stenner Creek	6441443.393	34270.614	0.0906	0.1813	0.2422	0.2925	0.3299
36	A	Lower Stenner Creek	6441443.393	30857.288	0.0815	0.1633	0.2181	0.2634	0.2971
37	A	Lower Stenner Creek	6441443.393	5720.293	0.0151	0.0303	0.0404	0.0488	0.0551
38	A	Lower Stenner Creek	6441443.393	1585.155	0.0042	0.0084	0.0112	0.0135	0.0153
39	A	Lower Stenner Creek	6441443.393	1844.952	0.0049	0.0098	0.013	0.0157	0.0178
40	A	Lower Stenner Creek	6441443.393	6373.487	0.0168	0.0337	0.045	0.0544	0.0614
41	A	Lower Stenner Creek	6441443.393	6986.093	0.0185	0.037	0.0494	0.0596	0.0673
42	A	Lower Stenner Creek	6441443.393	24631.107	0.0651	0.1303	0.1741	0.2102	0.2371
43	A	Lower Stenner Creek	6441443.393	9296.897	0.0246	0.0492	0.0657	0.0794	0.0895
44	A	Lower Stenner Creek	6441443.393	14094.022	0.0372	0.0746	0.0996	0.1203	0.1357
45	A	Lower Stenner Creek	6441443.393	11570.423	0.0306	0.0612	0.0818	0.0998	0.1114
46	A	Lower Stenner Creek	6441443.393	27851.291	0.0736	0.1474	0.1969	0.2377	0.2691
47	A	Lower Stenner Creek	6441443.393	3459.275	0.0091	0.0183	0.0245	0.0295	0.0333
48	A	Lower Stenner Creek	6441443.393	5872.412	0.0155	0.0311	0.0415	0.0501	0.0565
49	A	Lower Stenner Creek	6441443.393	22469.082	0.0594	0.1189	0.1588	0.1918	0.2163
50	A	Lower Stenner Creek	6441443.393	107307.965	0.2835	0.5677	0.7585	0.9159	1.033
51	A	Lower Stenner Creek	6441443.393	3238.323	0.0086	0.0171	0.0229	0.0276	0.0312
52	A	Lower Stenner Creek	6441443.393	11817.127	0.0312	0.0625	0.0835	0.1009	0.1138
53	A	Lower Stenner Creek	6441443.393	45209.669	0.1221	0.2445	0.3266	0.3944	0.4448
54	A	Lower Stenner Creek	6441443.393	4556.065	0.0112	0.0224	0.0322	0.0389	0.0439
55	A	Lower Stenner Creek	6441443.393	1538.309	0.0041	0.0081	0.0109	0.0131	0.0148
56	A	Lower Stenner Creek	6441443.393	6970.761	0.0184	0.0369	0.0483	0.0595	0.0671
57	A	Lower Stenner Creek	6441443.393	4531.263	0.0119	0.0239	0.032	0.0386	0.0435
58	A	Lower Stenner Creek	6441443.393	955.4	0.0016	0.0033	0.0044	0.0053	0.006
59	B	Laguna Lake Drainage	21691014.05	2401.242	0.0048	0.0092	0.0111	0.0134	0.0151
60	B	Laguna Lake Drainage	21691014.05	5158.108	0.0088	0.0177	0.0238	0.0297	0.0324
61	B	Laguna Lake Drainage	21691014.05	1381.424	0.0034	0.0068	0.0091	0.011	0.0125
62	B	Laguna Lake Drainage	21691014.05	1430.452	0.0024	0.0049	0.0066	0.008	0.009
63	A	Lower Stenner Creek	6441443.393	2386.973	0.0063	0.0126	0.0169	0.0204	0.023
64	A	Lower Stenner Creek	6441443.393	406.066	0.0011	0.0022	0.0029	0.0036	0.0039
65	B	Laguna Lake Drainage	21691014.05	62316.383	0.1058	0.2133	0.2876	0.3468	0.3918

## **Attachment B**

## Patricia Channel at bridge - 100-Year

### Trapezoidal

Bottom Width (ft) = 30.00  
 Side Slopes (z:1) = 9.00, 5.00  
 Total Depth (ft) = 2.00  
 Invert Elev (ft) = 100.00  
 Slope (%) = 3.00  
 N-Value = 0.026

### Highlighted

Depth (ft) = 0.54  
 Q (cfs) = 110.00  
 Area (sqft) = 18.24  
 Velocity (ft/s) = 6.03  
 Wetted Perim (ft) = 37.64  
 Crit Depth, Yc (ft) = 0.71  
 Top Width (ft) = 37.56  
 EGL (ft) = 1.11

### Calculations

Compute by: Known Q  
 Known Q (cfs) = 110.00

At 110 cfs, the expected depth of flow is 0.54 ft.

