

2018

Mitigation & Level of Service Policy



**SHORELINE FIRE
DEPARTMENT**

Mitigation and Level of Service
Policy for Fire Service Concurrency
Adopted July, 2017

Attachment 8- 2018 Mitigation & Level of Service Policy

Shoreline Fire Department Mitigation and Level of Service Policy

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July 2017

This policy has been designed with two distinct purposes in mind, first to inform the lay reader regarding issues critical to maintaining fire service concurrency and second, to provide guidance to Shoreline Fire Department's staff in implementing appropriate mitigations that are necessary for maintaining fire service concurrency within the Shoreline Fire Department service area. The basis for impact and level of service contribution fees is derived from the revenues needed to maintain Shoreline Fire Department's 2018–2037 Capital Improvement Plan.

Attachment 8- 2018 Mitigation & Level of Service Policy

Attachment 8- 2018 Mitigation & Level of Service Policy

Table of Contents

1.	Acronyms	4
2.	Definitions.....	4
3.	Concurrency Policy Statement.....	6
4.	Purpose Statement.....	7
5.	Consistency with other Plans and Policies:	7
6.	Introduction:.....	8
7.	The Importance of Time and Fire Service Measures	8
	Figure 1: Photo of a Witnessed Flashover	10
	Figure 2: Time vs. Products of Combustion	11
	Figure 3: Cardiac Survival Rate.....	13
	Figure 4: Cardiac Survival with CPR and Defibrillation.....	13
8.	National Fire Service Standards for Performance:	14
	Figure 5: Community Definitions and Performance Expectations	16
9.	State and Local Standards.....	18
	Figure 6: SFD Turnout Time Performance Objectives.....	19
	Figure 7: SFD Drive Time Performance Objectives.....	19
	Figure 8: SFD Reliability Objectives.....	19
10.	Local Restriction on Level of Service	19
11.	Need for Mitigation of Development Impacts	20
12.	Determining Development Impacts	20
13.	Developer Agreements Required.....	24
14.	Mitigation Methodology and Fee Application:.....	26
15.	Assurance of Adequate Provisions for Public Safety:	30
16.	Policy Review and Adjustment:.....	30
	Appendix A.....	31
	Appendix B	33

1. Acronyms

ALS:	Advanced Life Support
BLS:	Basic Life Support
C&E:	Capital and Equipment
CFAI:	Commission on Fire Accreditation International
CPSE:	Center for Public Safety Excellence
EMS:	Emergency Medical Services
ERF:	Effective Response Force
IAFC:	International Association of Fire Chiefs
ICMA:	International City/County Management Association
ISO:	Insurance Services Office
SFD:	Shoreline Fire Department
NFPA:	National Fire Protection Association
SOC:	Standard of Cover

2. Definitions

- 2.1. Call Stacking:** Refers to the occurrence of simultaneous emergency calls. Call stacking occurs when more than one request for emergency assistance occurs within the same fire station **service** area. When this occurs, the primary response unit cannot answer the second emergency and a second fire unit from the same station must respond or a fire unit from a fire station much farther away responds.
- 2.2. Concentration:** Refers to the deployment of multiple fire and rescue resources from within a fire service jurisdiction so that the proper number of resources needed for all types of emergency incidents can be assembled at the scene of an emergency within the defined level of service time.
- 2.3. Concurrence:** Concurrence refers to the twelfth goal of the Washington State Growth Management Act¹ which requires public facilities and services necessary for public safety to be adequate to serve new development without decreasing current service levels below locally established minimum standards.

¹ Source: RCW 36.70A.020

Attachment 8- 2018 Mitigation & Level of Service Policy

- 2.4. Distribution:** The deployment or “distribution” of fire stations and resources across a fire service jurisdiction so that the adopted first-in drive time standard for fire and rescue resources can be achieved.
- 2.5. Drive Time:** The elapsed time needed for an emergency vehicle to travel to a dispatched address. Drive time begins when the wheels of a fire apparatus begin to roll in response to a dispatch and ends when the apparatus is parked at the scene of the dispatched address.
- 2.6. Effective Response Force:** Refers to the number of resources and personnel needed to effectively provide fire or emergency medical services. The number of resources making up an effective response force varies by type of emergency.
- 2.7. F-Box or Fire Box:** A geographic area usually a quarter section of land (1/4 mile square) that is used to define the types, numbers and locations of fire and rescue resources to be dispatched to an emergency.
- 2.8. Fire Impact Fee:** A fee authorized under Chapter 82.02 RCW that is assessed on new development to pay a proportionate share of the costs associated with maintaining fire service concurrency inside of a jurisdiction that has adopted fire impact fees. Fire Impact fees must be adopted and authorized by the local land use authority (City of Shoreline).
- 2.9. Fire Level of Service Fee:** A fee that is used to mitigate the direct impacts new development has upon fire services inside of a jurisdiction that has not adopted fire impact fees. Fire Level of Service Fees are consistent with the Growth Management Act and applied through the SEPA process or in cooperation with the authority having permitting jurisdiction under RCW 54.18.110.
- 2.10. Fire Service Concurrency:** See Concurrency
- 2.11. First-in:** Refers to the first fire and rescue resource to arrive at the scene of an emergency. Distribution performance is a measure of first-in drive time.
- 2.12. Fractile Performance:** Refers to the percentage of time a specified performance expectation is achieved. If an emergency response drive time of five minutes is achieved on 82 of 100 responses, the fractile performance would be 82%.
- 2.13. Full First Alarm:** Refers to the number of fire resources and personnel assigned to a specific alarm type that is capable of assembling an effective response force.

Attachment 8- 2018 Mitigation & Level of Service Policy

- 2.14. Reliability:** Refers to the use of fire resource capacity. For a resource to be reliable, it must be available to answer emergency calls as least as often as the service expectation placed upon that resource. For instance, if a fire resource is expected to deliver service at the adopted standard 90% of the time, then that resource should be available to respond to an emergency incident from its assigned fire station at least 90% of the time. Reliability levels below the adopted performance expectation indicate resource exhaustion.
- 2.15. Resource Exhaustion:** Resource exhaustion occurs when the demand for service placed upon a fire service resource is so great, that its fractile reliability begins to fall below the adopted level of service for that resource resulting in the need for resources from fire stations farther away to respond in place of the resource experiencing exhaustion. A fire station service area experiencing regular resource exhaustion will result in longer and longer response times unless additional resources are added to the fire station serving that area to create more capacity.
- 2.16. Response:** Response refers to the movement of firefighters and fire apparatus to the scene of an emergency request for fire or emergency medical services. The request for response is generally issued through North East King County Regional Public Safety Communication Agency (NORCOM), the 9-1-1 answering point for SFD.
- 2.17. Standard of Cover:** Refers to the in-depth process developed by the Center for Public Safety Excellence in their accreditation process for the strategic planning of fire station and fire resource deployment. Standard of Cover is the “**Standard**” to which the fire department will deliver service based upon community descriptions and the risks within those community types.

3. Concurrency Policy Statement

- 3.1.** It is the policy of the Shoreline Fire Department (SFD) to participate in the orderly growth of the community and to maintain concurrency of fire and life safety services as the community grows. Concurrency describes the ideal that service capacity of SFD shall grow with or stay concurrent with the impacts of development occurring within the service area. SFD recognizes that regional economic vitality depends upon orderly growth and supports community growth through development and is not opposed to new development.
- 3.2.** However, new development and the population increase that comes with new development, has a direct impact on the ability of SFD to maintain adopted levels of

Attachment 8- 2018 Mitigation & Level of Service Policy

service that assures adequate public safety and concurrency with development. Consequently, SFD opposes the negative impacts development imposes upon level of service performance and directs the Fire Chief to utilize the mitigation strategies found within this document to mitigate any and all negative impacts of development that threaten concurrency by reducing service capacity below the benchmark level of service standards adopted herein.

- 3.3.** The Fire Chief shall cause the evaluation of each development proposed to occur within the service area. The Chief's evaluation shall identify any adverse impacts that may affect SFD's ability to maintain adopted benchmark levels of service and the mitigation strategies necessary to maintain concurrency with development. It is the intent of SFD to recognize when adequate service capacity exists and to only impose mitigations that are rational and relational to the impacts of new development upon service capacity.

4. Purpose Statement

- 4.1.** The purpose of this policy is to establish guidelines for the implementation of monetary and non-monetary mitigations appropriate to maintaining fire service concurrency within SFD's emergency response area. It is the intent to utilize the guidelines herein to mitigate the direct impacts of new development upon SFD's ability to deliver fire and life safety services in accordance with its adopted level of service standards. Further, this policy shall constitute Impact Fee, State Environmental Protection Act (SEPA) and land subdivision policy, as adopted by the Board of Commissioners of Shoreline Fire Department.

5. Consistency with other Plans and Policies:

- 5.1.** To ensure that Shoreline Fire Department (SFD) will be able to meet the increasing demand for fire protection services resulting from future development and population growth, this policy utilizes the findings and conclusions of a number of plans and policies including but not limited to; Shoreline and King County Comprehensive Plans, SFD's Capital Facilities Plan, Station Location Analysis, and annual reports required by Chapter 52.33 RCW.

6. Introduction:

- 6.1. The primary responsibility of SFD is the delivery of fire and rescue services. The delivery of these services ideally originates from fire stations located throughout the service area. To provide effective service, firefighters must respond in a minimal amount of time after the incident has been reported and with sufficient resources to initiate meaningful fire, rescue, or emergency medical services.

7. The Importance of Time and Fire Service Measures

- 7.1. Time is the critical issue when an emergency is reported. Fire can expand at a rate of many times its volume per minute and as a result, quick response is critical for the rescue of occupants and the application of extinguishing agents to minimize loss. The time segment between fire ignition and the start of fire suppression activities has a direct relationship to fire loss.
- 7.2. The delivery of emergency medical services are also time critical. Survival rates for some types of medical emergencies are dependent upon rapid intervention by trained emergency medical personnel. In most cases, the sooner that trained fire or emergency medical rescue personnel arrive, the greater the chance for survival and conservation of property. The importance of time and the critical factors affected by time are discussed below in 7.3.

7.3. Fire Department Total Reflex Time Sequence

- 7.3.1. There are five components of the fire department total reflex time sequence. Each of these components is defined below:
- 7.3.1.1. **Dispatch time:** Amount of time that it takes to receive and process an emergency call. This includes (1) receiving the call, (2) determining what the nature of the emergency is, (3) verifying where the emergency is located, (4) determining what resources and fire department units are required to handle the call, and (5) notifying the fire department units that are to respond.
 - 7.3.1.2. **Turnout time:** The time from when fire department units are first notified of an emergency to the beginning point of response time. This includes

Attachment 8- 2018 Mitigation & Level of Service Policy

discontinuing and securing the activity they were involved in at time of dispatch, traveling by foot to their apparatus, donning appropriate protective clothing and taking a seat-belted position on the apparatus.

- 7.3.1.3. **Response/Drive time:** The time that begins when the wheels of a response unit begin to roll en route to an emergency incident and ends when wheels of the response unit stop rolling upon arrival at the address of the emergency scene.
- 7.3.1.4. **Access time:** Amount of time required for the crew to move from where the apparatus stops at the address of an emergency incident to where the actual emergency exists. This can include moving to the interior or upper stories of a large building and dealing with any barriers such as locked gates, doors or other restrictions that may slow access to the area of the emergency.
- 7.3.1.5. **Setup time:** The amount of time required for fire department units to set up, connect hose lines, position ladders, and prepare to extinguish the fire. Setup time includes disembarking the fire apparatus, pulling and placing hose lines, charging hose lines, donning self-contained breathing apparatus, making access or entry into the building, and applying water. The opportunity for saving time during setup is minimal.
 - 7.3.1.5.1. Setup time also includes the time required for firefighters to deploy lifesaving equipment such as defibrillators, oxygen masks, and other rescue tools such as the jaws-of- life.

7.4. Fire Department Total Reflex Time Sequence

- 7.4.1. The term flashover refers to the most dangerous time in fire growth. As a fire grows within a room, its radiant heat is absorbed by the contents of the room heating up the combustible gases and furnishings to their ignition point until finally the entire room bursts into flame.

Figure 1: Photo of a Witnessed Flashover



- 7.4.2. Measuring the time to flashover is a function of time and temperature. Fire growth occurs exponentially; that is, fire doubles itself every minute of free burn that is allowed.
- 7.4.3. There are a number of factors that determine when flashover may occur. These include the type of fuel, the arrangement of the fuels in the room, room size, and so on. Because these factors vary, the exact time to flashover cannot be predicted, making quick response and rapid fire attack the best way to control fire, protect life and reduce fire loss.
- 7.4.4. Over the past 50 years, fire engineers agree that the replacement of wood and other natural products with plastics and synthetic materials for interior furnishings has resulted in increased fuel loads, higher fire temperatures and decreasing time to flashover, making quick response more important than ever. Flashover can typically occur from less than four (4) to beyond 10 minutes after free burning starts, depending upon the air or oxygen supply available to the fire.

Attachment 8- 2018 Mitigation & Level of Service Policy

resources available to supply a full first alarm and the effective response force resources required for a structure fire. As a result, it is typical for structure fire responses to be supplemented with mutual aid companies from other jurisdictions that take much longer to arrive, limiting SFD's overall ability to control larger fires.

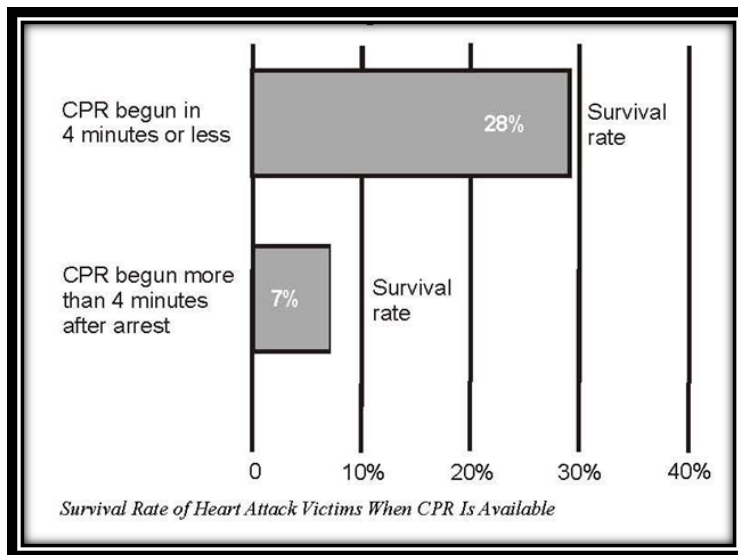
7.5. Consequences of Flashover

- 7.5.1. Once flashover occurs, it is no longer possible for survival in the room of flashover. Not even firefighters in complete protective gear can survive the intense heat of flashover. A post-flashover fire burns hotter and moves faster, compounding the search and rescue problems in the remainder of the structure at the same time that more firefighters are needed to deal with the much larger fire problem.
- 7.5.2. Because of the dramatic change in fire conditions post flashover, all fire based performance standards attempt to place fire resources on scene of a fire prior to flashover.

7.6. Brain Death in a Non-Breathing Patient

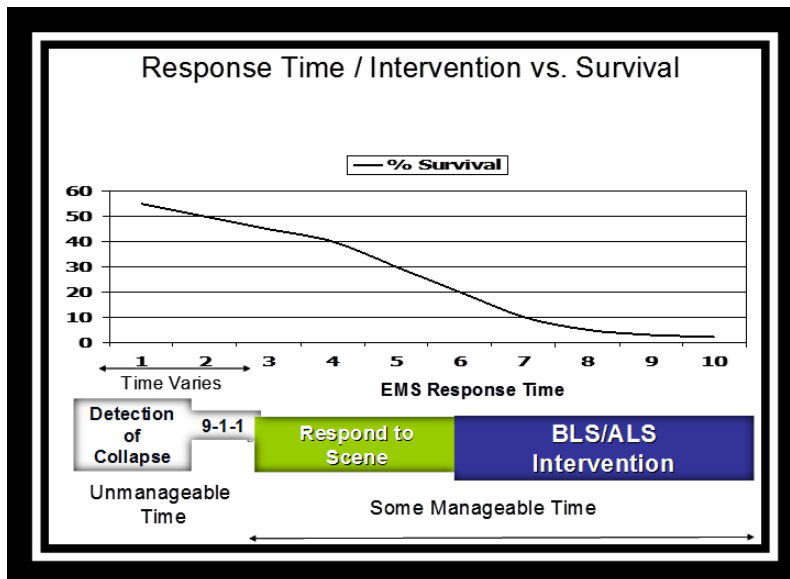
- 7.6.1. The delivery of emergency medical services (EMS) by first responders is also time critical for many types of injuries and events. If a person has a heart attack and cardiopulmonary resuscitation (CPR) is started within four minutes, that person's chances of leaving the hospital alive are almost four times greater than if they did not receive CPR until after four minutes. Exhibit 3 shows the survival rate for heart attack victims when CPR is available.

Figure 3: Cardiac Survival Rate²



7.6.2. Chances of survival are increased with the intervention of a cardiac defibrillator. All SFD units carry defibrillators. Exhibit 4 shows the survival rate of a heart attack victim with CPR and defibrillation.

Figure 4: Cardiac Survival with CPR and Defibrillation³



² Source: National Fire Protection Association Handbook Volume 19

³ Data Source: King County Emergency Medical Services

8. National Fire Service Standards for Performance:

8.1. National Fire Protection Association (NFPA) Standard 1710

8.1.1. NFPA 1710 establishes Standards for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments and contains the following time objectives:

8.1.1.1. **Turnout time:**

- Fire based response: 1 minute 20 seconds (80 seconds)
- Medical based response: 1 minute 00 seconds (60 seconds)

8.1.1.2. **Fire response/drive time:** Four minutes (240 seconds) or less for the arrival of the first arriving engine company and at least four (4) firefighters at a fire suppression incident and/or eight minutes (480 seconds) or less for the deployment of a full first alarm assignment of at least 14 firefighters at a fire suppression incident in a 2,000 square foot, single family residence.

8.1.1.3. **First responder or higher emergency medical response/drive time:**

Four minutes (240 seconds) or less for the arrival of a unit with first responder or higher-level capability and an automatic electronic defibrillator (AED) at an emergency medical incident

8.1.1.4. **Advanced life support response/drive time:** Eight minutes (480 seconds) or less for the arrival of an advanced life support unit at an emergency medical incident, where the service is provided by the fire department

8.1.1.5. The NFPA Standard 1710, states that the fire department shall establish a performance objective of not less than 90 percent for the achievement of each response time objective. NFPA 1710 also contains a time objective for dispatch time by requiring that "All communications facilities, equipment, staffing, and operating procedures shall comply with NFPA 1221." NFPA 1221 sets the performance standard for dispatch time at one (1) minute (60 seconds), 90 percent of the time.

8.1.1.6. Adding the three separate time segments together, the NFPA expects the following temporal benchmarks to be performed at least 9 out of every 10 times from receipt of a 9-1-1 call to the arrival of fire and EMS resources;

Attachment 8- 2018 Mitigation & Level of Service Policy

- Fire call
 - First-in Dispatch = 1:00 + Turnout = 1:20 + Drive = 4:00 = 6:20
 - Full alarm Dispatch = 1:00 + Turnout = 1:20 + Drive = 8:00 = 10:20
- EMS – Basic Life Support (BLS)
 - First-in Dispatch = 1:00 + Turnout = 1:00 + Drive = 4:00 = 6:00
 - Full Alarm Dispatch = 1:00 + Turnout = 1:00 + Drive = 8:00 = 10:00
- EMS – Advanced Life Support (ALS)
 - First-in Dispatch = 1:00 + Turnout = 1:00 + Drive = 4:00 = 6:00
 - Full alarm Dispatch = 1:00 + Turnout = 1:00 + Drive = 8:00 = 10:00

8.2. Center for Public Safety Excellence Standards of Response Coverage

8.2.1. The Center of Public Safety Excellence is a consortium of the International Association of Fire Chiefs (IAFC), the International Association of Fire Fighters (IAFF), the International City/County Management Association (ICMA), the National Fire Protection Association (NFPA), the Department of Defense (DOD), and the Insurance Services Office (ISO). Together this group has established the Commission on Fire Accreditation International (CFAI) and criteria for fire departments to achieve Accredited Agency Status. Critical to achieving Accredited Agency Status is an assessment of the fire department's ability to effectively deliver service. To make this assessment, the CFAI has established a methodology for; determining the fire service risk of a community, assessing the fire department's capability compared to risk, measurement of resource capacity, and guidelines for performance standards to assess overall capabilities of a fire department. The CFAI publishes this methodology in its Standards of Cover manual.

8.2.2. The term standard of cover refers to the "standard(s)" to which a fire department runs daily operations in order to "cover" the service area of the fire department. The CFAI process for establishing a Standard of Cover has nine parts that are described below with relevant information to SFD:

8.2.2.1. **Existing deployment assessment:** Identifies current inventory of fire stations, apparatus and staffing. SFD's stations apparatus and staffing are found in the Capital Improvement Plan in Section 2, Inventory of Current Capital Assets.

8.2.2.2. **Review of Community outcome expectations:** Ultimately, level of service standards are driven by the community. SFD's standards have been adopted herein and by the City of Shoreline in their Comprehensive Plan which has undergone a public review and hearing process.

Attachment 8- 2018 Mitigation & Level of Service Policy

- 8.2.2.3. **Community risk assessment:** The CFAI identifies the service area definitions, and benchmarks for performance in Figure 5: Community Definitions and Performance Expectations on the next page. SFD provides fire and life safety services to approximately 13 square miles and serves an urban community. Suburban and Rural benchmarks are also included in the following tables for comparison only.

Figure 5: Community Definitions and Performance Expectations

Urban -an incorporated or un-incorporated area with a population of over 30,000 people and/or a population density of 2,000 people per square mile				
	1st Unit	2nd Unit	Balance of 1st Alarm	Performance
Benchmark	4 minutes	8 minutes	8 minutes	90%
Suburban -an incorporated or un-incorporated area with a population of 10,000-29,999 and/or any area with a population density of 1,000 to 2,000 people per square mile.				
	1st Unit	2nd Unit	Balance of 1st Alarm	Performance
Benchmark	5 minutes	8 minutes	10 minutes	90%
Rural –an incorporated or un-incorporated area with a population less than 10,000 people, or with a population density of less than 1,000 people per square mile.				
	1st Unit	2nd Unit	Balance of 1st Alarm	Performance
Benchmark	10 minutes	14 minutes	14 minutes	90%

- 8.2.2.4. **Distribution of Resources:** Fire stations should be distributed so that resources deployed from them can provide coverage to the response area within the level of service (LOS) standard established for first-in fire and rescue units.
- 8.2.2.5. **Concentration of Resources:** Fire resources should be concentrated near high demand areas and in large enough numbers of equipment and personnel to provide an effective response force with the full first alarm assignment. Because of a lack of resources, SFD often relies on resources from neighboring fire departments to assemble an effective response force.

Attachment 8- 2018 Mitigation & Level of Service Policy

- 8.2.2.6. **Capacity Analysis/Reliability:** To achieve an adopted performance standard, resources must be available or “reliable” at least as often as their adopted performance expectation. Historic reliability below the adopted performance standard places the service area in “Resource Exhaustion” and creates call stacking and simultaneous calls within a specific service area. SFD is currently experiencing resource exhaustion at all three staffed stations.
- 8.2.2.7. **Historical response effectiveness studies:** The percentage of compliance the existing response system delivers based on current LOS. The 2014-2016 SFD “Benchmark” performance; Table 8 in the SFD Capital Improvement Plan, identifies historical sub-standard performance.
- 8.2.2.8. **Prevention and mitigation:** Prevention and mitigation directly impacts the level of safety for responding firefighters and the public. Using analysis of risk and looking at what strategic mitigations can be implemented may not only prevent the incident from occurring but may also minimize the severity when and if the incident ever occurs.
- 8.2.2.8.1. SFD works closely with the City of Shoreline to reduce risk by providing enforcement of the International Fire Code. This policy will provide the additional mitigations necessary to maintain fire service concurrency.
- 8.2.2.9. **Overall evaluation:** In 90 percent of all incidents, the first-due unit shall arrive within 4 minutes travel or 6 minutes 20 seconds of total reflex time which includes; dispatch, turnout and response times. The first-due unit shall be capable of advancing the first hose line for fire control, starting rescue procedures or providing basic life support for medical incidents. In a moderate risk area, an initial effective response force shall arrive within 8 minutes travel or 10 minutes 20 seconds of total reflex time, 90 percent of the time, and be able to provide a fire flow capable of matching community risk for firefighting, or be able to handle a five-patient emergency medical incident.

9. State and Local Standards

9.1. Washington State Law

9.1.1. Chapter 52.33 RCW requires fire departments with paid staff to establish Level of Service (LOS) policies and performance objectives based on the arrival of first responders with defibrillation equipment prior to brain death and the arrival of adequate fire suppression resources prior to flashover. This law recognizes the NFPA's Standard 1710 and the Commission on Fire Accreditation International's (CFAI) Standard of Cover as bases for this statute and requires a 90% performance expectation of the established LOS.

9.2. King County Standards

9.2.1. The King County Comprehensive Plan and Countywide Planning Policies are based on the concept of concurrency and require that adequate facilities and services be available or be made available to serve development as it occurs. The County Comprehensive Plan recognizes the validity of using a response time analysis in determining appropriate service levels and recognizes the central role of fire protection districts in providing those services. The King Countywide Planning Policies further state that capital facility investment decisions place a high priority on public health and safety.

9.3. City of Shoreline Response Standards

9.3.1. The Shoreline Comprehensive Plan has adopted the following fire service response standards:

9.3.1.1. Urban areas: Seven (7) minutes from time of 911 call until curbside arrival of emergency response personnel.

9.4. Level of Service (LOS) Standard

9.4.1. SFD has established benchmark performance measures following the guidelines established by the Center for Public Safety Excellence (CPSE) as published in their 9th edition of the Commission on Fire Accreditation (CFAI) Self-Assessment Manual. Benchmark performance represents industry best practices and performance below those standards can contribute to unnecessary property and life loss.

Attachment 8- 2018 Mitigation & Level of Service Policy

Figure 6: SFD Turnout Time Performance Objectives

Turnout Time Objectives				
Performance Type	Urban	Suburban	Rural	Performance Factor
Daytime: all alarms	2 min, 00 sec	2 min, 00 sec	2 min, 00 sec	90% of the time
Nighttime: all alarms	2 min, 30 sec	2 min, 30 sec	2 min, 30 sec	90% of the time

Figure 7: SFD Drive Time Performance Objectives

SFD Drive Time Objectives				
Performance Type	Urban	Suburban	Rural	Performance Expectation
Distribution - Benchmark	4 min, 00 sec	5 min, 00 sec	8 min, 00 sec	90% of the time
Concentration - Benchmark	8 min, 00 sec	10 min, 00 sec	14 min, 00 sec	90% of the time

Figure 8: SFD Reliability Objectives

Minimum Reliability Objectives			
Performance Type	Urban	Suburban	Rural
Minimum Peak Hour Unit Reliability	90%	90%	90%

10. Local Restriction on Level of Service

10.1. SFD has assessed its ability to deliver service in compliance with established national standards finding that current deployment will not allow the department to meet recognized standards. As a result of the level of service analysis, SFD has completed a fire station analysis with a focus on determining the optimum station location and resource deployment necessary to achieve effective response times. This study has considered the National Fire Protection Association’s Standard 1710, the Center for Public Safety Excellence’s (CPSE) Standard of Coverage recommendations and Chapter 52.33 RCW in establishing standards for emergency response.

11. Need for Mitigation of Development Impacts

- 11.1.** SFD current fire system performance falls far short of national standards and would be considered in response failure compared to the CFAI standards. Any additional impacts posed by new development will further erode SFD's ability to deliver service at adopted standards.
- 11.2.** As a result of the economic recession that began in 2009, tax revenues available to SFD were reduced because of the reduction in assessed property values. SFD is dependent upon property tax revenues generated from a levy of \$1.00 per thousand dollars of assessed real and personal property value and a recently approved Fire Benefit Charge. The declining property values, and resulting declining revenues, caused staffing reductions, delays in equipment replacements, and significant depletion of capital funds. Traditional funding of capital replacement programs has been shifted to meet operating expenses which is largely made up of salary and benefits for firefighters and other staff leaving the capital plan under-funded. A recent capital bond was passed, but it is inadequate to address current and future capital needs.
- 11.3.** Unless new development can mitigate their impacts to the SFD system in accordance with this policy, SFD must oppose each and every development occurring within the SFD service area.

12. Determining Development Impacts

12.1. Concepts of Fire Service Capacity and Cascading Failure:

- 12.1.1. The deployment of fire and life safety resources such as fire engines and emergency medical vehicles is geographically based through planned selection of fire station locations. Fire station locations must be carefully chosen to allow the resource(s) deployed from these locations to reach all portions of the fire stations assigned service area within a time frame capable of providing successful outcomes for critically injured or non-breathing patients and to prevent flashover and minimize life and property loss during a structure fire.
- 12.1.2. This type of geographic deployment depends on the availability of the resources assigned to that fire station location. System failure begins to occur when the demand for these resources is increased to a point where simultaneous requests for a resource begins to commonly occur as a result of exceeding the capacity of that resource. When service demand exceeds a fire station's capacity, a resource from a fire station further away must respond in its place. The result of this situation is often referred to as cascading failure. The failure of one resource to be

Attachment 8- 2018 Mitigation & Level of Service Policy

available to answer emergency calls cascades to the next closest fire station resource, leaving two service areas unprotected when the covering resource vacates its assigned area to make up for lack of capacity of the failing resource. This effect continues to cascade out with a ripple effect to yet other fire stations and jurisdictions.

12.1.3. Cascading failure causes longer drive times to reach emergency scenes and as a result, it is less likely that those resources can positively affect the negative outcomes of flashover and brain death.

12.1.4. The solution to cascading failure is the addition of service capacity through the deployment of additional response resources to the fire station that is experiencing substandard reliability. The deployment of additional fire resources results in considerable expense to a community, therefore a delicate balance must be maintained to use but not exceed the service capacity of resources.

12.1.5. The Center for Public Safety Excellence refers to a fire resource's capacity in their Commission on Fire Accreditation International Standards of Cover guidelines, in terms of level of "reliability" of a fire resource. If a resource is available at least as often as the expected performance measurement, it is considered reliable.

12.1.6. SFD's ability to meet its response time standards is directly affected by resource reliability.

12.2. Components of Response:

12.2.1. SFD measures the direct impact of an individual development on system performance by determining the development's impact on service capacity and fire department response times. Fire department response times have two primary measures. First is the arrival time of the initial arriving "first-in" or distribution resource. Second is the arrival of all resources needed to effectively mitigate the incident which is referred to as the "Effective Response Force" (ERF) or concentration of resources. The ERF is also commonly referred to as the full first-alarm assignment. An initial arriving resource can begin to render aid or perform other necessary tasks as a component of the ERF but cannot resolve the incident alone. An ERF for a life threatening medical call requires two or more fire resources and a structure fire requires five or more fire resources. The additional resources of the ERF must respond from greater distances than the first-in resource therefore the first-in and ERF have two separate performance expectations.

Attachment 8- 2018 Mitigation & Level of Service Policy

12.3. Effect of Development on Fire System Performance:

- 12.3.1. Each additional development impacts service capacity affecting the reliability and the temporal performance of fire service resources. Where service capacity exists to accommodate the impacts of new development, mitigations should be reduced accordingly to allow new development credit for the existing capacity. However, service capacity or resource reliability must be carefully measured to assess the reliability and response performance of both first-in and full first alarm ERF resources.
- 12.3.2. It is important to understand whether a new development is placed nearer to or farther from a fire station, its use of service capacity will have a negative effect on the fire service systems performance.
- 12.3.3. Mitigations necessary to maintain fire service concurrency is not dependent on geographical location within a fire station's service area, but on the fact that each development consumes service capacity. This negatively affects reliability and response performance. Those developing property close to an existing fire station directly impact the system by reducing resource reliability for those developments that are more distant.

12.4. Mitigation Actions Required:

- 12.4.1. SFD's limited capital funding and resources has caused the need to adopt standards that establish levels of service below nationally recognized benchmark standards and as a result, all new development has a direct impact on the SFD's service capacity.
- 12.4.2. When system inadequacies exist, the impact of each new development will have an unacceptable direct impact on SFD's ability to provide service. Each new development shall be reviewed to determine whether it will further impact the following identified service deficiencies. Mitigation shall be required if any one or more of the following performance deficiencies listed below exist within the service area of the proposed development:
 - 12.4.2.1. Historical performance data shows arrival time for first-in unit response times exceed the adopted Level of Service standard.
 - 12.4.2.2. Historical performance data shows arrival time of full first alarm units exceed the adopted Level of Service standard.

Attachment 8- 2018 Mitigation & Level of Service Policy

- 12.4.2.3. Historical performance data shows fractile reliability of first in units is equal to or less than 5% more than the adopted Level of Service on a 24 hour basis, or equal to or less than the adopted standard during peak demand hours.
- 12.4.2.4. Historical performance data shows fractile reliability of Full First Alarm resources is equal to or less than 5% more than the adopted Level of Service during peak demand hours.
- 12.4.2.5. Historical data shows evidence that more than one mutual-aid company has been consistently relied upon to provide an Effective Response Force to the area of proposed development.
- 12.4.2.6. Less than 1,500 gallons of fire flow is available when any residential structure to structure spacing is less than 15 feet from any part of another structure.

12.5. Mitigation Options:

- 12.5.1. Selected mitigation measures should be relational to the risk imposed by the development. Time is the critical issue in the delivery of fire and emergency medical services. Mitigation measures should be appropriate and adequate to achieve a level of public safety that would be equivalent to SFD's achievement of response time standards.
 - 12.5.1.1. SFD staff may utilize, but not be limited to the options listed below and/or any State or locally adopted building code set, and any NFPA or other recognized standard to mitigate the impacts of new development upon the ability of SFD to deliver service.
 - 12.5.1.2. Installation of automatic fire sprinkler systems to provide onsite fire control until SFD response units can arrive on scene.
 - 12.5.1.2.1. All automatic fire sprinkler systems shall comply with NFPA 13.
 - 12.5.1.2.1.1. Flow through or "Multi-Purpose" systems may be allowed in one and two family structures upon approval of the Fire Marshal representing Shoreline or the authority having jurisdiction.

Attachment 8- 2018 Mitigation & Level of Service Policy

- 12.5.1.3. Installation of monitored alarm and alerting systems to provide early alerting to SFD.
- 12.5.1.4. Installation of fire walls or other building separations to reduce fire flow and/or firefighting resource requirements.
- 12.5.1.5. Use of alternate construction materials to reduce chance of fire spread between structures.
- 12.5.1.6. Installation of intercom systems in multi-family housing to assist evacuation and sheltering in place.
- 12.5.1.7. Addition of access enhancements such as secondary access points, fire lanes, ambulance parking spaces etc.
- 12.5.1.8. Installation of incident reduction features such as grab bars in senior and disabled housing units.
- 12.5.1.9. Installation of monitored medical alarms.
- 12.5.1.10. Installation of alarm monitored defibrillators in public areas of multi-family housing, places of assembly, and public buildings.
- 12.5.1.11. Impact Fees.
- 12.5.1.12. Level of Service Fees.

13. Developer Agreements Required

13.1. Developer agreements are required for all developments occurring within the SFD service area. SFD and the development applicant shall enter into a mitigation agreement that clearly identifies all mitigation required to maintain fire service concurrency.

13.1.1. Exceptions:

- 13.1.1.1. Where the development occurs within the City of Shoreline and impact fees are the only mitigation required an agreement may not be necessary when utilizing the City of Shoreline's policies will ensure collection of impact fees necessary to maintaining fire service concurrency.

Attachment 8- 2018 Mitigation & Level of Service Policy

- 13.1.1.2. When all mitigation requirements are included as plat notes into the approved and permitted land use plans, a mitigation agreement may not be required.

13.2. Basis for Calculating Impact and Level of Service Fees:

- 13.2.1. **Boundaries:** As a point of reference, SFD boundaries at time of adoption of this policy shall be used as a determinant or benchmark as to the extent of capacity of service according to SFD's adopted response time standards. This policy may be applied to all or administratively defined areas of SFD.
- 13.2.2. **Property Categories:** Properties are grouped by two basic categories, residential, and commercial. Residential properties shall include both single-family and multifamily units. Commercial property shall be those property uses that would otherwise be classified as industrial, business, retail sales and services, wholesale sales, storage, assisted care facilities and hospital and medical facilities.
- 13.2.3. **Capital Improvements:** SFDs Capital Improvement Plan identifies the resources and revenue needed to provide adequate service and maintain public health and safety over a 20 year planning cycle. Each year an updated Six Year Capital Improvement Plan shall be adopted to serve as the basis for updating construction and equipment costs and impact and level of service fees.
- 13.2.4. **Fire Department Service Demand:** Past demand for fire department services to property categories identified above, shall be used to predict future service level demand to those property types. The percentage of service use by new development and its impact on SFD Service Levels shall be used to determine appropriate and relational contributions for each property type (see Appendix A, Res/Com Split). Needed expenditures for improvements identified in the SFD Capital Improvement Plan will be the basis for determining the construction and equipment costs (C&E) which are used in calculating impact fees and level of service contributions.
- 13.2.5. **Usage Factor:** The specific use of fire services by land use category. Use factors are based on actual call rates. (see Appendix B)
- 13.2.6. **ERF (Effective Response Force) Factor:** The minimum amount of staffing and equipment that must reach a specific emergency location within the maximum adopted level of service time capable of fire suppression, EMS and/or other incident mitigation.

Attachment 8- 2018 Mitigation & Level of Service Policy

13.2.7. **New Development Share:** That portion of the LOS fee to be paid for by new development. New development share is used to assure that new development does not solely pay for improvements that increase the ability to-serve throughout SFD.

13.2.8. **Projected Development:** The 20 year development capacity analysis found in SFD's Capital Improvement Plan will be the basis for SFD calculations of future dwelling units and future square-footage of commercially developed properties.

14. Mitigation Methodology and Fee Application:

14.1. New Development Assessment:

14.1.1. Impact Fees & Mitigations

14.1.1.1. In areas where fire service impact fees have been adopted in support of SFD by the authority having jurisdiction to permit building and land uses, each new proposed development will have a capacity analysis completed to determine the system wide impacts the proposed development will have on fire concurrency within the SFD service area.

14.1.1.2. System impacts will be assessed utilizing SFDs Mitigation Assessment Worksheet. (See Appendix B)

14.1.1.3. Impact fees will be calculated and determined by applying the appropriate formula found in Appendix A.

14.1.1.4. SFD staff will determine appropriate non-fee mitigations that will provide adequate protection necessary to provide fire service concurrency to the proposed development.

14.1.1.5. SFD staff shall consider developer submitted alternate mitigations and fee amounts presented in a study that provides acceptable alternatives to the mitigations found in this policy.

14.1.2. Impact & Level of Service Fees & Mitigations

14.1.2.1. In areas where fire service impact fees have not been adopted in support of SFD by the authority having jurisdiction to permit building and land uses, each new development when proposed, and upon notice of application,

Attachment 8- 2018 Mitigation & Level of Service Policy

shall have their direct impacts assessed and their appropriate mitigation options determined.

- 14.1.2.2. SFD shall pursue all appropriate mitigations necessary to maintain public safety and fire service concurrency through the provisions provided by the Growth Management Act (GMA), State Environmental Protection Act (SEPA), Washington State subdivision codes, and the adopted land use regulations in the authority having jurisdiction.
- 14.1.2.3. Direct impacts will be assessed utilizing SFDs Mitigation Assessment Worksheet. (See Appendix B)
- 14.1.2.4. Appropriate Level of Service Contribution fees will be calculated and determined by applying the formula found in Appendix A
- 14.1.2.5. SFD staff will determine appropriate non-fee mitigations that will provide adequate protection necessary to provide fire service concurrency to the proposed development.
- 14.1.3. Impact and Level of Service Fee Reduction:
 - 14.1.3.1. Where automatic fire sprinklers are voluntarily installed in single-family residential occupancies, a reduction equal to 30% of the impact or level of service fee shall serve to mitigate the costs of needed EMS and rescue resources. If the sprinklers are required as part of code requirements or law, the reduction does not apply. Additional reductions shall be applied as identified on the SFD Service Capacity Analysis worksheet in Appendix B.
- 14.1.4. Fee Payment Policy:
 - 14.1.4.1. Payment of impact fees within the City of Shoreline will be collected by the City of Shoreline at time of permitting or as defined by a required development agreement. Impact or level of service fees shall be based on the most recently adopted formula and fees. Any fees paid later than required shall be subject to interest at a rate of one (1) percent per month.

Attachment 8- 2018 Mitigation & Level of Service Policy

- 14.1.4.2. All impact fees and level of service contributions collected shall be held by SFD in a reserve account used to fund SFD's Capital Improvement Plan. If impact fees are not utilized within ten years of receipt or five years of receipt for level of service fees, a refund will be issued to the developer with interest.
- 14.1.4.3. In all cases, it is SFD's intent to collect impact and level of service fees in a manner consistent with this section. However, in an interest to work with developers in as fair and equitable fashion as possible, SFD staff shall use the following guidelines for negotiating payment schedules.
 - 14.1.4.3.1. Residential fee payment:
 - 14.1.4.3.1.1. Collection of all residential impact and level of service fees shall be collected at the time of building permit issuance and level of service fee payments should occur at the time of final platting or prior to the start of construction. In extenuating circumstances the following payment option may be exercised. Any fees received late from any payment option will be subject to interest penalties of one (1) percent per month.
 - 14.1.4.3.1.2. Fire impact and level of service fees shall be at least 50% collected at the time of building permit issuance for a structure and the remaining balance of the fee paid within three business days of the issuance of a certificate of occupancy for the structure that the fee was to be paid for. The consideration of this option will be at the discretion of the SFD Board of Commissioners.
 - 14.1.4.3.1.3. In jurisdictions where fire impact fees have been implemented, fees shall be collected in compliance with the jurisdiction's municipal code.
 - 14.1.4.3.2. Commercial fee payment:
 - 14.1.4.3.2.1. Collection of all commercial impact and level of service fees shall be collected at the time of building permit issuance by the authority having jurisdiction and level of service fee amounts should occur at time of final platting or prior to the start of construction.

Attachment 8- 2018 Mitigation & Level of Service Policy

14.1.4.3.2.2. In jurisdictions where fire impact fees have been implemented, fees shall be collected in compliance with the jurisdiction's municipal code.

14.1.4.3.3. Fee Exempt Properties:

14.1.4.3.4. Existing structures retained and incorporated into a new subdivision of land.

14.1.4.3.5. Square footage of the same type of new construction equal to the percentage of square footage of existing structures to be redeveloped.

14.1.4.3.6. Agreements:

14.1.4.3.7. All mitigation agreements between SFD and developers shall be recorded as a lien against the property of the proposed development unless the developer agrees to include all mitigation requirements specified in the agreement in the approved plat notes. Upon receipt of payment, SFD shall promptly notify the appropriate authority having jurisdiction and remove any encumbrances recorded against the appropriate property.

14.1.4.3.8. SFD Funding Participation: There is currently an identified need for additional fire and life safety facilities and equipment in SFD. SFD will share in the expense of needed resources as outlined in Table 16, 20 Year Cost/Funding Plan, found in Section 6 of the SFD Capital Improvement Plan, and in the following manner:

14.1.4.3.8.1. SFD will be directly responsible for the percentage of construction and equipment costs beyond the growth share determined for new developments.

14.1.4.3.8.2. SFD will contribute shortages as a result of loss of, or default on collections of impact and level of service fees.

14.1.4.3.8.3. Estimated revenues are never fully realized from development and SFD will need to supplement shortages.

14.1.4.3.8.4. SFD will contribute the actual construction and other costs exceeding original estimates.

Attachment 8- 2018 Mitigation & Level of Service Policy

- 14.1.4.3.8.5. Payment of unanticipated costs associated with implementing the SFD Capital Improvement Plan.
- 14.1.4.3.8.6. Advancing funds for the project before total collection of impact fee or level of service contributions.
- 14.1.4.3.8.7. Management of this policy, and the Capital Improvement Plan.

15. Assurance of Adequate Provisions for Public Safety:

- 15.1.** The safety and welfare of current and future residents of SFD is of paramount concern to SFD. It is recognized that this policy may have limitations and may not provide definitive guidance for effective mitigation of direct development impacts on SFD's service capacity in all cases.
- 15.2.** It is not the intent of this policy to limit SFD's staff in making decisions outside of this policy where those decisions and mitigation options serve the intent of maintaining concurrency with development and protecting SFD's service capacity, making rational and relational mitigation requests appropriate to the level of risk, and protecting the safety of the public and firefighters in a fair and consistent manner.

16. Policy Review and Adjustment:

- 16.1.** At least annually, this Policy will be reviewed and amended as necessary. Amendments shall be made consistent with the annual revision of the six (6) year Capital Improvement Plan and shall be approved through a resolution of SFD's Board of Fire Commissioners.

Appendix A

EXAMPLE APPLICATIONS OF LEVEL OF SERVICE FORMULAS

LOS Formula Calculation

Land Use Type	System-Wide C&E	Res/Com Split	Usage Factor	ERF Factor	New Dev Share	Projected Development 2018 - 2037	Impact & LOS Contribution Fee Amount
Residential							
Single-family	\$41,217,424	64%	60%	1.0	80%	5,000 living units	\$2,532 per house
Multi Family	\$41,217,424	64%	40%	1.3	80%	5,000 living units	\$2,195 per unit
Commercial							
COMM/IND	\$41,217,424	36%	35%	2.0	80%	1,500,000 sq ft	\$5.540 per sq ft
HOSP/MED/CIV/SCH/CHUR	\$41,217,424	36%	18%	2.0	80%	1,500,000 sq ft	\$2.849 per sq ft
ASSISTED CARE	\$41,217,424	36%	47%	3.0	80%	1,500,000 sq ft	\$11.158 per sq ft

LOS Formula Definitions

- **Land Use Type:**
Defines the land use types and structure uses upon which Impact and Level of Service Fees are assessed.
- **System-Wide C&E:**
The construction and equipment costs for the 20 year time span of SFD's Capital Improvement Plan
- **Res/Com Split:**
Percentage of annual emergency responses by property type; Residential = 64%, Commercial = 36%
- **Usage Factor:**
The portion of Res/Com Split that is used by a specific property type; single-family = 60% of all emergency responses that are used by the residential properties and the remaining 40% is used by multi-family properties.
- **ERF Factor:**
The ERF or effective response force factor represents the size of the first alarm emergency response in numbers of firefighters and equipment that is needed to effectively handle the risk posed by that property type.

Attachment 8- 2018 Mitigation & Level of Service Policy

- **New Dev Share:**

Is the portion of C&E costs assigned to new development? The remaining portion is to be paid for by SFD through annual tax collections.

- **Projected New Units:**

Defines the number of new units projected to be constructed with the SFD service area between 2018 and 2037

- **Impact and LOS Contribution Fee Amount:**

This amount represents the maximum fee to be paid by new development for each specific property type. This fee might be reduced if existing fire service capacity is adequate to serve the new development.

Service Capacity Credit Criteria

Single Family Residential Fee Reduction Factors:*

Historical data shows first in station response area meets LOS	= 15%
Historical data shows F-Box of development meets first in LOS	= 10%
First in station reliability data meets peak hour standard	= 15%
If fire flow is $\geq 1,500$ GPM or spacing between structures is > 15 feet	= 15%
Historical data shows full first alarm reliability meets peak call volume standard	= 15%
Automatic sprinkler system installed (single-family only)	= 30%
Historical data shows full first alarm ERF meets LOS standard to F-Box	= 40%

*Accumulated discounts cannot exceed the LOS contribution amount and cumulative discounts cannot be used as credits to be transferred.

Multi-Family and Commercial/Industrial Reduction Factors:

Historical data shows first in station response area meets LOS	= 15%
Historical data shows F-Box of development meets first in LOS	= 10%
First in station reliability data meets peak hour standard	= 10%
Historical data shows full first alarm reliability meets peak call volume standard	= 15%
Historical data shows full first alarm ERF meets LOS standard to F-Box	= 50%



Appendix B

Service Capacity Analysis for New Single-Family Residential Development

Date of Analysis: _____ Project Permit # _____

Project Address: _____ Land Parcel # _____

Fire Box Location: _____ Fire Box Performance: 1st In _____% ERF _____%

1st in Station ____ Peak Hour Reliability ____% 1st in Area Performance ____%

Fire ERF Required _____ ERF Pick List _____, _____, _____, _____, _____, _____

ERF Reliability _____% _____% _____% _____% _____% _____%

Capacity Allowance Calculator:

1 st in response area meets LOS	_____ = 15%	_____%
F-Box development meets first in LOS	_____ = 10%	_____%
1 st in reliability meets peak hour standard	_____ = 15%	_____%
Fire flow ≥1,500 GPM or structure spacing > 15 feet	_____ = 15%	_____%
1st alarm reliability meets peak hour standard	_____ = 15%	_____%
Sprinklers installed	_____ = 30%	_____%
1st alarm ERF meets LOS standard to F-Box	_____ = 40%	_____%
Total Capacity Allowance		_____%

Total Fee Calculation:

Full SFR Impact Fee Rate = _____
 SFR units in development _____ x _____
 Total impact fee amount _____

Impact fee to be assessed:

Total impact fee _____ x capacity allowance _____ = \$ _____

Attachment 8- 2018 Mitigation & Level of Service Policy

**Service Capacity Analysis for
New, Non Single-Family
Residential Development**



Date of Analysis: _____ Project Permit # _____

Project Address: _____ Land Parcel # _____

Fire Box Location: _____ Fire Box Performance: 1st In _____% ERF _____%

1st in Station _____ Peak Hour Reliability _____% 1st in Area Performance _____%

Fire ERF Required _____ ERF Pick List _____, _____, _____, _____, _____, _____, _____,

ERF Reliability _____% _____% _____% _____% _____% _____% _____%

Capacity Allowance Calculator:

1 st in response area meets LOS	_____ = 15%	_____
F-Box development meets first in LOS	_____ = 10%	_____
1 st in reliability meets peak hour standard	_____ = 10%	_____
1st alarm reliability meets peak hour standard	_____ = 15%	_____
1st alarm ERF meets LOS standard to F-Box	_____ = 50%	_____
Total Capacity Allowance		_____

Impact fee category and rate:

Multi Family	___	Impact fee rate per square foot	_____
Commercial/Industrial	___	Impact fee rate per square foot	_____
Hospital/Medical/Civic	___	Impact fee rate per square foot	_____
Assisted Care	___	Impact fee rate per square foot	_____

Total fee calculation:

Full impact fee rate	=	_____
Square footage of development	x	_____
Total impact/LOS amount	\$	_____

Impact fee to be assessed:

Total impact/LOS amount _____ x capacity allowance _____ = \$ _____