

EXHIBIT 4-A



Division of Science & Environmental Policy California State University Monterey Bay

100 Campus Center, Seaside CA 93955-8001

(831)582-4110; FAX:(831)582-4122

28 April 2017

2017 Carmel River Cross Section Survey and Large Wood Inventory

From: Dr. Douglas Smith (CSUMB School of Natural Sciences)

To: Larry Hampson (Monterey Peninsula Water Management District)

Overview

San Clemente Dam was removed in 2015. We propose to document geomorphic changes, shifts in sediment size distributions, and variability in large wood abundance in the second winter runoff following dam removal. We will use benchmarked cross sections, bed material particle counts, and a longitudinal river traverse to collect the data.

The dam removal project is unique in the world because it was designed to produce *de minimis* negative impacts to the downstream reach of river, while providing the ecological benefits of fish passage and the safety benefits of dam removal (Blanco et al., 2013; Boughton et al., 2016). Given that coarse sediment and large wood have not been able to pass the dam for over 90 years, two potential downstream impacts from the dam removal the project include channel-filling sand and gravel deposits and a change in the abundance and size of tree trunks that reach the lower river. Sediment deposits can locally influence flood hazard, and, if fine enough, can degrade spawning habitat. Large wood can improve aquatic habitat, produce bed and bank scour, increase channel roughness, and can impact bridge safety (Beck et al., 2013).

To monitor these potential impacts, CSUMB has established 40 benchmarked river cross sections where we periodically collect topographic data and perform grainsize analysis on the Carmel River (e.g., Chow et al., 2016a; 2017). We have also performed episodic large wood surveys to determine how dynamic the wood abundance is on the Carmel River (Smith and Huntington, 2004; MacCarter et al., 2016, 2017). The most recent cross section surveys and large wood surveys were performed in fall 2016, immediately before the second year of post-dam-removal flows. That work indicated that river flows in the first year after dam removal produced virtually no changes to river cross sections and sediment size distributions, except for gravel and coarse sand deposition within 3.5 km of the former dam location (Chow et al. 2017; 2016a).

This proposal is to fund the second post-dam removal surveys that will document any changes resulting from the high flows (~25 year event) of winter 2017. There might also be Soberanes Fire impacts in the river this year. Fire impacts might include burned wood deposits, carbon-rich floodplain deposits, and excessive mud.

The impacts (or lack of impacts) documented by this project will inform the MPWMD and Carmel Valley residents about continual change (or stability) present in the Carmel River channel.

Deliverables

The deliverables will include two reports and associated data in spreadsheet format. The cross section report will include data for approximately 40 cross sections spanning from below Los Padres Dam to the Crossroads shopping center. The report will be approximately like Chow et al. (2017). It will include the following sections:

- 1) Project background
- 2) Data collection methods
- 3) Presentation of cross section and grainsize analyses in graphs and summary data tables
- 4) Comparison with previous data sets to analyze change occurring before dam removal and as a result of dam removal
- 5) Well organized and annotated data spreadsheet.

The large wood inventory will cover the Carmel River channel from the lagoon to Camp Steffani. Every occurrence of wood larger than 15 cm in diameter and 2 m long will be mapped and described. The report will be approximately like MacCarter et al. (2017). It will include the following sections:

- 1) Project background
- 2) Data collection methods
- 3) Presentation of data in map format, graphs, and in summary data tables
- 4) Comparison with previous data sets to analyze change occurring before dam removal and as a result of dam removal
- 5) Well organized and annotated data spreadsheet.

If flow remains too deep for a complete transect of the river, suitable subsections will be surveyed for wood abundance.

Budget

We propose to complete the work for \$19,000.

These costs include hourly labor for fieldwork and report preparation, benefits, transportation and 20% indirect costs charged by the University Corporation. All materials and survey equipment will be provided by the CSUMB Watershed Geology Lab.

We propose to complete the fieldwork in summer and fall of 2017 before significant runoff of 2018 water year impedes access to the channel. Reports will be completed before February 2018.

EXHIBIT 4-A

CSUMB CARMEL SURVEYS

Work on this project is contingent upon contracting between the MPWMD and the University Corporation. Bay of this estimate will be required before the formal contract and budget can be finalized and work begun.



Dr. Douglas Smith, Professor
Division of Science and Environmental Policy

References

- Beck E, Geisler E, Gehrke M, Goodmansen A, Leiker S, Phillips S, Rhodes J, Schat A, Snyder A, Teaby A, Urness J, Wright D., Smith, D. 2013. A Survey of Large Wood on the Carmel River: Implications for Bridge Safety Following San Clemente Dam Removal: The Watershed Institute, California State Monterey Bay, Publication No. WI-2013-04, 46 pp.
http://ccows.csUMB.edu/pubs/reports/CSUMB_ENVS660_ClassReport_CarmelWood_131002.pdf
- Blanco, S., Bohlke, B., Crawford, C., David, C., Delay, T., Keefauver, S., Miller, G., Perkins, P., Petruccelli, S., Post, K., Silveus, J., & Smith, D. 2012. San Clemente Dam Removal and Carmel River Reroute Monitoring Plan: Carmel, CA. The Watershed Institute, California State Monterey Bay, Publication No. WI-2012-05, 93 pp.
http://ccows.csUMB.edu/pubs/proj_pubs/2012/ENVS660_Carmel_Monitoring/CSUMB_ENVS660_ClassReport_DamRemovalMonitoring_121128.pdf
- Boughton DA, East A, Hampston L, Kiernan J, Leiker S, Mantua N, Nicol C, Smith D, Urquhart K, Williams T, Harrison L. 2016. Removing a dam and re-routing a river: Will expected benefits for steelhead materialize in Carmel River, California? NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-553. US Department of Commerce. Southwest Fisheries Science Center, Santa Cruz, CA. 89 pp.
<https://swfsc.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-553.pdf>
- Chow K., Luna L., and Smith D. 2017. 2016 Post-San Clemente Dam Removal Morphological Monitoring of the Carmel River Channel in Monterey County, California. The Watershed Institute, California State University Monterey Bay, Publication No. WI-2017-01, 58 pp.
http://ccows.csUMB.edu/pubs/reports/CCoWS_CarmelRiverGeomorph2016_1703301.pdf
- Chow K, Fields J, Flores S, Hart K, Kleven A, Luna L, MacCarter L, and Smith D. 2016(a). San Clemente Dam Removal Sediment Impacts: Year One Report. Watershed Institute, California State University Monterey Bay, Publication No. WI-2016-10, 38 pp.
- Chow K., Luna L., Delforge A. and Smith D. 2016(b). 2015 Pre-San Clemente Dam Removal Morphological Monitoring of the Carmel River Channel in Monterey County, California. The Watershed Institute, California State University Monterey Bay, Publication No. WI-2016-01, 50 pp.
http://ccows.csUMB.edu/pubs/reports/CCoWS_CarmelRiverGeomorph2015_160128a.pdf

EXHIBIT 4-A

CSUMB CARMEL SURVEYS

MacCarter L, Fields J, Smith DP. 2017. Large Woody Debris on the Carmel River from the Dam Keeper's House to Carmel Lagoon, Fall 2016: Watershed Institute, California State University Monterey Bay, Publication No. WI-2017-03, 27 pp.
http://ccows.csumb.edu/pubs/reports/CCoWS_CarmelLWD_2016Report_170307a.pdf

MacCarter, L., Fields, J., Smith, D.P. 2016. Large Woody Debris on the Carmel River from Camp Steffani to the Carmel Lagoon, Fall 2015: Watershed Institute, California State University Monterey Bay, Publication No. WI-2016-05, 25 pp.
http://ccows.csumb.edu/pubs/reports/CCoWS_CarmelLWD_2015Report_160228.pdf