Effective Initial Damage Assessment

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CERTIFICATION STATEMENT

I hereby certify 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 writing of another.

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ABSTRACT

The City of Anacortes, located on Fidalgo Island, is accessible by three bridges. During a major disaster, such as earthquake, winter storm, tsunami, etc., coordinated response and recovery efforts are essential to ensure that the limited and isolated resources are properly deployed to the most critical needs. The City of Anacortes' Emergency Operations Plan assigns on-duty police officers to conduct windshield surveys in order to gather initial damage assessment information. The problem is the City of Anacortes has an inadequate plan to effectively conduct initial damage assessment information. The purpose of this research is to design an effective system to conduct effective initial damage assessments that best fits the City of Anacortes' local resources. The action research will answer four questions: What are the best practices and systems other communities utilize in conducting initial damage assessments? What kinds of training programs are implemented to train the participants? What types of human resources are utilized in conducting initial damage assessments? What job aids such as guides, forms, or applications, are utilized to conduct initial damage assessments?

To answer these questions, a survey was administered to communities of similar size and like resources. Specific individuals from some of these communities were interviewed to elicit more specific details about their programs. A Graphic Informational System (GIS) was utilized to evaluate the efficacy of the existing plan to use City of Anacortes police officers to conduct initial damage assessments, compared against deploying Citizen Patrol and Community Emergency Response Team (CERT) resources. The comparative analyses measured the time on task to gather the data. The results showed that a change in the City of Anacortes' Emergency Operations Plan (EOP) should utilize Community Emergency Response Team members and Citizen Patrol members. The action research resulted in a change in the City's EOP, adoption of a standardized system, and establishment of geographic zones for the effective management of deployed resources.

INTRODUCTION

The City of Anacortes is a small community with a population of almost 17,000 residents located on the north end of Fidalgo Island. Fidalgo Island comprises the Western most portion of Skagit County and is accessible by three bridges. Two refineries operate on Fidalgo Island adjacent to the City of Anacortes. If a disaster strikes the region, these refineries could create secondary impacts for the community, requiring evacuation or shelter in place procedures. On a daily basis, the refinery receives Bakken crude oil via tankers by rail. Island Hospital is located in the city and is a level III trauma and level II stroke hospital that provides services regionally. The hospital is certified as a 43-bed center, 31 medical/surgical, 6 labor and delivery, and 6 ICU beds (http://www.islandhospital.org/factsheet). Adjacent to the City is a navigable deep-water port where oil tankers offload crude oil at the refineries. Further, large ships load and transport prilled sulfur and coke dust—both byproducts of the oil refinery process from Anacortes. The City of Anacortes is a major port for the Washington State Ferry system, which transports vehicles and people to and from the San Juan Islands in the United States, and to Vancouver Island in British Columbia, Canada.

The problem is the City of Anacortes has not validated its current plan to conduct initial damage assessments. The City's Emergency Operations Plan (EOP) assigns on duty police officers to conduct immediate damage assessments (IDA's), or windshield surveys (Appendix A). The Anacortes Police Department has an average of three on duty police officers during each 24-hour period. Assuming the disaster does not block streets, and an officer can travel an average of 15 miles per hour, which would take three police officers several hours to traverse all the streets in order to conduct the initial damage assessment. Furthermore, citizens would likely deter police officers from completing the initial damage assessments because they are in highly visible vehicles and citizens would likely wave them down for assistance.

The purpose of this research is to design an effective system to conduct initial damage assessments that best fits the City of Anacortes local resources. The current plan as shown through a

quantitative examination, using GIS Mapping tools, proves to be ineffective—taking too long to complete, and would result in the diversion of limited and important resources.

The action research will answer four questions: What are the best practices and systems other communities utilize in conducting initial damage assessments? What kinds of training programs are implemented to train the participants? What types of human resources are utilized in conducting initial damage assessments? What job aids, guides, forms, applications, are utilized by participants while conducting initial damage assessments?

Action research methodology was applied to develop a new system for the City of Anacortes to obtain quality initial damage assessment information in a timely manner. A survey was emailed to jurisdictions in Washington State with populations between 10,000 to 50,000 citizens, to seek information from similar size jurisdictions. Nine specific questions were developed to solicit answers on IDA training, processes, resources used, and recordkeeping. Network Analyst, a GIS tool, was used to conduct quantitative analyses of the City's street network. The quantitative analyses contemplated two scenarios to evaluate the time it takes to reasonably complete the IDA for the entire City. A new system was developed for the City of Anacortes to geographically divide and assign Citizen Patrol and CERT members to conduct IDA's and report back to the Emergency Operations Center their results within the first 12 hours of an incident.

BACKGROUND & SIGNIFICANCE

The City of Anacortes is a small city, encompassing 14 square miles, containing a population of 16,048 (http://quickfacts.census.gov/qfd/states/53/5301990.html) located on the northern tip of Fidalgo Island. The south end of the island has no other incorporated cities. The City of Mount Vernon is the closest and largest municipality, located over 20 miles from Anacortes, and is where significant resources can be retrieved. This is also where the County Department of Emergency Management headquarters and County EOC is located. The City provides the typical services of similar size communities: fire protection, EMS, police, water/sewer utility, parks, street repairs,

library, and museum. Because the City is located on an island accessible by three bridges that are vulnerable to a major earthquake, the residents expect to be self-sufficient in most disaster situations for several days to weeks. Historically, only a handful of disasters have struck the City or region.

The City experienced a winter/windstorm in 1992, which caused significant damage from downed trees, fallen power lines, and damaged buildings. This event caused residents to be without power for 96 hours, and many were isolated by fallen trees for up to 36 hours or more. The City did not have a plan for conducting IDA's for this event, and damage assessment was gathered as resources cleared roads, which resulted in delays in identifying the damage and hampered the limited resources from responding to the greatest need. Residents who lived on the main arterials were served first by the City departments and utility companies. Those residents who lived off the arterial roads, many of who were elderly residents living alone, suffered for longer periods of time before resources were restored. No deaths occurred, but it was later discovered that several residents went without basic needs being met.

In December 1996, the City of Anacortes was struck by a significant snowstorm resulting in an accumulation of 34" of snow, which is unusual for the region. Up to that time, the City had received only minor accumulations of snow and as a result never invested in snowplows. Again, residents were isolated at home, and only those with four-wheel drive vehicles were able to obtain supplies, and again elderly residents were isolated in homes without heat and food supplies. Portions of the City were without power for almost 48 hours, and only two public-works pickup trucks were equipped with four-wheel drive vehicles. The 911 system was still intact so that emergency medical problems were managed by relying on these two trucks to access homes and to transport patients to the local hospital. There was still no plan for conducting IDA's and only citizens who were able to drive to the fire station or police department were able to report problems throughout the City.

In consideration of future threats to our community, the Skagit County Hazard Mitigation Plan identifies significant natural disaster types: drought, earthquake, flood, high winds,

infestation/disease, landside/erosion, lightning, storm surge, subsidence/expansive soils, urban fire, wildfire, winter storm, volcano, and tsunami. A hazard identification analyses was conducted for each disaster type that ranked the probability of occurrence, environmental damage, economic impact, property damage, health & Safety, and the area impacted. The top three ranked disaster types for our community are winter storms, high winds, and earthquakes (Skagit Council of Governments, 2014).

Almost each year the City of Anacortes experiences a winter storm, involving either an accumulation of snow, ice, or freezing rain, that disrupts services, impacts residents, and challenges resident's preparedness. Likewise, high winds impact the City of Anacortes because of what is known as the Frazier Canyon effect. "In winter, the Fraser Valley occasionally plays a significant role in the weather regime along the west coast of North America as far south as California, acting as a natural outlet for the intensely cold Arctic air mass, which typically sits over Western Canada during winter. Under certain meteorological conditions strong winds pour out of the Fraser Valley and over the relatively warmer waters of the Strait of Georgia and the Strait of Juan de Fuca ("Fraser Valley," n.d., p. 1)."

A significant earthquake is the greatest natural disaster threat to our community as indicated in the Skagit County hazard mitigation plan. "Washington ranks second in the nation (after California) among states susceptible to earthquake loss according to a Federal Emergency Management Agency (FEMA) study. More the 1,000 earthquakes are recorded in the State annually, the majority of these occurring in the Puget Sound region (Skagit Council of Governments, 2014, p. 61)." Because the City of Anacortes has the potential for major damage, multiple injuries and fatalities, a well-designed system using the full capability of community resources to quickly assess the damage following the event is imperative.

The City has an all-hazards Emergency Operations Plan since 1996 and had identified the City police department as the resource to conduct immediate damage assessments (City of Anacortes,

2014). The Anacortes police department's staffing levels fluctuate between two to five officers during each shift, with the average over each 24-hour period being three police officers. The existing plan to utilize on-duty police officers will not work well for several reasons, there are insufficient numbers of officers to drive the street network and complete the IDA's quickly. Police officers are not equipped with chainsaws and may not be able to access many of the streets during a windstorm or winter-storm scenarios. Because patrol vehicles are well marked, officers would likely be flagged down to manage an immediate crisis for the citizen(s). Lastly, the patrol officers may already be committed to higher priority emergencies and would not be available to be used for an IDA assignment (B. Bowers, Police Chief, personal communication, July 16, 2014). This particular study is essential for the City of Anacortes so that a new system and plan can be developed to effectively conduct initial damage assessments in the time frame of 12 hours or less. This study is also paramount so that limited resources can be dispatched and assigned to the most critical of incidents.

"The goal of this EAFSOEM course is to prepare senior fire officers in the administrative functions necessary to manage the operational component of a fire department effectively…and to improve the knowledge, skills, and attitudes (KSAs) required of fire service leaders when applied to large-scale multiagency emergency incidents in their communities (FEMA/USFA/NFA, 2013, Chapter 1)." This research project will increase KSAs to effectively improve our response to major disasters and enable our community to report initial damage assessment information, further enabling our limited resources to be assigned properly.

The United States Fire Administration's Strategic Goals are: Reduce risk at the local level through prevention and mitigation; Improve local planning and preparedness; Improve the fire and emergency services' capability for response to and recovery from all hazards; Improve the fire and emergency services' professional status; Lead the Nation's fire and emergency services by establishing and sustaining USFA as a dynamic organization (United States Fire Administration [U.S.F.A.], 2010-2014, p. 13). This research project will reduce community risk through the

effective assignment of resources to the most critical issues; improve local planning and preparedness by establishing a procedure for conducting damage assessments in a timely manner; improve fire service capability by reserving critical resources for the most critical issues; improve the professional status of the fire service through leadership in development of the IDA process, and reinforcing the USFA as a dynamic organization through promotion of the information learned at the National Fire Academy's Executive Fire Officer Program.

LITERATURE REVIEW

The comprehensive emergency management approach contains four phases to managing disasters, which function simultaneously between State, County, and local governments. These phases are mitigation, preparedness, response, and recovery. The mitigation phase is conducted prior to the disaster occurring and is predictive in nature. The goal is to assess potential risks and work toward ways to reduce that risk to the community. For example, Skagit County governments participate in a countywide hazard mitigation planning process, which is required under the Disaster Mitigation Act of 2000. The process involves the evaluation of each hazard type that may be faced by the community, and then an assessment of vulnerability of the community after considering historical patterns, infrastructure weaknesses, and the intensity or impact of the disaster type. A numerical priority ranking is developed for the community after scoring each of these factors. Then, each jurisdiction provides a list of mitigation efforts that rank highest within their community, which is coordinated with the County and State for grant funding. The plan is updated every decade and approved by FEMA (Skagit Council of Governments, 2014).

The preparedness phase involves activities that agencies and individuals can do to prepare for a potential disaster. For example, boarding up windows, stockpiling supplies, sheltering, and evacuating the area reduce the potential damage and risk to people before the disaster strikes. Further, personal preparedness such as sufficient food and water storage will reduce the impact on the

emergency response system.

The response phase follows the disaster impact with priority given to life safety, incident stabilization, and property conservation. Resources deployed can reduce the impact of the disaster effects through mitigating further damage. For example, shutting down water lines protect property or evacuating community members from the area of a hazardous materials release reduces the risk to life in a disaster. In order to effectively respond to the impacts, immediate damage assessment is a critical component of the response phase.

The recovery stage can be divided into short-term (up to two weeks) and long term, (months or years after the disaster impact). The short-term involves the recovery of basic human needs to as normal as possible. This could include restoring utilities (water, sewer, power), providing food supplies, and securing shelter needs. The long-term recovery will be directly proportional to the impact of the disaster. For example, a major earthquake or tornado can completely devastate utilities and buildings in a community, which can take months to years to completely recover (National Fire Academy, 1998).

The Comprehensive Emergency Management Plan for Skagit County places the responsibility on immediate damage assessments on local and county governments (Skagit County Department of Emergency Management Office [Skagit County DEM], 2009). Initial or urgent damage assessment survey activities must be promptly carried out to provide the EOC with disaster situation information. "The goals of conducting an initial or urgent damage assessment survey are to determine: Boundaries of the disaster area and identify the jurisdictions impacted [sic]; Status of transportation routes and communications systems; Status of operating facilities and critical facilities; Status of key personnel; Hazard-specific information and access points to the disaster; Priorities for response and resource shortfalls (Skagit County DEM, 2009, p. 9)." The City of Anacortes Emergency Operations Plan

does not have an effective plan to conduct immediate damage assessments. However, responsibilities within the framework of a disaster are outlined for each City department with windshield surveys generally to the police department (City of Anacortes, 2014).

The EAFSOEM Student Manual identifies two types of damage assessments, "Immediate" and "Preliminary." "An immediate damage assessment is a rapid estimate of damage at a specific incident site or within an incident area. The immediate damage assessment is made on initial arrival at the incident site or area. The information obtained during the immediate damage assessment is used for a variety of purposes during the active phase of the incident or event. A preliminary incident damage assessment is a detailed examination and analysis of the total damage at a specific incident site or within an incident area. The preliminary incident damage assessment is conducted after the active phase of the incident has been concluded (FEMA/USFA/NFA, 2013, p. 4-5)."

The research paper titled "Need for Rapid Assessment in the Tacoma Fire Department" has no policy or procedure to conduct rapid damage assessments, like many fire service agencies (Mueller, 2013). A survey in Klamath County, Oregon showed that 69% of organizations do not have an immediate damage assessment procedure (Hard, 2007). Gillis conducted a survey of similar size communities, which were also former Executive Fire Officer students. He reported that 55% of organizations surveyed did not have a plan for Immediate Damage Assessment (Gillis, 2012). The City of Anacortes has identified the police department within the emergency operations plan to conduct windshield surveys, but there are no internal procedures outlining how to conduct immediate damage assessments. Police personnel have not been trained to conduct immediate damage assessments, and there are no instruments to record and report the data to the EOC.

"There are numerous benefits to conducting a rapid damage assessment during a major natural disaster. One of the most important benefits is that emergency responders accurately gauge the size,

scope, and magnitude of an incident to ensure that the limited resources are directed and allocated to appropriate areas of the community (Mueller, 2013, p. 10)." Berman discussed benefits in utilizing volunteer citizen groups for performing immediate damage assessments: The need exists to pre-plan how an organization is going to conduct rapid damage assessments, volunteer groups outside the fire service agency are able to help, and using such resources can be cost effective (Berman, 2011). "The rapid damage assessment allows the incident commander to get a handle on the event and will assist in determining and managing the kind and amount of resources to mitigate the event, which will in turn aid in the reduction of life and property loss (Grendze, 2011, p. 7)."

An EFO research paper titled "Validating the Efficacy of Windshield Surveys" reviews the efficacy of the current policy for Tualatin Valley Fire and Rescue (TVF&R). TVF&R is an independent fire district from other local governments and has developed an independent damage assessment program for each of its 22 fire stations. After assessing its internal communications equipment and facilities, crews are directed to conduct windshield surveys in their first due area, initially checking "critical facilities: schools (if in Session), hospitals/nursing homes, government buildings, bridges, overpasses, and haz-mat storage facilities (Collins, 2011, p. 63)." Gillis' concluded from his research that dividing the jurisdiction into geographic areas would better enable management of the resources and information performing the IDA. He also concluded that the IDA team should use FEMA's four point system of building types: Single family home (SFH), multi-family home (MFH), mobile home (MH), and commercial structure (COM) (Gillis, 2012).

One of the issues that many of the research papers discussed was the type of resources used to conduct immediate damage assessments. Most of the research papers indicate that the fire department is responsible for conducting immediate damage assessment. Some variables are whether the organization is part of a City or an independent fire district, the amount of fire service resources available, and how much staffing is assigned to each station. Chief officers from the Roanoke Fire

Department who have past experience with incident management and disaster management believe that fire station personnel are best suited for conducting rapid damage assessments (Armstrong, 2009).

TVF&R has a pre-designated route for each station and has identified the particular critical facilities that should be evaluated. Collin's research showed that 91% of agencies surveyed do not have pre-designated routes. Also, by TVF&R policy, the engine company officer has the discretion to render aid while conducting the rapid damage assessment. His research identified a flaw in the system. If a crew is diverted to render aid, then there is no plan to complete the damage assessment (Collins, 2011).

The author questions the validity of sending public safety resources (Firefighters and Police Officers) to conduct community wide immediate damage assessments because they could be easily diverted to serving emergency needs while traveling through community. How does an engine company pass a burning structure to complete the damage assessment? How does a police officer pass criminals looting a grocery store? Some research discussed the need for other agencies to coordinate the damage assessment activities with citizen groups. "There is the opportunity for citizens within TVF&R's jurisdiction to participate in CERT and assist in damage assessment; however, there have not been collective drills to assess the coordination of these citizen's efforts (Collins, 2011, p. 33)." "In its discussion regarding the functions of a CERT, FEMA EMI (2003) emphasized that collection of disaster intelligence by CERT assists responders with prioritization and allocation of resources (TeKippe, 2003, p. 48)." Gillis concluded, "…IDA teams should be comprised of personnel from different agencies. With the limited resources the fire department would have for emergency response, assigning response resources may quickly deplete response capability. The researcher determined that an IDA team should consist of at least three people incorporating fire personnel (not assigned to operational positions), public works personnel, other

Town employees as well as CERT members (Gillis, 2012, p. 26)."

In reviewing the literature and research by others, the author believes that too much emphasis is placed on plans to exclusively utilize public safety resources to conduct the initial damage assessments. Too often those resources will likely be diverted to take immediate actions and that the immediate damage assessments will likely be delayed, stalled, or never completed. This general approach taken by many fire service agencies will result in limited and critically important resources being self-assigned to lower priority issues. This review has reinforced the importance of utilizing community resources, such as CERT, Citizen Patrol, HAM and Medical Reserve Core members, to be incorporated in a plan to conduct the immediate damage assessment, then reserving the fire, police, and EMS resources for the greatest identified needs.

PROCEDURES

A search for applied research projects (ARP's) on the National Fire Academy's card catalogue on "Damage Assessments" revealed 163 possible papers for review. The search was then narrowed to "Immediate Damage Assessments" resulting in 43 possible papers. A search of Rapid Damage Assessments" resulted in 66 possible papers for review. The author then narrowed the search to the years 2003 through 2014 and refined it to "Development of Immediate or Rapid Damage Assessments" which resulted in eight applied research projects. These eight research projects are examined and discussed in the literary review, and provided the author a broader understanding of the issues and to more effectively conduct this research. The Anacortes Fire Department Library was also searched for books, journals and other articles on immediate damage assessments.

In order to conduct the prescribed research, a survey was developed to get the key answers to the four research questions. A nine-question survey was developed to obtain answers to the primary

research questions. Because each state is unique in how they mange damage assessments and the effectiveness of the local jurisdiction is dependent on local resources, the author restricted the survey sample to Washington State Fire Service agencies having similar characteristics: incorporated cities, or fire districts that serve incorporated cities, and a population from 10,000 to 50,000 residents. The Washington State Fire Chief's Handbook, which lists each fire department, contact information, and basic demographic information, was used to develop an email list for the survey. A total of 44 fire departments were identified that met the criteria, in total, encompassing a population of 1,084,236 residents.

An email list was developed to include the Fire Chief and Administrative Secretary in order to improve responses. The City of Anacortes has a subscription to Survey Monkey and the program was used to develop the questions. The nine questions developed included forced choice answers, multiple answers, with most questions containing an "other" category to obtain responses that the question was unable to fully capture, or information that the author failed to recognize in the development of the question. The survey was distributed via email to the respondents, asking for a response within one week time period.

The inclusion of only 44 potential respondents in the survey pool is a limitation for this survey. Another limiting factor is that only fire service agencies were included in the sample. Cities often have public works, police, and parks departments who may have differing attitudes, perspectives, and knowledge about the jurisdiction's immediate damage assessment program.

In this research, a comparison of the current plan was made in conducting immediate damage assessment versus a proposed change utilizing volunteer resources. The city's GIS department was solicited to conduct a quantitative comparison between the two plans. The current plan is to deploy city police officers to conduct windshield surveys, with an average of three officers on duty for each shift. The city's Esri© GIS program, Network Analyst, was used to evaluate the time it would take for three police officers to travel each street and record the damage assessment. The GIS department

divided the city into three zones that corresponded to the response zones for each of the three fire stations located in the community. Each street segment was changed from the normal street speed limits to a 15 MPH travel speed in order to simulate a vehicle traveling slowly enough to record damage assessment data. The GIS Network Analyst program simulated the most efficient drive time, totaling the number of minutes it would take for each of the 3 zones to complete the assessment.

Then, the city GIS took the City Map and divided the city into 12 zones, which visually seemed to be logically and equally distributed, simulating Citizen Patrol members and Community Emergency Response Team volunteers conducting the immediate damage assessments. Again, the street travel time was adjusted to 15 MPH for each zone to simulate a vehicle driving slowly enough to record data on damage assessments. After running the simulation with the GIS Network Analyst, it showed the timing of three particular zones took much longer than the other nine zones. Therefore, the zone boundaries were realigned, and the program simulation was run again. This balanced each of the 12 zones more equally, and provided the basis for the final analyses.

While this assessment is a good estimation of the time to conduct the immediate damage assessments, the type and extent of damage would likely change the actual time required to complete each zone. For example, barriers across roadways would inhibit travel time, and extend the time needed to complete a zone. The Network Analyst also chose the starting point and travel route, which maximized the most efficient time to complete each zone.

RESULTS

The results of the survey assisted the author in obtaining the key answers to the four research questions: What are the best practices and systems other communities utilize in conducting initial damage assessments? What kinds of training programs are implemented to train the participants? What types of human resources are utilized in conducting initial damage assessments? What job aids, such as guides, forms, applications, are utilized by participants while conducting initial damage assessments? Of the 44 potential respondents, 29 surveys were returned, equaling a 66% return rate.

Question #1: *If your community suffered a major disaster, what resources would be deployed to conduct windshield surveys in the first 12 hours in order to determine immediate damage and/or injuries? (Check all that apply).* The results showed that 69% of respondents utilize the Police Department, 93% utilize the Fire/EMS Department, 69% utilize the Public Works Department, and 24% utilize the Parks Department (Figure 1). The most common narrative response for three respondents was to utilize the Building Department. Only one respondent utilized CERT members.

Question #2: *Would you receive immediate damage assessment information in other ways, if so how? (Check all that Apply).* The results showed that 97% would receive damage assessment from 911 calls to the dispatch center, 83% from walk-in reports, 66% from HAM Radio operators, and 59% from CERT team members (Figure 2). Two respondents also relied on social media to receive damage assessment information.

Question #3: *What is the average On-Duty Personnel in each division of service in a 24 hour period?* Forty seven percent (47%) of agencies reported to have an average of two (2) police officers. Thirty Nine percent (39%) reported to have an average of six (6) firefighters. And thirty nine percent (39%) of the agencies have an average of six (6) Public Works (Figure 3).

Question #4: *Does your jurisdiction conduct training on Immediate Damage Assessment?* Eleven percent (11%) of respondents report that they conduct training each year, 35% conduct training once every three years, 23% conduct training once every five years, and 31% never have provided immediate damage assessment training (Figure 4).

Question #5: *How many hours of training do you average, per training interval in the previous question?* Four hours of training is conducted for 50% of the respondents, eight hours of training is conducted for 8% of the respondents, and no respondent provides sixteen hours of training (Figure 5). One respondent reported in the narrative that they provide 2 hours of training.

Question #6: *How do you collect and track Immediate Damage Assessment reports? (Check All that Apply).* Eighty-eight (88%) percent of the respondents rely on radio reports to a central

location. Seventy-two (72%) percent rely on walk in reporting, Sixty percent (60%) rely on telephone reports to a central location. Fifty-two percent (52%) rely on paper form transferred to a central point, Sixteen percent (16%) transfer electronic forms manually, and Sixteen percent (16%) upload the data electronically to a central location (Figure 6).

Question #7: *What categories would you assess during the Immediate Damage Assessment phase? (Check All that Apply).* Emergency medical rescue needs and fire suppression both rank at the top of the list for items to be assessed during immediate damage assessment totaling 100% each. Critical infrastructure is rated second at 88%, hazardous materials releases at 80%, commercial districts at 68%, residential neighborhoods at 48%, ending with civil disorders at 28% (Figure 7). Two narrative responses assess transportation networks as well.

Question #8: *Do you have pre-planned geographical zones for the deployment of personnel for conducting Immediate Damage Assessments?* Over half, 52% of respondents, have pre-planned geographical zones to conduct immediate damage assessments, and 48% have none (Figure 8).

Question #9: *How quickly do you estimate that Immediate Damage Assessments can be completed for your community?* Thirty-two percent (32%) of the respondents estimate that they can complete their immediate damage assessment within 6 hours or less. Twenty-eight percent (28%) can accomplish damage assessment in 6-12 hours, while another 28% of the respondents can accomplish damage assessment between 12–24 hours. Twelve percent (12%) of respondents estimate that it will take 24 or more hours to complete the task (Figure 9).

The GIS network analyst program results show that it would take three police officers approximately from 90 to 340 minutes with the average time taking 196 minutes to accomplish the immediate damage assessment, assuming that no roadway obstacles occur (Figure 10). In comparison, with the City divided into 12 zones utilizing Citizen Patrol and CERT members, the time to complete the immediate damage assessment would take from 22 to 88 minutes, with the average taking 49 minutes (Figure 11).

Table 1

Summary GIS Analyst Results

Three Zone Comparison – Utilizing Police Officers	
ZONE	MINUTES
Zone #1	340
Zone #2	159
Zone #3	90
Average	**196**

Twelve Zone Comparison – Utilizing CP & CERT Members	
ZONE	MINUTES
Zone #1A	44
Zone #1B	57
Zone #1C	88
Zone #1D	32
Zone #1E	44
Zone #1F	75
Zone #2A	47
Zone #2B	58
Zone #2C	22
Zone #2D	32
Zone #3A	38
Zone #3B	52
Average	**49**

DISCUSSION/IMPLICATIONS

One of the major themes discussed in the literature review was the use of public safety resources (police officers and firefighters) being the most commonly used for immediate damage assessments (IDA's) tasks. This was also corroborated by the author's survey that showed that firefighters and police officers ranked first and second, respectfully, for IDA plans. In fact, the research data shows that jurisdictions utilize fire, police, public works employees in a combined

effort to conduct IDA's. The immediate damage assessment deployment found in the literature ranged from conducting only critical infrastructure to a systematic neighborhood by neighborhood survey. The author's research shows that 52% of the Cities in Washington State have pre-designated zones or routes for IDA plans. However, other research of 150 urban and suburban jurisdictions in Oregon State showed that 91% of agencies surveyed do not have pre-designated routes (Collins, 2011).

Interestingly, the research and literary review correspond in that very few jurisdictions utilize volunteer groups to conduct IDA's, although the author's research found that 59% of the jurisdictions in Washington State do rely on casual reports from CERT members. TeKippe's research for City of Des Moines Fire Department considered the possibility of utilizing CERT members, but concluded not to recommend doing so. "The DMFD should create an internal damage assessment process. This process may impact the stated problem by providing responding personnel with a means to conduct and record damage assessment information before, during, and after emergency responses (TeKippe, 2003, p. 47)." This recommendation was largely based on the inadequacy of the City's current CERT program. Therefore, he recommends continuing to use public safety personnel. The number of on-duty public safety personnel is an important factor in determining the efficacy of utilizing those resources.

The sample group in the author's research had a population range from 10,000 to 50,000 residents. The Author's research of comparable size communities in Washington State revealed that 47% have an average of two (2) police officers, and 39% have an average of six (6) firefighters on duty. While police and public works employees typically operate individually, fire service personnel operate in teams of two or more; therefore, if you consider the average number of firefighting personnel on duty, there are only two or three units available.

The implications of dedicating critical and limited resources to a task that could be accomplished with CERT members may delay those resources to be used elsewhere. In particular,

fire and police vehicles traveling through areas devastated by a disaster would likely be waved down by residents and would likely be distracted from finishing the IDA process. Tualatin Valley Fire and Rescue has a policy to provide guidance on this issue, adding credence to the fact that personnel will likely be deterred from completing the IDA process: "Ninety-five percent of the organizations surveyed stated that response companies were given latitude to stop and render aid while completing the damage assessment and continue to use a common dispatch protocol if available immediately following a catastrophe (Collins, 2011, p. 34)."

Research for the City of Tacoma, Washington, resulted in a policy that instructs engine companies to drive pre-designated routes without stopping to render aid. "'The routes will be driven with emergency lights activated, no sirens, and routine speed unless otherwise directed.' 'The expectation is that they will be completed in 30 minutes or less without stopping (Mueller, 2013, p. 18).'" While this is the City of Tacoma's policy, the author believes this will be difficult policy to adhere to and could fail during a major disaster.

Instead of developing polices to mitigate the potential flaw in the system design, the author believes it would be more prudent to train and activate Citizen Patrol and CERT members within the community to conduct community wide IDA's rather than utilize limited and critical resources such as police officers, firefighters, and public works personnel. Other research from the literary review did not consider the staffing levels, although some of the agencies represented large metropolitan cities with a greater level of resources.

Considering that the City of Anacortes has an average of three police officers and four firefighters on duty, deploying these resources to conduct IDA would quickly exhaust the ability to respond to life safety issues. Likewise, the IDA process would stand a high probability of failure if, and likely when, fire and police resources stop to render aid, extinguish a fire, become stranded by falling debris, or any number of other issues.

RECOMMENDATIONS

The City of Anacortes should formalize a program to train, activate, and deploy Citizen Patrol and CERT members of the community to conduct immediate damage assessments. The City will need to identify willing Citizen Patrol and CERT members that are strategically located within each of the 12 IDA zones. A policy must be developed to instruct members on the IDA process, how teams are activated, how information is recorded, and the means of communicating that information to the Emergency Operations Center. A set of forms to record the damage assessment information should be developed and distributed to team members in advance so that they are readily available. A zone map and street index will need to be provided so that each team members will know the boundaries of their zone, track their progress, and indicate which streets they are responsible to assess (Appendix B).

The City of Anacortes will need to develop a comprehensive training program including an annual refresher component. The purpose of conducting damage assessments should be explained in detail so that participants understand the importance of this program. A portion of the training will need to focus on the specific types of disasters facing the community, frequency, history, and potential impacts. Further, the mitigation efforts currently in place or planned to be undertaken by the City should be described in detail. An elementary primer on building construction and vulnerabilities under wind, earthquake, fire and flood scenarios will serve the participants well for assessing damage.

The training program will need to instruct the team members how to categorize buildings and the varying degrees of damage based on different types of disasters. The training program will need to provide instruction on how to record the information on forms, and where to transfer the data. Finally, the City of Anacortes will need to update the existing Emergency Operations Plan (Appendix A) to indicate the Citizen Patrol and CERT members will be responsible to conduct the IDA rather than police officers.

Future researchers should investigate active IDA programs that use volunteer citizen groups such as Amateur Radio, CERT, Citizen Patrol, Medical Reserve Corp, and others to determine the efficacy of utilizing these types of resources for immediate damage assessments.

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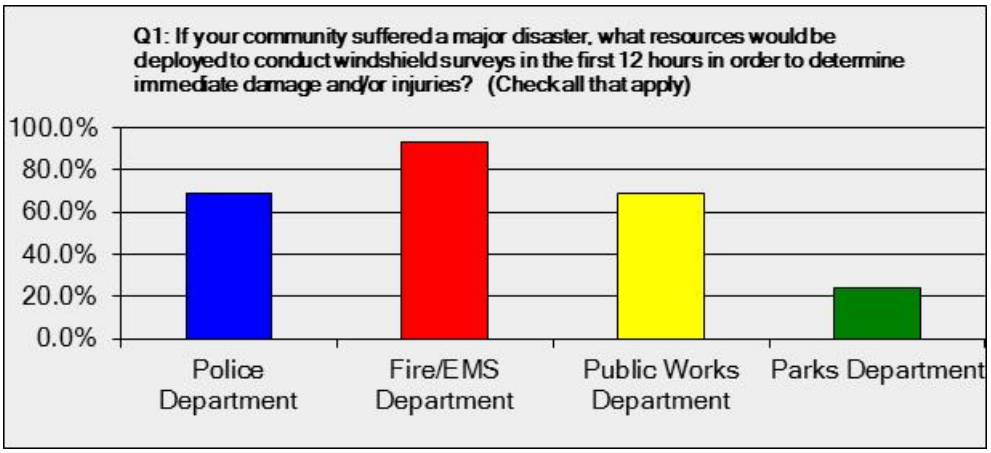


Figure 1: Question 1 summary, Reprinted [or adapted] from SurveyMonkey, by R.B.Curtis, 2014, https://www.surveymonkey.com, 2014 Reprinted [or adapted] with permission.

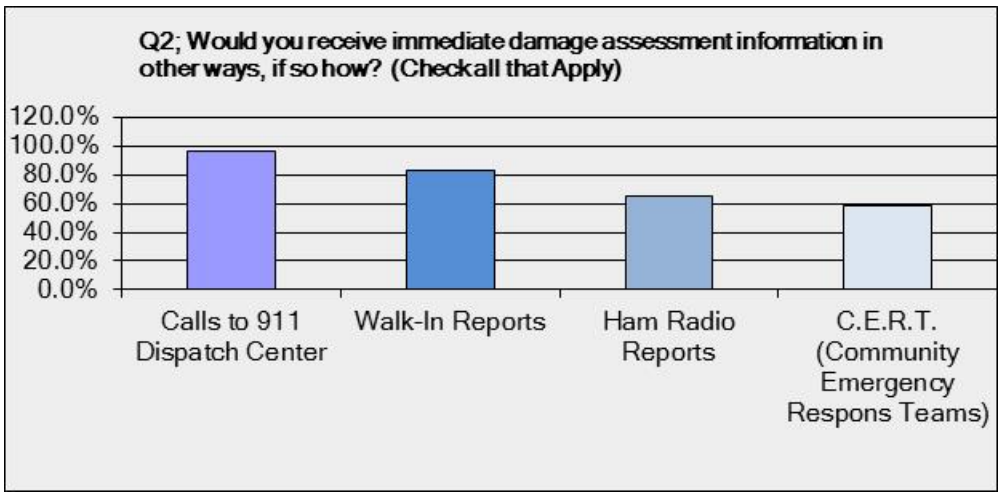


Figure 2: Question 2 summary, Reprinted [or adapted] from SurveyMonkey, by R.B.Curtis, 2014, https://www.surveymonkey.com, 2014 Reprinted [or adapted] with permission.

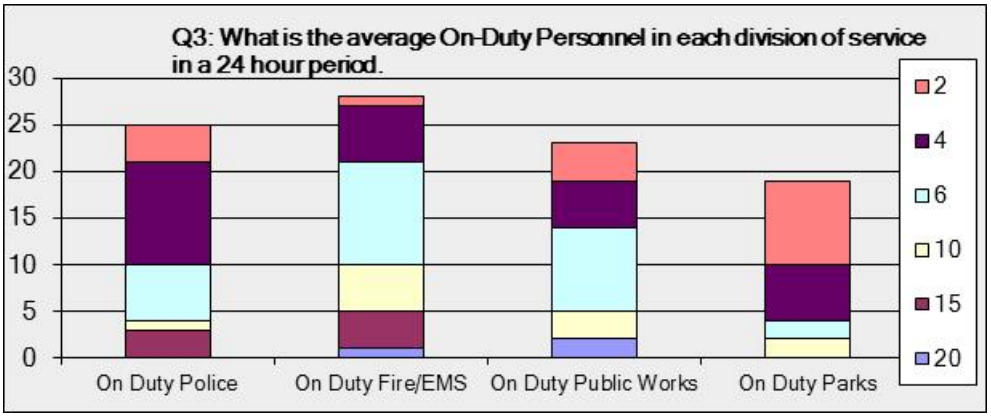


Figure 3: Question 3 summary, Reprinted [or adapted] from SurveyMonkey, by R.B.Curtis, 2014, https://www.surveymonkey.com, 2014 Reprinted [or adapted] with permission.

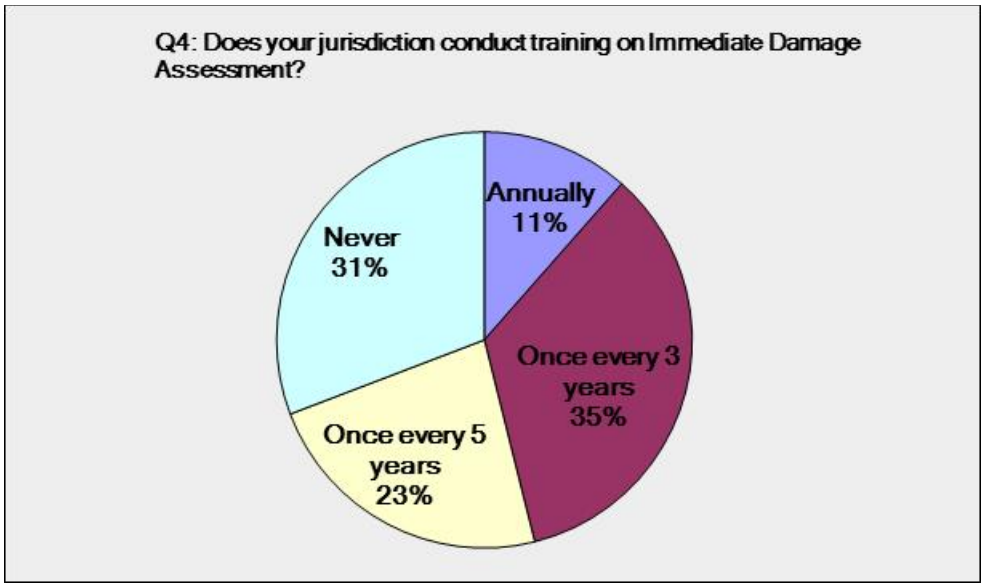


Figure 4: Question 4 summary, Reprinted [or adapted] from SurveyMonkey, by R.B.Curtis, 2014, https://www.surveymonkey.com, 2014 Reprinted [or adapted] with permission.

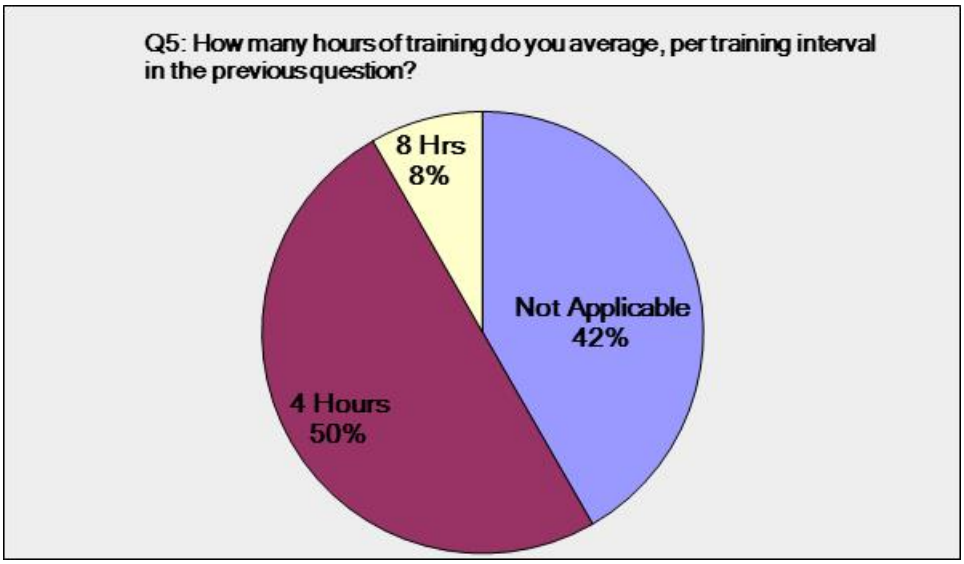


Figure 5: Question 5 summary, Reprinted [or adapted] from SurveyMonkey, by R.B.Curtis, 2014, https://www.surveymonkey.com, 2014 Reprinted [or adapted] with permission.

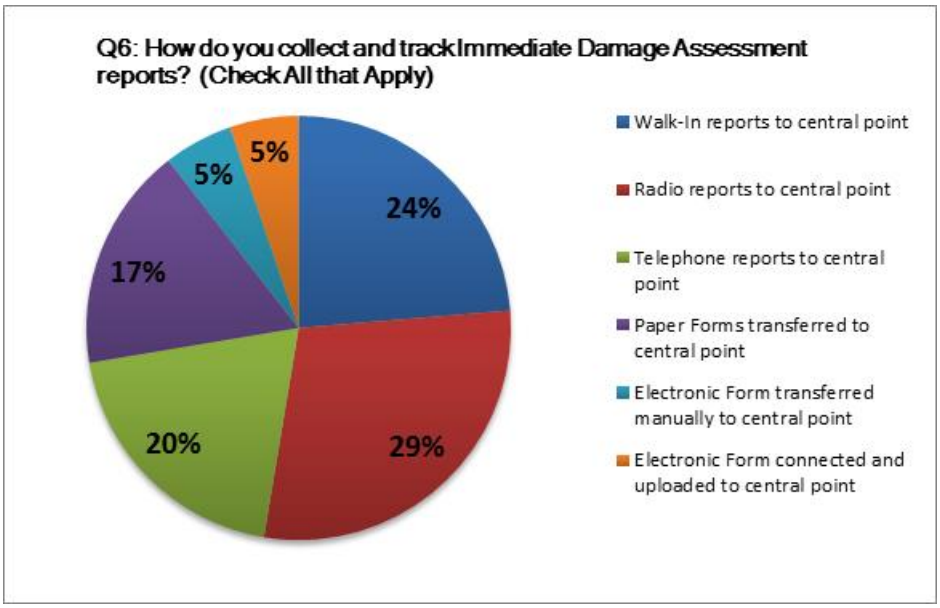


Figure 6: Question 6 summary, Reprinted [or adapted] from SurveyMonkey, by R.B.Curtis, 2014, https://www.surveymonkey.com, 2014 Reprinted [or adapted] with permission.

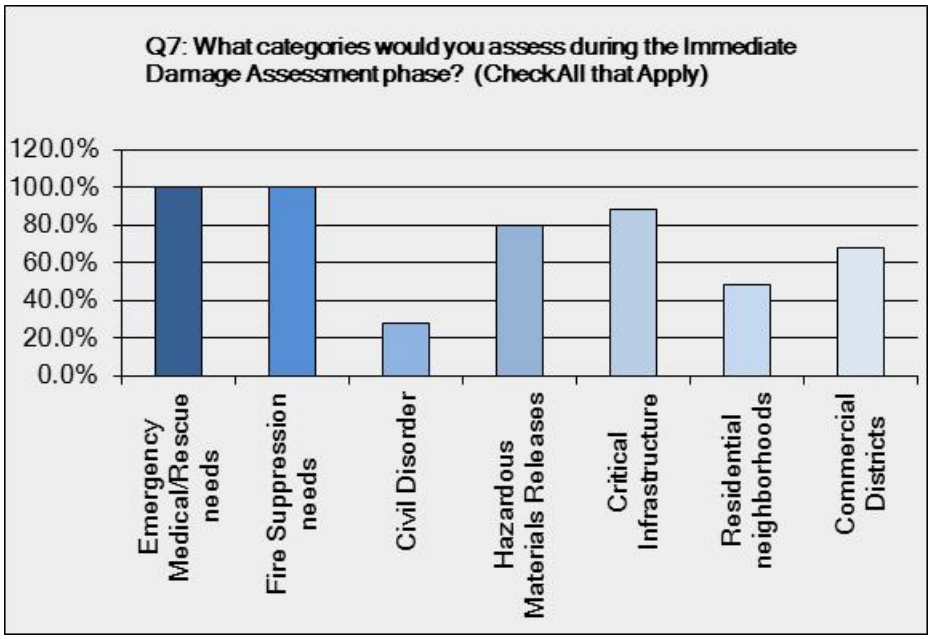


Figure 7: Question 7 summary, Reprinted [or adapted] from SurveyMonkey, by R.B.Curtis, 2014, https://www.surveymonkey.com, 2014 Reprinted [or adapted] with permission.

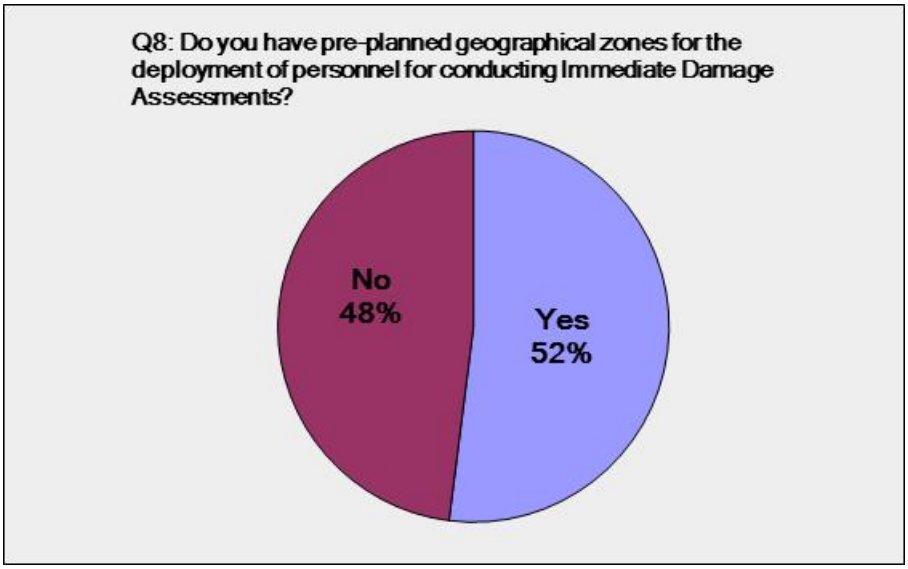


Figure 8: Question 8 summary, Reprinted [or adapted] from SurveyMonkey, by R.B.Curtis, 2014, https://www.surveymonkey.com, 2014 Reprinted [or adapted] with permission.

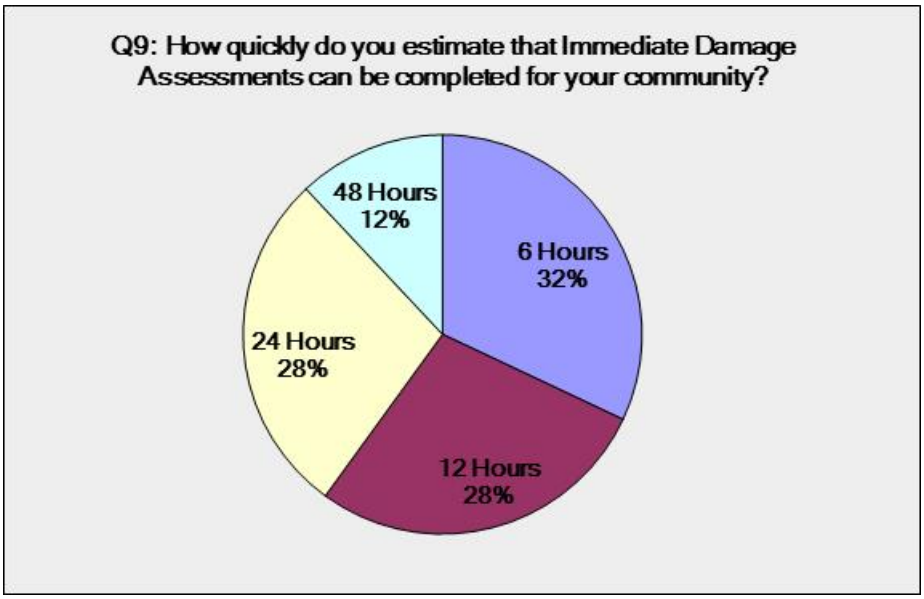


Figure 9: Question 9 summary, Reprinted [or adapted] from SurveyMonkey, by R.B.Curtis, 2014, https://www.surveymonkey.com, 2014 Reprinted [or adapted] with permission.

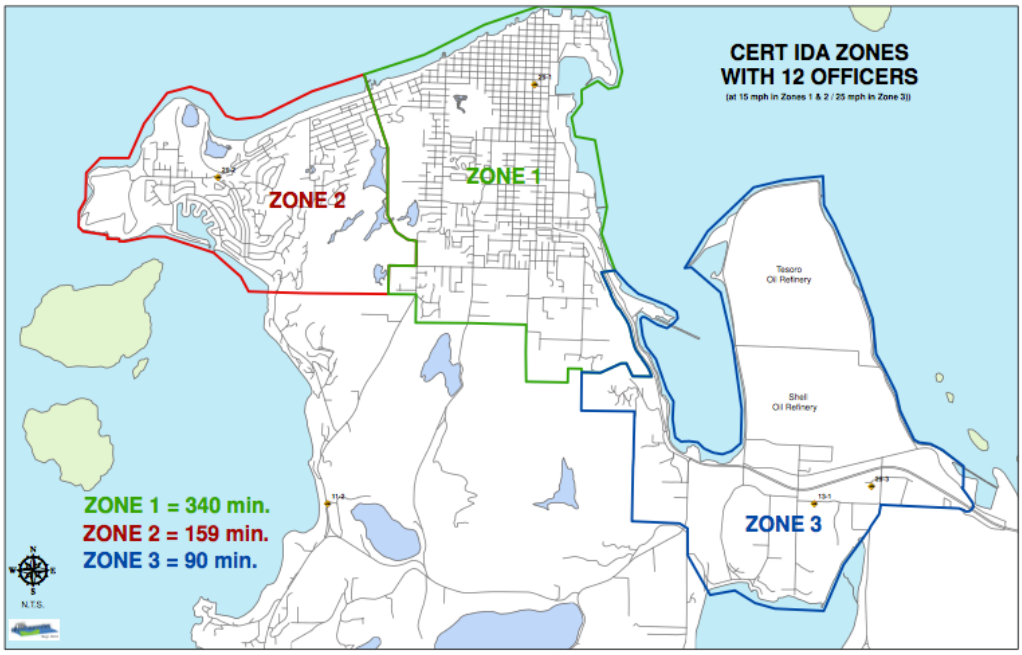


Figure 10: Analyses of 3 IDA Zones, Reprinted [or adapted] from ESRi, by R.Hoxie, 2014 Reprinted [or adapted] with permission.

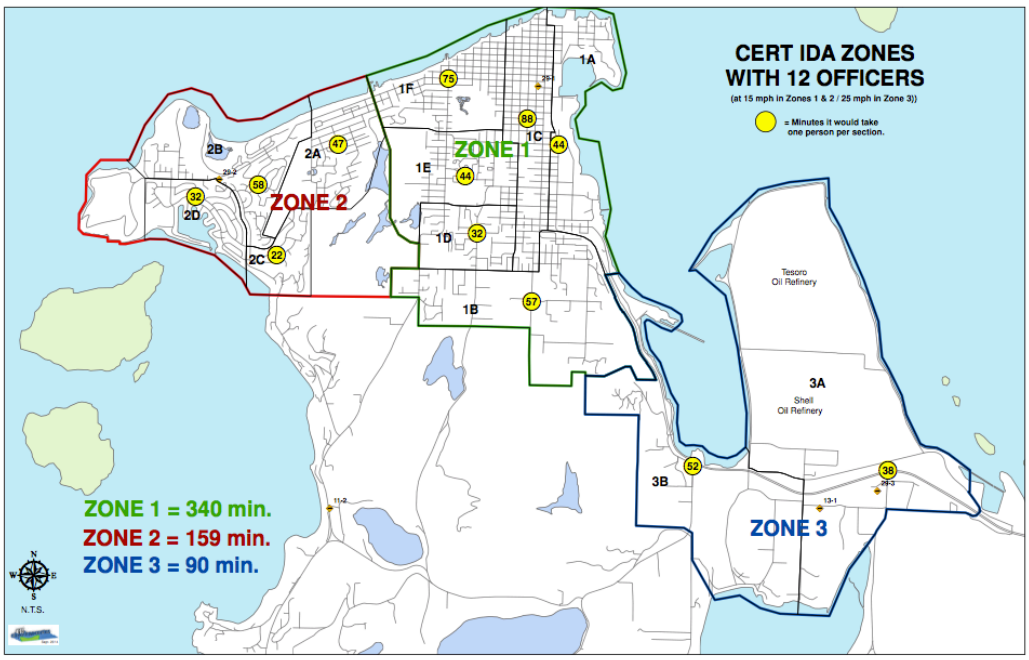


Figure 11: Analyses of 12 IDA Zones, Reprinted [or adapted] from ESRi, by R.Hoxie, 2014 Reprinted [or adapted] with permission.

APPENDIX A

EXISTING EMERGENCY OPERATIONS PLAN
Windshield Surveys

Police Chief:

- Assign a representative to the E.O.C. to act in cooperation with other city agencies.
- Deploy police officers to conduct windshield surveys and report damage to EOC.
- Issue instructions to ensure the coordinated and effective deployment of personnel and equipment.
- Evaluate the need for additional personnel and equipment, request assistance, and coordinate incoming mutual aid law enforcement units from other jurisdictions.
- Coordinate with the Incident Commander for the establishment of staging areas for outside personnel and equipment.
- Establish communication liaison with outside agencies as needed.
- Keep the Incident Commander, Mayor and other City officials informed as to police activities related to the emergency.
- Provide accurate and updated information to the Public Information Officer on a regular basis.
- Assist with the rapid dissemination of warning and emergency information to the public.
- Coordinate evacuation of endangered areas and oversee security, area access, crime prevention and law enforcement patrols.
- Establish crowd and traffic controls and direct the use of signs and barricades for crowd and traffic control, security, and access control.
- Initiate mass arrest procedures if necessary.
- Impose a curfew if necessary.

APPENDIX B

PROPOSED PLAN

DAMAGE ASSESSMENT PLAN

GOAL: To ensure that limited resources are assigned and directed to the most critical issues first.

OBJECTIVE: Utilize available community resources such as CERT, Citizen Patrol (CP), and Building Safety Evaluation Team (BSET) members to conduct a immediate and long term damage assessments throughout the City.

CONCEPT OF OPERATIONS: The City will incorporate a three phase approach to conducting damage assessments.

- Phase I will involve City resources to assess the Critical Infrastructure Lists, completed within the first 12 hours.
- Phase II will utilize CERT and Citizen Patrol Members (CP) to conduct rapid and immediate survey of the entire City.
- Phase III will utilize Building Safety Evaluation Team which will evaluate and value the damage to structures throughout the City. This will begin 12 hours after the incident and may take as long as 96 hours.

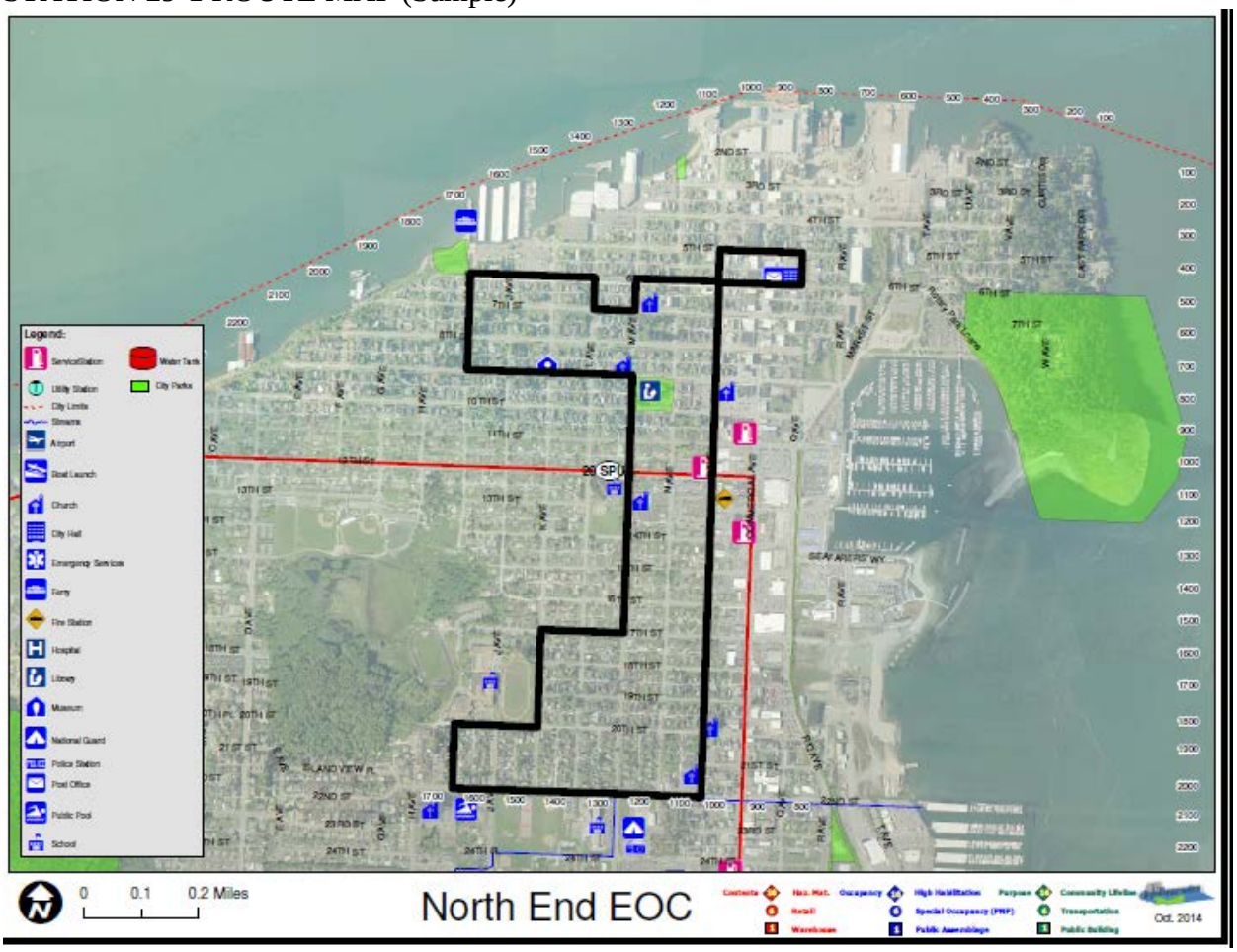
PROCEDURES:
Phase I: Anacortes Police and Fire Departments will conduct a rapid survey of the critical infrastructure within their pre-assigned locations. This will be conducted on CIKR Chart Form and transmitted to the City EOC. Units shall conduct assignment with lights on and occasional siren use.

Phase II: Pre-designated CERT and CP members will conduct survey for life safety, property conservation, and environmental issues on the "Immediate Damage Reports." Once the pre-designated survey areas are complete, the forms and information will be transmitted to the City EOC. The information may be transmitted by hand delivery to EOC and/or local Fire Station. The information may be also give to a local HAM radio operator in contact with the EOC, and then transmitted over short band to the EOC. Attached area maps and forms are attached.

Phase III: Members of the Building Safety Evaluation Team (BSET) will utilize the immediate damage assessment reports and begin a more thorough evaluation of structural issues, loss estimates and report any other immediate concerns discovered to the EOC.

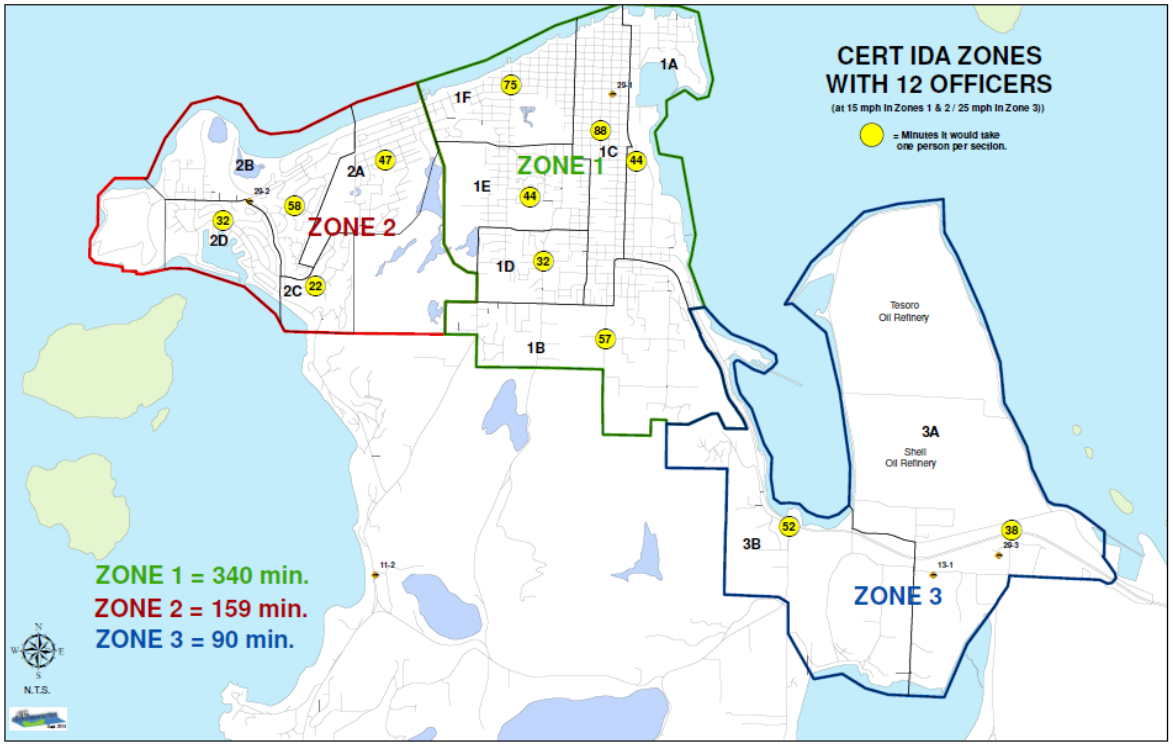
PHASE I PLAN

STATION 29-1 ROUTE MAP (Sample)



PHASE II PLAN

CITIZEN PATROL AND CERT ZONES (Sample)



CITY OF ANACORTES – IMMEDIATE DAMAGE ASSESSMENT FORM

ZONE 1D

Address	Residential	Commercial	Streets	Life Safety	Notes
	M=Minor (<25%) MJ=Major (25>50%) D=Destroyed (>50%)	M=Minor (<25%) MJ=Major (25>50%) D=Destroyed (>50%)	M=Minor (<25%) MJ=Major (25>50%) D=Destroyed (>50%)	D=Death R=Rescue MJ=Major Injury MI=Minor Injury PA=Public Assistance	
1012 38th Street					
1014 38th Street					
1015 38th Street					
1016 38th Street					
1017 38th Street					
1018 38th Street					
1019 38th Street					
1020 38th Street					
1021 38th Street					
1022 38th Street					
1023 38th Street					
1024 38th Street					