Date of Report: 08/26/2021

BURNED-AREA REPORT

PART I - TYPE OF REQUEST

A. Type of Report

☐ 1. Funding request for estimated emergency stabilization funds
☒ 2. No Treatment Recommendation

B. Type of Action

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

☐ 2. Interim Request #___
☐ Updating the initial funding request based on more accurate site data or design analysis

PART II - BURNED-AREA DESCRIPTION

A. Fire Name: Parleys Canyon

B. Fire Number: UT-NWS-000763

C. State: Utah

D. County: Salt Lake County

E. Region: R4 – Intermountain Region

F. Forest: Uinta Wasatch Cache NF

G. District: Salt Lake RD

H. Fire Incident Job Code: PNN8FS (1522)

I. Date Fire Started: 8/14/2021

J. Date Fire Contained: 8/21/2021

K. Suppression Cost: $2,600,000

L. Fire Suppression Damages Repaired with Suppression Funds (estimates):

1. **Fireline repaired (miles):** Not reported
2. **Other (identify):**

M. Watershed Numbers:

Table 1: Acres Burned by Watershed

HUC #	Watershed Name	Total Acres	Acres Burned	% of Watershed Burned
160202040302	Headwaters Parleys Creek	33,174	649	2%

N. Total Acres Burned: Acreage burned represents the BAER analysis perimeter which was created by GTAC by using 20m resolution satellite imagery of the burned area to modify the NIFC perimeter.

Table 2: Total Acres Burned by Ownership

OWNERSHIP	ACRES
NFS	158
OTHER FEDERAL (LIST AGENCY AND ACRES)	0
STATE	0

OWNERSHIP	ACRES
PRIVATE/SALT LAKE CITY	491
TOTAL	649

O. Vegetation Types: Gamble Oak, Aspen, Mixed Conifer

P. Dominant Soils: HHF—Harkers soils, 6 to 40 percent slopes (44% of area), HYG—Hourglass loam, 30 to 60 percent slopes (16% of area), DGG—Deer Creek-Picayune association, steep (11% of area), Hades-Agassiz-Rock outcrop complex, 30 to 70 percent slopes (8% of area)

Q. Geologic Types: Jt: Twin Creek Limestone - Thin to medium-bedded, gray, light-gray, and purplish-gray limestone and some beds of grayish-red to brown siltstone and sandstone. Locally fossiliferous. Qof: Older Alluvial Fan and Debris Fan Deposits - Poorly sorted gravel, sand, and silt; locally bouldery. Crudely bedded to nonbedded. Occur above present drainage and are inactive. Qf: Alluvial Fan and Debris Fan Deposits - Gravel, sand, and silt; locally bouldery. Crudely bedded to nonbedded and poorly sorted.

R. Miles of Stream Channels by Order or Class:

Table 3: Miles of Stream Channels by Order or Class

STREAM TYPE	MILES OF STREAM
PERENNIAL	0.5
INTERMITTENT	0.0
EPHEMERAL	1.7
OTHER (DEFINE)	N/A

S. **Transportation System:**
Trails: *National Forest (miles):* 0.0 *Other (miles):* 0.0
Roads: *National Forest (miles):* 0.0 *Other (miles):* 0.1

PART III - WATERSHED CONDITION

A. Burn Severity (acres):

Table 4: Burn Severity Acres by Ownership

Soil Burn Severity	NFS	Other Federal (List Agency)	State	Private/Salt Lake City	Total	% within the Fire Perimeter
Unburned/Very Low	27	0	0	119	146	23%
Low	44	0	0	119	163	25%
Moderate	86	0	0	251	337	52%
High	1	0	0	2	3	<1%
Total	158	0	0	491	649	100%

B. Water-Repellent Soil (acres): Unable to determine due to wet soil surface at the time of the BAER survey. Heavy rain had fallen for multiple days prior to BARC map validation field work. Evidence of sheet flow, puddling, and minor rill formation were observed in areas of moderate SBS. Some level of water repellency is suspected.

C. Soil Erosion Hazard Rating: Slight on 48% of burned area, Severe on 35% of burned area, Moderate on 17% of the burned area

D. Erosion Potential: Postfire hillslope erosion is estimated to be 360 lb/acre/year. Postfire channel erosion is estimated to be 120 lb/acre/year.

E. Sediment Potential: Postfire sediment discharge at the outlet of the modeled 260 acre drainage of concern is estimated to be 60 tons/year.

F. Estimated Vegetative Recovery Period (years): 1-3 years for grasses and shrubs, 3-5 years for oak and aspen, 20 years for mixed conifer.

G. Estimated Hydrologic Response (brief description): An analysis of expected peak flows was conducted using the peak flow calculator in the WEPPcloud model for the 2, 5, and 10-year return interval flood events. The results of the modeling are presented below in table 5. It is worth noting that the discharge volumes do not have a bulking factor applied to the output and are only displayed to show relative changes in the post-fire watershed response. The actual volume of material (water, sediment, and organic debris) transported during post fire floods can be many times greater than what is observed during a typical pre-fire high flow event and is highly dependent on multiple factors which cannot be accurately predicted.

These increases in peak flows are expected to occur in response to short duration, high intensity thunderstorms. The increased watershed response to these precipitation events is expected to persist for approximately 3 to 5 years while canopy vegetation, ground cover, and soil hydrophobicity recover to pre-fire conditions.

Rainfall runoff hydrograph modeling (Wildcat5 model) was conducted for the same analysis watershed in an attempt to show relative changes in response to a typical short-duration high-intensity design storm. However, pre-fire modeling did not produce runoff at the watershed outlet when reasonable pre-fire curve numbers were used to represent land use, hydrologic condition, and hydrologic soil groups. Post-fire modeling of the same design storm did produce runoff at the watershed outlet when the runoff curve numbers were modified to represent observed soil burn severities. The conclusion that can be drawn from this is that short duration precipitation events with sustained heavy rainfall for 15-30 minutes can produce flash floods that would not have been expected from the same watershed before the fire occurred.

Table 5. Pre and post fire peak flows

Modeled Watershed	Pre-fire Q2 (cfs)	Post-fire Q2 (cfs)	Q2 Percent Increase	Pre-fire Q5 (cfs)	Post-fire Q5 (cfs)	Q5 Percent Increase	Pre-fire Q10 (cfs)	Post-fire Q10 (cfs)	Q10Percent Increase
Unnamed drainage on the west side of the fire, above I-80	15	60	300%	20	76	280%	31	100	223%

An analysis of post-fire debris flow threats in response to a range of rainfall intensities was conducted by the USGS. When a 15-minute rainfall intensity of 28 millimeters per hour design storm was modeled (equivalent to approximately 0.28” of rain in 15 minutes), the probability of debris flows occurring on the burn scar reaches 80-100% in the 260-acre drainage that contains the steepest slopes, highest burn severities, and most well-defined channel network (Figure 3). This design rainstorm has a 1-year recurrence interval for the burned area. While the likelihood of debris flow occurrence under this design storm is high, the estimated volume of the debris flow is relatively low at approximately 11,000 m^3.

PART V - SUMMARY OF ANALYSIS

Introduction/Background

The Parleys Canyon fire was caused by a vehicle with a faulty catalytic converter traveling eastbound on Interstate 80 on the afternoon of August 14th, 2021. Initial reports and photographs indicate that multiple fires were started along the roadway. The fires quickly merged and spread upslope on the south side Parleys Canyon. An extremely aggressive initial attack was conducted using aerial resources from throughout the

Western US as the fire was threating an estimated 8,000 homes, the municipal water supply for Salt Lake City, and many other critical values at risk.

Burned Area Emergency Response specialists from the Uinta Wasatch Cache NF conducted an initial site visit to the burn scar on August 17th. Burned area reflectance classification (BARC) imagery was not yet available to the BAER team, however an initial assessment of flood and debris flow threats was needed as strong thunderstorms with heavy rainfall were expected. Threats to travelers on I-80 and the municipal water supply were noted and conveyed immediately to the Incident Management Team, Utah Department of Transportation, Utah Highway Patrol, and Salt Lake City Public Utilities.

An initial BARC map image was acquired by the Forest Service Geospatial Technology and Applications Center following a Sentinel 2 satellite pass over the burned area on August 20th. BAER specialists returned to the burnscar to validate the BARC map and further review flood and debris flow threats. Heavy rainfall had occurred in between the two site visits and evidence minor debris flow activity (Figure 1) and moderate flash flooding (Figure 2) were observed.

Figure 1. Minor debris flow deposits in the burn scar located at 40° 44.183', -111° 38.610'.

Figure 2. Flash flood deposits in the burn scar located at 40° 44.475', -111° 39.290.

The findings of the field review, soil burn severity maps, and the USGS debris flow hazard assessment results have been shared with the Utah Post Wildfire Team and meteorologists at the National Weather Service and UDOT. This information is being used to establish flash flood warning precipitation threshold values and to better inform UDOT operations and maintenance personnel of the upstream threats that could impact the highway.

Ongoing coordination with Salt Lake City Public Utilities and Utah Division of Wildlife Resources is also occurring as these agencies have expressed interest in post-fire rehabilitation activities outside of the USFS BAER program's authority.

The remainder of this report will focus on threats to Forest Service Critical BAER values as identified in FSM 2523 – Emergency Stabilization – Burned Area Emergency Response.

Describe Critical Values/Resources and Threats (narrative):

Table 6: Critical Value Matrix

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**

1. **Human Life and Safety (HLS):**

   a. Human life and safety of Forest visitors and employees traveling on NFS lands throughout the burnscar is threatened due to the potential for injury or loss of life from debris flows, flash floods, falling trees, rolling rocks, and other burned area hazards. The probability of damage or loss is **unlikely** because of the lack of designated access points, roads, or trails within the burned NFS lands. Access is limited to cross country travel. The magnitude of consequence is **major** since entrapment during a flood event or being hit by falling debris could result in serious injury or loss of life. The risk level is **intermediate**. Treatments are not recommended.

2. **Property (P):**

   a. There are no threats to USFS property within or downstream/downslope of the burned area.

3. **Natural Resources (NR):**

   a. Soil productivity and hydrologic function on NFS lands within the burnscar are threatened due to the potential for increased runoff and erosion of soil horizons. The probability of damage or loss is **possible** as hillslopes within the upper portions of the burned area are steep, lack effective ground cover, and are susceptible erosion during 1-2 year return interval precipitation events. The magnitude of consequence is **minor**. Damage to the soil resource is expected to be minimal and localized following thunderstorms and will result in relatively low rates of soil loss through rill and gully formation as well as channel scouring. The risk rating is **low.** Treatments are not recommended.

   b. The NFS lands within the burnscar are located in Salt Lake City's municipal watershed, however the stream channels on NFS lands are ephemeral and only contribute water to the municipal water supply following runoff producing events. During these events the quality of the water supplied by the channels on NFS lands is threatened by excessive sediment and ash loading from burned hillslopes and any scour that occurs within the channel network. The probability of damage or loss is **very likely** because hillslope and channel erosion are expected to occur during 1-2 year return interval precipitation events. Since the water quality degradation on NFS lands is expected to occur only when the ephemeral stream channels convey water during and immediately after high intensity rainfall events, the damage to the water resource is both recoverable and localized, resulting in a **minor** magnitude of consequence. The risk rating is **low**. Treatments are not recommended

4. **Cultural and Heritage Resources:**

   a. There are no threats to cultural sites on NFS lands within or downstream/downslope of the burned area.

A. Emergency Treatment Objectives: No BAER treatments are recommended.

B. Probability of Completing Treatment Prior to Damaging Storm or Event:
Land: N/A

Channel: N/A
Roads/Trails: N/A
Protection/Safety: N/A

D. Probability of Treatment Success

Table 7: Probability of Treatment Success

	1 year after treatment	*3 years after treatment*	*5 years after treatment*
Land	N/A	N/A	N/A
Channel	N/A	N/A	N/A
Roads/Trails	N/A	N/A	N/A
Protection/Safety	N/A	N/A	N/A

E. Cost of No-Action (Including Loss): $0

F. Cost of Selected Alternative (Including Loss): $0

G. Skills Represented on Burned-Area Survey Team:

☒ Soils ☒ Hydrology ☐ Engineering ☒ GIS ☐ Archaeology
☐ Weeds ☐ Recreation ☐ Fisheries ☐ Wildlife
☐ Other:

Team Leader: Brendan Waterman
Email: brendan.waterman@usda.gov **Phone(s)** 385-377-4338

Forest BAER Coordinator: Brendan Waterman
Email: brendan.waterman@usda.gov **Phone(s):** 385-377-4338

Team Members: *Table 8: BAER Team Members by Skill*

Skill	**Team Member Name**
Team Lead(s)	Brendan Waterman
Soils	
Hydrology	
Engineering	
GIS/SBS Analyst	Jess Clark
Archaeology	
Weeds	
Recreation	
Other	

H. Treatment Narrative: N/A

Land Treatments: N/A

Channel Treatments: N/A

Roads and Trail Treatments: N/A

Protection/Safety Treatments: N/A

I. Monitoring Narrative: N/A

PART VI – EMERGENCY STABILIZATION TREATMENTS AND SOURCE OF FUNDS

			NFS Lands			Other Lands				All
		Unit	# of		Other	# of	Fed	# of	Non Fed	Total
Line Items	Units	Cost	Units	BAER $	$	units	$	Units	$	$
A. Land Treatments										
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Land Treatments				$0	$0		$0		$0	$0
B. Channel Treatments										
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Channel Treatments				$0	$0		$0		$0	$0
C. Road and Trails										
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Road and Trails				$0	$0		$0		$0	$0
D. Protection/Safety										
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Protection/Safety				$0	$0		$0		$0	$0
E. BAER Evaluation										
Initial Assessment	Report	$3,300		---	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				---	$0		$0		$0	$0
Subtotal Evaluation				$0	$0		$0		$0	$0
F. Monitoring										
				$0	$0		$0		$0	$0
				$0	$0		$0		$0	$0
Insert new items above this line!				$0	$0		$0		$0	$0
Subtotal Monitoring				$0	$0		$0		$0	$0
G. Totals				$0	$0		**$0**		**$0**	**$0**
Previously approved										
Total for this request				**$0**						

PART VII - APPROVALS

CHAD HUDSON

Digitally signed by CHAD HUDSON
Date: 2021.09.01 12:23:20 -06'00'

1. _____
Forest Supervisor Date

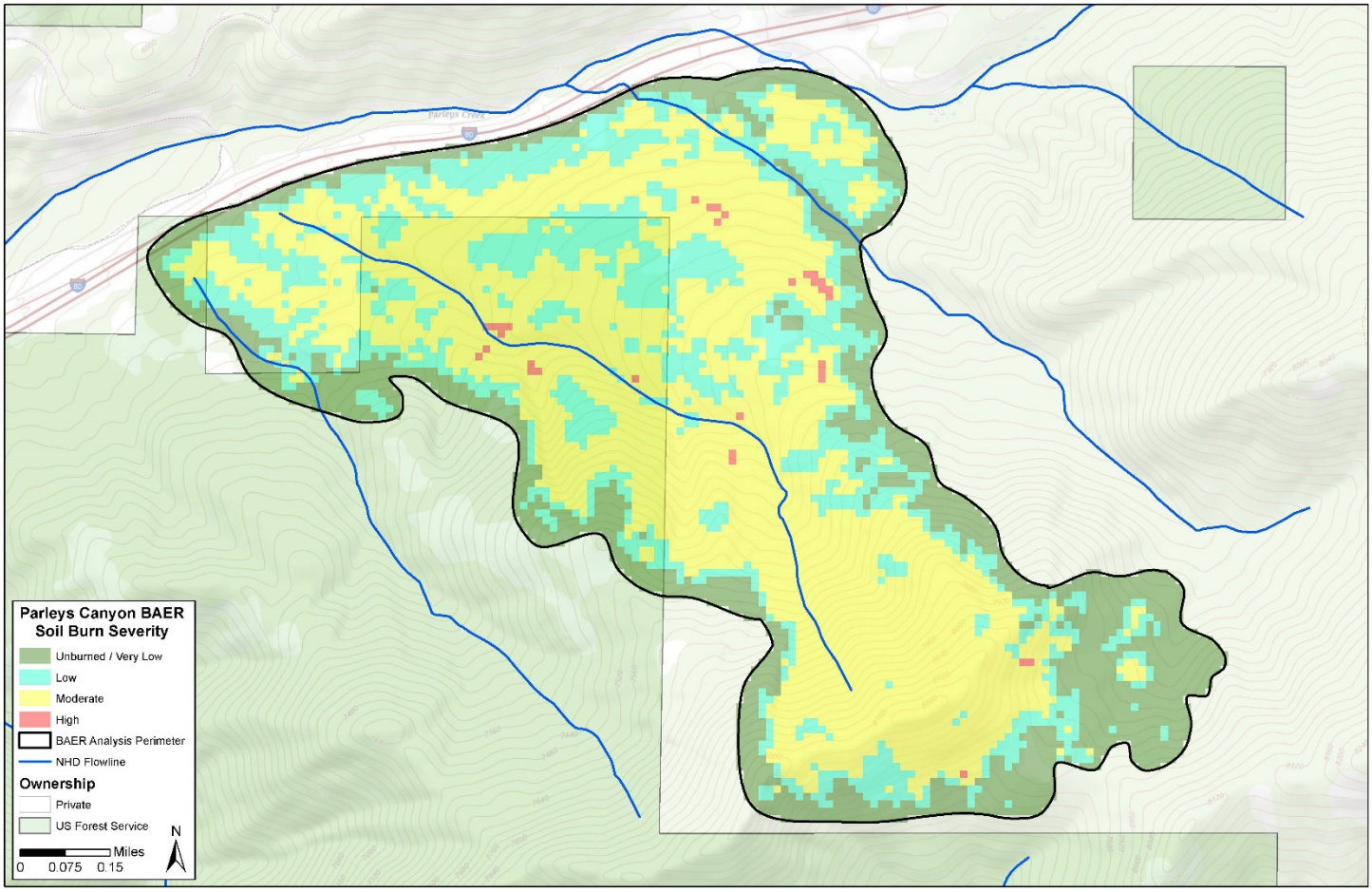

Figure 3. Soil Burn Severity

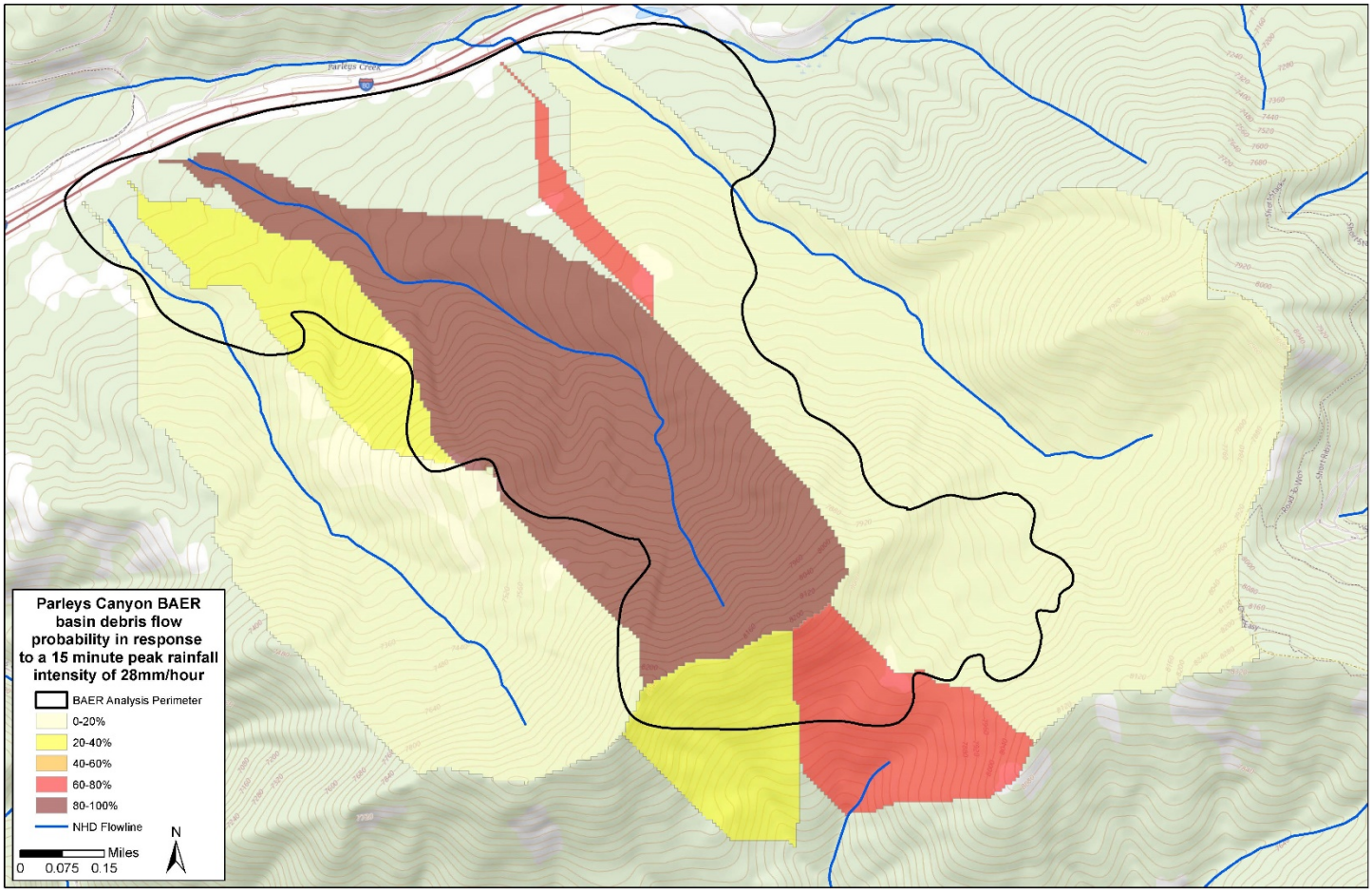

Figure 4. Probability of debris flow initiation

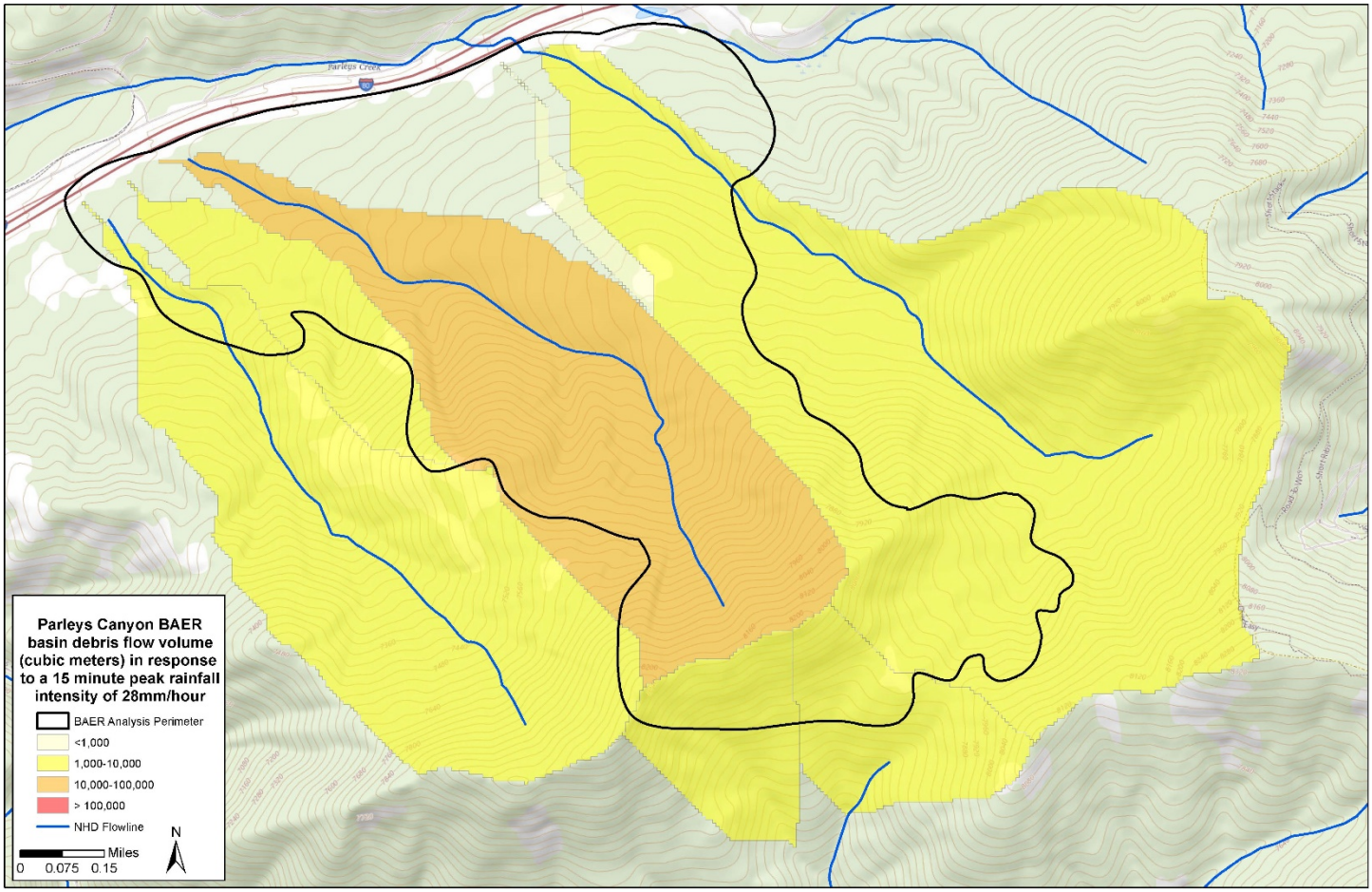

Figure 5. Volume of debris flow