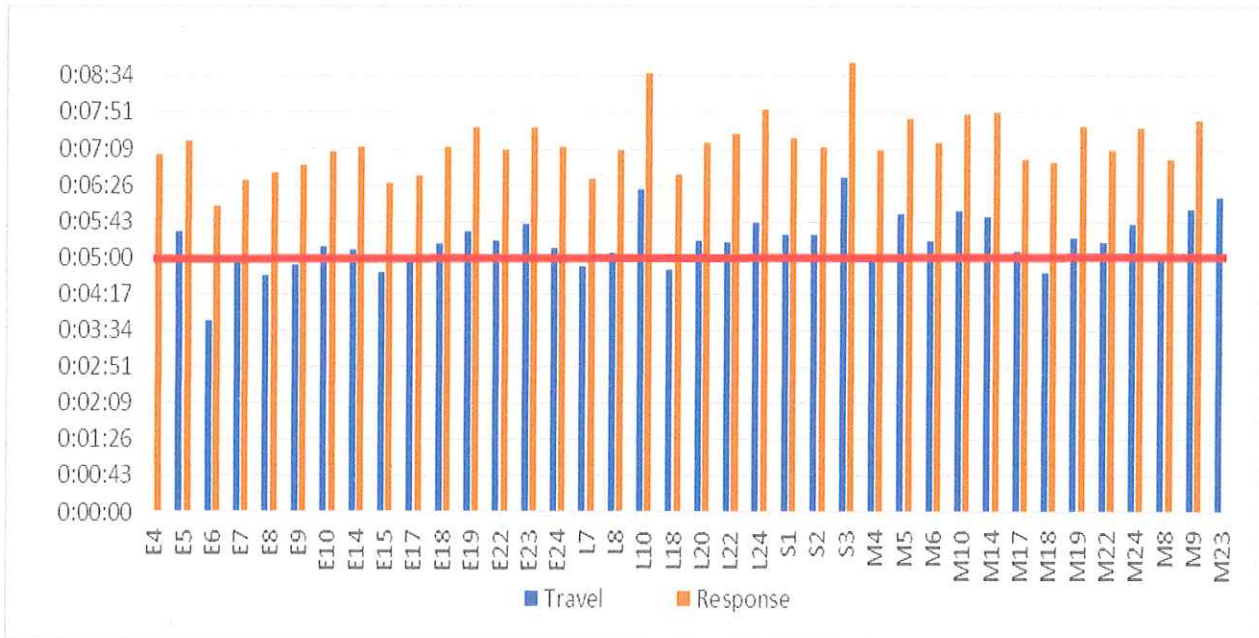


Turnout time can be affected by many factors that include proximity to the apparatus; however, it is an aspect of the response time that emergency crews have some control. Based on the data spanning April 2016 to March 2017, turnout time was 2 minutes and 46 seconds at the 90th percentile. Turnout times are too long and SPFD should take steps to improve them. Reducing turn-out times by 30 seconds to one minute is the equivalent to moving the fire station a half mile closer to the incident. This improvement in service delivery has no cost!

Figure 12: 90th Percentile Response and Travel Times, April 2016-March 2017



It is instructive to calculate response time criteria for individual units to gain a snapshot of potential service delivery gaps in the system using a universal response time benchmark. However, evaluating response times to specific incident types across clearly defined geographic boundaries can prove more useful for making future resource allocation decisions.

Service Demand, Workload, and Response Times by District Council

City officials collect demographic, economic, housing, and other data about each of the 17 neighborhoods/district council areas to help guide policy decisions. To perform this analysis, TriData requested city GIS connect each emergency response in the CAD data with the appropriate District Council area. City GIS linked each incident to the district council area where it occurred using longitude and latitude coordinates from the CAD. Only 60 cases out of the over 158,000 total cases did not have longitude and latitude coordinates preventing these records from being assigned a district council area. With this information, TriData calculated travel/response times, workload, fire loss, and other metrics for each of the district council areas. The information about the district councils uses the second year of data that spans April 2016 to

March 2017. This time duration provides information from the most recent operational and unit deployment changes.

Table 10 lists the 17 District Council areas and the fire station(s) which are *typically* dispatched to calls in those areas.

Table 10: Closest Fire Stations to District Council Areas

District Council Areas	Station Response Area
1: Eastview-Conway-Battlecreek-Highwood Hills	Station 9 & 24
2: Greater East Side	Station 9
3: West Side	Station 6
4: Dayton's Bluff	Station 7
5: Payne-Phalen	Station 9 & 17
6: North End	Station 22
7: Thomas-Dale/Frogtown	Station 18
8: Summit-University	Station 5
9: Fort Road/West Seventh	Station 1
10: Como	Station 23
11: Hamline-Midway	Station 20
12: Saint Anthony Park	Station 23
13: Union Park	Station 14 & 20
14: Macalester-Groveland	Station 14
15: Highland Park	Station 19
16: Summit Hill	Station 1 & 5
17: Capital River	Station 8

Information for each district council is divided into five sections based on incident type: 1) Structure Fires, 2) Other Fires, 3) Hazardous Materials, 4) Rescue/EMS, and 5) Other incident types. These category designations are based on the National Fire Incident Reporting System (NFIRS) incident type definitions. NFIRS assigns three digit codes to identify the many different types of incidents fire departments manage. All 100 codes are fires, 200 and 400 codes identify hazardous materials/conditions, 300 codes are for medical and rescue incidents, and 500, 600 and 700 codes are assigned to false calls, miscellaneous, and other response types.

Structure Fires by District Council - This section includes all incidents assigned a NFIRS code 111, which identifies a structure fire response. Structure fires are fire events involving a building, home, or other fixed structure. These events are isolated for analysis because they involve significant life hazard, potential property loss, and are time sensitive events. It is also the mission of the fire department to protect life and save property, so evaluating structure fire responses is a valid measure of service delivery. As mentioned above, fire grows exponentially (doubles in size every minute) when left unchecked, with flashover occurring in the room of origin within about 10 minutes. Flashover is an important benchmark because during this phase of fire growth temperatures reach a point that everything in the room/area combust. Flashover is not a survivable event, so it is critical that fire suppression resources arrive prior to flashover to

improve survivability of victims and limit fire spread to other parts of the structure. NFPA 1710 recommends the first unit arrive within 5 minutes with a full response complement of at least 15 fire personnel arrive within 8 minutes.

Table 11 provides the number of structure fire responses into each district council area. Total number of responses counts each time a fire apparatus responded to a structure fire. Structure fire incidents with estimated property and content dollar loss are also included. The final column is “Fires >\$1,000 Loss” which counts the number of structure fires that caused at least \$1,000 in property damage. Property loss is damage caused to the structure itself, while content loss is damage to items that can be removed from the structure. Counting the number of fires with at least \$1,000 in property loss is a means to identify truly working fire events that either did or could have escalated if not for the fire department responding.

Roughly 139 of the 225 structure fires, or 62 percent, involved property loss greater than \$1,000 across the 17 district council areas.

Table 11: Structure Fire Responses and Loss by District Council, April 2016-March 2017

April 2016 to March 2017						
District	Fire Responses	Fire Incidents	Property Loss	Content Loss	Total Fire Loss	Fires >\$1000 Loss
1	190	21	\$1,021,800	\$465,400	\$1,487,200	14
2	152	17	\$307,025	\$198,200	\$505,225	11
3	135	14	\$360,750	\$140,000	\$500,750	11
4	148	17	\$203,130	\$85,347	\$288,477	10
5	383	36	\$943,005	\$282,390	\$1,225,395	26
6	240	24	\$439,543	\$345,245	\$784,788	19
7	123	14	\$359,200	\$136,350	\$495,550	8
8	115	14	\$429,000	\$191,350	\$620,350	7
9	94	11	\$117,100	\$64,175	\$181,275	4
10	89	10	\$565,108	\$339,847	\$904,955	9
11	65	10	\$84,200	\$49,900	\$134,100	5
12	57	6	\$164,000	\$87,000	\$251,000	4
13	42	6	\$25,000	\$4,300	\$29,300	5
14	41	6	\$5,500	\$1,000	\$6,500	1
15	62	8	\$17,500	\$7,000	\$24,500	4
16	6	1	\$0	\$0	\$0	0
17	46	6	\$3,010	\$3,550	\$6,560	1
Total	2046	225	\$5,044,871	\$2,401,054	\$7,445,925	139

Structure fire events accounted for just one-half of one percent of the total incidents responded to by SPFD during this one-year period. Working structure fires are low probability events but generate high risk to life and property. Therefore, responding to these less predictable events in an expeditious fashion with sufficient resources is critical to effectively mitigating these incidents.

Total loss from fire approached or exceeded \$1.0M in District Council areas 1, 5, & 10. District Council 10 experienced 36 structure fire incidents, while District Council 6 had 24 incidents. The fewest structure fires causing greater than \$1,000 property damage were in District Council 16 with zero and then District Council areas 14 and 17 – one each. District Council 17 is the

downtown area where most of the structures are concrete office type buildings with fire protection systems that are less likely to experience a significant fire event. District Council areas 14 and 16 are affluent areas with high owner occupancy rates and median incomes that often correlate with low fire demand.

Structure fire events are time sensitive, so response times are an important aspect of effective incident mitigation to ensure life safety and limit property loss. Table 12 provides 90th percentile travel times to structure fire events for the first six units arriving on scene, which accounts for a first alarm that should arrive within 8 minutes 90 percent of the time. The max response time for first-in apparatus and the average response times for first arriving units is included, which accounts for not only travel time but the turn-out time following dispatch.

Travel times for the first-in unit were less than 4 minutes to 90 percent of structure fire events in all district council areas except areas 1, 6, 10 and 12. The average response times and 90th percentile travel times for District Councils 1, 6, and 12 were two standard deviations above the average time for the first arriving unit across the 17 districts. Each of these areas is served by stations that are somewhat more spread out, as these areas have lower population density.

District Council 6 is covered by Station 17, which has a dual-staffed medic unit. This unit is often covering medical calls in adjacent areas such as Station 7, which has no medic. Keeping the engine in Station 17 available more of the time would improve structure fire response times in District Council 6.

Table 12: 90th Percentile Travel times (Structure Fires)

District	90th Percentile Travel						Max- First Unit	1st Avg RespTime
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6		
1	0:05:44	0:09:27	0:08:48	0:07:55	0:08:46	0:11:39	0:08:53	0:05:16
2	0:03:19	0:05:19	0:05:15	0:05:07	0:07:24	0:11:02	0:08:34	0:04:11
3	0:02:42	0:03:43	0:05:19	0:05:24	0:06:02	0:07:22	0:05:20	0:03:42
4	0:02:57	0:04:40	0:03:52	0:04:38	0:05:15	0:07:13	0:05:11	0:03:17
5	0:02:51	0:04:37	0:04:37	0:05:40	0:05:13	0:06:55	0:05:45	0:03:12
6	0:05:31	0:05:00	0:05:37	0:05:42	0:08:45	0:07:21	0:10:37	0:04:47
7	0:03:37	0:04:40	0:04:18	0:06:16	0:05:31	0:07:39	0:04:56	0:03:39
8	0:02:49	0:03:03	0:03:11	0:03:32	0:04:28	0:04:58	0:05:37	0:03:14
9	0:03:47	0:03:44	0:05:32	0:05:36	0:06:29	0:07:00	0:05:42	0:03:57
10	0:04:48	0:05:30	0:06:30	0:05:56	0:08:35	0:06:54	0:07:42	0:04:11
11	0:03:42	0:03:56	0:03:28	0:04:57	0:07:18	0:08:33	0:07:49	0:04:17
12	0:05:58	0:06:14	0:08:05	0:07:59	0:08:41	0:09:49	0:07:31	0:05:00
13	0:03:15	0:03:04	0:06:16	0:05:48	0:03:59	0:07:17	0:13:23	0:05:02
14	0:03:07	0:03:52	0:03:09	0:04:42	0:06:15	0:10:49	0:04:59	0:03:55
15	0:03:40	0:04:56	0:04:49	0:07:10	0:06:16	0:06:36	0:05:52	0:04:29
16	0:01:29	0:03:21	0:02:41	0:04:08	0:04:03	0:00:00	0:02:53	0:02:53
17	0:01:54	0:02:48	0:02:33	0:03:33	0:04:10	0:03:59	0:04:51	0:03:17

Primary response boundaries around each station do not perfectly match District Council boundaries; however, it is possible to approximate the station areas with district council areas. When assessing travel and response times, it is valuable to also understand whether the primary fire unit responded as the first apparatus or if a unit from outside the area arrived first because the primary unit was on another call or unavailable.

For structure fires, the first-in unit is the primary response unit for that area about 70 percent of the time. For example, the first-in unit to all but one of the structure fires in District Council 12's area was Engine 23, which is the primary unit for that area. When the primary response unit is the first-in unit with an extended travel time, other factors such as traffic, weather conditions, or even station location may be the cause. It is also important to keep in mind that the low number of structure fire responses provides an opportunity for response times to be skewed by outliers.

As more reliable data becomes available using the district councils as study areas, any service gaps that may exist will become more evident.

Other Fires by District Council - "Other fires" are incidents coded 100 to 199, but does not include the "111" structure fires. Other fires include cooking fires without extension to the structure, chimney fires without extension, trash or rubbish fires, grass fires, vehicle fires, dumpster fires, etc. These are lower risk fire events but require rapid response and extinguishment to prevent extension or spread into a building or other area that may threaten life or property. Table 13 provides response, incident, and fire loss data for each of the district council areas caused by fires not considered structure fires.

Table 13: Other Fires by District Council

District	Fire Responses	Fire Incidents	Property Loss	Content Loss	Total Loss	Fires >\$1000 loss
1	484	94	\$9,762	\$200	\$9,962	2
2	503	107	\$28,549	\$800	\$29,349	6
3	148	45	\$5,600	\$0	\$5,600	3
4	258	63	\$75,700	\$2,000	\$77,700	10
5	484	140	\$75,374	\$15,600	\$90,974	14
6	389	83	\$56,300	\$9,500	\$65,800	10
7	306	69	\$14,410	\$1,500	\$15,910	4
8	360	84	\$25,618	\$0	\$25,618	4
9	102	26	\$8,500	\$400	\$8,900	2
10	204	44	\$22,300	\$1,000	\$23,300	2
11	169	43	\$17,280	\$325	\$17,605	3
12	123	26	\$10,400	\$1,000	\$11,400	1
13	287	69	\$38,898	\$1,400	\$40,298	6
14	132	29	\$0	\$0	\$0	0
15	285	64	\$3,800	\$0	\$3,800	1
16	56	15	\$600	\$500	\$1,100	0
17	435	96	\$11,200	\$0	\$11,200	3
Total	4,819	1,119	\$404,291	\$34,225	\$438,516	73

Other Fires tend to cause less property loss than structure fire events, which is why they are analyzed separately. District Councils 4, 5, & 6 suffered the largest losses due to other fires. These areas are the most disadvantaged, poverty-wise, of the 17 District Council areas.

The 90th percentile travel times for the first arriving unit are consistently between 4-5 minutes to all areas. Again, District Council 1 and 10 appear to have extended travel times for the first-in unit compared to many of the other district councils. In these districts, the times are just beyond one standard deviation above the average response times of the other districts. While not structure fires, a full first alarm assignment is arriving on scene 90 percent of the time within 8 minutes travel time to each of the 17 district council areas.

Table 14: 90th Percentile Travel Times for Other Fire Events

District	90th Percentile Travel						Max-First Unit	1st Avg RespTime
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6		
1	0:05:13	0:06:51	0:07:05	0:07:24	0:07:58	0:07:47	0:14:14	0:05:12
2	0:04:09	0:05:00	0:05:59	0:05:31	0:05:31	0:04:56	0:08:38	0:04:05
3	0:04:32	0:05:30	0:05:14	0:05:45	0:06:35	0:05:05	0:07:53	0:04:09
4	0:03:44	0:03:56	0:07:31	0:04:21	0:04:25	0:06:47	0:07:22	0:03:56
5	0:04:27	0:04:56	0:05:28	0:05:11	0:04:54	0:05:32	0:13:22	0:04:07
6	0:04:25	0:05:48	0:07:02	0:06:03	0:06:27	0:07:00	0:16:27	0:04:39
7	0:03:04	0:04:00	0:05:44	0:04:34	0:05:10	0:06:13	0:17:19	0:03:57
8	0:03:12	0:03:35	0:04:28	0:04:34	0:04:37	0:04:51	0:13:54	0:03:36
9	0:03:22	0:03:39	0:03:53	0:04:18	0:04:28	0:04:23	0:06:56	0:04:26
10	0:05:07	0:06:07	0:06:16	0:05:47	0:06:20	0:08:04	0:08:39	0:04:44
11	0:04:38	0:04:13	0:04:46	0:04:19	0:04:48	0:05:18	0:10:55	0:04:48
12	0:04:50	0:05:46	0:07:05	0:05:20	0:06:34	0:06:12	0:14:41	0:04:10
13	0:04:08	0:04:00	0:05:25	0:04:41	0:05:39	0:05:18	0:13:14	0:04:09
14	0:04:29	0:05:35	0:06:20	0:05:07	0:04:38	0:04:09	0:08:43	0:04:37
15	0:05:49	0:06:05	0:06:11	0:06:47	0:06:28	0:05:41	0:12:16	0:05:23
16	0:05:17	0:04:36	0:03:36	0:04:05	0:04:02	0:03:57	0:15:07	0:05:08
17	0:03:12	0:03:15	0:03:26	0:03:02	0:03:28	0:04:24	0:07:00	0:03:26

Hazardous Materials by District Council - Incidents assigned NFIRS codes in the 200s or 400s were considered hazardous materials. The 200 codes signify overpressure rupture, explosion, and overheat (no fire) but exclude steam mistaken as smoke type incidents. The 400 codes are for incidents involving a hazardous condition, such as radiation, electrical wiring or equipment problem, biological hazard, bomb removal, or other conditions deemed hazardous but not involving fire. Hazardous material events are similar to structure fires in that they are low probability, high risk events.

Hazardous material incidents are more common in industrial areas and along major transportation corridors, such as rail or interstate highways. Travel and response times, especially for specialty units, are often extended because of their proximity to the incidents. SPFD has two hazardous material units to respond citywide. Because of the infrequent nature of these events, it is not cost effective to operate more than two units in this size city. The number of hazardous material incidents is somewhat evenly dispersed across all 17 district councils with District 5

experiencing the most and District 16 the fewest. Response and travel times are consistent and sufficient for these events across the 17 district council areas.

Table 15: Hazardous Material events by District Council

Districts	HM Responses	HM Incidents	1st Avg RespTime	90th Percentile Travel						
				Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Max First in
1	139	61	0:05:36	0:06:01	0:04:56	0:06:37	0:06:34	0:08:10	0:07:50	0:19:25
2	198	60	0:04:45	0:05:20	0:04:40	0:07:07	0:06:56	0:08:09	0:07:05	0:10:04
3	135	49	0:05:08	0:06:10	0:04:31	0:05:34	0:06:27	0:07:00	0:09:40	0:14:39
4	205	66	0:03:42	0:03:28	0:03:29	0:02:57	0:03:46	0:04:42	0:07:10	0:07:23
5	324	104	0:04:30	0:04:57	0:04:13	0:05:07	0:04:48	0:06:33	0:07:05	0:10:30
6	120	66	0:06:03	0:06:53	0:05:42	0:06:01	0:05:38	0:06:48	0:05:48	0:16:18
7	166	55	0:04:18	0:04:48	0:03:29	0:04:57	0:04:46	0:06:10	0:07:00	0:10:15
8	248	69	0:03:56	0:04:03	0:03:27	0:04:13	0:04:30	0:05:16	0:06:28	0:09:04
9	246	61	0:04:28	0:03:51	0:04:22	0:04:58	0:04:55	0:06:00	0:06:37	0:10:14
10	187	57	0:05:50	0:07:15	0:05:47	0:07:10	0:07:23	0:07:33	0:09:56	0:13:45
11	100	42	0:04:58	0:05:22	0:03:37	0:04:02	0:04:28	0:05:48	0:04:23	0:10:49
12	66	22	0:04:45	0:04:35	0:06:41	0:06:54	0:05:51	0:06:44	0:07:37	0:09:29
13	209	72	0:04:29	0:05:08	0:03:52	0:04:52	0:05:14	0:05:52	0:07:13	0:12:56
14	187	57	0:04:45	0:05:42	0:05:01	0:05:43	0:06:23	0:06:33	0:07:09	0:11:26
15	207	68	0:06:09	0:07:19	0:07:29	0:07:06	0:08:00	0:08:29	0:08:18	0:12:57
16	48	21	0:04:57	0:04:38	0:05:26	0:03:29	0:04:35	0:04:33	0:06:52	0:09:34
17	221	41	0:03:34	0:03:13	0:03:08	0:03:29	0:03:28	0:04:16	0:04:51	0:07:00
Total	3,116	991								

Rescue and EMS by District Council - Incidents assigned NFIRS codes in the 300s are rescue and EMS related events. The number of rescue and EMS responses and incidents is artificially low because only the ImageTrend data contains the NFIRS codes to filter the specific incident types by district council area. The detailed EMS data or patient care reports (PCRs) are part of the Sansio data, which provides a detailed accounting of each medical response but is not coded using NFIRS terminology. Therefore, ImageTrend data was used for this analysis paired with the CAD data, so that each incident could be located by district council area and separated by incident type.

ImageTrend reports are generated for rescue and EMS incidents where an engine, squad, ladder, or other fire unit responds to assist the medic transport unit. Therefore, an ImageTrend report is not always completed for incidents involving only a medic unit or BLS ambulance response. EMS medical responses account for about 80% of the total incidents the SPFD responds to in any given year. In 2016, the department responded to roughly 36,000 medical emergencies. A more detailed account of the EMS system and responses is provided in a separate chapter.

Table 16 provides the 90 percent travel times for the first arriving six units to rescue events; however, most rescue incidents require fewer response assets than do working fire incidents. Therefore, most incidents deemed rescue or EMS are mitigated with one to four units and do not require a full fire alarm assignment.

Table 16: Rescue/EMS Responses by District Council

District	Resc. Resp.	Resc. Inc.	1st Avg RespTime	90th Percentile Travel						Max First in
				Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	
1	1216	486	0:05:25	0:06:37	0:08:36	0:07:11	0:13:07	0:13:33	0:00:31	0:14:27
2	2654	1198	0:04:44	0:04:48	0:05:35	0:05:06	0:05:09	0:05:11	0:11:33	0:18:34
3	879	358	0:04:54	0:05:29	0:06:35	0:06:06	0:05:04	0:07:50	0:09:40	0:17:46
4	2395	921	0:04:05	0:04:28	0:05:55	0:04:54	0:04:23	0:05:36	0:05:45	0:19:11
5	1659	714	0:04:20	0:04:35	0:05:26	0:04:23	0:04:06	0:07:21	0:07:56	0:18:37
6	1004	449	0:04:50	0:05:06	0:06:28	0:06:34	0:04:18	0:10:40	0:00:06	0:17:41
7	889	421	0:04:25	0:04:13	0:05:08	0:05:19	0:03:27	0:09:02	0:09:57	0:19:16
8	1291	601	0:04:24	0:04:08	0:05:25	0:04:45	0:05:13	0:03:58	0:04:41	0:18:24
9	953	402	0:04:36	0:04:32	0:05:41	0:05:45	0:07:36	0:05:41	0:03:55	0:10:39
10	953	446	0:05:36	0:05:39	0:08:00	0:06:00	0:05:35	0:05:33	0:03:27	0:13:40
11	759	344	0:04:55	0:05:00	0:06:18	0:05:41	0:03:29	0:00:00		0:11:53
12	1228	517	0:04:53	0:05:10	0:07:26	0:06:31	0:07:07	0:03:51	0:07:41	0:18:45
13	1872	787	0:04:36	0:05:06	0:06:59	0:06:15	0:05:35	0:07:03	0:09:36	0:17:40
14	302	139	0:05:07	0:05:53	0:06:19	0:06:30	0:03:59	0:06:08	0:04:38	0:11:44
15	629	281	0:06:23	0:07:04	0:09:14	0:07:46	0:07:57	0:02:50	0:00:00	0:14:14
16	232	106	0:04:04	0:03:57	0:05:04	0:03:46	0:05:16			0:08:02
17	2902	1317	0:03:59	0:03:30	0:04:00	0:04:33	0:04:32	0:05:38	0:06:24	0:19:59
Total	22,254	9,672								

Other Incident Types by District Council “Other” type incidents is in many ways a catch all for non-emergency calls. These incident types are assigned NFIRS codes in the 500s, 600s and 700s. The 500 series are for service calls that include water problems, smoke odor, animal problem or unauthorized burning. The 600 series is for good intent calls such as dispatched and cancelled enroute, wrong location, controlled burning, or vicinity alarm. Finally, the 700 series is for false alarms and false calls.

Table 17: Other responses by District Council

District	Other Resp.	Other Inc.	1st Avg RespTime	90th Percentile Travel						Max First in
				Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	
1	967	336	0:05:45	0:06:48	0:06:41	0:06:55	0:07:14	0:07:38	0:08:00	0:17:20
2	989	307	0:05:21	0:05:59	0:04:32	0:04:58	0:05:34	0:05:25	0:05:11	0:17:42
3	833	263	0:04:26	0:05:10	0:04:04	0:04:46	0:05:07	0:05:04	0:05:49	0:11:41
4	833	297	0:04:16	0:03:52	0:03:20	0:03:33	0:04:03	0:04:11	0:04:27	0:15:13
5	1523	480	0:04:34	0:04:36	0:04:12	0:04:11	0:04:32	0:04:45	0:04:38	0:19:44
6	1014	337	0:04:40	0:04:47	0:04:57	0:05:57	0:05:56	0:06:29	0:05:58	0:14:47
7	792	223	0:04:21	0:04:25	0:04:04	0:04:27	0:04:36	0:05:25	0:06:10	0:10:51
8	1005	306	0:04:34	0:04:15	0:03:36	0:03:58	0:04:28	0:04:44	0:04:58	0:17:46
9	997	319	0:04:54	0:04:37	0:04:07	0:04:45	0:04:26	0:05:06	0:04:55	0:16:31
10	639	234	0:06:15	0:06:43	0:05:40	0:05:48	0:06:29	0:07:08	0:06:56	0:13:36
11	593	203	0:05:14	0:05:02	0:04:13	0:05:09	0:04:55	0:05:04	0:06:10	0:11:48
12	699	164	0:04:42	0:05:27	0:05:59	0:06:11	0:06:34	0:07:30	0:07:25	0:15:26
13	1126	349	0:04:38	0:04:18	0:04:36	0:04:43	0:04:59	0:05:14	0:04:58	0:17:28
14	419	147	0:05:45	0:06:25	0:03:33	0:04:59	0:05:39	0:05:09	0:05:04	0:12:08
15	1024	372	0:06:44	0:06:55	0:05:13	0:05:48	0:06:21	0:05:59	0:05:19	0:14:37
16	275	72	0:04:56	0:04:55	0:04:06	0:04:10	0:04:05	0:04:27	0:03:56	0:10:58
17	1780	458	0:03:54	0:03:23	0:03:04	0:03:33	0:03:31	0:04:11	0:05:23	0:15:48
Total	16,097	4,990								

The majority of these incidents are not time sensitive and do not pose significant life hazard or potential for property loss. Therefore, travel and response times are less reliable to these types of incidents as units often respond routine traffic or quickly reduce their response to non-emergent after incident severity has been verified by the first arriving fire unit.

Comparison of District Councils - The 17 District Council neighborhood areas provide a unique opportunity for Saint Paul decision-makers to drive emergency service resource allocation decisions based on geographic, structural, and socioeconomic community variables that are associated with emergency service demand. Population density and service demand are clearly correlated, but density alone is just one factor that affects demand. Using population counts alone provides only limited information to guide decision-makers in allocating emergency resources efficiently and effectively. For example, an inner-city revitalization effort may spawn new high-density residential living opportunities. The new or refurbished residential structures are likely to replace older, dilapidated structures. Based on population measures, the emergency resources protecting this area would likely increase, while a decrease in emergency service demand related to fire risk is more likely because of the new construction and changing population characteristics.

A challenge for policy-makers is to allocate scarce emergency resources to their highest net present value. The goal of any emergency resource deployment strategy is to reduce the loss of life and property associated with fire, hazardous materials, rescue and medical events that afflict citizens. This requires emergency resources to be available and positioned to arrive in time to limit loss of life and/or property. Response time is a prevalent measure used in the emergency services industry to evaluate service delivery. Because of this, many communities make resource allocation decisions based solely on minimizing response times to all areas of a jurisdiction. This often leads to resources being equally located throughout a community, yet service demand for these resources is not dispersed evenly, creating resource allocation service demand mismatches. Because different areas within a community have varying degrees of risk for fire or other emergency events based on geographical, social, and structural characteristics, more effective and efficient locational decisions can be made by considering factors beyond response time and population density.

The scope of this analysis does not include true probability and correlation analysis of demographic, structural, and geographic variables for each district council area. The city is a dynamic community that continues to evolve with a myriad of development projects moving forward over the next decade that will not only influence the socio-economic make-up of the city but also significantly impact emergency service deployment strategies. For example, the light rail will continue to create new residential and retail growth along an extended corridor in center city that will displace older structures and change population dynamics. New high density residential growth in the Highland Park area such as redevelopment of the former Ford truck plant is likely to change service demand needs in that area.

Table 18 provides descriptive data about each of the 17 district council areas.

Table 18: District Council Demographic Data and Standard Scores

District Councils	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Mean	StdDev
Population Information																			
Total Population	22,011	28,000	15,358	16,013	31,121	22,848	15,504	18,296	11,324	16,022	12,435	8,196	17,773	18,838	24,724	6,839	7,756	17,356	6716
difference from mean	4,655	10,644	-1,998	657	13,765	5,492	-1,852	940	-6,032	-1,334	-4,921	-9,760	417	1,482	7,868	-10,517	-9,600		
Standard score	0.69	1.38	-0.30	0.10	2.05	0.82	-0.28	0.14	-0.28	-0.20	-0.73	-1.36	0.06	0.22	1.10	-1.56	-1.43		
Square Miles	9.60	4.70	2.80	4.30	4.30	1.70	1.80	2.80	3.30	1.90	2.40	3.00	2.50	2.50	6.10	0.96	1.00	3	2
Pop/SqMile	2,293	7,129	3,268	6,433	7,237	6,528	9,120	10,164	4,044	4,855	5,924	3,415	5,924	7,335	4,053	7,124	7,756	6087	2089
difference from mean	-3,794	1,093	-2,819	346	1,151	441	3,033	4,078	-2,042	-1,232	458	-2,672	-1,62	1,448	-2,034	1,037	1,669		
Standard score	-1.82	0.52	-1.35	0.17	0.55	0.21	1.45	1.95	-0.98	-0.59	0.22	-1.28	-0.08	0.69	-0.97	0.50	0.80		
Race/Ethnicity																			
White, not Hispanic	8,804	11,636	6,887	6,543	10,992	9,792	3,244	8,867	8,542	12,680	8,855	6,042	13,888	16,338	18,773	5,799	5,671	9597	3964
difference from mean	-793	2,039	-2,910	-3,054	1,395	195	-6,353	-730	-1,055	3,083	-742	-3,555	4,291	6,741	9,176	-3,798	-3,926		
Standard score	-0.20	0.51	-0.73	-0.77	0.35	0.05	-1.60	-0.18	-0.27	0.78	-0.19	-0.90	1.08	1.70	2.31	-0.96	-0.99		
Of Color	13,207	16,683	8,671	11,471	20,129	16,056	12,260	9,429	2,782	3,342	3,580	2,154	3,885	2,500	5,952	1,041	2,094	7955	5864
difference from mean	5,252	8,728	716	3,516	12,114	8,101	4,305	1,474	-5,173	-4,613	-4,375	-5,801	-4,070	-5,455	-2,003	-6,914	-5,861		
Standard score	0.90	1.49	0.12	0.60	2.08	1.38	0.73	0.25	-0.88	-0.79	-0.75	-0.99	-0.69	-0.93	-0.34	-1.38	-1.00		
African American	5,036	4,078	2,230	2,515	3,884	5,148	4,403	6,253	935	1,206	1,740	588	1,773	517	3,119	298	852	2622	1817
American Indian/Alaska	215						238											227	12
Asian/Pacific Islander	4,311	7,419	1,046	5,777	10,424	7,612	5,585	1,322	381	474	597	963	591	622	669	155	705	2862	3179
Other Race																			
Two or more Races	1,181	1,159	542	838	2,040	473	819	682	469	528	443	223	408	530	802	147	244	678	444
Hispanic/Latino Total	2,481	3,859	4,535	2,210	3,422	2,590	1,205	997	943	1,002	742	299	1,065	785	1,291	427	265	1654	1262
Household Income																			
Total Households	7,896	9,562	5,415	5,707	9,574	7,718	4,750	7,652	5,219	6,911	4,767	3,486	7,019	7,888	10,987	3,358	5,116	6647	2115
less than \$35,000	2,672	3,940	2,182	2,593	4,143	4,099	2,483	3,311	1,734	1,721	1,795	1,315	2,440	1,833	2,783	806	2,593	2493	922
\$35,000 to \$49,999	1,385	1,515	814	689	1,359	1,170	617	972	1,170	932	1,387	907	430	1,207	1,380	841	655	894	328
\$50,000 to \$74,999	1,685	1,754	1,009	1,065	1,745	1,174	686	1,194	932	1,387	907	430	1,207	1,380	1,810	594	670	1155	417
\$75,000 to \$99,999	1,084	1,325	573	698	1,140	675	429	802	707	965	656	385	739	873	1,616	365	445	793	335
\$100,000 or more	1,071	1,028	837	663	1,186	660	535	1,353	1,007	2,046	887	881	1,750	2,961	3,508	1,199	753	1313	800
Median House Income	\$49,964	\$43,630	\$43,537	\$40,145	\$43,229	\$32,339	\$35,126	\$47,306	\$51,990	\$67,600	\$50,750	\$55,000	\$53,710	\$73,462	\$70,740	\$76,760	\$34,059	\$51,191	\$13,406
difference from mean	-\$1,227	-\$7,561	-\$7,654	-\$11,046	-\$7,962	-\$18,852	-\$16,065	-\$3,885	\$7,999	\$16,400	-\$441	\$4,709	\$2,519	\$72,271	\$10,553	\$25,569	-\$17,132		
Standard score	-0.09	-0.56	-0.57	-0.82	-0.59	-1.41	-1.20	-0.29	0.06	1.22	-0.03	0.35	0.19	1.66	1.46	1.91	-1.28		
Income below poverty	3608	7106	4828	5655	9087	8091	5459	4842	1339	2049	2036	1593	3057	1480	2148	1591	1636	3767	2498
Population w/o Health Ins.	2270	3943	1944	2720	4233	3341	2428	1600	1048	874	1166	642	1451	703	1549	429	643	1823	1142
Housing Information																			
Vacant Housing Units	394	659	387	543	1029	520	547	371	459	350	163	199	333	348	576	156	335	433	204
Occupied Housing Units	7893	9562	5415	5709	9576	7716	4721	7630	5236	6911	4770	3472	7039	7879	10588	3337	5024	6640	2123
Owner-Occupied	3992	5414	3038	2912	4823	3010	1771	2591	2467	4238	2799	1311	3249	3277	6045	1710	1046	3277	1441
difference from mean	715	2137	-239	-365	1546	-267	-1506	-686	-810	981	-478	-1966	-28	2000	2768	-1567	-2231		
Standard score	0.50	1.48	-0.17	-0.25	1.07	-0.19	-1.05	-0.48	-0.56	0.68	-0.33	-1.36	-0.02	1.39	1.92	-1.09	-1.55		
Renter Occupied	3901	4147	2377	2797	4753	4706	2950	5039	2769	2633	1972	2161	3789	2802	4943	1637	3978	3363	1079
difference from mean	538	784	-986	-566	1390	1343	-413	1676	-594	-710	-1391	-1202	426	-761	1580	-1736	615		
Standard score	0.50	0.73	-0.91	-0.52	1.29	1.24	-0.38	1.55	-0.55	-0.66	-1.29	-1.11	0.40	-0.70	1.46	-1.61	0.57		
Year Built																			
2000 or later	342	547	181	441	438	560	248	671	1034	212	63	604	642	228	1070	46	447	457	287
1970-1999	3573	2442	845	766	1889	2277	961	1477	1270	1876	699	762	696	767	2500	257	2163	1484	866
1940-1969	3691	5792	1763	1561	2909	2800	1032	1356	806	2643	778	654	1413	1849	4589	459	721	2048	1465
1939 or earlier	538	1218	499	323	752	539	256	363	186	923	241	235	405	742	1177	124	138	509	335
Housing by Type																			
Total Housing Units	8251	10345	5957	6597	10901	8259	5354	8102	5685	7403	5040	3634	7522	8361	11670	3548	5360	7176	2798
Owned Single-Family	3962	5817	2718	2607	4755	2853	1638	1642	2113	4226	2603	1035	2912	5279	5419	1067	12	2986	1643
Rental Single-Family	453	919	516	782	1288	857	655	374	375	380	366	112	403	420	373	79	3	491	316
Duplex/Triplex	383	507	969	1340	2046	778	1190	1181	1081	617	361	819	1028	583	332	386	2	755	484
Owned Multi-Fam(Condos)	241	160	144	144	99	262	242	1081	457	130	18	344	160	303	484	440	156	363	360
Rent Multi-Fam(Townhomes)	54	58	87	69	82	64	47	507	345	24	11	98	33	48	130	119	576	138	164
Rent Unit Apartment Build	3154	2880	1493	1632	2557	3278	1565	3268	1715	2277	1212	1652	2951	1713	4802	1452	3303	2408	945
Mobile Home	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown	4	4	30	23	34	67	17	49	67	5	11	75	35	15	130	5	8	34	33

SPFD • Delivery of Services Analysis

Housing Assessed Value	4415	6736	3734	3389	6043	3810	2293	2016	2488	4606	2969	1147	3315	5699	5792	1146	15	3477	1839
Total Single Family Units	3722	6701	2842	3338	5866	3668	2272	1207	2264	2755	2702	221	1006	1005	1175	65	4	2401	1846
Less than \$200,000	466	30	267	33	105	109	12	166	161	1236	235	220	668	1473	1344	142	2	392	474
\$200,000 to \$249,000	127	3	66	10	38	26	8	143	32	406	22	201	542	1173	948	116	3	227	339
\$250,000 to \$299,999	100	2	59	8	34	7	1	500	31	209	10	505	1099	2048	2325	823	6	457	707
\$300,000 or more	\$850	\$787	\$736	\$864	\$821	\$761	\$743	\$736	\$936	\$911	\$772	\$918	\$788	\$897	\$866	\$907	\$931	\$838	\$71
Median Rent Payment																			
Education																			
Population 25 or older	13973	16104	9222	10504	17505	12457	5423	11563	8221	11067	7604	5230	10961	11678	17655	4894	6510	10593	3926,70
Less than HS	1772	3181	1811	2342	4671	3210	2387	1378	634	492	529	201	665	232	653	119	356	1449	1285
difference from mean	323	1732	362	893	3222	1761	938	-71	-815	-957	-920	-1248	-784	-1217	-796	-1330	-1093		
Standard score	0.25	1.35	0.28	0.69	2.51	1.37	0.73	-0.06	-0.63	-0.74	-0.72	-0.97	-0.61	-0.95	-0.62	-1.03	-0.85		
HS or GED	4103	4563	2577	2822	4357	3753	1981	2146	2125	1859	1662	507	1456	957	2424	477	1065	2287	1245
Some college/Associates	4104	5115	2396	3223	4947	3380	2462	2798	2502	2643	2083	997	2228	2240	4100	886	1612	2807	1182
Bachelors	2238	2350	1591	1506	2446	1570	1139	3075	1669	3353	1926	1550	3489	4458	5823	1685	2267	2479	1192
Grad or Prof Degree	1154	895	847	611	1084	544	485	2167	1292	10574	7075	5029	10296	11445	17012	4775	6254	9320	3160
HS Grad or higher	11600	12923	7411	8162	12834	9247	6036	10185	7387	10574	7075	5029	10296	11445	17012	4775	6254	9320	3160
difference from mean	2280	3603	-1909	-1158	3514	-73	-3284	865	-1733	1254	-2245	-4291	976	2125	7692	-4545	-3066		
Standard score	0.72	1.14	-0.60	-0.37	1.11	-0.02	-1.04	0.27	-0.55	0.40	-0.71	-1.36	0.31	0.67	2.43	-1.44	-0.97		
Bachelors or higher	3393	3245	5821	2117	3529	2114	1624	5241	2961	6072	3329	3525	6572	8248	10488	3411	3577	4427	2288
Worker Earnings																			
\$15,000 or less	2059	2520	1311	1680	2819	1972	1480	1739	1047	1305	1085	553	1406	1182	1980	582	619	1491	628
\$15,001 to \$39,999	3576	4828	2175	2918	4971	3842	2551	2488	1847	2210	1778	902	2139	1715	3275	914	965	2535	1202
\$40,000 or more	3726	4161	2335	2074	3897	2488	1362	3090	2537	4524	2472	1734	4078	5030	6858	2063	1928	3197	1391
difference from mean	528	964	-862	-1123	700	-709	-1835	-107	-660	1327	-725	-1463	881	1833	9661	-1134	-1269		
Standard score	0.38	0.69	-0.62	-0.81	0.50	-0.51	-1.32	-0.08	-0.47	0.95	-0.52	-1.05	0.63	1.32	2.63	-0.82	-0.91		

Source: <http://www.micromaps.org/profiles/neighborhoods/rmneapolis-saint-paul/community-areas>

Table 18 provides the detailed demographic data from the Saint Paul Neighborhood Profile website by District Council area. For many of the descriptive variables the difference from mean and a standard score are calculated to better compare across district councils. The difference from mean provides the distance each district council measure is from the overall average across all district councils. For example, the average population across the 17 district councils is 17,356 based on 2015 information. District Council 1 has a population of 22,011, so its difference from mean is 4,655 more people than the average across the 17 districts.

The second calculation, standard score, uses the standard deviation of each metric across the 17 district councils to show how far from average based on a standardized metric. Again, District Council 1 has a population standard score of 0.69. This means that District Council 1's population is 0.69 standard deviations from the average population across all district council areas. The standard score provides a way to reliably compare measures between districts. District Council 16 has a population standard score of -1.56, which can be interpreted to indicate that District 16's population count is almost three times less than that of District 1.

Standard scores were also calculated for emergency service demand and response variables for each District Council, as a way to compare "apples-to-apples." The average total number of emergency service incidents across the district council areas was 2,635 for the 12-month period spanning April 2016 through March 2017. District 17 had the highest service demand with 5,858 incidents, which is 3,223 incidents more than average or 2.55 standard deviations above the average of the other districts.

The second highest total demand was in District Council 5 with 4,558 incidents or 1,923 above average (1.52 standard deviations above average). Both District's 5 and 17 are somewhat distressed based on median household income and education metrics, which measured below average compared to the other district council areas. However, response times to fire and EMS incidents in these areas measured at the 90th percentile are at least one standard deviation faster compared to the other districts with the exception of structure fire responses that are roughly half a standard deviation better. This translates to about a minute better response time than average to both fire and EMS incidents in these two districts compared to the others (Table 20 and Table 21).

District Council areas 16, 14, and 12 had the lowest total service demand with District 16 having 620 (-1.6 standard deviations below average) incidents and District 14 having 976 incidents (-1.31 standard deviations below average). District's 14 and 16, but 12 as well, measure well above average in median household income and education variables. Response measures for District 16 are some of the shortest for fire and EMS incidents, as this is a relatively small district with low demand and Fire Station 10 located within its boundaries. Response times to structure fire events in District 14 measure below the average compared to the other districts measured at the 90th percentile; however, response times to EMS incidents for both District's 12 and 14 are above average with District 12 experiencing some of the slowest response times in the city. District 12 is the far northwest part of the city. Station 23 is the closest station to this area.

Response times to 90% of incidents in this part of the city are about two minutes longer than average.

Table 19: Total Incidents across the District Councils with Standard Scores

District Council	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Average	Stddev
Total Incidents	2609	3048	2334	3190	4558	3019	2386	3595	2384	1746	1531	1139	3079	976	2726	620	5858	2635	1263
difference from mean	-26	413	-301	555	1923	384	-249	960	-251	-889	-1104	-1496	444	-1659	91	-2015	3223		
Standard score	-0.02	0.33	-0.24	0.44	1.52	0.30	-0.20	0.76	-0.20	-0.70	-0.87	-1.18	0.35	-1.31	0.07	-1.60	2.55		

Fire and EMS related service demand are dispersed somewhat differently across the city and impact how resources can be most efficiently allocated. As mentioned above, fire incidents account for about 20% of all incidents with structure fires being less than 1% of incidents. However, structure fires present high life hazard and property loss potential so are important to isolate for analysis.

Structure Fires – Between April 2016 and March 2017, the SPFD responded to 221 structure fire incidents located within the city limits. The average structure fire incidents per district was 13. District Council areas 5, 6, and 1 experienced the most structure fires with Districts 16, 12, 13, 14, and 17 experiencing the fewest. The number of structure fires by district ranged from 1 to 36 over this 12-month time-period.

Dollar loss from structure fire events ranged from \$1,487,200 in District 1 to \$0 in District 16 with \$437,996 the average loss across all districts. The dollar loss variation across the districts is significant, as one large fire incident can skew the overall fire loss statistics with so few incidents. District Council 1 experienced 21 structure fire events with fire loss \$1,049,200 over the average loss, which was 2.41 standard deviations above average. District 5 had 36 structure fire with \$1,225,395 in total loss or 1.81 standard deviations above average. District 10 also had fire loss greater than one standard deviation from average that totaled \$904,955 from 10 structure fire incidents. District 16, 17 and 14 had the lowest fire loss and the fewest fire incidents.

The average 90th percentile response time to structure fire events for the first arriving unit was 5 minutes 37 seconds. 90th percentile responses ranged from 2 minutes 53 seconds in District 16 to 9 minutes 7 seconds in District 13. Both of these areas had relatively few fires. District Council 1 had 21 structure fires sustaining the highest fire dollar loss with a 90th percentile response time of the first-in unit at 8 minutes 15 seconds. While this 90th percentile response time is the second longest among the 17 district council areas, it is only 2 minute 38 seconds above average in the largest district by square mileage that has the fifth highest population count. District 6 had 24 structure fire incidents with a 90th percentile response for the first-in unit of 7 minutes 20 seconds or 1 minute 43 seconds above the average. Districts 16 and 17 experienced the shortest response times, which makes sense with the higher density of these areas and low number of structure fire incidents.

Table 20: Structure Fire Incident Response Times and Standard Scores

District Council	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Average	Stddev
Structure Fire Incidents	21	17	14	17	36	24	14	14	11	10	10	6	6	6	8	1	6	13	8.17
difference from mean	8	4	1	4	23	11	1	1	-2	-3	-3	-7	-7	-7	-5	-12	-7		
standard score	0.98	0.49	0.12	0.49	2.81	1.35	0.12	0.12	-0.24	-0.37	-0.37	-0.86	-0.86	-0.86	-0.61	-1.47	-0.86		
Total Fire Loss	\$1,487,200	\$505,225	\$500,750	\$288,477	\$1,225,395	\$784,788	\$495,550	\$620,350	\$181,275	\$904,955	\$134,100	\$251,000	\$29,300	\$6,500	\$24,500	\$0	\$6,560	\$437,996	\$435,345
difference from mean	\$1,049,204	\$67,229	\$62,754	-\$149,519	\$787,399	\$346,792	\$57,554	\$182,354	-\$256,721	\$466,959	-\$303,896	-\$186,996	-\$408,696	-\$431,496	-\$413,496	-\$437,996	-\$431,436		
Standard score	2.41	0.15	0.14	-0.34	1.81	0.80	0.13	0.42	-0.59	1.07	-0.70	-0.43	-0.94	-0.99	-0.95	-1.01	-0.99		
Fire (111) 1st 90th Resp	0:08:15	0:04:47	0:04:50	0:04:54	0:04:46	0:07:20	0:04:52	0:04:23	0:05:32	0:06:19	0:05:22	0:07:30	0:09:07	0:04:49	0:05:28	0:02:53	0:04:15	0:05:37	0:01:33
difference from mean	0:02:38	-0:00:50	-0:00:47	-0:00:43	-0:00:51	0:01:43	-0:00:45	-0:01:13	-0:00:05	0:00:43	-0:00:14	0:01:54	0:03:30	-0:00:48	-0:00:08	-0:02:44	-0:01:22		
Standard score	1.70	-0.54	-0.50	-0.46	-0.54	1.11	-0.48	-0.79	-0.05	0.46	-0.15	1.22	2.26	-0.52	-0.09	-1.76	-0.88		
Avg. Fire (111) Response (1st in)	0:05:16	0:04:11	0:03:42	0:03:17	0:03:12	0:04:47	0:03:39	0:03:14	0:03:57	0:04:11	0:04:17	0:05:00	0:05:02	0:03:55	0:04:29	0:02:53	0:03:17	0:04:01	0:00:42
difference from mean	0:01:14	0:00:10	-0:00:19	-0:00:45	-0:00:49	0:00:46	-0:00:22	-0:00:47	-0:00:04	0:00:10	0:00:16	0:00:59	0:01:01	-0:00:06	0:00:28	-0:01:08	-0:00:44		
Standard score	1.77	0.23	-0.45	-1.06	-1.17	1.09	-0.51	-1.12	-0.09	0.25	0.38	1.40	1.44	-0.15	0.66	-1.62	-1.05		
Avg. Other Fire Response (1st in)	0:05:12	0:04:05	0:04:09	0:03:56	0:04:07	0:04:39	0:03:57	0:03:36	0:04:26	0:04:44	0:04:48	0:04:10	0:04:09	0:04:37	0:05:23	0:05:08	0:03:26	0:04:23	0:00:32
difference from mean	0:00:49	-0:00:18	-0:00:14	-0:00:27	-0:00:16	0:00:16	-0:00:26	-0:00:47	0:00:03	0:00:21	0:00:25	-0:00:13	-0:00:14	0:00:14	0:01:00	0:00:45	-0:00:57		
Standard score	1.53	-0.57	-0.43	-0.83	-0.51	0.48	-0.82	-1.47	0.10	0.66	0.78	-0.39	-0.45	0.43	1.86	1.40	-1.77		

Included in Table 20 is the average response time for the first-in unit to structure fires. While all fire events can pose a threat to life and cause property damage, other type fires are often not the primary focus when analyzing fire events. The average response time to these events across the districts is 4 minutes 23 seconds with the average range spanning from 3 minutes 26 seconds in District 17 to 5 minutes 17 seconds in District 1.

EMS Response – The total number of EMS incidents were also analyzed across the District Council areas. The average number of EMS incidents from April 2016 to March 2017 is 2,024. District Councils 5 and 17 experienced the highest EMS demand with Districts 12, 14, and 16 having the lowest. District 5 had 3,686 EMS incidents which was 1,662 more than the average, while District 17 had 3,612 or 1,588 more than the average. District Councils 17, 7, 16, 5, and 8 had the shortest response times for the first-in medic unit measured at the 90th percentile. The District 17 90th percentile response time was 6 minutes 26 seconds or 1 minute 15 seconds faster than the average across the 17 districts. District Councils 10 and 12 experienced the longest response times at the 90th percentile with the District 12 response time of 9 minutes 50 seconds or 2 minutes 9 seconds above the average 90th percentile response times across all districts.

Average response times for the first-in medic unit by District Council area were included in Table 21. Averages are useful to compare where larger number of incidents are included to help limit the impact of outlier response times. The average response times tend to validate the 90th percentile calculations across the 17 district council areas.

Table 21: EMS Response Time Measures and Standard Scores

District Council	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Average	Stddev
Total EMS Incidents	2062	2519	1898	2680	3686	2487	1925	2888	1807	1346	1135	860	2354	628	2114	404	3612	2024	917
difference from mean	38	495	-126	656	1662	463	-99	864	-217	-678	-889	-1164	330	-1396	90	-1620	1588		
Standard score	0.04	0.54	-0.14	0.72	1.81	0.51	-0.11	0.94	-0.24	-0.74	-0.97	-1.27	0.36	-1.52	0.10	-1.77	1.73		
EMS Medic Response (90th)	0:08:57	0:07:48	0:07:34	0:07:22	0:06:39	0:07:24	0:06:37	0:06:45	0:07:07	0:08:29	0:07:45	0:09:50	0:08:30	0:08:20	0:08:21	0:06:38	0:06:26	0:07:41	0:00:56
difference from mean	0:01:16	0:00:07	-0:00:07	-0:00:19	-0:01:02	-0:00:17	-0:01:04	-0:00:56	-0:00:34	0:00:48	0:00:04	0:02:09	0:00:49	0:00:39	0:00:40	-0:01:03	-0:01:15		
Standard score	1.37	0.13	-0.12	-0.34	-1.11	-0.30	-1.14	-1.00	-0.60	0.87	0.08	2.32	0.88	0.70	0.72	-1.12	-1.34		
EMS Avg. Medic Response	0:05:43	0:05:27	0:05:07	0:05:24	0:04:41	0:05:14	0:04:51	0:04:54	0:04:50	0:06:07	0:05:47	0:06:22	0:05:45	0:05:46	0:05:51	0:04:57	0:04:35	0:05:22	0:00:31
difference from mean	0:00:21	0:00:04	-0:00:16	0:00:02	-0:00:41	-0:00:09	-0:00:31	-0:00:28	-0:00:32	0:00:44	0:00:24	0:01:00	0:00:23	0:00:24	0:00:29	-0:00:25	-0:00:48		
Standard score	0.67	0.14	-0.51	0.05	-1.33	-0.28	-1.02	-0.91	-1.04	1.43	0.78	1.94	0.74	0.76	0.93	-0.82	-1.55		
Cardiac Arrest - Total Incidents	18	18	11	18	21	13	10	14	12	7	9	1	14	4	12	3	20	12	6
90th Response to CPR	0:10:00	0:06:57	0:08:18	0:07:12	0:06:23	0:05:36	0:04:30	0:05:34	0:05:56	0:05:41	0:07:23	0:06:56	0:08:39	0:07:55	0:07:20	0:07:55	0:04:54	0:06:53	0:01:24
difference from mean	0:03:07	0:00:03	0:01:25	0:00:19	-0:00:30	-0:01:18	-0:02:24	-0:01:20	-0:00:57	-0:01:12	0:00:29	0:00:03	0:01:46	0:01:01	0:00:27	0:01:02	-0:01:59		
Standard score	2.23	0.04	1.01	0.22	-0.36	-0.93	-1.72	-0.95	-0.68	-0.86	0.35	0.03	1.26	0.73	0.32	0.74	-1.42		

In addition to analyzing total incidents and responses, cardiac arrest incidents were evaluated independently. Cardiac arrest incidents, like structure fire events, are relatively low frequency in number but present significant life hazard. A person in cardiac arrest is not breathing and does not have a pulse. These patients need definitive care in the form of CPR and defibrillation within 10 minutes of the onset to have a statistical chance of survival. While many factors that contribute to cardiac arrest survivability are beyond the control of EMS personnel, these events are time sensitive to provide the patient the best chance for survival.

SPFD responded to 205 cardiac arrest medical incidents between April 2016 and March 2017 with an average 90th percentile response time across the 17 district council areas of 6 minutes and 53 seconds. The fastest response times at the 90th percentile to cardiac arrest events were in Districts 7 and 17. District 7 had a 90th percentile response of 4 minutes 30 seconds to 10 incidents and District 17 was 4 minutes and 54 seconds to 20 cardiac arrest incidents. District 1's 90th percentile response time was 10 minutes to 18 cardiac arrest events, which was 3 minutes 7 seconds slower than the average. District 3 and 13 also experienced response times more than one standard deviation slower than the average 90th percentile response times to cardiac arrest incidents.

Data Analysis Conclusions

Service delivery across the 17 district council areas based on fire and EMS demand is fairly consistent and significant gaps in service to areas of the city do not exist. This is not to say that there are not places to monitor and potentially shore up with additional resources or deployment of current resources differently.

Fire and medical response are inevitably connected due to the dual-staffed engine/medic unit model and the way Super-Medics are deployed and used. Dual-staffed units provide efficiencies

and it is effective strategy for some areas, as the low frequency of structure fires and quick turn-around times for EMS units delivering patients to a medical facility keep response times generally good. The downside is that high medical demand coupled with fire calls and other fire unit responses is a drain on responders, especially paramedics. Personnel and decision-makers recognize that as EMS call volume increases the dual-staffing concept is becoming more problematic. Increased medical calls will mean that fire units (mostly engines) will be out-of-service for longer periods of time, thus response times will get longer.

The city does have a sufficient number of suppression resources and fires will continue to be low, as compared to medical calls. Medical calls will continue to increase SPFD needs to prepare for it. Some engine/ medic units are already responding to a large number of calls in other districts which, because of AVL is understandable.

As to District Council areas, Payne-Phalen (5) and North End (6) are areas to monitor, as these districts have large populations, generate significant service demand, and based on economic, education, and structural measures are somewhat distressed compared to other parts of the city. District 6, which is served by Station 17, is likely to experience even longer response times if changes are not made. The good news is the addition of Medic 5, which improved response and reduced some of the workload of Medic 8 in District 17.

District 5 experienced 36 structure fire incidents, which was the most of all districts. Only Engine/Medic 17, which is a dual staffed unit, are housed at Station 17. Station 17 is an outlying station, so as the volume of EMS responses continues to increase the area will become more exposed. During the most current 12-month period Medic 17 responded to 3,060 incidents while Engine 17 responded to 622. Well over half of Medic 17's responses were into adjacent areas. Station 7's area has high EMS demand and currently does not house a medic unit. A medic unit at Station 7, or staffing adjacent units as Super-Medics is an option moving forward.

Other problem areas to watch are Districts 10, 12, and 13. District 13 (Union Park) is the more imminent, as response times to medical calls and fire incidents are longer compared to the other districts and its service demand is above average. District 13 presents some response challenges, because its primary fire station, Station 20, does not have a medic unit. Medic 14, which is dual-staffed and Super-Medic 23 respond regularly into District 13 on medical calls. Districts 10 and 12, which are covered by Super-Medics 23 are also at risk for longer response times, due in part to the automatic-aid agreement with Falcon Heights and the absence of a medic unit at Station 20.

Analysis of District Council areas and the response times determined that services are delivered equitably. In fact, areas with the highest population of disadvantaged citizens often get a slightly faster response. In all Districts, response times for medical calls are slightly higher than for fires. This is because there are fewer medical response units, and there are multiple fire units in most stations. There are also many more medical incidents and calls often overlap, thus medic calls often have longer travel distances.