

**ARLINGTON COUNTY FIRE DEPARTMENT – DEVELOPING A DAMAGE  
ASSESSMENT STANDARD OPERATION PROCEDURE**

Executive Analysis of Fire Service Operations in Emergency Management

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### Abstract

The problem was that the Arlington County Fire Department (ACFD) did not have a prescribed immediate damage assessment plan or procedure that could be applied following a disaster. The purpose of this research was to examine the components of comprehensive damage assessment and develop a plan that would allow for a systematic approach for the efficient use of resources to conduct damage assessment within the community of Arlington following a major disaster. Action research methodology was used for the research to assess current policies and develop a standard operating procedure for conducting damage assessment in the future. The following questions were used to assist develop the procedure:

1. What are the potential types of disasters that are probable to take place in Arlington County?
2. What are the principle components of an immediate damage assessment plan?
3. What are other fire departments in the National Capital Region doing to address immediate damage assessment?
4. What are the objectives for damage assessment?

The procedures used to complete this study included a thorough literature review of journals, internet, and research papers. Also a survey was created to find out how other departments in the National Capital Region are conducting immediate damage assessments.

The results revealed that immediate damage assessment plans were essential to the recovery process and that ACFD could benefit from adopting the procedure presented in this research.

Certification Statement

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: \_\_\_\_\_

## Table of Contents

Abstract	2
Certification Statement	3
Table of Contents	4
Introduction	5
Background and Significance	5
Literature Review	8
Procedures	17
Results	19
Discussion	22
Recommendations	24
References	25
<b>Appendices</b>	
<b>Appendix A</b>	<b>Departments Contacted</b>
<b>Appendix B</b>	<b>Survey and Results</b>
<b>Appendix C-1</b>	<b>Public Assistance Criteria</b>
<b>Appendix C-2</b>	<b>Public Assistance Form</b>
<b>Appendix D-1</b>	<b>Individual Assistance Criteria</b>
<b>Appendix D-2</b>	<b>Individual Assistance Form</b>
<b>Appendix E</b>	<b>Fire Box Map</b>
<b>Appendix F</b>	<b>Damage Assessment Go Kit List</b>
<b>Appendix G</b>	<b>Draft SOP</b>

## Introduction

The problem is that Arlington County is susceptible to natural and manmade disasters and the fire department does not have a prescribed procedure that could be used to allow for a systematic assessment of damage after a disaster. The intent of the research is to develop a standard operating procedure that provides direction for conducting an immediate damage assessment after a disaster.

The research questions are:

1. What are the potential types of disasters that are probable to take place in Arlington County?
2. What are the principle components of an immediate damage assessment plan?
3. What are other fire departments in the National Capital Region doing to address immediate damage assessment?
4. What are the objectives for damage assessment?

## Background and Significance

Named after the Robert E. Lee estate, Arlington County, Virginia is located across the Potomac River from Washington, DC. In 1920 it was decided to eliminate the confusion between Alexandria City and Alexandria County, and the area once named Alexandria County became Arlington County. The county form of government was established in 1932, and Arlington County became the first County Manager form of government in the United States. The fire department would later be established in 1940. (Arlington County, 2006)

Arlington County is the smallest county in the Commonwealth of Virginia. While only 26 square miles, the county has a population just shy of 200,000 people. The population increases with an additional 100,000 people during the workdays. The County is home to many

Fortune 500 companies and leading United States Government agencies. The Department of Defense headquarters, and the largest office complex in the United States; the Pentagon, is located in Arlington County. More than 27,000 people are employed at the Pentagon Reservation. Other agencies such as the Central Intelligence Agency, Defense Advanced Research Projects Agency, and Fort Myer are located in Arlington as well. (Arlington County, 2006)

The Arlington County Fire Department (ACFD) employs 313 firefighters and civilian employees that staff ten fire stations, a training academy, fire prevention office, logistical warehouse and support administrative offices. The fire department responds to over 28,000 emergency and non-emergency responses annually and has an annual budget of over 31 million dollars with most of the funding contributed to personnel service (ACFD, 2006).

During the past seven years, Arlington County has had two major disasters to strike the community. In 2001, the Pentagon was attacked by terrorist using a 757 jet airplane as a missile and purposely crashed it into the building killing 178 people. While the incident was contained to the Pentagon Reservation, it did have a major impact on being able to provide emergency service delivery to other portions of the County. ACFD was involved with the incident for fourteen days. During one of the last days of the incident a supercell storm system roared through the National Capital Region spawning an F-3 tornado, with winds between 158-206 mph, killing two people on the campus of University of Maryland. Before touching down in College Park, MD, a funnel cloud system came directly over the Pentagon and blew down tents and other temporary shelters being used to manage the terrorist incident (NOAA 2001). The second incident occurred in 2003 when Hurricane Isabel, one of the costliest and deadliest hurricanes in the 2003 Atlantic hurricane season came through the east and central parts of

Virginia (NOAA 2003). The storm toppled numerous trees and power lines down over a wide area, with over 2 million households without power in Virginia. Virginia damage was over \$625 million, and there were 36 deaths in Virginia directly or indirectly related to the storm (VDEM, 2007). In Arlington County, the storm produced severe flooding, destroyed two houses and damaged 192 homes in which 46 were considered severe. The storm surge flooded the parking lot at the Reagan National Airport. The total damage to the County totaled \$2.5 million USD (2003 (Wikipedia, 2007)).

The ACFD responded to both of these incidents and carried out their duties the best they could considering the conditions they were faced with. These incidents were handled in the same manner as standard calls. ACFD operational personnel were taxed to the limit.

While the Pentagon incident was considered a major disaster it was confined to the Pentagon Reservation and no other damage assessments were needed. However there are manmade potential threats such as a major railroad line that travels along the eastern boarder of the county that could have a chemical release to affect the entire community. Arlington County like other communities is susceptible to natural disasters. Nationally the United States averages over 800 tornadoes per year. During any month and any time of day, a tornado can strike anywhere. In 1982 Virginia had only reported one tornado and in 1993 there were as many as 29 (VDEM, 2007).

The Arlington County Emergency Operations Plan states “To respond effectively to any emergency of a size or complexity beyond routine response systems, it is critical that all Arlington County employees, public officials, departments, and agencies, non-governmental emergency organizations and the public understand their roles and responsibilities” (Arlington County, 2007).

Being prepared by knowing what to do after incidents that have been mentioned is an important step in meeting the goal stated from the Arlington County Emergency Operations Plan. The development of a standard operation procedure for immediate damage assessment will provide the opportunity for the department to meet that goal. This will also allow members to systematically assess what has happened and determine the appropriate resource needs for the conditions at hand.

This Applied Research Project (ARP) is in direct correlation with the “Damage Assessment” unit in the *Executive Analysis of Fire Service Operations in Emergency Management* (EAFSOEM) Course, R306, (NFA, 2007). The EAFSOEM student manual section of Unit Six concentrates on damage assessment which includes the importance of being prompt and accurate with performing the duties of such. An immediate damage assessment standard operating procedure would assist in achieving this objective.

### Literature Review

The purpose of this literature review is to obtain support information in order to develop an immediate damage assessment plan. The plan will provide ACFD with a prescribed method to perform an immediate damage assessment after a disaster. The literature review includes a review of local emergency operations plans, fire service journals, Executive Fire Officer (EFO) applied research projects, magazines, textbooks, published trade journals, and information from the World Wide Web. The information from the review provided answers to four basic questions that needed to be addressed to institute the plan. The questions included:

1. What are the potential types of disasters that are probable to take place in Arlington County?
2. What are the principle components of an immediate damage assessment plan?

3. What are other fire departments in the National Capital Region doing to address immediate damage assessment?
4. What are the objectives for damage assessment?

The literature review began by answering the first question: What are the potential types of disasters that are probable to take place in Arlington County?

Arlington County is an urban community located in northern Virginia just across the Potomac River from Washington D.C... In January 2007, Arlington reported to have just over 200,000 people (Wikipedia 2007). Although it is the most densely populated county, at 26 square miles, it is the smallest in the Commonwealth of Virginia and the fourth smallest county in the United States. Arlington County is susceptible to a number of hazards ranging from natural hazards, to accidents. And because of its proximity to the Nation's Capitol and having the Pentagon within its boundaries, cause's major threats from deliberate acts of violence.

According to the Arlington County Hazard Identification and Vulnerability Analysis (HIVA) (2005) conducted as a part of a hazard mitigation plan, Arlington County is a risk for natural, technological and intentional disasters. Natural disasters included disasters from tornados, hailstorms, thunderstorms, tropical storms and windstorms. The analysis also mentions other natural disasters such as extreme temperatures (e.g., heat, cold), floods, and droughts, winter storms (e.g., ice, heavy snow, sleet, and blizzard). The HIVA identified technological disasters that would involve hazardous material releases, transportation mishaps, electrical failures, gas pipeline incidents, and water contamination. Reagan National Airport (DCA) is located in Arlington County. In 2006, DCA registered over 276,000 flight operations at the airport (MWAA, 2007). The HIVA identifies civil disturbance and terrorism as intentional disaster threats. In September 2001 the Pentagon was attacked by terrorist by hijacking a 757 jet airplane

and purposely crashing it into the building killing people on the plane and 125 in the building (Wikipedia 2007).

Arlington County is a participating member of the Northern Virginia Regional Commission (NVRC). The NVRC is a regional council of local governments in Northern Virginia. It was created to serve as a neutral forum where representatives of the member local governments can discuss and decide how to approach problems that cross city, county, and town boundaries. The NVRC has submitted a regional hazard mitigation plan that has been approved by the Virginia Department of Emergency Management (VDEM). The plan was later approved by the Federal Emergency Management Agency (FEMA). Based on the data compiled from a NVRC hazard assessment team, the plan outlines actions designed to address and reduce the impact of hazards facing the region. The different hazards identified in the plan include natural hazards such as floods, tornadoes, hurricanes, earthquakes, wildfires and drought (NVRC, 2007).

An inquiry from the National Climate Data Center (2007) revealed that there were 228 severe wind events reported in Arlington County between January of 1950 and March 2007. The query included two recent tropical storms between September 1999 and September 2003 which resulted in 1 death, 29 injuries and over \$30 million in property damage (NOAA, 2007).

The Virginia Department of Emergency Management (VDEM) (2007) reports from 1950 through the year 2001, 376 tornadoes was documented in Virginia. That is an average of 7 tornadoes per year. Nationally, statistics have suggested that prior to 1990, only a third of all tornadoes were actually recorded. Hurricane Isabel, one of the costliest and deadliest hurricanes in the 2003 Atlantic hurricane season came through the east and central parts of Virginia (NOAA 2003). The storm toppled numerous trees and power lines down over a wide area, with over 2 million households without power in Virginia. Virginia damage was over \$625 million, and there

were 36 deaths in Virginia directly or indirectly related to the storm (VDEM 2007). In Arlington County, the storm produced severe flooding, destroyed two houses and damaged 192 homes in which 46 were considered severe. The storm surge flooded the parking lot at the Reagan National Airport. The total damage to the County totaled \$2.5 million USD (Wikipedia, 2003).

What are the principle components of an immediate damage assessment plan?

According to the Florida Division of Emergency Management (2007), one of the most important essentials of a community's response to an emergency or disaster is damage assessment. The process is paramount in determining what happened, what are the effects, which areas were attacked the hardest, what situations are give priority, and what type of assistance are needed (e.g., local, state, or federal). Performing a thorough damage assessment will allow for a more effective emergency response, equipment and personnel can be efficiently, and help can be afforded quicker (Florida, 2007).

The National Emergency Training Center's Rapid Assessment Planning Workshop in Emergency Management (1995), recommends that the components of a damage assessment plan should include, "developing a community profile, sectoring the community, performing a risk assessment by sector, determining staffing patterns and resource requirements, developing communication procedures, and exercising and evaluating the procedures" (Emergency Management Institute (EMI), 1995, p. II 1-29). The components should address the assessment for the potential injuries and deaths, unsafe conditions in the community, and the need for emergency services (NFA, 2006)

The Arlington County Emergency Operations Plan (EOP) (2006) has assigned Emergency Support Function #3, Public Works & Engineering as the lead agency for damage assessment. The ACFD along with other county agencies have been assigned to support Public Works &

Engineering to perform damage assessment, reporting functions, estimate the nature and extent of the damage, and provide disaster recovery assistance (Arlington County, 2006). While the EOP is specific with Situations and Assumptions as to what actions need to be coordinated, it does not address the specifics for what type and what amount of resources will be needed from the ACFD. Additionally, the ACFD has not developed a standard operating procedure for their own personnel to follow that they will address what resources will be assisting and what are the expectations. The plan has to be thorough, straightforward and reviewed regularly. The plan also needs to be functional for other agencies and departments, for example ACFD uses automatic aide as apart of its day to day resources. These personnel would have to be familiar as well. To be successful, all aspects of the plan must be compiled and practiced prior to an event (Seidel, 1997). Success for the damage assessments conducted after the earthquake in Paso Robles, California was attributed to exercising the plan before the event (Cope and McEntire, 2004).

Geographically subdividing or segmenting the affected community is essential for an immediate assessment plan. Subdividing the community allows for the established response areas to be known to the response agencies prior to the incident. The subdivided areas can be used on the same bases as the response districts of a fire station. Arlington uses a *Fire Box* system (Appendix E) that subdivides the county into smaller segments. Using this model, personnel do a brief survey of a specific area and report the information to the next level of command. This process will also provide manageable areas for a coordinated collection off reporting of information from various areas of the community (NFA, 2006 p. SM 6-5). Pinpointing or evaluating the risk with in each subdivided area of the community provides a better picture for what needs to be taken care of. It basically provides information for how many

additional responders may be needed, critical infrastructure status, target hazards and special need facilities that must be accounted for during a damage assessment (NFA, 2006)

Staffing is a key component for resources that are needed to implement the plan. An adequate number of personnel would need to be determined to perform damage assessments with in the community. The VDEM recommends establishing teams consisting of at least two members. Each team tours the areas they have been assigned, looking for damage, compiling forms and reporting information as rapidly as possible. It is recommended that each team member have credentials of some type (VDEM, 2007).

Staffing for the Arlington County Fire Department consist of 313 career personnel. On occasion, volunteer emergency workers are used to enhance emergency response upon request by the department. The ACFD has three shifts commanded by an Assistant Chief of Operations. The County is divided into two districts with a Battalion Chief assigned to each district on all three shifts. All department personnel are certified as Firefighter II, Hazardous Materials Operations, and EMT. In addition, the department maintains a minimum number of personnel on each shift certified in technical rescue and hazardous materials response. The ACFD also has 16 personnel assigned to Fire Prevention Office. The Fire Prevention Office is responsible for all fire inspections, fire investigations, life safety education, systems testing, hazardous materials response cost recovery and explosive ordinance device, EOD, response.

During different disaster throughout the Virginia and the United States, Fire Marshals have been used to conduct damage assessment in the community after a storm. In June of 2004, four Fire Marshals were assigned to assist building inspectors to conduct damage assessment in the Southwest Virginia Flood/Tornado incident (VDES, 2004).

In California during the Sawtooth fire incident, the San Bernardino County Assessor's Office, the San Bernardino County Building and Safety Department and the San Bernardino County Fire Marshal's Office created Damage Assessment Teams that surveyed the affected communities for damaged and destroyed structures and vehicles. This damage assessment effort was limited to areas declared safe for the Damage Assessment Teams to enter (California, 2007).

During a disaster, many operational emergency response personnel are needed to respond to people that have a need for rescue, medical assistance, and hazard mitigation. Therefore personnel assigned to the Fire Marshal may be best suited to conduct immediate damage assessment. Fire Marshals are usually are not apart of emergency response and have a better understanding for inspection or damage assessment of structures. Also Fire Marshals are familiar with codes as they pertain to structures. The Fire Marshal can provide technical assistance to the incident commander concerning damage assessment. In the State of New Hampshire, the Fire Marshal's Office is used to assist with Urban Search and Rescue (USAR) issues. (New Hampshire 2007). In Florida the State Fire Marshal's Office staffs multiple teams responsible for many duties including damage assessment (Florida, 2000).

The personnel conducting damage assessments will need to have specific tools to be successful in properly carrying out the plan. Departments can preassemble *Damage Assessment Go Kits* that member would be issued to conduct the assessment (Appendix F). The kit would contain measuring tapes, camera, GPS, community contact names and numbers, assessment forms/checklist with instructions, and pens/pencils, clipboards. The forms\checklist (Appendix C-1, C-2, D-1, and D-2) are a part of the tool box. The preassembly of the kit would allow for personnel to become familiar with how to use the contents before an actual event. Personnel

should be familiar with how to conduct damage assessment for both *Individual Assistance* and *Public Assistance* (VDEM, 2007).

The author produced a survey instrument which was sent to other fire departments in the National Capital Region to find out what is being done to address damage assessment. The participants were asked eight questions in reference to preparedness, response, and training to conduct damage assessment. The survey and results can be found in Appendix B. The results from the survey were for the purpose to assist the author in the development of an immediate damage assessment standard operating procedure.

What are the objectives of damage assessment?

Damage assessment information is vital both during an incident and after the active phase of an incident have been concluded. It is important to know how damage assessment information is obtained and processed, and how it is used for specific purposes (NFA, 2006 p. SM 6-3).

The document *A Guide To Successful Damage and Needs Assessment*, describes an immediate damage assessment as the act of determining immediate response requirements by conducting a survey immediately or in the early stages of an event that focuses on widespread patterns or trends (Planitz, 1999). Planitz states that the clear and concise assessment of damages, losses and injuries in the aftermath of a disaster is a prerequisite for the effective planning and implementation of relief and recovery (Planitz, 1999, p. SPDRP 2). The EAFSOEM student manual explains damage assessment as the “gathering of information related to the impact of an event, or series of events, on life and property within a defined area” (NFA, 2006 p. SM 6-3).

Immediate damage assessment must be completed to establish a priority for response efforts and to determine eligibility for disaster aid (FEMA, 2003). The VDEM explains that the objectives for damage assessment should include the ability to assess threats to life safety and to deploy all disaster response resources tactically. In addition, local property and infrastructure damage needs to be assessed for the need of state assistance. Also the assessment should decide the need for the eligibility for federal recovery programs (VDEM Workshop, 2007).

Basically damage assessment is a “sizing-up” of an event in order to facilitate resources in the direction of rescue and recovery (NFA, 2006 p. SM 6-4). The coordination and deployment of search and rescue functions becomes a monumental task without a predetermined assessment and response system in place (Naum, 2003). Increasing the efficiency of damage assessment techniques could help diminish the losses of life as many victims die after and not during the event (McEntire & Cope, 2004).

In summary the literature stressed there is a critical need for damage assessment following major disasters. Response agencies are more efficient when they have a plan for how they are going to address damage assessment. A local response or other government agency can be more effective in handling the response to the emergency, and recovery from the effects of the event when damage assessments are conducted properly. Vital information can be provided from damage assessment. This information from the assessments is usually needed for long-range recovery planning. Also the assessments are necessary to document the incident properly and to initiate the reimbursement process (NFA, 2006, p. SM 6-9).

## Procedures

The applied research purpose was to locate damage assessment information to assist in the development of a standard operating procedure for ACFD personnel that would assist with immediate damage assessment. The research method used in the foundation of this report began with an inclusive literature review of fire service and non-fire service data from the Learning Resource Center (LRC) at the National Fire Academy (NFA) in Emmitsburg, Maryland. Articles from magazines, text books, technical reports, and previous executive fire officer (EFO) applied research papers were used to obtain information for the topic. The applied research papers and manuals provide exemplary procedures for damage assessment as well as different points of view on the topic.

Information was also taken from sources on the World Wide Web and established policies and procedures from various local state and federal emergency management agencies.

In addition to the written literature review, a survey was conducted by the author with fire departments in the National Capitol Region (Appendix A) which include Washington, D.C. and the surrounding counties and independent cities in Maryland and Virginia. The purpose of the survey was to obtain information on the procedures and practices used in damage assessment. The participants were asked a number of questions regarding preparedness, response, and training to conduct damage assessment (Appendix B).

The literature review was directed toward four research questions. The first question assisted in finding what type of natural and manmade disasters could potentially affect Arlington County. The second was used to assist the author determine what are the recommended components to be addressed in a standard procedure. The third question looked at what other department doing to

address damage assessment and the fourth was used to describe the importance of conducting damage assessment.

The author found through reviewing the literature and survey that there are different types of disasters that could affect Arlington County, there are key components that should be included in a standard procedure, there are a number of ways to conduct damage assessment, and damage assessments are paramount for recovery assistance. In essence the information gained from reviewing the literature helped to create the draft standard operating procedure for ACFD. A copy of the draft can be found in (Appendix G)

#### Limitations

Many elements in the research substantiated the limited information available for this project. To some extent there is a limited amount of research availability to establish the objective that is related with the subject.

It is presumed that the authors of reviewed materials were accurate and correct in the performance of their immediate research. The delivery of the survey instrument was limited. While emergency management departments are involved with damage assessment, the survey was only disseminated to fire departments. Finally, it is assumed that respondents answered the feedback questions in an honest and objective manner.

#### Definitions

ARP: Applied Research Project. A paper authored by Executive Fire Officer student at the National Fire Academy in Emmitsburg, Maryland

High Wind Event: has occurred whenever sustained winds of 40 MPH or more, or a peak gust of 58 MPH or more, has been reported from reliable observing equipment. Public impact such as power outages or damage to

trees, roofs, windows or cars can also be used to indicate that a high wind event has occurred (NWS, 2005)

Immediate Damage Assessment: Immediate damage assessments are conducted during the immediate stages of the event or incident. The immediate damage assessment determines the amount of damage, or probability of damage, that the event already has caused. This specifically includes the impact on life and property within the incident site or area. (FEMA, 2006)

Individual Assistance: Include damage assessment for private residence and businesses (VDEM, 2007)

Manmade Disaster: Disastrous event caused directly and principally by one or more identifiable deliberate or negligent human actions. Also called human-made disaster. (Businessdictionary.com, 2007)

Natural Disaster: Disaster caused by natural hazards (Businessdictionary.com, 2007)

Public Assistance: Include damage assessment for public infrastructure (VDEM, 2007)

## Results

*Research Question 1: What are the potential types of disasters that are probable to take place in Arlington County?*

The research indicates that Arlington County has the potential for major events such as severe natural disasters to include strong wind events, flooding, and winter storms and manmade catastrophes such as transportation or terrorist attacks. Arlington County is the

most densely populated county in Virginia. The 2007 HIVA suggest Arlington has the probability for the hazards mentioned.

Arlington County has responded to two major incidents mentioned in the Analysis. This includes the terrorist attack on the Pentagon and hurricane Isabel. The department consequently should prepare for future events of the same.

*Research Question 2: What are the principle components of an immediate damage assessment plan?*

The research indicates several principle components that should be incorporated within an immediate damage assessment plan. The components include developing a profile for probable risks the community faces (EMI, 1995). The community should be broken down into subdivisions or sectors for clear communication of the effected areas (NFA, 2006). Resources that include both staffing and equipment should be predetermined be for being placed in service (Florida, 2007). Forms including check list should be developed to track the amount and severity of damage for Public and Individual Assistance (VDEM, 2007). Personnel should train and become familiar with forms need to perform damage assessment (EMI, 1995).

*Research Question 3: What are other fire departments in the National Capital Region doing to address immediate damage assessment?*

The survey instrument conducted with the National Capital Region Fire Departments (Appendix B) solicited information for the individual(s) responsible for conducting damage assessment. Nine departments were surveyed. The results are as follows: While 66% percent responded that damage assessment is conducted by their department, 44% reported being the primary agency responsible for conducting the same. When asked if there is a

formal damage assessment standard procedure, 11% answered yes and 88% answered no.

When the respondents were asked what personnel are responsible for conducting the damage assessments, 55% reported that uniform staff consisting of Fire Marshal's is responsible for conducting the assessments, While 33% reported emergency responders and 11% other which included the Building Department. When asked about having a form\checklist to assist with damage assessment, 33% reported having such a tool. When the respondents were asked if their jurisdictions were divided into distinct areas\segments for the purpose of organization in completing damage assessments, 11% responded that subdivisions was used within their jurisdiction, while 88% that it does not. The same results were turned in for training on the plan with 11% reporting training takes place and 88% do not train. When asked about areas of high risk being identified, 22% reported identifying such areas and the remaining 77% do not.

*Research Question 4: What are the objectives for damage assessment?*

The research identified several objectives for damage assessment. One of the objectives for damage assessment is the importance to know how damage assessment information is obtained and processed, and how it can be used for specific purposes (NFA, 2006 p. SM 6-3). In addition, the clear and concise assessment of damages, losses and injuries in the aftermath of a disaster is a prerequisite for the effective planning and implementation of relief and recovery (Planitz, 1999, p. SPDRP 2). The objectives for damage assessment should include the ability to assess threats to life safety and to deploy all disaster response resources tactically. In addition, local property and infrastructure damage needs to be assessed for the need of state assistance. Also the assessment should decide the need for the eligibility for federal recovery programs (VDEM, 2007). The coordination and deployment of search and

rescue functions becomes a monumental task without a predetermined assessment and response system in place (Naum, 2003).

### Discussion

Given the geographical proximity to our Nation's Capital and being adjacent to the Atlantic Ocean, Arlington County is likely to experience other disasters related to the weather or terrorist event. The HIVA identified technological disasters that would involve hazardous material releases, transportation mishaps, electrical failures, gas pipeline incidents, and water contamination. According to the Arlington County Hazard Identification and Vulnerability Analysis (HIVA, 2005) conducted as a part of a hazard mitigation plan, Arlington County is at risk for natural, technological and intentional disasters. Natural disasters included disasters from tornados, hailstorms, thunderstorms, tropical storms and windstorms.

The Arlington County Emergency Operations Plan states "To respond effectively to any emergency of a size or complexity beyond routine response systems, it is critical that all Arlington County employees, public officials, departments, and agencies, non-governmental emergency organizations and the public understand their roles and responsibilities." (Arlington County EOP, 2007)

Being prepared by knowing what to do after incidents that have been mentioned is an important step in meeting the goal stated from the Arlington County Emergency Operations Plan.

Damage assessment plans or procedures have to include components that allow for a thorough view of the community. To be successful, all aspects of the plan must be compiled and practiced prior to an event. (Seidel, 1997) For example the hazardous incident vulnerability analysis outlines hazards that are present daily and must be accounted for during a damage assessment. Establishing subdivisions of the community is important for span of control and

manageability of collecting the data (VDEM, 2007). The *Fire Box* system could possibly be used for subdividing the community. The HIVA identifies the specific probability for the possible events (NFA, 2006). With the possible events being identified, operational issues can be addressed. This includes the resources that are needed to make the plan work and methods of reporting (VDEM, 2007). Staffing is a key component for resources that are needed to implement the plan. An adequate number of personnel would need to be determined to perform damage assessments within the community. Fire Prevention staff such as Fire Marshals are usually not directly involved in emergency operations. Fire Prevention personnel may be more familiar with inspections and therefore may be better suited to perform damage assessments. Providing training staffing before the event is important as well. Success for the damage assessments conducted after the earthquake in Paso Robles, California was attributed to exercising the plan before the event (Cope and McEntire, 2004).

The request for information from other fire departments intended to seek those practices currently used and whether the key components identified by the research were being utilized. The results revealed that a majority of the departments surveyed conduct damage assessment assessments. A disconcerting point highlighted that many of the departments surveyed had no established damage assessment procedure. Generally, the survey instrument provided support of the preceding research on the practices and procedures in damage assessment and provided a foundation for the development of a comprehensive standard procedure.

The importance of having a damage assessment plan was reinforced by all of the literature examined. Clearly damage assessment information is vital both during an incident and after the active phase of an incident have been concluded. It is important to know how damage assessment information is obtained and processed, and how it can be used for to facilitate a

community's recovery from a disaster (NFA, 2006 p. SM 6-3). Clear and concise assessment of damages, losses and injuries in the aftermath of a disaster is a prerequisite for the effective planning and implementation of relief and recovery (Planitz, 1999, p. SPDRP 2). Initial Damage Assessments are divided into two categories. Local damage assessments teams should use two distinct field forms to record damage assessments for the Individual Assistance and Public Assistance process (VDEM, 2007). The coordination and deployment of search and rescue functions becomes a monumental task without a predetermined assessment and response system in place (Naum, 2003). The idea is to provide a snap shot of the impact sustained by the community (NFA, 2006 p. SM 6-4).

### Recommendations

The problem was that the Arlington County Fire Department did not currently have a standard operating procedure to handle immediate damage assessment after a disaster. The research provided information for the development of such a procedure. As a result of this study, the author suggests the following recommendations:

1. The Arlington County Fire Department should implement or modify the proposed immediate damage assessment SOP and attached forms located in Appendix C-1, C-2, D-1, and D-2.
2. Use Fire Prevention Office personnel to conduct assessments
3. Assemble "Damage Assessment Go Kits" to be ready for use.
4. Form a committee to develop and provide a training program for the adoption of the proposed SOP
5. Offer regular refresher training sessions on the proposed SOP

6. Use the *Fire Box* map system to subdivide the County to track and communicate affected areas located in Appendix E
7. Continue with ongoing evaluation of the SOP and changes should be made as necessary

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## Appendix A

### National Capital Region Fire Departments Surveyed

Alexandria Fire Department  
301 King St  
Alexandria, VA 22314  
(703) 838.4360

City of Fairfax Fire Department  
4081 University Dr.  
Fairfax, VA 22030  
(703) 385.7940

City of Manassas Park Fire Department  
9080 Manassas Drive  
Manassas Park, VA 20111  
(703) 335-8845

District of Columbia Fire\EMS Department  
1923 Vermont Ave NW #201S  
Washington, DC 20001  
(202) 673.3320

Fairfax County Fire and Rescue Department  
4100 Chain Bridge Road  
Fairfax, VA 22030  
(703) 246.2126

Loudoun County Department of Fire, Rescue & Emergency Management  
803 Sycolin Road, Suite 104  
Leesburg, VA 20175  
(703) 777.0333

Montgomery County Fire and Rescue Service  
101 Monroe St., 12<sup>th</sup> Floor  
Rockville, MD 20850  
(240) 777.2400

Prince George's County Fire\EMS Department  
9201 Basil Court, Suite 452  
Largo, MD 20774  
(301) 583.2200

Prince William County Department of Fire and Rescue  
1 County Complex Court  
Prince William, VA 22192  
(703) 792.6800

**Appendix B**  
Damage Assessment Survey and Results

1. Does your department conduct immediate damage assessments after a natural or manmade disaster?

Yes (6) 66%      No (3) 33%      Other ( )

2. Is your department the primary agency responsible for conducting immediate damage assessment after a disaster in your community?

Yes (5) 55%      No (4 )44%      Other ( )

3. Does your department have a formal damage assessment procedure/guideline?

Yes (2) 22%      No (7) 77%      Other ( )

4. What personnel from your department are responsible for conducting immediate damage assessment?

Emergency Responders (3) 33%      Uniform Staff (5) 55%      Other (1) 11% Building Dept

5. Does your department have standardized form\checklist to be completed for damage assessments?

Yes (3) 33%      No (6) 66%      Other ( )

6. Is your jurisdiction divided in to distinct areas for the purpose of completing damage assessment?

Yes (1) 11%      No (8) 88%      Other ( )

7. Does your department conduct regular\on going training sessions for damage assessment?

Yes (1) 11%      No (8) 88%      Other ( )

8. Are those areas of high risk for the loss of life identified in your damage assessment plan?

Yes (2) 22%      No (7) 77%      Other ( )

## Appendix C-1

Category	Purpose	Eligible Activities
<b>A: Debris Removal</b>	Clearance of trees and woody debris; building wreckage; sand, mud, silt, and gravel; vehicles; and other disaster-related material deposited on public and, in very limited cases, private property	<ul style="list-style-type: none"> <li>• Debris removal from a street or highway to allow the safe passage of emergency vehicles</li> <li>• Debris removal from public property to eliminate health and safety hazards</li> </ul>
<b>B: Emergency Protective Measures</b>	Measures taken before, during, and after a disaster to save lives, protect public health and safety, and protect improved public and private property	<ul style="list-style-type: none"> <li>• Emergency Operations Center activation</li> <li>• Warning devices (barricades, signs, and announcements)</li> <li>• Search and rescue</li> <li>• Security forces (police and guards)</li> <li>• Construction of temporary levees</li> <li>• Provision of shelters or emergency care</li> <li>• Sandbagging • Bracing/shoring damaged structures</li> <li>• Provision of food, water, ice and other essential needs</li> <li>• Emergency repairs • Emergency demolition</li> <li>• Removal of health and safety hazards</li> </ul>
<b>C: Roads and Bridges</b>	Repair of roads, bridges, and associated features, such as shoulders, ditches, culverts, lighting and signs	<ul style="list-style-type: none"> <li>• Eligible work includes: repair to surfaces, bases, shoulders, ditches, culverts, low water crossings, and other features, such as guardrails.</li> </ul>
<b>D: Water Control Facilities</b>	Repair of irrigation systems, drainage channels, and pumping facilities. Repair of levees, dams, and flood control channels fall under Category D, but the eligibility of these facilities is restricted.	<ul style="list-style-type: none"> <li>• Channel alignment • Recreation</li> <li>• Navigation • Land reclamation</li> <li>• Fish and wildlife habitat</li> <li>• Interior drainage • Irrigation</li> <li>• Erosion prevention • Flood control</li> </ul>
<b>E: Buildings and Equipment</b>	Repair or replacement of buildings, including their contents and systems; heavy equipment; and vehicles	<ul style="list-style-type: none"> <li>• Buildings, including contents such as furnishings and interior systems such as electrical work</li> <li>• Replacement of pre-disaster quantities of consumable supplies and inventory. Replacement of library books and publications.</li> <li>• Removal of mud, silt, or other accumulated debris is eligible, along with any cleaning and painting necessary to restore the building.</li> <li>• All types of equipment, including vehicles, may be eligible for repair or replacement when damaged as a result of the declared event.</li> </ul>
<b>F: Utilities</b>	Repair of water treatment and delivery systems; power generation facilities and distribution lines; and sewage collection and treatment facilities	<ul style="list-style-type: none"> <li>• Restoration of damaged utilities.</li> <li>• Temporary as well as permanent repair costs can be reimbursed</li> </ul>
<b>G: Parks, Recreational Facilities, and Other Items</b>	Repair and restoration of parks, playgrounds, pools, cemeteries, and beaches. This category also is used for any work or facility that cannot be characterized adequately by Categories A-F	<ul style="list-style-type: none"> <li>• Roads, buildings, and utilities within those areas and other features, such as playground equipment, ball fields, swimming pools, tennis courts, boat docks and ramps, piers, and golf courses.</li> <li>• Grass and sod are eligible only when necessary to stabilize slopes and minimize sediment runoff.</li> <li>• Repairs to maintained public beaches may be eligible in limited circumstances</li> </ul>

Form from Virginia Department of Emergency Management

## Appendix C-2

JURISDICTION: \_\_\_\_\_ INSPECTOR: \_\_\_\_\_ DATE: \_\_\_\_\_ PAGE \_\_\_\_\_ of \_\_\_\_\_

Key for Damage Categories (Use appropriate letters in the 'category' blocks below)						
A. Debris Clearance		D. Water Control Facilities		G. Parks, Recreation Facilities & Other		
B. Emergency Protective Measures		E. Public Buildings & Equipment				
C. Roads & Bridges		F. Public Utility System				

SITE #	WORK CATEGORY:	NAME of FACILITY and LOCATION:				
		GPS (in decimal deg.):				
DAMAGE DESCRIPTION:						
EMERGENCY FOLLOW-UP NEEDED?		Y	N	TOTAL ESTIMATED DAMAGES: \$		
FLOOD INSURANCE		Y	N	PROPERTY INSURANCE	Y	N
				NO DATA AVAILABLE (check box)		

SITE #	WORK CATEGORY:	NAME of FACILITY and LOCATION:				
		GPS ( in decimal deg.):				
DAMAGE DESCRIPTION:						
EMERGENCY FOLLOW-UP NEEDED?		Y	N	TOTAL ESTIMATED DAMAGES: \$		
FLOOD INSURANCE		Y	N	PROPERTY INSURANCE	Y	N
				NO DATA AVAILABLE (check box)		

SITE #	WORK CATEGORY:	NAME of FACILITY and LOCATION:				
		GPS ( in decimal deg.):				
DAMAGE DESCRIPTION:						
EMERGENCY FOLLOW-UP NEEDED?		Y	N	TOTAL ESTIMATED DAMAGES: \$		
FLOOD INSURANCE		Y	N	PROPERTY INSURANCE	Y	N
				NO DATA AVAILABLE (check box)		

## Appendix D-1

Damage Definitions	General Description	Things to Look For	Water Levels
<b>DESTROYED</b>	<b>DESTROYED</b>	<b>DESTROYED</b>	<b>DESTROYED</b>
Structure is a total loss.  <u><i>Not economically feasible to rebuild.</i></u>	Structure leveled above the foundation, or second floor is gone. Foundation or basement is significantly damaged.	Structure leveled or has major shifting off its foundation or only the foundation remains. Roof is gone, with noticeable distortion to walls.	More than 4 feet in first floor.  More than 2 feet in <i>mobile home</i> .
<b>MAJOR</b>	<b>MAJOR</b>	<b>MAJOR</b>	<b>MAJOR</b>
Structure is currently uninhabitable. Extensive repairs are necessary to make habitable.  <u><i>Will take more than 30 days to repair.</i></u>	Walls collapsed. Exterior frame damaged. Roof off or collapsed. Major damage to utilities: furnace, water heater, well, septic system.	Portions of the roof and decking are missing. Twisted, bowed, cracked, or collapsed walls. Structure penetrated by large foreign object, such as a tree. Damaged foundation.	2 to 4 feet in first floor without basement. 1 foot or more in first floor with basement.  6 inches to 2 feet in <i>mobile home</i> with <i>plywood</i> floors. 1 inch in <i>mobile home</i> with <i>particle board</i> floors.
<b>MINOR</b>	<b>MINOR</b>	<b>MINOR</b>	<b>MINOR</b>
Structure is damaged and uninhabitable. Minor repairs are necessary to make habitable.  <u><i>Will take less than 30 days to repair.</i></u>	Interior flooring / exterior walls with minor damage. Tree(s) fallen on structure. Smoke damage. Shingles / roof tiles moved or missing.	Many missing shingles, broken windows and doors. Loose or missing siding. Minor shifting or settling of foundation. Minor damage to septic system.	2 inches to 2 feet in first floor without basement. 1 foot or more in basement. <u>Crawlspace</u> – reached insulation. <u>Sewage</u> - in basement. <i>Mobile home</i> , "Belly Board" to 6 inches.
<b>AFFECTED HABITABLE</b>	<b>AFFECTED HABITABLE</b>	<b>AFFECTED HABITABLE</b>	<b>AFFECTED HABITABLE</b>
Structure has received minimal damage and is <u><i>habitable without repairs.</i></u>	Chimney or porch damaged. Carpet on first floor soaked. Broken windows.	Few missing shingles, some broken windows. Damage to air conditioning units / etc. Some minor basement flooding.	Less than 2 inches in first floor Minor basement flooding. <i>Mobile home</i> , no water in "Belly Board".

IDA Tips: Estimating Water Depths

Brick - 2 1/2 inches per course

Lap or aluminum siding - 4 inches or 8 inches per course

Stair risers - 7 inches

Concrete or cinder block - 8 inches per course

Door knobs - 36 inches above floor

Standard doors - 6 feet 8 inches






Appendix F

## Damage Assessment Go Kit

- ☐ Highway & GIS or TOPO Maps
- ☐ Handlights and Extra Batteries
- ☐ Reflective Vest/Rain Gear/Gloves/Hard Toe Shoe
- ☐ Water and Snacks
- ☐ Insect Repellant
- ☐ Measuring Tape
- ☐ Camera
- ☐ Community Contact Numbers
- ☐ Assessment Forms
- ☐ Pens/ Pencils/Clipboards
- ☐ Cell Phone

## Appendix G

	<b>ARLINGTON COUNTY FIRE DEPARTMENT STANDARD OPERATING PROCEDURE</b>	
	<b>SUBJECT:     Immediate Damage Assessment Standard Operating Procedures</b>	<b>SOP# P.1/Cat 1</b>
		<b>Initiated 00/00/00</b>
	<b>APPROVED:   James Schwartz Fire Chief</b>	<b>Revised 00/00/00</b>

### A. PURPOSE

To provide guidelines for immediate damage assessment following a significant incident or disaster. Performing an immediate damage assessment within the first hours after a major incident or disaster is critical for Arlington County and the Arlington County Fire Department and its recovery efforts. The ACFD must be able to identify life safety issues and imminent hazards in order to prioritize its response and allocate resources, and specifically to request assistance from state and federal resources.

### B. Policy

The procedure shall apply to the Fire Prevention Office personnel. It shall be the policy of the Arlington County Fire Department to conduct an organized and preplanned immediate damage assessment of the community following a natural or manmade disaster.

### C. Procedure

1. In an emergency, activation of the Emergency Operations Center is begun by the Emergency Communications Center
2. In the event of an imminent disaster, the Emergency Operations Center (EOC) will be activated by the Office of Emergency Management (OEM)
3. The Fire Chief or designee will initiate the ACFD procedures for callback of all personnel
4. The Chief Fire Marshal or designee will serve as the Damage Assessment Group Supervisor (DAGS) and report to the EOC. The DAGS will gather information for areas of the community that will need assessment. An all call page for all Fire Prevention personnel will be initiated. The page will include the reporting location. If not affected, the Fire Prevention Office will normally be the reporting location.

5. Fire Prevention Office personnel will assemble in teams of two and arrange the Damage Assessment Go Kits.
6. When safe to do so and from the direction of the Chief Fire Marshal, personnel will conduct an immediate damage assessment on the effected areas of the County. Fire Box maps will be used to subdivide the county to track, chart and communicate damage that has occurred including road closures.

**Note; Fire Prevention Office personnel shall first conduct an assessment of fire stations in the effected areas.**

7. Immediate Damage Assessment reports shall be communicated back to the Chief Fire Marshal for each box as soon as practical.

#### **D. Training and Evaluation**

The immediate damage assessment procedure will be scheduled for training annually during the month of March. Personnel will focus on equipment and forms in Disaster Assessment Go Kits. This training will serve to exercise and evaluate the existing procedure. The needed forms and checklist are attached to this procedure. Any recommended changes shall be reported through the chain of command for consideration.

**END**