

Spatiotemporal Analysis of the Lake Delhi, IA Dam Breach using Hazardus-MH

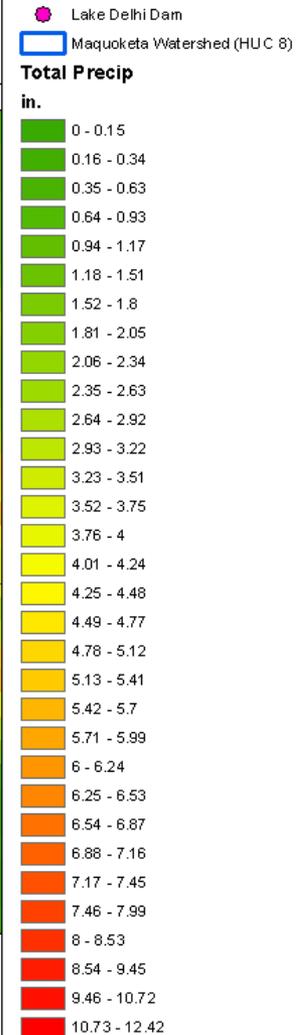
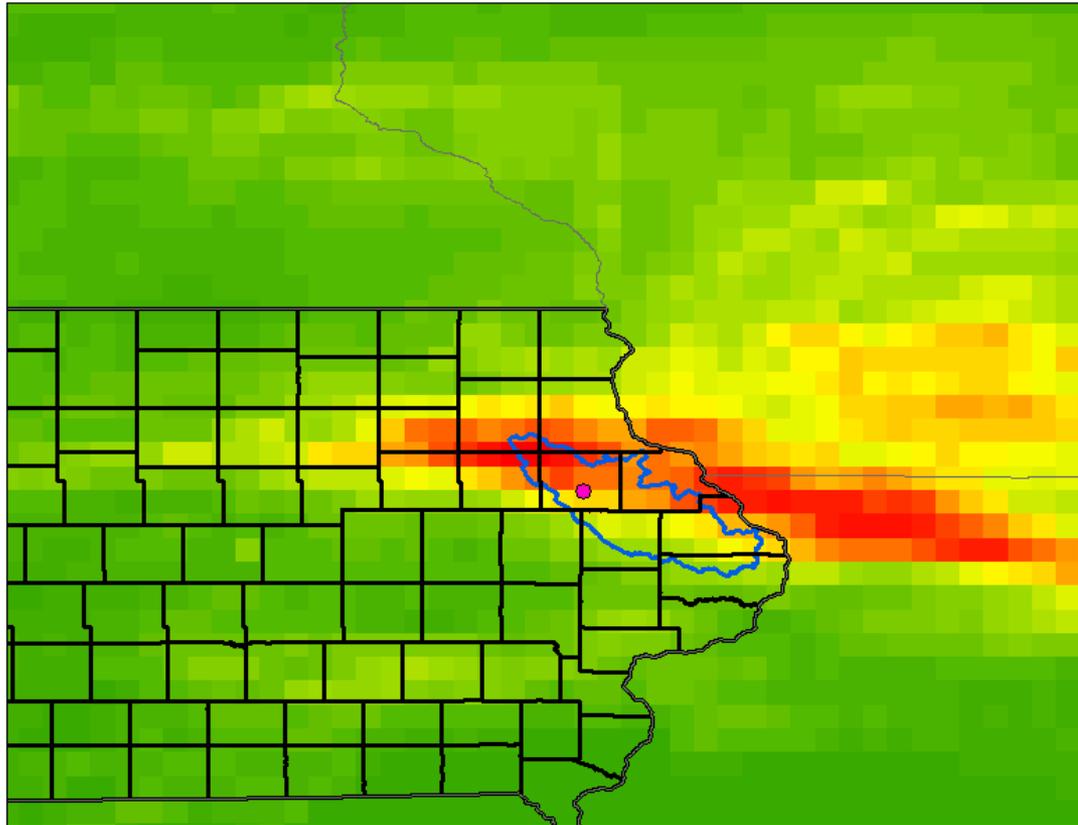
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Background

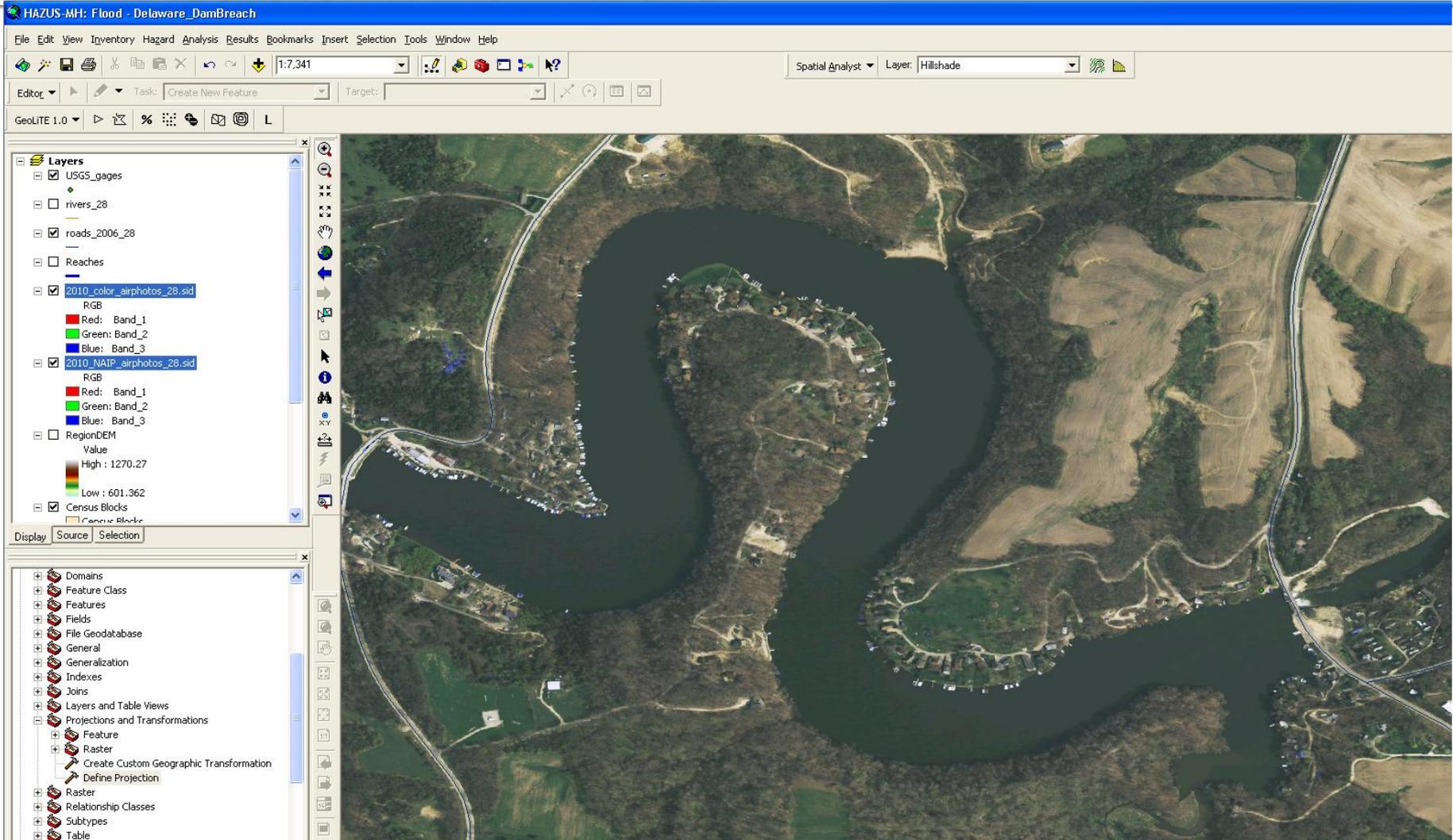
- Extreme rainfall event with 2 thunderstorm complexes on July 23rd and 24th, 2010.
- Rainfall totals greater than 8 inches in 24 hours.
- The rainfall was greatest at the top of the watershed, just upstream of the dam.

Heavy Rainfall Event

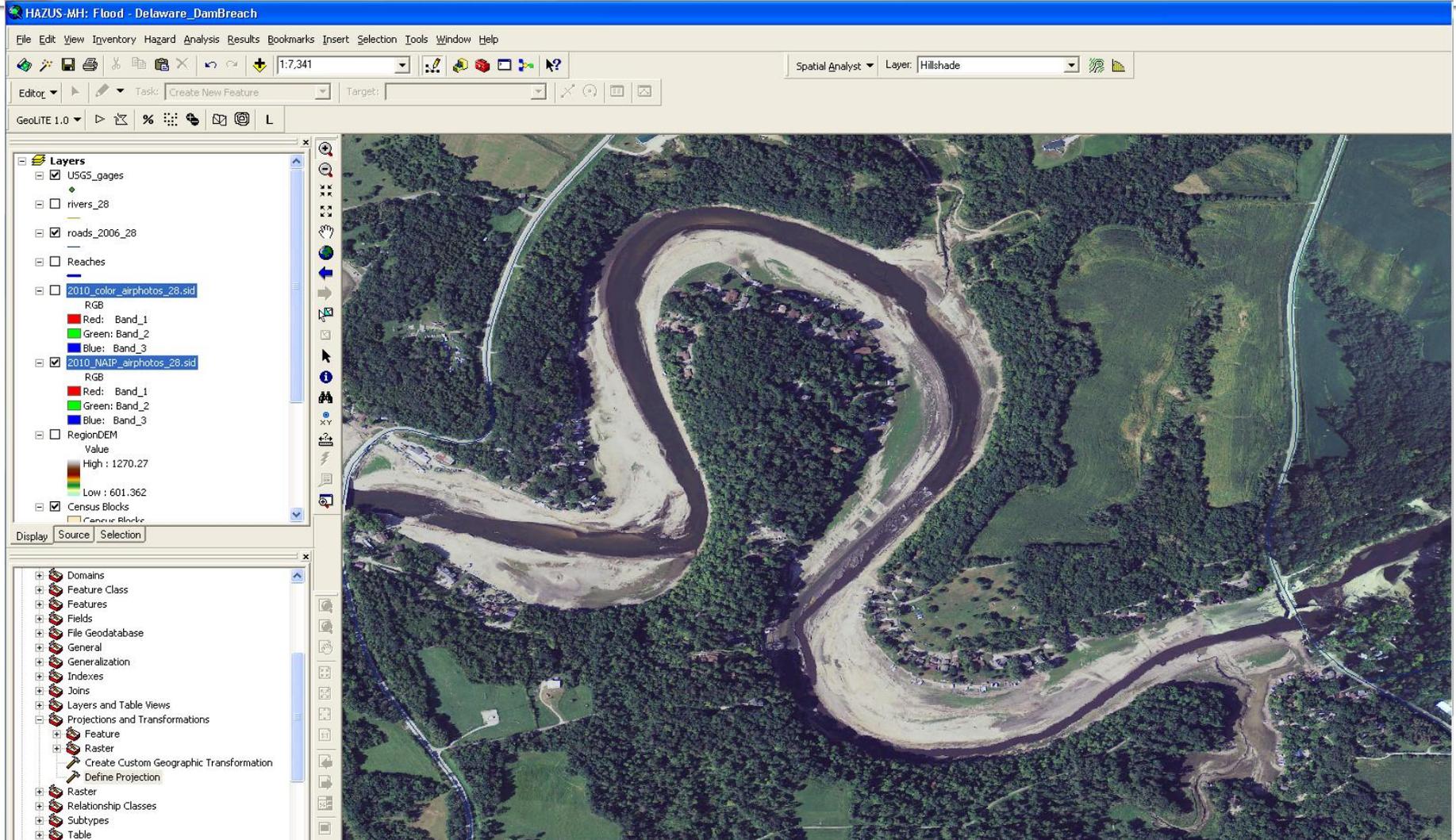
Study Region: Delaware_DamBreach
Scenario: <no scenario currently open>



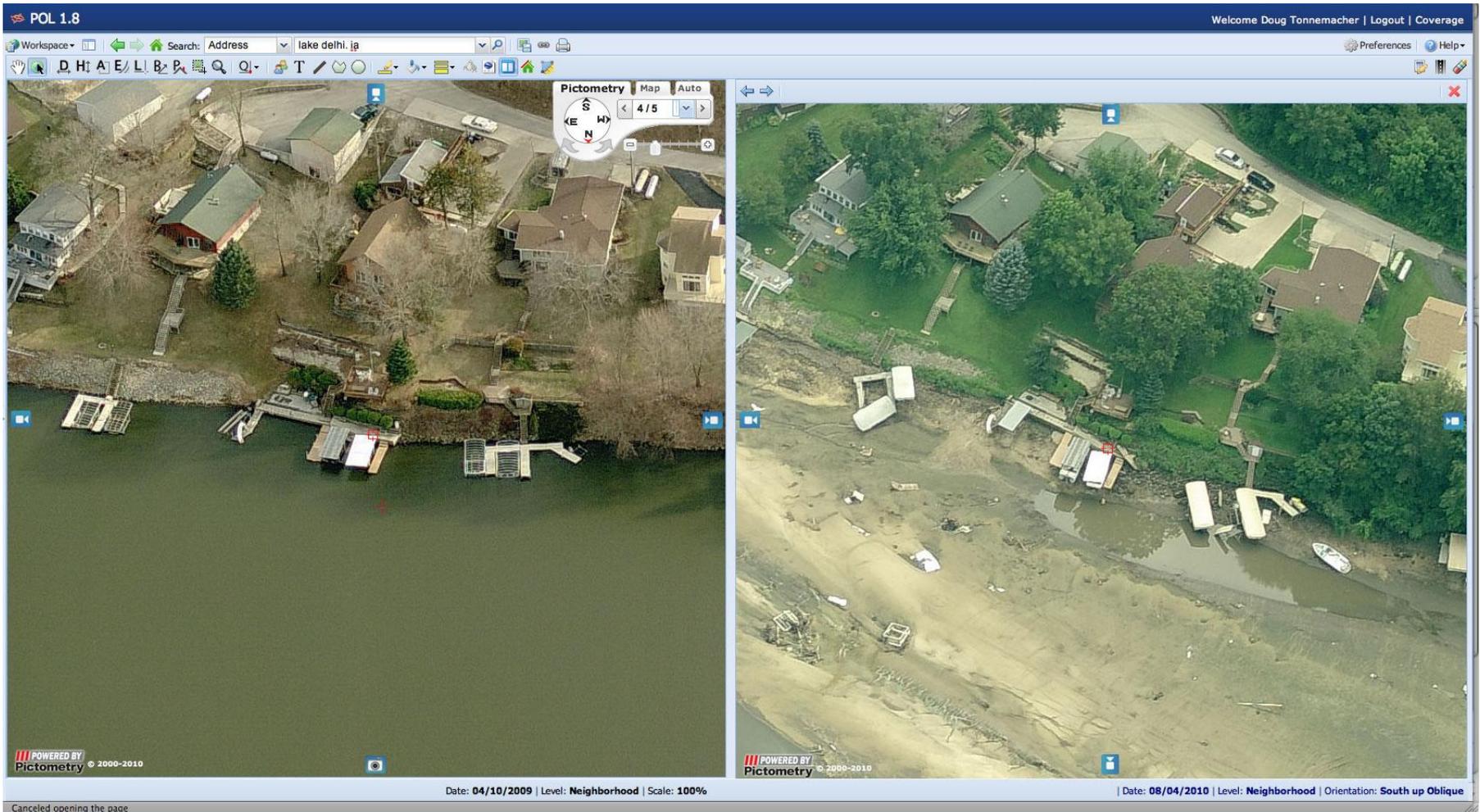
Lake Delhi Before



Lake Delhi After

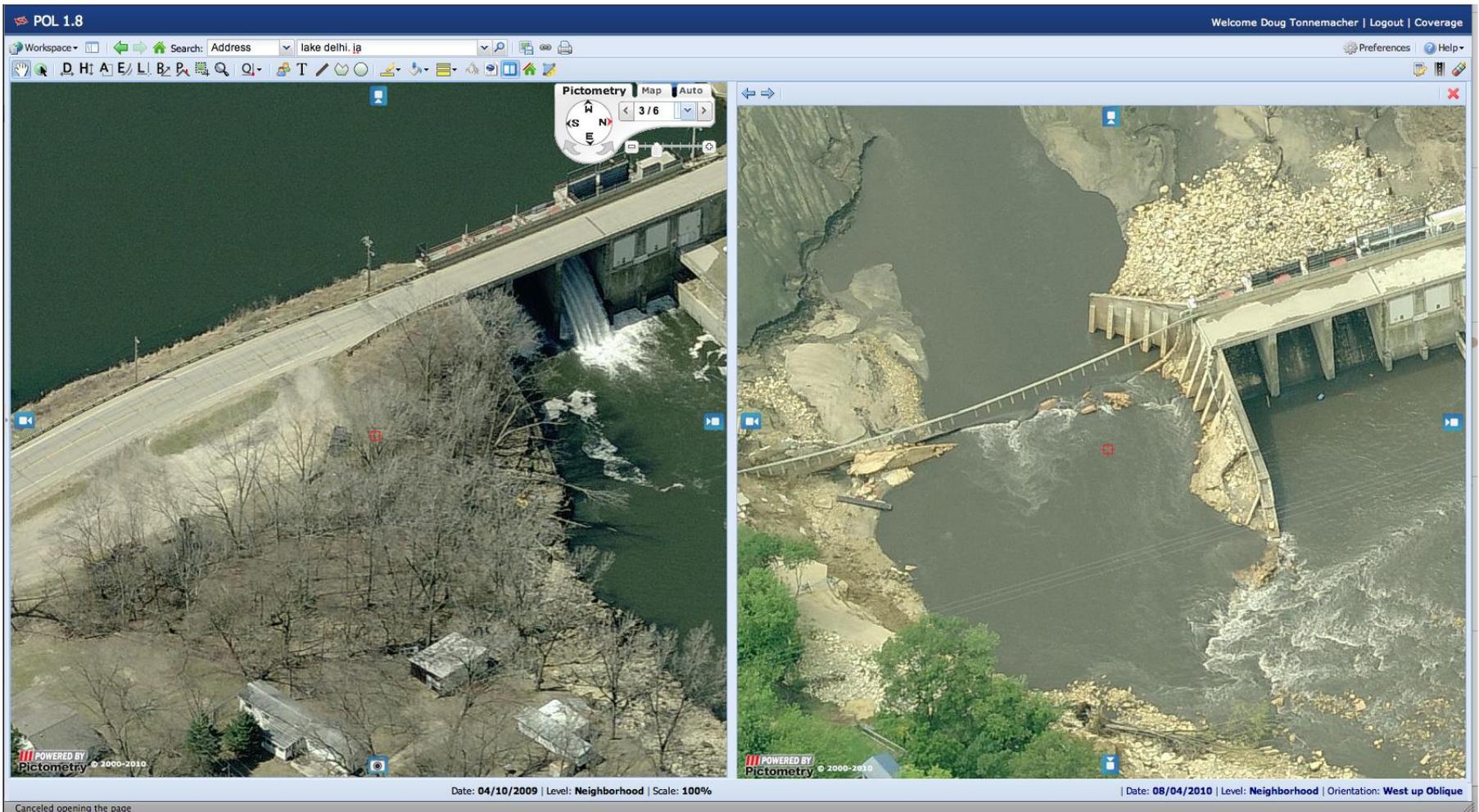


Before and After



Cancelled opening the page

Dam Breach



Dam Breach



Houses next to the dam that were destroyed

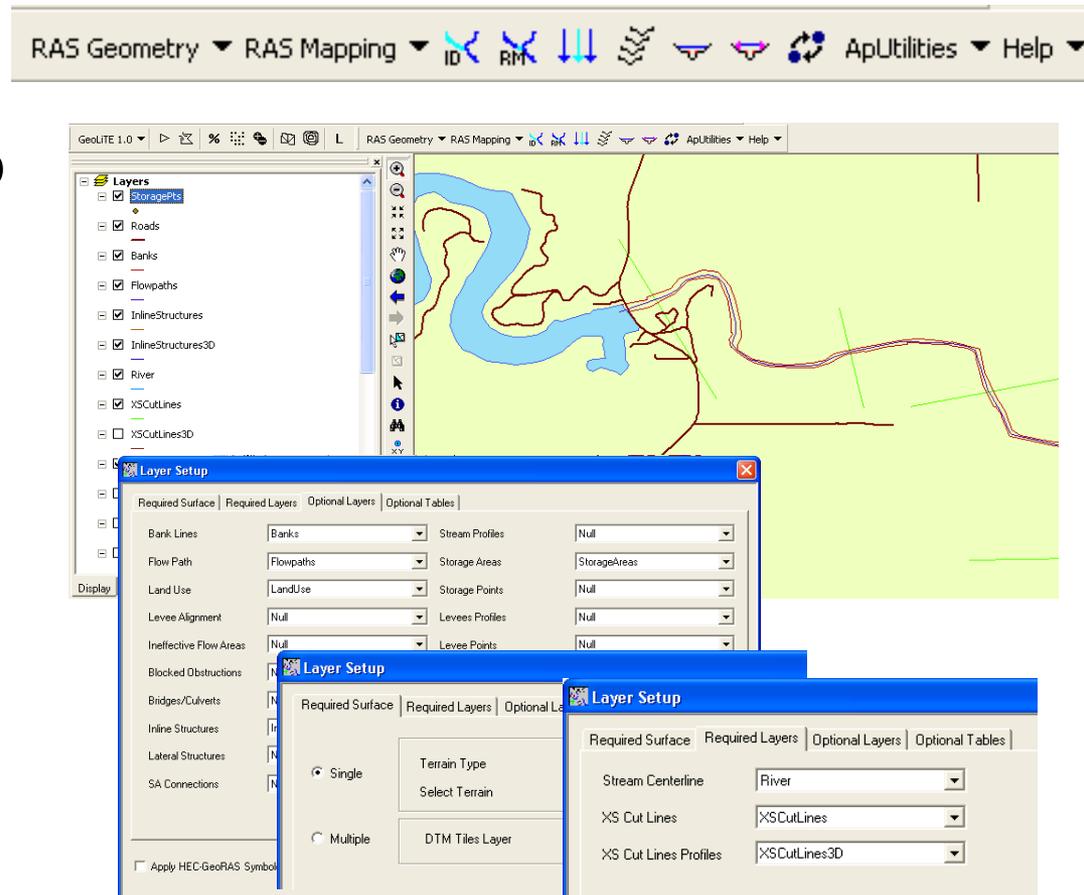
Involvement with Delaware County, IA

- Emergency Manager to Emergency Manager interaction.
- Mike Ryan – Delaware County, IA Emergency Manager.
 - Setup a Hazus-MH run for damage estimation, reconstruction, and mitigation
 - Too late for response (evacuations already in progress).



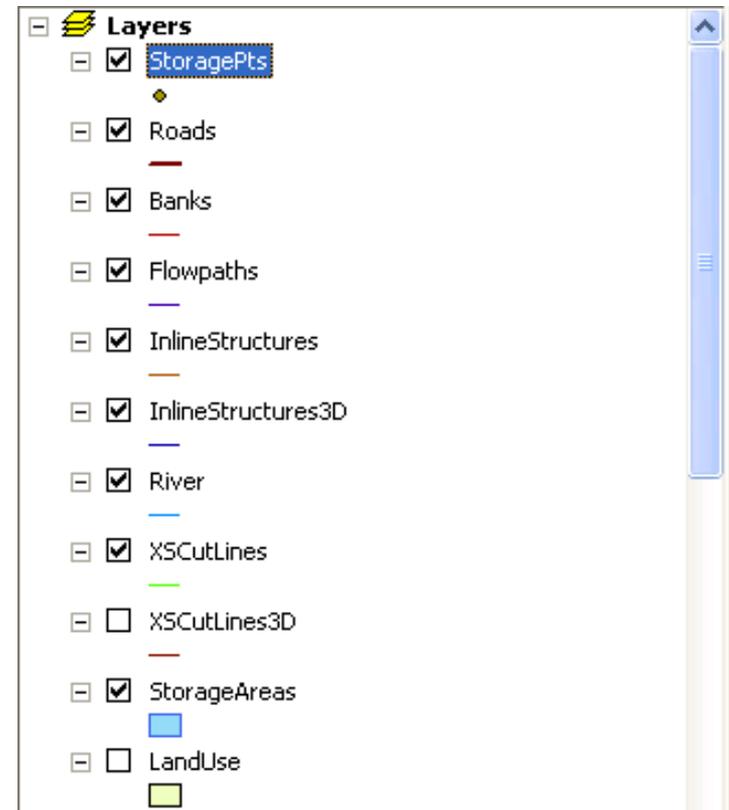
Step 1: HEC-GeoRAS

- Setup the scenario using GeoRAS
 - This process sets up a geodatabase with all of the necessary layers included.
 - The intent with this scenario was to create an analysis quickly to provide EM loss estimation values.
 - Generalizations were made.



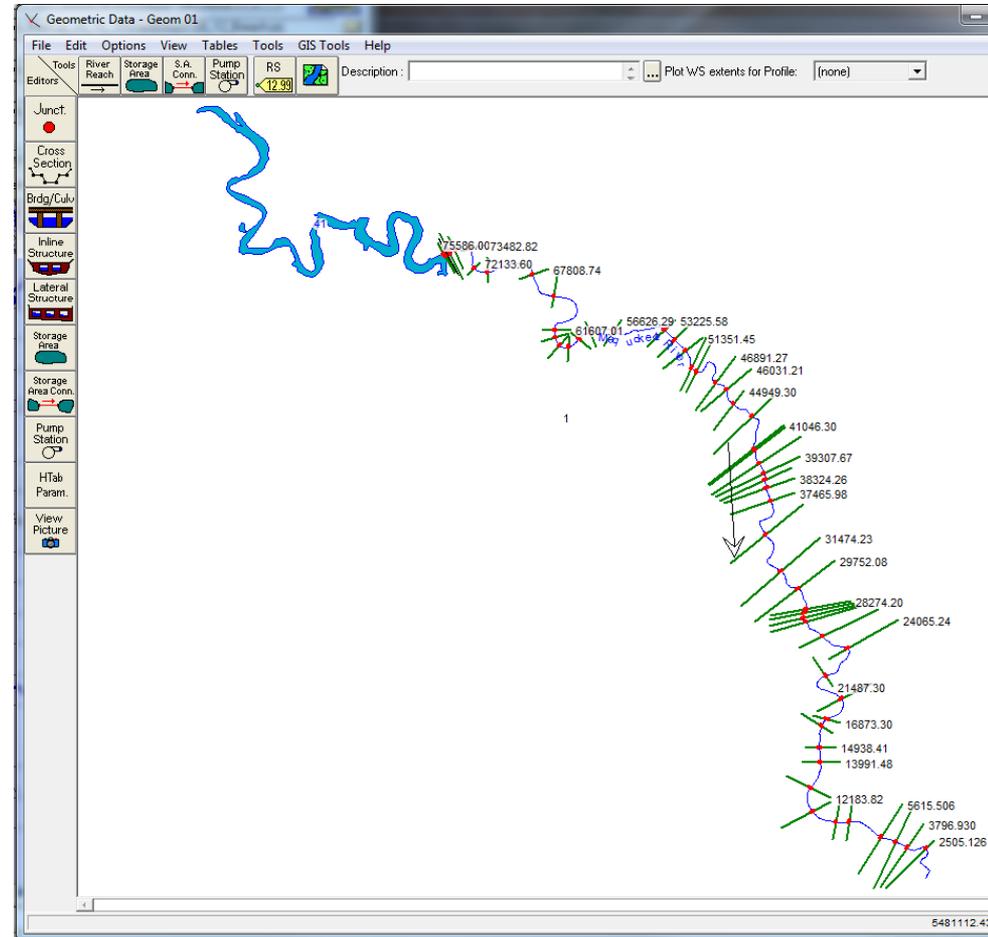
Step 1: HEC-GeoRAS

- Stream Centerline
 - Created from ortho
- Reservoir boundary
 - Created from ortho
- Cross Sections
 - generalized



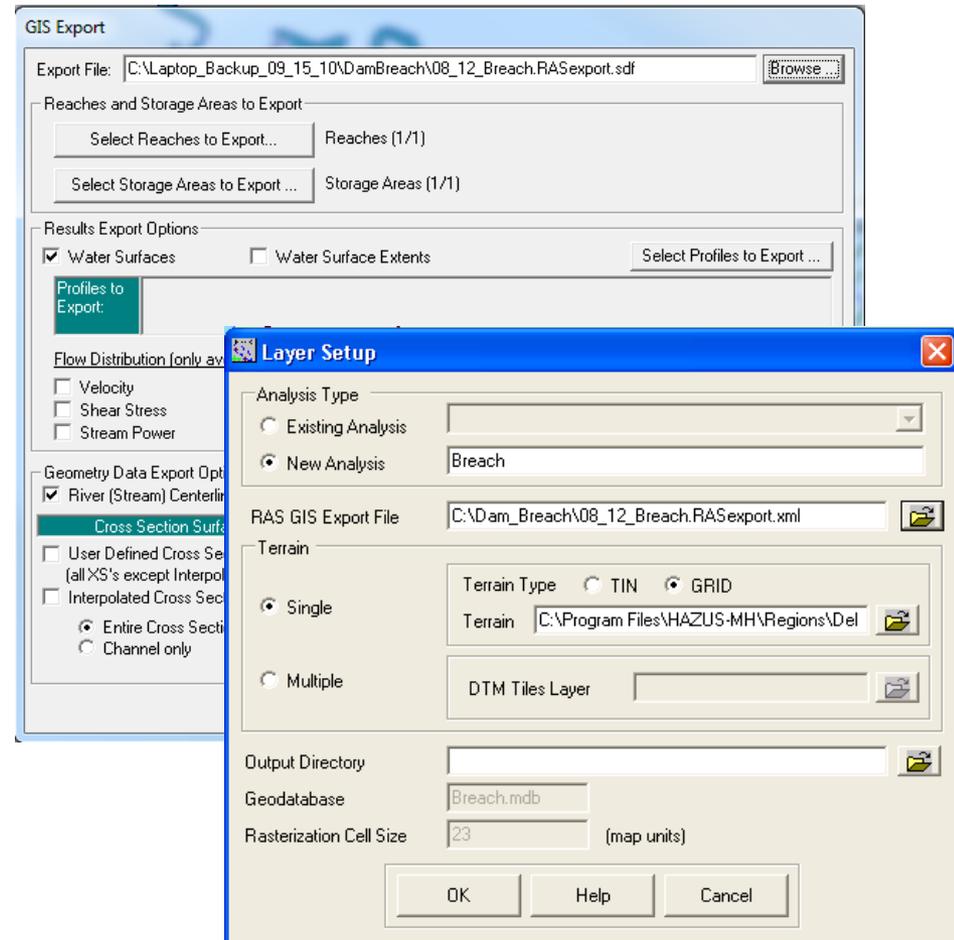
Step 2: HEC-RAS

- Data from GeoRAS was imported into HEC-RAS
 - Entered in the Dam parameters related to the breach, dam geometries.
 - Dam Breach calculations

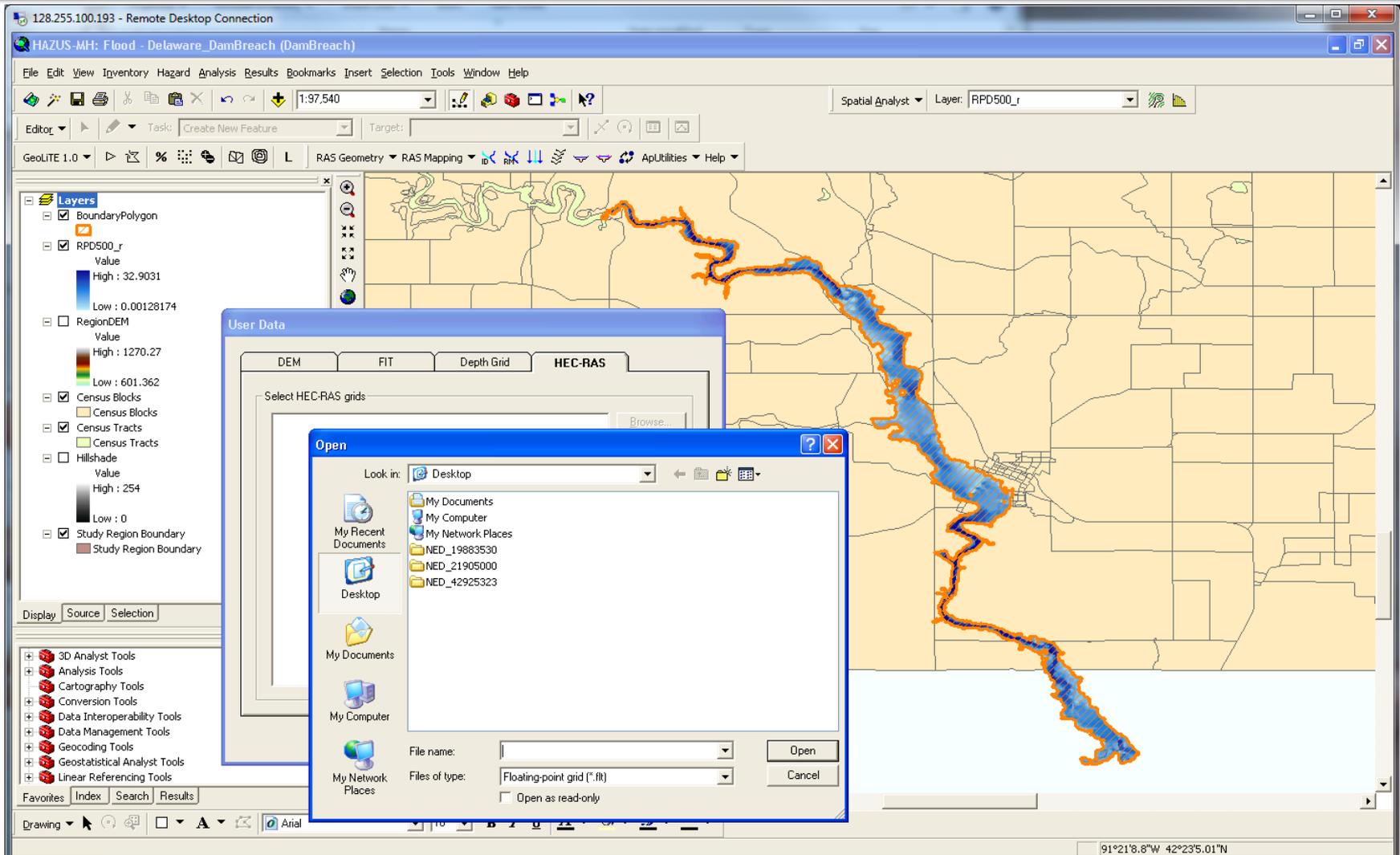


Step 3: HEC-GeoRAS

- Attempted to use the newly acquired DEM that had been generated from the Statewide Lidar project.
 - 3meter resolution readily available.
 - Was still processing after 24 hours.
 - Moved to 30 meter NED.



Step 4: Hazus-MH import



Step 5: User Defined Facilities

- Building Footprints
- Parcels
- Attributed with Assessments
 - 18 Ag
 - 5 Commercial
 - 26 Residential

General Building Stock Damage

HAZUS estimates that about 6 buildings will be at least moderately damaged . This is over 0% of the total number of buildings in the scenario . There are an estimated 3 buildings that will be completely destroyed . The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood 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

Occupancy	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%) Count	(%) Count	(%) Count	(%) Count	(%) Count	(%) Count	(%) Count	(%) Count	(%)	(%)	
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	0	0.00	0	0.00	1	16.67	2	33.33	3	50.00
Total	0		0		0		1		2		3	

UDF Results

- 33 Buildings Damaged
- \$420,000 in building damage
- \$1,100,000 in contents and inventory damage.

The screenshot shows a software window titled "User Defined Facilities Loss". It displays results for a "Scenario: DamBreach" with a "Return period: 500". The main data is presented in a table titled "User Defined Facilities (thous. dollars)". The table has six columns: "UserDefinedFtyId", "FacilityName", "OccupancyClass", "ControllingHazard", and "BldgDmgPct". The table lists 22 rows of data, with the first row highlighted. The "BldgDmgPct" values range from 11.82 to 60.10.

	UserDefinedFtyId	FacilityName	OccupancyClass	ControllingHazard	BldgDmgPct
1	US000001	6100001023	COM1	R	24.19
2	US000002	6100001023	COM1	R	18.75
3	US000003	6100001023	COM1	R	12.29
4	US000004	6100001023	COM1	R	17.12
5	US000005	6100001023	COM1	R	18.84
6	US000007	2202902013	RES1	R	28.46
7	US000008	2202902013	RES1	R	28.46
8	US000009	2202902013	RES1	R	25.99
9	US000010	2202902013	RES1	R	25.99
10	US000011	2202902013	RES1	R	46.94
11	US000012	2202902013	RES1	R	46.94
12	US000013	2202902013	RES1	R	23.77
13	US000014	2202902013	RES1	R	23.77
14	US000015	2202902014	RES1	R	50.00
15	US000016	2203400003	AGR1	R	60.10
16	US000017	2203400003	AGR1	R	11.82
17	US000018	2202900006	AGR1	R	45.14
18	US000019	2202900006	AGR1	R	45.14
19	US000020	2202902014	RES1	R	23.52
20	US000021	2202902014	RES1	R	46.33
21	US000025	2202901004	RES1	R	46.28
22	US000026	2202901004	RES1	R	27.08

Next Steps

- More detailed HEC-RAS analysis, if dam is rebuilt.
- Hazus-MH run for the county with GIS data.
- Incorporate into mitigation planning efforts and for other use (response).
- Include additional analyses, e.g., closed roads, evacuation times.

Thank You

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