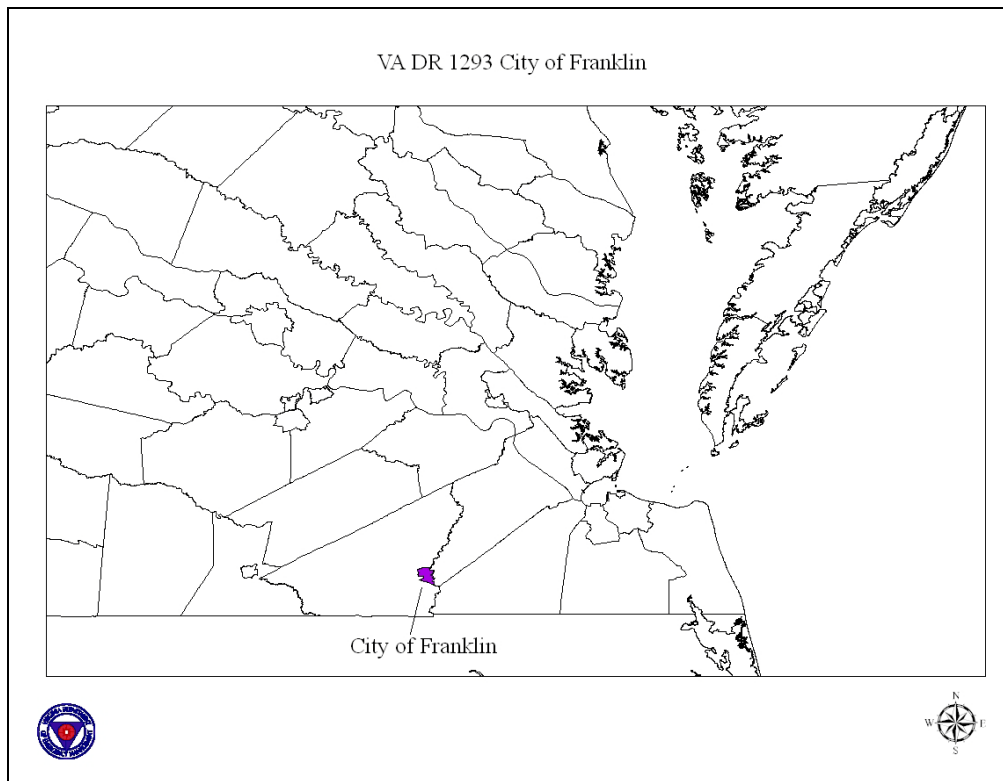


LOSS AVOIDANCE STUDY

City of Franklin, VA
Residential Acquisitions
VA-DR-1293

Virginia Enhanced Hazard Mitigation Plan





Introduction

Parts of Southampton County and the City of Franklin were devastated by Hurricane Floyd that dropped 10-20 inches of rain on the region in September of 1999. The intense rainfall amounts resulted in the flood of record on the Blackwater River reaching 26.27 ft. As a result of the disaster, federal funds were authorized through the Robert T. Stafford act to provide mitigation assistance through the Hazard Mitigation Grant Program (HMGP). HMGP provides funds to mitigate at-risk structures to reduce the risk of future damages. This disaster became known as VA-DR-1293.

One of the questions that is always asked is how effective are FEMA and state funded mitigation projects? When developing and implementing a project, it is designed to reduce risk and over time result in a cost savings. It isn't until after an event occurs at the location of the mitigated property that one can determine how much money or damages were avoided as a result of the project.

The purpose of this study is to determine the losses that were avoided by mitigating properties through FEMA Hazard Mitigation Assistance (HMA) programs in the Commonwealth. There were several target communities to conduct loss avoidance, but in this instance the City of Franklin will be used as an example. The methodology and format for this study was modeled after the FEMA report titled "*Evaluated Losses Avoided Through Hazard Mitigation, City of Centralia, Washington.*"

The Event

In October of 2006 a Nor'Easter stalled over the eastern portion of the state, causing torrential rain to fall over southeastern Virginia. The event resulted in the 2nd flood of record on the Blackwater River, again inundating the City of Franklin and parts of Southampton and Isle of Wight Counties. It was VDEMs goal to perform loss avoidance calculations based on this event and mitigated properties from VA-DR-1293. There were many properties that were mitigated in the City of Franklin, but for this study only 10 were chosen. The number of properties was narrowed down to 10 due to high first floor elevations, or lack of elevation certificates.

Methodology

To be able to conduct a loss-avoidance study several important pieces of information are needed. They include:

- Location of Structure
- Flood Insurance Study (FIS)
- Structure Square Footage
- First Floor Elevation (for acquisition only pre-mitigation is needed)
- Number of Floors
- BCAR Software
- Flood Depths of events occurring after mitigation

Assumptions

- Building replacement value of \$84.30/sq foot (2006 prices and conditions) were obtained from R.S. Means 2006. This was a generic value of a one story economy structure with no basement. The value was the average of a 600sq/ft building through a 1200 sq/ft building which was the range of the structures in this study.
- A contents value of 30 percent of the building replacement value was used
- Depth Damage functions from the BCAR 4.5 module were used for each structure to determine avoided building, contents, and displacement costs during the 2006 event.
- Actual high water marks were recorded at S.W. Rawls, a business located near the mitigated residential structures, these high water marks are assumed to be in NGVD 29 datum. S.W. Rawls also provided ground elevation of their structure, which came out to 19.7 feet. Please note the high water mark below, representing 8 cinder blocks which comes out to 5.3 feet. Those two values were used to come up with the value of 25 feet for the flood depth.



Yellow Line Denotes 2006 Nor'easter, Orange Line Denotes Hurricane Floyd (1999)

Calculation of Losses Avoided

Building Data

Table 2 provides building data and HMGP Disaster number for 10 residential structures that were acquired after the 1999 FEMA flood disaster declarations. VDEM VA-DR-1293 project files contained structure specific information and FEMA Elevation Certificates for the 10 structures. Files contained address, structure square footage, first floor elevation, number of floors, type of foundation, and pictures of structures.

FIS Data Needed

- 10, 50, 100, 500 year flood elevation and associated discharge in cubic feet per second (cfs).
- Flood Profile Number
- Date of FIS
- FIRM Panel Number

Table 1 – Sample FIS Data Used for Study

Recurrence Interval	Elevation	Discharge
10	13	7900
50	119	14500
100	20.8	18300
200	25	30200

Depth-Damage Function

Data from Tables 1 and 2 were entered into the BCAR version 4.5.2 for flooding and acquisition projects to determine the depth-damage relationship. The BCAR gave an output of expected building, contents, and displacement costs. Tables 3 and 4 provide an example of the depth-damage outputs. The building replacement values and contents values from Table 2 were multiplied by the depth damage function associated with the 2006 flood depths (Tables 3 and 4) to get the losses avoided. Each of the 10 structures were run through the BCAR to confirm the results, and also to get the anticipated displacement costs.

The BCAR module recognizes flood depths on a 0.5ft interval, so for instance the damages associated with 1 foot of flooding is actually the damages associated with flooding from 0.5 feet to 1.5 feet. To simplify this study, 2006 flood depths that fell within that range were given the damage value associated with the whole number. So 1.2 feet would be assigned damages associated with a 1 ft flood depth.

Figure 2 - Study area and the location of the 10 acquired properties with relationship to the Blackwater River.



Table 2 – Building data for acquired structures in Southampton County.

Property ID	Base Flood Elevation	FFE (Before)	FFE (After)	Structure Type	Square Footage	2006 Structure Replacement Value	Assumed Contents Value	2006 Flood Depths
FEMA DISASTER DR 1293 VA - City of Franklin Acquisitions								
1	20.8	16.6	Acquired	1 Story	630	\$53,109	\$15,932.70	25
2	20.8	17.4	Acquired	1 Story	630	\$53,109	\$15,932.70	25
3	20.8	16.8	Acquired	1 Story	630	\$53,109	\$15,932.70	25
4	20.8	17.4	Acquired	1 Story	630	\$53,109	\$15,932.70	25
5	20.8	15.2	Acquired	1 Story	630	\$53,109	\$15,932.70	25
6	20.8	14.1	Acquired	1 Story	630	\$53,109	\$15,932.70	25
7	20.8	13.6	Acquired	1 Story	630	\$53,109	\$15,932.70	25
8	20.8	16.6	Acquired	1 Story	1146	\$96,607.80	\$28,982.34	25
9	20.8	16.4	Acquired	1 Story	911	\$76,797.30	\$23,039.19	25
10	20.8	16.1	Acquired	1 Story	816	\$68,788.80	\$20,636.64	25
Assumption: Building Replacement Value is 84.30 per square foot, which is an average of the range of square footage from 600 to 1200 sq ft.								

Note:

FFE designates First Floor Elevation

BRV designates Building Replacement Value

BFE designates Base Flood Elevation

Contents Value is 30% of the Building Replacement Value

Structure Replacement Value is the BRV multiplied by the Square Footage

Base Flood Elevation and FFE referenced to NGVD 1929



Table 3 – BCAR depth damage for buildings 1-7 (Mobile Homes)

Flood Depth	Building (DDF)	Contents (DDF)	Displacement (Days)
-2	0	0	0
-1	0.0%	0.0%	0
0	8.0%	12.0%	0
1	44.0%	66.0%	45
2	63.0%	90.0%	90
3	73.0%	90.0%	135
4	78.0%	90.0%	180
5	80.0%	90.0%	225
6	81%	90.0%	270
7	82%	90.0%	315
8	82%	90.0%	360
9	82%	90.0%	405
10	82%	90.0%	450
11	82%	90.0%	495

Table 3 – BCAR depth damage for buildings 8-10 (1 Story Building, No Basement)

Flood Depth	Building (DDF)	Contents (DDF)	Displacement (Days)
-2	0	0	0
-1	2.5%	2.4%	0
0	13.4%	8.1%	0
1	23.3%	13.3%	45
2	32.1%	17.9%	90
3	40.1%	22.0%	135
4	47.1%	25.7%	180
5	53.2%	28.8%	225
6	59%	32%	270
7	63%	34%	315
8	67%	36%	360
9	71%	37%	405
10	73%	38%	450
11	75%	39%	495

The depth damage function represents damages expected on a half foot interval. So for instance a flood depth of 1 foot would indicate flood damages expected from 0.5 ft to 1.5 ft. It is also important to note that buildings with over 50% damage are considered destroyed, therefore the cost is considered to be 100% of the building replacement value.

Table 4 – Losses Avoided

Property ID	Water Depth above FFE Pre-Mitigation (feet)	Flood Depth Used	Building Repair Costs	Content Losses	Displacement Costs	Total
1	8.4	8	\$53,109	\$14,339	\$10,737	\$78,185
2	7.6	8	\$53,109	\$14,339	\$10,737	\$78,185
3	8.2	8	\$53,109	\$14,339	\$10,737	\$78,185
4	7.6	8	\$53,109	\$14,339	\$10,737	\$78,185
5	9.8	10	\$53,109	\$14,339	\$13,422	\$80,870
6	10.9	11	\$53,109	\$14,339	\$14,764	\$82,212
7	11.4	11	\$53,109	\$14,339	\$14,764	\$82,212
8	8.4	8	\$96,608	\$26,084	\$10,737	\$133,429
9	8.6	9	\$76,797	\$8,571	\$15,646	\$101,014
10	8.9	9	\$68,789	\$7,677	\$15,646	\$92,112
Total			\$613,957	\$142,708	\$127,927	\$884,591

Table 5 – Total Mitigation Savings

Property ID	Total Losses Avoided	Mitigation Funds Spent	% Savings in 7 Years
1	\$78,185	\$ 19,714	397%
2	\$78,185	\$ 19,714	397%
3	\$78,185	\$ 19,714	397%
4	\$78,185	\$ 19,714	397%
5	\$80,870	\$ 19,714	410%
6	\$82,212	\$ 19,714	417%
7	\$82,212	\$ 19,714	417%
8	\$133,429	\$ 19,714	677%
9	\$101,014	\$ 19,714	512%
10	\$92,112	\$ 19,714	467%
Total	\$884,591	\$ 197,142	449%

It should be noted that the total project costs was divided by 10 to determine the average cost per structure for this project.

Summary

Had these structures not been acquired, all 10 structures in the study area would have been destroyed from the October 2006 flood event. All structures would have experienced at least 8 feet of water above the first floor. This was a historic event as the Blackwater River reached 22.77 ft, second highest recorded at the Franklin USGS gauge to date. Had these 10 homes not been acquired, an estimated \$884,591 in flood damages would have occurred. Since the total cost to acquire these properties was \$197,142 in just seven years there was a savings in excess of 4 times the original cost of the project. It can be expected that the benefits or savings from this project will increase overtime as the Blackwater River will flood the areas of the acquired properties as they are in the 100 year floodplain.

