

A geographical information system was used for comparative residential damage analysis between simulations of a lower category slow moving hurricane and a faster high category hurricane. The method involved determining area of impact for the simulated excess storage volume for each event. Cumulative volumes at 1ft contour intervals were calculated to determine the elevation for which storage occurs. All areas at or below this elevation were then delineated for each event and residences lying within impacted areas were counted. Residences were classified according foundation type and elevation to estimate the residential damage costs.

Using ArcView 3.2, a project file for the drainage area of DPS #4 (Area G) was created. The drainage area was delineated using a streets layer and paper map from the Sewerage and Water Board of New Orleans. The USGS 7.5-minute, 1:24000 scale digital elevation model (DEM) files 3009064 (Spanish Fort) and 29090H1 (New Orleans East) were imported as new themes (Figure 1).

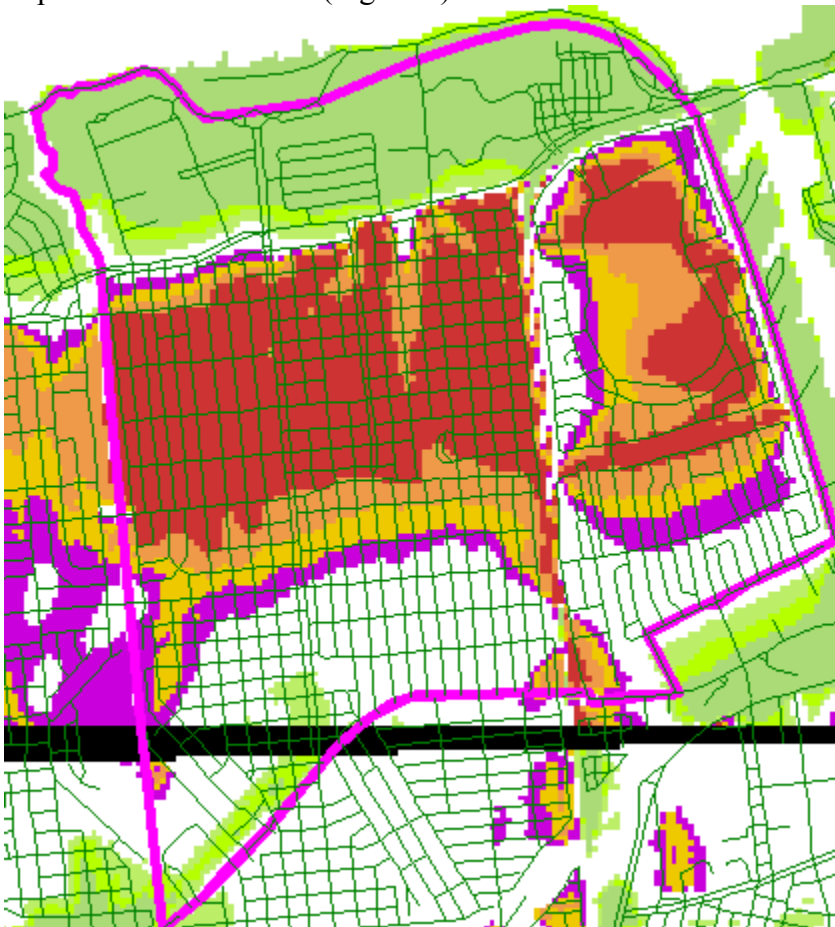


Figure 1: Drainage area for pumping station #4

These DEM elevations are based on 30 meter spacing with Universal Transverse Mercator (UTM) projection. Elevation units are in feet relative to the National Geodetic Vertical Datum 1983. Accuracy of the 15-minute is equal to or better than one-half of a contour interval of the 15-minute topographic quadrangle map. Within ArcView, areas at

each elevation are tabulated and exported to an Excel spreadsheet for computing the cumulative volume in acre-ft (Table 1).

Table 1: Cumulative volume spreadsheet

	A Elevations		B	C	D	E	F	G	H	I	J
1	Elevations		Mgrid 2	Spanish Fort	(Mgrid2 + Spa.Fort)	(Mgrid2 + Spa.Fort)* ΔElev	Cumulative(Mgrid2 + Spa.Fort)*ΔElev	Cumulative(Mgrid2 + Spa.Fort)*ΔElev			
2	Elev (ft)	Elev (m)	G (m²)	G (m²)	(m²)	(m²)	(m²)	(acre*ft)			
3	-4	-1.2192	0	3357000	3357000	1291773.6	1291773.6	1047.253712			
4	-3	-0.9144	4500	1323000	1327500	510822	1802595.6	1461.38219		Hurricane Fran	
5	-2	-0.6096	6300	892800	899100	345973.68	2148569.28	1741.866496			
6	-1	-0.3048	10800	905400	916200	352553.76	2501123.04	2027.685337			
7	0	0	3E+05	2628000	2898000	1115150.4	3616273.44	2931.748863			
8	1	0.3048	88200	296100	384300	147878.64	3764152.08	3051.635548			
9	2	0.6096	82800	155700	238500	91774.8	3855926.88	3126.036292		Hurricane Danny	
10	3	0.9144	12600	439200	451800	173852.64	4029779.52	3266.982357			
11	4	1.2192	0	667800	667800	256969.44	4286748.96	3475.310039			
12	5	1.524	0	890100	890100	342510.48	4629259.44	3752.986693			
13	6	1.8288	0	82800	82800	31861.44	4661120.88	3778.81708			
14	7	2.1336	0	3600	3600	1385.28	4662506.16	3779.94014			
15	8	2.4384	0	0	0	0	4662506.16	3779.94014			
16	9	2.7432	0	0	0	0	4662506.16	3779.94014			
17	10	3.048	0	0	0	0	4662506.16	3779.94014			
18	11	3.3528	0	0	0	0	4662506.16	3779.94014			
19	12	3.6576	0	0	0	0	4662506.16	3779.94014			
20					2994.101776	4662506.16					

A cumulative volume of 1461 acre-ft is the next volume greater than the simulated 1180 acre-ft of excess storage for the hurricane Fran simulation. At this volume all areas at or below an elevation of -3 ft are impacted. At a cumulative volume of 3126 acre-ft, just above the simulated 3118 acre-ft for hurricane Danny, all areas at or below +2 ft are impacted. The corresponding impacted areas were digitized and added as new themes (Figures 2-3).

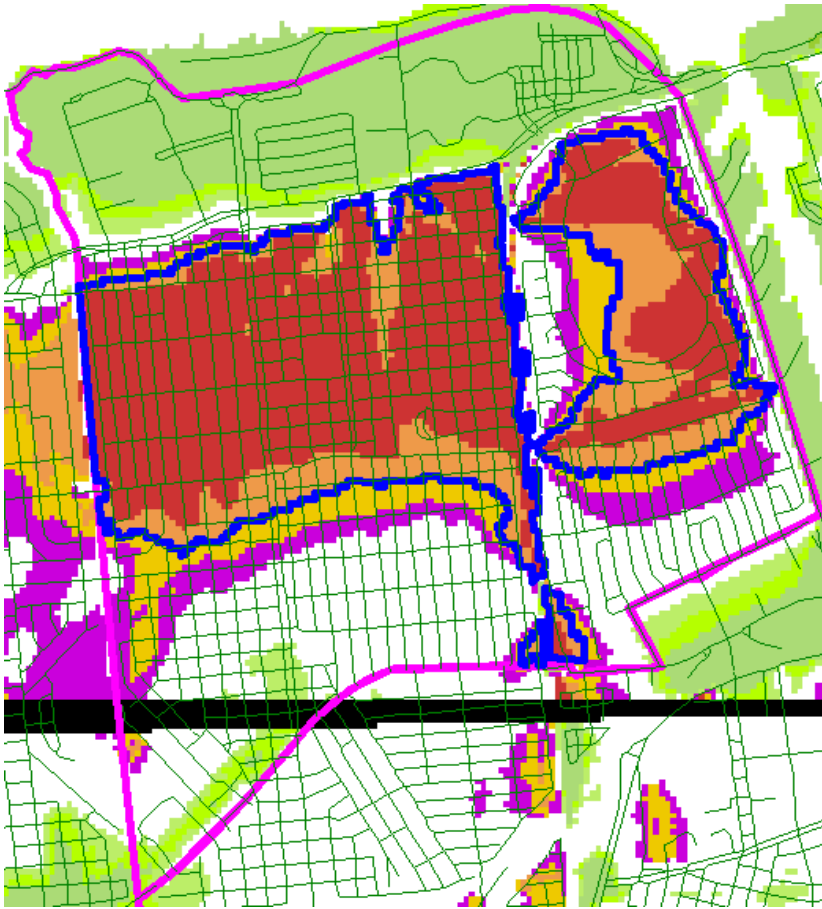


Figure 2: Area impacted by Hurricane Fran simulation

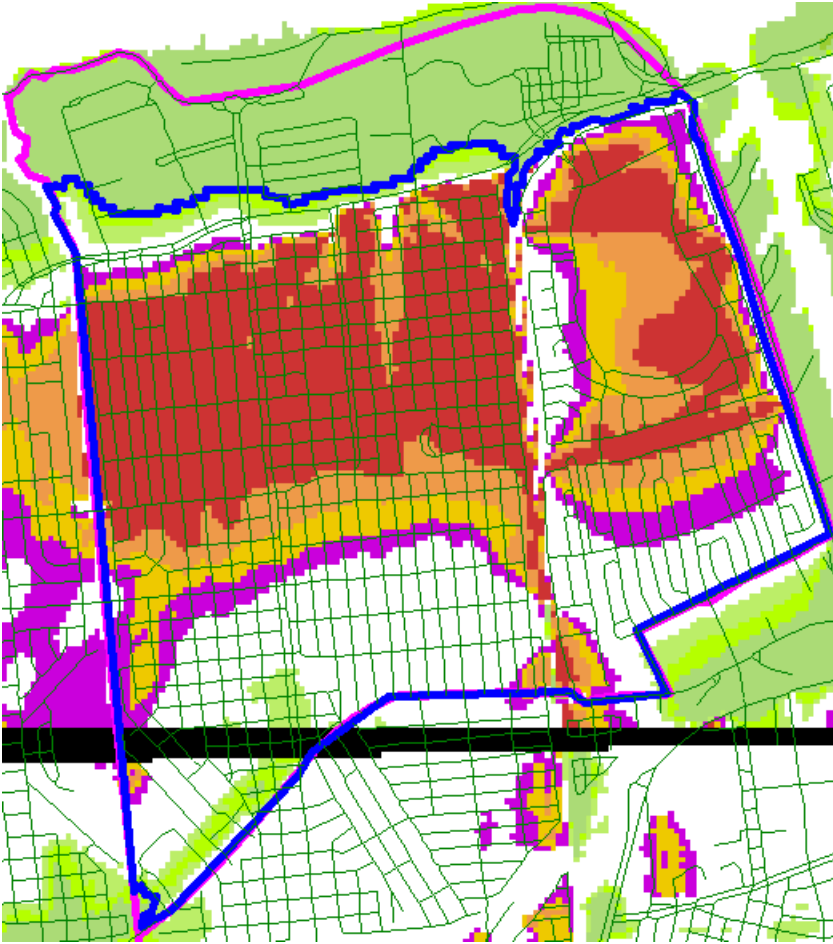


Figure 3: Area impacted by Hurricane Danny simulation

These were then overlain onto the digital color infrared orthophoto for the Spanish Fort quadrangle in Louisiana for counting the residences. There were 4518 houses affected by the hurricane Fran simulation and 8687 affected for the hurricane Danny simulation.

References

U.S. Geological Survey, 7.5-minute Digital Elevation Model

Louisiana Oil Spill Coordinator's Office (LOSCO), 19990309, Color Infrared Orthophoto, SW quadrant of Spanish Fort Quadrangle, LA, 50:1 MrSID compressed, LOSCO (1999) [c3009064_sws_50]