

EXHIBIT A
Lagunitas Creek Woody Debris Enhancement Project
SCOPE OF WORK

Under direction of the Grantor, and under the following conditions and terms, the Grantee will:

I Goals Statement

Increase the survival of juvenile coho salmon through the installation of large woody debris (LWD) structures that increase pool frequency and depth, enhance summer rearing habitat and provide flow refuge during the winter and spring in Lagunitas Creek, tributary to Tomales Bay, Marin County.

II Objectives Statement

The objective is to install LWD structures that increase pool frequency and depth, enhance summer rearing habitat and provide flow refuge during the winter and spring. Four large complex wood structures will be installed in the channel at a height that will capture small wood for greater fish shelter and complexity.

The arrangement of the proposed structures is also intended to turn a long, plane-bed run (single habitat) into a sequence of pools and riffles (multiple habitats).

III Location Description

Lagunitas Creek, Marin County. The project is located in portions of Rancho lands of Tomales y Baulines, San Geronimo, Punta De Los Reyes, and Nicasio of the San Geronimo 7.5 Minute U.S.G.S. Quadrangle, North 38.007; West 122.711 (GCS NAD83, Decimal Degrees) as depicted in Exhibit C, Project Location Map, which is attached and made part of this agreement by this reference.

IV Quantitative Description

The proposed project will include the construction and installation of four multiple log structures at three sites. The log structures will be used to accomplish several objectives; one is to slow stream flow (hydraulic roughness) enhancing bedload storage; two is to provide high flow refugia for coho salmon juveniles; three is to provide complex cover and rearing habitat during the summer months for coho juveniles.

Project Tasks

Task 1 – Engineering Consultation

During the last 13 years of LWD installation in Lagunitas Creek, MMWD employed a hydrologist and engineer who calculated buoyancy and hydrologic forces on each structure and recommended appropriate anchoring to stabilize them. That employee has since retired, so the District will consult with a licensed professional for these services.

Task 2 – Environmental Compliance

The Department of Fish and Game will be the lead CEQA agency for this project. MMWD has budgeted to obtain the required Section 1602 Lake or Streambed Alteration Agreement issued by DFG.

Task 3 – Special Status Species Surveys and Avoidance

Lagunitas Creek provides habitat for four federally listed species: coho salmon, steelhead, CA red-legged frogs, and CA freshwater shrimp. Daily pre-construction surveys for red-legged frogs will be conducted by MMWD's Aquatic Ecologist. In the unlikely event of encountering red-legged frogs, frogs will be relocated to suitable habitat downstream, as authorized by USFWS.

California freshwater shrimp have not been observed in the upstream reaches of Lagunitas Creek since the early 1990s and habitat at the site is unsuitable for shrimp. Surveys for or avoidance of freshwater shrimp is unnecessary.

Northern spotted owls are known to breed near the project area and construction activities will be limited to the owl non-breeding season, August 1 to October 31.

Task 4 – Project Construction

Nearly all of the LWD structures currently in Lagunitas Creek have been built by MMWD construction crews, but ongoing financial limitations are likely to require the reassignment of these crews to other tasks. MMWD will therefore need to hire experienced construction contractors to install the proposed structures. The contractors will be under the direct supervision of MMWD's Aquatic Ecologist, who has designed and supervised the construction of all LWD structures built since 2001.

Logs for these structures will be provided by MMWD from logs pulled from Kent Lake. Boulders will be purchased from a quarry in the Lagunitas watershed. Logs and boulders will be moved into position using ropes and pulleys, as has been done in previous years, and at no time will heavy equipment enter the wetted channel. Logs will be anchored to each other and to trees using threaded rebar. Steel cables will be adhered to boulders with epoxy and clamped to threaded rebar drilled through the logs. Attachment hardware will be hidden and camouflaged to minimize risk of injury to park visitors and make the structures appear less artificial.

The four proposed LWD structures will interact with each other, and with an existing structure downstream, to encourage a more sinuous channel. The new structures will be located at three stations, identified in the figure titled Project Overview, as Stations 130, 250 and 370. Two structures will constrict the channel at Station 250, and three-log deflector (or "spider") structures will be located at Stations 130 and 370. Flows will be directed from Station 130 towards the right bank and then back into the center of the channel at Station 250. The offset of the two structures at Station 250 will again direct flows towards the right bank, where Station 370 will direct flows toward the existing structure on the left bank, approximately 100' downstream. Flows directed at the existing structure should deepen the existing pool there.

The four new structures will be anchored to alders and redwoods on the bank, as well as to boulders to provide stability. Lagunitas Creek is too wide and flows are too high to leave structures unanchored.

The three-log designs at Stations 130 and 370 will form stable triangles and the upstream-angled top logs are intended to capture small woody debris for fish cover. Root wads angled upstream are also intended to collect small woody debris as well as increase scouring around the structures. The creek constriction at Station 250 is not intended to collect large volumes of woody debris, so as to avoid a channel-spanning debris jam. These structures are intended to maximize scour in the center of the channel

while providing fish cover under the structures. The right bank structure at Station 250 is stably anchored to two trees while the left bank logs are wedged between two trees, braced by a steep bank downstream, and cabled together to minimize movement. Each of these structures occupy approximately 40 percent of the wetted channel and extend up the bank to or past the edge of the bankfull channel. Occupying much of the bankfull channel will provide flow refuge at bankfull flows.

Measurable and quantifiable objectives for this project include creation of pools, increase in stream depths and increased juvenile coho densities at each of the proposed LWD sites. Monitoring will be conducted as part of this project. Effectiveness monitoring will follow DFG protocols as well as protocols developed by MMWD, which include pre- and post-construction snorkel surveys, streambed depth mapping and photo monitoring. Project monitoring is more fully described under Task 5, below.

Task 5 – Effectiveness Monitoring

Effectiveness monitoring will follow DFG protocols as well as protocols developed by MMWD, which include pre- and post-construction snorkel surveys, streambed depth mapping and photo monitoring. Stream depths will be mapped during the summer baseflow period, on a two-meter by two-meter grid, as has been done with all previous woody debris installations (see “Project Effectiveness Monitoring” figure). Pre-construction snorkel surveys will likely not be feasible given the shallow nature of the site, and presumably no coho currently exist there due to the lack of pool habitat. If site conditions change prior to project construction, such that coho may occupy the site, pre-construction snorkel surveys will be conducted.

Project effectiveness can only be determined after the project area has experienced a bankfull flow event or similar flow adequate to cause streambed scour and associated habitat changes. In Lagunitas Creek, bankfull occurs at approximately 1,800 cfs. Following the first flow of this magnitude, MMWD will again map stream depths and measure coho densities in the project area. If channel-altering flows occur during the first winter following construction, MMWD will conduct effectiveness monitoring for two consecutive years. If such a flow does not occur during the first winter, MMWD will conduct one year of effectiveness monitoring during the second summer following construction.

California Department of Fish and Game
 Natural Diversity Database
 723829 Lagunitas Creek Woody Debris Enhancement Project

Common Name/Scientific Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
1 A leaf-cutter bee <i>Trachusa gummifera</i>	IHYM80010			G1	S1	
2 American badger <i>Taxidea taxus</i>	AMAJF04010			G5	S4	SC
3 Baker's larkspur <i>Delphinium bakeri</i>	PDRAN0B050	Endangered	Endangered	G1	S1.1	1B.1
4 Baker's navarretia <i>Navarretia leucocephala ssp. bakeri</i>	PDPLM0C0E1			G4T2	S2.1	1B.1
5 Bolander's water-hemlock <i>Cicuta maculata var. bolanderi</i>	PDAP10M051			G5T3T4	S2	2.1
6 California beaked-rush <i>Rhynchospora californica</i>	PMCYP0N060			G1	S1.1	1B.1
7 California black rail <i>Laterallus jamaicensis coturniculus</i>	ABNME03041		Threatened	G4T1	S1	
8 California clapper rail <i>Rallus longirostris obsoletus</i>	ABNME05016	Endangered	Endangered	G5T1	S1	
9 California freshwater shrimp <i>Syncaris pacifica</i>	ICMAL27010	Endangered	Endangered	G1	S1	
10 California red-legged frog <i>Rana draytonii</i>	AAABH01022	Threatened		G4T2T3	S2S3	SC
11 Coastal Brackish Marsh	CTT52200CA			G2	S2.1	
12 Coastal Terrace Prairie	CTT41100CA			G2	S2.1	
13 Contra Costa goldfields <i>Lasthenia conjugens</i>	PDAST5L040	Endangered		G1	S1.1	1B.1
14 Diablo helianthella <i>Helianthella castanea</i>	PDAST4M020			G2	S2	1B.2
15 Franciscan onion <i>Allium peninsulare var. franciscanum</i>	PMLIL021R1			G5T2	S2.2	1B.2
16 Franciscan thistle <i>Cirsium andrewsii</i>	PDAST2E050			G2	S2.2	1B.2
17 Humboldt Bay owl's-clover <i>Castilleja ambigua ssp. humboldtiensis</i>	PDSCR0D402			G4T2	S2.2	1B.2
18 Koch's cord moss <i>Entosthodon kochii</i>	NBMUS2P050			G1	S1	1B.3
19 Lyngbye's sedge <i>Carex lyngbyei</i>	PMCYP037Y0			G5	S2.2	2.2
20 Marin County navarretia <i>Navarretia rosulata</i>	PDPLM0C0Z0			G2?	S2?	1B.2
21 Marin blind harvestman <i>Calicina diminua</i>	ILARAU8040			G1	S1	
22 Marin checker lily <i>Fritillaria lanceolata var. tristulis</i>	PMLILOV0P1			G5T1	S1.1	1B.1
23 Marin checkerbloom <i>Sidalcea hickmanii ssp. viridis</i>	PDMAL110A4			G3T2	S2.2?	1B.3
24 Marin elfin butterfly <i>Callophrys mossii marinensis</i>	IILEPE2207			G4T1	S1	

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Common Name/Scientific Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
25 Marin hesperian <i>Vespericola marinensis</i>	IMGASA4140			G2G3	S2S3	
26 Marin knotweed <i>Polygonum marinense</i>	PDPGN0L1C0			G1Q	S1.1	3.1
27 Marin manzanita <i>Arctostaphylos virgata</i>	PDERI041K0			G2	S2.2	1B.2
28 Marin western flax <i>Hesperolinon congestum</i>	PDLIN01060	Threatened	Threatened	G2	S2.1	1B.1
29 Mason's ceanothus <i>Ceanothus masonii</i>	PDRHA04200		Rare	G1	S1.3	1B.2
30 Mason's lilaepsis <i>Lilaeopsis masonii</i>	PDAPI19030		Rare	G2	S2	1B.1
31 Mount Tamalpais bristly jewel-flower <i>Streptanthus glandulosus ssp. pulchellus</i>	PDBRA2G0J2			G4T1	S1.2	1B.2
32 Mt. Tamalpais manzanita <i>Arctostaphylos montana ssp. montana</i>	PDERI040J5			G3T2	S2.2	1B.3
33 Mt. Tamalpais thistle <i>Cirsium hydrophilum var. vaseyi</i>	PDAST2E1G2			G1T1	S1.2	1B.2
34 Mt. Vision ceanothus <i>Ceanothus gloriosus var. porrectus</i>	PDRHA040F7			G3G4T2	S2.2	1B.3
35 Napa false indigo <i>Amorpha californica var. napensis</i>	PDFAB08012			G4T2	S2.2	1B.2
36 North Coast phacelia <i>Phacelia insularis var. continentis</i>	PDHYD0C2B1			G2T1	S1.2	1B.2
37 North Coast semaphore grass <i>Pleuropogon hooverianus</i>	PMPOA4Y070		Threatened	G1	S1.1	1B.1
38 Northern Coastal Salt Marsh	CTT52110CA			G3	S3.2	
39 Northern Maritime Chaparral	CTT37C10CA			G1	S1.2	
40 Northern Vernal Pool	CTT44100CA			G2	S2.1	
41 Petaluma popcorn-flower <i>Plagiobothrys mollis var. vestitus</i>	PDBOR0V0Q2			G4?TX	SX	1A
42 Point Reyes bird's-beak <i>Chloropyron maritimum ssp. palustre</i>	PDSCR0J0C3			G4?T2	S2.2	1B.2
43 Point Reyes checkerbloom <i>Sidalcea calycosa ssp. rhizomata</i>	PDMAL11012			G5T2	S2.2	1B.2
44 Point Reyes horkelia <i>Horkelia marinensis</i>	PDROS0W0B0			G2	S2.2	1B.2
45 Point Reyes mountain beaver <i>Aplodontia rufa phaea</i>	AMAF01012			G5T2	S2	SC
46 Ricksecker's water scavenger beetle <i>Hydrochara rickseckeri</i>	IICOL5V010			G1G2	S1S2	
47 Sacramento splittail <i>Pogonichthys macrolepidotus</i>	AFCJB34020			G2	S2	SC
48 San Bruno elfin butterfly <i>Callophrys mossii bayensis</i>	IILEPE2202	Endangered		G4T1	S1	

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49 San Francisco Bay spineflower <i>Chorizanthe cuspidata</i> var. <i>cuspidata</i>	PDPGN04081			G2T2	S2.2	1B.2
50 San Francisco forktail damselfly <i>Ischnura gemina</i>	IIOD072010			G2	S2	
51 San Pablo song sparrow <i>Melospiza melodia samuelis</i>	ABPBXA301W			G5T2?	S2?	SC
52 Santa Cruz microseris <i>Stebbinsoseris decipiens</i>	PDAST6E050			G2	S2.2	1B.2
53 Santa Cruz tarplant <i>Holocarpha macradenia</i>	PDAST4X020	Threatened	Endangered	G1	S1.1	1B.1
54 Serpentine Bunchgrass	CTT42130CA			G2	S2.2	
55 Sonoma alopecurus <i>Alopecurus aequalis</i> var. <i>sonomensis</i>	PMPOA07012	Endangered		G5T1Q	S1.1	1B.1
56 Sonoma spineflower <i>Chorizanthe valida</i>	PDPGN040V0	Endangered	Endangered	G1	S1.1	1B.1
57 Tamalpais jewel-flower <i>Streptanthus batrachopus</i>	PDBRA2G050			G1	S1.2	1B.3
58 Tamalpais lessingia <i>Lessingia micradenia</i> var. <i>micradenia</i>	PDAST5S063			G2T1	S1.1	1B.2
59 Tamalpais oak <i>Quercus parvula</i> var. <i>tamalpaisensis</i>	PDFAG051Q3			G4T1	S1.3	1B.3
60 Tiburon buckwheat <i>Eriogonum luteolum</i> var. <i>caninum</i>	PDPGN083S1			G5T2	S2	1B.2
61 Tiburon paintbrush <i>Castilleja affinis</i> ssp. <i>neglecta</i>	PDSCR0D013	Endangered	Threatened	G4G5T1	S1.2	1B.2
62 Tomales isopod <i>Caecidotea tomalensis</i>	ICMAL01220			G2	S2	
63 Tomales roach <i>Lavinia symmetricus</i> ssp. 2	AFCJB19022			G5T2T3	S2S3	SC
64 Townsend's big-eared bat <i>Corynorhinus townsendii</i>	AMACC08010			G4	S2S3	SC
65 Ubick's gnaphosid spider <i>Talanites ubicki</i>	ILARA98030			G1	S1	
66 alkali milk-vetch <i>Astragalus tener</i> var. <i>tener</i>	PDFAB0F8R1			G2T2	S2	1B.2
67 bent-flowered fiddleneck <i>Amsinckia lunaris</i>	PDBOR01070			G2?	S2	1B.2
68 black swift <i>Cypseloides niger</i>	ABNUA01010			G4	S2	SC
69 blue coast gilia <i>Gilia capitata</i> ssp. <i>chamissonis</i>	PDPLM040B3			G5T2	S2.1	1B.1
70 bumblebee scarab beetle <i>Lichnanthe ursina</i>	IICOL67020			G2	S2	
71 burrowing owl <i>Athene cunicularia</i>	ABNSB10010			G4	S2	SC
72 coast lily <i>Lilium maritimum</i>	PMLIL1A0C0			G2	S2	1B.1

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73 coast yellow leptosiphon <i>Leptosiphon croceus</i>	PDPLM09170			G1	S1.1	1B.1
74 coastal marsh milk-vetch <i>Astragalus pycnostachyus var. pycnostachyus</i>	PDFAB0F7B2			G2T2	S2.2	1B.2
75 coastal triquetrella <i>Triquetrella californica</i>	NBMUS7S010			G1	S1	1B.2
76 coho salmon - central California coast ESU <i>Oncorhynchus kisutch</i>	AFCHA02034	Endangered	Endangered	G4	S2?	
77 elongate copper moss <i>Mielichhoferia elongata</i>	NBMUS4Q022			G4?	S2	2.2
78 foothill yellow-legged frog <i>Rana boylei</i>	AAABH01050			G3	S2S3	SC
79 fragrant fritillary <i>Fritillaria liliacea</i>	PMLILOV0C0			G2	S2.2	1B.2
80 golden larkspur <i>Delphinium luteum</i>	PDRAN0B0Z0	Endangered	Rare	G1	S1.1	1B.1
81 great blue heron <i>Ardea herodias</i>	ABNGA04010			G5	S4	
82 great egret <i>Ardea alba</i>	ABNGA04040			G5	S4	
83 hairless popcorn-flower <i>Plagiobothrys glaber</i>	PDBOR0V0B0			GH	SH	1A
84 hoary bat <i>Lasiurus cinereus</i>	AMACC05030			G5	S4?	
85 marbled murrelet <i>Brachyramphus marmoratus</i>	ABNNN06010	Threatened	Endangered	G3G4	S1	
86 marsh microseris <i>Microseris paludosa</i>	PDAST6E0D0			G2	S2.2	1B.2
87 mimic tryonia (=California brackishwater snail) <i>Tryonia imitator</i>	IMGASJ7040			G2G3	S2S3	
88 minute pocket moss <i>Fissidens pauperculus</i>	NBMUS2W0U0			G1G2	S1	1B.2
89 monarch butterfly <i>Danaus plexippus</i>	IILEPP2010			G5	S3	
90 northern spotted owl <i>Strix occidentalis caurina</i>	ABNSB12011	Threatened		G3T3	S2S3	SC
91 osprey <i>Pandion haliaetus</i>	ABNKC01010			G5	S3	
92 pallid bat <i>Antrozous pallidus</i>	AMACC10010			G5	S3	SC
93 perennial goldfields <i>Lasthenia californica ssp. macrantha</i>	PDAST5L0C5			G3T2	S2.2	1B.2
94 pink sand-verbena <i>Abronia umbellata var. breviflora</i>	PDNYC010N2			G4G5T2	S2.1	1B.1
95 robust walker <i>Pomatiopsis binneyi</i>	IMGASJ9010			G1	S1	

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96 round-leaved filaree <i>California macrophylla</i>	PDGER01070			G2	S2	1B.1
97 salt-marsh harvest mouse <i>Reithrodontomys raviventris</i>	AMAFF02040	Endangered	Endangered	G1G2	S1S2	
98 saltmarsh common yellowthroat <i>Geothlypis trichas sinuosa</i>	ABPBX1201A			G5T2	S2	SC
99 sandy beach tiger beetle <i>Cicindela hirticollis gravida</i>	IICOL02101			G5T2	S1	
100 seaside tarplant <i>Hemizonia congesta ssp. congesta</i>	PDAST4R065			G5T2T3	S2S3	1B.2
101 showy rancheria clover <i>Trifolium amoenum</i>	PDFAB40040	Endangered		G1	S1	1B.1
102 silver-haired bat <i>Lasionycteris noctivagans</i>	AMACC02010			G5	S3S4	
103 small groundcone <i>Kopsiopsis hookeri</i>	PDORO01010			G5	S1S2	2.3
104 soft bird's-beak <i>Chloropyron molle ssp. molle</i>	PDSCR0J0D2	Endangered	Rare	G2T1	S1.1	1B.2
105 steelhead - central California coast DPS <i>Oncorhynchus mykiss irideus</i>	AFCHA0209G	Threatened		G5T2Q	S2	
106 swamp harebell <i>Campanula californica</i>	PDCAM02060			G3	S3	1B.2
107 thin-lobed horkelia <i>Horkelia tenuiloba</i>	PDROS0W0E0			G2	S2.2	1B.2
108 tidewater goby <i>Eucyclogobius newberryi</i>	AFCQN04010	Endangered		G3	S2S3	SC
109 western leatherwood <i>Dirca occidentalis</i>	PDTHY03010			G2G3	S2S3	1B.2
110 western pond turtle <i>Emys marmorata</i>	ARAAD02030			G3G4	S3	SC
111 western red bat <i>Lasiurus blossevillii</i>	AMACC05060			G5	S3?	SC
112 western snowy plover <i>Charadrius alexandrinus nivosus</i>	ABNNB03031	Threatened		G4T3	S2	SC
113 white-rayed pentachaeta <i>Pentachaeta bellidiflora</i>	PDAST6X030	Endangered	Endangered	G1	S1.1	1B.1
114 white-tailed kite <i>Elanus leucurus</i>	ABNKC06010			G5	S3	
115 woolly-headed gilia <i>Gilia capitata ssp. tomentosa</i>	PDPLM040B9			G5T1	S1.1	1B.1
116 yellow warbler <i>Dendroica petechia brewsteri</i>	ABPBX03018			G5T3?	S2	SC

Exhibit B

Lagunitas Creek Woody Debris Enhancement Project

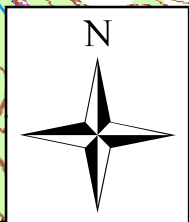
Project Location Map

T2N, R8W, S n/a , San Geronimo Quad

Marin County

38°1'0"N

38°1'0"N

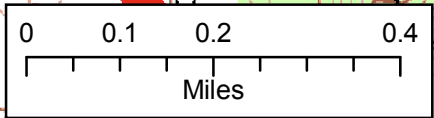
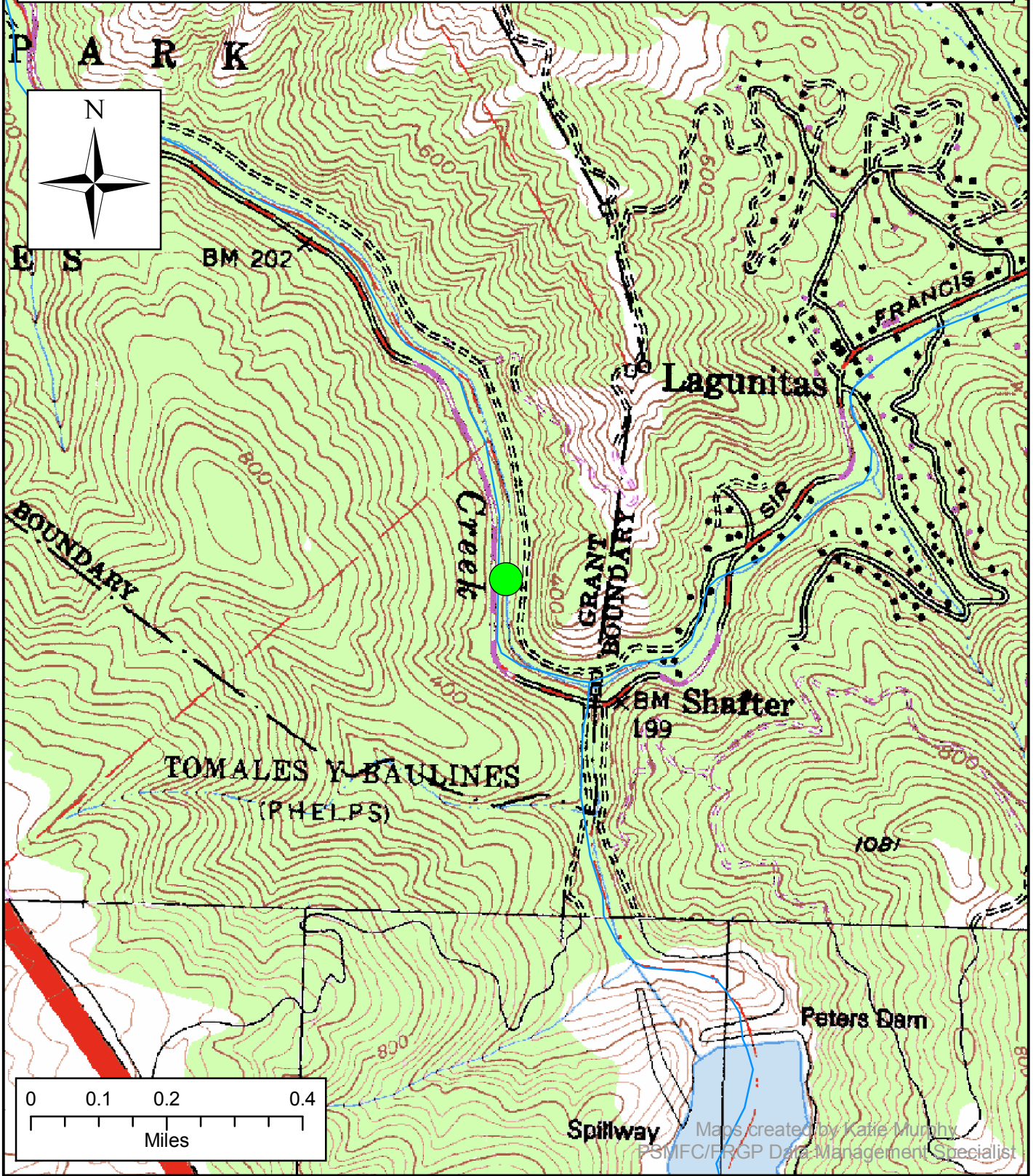


38°0'30"N

38°0'30"N

38°0'0"N

38°0'0"N



Maps created by Katie Murphy
PSMFC/FRGP Data Management Specialist