

**Scenario: M 7.2 Chelan Fault  
Chelan County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	2	0	0	2	0	0	4	0	0	1	0	0	9
Commercial	0	7	5	0	1	1	0	0	0	0	0	0	0	8	6
Educational	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Hotels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Other-Residential	5	1	2	0	0	0	0	0	0	0	0	0	5	1	2
Single Family	3	1	1	0	0	0	0	0	0	0	0	0	3	1	1
<b>Total Chelan</b>	<b>8</b>	<b>11</b>	<b>10</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>8</b>	<b>12</b>	<b>18</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	297	56	22	4	0	379
Commercial	1295	237	88	10	0	1,630
Education	53	8	3	0	0	64
Government	51	11	5	1	0	68
Industrial	407	77	33	4	0	521
Religion	108	16	5	0	0	129
Other Residential	6819	1,589	566	32	1	9,007
Single Family	19,148	1,882	58	9	2	21,099

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					Total Loss
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	
\$9,653,000	\$38,478,000	\$20,401,000	\$990,000	0.88	\$4,601,000	\$1,873,000	\$2,671,000	\$2,371,000	\$81,036,000

**Hospital Functionality**

	At Day 1			At day 3		At day 7		At day 30		At day 90	
	Total Number of Beds	Number of Beds	%								
Large	206	185	90	186	90	205	100	206	100	206	100
Medium											
Small	78	47	61	48	61	59	76	75	96	76	98
<b>Total</b>	<b>284</b>	<b>232</b>	<b>—</b>	<b>234</b>	<b>—</b>	<b>264</b>	<b>—</b>	<b>281</b>	<b>—</b>	<b>282</b>	<b>—</b>

Large Hospital: > 150 beds

Medium Hospital: 50-150 beds

Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
107	100	2	2	2	1

**Scenario: M 7.2 Chelan Fault  
Chelan County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
2	45	\$3,374,000

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
25,813	20	0	0	0	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
25,813	0	0	0	0	0	0	0	0	0	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
9,000	11,000	20,000	800

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
10	7

**Essential Facilities Functionality**

	Count	Functionality (%)
	At Day 1	
Emergency Operation Center	1	84
Fire Station Facilities	24	82
Police Station Facilities	3	83
School	43	74

**Scenario: M 7.2 Chelan Fault  
Douglas County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	1	0	0	2	0	0	3	0	0	1	0	0	7
Commercial	0	6	6	0	1	1	0	0	0	0	0	0	0	7	7
Educational	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0
Hotels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Other-Residential	12	3	4	1	0	0	0	0	0	0	0	0	13	3	4
Single Family	4	1	2	0	0	0	0	0	0	0	0	0	4	1	2
<b>Total Douglas</b>	<b>16</b>	<b>14</b>	<b>13</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>17</b>	<b>15</b>	<b>20</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	84	46	39	9	0	178
Commercial	230	186	145	22	0	583
Education	10	6	5	1	0	22
Government	10	8	8	1	0	27
Industrial	63	53	45	8	0	169
Religion	22	14	11	2	0	49
Other Residential	1,984	1,563	1,380	242	6	5,175
Single Family	6,259	1,960	197	11	0	8,427

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					Total Loss
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	
\$9,368,000	\$31,309,000	\$14,293,000	\$382,000	2.13	\$6,281,000	\$2,537,000	\$2,901,000	\$2,582,000	\$69,654,000

**Hospital Functionality (Douglas county contains no hospitals in HAZUS database)**

	Total Number of Beds	At Day 1		At day 3		At day 7		At day 30		At day 90	
		Number of Beds	%								
Large											
Medium											
Small											
<b>Total</b>	<b>0</b>	<b>0</b>	<b>—</b>								

Large Hospital: > 150 beds

Medium Hospital: 50-150 beds

Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
49	34	4	3	4	4

**Scenario: M 7.2 Chelan Fault  
Douglas County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
2	39	\$2,366,000

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
12,663	446	4	51	0	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
12,663	0	0	0	0	0	0	0	0	0	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
9,000	13,000	22,000	880

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
22	17

**Essential Facilities Functionality**

	Count	Functionality (%)
		At Day 1
Emergency Operation Center	1	84
Fire Station Facilities	15	58
Police Station Facilities	3	88
School	19	54

**Scenario: M 7.2 Chelan Fault  
Ferry County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Educational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hotels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other-Residential	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single Family	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Ferry</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	25	0	0	0	0	25
Commercial	170	0	0	0	0	170
Education	7	0	0	0	0	7
Government	22	0	0	0	0	22
Industrial	58	0	0	0	0	58
Religion	12	0	0	0	0	12
Other Residential	1,798	10	0	0	0	1,808
Single Family	2,667	1	0	0	0	2,668

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					Total Loss
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	
\$4,000	\$90,000	\$62,000	\$3,000	0.02	\$1,000	\$0	\$1,000	\$1,000	\$162,000

**Hospital Functionality**

	Total Number of Beds	At Day 1		At day 3		At day 7		At day 30		At day 90	
		Number of Beds	%								
Large											
Medium											
Small	25	25	100	25	100	25	100	25	100	25	100
<b>Total</b>	<b>25</b>	<b>25</b>	<b>—</b>								

Large Hospital: > 150 beds  
 Medium Hospital: 50-150 beds  
 Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
41	41	0	0	0	0

**Scenario: M 7.2 Chelan Fault  
Ferry County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
0	0	\$0

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
2,859	0	0	0	0	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
2,859	0	0	0	0	0	0	0	0	0	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
0	0	0	0

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
0	0

**Essential Facilities Functionality**

	Count	Functionality (%)
	At Day 1	
Emergency Operation Center	1	100
Fire Station Facilities	12	100
Police Station Facilities	2	100
School	12	100

**Scenario: M 7.2 Chelan Fault  
Grant County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1
Educational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hotels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other-Residential	3	1	1	0	0	0	0	0	0	0	0	0	3	1	1
Single Family	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Grant</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>2</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	446	21	8	1	0	476
Commercial	1,474	80	22	1	0	1,577
Education	62	3	1	0	0	66
Government	57	3	1	0	0	61
Industrial	362	19	6	0	0	387
Religion	125	6	1	0	0	132
Other Residential	13,886	1,095	365	11	0	15,357
Single Family	16,342	202	6	0	0	16,550

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					Total Loss
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	
\$1,528,000	\$7,227,000	\$3,945,000	\$173,000	0.19	\$967,000	\$281,000	\$357,000	\$410,000	\$14,890,000

**Hospital Functionality**

	At Day 1			At day 3		At day 7		At day 30		At day 90	
	Total Number of Beds	Number of Beds	%								
Large											
Medium	161	154	96	154	96	161	100	161	100	161	100
Small	38	29	75	29	76	37	98	38	100	38	100
<b>Total</b>	<b>199</b>	<b>183</b>	<b>—</b>	<b>183</b>	<b>—</b>	<b>198</b>	<b>—</b>	<b>199</b>	<b>—</b>	<b>199</b>	<b>—</b>

Large Hospital: > 150 beds  
 Medium Hospital: 50-150 beds  
 Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
272	272	0	0	0	0

**Scenario: M 7.2 Chelan Fault  
Grant County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
3	31	\$1,820,000

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
27,584	0	0	0	0	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
27,584	0	0	0	0	0	0	0	0	0	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
2,000	2,000	4,000	160

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
1	1

**Essential Facilities Functionality**

	Count	Functionality (%)
	At Day 1	
Emergency Operation Center	1	100
Fire Station Facilities	52	99
Police Station Facilities	13	98
School	60	99

**Scenario: M 7.2 Chelan Fault  
Kittitas County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Educational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hotels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other-Residential	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Single Family	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Kittitas</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	182	3	1	0	0	186
Commercial	908	35	7	0	0	950
Education	27	1	0	0	0	28
Government	35	1	0	0	0	36
Industrial	281	9	2	0	0	292
Religion	72	2	0	0	0	74
Other Residential	7,097	211	36	0	0	7,344
Single Family	10,210	90	1	0	0	10,301

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					Total Loss
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	
\$388,000	\$2,850,000	\$1,355,000	\$41,000	0.12	\$200,000	\$161,000	\$182,000	\$165,000	\$5,340,000

**Hospital Functionality**

	At Day 1			At day 3		At day 7		At day 30		At day 90	
	Total Number of Beds	Number of Beds	%								
Large											
Medium											
Small	25	25	100	25	100	25	100	25	100	25	100
<b>Total</b>	<b>25</b>	<b>25</b>	<b>—</b>								

Large Hospital: > 150 beds  
 Medium Hospital: 50-150 beds  
 Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
257	257	0	0	0	0

**Scenario: M 7.2 Chelan Fault  
Kittitas County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
2	26	\$1,521,000

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
14,952	0	0	0	0	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
14,952	0	0	0	0	0	0	0	0	0	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
1,000	0	1,000	40

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
0	0

**Essential Facilities Functionality**

	Count	Functionality (%)
	At Day 1	
Emergency Operation Center	2	99
Fire Station Facilities	27	99
Police Station Facilities	5	99
School	18	99

**Scenario: M 7.2 Chelan Fault  
Lincoln County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Educational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hotels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other-Residential	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single Family	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Lincoln</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	123	1	0	0	0	124
Commercial	248	2	0	0	0	250
Education	15	0	0	0	0	15
Government	19	0	0	0	0	19
Industrial	55	0	0	0	0	55
Religion	36	0	0	0	0	36
Other Residential	3,602	42	5	0	0	3,649
Single Family	3,966	7	0	0	0	3,973

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					Total Loss
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	
\$24,000	\$195,000	\$119,000	\$5,000	0.03	\$10,000	\$4,000	\$5,000	\$5,000	\$368,000

**Hospital Functionality**

	Total Number of Beds	At Day 1		At day 3		At day 7		At day 30		At day 90	
		Number of Beds	%								
Large											
Medium	95	95	100	95	100	95	100	95	100	95	100
Small	44	44	100	44	100	44	100	44	100	44	100
<b>Total</b>	<b>139</b>	<b>139</b>	<b>—</b>								

Large Hospital: > 150 beds  
 Medium Hospital: 50-150 beds  
 Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
181	181	0	0	0	0

**Scenario: M 7.2 Chelan Fault  
Lincoln County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
0	0	\$0

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
4,276	0	0	0	0	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
4,276	0	0	0	0	0	0	0	0	0	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
0	0	0	0

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
0	0

**Essential Facilities Functionality**

	Count	Functionality (%)
	At Day 1	
Emergency Operation Center	1	100
Fire Station Facilities	12	100
Police Station Facilities	4	100
School	16	100

**Scenario: M 7.2 Chelan Fault  
Okanogan County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Educational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hotels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other-Residential	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Single Family	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Okanogan</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	244	10	3	0	0	257
Commercial	937	42	10	0	0	989
Education	35	2	0	0	0	37
Government	55	2	0	0	0	57
Industrial	292	12	3	0	0	307
Religion	85	4	1	0	0	90
Other Residential	8,391	641	164	4	0	9,200
Single Family	12,973	206	3	0	0	13,182

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					Total Loss
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	
\$794,000	\$4,436,000	\$2,253,000	\$90,000	0.2	\$435,000	\$139,000	\$206,000	\$202,000	\$8,556,000

**Hospital Functionality**

	Total Number of Beds	At Day 1		At day 3		At day 7		At day 30		At day 90	
		Number of Beds	%								
Large											
Medium	25	25	99	25	99	25	100	25	100	25	100
Small	87	69	79	69	79	84	96	86	99	86	99
<b>Total</b>	<b>112</b>	<b>94</b>	<b>—</b>	<b>94</b>	<b>—</b>	<b>109</b>	<b>—</b>	<b>111</b>	<b>—</b>	<b>111</b>	<b>—</b>

Large Hospital: > 150 beds

Medium Hospital: 50-150 beds

Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
129 (127*)	124	1	1	1	0

\* values in parentheses include rounding error.

**Scenario: M 7.2 Chelan Fault  
Okanogan County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
1	0	\$0

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
15,190	0	0	0	0	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
15,190	0	0	0	0	0	0	0	0	0	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
1,000	1,000	2,000	80

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
0	0

**Essential Facilities Functionality**

	Count	Functionality (%)
		At Day 1
Emergency Operation Center	1	97
Fire Station Facilities	34	95
Police Station Facilities	5	90
School	32	93

# HAZUS-MH: Earthquake Event Report

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**Region Name:** Chelan\_redo\_oct09M68

**Earthquake Scenario:** Chelan M7.2 - redo Oct 09

**Print Date:** March 10, 2010

*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 13 county(ies) from the following state(s):

Washington

Note:

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

The geographical size of the region is 34,228.54 square miles and contains 658 census tracts. There are over 1,289 thousand households in the region and has a total population of 3,314,762 people (2005 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 1,145 thousand buildings in the region with a total building replacement value (excluding contents) of 261,715 (millions of dollars). Approximately 91.00 % of the buildings (and 0.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 108,048 and 14,261 (millions of dollars) , respectively.

## Building and Lifeline Inventory

### **Building Inventory**

HAZUS estimates that there are 1,145 thousand buildings in the region which have an aggregate total replacement value of 261,715 (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 81% 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 55 hospitals in the region with a total bed capacity of 8,519 beds. There are 1,448 schools, 567 fire stations, 150 police stations and 34 emergency operation facilities. With respect to HPL facilities, there are 322 dams identified within the region. Of these, 114 of the dams are classified as 'high hazard'. The inventory also includes 531 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 122,309.00 (millions of dollars). This inventory includes over 6,857 kilometers of highways, 3,748 bridges, 206,684 kilometers of pipes.

**Table 1: Transportation System Lifeline Inventory**

<b>System</b>	<b>Component</b>	<b># locations/ # Segments</b>	<b>Replacement value (millions of dollars)</b>
<b>Highway</b>	Bridges	3,748	63,831.00
	Segments	2,297	37,883.50
	Tunnels	20	55.50
		<b>Subtotal</b>	<b>101,770.10</b>
<b>Railways</b>	Bridges	43	8.60
	Facilities	40	106.50
	Segments	1,051	2,252.10
	Tunnels	0	0.00
		<b>Subtotal</b>	<b>2,367.20</b>
<b>Light Rail</b>	Bridges	0	0.00
	Facilities	29	77.20
	Segments	39	169.10
	Tunnels	0	0.00
		<b>Subtotal</b>	<b>246.30</b>
<b>Bus</b>	Facilities	24	28.80
		<b>Subtotal</b>	<b>28.80</b>
<b>Ferry</b>	Facilities	27	35.90
		<b>Subtotal</b>	<b>35.90</b>
<b>Port</b>	Facilities	306	611.10
		<b>Subtotal</b>	<b>611.10</b>
<b>Airport</b>	Facilities	49	521.90
	Runways	65	2,467.70
		<b>Subtotal</b>	<b>2,989.60</b>
		<b>Total</b>	<b>108,049.00</b>

**Table 2: Utility System Lifeline Inventory**

<b>System</b>	<b>Component</b>	<b># Locations / Segments</b>	<b>Replacement value (millions of dollars)</b>
<b>Potable Water</b>	Distribution Lines	NA	2,066.80
	Facilities	35	1,282.10
	Pipelines	0	0.00
		<b>Subtotal</b>	<b>3,348.90</b>
<b>Waste Water</b>	Distribution Lines	NA	1,240.10
	Facilities	84	6,153.80
	Pipelines	0	0.00
		<b>Subtotal</b>	<b>7,393.90</b>
<b>Natural Gas</b>	Distribution Lines	NA	826.70
	Facilities	27	32.40
	Pipelines	0	0.00
		<b>Subtotal</b>	<b>859.10</b>
<b>Oil Systems</b>	Facilities	11	1.20
	Pipelines	0	0.00
		<b>Subtotal</b>	<b>1.20</b>
<b>Electrical Power</b>	Facilities	56	6,776.00
		<b>Subtotal</b>	<b>6,776.00</b>
<b>Communication</b>	Facilities	147	16.20
		<b>Subtotal</b>	<b>16.20</b>
		<b>Total</b>	<b>18,395.30</b>

## Earthquake Scenario

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

<b>Scenario Name</b>	Chelan M7.2 - redo Oct 09
<b>Type of Earthquake</b>	User-defined
<b>Fault Name</b>	NA
<b>Historical Epicenter ID #</b>	NA
<b>Probabilistic Return Period</b>	NA
<b>Longitude of Epicenter</b>	NA
<b>Latitude of Epicenter</b>	NA
<b>Earthquake Magnitude</b>	7.20
<b>Depth (Km)</b>	NA
<b>Rupture Length (Km)</b>	NA
<b>Rupture Orientation (degrees)</b>	NA
<b>Attenuation Function</b>	NA

## Building Damage

### Building Damage

HAZUS estimates that about 3,646 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 10 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 summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

**Table 3: Expected Building Damage by Occupancy**

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
<b>Agriculture</b>	6,042	0.53	136	1.30	73	2.23	13	3.56	1	4.74
<b>Commercial</b>	63,506	5.61	584	5.56	273	8.36	34	9.01	1	8.63
<b>Education</b>	2,307	0.20	19	0.18	9	0.28	1	0.31	0	0.30
<b>Government</b>	1,320	0.12	25	0.24	15	0.45	2	0.66	0	0.91
<b>Industrial</b>	18,641	1.65	172	1.64	90	2.76	12	3.30	0	3.03
<b>Other Residential</b>	224,589	19.85	5,167	49.25	2,518	77.20	290	77.25	7	61.62
<b>Religion</b>	4,307	0.38	41	0.40	19	0.57	2	0.56	0	0.40
<b>Single Family</b>	810,759	71.66	4,348	41.44	265	8.14	20	5.35	2	20.37
<b>Total</b>	<b>1,131,471</b>		<b>10,491</b>		<b>3,261</b>		<b>375</b>		<b>11</b>	

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

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
<b>Wood</b>	923,275	81.60	5566	53.06	294	9.02	13	3.35	2	21.09
<b>Steel</b>	25,759	2.28	304	2.90	214	6.56	40	10.56	1	11.69
<b>Concrete</b>	25,139	2.22	320	3.05	147	4.51	15	3.94	0	2.50
<b>Precast</b>	18,479	1.63	193	1.84	141	4.31	26	6.88	1	5.35
<b>RM</b>	43,741	3.87	286	2.72	204	6.24	29	7.60	0	2.77
<b>URM</b>	9,640	0.85	237	2.26	104	3.18	14	3.70	1	7.91
<b>MH</b>	85,439	7.55	3585	34.17	2,158	66.18	240	63.97	5	48.71
<b>Total</b>	<b>1,131,471</b>		<b>10,491</b>		<b>3,261</b>		<b>375</b>		<b>11</b>	

\*Note:

RM Reinforced Masonry  
URM Unreinforced Masonry  
MH Manufactured Housing

## **Essential Facility Damage**

Before the earthquake, the region had 8,519 hospital beds available for use. On the day of the earthquake, the model estimates that only 8,195 hospital beds (96.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 99.00% 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	55	1	0	54
Schools	1,448	4	0	1,431
EOCs	34	0	0	34
PoliceStations	150	0	0	150
FireStations	567	1	0	559

## Transportation and Utility Lifeline Damage

Table 6 provides damage estimates for the transportation system.

**Table 6: Expected Damage to the Transportation Systems**

System	Component	Locations/ Segments	Number of Locations_			
			With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	2,297	0	0	2,297	2,297
	Bridges	3,748	11	2	3,738	3,744
	Tunnels	20	0	0	20	20
Railways	Segments	1,051	0	0	1,051	1,051
	Bridges	43	0	0	43	43
	Tunnels	0	0	0	0	0
	Facilities	40	0	0	40	40
Light Rail	Segments	39	0	0	39	39
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	29	0	0	29	29
Bus	Facilities	24	0	0	24	24
Ferry	Facilities	27	0	0	27	27
Port	Facilities	306	0	0	306	306
Airport	Facilities	49	2	0	47	49
	Runways	65	0	0	65	65

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	35	0	0	35	35
Waste Water	84	2	0	78	84
Natural Gas	27	0	0	27	27
Oil Systems	11	0	0	11	11
Electrical Power	56	2	0	52	56
Communication	147	2	0	146	147

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

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	103,342	636	238
Waste Water	62,005	503	188
Natural Gas	41,337	538	201
Oil	0	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	1,289,824	466	51	0	0	0
Electric Power		0	0	0	0	0

### **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 10 ignitions that will burn about 0.28 sq. mi (0.00 % of the region's total area.) The model also estimates that the fires will displace about 142 people and burn about 9 (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 0.050 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 45.00% 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 1,880,000 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 33 households to be displaced due to the earthquake. Of these, 25 people (out of a total population of 3,314,762) 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
<b>2 AM</b>	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	22	2	0	0
	Single Family	8	0	0	0
	<b>Total</b>	<b>31</b>	<b>3</b>	<b>0</b>	<b>0</b>
<b>2 PM</b>	Commercial	14	2	0	0
	Commuting	0	0	0	0
	Educational	5	1	0	0
	Hotels	0	0	0	0
	Industrial	2	0	0	0
	Other-Residential	5	0	0	0
	Single Family	2	0	0	0
	<b>Total</b>	<b>28</b>	<b>3</b>	<b>0</b>	<b>0</b>
<b>5 PM</b>	Commercial	12	1	0	0
	Commuting	3	4	7	1
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	1	0	0	0
	Other-Residential	8	1	0	0
	Single Family	3	0	0	0
	<b>Total</b>	<b>28</b>	<b>7</b>	<b>7</b>	<b>2</b>

## Economic Loss

The total economic loss estimated for the earthquake is 584.12 (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 180.25 (millions of dollars); 16 % 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 51 % 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
<b>Income Losses</b>							
	Wage	0.00	0.57	5.03	0.15	0.57	6.32
	Capital-Related	0.00	0.24	4.48	0.09	0.18	5.00
	Rental	0.48	1.76	3.17	0.07	0.25	5.74
	Relocation	1.31	3.86	4.62	0.46	2.24	12.50
	<b>Subtotal</b>	<b>1.80</b>	<b>6.44</b>	<b>17.30</b>	<b>0.78</b>	<b>3.24</b>	<b>29.55</b>
<b>Capital Stock Losses</b>							
	Structural	4.35	4.61	5.58	1.01	6.22	21.77
	Non_Structural	34.78	18.77	17.94	4.11	9.12	84.72
	Content	16.81	4.87	11.27	2.78	6.79	42.52
	Inventory	0.00	0.00	0.41	0.56	0.72	1.69
	<b>Subtotal</b>	<b>55.94</b>	<b>28.25</b>	<b>35.19</b>	<b>8.46</b>	<b>22.86</b>	<b>150.70</b>
	<b>Total</b>	<b>57.74</b>	<b>34.69</b>	<b>52.49</b>	<b>9.24</b>	<b>26.10</b>	<b>180.25</b>

## 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	37,883.53	\$37.46	0.10
	Bridges	63,831.00	\$92.11	0.14
	Tunnels	55.55	\$0.09	0.16
	Subtotal	<b>101770.10</b>	<b>129.70</b>	
Railways	Segments	2,252.12	\$1.04	0.05
	Bridges	8.56	\$0.06	0.66
	Tunnels	0.00	\$0.00	0.00
	Facilities	106.52	\$0.97	0.91
	Subtotal	<b>2367.20</b>	<b>2.10</b>	
Light Rail	Segments	169.10	\$0.00	0.00
	Bridges	0.00	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Facilities	77.23	\$0.00	0.00
	Subtotal	<b>246.30</b>	<b>0.00</b>	
Bus	Facilities	28.78	\$0.52	1.82
	Subtotal	<b>28.80</b>	<b>0.50</b>	
Ferry	Facilities	35.94	\$1.10	3.07
	Subtotal	<b>35.90</b>	<b>1.10</b>	
Port	Facilities	611.08	\$0.00	0.00
	Subtotal	<b>611.10</b>	<b>0.00</b>	
Airport	Facilities	521.90	\$24.58	4.71
	Runways	2,467.66	\$0.89	0.04
	Subtotal	<b>2989.60</b>	<b>25.50</b>	
	<b>Total</b>	<b>108049.00</b>	<b>158.80</b>	

**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	1,282.10	\$1.34	0.10
	Distribution Lines	2,066.80	\$3.65	0.18
	<b>Subtotal</b>	<b>3,348.90</b>	<b>\$4.99</b>	
Waste Water	Pipelines	0.00	\$0.00	0.00
	Facilities	6,153.80	\$67.41	1.10
	Distribution Lines	1,240.10	\$2.89	0.23
	<b>Subtotal</b>	<b>7,393.95</b>	<b>\$70.30</b>	
Natural Gas	Pipelines	0.00	\$0.00	0.00
	Facilities	32.40	\$0.26	0.80
	Distribution Lines	826.70	\$3.09	0.37
	<b>Subtotal</b>	<b>859.11</b>	<b>\$3.34</b>	
Oil Systems	Pipelines	0.00	\$0.00	0.00
	Facilities	1.20	\$0.00	0.00
	<b>Subtotal</b>	<b>1.21</b>	<b>\$0.00</b>	
Electrical Power	Facilities	6,776.00	\$166.22	2.45
	<b>Subtotal</b>	<b>6,776.00</b>	<b>\$166.22</b>	
Communication	Facilities	16.20	\$0.19	1.18
	<b>Subtotal</b>	<b>16.17</b>	<b>\$0.19</b>	
	<b>Total</b>	<b>18,395.34</b>	<b>\$245.04</b>	

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

	LOSS	Total	%
<b>First Year</b>			
	Employment Impact	56,784	4.34
	Income Impact	166	0.25
<b>Second Year</b>			
	Employment Impact	15,356	1.17
	Income Impact	66	0.10
<b>Third Year</b>			
	Employment Impact	315	0.02
	Income Impact	12	0.02
<b>Fourth Year</b>			
	Employment Impact	16	0.00
	Income Impact	(4)	-0.01
<b>Fifth Year</b>			
	Employment Impact	0	0.00
	Income Impact	(5)	-0.01
<b>Years 6 to 15</b>			
	Employment Impact	0	0.00
	Income Impact	(5)	-0.01

## **Appendix A: County Listing for the Region**

Adams,WA

Chelan,WA

Douglas,WA

Ferry,WA

Grant,WA

King,WA

Kittitas,WA

Lincoln,WA

Okanogan,WA

Skagit,WA

Snohomish,WA

Whatcom,WA

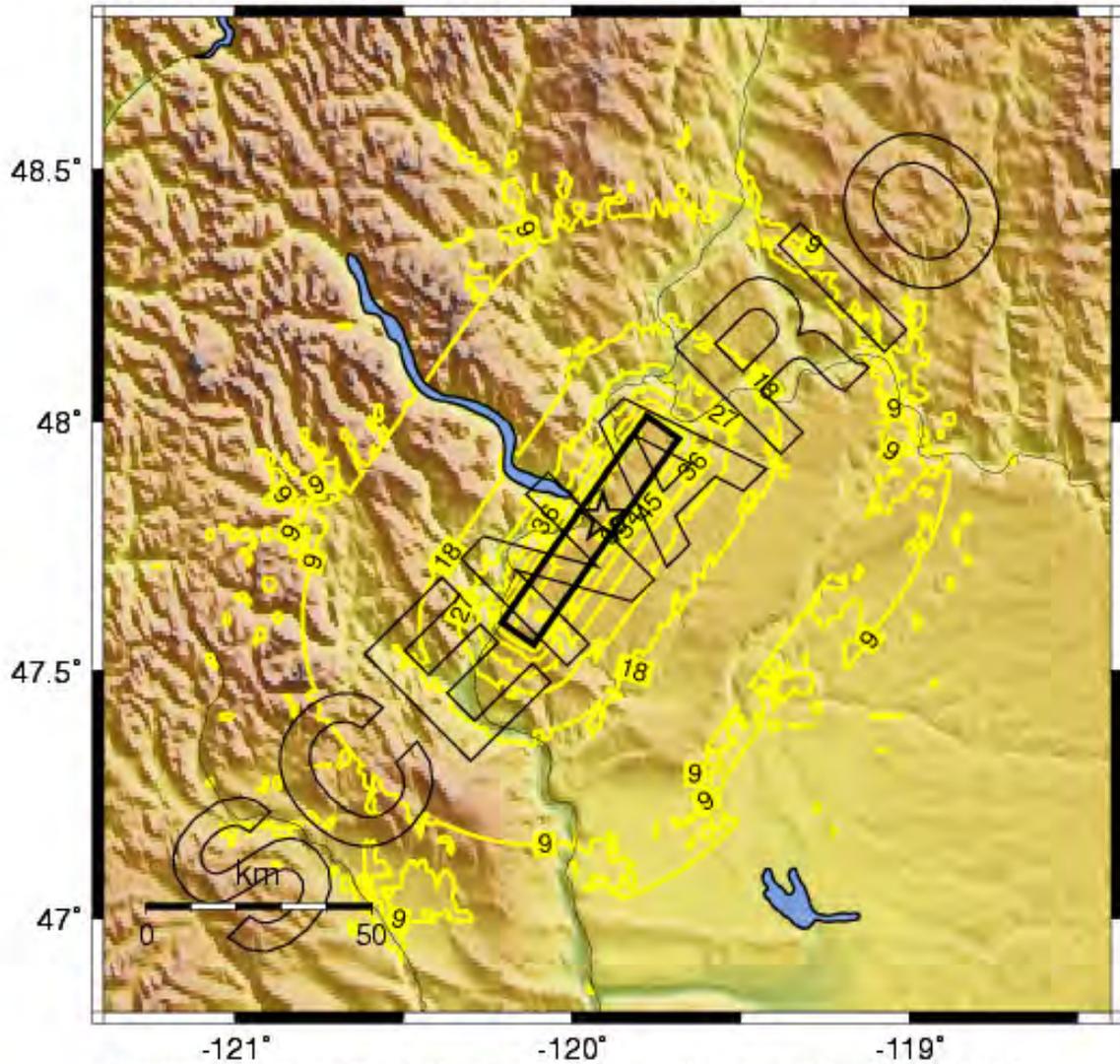
Yakima,WA

**Appendix B: Regional Population and Building Value Data**

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Washington	Adams	17,108	650	278	928
	Chelan	68,646	3,915	1,524	5,439
	Douglas	35,219	1,522	385	1,907
	Ferry	7,347	381	140	522
	Grant	81,821	2,986	1,504	4,491
	King	1,828,516	123,492	35,829	159,322
	Kittitas	37,701	2,087	539	2,627
	Lincoln	10,493	558	215	773
	Okanogan	39,942	2,041	631	2,672
	Skagit	111,356	6,119	1,896	8,015
	Snohomish	661,444	38,562	8,570	47,132
	Whatcom	185,545	10,528	3,715	14,244
	Yakima	229,624	9,899	3,738	13,637
<b>Total State</b>		<b>3,314,762</b>	<b>202,740</b>	<b>58,964</b>	<b>261,709</b>
<b>Total Region</b>		<b>3,314,762</b>	<b>202,740</b>	<b>58,964</b>	<b>261,709</b>

-- Earthquake Planning Scenario --  
Peak Accel. Map (in %g) for Chelan7.2 Scenario

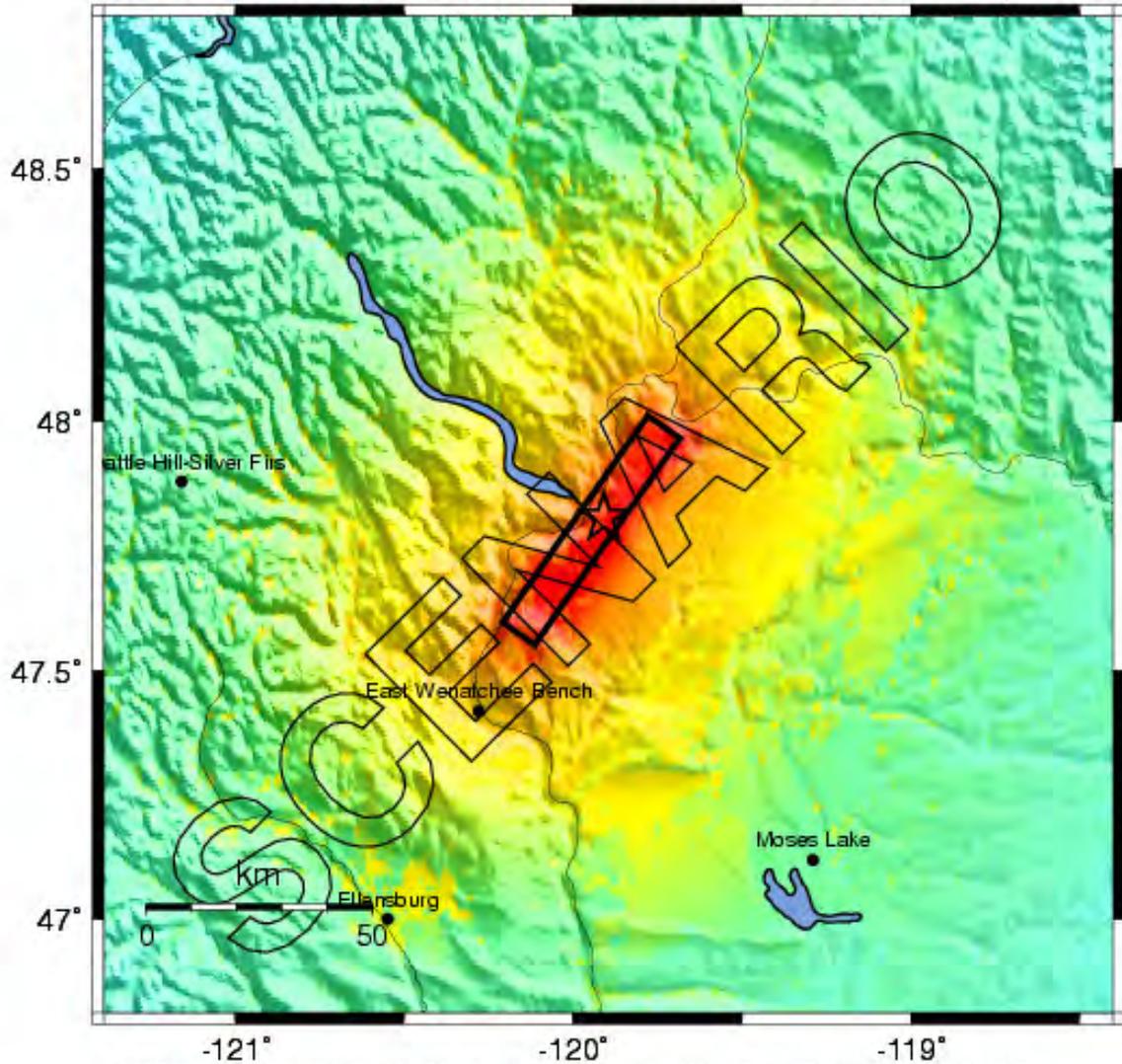
Scenario Date: Tue May 5, 2009 12:00:00 GMT M 7.2 N47.81 W119.91 Depth: 0.0km



PLANNING SCENARIO ONLY -- Map Version 5 Processed Wed May 6, 2009 11:43:15 PM MDT

-- Earthquake Planning Scenario --  
 ShakeMap for Chelan7.2 Scenario

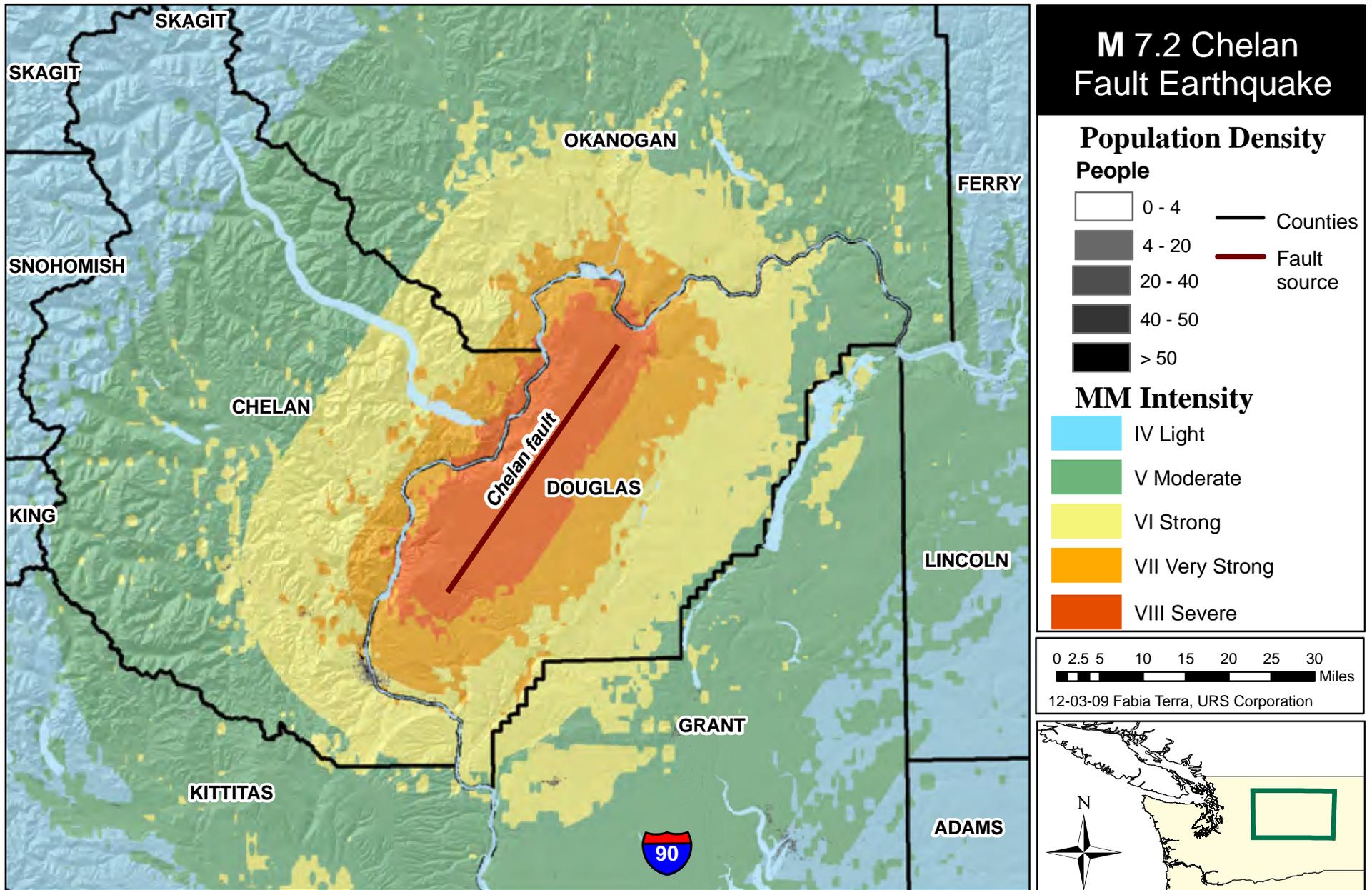
Scenario Date: Tue May 5, 2009 12:00:00 GMT M 7.2 N47.81 W119.91 Depth: 0.0km



PLANNING SCENARIO ONLY -- Map Version 5 Processed Wed May 6, 2009 11:43:15 PM MDT

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC. (%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL. (cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

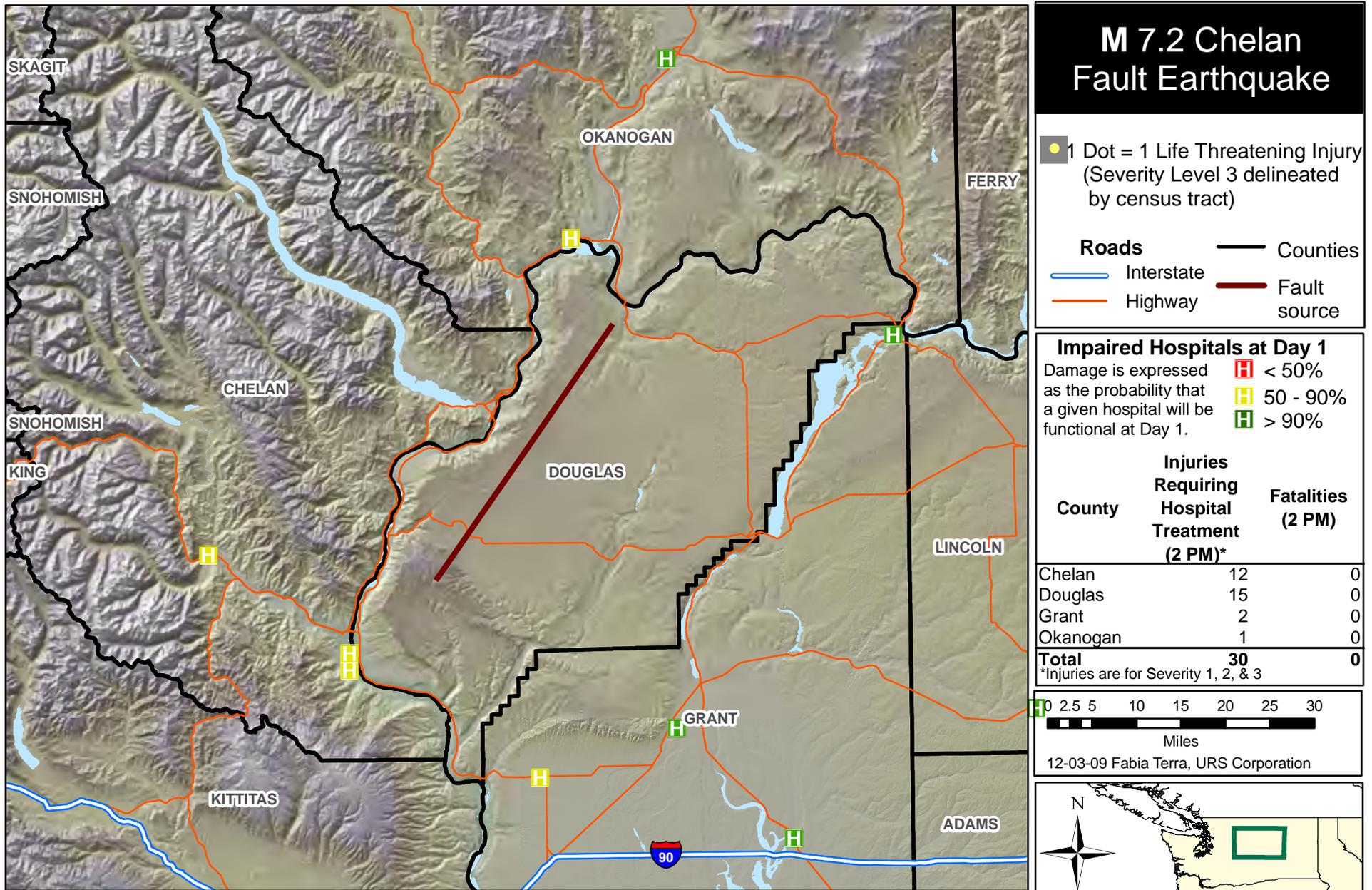
# Population Density and Ground Shaking Intensities - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, MMI Map USGS 2009  
Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 1

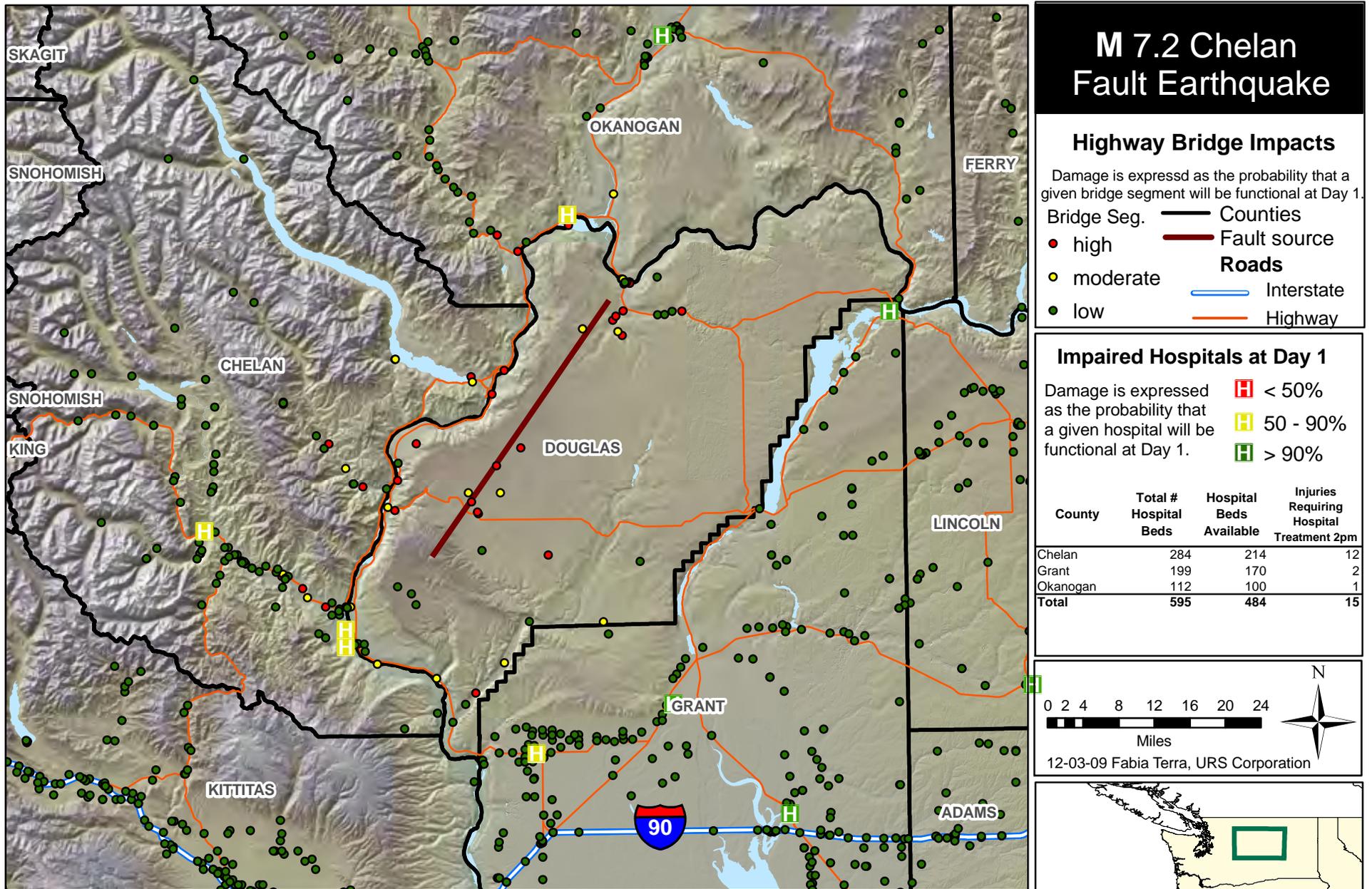
# Injuries (2 pm) and Impaired Hospitals (Day 1) - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 2

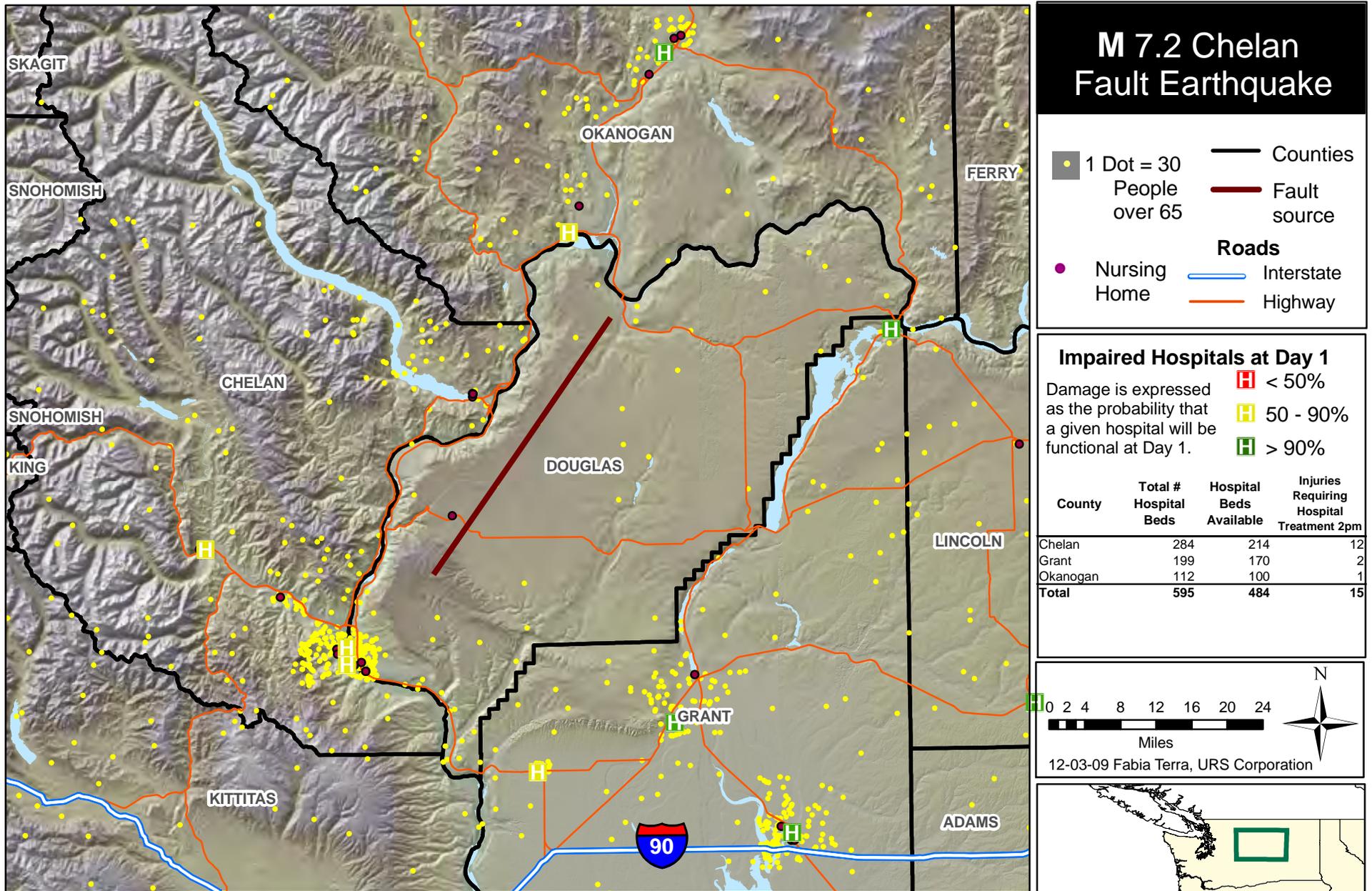
# Impaired Hospitals (Day 1), Hospital Bed Availability, & Bridge Impacts - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 3

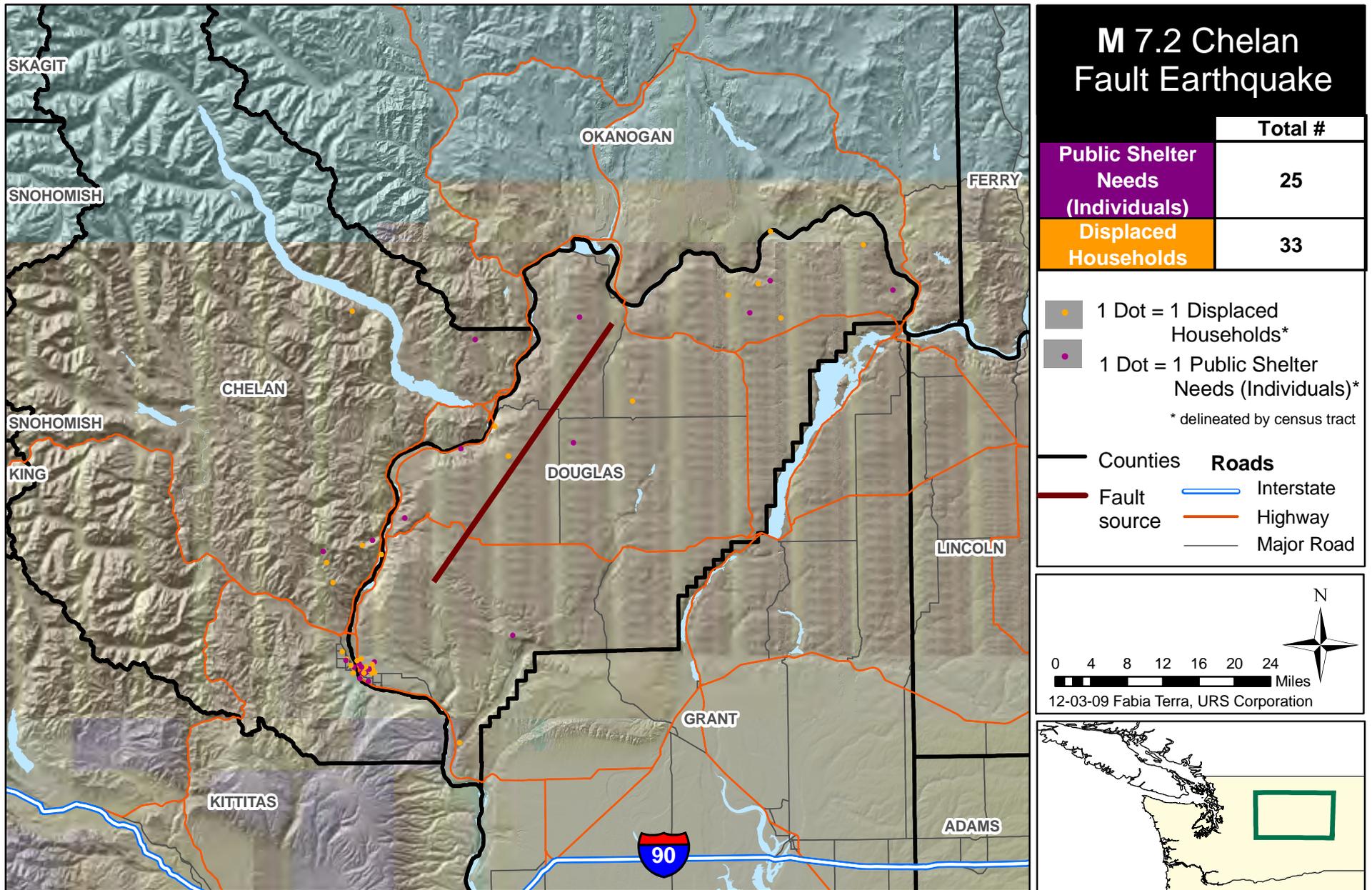
# Distribution of Elderly, Impaired Hospitals (Day 1), & Hospital Bed Availability - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways and Nursing homes HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 4

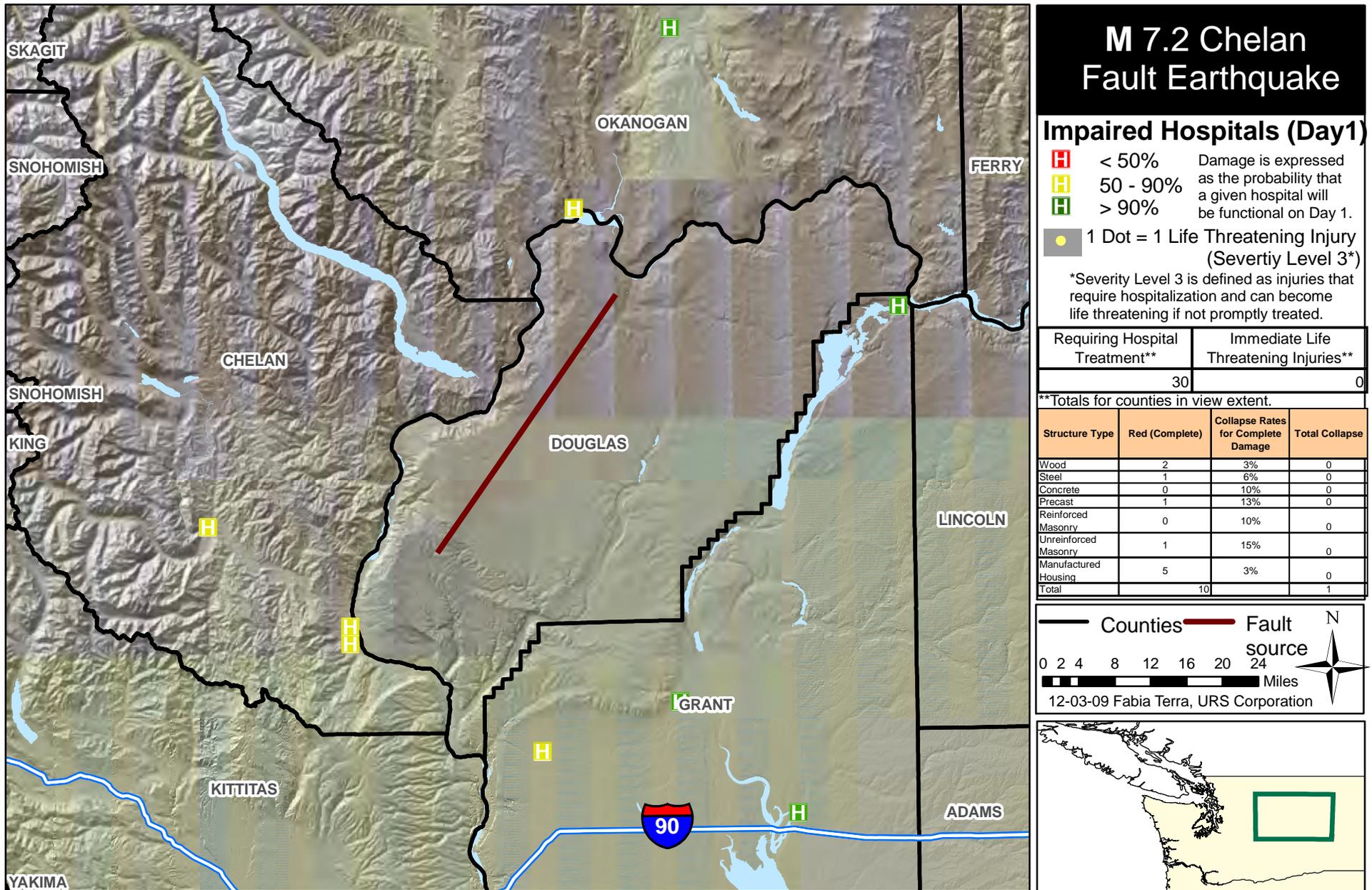
# Estimated Displaced Households & Short Term Public Shelter Needs - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 5

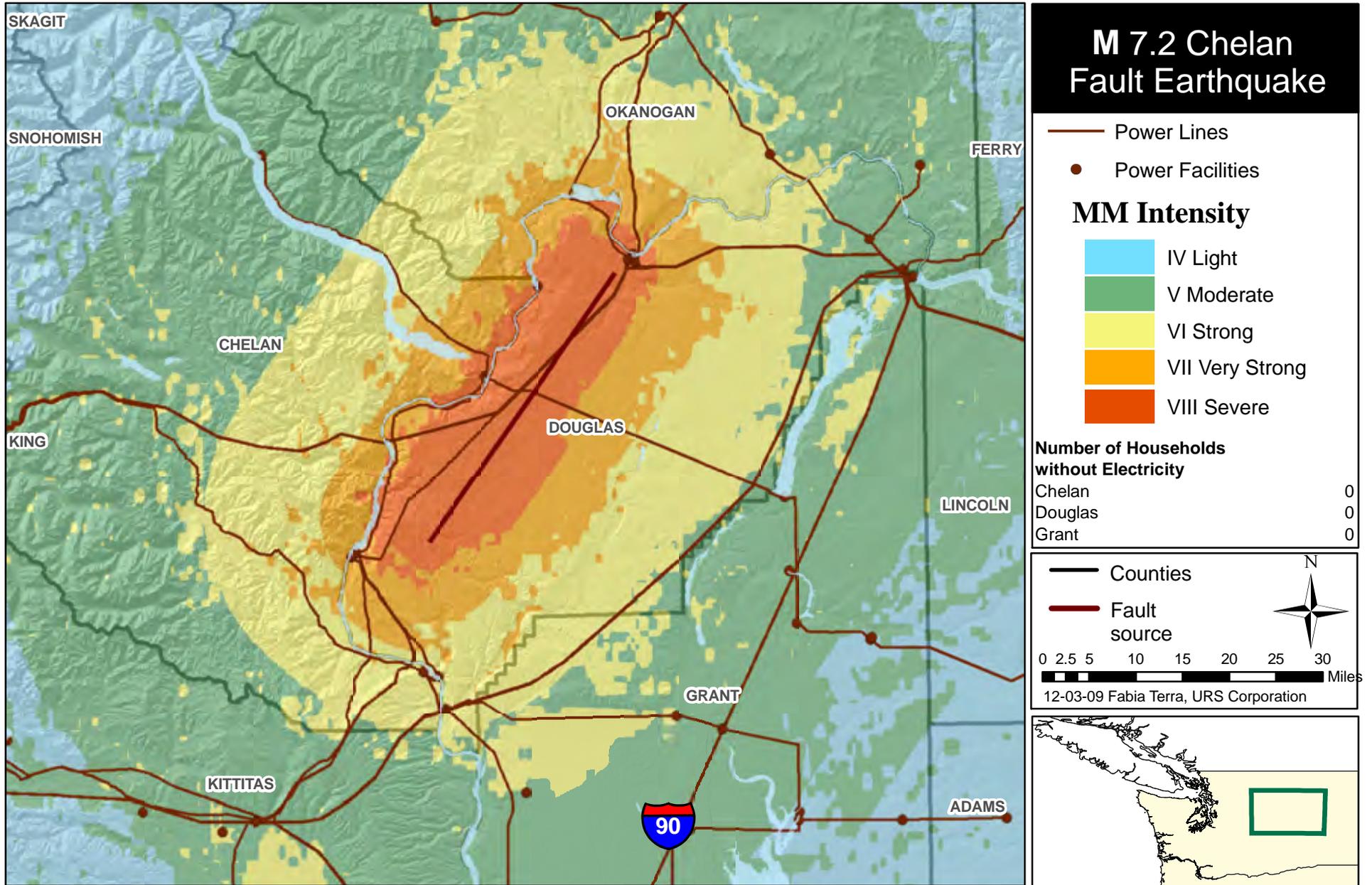
# Potential Search and Rescue Needs, Collapsed Structures, and Impaired Hospitals - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 6

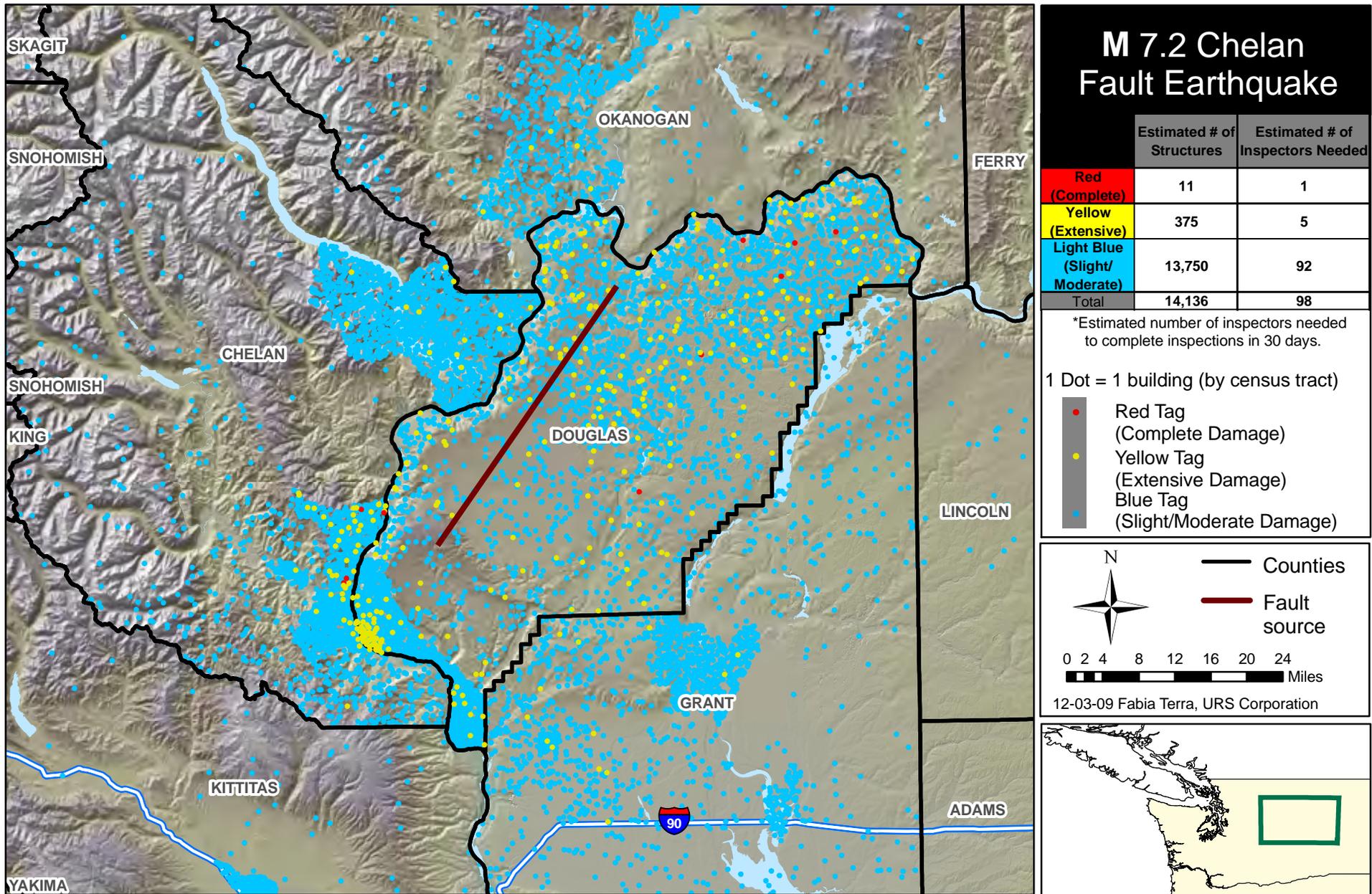
# Power Lines and Facilities, Households Without Electricity, and Ground Shaking Intensities - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Power lines and facilities HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 7

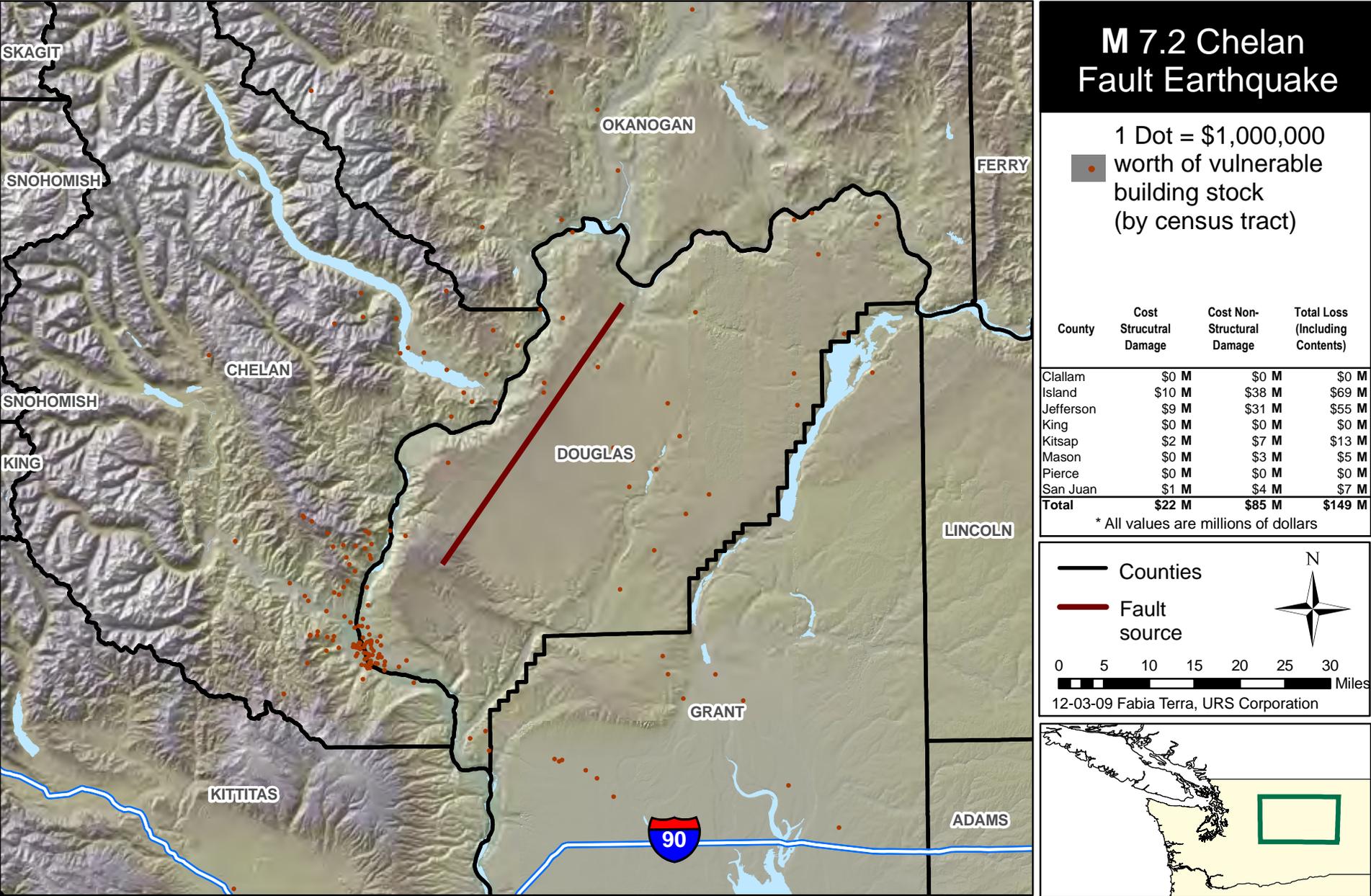
# Estimated Building Inspection Needs - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 8

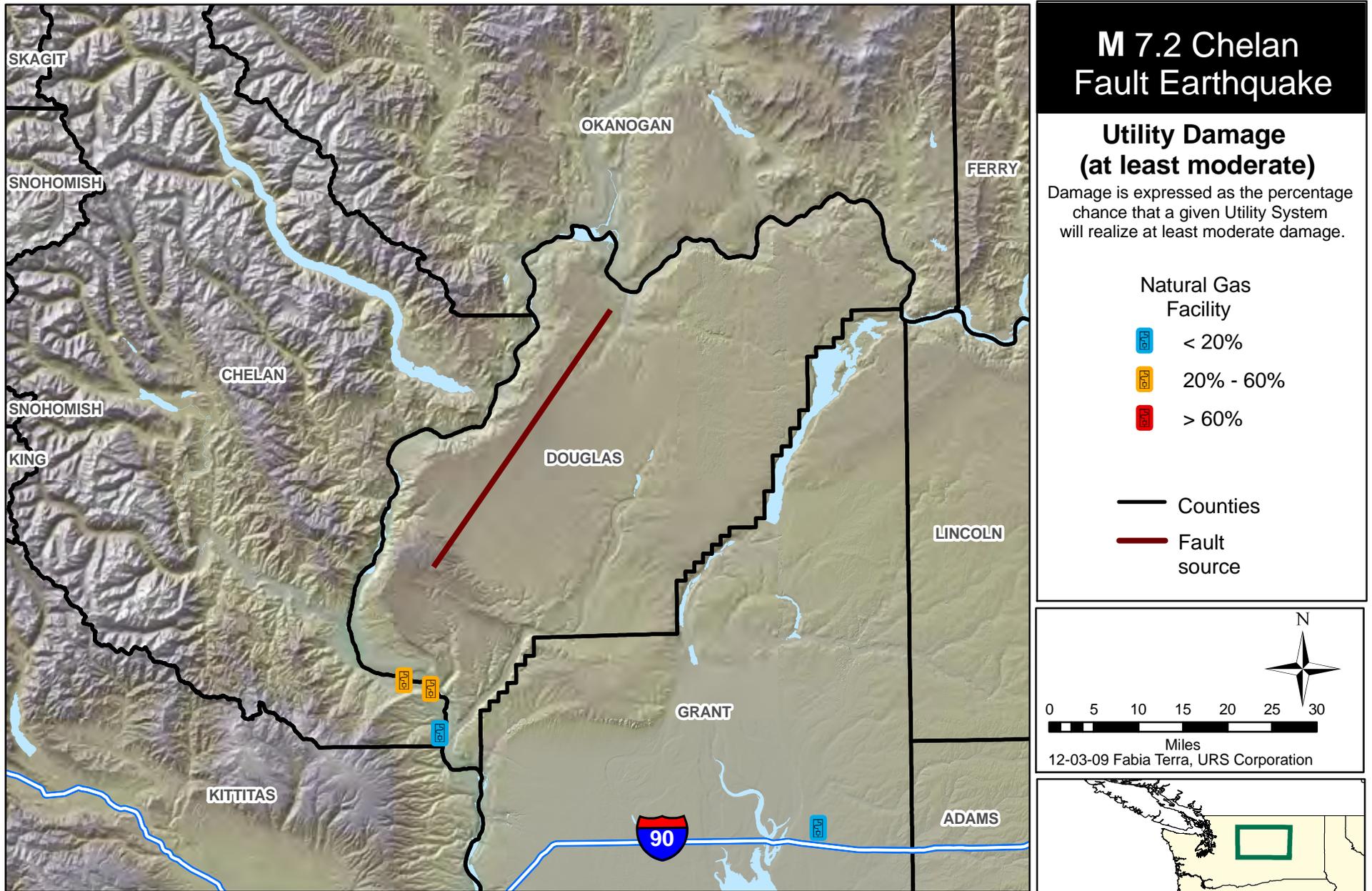
# Direct Building Economic Loss - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

**Figure 9**

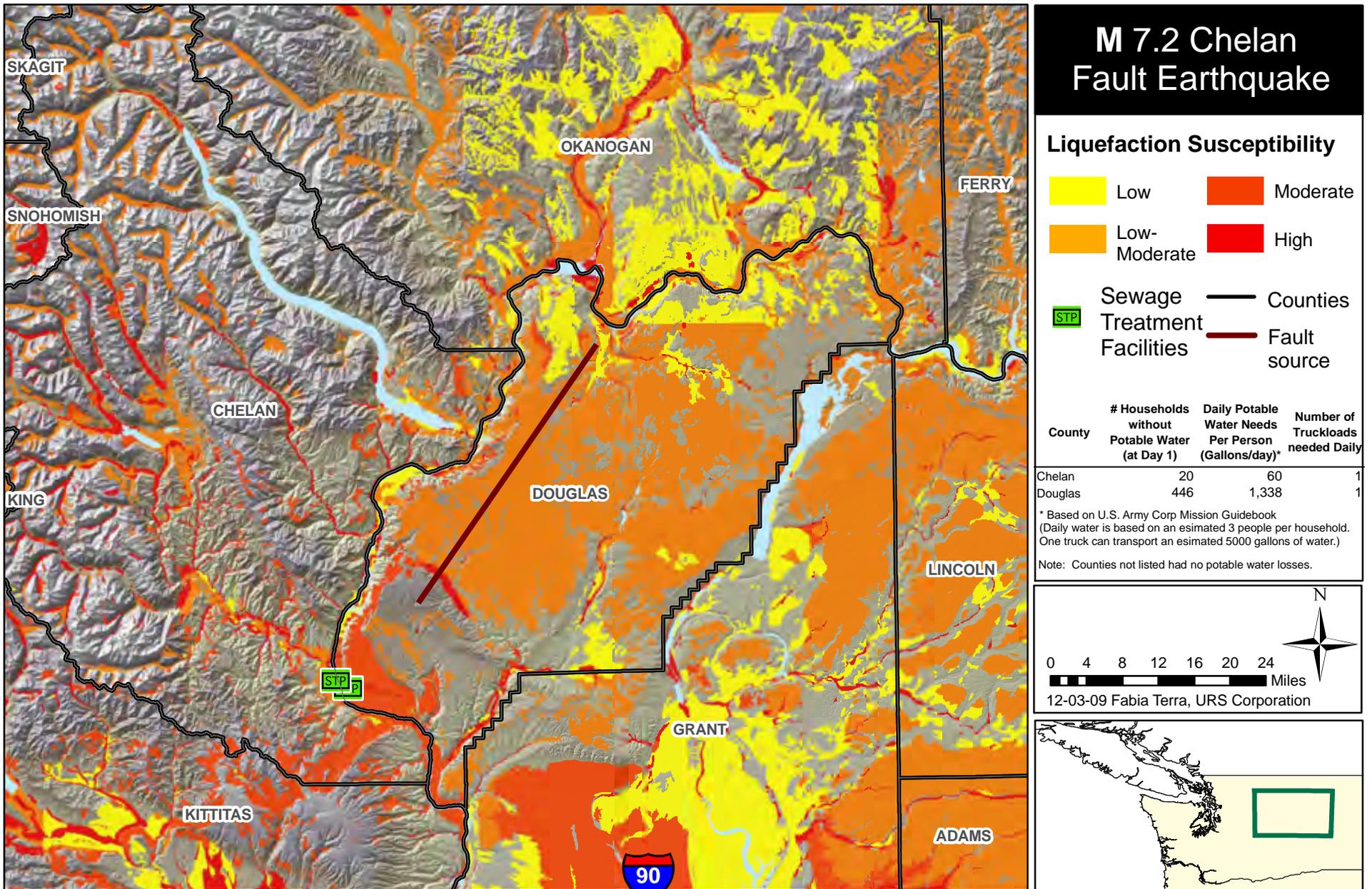
# Natural Gas, and Oil Facility Damage - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 10

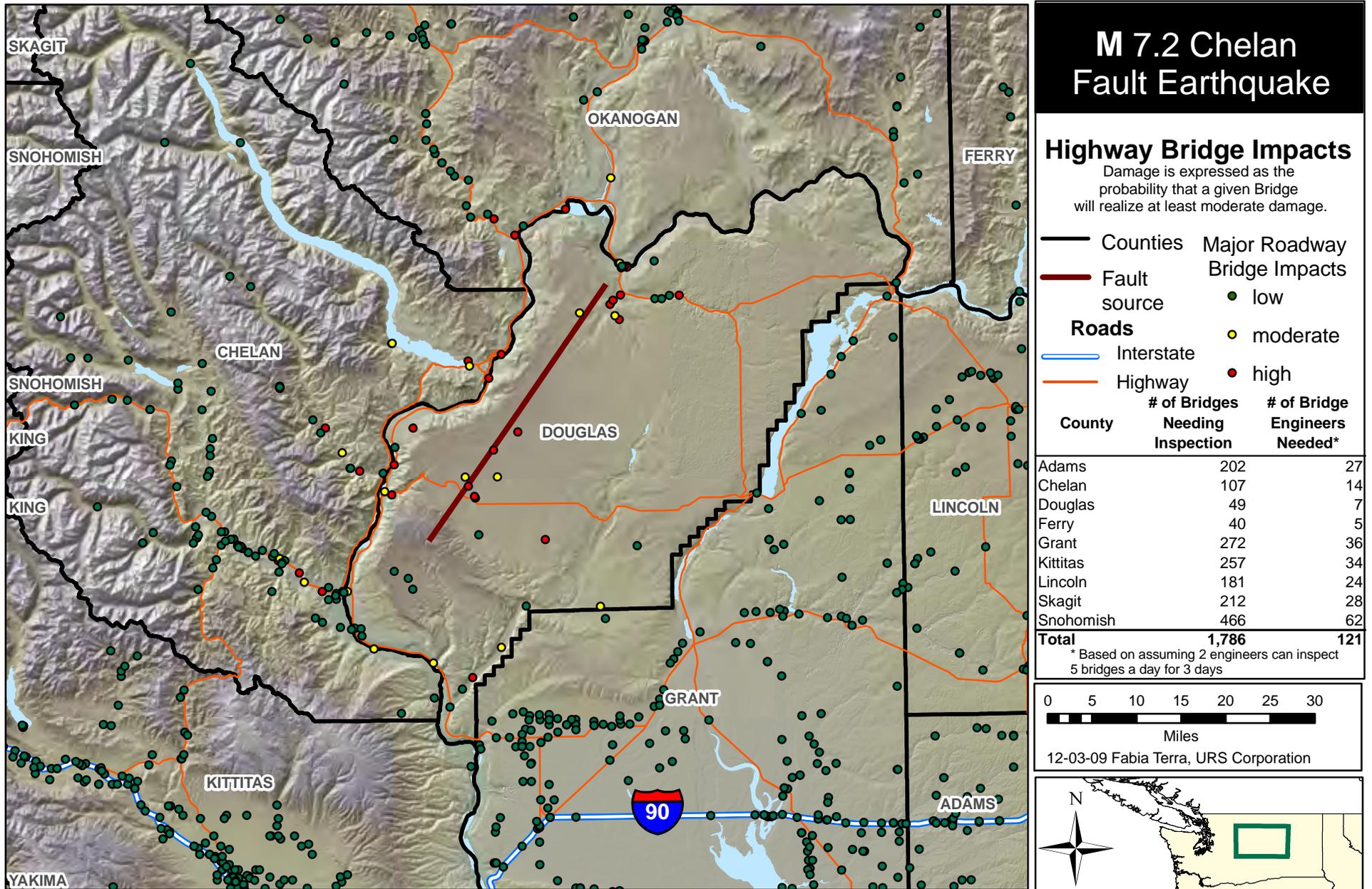
# Sewage Treatment Facility Distribution, Households Without Potable Water, and Liquefaction Susceptibility - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Sewage Treatment Facilities HSIP Gold 2007, Liquefaction The Wash State Geological Survey  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 11

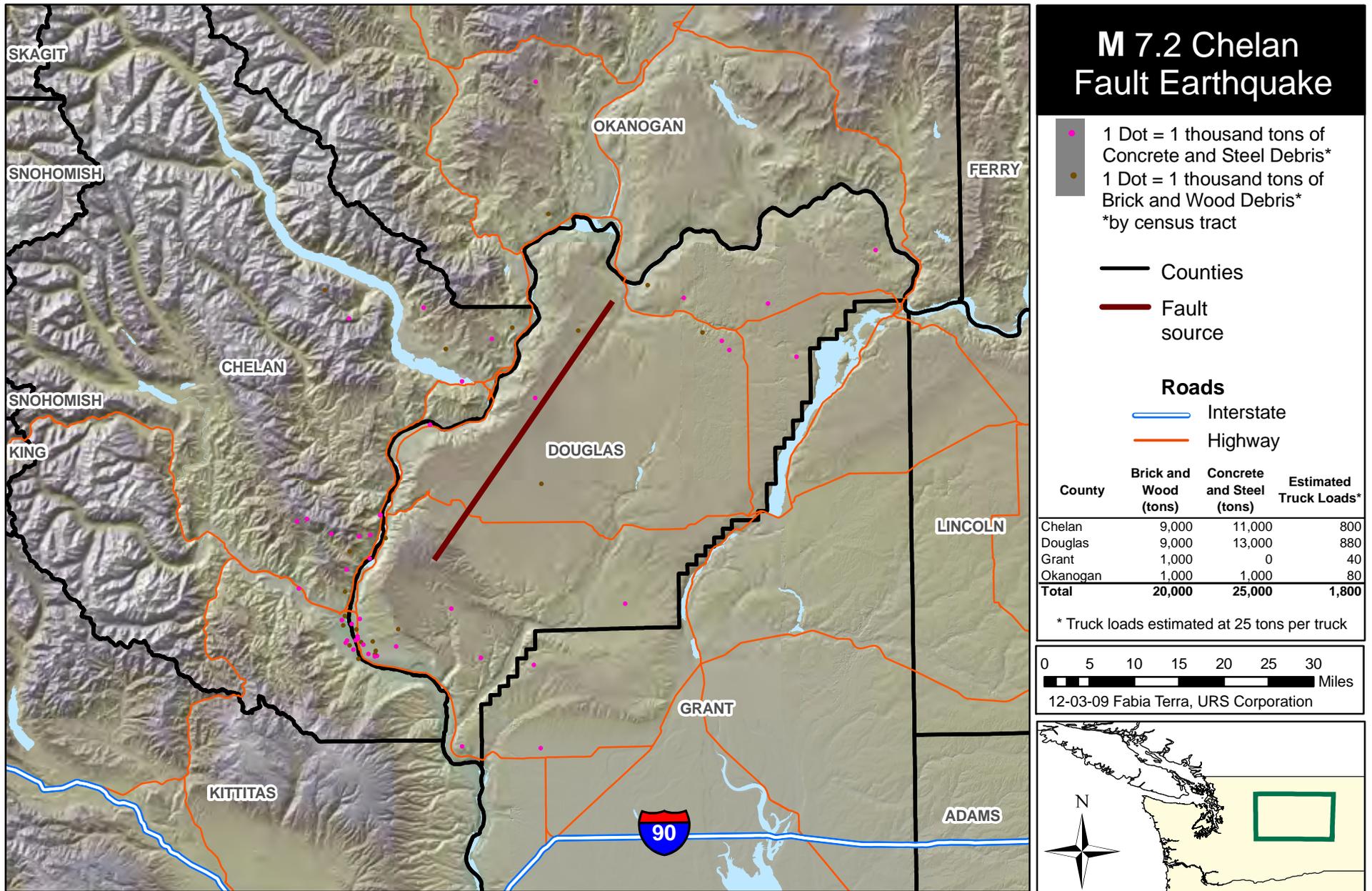
# Estimated Highway Bridge Damage - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 12

# Estimated Brick, Concrete, Steel, and Wood Debris - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 13