



**SOUTHERN MARIN EMERGENCY MEDICAL PARAMEDIC SYSTEM**

# **RESOURCES DEPLOYMENT AND HIGH-LEVEL FISCAL ANALYSIS**

**JANUARY 23, 2018**



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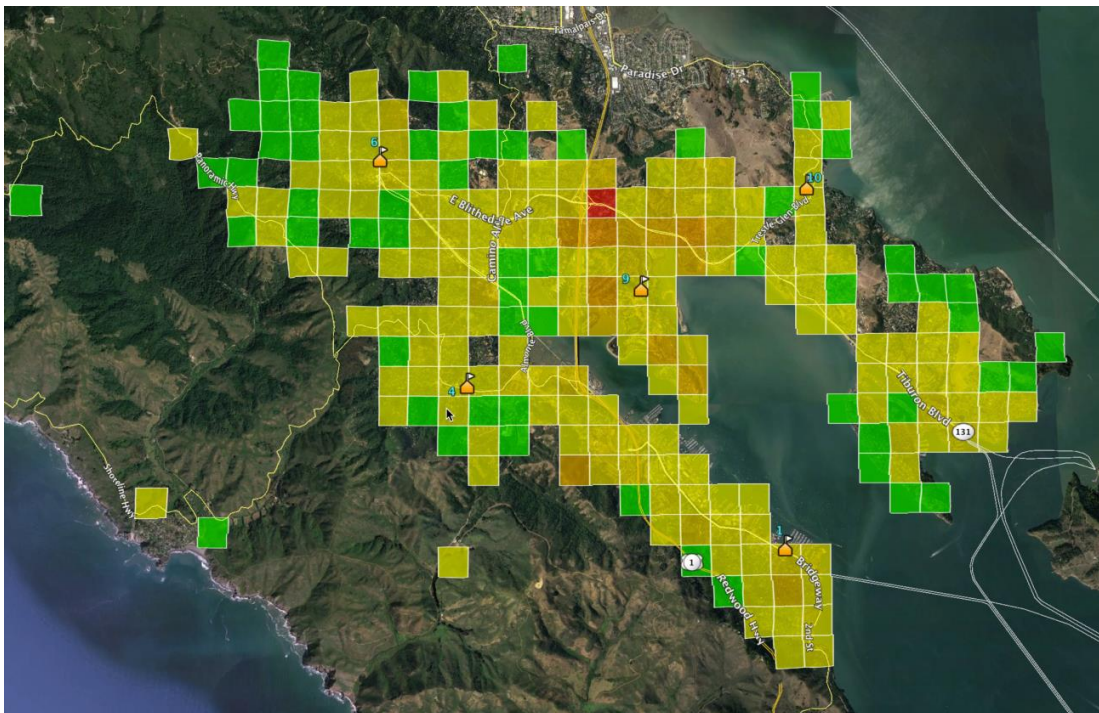
## EXECUTIVE SUMMARY

Citygate Associates, LLC conducted a resources deployment and high-level fiscal analysis for the Southern Marin Emergency Medical Paramedic System Joint Powers Authority (SMEMPS, or JPA), the results of which are presented in this study.

### **CITYGATE'S OVERALL OPINIONS**

In brief, Citygate finds SMEMPS serves an urban- and suburban-populated area across challenging topography with limited major cross-connecting roadways. As the following figure shows (also found in Section 5—Evaluations and Recommendations of this report), even with four paramedic ambulances, and one paramedic/firefighter with an EMT staff at Station 9 on the JPA technical rescue unit, achieving travel times based on best practices is difficult. This is due to topography and limited cross-connecting roads. Paramedic Ambulance Stations 1, 4, and 6 are well placed in a line through the center of the JPA. A paramedic ambulance unit at Station 10 in the east will continue to be needed due to the separation of the land mass where that section of the JPA is established.

**Figure 1—Travel Time for First-Due Units in 2015**



The JPA wanted to review if Station 9 should have an ambulance paramedic unit instead of Station 4. Currently, Medic 4 goes to more incidents that occurred in all of Station 9's area in the last year,



and Station 9 is too close to Station 10. The current three paramedic ambulance locations that surround Station 9 are providing adequate travel times to Station 9's area and the overall core of the S MEMPS operating area.

Station 1 is busy servicing the population and tourism activity in the southern JPA area and the Golden Gate National Recreation Area (GGNRA). On peak-activity days, weekends, and holidays, Medic 4 could be moved south to Station 1 when Medic 1 is committed on a transport or long travel-time call into the GGNRA. When that occurs, Medic 10 would cover the center of the JPA.

If Marin City and other County fire areas want improved paramedic travel times, the most cost-effective way would be to upgrade some of the engines to paramedic first responders by transitioning one of the three crew members into a paramedic.

Since the need for acute paramedic care is only 16 to 25 percent of all incidents, and the incidents per paramedic-staffed S MEMPS fire station area are relatively small, Citygate does not see the cost-effectiveness of upgrading every fire crew to first responder paramedic for those stations that already have a paramedic unit.

Citygate does not see that S MEMPS has the revenues to support adding paramedic first responder engine crews when it cannot fully cover the current ambulance personnel costs from transport revenues.

If both dispatch and crew turnout times could be lowered by 36 seconds and 43 seconds respectively, the total response time for a paramedic unit to serious incidents would drop to 10:31 minutes across the JPA, a significant improvement.

## ***FINDINGS***

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Throughout this report, Citygate makes key findings, and, where appropriate, specific action item recommendations. Overall, there are 13 key findings and 7 specific action item recommendations.

Citygate's findings are listed as follows for ease of reference. The finding and recommendation numbers refer to the sequential numbers as presented in this report.

**Finding #1:** The S MEMPS Board of Directors has not adopted a deployment measure, nor has the County EMS Agency, to drive its deployment of paramedic ambulances or to measure the effectiveness of the JPA's efforts.

**Finding #2:** Unit-hour utilization measures for the paramedic ambulances are not yet high enough to warrant an additional peak-hour unit.

**Finding #3:** While the unit-hour utilization measures *do show* capacity to absorb incident growth, it would not be beneficial to reduce the total number of paramedic ambulances from four to three. This is because the workload of even the least busy

ambulance, at present, would be transferred to another unit and three paramedic ambulances may not be sufficient at peak hours of the day to provide adequate response times JPA-wide given a simultaneous rate of two incidents 34.41 percent of the time.

Additionally, because each paramedic ambulance service area is somewhat physically separated due to topography and main access road design, closing a paramedic ambulance area would result in an increase in response times in that area.

- Finding #4:** A desirable time between receipt of call and arrival time for a paramedic ambulance in urban California is typically 11:00 to 12:00 minutes. This is largely achieved from the four ALS units in SMEMPS for priorities D and E.
- Finding #5:** SMEMPS is not in control of the Sheriff’s Office Communications Center performance; however, for time-sensitive EMS events, the Center’s performance is not consistent with best practices, and the time lost in dispatch processing cannot be made up by driving faster.
- Finding #6:** Turnout times need improvement to be at or below 2:00 minutes.
- Finding #7:** A desirable travel time for first responder paramedic units in urban California is typically 4:00 to 5:00 minutes. For 90 percent of priority D and E incidents, travel time for paramedic ambulances is 8:50 minutes.
- Finding #8:** The out-of-service time for SMEMPS paramedic ambulances on 90 percent of the incidents is approximately 100:00 minutes per response. This helps explain the need for a minimum of three and, due to geography coverage distances and simultaneous incidents, four paramedic ambulances.
- Finding #9:** SMEMPS does not need more paramedic ambulances for existing workload per paramedic ambulance; however, if it wanted to deploy paramedics faster, then the first responder agencies would need to add one engine-based first responder paramedic in those station areas that do not contain a paramedic ambulance. Otherwise, the topography and road network make it too difficult to deliver a sub-regional deployed paramedic within typical urban area travel times.
- Finding #10:** Given that Rescue 9 is both a first responder and a specialty response unit, its location provides adequate travel times to all area response districts.
- Finding #11:** While all four ambulances are not heavily used all day, every day, the size of the JPA means that, to ensure adequate response times, it is best to have four

ambulances. While one ambulance could be cross-staffed by an engine crew, doing so should mean the crew always responds with both the engine and ambulance or just the ambulance as the incident requires.

**Finding #12:** The SMEMPS billing systems and practices meet current best practices.

**Finding #13:** Citygate finds the JPA reserves policy perhaps a little too excessive.

### ***RECOMMENDATIONS***

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Based on the technical analysis and findings in this study, Citygate offers the following overall deployment recommendations:

**Recommendation #1:** Citygate encourages an annual or bi-annual transport rate review against internal JPA full costs and other comparable agency rates.

**Recommendation #2:** The Board should adopt a very clear policy on essential reserves to allow for the maximum payment possible to JPA fire department partners for their personnel expenses.

**Recommendation #3:** **Adopt Deployment Measures Policies:** The appointed officials of SMEMPS should adopt complete performance measures for emergency medical services planning and monitor operations. The measures of time should be designed to save patients where medically possible.

As a starting point, response time measures that could be considered with input from the County EMS Agency could be as recently proposed in another Bay Area county after considerable clinical research. For clinical priorities D/E, this would be from the time of *crew notify to on-scene*:

Urban – 10:00 minutes

Suburban – 14:00 minutes

Rural / Open Space – 16:00 minutes

**Recommendation #4:** SMEMPS should investigate the reason that call processing time increased for incident categories D and E between 2013 and 2014 and assist the communications center, as possible, in improving its performance.

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**Recommendation #5:** SMEMPS and its partner fire departments must work to substantially lower crew turnout times to 90 seconds during waking hours and to no more than 2:00 minutes during sleeping hours.

**Recommendation #6:** SMEMPS should conduct regular transport charge reviews to maintain fees at full cost.

**Recommendation #7:** SMEMPS should set a reserve policy to ensure capacity to replace ambulances and annual expenses only. Revenues in excess of expenses should be remitted to the member agencies per the JPA formula.



## SECTION 1—INTRODUCTION AND BACKGROUND

Citygate’s scope of work and corresponding Work Plan was developed consistent with Citygate’s Project Team members’ experience in emergency medical services (EMS) and fire administration. Citygate utilizes various National Fire Protection Association (NFPA) publications as best-practice guidelines, as well as the requirements of the State of California, Marin County EMS agencies, and the self-assessment criteria of the Commission on Fire Accreditation International (CFAI).

### 1.1 REPORT ORGANIZATION

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This report is structured into the following sections:

- Section 1 Introduction and Background: An introduction to the study and background facts about S MEMPS services.
- Section 2 Deployment Goals/Measures and Risk Assessment: An examination of the JPA’s ability to meet the community’s risks, expectations, and emergency needs through deployment of EMS personnel and paramedic apparatus.
- Section 3 Response Statistical Analysis: A statistical data analysis of the JPA’s incident responses and an overall deployment evaluation.
- Section 4 Financial Analysis: A study of the revenues and expenditures for S MEMPS.
- Section 5 Evaluation and Recommendation: A summary of issues and an overall deployment recommendation.

#### 1.1.1 Goals of Report

This report will cite findings and make recommendations, if appropriate, that relate to each finding. All of the findings and recommendations throughout Sections 2 through 5 of this report are numbered sequentially. To provide a comprehensive summary, a complete list of all these same findings and recommendations, in order, is found in the Executive Summary.

This document provides technical information about how S MEMPS paramedic resources are currently provided. This information is presented in the form of recommendations and policy choices for S MEMPS leadership to discuss.

### 1.2 PROJECT SCOPE OF WORK

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#### 1.2.1 Study Goals

- ◆ Develop an EMS hazard and risk analysis using population density.

- ◆ Assess whether the paramedic ambulance units are located effectively and efficiently and if the number of units could be reduced or enhanced for service levels.
- ◆ Assess the paramedic ambulance demand, response time, and unit-hour incident workload utilization.
- ◆ Assess whether S MEMPS could benefit from the use of advanced life support (ALS) engines.
- ◆ Assess deployment of Rescue 9 (R-9).
- ◆ Assess if R-9 is in the most effective location.
- ◆ Provide a macro-level assessment of the S MEMPS funding model.
- ◆ Determine the annual operating cost per paramedic ambulance unit.
- ◆ Assess the cost for each agency to subsidize the S MEMPS program, if at all.
- ◆ Assess the current transport revenues, collection rates, cost per call, and cost by agency.

### **1.3 S MEMPS OVERVIEW**

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S MEMPS provides paramedic ambulance services for the eastern coastal corner of Marin County, covering County and incorporated areas. The JPA partner agencies consist of the fire departments, cities, and County areas in this region of the County.

## SECTION 2—DEPLOYMENT GOALS/MEASURES AND RISK ASSESSMENT

### 2.1 WHY DOES S MEMPS EXIST AND HOW DOES IT DELIVER THE EXISTING EMS DEPLOYMENT SERVICES?

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#### 2.1.1 Existing Response Time Policies or Goals—Why Does S MEMPS Exist?

The S MEMPS Board of Directors, over the years, has not adopted formal response time policies based on best practices. S MEMPS has a long history of striving to provide emergency medical services that can be documented in annual reports. However, without response time measures, it is difficult to determine service delivery effectiveness.

#### 2.1.2 Existing Outcome Expectations

In adopting a response time goal, agencies are encouraged to no longer use an average time measure. Response time measures should specifically denote a beginning and end point response time and staffing quantity by EMS risk type consistent with the recommendations of the NFPA or CFAI best practices. A complete response time goal is a fractile (percent of goal completion) measure that includes dispatch processing time, crew turnout time, and, finally, travel time, along with the type of emergency outcome or staffing needed to accomplish an outcome goal.

Current national best practice is to measure percent completion of a goal (e.g., 90 percent of responses) instead of an average measure. Mathematically, this is called a “fractile” measure.<sup>1</sup> An average only identifies the central, or middle, point of response time performance for all calls for service in the data set. Using an average makes it impossible to know how many incidents had response times that were way over the average, or just over. For example, if a department had an average response time of 5:00 minutes for 5,000 calls for service, it cannot be determined how many calls past the average point of 5:00 minutes were answered in 6:00 minutes, or way out at 10:00 minutes. This is a significant issue if hundreds or thousands of calls are answered far beyond the average point. Fractile measures will identify, per minute, the number of incidents that are reached up to 100 percent.

For this report, “total” response time is the sum of the call processing, dispatch, crew turnout, and road travel time steps for S MEMPS paramedic ambulances. Each fire department in S MEMPS also dispatches the closest neighborhood fire engine as a first responder. In such a tiered system, each paramedic ambulance services more than one fire station area.

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<sup>1</sup> A *fractile* is that point below which a stated fraction of the values lies. The fraction is often given in percent; the term percentile may then be used.

**Finding #1:** The S MEMPS Board of Directors has not adopted a deployment measure, nor has the County EMS Agency, to drive its deployment of paramedic ambulances or to measure the effectiveness of the JPA's efforts.

## 2.2 COMMUNITY RISK ASSESSMENT

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The risk assessment for this study is primarily focused on S MEMPS units and service delivery areas (Medic Zones) established by the Marin County Local Emergency Medical Services Agency.

Citygate's evaluation of the various risks likely to adversely impact the Southern Marin Emergency Medical Paramedic Systems service area yields the following observations:

- ◆ S MEMPS has a very diverse suburban population density with rural population densities in the outlying areas.
- ◆ S MEMPS has a mix of residential, commercial, office, and light industrial buildings.
- ◆ S MEMPS has transportation networks, including highways and other primary vehicle transportation routes, mass transportation modes, and a ferry landing.

### 2.2.1 Population Density Summary and Impact

Given that EMS and technical rescue incident responses are the primary focus for S MEMPS units, it follows that population drives calls for service, including resident, employment, and transportation uses. There are no set population density definitions in the United States. The Commission on Fire Accreditation International considers an area as urban when it exceeds more than 2,500 people. The National Fire Protection Association uses the following guidelines:

- ◆ Urban – greater than 1,000 people per square mile
- ◆ Suburban – 500 to 1,000 people per square mile
- ◆ Rural/Remote – less than 500 people per square mile.

The United States Census Bureau defines an urban area as having a population density of at least 1,000 people per square mile. In the communities served by S MEMPS, Citygate found the following population densities for the community.

**Table 1—Population Density of Communities Served by S MEMPS**

Community	Population Per Square Mile (2010 Census Residents Only)
Alto	5,654
Strawberry	4,095
Tamalpais-Homestead Valley	2,308
Sausalito	3,128
Mill Valley	2,868
Tiburon	2,076
Belvedere	4,333

Obtaining updated population counts outside of cities in California is difficult. In addition to the per-square-mile figures in Table 1, Citygate obtained a second source from a mapping provider that displays population densities for counties. The results are displayed in the following figure.



**Figure 2—SMEMPS 2016 Population Density**



The current ambulance plan places the ambulances in the most populated areas. Given this data, by any measure, the more populated areas served by SMEMPS are urban in nature and, as such, generate significant emergency services demand. Also, very apparent are the very large and lower population density areas that SMEMPS must respond across.

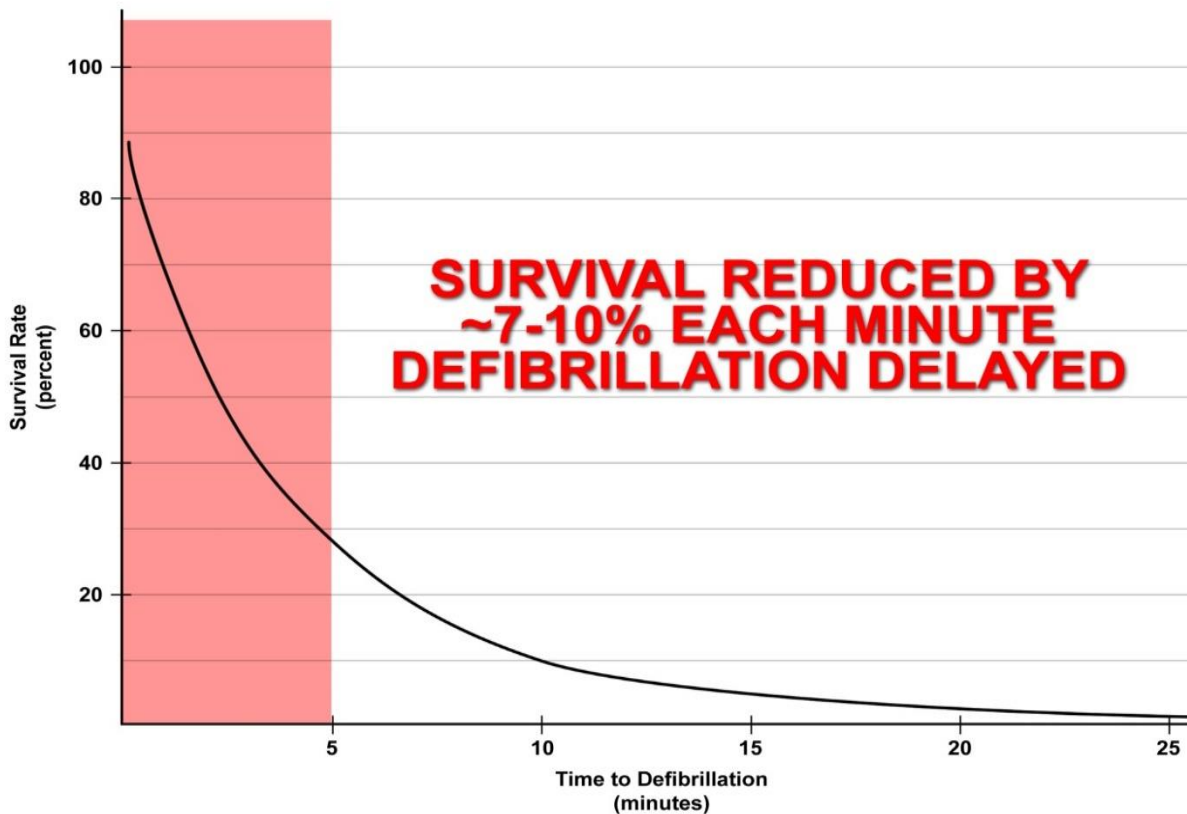
Given the wide differences in population areas, SMEMPS could consider adopting tiered response time goals based on urban, suburban, and rural to wilderness population densities.

### **2.2.2 EMS Risk Factors**

Emergency medical services (EMS) risk in most communities is predominantly a function of population demographics, violence, and vehicle traffic. Relative to population demographics, EMS risk tends to be higher among poorer, older, less educated, and uninsured populations. As would be expected, EMS risk is also higher in communities or segments of communities with higher rates of violence. EMS risk is also higher in those areas of a community with high loads of vehicle traffic, particularly those areas with high traffic volume travelling at higher speeds. The SMEMPS area, while having above-average socio-economic factors, has a very difficult-to-serve road network that twists and turns across hilly topography. So, while incident demand is modest due to the types of populations served, providing quick urban response times is difficult.

EMS risk can also be categorized as either a medical emergency resulting from a health-related condition or event, or from a traumatic injury. One serious medical emergency is cardiac arrest or some other emergency where there is an interruption or blockage of oxygen to the brain. Figure 3 illustrates the reduced survivability of a cardiac arrest victim as time to defibrillation increases. While early defibrillation is one factor in cardiac arrest survivability, other factors can influence survivability as well, such as early CPR and pre-hospital advanced life support interventions.

**Figure 3—Survival Rate Versus Time to Defibrillation**



Source: [www.suddencardiocarrest.org](http://www.suddencardiocarrest.org)

### 2.2.3 JPA Paramedic Ambulance Response Capacity

SMEMPS service capacity for EMS risk consists of a minimum daily on-duty response force of ten personnel in paramedic ambulance units from four fire stations and a technical rescue vehicle. Additionally, the area fire departments have a joint response system for water rescues and other types of incidents. Members of SMEMPS agencies are trained rescue swimmers and water-rescue technicians. In the JPA, all calls for medical assistance receive the closest fire department engine response. All firefighters are trained to either the Emergency Medical Technician (EMT) level capable of providing basic life support (BLS) pre-hospital emergency medical care, or Paramedic level capable of providing advanced life support (ALS) pre-hospital emergency medical services.

This service capacity is appropriately designed to mitigate the area's current and anticipated near-future EMS risk, exclusive of a disaster event.

### 2.2.4 EMS Incident Type Demands

Table 2 shows annual EMS incident type demand for SMEMPS agencies over the previous three years as dispatched by the County Communications Center at the time of call.

**Table 2—EMS Risk Service Demand by Year**

Type of EMS Emergency	2013	2014	2015	Total
ALOC	497	476	513	1,486
Headache, Severe	378	378	345	1,101
Falls, Spinal Injury	246	300	333	879
Seizures	225	253	261	739
Breathing Problems	231	255	218	704
Unknown Prob. Person Down	203	214	216	633
Allergic Reaction	197	218	209	624
Chest Pain	169	162	166	497
Traumatic Injuries	185	153	135	473
Sick Person	98	145	139	382
Heat/Cold Exposure	104	132	137	373
Stroke	90	105	85	280
Diabetic	92	89	86	267
Cardiac/Respiratory Arrest	78	81	80	239
Abdominal Pain	66	66	63	195
Hemorrhage, Severe	54	50	70	174
Assault Rape	47	52	59	158
Pregnancy/Childbirth	38	29	43	110

### 2.2.5 Technical Rescue Risk Factors

Technical rescue risk factors include construction work, structural collapse, confined spaces such as tanks and underground vaults, bodies of water and rivers or streams, urban flooding, machinery, transportation accidents, and other factors that may create a need for technical rescue skills and/or equipment.

#### *Technical Risk Service Demand*

Over the most recent three-year period evaluated for this study, there were 905 transportation-related incidents in the area comprising 0.07 percent of total service demand over the same period, as shown in Table 3.

**Table 3—Technical Rescue Risk Service Demand by Year**

Incident Type*	2013	2014	2015	Total
Vehicle Accident with Injuries	325	299	281	905
Industrial Accidents	45	52	53	150
Water Rescues	52	54	37	143
Possible Drownings	45	40	27	112
Total Responses by Year	467	445	398	1,310

\* Source: Dispatch Data for Incident Type codes

### 2.2.6 Technical Rescue Risk Response Capacity

The S MEMPS organization staffs a technical rescue unit (R-9) in Station 9 in the Southern Marin Fire District. This unit is cross-staffed from a fire engine by two members and responds to all technical rescues in the S MEMPS response area and outside Medic Zones. In the JPA, the only engine companies that carry extrication equipment are Tiburon E-11 and 1585.

### ***2.3 EXISTING S MEMPS DEPLOYMENT***

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The S MEMPS current daily staffing plan is shown in Table 4.

**Table 4—Daily Minimum Staffing by Unit – 2016**

Unit	Number of Firefighters	Staff	Total
4 Paramedic Ambulances	2	Medic/Firefighters per Day	8
1 Technical Rescue Squad	2	Firefighters per Day	2
Total Firefighters			10



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Table 5 illustrates the units and number of personnel that respond to each type of EMS incident.

**Table 5—Resources and Number of Personnel by EMS Incident Type**

<b>Risk Type</b>	<b>Resources Deployed</b>	<b>Minimum Total Firefighters Sent</b>
1-Patient EMS	1 Engine and 1 Paramedic Ambulance	4–5
Technical Rescue and/or Multiple Patients	1 Battalion Chief, 2 Engines, R-9, and 1 Paramedic Ambulance	10
Cardiac Arrest	1 Engine, R-9, and 1 Paramedic Ambulance	7
Traffic Accident	1 Battalion Chief, 2 Engines, R-9, and 1 Paramedic Ambulance	10

## SECTION 3—RESPONSE STATISTICAL ANALYSIS

### 3.1 DATA SET IDENTIFICATION

SMEMPS provided Computer-Aided Dispatch (CAD) apparatus response data for the period from January 1, 2013 to December 31, 2015. The data provided resulted in 10,962 incidents and 14,610 individual apparatus response records. Only SMEMPS paramedic ambulance units consisting of Southern Marin Fire M1 and M4, Mill Valley Fire M6, Tiburon Fire M10, and Southern Marin Fire Rescue R-9 were used in these calculations and data analysis. The R-9 response data includes only EMS-related responses, as established by CAD nature codes.

The figures and tables in this report do not use any data from those units located in Fire Stations 3, 5, 7, 11, or 13. The data used in the analysis are for SMEMPS units assigned for paramedic ambulance response in that station area.

### 3.2 SERVICE DEMAND

In 2015, SMEMPS responded to 3,685 incidents. During this period, there was a daily demand of 10.1 incidents and a fairly level demand.

**Figure 4—Number of EMS Incidents by Year**

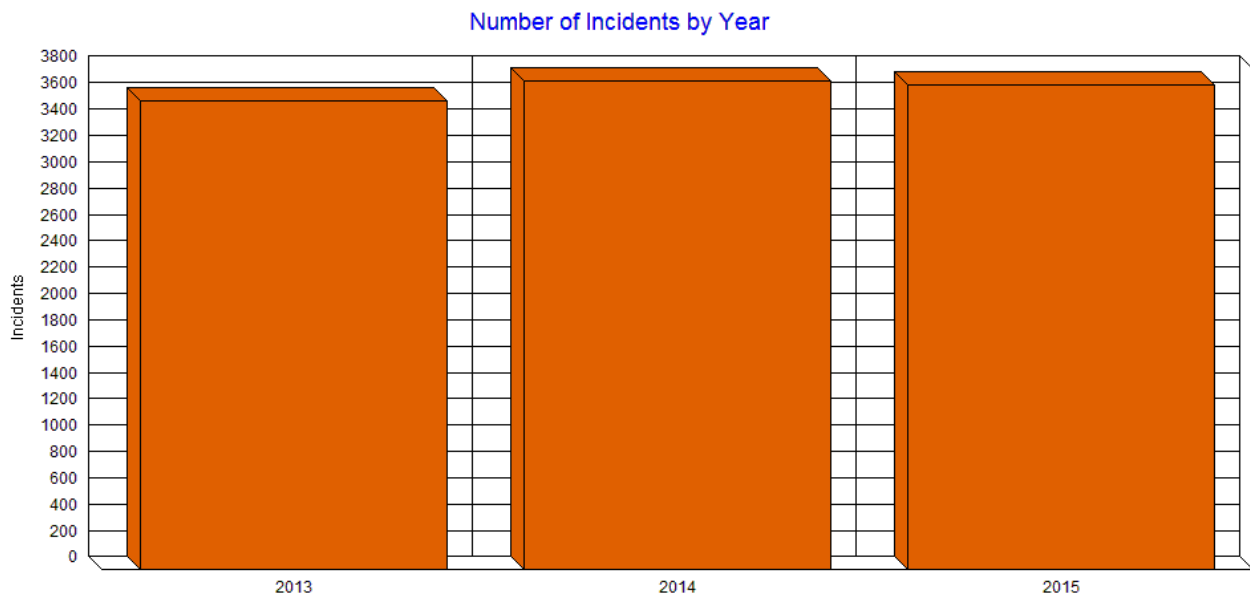


Table 6 depicts the number of incidents by call priority as established by the Emergency Medical Dispatching Criterion. This system is used in the Communications Center by the dispatcher to determine the type of EMS response that is required. Priority types A and B are less acute, basic

life support calls, and types D, E, and F are incidents requiring advanced life support from a paramedic.

**Table 6—Number of Incidents by Call Priority in 2015**

Call Priority	2013	2014	2015	Total
A	118	123	131	372
B	697	835	896	2,428
D	2,657	2,645	2,571	7,873
E	89	93	77	259
F			1	1
Water Rescue	6	14	9	29
Total	3,567	3,710	3,685	10,962

### 3.2.1 Simultaneous Analysis

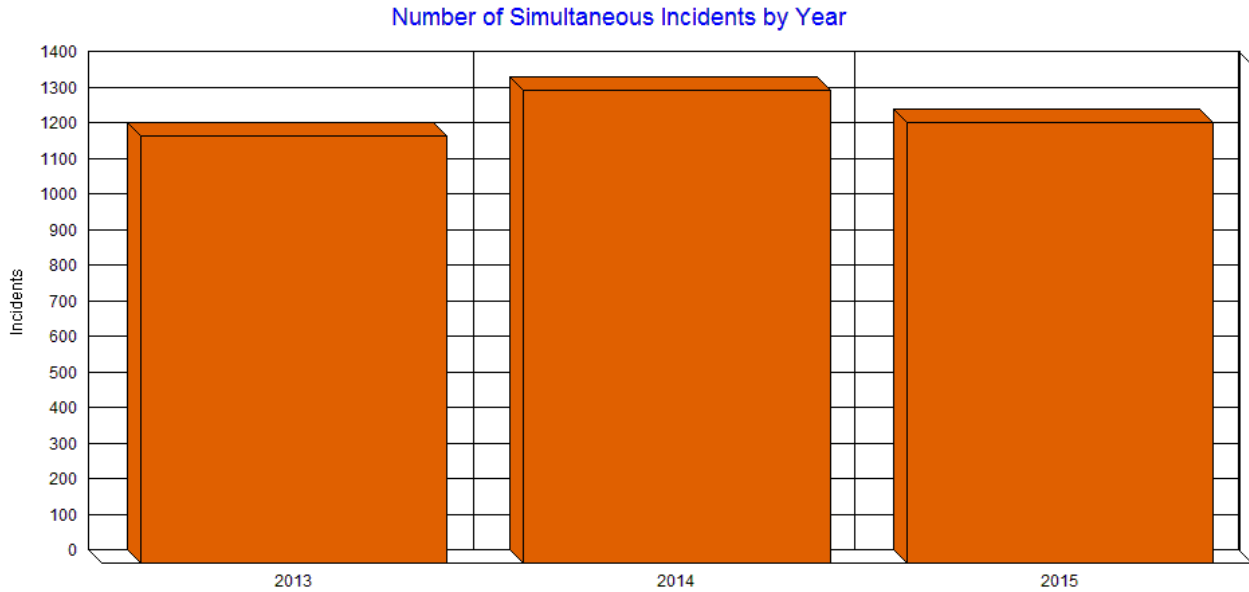
Simultaneous incidents are incidents that begin when other incidents are already underway. In 2015, 34.41 percent of incidents occurred while one or more other incidents were underway within SMEMPS boundaries. Table 7 shows the percentage of simultaneous incidents broken down by the number of simultaneous incidents.

**Table 7—Simultaneous Incidents in 2015**

Simultaneous Incidents	Proportion of Occurrence
1 or more simultaneous incidents	34.41%
2 or more simultaneous incidents	7.97%
3 or more simultaneous incidents	1.44%

Figure 5 shows the number of simultaneous incidents peaked in 2014.

**Figure 5—Number of Simultaneous Incidents by Year**



### 3.2.2 Unit-Hour Utilization

The utilization percentage for apparatus is calculated by two primary factors: the number of responses and the duration of responses. Table 8 illustrates the unit-hour utilization for the paramedic ambulance and rescue company responses for SMEMPS in 2015. The busiest units are displayed from left to right on the table.

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**Table 8—SMEMPS Medic Unit-Hour Utilization – 2015**

Hour	M-1	M-6	M-4	M-10	R-9
0:00	4.34%	2.57%	4.92%	2.76%	1.97%
1:00	4.48%	1.73%	2.47%	2.85%	1.35%
2:00	2.09%	1.89%	1.97%	2.10%	1.02%
3:00	3.92%	2.04%	1.47%	1.41%	1.19%
4:00	3.59%	3.80%	2.53%	2.35%	2.77%
5:00	4.30%	3.16%	2.36%	2.14%	1.02%
6:00	7.56%	3.53%	1.97%	1.51%	1.05%
7:00	7.81%	3.21%	3.90%	2.57%	1.69%
8:00	7.81%	8.21%	5.78%	5.19%	2.41%
9:00	10.36%	8.20%	5.53%	5.04%	2.70%
10:00	12.41%	12.42%	7.05%	9.43%	4.67%
11:00	15.50%	8.66%	10.83%	6.27%	3.09%
12:00	15.76%	12.29%	10.51%	6.98%	3.61%
13:00	16.36%	7.68%	14.20%	6.26%	4.61%
14:00	19.38%	10.97%	10.66%	6.94%	3.76%
15:00	14.32%	8.72%	10.76%	6.82%	3.22%
16:00	14.94%	4.07%	10.27%	6.10%	3.93%
17:00	12.45%	9.15%	6.09%	6.54%	4.32%
18:00	12.61%	6.67%	8.29%	6.13%	4.20%
19:00	6.49%	6.70%	7.35%	5.54%	3.51%
20:00	9.99%	5.91%	4.76%	5.43%	3.76%
21:00	8.92%	5.11%	3.66%	2.98%	2.56%
22:00	7.00%	4.96%	2.84%	3.67%	1.79%
23:00	5.09%	1.54%	2.82%	1.38%	1.68%
<b>Overall</b>	<b>9.48%</b>	<b>5.97%</b>	<b>5.96%</b>	<b>4.52%</b>	<b>2.75%</b>
<b>Runs</b>	<b>823</b>	<b>518</b>	<b>601</b>	<b>502</b>	<b>715</b>

What should be the maximum utilization percentage on a firefighter staffed paramedic ambulance unit? During the nine-hour daytime work period, when crews on a 24-hour shift need to also pay attention to apparatus checkout, station duties, training, public education, and paperwork, plus required physical training and meal breaks, Citygate recommends, based on our experience with all the required duties in a fire service work day in addition to emergency responses, that the



maximum unit-hour utilization should not exceed 30 percent. Beyond that, the most important element to suffer will be training hours.

For a dedicated unit, such as a peak activity squad working less than a 24-hour shift, unit-hour utilization can rise to 40–50 percent at a maximum. At that level, peak-hour squad crews must then have additional duty days for training only, in which they do not respond to incidents, to meet their annual continuing education and training hour requirements.

In the case of SMEMPS, the modest incident volume per hour is not yet taxing the units to the point of needing another unit *solely* for peak-hour workload. The units have the capacity for more incident load per hour *if there is not a surge in simultaneous incidents*. The rate of simultaneous occurrences at 34.41 percent is still relatively low for an agency fielding up to four transport units.

**Finding #2:** Unit-hour utilization measures for the paramedic ambulances are not yet high enough to warrant an additional peak-hour unit.

**Finding #3:** While the unit-hour utilization measures *do show* capacity to absorb incident growth, it would not be beneficial to reduce the total number of paramedic ambulances from four to three. This is because the workload of even the least busy ambulance, at present, would be transferred to another unit and three paramedic ambulances may not be sufficient at peak hours of the day to provide adequate response times JPA-wide given a simultaneous rate of two incidents 34.41 percent of the time.

Additionally, because each paramedic ambulance service area is somewhat physically separated due to topography and main access road design, closing a paramedic ambulance area would result in an increase in response times in that area.

### 3.2.2 Home Activity Versus Outside Resources

Table 9 shows the number of times during the three reporting years that a home paramedic ambulance unit was not able to respond to an incident and another unit had to respond. This illustrates the delayed response times when the home ALS unit is not available in its home area. In the case of Stations 7, 9, and 11, the times listed are the actual travel times a SMEMPS unit took to arrive on scene.

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**Table 9—Response Analysis: Primary Apparatus by Station Area – 2015**

Station Area	1 <sup>st</sup> Arrivals	Home Resources	Outside Resources	Outside Percent	Overall Travel	Home Travel	Outside Travel	Delta Home/Out
1	2,077	1,705	372	17.91%	10:13 (1,863)	09:29 (1,550)	12:21 (313)	2:52
10	528	466	62	11.74%	08:15 (510)	06:21 (452)	11:25 (58)	5:04
11	744	0	744	100.00%	10:48 (705)		10:48 (705)	
13*	275	0	275	100.00%	10:53 (261)		10:53 (261)	
3	916	0	916	100.00%	07:36 (898)		07:36 (898)	
4	1,193	778	415	34.79%	08:31 (1,135)	07:04 (742)	09:56 (393)	2:52
5	367	0	367	100.00%	13:43 (229)		13:43 (229)	
6	1,099	901	198	18.02%	09:11 (1,010)	07:40 (836)	11:56 (174)	4:16
7	1,513	0	1,513	100.00%	07:17 (1,458)		07:17 (1,458)	
9	373	0	373	100.00%	08:56 (294)		08:56 (294)	2:46

\* Station 13 is used by Tiburon units to identify the City of Belvedere. There is NO Station 13 in S MEMPS.

Source: S MEMPS CAD Data 2013–2015

### 3.2.3 Response Time Analysis by Reporting District and Medic Zone

The S MEMPS units also respond outside of the dedicated S MEMPS service area for Marin County responses. Marin County Fire Chiefs have identified dedicated paramedic response zones in the County for which S MEMPS units are assigned. M-1 and M-4 have larger response zones due to the Golden Gate National Park and the southwestern areas of Marin County. M-1 is the primary responding unit for Marin City and the Golden Gate National Park. In the three-year study period, M-1 responded to over 1,700 incidents in its first-due area.

Table 10 illustrates the number of responses to the specific CAD reporting district.

**Table 10—Apparatus Quantity by CAD Reporting District from 1/1/13 to 12/31/15**

District	M-1	M-6	M-10	R-9	M-4	Total
COTM	1	2		7	7	17
GGN1A	174	17	8	110	50	359
GGN1B	99	7	4	43	27	180
GGN1C	73	4		52	13	142
GGN1D	158	9	3	43	35	248
MRN2A	8	18	4	32	88	150
MRN2B2		2		4	6	12
MRN2C1		4	1	1	6	12

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District	M-1	M-6	M-10	R-9	M-4	Total
MRN2C2	4	18		14	50	86
MRN2C3	4	5		4	20	33
MRN2D1	9	21	2	28	123	183
MRN2D2	4	5	1	13	18	41
MRN2E		2				2
MRN3A <sup>2</sup>	844	38	16	89	163	1,150
MRN3D	2	4	44	2	6	58
MVY06A	12	571	30	92	113	818
MVY06B	2	144	9	20	17	192
MVY06C		1	1	2	3	7
MVY06D		8	1	2	2	13
MVY06E	8	258	4	28	55	353
MVY07A	10	412	25	50	91	588
MVY07B	19	818	48	76	171	1,132
MVY07C		11	1	1	1	14
MVY07D	2	69	1	11	5	88
SAS2F	127	15	6	122	34	304
SOM01	442	18	9	55	70	594
SOM01A	928	37	21	137	182	1,305
SOM04A	54	21	5	47	304	431
SOM04B	10	2	1	23	75	111
SOM04C	5	14	1	13	110	143
SOM04D	2	83	2	8	20	115
SOM04E		4			1	5
SOM04G	53	22	8	58	294	435
SOM04H	5	97	2	7	19	130
SOM09A	46	19	672	778	92	1,607
SOM09B	4	19	293	360	46	722
SOM09C	3	34	10	48	59	154
SOM09D	5	1	1	18	13	38
SOM31A	3	7	1	9	26	46

<sup>2</sup> This reporting district is Marin City.

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District	M-1	M-6	M-10	R-9	M-4	Total
SOM31C	40	2	1	9	15	67
SOMF1	1	2	1	15	19	38
SOMF2	2	11	56	68	12	149
TIB10A	5	50	368	73	8	504
TIB10B	3	2	128	16	1	150
TIB11	2	39	274	49	4	368
TIB11A	7	60	429	71	13	580
TIB12	2	42	277	31	8	360
<b>Total</b>	<b>3,184</b>	<b>3,054</b>	<b>2,778</b>	<b>2,770</b>	<b>2,521</b>	<b>14,307</b>

### **3.3 RESPONSE TIME ANALYSIS**

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Once the types of incidents are quantified, the next step is to analyze the time required to respond to those incidents. Fractile breakdowns track the percentage and number of incidents meeting defined criteria, such as the first apparatus to reach the scene within progressive time segments.

Included in all aspects of the time continuum is R-9, a technical rescue response vehicle that is continuously staffed with a paramedic and EMT with no capability to transport EMS patients to a hospital. The purpose of including R-9 was to help Citygate establish the data for its analysis on the placement and use of R-9 for S MEMPS agencies.

#### **3.3.1 S MEMPS Service Area Response Time Performance**

A resident or visitor of the response area measures the speed of medical services response from the time assistance is requested until the assistance arrives. This measurement is called “Call to First Apparatus Arrival” (or “Call to Arrival”). Police and sheriff’s departments, under state law, act as a Public Safety Answering Point (PSAP) for 9-1-1 calls. All 9-1-1 calls for fire service in the S MEMPS service area are under contract to be received and dispatched by the Marin County Sheriff’s Office Communications Center.

Table 11 shows the breakdown of fire dispatch call received to first apparatus arrival for the overall JPA and by station area by year for Priority D and E emergency medical incidents.

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**Table 11—Priority Call to Arrival Response Time – 90% Performance**

Station	Overall	2013	2014	2015
Department-Wide	11:37 (7,304)	11:18 (2,486)	11:35 (2,470)	11:50 (2,348)
Station 1	12:08 (1,509)	11:51 (484)	12:08 (504)	12:43 (521)
Station 10	10:35 (350)	09:48 (135)	10:35 (114)	11:10 (101)
Station 11	12:59 (558)	12:39 (186)	13:09 (199)	12:57 (173)
Station 13	13:47 (189)	13:34 (62)	12:35 (70)	15:39 (57)
Station 3	09:57 (677)	09:03 (227)	10:16 (238)	10:04 (212)
Station 4	10:25 (886)	09:43 (303)	10:51 (268)	10:35 (315)
Station 5	18:25 (222)	17:42 (82)	18:25 (74)	18:29 (66)
Station 6	11:24 (829)	11:03 (295)	11:47 (276)	11:18 (258)
Station 7	09:18 (1,085)	09:06 (363)	09:07 (367)	09:41 (355)
Station 9	08:31 (972)	07:52 (338)	08:53 (344)	08:23 (290)

Table 12 illustrates the ranking of incidents by call priority. There is better Call to Arrival performance for incident types D and E than for the lower priority A and B incident types.

**Table 12—Call to Arrival: 90% Performance Minutes – Year by Call Priority**

Call Priority	2013	2014	2015
A	15:09 (104)	17:41 (106)	17:40 (115)
B	14:22 (617)	16:17 (752)	16:08 (777)
D	11:36 (2,449)	11:52 (2,433)	12:27 (2,330)
E	14:32 (69)	10:43 (69)	11:50 (59)
F			19:33 (1)
Water	21:32 (5)	27:06 (9)	17:06 (6)

**Finding #4:** A desirable time between receipt of call and arrival time for a paramedic ambulance in urban California is typically 11:00 to 12:00 minutes. This is largely achieved from the four ALS units in SMEMPS for priorities D and E.

### 3.3.2 Alarm Processing Time

For SMEMPS, dispatch time is defined as the time it takes to answer the 9-1-1 call at the Marin County Sheriff’s Office Communications Center to notifying the SMEMPS service area, which

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includes determining the emergency, entering information into the CAD system, and alerting the closest crew. The recommendation of NFPA 1710 is for 90 percent of the calls to be dispatched in 90 seconds. Where language barriers exist, or medical self-help instructions are needed, these calls should be dispatched within 120 seconds. The performance of the Marin County Sheriff’s Office Communications Center is shown in Table 13.

**Table 13—Alarm Processing Time – 90% Performance All Types**

Station	Overall	2013	2014	2015
Department-Wide	02:06 (7,979)	01:33 (2,697)	02:15 (2,685)	02:13 (2,597)
Station 1	01:53 (1,647)	01:23 (522)	02:03 (549)	02:03 (576)
Station 10	01:51 (363)	01:25 (138)	02:06 (120)	01:53 (105)
Station 11	01:56 (640)	01:42 (207)	01:58 (229)	02:02 (204)
Station 13	01:50 (219)	01:20 (75)	01:54 (81)	02:07 (63)
Station 3	02:02 (706)	01:37 (232)	02:11 (252)	02:07 (222)
Station 4	01:58 (992)	01:27 (332)	02:13 (298)	02:05 (362)
Station 5	02:19 (334)	01:28 (123)	02:18 (105)	02:49 (106)
Station 6	01:50 (886)	01:18 (313)	02:01 (298)	01:54 (275)
Station 7	02:00 (1,148)	01:38 (382)	02:03 (380)	02:06 (386)
Station 9	03:08 (1,011)	02:07 (356)	03:09 (357)	03:25 (298)

Table 14 illustrates the ranking of incidents by call priority. Call processing for lower priority calls is longer. Notice the decrease in call processing performance between 2013 and 2014. If new call screening requirements caused this drop, a review of call screening procedures would be helpful.

**Table 14—Call Processing: 90% Performance Minutes – Year by Call Priority**

Call Priority	2013	2014	2015
A	03:21 (95)	03:44 (81)	04:04 (87)
B	02:10 (600)	02:47 (727)	02:37 (737)
D	01:35 (2,425)	02:17 (2,399)	02:15 (2,297)
E	01:10 (66)	00:57 (68)	01:26 (56)

**Finding #5:** SMEMPS is not in control of the Sheriff’s Office Communications Center performance; however, for time-sensitive EMS events, the Center’s performance is not consistent with best practices, and the time lost in dispatch processing cannot be made up by driving faster.

### 3.3.3 Turnout Time

Turnout time is the time it takes for all crews to hear the dispatch message, don safety clothing, and begin moving the assigned apparatus.

**Table 15—Turnout Time Performance – 90% Performance**

Station	Overall	2013	2014	2015
Department-Wide	02:37 (6,823)	02:40 (2,367)	02:36 (2,277)	02:36 (2,179)
Station 1	02:35 (1,405)	02:25 (447)	02:35 (464)	02:44 (494)
Station 10	02:26 (340)	02:27 (129)	02:26 (111)	02:24 (100)
Station 11	02:24 (547)	02:40 (180)	02:23 (197)	02:14 (170)
Station 13	02:39 (188)	02:42 (63)	02:39 (69)	02:28 (56)
Station 3	02:50 (648)	02:45 (220)	03:03 (225)	02:40 (203)
Station 4	02:44 (844)	02:48 (292)	02:29 (253)	02:48 (299)
Station 5	02:44 (262)	02:57 (96)	02:25 (84)	02:43 (82)
Station 6	02:51 (792)	03:00 (282)	02:49 (269)	02:45 (241)
Station 7	02:33 (1,042)	02:41 (351)	02:31 (352)	02:24 (339)
Station 9	02:19 (730)	02:13 (296)	02:26 (239)	02:10 (195)

Table 16 illustrates the ranking of incidents by call priority. The turnout time for paramedic ambulances does not seem to be impacted by call priority.

**Table 16—Turnout: 90% Performance Minutes – Year by Call Priority**

Call Priority	2013	2014	2015
A	02:42 (39)	02:56 (43)	02:29 (46)
B	03:00 (538)	02:48 (660)	02:51 (687)
D	02:40 (2,294)	02:37 (2,207)	02:35 (2,105)
E	02:29 (66)	02:25 (63)	02:49 (53)

While the NFPA recommends 60 seconds for EMS response turnout time, it has long been recognized as a standard rarely met in practical experience. Crews must not just hear the dispatch message, they must also don the OSHA-mandated personal protective clothing for the type of emergency. Due to this and the floor plan design of some stations, Citygate has long recommended that agencies can reasonably achieve a 2:00-minute crew turnout time to 90 percent of emergency incidents.



**Finding #6:** Turnout times need improvement to be at or below 2:00 minutes.

### 3.3.4 Travel Time

Travel time is defined as the time needed for the unit to travel to the address or street location of the call, not the patient’s side. Table 17 shows the SMEMPS service area travel time to all emergency incidents by the first arriving unit from *any location*.

**Table 17—Travel Time Performance – 90% Performance**

Station	Overall	2013	2014	2015
Department-Wide	08:43 (7,044)	08:31 (2,399)	08:44 (2,397)	08:50 (2,248)
Station 1	09:51 (1,416)	09:32 (448)	09:41 (479)	10:04 (489)
Station 10	08:01 (347)	08:01 (135)	07:53 (113)	08:26 (99)
Station 11	10:03 (547)	10:03 (185)	09:56 (196)	10:03 (166)
Station 13	10:35 (184)	10:41 (61)	09:45 (68)	11:30 (55)
Station 3	06:21 (672)	06:04 (226)	06:17 (236)	06:53 (210)
Station 4	07:42 (864)	07:27 (295)	08:02 (264)	07:29 (305)
Station 5	13:39 (191)	13:09 (70)	14:40 (66)	13:11 (55)
Station 6	08:35 (791)	08:35 (281)	08:51 (268)	08:08 (242)
Station 7	06:24 (1,061)	06:34 (358)	06:04 (357)	06:19 (346)
Station 9	05:25 (945)	05:17 (330)	05:54 (334)	05:11 (281)

Table 18 illustrates the ranking of incidents by call priority. Travel times vary, as should be expected.

**Table 18—Travel: 90% Performance Minutes – Year by Call Priority**

Call Priority	2013	2014	2015
A	09:10 (99)	07:49 (100)	09:14 (109)
B	11:30 (594)	12:49 (731)	12:21 (754)
D	08:57 (2,380)	09:12 (2,374)	09:33 (2,248)
E	11:03 (68)	09:07 (67)	09:55 (57)

**Finding #7:** A desirable travel time for first responder paramedic units in urban California is typically 4:00 to 5:00 minutes. For 90 percent of priority D and E incidents, travel time for paramedic ambulances is 8:50 minutes.

There are several reasons for slower travel time, not all of which can be cost-effectively improved. Traffic congestion variation, non-grid road network areas, open spaces, limited cross access boulevards, and a geographically spread out service area for individual units all affect travel time.

### 3.3.5 Call Commitment Time for SMEMPS Units

An important measurement for the SMEMPS management team is the amount of time each medic unit is committed on a response, requiring another unit to fill that void, or some other response configuration, if needed. Table 19 indicates the time each SMEMPS unit is out on a response. The times, shown in minutes and seconds, are from the time the call was received in the communications center to when the unit indicated it was available and in service for an additional response.

**Table 19—Apparatus: 90% Performance Minutes – Vehicle ID by Year**

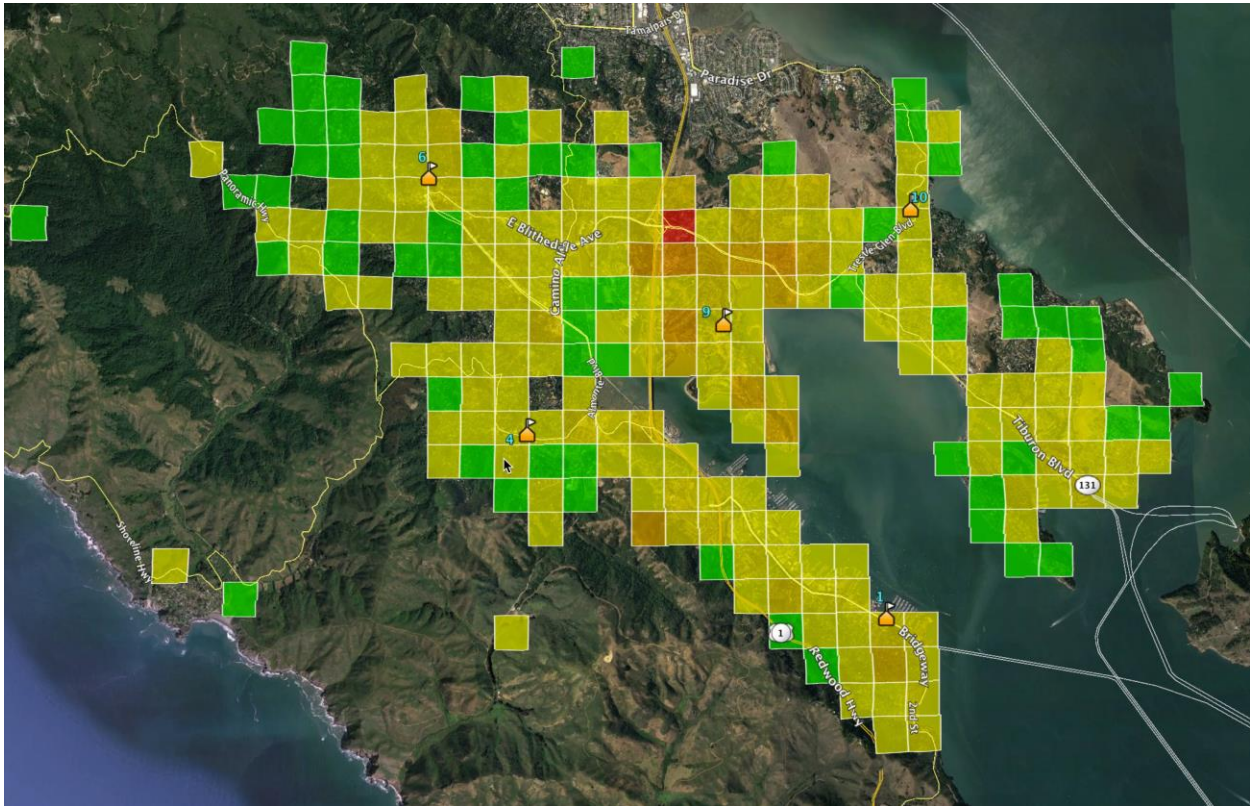
Year	M1	M10	M4	M6
2013	112:06 (984)	105:35 (897)	117:28 (808)	107:39 (972)
2014	116:49 (1,066)	97:38 (992)	117:45 (855)	103:25 (1,029)
2015	108:10 (1,131)	93:22 (888)	116:25 (854)	102:22 (1,052)

**Finding #8:** The out-of-service time for SMEMPS paramedic ambulances on 90 percent of the incidents is approximately 100:00 minutes per response. This helps explain the need for a minimum of three and, due to geography coverage distances and simultaneous incidents, four paramedic ambulances.

### 3.3.6 Travel Time Results on Geography

Figure 6 shows, by small grid area, where the travel times varied across the topography from fastest (green) to slowest (red).

**Figure 6—Travel Time for First-Due Units in 2015**



### 3.4 SPECIAL STUDY EVALUATIONS

Citygate was asked to perform two special evaluations for the JPA as part of this project. First was to determine if the organization would benefit from the use of advanced life support (ALS) engines, and the second to determine if Recue 9 is in the correct location for responses.

#### 3.4.1 Advanced Life Support Engines

Many communities throughout California and the country use ALS engine companies to deliver ALS service.

SMEMPS asked Citygate to investigate and review the feasibility of using ALS engines to enhance the ALS delivery system. Marin County Local Emergency Medical Service Authority (LEMSA) allows for paramedic engines.

To perform this analysis, Citygate used the travel time from each unit's first-due travel, home resource compared to outside resource travel times, the total out-of-service times for each unit, simultaneous incident numbers, and the number of ALS responses generated in each station area. For clarification, the information within Table 20 is also found in Table 9 of this report.

**Table 20—Response Analysis: Primary Apparatus by Station Area – 2015**

Station Area	1 <sup>st</sup> Arrivals	Home Resources	Outside Resources	Outside Percent	Overall Travel	Home Travel	Outside Travel	Delta Home/Out
1	2,077	1,705	372	17.91%	10:13 (1,863)	09:29 (1,550)	12:21 (313)	2:52
10	528	466	62	11.74%	08:15 (510)	06:21 (452)	11:25 (58)	5:04
11	744	0	744	100.00%	10:48 (705)		10:48 (705)	
13 <sup>3</sup>	275	0	275	100.00%	10:53 (261)		10:53 (261)	
3	916	0	916	100.00%	07:36 (898)		07:36 (898)	
4	1,193	778	415	34.79%	08:31 (1,135)	07:04 (742)	09:56 (393)	2:52
5	367	0	367	100.00%	13:43 (229)		13:43 (229)	
6	1,099	901	198	18.02%	09:11 (1,010)	07:40 (836)	11:56 (174)	4:16
7	1,513	0	1,513	100.00%	07:17 (1,458)		07:17 (1,458)	
9	373	0	373	100.00%	08:56 (294)		08:56 (294)	2:46

Source: S MEMPS CAD Data 2013–2015

**Finding #9:** S MEMPS does not need more paramedic ambulances for existing workload per paramedic ambulance; however, if it wanted to deploy paramedics faster, then the first responder agencies would need to add one engine-based first responder paramedic in those station areas that do not contain a paramedic ambulance. Otherwise, the topography and road network make it too difficult to deliver a sub-regional deployed paramedic within typical urban area travel times.

### 3.4.2 Rescue 9 Location Analysis

Rescue 9 (R-9) is currently located at Fire Station 9 in the northeast corner of the S MEMPS service area near Highway 101. The location provides easy access to respond to the south on Highway 101. R-9 is staffed with one paramedic and one EMT. R-9 responds to all locations in the S MEMPS service area and the Marin County Medic Zones for vehicle accidents, industrial accidents, and technical rescue incidents. This study only reviewed S MEMPS units responding to motor vehicle accidents with extrication, industrial accidents, water rescues, and special rescue incidents such as high-angle rope rescues. There were 1,310 technical rescue calls for service for the study period. Table 21 illustrates the technical rescue service demand previously shown in Table 3.

<sup>3</sup> Station 13 is used by Tiburon units to identify the City of Belvedere. There is NO Station 13 in S MEMPS.

**Table 21—Technical Rescue Risk Service Demand by Year**

Incident Type	2013	2014	2015	Total
Vehicle Accident with Injuries	325	299	281	905
Industrial Accidents	45	52	53	150
Water Rescues	52	54	37	143
Possible Drownings	45	40	27	112
Total Responses by Year	467	445	398	1,310

Source: Dispatch CAD incident records

Table 22 indicates the travel times of R-9 to reach station response areas. Station areas with low incident numbers decrease the accuracy of the data analysis. Travel time was chosen as a benchmark to help determine if R-9 is in the proper location to meet the needs of S MEMPS agencies.

**Table 22—Travel Time Analysis for R-9 to Fire Station First-Due Response Areas**

Station	1 <sup>4</sup>	10	11	13 <sup>5</sup>	3	4	5	6	7	9
Travel Times	11:58 (50)	07:55 (11)	08:38 (18)	14:36 (1)	04:53 (4)	09:42 (41)	14:12 (4)	09:36 (10)	06:18 (27)	05:02 (950)

Source: S MEMPS CAD records 2013–2015. Numbers in parenthesis are number of incidents counted in the analysis. Lower incident numbers increase volatility and potentially decrease accuracy of analysis findings.

Travel times for the ten fire station areas that R-9 responds to are diverse mainly due to terrain and distance. As this unit is a secondary response unit to augment the effective response force for certain types of calls, response time is not as sensitive given that first-due units arrive much earlier and can begin stabilizing the incident as specialized equipment continues to the scene.

Table 23 illustrates the travel times for R-9 to the agencies it services through the Marin County Medic Zones and the S MEMPS response area. As expected, the travel times to the Western Medic Zones in Muir Beach and Marin County are longer than the travel times to S MEMPS member agencies. However, given the distance and road network, as well as a limited number of responses, the times are not problematic.

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<sup>4</sup> Station 1’s area includes more than the City of Sausalito. It includes all the GGNP area, as well as Highway 101 and the Golden Gate Bridge access.

<sup>5</sup> Station 13 is a past City of Belvedere Station Number.

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**Table 23—Travel Time Analysis for R-9 to Marin County Fire Agencies**

District	2013	2014	2015
MLV	08:56 (82)	08:47 (104)	08:39 (80)
MRN	09:19 (41)	16:36 (40)	09:42 (49)
MUI	16:24 (17)	19:29 (15)	14:12 (8)
SOM	09:48 (670)	10:11 (654)	09:53 (612)
TIB	08:18 (70)	08:38 (76)	09:48 (69)

Source: 2013–2015 CAD Data

Table 24 shows a more in-depth geographical analysis for R-9 travel times to all reporting districts in the primary response area, including the SMEMPS response area and the Marin County medic response zones.

As expected, the travel times to the Golden Gate National Park (GGNP) were long. The same holds true for the Marin County zones west of the City of Mill Valley and the Southern Marin Fire District.

**Table 24—Travel Time Analysis for R-9 to Reporting Districts**

District	2013	2014	2015
GGN1A	12:00 (32)	11:37 (35)	11:50 (26)
GGN1C	08:36 (10)	11:47 (6)	13:34 (6)
GGN1D	11:19 (2)	25:33 (1)	
MRN2A	11:35 (7)	09:55 (6)	13:48 (6)
MRN2C1			07:40 (1)
MRN2C2			01:55 (1)
MRN2D1	06:17 (1)	19:29 (1)	13:34 (1)
MRN2D2			14:12 (4)
MRN3A	06:47 (27)	07:14 (22)	06:29 (31)
MVY06A	09:02 (22)	08:54 (36)	10:29 (19)
MVY06B	14:01 (5)	24:31 (8)	08:14 (5)
MVY06C	12:38 (2)		
MVY06D	09:16 (1)		04:49 (1)
MVY06E	05:07 (5)	06:44 (11)	08:43 (12)
MVY07A	04:34 (11)	05:17 (18)	08:33 (14)
MVY07B	05:55 (26)	06:30 (16)	04:57 (16)



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District	2013	2014	2015
MVY07C		04:44 (1)	
MVY07D	03:18 (2)	09:14 (2)	05:40 (3)
SAS2F	13:13 (31)	10:37 (33)	10:02 (36)
SOM01	11:44 (15)	10:19 (13)	18:08 (15)
SOM01A	08:23 (37)	09:23 (40)	09:08 (46)
SOM04A	07:56 (16)	10:23 (15)	13:43 (8)
SOM04B	11:00 (5)	14:08 (7)	11:02 (5)
SOM04C	10:41 (4)	09:50 (5)	08:47 (3)
SOM04D	08:00 (3)	06:33 (3)	07:40 (1)
SOM04G	05:48 (14)	05:41 (12)	06:33 (20)
SOM04H	07:27 (2)	07:38 (1)	11:19 (3)
SOM09A	05:08 (236)	05:04 (235)	05:18 (218)
SOM09B	06:06 (117)	05:45 (82)	05:46 (89)
SOM09C	06:51 (15)	06:19 (14)	11:22 (12)
SOM09D	10:56 (7)	06:50 (4)	06:17 (5)
SOM31A		10:14 (4)	
SOMF1	03:49 (4)	06:35 (6)	05:11 (2)
SOMF2	08:18 (4)	10:37 (9)	09:04 (12)
TIB10A	07:18 (19)	05:36 (8)	08:53 (14)
TIB10B	06:14 (1)	07:55 (9)	07:24 (4)
TIB11	10:16 (8)	09:31 (18)	10:52 (13)
TIB11A	08:18 (12)	08:38 (24)	07:10 (22)
TIB12	07:06 (8)	09:57 (7)	08:44 (11)

Source: CAD Response Data 2013–2015

**Finding #10:** Given that Rescue 9 is both a first responder and a specialty response unit, its location provides adequate travel times to all area response districts.

**Finding #11:** While all four ambulances are not heavily used all day, every day, the size of the JPA means that, to ensure adequate response times, it is best to have four ambulances. While one ambulance could be cross-staffed by an engine crew, doing so should mean the crew always responds with both the engine and ambulance or just the ambulance as the incident requires.



## SECTION 4—FINANCIAL ANALYSIS

### 4.1 OVERVIEW OF SMEMPS'S ORGANIZATION

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SMEMPS dates to 1980 when it was established to cost-effectively provide paramedic ambulance service to the southern region of Marin County. The foundational documents consist of a JPA agreement and, to avoid unnecessarily changing the JPA agreement, an Operations Plan which provides the detail for year-to-year operations. The JPA was updated in 2000, and the most recent Operations Plan and bylaws have existed since 2007. The Operations Plan is currently under review. The JPA Board of Directors and stakeholders completed a new Strategic Plan in August 2016. In addition to supplying all these documents for review, the JPA provided Citygate with recent and detailed documents pertaining to paramedic ambulance revenue and operating budget.

In summary, the JPA exists to provide paramedic ambulances, billing, and logistical support (supplies and oversight) for the delivery of paramedics and transportation to hospitals. The actual paramedic labor is provided directly by the partner fire departments. The JPA Board of Directors consists of appointed members from the partner agencies. The Executive Director and finance/office support roles are presently provided by the Tiburon Fire Department and Mill Valley Fire Department respectively. The Executive Director and partner agency Fire Chiefs form the Administration Chiefs committee.

The member agencies are entirely responsible for the hiring, employment costs, and day-to-day supervision of all personnel who serve on the JPA's paramedic ambulances. Some costs of training and clinical oversight are expensed by the JPA.

While any JPA agreement should be updated from time to time, the current agreement is not overly problematic. It is past time to update the operations agreement and/or bylaws, and Citygate suggests these be reviewed formally at least every three years, with updates no less often than every five years.

### 4.2 OVERVIEW OF SMEMPS'S FISCAL CAPACITY

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Citygate's review is not an annual or a forensic audit. Rather, given Citygate's experience with JPAs, local government finance, and EMS, the purview of this review is simply to determine the way the JPA is structurally doing business.

The JPA has two major sources of operational revenue: paramedic ambulance transport fees (all types/sources) and a partnership healthcare payment for certain services. Ambulance billing is very specialized due to Medicare and Medi-Cal rule sets and the differences between what the various private insurance companies will or will not cover. To its credit, the JPA understands this and has historically contracted a third-party billing firm for this work. Recently, the JPA switched billing providers to the Novato Fire Department EMS billing team.

### 4.2.1 Revenues and Billing

In reviewing SMEMPS billing practices with SMEMPS staff, Citygate found a set of best-practice policies and procedures, meeting the current standards of the federal and state systems. The JPA also participates in Ground Emergency Medical Transport (GEMT), a supplemental Medi-Cal ambulance payment system open only to government agencies. The JPA’s current rate structure system also meets current reimbursement best practices. Citygate did not conduct a transport rate survey, but given the multiple clients in the Novato partnership, an annual rate survey should be conducted to keep rates to two benchmarks: the actual full cost of the transport and what others are charging in the marketplace.

### 4.2.2 Ambulance Payor Mix

The system of receiving payment for an ambulance charge is as broken as the fiscal policy for the rest of the American medical system. The federal and state governments do not ever pay the full cost of a transport. Commercial insurance companies are increasingly using regional rate averaging to do the same, or they directly tell the patient they will only pay the Medicare allowable as a “usual and customary” charge, which it is not. In addition, there are individuals with no insurance or high deductibles. Federal health care reform and Covered California did not fix all of this; in fact, Covered California largely enrolled undiscovered Medi-Cal-eligible patients, and Medi-Cal pays the least of any source.

In SMEMPS, the payor mix is as shown in Table 25.

**Table 25—Ambulance Payor Mix**

Source	Percent of Invoices
Medicare	35.9%
Medicare HMO	5.13%
Medi-Cal	1.71%
Medi-Cal HMO	9.83%
Private Insurance	10.68%
Private pay with no insurance	18.8%
Kaiser	2.56%
Kaiser MCAL	0
Kaiser MCARE	15.38%
Other	0

**Finding #12:** The SMEMPS billing systems and practices meet current best practices.

**Recommendation #1:** Citygate encourages an annual or bi-annual transport rate review against internal JPA full costs and other comparable agency rates.

### 4.2.3 Expenses

The JPA's chart of accounts and amount of line-item detail is sufficient for the size of services. Operating expenses fall logically into three themes: maintenance, capital equipment, and apparatus replacement. The JPA also, very appropriately, uses a four-level tier of reserve funds: operating, apparatus, equipment, and general reserve.

For this study, Citygate reviewed the FY 2016/17 budget. The operational line items are consistent with the JPA agreement and Operations Plan. In this fiscal year, there were no capital equipment purchases, but there was a capital apparatus (ambulance) replacement purchase.

- ◆ The total expenses budget was \$1,003,513, of which:
  - \$768,513 went to operations and \$235,000 was used for apparatus purchase.
  - There were transfers from and into the General Fund amounting to \$340,000 into the capital equipment fund consisting of \$200,000 from capital equipment and \$140,000 out of ALS equipment.

Overall, the JPA operated with a surplus of \$937,213 in just this year. The apparatus fund was large at this point due to the planned replacement of Rescue 9, which is something completed every 15 years or more. The ambulances are on a five-year replacement cycle, and given an inventory of five ambulances, one is replaced almost every year due to their staggered service dates.

Citygate typically advises clients to have six months of net billing revenue in reserve to cover for slow payments and/or a change in federal or state reimbursement policies. For this JPA, that would amount to \$842,810, which would cover one year's current operating cost plus \$108,000 toward capital apparatus.

Overall, Citygate finds the reserves a little on the high side, but this is distorted by the savings for Rescue 9. Ideally, if total reserves could cover one year's operating cost and the annual payment of one ambulance at \$200,000, that would be sufficient. In FY 2016/17, total reserves were \$1,575,546. If \$650,000 is subtracted for Rescue 9, the remainder of \$925,546 is slightly more than a possible goal of \$842,810.

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Excessive reserves should be avoided because the JPA construct allows excess revenues to be paid back annually to the member agencies after the close of each year's books to partially offset paramedic personnel costs. Currently, the agencies expend a total of \$6,247,467 for paramedics against a JPA net revenue in FY 2016/17 of \$1,940,726. Thus, the personnel side of the JPA agreement means the fire departments are **heavily** subsidizing the provision of ambulances from their taxpayers. Every dollar not needed for essential reserves should be paid back to the member fire departments.

Given this subsidy, the fire departments are already exposed for losses should a revenue downturn occur. If the JPA only held essential reserves for JPA apparatus and equipment and thus provided the maximum available reimbursement each year to the partner fire departments, then its annual subsidy would soften. If an ambulance revenue downturn would occur, then the agencies would, at that point, absorb their share of loss, given the agency reimbursement formula. Either way, the fire departments are exposed for losses. In Citygate's opinion, keeping joint reserves just hurts all of their annual budgets.

The JPA agreement allows for flexible, year-to-year reimbursement as the current reimbursement formula, based on the number of paramedics per agency, is 60 percent to South Marin FPD and 20 percent each to Mill Valley and Tiburon. These payments are being made. The goal should be to maximize them to the extent fiscally prudent for sustainable JPA operations.

**Finding #13:** Citygate finds the JPA reserves policy perhaps a little too excessive.

**Recommendation #2:** The Board should adopt a very clear policy on essential reserves to allow for the maximum payment possible to JPA fire department partners for their personnel expenses.

## SECTION 5—EVALUATIONS AND RECOMMENDATIONS

### 5.1 OVERALL S MEMPS DEPLOYMENT EVALUATION

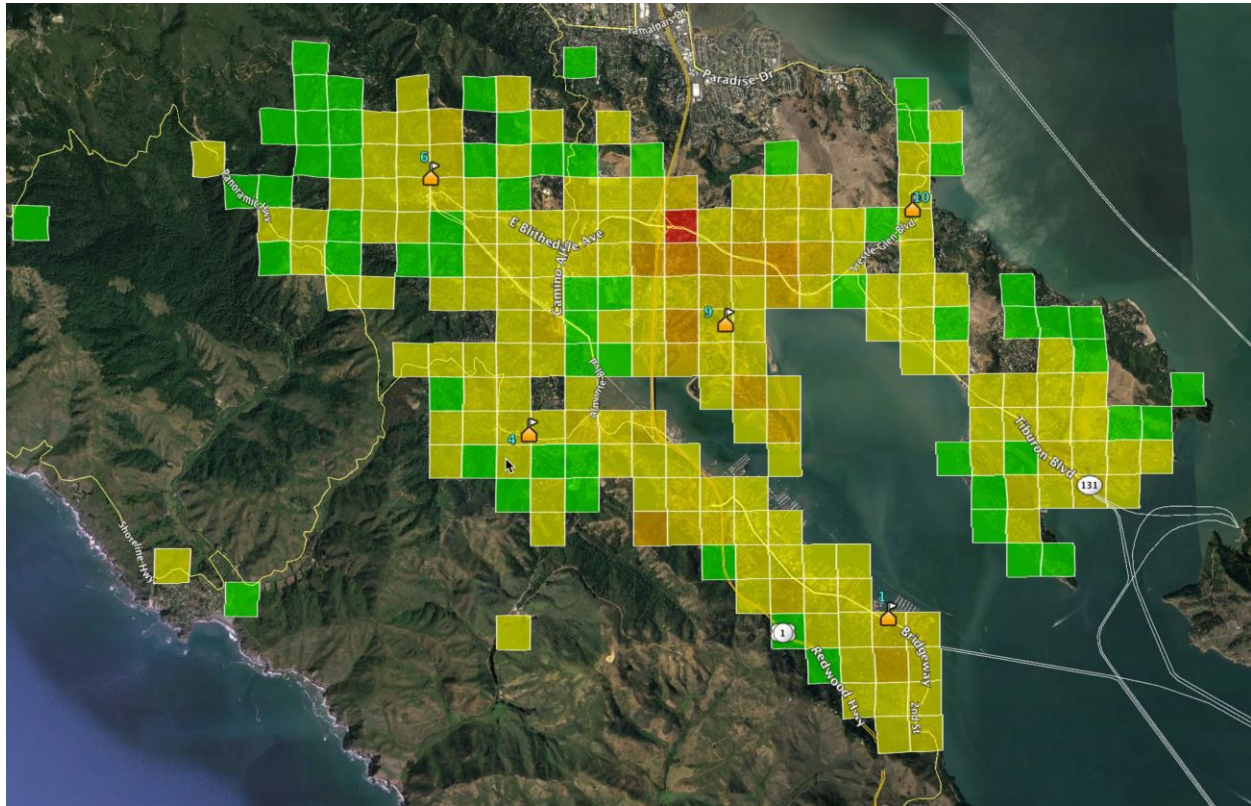
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S MEMPS serves an urban- to suburban-populated area across challenging topography with limited major cross-connecting roadways. As Figure 7 shows, even with four paramedic ambulances, achieving travel times based on best practices is difficult. This is due to topography and limited cross-connecting roads. Paramedic Stations 1, 4, and 6 are well placed in a line through the center of the JPA. A paramedic unit at Station 10 in the east is needed due to the separation of the land mass where that section of the JPA is established.

Currently, Medic 4 goes to more incidents that occurred in all of Station 9's area in the last year, and Station 9 is too close to Station 10. The current three paramedic locations that surround Station 9 are providing adequate travel times to Station 9's area and the overall core of the JPA's operating area.

Station 1 is busy servicing the population and tourism activity in the southern JPA area and the GGNRA. On peak-activity days, weekends, and holidays, Medic 4 could be moved south to Station 1 when Medic 1 is committed on a transport or long travel-time call into the GGNRA. When that occurs, Medic 10 would cover the center of the JPA.

**Figure 7—Travel Time for First-Due Units in 2015**



If Marin City and other County fire areas want improved paramedic travel times, the most cost-effective way would be to upgrade some of the engines to paramedic first responders by transitioning one of the three crew members into a paramedic.

Since the need for acute paramedic care is only 16 to 25 percent of all incidents and the incidents per paramedic-staffed SMEMPS fire station areas are relatively small, Citygate does not see the cost-effectiveness of upgrading every fire crew to first responder paramedic for those stations that already have a paramedic unit in the district.

Citygate does not see that SMEMPS has the revenues to support adding paramedic first responder engine crews when it cannot fully cover even the ambulance personnel costs.

If both dispatch and crew turnout times could be lowered by 36 seconds and 43 seconds respectively, the total response time for a paramedic unit to serious incidents would drop to 10:31 minutes across the JPA, a significant improvement.

### 5.1.1 Recommendations

Based on the technical analysis and findings in this study, Citygate offers the following overall deployment recommendations:



**Recommendation #3:** **Adopt Deployment Measures Policies:** The appointed officials of S MEMPS should adopt complete performance measures for emergency medical services planning and monitor operations. The measures of time should be designed to save patients where medically possible.

As a starting point, response time measures that could be considered with input from the County EMS Agency could be as recently proposed in another Bay Area county after considerable clinical research. For clinical priorities D/E, this would be from the time of crew notify to on-scene:

Urban – 10:00 minutes

Suburban – 14:00 minutes

Rural / Open Space – 16:00 minutes

**Recommendation #4:** S MEMPS should investigate the reason that call processing time increased for incident categories D and E between 2013 and 2014 and assist the communications center, as possible, in improving its performance.

**Recommendation #5:** S MEMPS and its partner fire departments must work to substantially lower crew turnout times to 90 seconds during waking hours and to no more than 2:00 minutes during sleeping hours.

**Recommendation #6:** S MEMPS should conduct regular transport charge reviews to maintain fees at full cost.

**Recommendation #7:** S MEMPS should set a reserve policy to ensure capacity to replace ambulances and annual expenses only. Revenues in excess of expenses should be remitted to the member agencies per the JPA formula.