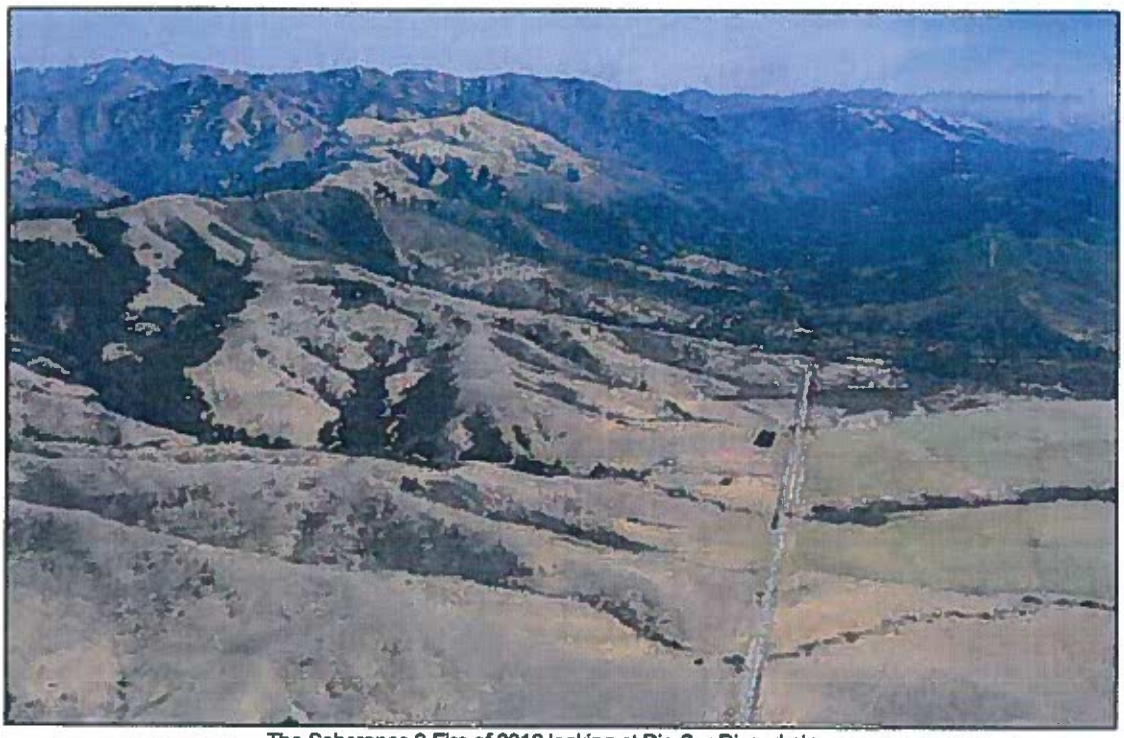
USDA-FOREST SERVICE
(7/08)

FS-2500-8
Date of Report: 10/20/16

DRAFT SOBERANES 2 BURNED AREA REPORT
(Reference FSH 2509.13)

PART I - TYPE OF REQUEST



The Soberanes 2 Fire of 2016 looking at Big Sur River drainage.

A. Type of Report

[x] 1. Funding request for estimated emergency stabilization funds
[ ] 2. Accomplishment Report
[ ] 3. No Treatment Recommendation

B. Type of Action

[x] 1. Initial Request (Best estimate of funds needed to complete eligible stabilization measures)

[ ] 2. Interim Report #____
[ ] Updating the initial funding request based on more accurate site data or design analysis
[ ] Status of accomplishments to date

[ ] 3. Final Report (Following completion of work)

The US Forest Service Burned Area Emergency Response (BAER) team has analyzed the entire Soberanes Fire for post-fire including the SOBERANES 2 BURNED-AREA REPORT/2500-8. An early version of this report covering only the northern section of the fire was posted on in early September before the fire was completely out but now that the final fire perimeter has been reached so the final version includes information from both assessments. This second report is a synopsis of BAER findings and the Forest Service's internal request for implementation funding **on Forest Service lands only**. Forest Service lands that burned are very steep and remote with few values at risk such as Botcher's Gap Campground, the road leading to the Pico Blanco Boy Scout Camp, hiking trails, native plants, fish, wildlife, and some cultural resources. Work to prepare these values at risk on Forest represents a small portion of the implementation work that will need to be done on the lands surrounding the National Forest; that is being addressed by the California Post-Fire Watershed Emergency Response Team and Natural Resource Conservation Service along with many land owners who will use the information that the Forest Service has generated across the total burn area to focus their work. Reports from these agencies will be posted when then are completed.

A second Burned Area Emergency Response (BAER) team was assembled by the Los Padres National Forest on October 12 to begin a rapid assessment of the southern half of the Soberanes Fire burned area. This second US Forest Service team included the following specialists: wildlife biologists, archeologists, engineers, botanists, wildlife biologists, trails specialists, soil scientists, hydrologists, and recreation personnel.

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Soberanes 2 Fire

B. Fire Number: CA-BEU-003422

C. State: CA

D. County: Monterey

E. Region: 5

F. Forest: Los Padres

G. Districts: Carmel River Management Unit

H. Fire Incident Job Code: PNKG7Z

I. Date Fire Started: July 22, 2016

J. Date Fire Contained: Oct. 12 2016

K. Suppression Cost: $250+ million

L. Fire Suppression Damages Repaired with Suppression Funds
   1. Dozerline repaired / waterbarred: 300 out of 380 miles as of 10/9/2016
   2. Hand line repaired: 18 out of 25 miles as of 10/9/2016

M. Watershed Number and Name:

HUC 12 watersheds affected by the Soberanes 2 Fire.

Watershed	HUC number	Acres Burned
Big Sur River	180600060104	24759
Cachagua Creek	180600060101	278
Danish Creek-Carmel River	180600060102	18775
Horse Creek-Arroyo Seco	180600051307	278
Las Gazas Creek-Carmel River	180600060105	521
Las Piedras Canyon Frontal	180600060102	9290
Little Sur River	180600060103	20951
Lost Valley Creek-Arroyo Seco	180600051301	5280
Partington Creek Frontal	180600060302	21
Piney Creek	180600051306	6043
San Clemente Creek-Carmel River	1806000601.	11020
Soberanes 2 Creek-Frontal Pacific Ocean	180600060203	1789
Tassajara Creek-Arroyo Seco	180600051302	2908

N. Total Acres Burned: Soberanes 2 Fire Assessment Area: 132,603
(NFS Acres 92,153; BLM 655; Private 24,379; State &Local 15,416)

O. Vegetation Types: The dominant vegetation communities within the fire perimeter include Mixed Evergreen Forest, Mixed Conifer Forest, Redwood Forest, Hardwood (Chaparral, Coastal Sage Scrub, and canyon live oak), and Riparian Woodland. Vegetation communities were classified based on information obtained from CALVEG (USDA, 2009).

P. Soil: The following 10 soil map units comprise approximately 84.2% of the burned area in the Soberanes 2 Fire.

Top 10 Map Units Burned by Acre			
MUSYM	MapUnit Name	Acres	Percent of Burned Area
Ss	Sur-Junipero complex	38,445	29.12%
Ce	Cieneba-Sur Rock outcrop complex	22,400	16.96%
Rc	Rock outcrop-Xerorthent association	14,020	10.62&
Cd	Cieneba-Rock outcrop complex, 50 to 75 percent slopes, cool MAAT, MLRA 15	12,837	9.72%
JbG	Junipero sandy loam, 30 to 75 percent slopes	9,913	7.51%
CcG	Cieneba fine gravelly sandy loam, 30 to 75 percent slopes	8,519	6.45%
SoG	Sheridan coarse sandy loam, 30 to 75 percent slopes	6,395	4.84%
Ga	Gamboa-Sur complex	6,331	4.79%
Jc	Junipero-Sur complex	5,070	3.84%
Sg	Santa Lucia-Reliz association	1,305	0.99%
Toatal		125,235	84.22%

Q. Geologic Types: The Soberanes 2 Fire occurred in the Santa Lucia Mountain Range, considered a part of the California Central Coast Mountain Range. The Santa Lucia Mountain Range is 140 miles long, extending from Carmel in the north (Monterey County) to the Cuyama River in the south (in San Luis Obispo County). The physiography of the Santa Lucia mountains is dominated by extremely steep slopes, all associated with watersheds flowing directly or

indirectly into the Pacific Ocean. The range is of recent tectonic origin, and is rugged, steep and dissected by deep stream canyons. The general trend of the range is northwest-southeast, paralleling the numerous faults that transect the area. The topography is complex, however, reflecting active uplift and deformation, a variety of lithological types, rapidly incising stream networks and highly unstable slopes. Stream channels and hillslopes are very steep, with average hillslope gradients exceeding 60% in some sub watersheds. The coastal side of the range rises directly from the shoreline, with oceanfront ridges rising directly 4,000 to 5,000 feet to the crest ridge.

The basement rocks of the Santa Lucia Range contain Mesozoic Franciscan and Salinian block rocks. The Franciscan complex is composed of greywacke sandstone and greenstone, with serpentinite bodies and other ultramafics present. Small areas of marble and limestone lenses form resistant outcrops that are prominent landscape features, often white to light gray in color. The Salinian block is made up of highly fractured, and deeply weathered meta-sediments, especially biotite schist and gneiss, intruded by plutonic (granitic) rocks such as quartz diorite and granodiorite. Both formations have been disrupted and tectonically slivered by motion on the San Andreas and associated fault systems. The Palo Colorado and Church Creek faults are prominent features influencing the linear NW/SE alignment of primary drainages.

R. Miles of Stream Channels by Order or Class: 38 Miles Perennial, 238 Miles Intermittent

S. Transportation System:
- Roads: 123 (3 FS, 10 BLM, 110 County, 0.47 private) miles
- Trails: 59 miles

PART III - WATERSHED CONDITION

A. Soil Burn Severity by total and FS (acres):

Agency	High	Low	Moderate	Unburned	Grand Total
Big Sur Land Trust	31	478	692	128	1329
Bureau of Land Management	10	214	415	16	655
California Department of Fish and Wildlife	430	897	4191	200	5718
California Department of Parks and Recreation	2	1737	1366	315	3419
Monterey Peninsula Regional Park District	18	1297	1482	206	3003
Monterey, County of		23	75	3	100
Other State		19	32	1	52
Private	324	8888	13380	1787	24379
Santa Lucia Conservancy	3	1053	460	268	1784
Save the Redwoods League		1	1	0	1
Unknown Federal		8	1	0	9
USDA Forest Service	3340	20639	55447	12719	92145
Grand Total	4158	35254	77541	15642	132594

Interpreting the Soil Burn Severity Map: Fire Intensity vs Soil Burn Severity

Parameters commonly used to define fire intensity or burn severity on vegetation are flame height, rate of spread, fuel loading, thermal potential, canopy consumption or tree mortality. Soil burn

severity for BAER analysis considers additional surface and below-ground factors that relate to soil hydrologic function, runoff and erosion potential, and vegetative recovery. Indicators of soil burn severity include degradation of surface structure, loss of soil organic matter, and consumption of fine roots and formation of water repellent layers. Soberanes 2 BAER Soil Scientists followed standard soil burn severity mapping methods fully described in the Field Guide for Mapping Soil Burn Severity (http://www.fs.fed.us/rm/pubs/rmrs_gtr243.pdf).

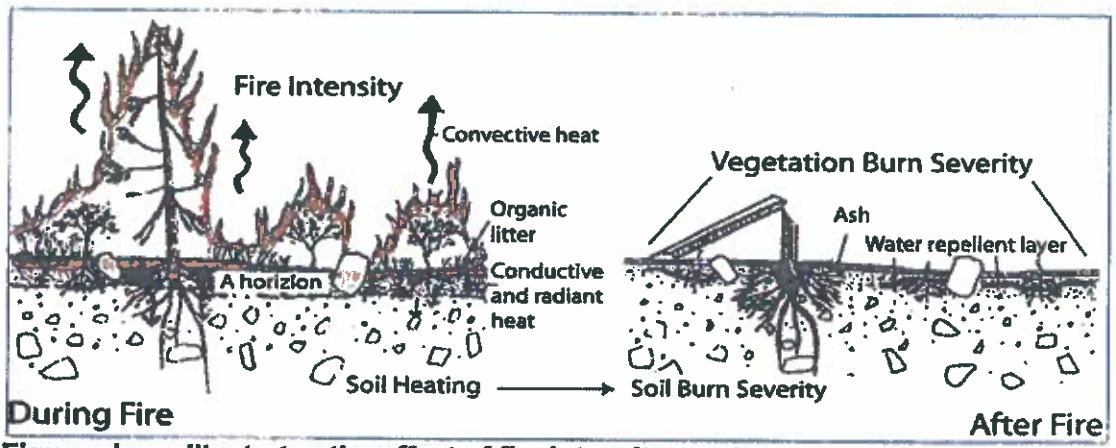
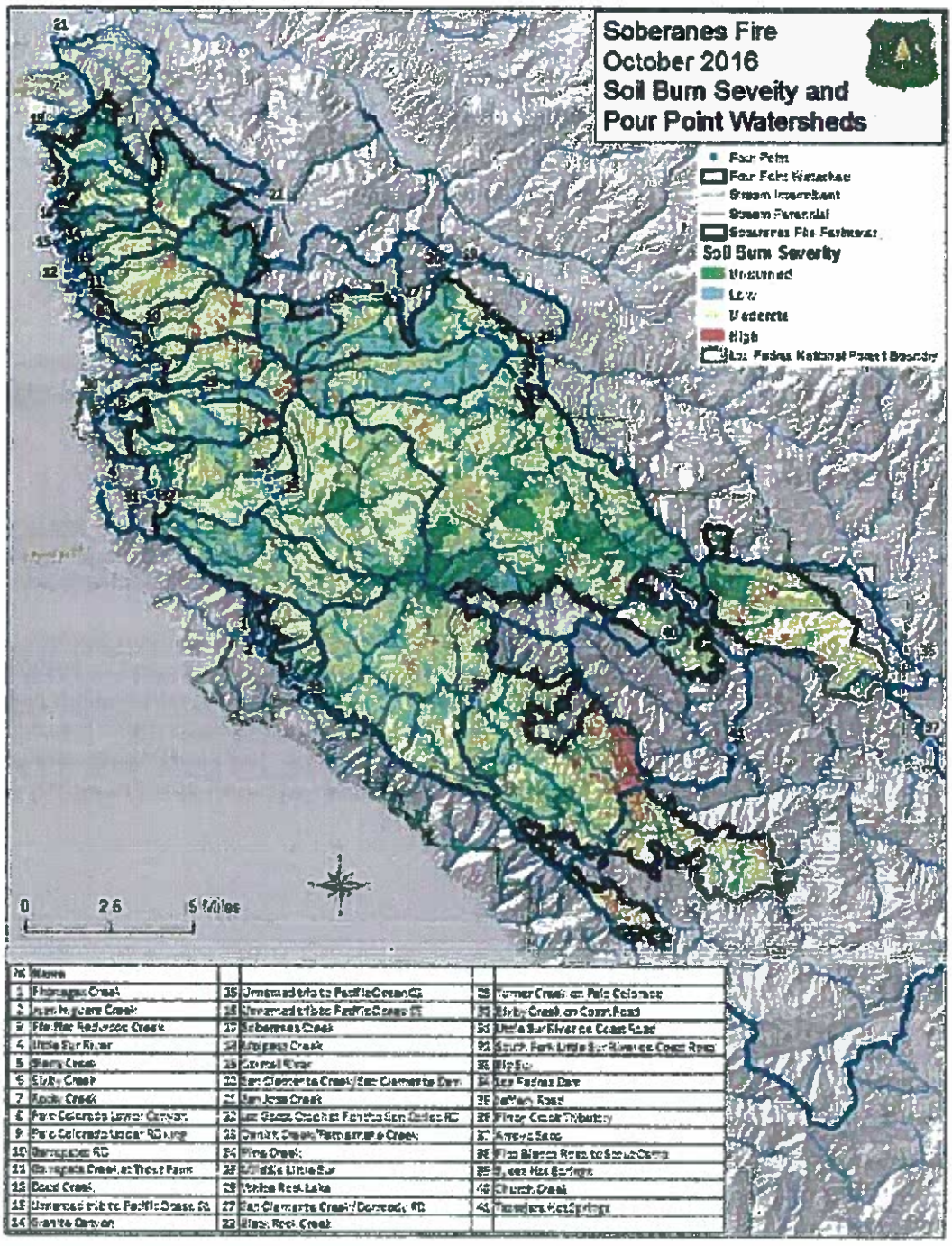


Figure above illustrates the effect of fire intensity on above-ground vegetation and Below ground soil properties (Graphics by Mike Hankinson, National Park Service)

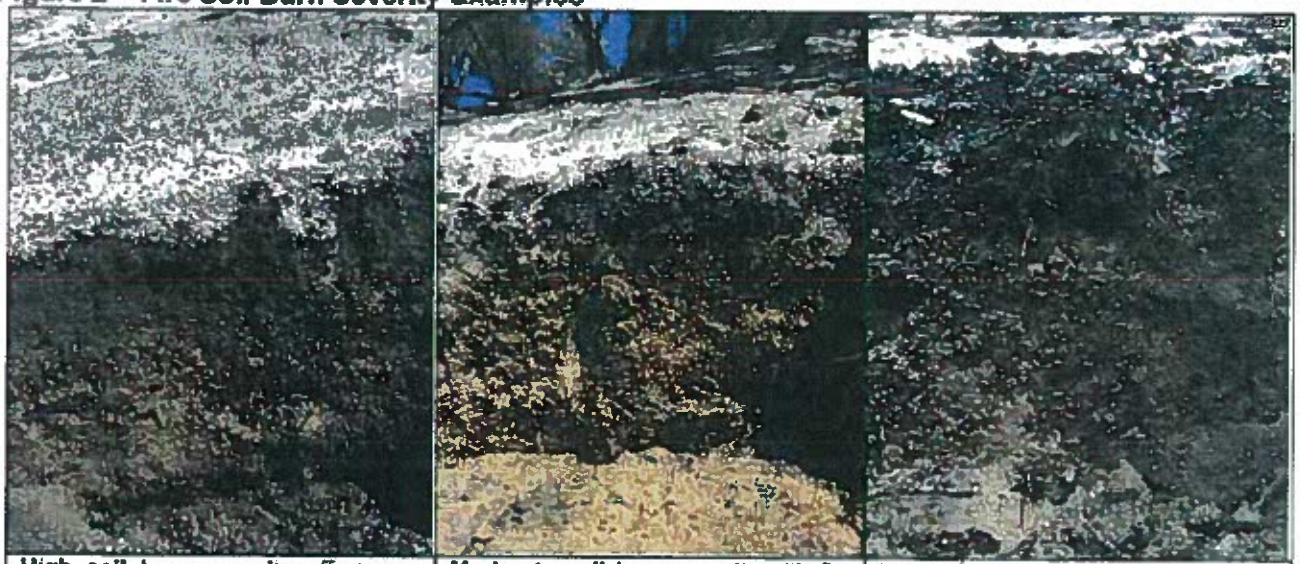
The following soil burn severity map (Figure 1) illustrates the general soil burn severity pattern on the landscape. The soil burn severity is overwhelmingly moderate (59%) and low (32%). In most of the moderate burn severity, and some of the low severity (particularly on south-facing slopes), there is very little vegetation or ground cover remaining except surface rock. There is only 2% high soil burn severity because of the low pre-fire ground cover, and partly because the fire was heavily wind-driven and had short residence times. Very low soil burn severity was 6% of the fire area.

Figure 1 – Soil Burn Severity Map for the Soberanes 2 Fire



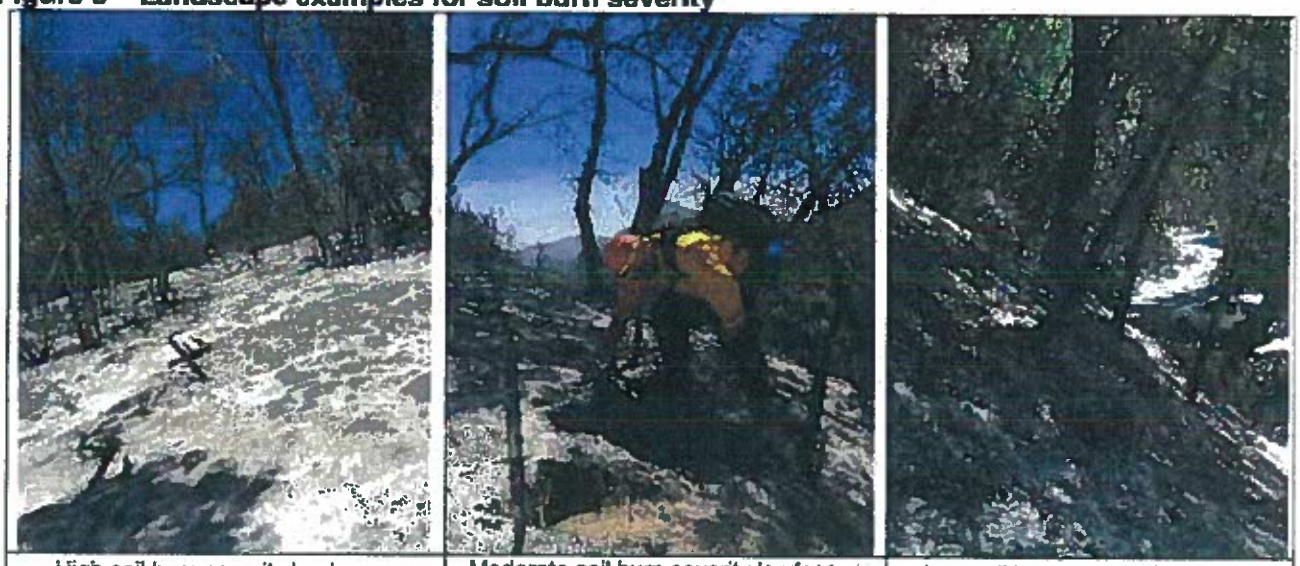
The following pictures (Figures 2 & 3) are companion pictures to show typical soil burn severity and landscapes with mixed mortality due to differing vegetation types, slopes, aspect, and location.

Figure 2 – Fire Soil Burn Severity Examples



High soil burn severity effects are degradation of surface structure, consumption of soil organic material and formation of water repellent layers	**Moderate soil burn** severity with fire effects of litter and duff removal and char and water repellency to 1 inch below the surface	**Low soil burn severity** due to minimal fire effects on this soil with a clay-loam surface texture

Figure 3 – Landscape examples for soil burn severity



High soil burn severity landscape	Moderate soil burn severity landscape	Low soil burn severity landscape

General Soil Burn Severity Patterns, Selected Influencing Factors and Recovery Interpretations (based on field observations)

Selected Factor Influencing Soil Burn Severity: Weather

Weather conditions which influenced fire behavior. For example the fire progression was extreme due to strong winds and light, flashy fuels and moved east from the Soberanes 2 to Carmel Valley within a few days of ignition. The fire then moved in a southerly direction, burning in the Ventana Wilderness parallel to and within the Carmel, Little and Big Sur River drainages.

Selected Factor Influencing Soil Burn Severity: Terrain
Steep terrain and chimney canyons played a role in fire behavior along with wind patterns. South and southwest slopes typically have lower humidity, higher fuel temperatures and are more exposed to summer winds. These areas had more brush and flashy fuels creating rapid fire spread.

Selected Factor Influencing Soil Burn Severity: General Vegetation, Density, and Fire History
Vegetation cover type, density and fuel loading also likely influenced the soil burn severity patterns especially areas that have burned many times in the past. Areas subject to coastal fog and humidity the north-facing slopes were generally timbered and experienced low underburing where southern exposures were brush and grass that experienced moderate to high burning. Areas inland are not influenced by coastal fog and humidity experienced moderate to high burning on north-facing slopes where south-facing slopes experienced light to moderate burning.

Selected Factor Influencing Soil Burn Severity: Soil Type/Surface Layer Texture
Soil type also influenced soil burn severity patterns. Fire effects on soils such as degradation of structure, changes in soil color, consumption of fine roots and depth of water repellent layers were strongly influenced by soil surface texture. In soils with clay loam surface textures, fire effects on soil were commonly minimal and water repellency generally occurred at the surface. In soils with sandy loam and fine-gravelly loam surface textures, fire effects on soil were common to depths of up to an inch and water repellency was observed at depths of up to 4 inches.

Initial Interpretation for Recovery of Hillslope Stability: Ground Cover
Very high rates of needle and leaf cast were observed in forested areas with low and moderate soil burn severity. Thin layers of scorched needles and leaves are providing effective erosion control in these areas. In forested areas that experienced high soil burn severity or areas where shrub cover was consumed, ground cover recovery will be slower. Recovery of low lying vegetation will heavily influence recovery of hill-slope stability in these areas.

B. Soil Resource Condition Assessment Sections:

The Soberanes 2 Fire burned over 132,603 acres from Carmel Heights to the Ventana Wilderness south of Monterey, CA between 1,500 and 5,500 foot elevations. The average slope of the burned area is 60%. The vegetation included a mix of oak woodland, chaparral, and mixed forest at the higher elevations. Much of the forested area was a re-burn of several past fires (Marble Cone Complex of 1977, Bottcher fire 1986, Molera fire 1989, Sur fire 1996, Kirk fire 1999, Basin Complex fires 2008, and the Tassajara fire 2013), which had a notable component of dead & down woody debris that was consumed. One thing to point out for this fire the upper 1/3 has never burned in the past 50 to 100 years.

The soils are mostly moderately deep, with some deep soils in the forested terrain with rock outcrop. Total surface water holding capacity of the mod-deep soils is ~1.5 inches, while deeper soils hold ~3 inches of water. Total annual precipitation for the burned area varies drastically with elevation & from the ocean (20 inches) to mountain tops (50 inches) because of orographic uplift.

The high and moderate soil burn severity classes have evidence of severe soil heating in a patchy distribution – increased runoff and accelerated erosion are likely. Some of these areas do have good needle-cast potential, which is expected improve groundcover. The low to very low soil burn severity classes still have good soil structure; contain intact fine roots and organic matter with hydrologic function unaltered.

Recovery of soil cover for coastal influenced terrane is expected to be rapid on north aspect slopes because the canopy generally did not burn. Needle scorch and normal needle fall will rapidly replenish the soil cover which will moderate hydrologic response. Recovery on the south slopes will take several years to fully recover. Recovery of soil cover for inland influenced terrane is expected to be rapid on south aspect slopes because the lack of vegetation that generally did not burn hot. Recovery on the north slopes will take several years to fully recover.

C. Water Repellent Soils:

92,435 acres (70% of fire area)

Hydrophobic strength was observed in approximately 70% of the observed fire area. Soils that burned with moderate and high soil burn severity on south aspect slopes resulted in near complete vegetation canopy and organic horizon removal, leaving surface rock as the only effective ground cover. The other moderate soil burn severity class occurred.

D. Erosion Potential (erosion hazard rating):

Soil texture, climate, slope, rock content and burn severity dictate soil EHR. These ratings are consistent with field observations made during the BAER soil assessment. These observations were calculated from the 2 year storm on the burned sediment severity ERMiT map.

Table 1: 2-year storm event burned EHR

Erosion Hazard Rating	Acres	% of Fire
Low	26,647.25	20.10%
Moderate	26,379.23	19.90%
High	79,501.60	59.97%
Very High	46.48	0.04%

Erosion and Sediment Potential is assumed to be similar in burned landscapes dominated by steep slopes and is discussed in Section E.

E. Sediment Potential:

The Erosion Risk Management Tool (ERMiT), was used to model both pre and post fire sedimentation. In areas with moderate and high burn severity, erosion potential was generally increased above natural conditions. Sedimentation was modeled for the first year post-fire with 2, 5, and 10 year runoff events.
Predicted sedimentation rates increased from 0.9 to 5.95 tons/acre for a 2-year runoff event. The watersheds with the highest predicted rates were the Little Sur River, Bixby Creek, the analyzed portion of the Big Sur River watershed situated above the Big Sur Lodge, and Juan Higuera Creek.

Recovery of soil cover is expected to be rapid on north aspect slopes because the canopy generally did not burn. Needle scorch and normal needle fall will rapidly replenish the soil cover which will moderate hydrologic response. Recovery on the south slopes will take several years to fully recover.

Summary of Watershed Response

Erosion Response: In some, but not all pour-point watersheds, significant erosion and sedimentation is expected. Most of the moderate burn severity, and even some of the low burn severity areas contain extremely low ground cover levels, which could contribute to high erosion levels. 57% of the fire area has either a high or very high erosion hazard rating (Table 3).

Table 2 - Modelled Hillslope Erosion for post-fire 2 and 10 year runoff events

Year Storm	Pre-Fire (Tons\Acre)	Post-Fire (Tons/Acre)
2	0.85	18.06
10	32.08	88.56

In most, but not all pour point watersheds, significant erosion (over 2 tons/acre) and sedimentation is expected for a 5 year storm. Sediment increases are mostly pronounced on north facing slopes and in the a few main pour-sheads. The largest watershed is the Carmel River Watershed with 39,810 acres and is projected to contribute 2.15 tons/acre on a 2 year storm, 4.24 tons/acre on a 5 year storm, and 6.91 tons/acre on a 10 year storm. The smallest watershed is the Unnamed Trib to Pacific Ocean 1 Watershed with 120 acres and is projected to contribute 1.14 tons/acre on a 2 year storm, 2.9 tons/acre on a 5 year storm, and 8.7 tons/acre on a 10 year storm. The highest sediment contributing watershed is the Juan Higuera Creek Watershed with 1,165 acres and is projected to contribute 5.21 tons/acre on a 2 year storm, 12.77 tons/acre on a 5 year storm, and 19.08 tons/acre on a 10 year storm. The lowest sediment contributing watershed is the San Clemente Creek Watershed with 3,696 acres and is projected to contribute 0.2 tons/acre on a 2 year storm, 0.49 tons/acre on a 5 year storm, and 3.43 tons/acre on a 10 year storm (see Appendix A for 2 and 10-year events).

Table 3 – Predicted 5-year ERMIT Erosion Rates for the Phase 1 Soberanes 2 Fire

Pourshed	Sum of Acres	Sedimentation Rate (Tons/Acre)					
		2 Year		5 Year		10 Year	
		Unburned	Burned	Unburned	Burned	Unburned	Burned
Bixby Creek	5539	0.02	4.08	0.05	8.43	2.44	11.54
Bixby Creek on Coast Road	7057	0.02	3.76	0.06	7.80	2.75	11.08
Black Rock Creek	5233	0.02	3.40	0.05	6.66	1.81	9.20
Carmel River	39810	0.02	2.15	0.06	4.24	2.26	6.91
Danish Creek/Rattlesnake Creek	29313	0.02	1.92	0.06	3.74	2.17	6.27
Doud Creek	1740	0.03	4.29	0.07	8.70	3.33	12.27

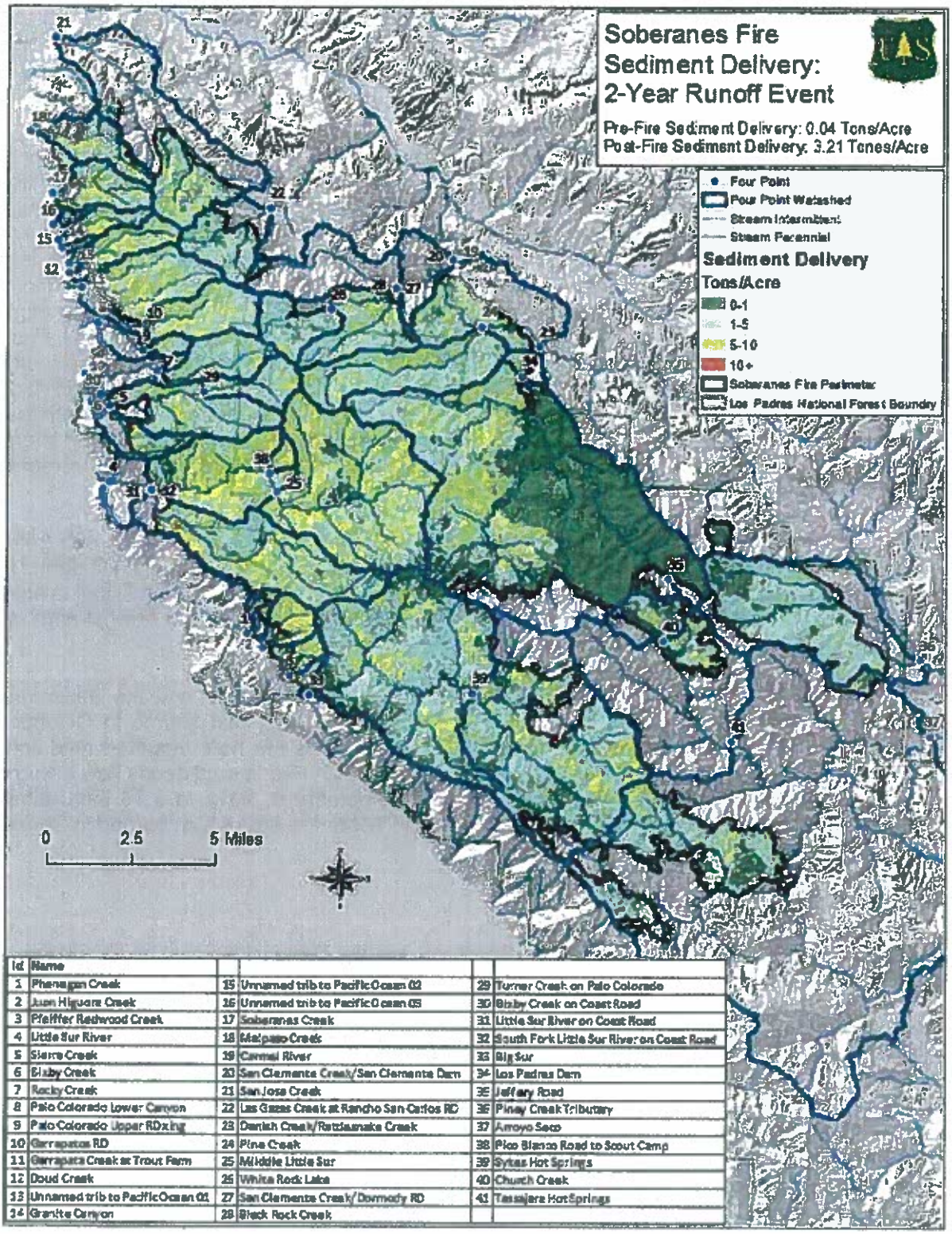
Garrapata Creek at Trout Farm	6696	0.02	4.25	0.06	8.21	2.48	11.20
Garrapatos RD	2734	0.02	4.58	0.06	8.53	1.94	11.21
Granite Canyon	992	0.03	3.55	0.08	8.49	5.29	13.36
Juan Higuera Creek	1165	0.05	5.21	0.10	12.77	7.10	19.08
Las Garzas Creek at Rancho San Carlos RD	2852	0.02	2.34	0.05	5.20	4.12	9.51
Little Sur River	25567	0.04	4.23	0.08	8.59	3.20	12.19
Little Sur River on Coast Road	17031	0.02	4.62	0.07	9.12	2.77	12.53
Malpaso Creek	2109	0.03	2.79	0.07	6.80	5.51	11.95
Middle Little Sur	11682	0.02	4.43	0.07	8.55	2.36	11.55
Palo Colorado Lower Canyon	1195	0.02	2.29	0.05	4.47	1.96	6.83
Palo Colorado Upper RD xing	442	0.02	4.06	0.06	7.62	1.58	9.89
Pfeiffer Redwood Creek	545	0.06	4.62	0.13	11.29	6.50	16.62
Pheneger Creek	522	0.08	2.66	0.16	6.69	7.69	13.75
Pine Creek	5074	0.02	3.99	0.05	7.76	1.62	10.42
Rocky Creek	2225	0.02	4.07	0.07	9.54	4.20	13.46
San Clemente Creek/Dormody RD	3693	0.02	0.20	0.05	0.49	2.97	3.43
San Clemente Creek/San Clemente Dam	10651	0.02	1.77	0.05	3.50	2.51	6.34
San Jose Creek	8843	0.05	1.49	0.09	2.87	2.09	5.34
Sierra Creek	1357	0.04	2.77	0.09	5.88	4.08	9.99
Soberanes 2 Creek	1929	0.02	3.84	0.06	8.47	3.80	12.42
South Fork Little Sur River on Coast Road	7277	0.05	3.98	0.10	8.66	4.06	12.67
Turner Creek on Palo Colorado	1630	0.02	3.99	0.05	7.67	1.67	10.11
Unnamed trib to Pacific Ocean 01	120	0.03	1.14	0.08	2.90	6.14	8.70

Unnamed trib to Pacific Ocean 02	128	0.02	1.86	0.06	4.41	4.88	9.10
Unnamed trib to Pacific Ocean 03	212	0.03	1.51	0.07	3.58	3.69	7.21
White Rock Lake	2164	0.01	2.98	0.04	5.75	1.15	7.79
Average	6485	0.03	3.21	0.07	6.79	3.44	10.43

Table 4 – Predicted 2 and 10-year ERMIT Erosion Rates for the Phase 2 Soberanes 2 Fire

Sedimentation Rate (Tons/Acre)					
		2 Year		10 Year	
Pourshed	Acres	Burned	Unburned	Burned	Unburned
Arroy Seco	76,589	0.4	0.1	2.9	1.3
Big Sur	30,022	6.6	0.3	35.2	12.6
Church Creek	1,793	1.3	0.1	2.9	1.3
Jeffery Road	788	0.0	0.0	2.1	2.0
Los Padres Dam	28,771	1.9	0.0	6.2	2.1
Pico Blanco Scout Camp	377	4.0	0.0	11.0	2.4
Piney Canyon Road	10,210	1.5	0.2	11.2	3.8
Sykes Hot Springs	15,623	1.9	0.1	13.3	5.0
Tassarajara Hot Springs	12,797	0.5	0.1	3.9	1.6
Average	**19,663**	**2.0**	**0.1**	**9.8**	**3.6**

Figure 4 – Sediment Delivery for 2-Year Runoff Event



Id	Name				
1	Phenagan Creek	15	Unnamed trib to PacificOcean 02	29	Turner Creek on Palo Colorado
2	Juan Higuera Creek	16	Unnamed trib to PacificOcean 03	30	Bixby Creek on Coast Road
3	Pfeiffer Redwood Creek	17	Soberanes Creek	31	Little Sur River on Coast Road
4	Little Sur River	18	Malpaso Creek	32	South Fork Little Sur River on Coast Road
5	Sierra Creek	19	Carmel River	33	Big Sur
6	Bixby Creek	20	San Clemente Creek/San Clemente Dam	34	Los Padres Dam
7	Rocky Creek	21	San Jose Creek	35	Jeffery Road
8	Palo Colorado Lower Canyon	22	Las Garzas Creek at Rancho San Carlos RD	36	Pinay Creek Tributary
9	Palo Colorado Upper RDxing	23	Danish Creek/Rattlesnake Creek	37	Arroyo Seco
10	Garrapatos RD	24	Pine Creek	38	Pico Blanco Road to Scout Camp
11	Garrapata Creek at Trout Farm	25	Middle Little Sur	39	Sykes Hot Springs
12	Doud Creek	26	White Rock Lake	40	Church Creek
13	Unnamed trib to PacificOcean 01	27	San Clemente Creek/Dormody RD	41	Tassajara Hot Springs
14	Granite Canyon	28	Black Rock Creek		

Hydrology

Areas affected by the Fire drain portions of the Carmel River and Santa Lucia Hydrologic Units (Central Coast Basin Plan 2016). Watersheds directly impacted by the fire are shown in figure 1. Beneficial uses common across these watersheds include; municipal, domestic and agricultural supply, groundwater recharge, recreation, wildlife habitat, aquatic habitat and spawning, and commercial/sport fishing.

Wildfires primarily affect water quality through increased sedimentation. As a result, the primary water quality constituents or characteristics affected by this fire include color, sediment, settleable material, suspended material, and turbidity. Floods and debris flows can entrain large material, which can physically damage infrastructure associated with the beneficial utilization of water (e.g., water conveyance structures; hydropower structures; transportation networks). The loss of riparian shading and the sedimentation of channels by floods and debris flows may increase stream temperature. Fire-induced increases in mass wasting along with extensive tree mortality can result in increases in floating material – primarily in the form of large woody debris. Post-fire delivery of organic debris to stream channels can potentially decrease dissolved oxygen concentrations in streams. Fire-derived ash inputs can increase pH, alkalinity, conductivity, and nutrient flux (e.g. ammonium, nitrate, phosphate, and potassium), although these changes are generally short lived. Post-fire increases in runoff and sedimentation within the urban interface, and burned structures and equipment within the fire perimeter may also lead to increases in chemical constituents, oil/grease, and pesticides.

The most noticeable effects on water quality will be increases in sediment and ash from the burned area into waterbodies in and downstream of the fire area. Flash flooding and debris flows are natural watershed response for this area. The risk of flash flooding and erosional events will increase as a result of the fire, creating hazardous conditions within and downstream of the burned area.

Historical information from prior fires in this area can be used to predict how the landscape will respond to this fire. Following the Molera Fire in August 1972, rain storms in October and November having peak rainfall intensities of about 0.7 inches per hour triggered mud flows in Pheneger Creek (Cleveland 1972). Following the 2008 Basin Fire, a mud/debris flow occurred in Pfeiffer Redwood Creek (Cooper pers comm). On February 6, 2014, a 2.14 inch rainstorm generated a mudflow in Sycamore Canyon from the Pfeiffer fire area which burned in December 2013 (Anderson pers comm).

Design Flow Runoff Response

Before an adjusted design flow can be determined, pre-fire design flow must be calculated. This is the flow expected to occur prior to the fire and the flow responsible for forming present day channel conditions. These flows are used to estimate proper performance of culverts and other drainage structures. Design flow estimates for the Soberanes 2 Fire have been based on the U.S. Geological Survey regression equations developed for the Sierra Nevada (Gotvald, et al., 2012).

Adjusted design flow is calculated using the same relationships as design flow; however, runoff response is estimated by assuming an increased runoff commensurate with soil burn severity in terms of recurrence interval. This recurrence interval estimates the response of the newly burnt landscape to the design storm of interest. The Soberanes 2 Fire is expected to respond to an average rainfall event differently for the unburned, low, moderate, and high soil severity burned

areas. Figure shows the estimated runoff response for a 2 year, 6 hour design storm by soil burn severity.

In order to further assess potential values at risk within the fire, pour point basins were identified and mapped. These basins are various sizes and are determined by the desired outlet or pour point above a value at risk or area of concern. These sites may be within or downstream of the burned area. The size of the watershed is dependent on the local flow patterns in addition to the need to evaluate a basin for values at risk.

The risk or probability (R) that a certain return interval flood (T) will occur over different time periods (n) was calculated by the following equation (Chow et al. 1988):$R = 1 - (1 - \frac{1}{T})^n$. A design flood with a 2 year recurrence interval has a 50% chance of occurring in any given year, and a 97% chance of occurring in the next five years (recovery period). The 2 year, 30 minute duration storm anticipated for these watersheds range from 0.589-0.737 inches (NOAA, 2016). A 5 year flood has a 20% chance of occurring in any given year, and a 67% chance of occurring in the next five years. The 5 year, 30 minute duration storms anticipated for these watersheds range from 0.711-0.896 inches. A 10 year flood has a 10% chance of occurring in any given year, and a 41% chance of occurring in the next five years. The 10 year, 30 minute duration storms anticipated for these watersheds range from 0.805-1.04 inches.

Before an adjusted design flow can be determined, pre-fire design flow must be calculated. This is the flow expected to occur in pre-fire conditions. This is the flow responsible for forming present day channel conditions and flows used to estimate proper performance of culverts and other drainage structures. However due to the lack of real data on that system, and the rapid nature of this assessment, design flow estimates have been calculated based on the equations in the document "Methods for Determining Magnitude and Frequency of Floods in California, Based on Data through Water Year 2006" (USGS, 2012). This is an empirical model based on gauge data. These estimates assume pre-fire ground infiltration and ground cover conditions.

Adjusted design flow is calculated using the same equations as design flow; however runoff response is estimated by assuming an increased runoff commensurate with soil burn severity in terms of recurrence interval. This recurrence interval estimates the response of the newly burnt landscape to an average annual storm. Areas within the Fire perimeter that experienced moderate to high soil burn severity are expected to respond to an average rainfall event, an event usually associated with the 2-year storm, differently than the unburned and low severity burned areas. It is expected the landscape would respond as if the 2-year storm discharge were associated with a 2-year storm (unburned soil burn severity), 5-year event (low soil burn severity) and 10-year event (moderate and high soil burn severity), respectively.

The moderate and high soil burn severity in this fire is on high slopes, has little or no soil cover in the form of duff or expected needle cast, and is prone to flash flood and debris flows under pre-fire conditions. These factors increase the probability of increased watershed response from that area within the burn. As a result, moderate burn severity is assumed to have the same recurrence interval as high burn severity. The unburned lands within the fire would respond as the unburned lands outside the fire and would have a discharge associated with the 2-year return interval. Surface vegetation has burned within the low soil burn severity, however some duff and roots from the past surface plants remain. Thus, initially the low soil burn severity areas would be expected to have a higher response than the unburned but would not be as intense and potentially recover quicker than the moderate and high soil burn severity areas. Consequently the low soil burn severity area would be expected to have a discharge associated with the 5-year return interval. The range in return interval is based on the Central Coastal California flood frequency

equations (USGS 2012). Increases in discharge associated with predicted recurrence intervals are pro-rated across watersheds by soil burn severity to yield post-fire discharge or the adjusted design flow. The modeling assumes the design storm event.

The fire has been analyzed by watersheds. Watersheds are various sizes and shapes and are dependent on the analysis of the desired outlet or pour point above a value at risk or area of concern. Watersheds are defined as the area above a point in which all surface water will flow. These sites may be within or downstream of the burned area. Size of watershed is dependent on the local flow patterns in addition to the need to evaluate a basin for values at risk. Figure 5 displays the response of pour point watersheds for a 2 year flood. The results show the response ranged from 1.07 to 3.34 times the unburned pre-fire condition.

Post-fire flood peaks for the 5-year and 10-year floods were also modelled using the process described above. For the 5-year flood, low burn was calculated at the 10-year flow while moderate/high burn was calculated as the average between the 10- and 25-year flows. For the 10-year peak, low burn was calculated as the average between the 10- and 25-year flows and the moderate/high burn was calculated as the 25-year flood.

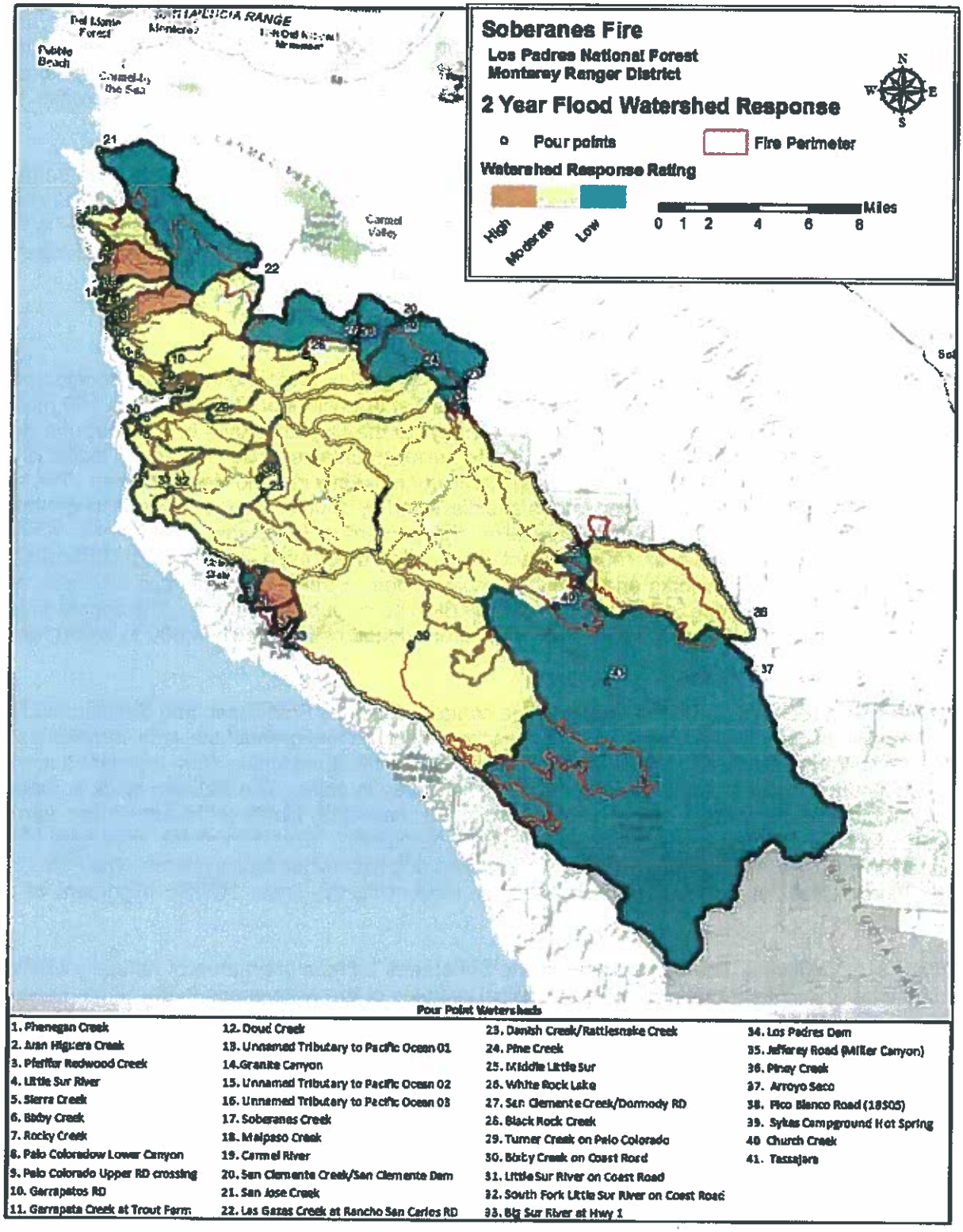
Results for the post-fire 5-year flood were 1.04 to 1.78 times the pre-fire values. The post-fire 10-year flood results were 1.03 to 1.40 times pre-fire. This result is to be expected as the influence of the fire effects lessens for larger fires. The increase in flow is mainly due to the loss of infiltration. This is a smaller portion of the total runoff of larger flows.

The areas that have the highest potential for flooding include:

- Pfeiffer Redwood Creek
- Juan Higuera Creek
- Palo Colorado Upper Road Crossing
- Doud Creek
- Sobranes Creek

Watersheds along the coast are expected to have the highest post fire watershed response. State and private property and state, county and private roads within and downstream of these areas are identified as values at Risk.

Figure 5 – 2-Year Storm Watershed Response



The increase in peak flows is most applicable during the first year of recovery, as hydrologic response will decrease in subsequent years. Predicted post-fire peak flows show an increase of about one to three times pre-fire values. The peak flow values highlight the post-fire effects on the Fire, with the most increase reflected in watersheds where burn severity is moderate and high and where the greatest susceptible soils are affected. The early precipitation events fill in available slope detention storage and create the rill and gully networks that are necessary to fully induce the expected increase in flood response from rainstorms.

As previously mentioned, the post-fire flows could lead to plugged culverts, flow over road surfaces, rill and gully erosion of cut and fill slopes, erosion and deposition along road surfaces and relief ditches, loss of long-term soil productivity, and threats to human safety. Some sedimentation of the ephemeral channels is likely to occur at an accelerated rate until vegetation establishes itself and provides ground cover.

Geology

Geologic Types: The Soberanes 2 Fire occurred in the Santa Lucia Mountain Range, considered a part of the California Central Coast Mountain Range. The Santa Lucia Mountain Range is 140 miles long, extending from Carmel in the north (Monterey County) to the Cuyama River in the south (in San Luis Obispo County). The physiography of the Santa Lucia mountains is dominated by extremely steep slopes, all associated with watersheds flowing directly or indirectly into the Pacific Ocean. The range is of recent tectonic origin, and is rugged, steep and dissected by deep stream canyons. The general trend of the range is northwest-southeast, paralleling the numerous faults that transect the area. The topography is complex, however, reflecting active uplift and deformation, a variety of lithological types, rapidly incising stream networks and highly unstable slopes. Stream channels and hillslopes are very steep, with average hillslope gradients exceeding 60% in some sub watersheds. The coastal side of the range rises directly from the shoreline, with oceanfront ridges rising directly 4,000 to 5,000 feet to the crest ridge.

The basement rocks of the Santa Lucia Range contain Mesozoic Franciscan and Salinian block rocks. The Franciscan complex is composed of greywacke sandstone and greenstone, with serpentinite bodies and other ultramafics present. Small areas of marble and limestone lenses form resistant outcrops that are prominent landscape features, often white to light gray in color. The Salinian block is made up of highly fractured, and deeply weathered meta-sediments, especially biotite schist and gneiss, intruded by plutonic (granitic) rocks such as quartz diorite and granodiorite. Both formations have been disrupted and tectonically slivered by motion on the San Andreas and associated fault systems. The Palo Colorado and Church Creek faults are prominent features influencing the linear NW/SE alignment of primary drainages.

Watershed Conditions: The burned area of the Soberanes 2 fire is in an area of naturally existing high slope instability. The geomorphic and ecological systems of the watersheds in the Santa Lucia Range evolved over thousands of years and are constantly adapting to periodic widespread disturbances due to fire, storms and tectonic events. Natural recovery of these systems occurs in relatively short timeframe.

Rock-fall and debris slides are eminent along some steep slopes in the burn area which experienced moderate to high soil burn severity. Concerns regarding these rockfall and debris slide events are focused along access roads and structures within the burn area. Drainages in some regions of the burn area have been identified in the field for potential debris flow hazard zones. With the aid of USGS Debris Flow Modeling, debris flow probabilities and potential volumes have been calculated.

Based on a flight recon and field observations, our conclusion is that whether the primary post-fire process is rockfall, debris slides, debris flows or sediment laden flooding, the cumulative risk of various types of slope instability, sediment bulking and channel flushing is high along some steep slopes and creeks in the burn area. Over most of the burned area, no effective treatments exist that will slow or stop the occurrence of landslides and the transport of flood debris. Limited measures can be employed to protect life, property and natural values in the area, largely consisting of implementing timely warning systems of dangerous conditions, and closure of areas where human life is at risk. Some of the communities that were identified as in high risk of debris flows, flooding and/or excessive sedimentation include the Rancho San Clemente, the White Rock Lake, the Palo Colorado community and the Big Sur community.

Following the Soberanes 2 fire segments of the Palo Colorado Road, from Bottchers Gap to the Pico Blanco Boy Scout Camp will experience excessive rock-fall, potential debris flows and erosion due to drainage system failure. In order to prevent as much erosion and damage to the road surface as possible it is recommended to take some actions (storm proofing) before the first winter-storms arrive. Specific recommendations/treatments are described in detail in Appendix #1 of this report. In addition, concerns of excessive sedimentation exist for the Los Padres Reservoir which supplies about 80% of the fresh water to the Monterey Peninsula communities. Based on field observations and past data, concerns are high for potential debris flows impacts to some private properties in the communities of Rancho San Clemente, White Rock Lake, Palo Colorado and some private properties in the community of Big Sur, in addition to the Pfeiffer Big Sur State Park and the Big Sur Lodge.

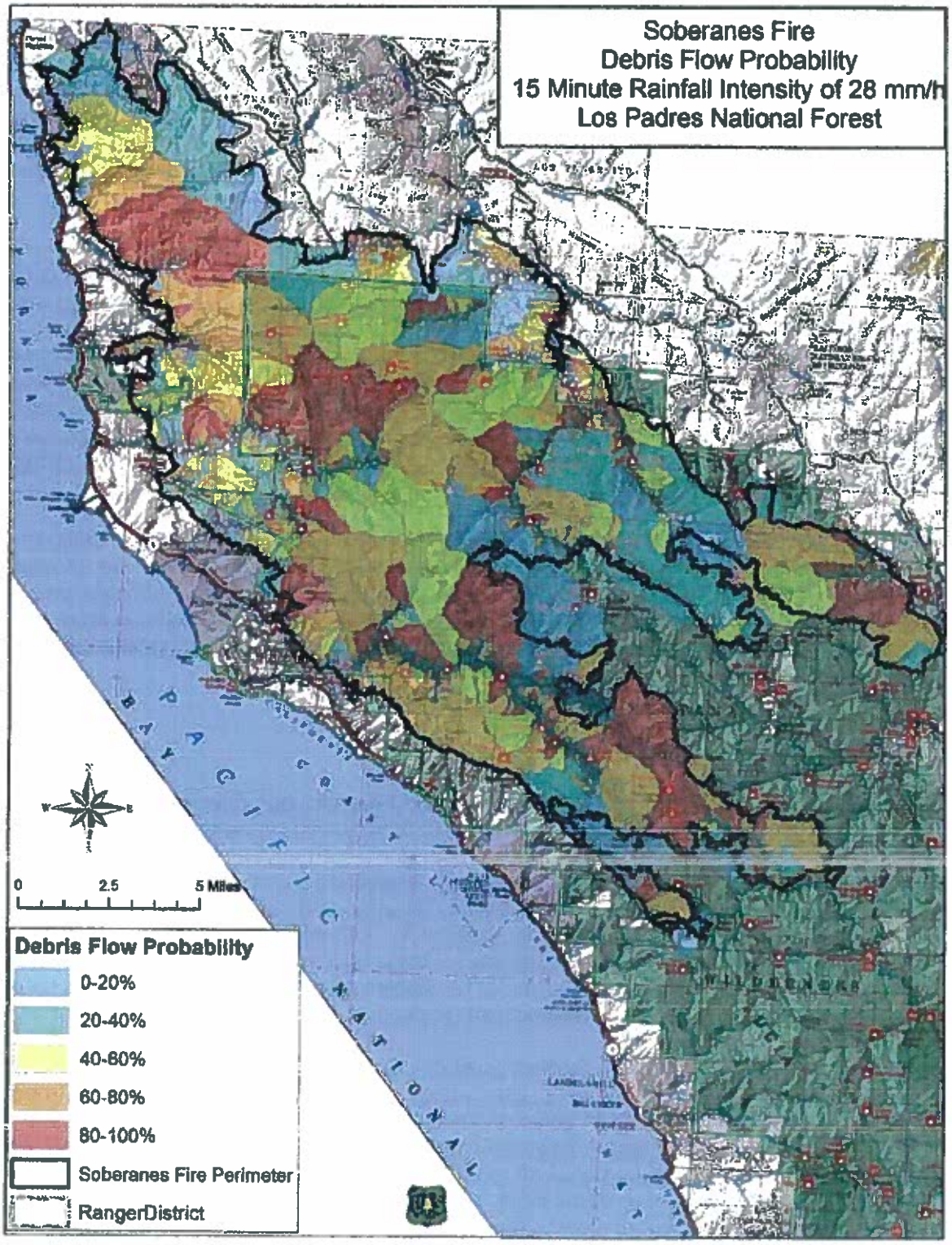
Following the Soberanes 2 fire segments of the Palo Colorado Road, from Bottchers Gap to the Pico Blanco Boy Scout Camp will experience excessive rock-fall, potential debris flows and erosion due to drainage system failure. In order to prevent as much erosion and damage to the road surface as possible it is recommended to take some actions (storm proofing) before the first winter-storms arrive. In addition, concerns of excessive sedimentation exist for the Los Padres Reservoir which supplies about 80% of the fresh water to the Monterey Peninsula communities.

Debris Flow Potential:

The US Geological Survey (USGS) - Landslide Hazards Program, has developed empirical models for forecasting the probability and the likely volume of post-fire debris flow events. To run their models, the USGS uses geospatial data related to basin morphometry, burn severity, soil properties, and rainfall characteristics to estimate the probability and volume of debris flows that may occur in response to a design storm (Staley, 2016). Estimates of probability, volume, and combined hazard are based upon a design storm with a peak 15-minute rainfall intensity of 12 – 40 millimeters per hour (mm/h) rate, equal to 0.47 – 1.57 inches per hour rate. . We selected a design storm of a peak 15-minute rainfall intensity of 28 millimeters per hour (mm/h) rate (equal to 1.1 inch/hr rate) to evaluate debris flow potential and volumes since this magnitude of storm seems likely to occur in any given year.

Based on USGS debris flow modeling, basins / creeks in the Soberanes 2 fire burned area have a wide range of probability (0-100%) of producing debris flows. Similarly, predicted volumes of debris flows through-out the burned area range from under 1k cubic meters to 100k cubic meters. Even though some creeks are predicted to produce debris flows with high probability and /or high volumes, based on field observations and the parent rock material not all of these creeks / slopes contain the surface rocks to produce those large and destructive debris flows. From analyzing the combined hazard maps, it is clear that even though high hazard debris flows drainages exists through-out the burned areas, the concern areas are focused on the creeks and drainages located directly above existing communities, private residences and State Park facilities

Figure 6 – Predicted Debris Flow Probabilities for the Soberanes 2 Fire



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PART IV - HYDROLOGIC DESIGN FACTORS

Table 3. Hydrologic design factors

A. Estimated Vegetative Recovery Period	2-5 years
B. Design Chance of Success	80 %
C. Equivalent Design Recurrence Interval	2 years
D. Design Storm Duration	30 minute
E. Design Storm Magnitude	0.589-0.737 in
F. Design Flow	25.4 cfs / mi^2
G. Estimated Reduction in Infiltration	10%
H. Adjusted Design Flow	27.1 cfs / mi^2

A. Estimated Vegetative Recovery Period	3-5 years
B. Design Chance of Success	80 %
C. Equivalent Design Recurrence Interval	2 years
D. Design Storm Duration	30 minute
E. Design Storm Magnitude	0.589-0.737 in
F. Design Flow	48.8 cfs / mi^2
G. Estimated Reduction in Infiltration	30%
H. Adjusted Design Flow	163 cfs / mi^2

PART V - SUMMARY OF ANALYSIS

A. Describe Critical Values/Resources and Threats:

Background:
The Soberanes 2 Fire started July 22, 2016 and burned a total of 132,603 acres from Carmel Heights into the Ventana Wilderness south of Monterey, CA between 1,500 and 5,500 foot elevations. The average slope of the burned area is 60%.The fire started at Soberanes 2 Point by an illegal campfire from unknown source (under investigation) and rapidly spread. The fire burned over private, state, and National Forest land ownerships (Table 5), and has impacted the communities of Carmel-by-the-Sea, Carmel Valley, Big Sur, and other small communities along the Hwy 1 south of Carmel. A Total of 57 homes were destroyed with one confirmed fatality. The fire progression was extreme due to strong winds and light, flashy fuels and moved east from Sobranes Point to Carmel Valley then south effecting Little and Big Sur River drainages.

Summary of Soberanes 2 Phase 1 Fire BAER Values at Risk
Based on field observations and assessment of burned watershed conditions and expected responses the BAER team identified potential for post wildfire impacts on the following BAER values at risk:

Human Life and Safety

- Increased risk for the general public to be impacted by rolling rocks, flooding, landslides, debris flow and hazardous trees

Property

- USFS system roads
- USFS trails
- Water diversion and conveyance infrastructure

Natural Resources

- Water for domestic and agricultural uses
- Native or naturalized plant communities
- Soil productivity and hydrologic function
- Fisheries
- Wildlife

Cultural Resources

- Prehistoric sites
- Historic sites

Risk Assessment Process:
The risk matrix below, Exhibit 2 of Interim Directive No.: 2520-2010-1 was used to evaluate the Risk Level for each value identified during Assessment:

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High	Very High	Low
Likely	Very High	High	Low
Possible	High	Intermediate	Low
Unlikely	Intermediate	Low	Very Low

Values at Risk Matrix:
The values at risk (VAR) matrix displayed in Appendix C below summarizes values at risk, post wildfire threats and risk ratings for forest service lands. Other lands that are not forest service (BLM, UFWS, State, County, City, and Private) were noted but not evaluated for risk. Values with high or very high risk ratings are addressed, where possible, with BAER response actions (treatments). Generally, response actions are not recommended for values with low and intermediate risk ratings (except in the case for life).

Life and Safety Values at Risk: Forest Users and Personnel: The BAER team identified increased risk for potential impacts to life and/or safety of Forest visitors and personnel entering the burned area. Potential threats include rolling rocks, flooding, debris flows and/or landslides, sediment or debris delivery

to hazardous trees, loss of road or trail tread, and loss of ingress/egress. Generally, increased risk occurs within or directly down-slope from high and moderate burn severity areas.

The proposed installation of warning signs outreach efforts to share key information from the BAER report will also lower the probability that life and/or safety could be impacted by post wildfire processes.

- Probability of Damage or Loss: Possible
- Magnitude of Consequence: Major
- Risk Level: High

Private Property (Property and Life Safety): Private Homes and Structures: The BAER team did identify private residences and structures at increased risk from post wildfire processes. However, extensive inventory of structures and other values on private land was not conducted. Information sharing and outreach efforts with the CalFire WERT team, NRCS, Monterey County departments of transportation and emergency services focusing on potentially affected communities are proposed to increase awareness of burned area conditions and potential impacts to private values.

Property Values at Risk: Forest Service Roads
The following values as related to National Forest roads were identified during the the Soberance Fire BAER assessment.

Human Life and Safety: There is a risk to Forest visitors, permittees, private in-holders, and Government employees using and working in the National Forest. This includes but limited to Roads, Trails, Administration sites, Campgrounds and other facilities within and outside the Soberanse Fire perimeter. Loss of control of water resulting in flooding on roads, trails and facilities occupied by users. Debris flows, rock fall, tree fall, landslides, road washouts, and entrapment, are hazards and risk to users.

Property: The road infrastructure is considered the value at risk when there is a loss of function, access is denied and the cost to repair the damaged anticipated, is greater than the cost to mitigate that damage.

On National Forest Lands there are approximately 25.8 miles of National Forest System Roads (NFSR) within the Soberanse Fire perimeter. NFSR and infrastructures are a government asset and safe passage is necessary for long term administrative use, emergency access, recreational opportunities such as camping, and hiking along with permittees, and private in-holder accessibility during and after the fire recovery period. County road 5012 aka Palo Colorado road 18S05.1, provides access to Bottchers Gap TH and Forest road 18S05.2 Scout Camp road. This road segment from Bottchers Gap to the Pico Blanco Boy Scout Camp is approximately 3.0 miles in length of this 3.0 miles 1.3 miles is on Government lands and under the jurisdiction of the Forest Service. This road segment is generally closed to motorized vehicles, but in some cases vehicles are allowed by permit. The road provides non-motorized access to serveral popular Forest Service primitive Trailheads and Camp Grounds. Although the road segment is inventoried in Infra as maintenance level-2 high clearance and is not shown on the MVUM it is considered an important part of the road infrastructure on the Los Padres National Forest.

A. Findings on the Ground Surveyed

The field survey was conducted over August 30 – September 2 (4 days) by the road engineer along with field coordination with the Hydrologist and Geologist. Forest Service road 18S05.2 within the fire perimeter;

B. Consequences of the Fire on Values at Risk

- **Life and Safety (18S05):** As a result of the burned watershed, it has been determined through the BAER risk assessment process/matrix, that the risk to road users along the BoyScout Camp Road is considered high with major consequence due to the burned slopes above the road creating the potential for debris flows, and washouts during the first winter season or until the post burn watershed stabilizes.

- **Property (18S05):** As a result of the burned watersheds, it has been determined through the BAER risk assessment process/matrix, that the risk to BoyScout Camp Road is considered high with moderate consequences. Damage to the invested road improvements, loss of road functions, and forest users' access to recreation opportunities.

C. Emergency Determination

This assessment determines an emergency and high risk related to life-safety and property related to the Forests developed road system.

a. **Life and Safety (18S05)** - Risk to road users is determined to be high with major consequences on Boyscout Camp Road. Potential for debris flows, and washouts are considered to be possible the first winter due to the burned watershed on slopes above road segments on these roads. Based on Travel Management, these roads are open year round for wheel traffic and over snow vehicles. It is recommended to post BAER warning signs and information signs on the road to caution road users of potential debris flows and washouts that could occur in the area.

b. **Property (18S05)** - Risk to road improvements and loss of road functions is considered to be possible with major consequences on segments of these roads. Diversion of uncontrolled water from road drainage courses on to the road surface results in degradation and unacceptable erosion, gullies, loss of road functions, and denial of access to road users.

Risk Assessment – Forest Service roads

- Probability of Damage or Loss: Likely. This determination is based on the expectation that increased erosion and sediment will occur and could plug drainage structures along roads.
- Magnitude of Consequence: Moderate. This determination was made based on the amount of damage that would occur if culverts were temporarily plugged.
- Risk Level: High

Property Values at Risk: Forest Service Trails

As described in the BAER recreation, hydrology, and geology reports there is potential for damage to occur on trails within the fire perimeter. In addition to impacts to Forest Service trails, this report also describes increased risk for the safety of trail users.

Potential impacts to trails include erosion of trail tread, damage to trail drainage features, sediment or debris deposition on trails and impacts to trail crossings. For complete details see recreation report in project folder.

Values at risk are life and health and property.

Risks to life and health will exist because of hazards such as flooding, high water flow, rock fall, falling trees, and debris. These hazards are expected to be present at all trails and recreation sites in or adjacent to the burn area.

Probability of Damage or Loss: Possible.
Magnitude of Consequence: Major
Risk Level: High

The property values at risk are segments of Forest Service system trails. In areas of high soil burn severity mid-slope trails are likely to become covered by dry ravel and debris. It is also likely that there will be moderate trail damage caused by the loss of water control. In addition, fire-damaged trees will fall across the trail. This added material will also obscure trail definition, causing users to wander off the established trail, especially at switchbacks. Repeated off-trail travel may eventually create a new path that is hazardous to users and subject to enhanced erosion.

Some system trail segments have been found to be at high risk of damage and/or loss. These findings are based on proximity to moderate and high burn severity areas, side hill slope, soil characteristics, and results of aerial and on-the-ground surveys. The trails in question are the Turner Creek Trail (1E02), the Skinner Ridge Trail (1E04), the Mount Manuel Trail (2E06), the Carmel River Trail (3E03), the Pine Ridge Trail (3E06), the South Fork Trail (3E09), the Black Cone Trail (3E14), and the Marble Peak Trail (4E07).

Probability of Damage or Loss: Likely
Magnitude of Consequence: Moderate
Risk Level: High

Water Quality – Human Use Values at Risk: Impacts to Domestic water users

Numerous small water systems are scattered throughout the Soberanes 2 Fire area. The majority of these water systems are associated with private property and are located on mid to lower slope drainages. Burn severity mapping indicates that these systems may have impacted by high severity fire, however many of the systems are located below hillslopes that burned at in the Soberanes 2 Fire. Systems that take water from streams in burned watershed will likely experience issues with turbidity and potential damage to system infrastructure during fall and winter storms. Systems that take water from springs will have a lower potential for impacts.

- Magnitude of Consequences: Possible
- Probability of Damage or Loss: Moderate
- Risk: Intermediate

Treatments: Share assessment information with water users and NRCS. Increase maintenance at water intake facilities. Monitor system during storm events. Consider adding storage to ensure a clean water sources during high turbidity events.

Natural Resource Values at Risk – Water Quality

Surface waters in the fire area will be bulked by ash, debris, and other floatable and transportable material during storm events. It is likely that stream flows from the first post-fire runoff producing rain events will see high concentrations of ash and fine sediment that will cause considerable turbidity and degradation of water quality and the beneficial uses of water. Beneficial uses of water are identified and protected by the California State Water Quality Control Board by regulation as found in the Carmel River Basin Plan. Beneficial uses are: municipal water supply, contact and non-contact recreation, wildlife habitat, warm and cold water aquatic habitat, rare species habitat, fresh water replenishment, and spawning.

Water Quality

- The most noticeable effects on water quality will be increased sediment and ash from the burned area into the Little and Big Sur Rivers, although this may largely depend on volume at the time of runoff events. If hydrologic connectivity is indeed present, this material could increase the rate of pool filling by fines, which may affect aquatic habitat.

Treatment: Share assessment information with private property owners and NRCS. Increased post-fire flood flows may overwhelm existing NFS road crossing structures, causing washouts, and stream diversion down the road. This can result in a threat to public safety, damage to infrastructure, and increased sediment delivery to downstream channels.

- Magnitude of Consequences: Moderate
- Probability of Damage or Loss: Likely
- Risk: Intermediate

- Set up early warning system for weather events that could potentially trigger debris flows.
- No channel or hillslope treatments recommended except those associated with road - stream crossing emergency measures.
- Storm patrols should be conducted by all relevant parties to ensure that blockage of crossing structures do not occur during the first runoff producing storms. Roads should be storm-proofed as necessary.
- Share assessment information with local communities, landowners, water users, permit holders, NRCS, and NOAA/NWS to facilitate preparation for fall and winter storm.
- Treatment: Share assessment information with water users and NRCS. Increase maintenance at water intake facilities. Consider adding storage to ensure a clean water source during high turbidity events. For complete details see Hydrology report in project folder.

Natural Resource Values at Risk: Soil Productivity

Soil productivity on steeper slopes could be compromised in the areas that have burned at high soil burn severity and contain a water repellent layer. Portions of Rocky, Bixby, Juan Higuera, Pfeiffer-Redwood creeks, and Little and Big Sur Rivers headwaters are at risk based on a lack of soil cover, deep soil charring, and steep slopes that could erode productive topsoil. For complete details see soils report in project folder.

Natural Resource Values at Risk: Threatened and Endangered, Sensitive, and Invasive Plants

Plant Communities of the Soberanes 2 Fire Burned Area

There are no known locations of federally Threatened or Endangered plant species within the fire area. There are Forest Service Sensitive or Survey and Manage species locations within the fire area.

Forest Sensitive & Endemic Botanical Species

No federally listed Threatened or Endangered plant species or their critical habitats are known to occur within the Soberanes 2 Fire. Three Forest Service Sensitive or Forest Plan Endemic plant species are documented within that same area. They are shown in the following list.

The R5 Sensitive Plants with potential to be affected by noxious weeds are:

- Santa Lucia fir (*Abies bracteata*)

- Little Sur manzanita (*Arctostaphylos edmundsii*)
- Jolon clarkia (*Clarkia jolonensis*)
- Tear drop moss (*Dacryophyllum falcifolium*)
- Monterey larkspur (*Delphinium hutchinsoniae*)
- Umbrella larkspur (*Delphinium umbraculorum*)
- Butterworth's buckwheat (*Eriogonum butterworthianum*)
- Santa Lucia Horkelia (*Horkelia yadonii*)
- Santa Lucia dwarf rush (*Juncus luciensis*)
- Arroyo Seco bush mallow (*Malacothamnus palmeri* var. *lucianus*)
- Carmel Valley malacothrix (*Malacothrix saxatilis* var. *arachnoidea*)
- Kellman's bristle moss (*Orthotrichum kellmanii*)
- Dudley's lousewort (*Pedicularis dudleyi*)
- Slender pentachaeta (*Pentachaeta exilis* ssp. *aeolica*)
- Hooked popcorn flower (*Plagiobothrys uncinatus*)
- Hickman's checkerbloom (*Sidalcea hickmanii* ssp. *hickmanii*)

Recommendations: Re-visit known populations and document any damage to them. Determine if there are any measures that may be possible to aid their recovery and implement them. Monitor the recovery.

Invasive plants and Noxious Weeds

The following table refers to known invasive plant and noxious infestations along major access roads to the fire perimeter. Additional weeds populations were observed in developed and repeatedly disturbed areas adjacent to the burn. Priority infestations for treatment are those adjacent to dozer-lines, hand lines, drop points and riparian areas.

Common Invasive Noxious Weeds Known In, and Adjacent to the Soberanes 2 Fire Area

Scientific Name	Common Name
Carduus pycnocephalus	Italian thistle
Centaurea melitensis	Tocalote
Centaurea solstitialis	Yellow starthistle
Cortaderia jubata	Jubata grass
Delairea odorata	Cape ivy
Genista monspessulana	French broom
Tamarix ramosissima	Tamarisk

During fire suppression operations, more than 75 miles of dozer line, 20 miles of hand line, and 19 miles of road completed as dozer line were constructed on National Forest. Of this, over 45 miles of dozer line and over 12 miles of hand line were constructed in the Ventana Wilderness. The majority of dozer lines were contingency lines located well away from the fire perimeter. In addition, there are a number of roads within the fire area of operations which could also serve to disperse weed seeds. Dozer lines, drop points, and safety zones serve as weed dispersal areas or corridors and suppression equipment can act as weed vectors. Movement of fire suppression and rehab equipment can disperse and spread noxious weeds to and from areas within the fire and among home units. Dispersal of weeds from fire equipment movement poses a significant risk to post-fire regeneration. Roadsides and dozer lines will be most impacted by this threat.

Threats to Forest Sensitive Species:

Probability of Damage or Loss: Likely

Magnitude of Consequences: Moderate
Risk Level: High

Significantly, the over 75 miles of dozer constructed on the Los Padres NF passed near or through several populations 16 species of Forest Service Sensitive plants. This did two things. First it removed both plants and the seed bank from areas where the dozers worked. This could significantly affect the recovery of native vegetation including Forest Service Sensitive species. Second, it opened the habitat occupied by Forest Service Sensitive species to invasion by noxious weed species on the newly exposed bare soil. Additionally, over 45 miles of dozer line and over 12 miles of hand line were constructed in the Ventana Wilderness. This opens the wilderness to a significant amount of invasion by noxious invasive weeds. This will result in negative effects on the natural quality of wilderness character.

Natural Resource Values at Risk: Threatened and Endangered, Sensitive Wildlife

This assessment evaluates the effects of the Soberanes 2 Fire and the potential effects of the burned area emergency response (BAER) treatments on the following federally-listed fish and wildlife species: California condor (*Gymnogyps californicus*), Marbled murrelet (*Brachyramphus marmoratus*), California red-legged frog (*Rana draytonii*) and designated critical habitat for California red-legged frog, Steelhead trout (*Oncorhynchus mykiss)*, South-Central California Coast (SCCC) Distinct Population Segment (DPS) Smith's blue butterfly (*Euphilotes enoptus smithi*).

Table 1. A summary of determinations for Threatened and Endangered species and the related emergency condition.

Species	Emergency Condition
California condor	None
Marbled murrelet	None
California red-legged frog	Direct mortality from the fire, Impaired habitat use due to sedimentation, debris flows.
California red-legged frog critical habitat	Impaired habitat due to high water flows, sedimentation and debris flows.
Steelhead trout, SCCC DPS	Direct mortality from debris flows or landslides. Impaired habitat use due to sedimentation, debris flows.
Steelhead trout, SCCC DPS critical habitat	Impaired habitat due to sedimentation and debris flows.
Smith's blue butterfly	None

While negative impacts to both California red-legged frog and SCCC steelhead, and their respective critical habitats are considered likely and very likely, it is considered unfeasible for BAER treatments to effectively prevent the sedimentation and debris flows which are expected to result. Treatment of all possible acres would only reduce impacts for geology, hydrology, and soils characteristics in the Big Sur River, Little Sur River, San Clemente Creek- Carmel River and Danish Creek- Carmel River HUC 6 watersheds within a minor range. Steep slopes (< 60%) and geological features in many parts of the watersheds for the 3 river systems make them untreatable. Soil delivery, debris flows and hydrological response; particularly on the Big and Little Sur Rivers, burned at moderate severity and are projected to be exacerbated by the physical characteristics of the terrain.

Soil Productivity Values at Risk

Threats to Soil Productivity:

Probability of Damage or Loss: Likely
Magnitude of Consequences: Moderate
Risk Level: High

An elevated level of erosion can be expected in the aftermath of the fire based on modeling of erosion and sedimentation and erosion risk analysis. However, this is a fire-adapted ecosystem that has evolved in the presence of fire, and many of the slopes with the highest predicted erosion are too steep to effectively treat with mulch. Of the ground that is treatable, erosion rates are not elevated high enough to constitute an emergency situation to soil productivity.

The Soberanes 2 Fire BAER team assessed the landscape for the effectiveness of potential land treatments; specifically soil cover additions by methods such as straw mulching, wood straw or hydro-mulching. To consider the maximum benefit of treatments, both private and public land were considered. Our analysis showed the percentage of each pour point watershed that could be treated following the feasibility analysis. It is generally considered to treat watersheds if at least 50% of the watershed can be treated. The greatest area of a watershed that could be treated is Rocky Creek is 20%. Generally, however, treatable areas for the watersheds are less than 10 % (Appendix A Land Treatment Feasibility Analysis Methodology).

Property Values at Risk: Heritage Sites

Fire-effects to cultural resources occur at several levels. The first, of course, are the direct effects of the fire itself—ranging from the destruction of cultural material to more subtle effects such as resetting the obsidian hydration clock or introducing modern carbon into a site's assemblage. Post-fire risks to cultural resources fall into two categories: 1) degradation from erosion, soil deposition, mass wasting and other geological effects brought about by vegetation loss, and 2) increased public access stemming from loss of vegetation cover and resulting in risk for looting, vandalism, and vehicular impacts. The cultural resources assessment centers on post-fire conditions that could directly or indirectly result in adverse effects to known cultural resource sites. Adverse effects may include the potential to bury surface and subsurface cultural resources to prohibit discovery; the possibility of soil movement that would change the context of the remains which are vital to any scientific analysis or interpretation value; and increasing the visibility of site locations that would make them more susceptible to looting or vandalism.

Botchers Camp Host Outbuilding Hazmat Site

Botchers camp host outbuilding burned down to the ground exposing burned paint supplies, auto oils, gasoline, cleaning fuilds, and houshold cleaning supplies creating a toxic mix of hazardous waste.

Protection/Safety Treatments

Human Life and Resource protection (Fire Area Closure): To support the Forest closure order and ensure safety for Forest visitors and protection to Forest resources during the recovery period, road closure and information along with BAER warning, signs will be installed around the fire perimeter at main entry points, trailheads and other strategic locations.

B. Emergency Treatment Objectives:

To allow safe passage of water to protect infrastructures, watersheds, cultural sites, and fish habitat from accelerated sheet and rill erosion. Also, to protect watersheds from the spread of noxious weeds. Risk determination is dependent on the design storm selected and downstream values at risk. By using a set of average storms (2, 5, and 10-year events) emergency planning measures can be designed to mitigate and minumize anticipated risks. Using a 2-year design storm the values at risk can be evaluated to determine if an emergency exists for a typical winter storm.

C. Probability of Completing Treatment Prior to Damaging Storm or Event:

Land **80** % Channel **n/a** % Roads/Trails **95** % Protection/Safety **90** %

D. Probability of Treatment Success

	Years after Treatment		
	1	3	5
Land	90%	85%	80%
Channel	n/a	n/a	n/a
Roads/Trails	95%	90%	85%
Protection/Safety	95%	90%	85%

E and F. Summary of VARTool Calculations (see Appendix D):

- Market Resource Values (direct losses and loss of use): $2,180,000
- Soberanes 2 Fire Treatment Cost: $106,665
- Expected benefit of treatment $863,000
- Benefit/cost ratio = 8.1

As described in this report, threats to life/safety and non-market cultural and ecological values exist throughout the burned area. These values were decribed in the VARTool Assessment but not considered in the benefit/cost ratio. Although not represented in the calculations, all proposed treatments reduced risk for multiple market and non-market values at risk. These important indirect benefits are not represented in the calculations.

G. Skills Represented on Burned-Area Survey Team:

Hydrology	Soils	Geology	Engineering
Archeology	Recreation	Botany	Wildlife

Team Leader: Brad Rust	Email: brust@fs.fed.us	Phone: 530-226-2427
Tim Short	District Ranger	tshort@fs.fed.us
Kevin Cooper	BAER Team Coordinator	kcooper@fs.fed.us

H. Treatment Narrative for Forest Service:

Land Treatments:

Invasive Weed Detection Surveys

The unknowing introduction of invasive noxious weeds into areas disturbed by fire suppression and suppression repair has the potential to establish persistent weed populations and presents a high risk to values at risk. These persistent invasive weed populations could affect the structure and habitat function of plant communities within the burn area. Forest Service direction is to minimize the establishment of non-native invasive species to prevent unacceptable degradation of the burned area. Consequently, delayed assessment of roads, dozer lines, hand lines, drop points, and safety zones is necessary to detect the spread and introduction of weeds in the first year after fire. Assessing the establishment of weeds and treating small outlying populations before they expand, will prevent the weeds from becoming serious threats to the recovery of native plants and Forest Service Sensitive species.

The treatment is noxious weed detection surveys of all roads, dozer lines, drop points, and safety zones affected by the Soberanes 2 Fire on NFS lands. These areas will be surveyed for evidence of introduction or spread of noxious weeds. If any new or outlying populations are found, these will be mapped and documented for future treatment and where possible hand treatments will be applied during at the same time the surveys are conducted.

Inspect all areas and monitor for newly established weed occurrences or the introduction of new invasive species. Monitoring will include documentation and hand pulling small new weed occurrences at the time of inspection. New weed occurrences will be pulled to root depth, placed in sealed plastics bags, and properly disposed. Additionally, tamarisk infestations can be treated with herbicide as per the soon to be completed tamarisk removal EIS.

Inspections and monitoring should be accomplished during April/August 2017. Based upon the first year's survey, additional surveying may be requested for up to three years. BAER funding is only requested for the first year after fire.

D. Treatment Cost

GS –11 Botanist/Resource Officer	$465/day x 10 days =	$4,650
GS – 9 Botanist/Biologist (2)	$291/day x 2 pay periods (20 days) x 2 =	$11,640
GS – 5 Bio Tech (2)	$225/day x 2 pay periods (20 days) x 2 =	$9,000
Mileage:	1500 miles @ 0.45/mile =	$675
Per Deum	20 days @ $200/day =	$4,000
	Total Cost Estimate for FY 2017 =	**$29,965**

Natural Recovery

Vegetation in the mixed conifer will recover slowly. Even in areas of moderate soil burn severity, the canopy was mostly killed and the seed source removed. Stands with an element of Ponderosa pine and Douglas fir will likely recover more quickly, since at least a few mature trees are likely to have survived to produce seed into newly exposed mineral soil. The montane chaparral shrubs were mostly killed by the fire, but fire stimulates manzanita seeds stored in the soil to germinate along with other re-sprouting species. Redwoods in the stream bottoms for the most part survived. The ones that succumbed to having

their cambium burned due to deep litter and duff around the base of the tree will resprout at the base and will create a new tree.

Hillslope mulching

Typical land treatments to reduce runoff and peakflows/flooding include hydromulch and strawmulch. These treatments are not usually effective on slopes over 50% (hydromulch) or 40% for straw mulch). Straw mulch also is ineffective in windy areas that blow the straw around. Wood mulch can be used on steeper slopes and can be used in areas with higher winds than agriculture or straw mulch. Hillslope mulching was considered but not recommended since slopes were too steep and values at risk were not great enough to justify treatments.

Hillslope mulching was considered but not recommended since slopes were too steep and values at risk were not great enough to justify treatments (Appendix C - Land Treatment Feasibility Analysis Methodology).

Road Treatments:

Treatment Objective: Minimize the risk of road failure in the burn area through the placement and maintenance of effective water control measures. Prevent the channeling of water on roads. Ensure the diversion of runoff in controlled intervals to reduce erosion and further watershed degradation. Road treatments along with Storm Inspection and Response monitors and maintains the function of drainage features, and ensure road access for FS administration, permmittes, and private in-holders.

Road Treatments: An emergency determination was made on NFSR road 18S05.2 Scout Camp road. For more information see the Roads Specialist Report.

The following road and safety treatments were identified for the Soberanse Fire burned area:

- Installing roadway and critical dips
- Install culvert Inlet Treatment (metal end section)
- Restore drainage function
- Install Drainage Armor 4" to 12" (riprap rock).
- Upsizes culverts with flumes.
- Excavate Culvert Inlet/Outlet & Catch Basins
- Storm Inspection and Response
- Install Signs

Road Treatment Costs Estimate:

Item	Unit	# of Units	Unit Cost	Total
Install road Dips with armor	Each	4	500	2,000
Install culvert inlet treatments 60 " (metal end section)	Each	1	2,500	2,500
Restore drainage function, clean roadside ditches and run-outs.	Mile	1.3	1,250	1,600
Install Drainage Armor (4" to 12") Riprap	Cubic Yard	45	200	9,000
Excavate melted 18" culvert, install new 24" CMP w/ flume	Each	2	4,500	9,000
Excavate double 24" culvert, install new 60" x 50' CMP	Each	1	18,300	18,300

Excavate culvert inlet / outlet & Catch basin, repair culvert pipe ends	Each	5	700	3,500
Storm Inspection and Response Palo Colorado Hwy-1 to Bottchers Gap 7.6 mi	Days	6	800	4,800
Storm Inspection and Response Scout Camp Rd. from Bottchers Gap to BSA	Days	6	1,340	8,000
Sub Total				**$58,700.00**
Mobilization, Contract prep, Administration and Implementation	%	1	30	$17,610.00
Total				**$76,310.00**

Road Storm Patrol

General Description: The patrols are used to identify road problems such as plugged culverts and washed out roads, and to clear, clean, and/or close roads that are or have received damage. Those conducting storm patrols shall have rapid access to a backhoe and dump truck that can be used when a drainage culvert is plugged or soon to be plugged, to repair any road having severe surface erosion, or to clean debris from roadside drainage ditches.

Locations (Suitable Sites): Patrols are based on the areas expected to have or that did have localized precipitation events. Secondly, patrols should then focus on those roads that receive the most traffic and are of more value to the transportation system.

Design/Construction Specifications:

1. FS personnel will direct the work.
2. Immediately upon receiving heavy rain the FS will send out patrols to identify road hazard conditions. Observations of rocks and sediment causing washouts and plugged culverts are identified and corrected before they worsen or jeopardize motor vehicle users.
3. The road patrol personnel bring heavy equipment necessary to mechanically remove any obstructions from the roads and culvert inlets and catch basins where necessary.
4. All excess material and debris removed from the drainage system shall be placed outside of bank-full channel where it cannot re-enter stream channels.

Purpose of Treatment: Roads within the Soberanes 2 Fire contain drainage structures that cross streams located in watersheds having areas of high to moderate soil burn severity. These flood source areas have a greater potential for increased runoff and debris flows. These increases in flows pose a threat to the existing crossings which may result in plugging culverts or exceeding their maximum flow capacity. With the loss of stabilizing vegetation, normal storm frequencies and magnitudes can more easily initiate rill and gully erosion on the slopes and it is likely this runoff will cover the roads or cause washouts. These events make for hazardous access along steep slopes and put the safety of users at risk.

Trail Treatments

To mitigate threats to life and health, close trails and recreation sites affected by the fire (as part of an area closure) for the first winter following the fire, and prior to lifting the closure, install warning signs at all trailheads within or leading to the burned area. Trailheads requiring warning signage are Skinner Ridge (1E04), Little Sur (1E03), Little Sur Camp (2E09), Mt Manuel (2E06), Pine Ridge (3E06), Terrace Creek

(3E22), Big Sur (3E07), Marble Peak (4E07), Lost Valley (4E08), Arroyo Seco (4E10), North Coast Ridge (3E10), Church Creek (3E05), Miller Canyon (3E04), and Carmel River (3E03).

To mitigate threats to property install trail erosion structures (rolling dips, check dams, log erosion barriers, and drainage armoring) to maintain natural drainage patterns and maintain trail stability during increased flows. Rolling dips, check dams, and log erosion barriers (LEBs) will stabilize trail tread and prevent further erosion caused by the loss of vegetation and root systems previously supporting outer trail edge. Armoring key ephemeral drainages is done by placing rock in a rip-rap fashion below trail in drainages to dissipate energy of across trail water flows and prevent down slope head cutting and trail loss. LEBs may be used in place of rock armoring when rock is unavailable.

Specific treatments recommended for the Turner Creek Trail are to armor two drainage crossings and to install one rolling dip. All recommended structures are within 0.3 mi of the junction of with the Skinner Ridge Trail.

Specific treatments recommended for the Skinner Ridge Trail Trail are to clean out 44 existing waterbars, armor three drainage crossings, and install 54 rolling dips, all within 3.7 miles from the trailhead at Bottcher's Gap Campground.

Specific treatments recommended for the Mt. Manuel Trail are to install 38 rolling dips, all within 0.5 mi of the Forest boundary (i.e., at the junction with the Oak Grove Trail in Pfeiffer Big Sur State Park).

Specific treatments recommended for the Carmel River Trail are to armor three drainage crossings, all within 0.3 mi of the junction with the Pine Ridge Trail.

Specific treatments for the Pine Ridge Trail are to armor seven drainage crossings and to install 38 rolling dips on a 1.1-mi segment of trail in the vicinity of the Church Creek Divide.

Specific treatments recommended for the Terrace Creek Trail are to clear a slide near Outlaw Camp that threatens to block Terrace Creek and to build a retaining wall to prevent the trail from washing out when additional material comes down.

No treatments are recommended for the South Fork Trail, the Black Cone Trail, and the Marble Peak Trail because of the remoteness of these trails makes it unlikely that storm proofing work could be completed before the first damaging storm.

All recommended treatments include log outs necessary to make the work sites accessible and to allow for safe crew egress in case of emergency. The cost and time estimates are based on the assumption that emergency authorization for chainsaw use within wilderness areas will still be in place. If traditional tools are to be used time and costs will increase significantly, and the likelihood of completing the prescribed treatments before the first significant rains will be minimal.

Estimated costs for these treatments are summarized in the following table.

Trail Treatments				
Item	Unit	Unit Cost	# of units	Total Cost
Skinner Ridge Trail / Turner CreekTrail	project	8750.00	1	8750.00
Mt. Manuel Trail	project	3500.00	1	3500.00

Pine Ridge Trail / Church Creek Trail	project	3500.00	1	3500.00
Terrace Creek Trail	project	5250.00	1	5250.00
Trailhead Warning Signs	project	3100.00	1	3100.00
Transportation to region	pay period	473.00	2	946.00
Per Diem / 7 member crew	pay period	3878.00	2	7756.00
Lodging / 7 member crew / travel days	pay period	980.00	2	1960.00
Travel Time / 7 member crew	pay period	3500	2	7000.00
Total				**41762.00**

Protection/Safety Treatments

Burned Area Closure and Warning Signs

Posting of areas burned will alert the public to potential dangers of falling trees and rolling rocks. For roads, the recommended treatment is installation of seasonal closure and warning signs at major points of entry. Roads requiring such signage are Forest Road 18S05 (see roads report), Botcher Campground, Tassajara Road (18S02), Church Creek Road (19S04), Piney Creek Road (18S01), and Old Coast Highway (20S05).

Install Closure and Information signs at the existing gate location of NFSR 18S05.2 Scout Camp near Bottchers Gap. Once the area closure has been lifted, install BAER Warning signs at this location.

Install Closure and Information signs at the existing gate on 20S05 North Coast Ridge road. Once the area closure has been lifted, install BAER Warning signs at this location.

Install Closure and Information signs on road 18S02 Tassajara road at the Forest boundary in section 30. Once the area closure has been lifted, install BAER Warning signs at this location.

Item	Unit	# of Units	Unit Cost	Total
Install BAER Warning Signs	Each	6	500	3,000
Install Road Closure & Information Signs	Each	6	250	1,500
Sub Total				**$4,500.00**
Mobilization, Contract prep, Administration and Implementation	%	1	30	$1,300.00
Total				**$5,850.00**

Boundry Fencing OHV Protections

Safety fencing at Botchers Campground to protect campers from dangerous cliff overlook area that was burned up and in various locations needs replacing (Figure 7).

Figure 7 – Botchers Campground

Botchers Camp Host Outbuilding Hazmat Site

Botchers camp host outbuilding burned down to the ground exposing burned paint supplies, auto oils, gasoline, cleaning fuilds, and houshold cleaning supplies creating a toxic mix of hazardous waste. Treatment necessary is stablization of site till material can be cleaned up but a hazmat crew. Stablization will consist of mulching the site and lining with silt fencing.

Table 10 – Hazmat Treatments

Item	Unit	Unit Cost	# of Units	Cost
Woodstraw mulch	ft2	$0.07	10,000	700
Silt fence erosion prevention	feet	$4	100	400
Implementation	project	$50	5	250
			Total Cost	**$1,350**

Heritage Treatments

When the BAER Risk Matrix is applied to cultural resource sites in the Soberanes Fire (see Table 1.), ***the Probability of Damage or Loss is Unlikely whereas the Magnitude of Consequences is Moderate, resulting in a Low risk to cultural resource sites from post-fire conditions. Therefore, only three sites with higher risk are recommended for emergency rehabilitation treatment.***

Proposed treatments made by other specialists (hydrologists, soil scientists, geologists) that have the potential to affect cultural resources are subject to the provisions of 36 CFR 800. Prior to BAER implementation, an archaeologist should be assigned to the implementation team to ensure that inventory and compliance requirements per NHPA and the R5/SHPO Programmatic Agreement are satisfied.

Treatments to mitigate the emergency:

a. Treatment Type: The placement of wattles upstream or below cultural resource at risk.

b. Treatment Objective: Mitigate increased erosion associated with anticipated heavy winter rains.

Part VI – Emergency Stabilization Treatments & Source of Funds, Los Padres NF Initial Request

Click red icons for notes	NFS Lands					Other Lands				Money Left
Line Items	Units	Unit Cost	# of Units	BAER $	Spent $	# of Units	Fed $	# of Units	Non Fed $	Total $
A. Land Treatments										
Invasive Weed Detection Survey	project	$29,965	1	$29,965	$0		$0		$0	$29,965
Subtotal Channel Treatments				$29,965	$0		$0		$0	$29,965
B. Channel Treatments - none										
				$0	$0		$0		$0	$0
Subtotal Channel Treatments				$0	$0		$0		$0	$0
C. Road and Trails										
Road Stormproofing & Patrol	project	$76,310	1	$76,310	$0		$0		$0	$76,310
Trail Stormproofing	project	$41,762	1	$41,762	$0		$0		$0	$41,762
Subtotal Road & Trails				$118,072	$0		$0		$0	$118,072
D. Protection/Safety										
Warning Signs	ea	$625	6	$3,750	$0		$0		$0	$0
Botchers Camp Protection	ea	$2,500	1	$2,500	$0		$0		$0	$0
Botchers Camp Host Hazmat Site	ea	$1,350	1	$1,350	$0		$0		$0	$0
Heritage protection	project	$2,880	1	$2,880	$0		$0		$0	$0
Coordination with Public & Private	ea	$500	20	$10,000	$0		$0		$0	$0
Closure Signs	ea	$350	6	$2,100	$0		$0		$0	$0
Subtotal Protection				$22,580	$0		$0		$0	$22,580
E. BAER Evaluation										
Assessment Team	0520	H5BAER	---	---	$217,096	---	$0	---	$0	$0
	---	---	---	---	$0	---	$0	---	$0	$0
Subtotal Evaluation				---	$217,096	---	$0	---	$0	$0
F. Monitoring										
Trail Treatment Monitoring	ea	$1,000	1	$1,000	$0		$0		$0	$0
Road Treatment Monitoring	ea	$1,000	1	$1,000	$0		$0		$0	$0
Heritage Treatment Monitoring	ea	$1,000	1	$1,000	$0		$0		$0	$0
Subtotal Monitoring				$3,000	$0		$0		$0	$3,000
G. Totals				**$173,617**	$0		$0		$0	$173,617
Previously approved						Comments:				
Total for this request				**$173,617**						

PART VII - APPROVALS

1. Los Padres N.F. Forest Supervisor (signature) — Date: 10/26/16

2. Regional Forester (signature) — Date: 11/2/16

c. Treatment Description: Placement of wattles to direct excess run-off around high risk cultural.

d. Treatment Costs – Unit Cost: 5 ea. 10 ft x 12" Coir Fiber Logs $1200
5 person-days $1680
Total $2880

Implementation Team Leadership and Coordination

Interagency Coordination:
Interagency coordination started during the fire and continued throughout the BAER Assessment. Continuing this coordination by providing the BAER Assessment Report, specialist reports and attending meetings is anticipated. In addition, letters detailing potential physical responses and impacts from the fire that may influence safety in and downstream of the fire area will need to be composed and sent to all public and private stakeholders at risk from increased sediment and flooding. Funding is requested for agency coordination, Implementation team lead, and for the Forest BAER Coordinator to ensure continued coordination with cooperating agencies, prompt implementation, and tracking of BAER treatments, and installation of burn area warning signs. The facilitation may include: phone calls, meetings, and field trips to the affected areas.

Table 11 – BAER Interagency Coordination

Item	Unit	Unit Cost	# of Units	Cost
BAER Coordinator and Interagency Coordination	Days	$500	20	$10,000
				$10,000

I. Monitoring Narrative:

(Describe the monitoring needs, what treatments will be monitored, how they will be monitored, and when monitoring will occur. A detailed monitoring plan must be submitted as a separate document to the Regional BAER coordinator). See Appendix B below for road, trail, and heritage monitoring.

APPENDICES: Supporting Information:

Appendix A: Soberanes 2 Fire Fire BAER Team

Appendix B: Monitoring for Roads, Trails, and Hertitage

Appendix C: Soberanes 2 Values at Risk Matrix, Treatments and Recommended Post-Fire Response

Appendix D: Land Treatment Feasibility Analysis Methodology

Appendix E: Summary of Cost-Risk Analysis

Appendix F: Treatment Maps for the Soberanes 2 Fire

Appendix A: Soberanes 2 Fire Fire BAER Team:

Soberanes BAER II										
Team Member	Team Position	IQCS	Forest	Departure place	Travel mode	Depature time	Arrival Time*	Cell phone	Office phone	email
Brad Rust	Team Leader	BAES	Shasta-Trinity	Redding	GOV	10/10 1000	10/10 1800	530-917-0434	530-226-2427	brust@fs.fed.us
Judith Downing	BAER PIO	BAES	NIMO - RO	Vallejo	Rental	10/11 1500	10/11 1800	530-908-5128	707-562-8783	jkdwoning@fs.fed.us
Brad/Kevin	Admin. Assistant (AD)	THSP			POV	10/14 1000	10/14 1400			gmail.com
Deb Evans	Road assistant	BAES	Los Padres	Goleta	GOV	10/11 1200	10/11 1800	208-830-4270	805-961-5772	deborahlevans@fs.fed.us
Rusty LaBlanc	Road engineer (AD)	BAES	Stanislas	Residence	Rental	10/11 1200	10/11 1800	209-591-7518	209-532-7761	rablanc14@gmail.com
Erich Huebner	Trails Specialist	BAES	Stanislas	Office	GOV	10/11 1000	10/11 1800	(209)743-3134		ehuebner@fs.fed.us
Mike Heard	Trails Specialist (AD)	BAES	Los Padres	King City	GOV	10/12 1200	10/12 0800	650-261-1776	831-385-5434	charlesmheard@fs.fed.us
Eric Nicita	Soil Scientist	BAES	Eldorado	Placerville, CA	POV	10/11 1200	10/11 1800	530-748-5827	530-621-5290	enicita@fs.fed.us
Albert Desrosier	Trails Specialist	BAES	Stanislas	Office	GOV	10/14/ 800	10/14/ 1300	209-840-1182		
Louis Lonail	Trails Specialist	BAES	Stanislas	Office	GOV	10/14/ 801	10/14/ 1300	209-591-3032		tblomell@gmail.com
William Tripp	Soil Scientist	BAES	Shasta-Trinity	Yreka	GOV	10/10 1000	10/10 1800	254-459-9262	530-841-4591	wtripp@fs.fed.us
Kaisha Anderson	Hydrologist	BAES	Angeles	Arcadia	GOV	10/11 1000	10/11 1800	435-414-0456	626-574-5257	kaishaanderson@fs.fed.us
Jonathan Schwartz	Geologist	BAES	Los Padres	Ojai	GOV	10/11 1200	10/11 1800	805-698-9752	805-646-4348	jonathanschwartz@fs.fed.us
Allen King	Geologist (AD)	BAES	Los Padres	Ojai	POV	10/11 1200	10/11 1800	805-729-2527		allen.king7@gmail.com
Patrick Lieske	Wildlife Biologist	BAES	Los Padres	Goleta	GOV	10/11 1200	10/11 1800	541-661-4415	805-961-5746	pdlieske@fs.fed.us
Lloyd Simpson	Botanist	BAES	Los Padres	Ojai	GOV	10/11 1200	10/11 1800	805-901-2869	805-646-4348	lsimpson@fs.fed.us
Kristie Klose	Fisheries Biologist	BAES	Los Padres	Goleta	GOV	10/18 0700	10/18 1200	805-252-7019	805-961-5745	kristieaklose@fs.fed.us
Marilyn Porter	GIS Specialist	BAES	Los Padres	Goleta	POV	10/11 1200	10/11 1800	714-305-9177	805-961-5721	mrporter@fs.fed.us
Kevin Cooper	BAER Coordinator	BAES	Los Padres	Santa Maria	GOV	10/12 0600	10/12 0900	805-680-0318	805-925-9538 x216	kccooper@fs.fed.us
Bill Goodman	Hydrologist	BAES	Fremont/Wine	Lakeview, OR	GOV	10/12 0601	10/12 0901	435-691-3778		wgoodman@fs.fed.us
Mark Strudley	Hydrologist	BAES	NOAA	Monterey	GOV	10/15/0800	10/15/1000	831-656-1710		mark.strudley@noaa.gov
Renee Barlow	Archeologist	BAES	Los Padres	Monterey	GOV	10/15/0800	10/15/1000	831-277-7650	831-385-5434	Katherineberlow@fs.fed.us
Jeremy Haines	Archeologist	BAES	Coconino		GOV	10/12 0900	10/12 1100	928-240-0912	928-527-8261	jhaines@fs.fed.us

Appendix B: Monitoring Protocols:

Soberanes 2 Fire
Road Effectiveness Monitoring

The 2500-8 report requests funds to monitor the effectiveness of road treatments on Soberanes 2 Fire Fire roads.

4. Monitoring Questions
- Is the road-tread stable?
- Is the road leading to concentrating runoff leading to unacceptable off-site consequences?

2. Measurable Indicators
- Rills and/or gullies forming of the road
- Loss of road bed.

3. Data Collection Techniques
- Photo documentation of site
- Inspection Checklist (attached)

4. Analysis, evaluation, and reporting techniques

- Monitoring will be conducted after storm events. If the monitoring shows the treatment to be ineffective at stabilizing road and there is extensive loss of road bed or infrastructure an interim report will be submitted. A several page report would be completed after the site visit. The report would include photographs and a recommendation on whether additional treatments are necessary.

Road Inspection Checklist

Date:_____ Inspector_____
Time:_____ Forest Road_____

Describe locations reviewed during inspection:_____

_____

_____

Was there road damage?

Was culvert plugged?_____.

GPS _____

Describe damage and cost to repair? (GPS)_____

Photo taken of road damage_____

Recommended actions to repair:_____

Soberanes 2 Fire
Trail Effectiveness Monitoring

The 2500-8 report requests funds to monitor the effectiveness of trail treatments on Forest Trails in the Soberanes 2 Fire.

1. Monitoring Questions
   - Is the trail tread stable?
   - Is the trail leading to concentrating runoff leading to unacceptable off-site consequences?

2. Measurable Indicators
   - Rills and/or gullies forming on the trail
   - Loss of trail bed

3. Data Collection Techniques
   - Photo documentation of site
   - Inspection Checklist (attached)

4. Analysis, evaluation, and reporting techniques

   - Monitoring will be conducted after storm events. If the monitoring shows the treatment to be ineffective at stabilizing trail and there is extensive loss of trail bed or infrastructure an interim report will be submitted. A several page report would be completed after the site visit. The report would include photographs and a recommendation on whether additional treatments are necessary.

Trail Inspection Checklist

Date:_____ Inspector_____
Time:_____ Forest Trail_____

Describe locations reviewed during inspection:_____

Was there trail damage?
Did the trail crossing fail?_____
GPS)_____

Describe damage and cost to repair? (GPS)_____

Photo taken of trail damage_____

Recommended actions to repair:_____

Soberanes 2 Fire
Cultural Site Effectiveness Monitoring

The 2500-8 report requests funds to monitor the effectiveness of native grass treatment on Soberanes 2 heritage sites.

4. Monitoring Questions
- Is the grass with good cover stable?
- Is the grass being undercut by concentrated runoff leading to unacceptable on-site erosion?

2. Measurable Indicators
- Rills and/or gullies forming around the artifacts
- Loss of artifacts

3. Data Collection Techniques
- Photo documentation of site
- Inspection Checklist (attached)

4. Analysis, evaluation, and reporting techniques

- Monitoring will be conducted after storm events. If the monitoring shows the treatment to be ineffective at stabilizing and there is extensive rilling an interim report will be submitted. A several page report would be completed after the site visit. The report would include photographs and a recommendation on whether additional treatments are necessary.

Heritage Protection Inspection Checklist

Date:_____ Inspector_____
Time:_____ Forest Road Nearby_____

Describe locations reviewed during inspection:_____

_____

_____

Was there artifact damage?

Was artifacts covered or eroded?_____.

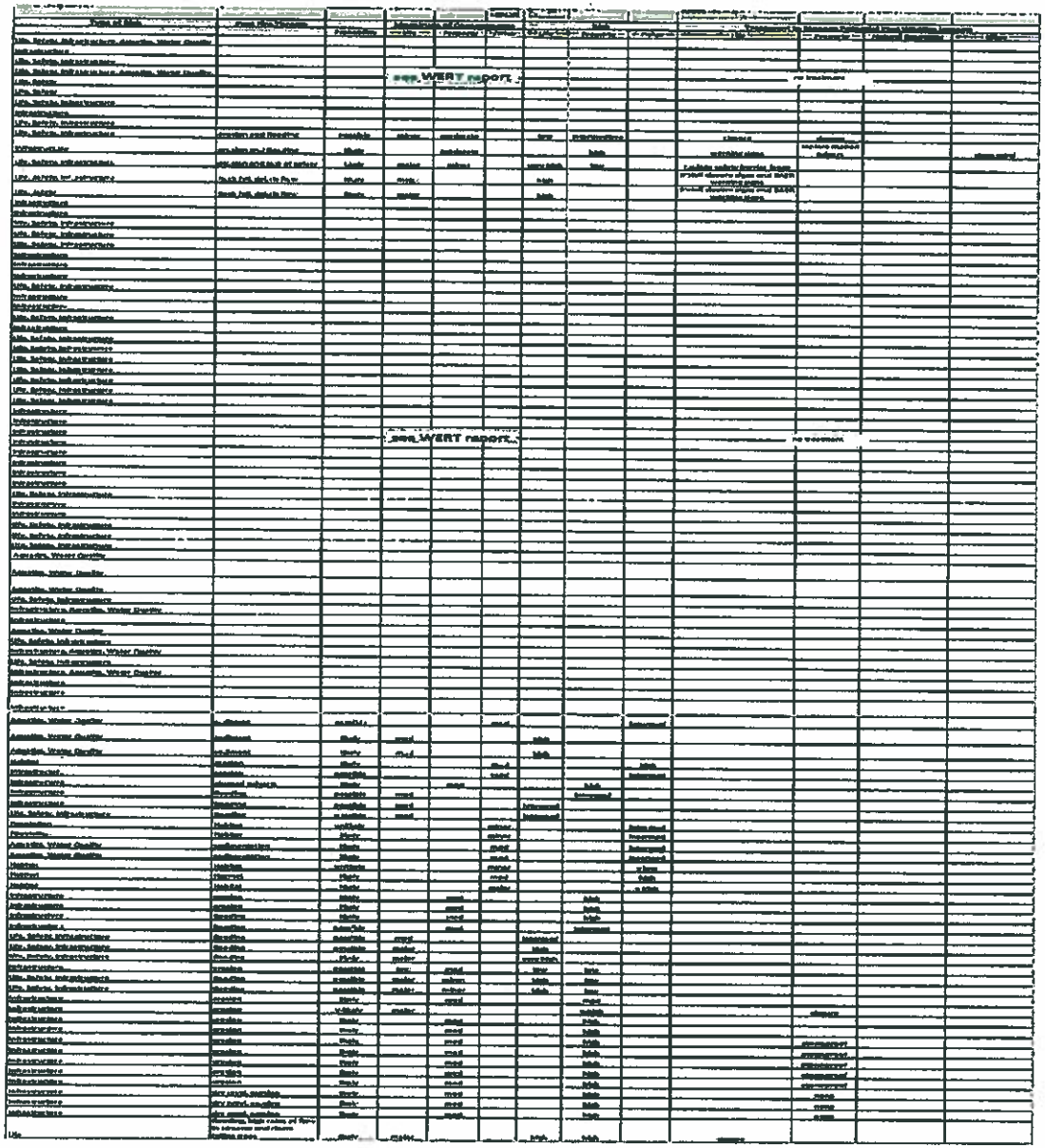
GPS)_____

Describe damage and cost to repair? (GPS)_____

Photo taken of artifact damage_____

Recommended actions to repair:_____

Appendix C: Soberanes 2 Values at Risk Matrix, Treatments and other recommended Post-Fire Response



Appendix D: Land Treatment Feasibility Analysis Methodology

The Soberanes 2 Fire resulted in elevated risk to many public and private facilities. This elevated risk includes threats to life and property as a result of increased hydrologic response and debris flows. The Soberanes 2 Fire Phase 1 BAER team assessed the landscape for the effectiveness of potential land treatments; specifically soil cover additions by methods such as straw mulching, wood straw or hydro-mulching. To consider the maximum benefit of treatments, both private and public land were considered. The following methodology was used to assess the feasibility and effectiveness of land treatments.

- ***Slope***: A slope map was created with a 20%-60% range. Erosion is strongly dependent on slope. Erosion still occurs on slopes less than 20%, but the efficacy of treatments drops off as slopes become more gentle. BAER teams generally do not recommend treatments on these slopes. Also, there is very little slopes less than 20%. Slopes greater than 60% are too steep for mulch treatments to stay in place; mulch strands tend to rapidly migrate downslope with gravity. The Soberanes 2 Fire has an average slope of 55% which precludes much of the area from treatment. Figure C-1 displays the slopes within the Phase 1 analysis perimeter.

- ***Burn Severity***: Only soil burn severities of *Moderate* and *High* are considered for land treatments. Soil severities of *Low* and *Unburned* have enough soil cover remaining to ameliorate flow and sedimentation. Areas of *Low* and *Unburned* soil burn severities are illustrated in Figure C-1 as a black mask.

- ***Topography:*** Using the previously mentioned characteristics as treatment sideboards, topographical and vegetation characteristics were used to manually derive potential treatment units. Figure C-1 illustrates the potential treatment units. Factors used to evaluate placement of units include:

    - *Slope profile:*
        - If a slope has a low or unburned soil severity at the toe of the slope, this is considered a filter that would trap and minimize sediment transport to a watercourse.
        - If a slope is very rocky or rock outcrop, mulch is not effective and therefore not considered.
        - Slopes with a mosaic of soil burn severities or vegetation with retained crown are not considered because the mosaic pattern interrupts surface flow and, subsequently, sediment transport to watercourses.
        - Buffers of approximately 100 feet from perennial streams are considered as non-mulch areas. Mulch applied in streams may contribute to culvert plugging and mulch applied to streambanks may suppress streamside vegetation which is essential for long-term stream bank stability.

    - *Aspect*: North versus south aspects were an important factor in the Soberanes 2 Phase 1 assessment for treatment polygons. Slopes with a north aspect supported a pre-fire community of conifer whereas the south aspect supported a community of coastal chaparral communities. Fire on the south aspects were primarily crown replacement fires within the coastal Chaparral communities. Fire on the north aspect was primarily a ground fire. Although it consumed the soil cover and increased water repellency, the crowns

either were browned or remained intact. It is expected that natural needle fall will provide enough soil cover to lessen the hydrologic response of the first damaging storm. In addition, mulch applied to a forested stand with high canopy retention results in mulch interception in needles and branches greatly decreasing the efficacy of mulch applications. Figure C-2 depicts the burn characteristics differences between north and south aspects with *moderate* soil burn severity.

- ***Results***: Figure C-3 shows the percentage of each pour point watershed that could be treated following the feasibility analysis. It is generally considered to treat watersheds if at least 50% of the watershed can be treated. The greatest area of a watershed that could be treated is Rocky Creek is 20%. Generally, however, treatable areas for the watersheds are less than 10 %. Figure C-3 summarizes each watershed and percentage of treatable ground ("yes" value).

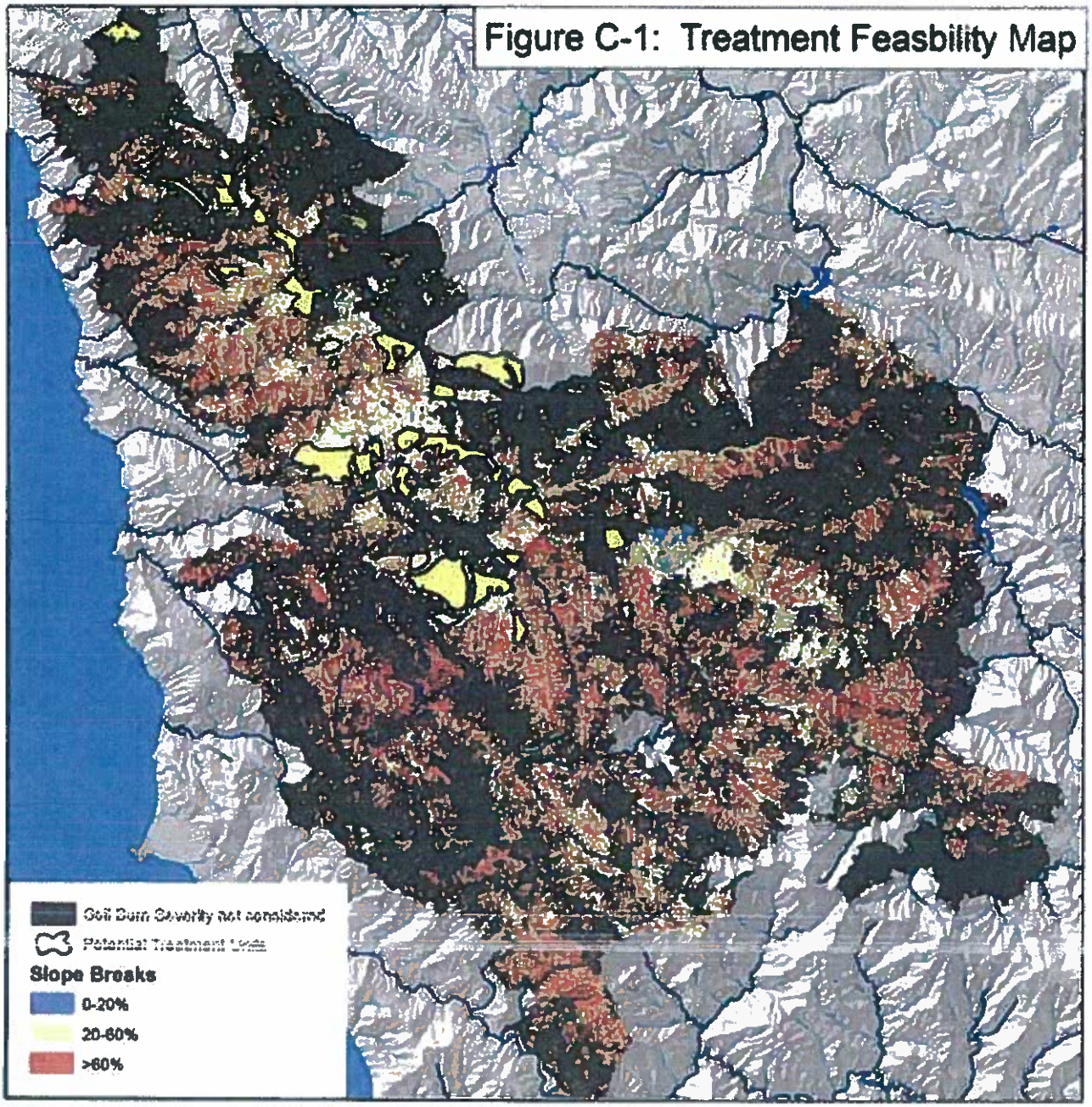


Figure C-1: Treatment Feasbility Map
Soil Burn Severity not considered
Potential Treatment Units
Slope Breaks
0-20%
20-60%
>60%

Figure C-2: North versus south aspect vegetation differences as shown in Turner Creek.

Figure C-3: Percentage of pour-point watershed that could be treated.

Pour Point Watershed	Acres of the Watershed	Percentage of watershed that is treatable
Bixby Creek	**5538.671711**	**2.66%**
no	4922.227548	88.87%
yes	616.4441625	11.13%
Bixby Creek on Coast Road	**7056.641231**	**3.39%**
no	6440.197069	91.26%
yes	616.4441625	8.74%
Black Rock Creek	**5232.772263**	**2.52%**
no	4980.080276	95.17%
yes	252.6919879	4.83%
Carmel River	**39870.87951**	**19.18%**
no	39805.49393	99.84%
yes	65.38558597	0.16%
Danish Creek/Rattlesnake Creek	**29363.84931**	**14.12%**

no	29363.84931	100.00%
Doud Creek	**1740.251802**	**0.84%**
no	1627.972338	93.55%
yes	112.2794638	6.45%
Garrapata Creek at Trout Farm	**6695.587896**	**3.22%**
no	6330.176652	94.54%
yes	365.411244	5.46%
Garrapatos RD	**2733.515436**	**1.31%**
no	2528.649033	92.51%
yes	204.8664028	7.49%
Granite Canyon	**992.3232152**	**0.48%**
no	991.2315695	99.89%
yes	1.091645747	0.11%
Juan Higuera Creek	**1164.723768**	**0.56%**
no	1164.723768	100.00%
Las Garzas Creek at Rancho San Carlos RD	**2852.102694**	**1.37%**
no	2840.025079	99.58%
yes	12.0776149	0.42%
Little Sur River	**25607.43191**	**12.32%**
no	25540.66858	99.74%
yes	66.76333124	0.26%
Little Sur River on Coast Road	**17033.30693**	**8.19%**
no	16966.51609	99.61%
yes	66.79084664	0.39%
Malpaso Creek	**2108.932004**	**1.01%**
no	2052.493109	97.32%
yes	56.43889489	2.68%
Middle Little Sur	**11684.6719**	**5.62%**
no	11651.03517	99.71%
yes	33.63672808	0.29%
Palo Colorado Lower Canyon	**1195.297533**	**0.57%**
no	1057.568742	88.48%
yes	137.7287914	11.52%
Palo Colorado Upper RD xing	**441.5722814**	**0.21%**
no	303.8104623	68.80%
yes	137.7618191	31.20%
Pfeiffer Redwood Creek	**545.2528973**	**0.26%**
no	545.2528973	100.00%
Pheneger Creek	**521.6363662**	**0.25%**
no	521.6363662	100.00%
Pine Creek	**5074.456455**	**2.44%**

no	5009.070869	98.71%
yes	65.38558597	1.29%
Rocky Creek	**2225.209328**	**1.07%**
no	1784.570281	80.20%
yes	440.639047	19.80%
San Clemente Creek/Dormody RD	**3697.020215**	**1.78%**
no	3696.85526	100.00%
yes	0.164954493	0.00%
San Clemente Creek/San Clemente Dam	**10666.26547**	**5.13%**
no	10413.41051	97.63%
yes	252.8549601	2.37%
San Jose Creek	**9040.815385**	**4.35%**
no	8883.518815	98.26%
yes	157.2965696	1.74%
Sierra Creek	**1356.766776**	**0.65%**
no	1356.766776	100.00%
Soberanes 2 Creek	**1929.114862**	**0.93%**
no	1768.119192	91.65%
yes	160.99567	8.35%
South Fork Little Sur River on Coast Road	**7297.163691**	**3.51%**
no	7297.163691	100.00%
Turner Creek on Palo Colorado	**1629.556637**	**0.78%**
no	1495.25668	91.76%
yes	134.299957	8.24%
Unnamed trib to Pacific Ocean 01	**120.3757768**	**0.06%**
no	120.3757768	100.00%
Unnamed trib to Pacific Ocean 02	**127.8439667**	**0.06%**
no	127.8439667	100.00%
Unnamed trib to Pacific Ocean 03	**212.2765287**	**0.10%**
no	212.2765287	100.00%
White Rock Lake	**2164.283579**	**1.04%**
no	1931.895304	89.26%
yes	232.3882748	10.74%
(blank)		**0.00%**
(blank)		

Appendix E: Summary of Cost-Risk Analysis

Soberanes Fire Benefit Cost Analysis:

Total benefits of resources for whole fire FS lands:

All Resource	Value $	
Roads at risk	$200,000	
Trails	$150,000	
Water quality/Aquatics/fisheries	$1,250,000	
Soil productivity	$80,000	
Threatened and Endangered Botanical Species	$1,000,000	
Heritage Resources	$1,000,000	Heritage resources are not a market value.
Public safety	$1,000,000	Human life and/or safety is not a market value. Estimated cost of injury accident.

Probility of loss without and with treatments:

All Resource	Probility loss no treatments:	Probility loss w/ treatments:	Reduction in probility of loss
Roads at risk(FS)	50%	10%	40%
Trails	60%	20%	40%
Water quality/Aquatics/fisheries	40%	35%	5%
Soil productivity	45%	35%	10%
Threatened and Endangered Botanical Species	60%	15%	45%
Heritage Resources	50%	25%	25%
Public safety	70%	20%	50%

Total cost of treatments on Forest Service:

Line not items for items	NFS Lands					Other Lands				Grand Total
Line Items	Units	Unit Cost	# of Units	BAER $	Spent $	# of Units	Paid $	# of Units	Paid $	
A. Land Treatments										
Invasive Weed Detection Survey	project	$29,965	1	$29,965	$0		$0		$0	$29,965
Subtotal Channel Treatments				$29,965	$0		$0		$0	$29,965
B. Channel Treatments - none										
				$0	$0		$0		$0	$0
Subtotal Channel Treatments				$0	$0		$0		$0	$0
C. Road and Trails										
Road Stormproofing & Patrol	project	$76,310	1	$76,310	$0		$0		$0	$76,310
Trail Stormproofing	project	$41,762	1	$41,762	$0		$0		$0	$41,762
Subtotal Road & Trails				$118,072	$0		$0		$0	$118,072
D. Protection/Safety										
Warning Signs	ea	$625	6	$3,750	$0		$0		$0	$0
Botchers Camp Protection	ea	$2,500	1	$2,500	$0		$0		$0	$0
Botchers Camp Host Hazmat Site	ea	$1,350	1	$1,350	$0		$0		$0	$0
Heritage protection	project	$2,880	1	$2,880	$0		$0		$0	$0
Coordination with Public & Private	ea	$500	20	$10,000	$0		$0		$0	$0
Closure Signs	ea	$350	6	$2,100	$0		$0		$0	$0
Subtotal Protection				$22,580	$0		$0		$0	$22,580
E. BAER Evaluation										
Assessment Team	0620	HSBAER	---	---	$217,086	---	$0	---	$0	$0
	---	---	---	---	$0	---	$0	---	$0	$0
Subtotal Evaluation				---	$217,086	---	$0	---	$0	$0
F. Monitoring										
Trail Treatment Monitoring	ea	$1,000	1	$1,000	$0		$0		$0	$0
Road Treatment Monitoring	ea	$1,000	1	$1,000	$0		$0		$0	$0
Heritage Treatment Monitoring	ea	$1,000	1	$1,000	$0		$0		$0	$0
Subtotal Monitoring				$3,000	$0		$0		$0	$3,000
G. Totals				$173,617	$0		$0		$0	$173,617
Previously approved						Comments:				
Total for this request				$173,617						

All Resource	Benefit of treatment	Treatment Cost	B/C ratio	Justified
Roads at risk(FS)	$60,000	$76,310	1.0	yes
Trails	$60,000	$41,762	1.4	yes
Water quality/Aquatics/fisheries	$62,500.00	natural	0.0	n/a
Soil productivity	$8,000	natural	0.0	n/a
Threatened and Endangered Botanical Species	$450,000	$29,965	15.0	yes
Heritage Resources	$250,000	$3,000	83.3	yes
Public safety	$500,000	$19,700	25.4	yes
	$1,410,360	$170,737	8.3	

Appendix F: Treatment Map - Soberanes 2 Fire