Groton Fire Department Staffing Options

Committee Charge

B. Committee Charge

More specifically the Task Force:

1. Engage the Community in establishing a desired level of service.

2. Compare performance and recommendations of current services provided to National Fire Protection Association (NFPA), Occupational Safety and Health Administration (OSHA) and Insurance Service Organization (ISO) standards.

3. Analyze benefits (including potential for future regionalization options) and disadvantages, cost impacts and anticipated times for implementation for each alternative identified.

4. Alternatives shall include, at a minimum:

    a) Maintenance of the status quo for staffing with existing compensation structure projected forward and with any recommended compensation structure and level changes.
    b) Addition of On-Call staff for basic 24-hour coverage of Fire and EMS with retention and growth mechanisms for on-call staff.
    c) Addition of non-call-based staff to ensure basic 24-hour coverage.

5. If the study shows that additional staffing is required, determine the additional, full-loaded, annual costs required and define, as qualitatively as possible, the added benefits that will accrue to the citizens of Groton.

GFD Staffing

		Current Staffing		Future Staffing		Original Proposal	
		Mon-Fri	Sat-Sun	Mon-Fri	Sat-Sun	Mon-Fri	Sat-Sun
0:00	1:00	0	0	0	0	2	2
1:00	2:00	0	0	0	0	2	2
2:00	3:00	0	0	0	0	2	2
3:00	4:00	0	0	0	0	2	2
4:00	5:00	0	0	0	0	2	2
5:00	6:00	0	0	0	0	2	2
6:00	7:00	2	2	2	2	2	2
7:00	8:00	2	2	2	2	2	2
8:00	9:00	4	2	5	3	4	2
9:00	10:00	4	2	5	3	4	2
10:00	11:00	4	2	5	3	4	2
11:00	12:00	4	2	5	3	4	2
12:00	13:00	4	2	5	3	4	2
13:00	14:00	4	2	5	3	4	2
14:00	15:00	4	2	5	3	4	2
15:00	16:00	4	2	5	3	4	2
16:00	17:00	2	2	3	3	2	2
17:00	18:00	2	2	3	3	2	2
18:00	19:00	0	0	1	1	2	2
19:00	20:00	0	0	1	1	2	2
20:00	21:00	0	0	0	0	2	2
21:00	22:00	0	0	0	0	2	2
22:00	23:00	0	0	0	0	2	2
23:00	0:00	0	0	0	0	2	2

248 Hours	332 Hours	416 Hours

Current: 5 career firefighters

- 2 from 6AM-6PM, Mon-Fri, Sat, Sun
- 2 from from 8AM-4PM, Mon-Fri

Future: 7 career firefighters

- 2 from 6AM-6PM, Mon-Fri, Sat-Sun
- 2 from from 8AM-4PM, Mon-Fri
- 1 additional from 8AM-8PM, Mon-Fri, Sat-Sun (84 hours/week additional career)

Original Proposal: 9 career firefighters

- 2 from 6AM-6PM, Mon-Fri, Sat-Sun
- 2 from from 8AM-4PM, Mon-Fri
- 2 additional 6PM-6AM, Mon-Fri, Sat-Sun (168 hours/week additional career)

Call distribution and Response Times

Call Distribution by Hour

		Sunday	Monday	Tuesday	Wed.	Thursday	Friday	Saturday	Grand Total
0:00	1:00	0.23%	0.12%	0.29%	0.23%	0.26%	0.20%	0.32%	1.6%
1:00	2:00	0.20%	0.43%	0.20%	0.37%	0.29%	0.17%	0.12%	1.8%
2:00	3:00	0.43%	0.17%	0.29%	0.12%	0.14%	0.29%	0.23%	1.7%
3:00	4:00	0.29%	0.20%	0.32%	0.09%	0.14%	0.26%	0.29%	1.6%
4:00	5:00	0.35%	0.12%	0.29%	0.20%	0.17%	0.29%	0.03%	1.4%
5:00	6:00	0.14%	0.35%	0.14%	0.17%	0.23%	0.14%	0.20%	1.4%
6:00	7:00	0.23%	0.37%	0.43%	0.37%	0.29%	0.23%	0.17%	2.1%
7:00	8:00	0.49%	0.46%	0.61%	0.81%	0.52%	0.63%	0.49%	4.0%
8:00	9:00	0.78%	0.84%	0.95%	0.98%	0.87%	0.92%	0.61%	5.9%
9:00	10:00	0.69%	0.95%	0.95%	0.84%	1.04%	0.95%	0.75%	6.2%
10:00	11:00	0.61%	1.04%	1.10%	0.78%	1.18%	1.10%	0.89%	6.7%
11:00	12:00	0.81%	0.95%	1.24%	1.01%	0.78%	1.27%	0.66%	6.7%
12:00	13:00	0.92%	0.89%	1.01%	0.81%	0.89%	0.78%	0.78%	6.1%
13:00	14:00	1.01%	1.01%	0.92%	0.89%	0.75%	1.01%	0.69%	6.3%
14:00	15:00	0.81%	1.07%	0.92%	0.66%	1.36%	0.87%	0.75%	6.4%
15:00	16:00	0.78%	0.92%	1.04%	0.84%	1.24%	0.92%	0.52%	6.3%
16:00	17:00	0.84%	1.15%	0.92%	0.87%	0.98%	1.07%	0.87%	6.7%
17:00	18:00	0.75%	0.89%	0.84%	0.98%	0.89%	0.69%	0.72%	5.8%
18:00	19:00	0.78%	0.52%	0.58%	0.61%	0.75%	0.84%	0.58%	4.6%
19:00	20:00	0.87%	0.58%	0.49%	0.75%	1.30%	0.43%	0.66%	5.1%
20:00	21:00	0.81%	0.52%	0.49%	0.72%	0.37%	0.35%	0.55%	3.8%
21:00	22:00	0.43%	0.69%	0.49%	0.52%	0.43%	0.37%	0.32%	3.3%
22:00	23:00	0.46%	0.26%	0.35%	0.26%	0.49%	0.43%	0.43%	2.7%
23:00	0:00	0.32%	0.40%	0.26%	0.29%	0.17%	0.14%	0.26%	1.8%
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Grand Total		14.0%	14.9%	15.1%	14.2%	15.5%	14.4%	11.9%	100.0%

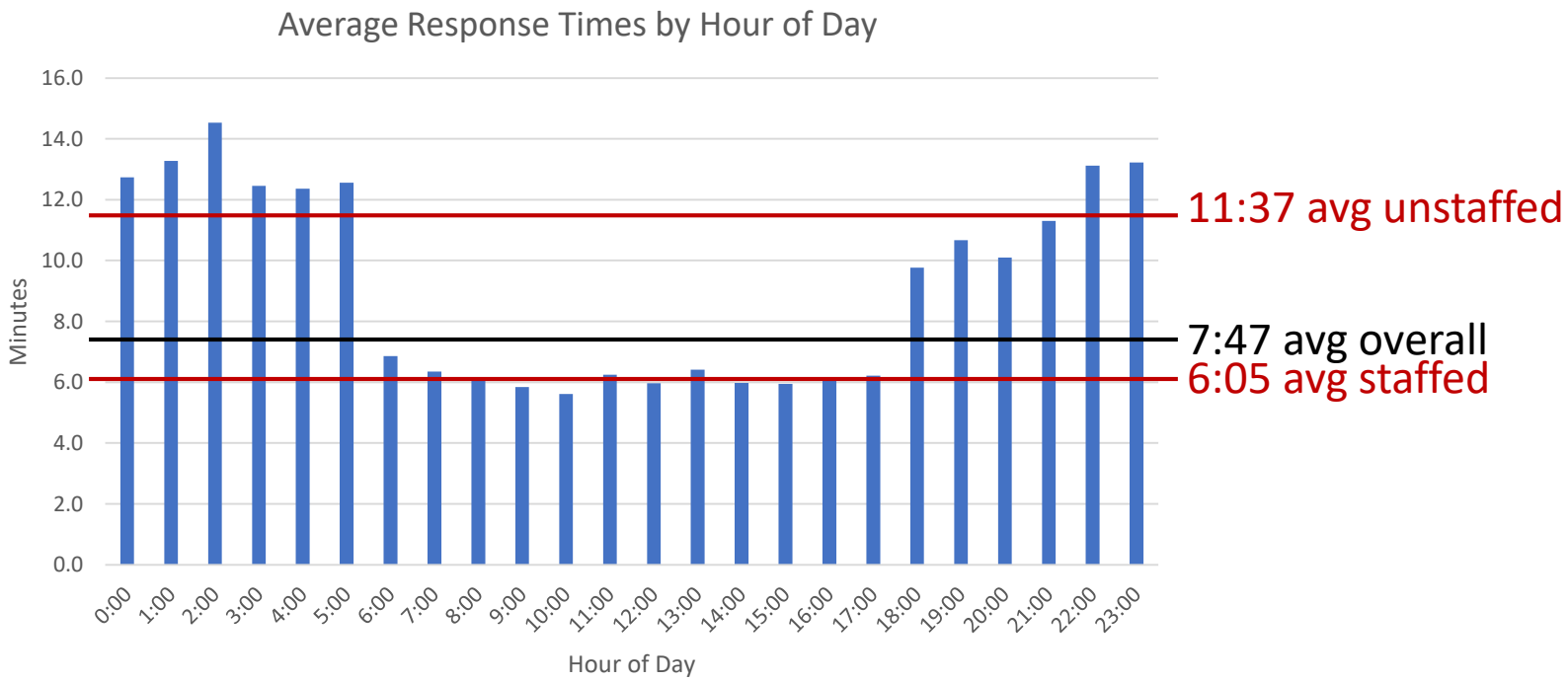
Busiest: 8AM – 8PM

Response Time by Hour

		Sunday	Monday	Tuesday	Wed.	Thursday	Friday	Saturday	(blank)	Grand Total
0:00	1:00	12.4	10.8	12.4	12.1	12.2	13.0	14.7		12.7
1:00	2:00	14.6	13.5	12.3	12.3	13.2	14.7	13.3		13.3
2:00	3:00	16.3	12.2	12.9	14.5	12.4	14.6	16.4		14.5
3:00	4:00	8.7	13.6	14.3	8.3	11.0	14.3	13.7		12.5
4:00	5:00	13.1	9.8	10.5	13.1	13.2	12.2	24.0		12.4
5:00	6:00	7.4	12.8	15.2	14.0	13.4	12.4	12.0		12.6
6:00	7:00	10.3	6.6	6.5	5.9	7.8	5.0	6.8		6.9
7:00	8:00	6.2	6.6	6.0	6.8	6.9	5.1	6.9		6.3
8:00	9:00	6.1	5.5	5.8	6.5	6.1	6.9	5.9		6.1
9:00	10:00	8.4	5.8	5.8	5.7	5.1	5.2	5.5		5.8
10:00	11:00	7.2	5.4	5.5	3.9	6.9	4.6	6.0		5.6
11:00	12:00	7.9	5.9	5.8	6.0	5.6	5.9	7.3		6.2
12:00	13:00	6.1	5.8	5.3	7.3	5.1	6.0	6.4		6.0
13:00	14:00	6.8	6.8	6.0	6.1	6.2	5.9	7.2		6.4
14:00	15:00	5.7	6.7	6.7	5.0	5.3	6.4	5.8		6.0
15:00	16:00	6.2	6.2	5.1	6.3	6.1	5.4	6.7		5.9
16:00	17:00	6.5	5.9	7.1	5.2	5.4	6.0	6.9		6.1
17:00	18:00	6.0	5.7	5.9	6.5	6.0	6.6	7.0		6.2
18:00	19:00	9.7	11.4	9.6	10.1	8.0	9.1	11.4		9.8
19:00	20:00	10.4	10.1	10.1	11.4	10.4	10.2	12.1		10.7
20:00	21:00	11.1	9.3	11.2	9.0	9.2	11.3	9.8		10.1
21:00	22:00	11.4	10.4	11.1	9.7	12.0	12.6	13.6		11.3
22:00	23:00	15.2	11.4	11.2	11.8	12.2	14.0	14.4		13.1
23:00	0:00	12.7	10.7	11.1	14.8	14.7	17.0	15.0		13.2
Grand Total		8.6	7.5	7.4	7.6	7.5	7.5	8.6		7.8

Fastest: 6AM – 6PM

Response Times



Response times are significantly slower when unstaffed.

Typically 5-6 minutes slower in all categories and overall.

Staffed: 6:05 minute response
Unstaffed: 11:37 minute response
Overall: 7:47 minute response

Cost Equation Analysis Methodology

Define the benefit

- Full benefit for responses while staffed
- Partial benefit for responses while unstaffed
- Consider additional penalty for unstaffed responses?

Define the cost

- Consider current 12 hour, 5 person staffing as the baseline
- Add 0.2 for each additional staff member

Build a matrix of (Total Benefit)/(Total Cost) for all possible staffing/cost

- Test all possible starting hours (current staffing begins at 6AM)
- Test all possible numbers of staffed hours (current staffing is 12 hours)
- Generate a number of these matrices for different Benefit/Penalty possibilities
  - e.g., Vary the additional penalty number for unstaffed responses

Sample Cost Equation Analysis Result

Optimal staffing range

Specific answer is 12 hours beginning at 8:00AM

Hours of Staffing

(Benefit of staffed - Penalty of unstaffed)/Divided by cost of staffing

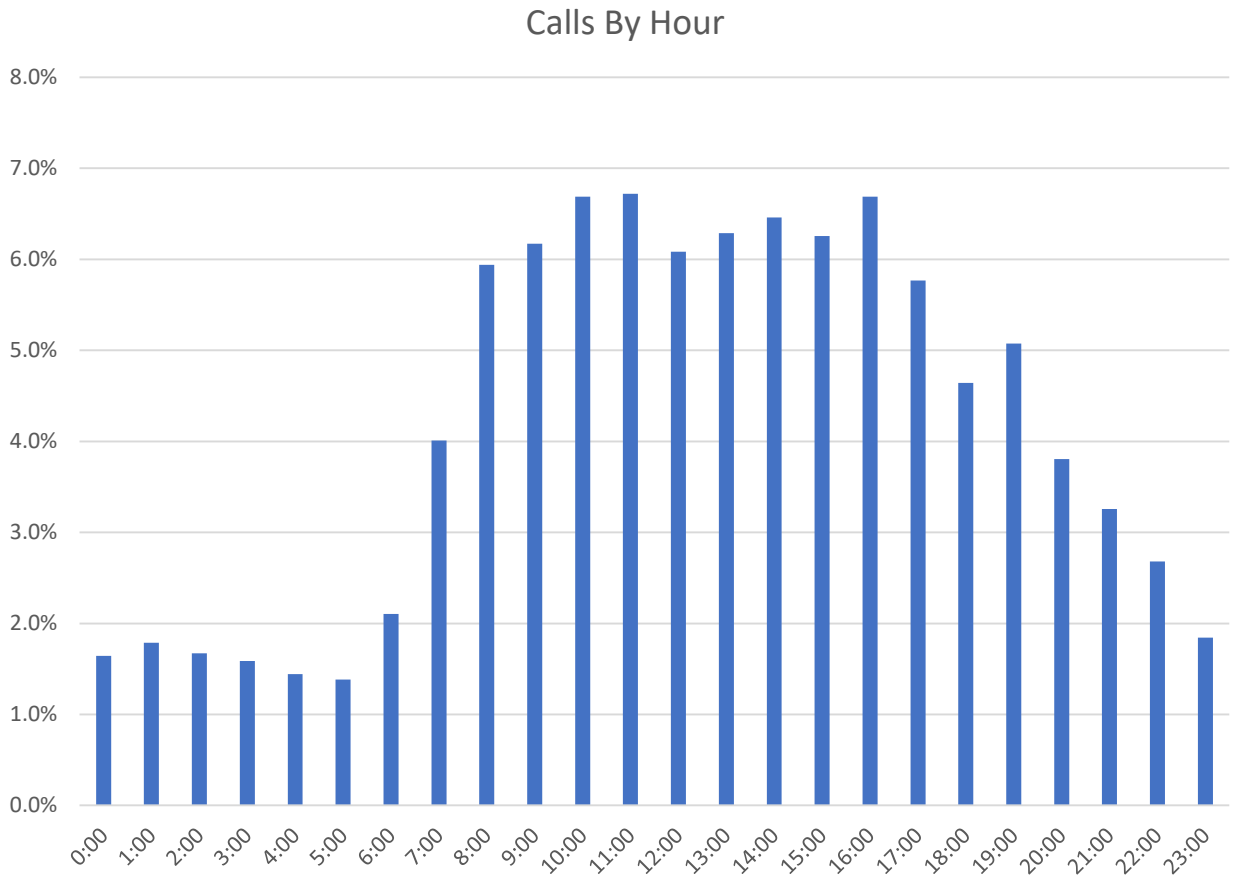
Beginning Hour of Staffing

Shift Start	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0:00	0.016734	0.035199	0.051699	0.06728	0.081767	0.095542	0.116266	0.156284	0.215348	0.276763	0.34354	0.409687	0.440282	0.470394	0.498575	0.522712	0.546564	0.5617	0.568398	0.576845	0.57656	0.572875	0.566246	0.555556
1:00	0.018465	0.034965	0.050546	0.065033	0.078808	0.099532	0.13955	0.198614	0.260029	0.326806	0.392953	0.4529	0.484105	0.513137	0.537807	0.56212	0.577235	0.583512	0.591655	0.590714	0.586286	0.578856	0.567269	0.555556
2:00	0.016501	0.032081	0.046568	0.060344	0.081067	0.121085	0.180149	0.241564	0.308342	0.374488	0.434435	0.497914	0.527898	0.55315	0.577961	0.593038	0.598839	0.60664	0.604975	0.599735	0.591434	0.578881	0.56627	0.555556
3:00	0.015581	0.030068	0.043843	0.064567	0.104585	0.163648	0.225064	0.291841	0.357987	0.417934	0.481413	0.54659	0.572253	0.5974	0.612234	0.61733	0.624597	0.621998	0.615745	0.606387	0.592688	0.579021	0.567403	0.555556
4:00	0.014487	0.028262	0.048986	0.089004	0.148068	0.209483	0.27626	0.342407	0.402354	0.465833	0.53101	0.594832	0.62013	0.6345	0.638642	0.64517	0.641412	0.633937	0.623327	0.608296	0.593409	0.580751	0.567934	0.555556
5:00	0.013775	0.034499	0.074517	0.13358	0.194996	0.261773	0.327919	0.387867	0.451345	0.516522	0.580335	0.646985	0.660575	0.663427	0.66894	0.663733	0.654769	0.642661	0.626068	0.609761	0.595895	0.581959	0.568565	0.555556
6:00	0.020724	0.060742	0.119805	0.181221	0.247998	0.314144	0.374091	0.43757	0.502747	0.56656	0.63321	0.690838	0.691977	0.696135	0.689128	0.678355	0.664463	0.646041	0.628085	0.612819	0.597598	0.583043	0.568976	0.555556
7:00	0.040018	0.099082	0.160497	0.227274	0.293421	0.353368	0.416847	0.482024	0.545836	0.612487	0.670114	0.717385	0.720215	0.711379	0.698772	0.683074	0.662801	0.643191	0.626545	0.610065	0.594384	0.579301	0.564967	0.555556
8:00	0.059064	0.120479	0.187256	0.253402	0.31335	0.376829	0.442005	0.505818	0.572468	0.630096	0.677367	0.728211	0.718324	0.704566	0.687674	0.666091	0.645337	0.627796	0.61051	0.594128	0.578427	0.563555	0.553836	0.555556
9:00	0.061416	0.128193	0.194339	0.254286	0.317765	0.382942	0.446755	0.513405	0.571033	0.618303	0.669148	0.707148	0.693229	0.676011	0.653877	0.632673	0.614888	0.597394	0.580863	0.565056	0.550122	0.540551	0.542848	0.555556
10:00	0.066777	0.132923	0.192871	0.256349	0.321526	0.385339	0.451989	0.509617	0.556888	0.607732	0.665733	0.678029	0.660684	0.63815	0.616642	0.598765	0.581202	0.564655	0.548866	0.533986	0.524689	0.527713	0.541491	0.555556
11:00	0.066146	0.126093	0.189572	0.254749	0.318562	0.385212	0.44284	0.490111	0.540955	0.578956	0.611252	0.637953	0.615431	0.593994	0.576382	0.559073	0.542805	0.527305	0.512729	0.503951	0.507965	0.523084	0.538398	0.555556
12:00	0.059947	0.123426	0.188603	0.252416	0.319066	0.376694	0.423964	0.474809	0.512809	0.545106	0.571807	0.590313	0.569107	0.551922	0.535011	0.519153	0.50406	0.489897	0.481759	0.486911	0.503538	0.520246	0.538762	0.555556
13:00	0.063479	0.128656	0.192468	0.259119	0.316747	0.364017	0.414862	0.452862	0.485159	0.51186	0.530366	0.5471	0.530217	0.513587	0.498039	0.483263	0.469431	0.46188	0.468171	0.486335	0.504456	0.524344	0.542338	0.555556
14:00	0.065177	0.12899	0.19564	0.253268	0.300538	0.351383	0.389383	0.42168	0.448381	0.466887	0.483621	0.502086	0.486175	0.471324	0.457212	0.444023	0.437365	0.445122	0.46516	0.484989	0.506517	0.525944	0.540301	0.555556
15:00	0.063813	0.130463	0.188091	0.235361	0.286206	0.324206	0.356503	0.383204	0.40171	0.418444	0.436909	0.45341	0.439679	0.426598	0.414377	0.408929	0.418496	0.440756	0.462596	0.486033	0.507123	0.522806	0.539321	0.555556
16:00	0.06665	0.124278	0.171549	0.222393	0.260394	0.29269	0.319391	0.337898	0.354632	0.373097	0.389597	0.405178	0.393436	0.382447	0.37847	0.390144	0.414934	0.439044	0.464617	0.487555	0.504707	0.522606	0.540108	0.555556
17:00	0.057628	0.104898	0.155743	0.193743	0.22604	0.252741	0.271247	0.287981	0.306446	0.322947	0.338528	0.353015	0.343865	0.341924	0.356276	0.384154	0.411008	0.439134	0.464273	0.483183	0.502725	0.521722	0.538471	0.555556
18:00	0.047271	0.098115	0.136116	0.168412	0.195113	0.21362	0.230354	0.248818	0.265319	0.2809	0.295387	0.309162	0.309268	0.326386	0.357473	0.387144	0.41787	0.445219	0.465855	0.486999	0.507443	0.525433	0.543676	0.555556
19:00	0.050844	0.088845	0.121141	0.147842	0.166349	0.183083	0.201548	0.218048	0.233629	0.248116	0.261891	0.282615	0.302469	0.336791	0.36926	0.402544	0.432027	0.454273	0.476906	0.498677	0.517782	0.537061	0.549652	0.555556
20:00	0.038001	0.070297	0.096998	0.115505	0.132239	0.150703	0.167204	0.182785	0.197272	0.211047	0.231771	0.271789	0.310174	0.346119	0.382538	0.414625	0.438854	0.463298	0.486678	0.507135	0.527661	0.541131	0.54759	0.555556
21:00	0.032296	0.058997	0.077504	0.094238	0.112703	0.129203	0.144784	0.159271	0.173046	0.19377	0.233788	0.292852	0.332125	0.37151	0.405992	0.431951	0.457962	0.48271	0.504277	0.525819	0.539928	0.546693	0.555	0.555556
22:00	0.026701	0.045208	0.061942	0.080406	0.096907	0.112488	0.126975	0.14075	0.161474	0.201492	0.260555	0.321971	0.364451	0.401377	0.429035	0.456569	0.482623	0.505221	0.5277	0.54234	0.549287	0.557822	0.558291	0.555556
23:00	0.018507	0.035241	0.053705	0.070206	0.085787	0.100274	0.114049	0.134773	0.174791	0.233854	0.29527	0.362047	0.401431	0.430712	0.459683	0.486944	0.510457	0.533757	0.548787	0.555755	0.564376	0.564602	0.561519	0.555556
	0.066777	0.132923	0.19564	0.259119	0.321526	0.385339	0.451989	0.513405	0.572468	0.630096	0.677367	0.728211	0.720215	0.711379	0.698772	0.683074	0.664463	0.646041	0.628085	0.612819	0.597598	0.583043	0.568976	0.555556

$$Cost\ Benefit = \frac{B * Responses\ - P * UnstaffedResponses}{Cost\ of\ Staffing}$$

Multiple cases were tested. The optimal answer is consistently in the 12-15 hours of staffing. With a large enough penalty, the optimal answer can be pushed to 18 hours. Does assume original staffing costs, e.g., 1 career firefighter adds 3 hours of coverage.

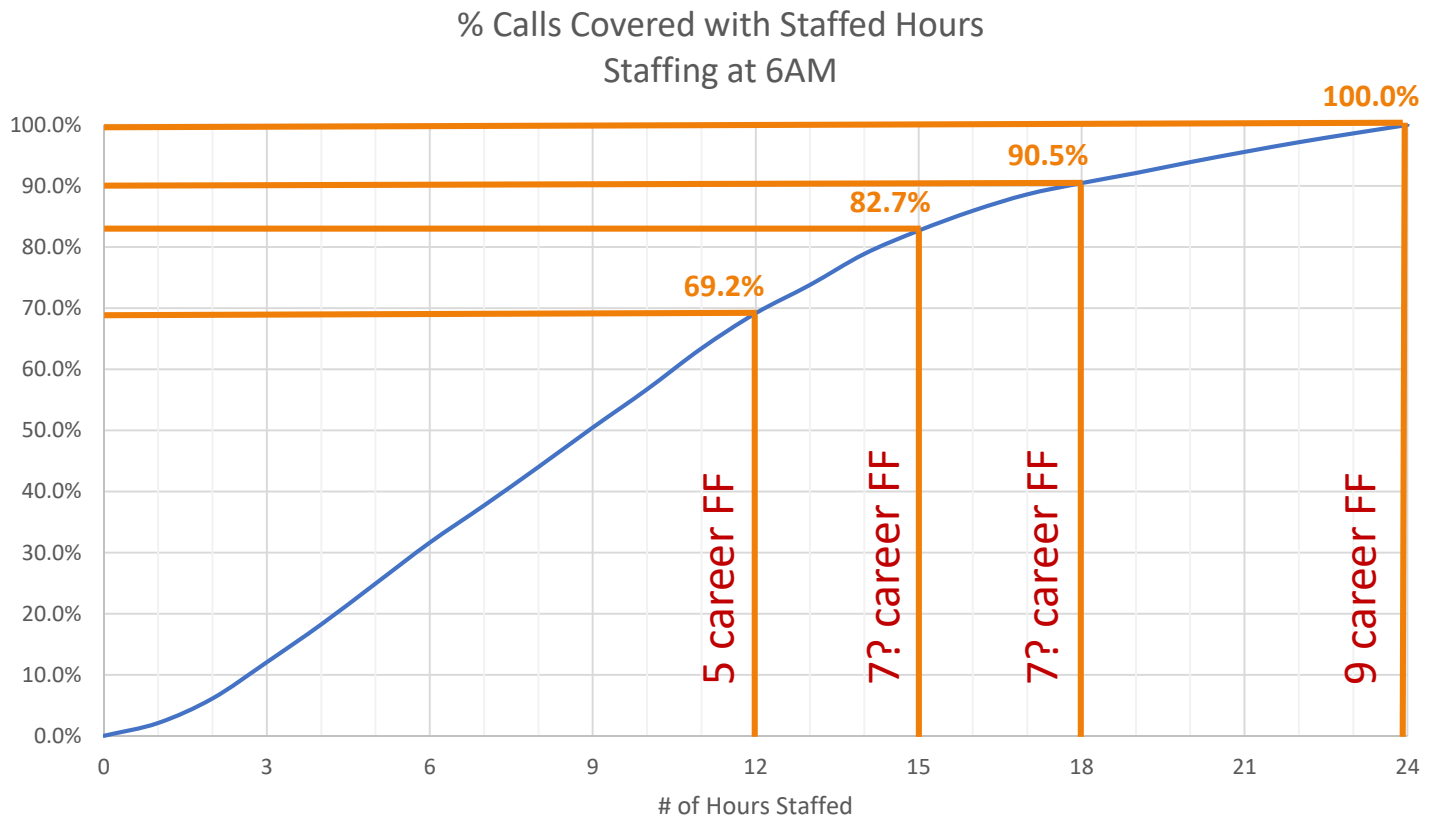
Calls by Hour



Optimal Staffing Levels from Cost/Benefit & Current Staffing Levels

		% Calls	
12 hours	6PM - 6AM	30.8%	Current Staffing
	6AM - 6PM	69.2%	
12 hours	7PM - 7AM	28.3%	
	7AM - 7PM	71.7%	
12 hours	8PM - 8AM	27.2%	
	8AM - 8PM	72.8%	
14 hours	8PM - 6AM	21.1%	Future Staffing
	6AM - 8PM	78.9%	
14 hours	9PM - 7AM	19.4%	
	7AM - 9PM	80.6%	
15 hours	9PM - 6AM	17.3%	
	6AM - 9PM	82.7%	
15 hours	10PM - 7AM	16.1%	
	7AM - 10PM	83.9%	
16 hours	11PM - 7AM	14.0%	
	7AM - 11PM	86.0%	
18 hours	12AM - 6AM	9.5%	
	6AM - 12PM	90.5%	

Coverage with Hours of Staffing



Confusion about staffing numbers.

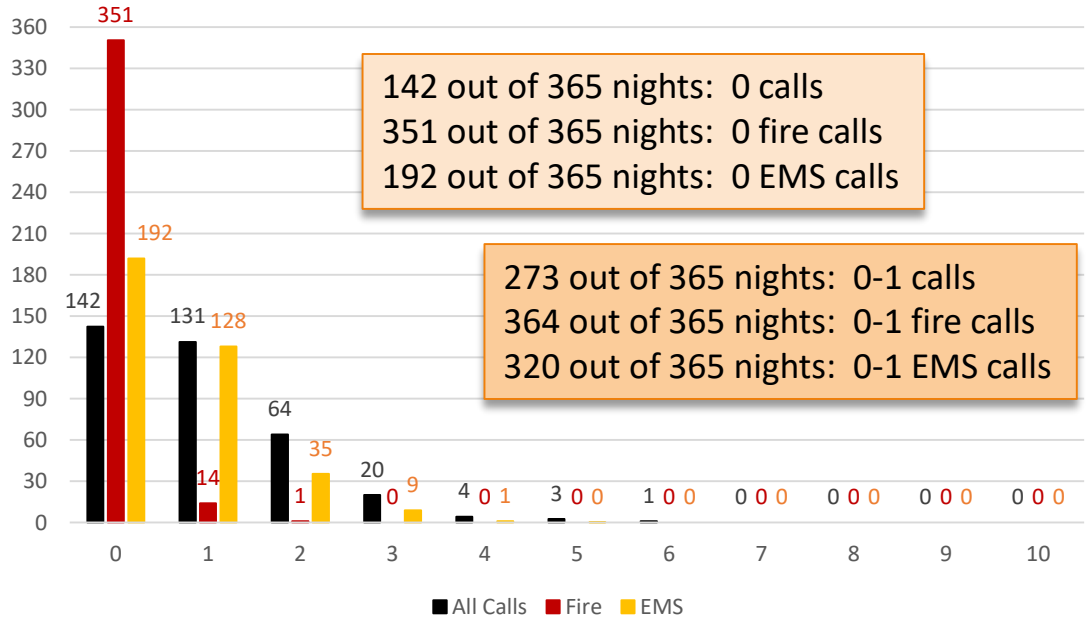
When study began,

- Adding 2 career would cover an additional 6 hours a day, 7 days a week.
- Adding 4 career would cover an additional 12 hours a day, 7 days a week.
- Just added 2 career and covering 2 hours a day, 7 days a week, with only 1 man for 2nd hour.

Calls During Unstaffed Hours

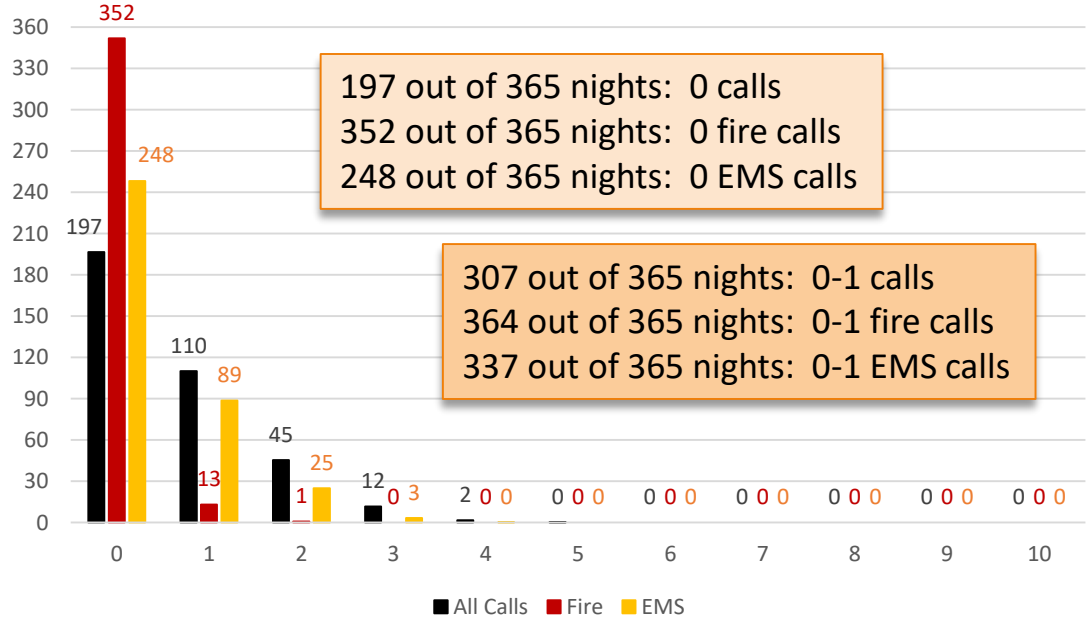
Current 6AM – 6PM Staffing

Number of Nights per Year with #Calls: Unstaffed



Future 6AM – 8PM Staffing

Number of Nights per Year with #Calls: Unstaffed



Current 6AM – 6PM Staffing

	Both	Staffed	Unstaffed
All Calls	1156	799	356
Fire Calls	52	36	16
EMS Calls	721	490	231

Extra two hours per day covers an additional 112 calls (~10%) per year.

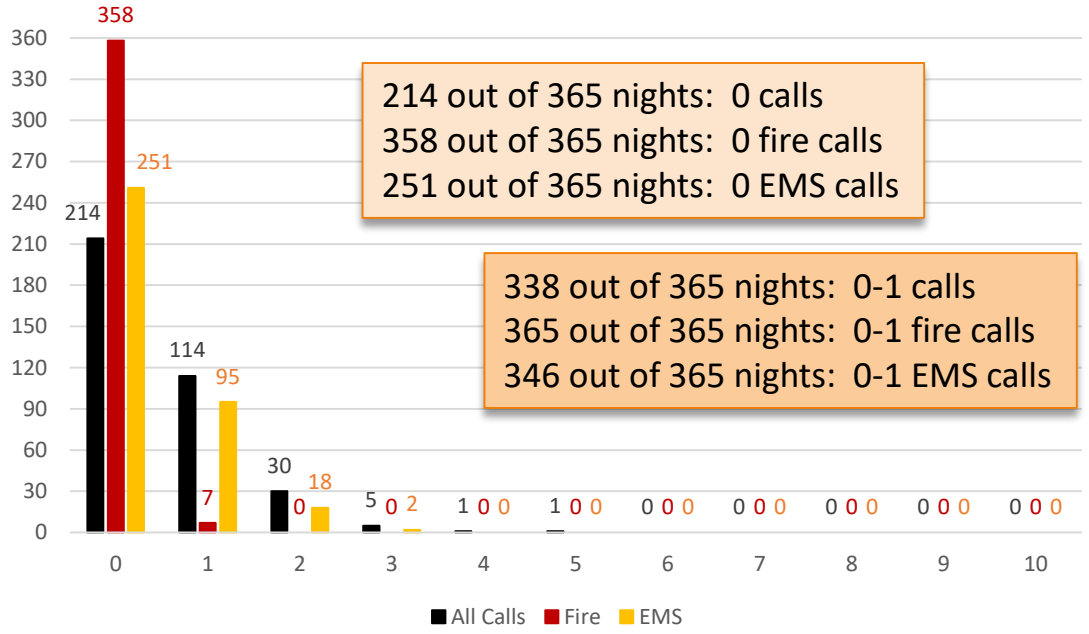
Future 6AM – 8PM Staffing

	Both	Staffed	Unstaffed
All Calls	1156	912	244
Fire Calls	52	38	14
EMS Calls	721	571	150

Calls During Unstaffed Hours

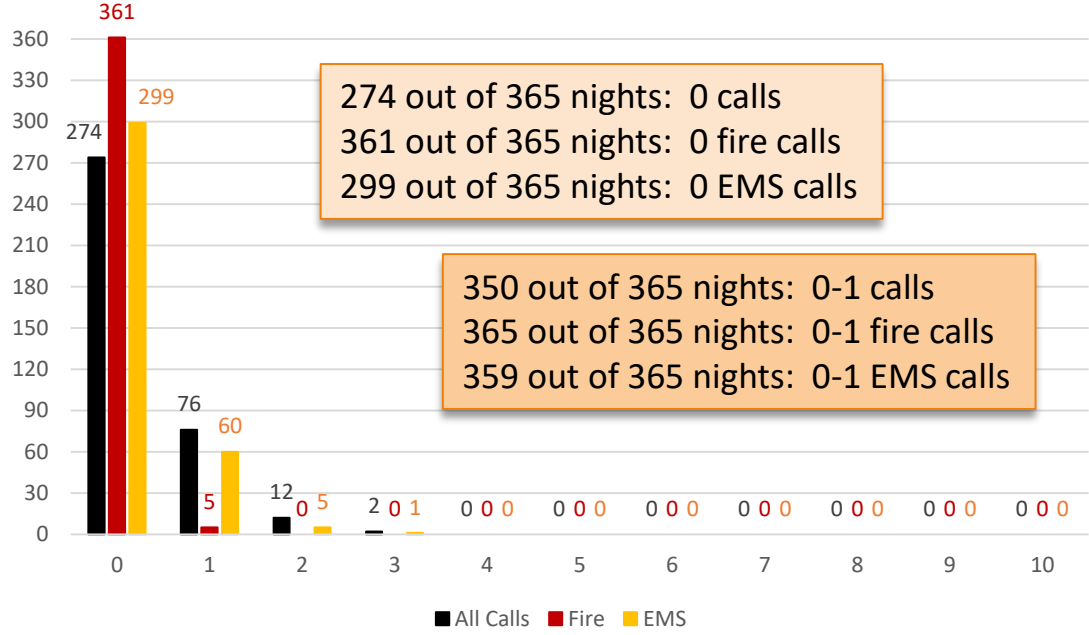
Current 6AM – 9PM Staffing

Number of Nights per Year with #Calls: Unstaffed



6AM – 12AM Staffing

Number of Nights per Year with #Calls: Unstaffed



Current 6AM – 6PM Staffing

	Both	Staffed	Unstaffed
All Calls	1156	799	356
Fire Calls	52	36	16
EMS Calls	721	490	231

Future 6AM – 8PM Staffing

	Both	Staffed	Unstaffed
All Calls	1156	912	244
Fire Calls	52	38	14
EMS Calls	721	571	150

Option 6AM – 9PM Staffing

	Both	Staffed	Unstaffed
All Calls	1156	956	200
Fire Calls	52	44	8
EMS Calls	721	583	138

Option 6AM – 12AM Staffing

	Both	Staffed	Unstaffed
All Calls	1156	1046	110
Fire Calls	52	47	5
EMS Calls	721	647	74

Traditional Cost-Benefit Analysis

This a pure money-based analysis

What is the financial cost to provide additional service

- ~$73K/firefighter per year

What is the financial benefit from additional service?

- How to determine for fire
  - What is the cost/loss per fire? Chief McCurdy says he has this data.
  - Chief McCurdy says he likes to think what was “saved” – with access to the Assessor’s data, we can quantify that.
  - Is there a relationship between loss/saved/%saved and response time? If no relationship, this type of analysis isn’t feasible.
  - If there is a relationship, it is possible to estimate the increased loss due to a 6 minute delay in response
  - The benefit is what is saved, and can possibly be calculated from the earlier staffing statistics, e.g., at 18 hours staffing, 9 fires a year would have the benefit of a faster response (smaller loss) at the cost of adding 3 firefighters.

How to determine for EMS

- There’s a significant body of work in peer-reviewed journals we can reference