STANDARD OF COVER
OBJECTIVE DEPLOYMENT ASSESSMENT

EXECUTIVE LEADERSHIP

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ABSTRACT

This research project produced a document that establishes a standard of cover for the distribution, concentration, and deployment of emergency resources.

The problem was that Fire District 3 (FD3) did not have a standard of cover (SOC) by which it could objectively measure emergency service delivery effectiveness. The purpose of this applied research project was to develop a baseline SOC document for the District, short of obtaining required input, leading to official adoption. The action research methodology was utilized to answer three research questions:

1. What standards should be considered in the development of an SOC?
2. What guides or aids are available to assist in the development of an SOC?
3. How should FD3 expect to benefit from establishing an SOC?

Procedures used to conduct research included (a) researching past deployment; (b) accessing what had been written by others regarding SOCs; (c) researching and obtaining software; (d) obtaining sample and actual SOCs; (e) searching out local GIS options; and (f) developing some baseline deployment reports, graphs and maps for developing an SOC.

Results revealed that in order to create an SOC, national and local standards did exist. Guides or aids available for the development of an SOC existed in seven forms: (a) actual standards, (b) existing SOCs, (c) templates and worksheets, (d) guides, (e) computer software, (f) a stopwatch, and (g) shared agency resources. Benefits revolved around three main issues: (a) liability, (b) outcome expectations, and (c) objective service assessment.

Recommendations included (a) purchasing software; (b) involving all personnel in data collection and SOC development; (c) utilizing the SOC in conjunction with strategic planning; (d) performing critical task analysis of emergency operations; (e) setting realistic performance
goals; (f) obtaining electronic call histories; (g) after review and adjustment, adopting the SOC; and (h) considering, monitoring, and planning for urban growth.
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INTRODUCTION

Emergency services are primarily provided from two of FD3’s four stations, Station 3-3 (ST3-3) and Station 3-1 (ST3-1). Station staffing is comprised of a combination of volunteer and career personnel. The number of line personnel located in a station varies from one to as many as six on a day-to-day basis (FD3, 2002a). With basically two engines being routinely staffed, providing effective levels of service throughout the 82-square-mile District can be challenging at best and potentially deadly at worst (Pegram, 2001).

In addition to in-District response and staffing challenges, neighboring jurisdictions exercise both mutual aid response agreements and make requests for station standby crews on a regular basis. While the use of outside resources may be reciprocated, they are negatively proportionate to the volume of aid provided by FD3 (FD3, 2002b).

The problem is that FD3 does not have an SOC by which it can objectively measure emergency service delivery effectiveness. For the purposes of this report, an SOC will be defined as, “... those written procedures that determine the distribution and concentration of fixed and mobile resources of an organization.” (Commission of Fire Accreditation International [CFAI], 2001, p. 2). Justification of resource allocations and deployment assignments is of significant value for communicating with fire service personnel, government officials and community members (Maxwell, 1997). With an SOC in place, deployment evaluations can be measured against identified benchmarks and desired goals. Evaluations will assist in the deployment-planning process for station locations, personnel staffing and apparatus typing (Kitsap Fire District 7 [KFD7], 2002a).
The purpose of this applied research project is to develop a baseline SOC document for the District, short of obtaining required input, leading to official adoption. The action research methodology was utilized to answer three research questions:

1. What standards should be considered in the development of an SOC?
2. What guides or aids are available to assist in the development of an SOC?
3. How should FD3 expect to benefit from establishing an SOC?

BACKGROUND AND SIGNIFICANCE

The need for having a formal SOC surfaced in 1999, when NFPA 1710 and 1720 were in the open comment period prior to calling for a vote regarding adoption. The proposed NFPA standards were entitled *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public;* 1710 addresses career fire departments, and 1720 addresses volunteer. These standards, for all practical purposes, are a standard of cover, or by name are deployment standards (NFPA, 2001a; 2001b). The proposed staffing and response time requirements were first officially recorded and discussed during FD3’s regular Board meeting in December of 1999 (FD3, 1999).

The Washington Fire Commissioners Association (WFCA) was involved and solicited comments regarding the NFPA standards (FD3, 2000a). The Washington State Association of Fire Chiefs (WSAFC) Labor Relations Seminar in 2000 focused on the proposed 1710 and 1720 standards (FD3, 2000b). All the chief officers of FD3 attended the WSAFC Labor Relations Seminar held in 2001, to discuss NFPA 1710 and 1720 (FD3 2001a). The Chief of FD3 attended the NFPA conference in Anaheim, California to vote on the standards (FD3, 2001b). The significance of the need for research conducted regarding an SOC is well documented by the high level of attention given by FD3, WSAFC and WFCA.
Since the passage of the standards, FD3 has entered, into its operational strategic plan, a goal to develop a deployment standard or standard of cover (FD3, 2001c).

The serious ramifications of not having an SOC in place are currently being manifested by the ongoing and increasing calls for assistance from neighboring fire jurisdictions and internally by the District’s evolving service-level demands (FD3, 2002b). With only two of four stations being staffed, when a request for out-of-District aid is filled, 50% of the District’s resources are unavailable for in-District response. Another important factor regarding out-of-District response is that sometimes requests are for two engines, or all of FD3’s staffed resources; this leaves the District with no coverage. Lastly, current station staffing practices, without factoring out-of-District service demands, allow for certain portions of the District to have response times in excess of 15 minutes.

Understanding of minimum drawdown requirements have and currently are creating contention by a requesting agency. Due to FD3’s geographic positioning, when it provides mutual response to the jurisdictions outside its western border, it has limited options for back filling. The entire eastern border of the District is wildland, and no fire agencies exist to back fill from this direction. Along the southern border, back filling (of ST3-1) can occur by requesting aid from Vancouver Fire Department which is 5.6 miles to the south with an approximate 10-minute drive time. Back filling of ST3-1 by an all-volunteer fire district to the north, requires a 16.2-mile drive with an approximate 39-minute drive time.

Without the aid of neighboring jurisdictions, it is not always possible to have an adequate number of resources on the scene to handle incidents of significant magnitude, especially during the daytime hours. Existing Countywide mutual and automatic-aid agreements call for response
when resources are available, as is reinforced by District administrative guides (FD3, 2000c). Fire agencies to the north and west of FD3 have similar staffing issues (FD3, 2002b).

The District is responsible for providing services to a large geographic area. In-District demands are increasing (FD3, 2002b); out-of-District aid is on the rise, and more than 50% of the District’s area is beyond a five-minute response area of staffed stations. In addition to existing staffing, response-time conditions, identified call-volume trends, talk of mergers, consolidations, contracts for services, and fire control authorities, are crucial elements in further justifying the need for having an SOC. This talk has been ongoing at official levels, to some degree, since a tri-jurisdictional master plan was conducted from 1987 – 1989 (FD3, 1989) and currently the number one legislative issue for the WSAFC is enabling the creation of fire control authorities to be developed (J. Broman, personal communication, December 27, 2002). With limited funds available for managing fire resources, another issue should be reevaluated at some point regarding bordering districts’ annexations that erode FD3’s tax base, yet existing Countywide mutual aid agreements call for response when resources are available, as is reinforced by District administrative guides (FD3, 2000c).

The significance of this study is fourfold. First, it will fulfill one of FD3’s identified strategic goals. Second, in order for the District to best serve its customers, it is imperative that it be able to present a clear understanding and justification for levels of service, established by policy. With this presentation, it will be able to demonstrate predicted consequences for the customer considering response, staffing and time-related issues. This research will be an excellent starting point for making presentation to all interested and vested parties that will objectively shape the future of FD3 for years to come. Third, as was presented in the Executive Leadership course, executive leaders must possess power and have influence in order to effect
change. Of the seven bases of power identified in the course, three (expert, connection, and information) will be directly enhanced for the leadership of FD3 by having an SOC in place (National Fire Academy [NFA], 2000). Fourth, it is anticipated that the results of this study will greatly benefit other fire service agencies when conducting further research in the development of their own SOC.

Results of researching an SOC, in support of the USFA operational objectives, will most certainly directly impact the following two areas:

1. Firefighter safety will be considered in the development of the deployment options established by the District.
2. The beginnings of a multi-hazard risk reduction plan will be laid through the establishment of service levels in the SOC.

**LITERATURE REVIEW**

The purpose of this literature review was to examine new information, theories, and methodologies regarding an SOC. These findings would then be applied to conducting further research for the development of a baseline SOC document especially designed for FD3. The first area of consideration was to identify standards of an SOC. The next consideration was to investigate what guides and aids are available to assist in the development of an SOC. The final consideration was to determine how FD3 should expect to benefit from establishing an SOC.

**Standards**

Standards were sought at the national, state, and local levels. Specific attention was given to response-time standards.

**National Standards.** There are two national fire-service standards regarding SOC issues, NFPA 1710 and NFPA 1720. NFPA 1710 is for career fire departments and 1720 for volunteer.
The major difference between the two standards is that “... 1720 has neither staffing nor response time criteria” (Kapler, 2000, p. 9). If an organization were to adopt one of the two standards, a determination as to whether the definition of career or of volunteer applies. Some organizations are made up of both career and volunteer members, “... combination of paid and volunteer firefighters will have a choice of adopting either 1710 or 1720” (EMS Insider, 2001, p. 3).

The NFPA standards offer the following wording to assist in determining which standard applies, “This standard contains minimum requirements ... to the public by substantially all career fire departments” (NFPA, 2001a, p. 4). Specifically addressing NFPA 1720, consider one author’s interpretation of which standard to adopt:

Unfortunately, neither standard defines the word substantially ... I would contend ... that for a department to be substantially volunteer, the volunteers must control the organization and operations ... be the majority of personnel responding to incidents if the department is to qualify under this standard. After all, the standard is intended to address how volunteers operate on the scene. (Savia, 2001, p. 28)

State Standards. Executive Director of the Washington State Association of Fire Chiefs (WSAFC), Duane Malo (personal communication, December 9, 2002), offered a model fire service deployment standard that is available to the fire agencies in Washington. This standard is based on the Oregon deployment standard. While the title of the document indicates it is a standard, the authors of the standard leave all time and staffing goals up to the authority having jurisdiction to develop and defend.
Local Standards. The Clark County EMS Administrative Rule 5.48A.095 (1999, pp. 13-15) does have response time and staffing requirements established for both first response and transporting agencies.

Response Times. The NFPA standards are influenced by other standards, of particular note is reference to the American Heart Association’s recommendation for cardiac defibrillation. Questions regarding the sufficiency of meeting requirements for a standard based on a 20-year-old study have been raised and generalizing eight-minute response times for all EMS calls lead to other questions. Casino guards in Las Vegas have a 70% resuscitation-to-hospital discharge rate with a 2.2 minute (+/- 1.1 minute) collapse to shock time interval, should this 2.2 minute response time be a standard to adopt (“Response times,” 1998)?

An area within an SOC that deserves careful consideration is the establishment of response-time performance goals. NFPA 1710 has a response time goal for initial companies set at four minutes or less with a 90% compliance objective (NFPA, 2001a). Rule (1996) suggests that a five-minute response time, based on a worldwide survey, could be used as a benchmark.

Regardless of what time standard may be adopted by an organization, the area of application and compliance measurement must be factored into the SOC.

If a department “call clustered” downtown around a few busy stations, it might be easy for them to achieve XX-minutes travel time, 90% of the time if all incidents department wide are measured at once. However, the outer areas may never come close to 90%. If you intend to cover all your area with 90% compliance, then it always will take more units to “cover the dirt” than to just cover all the calls department wide. But, if we are protecting “Mrs. Jones” all over the city, should we not set, measure and guarantee compliance to 90% of each first-due area? Why should we use the low response time
downtown incidents, where stations are more concentrated due to risk and call volumes, to “average” out the department wide measure and pretend we have the same coverage out in the suburbs? (CFAI, 2001, p. 28)

Coleman (2001) summarizes a final note for consideration when establishing response time standards.

The fire service generally subscribes to the notion that a five-minute travel time allows for respectable resource distribution through a community, but not everyone agrees. There are agencies with long travel times because of a low-density fire problem, and there are communities that have found five-minute travel times to be unacceptable. (p. 41)

**Summary.** The findings and observations of others have influenced the author to emphasize the importance of neither blindly adopting available standards nor ignoring the need for conducting further research in the ongoing development of an SOC for FD3. No doubt, an agency “. . . can adopt or develop some other standard but for it to be defensible it must meet the same standard of care as a national standard” (Kapler, 2000).

**Guides and Aids**

In order to develop an SOC, a comprehensive assessment of the District’s fire-service delivery system must be performed. Assessment includes “. . . consideration of existing (or proposed) deployment of resources, identifying risks and expectations, looking at distribution and concentration of resources based on time parameters and collecting data on reliability of response and actual performance” (CFAI, 1997-2000, p. 3-8).

**Guides.** Three guides for developing an SOC were identified by the author. First, the WSAFCs makes available a 13-page worksheet and 12-page template for developing an SOC.
The worksheet provides a fill-in-the-blank type format by which an organization can assess the basic elements required in developing an SOC (D. Malo, personal communication, December 9, 2002).

Second, in a joint effort by the International Association of Fire Fighters (IAFF) and the International Association of Fire Chiefs, a 1710 NFPA implementation guide has been published. This guide is very comprehensive in offering knowledge, data, tools, and a step-by-step process to evaluate fire and EMS services (IAFF, 2000).

Third, there is a document designed for creating and evaluating standards of response coverage. This document, encompassing everything an agency should understand to prepare and determine resource deployment, is made available through the CFAI (CFAI, 2001).

Aids. The 1710 Implementation Guide (IAFF, 2000) suggests the following means for collecting data to assess and project service capabilities:

1. Utilizing computer aided dispatch (CAD) data review of actual responses, indicating what is done.

2. Computer modeling, projecting capability utilizing GIS data. Careful attention must be given to including the input of reasonable and prudent travel speeds.

3. Driving protection area roads at reasonable speeds, recording times and manually marking a map. This information can be overlaid with actual responses indicating both potential and actual performance.

4. Combining both historical data (CAD generated or otherwise) and computer modeling indicating both potential and actual performance.

Resources that should be considered for aiding in developing an SOC include
1. purchasing GIS software such as (a) ArcView, (b) Flame, (c) FireView, (d) CAD Analyst & Fire/EMS ADAM, and (e) CATS.

2. tapping into the expertise and already purchased software of law enforcement agency personnel who use GIS and could adapt analysis techniques to fire and EMS needs.

3. developing a multi-agency partnership where one may purchase the software or basic data, while another could perform the legwork of gathering data, and yet another might generate the desired analysis.

4. obtaining a copy of Risk, Hazard and Value Evaluation program otherwise known as RHAVE. (CFAI, 2001, pp. A13 – A16)

**Summary.** After reviewing the guides available by others, the author was influenced to research and purchase a records management software program that would be better equipped to generate the information required for developing and maintaining an SOC.

Further, the author heeded the advice revealed through review of literature and pursued tapping into the expertise and already purchased software available at a neighboring fire jurisdiction. This proved very beneficial in that the agency representative was able to generate some response time maps, and a relationship enabling future requests for GIS information was developed. Additionally, the author tapped into the expertise of the County GIS Department. This inquiry proved enlightening in that the author became aware of a stand-alone computer-based program (ER Map) made available through the County that is specifically designed for emergency responding personnel and another one (ClarkView) that is designed to be used in conjunction with ArcView. Paul Newman (personal communication, December 12, 2002) of GIS suggested that simple and inexpensive software programs may be of some benefit in generating
and analyzing data for developing an SOC. The author exercised this option and did use Microsoft Streets and Trips.

Finally, the last influence was to utilize the software RHAVE to develop an Occupancy Vulnerability Assessment report of common occupancies within the District.

**Benefits.**

The benefits, or consequences as the case may be, of having an SOC, revolve around three main issues: (a) liability, (b) outcome expectations, and (c) objective service assessment.

**Liability.** Issues relating to liability focused on negative implications more than positive by presenting information from the perspective of not complying with a standard. “An expert witness in the trial will point out that the department was in violation of its own established minimum staffing and thus was negligent” (Savia, 2001, p. 30). “Municipalities that fail to adopt and comply with NFPA 1710 could be exposed to significant liability claims . . .” (Miller, 2001, p. 14). Contrarily, in reference to adopting an SOC, Kapler (2000, p. 9) stated, “Only communities that completely ignore the factors that lead to firefighter and civilian deaths will be exposed to liability.”


[T]he outcome of acute asthma, pulmonary edema, . . . is probably a better reflection of performance . . . By outcome, I am not just referring to death or length of ED or hospital
stay. It is tremendously important to realize that EMS intervenes in relief of symptoms and pain, which means an awful lot to our patient’s outcomes in terms of clinical improvement are tougher to measure since objective baseline data is rarely collected in the field. (p. 53)

**Objective Service Assessment.** After completing a survey developed by the Florida Fire Chiefs to create a position paper on NFPA 1710, Chief Bryson (2002) offers his perspective.

. . . I started developing a plan to improve our department with the ultimate goal being compliance. . . .Whether departments choose to adopt it or not, it can and should be used as an evaluation tool, as well as a mechanism to request and justify needed resources. This country lags in setting standards for the fire service, but now we have something to compare ourselves to. . . . Now looking at 1710, it appears that departments may move toward more stations with fewer apparatus in each station, so initial response time will be faster. . . . I think that even though it’s a painful process, it’s good to know your capabilities and shortcomings, especially if it leads to the delivery of better fire-rescue services. (p. 26 – 27)

CFAI (2001) emphasizes that by having an SOC in place, a fire agency is in a much better position to ensure equity in mutual and/or automatic aid and deal with imbalances.

When the staffing or incidents get vastly unbalanced, some agencies charge the other on an agreed to fee for service basis, which is still often less than the shortfall agency deploying a full resource. The bottom line is that the elected officials involved need to see better customer service and perceive equity in the relationship, and usually people know that when they see it! (CFAI, 2001, p. 73)
Summary. After reviewing the literature regarding benefits, the author was influenced to make sure that the development of an SOC must have input from multiple sources to ensure liability is reduced, expectations are clarified, and meaningful assessments are delivered. “The development of a standard of cover is a very serious issue and must include the customers, elected officials and other stakeholders in the process” (Maxwell, 1997, p. 9).

After reading that accredited agencies must have an SOC, the author was influenced to contact and obtain copies of SOCs from three CFAI accredited agencies.

This section is a critical element of CFAI because it is not adequately explained in other contemporary texts in the fire service. One of the major issues the fire service has struggled with in the past decade is defining levels of service. This concept has evolved in concert with the other components of the accreditation model because it is essential to determine whether a fire agency is prepared to provide a level of service commensurate with its responsibilities, risks, and adopted service level objectives. (CFAI 1997 – 2000)

When analyzing performance, it is important to verify reported and recorded times are accurate. “To get an accurate reflection of what is happening requires periodic sampling of times using a stopwatch to record actual times on communication center tapes” (Rule, 1996).

PROCEDURES

Definition of Terms


Drawdown. “Drawdown is the resource level an agency will not go below when asked for mutual aid” (CFAI, 1997 – 2000, p. 3-33 ).
**Mutual Aid.** “Reciprocal assistance by emergency services under a prearranged plan” (IAFF, 2000, p. A-6).

**Response Time.** “The time that begins when units are en route to the emergency incident and ends when units arrive at the scene” (NFPA, 2001a, p. 6).

**Standard of Cover.** “… those written procedures that determine the distribution and concentration of fixed and mobile resources of an organization” (CFAI, 2001, p. 2). This term SOC may be understood as a deployment standard of coverage (D. Malo, personal communication, December 9, 2002) or standard of response coverage (CFAI, 2001).

**Turnout Time.** “The time beginning when units acknowledge notification of the emergency to the beginning point or response time.” (NFPA, 2001a, p. 6).

**Research Methodology**

The action research methodology was employed for this study. The author first determined that the problem statement was clear and comprehensive enough to accomplish the stated purpose as an achievable goal. Second, as an ongoing process, the author continually identified and addressed causal/contributing factors that both assisted and impeded geographic information system the research. These factors are identified in each applicable subtitle of the procedures. Last, the author evaluated the outcomes of each factor that was addressed as a result of research.

An overview of procedures includes (a) researching past deployment issues for FD3; (b) accessing what has been written by others regarding SOCs; (c) researching fire records management software options; (d) obtaining sample and actual SOCs; (e) searching out local GIS options; and (f) developing some baseline deployment reports, graphs and maps for developing an SOC.
The specific time frame for conducting research was from June of 2001 to December of 2002. Information collected was used to develop a list of recommendations to establish an SOC by which the District may lead its personnel in the provision of the best service possible for the community and to generate some FD3 specific baseline information for an SOC.

Written Literature. The author had a partial understanding of what an SOC was, and this was identified as a positive contributing factor in fulfilling the purpose of the research. An impeding factor was a lack of written documentation for reference material that would help when the time comes for adopting an actual SOC for FD3. Specific objectives set to address a lack of written materials included obtaining copies of (a) applicable standards (local, state, and national), (b) guides for SOC development, and (c) samples of SOCs.

The author first began accessing written literature at the National Fire Academy’s Learning Resource Center (LRC) in Emmitsburg, Maryland, during June of 2001. Fire and EMS journals from the LRC provided many of the written sources for this research. The library at FD3 also provided valuable written references. Numerous materials were obtained from the CFAI, with the last order being filled in November of 2002. By contacting the Clark Regional Emergency Services Agency, a copy of the EMS administrative rule was obtained.

Several sites on the Internet were read. The WSAFC site provided links to the Oregon Fire Chiefs Association (OFCA) site. On December 9, 2002, the Executive Director of the WSAFC emailed an SOC worksheet and model or template for developing an SOC. At the OFCA site, the Oregon Fire Resource Deployment Standard Process document was downloaded. The United States Fire Administration site linked into the site for obtaining a copy of the RHAVE literature and software.
As research continued, another impeding force to developing an SOC was identified; the District did not have an objective means for determining hazard risks within its borders. The objectives to address this impedance involved obtaining the RHAVE software and inputting required data to generate a RHAVE Occupancy Vulnerability Assessment Report.

**Software options.** FD3’s incident-reporting system and information management software program needed to be updated. The need to update became readily apparent after reading the literature. Inadequate or new information management software issues were also identified in the SOCs from all three CFAI accredited agencies (KFD7 [Kitsap Fire District 7], 2002b, p. 45; CFD1 [Clackamas Fire District 1], 2002, p. 4; Tualatin Valley Fire & Rescue [TVFR], 1999, p. 13). This situational force (inadequate software) impeding the author’s ability to reach the goal of this research was given high priority to be corrected as soon as possible. The objective was to purchase and implement the use of modernized software capable of assisting FD3 with maintaining an ongoing SOC indefinitely.

A list of software vendors, that were compliant with the National Fire Incident Reporting System, was obtained from the Washington State Fire Marshal’s Office. Each vendor was contacted. Provided demonstration software was evaluated for ease of use, reporting features, costs (initial and maintenance), as well as testimonials of other users and responsiveness of the respective vendor for providing technical assistance. The District purchased software (FireHouse) in late November. The software was installed and all essential baseline information entered. It was then made accessible via any FD3 computer. The established date for entering actual incident information was set for January 1, 2003.

**Sample SOCs.** Not having an SOC to reference was a negative factor. The objective was simple: first ask local jurisdictions about SOCs to see what was available. All fire jurisdictions,
excepting FD3, within Clark County, were contacted, and copies of SOCs were requested; no agency had a completed SOC. Two agencies were actively working on their SOCs; one had an SOC of sorts. The objective was then broadened geographically, and yet focused to accredited agencies, and success was embraced. SOCs were obtained from TVFR, and CFD1 both from Oregon. A personal visit to KFD7 (WA), by the author, produced a copy of their SOC as well.

GIS options. The obstacle of not having a means for determining response zones and mapping past performance to assist in setting SOC standards for the District was a definite negative force. The goal to address this issue was obvious: determine what options exist and pursue the most feasible. Objectives included investigating assistance from (a) neighboring fire agencies, (b) County GIS, and (c) a consulting group. Research led to expanding the objectives to include utilizing a simple mapping software program purchased by the author.

The author, employing the technical skills and knowledge of Vancouver Fire Department’s senior engineering technician, combined with their software, was able to generate response time maps, with one-minute contour intervals for FD3 from each station. By physically driving fire apparatus and recording times at specific mileage points, the author was able to verify the accuracy of all computer modeled response time maps. Also, assessed valuation information for properties within FD3 was obtained for planning and conducting further research in the future.

Upon personally visiting the County GIS Department, a stand-alone computer-based program (ER Map) was available, that is specifically designed for emergency responding personnel. They also provide another mapping program, ClarkView, that is designed to be used in conjunction with ArcView. Paul Newman (personal communication, December 12, 2002), of Clark GIS, suggested that a simple and inexpensive software mapping program may be of some
benefit in generating and analyzing data for developing an SOC. The author exercised this option by using Microsoft Streets and Trips software ($20.00) to generate maps for the final product of this project. County GIS is able to generate just about any type of map if data is provided to them in an electronic format; they have the time to address the special project, and the District would be willing to pay for the service.

At the CFAI website, a grant application for obtaining GIS mapping technology was located; however, FD3 did not meet the criteria to apply. The International Association of Fire Chiefs website led to downloading and viewing a copy of the 1720 roundtable discussion video. This download led to contacting Emergency Services Education & Consulting Group (ESECG).

After several telephone calls and emails, furnishing information regarding FD3, ESECG was able to give an estimate for conducting a 1720 Station Location and Deployment study. Their study is very comprehensive and appears to be perfect for developing an SOC of the highest quality. The cost of this study was estimated to be in the area of $13,000.00 to $15,000.00. The author did discuss this option with the Chief of FD3 (S. Wrightson, personal communication, December 4, 2002), and it was decided to pursue other options.

Baseline reports, graphs and maps. What proved to be the largest undertaking and most difficult challenge to overcome was to work with FD3 data both computerized and as recorded in a logbook. The objectives were straight forward: (a) extract information from the District’s computerized incident reporting system to enable detailed analysis in a spreadsheet format, (b) enter logbook staffing entries into a spreadsheet, (c) verify accuracy of all data, and (d) generate summarized information graphically.

Considering key points identified through literature review and sample SOCs, the author focused specifically on generating staffing and response time information.
Finally, data collected from all sources was converged, and the resulting analysis was formatted in graphic display via maps, tables and graphs and then placed within an SOC template ready for final input and adoption at a later date (see all tables and figures in Appendix A). Consequently, a list of specific recommendations for developing and implementing a more in-depth SOC was generated (see Recommendations).

Results were reached after reviewing the facts as presented in the literature, comparing the work of one author to another, identifying commonality and uniqueness of each and then comparing those facts to the information found in actual SOCs. All data collected was analyzed, synthesized, and applied to the District’s specific situation, resulting in a list of recommendations and generating a baseline SOC document for the District.

**Limitations and Assumptions**

A great deal of information could be located regarding what should be contained in an SOC; however, samples of SOCs from the local area were non-existent. Of the three SOC samples acquired from CFAI accredited agencies, none of them had a combination of personnel types and operating procedures comparable with FD3.

National standards for developing an SOC limited research in that, of the two that were available, neither was designed for a combination fire agency. NFPA 1710 was designed for a substantially all-career fire department and 1720 for substantially all volunteer (NFPA, 2001a; 2001b). The WSAFCs adopted SOC wasn’t as specific as the national standards for requiring response time and staffing; it was limited to the format of information that agency should put into its own SOC. Last, local standards only addressed EMS response times and staffing issues.

The tasks involved with generating the required information to develop recommendations for establishing service-level benchmarks were severely limited in several ways. First, data
reflecting accurate times may be off by as much as a minute or more because all time-related information was not maintained to the second, but only to the minute. Second, FD3 does perform ongoing quality assurance regarding the content of narratives within its emergency run reports; however, it does not ensure that location-specific data has been properly recorded. Last, not all information required for developing a comprehensive SOC had been recorded by FD3; for example, turnout time was not recorded.

The author did not want to assume that FD3 data was without flaws. In an effort to generate the most accurate benchmarks possible, the author limited the research of FD3 information to the calendar year 2003. By working with this self-imposed limitation, the author was able to review computer generated data and compare it to hard-copy records. Multiple errors were identified and corrected concerning (a) station areas, (b) map zones, (c) street suffixes, and (d) the fire agency involved.

RESULTS

Research Question 1

What standards should be considered in the development of an SOC?

The author investigated applicable standards for developing an SOC at the local, state and national levels and focused attention on response time and staffing coverage.

Local. The only local standard related to emergency services was for the provision of EMS. This standard divided response by severity and the subsequent response mode: hot (lights and siren) and cold (no lights and siren). Response time zones were established by population density per square mile: rural (1 to 1000), suburban (1,000 to 2,000), urban (2,000 +) and wilderness (less than 1). Two sets of response times were established, one for first response agencies (see Appendix B) and another for transporting agencies (Clark County, 1999).
Staffing requirements were first divided into two major categories as determined by whether the agency was a first response or transport provider. Within the first response category, the required number of personnel was limited to one and was linked to the verified level of service that the agency is licensed to provide. The three service levels included basic, intermediate and paramedic life support (Clark County, 1999).

State. No standard existed, only a template that could be used by an agency to guide them in the development of an SOC was available at the State (WA and OR) level (J. Malo, personal communication, December 9, 2002).

National. Two standards existed at the national level: NFPA 1710 and NFPA 1720.

NFPA (2001a) 1710 established the following time standards to be met 90% of the time:

1. One minute (60 seconds) for turnout time
2. Four minutes (240 seconds) or less for the arrival of the first arriving engine company at a fire suppression incident and/or eight minutes (480 seconds) or less for the deployment of a full first-alarm assignment at a fire suppression incident
3. Four minutes (240 seconds) or less for the arrival of a unit with first responder or higher level capability at an emergency medical incident
4. Eight minutes (480 seconds) or less for the arrival of an advanced life support unit at an emergency medical incident, where this service is provided by the fire department

NFPA 1720 (2001b) unlike 1710 has no response time standards, but it does require that once resources are assembled on scene, they must have the capability to safely begin an initial attack within two minutes 90% of the time.
Research Question 2

What guides or aids are available to assist in the development of an SOC?

Available guides or aids that would be helpful in the development of an SOC existed in seven forms: (a) actual standards, (b) existing SOCs, (c) templates and worksheets, (d) guides, (e) computer software, (f) a stopwatch, and (g) shared agency resources.

Standards. The NFPA (2001a; 2001b) and local EMS standards (Clark County, 1999) provided an outline of criteria for consideration in the development of an SOC.

Existing SOCs. The SOCs located by the author, after being prompted by the written literature to contact accredited agencies, provided examples of how the NFPA standards may be applied and adopted by agencies with a variety of diverse service levels. Of particular note, is the fact that SOCs were not written to fully adopt the NFPA standard for either response times or staffing requirements (KFD7, 2002b; CFD1, 2002; TVFR, 1999). The partial SOC, located locally, was similar to the full SOCs in that it also had not adopted a national standard but rather created its own (T. Dawdy, personal communication, October 29, 2001). Appendix C provides a comparative view of adopted standards for first-due companies. The formats displayed in the SOCs of how to present compliance with adopted standards impacted all tabular and graphic depiction for FD3’s performance levels (see Appendix A).

Templates and worksheets. The template made available through the WSAFC (D. Malo, personal communication, December 9, 2002) was utilized as the outline for the SOC developed in Appendix A. Although worksheets were available from WSAFC (D. Malo, personal communication, December 9, 2002) and through the 1710 Implementation Guide (IAFF, 2000), the author did not utilize them for completing the District’s SOC.
Guides. The *1710 Implementation Guide* (IAFF, 2000) was very comprehensive in offering knowledge, data, tools, and a step-by-step process to evaluate fire and EMS services. The guide was also useful for obtaining definitions for terms to be utilized in the development of an SOC.

The document entitled *Standard of Response Coverage* assisted the author in making recommendations to the District regarding a more comprehensive view of times beyond response. This document emphasized recording time not just when arriving on scene, but also when the company has arrived at the patient’s side and when the escalation of the emergency has been brought under control (CFAI, 2000).

Computer software. The author obtained several results by utilizing various software options. The most useful data analysis was achieved by importing data files from the District’s antiquated computerized records management system (software is more than 10 years old) into a Microsoft Excel spreadsheet. This program allowed for cleaning, sorting, and graphically illustrating information (see Figures 1A, 2A, 3A, & 4A; Tables 2A, 3A, & 6A).

The author did not exercise the option to hire the Clark County GIS to create maps for assisting with the development of the SOC because of the expense involved. Newman (personal communication, December 12, 2002) estimated costs to be $60.00 per hour with an undetermined amount of time to generate usable products.

Some of the information contained in spreadsheets was imported into Microsoft Streets & Trips. Data importation allowed for the generation of maps that pinpoint the actual locations of emergencies that occurred within the District (see Figures 10A, 11A, 12A & 13A).

An advanced computer mapping program, ArcView®, was utilized to determine response time rings in one-minute intervals surrounding each station within the District. The program
utilized information purchased from Clark County GIS. Special speed inputs for the various road types (private drives, highways, etc.) allowed for realistic response-time predictions. Figures 6A, 7A, 8A, 9A & 14A were generated utilizing this software.

Results of utilizing the RHAVE software to generate OVAP (Occupancy Vulnerability Assessment Profile) scores ranged from 16 to 29.99, which landed structures common to the District in the moderate category (see Table 1A).

Upon visiting the County GIS Department (P. Newman, personal communication, December 12, 2002), it was unexpectedly discovered that a stand-alone computer-based program (ER Map and associated data - $150.00 annually) was available, that is specifically designed for emergency responding personnel. They also provide another program, ClarkView ($600.00 annually, plus $100.00 for data), that is designed to be used in conjunction with ArcView ($1200.00).

**Stopwatch.** In addition to computer modeling and actual incident response times, the author employed the use of a stopwatch and driving fire apparatus to verify the accuracy of modeling and the timeliness of actual responses. Recorded travel speeds were consistent with computer modeling; however, actual responses were found to be anywhere form one minute shorter in duration to two minutes longer than projections. The finding of conflicting times led to timing actual responses compared with recorded dispatch times. The author found that by the dispatch center giving alarm, arrival, and returning times in whole minutes, a difference of one minute was found 70% of the time.

**Shared agency resources.** The author did tap the expertise of Vancouver Fire Department’s senior engineering technician. The technician was able to develop Figures 6A, 7A, 8A, 9A & 14A and provide the author with tax-lot data generated by Clark County GIS.
The author did pursue expertise of Clark Regional Emergency Services Agency (CRESA) and Clark County GIS. Data from CRESA was not in a user-friendly format (J. Lorentz, personal communication, December 12, 2002), and end products from GIS were available for fee only (P. Newman, personal communication, December 12, 2002).

With information gleaned from the tax-lot data, business look ups in a Cole Directory, and an inspection summary from the Clark County Fire Marshal’s Office, a fairly comprehensive listing of business and building types was created (see Table 4A).

**Research Question 3**

How should FD3 expect to benefit from establishing an SOC?

The benefits, or consequences, whichever may apply, of developing an SOC revolve around three main issues: (a) liability, (b) outcome expectations, and (c) objective service assessment.

**Liability.** Research found that liability will not necessarily go away with the adoption of an SOC (Savia, 2001, p. 30); however, by conducting the research necessary to develop and maintain an SOC, it is anticipated that liability will be reduced (Kapler, 2000, p. 9).

**Outcome Expectations.** Research revealed the importance of utilizing percentile reporting of time measurements to better evaluate establishing, confirming, and meeting internal, customer and policy maker expectations (CFAI, 1997 – 2001; 2001; IAFF, 2000; NFPA, 2001a; “Response times,” 1998).

Percentile reporting of analyzed data gave an accurate and understandable presentation of the District’s response-time performance. For 2002, the District was able to arrive on the scene of an emergency within seven minutes, 77% of the time (see Table 6A).
In order to develop a comprehensive SOC, inclusive of identified outcomes and compliance, a great deal of information must be available for the researcher (“Response times,” 1998). With the shortage of available baseline information, it was impossible for the author to identify potential outcomes and evaluate compliance or achievement levels relevant to data input shortages. This shortage led the author to seek out a modernized records-management software program, purchase it, and implement its use. All benefits of utilizing this software are not fully realized yet; however, several benefits have been identified: (a) percentile reporting is accomplished within minutes, at any time; (b) user fields have been established for special studies; (c) the ability to separate emergent from non-emergent alarms is now possible; (d) audits for data accuracy is easily performed, and (e) the District is able to contribute to the National Fire Incident Reporting System.

**Objective Service Assessment.** The author, by exercising the evaluative phase for the development of an SOC, through the collection and analysis of data, was able to input data necessary for objective service assessment (see Appendix A).

Research considered Chief Bryson’s (2002) perspective of the benefits provided by employing the evaluation aspect of developing an SOC.

... I started developing a plan to improve our department with the ultimate goal being compliance. ... Whether departments choose to adopt it or not, it can and should be used as an evaluation tool, as well as a mechanism to request and justify needed resources. This country lags in setting standards for the fire service, but now we have something to compare ourselves to. ... Now looking at 1710, it appears that departments may move toward more stations with fewer apparatus in each station, so initial response time will be faster. ... I think that even though it’s a painful process, it’s good to know your
capabilities and shortcomings, especially if it leads to the delivery of better fire-rescue services. (p. 26 – 27)

Research found that five different comprehensive growth plans are up for consideration, as presented by the Clark County Department of Community Development (n.d.). This finding of objective growth management information points to the need for further evaluation regarding equity of mutual and/or automatic aid agreements and the need to deal with potential imbalances. Analysis of data regarding the provision of mutual and/or automatic aid is identified in Table 3A. At the time of this report, District data was not formatted in a manner that allowed for analyzing the frequency of how often it received mutual and/or automatic aid.

When the staffing or incidents get vastly unbalanced, some agencies charge the other on an agreed to fee for service basis, which is still often less than the shortfall agency deploying a full resource. The bottom line is that the elected officials involved need to see better customer service and perceive equity in the relationship, and usually people know that when they see it! (CFAI, 2001, p. 73)

The District, upon official adoption of the SOC making up Appendix A, will have a critical element of the accreditation process completed (CFAI 1997 – 2000). Accreditation is an identified goal for the District (FD3, 2001c).

**DISCUSSION**

**Standards**

Adoption. EMS Insider (2001, p. 3) suggests that when considering the adoption of a standard, it is important to identify which standard may apply, either NFPA 1710 for career or NFPA 1720 for volunteer organizations. The need to identify whether an organization is career or volunteer is reinforced in the NFPA (2001a; 2001b) standards themselves. Savia (2001, p. 28)
contends that in order for an organization to claim that it’s substantially volunteer means more than the number of volunteers on the roster comes into play; it also encompasses how much of the operation they control. The research of actual SOCs determined that organizations’ adopted goals neither fully embrace NFPA 1710 nor do they identify with NFPA 1720 (see Appendix C). The local standard (Clark County, 1999) applying to EMS is a codified administrative rule and cannot be ignored by the District in the development of the SOC.

The author interprets the findings to indicate that while agencies have flexibility in what standard to adopt, they must concur with the mentality as expressed by Kapler (2000) that whichever standard is developed, it must be defensible. Implications of the study relating to the adoption of a standard clearly indicate that the District must be in a continual state of evaluation and planning for moving toward full compliance with the national standard. Additionally, the impact of not following or at least striving to meet, as a minimum, the established local law, would only increase the potential for the District to encounter liability.

Format. While no standard was available from the State, the template provided by the WSAFC (D. Malo, personal communication, December 9, 2002), was utilized for developing the SOC making up Appendix A. All available SOCs followed the same format, the one offered by WSAFC (KFD7b, 2002; CFD1, 2002; TVFR, 1999). This led to the interpretation that the District would be in a better position to demonstrate a purposed effort to comply with progressive service and simultaneously minimize the potential for liability issues by having industry comparables.

Guides and Aids

Assessment. The need to conduct a comprehensive assessment of the District was identified in literature “...consideration of existing (or proposed) deployment of resources,
identifying risks and expectations, looking at distribution and concentration of resources based on time parameters and collecting data on reliability of response and actual performance” (CFAI, 1997-2000, p. 3-8). After obtaining actual SOCs, the findings in literature regarding comprehensive analysis were confirmed by the sheer length of the documents: 49 pages (TVFR, 1999); 52 pages (KFD7b, 2002); and 58 pages (CFD1, 2002). The author interpreted this finding as an indicator that in order to effectively develop an SOC, data collection, analysis, and presentation must be made, utilizing many different sources, including technology and subject matter expertise. The implications of this finding further supported the need to purchase new information management software.

Standards and SOCs. The national standards response-time goal of four minutes for first-due companies (NFPA 2001a) does not appear to be realistic when compared to the local standard that varies in time ranging from about five minutes to a best-effort time frame (see Appendix B). The point of questionable practicality is supported by the various response-time goals submitted by agencies that have SOCs in place, none of which meet the response-time goal nor the percent of time for compliance (see Appendix C).

Interpretation of all standards (national, local, and adopted by being in SOCs) imply that adoption of any standard must be based on an organization’s assessed ability to perform. The impact of this finding influenced the author to submit Fire District 3 specific goals based on historical and modeled information as opposed to blindly adopting some other standard.

Templates, worksheets and guides. The template provided through the WSAFC impacted the research by providing an outline to organize the vast amount of information required for developing an SOC. The worksheets located in the NFPA 1710 Implementation Guide were complimentary to the worksheet of WSAFC. The problem with the worksheets was that they
were too restrictive in fields for data input or not applicable. This further impacted the author to develop District specific worksheets for data analysis.

The *Standard of Response Coverage* document emphasized recording time not just when arriving on scene, but when the company has arrived at the patient’s side and when the escalation of the emergency has been brought under control (CFAI, 2001). In the KFD7’s (2002b) SOC on scene performance was evaluated as evidenced by their recording, patient dispositions upon transfer of care and property loss after intervention. Contrarily, in the *NFPA 1710 Implementation Guide*, among many points of emphasis, the author did not locate information regarding recording times after arriving on scene for measuring levels performance (IAFF, 2000). These findings led the author to believe that a guide can do more than the stated purpose which is to assist in the development an SOC (IAFF, 2000; D. Malo, personal communication, December 9, 2002). A guide can direct a focus to be on a particular subject (response times) or not (on-scene performance). The impact of this finding, to the District, was expressed in the recommendations of the research to record on-scene performance data, analyze it and report on it in order to broaden the perspective of evaluating service and establishing a standard of cover.

**Computer Software.** The value of quality computer software cannot be understated. Several options are available to assist in the evaluation and presentation of information in the development of an SOC: (a) ArcView, (b) Flame, (c) FireView, (d) CAD Analyst & Fire/EMS ADAM, and (e) CATS (CFAI, 2001. pp. A13 – A16).

While these software programs have tremendous computing and illustrating capabilities, the author did not feel they were essential for the development of an SOC. This feeling is proven by producing quality visuals utilizing commonly available programs such as Microsoft Excel and Microsoft Streets and Trips (see Appendices A, B, and C).
After gathering data, cleaning it, and manipulating it with various software programs, to include the use of ArcView (see Figures 6A, 7A, 8A, 9A, and 14A), the author was convinced that having the ability to chart and graph information through an integrated information management system would be ideal. The expense and time investment required to generate the evaluative reports for developing an SOC influenced the author to research, recommend, and purchase an integrated program for the District that can generate updated SOC information with the click of a mouse. The purchase of this software, coupled with the knowledge gained through the development of the SOC in Appendix A, will have both immediate and long lasting impacts on the District. The impact will include, but not be limited to, the ability of the District to continually evaluate performance and use the evaluations to assist in planning to improve service.

The computer software RHAVE, was utilized (see Table 1A); however, no similar program is known to exist by the author, and therefore a comparative analysis was not possible.

**Stopwatch.** Rule (1996) suggested that periodic sampling of recorded dispatch center times be checked with a stopwatch to ensure accuracy. The author confirmed this assertion when a totally random monitoring of emergency dispatch voice times and the times stamped in the call history were shown to be consistently different. CRESA’s senior communications systems specialist, Lorentz (personal communication, December 12, 2002), indicated two options were available for consideration by the District:

1. Pay for a direct connection to the dispatch center.
2. Wait and see if a free internet access option will come to fruition by the targeted time in the spring, 2003.
The impact of this finding on the District confirmed that the purchase of a voice recorder for obtaining times is not necessarily the best method to pursue. The finding of inaccurate time records was further confirmed when the author reviewed raw data. Review of the data revealed that response times to the exact locations, under similar conditions, would vary by as much as three minutes (FD3, 2002b). When times are given over the phone, from CRESA, seconds are not reported, and therefore District incident reports have all times rounded either up or down for each event considered.

A suggestion that a stopwatch could be used for determining response capabilities was suggested (CFAI, 2001) and heeded by the author. The impact to the District is that it now has current tested values for inputting travel speeds for use in the Microsoft Streets and Trips program for planning purposes.

**Shared agency resources.** The CFAI (2001) manual *Standards of Response Coverage* recommends tapping into the expertise of personnel and software programs from other agencies. While this suggestion was not found elsewhere in literature, it is common practice in the fire service to tap resources from other agencies whenever possible. The author ran with the idea of tapping other agency resources, and the results were helpful. The impact of exercising this option produced high-quality mapping figures in the District’s first SOC (see Figures 6A, 7A, 8A, 9A & 14A). Also, tax-lot data generated by Clark County GIS allowed for a greater accuracy in determining the number of buildings and occupancy types when coupled with information provided by the Fire Marshal’s Office (see Table 9A). The District will be able to use and add to this information for future planning purposes.
Benefits

**Liability.** Issues relating to liability focused on negative implications more than positive by presenting information from the perspective of not complying with a standard. “An expert witness in the trial will point out that the department was in violation of its own established minimum staffing and thus was negligent” (Savia, 2001, p. 30). “Municipalities that fail to adopt and comply with NFPA 1710 could be exposed to significant liability claims . . .” (Miller, 2001, p. 14).

The author interpreted the findings toward adopting standards to caution that national standards cannot be ignored and that jurisdictionally adopted standards should be attainable, or liability could increase.

The full benefit of reducing liability may never be fully experienced by the District; however, the peace of mind realized by District personnel in knowing that some fire service leaders recommend the development of an SOC to reduce liability will be enjoyed (Kapler, 2000, p. 9).

**Outcome Expectations and Objective Assessment.** Numerous sources complimented one another by emphasizing the importance of utilizing percentile reporting of time measurements to better evaluate, establish, confirm, and meet, internal customer and policy maker expectations (CFAI, 1997 – 2001; 2001; IAFF, 2000; NFPA, 2001a; “Response times,” 1998). Upon giving a preliminary view of percentile reporting (see Table 6A), the chief of the District and Board of Commissioners are anxiously anticipating the completed results of this SOC, and at the time of formal presentation, the positive impact will be more fully appreciated (S. Wrightson, personal communication, January 2, 2002).
With the requirement to have copious amounts of baseline information to develop an SOC (“Response times,” 1998) and the subsequent finding that District records did not have all the needed forms of information, it was impossible for the author to identify outcomes and compliance with those outcomes. This data shortage led the author to seek out a modernized records-management software program, purchase it, and implement its use. Benefits of utilizing this software are not fully realized yet; however, several benefits can be named: (a) percentile reporting is accomplished within minutes, at any time; (b) user fields have been established for special studies; (c) the ability to separate emergent from non-emergent alarms is now possible; (d) audits for data accuracy are easily performed; and (e) the District is able to contribute to the National Fire Incident Reporting System.

Bryson’s (2002) perspective that, by utilizing an SOC, an organization will be in a position to more effectively articulate its performance and needs, was complimented by CFAI (2001) when related to discussing equity in mutual aid agreements. Results of the research found that neighboring jurisdictions have and will again annex more of the District. This interpretation is supported by referencing existing urban growth boundaries that are not only encroaching, but actually extending into the District (see Figure 14A). These annexations have legally binding restrictions as to their application (Annexation of Unincorporated Areas, 1990).

The idea that the lines will not remain constant is further supported by the finding that five different comprehensive growth plans are up for consideration, as presented by the Clark County Department of Community Development (n.d.). The impact of being able to know capabilities and limitations of the District, by having an SOC, coupled with the research results indicating boundary lines will not remain constant, should position the District to most objectively ensure its constituent’s best interests are served first.
The District, upon official adoption of the SOC making up Appendix A, will benefit from the completion of a critical element of the accreditation process (CFAI 1997 – 2000). The impact of having an SOC, leading to CFAI accreditation, would be measurable by comparison to the low number of agencies that have met the requirements of proving operational excellence. The number of accredited agencies in Washington is two (G. Faucett, personal communication, December 17, 2002).

To summarize the benefits of having an SOC, the author concurs with this quote from the CFAI (2001, p. 73), “The bottom line is that the elected officials involved need to see better customer service and perceive equity in the relationship, and usually people know that when they see it!”

**RECOMMENDATIONS**

The results of literature review, investigation of the District’s records and administrative guidelines, consideration of applicable standards, consultation of existing SOCs and utilization of guides and aids led to fulfilling the purpose of developing a baseline SOC for the District (see Appendix A). Results of the research in embracing the problem of the District not being able to objectively measure emergency service delivery effectiveness clearly indicated that several organizational changes are warranted to effect positive change.

During the course of conducting research, the author acted on the results of findings, made recommendation to the District, and acted upon that recommendation to research, purchase, and implement the use of a new records management system. Acting on this recommendation was supported by all three of the accredited agencies (KFD7, 2002b, p. 45; CFD1, 2002, p. 4; TVFR, 1999, p. 13).
With the purchase of the records management system, it is recommended that the District educate all personnel as to the benefits that will be reaped from the data inputs. It is further recommended that all personnel have the SOC explained to them and demonstrate how important they are in refining the details of the SOC as an ongoing process for service improvement. The District will experience improvement by being able to generate up-to-date SOC related compliance without the need for any further data inputs, imports or conversions. The software purchased has the features needed to produce all baseline SOC information, by clicking on preset queries, graphs, and maps.

It is recommended that participants of the District’s scheduled strategic planning process consider, after careful review and explanation, the data contained within the baseline SOC to bring it to the next level. This next level will require critical task analysis of emergency operations to not only identify what would be ideal for response (see Tables 8A; 9A), but what is realistically attainable. Having realistic performance goals was supported by all agencies when evaluated against the 1710 standard (see Appendix C). At the time of this research, insufficient data was collected to assess the arrival of an effective response force and evaluate on-scene performance. This data must be collected to evaluate performance against goals. The outcome of adhering to this recommendation will lead to increased morale by challenging personnel to achieve objectively set, attainable goals.

With the inconsistencies experienced by obtaining voice times from dispatch, it is recommended that the District either exercise the option of accessing dispatch information via the internet or by installing a computer aided dispatching link for bringing up accurate and detailed call histories. The Internet option, which is purported to be available without a fee, should be ready for use by the spring of 2003 (J. Lorentz, personal communication, December
Whichever option becomes a reality, this will allow for the entry of times to the second and times that reflect on-scene performance, such as when the fire was reported under control. This will significantly improve the meaningfulness of reporting that is required in the ongoing SOC evaluation and assessment process.

It is recommended that the District reviews the suggested response-time goals (see Table 7A), makes adjustments as may be required, and adopts them by resolution inclusive of the entire SOC document. This recommendation is based on evaluation of the District’s objectively assessed performance and computer modeling (see Tables 2A; 5A; 6A & Figures 6A – 13A). The positive change for the District by exercising this recommendation will be two-fold:

1. It will have a critical element of the accreditation process completed (CFAI 1997 – 2000).

2. It will be able to justify why it does or doesn’t perform to a particular level, to any audience (Maxwell, 1997).

The remaining recommendation is that the District consider, monitor, and become more aware of potential outcomes relating to urban growth. Potential negative impacts of annexations could be effectively managed with proper planning. The potential improvement for the District may be that it ensures more equity in exercising mutual aid agreements as boundaries and income sources change (CFAI, 2001, p. 73).

The author makes a general recommendation, for other agencies pursuing the development of an SOC, to be open to all available options to accomplish the task. The research revealed several guides and aids to include sharing resources that should be considered. Should the reader take only one thing from this research, let it be that if a fire agency has the right information management system in place, developing and continually updating an SOC will be
very easy to accomplish. Agencies that have an SOC in place will be in a position to “. . . provide the body politic and the citizens a true picture of the risks in their community, and the fire department’s capabilities to respond to and manage those risks” (NFPA, 2001a, p. 1).
REFERENCES


Tualatin, OR: Author.
Appendix A

Standard of Cover
Appendix A

Clark County Fire District 3

Standard of Cover

SECTION ONE: INTRODUCTION

Overview and Legal Jurisdiction

Fire District 3 was legally formed in 1947 as authorized by Washington State statute (RCW 52.02.020). The District is governed under the policy-making direction of a three-member board of fire commissioners. Commissioners are elected every two years to serve six-year terms (RCW 52.14.060). The Board contracts the services of a fire chief who is responsible for administering all District business. The organizational structure consists of a paramilitary ranking system inclusive of 1 career fire chief, 1 career assistant chief, 1 career deputy chief, 1 volunteer public information officer, 3 career captains, 9 career firefighters, and 28 volunteer firefighters. Additionally, the District employs one administrative assistant (FD3, 2002c).

The District’s protection services span 82 square miles, made up of eight major unincorporated areas: (a) Hockinson, (b) Brush Prairie, (c) Venersborg, (d) Rawson, (e) Heisson, (f) Battle Ground Lake, (g) Crawford, and (h) Lucia Falls. As reported by the County’s GIS, 18,500 people reside within the District. Population fluctuates seasonally, for special events at a state park, a private park, and a sports complex, all of which are historically documented as affecting the demand on the District for providing emergency services. The Hockinson School District is the single largest employer, complimented by a variety of several other commercial enterprises: (a) general mercantile, (b) religious, (c) light manufacturing, (d) automotive repair, (e) farming and (f) specialty services. Building construction, seasonal farming, land clearing, tree
farming, and logging operations are ongoing activities which further impact service delivery demands.

Funding for the District is mainly derived from property tax that as of January, 2003, has been increased by a lid lift which passed in February of 2002, to a rate of $1.35 per $1,000.00 of assessed valuation. The Assessed valuation for 2003 is $1,281,749,531.00. Since its inception, the District has consistently improved its fire protection rating to its current level of a Class 5. This protection rating is exceptional for a rural fire jurisdiction to achieve. The benefits of this rating affect residents by having low insurance premiums and quality emergency services (as assessed by the Washington State Survey and Rating Bureau).

**Purpose**

This document will serve as the District’s standard of cover. The District recognizes that a standard of cover is made up of written, documented procedures that determine the distribution and concentration of the fixed and mobile resources of a fire and EMS organization.

The purpose of this standard of cover document serves to address seven key points:

- A baseline tool for defining emergency response performance standards.
- A descriptive tool for validating station location.
- A management tool for determining apparatus types, staffing levels, and staffing patterns.
- A predictive tool for helping to determine workload and ideal unit utilization.
- A basis for continually measuring performance improvements over time.
- Policy guidance when dealing with resource procurement and allocation as the District plans for the next 5-10 year period.
This document is divided into nine sections. Descriptions of the topics, current practices, facts, and proposed changes may be presented in each section. This standard was developed by first considering applicable national, state, and local standards of cover. Second, the District’s present practices and historical response data were reviewed and formatted for evaluation. Lastly, the results of these analyses were then used to make formal statements of the level of service that the District could be expected to deliver.

SECTION TWO: MISSION, VISION, GOALS, AND OBJECTIVES

Historically, the District has utilized both the master planning and strategic planning processes to guide its operations. Among many developments, these plans have included a mission statement and vision statement. Additionally, plans included some analysis of District historical, current, and projected service demands. Goals and objectives were established to address current and projected service needs. This standard of cover, through objective assessment, assists operational activities and planning processes to be optimally enhanced for providing service.

Mission Statement

The mission of Fire District 3 is to protect lives, the environment, and property, by providing prompt, skillful and cost effective fire protection and life safety.

Vision Statement

We challenge our assumptions by continually evaluating all Fire District operations. Our evaluations ensure that we have the right people, the right tools, and the right service level, in order to embrace the emergency service and safety challenges of our community, today and in the future.
Goals and Objectives

Fire District 3’s goals and objectives have been identified in three types of documents: (a) a policy-level strategic plan, (b) an operational level strategic plan, and (c) administrative guidelines. Specific goals and objectives directly related to emergency response services are restated, by paraphrasing, in this document because of their relevance to a standard of cover. Plans and administrative guides should be reviewed for exact wording and context.

First, the policy-level strategic plan identified goals to minimize risks of the community, specifically addressing traffic accidents and increasing prevention, detection, and intervention programs. Second, the plan established goals for facilities, apparatus, and equipment; objectives encompassed the need to establish master plans for purchase, maintenance, and replacement. With diversity of call types experienced in the District, the goals regarding training for personnel included the adoption of international training standards (inclusive of certifications) and pursuing training props. Lastly, one goal regarding personnel and staffing included several objectives. Staffing ST 3-3, 24-hours per day, with career and volunteer personnel, restructuring workloads, filling shift-officer positions, redefining volunteer requirements, and acquiring both more career and volunteer personnel are some of the objectives named.

The operational strategic plan set goals for quarterly and annual reporting against established benchmarks of success. Risk assessment, planning and the development of a built-in evaluation/review process for reporting purposes were included. Goals regarding fire suppression focused on policy review, deployment (including the development of a standard of cover), and our insurance rating. Specific response time goals were not established, yet to decrease times was identified as a goal. Finally, record management, personnel, and communication goals were identified.
Administrative guidelines are not paraphrased here; however, they were consulted for entering information in later sections of this document.

In anticipation of the accreditation process, the District has been improving its existing planning processes and gathering sound data for implementation of logically set goals for some time. It is expected that the District will continue to utilize all of its existing planning processes, its mission and vision statements, goals and objectives, coupled with this standard of cover, to guide its planning and deployment of resources.

**SECTION THREE: RISK ASSESSMENT**

Fire District 3 is what’s termed as an all-risk response agency; meaning, that to the best of its ability, it will respond to any emergency-related situation (fires, medical emergencies, hazardous materials incidents, natural and manmade disasters, etc.). All hazard risk assessment traditionally consists of an analysis of six key elements (fire flow, probability, consequence, occupancy risk, demand zones, and community profile).

In addition to the traditional elements, establishment of response performance standards must include consideration of the topography and the transportation network over which emergency responders must travel in order to meet the demands for service, the nature of emergency response activity, and patterns of future property development and population growth.

**Elements Defined**

*Fire Flow.* The amount of water required to control a fire, based on building structure and contents.

*Probability.* An estimate of the likelihood that a particular event will occur within a given period of time.
Consequence. The risk to human life and the economic impact of an event (including fire, medical, and other events).

Occupancy Risk – an assessment of the relative risk to life and property resulting from a fire, inherent in a specific occupancy or in a generic occupancy class.

Demand Zones – areas utilized to analyze risk situations. Fire District 3 utilizes three zone types for analyzing risk:

Map Pages (MPs) are square mile zones corresponding to the geographic range-township-section grid, which are named using a 4-digit system based on a datum selected by the fire service. MPs are further divided when topography, natural barriers, response routes, or resource locations indicate the need. MPs are used for emergency response navigation purposes, computer aided dispatching of the closest available unit, assignment of non-response functions, and other administrative purposes.

Station Areas (SAs) are irregularly shaped zones utilized to provide the base for dispatching determinations. SAs are developed based on neighborhood configurations, traffic flow patterns, topography, elevation, proximity to the closest fire station, and a variety of other considerations.

Response Zones (RZs) are defined by analysis of the physical ability of apparatus to travel a specified distance within predetermined time frames. Similar to SAs, RZs are affected by neighborhood configurations, traffic flow patterns, topography, elevation, proximity to the closest fire station, and a variety of other factors.

Community Profile – an analysis of the attributes of the community based on the unique mixture of demographics, socioeconomic factors, occupancy risk, demand zones, and levels of service currently provided.
Through a methodical analysis of the risk dynamics present in Fire District 3, a risk assessment makes it possible to develop rational resource deployment strategies. The goal of the risk assessment process was to determine the probability of an event occurring, as well as the potential consequences of that event.

**Risk Assessment Components**

**Geospatial Characteristics.** In order for the District to develop meaningful demand zones, four types of boundaries were considered: (a) urban growth, (b) station areas, (c) neighboring fire jurisdictions, and (d) forested land.

**Topography.** Fire District 3 is comprised of diverse topographic features. Along its western border, running parallel to a north and south mid point, elevation is 300′ on a mostly flat plain. Along its eastern border, elevation reaches 2,225′ among forested land.

Static water is found in numerous natural and manmade lakes and ponds throughout the District. Significant watercourses are found in every station area of the District: (a) The Lewis River, (b) Salmon Creek, (c) China Ditch, and (d) Shanghai Creek. These watercourses experience a cycle of flooding approximately every five years. Water over roadways impedes traffic flow, to include emergency response routes, and some structures suffer from water damage.

**Transportation Networks.** The District has a major state route highway running along its western boarder, which funnels traffic through the center of the entire County. Posted speeds range from 40 to 55 mph, with double to multiple lanes. In addition to passenger traffic, vehicles containing regular consumer goods and various hazardous materials traverse this route continually.
Major thoroughfares, with little or no shoulders and often with deep ditches, are typically traveled at 50 mph. High impact collisions continue to be one of the District’s most common call types, often requiring the use of heavy extrication tools to rescue victims.

Private roads, in various states of repair, are prevalent everywhere. It is common for these roads to be in less than ideal condition, narrow and obstructed, with low hanging vegetation. Some of the roads are not properly signed which only exacerbates the problem of distinguishing between a driveway and a roadway. Additionally, some homes do not have their house addresses clearly posted, which may delay response.

Two roadways, 182nd Avenue and 199th Street, experience heavy congestion, causing traffic to come to a near standstill twice daily. A new high school is near completion, which may further impact congestion in the Hockinson area. Congestion may have a two-fold impact: (a) slower emergency response and (b) increased number of motor vehicle and pedestrian collisions.

Elevation extremes impact the grade of the roadways, slowing response speeds of apparatus to as little as 12 mph, depending upon the type of apparatus. Elevation further impacts response by increasing the possibility of needing snow chains. Even with chains, some roads are impassable without the use of specialized four-wheel-drive apparatus. Affected by varied snow levels and direction of travel, the District will at times have one vehicle in a station chained while another is not.

No new roads, excepting private drives, have been constructed within the borders of the District in recent years. There have been, however, several traffic flow interventions employed in various locations. These interventions have included four-way stops, traffic lights, road-grade reductions, added turning lanes, resurfaced roads, and some redesigned three-way intersections.
These traffic interventions have reduced the number of high-impact motor vehicle collisions at several key locations along 159th Street, 119th Street, and 152nd Avenue (District records support this observation).

The District lies directly below the flight path for the Portland International Airport and is home to several private landing strips. Light plane collisions occur on almost an annual basis.

Development and Population Growth. The District has experienced a steady new-construction growth, consisting mainly of rural residential occupancies, of 29 million dollars averaged per year from 1994 through 2002. As identified through Clark County Community Development, the County has five comprehensive growth plans; it is anticipated one will be adopted during the year 2003. Regardless of which plan is adopted, pressure from both Battle Ground and Vancouver to annex significant portions of Fire District 3 will be increased. If the new urban growth boundaries redefine the borders of the District, existing revenues would be decreased with the loss of taxable properties. Additionally, the District, in honoring its Countywide mutual aid agreements, would be obligated to continue to provide emergency services to these areas. Of the plans up for consideration, one projects population growth at 1.8% and the remaining four at 1.5%. If the District’s boundaries remain the same, it is estimated that population is projected to increase to about 20,000 in five years.

Emergency Responses (Calls/Alarms/Incidents)

During the calendar year 2002, Fire District 3 responded to 1042 incidents, divided into 21 distinct call types (see Figure 1A). This distribution illustrates one of several challenges faced in providing service within the District. Unlike a pure fire suppression agency, whose demand for service is primarily driven by the characteristics of fixed real property (land and buildings), demand within Fire District 3 is primarily driven by people. People are highly mobile thus
affecting the demand for service in a particular area, time of day, and day of year. Although some call types indicate a low number of responses, for example drowning, this does not negate the District’s obligation to provide the personnel, training, and equipment required to mitigate a situation like water rescue.

**Risk Categories**

Fire service organizations classify risks according to methodologies that best suit their particular situation. Some fire jurisdictions classify risks according to a graded system comprised of category types such as maximum, key, routine, remote, and special. Another approach is to classify risks by population density and land use: (a) urban, (b) suburban, (c) rural, and (d) wilderness or frontier. The District is easily divided into four risk categories:

1. Urban – Urban areas lie within urban growth boundaries established by the County. Historically, these areas have been annexed by an adjoining city prior to developing the land with commercial ventures and/or high-density housing.

2. Suburban – Suburban areas have a population density of 1000 to 1999 persons. Currently, the District has approximately only one square mile within its borders that is zoned for this growth, but it is not populated to this potential.

3. Rural – Rural areas have 1 to 999 persons per square mile, and this accounts for the vast majority of the District’s make up. These areas contain agricultural land and related structures, forested land, and single-family dwellings on 1.5- to 20-acre parcels. These areas also contain rural centers, like Hockinson, that may have any combination of small businesses, schools, and churches.

4. Wilderness – Wilderness areas have no persons living per square mile. The District has approximately 25 square miles of wilderness area.
All areas of risk can be further divided with consideration given to whether the area has any hydrants. An area with hydrants positively affects the District’s ability to produce required fire flow. Without hydrants, the District relies on 4000-gallon water tenders to supplement tank water carried on fire engines.

Fire District 3 considers risk by utilizing a combination approach that takes into consideration past events and related responses. This combination approach has developed a relative rating of risks for six key areas:

**Single Family Dwellings.** The greatest risk to a citizen in the District is to be subject to some type of illness-related medical emergency or a traumatic fall in the home. Risk is high; occurrence is high.

**Roads.** The second most commonly occurring risk is to be involved in a motor vehicle collision. Collisions are frequently high impact, resulting in severe injuries or death and significant property damage. Risk is high; occurrence is high.

**Structure Fires.** The risk of fire in a structure, especially in the single-family dwelling, is relatively high in the District. Not only will property be damaged, but injuries or death may result as well. Risk is moderate; occurrence is low. Approximately 20 structure fires occur each year. Structures common to the District (churches, small businesses, and single-family dwellings), utilizing the RHAVE system of occupancy vulnerability assessment profile (OVAP) scores, fall in the moderate category for risk (see Table 1A).

**Wildland Interface.** The District is rated as one of the top twelve areas in the State for the potential of experiencing wildland or urban-interface fires. Homes in each station area are

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1 RHAVE (Risk, Hazard and Value Evaluation) is a software tool developed by the Commission on Fire Accreditation International for use by fire jurisdictions for objectively rating risks to a national standard.
affected, to some degree, by this risk. Consequences could be catastrophic. The risk for fire is high; however, the occurrence is low.

**Flooding.** The abundance of surface water and existing floodplains present a risk for flooding. The challenge with flooding is that so many people and properties are affected at one time that it severely taxes the ability of emergency responding personnel to intervene on such a large scale. The risk is low; the occurrence is low (approximately every five years).

**Earthquakes and Volcanic Eruptions.** The region has a long history of earthquakes and eruptions. The potential for devastation exists; however, the District has been only minimally impacted over the years. Risk is low; the occurrence is rare.

**Probability**

**Frequency.** An analysis of frequency and types of calls was conducted to assess the probability of a particular event taking place. Figure 2A depicts how call volume has steadily increased over the years; however, for 2002, call volume dropped. An average of all call types is 2.85 per day.

In addition to the number of calls experienced across the entire District, it is necessary to evaluate the distribution of those alarms. Call volume, type, location, and frequency assist in determining the priority order for the distribution of resources. As seen in Table 2A, not all station areas receive the same volume of emergency responses.

Fire District 3 was dispatched to 100 alarms during 2002, to provide assistance to neighboring fire agencies, accounting for 9.6% of its call volume (see Table 3A). This percentage is up from 2001, when out-of-District requests for aid comprised 8.8% of the District’s call volume.
**Type Comparisons.** The history and comparison of the top ten call types is graphically displayed in Figure 3A. An ongoing rise in medical calls may be attributed to both an aging and growing population. A decrease in motor vehicle collisions is due, in part, to prevention efforts that called for the installation of traffic control mechanisms at high-risk intersections. The increase in canceled calls is directly linked to a change in incident recording methods. Debris burning remains a significant and growing challenge; several factors influence burning (changing boundary lines, various regulatory agencies involved, confusing public information, etc.).

The District has included a temporal analysis of aggregated data to demonstrate the peak load demands for response services at various times of the day. As demonstrated in Figure 4A, the chart uses a visual aid known as the radius graph to display the temporal distribution of calls. An overlay of Fire (all non-EMS calls) and EMS calls is displayed. The times of day at which events are likely to occur can be ascertained with this temporal view. The information provided in this analysis make a convincing case for the possibility of some departure from traditional fire service scheduling practices.

**Buildings.** The communities served by the District have a variety of activities taking place in various occupancy types, which directly influence the type, frequency, and probability of an incident occurring. After compiling data from District records, the Clark County Fire Marshal’s Office, and the County Assessor’s Office, information presented in Table 4A is the District’s best estimate of the numbers of buildings protected. These buildings have been classified using the descriptions set forth in the Uniform Building Code.

In summary, as indicated by the correlation of all factors considered in the risk assessment, the District must establish and maintain a priority order of the distribution of response companies. These response companies are in limited supply and must be able to handle
the high frequency, moderate/low risk events, while at the same time maintain adequate
concentration to support the requirements of maximum risk occupancies. Table 5A indicates the
District’s prioritization of resources regarding station staffing (FD3, 2000a).

SECTION FOUR: TIME & ON-SCENE PERFORMANCE

Rapid response and competent performance of essential tasks on an emergency scene are
indicative of an effective response force. District time and on-scene performance standards have
been set considering NFPA, the American Heart Association, the National Registry of EMTs,
and other appropriate organizations. Individual and company evaluations occur on an ongoing
basis (monthly, quarterly, and annually) through the District’s training program, promotions, and
the employee evaluation process.

Response Performance Standards

Response time elements are a cascade of events. Some time intervals can be directly
influenced by the District (turnout, travel, and action), while others cannot (notification and
processing). Careful definition of terminology is essential to any conversation about response
performance standards. It becomes even more critical when an organization attempts to
benchmark its performance against other providers. Figure 5A displays how time intervals and
time points are related to the cascade of events.

The discovery interval is the most difficult time to quantify. If people are in their home
sleeping and a fire starts, it is difficult to accurately identify when the fire started (Event
Initiation). Additionally, it may be the occupants, a passer-by, or a neighbor who observes the
fire (Emergency Event Awareness).

Fire District 3 is served by a regionally based 911-dispatching center. It is accredited and
has established call taking and dispatching standards for its operation. The center was in
compliance with its established processing goal of 60 seconds for 90% of priority emergency responses.

The District currently does not have the ability to evaluate turnout time without the use of a manual stopwatch. Another method of recording times that would allow for turnout time evaluation would be for the District to install mobile data terminals on all of its apparatus. Because the responding crews are limited to voice transmissions with the dispatchers, recording of turnout time on significant alarms is limited. Responding personnel are not allowed to report to dispatchers that they are responding, for certain call types, until after they have been enroute and the alarm has been further coded by the dispatchers. This delay in radio traffic allows the dispatchers to first notify emergency crews and get them responding as soon as possible. While the crews are responding, the dispatchers then obtain more information from the reporting party and provide the crews with the additional information. This methodology reduces the response interval. Until the dispatching center hires more personnel or the District purchases and maintains mobile data terminals, evaluation of turnout time will not occur on a regular basis.

**Time and Interval Description Methods**

Until recently, the District, like other fire agencies, referenced performance intervals in terms of an average amount of time. Although an average provides some value, it is not as meaningful as reporting performance goals in terms of a percentile. For example, “The fire engine will arrive on the emergency scene within 6 minutes 75% of the time,” is a goal that can be clearly understood by everyone. Table 6A displays an analysis of the Districts response time performance expressed in percentile terms.
Response Time Goals

**First Arriving Unit.** Effective with the adoption of this document, Fire District 3’s response-time goals shall be to have the first-in company arrive within the intervals identified in Table 7A. Times were arrived at through extensive evaluation of actual performance, speed restrictions on travel, topography, and travel distances from existing fire stations. The single largest contributor to long response times is the lack of available personnel for staffing stations. Travel distance from stations, even when staffed, is further restricted by the inability of vehicles to travel safely at speeds greater than what is currently practiced. The District’s average response speed ranges from 32 mph to 38 mph (direction of travel impacts average). The District has identified a frontier response zone, which runs along its eastern border. This frontier area has no residents, limited road access, gates, and elevation in excess of 1800 feet.

**Drawdown.** In an effort to maintain an effective response force for meeting response-time goals, the District has established the following minimum drawdown standards:

1. In the event of a request for station move ups or standbys, a minimum drawdown shall not exceed having 50% (two) of the District’s stations staffed with a minimum of two personnel in each.

2. In the event of a request for mutual or automatic aid, a minimum drawdown shall not exceed having 25% (1) of the District’s stations staffed with a minimum of two personnel in each.

Station staffing may be accomplished with any combination of qualified personnel either from Fire District 3 or another fire agency.

**First-Alarm Response.** Information depicted in Table 8A has been developed in order to initiate the appropriate response to the scene of any incident requiring Fire District 3 assistance.
When an incident exists in Fire District 3, all necessary resources should be called regardless of their jurisdictional affiliation. These are first-alarm guides; response changes may be necessary at the discretion of the Shift Leader or On-Call Officer. In the case of multiple incidents, the On-Call Officer will be responsible for resource management. This list of initial response recommendations is programmed into the regional computer-aided dispatching.

As illustrated in Table 8A, the number of personnel required for filling a first-alarm response ranges from 1 to 17 personnel. In-District station staffing, during regular daytime hours, ranges from 7 to 9 personnel. During the evening hours, staffing ranges from 4 to 8 personnel. With the aforementioned in mind, it is obvious that the District relies on volunteer and neighboring jurisdictions to respond to large structure fires. Routine responses, as opposed to working structure fires, are typically handled with in-District personnel.

**SECTION FIVE: ON-SCENE OPERATIONS, CRITICAL TASKS, AND ESTABLISHING AN EFFECTIVE RESPONSE FORCE**

On scene operations, critical tasking, and effective response force are the elements of the District’s standard of cover that determine staffing levels, number of units needed, and duties to be performed at an incident. The District has determined what tasks need to be completed in order to have a positive influence on the outcome of various situations, and the number of personnel and apparatus required to complete necessary tasks.

**On-scene Suppression and Rescue Operations**

The variables of fire growth dynamics and associated risks to property and life combine to determine the fire ground tasks that must be accomplished to mitigate loss. These tasks are interrelated but can be separated into two basic types, suppression and rescue. Suppression tasks are those related to getting water on the fire and fire load; suppression tasks may be integral to
the saving of lives. Rescue tasks are those related to finding trapped victims and relocating them to safety.

**Initial Attack & Support.** Through critical task analysis, the District has identified tasks and the associated amount of personnel that would be required for implementing initial fireground actions (see Table 9A).

**Secondary Support.** Secondary support functions may be performed by initial response personnel after completion of an initial assignment, or by special or additional units dispatched to the emergency scene. Support functions include salvage, overhaul, staffing of the rehabilitation, air supply, etc.

**Greater Alarms.** In the event of a second alarm or greater fire, the County fire-resource mobilization officer is notified. The mobilization officer assists with determining available resources for on scene and station back filling. Additionally, by request of an incident commander, a request for overhead personnel or activation of the regional Type 3 incident management team would be expected to arrive and provide command support.

**Emergency Medical Services.** As depicted in Table 8A, two to four personnel may be required for various call types. All responding District personnel are certified (First Responder & EMT) for providing basic medical and trauma care. Basic skills include the ability to treat wounds, apply oxygen, splint fractures, deliver babies, and a full compliment of medical emergencies. Additional skills include cardiac defibrillation and administering epinephrine. A limited number of personnel are certified to a level that allows placement of intravenous lines for fluid replacement and a route for the administration of drugs.

**Special Rescues.** The District trains all personnel to a minimum of the awareness level for water rescue and confined space operations. The District has a boat, PFDs, heavy rescue
bags, heavy cutting and prying tools, ropes and a compliment of other specialized equipment for special rescues. The District has the option of calling for a technical rescue team from Clark County Fire District 6 which has a boom truck, specialized equipment and trained personnel which could be expected to arrive in approximately 30-45 minutes. A technical rescue team and equipment is also available upon request from Vancouver Fire Department; response time is estimated to be one hour.

Hazardous Materials. District personnel are trained, at a minimum, to the operations level for hazardous materials. Command staff are trained to the incident commander level. Should the incident require technician-level intervention, a second tier of response above our established response time goals would be indicated. Technician-level support is provided through contract with Vancouver Fire Department. A technician-level team could be expected to arrive in approximately one hour.

SECTION SIX: DISTRIBUTION OF RESOURCES

Distribution describes the needed physical locations of resources to minimize and terminate emergencies by assuring a sufficiently rapid first due response deployment. District fire stations are strategically located to provide coverage on a relatively equal basis of approximately 20 square miles each. Fire station locations of neighboring jurisdictions are located in such a manner that geospatial positioning is fairly proportionate. Figures 6A, 7A, 8A, and 9A illustrate computer modeled response time rings in one-minute intervals from each station area. Each ring should have one minute of response time added to accommodate turnout time.

Computer modeling does not entirely reflect actual responses which are affected by road conditions (gravel, wet/dry/ice/snow surfaces, heavy traffic, etc.), driver experience, vehicle
type, dispatch information, vegetation overgrowth, road signage and visible occupancy addresses.

Figures 10A, 11A, 12A, and 13A illustrate actual incident locations per station area. In this rural setting with large occupancy lots, the pushpins locations make it appear as though the incidents occur on streets; this is only a visual illusion limited by the constraints of the mapping program.

**SECTION SEVEN: CONCENTRATION OF RESOURCES**

Fire District 3 currently does not have the option of concentrating more personnel and apparatus in a particular station. Until all District stations are staffed, looking further into concentration options is not addressed in this standard of cover.

**SECTION EIGHT: RESPONSE RELIABILITY**

Response reliability refers to the probability of the District’s ability to have the required amount of personnel and apparatus available for emergencies. Reliability would be 100% if every company were in place and available for every call. The reliability is reduced when companies are unavailable for a multitude of reasons: (a) out-of-station-area training, (b) fueling apparatus, (c) routine apparatus maintenance, (d) emergency repair of apparatus, (e) on the scene of another emergency, (f) providing mutual aid out-of-District, (g) back filling another station, and (h) an insufficient number of available personnel for staffing stations.

The District has not tracked reliability in the past; however, by the end of 2003, with the creation of some user-defined fields in the District’s information management system, reliability will be tracked for future analysis.
SECTION NINE: FUTURE

The District has a consistent track record of continually improving its standard of cover by building strategically located stations, keeping pace with modern apparatus and equipment, increasing the knowledge skills and abilities personnel, and planning for the future.

With the adoption of this current standard of cover, the District is now engaging in developing its next three-year strategic plan. Review and solidification of response-time and station staffing goals will be an important component of the planning process.

The District will consider many internal and external influences for ongoing refinement of its standard of cover. External forces will include, but not be limited to, existing and proposed urban growth boundary changes. Figure 14A displays encroachment of current urban growth boundaries. These boundaries affect potential annexations of portions of the District, as limited by State law (Annexation of Unincorporated Areas, 1990). These changes may affect available funding and create an inequity in existing mutual aid contracts.

Times are exciting for the District. Service levels are increasing; community support is strong. An in-District training prop is planned for construction, and the personnel that comprise the workforce of the District is outstanding!
Figure 1A. Medical calls account for the single highest type of response; however, it should be noted that, MVCs (motor vehicle collisions), hazmat (hazardous materials), structure fires, and numerous other emergency types require the greatest number of emergency response personnel.

Figure 2A. Incident history for the last 10 years.
Figure 3A. Five-year call-type comparison.

Figure 4A. Temporal distribution of all calls identified in 24-hour format per hour of the day for 2002.
Figure 5A. Time points and intervals related to the cascade of events. Numbers indicated in parenthesis reflect NFPA 1710, time standards in seconds. Time points identified in italics, are recorded by, and made available through the central dispatching center.
Figure 6A. Station 3-1 (Hockinson)
Figure 7A. Station 3-4 (Rawson)
Figure 8A. Station 3-3 (Battle Ground Lake)
Figure 9A. Station 3-2 (Venersborg)
Figure 10A. Station 3-1. 516 Incidents plotted for 2002.
Figure 11A. Station 3-4. 52 Incidents plotted for 2002.
Figure 12A. Station 3-3. 270 Incidents plotted for 2002.
Figure 13A. Station 3-2. 104 Incidents plotted for 2002.
Figure 14A.

Figure 14A. Urban Growth Encroachment.
Table 1A

**OVAP Scores**

<table>
<thead>
<tr>
<th>Category</th>
<th>Score</th>
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<tbody>
<tr>
<td>Maximum</td>
<td>60+</td>
</tr>
<tr>
<td>Significant</td>
<td>40 - 59</td>
</tr>
<tr>
<td>Moderate</td>
<td>15 - 39</td>
</tr>
<tr>
<td>Low</td>
<td>&lt;15</td>
</tr>
</tbody>
</table>

Note. Of the buildings entered into the program, the lowest score (16) was generated for a single-family dwelling; the highest score (29.99) was applied to a public school.

Table 2A

**Call frequency/distribution (In District)**

<table>
<thead>
<tr>
<th></th>
<th>ST3-1</th>
<th>ST3-2</th>
<th>ST3-3</th>
<th>ST3-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire/Hazmat/Assists</td>
<td>143</td>
<td>46</td>
<td>78</td>
<td>24</td>
</tr>
<tr>
<td>Medical/MVC/Rescue</td>
<td>373</td>
<td>58</td>
<td>192</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>516</td>
<td>104</td>
<td>270</td>
<td>52</td>
</tr>
</tbody>
</table>

Note. Calls indicated do not reflect mutual and automatic responses out-of-District, but only per station area. Coverage for Station 3-4 is primarily provided out of Station 3-1, and coverage for Station 3-2 is primarily provided out of Station 3-3.
Table 3A

Call frequency/distribution (out of District)

<table>
<thead>
<tr>
<th>Fire jurisdiction requesting aid</th>
<th>FD 6</th>
<th>FD 10</th>
<th>FD 11</th>
<th>FD 13</th>
<th>VFD</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of calls</td>
<td>1</td>
<td>2</td>
<td>53</td>
<td>3</td>
<td>41</td>
<td>100</td>
</tr>
<tr>
<td>% of total FD 3 calls</td>
<td>0.1</td>
<td>0.2</td>
<td>5.1</td>
<td>0.3</td>
<td>3.9</td>
<td>9.6</td>
</tr>
</tbody>
</table>

Key: FD = Fire District, VFD = Vancouver Fire Department.

Table 4A

Building/Occupancy Types

<table>
<thead>
<tr>
<th>Classification</th>
<th>No. of Buildings</th>
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<tbody>
<tr>
<td>Single-family residential</td>
<td>5695</td>
</tr>
<tr>
<td>Multiple-family residential</td>
<td>17</td>
</tr>
<tr>
<td>Place of assembly</td>
<td>19</td>
</tr>
<tr>
<td>Educational facility/complex</td>
<td>7</td>
</tr>
<tr>
<td>Office, professional, service</td>
<td>26</td>
</tr>
<tr>
<td>High explosion hazard</td>
<td>1</td>
</tr>
<tr>
<td>Moderate-hazard factory &amp; industrial</td>
<td>1</td>
</tr>
<tr>
<td>Repair garage</td>
<td>16</td>
</tr>
<tr>
<td>Nursing home for ambulatory</td>
<td>5</td>
</tr>
<tr>
<td>Mercantile</td>
<td>9</td>
</tr>
<tr>
<td>Dwelling &amp; lodging house</td>
<td>12</td>
</tr>
<tr>
<td>Low hazard storage</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>5813</td>
</tr>
</tbody>
</table>

Note. Several hundred agricultural type buildings, not listed above, exist throughout the District.
Table 5A

*Resource Distribution & Concentration Priorities*

<table>
<thead>
<tr>
<th>Priority</th>
<th>Station</th>
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<tbody>
<tr>
<td>First</td>
<td>3-1</td>
</tr>
<tr>
<td>Second</td>
<td>3-3</td>
</tr>
<tr>
<td>Third</td>
<td>3-2</td>
</tr>
<tr>
<td>Fourth</td>
<td>3-4</td>
</tr>
</tbody>
</table>

Note. Stations may be staffed with as little as one firefighter at a time. Under normal conditions one on-call officer, two career personnel, and two additional qualified staff are minimums for District staffing.

Table 6A

*Percentile Response-Time Analysis (2002)*

<table>
<thead>
<tr>
<th>Station</th>
<th>0-4</th>
<th>0-5</th>
<th>0-7</th>
<th>0-9</th>
<th>0-11</th>
<th>0-13</th>
<th>0-22</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-1</td>
<td>38</td>
<td>65</td>
<td>89</td>
<td>98</td>
<td>99</td>
<td>99</td>
<td>100</td>
</tr>
<tr>
<td>3-2</td>
<td>7</td>
<td>22</td>
<td>42</td>
<td>74</td>
<td>88</td>
<td>95</td>
<td>100</td>
</tr>
<tr>
<td>3-3</td>
<td>33</td>
<td>49</td>
<td>78</td>
<td>89</td>
<td>94</td>
<td>98</td>
<td>100</td>
</tr>
<tr>
<td>3-4</td>
<td>14</td>
<td>14</td>
<td>30</td>
<td>48</td>
<td>76</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>Overall</td>
<td>32</td>
<td>52</td>
<td>77</td>
<td>90</td>
<td>95</td>
<td>98</td>
<td>100</td>
</tr>
</tbody>
</table>

Note. The District has a response time compliance within 7 minutes 77% of the time. By dividing performance evaluation into station areas, it is evident that the unstaffed stations (3-2 & 3-4) are not served as well.
Table 7A

*Response Time Goals*

<table>
<thead>
<tr>
<th>Station</th>
<th>Staffed</th>
<th>Unstaffed</th>
<th>Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-1</td>
<td>6 min</td>
<td>8 min</td>
<td>80</td>
</tr>
<tr>
<td>3-2</td>
<td>6 min</td>
<td>8 min</td>
<td>75</td>
</tr>
<tr>
<td>3-3</td>
<td>6 min</td>
<td>8 min</td>
<td>80</td>
</tr>
<tr>
<td>3-4</td>
<td>6 min</td>
<td>8 min</td>
<td>75</td>
</tr>
<tr>
<td>Frontier</td>
<td>15 min</td>
<td>15 min</td>
<td>75</td>
</tr>
</tbody>
</table>

Note. Response to the Frontier area would be from the closest staffed station area.
### Table 8A

**First-Alarm Response**

<table>
<thead>
<tr>
<th>CALL TYPE</th>
<th>Personnel</th>
<th>Engine/Squad&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Tender&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Rehab</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Vehicle Collision</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Medical – Code 99</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical – A, B, C, D</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural Fire “B”</td>
<td>11</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Chimney Fire</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Alarms</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passenger Vehicle Fires</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial Vehicle Fires</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Hazardous Materials</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Hazardous Condition</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Assistance</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Investigation</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appliance Fire</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grass/Brush Fires</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Possible Structure Fire “L”</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>Squad response must be supported by an engine response (prior to initiating attack, proper water flow/pumping requirements must exist) prior to Fire attack.  
<sup>b</sup>If an area is hydranted, a tender response is not required.
Table 9A

*Initial Attack & Support*

<table>
<thead>
<tr>
<th>Task</th>
<th>No. of Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size up and command</td>
<td>1</td>
</tr>
<tr>
<td>Pump operations</td>
<td>1</td>
</tr>
<tr>
<td>Forcible entry, initial attack lines, water supply</td>
<td>4-6</td>
</tr>
<tr>
<td>Search &amp; rescue, ventilation, utilities</td>
<td>2-4</td>
</tr>
<tr>
<td>RIT/EMS</td>
<td>2-4</td>
</tr>
<tr>
<td>Second attack/back up line</td>
<td>3-4</td>
</tr>
<tr>
<td>Safety</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14-21</strong></td>
</tr>
</tbody>
</table>

Note. Establishment of a total effective response force may require more or less personnel to be on scene. The range of personnel and tasks represented reflects requirements common to a typical structure fire in Fire District 3.
Appendix B

Response Time Standards for First Response Agencies
## Appendix B

*Response Time Standards for First Response Agencies*

<table>
<thead>
<tr>
<th>ZONE</th>
<th>COVERAGE^a</th>
<th>HOT</th>
<th>COLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>≥90%</td>
<td>4 min 59 s</td>
<td>8 min 59 s</td>
</tr>
<tr>
<td>Suburban</td>
<td>≥90%</td>
<td>5 min 59 s</td>
<td>12 min 59 s</td>
</tr>
<tr>
<td>Rural</td>
<td>≥90%</td>
<td>10 min 59 s</td>
<td>20 min 59 s</td>
</tr>
<tr>
<td>Wilderness</td>
<td>≥90%</td>
<td>Best Effort</td>
<td>Best Effort</td>
</tr>
</tbody>
</table>

^aPercent of time the standard is required to be met.
Appendix C

Response Time Performance Goal Comparisons
### Appendix C

*Response Time Performance Goal Comparisons (First-due Companies Only)*

<table>
<thead>
<tr>
<th>Agency</th>
<th>Category</th>
<th>Time in minutes / %</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Urban</td>
<td>Suburban</td>
</tr>
<tr>
<td>TVF&amp;R</td>
<td>All - Calls</td>
<td>6.0 / 75</td>
<td>8.5 / 75</td>
</tr>
<tr>
<td>TVF&amp;R</td>
<td>EMS</td>
<td>6.0 / 75</td>
<td>8.0 / 75</td>
</tr>
<tr>
<td>TVF&amp;R</td>
<td>HazMat</td>
<td>21.0 / 75</td>
<td>35.0 / 75</td>
</tr>
<tr>
<td>TVF&amp;R</td>
<td>Water Res</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TVF&amp;R</td>
<td>Tech Res</td>
<td>15.0 / 75</td>
<td>-</td>
</tr>
<tr>
<td>KCFD7</td>
<td>Priority</td>
<td>-</td>
<td>5.0 / 90</td>
</tr>
<tr>
<td>KCFD7</td>
<td>Non-Priority</td>
<td>9.0 / 90</td>
<td>15.0 / 90</td>
</tr>
<tr>
<td>KCFD7</td>
<td>Haz Mat</td>
<td>60.0 / 90</td>
<td>60.0 / 90</td>
</tr>
<tr>
<td>KCFD7</td>
<td>Marine</td>
<td>30.0 / 90</td>
<td>30.0 / 90</td>
</tr>
<tr>
<td>KCFD7</td>
<td>Tech Res</td>
<td>60.0 / 90</td>
<td>60.0 / 90</td>
</tr>
<tr>
<td>CFD1</td>
<td>All</td>
<td>4.0 / 90</td>
<td>6.0 / 90</td>
</tr>
<tr>
<td>CCFD12°</td>
<td>All</td>
<td>4 mins plus 1 min for each mile or partial mile / 80</td>
<td></td>
</tr>
<tr>
<td>NFPA</td>
<td>All</td>
<td>4.0 / 90</td>
<td>4.0 / 90</td>
</tr>
</tbody>
</table>

Note. Percentages reflect the performance goal desired to be met within the indicated time frame. Dashes indicate TVF&R had insufficient data to set goals. Blanks indicate that the jurisdiction has no areas meeting the identified description.  
°Fire District 12 applies their standard to all areas.