

HAZUS-MH: Earthquake Event Report

Region Name: San Rafael Swell Earthquake Mw 5.3 ShakeMap Scenario

Earthquake Scenario: San Rafael Swell Mw 5.3 ShakeMap Scenario

Print Date: October 19, 2009

Totals only reflect data for those census tracts/blocks included in the user's study region.

Disclaimer:

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 19 county(ies) from the following state(s):

Utah

Note:

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 64,789.58 square miles and contains 344 census tracts. There are over 521 thousand households in the region and has a total population of 1,676,289 people (2005 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 432 thousand buildings in the region with a total building replacement value (excluding contents) of 87,941 (millions of dollars). Approximately 94.00 % of the buildings (and 67.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 41,450 and 6,361 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are 432 thousand buildings in the region which have an aggregate total replacement value of 87,941 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 46% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 42 hospitals in the region with a total bed capacity of 5,147 beds. There are 711 schools, 230 fire stations, 91 police stations and 4 emergency operation facilities. With respect to HPL facilities, there are 429 dams identified within the region. Of these, 144 of the dams are classified as 'high hazard'. The inventory also includes 469 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 47,811.00 (millions of dollars). This inventory includes over 6,815 kilometers of highways, 2,046 bridges, 186,769 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

System	Component	# locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	2,046	2,530.60
	Segments	962	35,181.80
	Tunnels	4	2.00
	Subtotal		37,714.40
Railways	Bridges	24	2.70
	Facilities	9	24.00
	Segments	1,051	1,990.50
	Tunnels	0	0.00
	Subtotal		2,017.20
Light Rail	Bridges	0	0.00
	Facilities	24	63.90
	Segments	24	37.20
	Tunnels	0	0.00
	Subtotal		101.10
Bus	Facilities	5	5.30
	Subtotal		5.30
Ferry	Facilities	1	1.30
	Subtotal		1.30
Port	Facilities	0	0.00
	Subtotal		0.00
Airport	Facilities	23	245.00
	Runways	36	1,366.70
	Subtotal		1,611.70
		Total	41,451.00

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	2,280.40
	Facilities	1	32.60
	Pipelines	0	0.00
	Subtotal		2,313.00
Waste Water	Distribution Lines	NA	1,368.20
	Facilities	31	2,023.30
	Pipelines	0	0.00
	Subtotal		3,391.60
Natural Gas	Distribution Lines	NA	912.20
	Facilities	7	7.50
	Pipelines	695	1,456.20
	Subtotal		2,375.90
Oil Systems	Facilities	19	1.90
	Pipelines	245	459.80
	Subtotal		461.60
Electrical Power	Facilities	22	2,371.60
	Subtotal		2,371.60
Communication	Facilities	85	8.30
	Subtotal		8.30
		Total	10,922.00

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	San Rafael Swell Mw 5.3 ShakeMap Scenario
Type of Earthquake	User-defined
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	5.30
Depth (Km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Building Damage

Building Damage

HAZUS estimates that about 2 buildings will be at least moderately damaged. This is over 0.00 % of the total number of buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 3 below summaries the expected damage by general occupancy for the buildings in the region. Table 4 summaries the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	522	0.12	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	17,269	3.99	0	0.66	0	0.92	0	0.85	0	0.00
Education	588	0.14	0	0.07	0	0.09	0	0.06	0	0.00
Government	1,361	0.31	0	0.32	0	0.36	0	0.21	0	0.00
Industrial	6,372	1.47	0	0.14	0	0.22	0	0.18	0	0.00
Other Residential	52,570	12.15	8	22.90	0	17.62	0	0.88	0	0.00
Religion	1,864	0.43	0	0.11	0	0.12	0	0.08	0	0.00
Single Family	352,153	81.39	25	75.79	2	80.67	0	97.74	0	0.00
Total	432,699		33		2		0		0	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	198,222	45.81	0	0.69	0	0.00	0	0.00	0	0.00
Steel	4,720	1.09	0	0.19	0	0.30	0	0.24	0	0.00
Concrete	3,749	0.87	0	0.24	0	0.15	0	0.00	0	0.00
Precast	2,982	0.69	0	0.28	0	0.62	0	0.60	0	0.00
RM	76,977	17.79	0	0.54	0	0.29	0	0.00	0	0.00
URM	131,730	30.44	25	76.36	2	82.11	0	99.17	0	0.00
MH	14,319	3.31	7	21.70	0	16.53	0	0.00	0	0.00
Total	432,699		33		2		0		0	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 5,147 hospital beds available for use. On the day of the earthquake, the model estimates that only 5,147 hospital beds (100.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 100.00% of the beds will be back in service. By 30 days, 100.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	42	0	0	42
Schools	711	0	0	711
EOCs	4	0	0	4
PoliceStations	91	0	0	91
FireStations	230	0	0	230

Transportation and Utility Lifeline Damage

Table 6 provides damage estimates for the transportation system.

Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations_				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	962	0	0	962	962
	Bridges	2,046	0	0	2,046	2,046
	Tunnels	4	0	0	4	4
Railways	Segments	1,051	0	0	1,051	1,051
	Bridges	24	0	0	24	24
	Tunnels	0	0	0	0	0
	Facilities	9	0	0	9	9
Light Rail	Segments	24	0	0	24	24
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	24	0	0	24	24
Bus	Facilities	5	0	0	5	5
Ferry	Facilities	1	0	0	1	1
Port	Facilities	0	0	0	0	0
Airport	Facilities	23	0	0	23	23
	Runways	36	0	0	36	36

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	1	0	0	1	1
Waste Water	31	0	0	31	31
Natural Gas	7	0	0	7	7
Oil Systems	19	0	0	19	19
Electrical Power	22	0	0	22	22
Communication	85	0	0	85	85

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	114,021	155	39
Waste Water	68,412	123	31
Natural Gas	2,900	0	0
Oil	1,436	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	521,459	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.000 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 93.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 1,676,289) will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	0	0	0	0
2 PM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	0	0	0	0
5 PM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	0	0	0	0

Economic Loss

The total economic loss estimated for the earthquake is 9.36 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 0.28 (millions of dollars); 7 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 56 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.00	0.00	0.00	0.00	0.00
	Capital-Related	0.00	0.00	0.00	0.00	0.00	0.00
	Rental	0.00	0.00	0.00	0.00	0.00	0.00
	Relocation	0.01	0.00	0.00	0.00	0.00	0.01
	Subtotal	0.01	0.00	0.00	0.00	0.00	0.02
Capital Stock Losses							
	Structural	0.02	0.00	0.00	0.00	0.00	0.03
	Non_Structural	0.06	0.01	0.03	0.01	0.02	0.14
	Content	0.04	0.01	0.02	0.00	0.02	0.09
	Inventory	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	0.12	0.02	0.06	0.01	0.05	0.26
	Total	0.13	0.02	0.06	0.01	0.05	0.28

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 14 presents the results of the region for the given earthquake.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	35,181.81	\$0.00	0.00
	Bridges	2,530.62	\$0.00	0.00
	Tunnels	1.96	\$0.00	0.00
	Subtotal	37714.40	0.00	
Railways	Segments	1,990.49	\$0.00	0.00
	Bridges	2.73	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Facilities	23.97	\$0.05	0.20
	Subtotal	2017.20	0.00	
Light Rail	Segments	37.15	\$0.00	0.00
	Bridges	0.00	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Facilities	63.91	\$0.07	0.11
	Subtotal	101.10	0.10	
Bus	Facilities	5.34	\$0.01	0.11
	Subtotal	5.30	0.00	
Ferry	Facilities	1.33	\$0.00	0.11
	Subtotal	1.30	0.00	
Port	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	0.00	
Airport	Facilities	244.97	\$0.87	0.36
	Runways	1,366.70	\$0.00	0.00
	Subtotal	1611.70	0.90	
	Total	41451.00	1.00	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	\$0.00	0.00
	Facilities	32.60	\$0.02	0.07
	Distribution Lines	2,280.40	\$0.70	0.03
	Subtotal	2,313.05	\$0.72	
Waste Water	Pipelines	0.00	\$0.00	0.00
	Facilities	2,023.30	\$4.17	0.21
	Distribution Lines	1,368.20	\$0.55	0.04
	Subtotal	3,391.55	\$4.72	
Natural Gas	Pipelines	1,456.20	\$0.00	0.00
	Facilities	7.50	\$0.00	0.00
	Distribution Lines	912.20	\$0.59	0.06
	Subtotal	2,375.85	\$0.59	
Oil Systems	Pipelines	459.80	\$0.00	0.00
	Facilities	1.90	\$0.00	0.01
	Subtotal	461.63	\$0.00	
Electrical Power	Facilities	2,371.60	\$2.04	0.09
	Subtotal	2,371.60	\$2.04	
Communication	Facilities	8.30	\$0.00	0.01
	Subtotal	8.33	\$0.00	
	Total	10,922.01	\$8.08	

Table 14. Indirect Economic Impact with outside aid
(Employment as # of people and Income in millions of \$)

	LOSS	Total	%
First Year			
	Employment Impact	106	0.02
	Income Impact	0	0.00
Second Year			
	Employment Impact	5	0.00
	Income Impact	0	0.00
Third Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	0	0.00

Appendix A: County Listing for the Region

Beaver,UT

Carbon,UT

Duchesne,UT

Emery,UT

Garfield,UT

Grand,UT

Iron,UT

Juab,UT

Millard,UT

Piute,UT

Salt Lake,UT

San Juan,UT

Sanpete,UT

Sevier,UT

Tooele,UT

Uintah,UT

Utah,UT

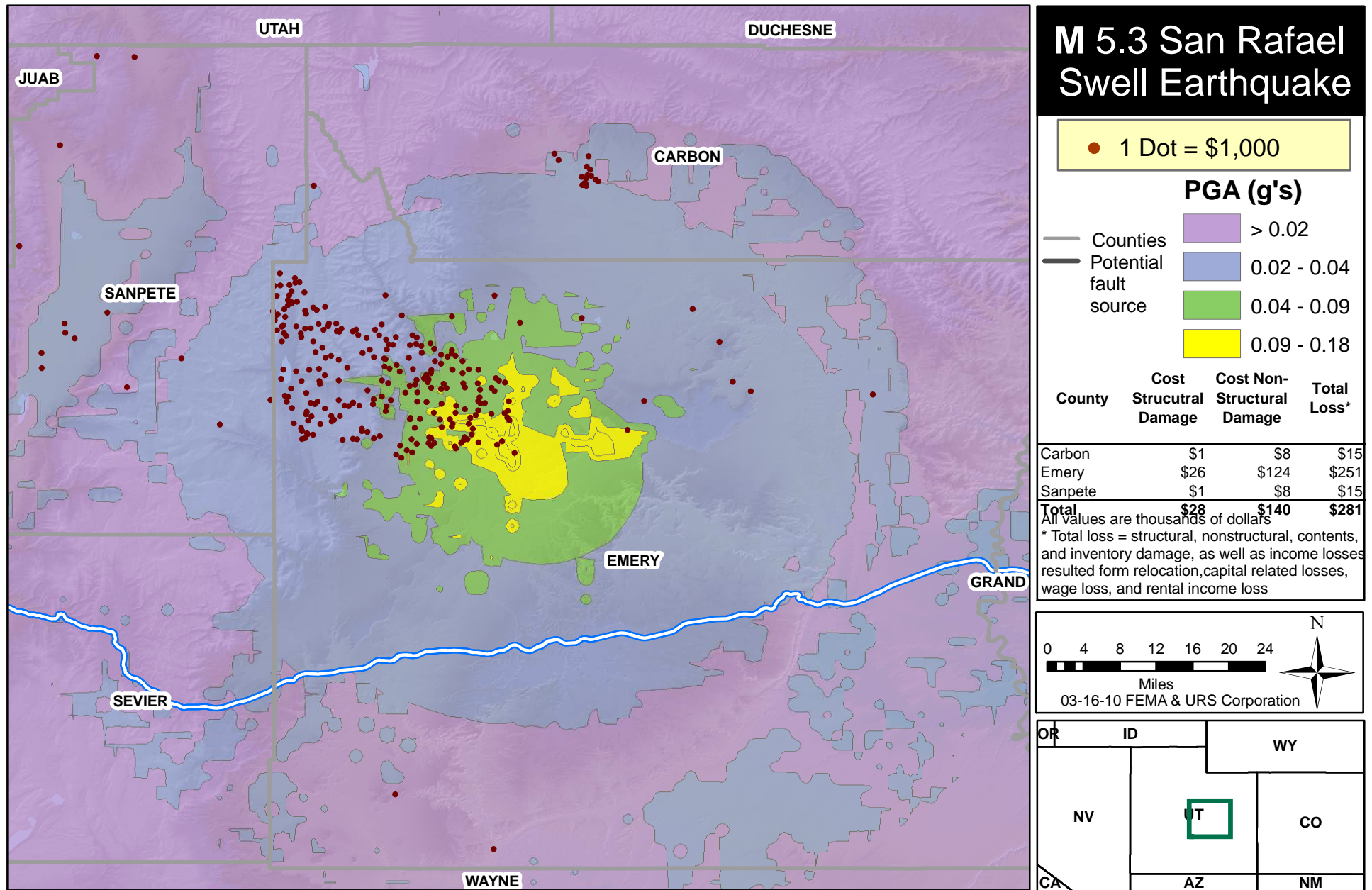
Wasatch,UT

Wayne,UT

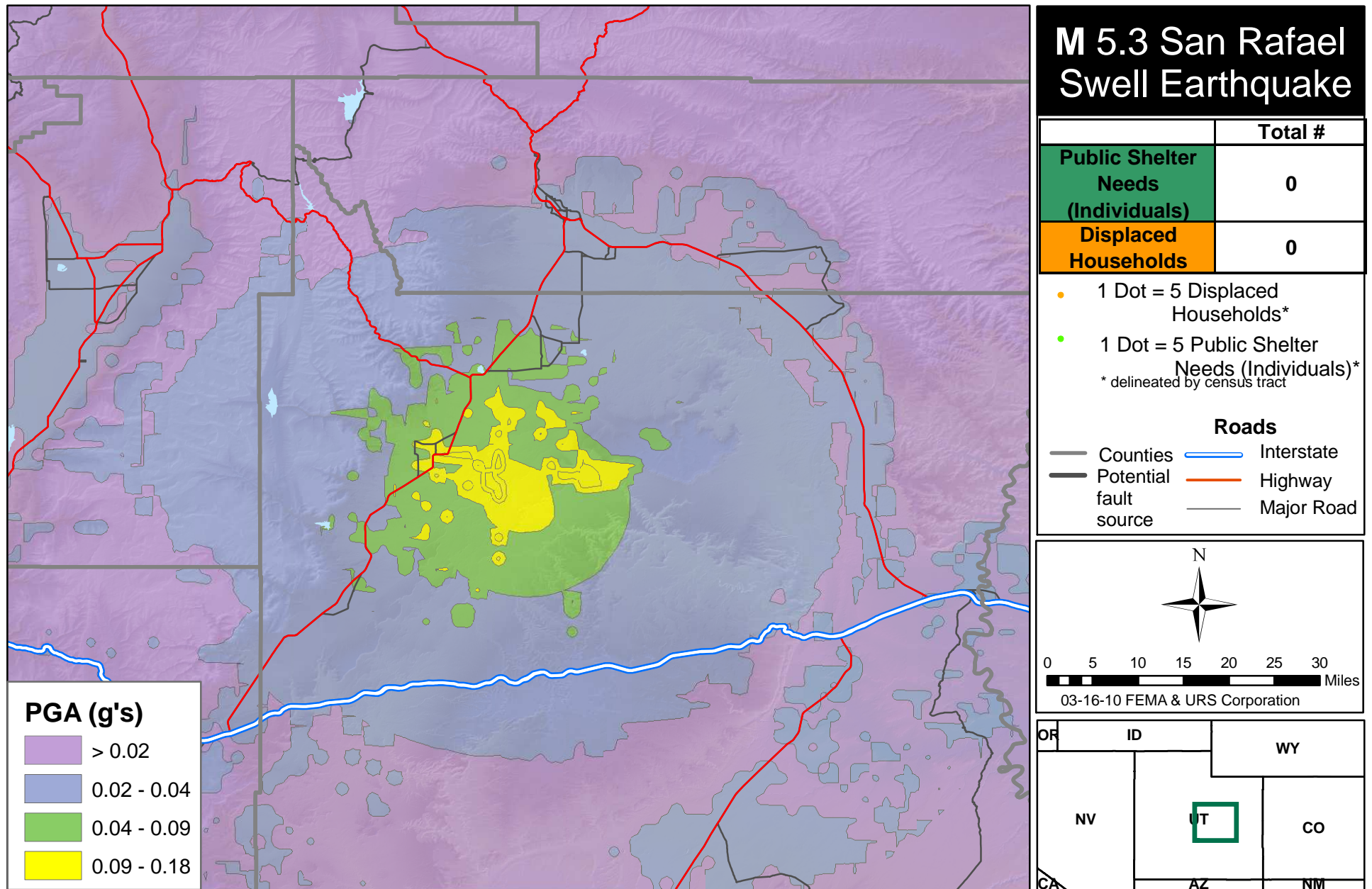
Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Utah	Beaver	6,295	252	89	341
	Carbon	19,947	825	395	1,220
	Duchesne	15,233	496	248	744
	Emery	10,885	403	142	546
	Garfield	4,957	276	94	370
	Grand	8,891	350	195	546
	Iron	37,498	1,323	741	2,065
	Juab	9,240	291	190	481
	Millard	12,713	447	233	681
	Piute	1,439	69	24	93
	Salt Lake	962,837	39,526	18,636	58,162
	San Juan	14,341	443	164	608
	Sanpete	24,037	708	387	1,095
	Sevier	19,623	697	315	1,013
	Tooele	50,184	1,782	564	2,347
	Uintah	26,973	851	460	1,312
	Utah	429,727	9,780	6,285	16,065
	Wasatch	18,879	0	89	89
	Wayne	2,590	115	38	154
Total State		1,676,289	58,634	29,289	87,932
Total Region		1,676,289	58,634	29,289	87,932

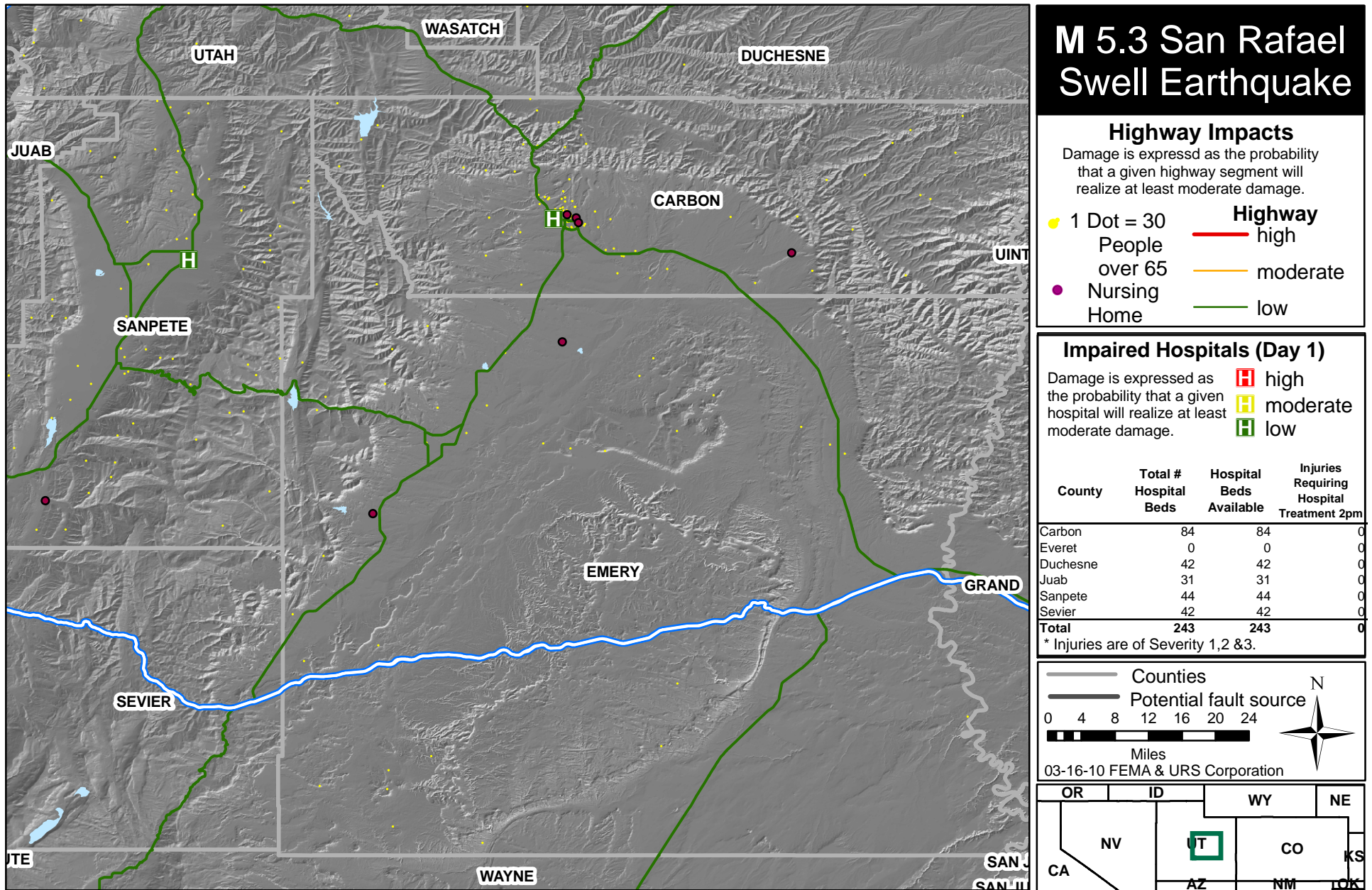
Direct Building Economic Loss - Earthquake Scenario: San Rafael Swell, UT



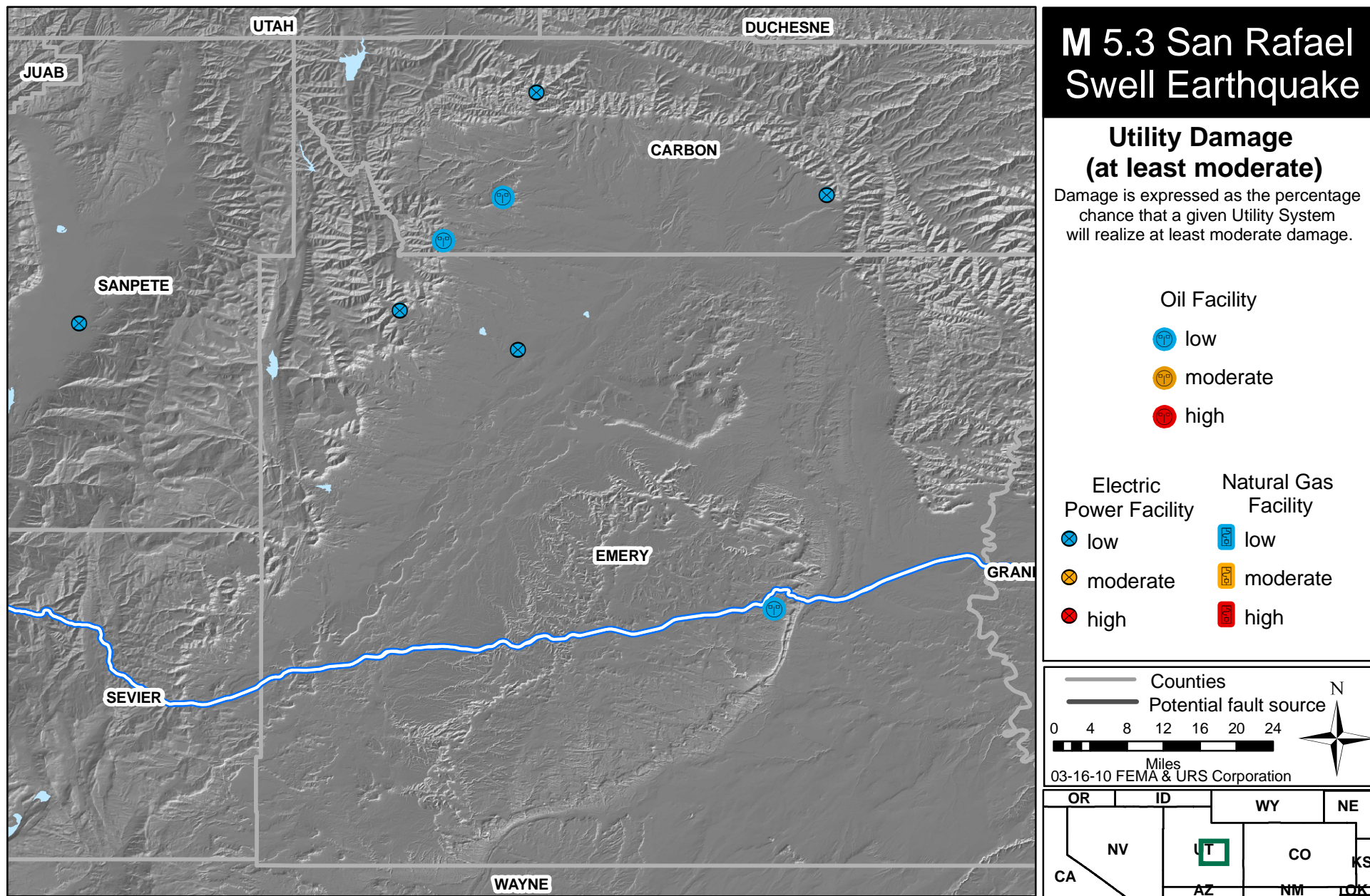
Estimated Displaced Households & Short Term Public Shelter Needs - Earthquake Scenario: San Rafael Swell, UT



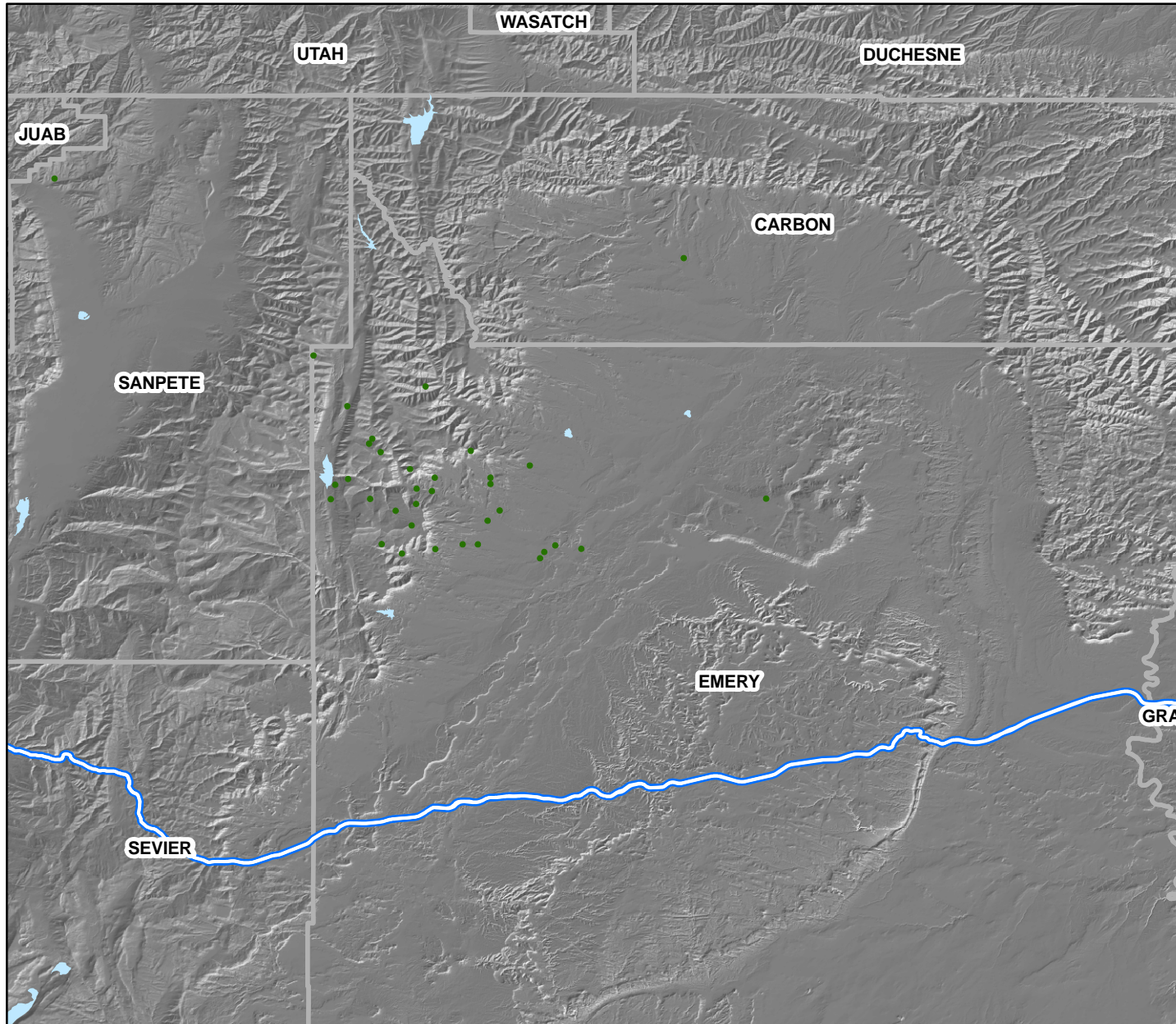
Distribution of Elderly, Impaired Hospitals (Day 1), & Hospital Bed Availability - Earthquake Scenario: San Rafael Swell, UT



Electrical, Natural Gas, and Oil Facility Damage - Earthquake Scenario: San Rafael Swell, UT



Estimated Building Inspection Needs - Earthquake Scenario: San Rafael Swell, UT

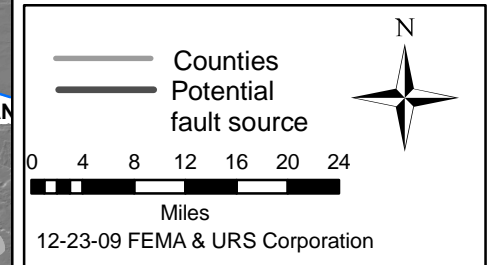


M 5.3 San Rafael Swell Earthquake

	Estimated # of Structures	Estimated # of Inspectors Needed
Red (Complete)	0	0
Yellow (Extensive)	0	0
Light Green (Slight/Moderate)	35	1
Total	35	1

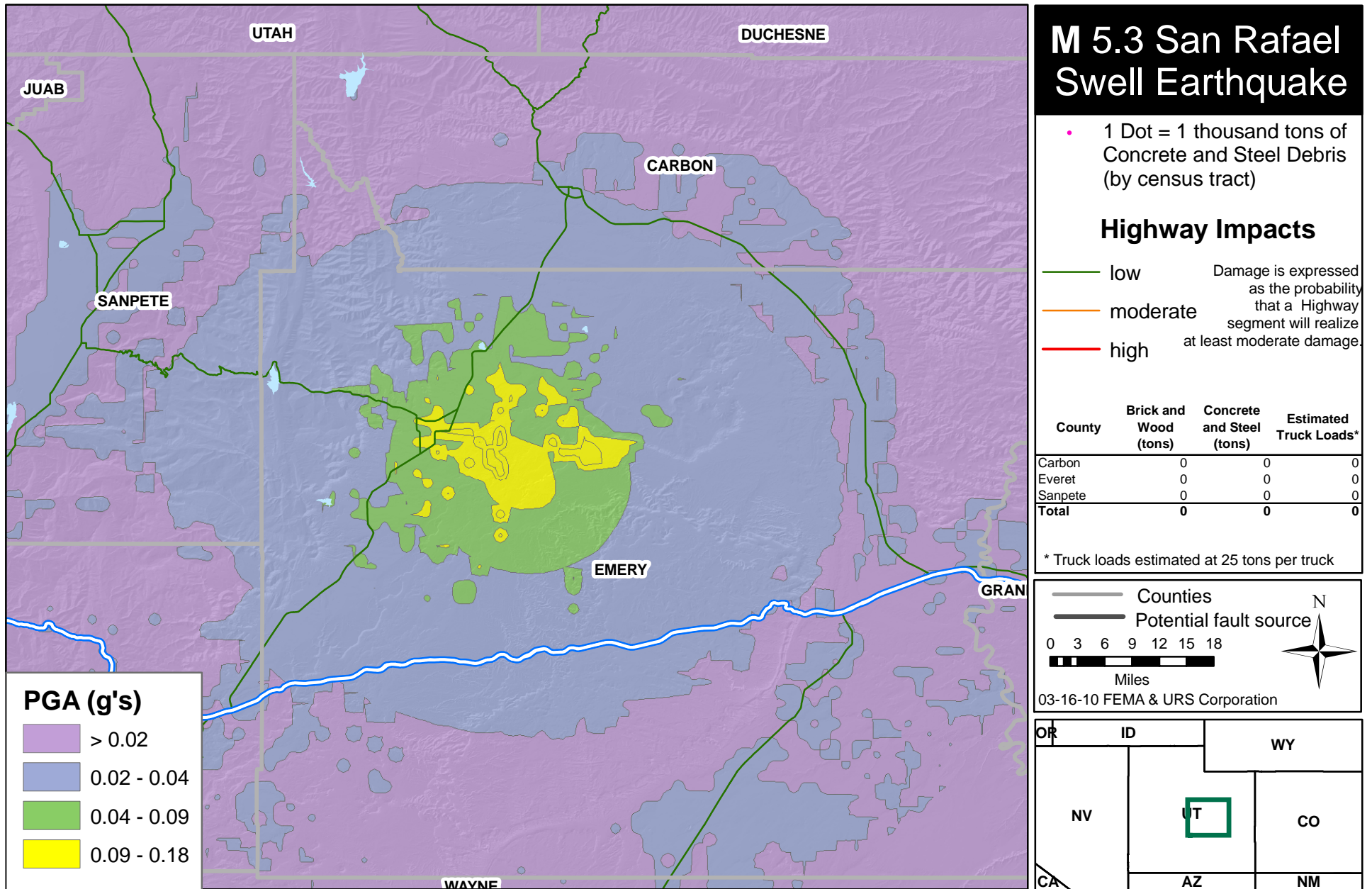
*Estimated number of inspectors needed to complete inspections in 30 days.

- 1 Dot = 10 (by census tract)
- Red Tag (Complete Damage)
- Yellow Tag (Extensive Damage)
- Green Tag (Slight/Moderate Damage)

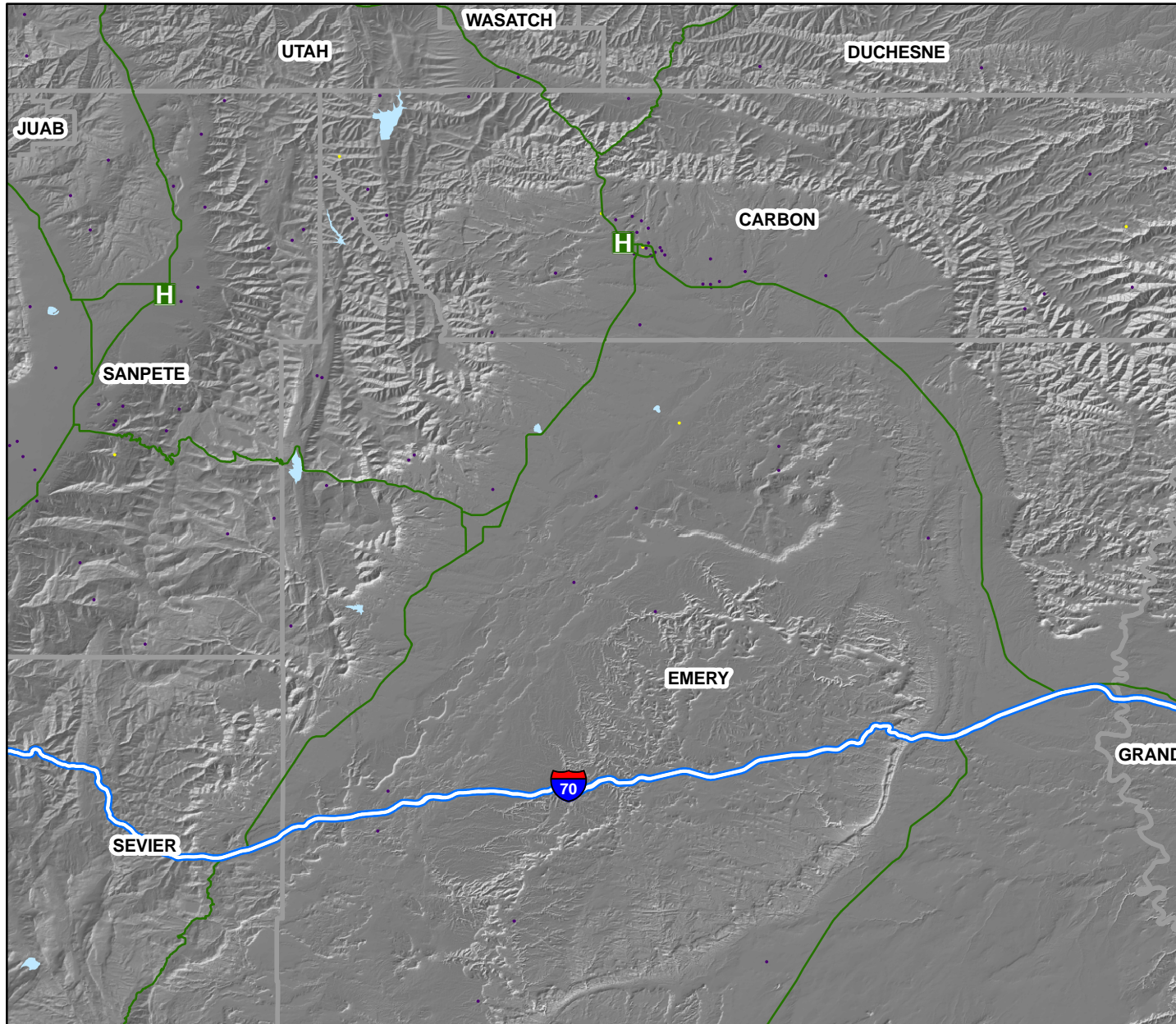


OR	ID	WY
NV	UT	CO
CA	AZ	NM

Estimated Concrete, Steel Debris and Highway Damage - Earthquake Scenario: San Rafael Swell, UT



Demographic Distribution and Highway Impacts - Earthquake Scenario: San Rafael Swell, UT



M 5.3 San Rafael Swell Earthquake

Highway Impacts

Damage is expressed as the probability that a given highway segment will realize at least moderate damage.

Highway

- high
- moderate
- low

Demographics

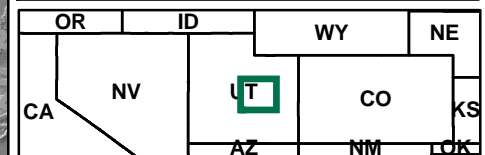
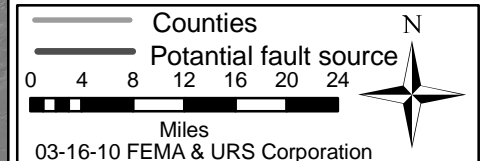
1 Dot = 500 People (by census tract)

- English Speaking
- Potentially Non-English Speaking

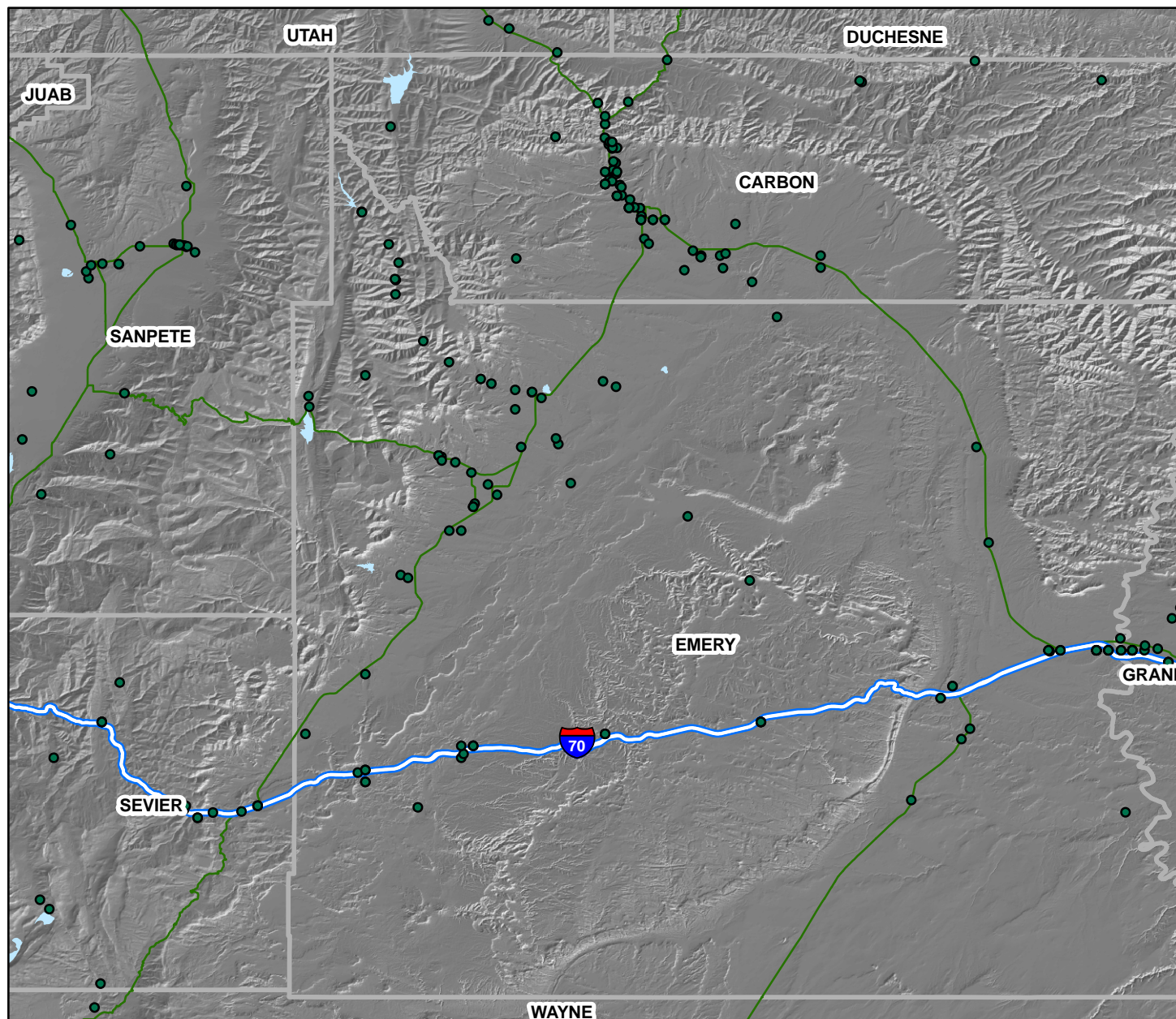
Impaired Hospitals (Day1)

- high
- moderate
- low

Damage is expressed as the probability that a given hospital will realize at least moderate damage.



Estimated Highway Infrastructure Impacts - Earthquake Scenario: San Rafael Swell, UT



M 5.3 San Rafael Swell Earthquake

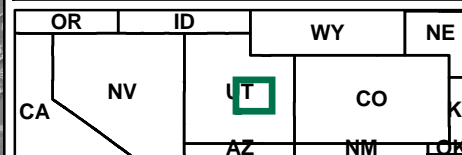
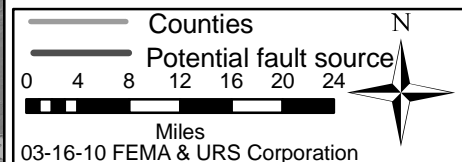
Highway Impacts

Damage is expressed as the probability that a given Bridge or Highway segment will realize at least moderate damage.

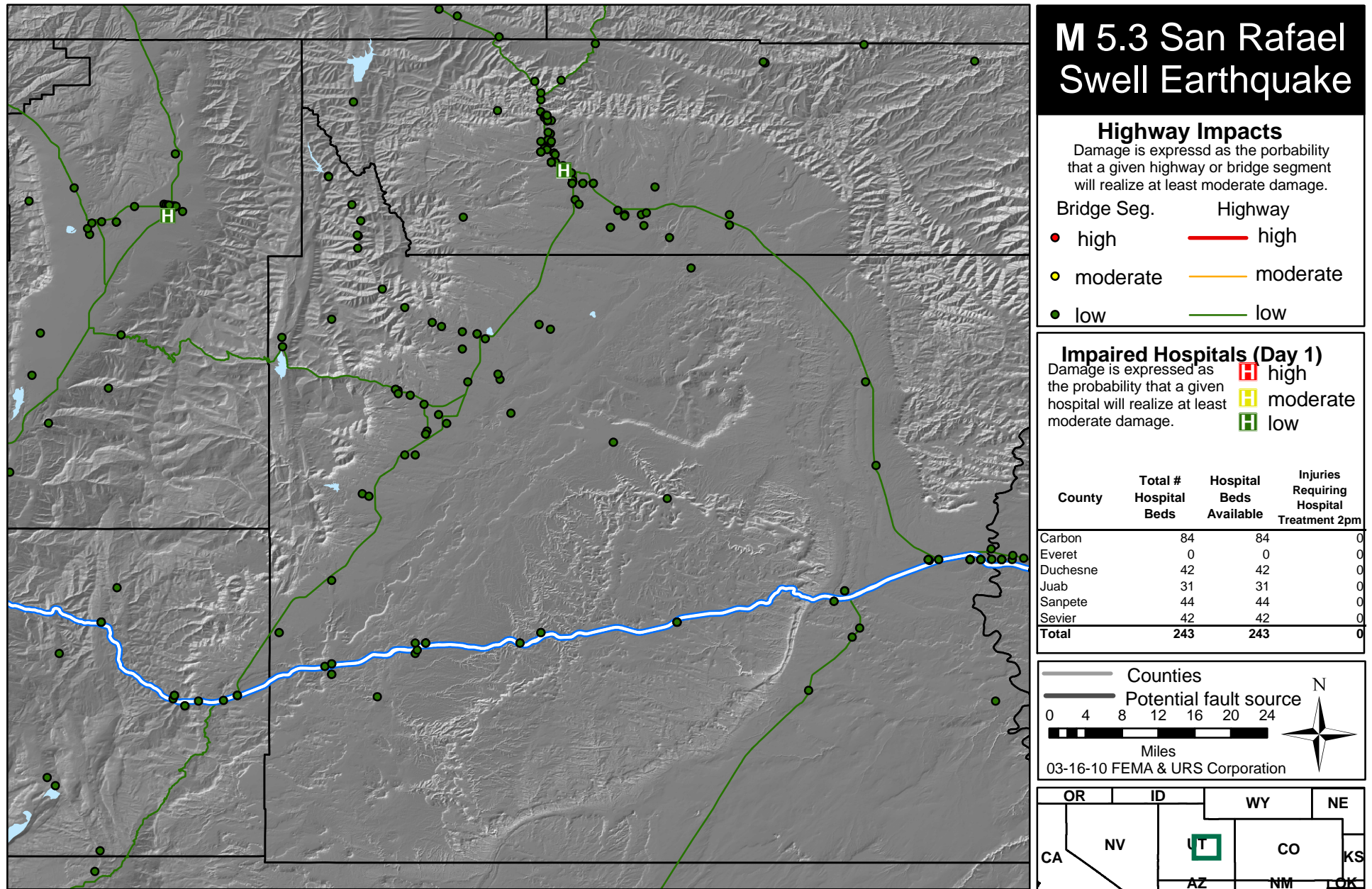
Highway Segment	Major Roadway Bridge
low	low
moderate	moderate
high	high

County	# of Bridges Needing Inspection	# of Bridges Needing Priority Inspection	# of Bridge Engineers Needed*
Carbon	67	0	9
Duchesne	80	0	11
Emery	90	0	12
Sanpete	38	0	5
Sevier	157	0	21
Utah	314	0	42
Wayne	15	0	2
Total	761	0	93

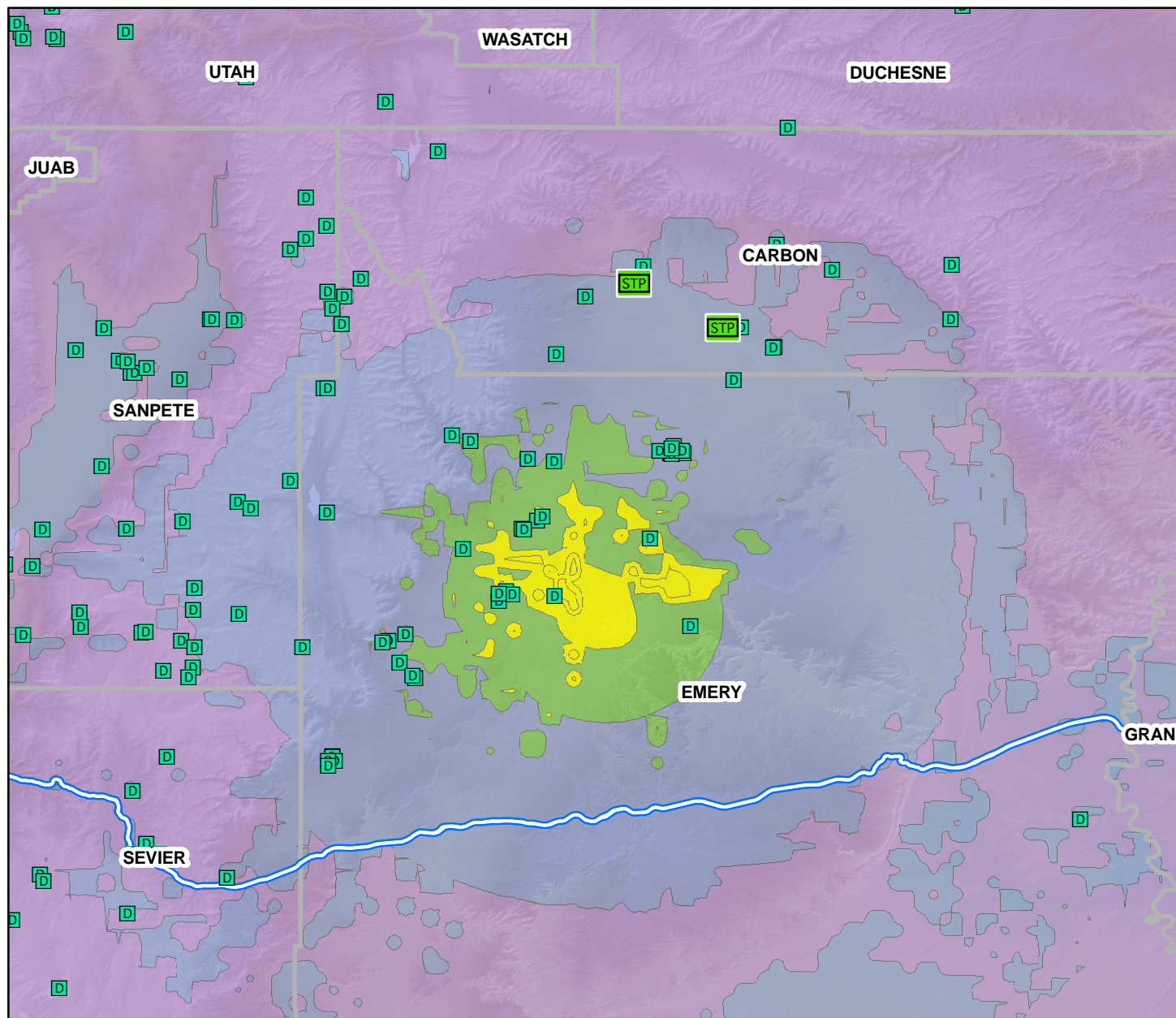
* For priority inspections only, assuming that 2 engineers can inspect 5 bridges a day for 3 days



Injuries, Impaired Hospitals (Day 1), Hospital Bed Availability, & Highway Impacts - Earthquake Scenario: San Rafael Swell, UT



Water Line, Sewage Treatment Facility Distribution - Earthquake Scenario: San Rafael Swell, UT



M 5.3 San Rafael Swell Earthquake

STP Sewage Treatment Facilities

D Dams

PGA (g's)

> 0.02

0.02 - 0.04

0.04 - 0.09

0.09 - 0.18

County	# Households without Potable Water (at Day 1)	Daily Potable Water Needs Per Person (Gallons/day)	Number of Truckloads needed Daily
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Emery	0	0	0
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* Based on U.S. Army Corp Mission Guidebook
(Daily water is based on an estimated 3 people per household.
One truck can transport an estimated 5000 gallons of water.)

— Counties
— Potential fault source

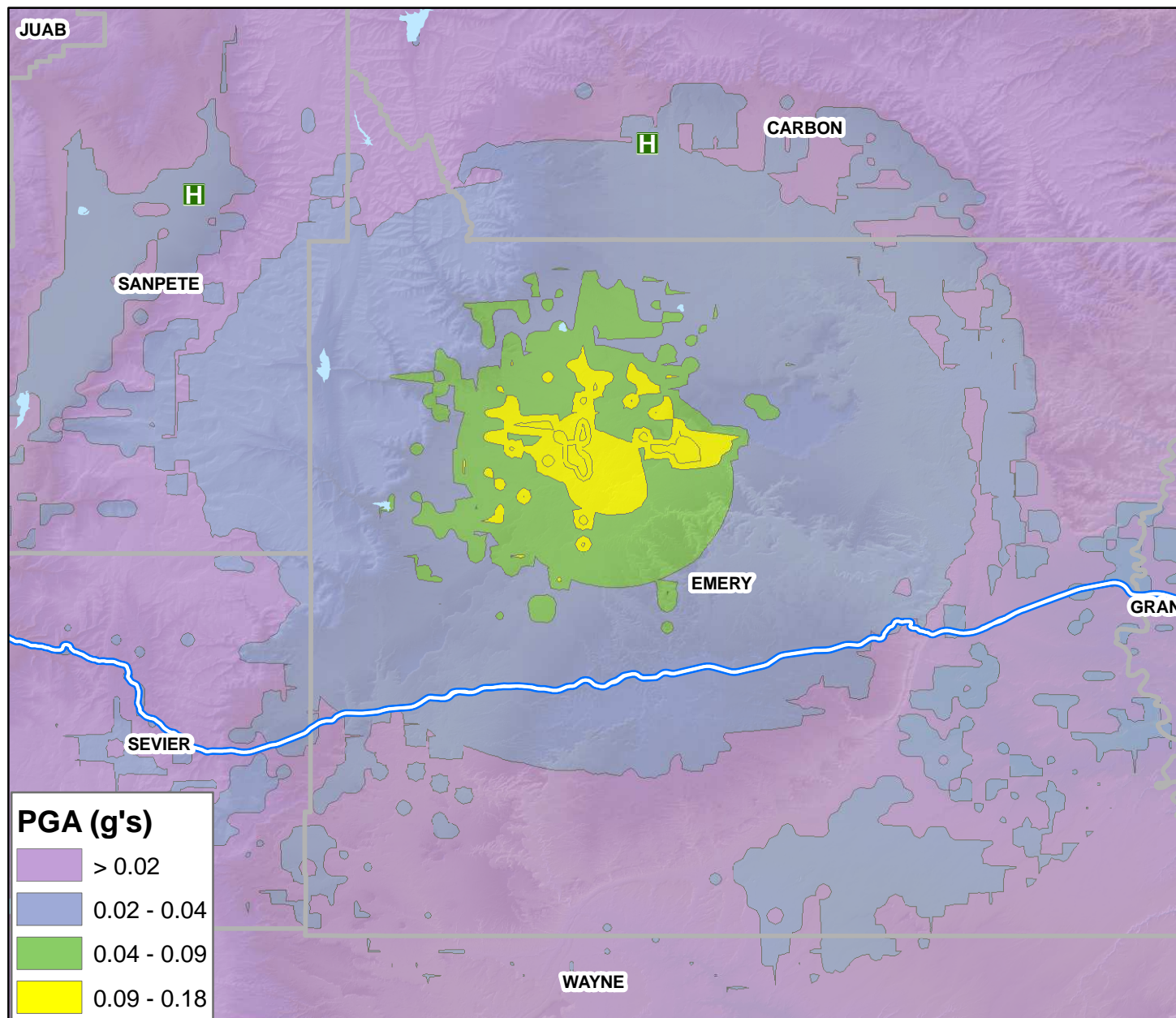


0 5 10 15 20 25 30 Miles

03-16-10 FEMA & URS Corporation

OR	ID	WY	
NV	UT	CO	
CA	AZ	NM	

Potential Search and Rescue Needs - Earthquake Scenario: San Rafael Swell, UT



M 5.3 San Rafael Swell Earthquake

Impaired Hospitals (Day1)

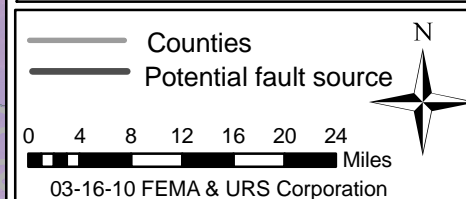
H high

H moderate

H low

Damage is expressed as the probability that a given hospital will realize at least moderate damage.

Structure Type	Red (Complete)	Collapse Rates for Complete Damage	Total Collapse
Wood	0	3%	0
Steel	0	6%	0
Concrete	0	10%	0
Precast	0	13%	0
Reinforced Masonry	0	10%	0
Unreinforced Masonry	0	15%	0
Manufactured Housing	0	3%	0
Total	0		0



OR	ID	WY
NV	UT	CO
CA	AZ	NM

Correctional and Daycare Facilities, Impaired Hospitals (Day 1), and Highway Impacts - Earthquake Scenario: San Rafael Swell, UT

