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Data Analysis

Brooklyn Park Fire Department
Brooklyn Park, Minnesota

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CONSULTANT REPORT

BROOKLYN PARK FIRE DEPARTMENT
DATA ANALYSIS

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METHODOLOGY

We collected five full years of Brooklyn Park Fire Department (BPFD) call-level and unit-level data spanning January 1, 2014 to December 31, 2018 from BPFD's records management system (RMS). All reporting periods were based on the calendar year from January 1 to December 31. As such, we present five full reporting periods of BPFD baseline workload and response time performance data, where available and applicable, in the last section of this report. We also obtained data files related specifically to EMS incidents from the state EMS board and the ambulance transport provider to further examine community EMS needs and BPFD workload.

We utilize two distinct measures in this report—call volume and workload. Number of requests for service are defined as "incidents" or "calls" (i.e., call volume). Call volume reflects the number of times a distinct incident was created involving one or more BPFD units, or calls received in BPFD's jurisdiction. Calls were categorized by BPFD as EMS, Fire, Hazmat, or Rescue using the "IncidentType" numeric code and corresponding NFIRS text definition from the RMS data file. "Responses" are the number of times that an individual unit (or units) responded to a call (i.e., workload).

Audits of the RMS data file were first conducted to identify any anomalies for attention and reconciliation prior to data analysis (see Table 45 through Table 48 in the Appendix). Records corresponding to dates outside of the 2014-2018 reporting periods were first excluded. No other exclusion criteria were applied prior to the identification of call volume. Records related to units outside of BPFD were excluded prior to the identification of response workload. Additional exclusion criteria were then applied to remaining records prior to the analysis of busy and performance time metrics (e.g., dispatch time; turnout time). Entries with performance times of 0 minutes, and entries with extremely high performance times (i.e., outliers) were also excluded. The application of these exclusion criteria for busy and performance time data resulted in reductions of call and response volume for each reporting period; these adjusted sample sizes are noted in the report where applicable.

Responses were classified by BPFD based on call status and the role of the responding unit. Call status as emergency (lights and sirens) was identified by the "Response" code 390 in the RMS data file. Units identified by BPFD as primary front-line units included all engines, rescue units, and battalion chiefs. The majority of analyses related to performance (e.g., travel time) were restricted based on these classifications to include only primary front-line units responding to emergency (lights and sirens) calls and are identified in the report where applicable.

Any reduced sample sizes due to missing data are noted in the report where applicable. Classifications of responses into call categories and program areas appear in Table 49 in the Appendix. For select analyses related to BPFD demand zones throughout the report, data are additionally presented for zones F401 and F402 combined.

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COMMUNITY RESPONSE HISTORY

During the 2018 reporting period (i.e., January 1, 2018 to December 31, 2018; hereinafter referred to as 2018), BPFD received a total of 9,407 requests for service, or incidents (Figure 1; Table 1; note that 30 of these requests for service indicated a "SceneZoneNumber" of "MA" and two of these requests for service indicated a "SceneZoneNumber" of "F501" in the RMS data file).

EMS related requests totaled 6,371, accounting for 67.7% of the total call volume, and fire related requests totaled 2,029, accounting for 21.6% of the total call volume. Of the 9,407 total incidents initiated by the community during 2018, 250 were noted to be cancelled calls (i.e., incident type 611, "Dispatched & cancelled en route" in the RMS data file). These calls were still considered part of the community demand and part of the department's workload.

Detailed descriptions of the community's EMS needs and related workload appear in Table 2 (data from the state EMS board) and Table 3 (data from the ambulance transport provider). Classifications of incident types from the RMS data file into program and call category are presented in Table 49 in the Appendix.

Figure 1: Percentage of Total Incidents by Program

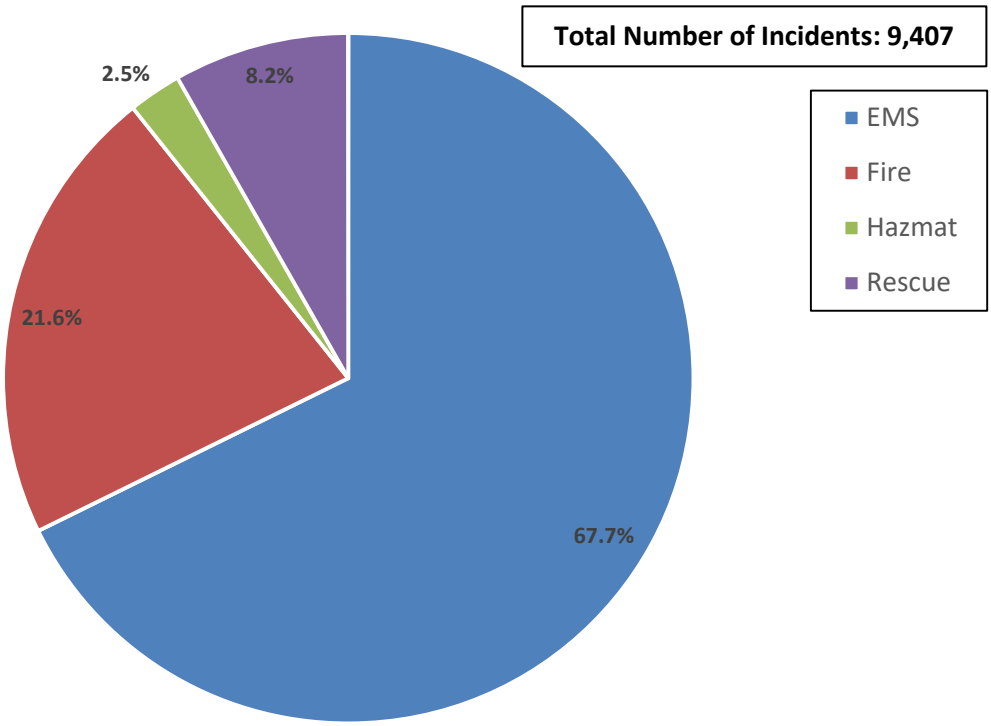

Table 1: Number of Incidents by Program and Call Category

Call Category[1]	Number of Calls	Average Calls per Day	Call Percentage
EMS	5,896	16.2	62.7
EMS MVC	475	1.3	5.0
EMS Total	**6,371**	**17.5**	**67.7**
Cancelled/Wrong Location/No Incident	371	1.0	3.9
False Call/Alarm	29	0.1	0.3
Fire Alarm	748	2.0	8.0
Fire Other	352	1.0	3.7
Outside Fire	27	0.1	0.3
Public Service	308	0.8	3.3
Structure Fire	146	0.4	1.6
Vehicle Fire	48	0.1	0.5
Fire Total	**2,029**	**5.6**	**21.6**
Hazmat Total	**234**	**0.6**	**2.5**
Rescue Total	**773**	**2.1**	**8.2**
Total	**9,407[2]**	**25.8**	**100.0**

[1]Classifications of incident types from the RMS data file into program and call category are presented in the Appendix.
[2]30 of these requests for service indicated a "SceneZoneNumber" of "MA" and two of these requests for service indicated a "SceneZoneNumber" of "F501" in the RMS data file.

Table 2: Number of EMS Incidents by Call Category – State EMS Board Data

Call Category[1]	Number of Calls	Average Calls per Day	Call Percentage
Abdominal Pain/Problems	311	0.9	3.7
Allergic Reaction/Stings	71	0.2	0.8
Animal Bite	10	0.0	0.1
Assault/Battery/Abuse Victim	251	0.7	3.0
Back Pain (Non-Traumatic)	110	0.3	1.3
Breathing Problem	886	2.4	10.5
Burns/Explosion	7	0.0	0.1
Carbon Monoxide/Hazmat/Inhalation/CBRN	27	0.1	0.3
Cardiac Arrest/Death	125	0.3	1.5
Chest Pain (Non-Traumatic)	433	1.2	5.1
Choking	40	0.1	0.5
Convulsions/Seizure	338	0.9	4.0
Diabetic Problem	144	0.4	1.7
Drowning/Diving/SCUBA Accident	2	0.0	0.0
Electrocution/Lightning	7	0.0	0.1
Eye Problem/Injury	21	0.1	0.2
Falls	686	1.9	8.1
Headache	63	0.2	0.7
Heart Problems/AICD	294	0.8	3.5
Heat/Cold Exposure	29	0.1	0.3
Hemorrhage/Laceration	250	0.7	2.9
Medical Alarm	146	0.4	1.7
No Other Appropriate Choice	36	0.1	0.4
Overdose/Poisoning/Ingestion	210	0.6	2.5
Pregnancy/Childbirth/Miscarriage	98	0.3	1.2
Psychiatric Problem/Abnormal Behavior/Suicide Attempt	1,083	3.0	12.8
Sick Person	1,296	3.6	15.3
Stab/Gunshot Wound/Penetrating Trauma	28	0.1	0.3
Standby	94	0.3	1.1
Stroke/CVA	120	0.3	1.4
Traffic/Transportation Incident	484	1.3	5.7
Transfer/Interfacility/Palliative Care	67	0.2	0.8
Traumatic Injury	189	0.5	2.2
Unconscious/Fainting/Near-Fainting	315	0.9	3.7
Unknown Problem/Person Down	202	0.6	2.4
Well Person Check	2	0.0	0.0
Total	**8,475**	**23.2**	**100.0**

[1]Call category reflects "Incident Complaint Reported By Dispatch" available in the data file for 2018; presented verbatim from the data file provided for 2018.

Table 3: Number of EMS Incidents by Call Category – Ambulance Transport Provider Data

Call Category[1]	Number of Calls	Average Calls per Day	Call Percentage
Abdominal Pain	260	0.7	3.8
Allergies/Reactions	71	0.2	1.0
Animal Bite	11	0.0	0.2
Assault	133	0.4	2.0
Back Pain	109	0.3	1.6
Breathing Problems	739	2.0	10.8
BURNS/EXPLOSION	5	0.0	0.1
CARBON MON/INHAL/HAZ	19	0.1	0.3
Cardiac/Resp Arrest	74	0.2	1.1
CHEST PAIN	392	1.1	5.7
CHOKING	33	0.1	0.5
CONVUL/SEIZURES	280	0.8	4.1
Diabetic	155	0.4	2.3
DROWNING/DIVING	0	0.0	0.0
ELECTROCUTION	5	0.0	0.1
EYE INJURY/PROBLEM	14	0.0	0.2
FALL/BACK INJURY	540	1.5	7.9
Headache	55	0.2	0.8
HEART PROBLEMS	237	0.6	3.5
Heat/Cold Exposure	24	0.1	0.4
HEMORRAGE/LAC	201	0.6	2.9
Industrial Accidents	0	0.0	0.0
INTERFACILITY/CARE	1	0.0	0.0
Interfacility/Eval	370	1.0	5.4
MEDICAL ALARM	18	0.0	0.3
O.B./GYN/Vag Bleed	113	0.3	1.7
O.D./INGEST/POISON	149	0.4	2.2
PROCEDURE SPECIAL	0	0.0	0.0
PSYCH/SUICIDE/ETOH	792	2.2	11.6
SICK PERSON	1035	2.8	15.2
STABBING/GUNSHOT	16	0.0	0.2
STANDBY	11	0.0	0.2
STROKE/C.V.A.	123	0.3	1.8
TRAFFIC ACCIDENT	312	0.9	4.6
TRAUMATIC INJURIES	130	0.4	1.9
UNCONSCIOUS/SYNCOPE	320	0.9	4.7
UNKNOWN PROBLEM	73	0.2	1.1
Total	**6,820[2]**	**18.7**	**100.0**

[1]Call category reflects "Dispatch problems by year" available in the data file for 2018; presented verbatim from the data file provided for 2018.

[2]Data file notes 7,285 "Count of IncidentNBR" for 2018, and notes 5,676 as "Code 3 response" and 1,592 as "Code 2 response" for 2018.

Combined, all BPFD units made 11,592 responses, and were busy on calls (i.e., from dispatch to clear time) for a total of 3,577.7 hours in 2018 (Table 4). The number of individual unit responses will also contribute to understanding total department workload, as 1,346 of 9,401 calls (14.3%) resulted in multiple BPFD units responding.

Table 4: Number of Calls, Number of Responses, and Total Busy Time by Program

Program	Number of Calls[1]	Number of Responses[2]	Average Responses per Call	Responses with Time Data[3]	Total Busy Hours	Average Busy Minutes per Response	Percentage of Total Busy Hours
EMS	6,366	7,113	1.1	7,025	2,139.6	18.3	59.8
Fire	2,028	3,404	1.7	3,058	1,267.0	24.9	35.4
Hazmat	234	274	1.2	268	104.5	23.4	2.9
Rescue	773	801	1.0	428	66.6	9.3	1.9
Total	**9,401**	**11,592**	**1.2**	**10,779**	**3,577.7**	**19.9**	**100.0**

[1]"Number of Calls" reflects an adjusted number of unique incidents to correspond with responses made by BPFD units.
[2]"Number of Responses" reflects the total number of entries in the unit-level data file, regardless of calculated busy time.
[3]"Responses with Time Data" reflects the number of responses in the unit-level data file with calculated busy time.

Temporal analyses were conducted to evaluate patterns in community demands. These analyses are based on the 9,407 incidents received by BPFD, and examine the frequency of requests for service by month, day of week, and hour of day. Month, day of week, and hour of day were derived from "Alarm" dates and times in the RMS data file. In the following analyses, Hazmat and Rescue calls were grouped into an "Other" category for presentation purposes.

Overall, average requests per month ranged from a low of 22.9 calls per day in January to a high of 28.5 calls per day in August (Table 5; Figure 2). The three months with the most requests for service in descending order were: August (28.5 per day), July (28.3 per day), and June (27.3 per day). The three months with the fewest requests for service in ascending order were: January (22.9 per day), March (23.8 per day), and November (23.9 per day).

Table 5: Overall: Total Calls and Average Calls per Day by Month

Month	Number of Calls	Average Calls per Day	Call Percentage
January	710	22.9	7.5
February	708	25.3	7.5
March	739	23.8	7.9
April	793	26.4	8.4
May	839	27.1	8.9
June	820	27.3	8.7
July	877	28.3	9.3
August	885	28.5	9.4
September	758	25.3	8.1
October	755	24.4	8.0
November	716	23.9	7.6
December	807	26.0	8.6
Total	**9,407**	**25.8**	**100.0**

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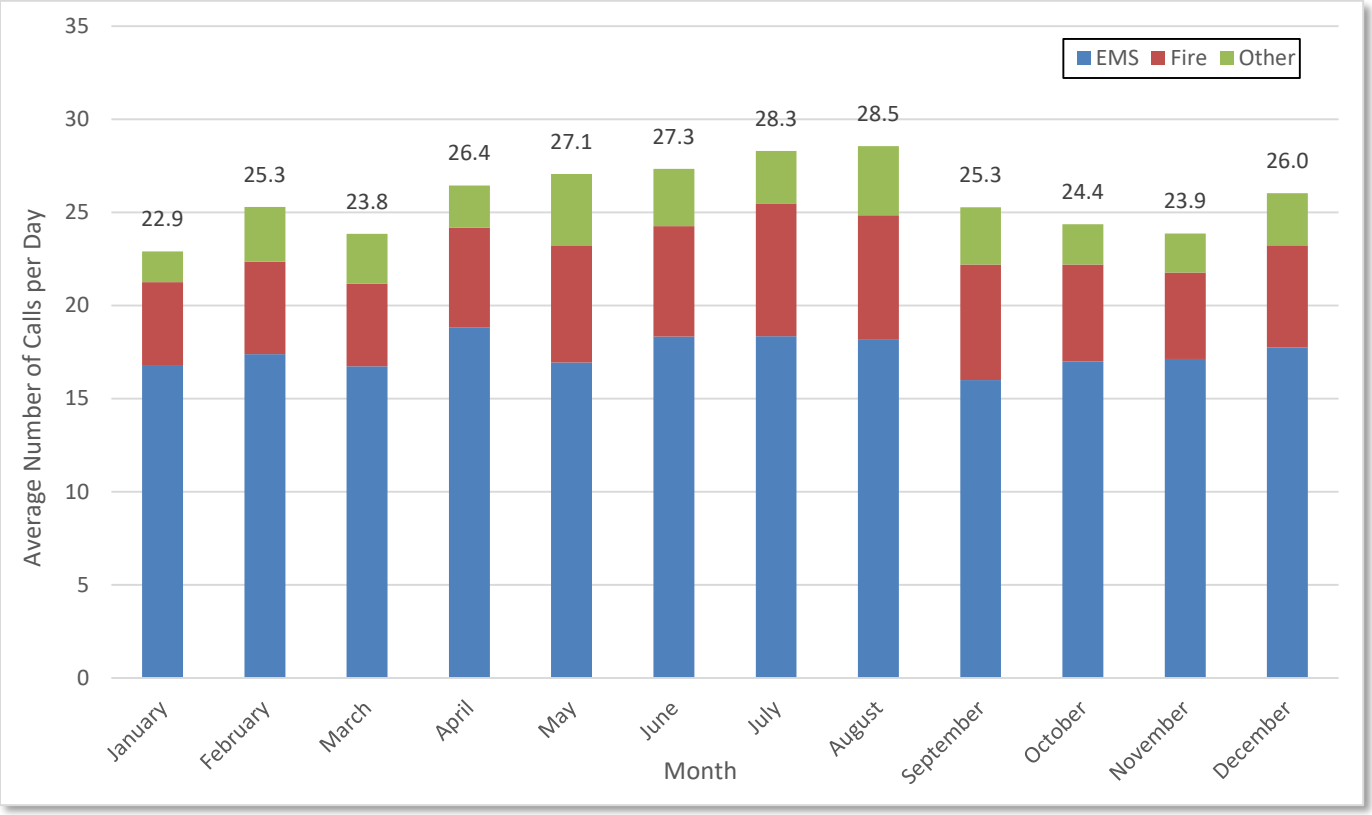
Figure 2: Overall: Average Calls per Day by Month



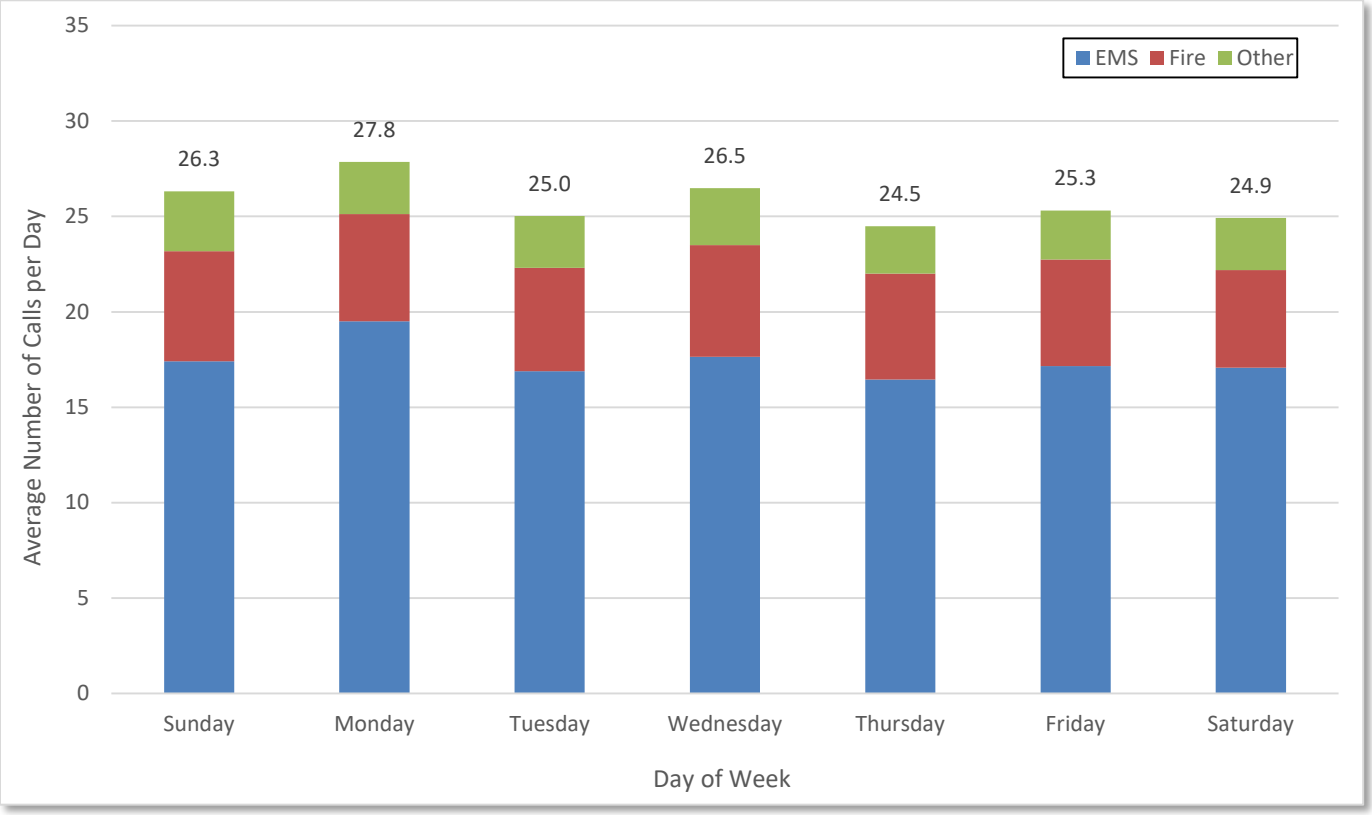
Similar analyses were conducted for requests by day of week (Table 6; Figure 3; 53 Mondays in 2018; 52 of all other days of the week). The lowest average number of calls per day occurred on Thursday (24.5 per day), and the highest average number of calls per day occurred on Monday (27.8 per day).

Table 6: Overall: Total Calls and Average Calls per Day by Day of Week

Day of Week	Number of Calls	Average Calls per Day	Call Percentage
Sunday	1,368	26.3	14.5
Monday[1]	1,476	27.8	15.7
Tuesday	1,301	25.0	13.8
Wednesday	1,377	26.5	14.6
Thursday	1,273	24.5	13.5
Friday	1,316	25.3	14.0
Saturday	1,296	24.9	13.8
Total	**9,407**	**25.8**	**100.0**

[1]There were 53 Mondays during 2018, and 52 of all other days of the week during 2018.

Figure 3: Overall: Average Calls per Day by Day of Week



Overall demands were also evaluated by hour of day (Table 7; Figure 4). Variability exists in the time of day that requests for services were received. Peak demand occurred at 1400 (1.5 calls per day). The hours of the day with the lowest average number of calls per day (ranging from 0.5-0.7 per day) were between 0100 and 0600.

Table 7: Overall: Total Calls and Average Calls per Day by Hour of Day

Hour of Day	Number of Calls	Average Calls per Day	Call Percentage
0	306	0.8	3.3
1	256	0.7	2.7
2	230	0.6	2.4
3	222	0.6	2.4
4	184	0.5	2.0
5	226	0.6	2.4
6	260	0.7	2.8
7	332	0.9	3.5
8	353	1.0	3.8
9	411	1.1	4.4
10	483	1.3	5.1
11	464	1.3	4.9
12	494	1.4	5.3
13	475	1.3	5.0
14	534	1.5	5.7
15	462	1.3	4.9
16	499	1.4	5.3
17	481	1.3	5.1
18	488	1.3	5.2
19	530	1.5	5.6
20	489	1.3	5.2
21	444	1.2	4.7
22	405	1.1	4.3
23	379	1.0	4.0
Total	**9,407**	**25.8**	**100.0**

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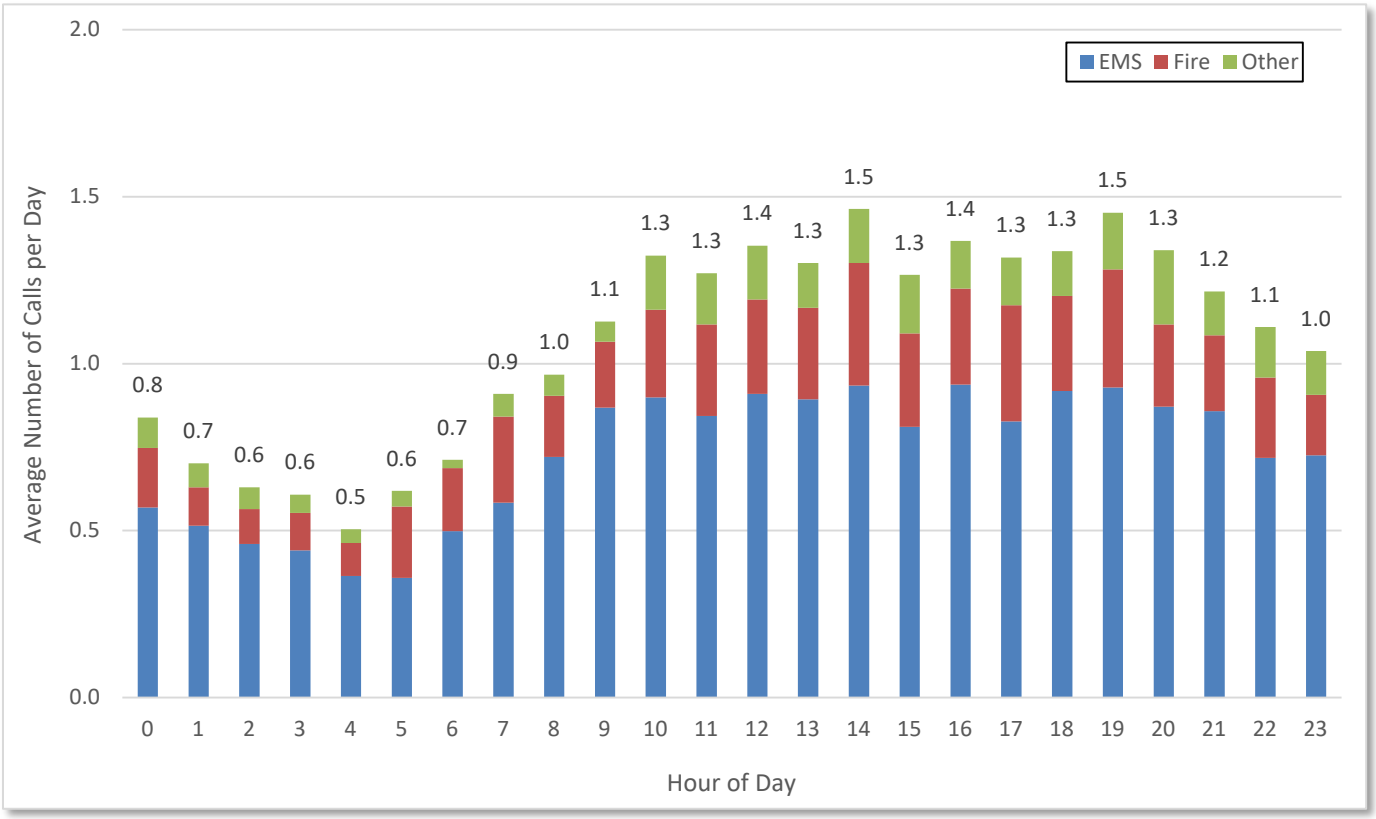
To provide a more granular understanding of the community's demand for services, this temporal analysis included the average number of calls per hour. In other words, when referring to Figure 4 below, the busiest hour is at 1400 with 534 calls occurring during that hour in 2018. The average number of calls per hour is a daily average for those 534 calls if they were distributed equally across the year (i.e., 534/365 = 1.5). Therefore, the busiest hour per day would be at 1400 with an average hourly call volume at 1.5 calls per day. The second busiest hour occurred at 1900 with 530 calls during that hour in 2018, with an average hourly call volume of 1.5 calls per day. For ease of presentation, values displayed in Figure 4 have been rounded to one decimal place.

Figure 4: Overall: Average Calls per Day by Hour of Day



Temporal distributions related to hour of day were also created for the department's demand zones to better understand each location's unique demand for services (Figure 5 through Figure 14). Figures reflect 9,375 unique incidents, as 30 requests for service indicated a "SceneZoneNumber" of "MA" and two requests for service indicated a "SceneZoneNumber" of "F501" in the RMS data file; these sample sizes are too small to permit any meaningful depiction of patterns by hour of day.

Figure 5: Average Calls per Day by Hour of Day – F201

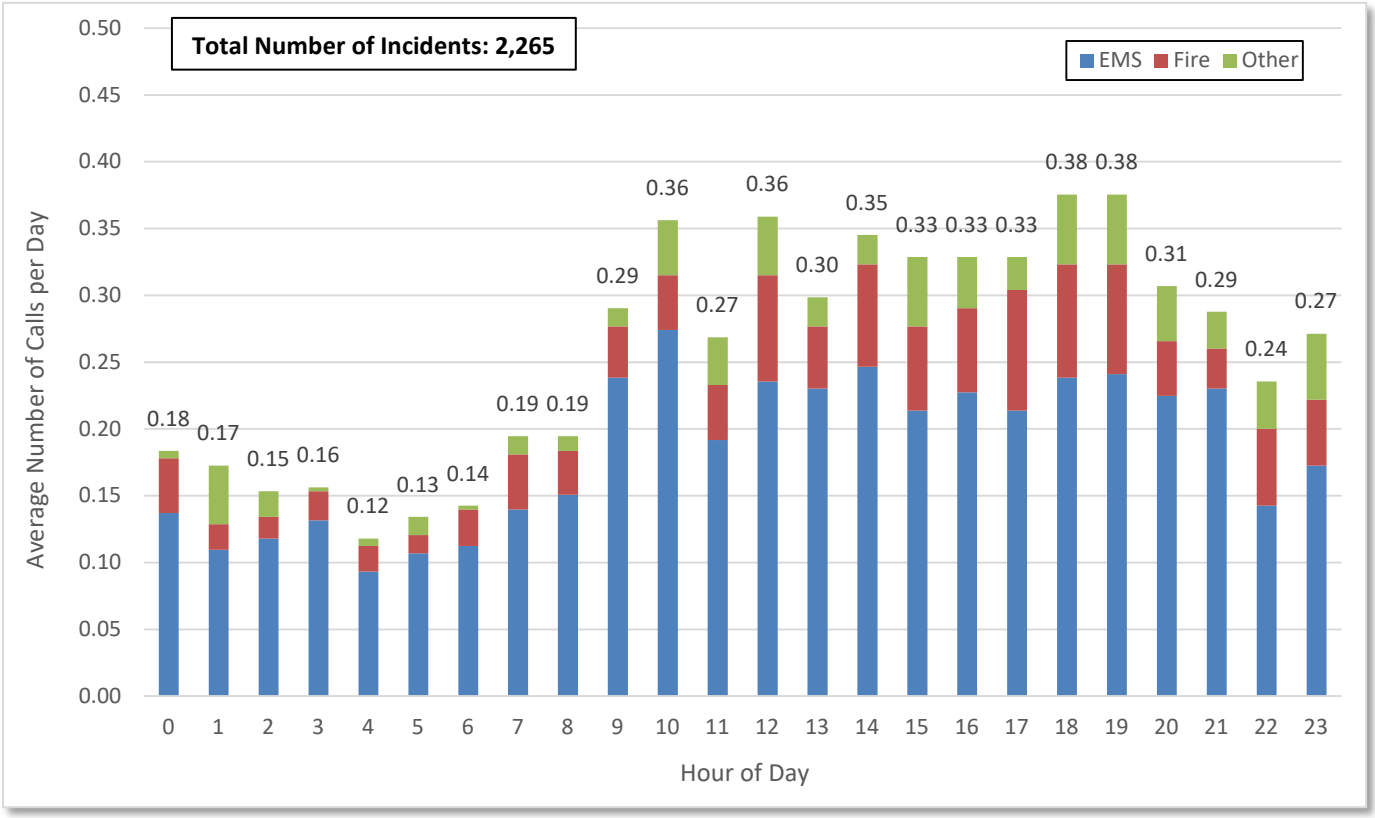


Figure 6: Average Calls per Day by Hour of Day – F202

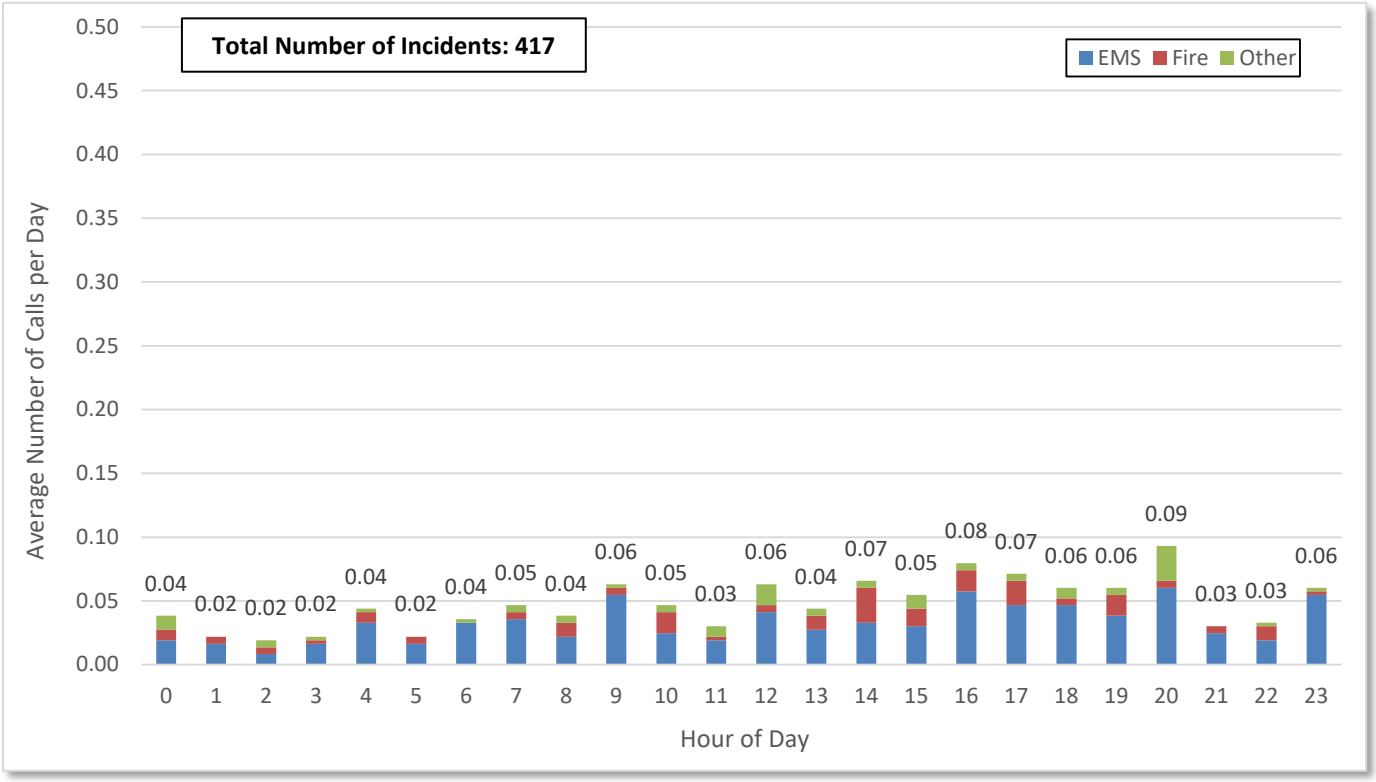


Figure 7: Average Calls per Day by Hour of Day – F301

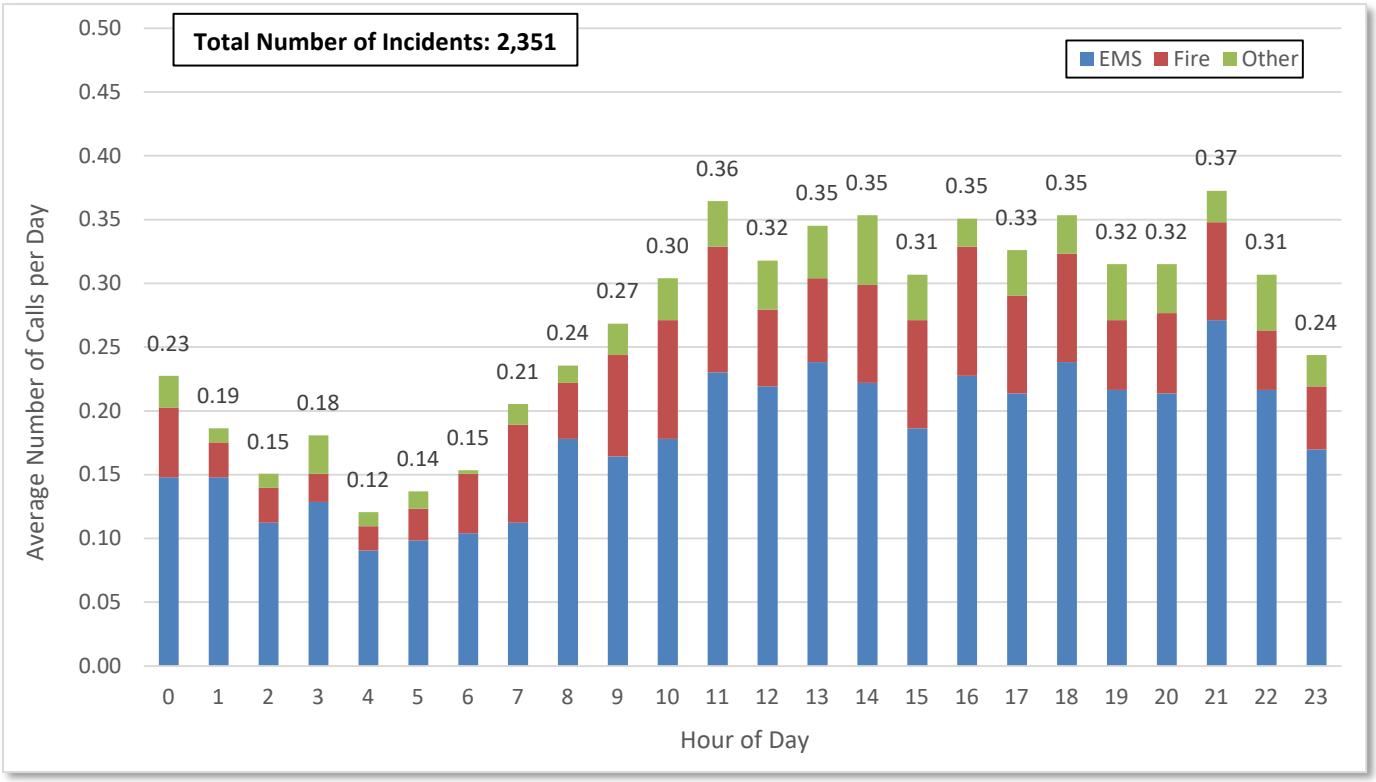


Figure 8: Average Calls per Day by Hour of Day – F302

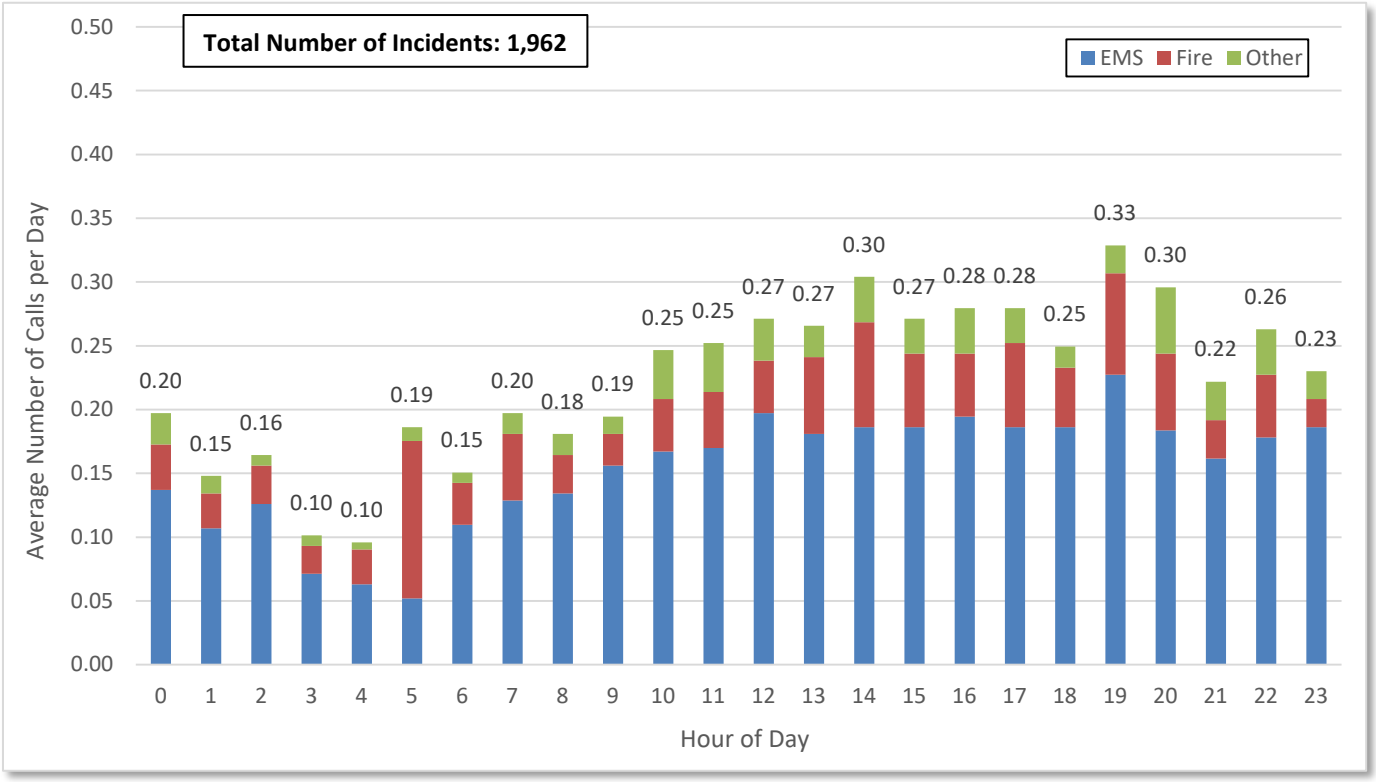


Figure 9: Average Calls per Day by Hour of Day – F401

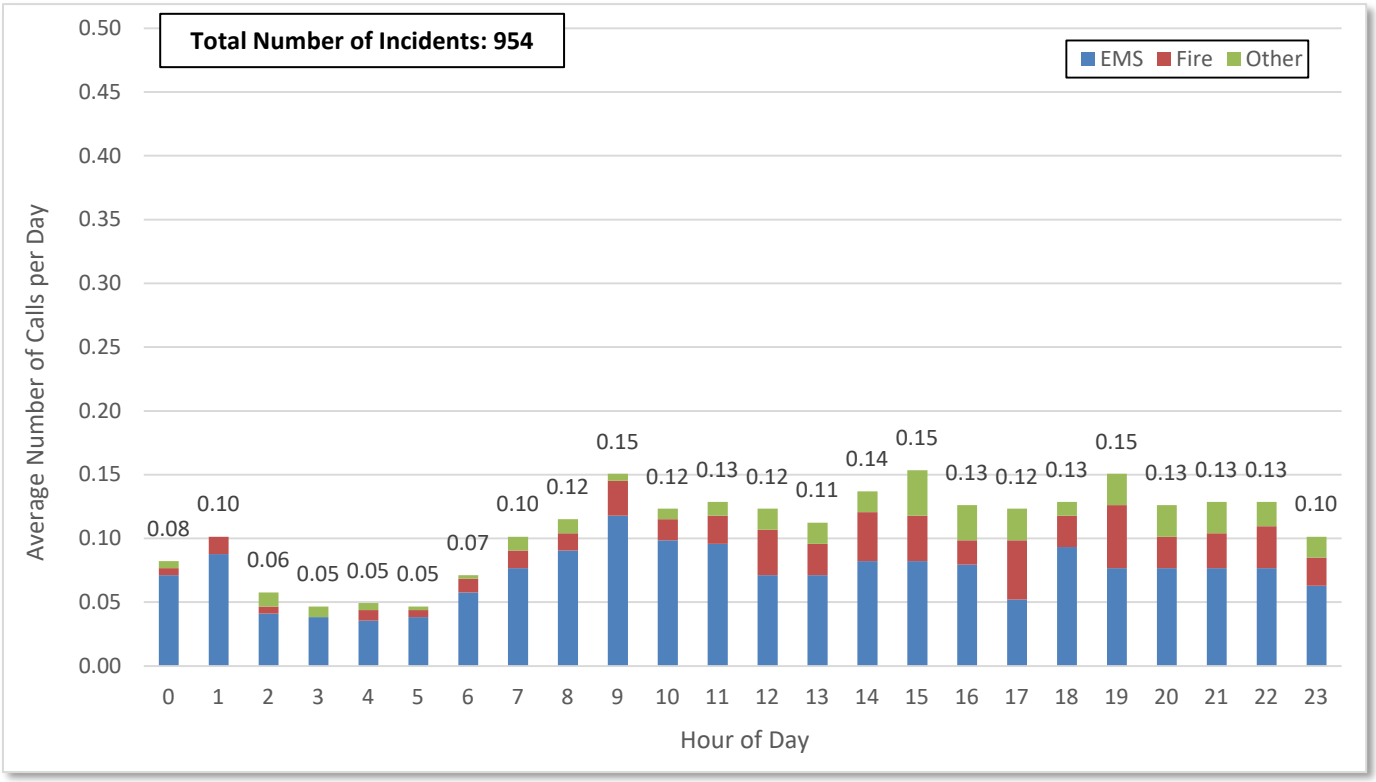


Figure 10: Average Calls per Day by Hour of Day – F402

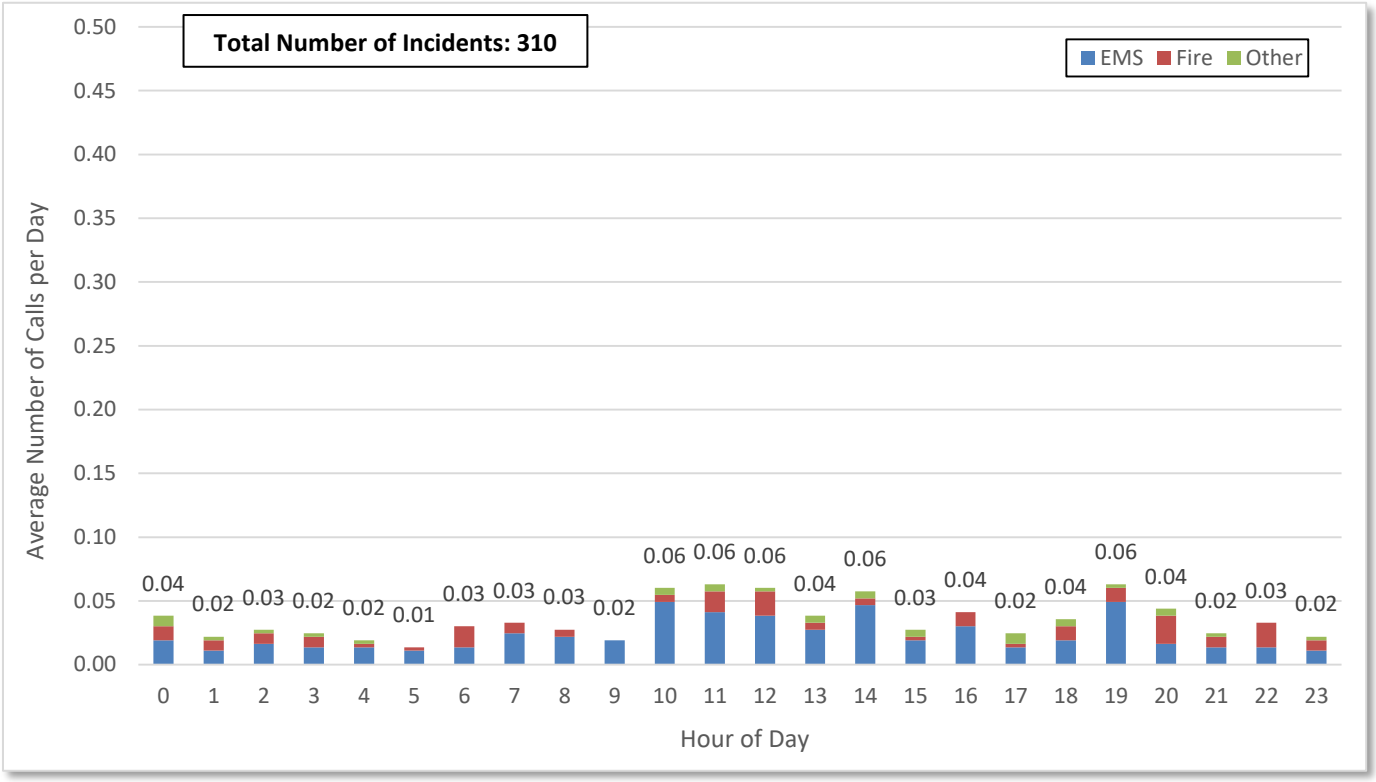


Figure 11: Average Calls per Day by Hour of Day – F401 and F402 Combined

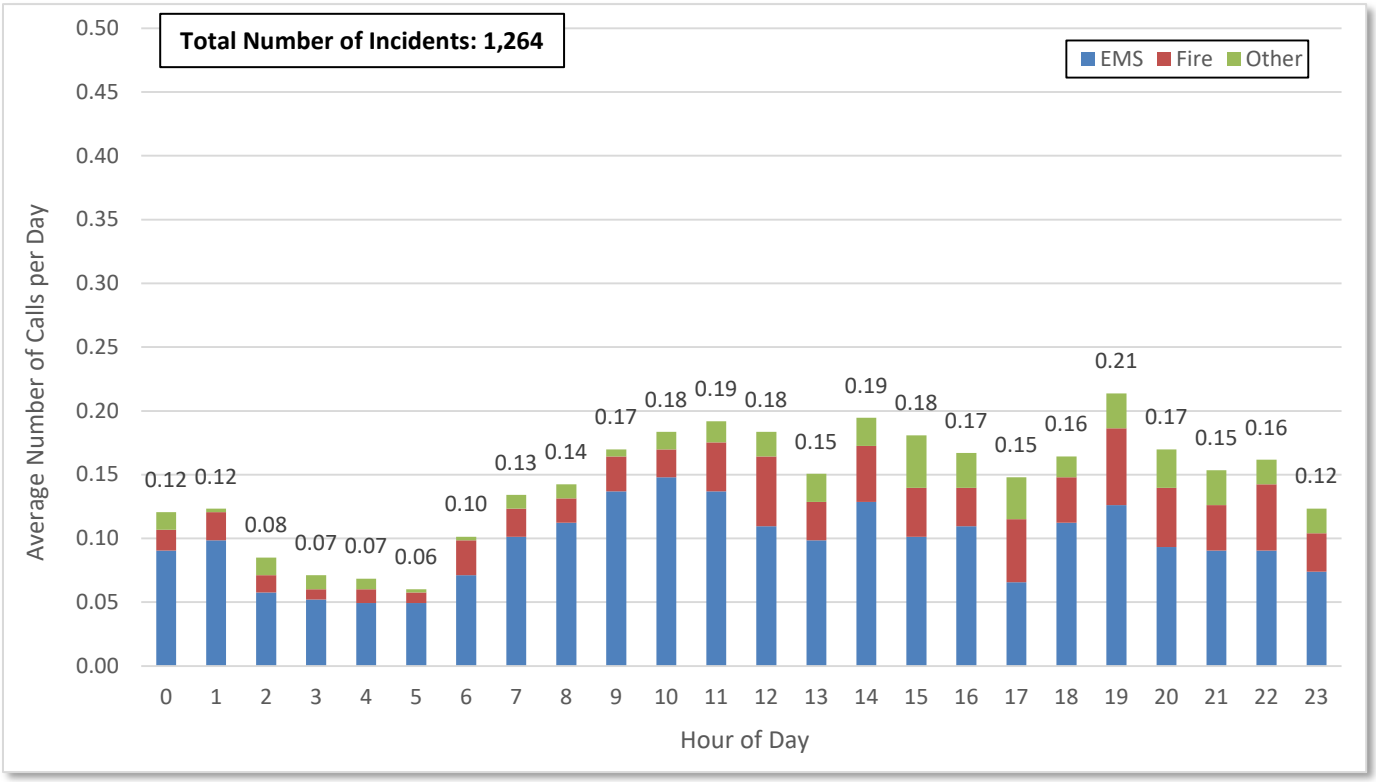


Figure 12: Average Calls per Day by Hour of Day – F403

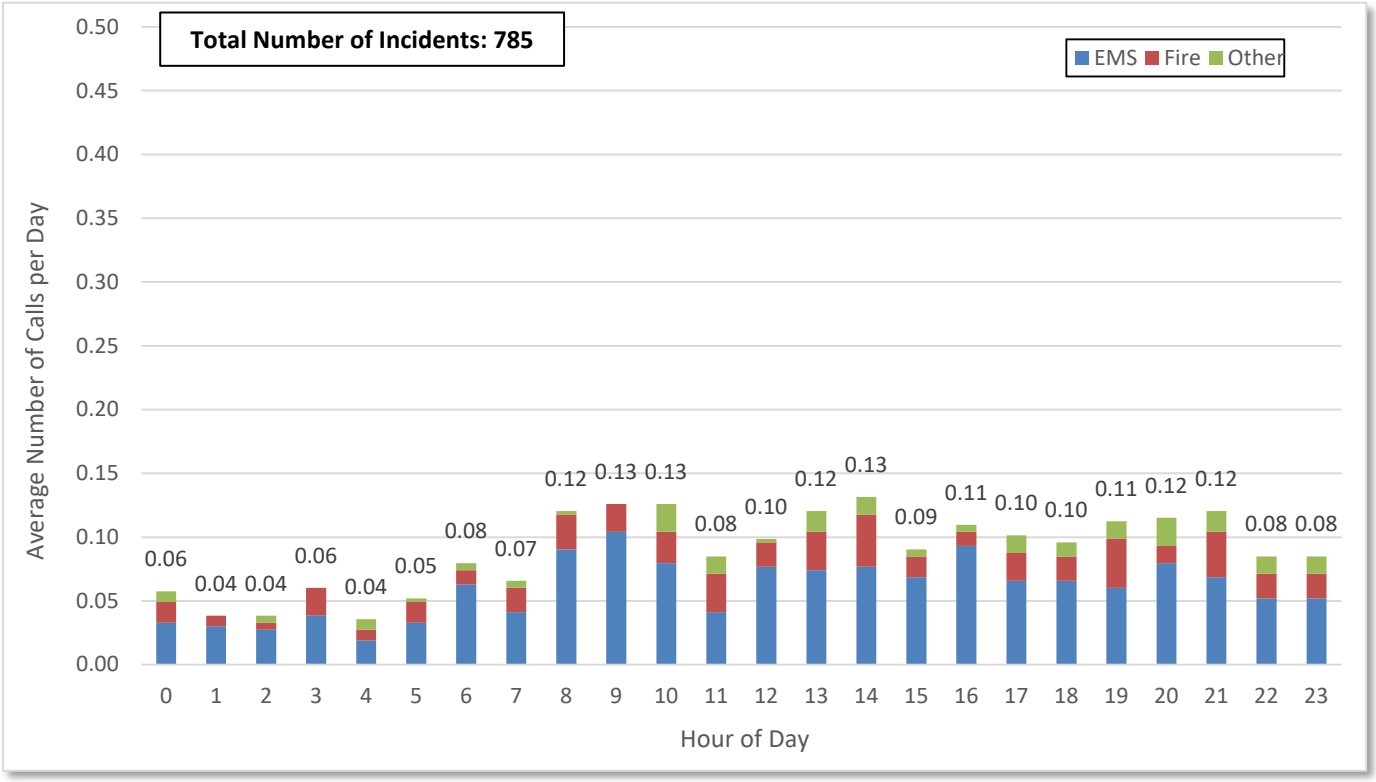


Figure 13: Average Calls per Day by Hour of Day – F404

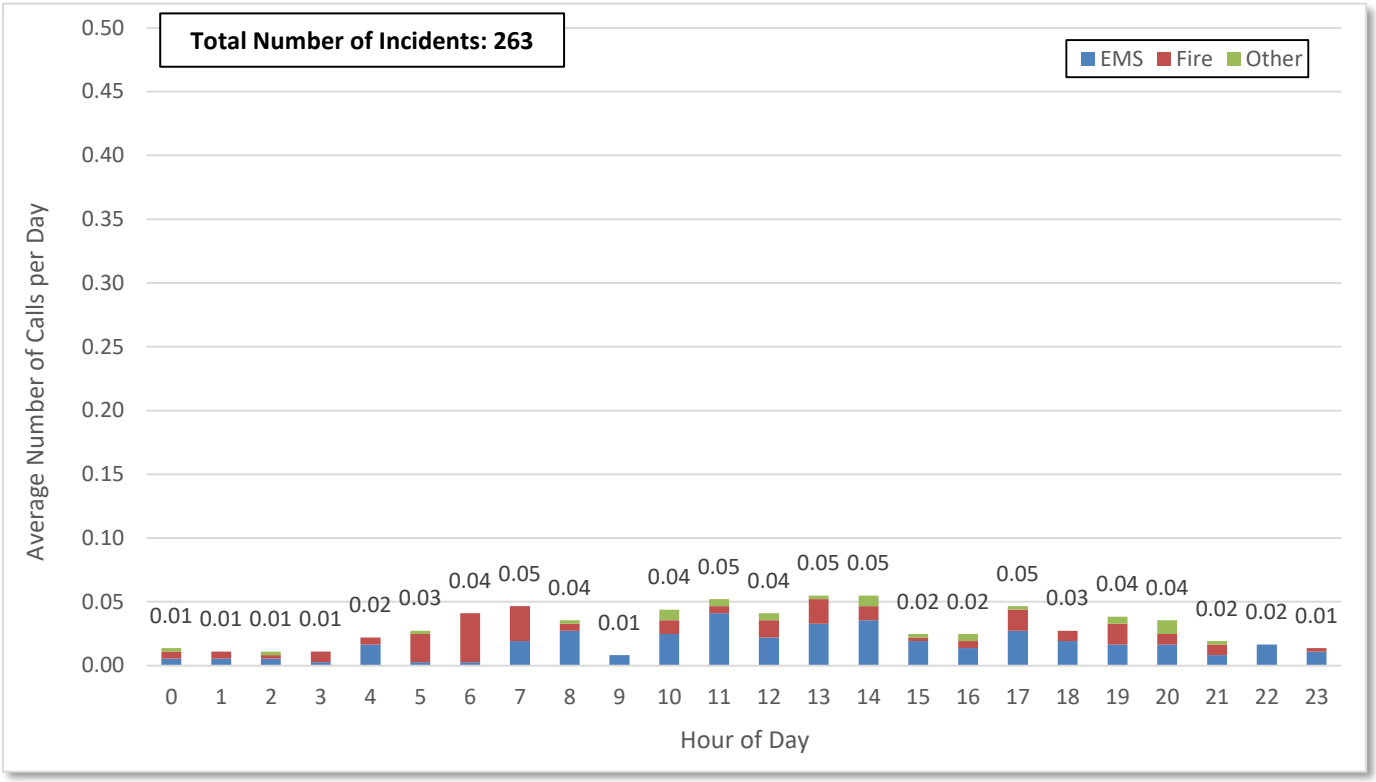
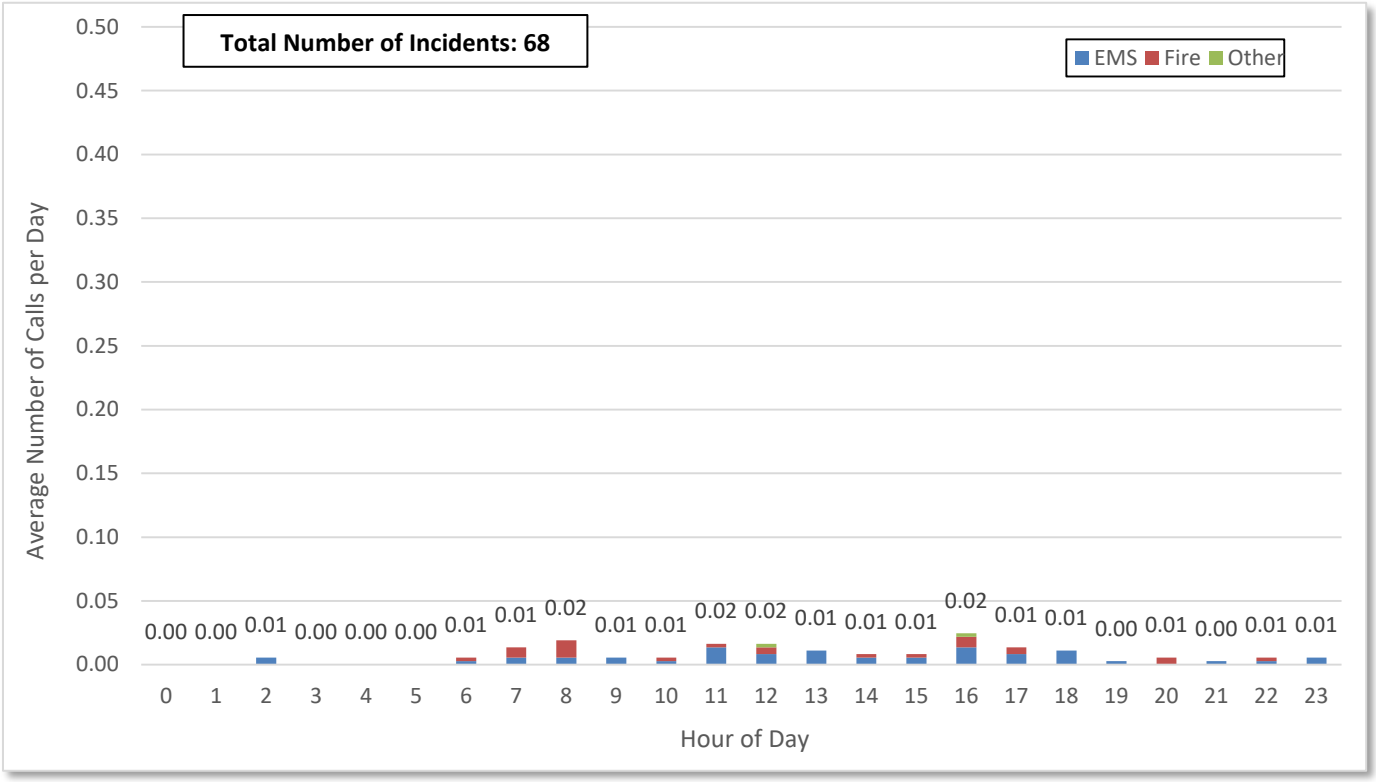


Figure 14: Average Calls per Day by Hour of Day – F405



Overall, BPFD made 11,592 responses, and the total busy hours were 3,577.7 hours during 2018 (Table 4; Table 8). The station-level demand is more reflective for deployment decisions (Table 8), and the unit-level workload will help evaluate the utilization of physical apparatus, and assist with apparatus procurement or maintenance decisions (Table 9).

Station 3 was the busiest station based on number of calls responded to by units always or primarily assigned to the station (4,144 calls; Table 8). Units always or primarily assigned to Station 3 also made the greatest number of responses to calls across the department (4,167 responses). Units always or primarily assigned to Station 2 had the greatest number of total busy hours during 2018 (1,273.7 hours).

E22 was the top utilized engine based on number of responses (2,694 responses), followed by E11 (1,771 responses) and E31 (1,236 responses; Table 9). E22, E11, and E31 were also the top utilized engines based on total busy hours (823.1, 471.8, and 346.1 hours, respectively). R41 made 2,182 responses and was busy for 621.5 hours; R31 made 1,160 responses and was busy for 316.5 hours.

Table 8: Overall Workload by Station

Station	Number of Calls Responded to by Units Assigned to Station[1]	Number of Responses Made by Units Assigned to Station[2]	Responses with Time Data[3]	Total Busy Hours	Average Busy Minutes per Response	Percentage of Total Busy Hours
Station 1	**6**	**6**	**5**	**4.6**	**54.7**	**0.1**
Station 2	1,080	1,103	1,023	450.6	26.4	12.6
Primarily Station 2, Moved as Needed	2,694	2,694	2,538	823.1	19.5	23.0
Station 2 Total	**3,247[4]**	**3,797**	**3,561**	**1,273.7**	**21.5**	**35.6**
Station 3	1,160	1,160	1,128	316.5	16.8	8.8
Primarily Station 3, Moved as Needed	3,005	3,007	2,730	817.9	18.0	22.9
Station 3 Total	**4,144[4]**	**4,167**	**3,858**	**1,134.4**	**17.6**	**31.7**
Station 4	2,183	2,184	2,016	622.8	18.5	17.4
Primarily Station 4, Moved as Needed	1,088	1,099	1,031	347.8	20.2	9.7
Station 4 Total	**3,211[4]**	**3,283**	**3,047**	**970.6**	**19.1**	**27.1**
Administration	**224**	**265**	**241**	**165.4**	**41.2**	**4.6**
N/A	**74**	**74**	**67**	**29.1**	**26.1**	**0.8**
Total	**--**	**11,592**	**10,779**	**3,577.7**	**19.9**	**100.0**

[1]"Number of Calls" reflects an adjusted number of unique incidents to correspond with responses made by BPFD units.
[2]"Number of Responses" reflects the total number of entries in the unit-level data file, regardless of calculated busy time.
[3]"Responses with Time Data" reflects the number of responses in the unit-level data file with calculated busy time.
[4]Total values are not the sum of the individual relevant components, as units assigned to each respective "Station" may respond to the same call.

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Table 9: Overall Workload by Unit

Station	Unit	Unit Type	Number of Responses[1]	Responses with Time Data[2]	Total Busy Hours	Average Busy Minutes per Response
Station 1	B12	Boat	1	0	--	--
	U11	Utility	5	5	4.6	54.7
	Station Total		**6**	**5**	**4.6**	**54.7**
Station 2	BC-1	Battalion Chief	292	282	143.0	30.4
	BC-2	Battalion Chief	384	342	137.1	24.0
	BC-3	Battalion Chief	398	373	152.6	24.5
	TW21	Tower	29	26	18.0	41.6
	Station Total		**1,103**	**1,023**	**450.6**	**26.4**
Station 3	R31	Rescue	1,160	1,128	316.5	16.8
	Station Total		**1,160**	**1,128**	**316.5**	**16.8**
Station 4	R1	4-Wheeler	1	1	1.2	72.2
	R41	Rescue	2,182	2,015	621.5	18.5
	U22	Command Vehicle	1	0	--	--
	Station Total		**2,184**	**2,016**	**622.8**	**18.5**
Primarily Station 2, Moved as Needed	E22	Engine	2,694	2,538	823.1	19.5
	Station Total		**2,694**	**2,538**	**823.1**	**19.5**
Primarily Station 3, Moved as Needed	E11	Engine	1,771	1,583	471.8	17.9
	E31	Engine	1,236	1,147	346.1	18.1
	Station Total		**3,007**	**2,730**	**817.9**	**18.0**
Primarily Station 4, Moved as Needed	E21	Engine	853	798	252.3	19.0
	E41	Engine	246	233	95.6	24.6
	Station Total		**1,099**	**1,031**	**347.8**	**20.2**
Administration	CA41	Captain	122	114	46.8	24.7
	CH1	Chief	46	46	48.9	63.8
	CH2	Deputy Chief	23	21	20.5	58.5
	DFM1	Deputy Fire Marshal	32	26	18.4	42.6
	INSP	Inspector	1	0	--	--
	INSP1	Inspector	41	34	30.8	54.3
	Administration Total		**265**	**241**	**165.4**	**41.2**
N/A	SC	Utility	74	67	29.1	26.1
	N/A Total		**74**	**67**	**29.1**	**26.1**
Department Total			**11,592**	**10,779**	**3,577.7**	**19.9**

[1]"Number of Responses" reflects the total number of entries in the unit-level data file, regardless of calculated busy time.
[2]"Responses with Time Data" reflects the number of responses in the unit-level data file with calculated busy time.

The last analyses in this section focus on performance times related to dispatch, turnout, travel, and response times. "Dispatch Time" was calculated as Unit Dispatch Date and Time – Alarm Date and Time. "Turnout Time" was calculated as Unit Enroute Date and Time – Unit Dispatch Date and Time. "Travel Time" was calculated as Unit Arrive Date and Time – Unit Enroute Date and Time. "Response Time" was calculated as Unit Arrive Date and Time – Alarm Date and Time. "Response Time" may also be calculated by summing relevant dispatch, turnout, and travel times, and "Average Response Time" may be derived by summing relevant average dispatch, turnout, and travel times when the sample data used during calculation of the outcomes are identical for all three outcomes.

Average performance times, median performance times, and performance times at the 90th percentile are reported in this section. The 90th percentile is presented as a more conservative and reliable measure of performance, as this measure is more robust, or less influenced by outliers, than measures of central tendency such as the average. Best practice is to measure at the 90th percentile. In other words, 90% of all performance is captured, expecting that 10% of the time the department may experience abnormal conditions that would typically be considered outliers. For example, if the department were to report an *average* response time of six minutes, then in a normally distributed set of data, half of the responses would be longer than six minutes and half of the responses would be shorter than six minutes. Utilizing six minutes as an example again, a *90th percentile value* of six minutes communicates that 9 out of 10 times, the department performance is six minutes or better (faster) and is therefore more predictable and more clearly articulated to policy makers and the community. Note, however, that the sum of the 90th percentile values for dispatch, turnout, and travel times is not equivalent to the 90th percentile response time.

Analyses of performance times first focused on emergency (lights and sirens) responses from the first arriving primary front-line units for all unique incidents in all demand zones, including first arrivals occurring in zones F501 (n = 1) and MA (n = 22). Call status as emergency (lights and sirens) was identified by the "Response" code 390 in the RMS data file. Units identified by BPFD as primary front-line units included all engines, rescues, and battalion chiefs.

Average performance times are presented in Table 10 and in Figure 15, median values are presented in Table 11, and 90th percentile values are presented in Table 12. Due to the restriction of these analyses to select responses and units, maximum available sample size for these analyses is 6,996. Sample data were not identical across all performance time calculations (i.e., missing data) such that the sum of average dispatch, turnout, and travel times will not necessarily equal average response times in Table 10. Note that all total performance time metrics are identical when excluding demand zone "MA" from the analyses, except for the 90th percentile response time which is 9.0 minutes instead of 9.1 minutes (full data not presented here). As such, responses made in demand zone "MA" were retained for all related analyses.

Across all BPFD responses made by first arriving primary front-line units to emergency calls, average dispatch time was 1.1 minutes (median = 0.9 minutes; 90th percentile = 1.7 minutes); average turnout time was 1.3 minutes (median = 1.2 minutes; 90th percentile = 2.2 minutes); average travel time was 4.1 minutes (median = 3.9; 90th percentile = 6.6 minutes); and average response time was 6.4 minutes (median = 6.2 minutes; 90th percentile = 9.1 minutes).

Typically, performance varies across call types or categories for a variety of reasons. For example, turnout time may be longer for fire related calls because the crews have to dress in their personal protective ensemble (bunker gear) prior to leaving the station, whereas on an EMS incident, they do not. Similarly, the larger fire apparatus may require longer travel and overall response times due to its size and lack of maneuverability.

Table 10: Average Dispatch, Turnout, Travel, and Response Times by Program – First Arriving Units

Program	Dispatch Time (Minutes)	Turnout Time (Minutes)	Travel Time (Minutes)	Response Time (Minutes)	Sample Size[1]
EMS	1.0	1.2	4.1	6.3	5,789
Fire	1.2	1.4	4.1	6.6	1,036
Hazmat	1.1	1.5	4.5	7.2	140
Rescue	1.3	1.5	4.0	6.9	31
Total	**1.1**	**1.3**	**4.1**	**6.4**	**6,996**

[1]Sample sizes reflect the number of responses made by first arriving primary front-line units to emergency calls; due to missing or excluded time data, sample sizes corresponding to individual table metrics may be smaller.

Table 11: Median Dispatch, Turnout, Travel, and Response Times by Program – First Arriving Units

Program	Dispatch Time (Minutes)	Turnout Time (Minutes)	Travel Time (Minutes)	Response Time (Minutes)	Sample Size[1]
EMS	0.9	1.2	3.9	6.1	5,789
Fire	1.1	1.4	3.9	6.5	1,036
Hazmat	1.0	1.5	4.6	7.2	140
Rescue	1.1	1.5	3.9	6.9	31
Total	**0.9**	**1.2**	**3.9**	**6.2**	**6,996**

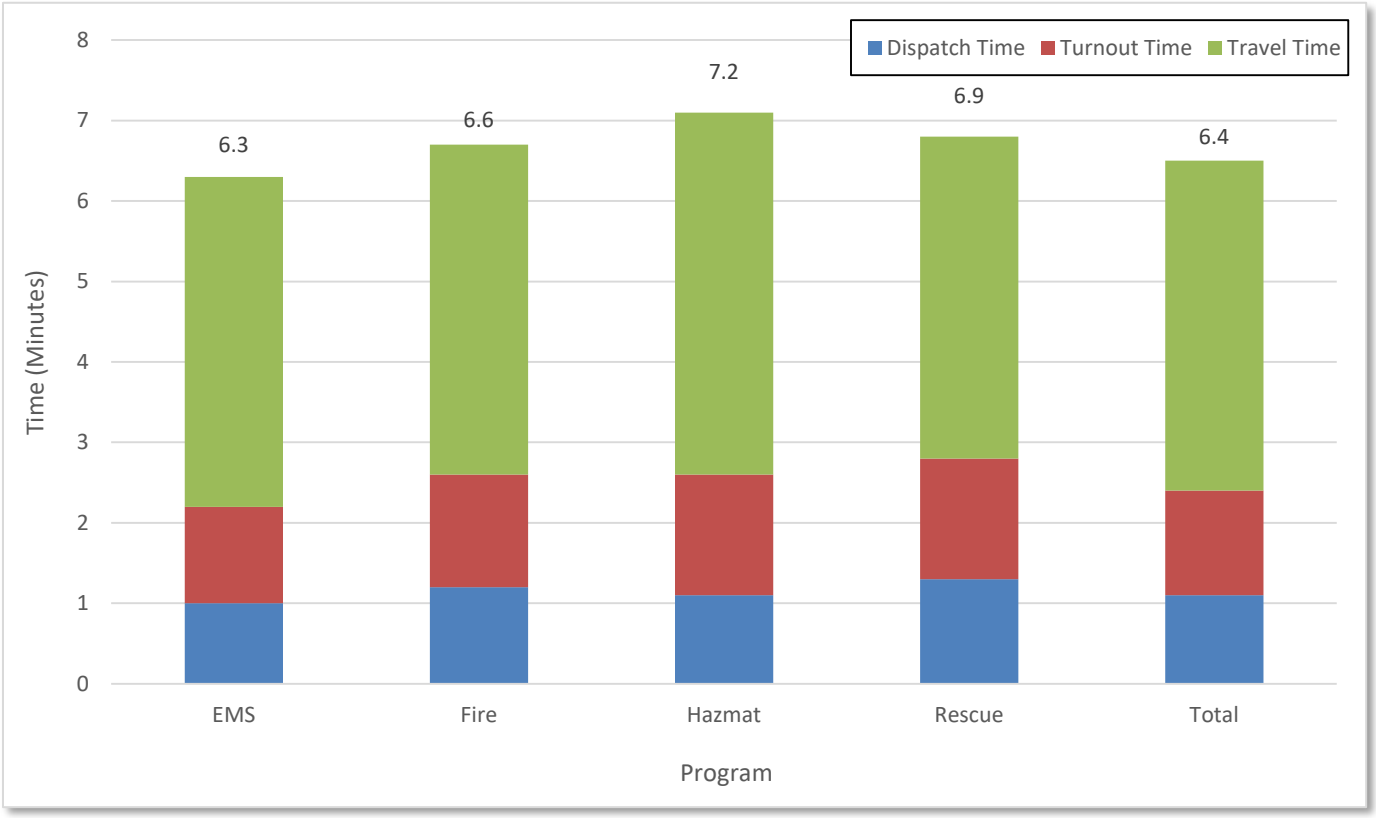
[1]Sample sizes reflect the number of responses made by first arriving primary front-line units to emergency calls; due to missing or excluded time data, sample sizes corresponding to individual table metrics may be smaller.

Table 12: 90th Percentile Dispatch, Turnout, Travel, and Response Times by Program – First Arriving Units

Program	Dispatch Time (Minutes)	Turnout Time (Minutes)	Travel Time (Minutes)	Response Time (Minutes)	Sample Size[1]
EMS	1.6	2.1	6.6	9.0	5,789
Fire	2.1	2.5	6.4	9.2	1,036
Hazmat	1.8	2.3	7.3	10.0	140
Rescue	2.9	2.8	9.0	10.8	31
Total	**1.7**	**2.2**	**6.6**	**9.1**	**6,996**

[1]Sample sizes reflect the number of responses made by first arriving primary front-line units to emergency calls; due to missing or excluded time data, sample sizes corresponding to individual table metrics may be smaller.

Figure 15: Average Dispatch, Turnout, Travel, and Response Times by Program – First Arriving Units



Analyses next focused on dispatch times of the first unit dispatched to each call by response mode (Table 13). Caution when interpreting metrics associated with small sample sizes, and note that some sample sizes were too small to permit calculation of metrics (noted as "--" in the table).

Table 13: Average, Median, and 90th Percentile Dispatch Times by Program and Response Mode – First Dispatched Units

Program and Response Mode	Average Dispatch Time (Minutes)	Median Dispatch Time (Minutes)	90th Percentile Dispatch Time (Minutes)	Sample Size[1]
EMS	**1.0**	**0.9**	**1.6**	**6,366**
380 Initial lights & sirens, downgraded	1.1	1.0	1.7	166
385 Initial NO lights & sirens, upgraded	1.2	1.0	2.7	11
390 Lights & sirens	1.0	0.9	1.6	5,801
395 NO lights & sirens	1.2	1.0	1.8	385
Missing Data	1.3	1.0	--	3
Fire	**1.2**	**1.0**	**2.0**	**2,028**
380 Initial lights & sirens, downgraded	1.2	1.0	1.9	217
385 Initial NO lights & sirens, upgraded	1.0	0.9	--	9
390 Lights & sirens	1.2	1.1	2.0	1,027
395 NO lights & sirens	1.2	1.0	1.9	759
Missing Data	1.5	1.0	3.9	16
Hazmat	**1.0**	**0.9**	**1.8**	**234**
380 Initial lights & sirens, downgraded	--	--	--	1
385 Initial NO lights & sirens, upgraded	--	--	--	1
390 Lights & sirens	1.1	1.0	1.8	139
395 NO lights & sirens	0.9	0.8	1.7	93
Rescue	**1.3**	**1.0**	**2.0**	**773**
380 Initial lights & sirens, downgraded	1.6	1.6	--	6
385 Initial NO lights & sirens, upgraded	1.7	1.2	--	8
390 Lights & sirens	1.3	1.1	2.5	35
395 NO lights & sirens	1.3	1.0	2.0	705
Missing Data	1.4	1.0	3.6	19
Total	**1.1**	**0.9**	**1.8**	**9,401**
380 Initial lights & sirens, downgraded	**1.1**	**1.0**	**1.8**	**390**
385 Initial NO lights & sirens, upgraded	**1.3**	**1.0**	**2.8**	**29**
390 Lights & sirens	**1.1**	**0.9**	**1.7**	**7,002**
395 NO lights & sirens	**1.2**	**1.0**	**1.9**	**1,942**
Missing Data	**1.4**	**1.0**	**3.1**	**38**

[1]Sample sizes reflect the total number of first dispatches made by BPFD units during 2018 per program and response mode noted; due to excluded dispatch times for some entries, sample sizes corresponding to individual table metrics may be smaller.

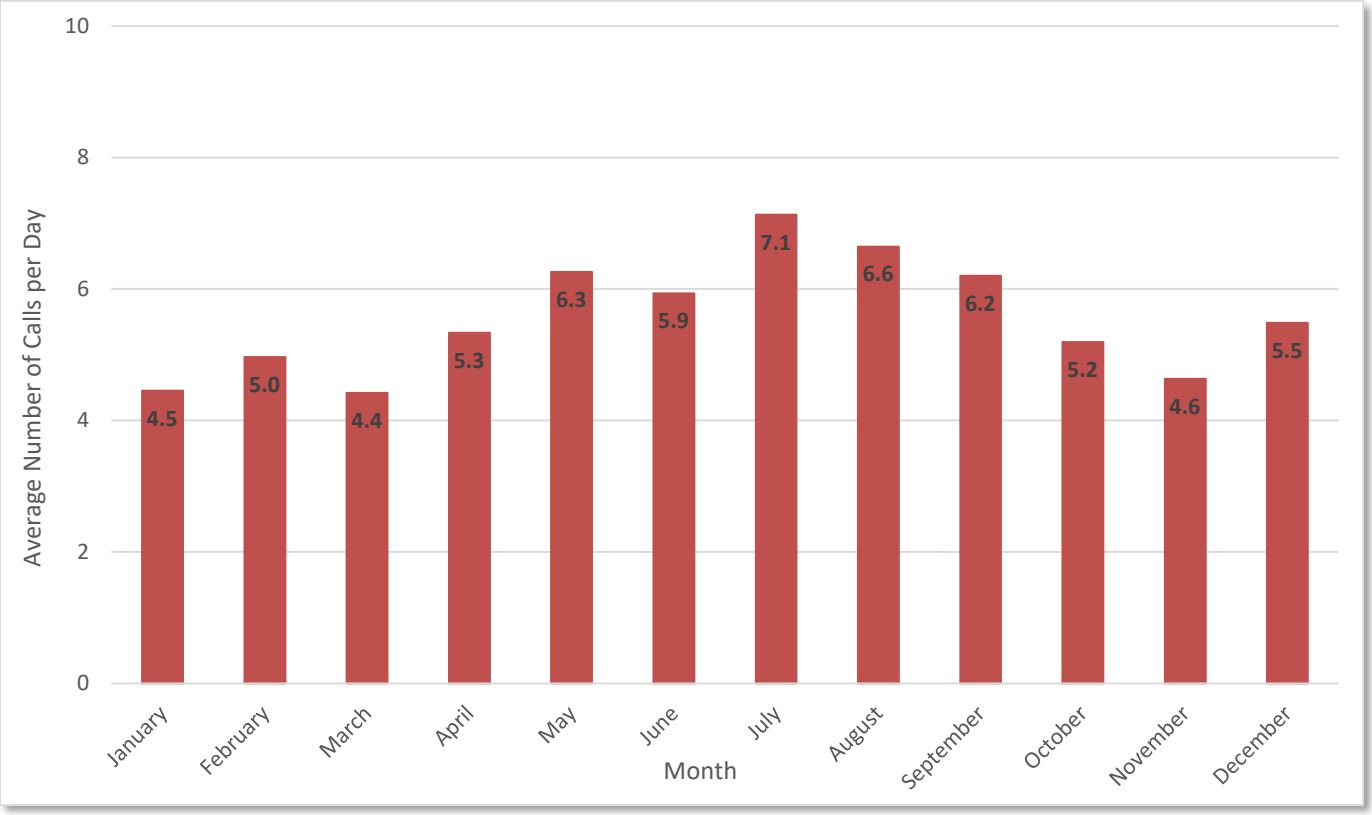
Fire Services

Temporal analyses were conducted to evaluate patterns in community demands for fire related services. These analyses examined the frequency of requests for service in 2018 by month, day of week, and hour of day. Results found that there was variability by month (Table 14; Figure 16). The three months with the most fire related calls in descending order were: July (7.1 per day), August (6.6 per day), and May (6.3 per day). The three months with the fewest fire related calls in ascending order were: March (4.4 per day), January (4.5 per day), and November (4.6 per day).

Table 14: Total Fire Related Calls and Average Calls per Day by Month

Month	Number of Calls	Average Calls per Day	Call Percentage
January	138	4.5	6.8
February	139	5.0	6.9
March	137	4.4	6.8
April	160	5.3	7.9
May	194	6.3	9.6
June	178	5.9	8.8
July	221	7.1	10.9
August	206	6.6	10.2
September	186	6.2	9.2
October	161	5.2	7.9
November	139	4.6	6.9
December	170	5.5	8.4
Total	**2,029**	**5.6**	**100.0**

Figure 16: Average Fire Related Calls per Day by Month



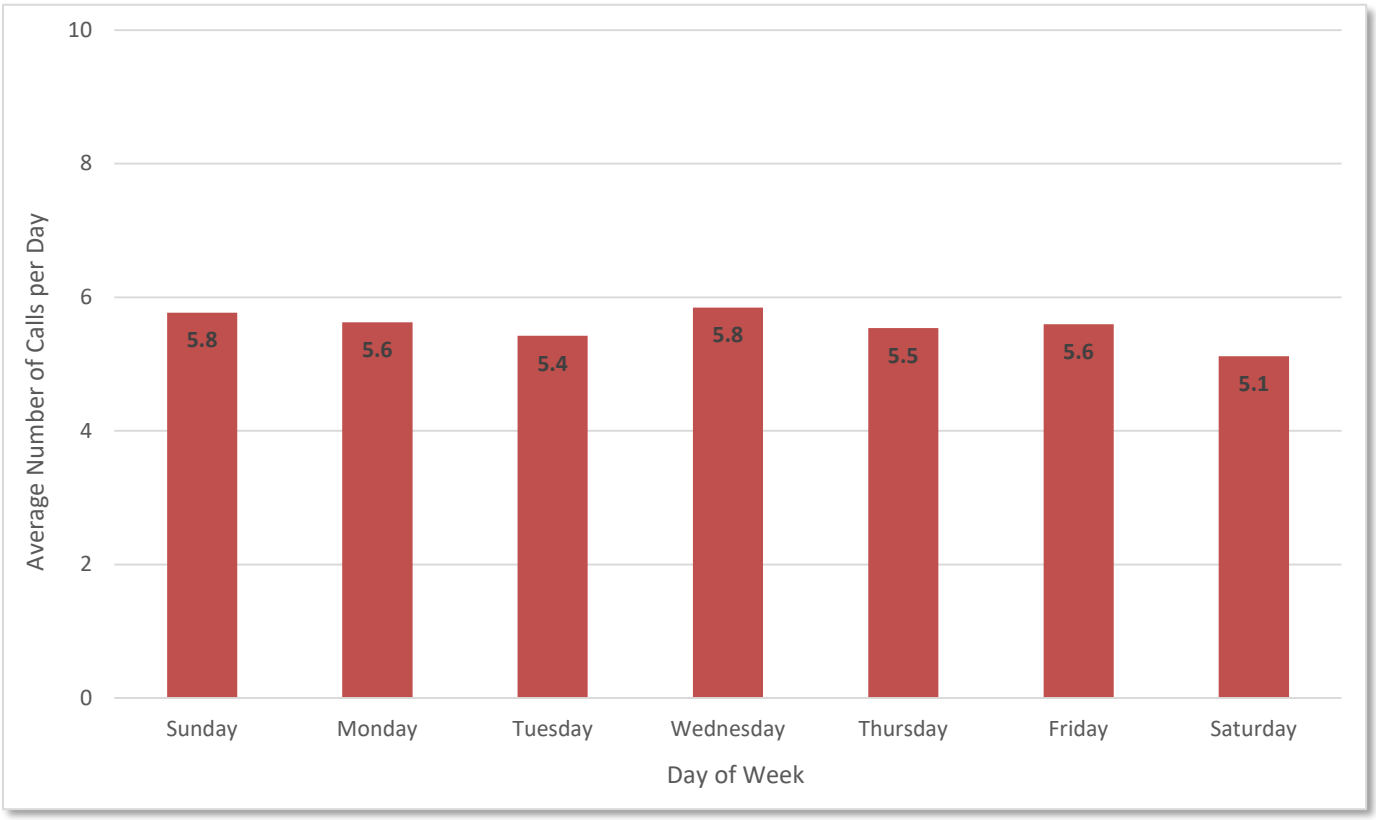
Similar analyses were conducted for fire related calls by day of week (Table 15; Figure 17). The data revealed that there is only slight variability in the demand for services by day of week. The three days with the most fire related calls in descending order were: Wednesday (5.8 per day), Sunday (5.8 per day), and Monday (5.6 per day). The three days with the fewest fire related calls in ascending order were: Saturday (5.1 per day), Tuesday (5.4 per day), and Thursday (5.5 per day).

Table 15: Total Fire Related Calls and Average Calls per Day by Day of Week

Day of Week	Number of Calls	Average Calls per Day	Call Percentage
Sunday	300	5.8	14.8
Monday[1]	298	5.6	14.7
Tuesday	282	5.4	13.9
Wednesday	304	5.8	15.0
Thursday	288	5.5	14.2
Friday	291	5.6	14.3
Saturday	266	5.1	13.1
Total	**2,029**	**5.6**	**100.0**

[1]There were 53 Mondays during 2018, and 52 of all other days of the week during 2018.

Figure 17: Average Fire Related Calls per Day by Day of Week

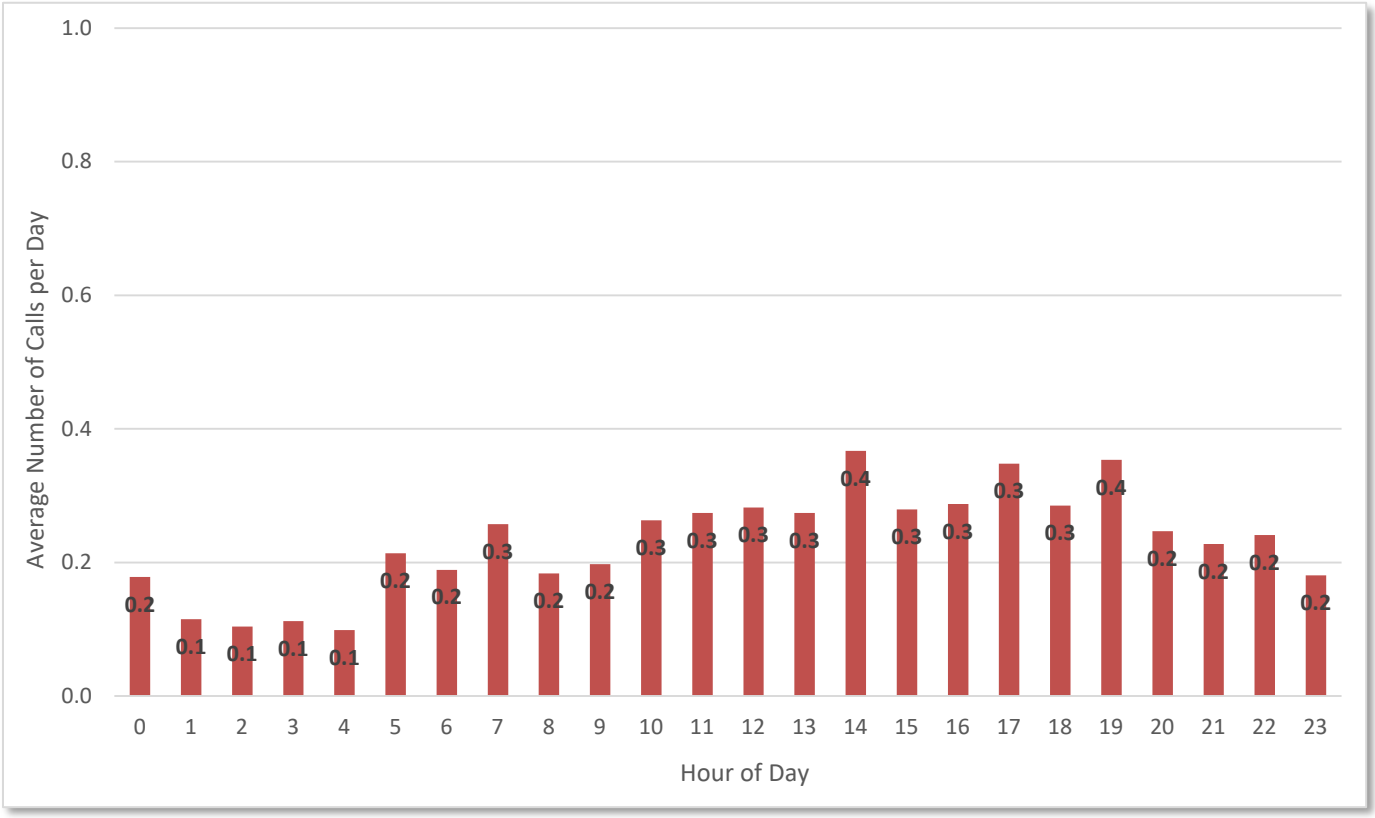


Fire related calls were also evaluated by hour of the day (Table 16; Figure 18). Slight variability exists in the time of day that requests for fire related services were received. The hours from 0100 to 0400 had the lowest demands, where average number of calls per day for each of those hours was 0.1. The highest demand for fire related services occurred at 1400 (134 total calls during this hour in 2018) and at 1900 (129 total calls during this hour in 2018), where average number of calls per day during each of those hours was 0.4.

Table 16: Total Fire Related Calls and Average Calls per Day by Hour of Day

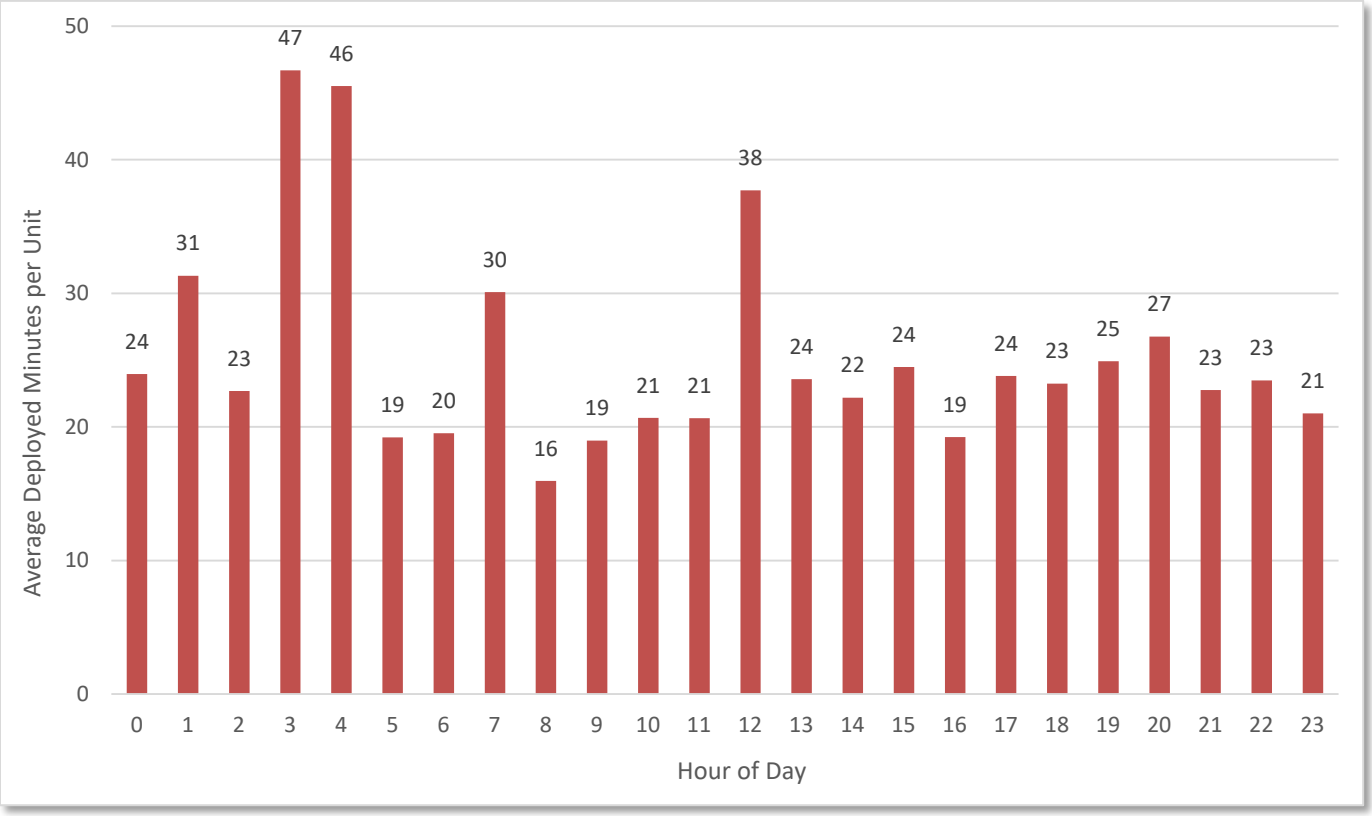
Hour of Day	Number of Calls	Average Calls per Day	Call Percentage
0	65	0.2	3.2
1	42	0.1	2.1
2	38	0.1	1.9
3	41	0.1	2.0
4	36	0.1	1.8
5	78	0.2	3.8
6	69	0.2	3.4
7	94	0.3	4.6
8	67	0.2	3.3
9	72	0.2	3.5
10	96	0.3	4.7
11	100	0.3	4.9
12	103	0.3	5.1
13	100	0.3	4.9
14	134	0.4	6.6
15	102	0.3	5.0
16	105	0.3	5.2
17	127	0.3	6.3
18	104	0.3	5.1
19	129	0.4	6.4
20	90	0.2	4.4
21	83	0.2	4.1
22	88	0.2	4.3
23	66	0.2	3.3
Total	**2,029**	**5.6**	**100.0**

Figure 18: Average Fire Related Calls per Day by Hour of Day



In addition, the average time on task was evaluated to assess the demand for resources through the lens of time commitment per hour of day (Figure 19). Understanding that many fire related incidents require multi-unit responses, this analysis incorporates unit-level activity. Overall, BPFD was busy for an average of 24.9 minutes per unit-level response to fire related calls (Table 4). The unusually high averages occurring at 0300, 0400, 0700, and 1200 were due to structure fires.

Figure 19: Average Deployed Minutes per Unit by Hour of Day for Fire Related Responses



Fire related requests accounted for 21.6% of the total requests for service during 2018 and averaged 5.6 requests per day (Figure 1; Table 1). Fire related incidents are an aggregated category of the various final incident types available in the RMS data file. Table 17 provides details of these fire related incidents by nature of the call (i.e., variable "IncidentType" in the RMS data file, mapped to each numeric code's text definition from the NFIRS data dictionary available as a separate table in the database). "Alarm system activation, no fire - unintentional" was the most frequent community demand (349/2,029 or 17.2% of calls).

Table 17: Total Fire Related Calls by Nature of Call

Nature of Call[1]	Number of Calls	Percentage of Total Fire Service Demands
Alarm system activation, no fire - unintentional	349	17.2
Dispatched & cancelled en route	250	12.3
Assist invalid	236	11.6
False alarm or false call, other	157	7.7
No incident found on arrival at dispatch address	113	5.6
Cooking fire, confined to container	82	4.0
Carbon monoxide detector activation, no CO	69	3.4
Smoke scare, odor of smoke	68	3.4
Alarm system sounded due to malfunction	66	3.3
Person in distress, other	62	3.1
Unauthorized burning	51	2.5
Building fire	46	2.3
Passenger vehicle fire	46	2.3
Assist police or other governmental agency	36	1.8
Smoke detector activation due to malfunction	29	1.4
Smoke detector activation, no fire - unintentional	27	1.3
Authorized controlled burning	23	1.1
Arcing, shorted electrical equipment	16	0.8
Sprinkler activation, no fire - unintentional	16	0.8
Trash or rubbish fire, contained	16	0.8
Public service assistance, other	15	0.7
Central station, malicious false alarm	14	0.7
Electrical wiring/equipment problem, other	14	0.7
Good intent call, other	14	0.7
Unintentional transmission of alarm, other	14	0.7
Smoke or odor removal	13	0.6
Overpressure rupture, explosion, overheat other	12	0.6
Power line down	12	0.6
Special type of incident, other	12	0.6
Public service	11	0.5
CO detector activation due to malfunction	8	0.4
Excessive heat, scorch burns with no ignition	8	0.4
Local alarm system, malicious false alarm	8	0.4

Nature of Call[1]	Number of Calls	Percentage of Total Fire Service Demands
Overheated motor	8	0.4
Wrong location	8	0.4
Grass fire	7	0.3
Police matter	7	0.3
Steam, vapor, fog or dust thought to be smoke	7	0.3
Dumpster or other outside trash receptacle fire	6	0.3
Brush or brush-and-grass mixture fire	5	0.2
Service Call, other	5	0.2
Municipal alarm system, malicious false alarm	4	0.2
Outside rubbish, trash or waste fire	4	0.2
Ring or jewelry removal	4	0.2
Sprinkler activation due to malfunction	4	0.2
System malfunction, other	4	0.2
Citizen complaint	3	0.1
Heat from short circuit (wiring), defective/worn	3	0.1
Malicious, mischievous false call, other	3	0.1
Outside rubbish fire, other	3	0.1
Overpressure rupture from steam, other	3	0.1
Water or steam leak	3	0.1
Attempt to burn	2	0.1
Bomb scare - no bomb	2	0.1
Cover assignment, standby, moveup	2	0.1
Detector activation, no fire - unintentional	2	0.1
Heat detector activation due to malfunction	2	0.1
Lightning strike (no fire)	2	0.1
Lock-out	2	0.1
Water problem, other	2	0.1
Camper or recreational vehicle (RV) fire	1	0.0
Chimney or flue fire, confined to chimney or flue	1	0.0
Extinguishing system activation due to malfunction	1	0.0
Incinerator overload or malfunction, fire confined	1	0.0
Natural vegetation fire, other	1	0.0
Off-road vehicle or heavy equipment fire	1	0.0
Outside equipment fire	1	0.0
Overpressure rupture from air or gas, other	1	0.0
Steam, other gas mistaken for smoke, other	1	0.0
Total	**2,029**	**100.0**

[1]Entries are presented verbatim from the NFIRS data dictionary in the RMS data file.

BPFD made a total of 3,404 responses to fire related calls (Table 4; Table 18). Total busy time was 1,267.0 hours, and the average busy minutes per response was 24.9 minutes. The three most utilized units based on busy hours were E22 (278.1 hours), R41 (136.4 hours), and E11 (133.2 hours; Table 18).

Table 18: Workload by Unit for Fire Related Calls

Station	Unit	Unit Type	Number of Responses[1]	Responses with Time Data[2]	Total Busy Hours	Average Busy Minutes per Response
Station 1	B12	Boat	1	0	--	--
	U11	Utility	1	1	2.3	138.2
	Station Total		**2**	**1**	**2.3**	**138.2**
Station 2	BC-1	Battalion Chief	187	181	99.0	32.8
	BC-2	Battalion Chief	216	196	85.0	26.0
	BC-3	Battalion Chief	190	178	78.2	26.3
	TW21	Tower	12	10	13.3	79.5
	Station Total		**605**	**565**	**275.4**	**29.2**
Station 3	R31	Rescue	238	225	84.7	22.6
	Station Total		**238**	**225**	**84.7**	**22.6**
Station 4	R1	4-Wheeler	0	--	--	--
	R41	Rescue	569	486	136.4	16.8
	U22	Command Vehicle	0	--	--	--
	Station Total		**569**	**486**	**136.4**	**16.8**
Primarily Station 2, Moved as Needed	E22	Engine	781	744	278.1	22.4
	Station Total		**781**	**744**	**278.1**	**22.4**
Primarily Station 3, Moved as Needed	E11	Engine	441	355	133.2	22.5
	E31	Engine	275	231	94.4	24.5
	Station Total		**716**	**586**	**227.6**	**23.3**
Primarily Station 4, Moved as Needed	E21	Engine	212	197	69.5	21.2
	E41	Engine	101	94	54.8	35.0
	Station Total		**313**	**291**	**124.3**	**25.6**
Administration	CA41	Captain	46	42	21.7	31.0
	CH1	Chief	33	33	41.9	76.3
	CH2	Deputy Chief	17	16	18.2	68.4
	DFM1	Deputy Fire Marshal	22	16	15.5	58.1
	INSP	Inspector	1	0	--	--
	INSP1	Inspector	22	17	24.1	85.1
	Administration Total		**141**	**124**	**121.5**	**58.8**
N/A	SC	Utility	39	36	16.7	27.8
	N/A Total		**39**	**36**	**16.7**	**27.8**
Department Total			**3,404**	**3,058**	**1,267.0**	**24.9**

[1]"Number of Responses" reflects the total number of entries in the unit-level data file, regardless of calculated busy time.
[2]"Responses with Time Data" reflects the number of responses in the unit-level data file with calculated busy time.

We also analyzed number of responding BPFD units by fire related call type (Table 19). Overall, 62.7% of fire related calls were responded to by one unit, and 14.2% were responded to by two units. However, for structure fire calls, 71.9% of calls (105/146) were responded to by three or more units (Table 19; Figure 20; Table 20). The maximum number of units responding to a structure fire call was ten (Table 20). BPFD was busy on structure fire calls for 468.0 hours during 2018 (Table 21), making 495 responses to 146 structure fire calls and averaging 3.4 responses per call. Average busy minutes per response was 58.6.

Table 19: Number of Responding Units by Fire Related Call Type

Call Category	Number of Responding Units							Total
	1	2	3	4	5	6	7 or more	
Cancelled/Wrong Location/No Incident	302	48	18	0	0	1	1	370
False Call/Alarm	4	8	17	0	0	0	0	29
Fire Alarm	438	133	174	3	0	0	0	748
Fire Other	217	48	73	13	1	0	0	352
Outside Fire	9	11	6	1	0	0	0	27
Public Service	280	13	13	2	0	0	0	308
Structure Fire	19	22	64	9	10	11	11	146
Vehicle Fire	3	4	36	5	0	0	0	48
Total	**1,272**	**287**	**401**	**33**	**11**	**12**	**12**	**2,028**
Percentage	**62.7**	**14.2**	**19.8**	**1.6**	**0.5**	**0.6**	**0.6**	**100.0**

Figure 20: Percentage of Structure Fire Calls by Number of Responding Units

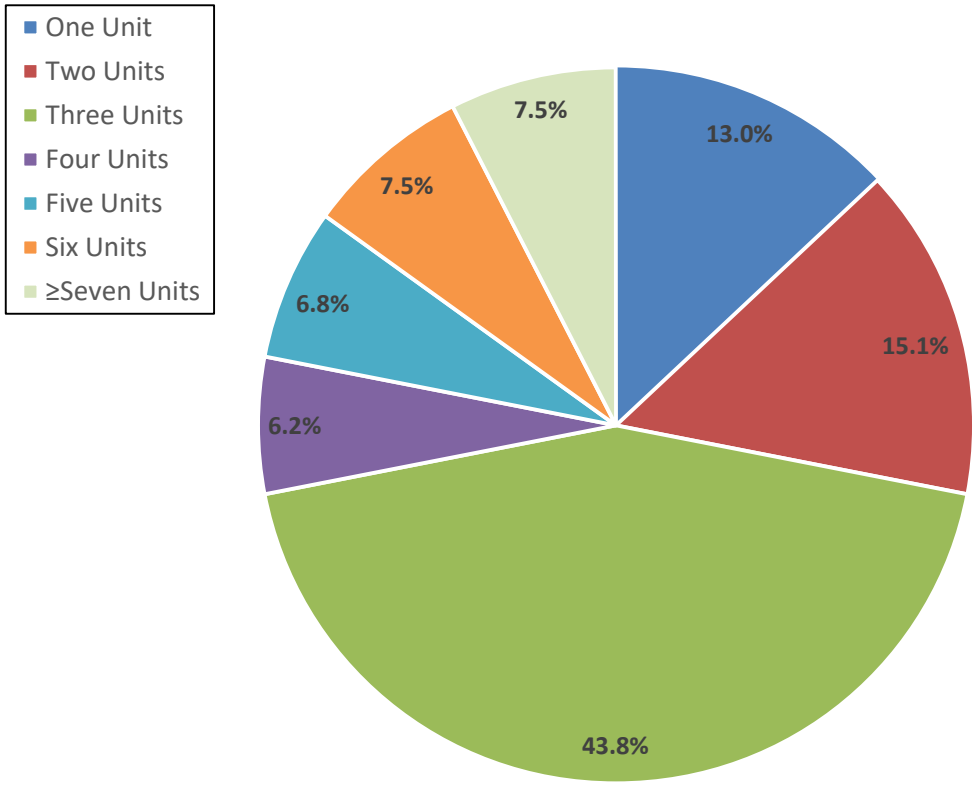


Table 20: Number of Responding Units for Structure Fire Calls

Number of Responding Units	Number of Calls
1	19
2	22
3	64
4	9
5	10
6	11
7	3
8	6
9	1
10	1
Total	**146**

Table 21: Workload by Unit for Fire Related Calls – Structure Fires

Station	Unit	Unit Type	Number of Responses[1]	Responses with Time Data[2]	Total Busy Hours	Average Busy Minutes per Response
Station 1	B12	Boat	1	0	--	--
	U11	Utility	1	1	2.3	138.2
	Station Total		**2**	**1**	**2.3**	**138.2**
Station 2	BC-1	Battalion Chief	43	43	49.3	68.8
	BC-2	Battalion Chief	46	45	35.3	47.1
	BC-3	Battalion Chief	22	22	25.1	68.4
	TW21	Tower	9	7	12.4	106.2
	Station Total		**120**	**117**	**122.1**	**62.6**
Station 3	R31	Rescue	25	24	21.4	53.6
	Station Total		**25**	**24**	**21.4**	**53.6**
Station 4	R1	4-Wheeler	0	--	--	--
	R41	Rescue	33	29	19.9	41.1
	U22	Command Vehicle	0	--	--	--
	Station Total		**33**	**29**	**19.9**	**41.1**
Primarily Station 2, Moved as Needed	E22	Engine	101	97	71.4	44.2
	Station Total		**101**	**97**	**71.4**	**44.2**
Primarily Station 3, Moved as Needed	E11	Engine	64	64	44.5	41.8
	E31	Engine	27	27	28.4	63.2
	Station Total		**91**	**91**	**73.0**	**48.1**
Primarily Station 4, Moved as Needed	E21	Engine	25	25	19.1	45.8
	E41	Engine	31	30	36.8	73.6
	Station Total		**56**	**55**	**55.9**	**60.9**
Administration	CA41	Captain	11	11	12.8	69.8
	CH1	Chief	23	23	33.7	87.9
	CH2	Deputy Chief	9	9	16.0	106.8
	DFM1	Deputy Fire Marshal	8	8	12.7	95.3
	INSP	Inspector	0	--	--	--
	INSP1	Inspector	11	10	20.6	123.5
	Administration Total		**62**	**61**	**95.8**	**94.3**
N/A	SC	Utility	5	4	6.3	93.8
	N/A Total		**5**	**4**	**6.3**	**93.8**
Department Total			**495**	**479**	**468.0**	**58.6**

[1]"Number of Responses" reflects the total number of entries in the unit-level data file, regardless of calculated busy time.
[2]"Responses with Time Data" reflects the number of responses in the unit-level data file with calculated busy time.

Emergency Medical Services

Temporal analyses were conducted to evaluate patterns in community demands for EMS related services. These analyses examined the frequency of requests for service in 2018 by month, day of week, and hour of day. Results found that there was some variability by month (Table 22; Figure 21). The three months with the most EMS related calls in descending order were: April (18.8 per day), July (18.4 per day), and June (18.3 per day). The three months with the fewest EMS related calls in ascending order were: September (16.0 per day), March (16.7 per day), and January (16.8 per day).

Table 22: Total EMS Related Calls and Average Calls per Day by Month

Month	Number of Calls	Average Calls per Day	Call Percentage
January	521	16.8	8.2
February	487	17.4	7.6
March	519	16.7	8.1
April	565	18.8	8.9
May	525	16.9	8.2
June	550	18.3	8.6
July	569	18.4	8.9
August	564	18.2	8.9
September	480	16.0	7.5
October	527	17.0	8.3
November	514	17.1	8.1
December	550	17.7	8.6
Total	**6,371**	**17.5**	**100.0**

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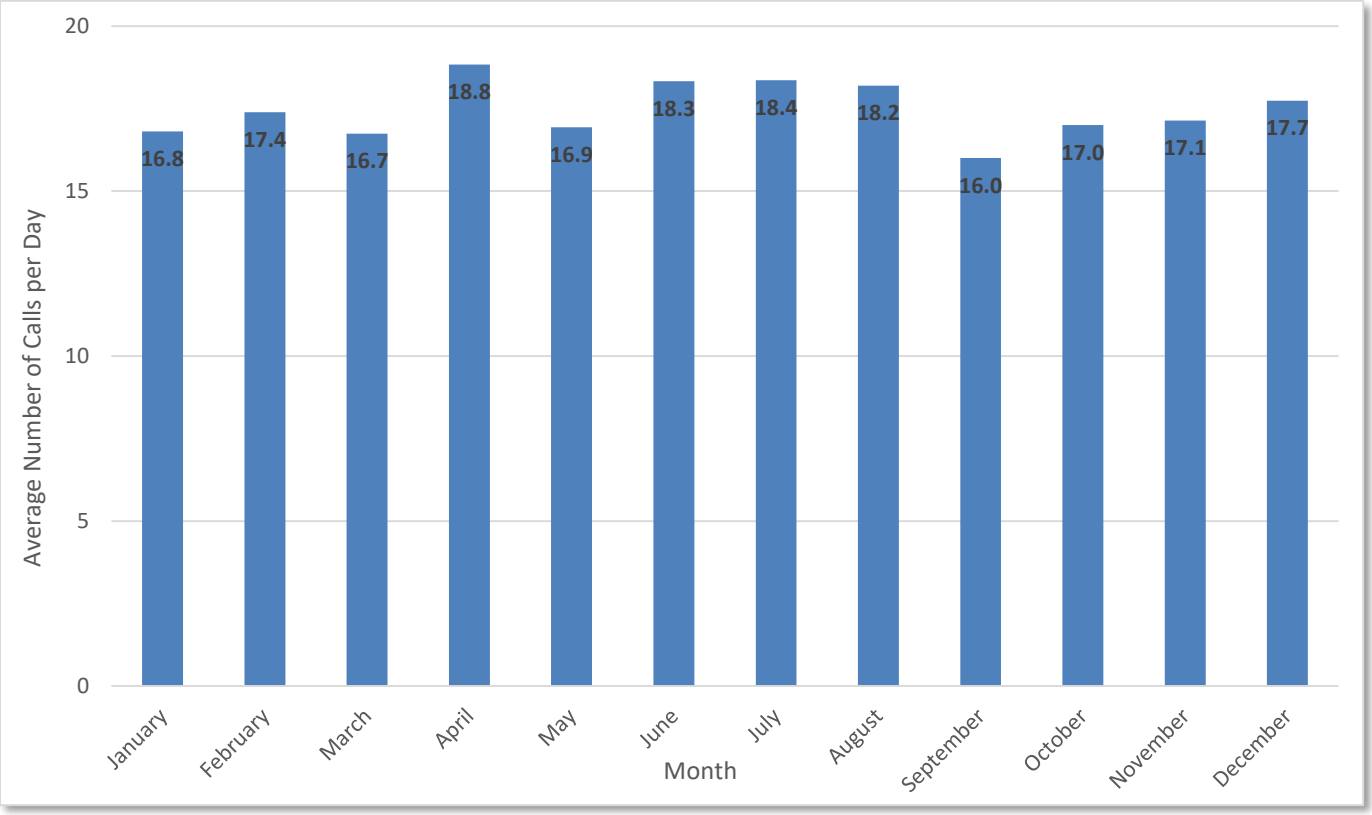
Figure 21: Average EMS Related Calls per Day by Month



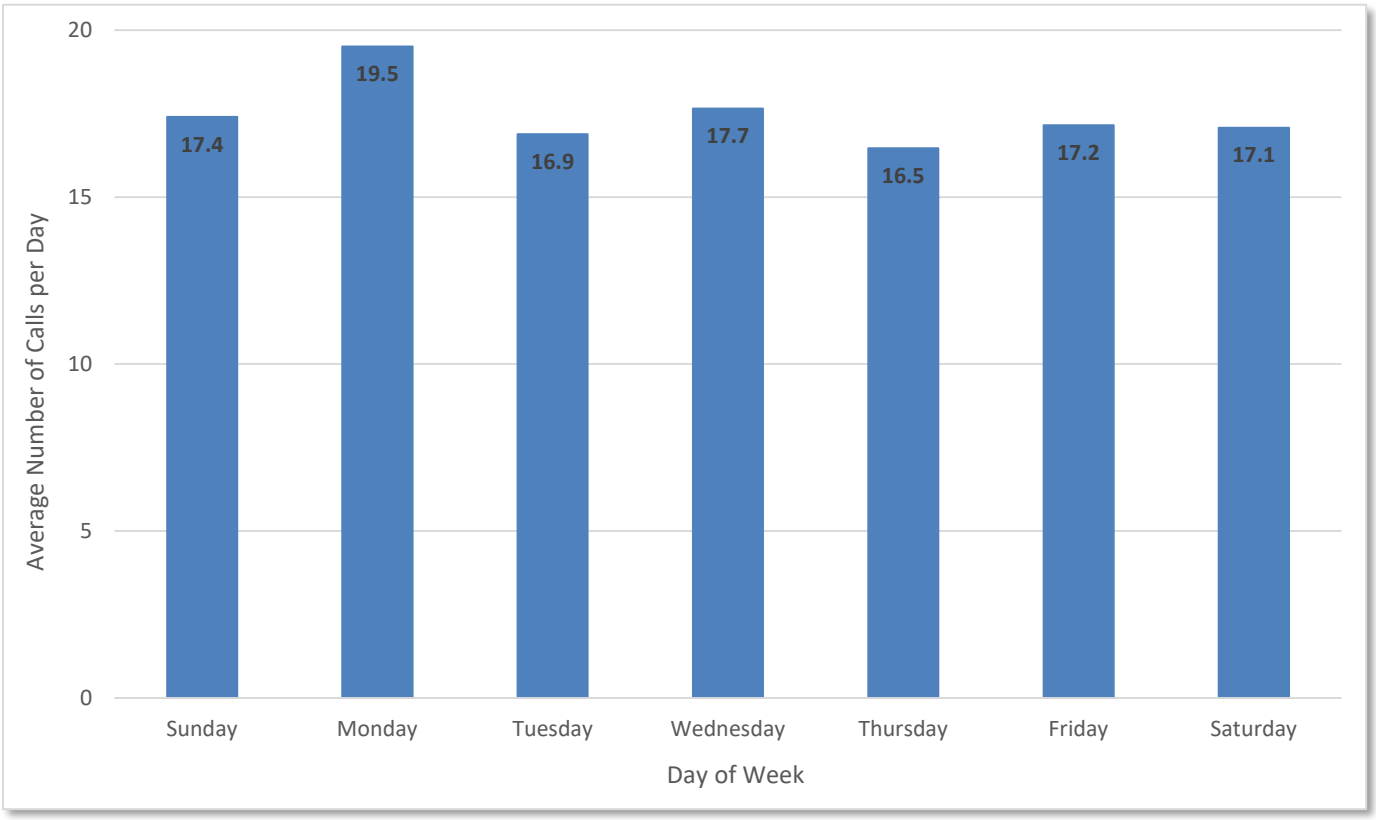
Similar analyses were conducted for EMS related calls by day of week (Table 23; Figure 22). The data revealed that there was some variability in demand for services by day of week. Monday had the highest frequency of requests for EMS related services, averaging 19.5 calls per day and accounting for 16.2% of all EMS related calls. Thursday had the lowest frequency of requests for EMS related services, averaging 16.5 calls per day and accounting for 13.4% of all EMS related calls.

Table 23: Total EMS Related Calls and Average Calls per Day by Day of Week

Day of Week	Number of Calls	Average Calls per Day	Call Percentage
Sunday	905	17.4	14.2
Monday[1]	1,034	19.5	16.2
Tuesday	878	16.9	13.8
Wednesday	918	17.7	14.4
Thursday	856	16.5	13.4
Friday	892	17.2	14.0
Saturday	888	17.1	13.9
Total	**6,371**	**17.5**	**100.0**

[1]There were 53 Mondays during 2018, and 52 of all other days of the week during 2018.

Figure 22: Average EMS Related Calls per Day by Day of Week

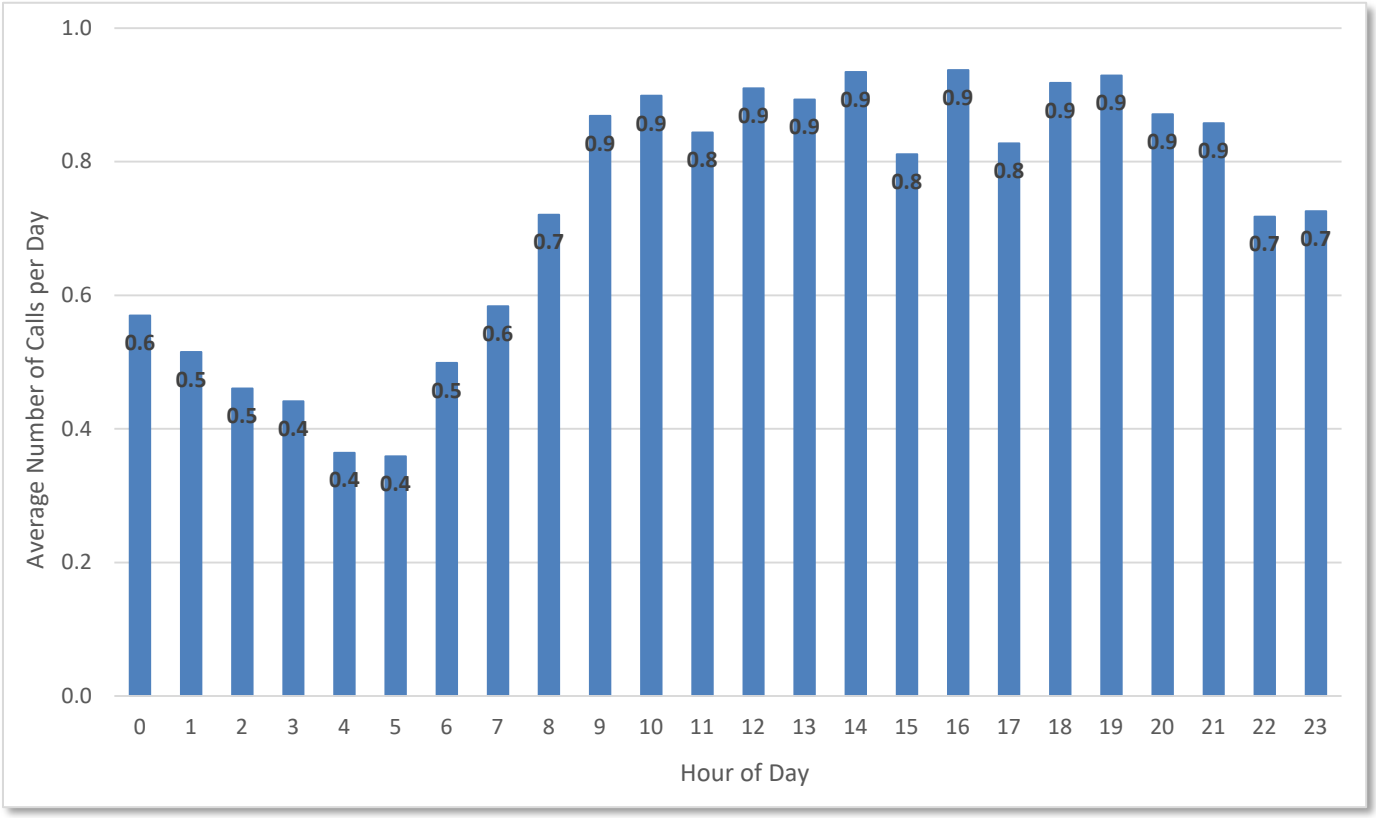


EMS related calls were also evaluated by hour of the day (Table 24; Figure 23). Some variability exists in the time of day that requests for EMS related services were received. The hours from 0100 to 0600 had the lowest demands, where average number of calls per day for each of those hours ranged from 0.4 to 0.5. The highest demand for EMS related services occurred at 1600, where average number of calls per day during that hour was 0.9.

Table 24: Total EMS Related Calls and Average Calls per Day by Hour of Day

Hour of Day	Number of Calls	Average Calls per Day	Call Percentage
0	208	0.6	3.3
1	188	0.5	3.0
2	168	0.5	2.6
3	161	0.4	2.5
4	133	0.4	2.1
5	131	0.4	2.1
6	182	0.5	2.9
7	213	0.6	3.3
8	263	0.7	4.1
9	317	0.9	5.0
10	328	0.9	5.1
11	308	0.8	4.8
12	332	0.9	5.2
13	326	0.9	5.1
14	341	0.9	5.4
15	296	0.8	4.6
16	342	0.9	5.4
17	302	0.8	4.7
18	335	0.9	5.3
19	339	0.9	5.3
20	318	0.9	5.0
21	313	0.9	4.9
22	262	0.7	4.1
23	265	0.7	4.2
Total	**6,371**	**17.5**	**100.0**

Figure 23: Average EMS Related Calls per Day by Hour of Day



EMS related requests accounted for 67.7% of the total requests for service during 17.5 requests per day (Figure 1; Table 1). EMS related incidents are an aggregated category of the various final incident types available in the RMS data file. Table 25 provides details for these EMS related incidents by nature of the call (i.e., variable "IncidentType" in the RMS data file, mapped to each numeric code's text definition from the NFIRS data dictionary available as a separate table in the database). "EMS call, excluding vehicle accident with injury" was the most frequent community demand (5,868/6,371 or 92.1% of calls).

Table 25: Total EMS Related Calls by Nature of Call

Nature of Call[1]	Number of Calls	Percentage of Total EMS Demands
EMS call, excluding vehicle accident with injury	5,868	92.1
Motor vehicle accident with injuries	280	4.4
Motor vehicle accident with no injuries.	193	3.0
Emergency medical service, other	11	0.2
Medical assist, assist EMS crew	9	0.1
Rescue, EMS incident, other	6	0.1
EMS call, party transported by non-fire agency	2	0.0
Motor vehicle/pedestrian accident (MV Ped)	2	0.0
Total	**6,371**	**100.0**

[1]Entries are presented verbatim from the NFIRS data dictionary in the RMS data file.

BPFD made a total of 7,113 responses to EMS related calls (Table 4; Table 26). Total busy time was 2,139.6 hours, and the average busy minutes per response was 18.3 minutes. The three most utilized units based on total busy hours were E22 (505.9 hours), R41 (457.7 hours), and E11 (311.0 hours; Table 26).

Table 26: Workload by Unit for EMS Related Calls

Station	Unit	Unit Type	Number of Responses[1]	Responses with Time Data[2]	Total Busy Hours	Average Busy Minutes per Response
Station 1	B12	Boat	0	--	--	--
	U11	Utility	3	3	1.0	19.6
	Station Total		**3**	**3**	**1.0**	**19.6**
Station 2	BC-1	Battalion Chief	99	96	39.0	24.4
	BC-2	Battalion Chief	144	131	48.6	22.3
	BC-3	Battalion Chief	179	177	60.8	20.6
	TW21	Tower	15	15	4.7	18.9
	Station Total		**437**	**419**	**153.2**	**21.9**
Station 3	R31	Rescue	801	796	217.3	16.4
	Station Total		**801**	**796**	**217.3**	**16.4**
Station 4	R1	4-Wheeler	1	1	1.2	72.2
	R41	Rescue	1,409	1,394	457.7	19.7
	U22	Command Vehicle	0	--	--	--
	Station Total		**1,410**	**1,395**	**458.9**	**19.7**
Primarily Station 2, Moved as Needed	E22	Engine	1,654	1,628	505.9	18.6
	Station Total		**1,654**	**1,628**	**505.9**	**18.6**
Primarily Station 3, Moved as Needed	E11	Engine	1,141	1,135	311.0	16.4
	E31	Engine	843	843	233.2	16.6
	Station Total		**1,984**	**1,978**	**544.2**	**16.5**
Primarily Station 4, Moved as Needed	E21	Engine	561	552	171.7	18.7
	E41	Engine	125	123	39.6	19.3
	Station Total		**686**	**675**	**211.3**	**18.8**
Administration	CA41	Captain	71	68	24.5	21.6
	CH1	Chief	9	9	3.4	22.8
	CH2	Deputy Chief	4	4	1.0	15.6
	DFM1	Deputy Fire Marshal	9	9	2.4	15.8
	INSP	Inspector	0	--	--	--
	INSP1	Inspector	16	15	6.1	24.4
	Administration Total		**109**	**105**	**37.4**	**21.4**
N/A	SC	Utility	29	26	10.4	24.1
	N/A Total		**29**	**26**	**10.4**	**24.1**
Department Total			**7,113**	**7,025**	**2,139.6**	**18.3**

[1]"Number of Responses" reflects the total number of entries in the unit-level data file, regardless of calculated busy time.
[2]"Responses with Time Data" reflects the number of responses in the unit-level data file with calculated busy time.

BPFD dispatched multiple units to 8.7% of EMS related calls (548/6,366; Table 27). On average, 1.1 units were dispatched per EMS related call (7,113/6,366; Table 4).

Table 27: Number of Responding Units by EMS Related Call Type

Call Category	Number of Responding Units							Total
	1	2	3	4	5	6	7 or more	
EMS	5,650	205	36	1	0	0	0	5,892
EMS MVC	168	162	128	15	1	0	0	474
Total	**5,818**	**367**	**164**	**16**	**1**	**0**	**0**	**6,366**
Percentage	**91.4**	**5.8**	**2.6**	**0.3**	**0.0**	**0.0**	**0.0**	**100.0**

REVIEW OF SYSTEM PERFORMANCE

The first step in determining the current state of the system's deployment model is to establish baseline measures of performance. This analysis is crucial to the ability to discuss alternatives to the status quo and in identifying opportunities for improvement. This portion of the analysis will focus efforts on elements of response time and the cascade of events that lead to timely response with the appropriate apparatus and personnel to mitigate the event. Response time goals should be examined in terms of total reflex time, or total response time, which includes the dispatch or call processing time, turnout time, and travel time.

Cascade of Events

The cascade of events is the sum of the individual elements of time beginning with a state of normalcy and continuing until normalcy is once again restored through the mitigation of the event. The elements of time that are important to the ultimate outcome of a structure fire or critical medical emergency begin with the initiation of the event. For example, the first onset of chest pain begins the biological and scientific time clock for heart damage irrespective of when 911 is notified. Similarly, a fire may begin and burn undetected for a period of time before the fire department is notified. The emergency response system does not have control over the time interval for recognition or the choice to request assistance.

Therefore, BPFD utilizes quantifiable "hard" data points to measure and manage system performance. These elements include alarm processing, turnout time, travel time, and the time spent prior to unit release. An example of the cascade of events and the elements of performance utilized by BPFD is provided on the next page (Figure 24).[1]

Detection

Detection is the element of time between the time an event occurs and someone detects it, and the emergency response system has been notified. This is typically accomplished by calling the 911 Primary Safety Answering Point (PSAP).

Call Processing

This is the element of time measured between when 911 answers the 911 call, processes the information, and subsequently dispatches BPFD.

[1] Olathe Fire Department. (2012). Adapted from Community Risk and Emergency Services Analysis: Standard of Cover. Olathe, Kansas: Author.

Turnout Time

This is the element of time that is measured between the time the fire department is dispatched or alerted of the emergency incident, and the time when the unit is enroute to the call.

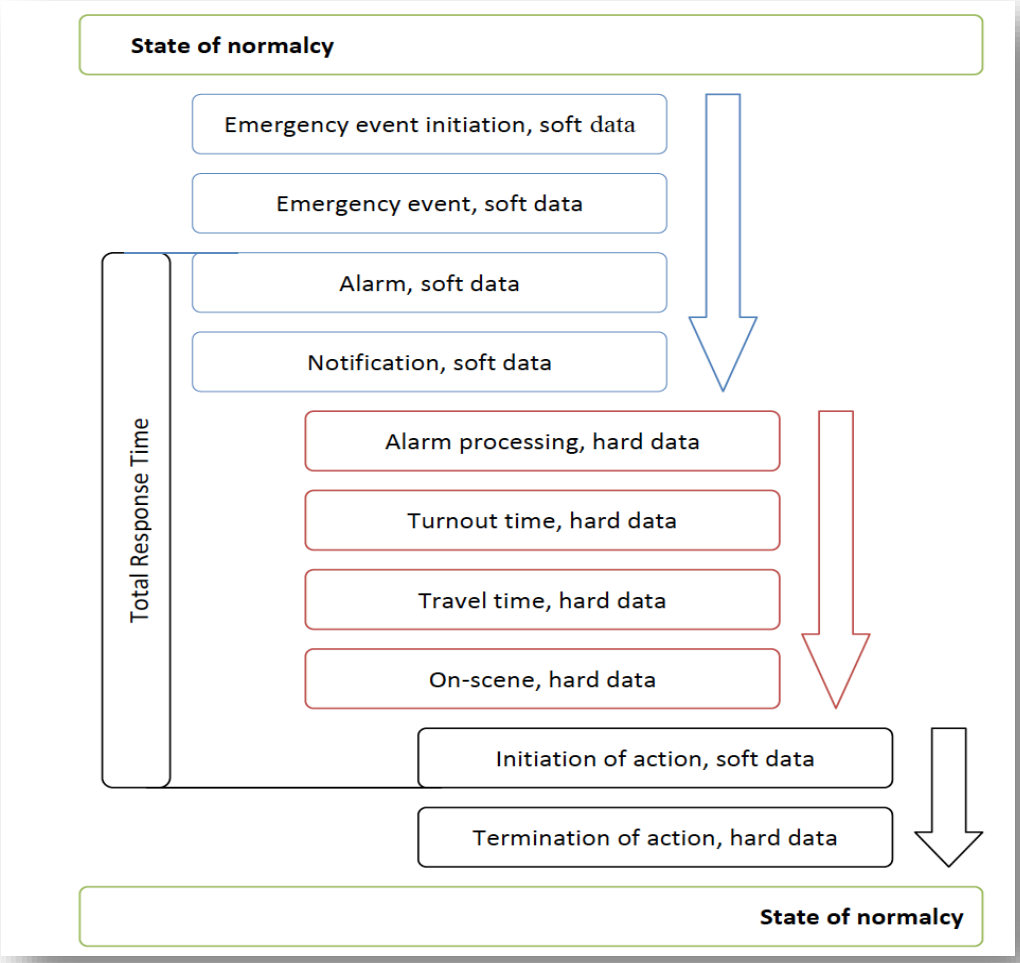
Travel Time

The travel time is the element of time between when the unit went enroute, or began to travel to the incident, and their arrival on scene.

Total Response Time

The total response time, or total reflex time, is the total time required to arrive on scene beginning with 911 answering the phone request for service and the time that the units arrive on scene.

Figure 24: Cascade of Events



Comparison of Workloads by Demand Zone

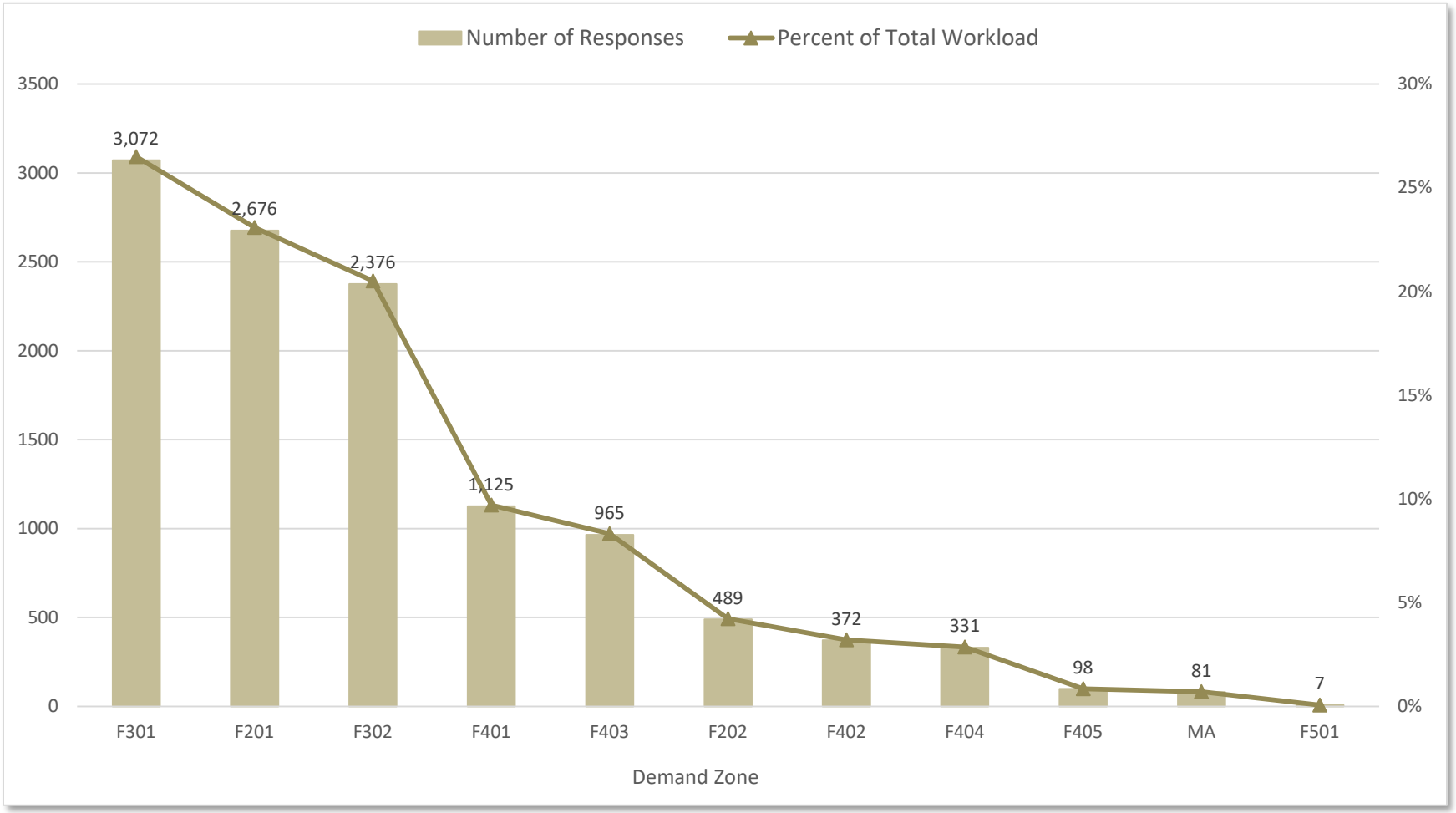
Another method for assessing the effectiveness of the distribution model is to analyze the demand for services across the distribution model. Workload is assessed at the demand zone level and at the individual unit level. The highest volume of incoming calls occurred for demand zones F301 (2,349 calls), F201 (2,265 calls), and F302 (1,962 calls). These three demand zones also had the highest volume of responses made by departmental units to the areas, requiring 26.5%, 23.1%, and 20.5% of BPFD's total responses, respectively (Table 28; Figure 25).

Table 28: Department Workload by Demand Zone

Demand Zone	Number of Calls Incoming to Demand Zone[1]	Number of Responses Made by Department in Demand Zone[2]	Percent of Department Workload[3]
F201	2,265	2,676	23.1
F202	417	489	4.2
Station 2 Zones Total	**2,682**	**3,165**	**27.3**
F301	2,349	3,072	26.5
F302	1,962	2,376	20.5
Station 3 Zones Total	**4,311**	**5,448**	**47.0**
F401	953	1,125	9.7
F402	310	372	3.2
F403	782	965	8.3
F404	263	331	2.9
F405	68	98	0.8
Station 4 Zones Total	**2,376**	**2,891**	**24.9**
F501	2	7	0.1
MA	30	81	0.7
Total	**9,401**	**11,592**	**100.0**
F401 and F402 Combined	1,263	1,497	12.9

[1]"Number of Calls" reflects an adjusted number of unique incidents to correspond with responses made by BPFD units.
[2]"Number of Responses" reflects the total number of entries in the unit-level data file, regardless of calculated busy time.
[3]"Percent of Department Workload" is based on "Number of Responses Made by Department in Demand Zone."

Figure 25: Department Workload by Demand Zone



Finally, workload by demand zone and program was analyzed for both comparative purposes as well as for introspection into potential system failures (Table 29). Demand zones F301, F201, and F302 had the highest demand for EMS, requiring 1,791, 1,778, and 1,438 responses, respectively. Demand zones F301, F302, and F201 had the highest demand for fire services, requiring 1,020, 721, and 639 responses, respectively.

Table 29: Number of Responses by Demand Zone and Program

Demand Zone	Program				Total
	EMS	Fire	Hazmat	Rescue	
F201	1,778	639	53	206	2,676
F202	308	123	20	38	489
Station 2 Zones Total	**2,086**	**762**	**73**	**244**	**3,165**
F301	1,791	1,020	61	200	3,072
F302	1,438	721	79	138	2,376
Station 3 Zones Total	**3,229**	**1,741**	**140**	**338**	**5,448**
F401	722	272	35	96	1,125
F402	231	112	5	24	372
F403	602	276	14	73	965
F404	181	123	6	21	331
F405	62	34	1	1	98
Station 4 Zones Total	**1,798**	**817**	**61**	**215**	**2,891**
F501	0	3	0	4	7
MA	0	81	0	0	81
Total	**7,113**	**3,404**	**274**	**801**	**11,592**
F401 & F402	953	384	40	120	1,497

Another measure, time on task, is necessary to evaluate best practices in efficient system delivery and consider the impact workload has on personnel. Unit Hour Utilization (UHU) values represent the proportion of the work period (24 hours) that is utilized responding to requests for service.

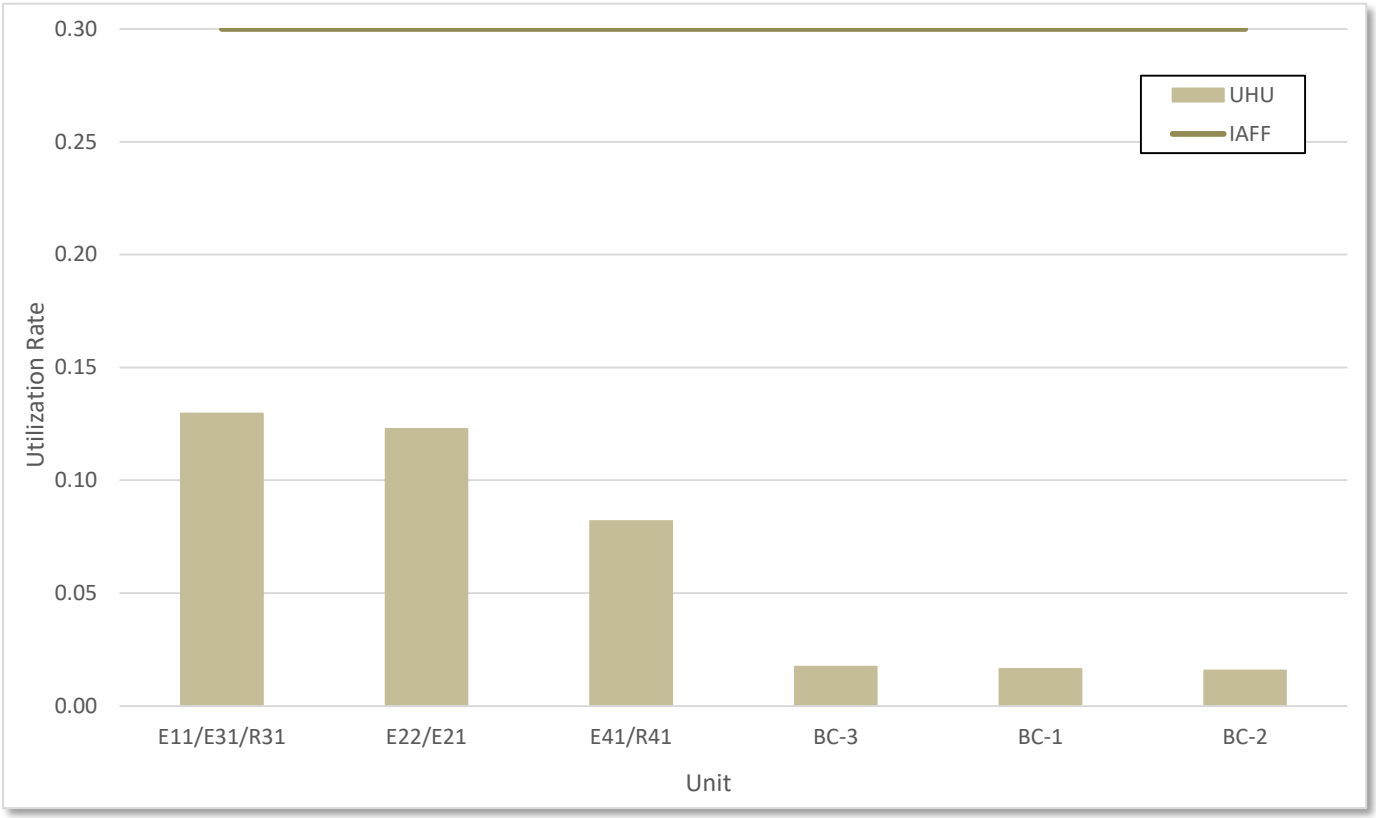
Historically, the International Association of Fire Fighters (IAFF) has recommended that 24-hour units utilize 0.30, or 30% workload as an upper threshold.[2] In other words, this recommendation would have personnel spend no more than 7.2 hours per day on emergency incidents. These thresholds take into consideration the necessity to accomplish non-emergency activities such as training, health and wellness, public education, and fire inspections. The 4th edition of the IAFF EMS Guidebook no longer specifically identifies an upper threshold. However, *FITCH* recommends that an upper unit utilization threshold of approximately 0.30, or 30%, would be considered best practice. In other words, units and personnel should not exceed 30%, or 7.2 hours, of their work day responding to

[2] International Association of Firefighters. (1995). Emergency *Medical Services: A Guidebook for Fire-Based Systems.* Washington, DC: Author. (p. 11)

calls. These recommendations are also validated in the literature. For example, in their review of the City of Rolling Meadows, the Illinois Fire Chiefs Association utilized a UHU threshold of 0.30 as an indication to add additional resources.[3] Similarly, in a standards of cover study facilitated by the Center for Public Safety Excellence, the Castle Rock Fire and Rescue Department utilizes a UHU of 0.30 as the upper limit in their standards of cover due to the necessity to accomplish other non-emergency activities.[4]

UHU analyses included units designated by BPFD as 24-hour units (i.e., engines, rescue units, and battalion chiefs; units combined where appropriate). All units had UHU values below 0.30 (Figure 26).

Figure 26: Unit Hour Utilization



[3] Illinois Fire Chiefs Association. (2012). An *Assessment of Deployment and Station Location: Rolling Meadows Fire Department*. Rolling Meadows, Illinois: Author. (pp. 54-55)
[4] Castle Rock Fire and Rescue Department. (2011). Community *Risk Analysis and Standards of Cover*. Castle Rock, Colorado: Author. (p. 58)

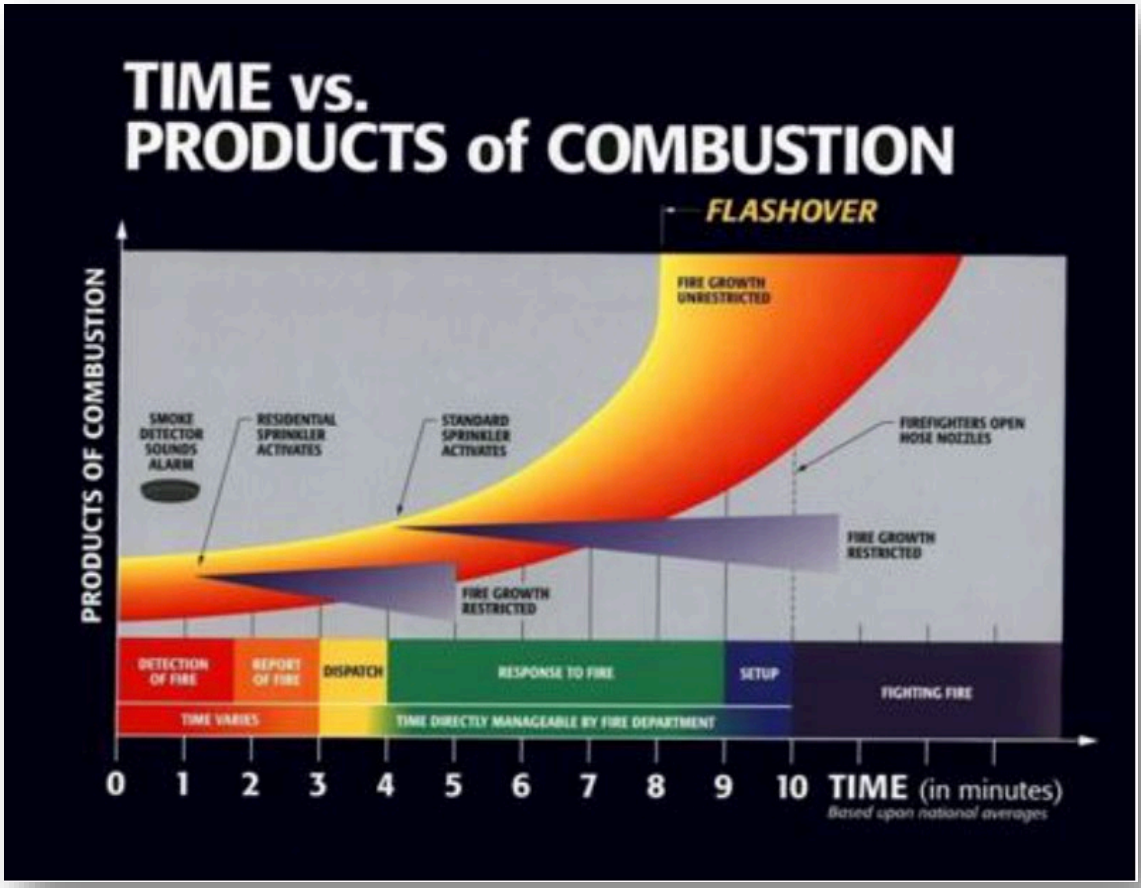
RESPONSE TIME CONTINUUM

Fire

The number one priority with structural fire incidents is to save lives followed by the minimization of property damage. A direct relationship exists between the timeliness of the response and the survivability of unprotected occupants and property damage. The most identifiable point of fire behavior is flashover.

Flashover is the point in fire growth where the contents of an entire area, including the smoke, reach their ignition temperature, resulting in a rapid-fire growth rendering the area un-survivable by civilians and untenable for firefighters. Best practices would result in the fire department arriving and attacking the fire prior to the point of flashover. A representation of the traditional time temperature curve and the cascade of events is provided in Figure 27.[5]

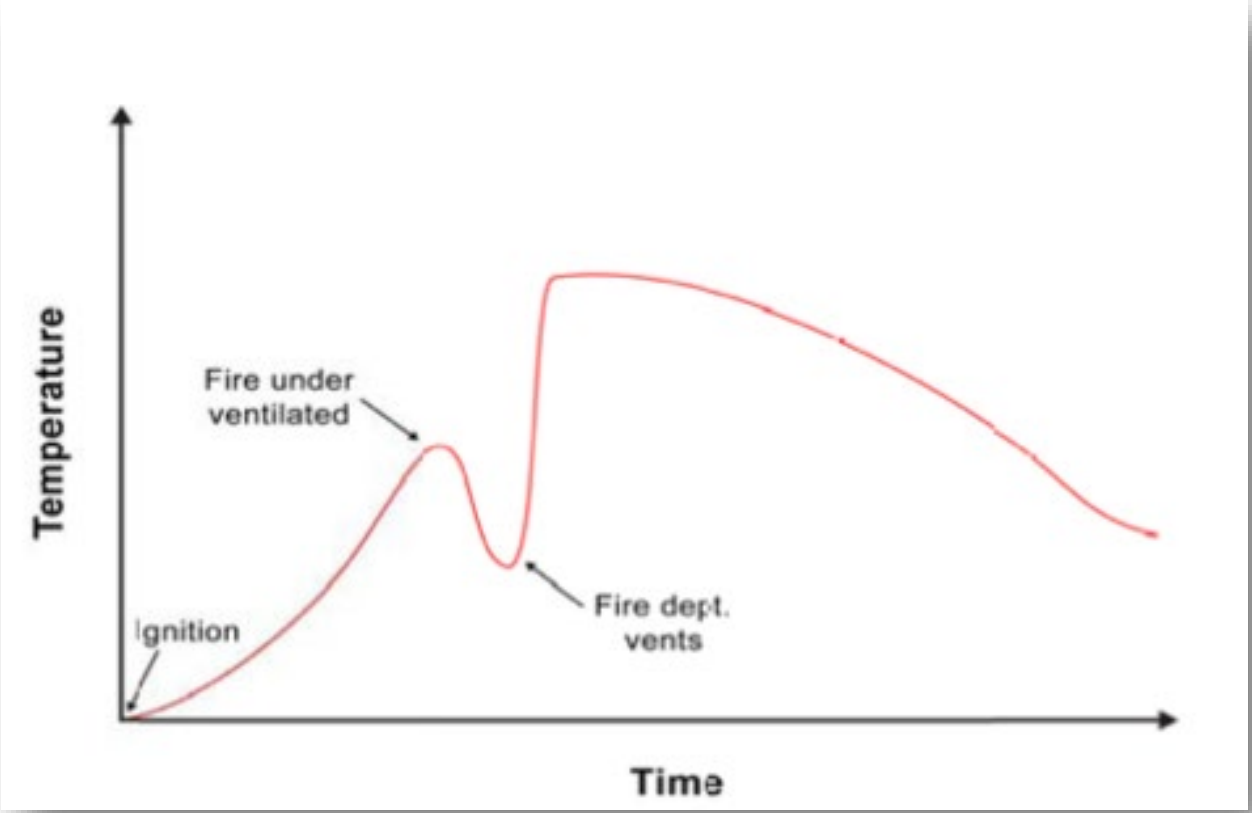
Figure 27: Example of Traditional Time Temperature Curve



[5] Example of Traditional Time Temperature Curve. Retrieved at http://www.usfa.fema.gov/downloads/pdf/coffee-break/time-vs-products-of-combustion.pdf

Recent studies by Underwriter's Laboratories (UL) have found that in compartment fires such as structure fires, flashover occurs within four minutes in modern fire environment. In addition, the UL research has identified an updated time temperature curve due to fires being ventilation-controlled rather than fuel-controlled as represented in the traditional time temperature curve. While this ventilation-controlled environment continues to provide a high risk to unprotected occupants to smoke and high heat, it does provide some advantage to property conservation efforts, as water may be applied to the fire prior to ventilation and the subsequent flashover. An example of UL's ventilation-controlled time temperature curve is provided in Figure 28.[6]

Figure 28: Ventilation-Controlled Time Temperature Curve



EMS

The effective response to EMS incidents also has a direct correlation to the ability to respond within a specified period of time. However, unlike structure fires, responding to EMS incidents introduces considerable variability in the level of clinical acuity. From this perspective, the association of response time and clinical outcome varies depending on the severity of the injury or the illness. Research has demonstrated that the overwhelming majority of requests for EMS are not time sensitive between five minutes and 11 minutes for emergency responses and 13 minutes for non-

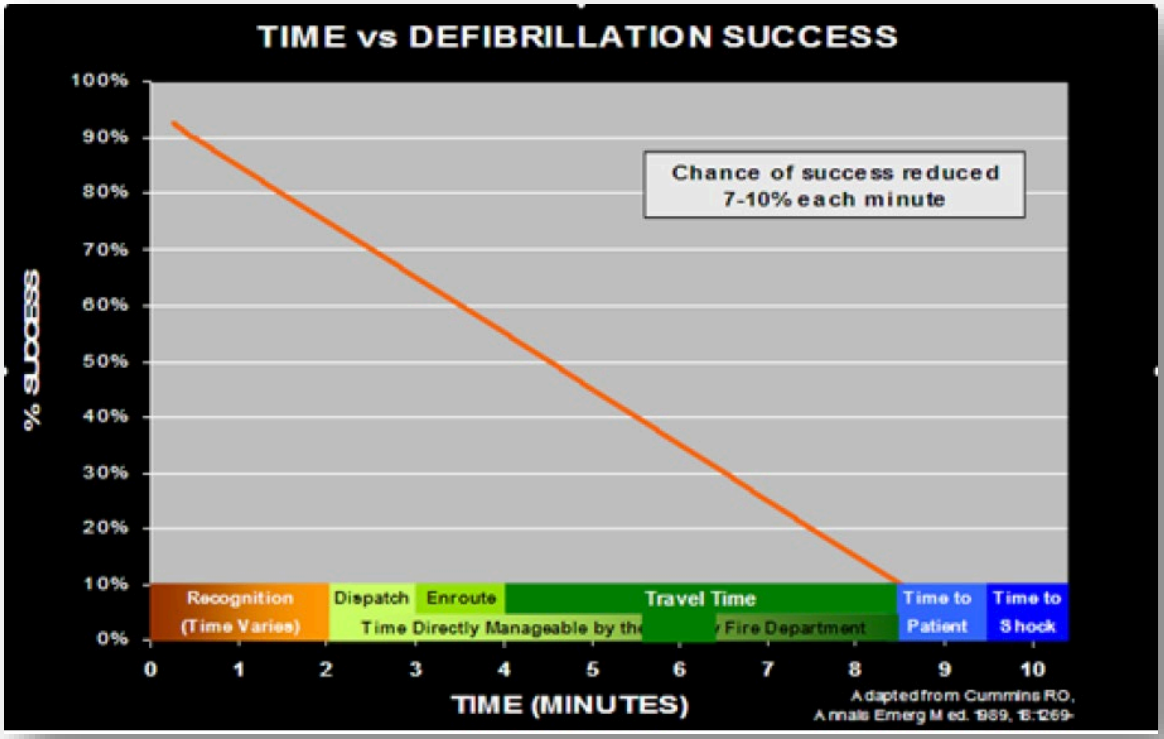
[6] UL/NIST Ventilation Controlled Time Temperature Curve. Retrieved from http://www.nist.gov/fire/fire_behavior.cfm

emergency responses.[7] The 12-minute upper threshold is only the upper limit of the available research and is not a clinically significant time measure, as patients were not found to have a significantly different clinical outcome when the 12-minute threshold was exceeded.[8]

Out-of-hospital sudden cardiac arrest is the most identifiable and measured incident type for EMS. In an effort to demonstrate the relationship between response time and clinical outcome, a representation of the cascade of events and the time to defibrillation (shock) is presented in Figure 29. The American Heart Association (AHA) has determined that brain damage will begin to occur between four and six minutes and become irreversible after ten minutes without intervention.

Modern sudden cardiac arrest protocols recognize that high quality Cardio-Pulmonary Resuscitation (CPR) at the Basic Life Support (BLS) level is a quality intervention until defibrillation can be delivered in shockable rhythms. Figure 29 below[9] is representative of a sudden cardiac arrest that is presenting in a shockable heart rhythm such as Ventricular Fibrillation or Ventricular Tachycardia.

Figure 29: Cascade of Events for Sudden Cardiac Arrest with Shockable Rhythm



[7] Blackwell, T.H., & Kaufman, J.S. (April 2002). Response time effectiveness: Comparison of response time and survival in an urban emergency medical services system. *Academic Emergency Medicine,* 9(4): 289-295.
[8] Blackwell, T.H., et al. (Oct-Dec 2009). Lack of association between prehospital response times and patient outcomes. *Prehospital Emergency Care,* 13(4): 444-450.
[9] Olathe Fire Department. (2012). Adapted from Community Risk and Emergency Services Analysis: Standard of Cover. Olathe, Kansas: Author.

DESCRIPTION OF FIRST ARRIVING UNIT PERFORMANCE

Additional analyses related to the response characteristics of first arriving units were conducted. The analyses in this first section focused on emergency (lights and sirens) responses from primary front-line units arriving first on scene, irrespective of station demand zone, for all distinct incidents. Call status as emergency (lights and sirens) was identified by the "Response" code 390 in the RMS data file. Units identified by BPFD as primary front-line units included all engines, rescues, and battalion chiefs. Due to the restriction of these analyses to select responses and units, maximum available sample size for these analyses is 6,996. Sample sizes for relevant metrics in this section may be smaller due to select exclusion of time data, as outlined in the Appendix.

To first recap the data presented previously in Table 10, Figure 15, Table 11, and Table 12, BPFD had an overall average dispatch time of 1.1 minutes (median = 0.9 minutes), and a dispatch time of 1.7 minutes at the 90th percentile (Table 30). Overall, BPFD had an average turnout time of 1.3 minutes (median = 1.2 minutes), and a turnout time of 2.2 minutes at the 90th percentile. A total of 2,435 of 6,454 calls with turnout times (37.7%) experienced turnout times of one minute or less, and 86.7% of calls (5,598/6,454) experienced turnout times of two minutes or less (Figure 30). The overall average travel time was 4.1 minutes (median = 3.9 minutes); performance at the 90th percentile for travel time was 6.6 minutes. A total of 1,979 of 6,826 calls with travel times (29.0%) experienced travel times of three minutes or less, and 52.1% of calls (3,555/6,826) experienced travel times of four minutes or less (Figure 31). The average response time was 6.4 minutes (median = 6.2 minutes); performance at the 90th percentile for response time was 9.1 minutes.

Table 30: Description of First Arriving Unit Emergency Response Performance in Minutes

Measure	Average	Median	90th Percentile
Dispatch Time	1.1	0.9	1.7
Turnout Time	1.3	1.2	2.2
Travel Time	4.1	3.9	6.6
Response Time	6.4	6.2	9.1

Figure 30: Distribution of Turnout Time of First Arriving Unit – All Emergency Calls

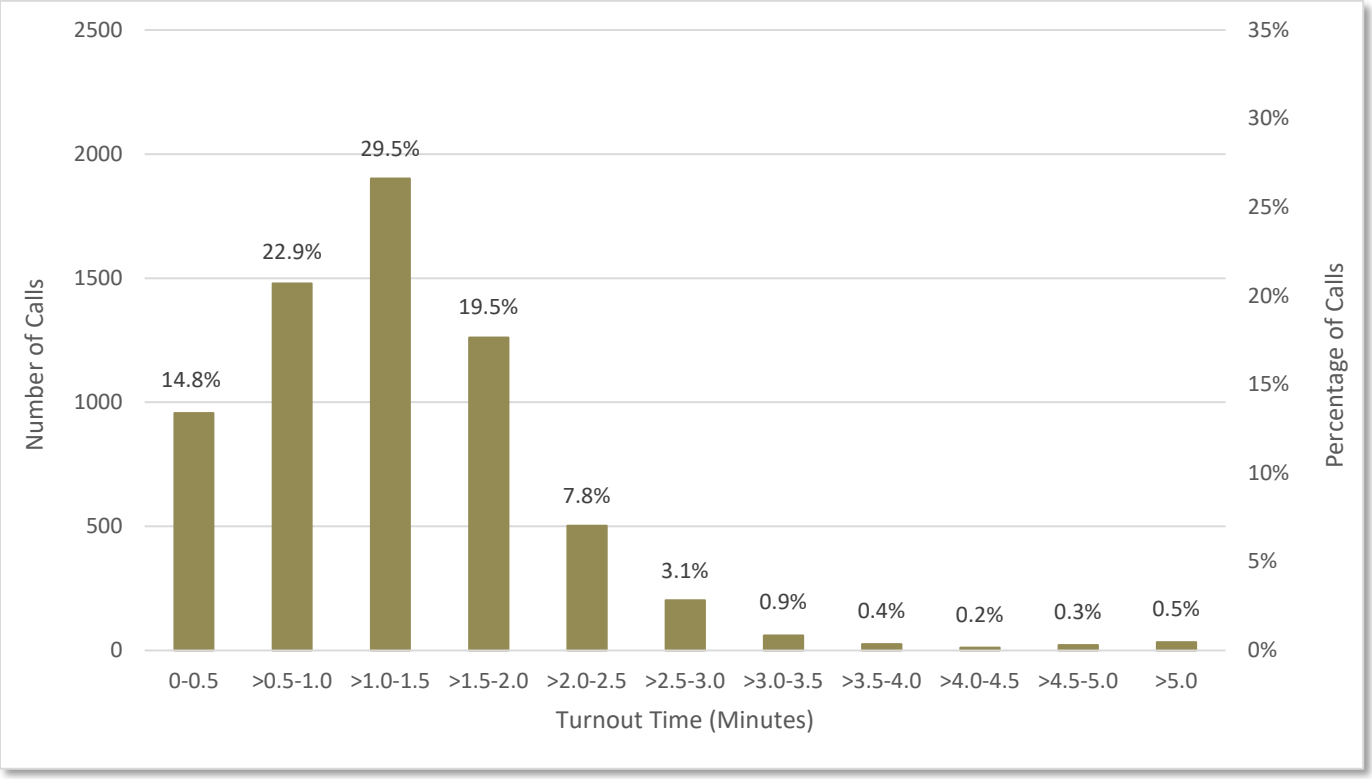
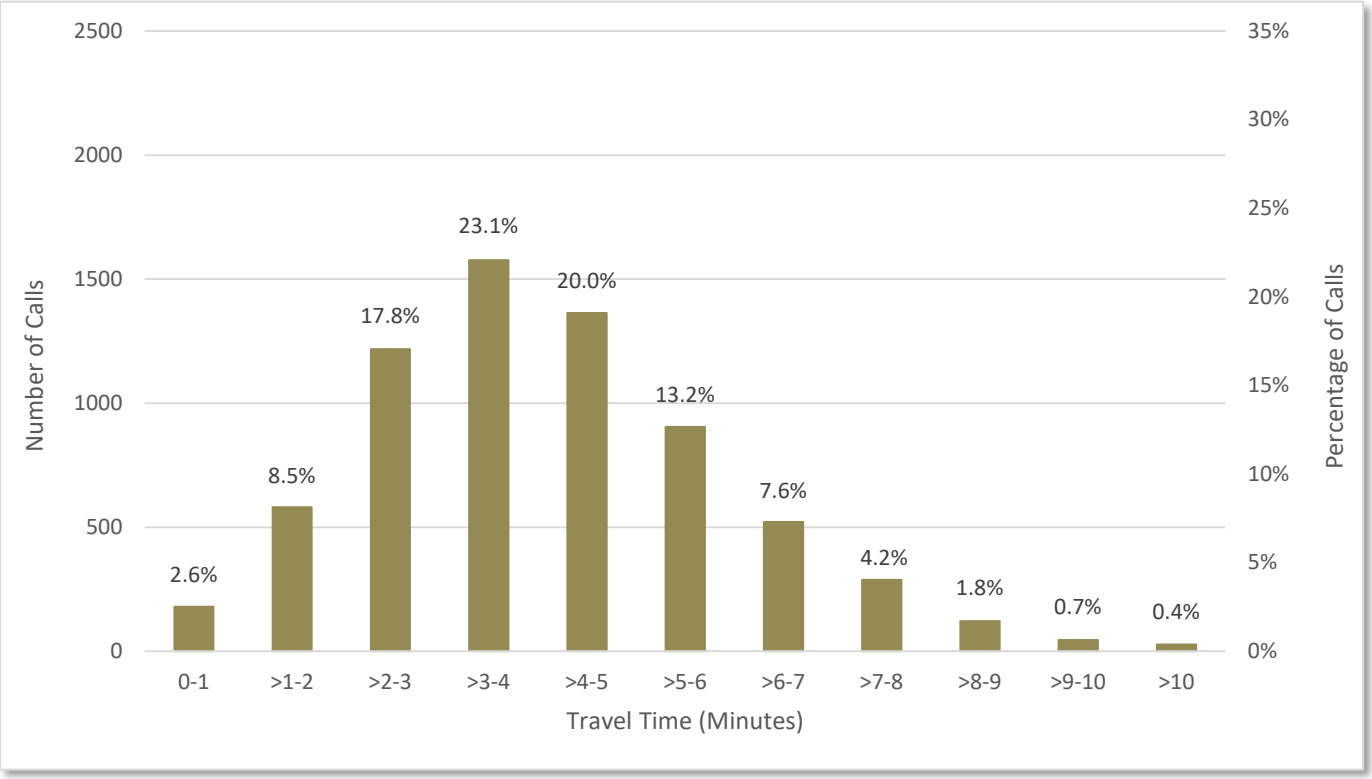


Figure 31: Distribution of Travel Time of First Arriving Unit – All Emergency Calls



National recommendations provide differentiation between EMS and fire/special operations incidents. For example, the best practice for an EMS incident is a turnout time of 60 seconds or less 90% of the time. Due to the necessity to don personal protective equipment prior to responding to fire related incidents, best practices provide either 80 seconds (NFPA) or 90 seconds (CFAI) or less at the 90th percentile for turnout times associated with fire calls. Therefore, turnout time and travel time is also reported by the major program areas of EMS and fire.

For EMS incidents, BPFD had an average turnout time of 1.2 minutes (Table 10), a median turnout time of 1.2 minutes (Table 11), and a turnout time of 2.1 minutes at the 90th percentile (Table 12). A total of 2,108 of 5,369 calls with turnout times (39.3%) experienced turnout times of one minute or less, and 88.5% of calls (4,752/5,369) experienced turnout times of two minutes or less (Figure 32). The average travel time for EMS incidents was 4.1 minutes (median = 3.9 minutes); performance at the 90th percentile for travel time was 6.6 minutes. A total of 1,649 of 5,659 calls with travel times (29.1%) experienced travel times of three minutes or less, and 52.5% of calls (2,970/5,659) experienced travel times of four minutes or less (Figure 33). The average response time for EMS calls was 6.3 minutes (median = 6.1 minutes); performance at the 90th percentile for response time was 9.0 minutes.

For fire related incidents, BPFD had an average turnout time of 1.4 minutes (Table 10), a median turnout time of 1.4 minutes (Table 11), and a turnout time of 2.5 minutes at the 90th percentile (Table 12). A total of 294 of 935 calls with turnout times (31.4%) experienced turnout times of one minute or less, and 77.5% of calls (725/935) experienced turnout times of two minutes or less (Figure 34). The average travel time for fire related incidents was 4.1 minutes (median = 3.9 minutes); performance at the 90th percentile for travel time was 6.4 minutes. A total of 286 of 1,003 calls with travel times (28.5%) experienced travel times of three minutes or less, and 51.6% of calls (518/1,003) experienced travel times of four minutes or less (Figure 35). The average response time for fire related calls was 6.6 minutes (median = 6.5 minutes); performance at the 90th percentile for response time was 9.2 minutes.

Figure 32: Distribution of Turnout Time of First Arriving Unit – Emergency EMS Related Calls

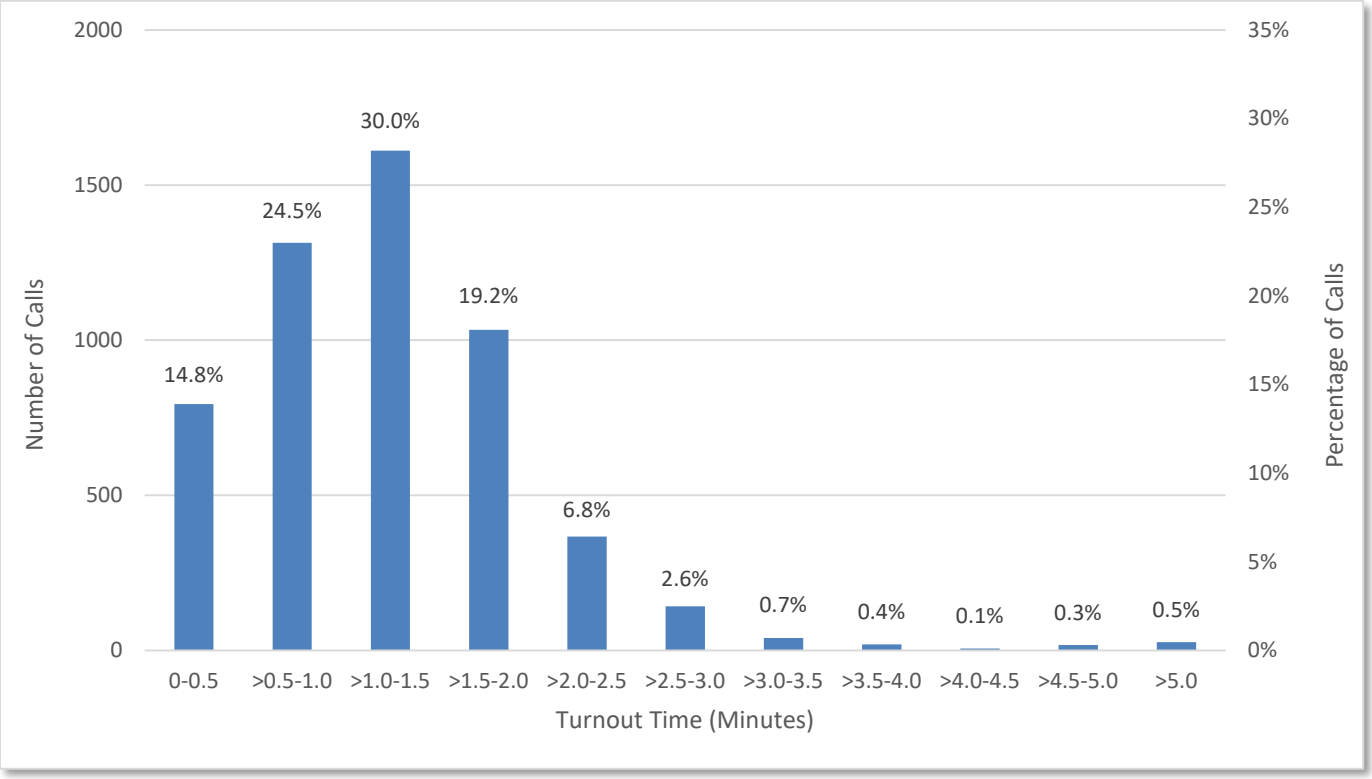


Figure 33: Distribution of Travel Time of First Arriving Unit – Emergency EMS Related Calls

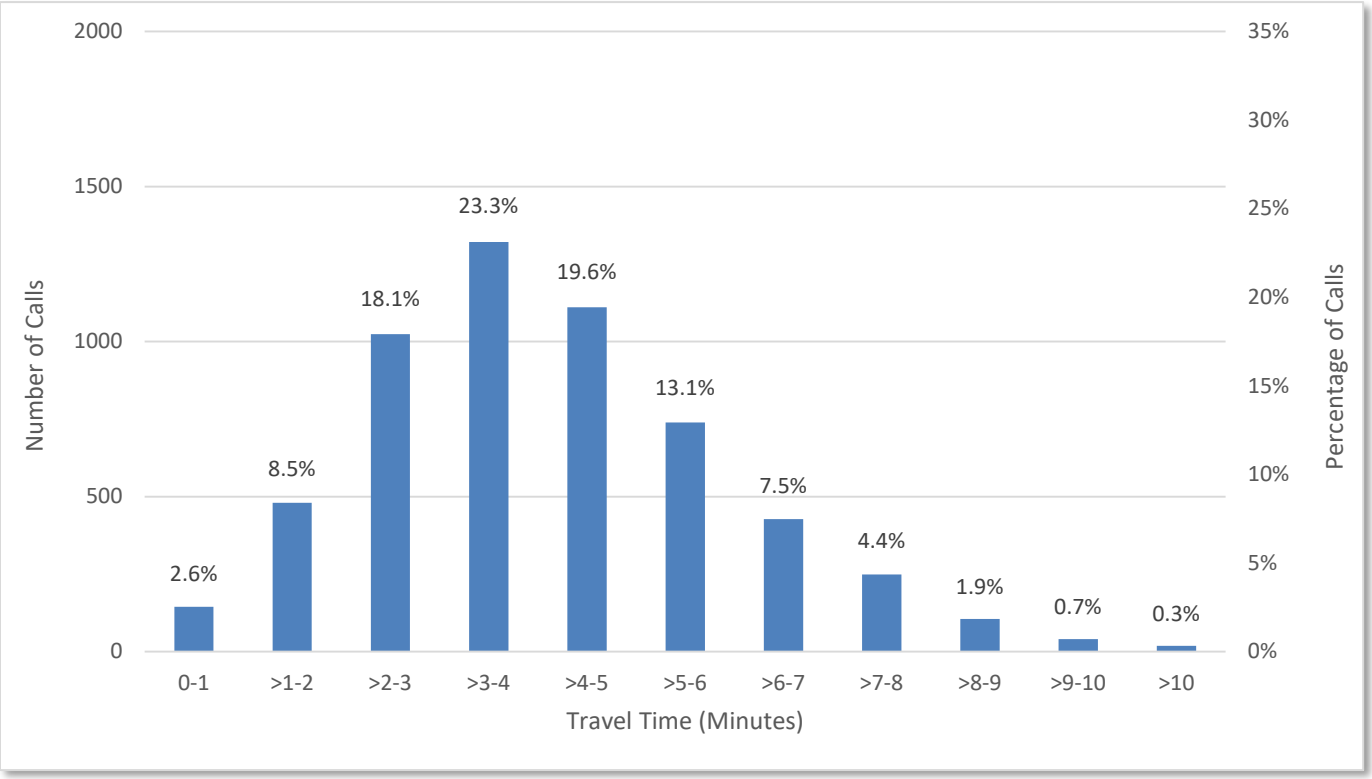


Figure 34: Distribution of Turnout Time of First Arriving Unit – Emergency Fire Related Calls

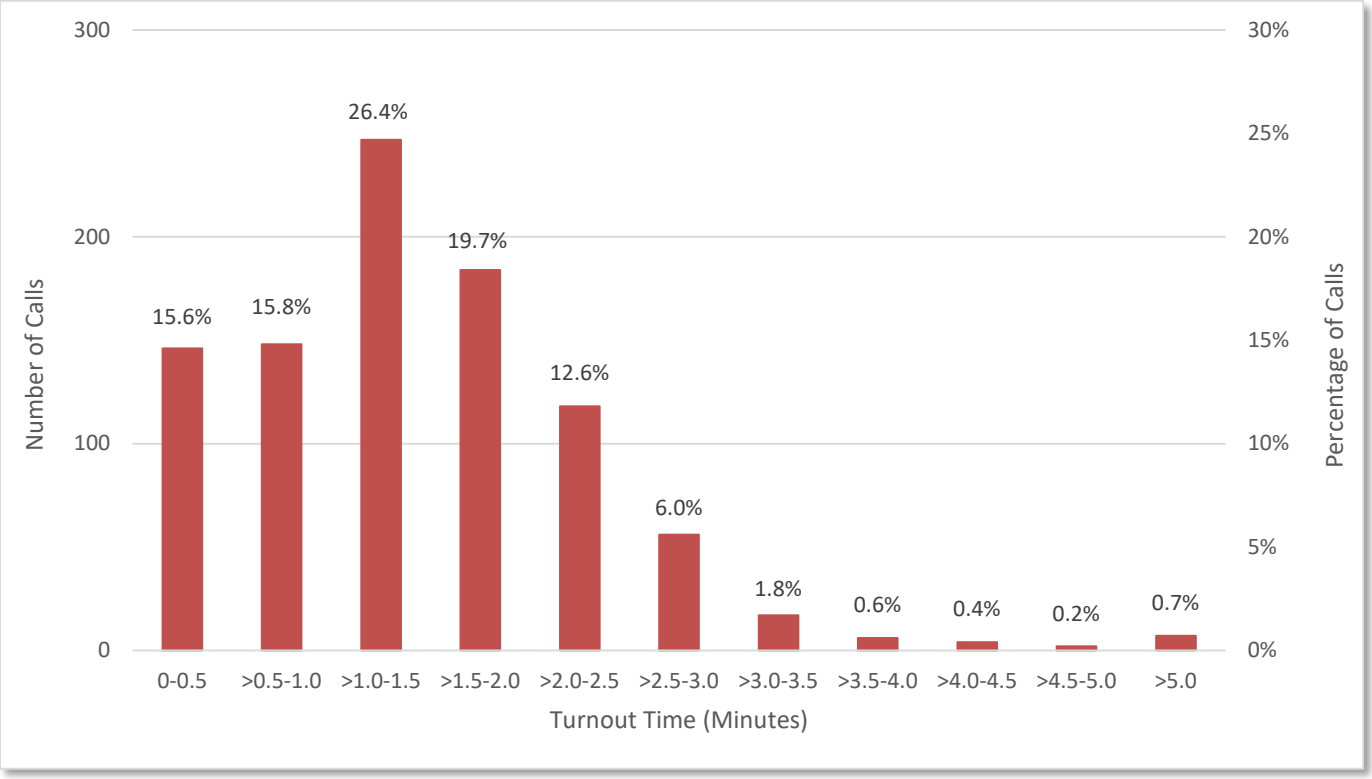
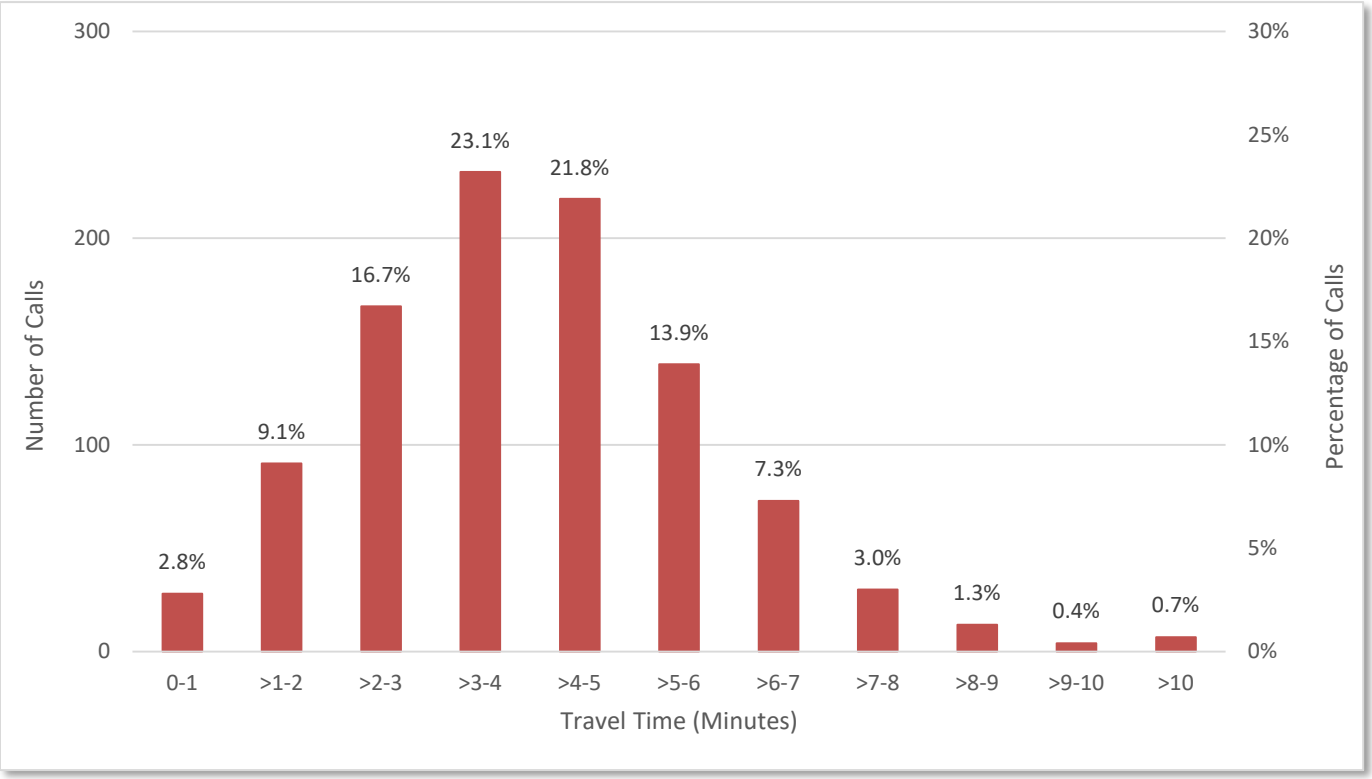


Figure 35: Distribution of Travel Time of First Arriving Unit – Emergency Fire Related Calls



First Arriving Unit Response Time by Demand Zone

Further analyses were conducted for the demand zones to measure the performance of the first arriving primary front-line units to emergency calls in each demand zone. Response times are reported at the average (Table 31; Figure 36), median (Table 32; Figure 37), and 90th percentile (Table 33; Figure 38) values.

Note that all total performance time metrics are identical when excluding demand zone "MA" from the analyses, except for the 90th percentile response time which is 9.0 minutes instead of 9.1 minutes (full data not presented here). As such, responses made in demand zone "MA" were retained for all related analyses.

Table 31: Average First Arrival Performance in Minutes by Demand Zone

Demand Zone	Dispatch Time	Turnout Time	Travel Time	Response Time
F201	1.1	1.3	3.2	5.5
F202	1.1	1.3	4.4	6.7
Station 2 Zones Combined	**1.1**	**1.3**	**3.4**	**5.7**
F301	1.1	1.3	4.4	6.7
F302	1.0	1.2	3.7	5.9
Station 3 Zones Combined	**1.1**	**1.3**	**4.1**	**6.4**
F401	1.0	1.3	6.3	8.5
F402	1.0	1.1	4.8	7.0
F403	1.0	1.3	3.7	5.9
F404	1.0	1.3	3.8	6.0
F405	1.2	1.3	5.4	7.6
Station 4 Zones Combined	**1.0**	**1.3**	**4.9**	**7.2**
F501	--	--	--	--
MA	2.9	2.2	6.7	12.2
Total	**1.1**	**1.3**	**4.1**	**6.4**
F401 and F402 Combined	1.0	1.3	5.9	8.2

Table 32: Median First Arrival Performance in Minutes by Demand Zone

Demand Zone	Dispatch Time	Turnout Time	Travel Time	Response Time
F201	0.9	1.2	3.0	5.3
F202	0.9	1.3	4.3	6.6
Station 2 Zones Combined	**0.9**	**1.2**	**3.2**	**5.5**
F301	0.9	1.2	4.3	6.7
F302	0.9	1.2	3.7	5.8
Station 3 Zones Combined	**0.9**	**1.2**	**4.0**	**6.3**
F401	0.9	1.2	6.3	8.6
F402	0.8	1.0	4.8	7.0
F403	0.9	1.2	3.6	5.8
F404	0.9	1.1	3.6	5.7
F405	1.0	1.2	5.3	7.6
Station 4 Zones Combined	**0.9**	**1.2**	**4.9**	**7.1**
F501	--	--	--	--
MA	1.9	2.0	6.4	11.1
Total	**0.9**	**1.2**	**3.9**	**6.2**
F401 and F402 Combined	0.9	1.2	6.0	8.2

Table 33: 90th Percentile First Arrival Performance in Minutes by Demand Zone

Demand Zone	Dispatch Time	Turnout Time	Travel Time	Response Time
F201	1.7	2.2	5.1	7.6
F202	1.8	2.3	6.2	8.8
Station 2 Zones Combined	**1.7**	**2.2**	**5.4**	**8.0**
F301	1.8	2.1	6.6	9.1
F302	1.6	2.0	5.5	8.0
Station 3 Zones Combined	**1.7**	**2.1**	**6.1**	**8.7**
F401	1.7	2.2	8.5	11.2
F402	1.6	2.0	7.1	9.9
F403	1.6	2.2	6.1	8.4
F404	1.6	2.2	6.0	8.9
F405	2.1	2.5	7.0	9.9
Station 4 Zones Combined	**1.6**	**2.2**	**7.8**	**10.3**
F501	--	--	--	--
MA	7.9	4.4	11.3	20.2
Total	**1.7**	**2.2**	**6.6**	**9.1**
F401 and F402 Combined	1.7	2.2	8.2	10.9

Table 34: Sample Sizes for First Arrival Performance by Demand Zone

Demand Zone	Dispatch Time	Turnout Time	Travel Time	Response Time
F201	1,650	1,550	1,618	1,493
F202	310	286	306	283
Station 2 Zones Combined	**1,960**	**1,836**	**1,924**	**1,776**
F301	1,782	1,701	1,790	1,669
F302	1,474	1,355	1,477	1,305
Station 3 Zones Combined	**3,256**	**3,056**	**3,267**	**2,974**
F401	646	614	646	607
F402	211	198	216	195
F403	568	530	547	499
F404	173	164	165	157
F405	41	37	39	35
Station 4 Zones Combined	**1,639**	**1,543**	**1,613**	**1,493**
F501	1	1	1	1
MA	18	18	21	15
Total	**6,874**	**6,454**	**6,826**	**6,259**
F401 and F402 Combined	857	812	862	802

Figure 36: Average First Arrival Performance in Minutes by Demand Zone

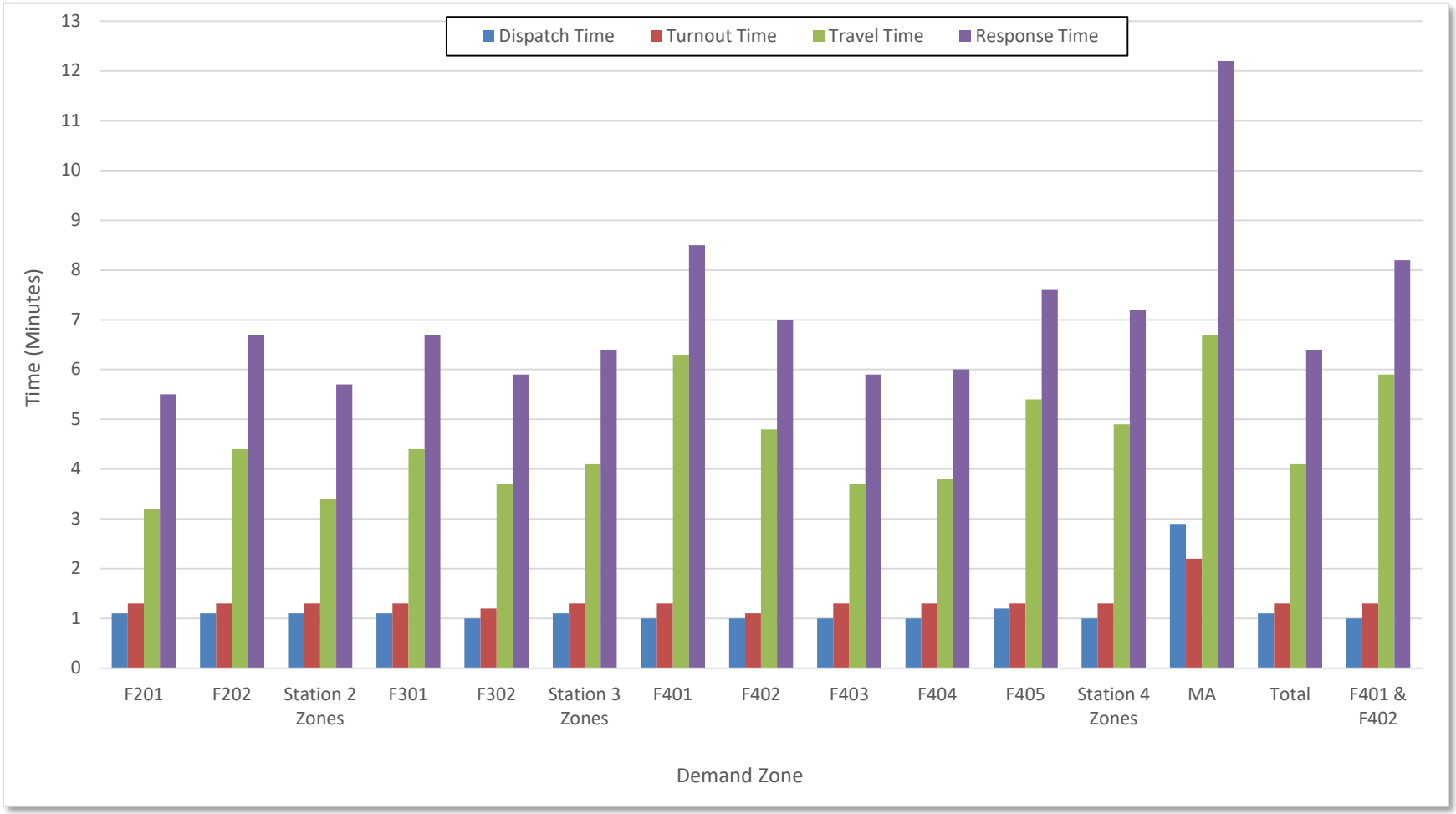


Figure 37: Median First Arrival Performance in Minutes by Demand Zone

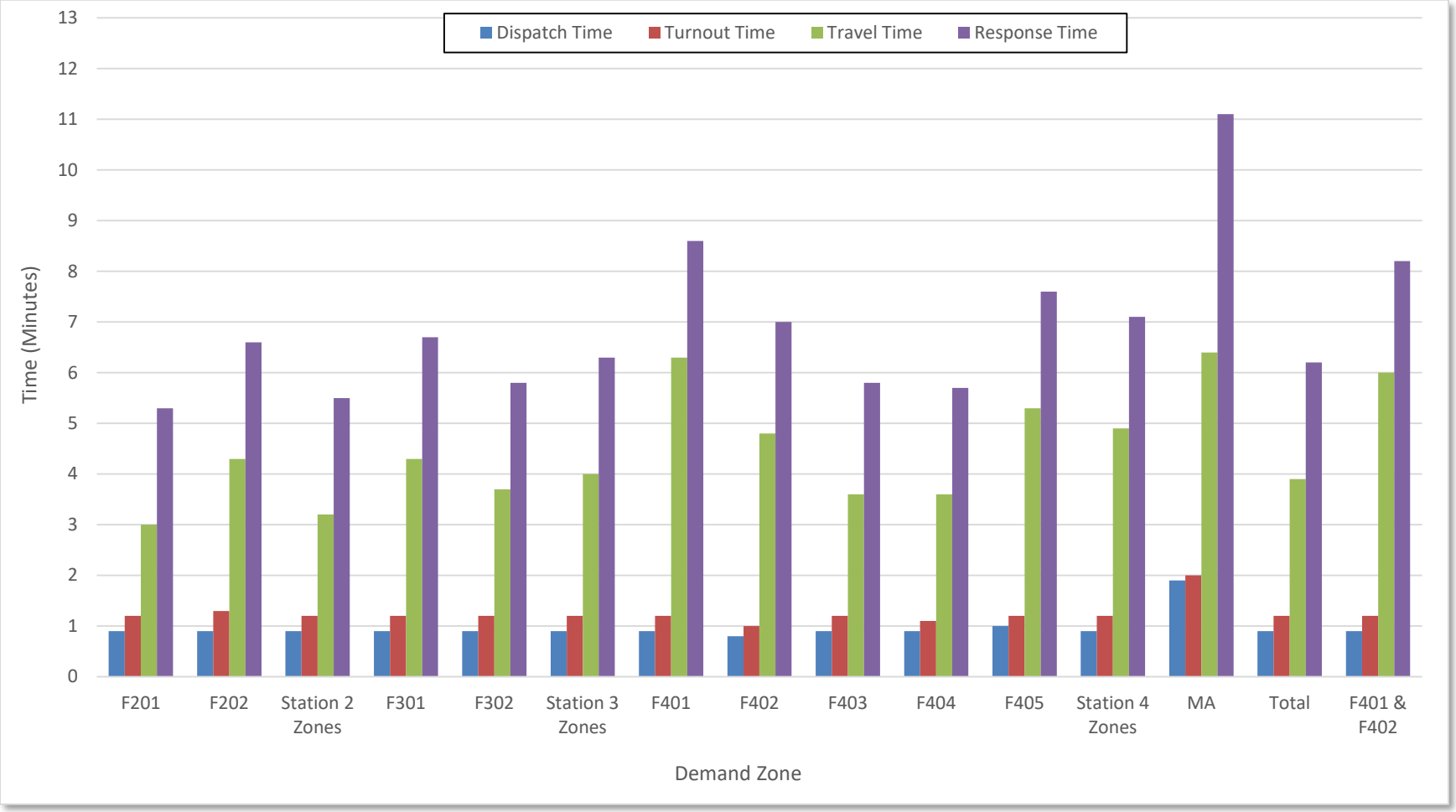
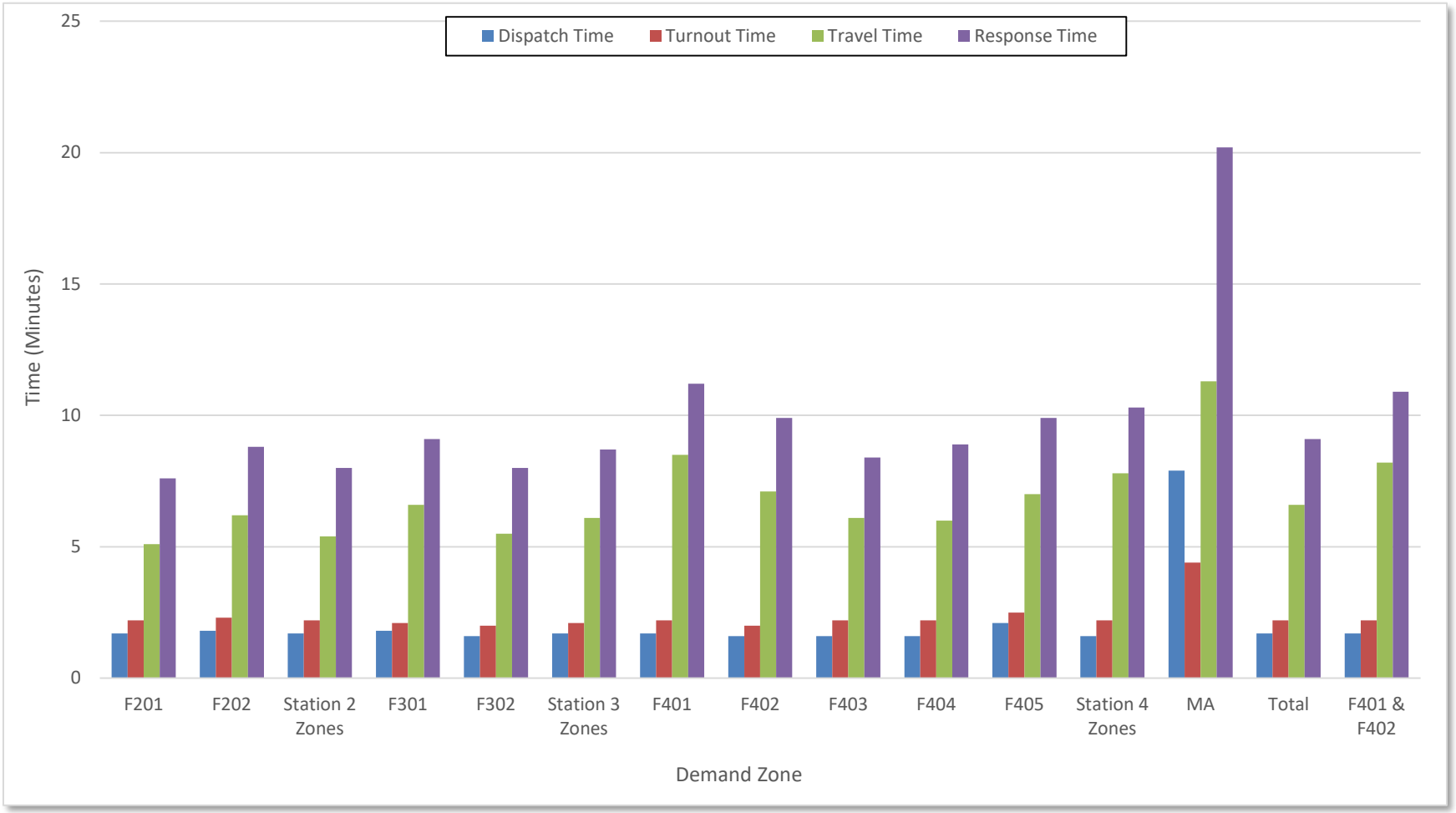


Figure 38: 90th Percentile First Arrival Performance in Minutes by Demand Zone



Effective Response Force Capabilities for Structure Fires

The capability of an Effective Response Force (ERF) to assemble in a timely manner with the appropriate personnel, apparatus, and equipment is important to the success of a significant structure fire event. Therefore, it is important to measure the capabilities of assembling an ERF. In most fire departments, the distribution model performs satisfactorily, but it is not uncommon to be challenged to assemble an ERF in the recommended timeframes. Several factors affect the capabilities to assemble an ERF such as the number of fire stations, number of units, and number of personnel on each unit. Each of these policy decisions should be made in relation to the community's specific risks and the willingness to assume risk.

Analyses of performance for BPFD's demand zones were based on an examination of travel times by any of the primary front-line units arriving on scene in response to a structure fire call in the demand zone's area (Table 35 through Table 38; Figure 39 and Figure 40). While BPFD had times for units arriving up to 10th to the scene, table data are presented up to the 6th arrival only for all demand zones. In select cases, small or zero sample sizes precluded calculation or presentation of performance metrics (noted as "--" in the tables). For this reason, limited figure data are presented.

Table 35: Structure Fire: Average Travel Time in Minutes for ERF by Demand Zone

Demand Zone	Order of Arrival					
	1	2	3	4	5	6
F201	2.4	3.1	3.7	4.5	--	--
F202	4.0	4.0	6.0	5.5	--	--
Station 2 Zones Combined	**2.9**	**3.3**	**4.4**	**4.8**	**--**	**--**
F301	4.2	4.9	5.4	5.7	--	--
F302	3.7	4.0	4.3	5.7	5.2	4.0
Station 3 Zones Combined	**4.0**	**4.6**	**5.0**	**5.7**	**5.6**	**4.0**
F401	4.8	4.9	6.1	12.2	6.7	--
F402	4.5	--	--	--	--	--
F403	4.3	4.2	4.6	--	--	--
F404	--	--	--	--	--	--
F405	--	--	--	--	--	--
Station 4 Zones Combined	**4.6**	**4.7**	**5.3**	**9.9**	**7.5**	**--**
F501	--	--	--	--	--	--
MA	--	--	--	--	--	--
Total	**3.8**	**4.3**	**4.9**	**6.1**	**6.9**	**4.4**
F401 and F402 Combined	4.8	4.8	6.0	11.3	6.7	--

Table 36: Structure Fire: Median Travel Time in Minutes for ERF by Demand Zone

Demand Zone	Order of Arrival					
	1	2	3	4	5	6
F201	2.1	2.6	4.1	4.4	--	--
F202	3.9	4.0	5.3	5.5	--	--
Station 2 Zones Combined	**2.8**	**3.5**	**4.4**	**4.7**	**--**	**--**
F301	4.4	4.7	5.3	6.6	--	--
F302	3.5	3.7	3.7	5.2	5.5	4.0
Station 3 Zones Combined	**4.2**	**4.6**	**5.0**	**6.1**	**5.9**	**4.0**
F401	4.9	5.0	6.1	6.1	6.7	--
F402	4.5	--	--	--	--	--
F403	3.7	3.6	4.2	--	--	--
F404	--	--	--	--	--	--
F405	--	--	--	--	--	--
Station 4 Zones Combined	**4.8**	**4.7**	**5.3**	**6.1**	**7.1**	**--**
F501	--	--	--	--	--	--
MA	--	--	--	--	--	--
Total	**3.8**	**4.3**	**4.9**	**5.9**	**7.0**	**4.0**
F401 and F402 Combined	4.9	4.9	5.4	7.2	6.8	--

Table 37: Structure Fire: 90th Percentile Travel Time in Minutes for ERF by Demand Zone

Demand Zone	Order of Arrival					
	1	2	3	4	5	6
F201	4.4	5.6	5.9	--	--	--
F202	--	--	--	--	--	--
Station 2 Zones Combined	**5.0**	**5.5**	**6.9**	**9.3**	**--**	**--**
F301	5.6	6.8	6.6	--	--	--
F302	6.5	6.7	6.3	--	--	--
Station 3 Zones Combined	**5.7**	**6.6**	**6.4**	**9.9**	**--**	**--**
F401	--	--	--	--	--	--
F402	--	--	--	--	--	--
F403	--	--	--	--	--	--
F404	--	--	--	--	--	--
F405	--	--	--	--	--	--
Station 4 Zones Combined	**6.6**	**6.8**	**8.0**	**--**	**--**	**--**
F501	--	--	--	--	--	--
MA	--	--	--	--	--	--
Total	**5.7**	**6.4**	**6.4**	**9.7**	**10.1**	**--**
F401 and F402 Combined	5.9	--	--	--	--	--

Table 38: Structure Fire: Sample Size for ERF Analysis by Demand Zone

Demand Zone	Order of Arrival					
	1	2	3	4	5	6
F201	21	20	12	7	1	0
F202	9	6	5	3	0	0
Station 2 Zones Combined	**30**	**26**	**17**	**10**	**1**	**0**
F301	54	47	35	6	1	0
F302	29	24	20	6	4	2
Station 3 Zones Combined	**83**	**71**	**55**	**12**	**5**	**2**
F401	9	6	5	3	2	0
F402	2	1	1	1	1	1
F403	5	3	3	1	1	0
F404	1	1	1	0	0	0
F405	1	1	1	0	0	0
Station 4 Zones Combined	**18**	**12**	**11**	**5**	**4**	**1**
F501	0	0	0	0	0	0
MA	0	0	0	0	0	0
Total	**131**	**109**	**83**	**27**	**10**	**3**
F401 and F402 Combined	11	7	6	4	3	1

Figure 39: 90th Percentile ERF Travel Performance for Structure Fires Overall

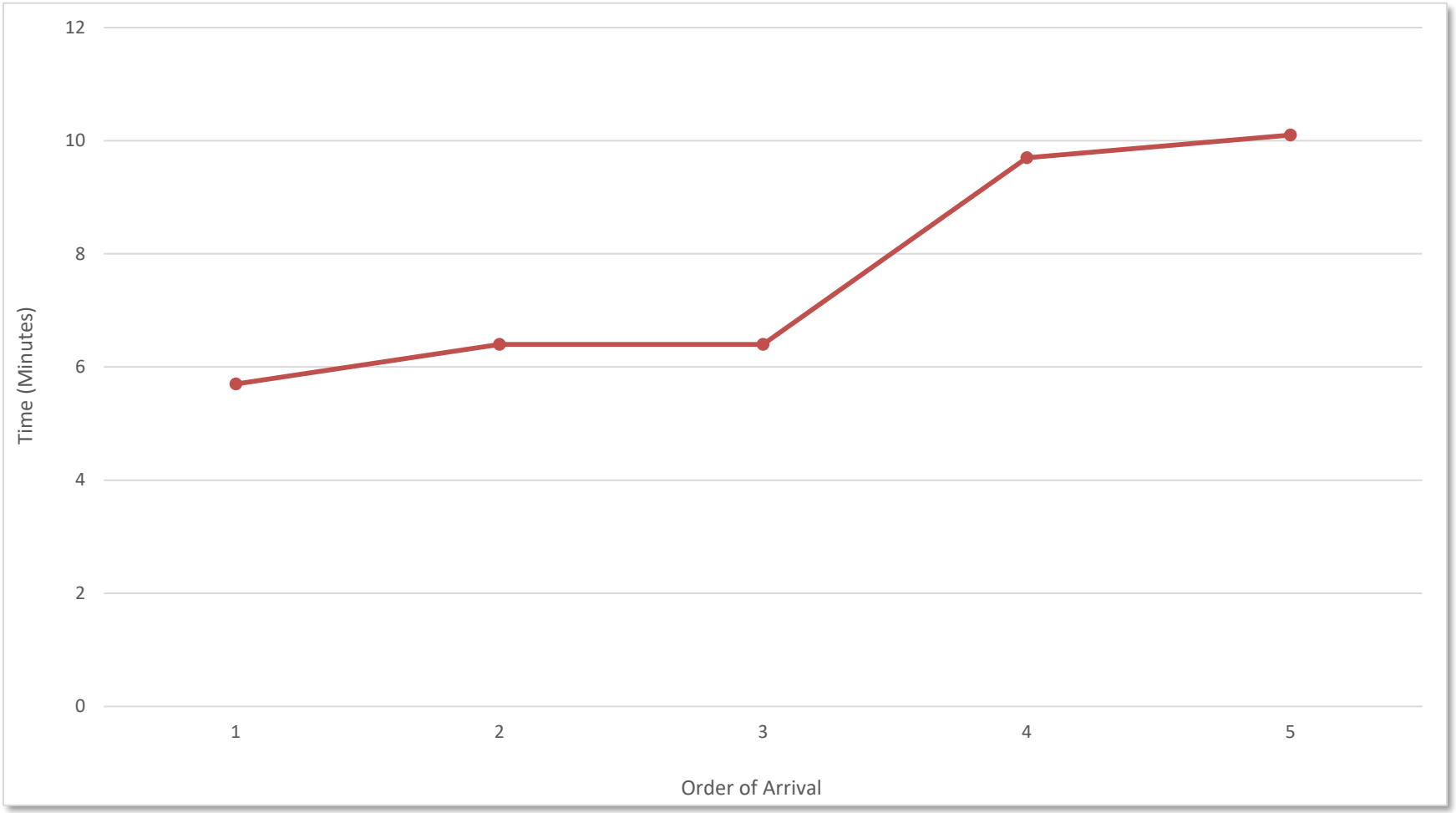
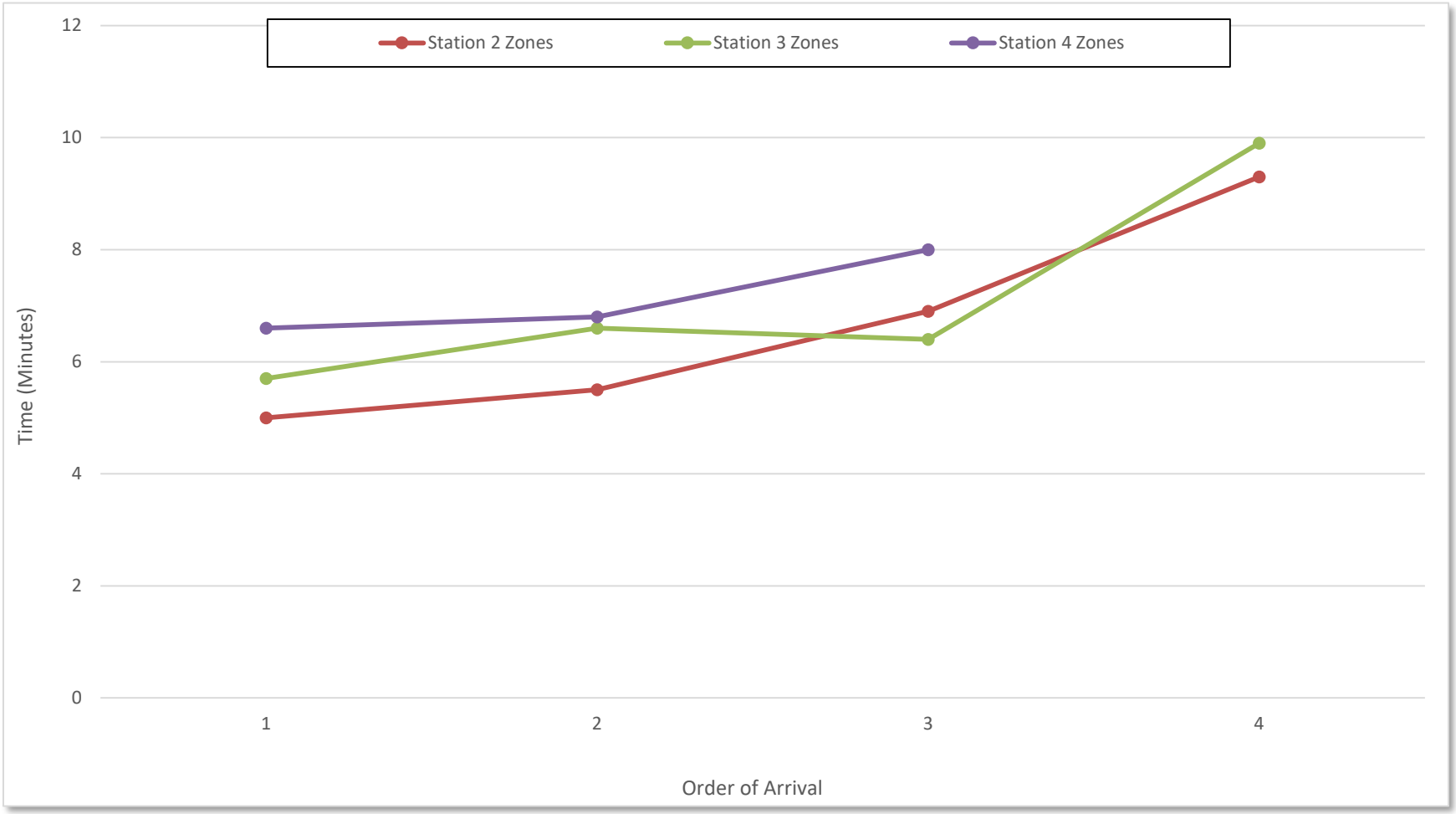


Figure 40: 90th Percentile ERF Travel Performance for Structure Fires by Demand Zone



Reliability Factors

Percentage of First Due Compliance

The reliability of the distribution model is a factor of how often the response model is available and able to respond to a call within the assigned demand zone. This analysis utilized all dispatched calls within the demand zones, and performance included responses from primary front-line units in BPFD's jurisdiction. Compliance was considered to be achieved if E22 or TW21 responded to calls in demand zones F201 and F202; if E11, E31, or R31 responded to calls in demand zones F301 and F302; and if E21, E41, or R41 responded to calls in demand zones F401, F402, F403, F404, and F405. Calls occurring in demand zones F501 (*n* = 2) and MA (*n* = 30) were not included in this analysis. Primary front-line units always or primarily assigned to Station 4 were able to respond to calls within demand zones F404 and F403 >88% of the time (Table 39; Figure 41).

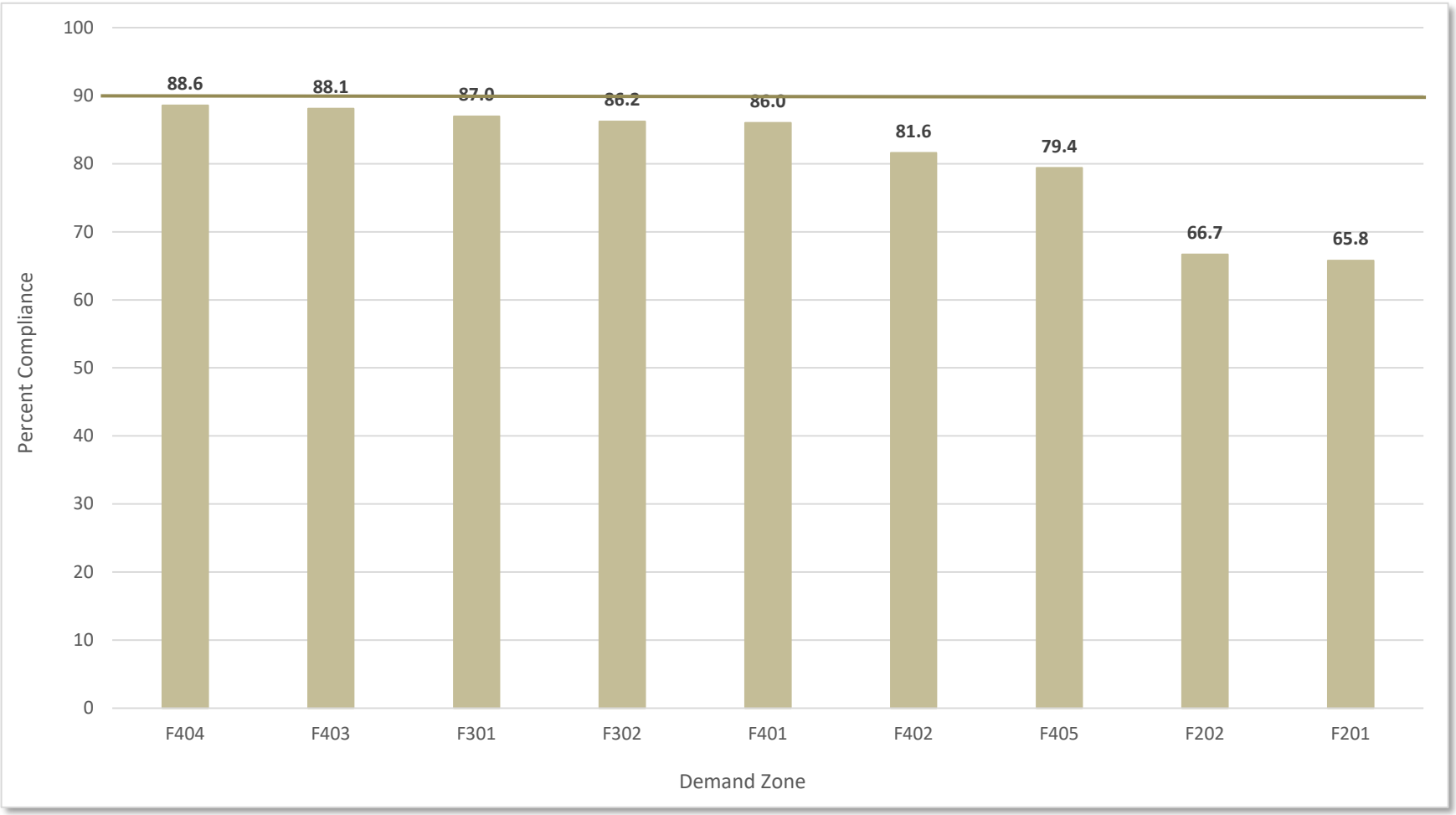
Overall, key units always or primarily assigned to Station 2 achieved 65.9% compliance in combined Station 2 demand zones, key units always or primarily assigned to Station 3 achieved 86.6% compliance in combined Station 3 demand zones, and key units always or primarily assigned to Station 4 achieved 86.2% compliance in combined Station 4 demand zones.

Table 39: First Due Compliance by Demand Zone

	Responding Unit's Assigned Station								
Demand Zone	Station 1 – B12 & U11	Station 2 – E22 & TW21	Station 3 – E11, E31, & R31	Station 4 – E21, E41, & R41	Station 2 – BCs	Station 4 – R1 & U22	Administration	N/A - SC	Total[1]
F201	1	1,490	194	666	207	2	41	21	2,265
F202	1	278	42	120	38	0	4	1	417
Station 2 Zones Total	**2**	**1,768**	**236**	**786**	**245**	**2**	**45**	**22**	**2,682**
F301	0	401	2,043	194	331	0	61	20	2,349
F302	1	245	1,692	175	183	0	34	15	1,962
Station 3 Zones Total	**1**	**646**	**3,735**	**369**	**514**	**0**	**95**	**35**	**4,311**
F401	0	104	50	820	101	0	28	8	953
F402	0	37	38	253	30	0	5	2	310
F403	1	96	39	689	90	0	28	7	782
F404	0	30	16	233	37	0	11	0	263
F405	0	8	13	54	14	0	8	0	68
Station 4 Zones Total	**1**	**275**	**156**	**2,049**	**272**	**0**	**80**	**17**	**2,376**
Total	**4**	**2,689**	**4,127**	**3,204**	**1,031**	**2**	**220**	**74**	**9,369**

[1]"Total" values may not equal the sum of the cell values across columns per row because units from multiple stations may have responded to a call within the given demand zone.

Figure 41: Percentage of First Due Compliance by Demand Zone



Overlapped or Simultaneous Call Analysis

Overlapped or simultaneous calls are defined as another call being received in a demand zone or for a first due station while one or more calls are already ongoing for the same demand zone or first due station. For example, if there is an ongoing call in station 1's zone wherein all units have not yet been cleared, and another request for service occurs in station 1's zone, those two calls would be captured as overlapped calls. Understanding the percentage of overlapped calls will help to determine the number of units to staff for each station. In general, the larger the call volume for a demand zone or first due station, the greater the likelihood of overlapped calls occurring. The distribution of the demand throughout the day will impact the chance of having overlapped calls. Additionally, the duration of a call plays a significant role; the longer it takes to clear a request, the greater the likelihood of having an overlapping request.

Results for these analyses are reported for all calls and by EMS and fire calls. Note that for EMS and fire calls, overlapped calls represent any call classified in its respective program area, but that overlapped with one or more calls from *any* program area. For example, demand zone F201 observed 183 calls during 2018 that overlapped with one or more calls within its demand zone—140 were classified as EMS calls, 38 were classified as fire calls, four were classified as hazmat calls, and one was classified as a rescue call. The 140 calls that were classified as EMS calls could have overlapped with one or more calls from EMS, fire, or other program areas.

Demand zone F301 had the highest percentage of overlapped calls during 2018 for overall calls (9.7%; Table 40; Figure 42) and for EMS calls (7.4%; Table 41; Figure 43). Demand zone F302 had the highest percentage of overlapped calls during 2018 for fire calls (1.9%; Table 42; Figure 44). Only demand zones with values >0 are presented in the figures.

When combining the individual demand zones into first due station areas, demand zones for Station 3 had the highest percentage of overall overlapped calls (13.5%), EMS overlapped calls (10.0%), and fire overlapped calls (2.9%; Table 40-42).

Table 40: Overlapped Calls by Demand Zone

Demand Zone	Overlapped Calls	Total Calls	Percentage of Overlapped Calls
F201	183	2,265	8.1
F202	6	417	1.4
Station 2 Zones Combined[1]	**243**	**2,682**	**9.1**
F301	227	2,349	9.7
F302	156	1,962	8.0
Station 3 Zones Combined[1]	**583**	**4,311**	**13.5**
F401	32	953	3.4
F402	4	310	1.3
F403	23	782	2.9
F404	1	263	0.4
F405	0	68	0.0
Station 4 Zones Combined[1]	**190**	**2,376**	**8.0**

[1]"Combined" values for "Overlapped Calls" and "Percentage of Overlapped Calls" are not sums of the corresponding individual demand zone values, as a greater number/percentage of overlapped calls is likely to occur when increasing the call volume by combining data from individual demand zones.

Figure 42: Percentage of Overlapped Calls by Demand Zone

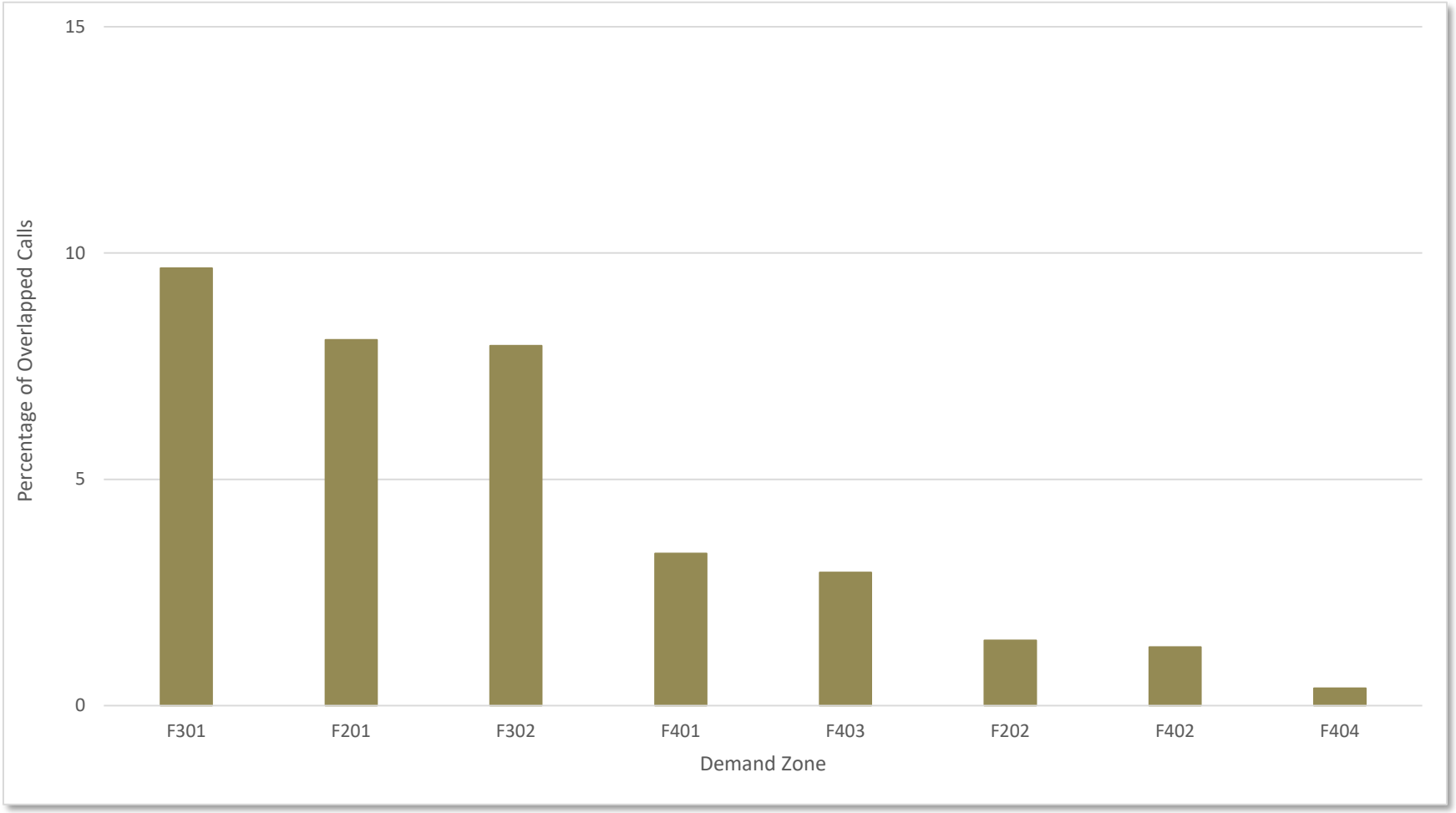


Table 41: Overlapped EMS Calls by Demand Zone

Demand Zone	Overlapped Calls	Total Calls	Percentage of Overlapped Calls
F201	140	2,265	6.2
F202	5	417	1.2
Station 2 Zones Combined[1]	**191**	**2,682**	**7.1**
F301	173	2,349	7.4
F302	108	1,962	5.5
Station 3 Zones Combined[1]	**431**	**4,311**	**10.0**
F401	20	953	2.1
F402	4	310	1.3
F403	16	782	2.0
F404	0	263	0.0
F405	0	68	0.0
Station 4 Zones Combined[1]	**136**	**2,376**	**5.7**

[1]"Combined" values for "Overlapped Calls" and "Percentage of Overlapped Calls" are not sums of the corresponding individual demand zone values, as a greater number/percentage of overlapped calls is likely to occur when increasing the call volume by combining data from individual demand zones.

Figure 43: Percentage of Overlapped EMS Calls by Demand Zone

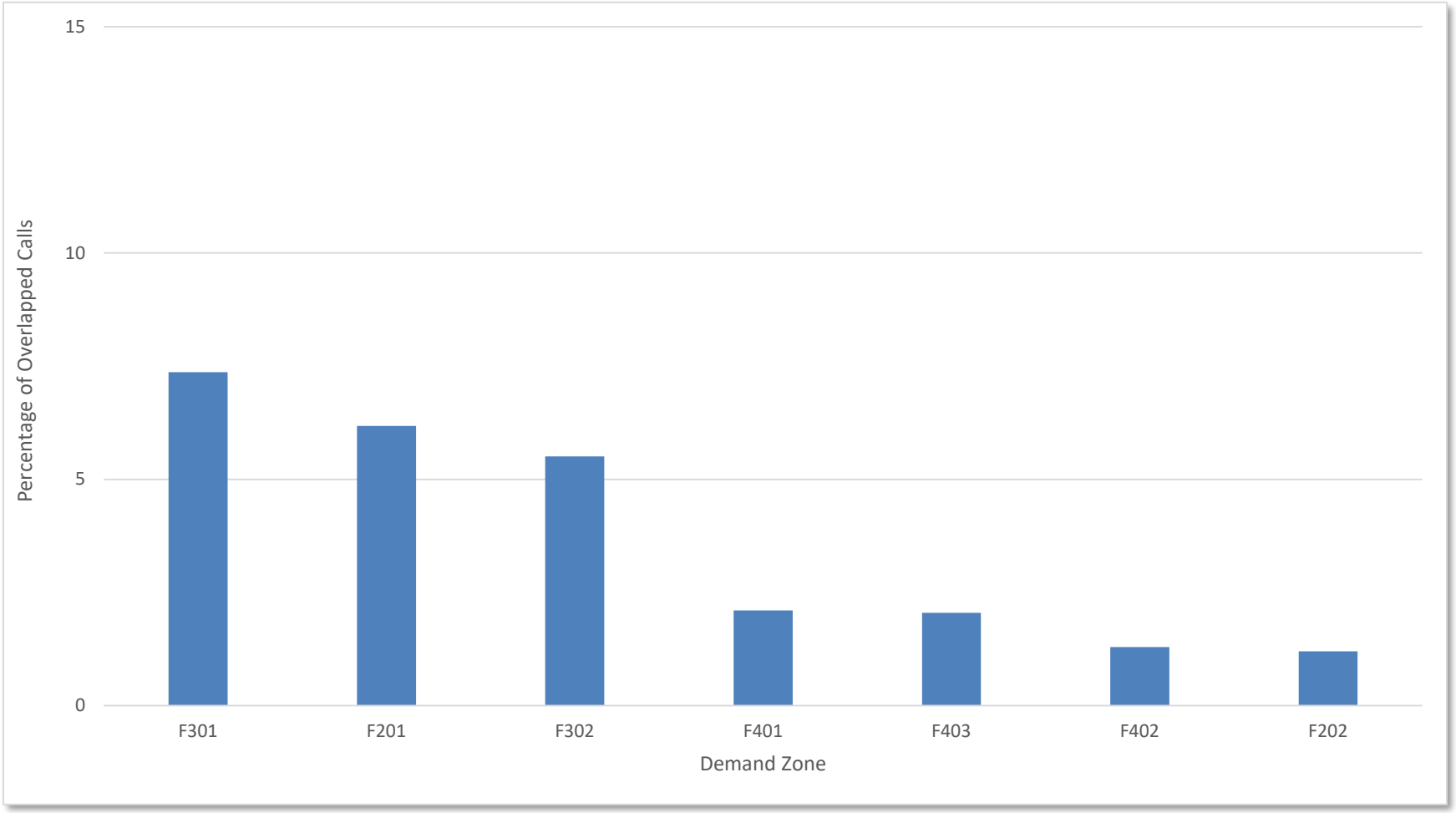
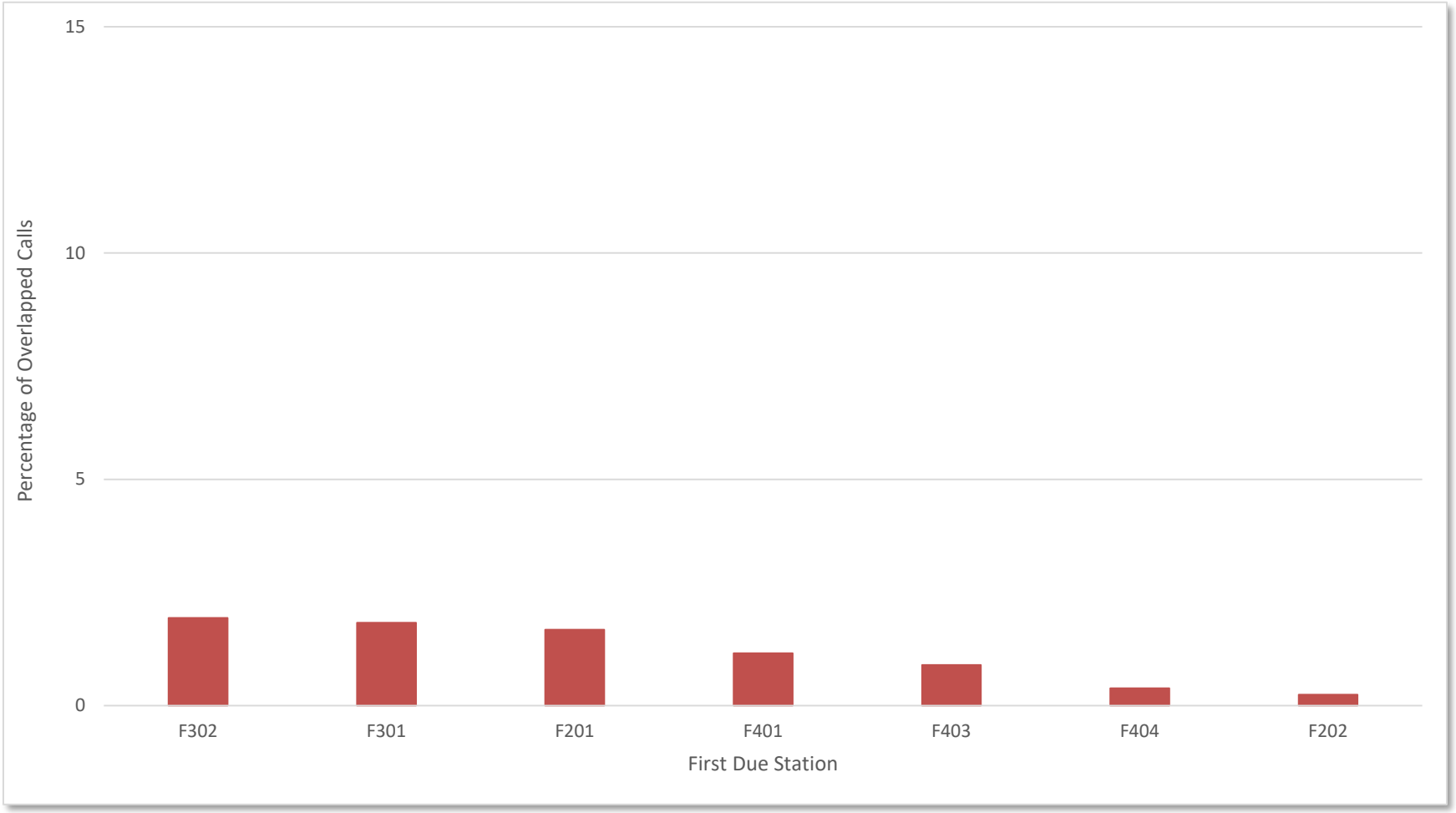


Table 42: Overlapped Fire Calls by Demand Zone

Demand Zone	Overlapped Calls	Total Calls	Percentage of Overlapped Calls
F201	38	2,265	1.7
F202	1	417	0.2
Station 2 Zones Combined[1]	**45**	**2,682**	**1.7**
F301	43	2,349	1.8
F302	38	1,962	1.9
Station 3 Zones Combined[1]	**126**	**4,311**	**2.9**
F401	11	953	1.2
F402	0	310	0.0
F403	7	782	0.9
F404	1	263	0.4
F405	0	68	0.0
Station 4 Zones Combined[1]	**50**	**2,376**	**2.1**

[1]"Combined" values for "Overlapped Calls" and "Percentage of Overlapped Calls" are not sums of the corresponding individual demand zone values, as a greater number/percentage of overlapped calls is likely to occur when increasing the call volume by combining data from individual demand zones

Figure 44: Percentage of Overlapped Fire Calls by Demand Zone



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BASELINE PERFORMANCE TABLES

From the reporting periods of 2014 to 2018, the total number of calls increased from 8,580 (average 23.5 calls per day) to 9,407 (average 25.8 calls per day; Table 43). Year-over-year (YoY) growth during this time frame ranged from 0.0% to 5.0%.

Table 43: Number of Incidents Dispatched by Category and Reporting Period

Call Category	Reporting Period[1]				
	2014	2015	2016	2017	2018
EMS	6,114	6,118	6,310	6,329	5,896
EMS MVC	398	423	498	488	475
EMS Total	**6,512**	**6,541**	**6,808**	**6,817**	**6,371**
Cancelled/Wrong Location/No Incident	338	306	310	340	371
False Call/Alarm	23	10	13	22	29
Fire Alarm	686	639	604	702	748
Fire Other	489	599	647	597	352
Outside Fire	41	36	53	32	27
Public Service	33	55	68	48	308
Structure Fire	209	163	194	168	146
Vehicle Fire	31	31	41	37	48
Fire Total	**1,850**	**1,839**	**1,930**	**1,946**	**2,029**
Hazmat Total	**193**	**193**	**204**	**175**	**234**
Rescue Total	**25**	**10**	**15**	**19**	**773**
Total[3]	**8,580**	**8,583**	**8,957**	**8,957**	**9,407[2]**
Average Calls per Day[3]	**23.5**	**23.5**	**24.5**	**24.5**	**25.8**
YoY Growth	**N/A**	**0.0%**	**4.4%**	**0.0%**	**5.0%**

[1]Reporting periods reflect full calendar years, from January 1 to December 31 of each respective year.
[2]30 of these requests for service indicated a "SceneZoneNumber" of "MA" and two of these requests for service indicated a "SceneZoneNumber" of "F501" in the RMS data file.
[3]Reporting period 2016 contained 366 days due to inclusion of leap year date February 29, 2016; all other reporting periods contained 365 days.

From the reporting periods of 2014 to 2018, the total number of responses decreased from 12,641 (average 34.6 responses per day) to 11,592 (average 31.8 responses per day; Table 44). Total busy hours decreased from 4,272.2 in 2014 to 3,577.7 in 2018. Average number of responses per call has decreased from 1.5 to 1.2 across the reporting periods.

Table 44: Number of Calls, Number of Responses, and Total Busy Time by Reporting Period

Reporting Period[1]	Number of Calls[2]	Number of Responses[3]	Average Responses per Call	Total Busy Hours	Responses with Time Data[4]	Average Busy Minutes per Response	Average Calls per Day[5]	Average Responses per Day[5]
2014	8,567	12,641	1.5	4,272.2	12,630	20.3	23.5	34.6
2015	8,575	11,241	1.3	3,737.8	11,229	20.0	23.5	30.8
2016	8,948	11,816	1.3	3,623.3	11,792	18.4	24.4	32.3
2017	8,945	11,354	1.3	3,362.8	11,318	17.8	24.5	31.1
2018	9,401	11,592	1.2	3,577.7	10,779	19.9	25.8	31.8

[1]Reporting periods reflect full calendar years, from January 1 to December 31 of each respective year.
[2]"Number of Calls" reflects an adjusted number of unique incidents to correspond with responses made by BPFD units.
[3]"Number of Responses" reflects the total number of entries in the unit-level data file, regardless of calculated busy time.
[4]"Responses with Time Data" reflects the number of responses in the unit-level data file with calculated busy time.
[5]Reporting period 2016 contained 366 days due to inclusion of leap year date February 29, 2016; all other reporting periods contained 365 days.

APPENDIX

This section reflects the audit, exclusion, and classification activities performed on the "Apparatus" table data (i.e., unit-level data) available in the RMS spanning July 20, 2005 to January 10, 2019. Because data from the "Basic" table (i.e., call-level data) spanning January 1, 2005 to January 10, 2019 available in the RMS were mapped to data in the "Apparatus" table, a separate audit was not performed on the "Basic" table except to examine "Latitude" and "Longitude" variables. Data related to these two variables were missing for 25,892 of 44,486 records (58.2%) from the 2014 to 2018 reporting periods. For the 2018 reporting period only, latitude and longitude values were missing for only eight of 9,407 records.

Prior to any exclusion activity, the "Apparatus" table originally contained 128,894 entries. Entries outside of the five-year reporting periods of full calendar years 2014 through 2018 were immediately excluded (*n* = 70,186). As such, audit, exclusion, and classification activities on the five-year data set were performed beginning with 58,708 entries. Audit and exclusion activities related to the data set for only the 2018 reporting period were performed beginning with 11,607 entries. All records related to BPFD units were retained to reflect response workload, but times indicating 0 minutes and times considered to be outliers were excluded from all related analyses.

Table 45: Basic Audit of "Apparatus" Table Data – 2014-2018

Audit Activity[1]	Frequency (*n*)	Percent of Total (%)
Total Entries in Data Set	**58,708**	--
Missing Scene Zone Number (First Due Area)	47,098[2]	80.2
Missing Enroute Date and Time	47,414[3]	80.8
Unit Dispatch Date and Time = Alarm Date and Time (Unit Dispatch Time = 0 Minutes)	22,830[4]	38.9
Alarm Date and Time to Unit Dispatch Date and Time (Unit Dispatch Time) > 30 Minutes	51	0.1
Unit Enroute Date and Time = Unit Dispatch Date and Time (Unit Turnout Time = 0 Minutes)	1,049	1.8
Unit Dispatch Date and Time to Unit Enroute Date and Time (Unit Turnout Time) > 30 Minutes	8	0.0
Unit Arrive Date and Time = Unit Enroute Date and Time (Unit Travel Time = 0 Minutes)	490	0.8
Unit Enroute Date and Time to Unit Arrive Date and Time (Unit Travel Time) > 60 Minutes	0	0.0
Unit Arrive Date and Time = Call Receipt Date and Time (Unit Response Time = 0 Minutes)	446	0.8
Call Receipt Date and Time to Unit Arrive Date and Time (Unit Response Time) > 60 Minutes	35	0.1
Unit Clear Date and Time = Unit Dispatch Date and Time (Unit Busy Time = 0 Minutes)	133	0.2
Unit Dispatch Date and Time to Unit Clear Date and Time (Unit Busy Time) > 24 Hours	7	0.0
Entries Reporting Unit Was Cancelled	1,421[5]	2.4

[1]Audit activities were independent of one another, such that frequency and percent data are not intended to be additive.
[2]All missing entries were prior to the 2018 reporting period.
[3]Nearly all missing entries were prior to the 2018 reporting period; 315 entries were missing for the 2018 reporting period, however, 305 of these entries noted that the unit was cancelled; the remaining ten entries indicated that the unit was not cancelled.
[4]Only 353 of these entries occurred during the 2018 reporting period; 111 of these entries noted that the unit was cancelled; the remaining 242 entries indicated that the unit was not cancelled.
[5]All entries occurred during the 2018 reporting period.

Table 46: Exclusions from "Apparatus" Table for Busy and Performance Time Analyses – 2014-2018

Exclusion Activity[1]	Frequency (*n*)	Percent of Total (%)
Total Entries in Data Set	**58,708**	--
Unit Dispatch Date and Time = Alarm Date and Time (Unit Dispatch Time = 0 Minutes)	22,780[2]	38.8
Alarm Date and Time to Unit Dispatch Date and Time (Unit Dispatch Time) > 30 Minutes	51[3]	0.1
Unit Enroute Date and Time = Unit Dispatch Date and Time (Unit Turnout Time = 0 Minutes)	1,045[4]	1.8
Unit Dispatch Date and Time to Unit Enroute Date and Time (Unit Turnout Time) > 30 Minutes	8[5]	0.0
Unit Arrive Date and Time = Unit Enroute Date and Time (Unit Travel Time = 0 Minutes)	489[6]	0.8
Unit Arrive Date and Time = Alarm Date and Time (Unit Response Time = 0 Minutes)	389[7]	0.7
Alarm Date and Time to Unit Arrive Date and Time (Unit Response Time) > 60 Minutes	4[8]	0.0
Unit Clear Date and Time = Unit Dispatch Date and Time (Unit Busy Time = 0 Minutes)	133[9]	0.2
Unit Dispatch Date and Time to Unit Clear Date and Time (Unit Busy Time) > 24 Hours	7[10]	0.0
Entries Reporting Unit Outside of BPFD	64	0.1
Entries with One or More Time Values Excluded	**24,970**	**42.5**

[1]Exclusion activities were sequential, such that frequency and percent data are additive.
[2]Retained records to reflect response workload, but excluded dispatch times from all related analyses; corresponding response times were not excluded due to volume of dispatch times = 0, so use caution when interpreting any reporting related to response times for the 2014-2017 reporting periods; amount of time elapsing between alarm date and time and arrival date and time for these entries seemed *somewhat* reasonable, even with the interim 0 times.
[3]Retained records to reflect response workload, but excluded dispatch times and corresponding response times from all related analyses, as dispatch times were considered to be outliers.
[4]Retained records to reflect response workload, but excluded turnout times and corresponding response times from all related analyses.
[5]Retained records to reflect response workload, but excluded turnout times and corresponding response times from all related analyses, as turnout times were considered to be outliers.
[6]Retained records to reflect response workload, but excluded travel times and corresponding response times from all related analyses.
[7]Retained records to reflect response workload, but excluded response times from all related analyses.
[8]Retained record to reflect response workload, but excluded response time from all related analyses, as response time was considered to be an outlier.
[9]Retained records to reflect response workload, but excluded busy times from all related analyses.
[10]Retained records to reflect response workload, but excluded busy times from all related analyses, as busy times were considered to be outliers.

Table 47: Basic Audit of "Apparatus" Table Data – 2018

Audit Activity[1]	Frequency (*n*)	Percent of Total (%)
Total Entries in Data Set	**11,607**	--
Missing Enroute Date and Time	315[2]	2.7
Unit Dispatch Date and Time = Alarm Date and Time (Unit Dispatch Time = 0 Minutes)	353[3]	3.0
Alarm Date and Time to Unit Dispatch Date and Time (Unit Dispatch Time) > 30 Minutes	11	0.1
Unit Enroute Date and Time = Unit Dispatch Date and Time (Unit Turnout Time = 0 Minutes)	1,049[4]	9.0
Unit Dispatch Date and Time to Unit Enroute Date and Time (Unit Turnout Time) > 30 Minutes	8	0.1
Unit Arrive Date and Time = Unit Enroute Date and Time (Unit Travel Time = 0 Minutes)	490[5]	4.2
Unit Enroute Date and Time to Unit Arrive Date and Time (Unit Travel Time) > 60 Minutes	0	0.0
Unit Arrive Date and Time = Alarm Date and Time (Unit Response Time = 0 Minutes)	57[6]	0.5
Alarm Date and Time to Unit Arrive Date and Time (Unit Response Time) > 60 Minutes	11	0.1
Unit Clear Date and Time = Unit Dispatch Date and Time (Unit Busy Time = 0 Minutes)	54[7]	0.5
Unit Dispatch Date and Time to Unit Clear Date and Time (Unit Busy Time) > 24 Hours	3[8]	0.0
Entries Reporting Unit Was Cancelled[9]	1,421	12.2
Entries Reporting Unit Outside of BPFD	15[10]	0.1

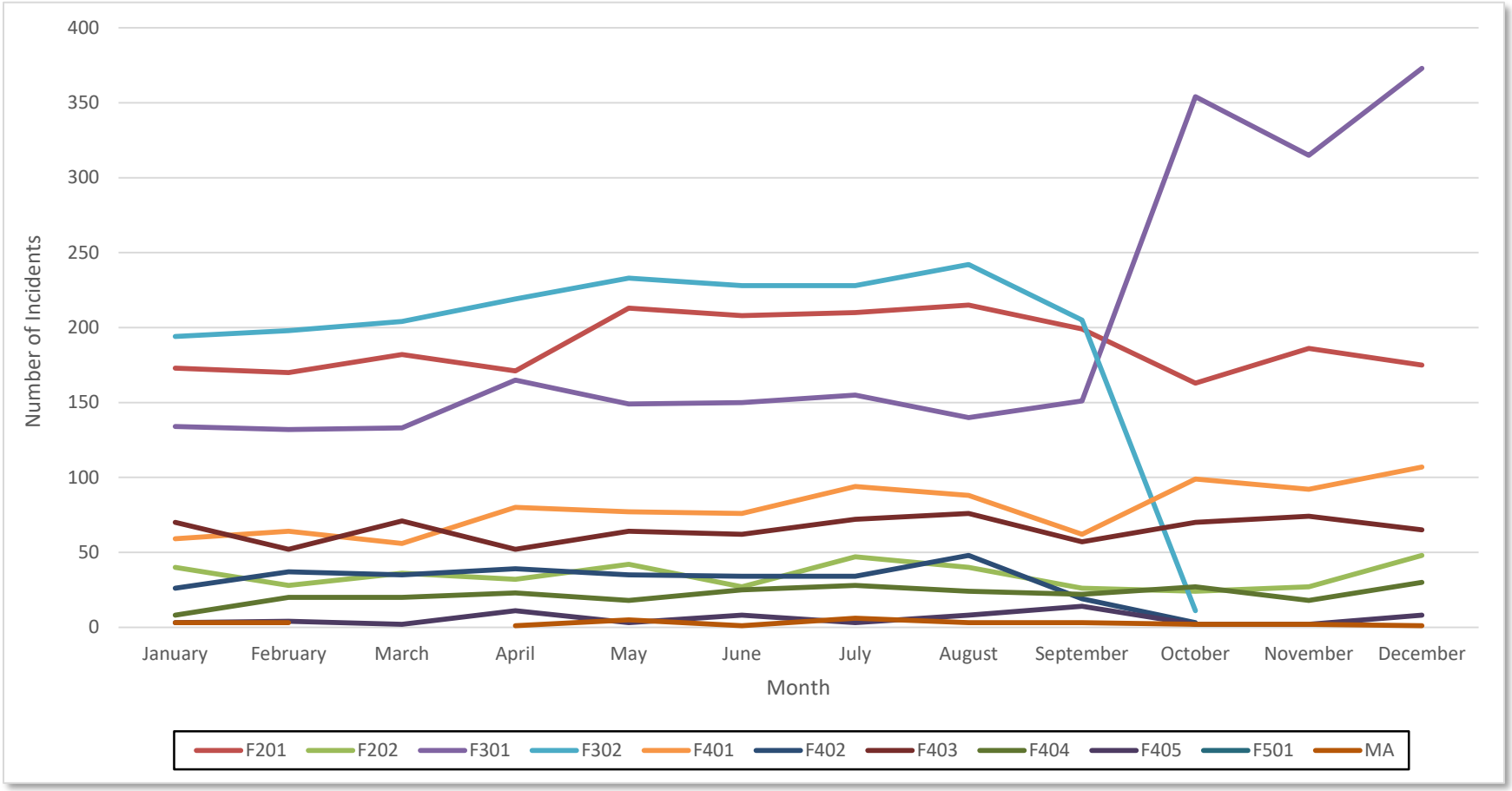
[1]Audit activities were independent of one another, such that frequency and percent data are not intended to be additive.
[2]305 of these entries noted that the unit was cancelled; the remaining ten entries indicated that the unit was not cancelled.
[3]111 of these entries noted that the unit was cancelled; the remaining 242 entries indicated that the unit was not cancelled.
[4]171 of these entries noted that the unit was cancelled; the remaining 878 entries indicated that the unit was not cancelled.
[5]27 of these entries noted that the unit was cancelled; the remaining 463 entries indicated that the unit was not cancelled.
[6]Nine of these entries noted that the unit was cancelled; the remaining 48 entries indicated that the unit was not cancelled.
[7]15 of these entries noted that the unit was cancelled; the remaining 39 entries indicated that the unit was not cancelled.
[8]All three entries were related to the same call, EID 32943454, incident type Smoke scare, odor of smoke; alarm date and time was reported as June 25, 2018 at 9:35:40 PM, and clear times for all three responding units were reported as June 26, 2018 at 10:30:00 PM.
[9]Based on "ApparatusWasCancelled" variable = "TRUE"; 300 of these entries indicated "Dispatched & cancelled en route" as the incident type; the remaining 1,121 entries indicated other incident types.
[10]15 entries reflected units with Brooklyn Center FD (*n* = 1), Fridley FD (*n* = 1), Osseo FD (*n* = 3), Plymouth FD (*n* = 4), St. Anthony FD (*n* = 1), and West Metro Fire Dist (*n* = 5).

Table 48: Exclusions from "Apparatus" Table for Busy and Performance Time Analyses – 2018

Exclusion Activity[1]	Frequency (*n*)	Percent of Total (%)
Total Entries in Data Set	**11,607**	**--**
Unit Dispatch Date and Time = Alarm Date and Time (Unit Dispatch Time = 0 Minutes)	353[2]	3.0
Alarm Date and Time to Unit Dispatch Date and Time (Unit Dispatch Time) > 30 Minutes	11[3]	0.1
Unit Enroute Date and Time = Unit Dispatch Date and Time (Unit Turnout Time = 0 Minutes)	1,049[4]	9.0
Unit Dispatch Date and Time to Unit Enroute Date and Time (Unit Turnout Time) > 30 Minutes	8[5]	0.1
Unit Arrive Date and Time = Unit Enroute Date and Time (Unit Travel Time = 0 Minutes)	490[6]	4.2
Alarm Date and Time to Unit Arrive Date and Time (Unit Response Time) > 60 Minutes	1[7]	0.0
Unit Clear Date and Time = Unit Dispatch Date and Time (Unit Busy Time = 0 Minutes)	54[8]	0.5
Unit Dispatch Date and Time to Unit Clear Date and Time (Unit Busy Time) > 24 Hours	3[9]	0.0
Entries Reporting Unit Outside of BPFD	15[10]	0.1
Entries with One or More Time Values Excluded	**1,984**	**17.1**

[1]Exclusion activities were sequential, such that frequency and percent data are additive.
[2]111 of these entries noted that the unit was cancelled; the remaining 242 entries indicated that the unit was not cancelled; retained records to reflect response workload, but excluded dispatch times and corresponding response times from all related analyses.
[3]Retained records to reflect response workload, but excluded dispatch times and corresponding response times from all related analyses, as dispatch times were considered to be outliers.
[4]171 of these entries noted that the unit was cancelled; the remaining 878 entries indicated that the unit was not cancelled; retained records to reflect response workload, but excluded turnout times and corresponding response times from all related analyses.
[5]Retained records to reflect response workload, but excluded turnout times and corresponding response times from all related analyses, as turnout times were considered to be outliers.
[6]27 of these entries noted that the unit was cancelled; the remaining 463 entries indicated that the unit was not cancelled; retained records to reflect response workload, but excluded travel times and corresponding response times from all related analyses.
[7]Retained record to reflect response workload, but excluded response time from all related analyses, as response time was considered to be an outlier.
[8]15 of these entries noted that the unit was cancelled; the remaining 39 entries indicated that the unit was not cancelled; retained records to reflect response workload, but excluded busy times from all related analyses.
[9]All three entries were related to the same call, EID 32943454, incident type Smoke scare, odor of smoke; alarm date and time was reported as June 25, 2018 at 9:35:40 PM, and clear times for all three responding units were reported as June 26, 2018 at 10:30:00 PM; retained records to reflect response workload, but excluded busy times from all related analyses, as busy times were considered to be outliers.
[10]15 entries reflected units with Brooklyn Center FD (*n* = 1), Fridley FD (*n* = 1), Osseo FD (*n* = 3), Plymouth FD (*n* = 4), St. Anthony FD (*n* = 1), and West Metro Fire Dist (*n* = 5).

Figure 45: Audit of Number of Incidents by Demand Zone by Month – 2018



For demand zones F302 and F402, few calls were reported in the data set for the month of October and no calls were reported in the data set for the months of November and December. Based on the trend in number of unique incidents for each demand zone across months of the year during 2018, it appears that zone F302 calls for those months were reported in the demand zone F301 instead (note the marked shift in the purple trend line above), and that zone F402 calls for those months may have been reported in the demand zone F401.

Table 49: Classification of Incident Type from RMS Data File into Program and Call Category

Program	Call Category	NFIRS Definition of "IncidentType" Numeric Code from RMS Data File[1]
EMS	EMS	Emergency medical service, other
		EMS call, excluding vehicle accident with injury
		EMS call, party transported by non-fire agency
		Medical assist, assist EMS crew
		Rescue, EMS incident, other
	EMS MVC	Motor vehicle accident with injuries
		Motor vehicle accident with no injuries.
		Motor vehicle/pedestrian accident (MV Ped)
Fire	Cancelled/Wrong Location/No Incident	Dispatched & cancelled en route
		No incident found on arrival at dispatch address
		Wrong location
	False Call/Alarm	Central station, malicious false alarm
		Local alarm system, malicious false alarm
		Malicious, mischievous false call, other
		Municipal alarm system, malicious false alarm
		Telephone, malicious false alarm
	Fire Alarm	Alarm system activation, no fire - unintentional
		Alarm system sounded due to malfunction
		Carbon monoxide detector activation, no CO
		CO detector activation due to malfunction
		Detector activation, no fire - unintentional
		Extinguishing system activation
		Extinguishing system activation due to malfunction
		False alarm or false call, other
		Heat detector activation due to malfunction
		Smoke detector activation due to malfunction
		Smoke detector activation, no fire - unintentional
		Sprinkler activation due to malfunction
		Sprinkler activation, no fire - unintentional
		System malfunction, other
		Unintentional transmission of alarm, other
		Vicinity alarm (incident in other location)
	Fire Other	Accident, potential accident, other
		Air or gas rupture of pressure or process vessel
		Aircraft standby
		Arcing, shorted electrical equipment
		Attempt to burn
		Attempted burning, illegal action, other
		Authorized controlled burning
		Bomb scare - no bomb
		Breakdown of light ballast
		Building or structure weakened or collapsed
		Cover assignment, standby, moveup

Program	Call Category	NFIRS Definition of "IncidentType" Numeric Code from RMS Data File[1]
Fire	Fire Other	Defective elevator, no occupants
		Electrical wiring/equipment problem, other
		Excessive heat, scorch burns with no ignition
		Explosion (no fire), other
		Explosive, bomb removal (for bomb scare, use 721)
		Fire, other
		Fireworks explosion (no fire)
		Flood assessment
		Good intent call, other
		Heat from short circuit (wiring), defective/worn
		Lightning strike (no fire)
		Lock-out
		Munitions or bomb explosion (no fire)
		Overheated motor
		Overpressure rupture from air or gas, other
		Overpressure rupture from steam, other
		Overpressure rupture of air or gas pipe/pipeline
		Overpressure rupture of boiler from air or gas
		Overpressure rupture of steam boiler
		Overpressure rupture of steam pipe or pipeline
		Overpressure rupture, explosion, overheat other
		Person in distress, other
		Power line down
		Prescribed fire
		Ring or jewelry removal
		Service Call, other
		Severe weather or natural disaster standby
		Severe weather or natural disaster, other
		Smoke from barbecue, tar kettle
		Smoke or odor removal
		Smoke scare, odor of smoke
		Special type of incident, other
		Steam rupture of pressure or process vessel
		Steam, other gas mistaken for smoke, other
		Steam, vapor, fog or dust thought to be smoke
		Unauthorized burning
		Vehicle accident, general cleanup
		Water evacuation
		Water or steam leak
		Water problem, other
		Wind storm, tornado/hurricane assessment
	Outside Fire	Brush or brush-and-grass mixture fire
		Cultivated trees or nursery stock fire
		Dumpster or other outside trash receptacle fire

Program	Call Category	NFIRS Definition of "IncidentType" Numeric Code from RMS Data File[1]
Fire	Outside Fire	Forest, woods or wildland fire
		Garbage dump or sanitary landfill fire
		Grass fire
		Natural vegetation fire, other
		Outside equipment fire
		Outside mailbox fire
		Outside rubbish fire, other
		Outside rubbish, trash or waste fire
		Outside stationary compactor/compacted trash fire
		Outside storage fire
		Special outside fire, other
	Public Service	Animal problem
		Animal rescue
		Assist invalid
		Assist police or other governmental agency
		Citizen complaint
		Police matter
		Public service
		Public service assistance, other
	Structure Fire	Building fire
		Chimney or flue fire, confined to chimney or flue
		Commercial Compactor fire, confined to rubbish
		Cooking fire, confined to container
		Fire in portable building, fixed location
		Fires in structure other than in a building
		Fuel burner/boiler malfunction, fire confined
		Incinerator overload or malfunction, fire confined
		Trash or rubbish fire, contained
	Vehicle Fire	Camper or recreational vehicle (RV) fire
		Mobile property (vehicle) fire, other
		Off-road vehicle or heavy equipment fire
		Passenger vehicle fire
		Road freight or transport vehicle fire
		Self-propelled motor home or recreational vehicle
		Water vehicle fire
Hazmat	Hazmat	Carbon monoxide incident
		Chemical hazard (no spill or leak)
		Chemical spill or leak
		Combustible/flammable gas/liquid condition, other
		Gas leak (natural gas or LPG)
		Gasoline or other flammable liquid spill
		Hazardous condition, other
		HazMat release investigation w/no HazMat
		Oil or other combustible liquid spill

Program	Call Category	NFIRS Definition of "IncidentType" Numeric Code from RMS Data File[1]
Hazmat	Hazmat	Refrigeration leak
		Toxic condition, other
Rescue	Rescue	Extrication of victim(s) from building/structure
		Extrication of victim(s) from machinery
		Extrication of victim(s) from vehicle
		Extrication, rescue, other
		High-angle rescue
		Ice rescue
		Lock-in (if lock out , use 511)
		Removal of victim(s) from stalled elevator
		Rescue or EMS standby
		Search for lost person, other
		Search for person in water
		Search for person on land
		Swift water rescue
		Swimming/recreational water areas rescue
		Trapped by power lines
		Trench/below-grade rescue
		Water & ice-related rescue, other
		Watercraft rescue

[1]Text definitions of NFRIS numeric codes are presented verbatim as available in the RMS data file.

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