

HOW WILL A SMALL LAW ENFORCEMENT AGENCY ACCOMPLISH
COUNTYWIDE RADIO INTEROPERABILITY BY THE YEAR 2009?

A project presented to
California Commission on
Peace Officer Standards and Training

By

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This Command College Project is a FUTURES study of a particular emerging issue in law enforcement. Its purpose is NOT to predict the future, but rather to project a number of possible scenarios for strategic planning consideration.

Defining the future differs from analyzing the past because the future has not yet happened. In this project, useful alternatives have been formulated systematically so that the planner can respond to a range of possible future environments.

Managing the future meant influencing the future: creating it, constraining it, adapting to it. A future study points the way.

The view and conclusions expressed in this Command College project are those of the author and are not necessarily those of the Commission on Peace Officer Standards and Training (POST).

TABLE OF CONTENTS

Chapter I	ISSUE IDENTIFICATION	1
	Introduction.....	1
	Statement of the Issue.....	6
	Description of the Model.....	10
Chapter II	FUTURES STUDY	17
	Introduction.....	17
	Forecasting the Future	17
	The Nominal Group Technique.....	18
	Trend Summary.....	19
	Events	28
	Cross Impact Analysis Summary.....	35
	Scenarios	39
	Optimistic Scenario.....	39
	Normative Scenario	42
	Pessimistic Scenario	43
	Summary.....	45
Chapter III	STRATEGIC PLAN.....	46
	Introduction.....	46
	Organizational Analysis	46
	Vision.....	49
	Internal Strengths	49
	Internal Weaknesses	50
	External Opportunities	50
	External Threats	51
	Stakeholder Identification	51
	Development of Key Strategies	57
	Summary.....	57
Chapter IV	TRANSITION MANAGEMENT	62
	Commitment Planning	62
	Responsibility	67
	Analysis of the Responsibility Chart	68
	Implementation Plan.....	74

Chapter V	CONCLUSION	79
	Summation	79
	THE APPENDICES	
	List of NGT Panel Members	84
	List of Trends Identified by NGT Panel.....	85
	List of Events Identified by NGT Panel.....	86
	NOTES.....	87
	BIBLIOGRAPHY.....	89

CHAPTER I

ISSUE IDENTIFICATION

Introduction

Throughout history, the need for human beings to communicate with one another has always existed. Various forms of communication have been used, with varying levels of success. In addition to voice and hand signals, some of the earliest forms of communication included the use of drums, smoke, animal horns, and church bells. Drums made of animal skins stretched over wooden frames provided an early form of communication that provided crude long distance warnings.¹

As populations grew and civilization expanded, so did the need for better, faster and more accurate forms of communication. Samuel Morse, an artist turned inventor, developed the telegraph. This technology employed telegraph lines to transmit electrical pulses consisting of a series of dots and dashes, named Morse code. Morse Code provided society with an accurate and more rapid form of long distance communication. In 1844, Morse sent his first message from the floor of the Supreme Court room in the Capitol to the Baltimore train station.²

Early forms of communications for law enforcement both here and abroad included bells and whistles. These forms of communication gave way to the installation of red signal lights as law enforcement started to integrate vehicles into their patrols. These red lights were installed in various locations throughout cities. When spotted by an officer on patrol, the officer would then drive to their

station to get an assignment. This improved response times in the developed urban areas, but were not very effective in outlying, less populated areas.³

By 1876, Alexander Graham Bell had invented the telephone. The telephone was able to carry the human voice over large distances, but the inherent weakness of both the telephone and the earlier telegraph systems was that the signals could only be carried as far as, or where, the telegraph wires led.⁴

By 1897, Guglielmo Marconi had developed the first “Marconi Spark Transmitters” that were capable of sending Morse code by radio. Radio did not require transmission lines or fixed point locations that telegraph and telephone systems required. The SS Titanic became the first ship to send an S.O.S. using Morse code when it struck an iceberg. This was the first “wireless” S.O.S. call. A nearby ship heard the S.O.S., responded, and rescued many of the victims.

In the late 1800s, the Los Angeles Police Department (LAPD) established the “Gamewell Call Box” system for its officers. These boxes allowed the officers to be dispatched to calls in the field over a telephone type of system, but it required officers to go to fixed-point locations in the city. The officers could not carry the call box communications systems with them on their patrols, which limited the effectiveness of system because of the time it took officers to go to a call box and call in.⁵

By the early 1900s, law enforcement had established agreements with local AM radio stations. When the police had an important call, they would phone it in to the radio station engineer who would in turn interrupt the local

programming and broadcast it over their radio channel. Officers in the field would keep the AM radios in their patrol cars tuned to that station while on patrol so they could receive calls over this one-way transmitter type of system.⁶

Law enforcement agencies applied to the Federal Radio Commission (FRC), the predecessor of the Federal Communications Commission (FCC), for their own broadcast licensing after the success they had in using their local radio broadcast stations. The FRC assigned only eight radio frequencies nationwide for police departments to share. In 1930, the Pasadena Police Department became the third police department in California to receive a license for their own one-way radio system.

These systems allowed the law enforcement dispatcher to broadcast a call to any vehicle equipped with a receiver, but the officer could not transmit back to the dispatcher because the early system only allowed one-way communications. Another inherent problem with these systems was that frequencies were shared amongst agencies because the number of channels was limited. This resulted in interference issues, but it also provided the first type of voice communications interoperability amongst law enforcement agencies, since the agencies that shared channels could hear one another's radio broadcasts.⁷

By 1937, the FCC had allocated twenty-nine (29) Very High Frequency (VHF) channels in the 30.58 – 39.9 Mhz low band range for law enforcement two-way radio use. The city of Pasadena was one of the first law enforcement agencies in California to utilize this developing communications technology that provided two-way operations. Now a dispatcher could relay timely, up to the

minute, accurate information to officers in the field and officers could rapidly respond to calls and provide timely information back to the dispatcher and management.⁸

Over the next several years, law enforcement agencies in Los Angeles County entered into agreements to provide dispatching services for agencies that did not have their own communications system infrastructure. The Pasadena Police Department and LAPD, for example, provided dispatching service to several of the Los Angeles County Sheriff's Department (LASD) substations until 1938 when Sheriff Biscailuz built the department's first, two-way radio system.⁹

As more and more law enforcement agencies developed and implemented two-way communications systems, the growth outpaced the available "spectrum." Spectrum is the electromagnetic waves that are defined by their frequency. There is a finite amount of spectrum, or available frequencies in a particular spectrum, and the FCC administers communications spectrum.¹⁰

To address the increased demands for additional spectrum, the FCC, over the last sixty years, has assigned additional spectrum at frequencies in the higher bands. Today, public safety agencies across the U.S. operate in 10 separate and incompatible spectrum bands.¹¹ In Los Angeles County, municipal, county and State law enforcement agencies operate in four separate and incompatible bands allocated by the FCC for public safety use. These bands include the High Frequency (HF), Very High Frequency (VHF), Ultra High Frequency (UHF), and 800 MHz.

Table 1 below illustrates the spectrum and frequencies bands currently in use in Los Angeles County. The first column identifies the spectrum or designated frequency band. Column two breaks down the spectrum into the frequency band set aside for public safety licensing and the third column identifies the number of licensed public safety users within Los Angeles County. The fourth row details the future 700 MHz spectrum that is set aside by the FCC for future use.

Table 1. Los Angeles County Public Safety Radio Spectrum

Spectrum	Frequency	Municipal & County Users Within Los Angeles County.
HF	25-50 MHz	2
VHF	150-174 MHz	17
UHF	450-470 MHz *470-512 MHz	36
700 MHz	764-776 MHz 794-806 MHz	0
800 MHz	821-824 MHz 866-869 MHz	3

In addition to the federal law enforcement agencies in Los Angeles County, such as the U.S. Marshal, FBI, Drug Enforcement Administration (DEA), and Secret Service, there are 47 municipal police agencies, the sheriff's department, the highway patrol, and a number of state law enforcement agencies, such as Alcohol Beverage Control (ABC), Department of Justice (DOJ), Office of Emergency Services (OES), Department of Motor Vehicles, as

well as law enforcement agencies at each of the state university and college campuses within Los Angeles county.¹²

Each of these law enforcement agencies interact with one another on varying levels and for various lengths of time to deliver law enforcement services within their respective jurisdictions. Mutual aid agreements exist between the various law enforcement agencies in the County of Los Angeles. These mutual aid agreements spell out responsibilities and operational and logistical plans for disasters, cross-jurisdictional operations, task force operations and short duration special events. Based on these interactions, there is a need for direct and immediate voice communications to facilitate coordinated public safety responses, and to effectively protect life and property.

In Los Angeles County and throughout the United States, there does not exist clear and immediate interoperable public safety communications because of the lack of spectrum. Because of the lack of spectrum, public safety agency systems are spread across different bands making voice communications with one another difficult, if not impossible, with today's current infrastructure and hardware. This inhibits law enforcement agencies from one city being able to communicate with a neighboring city for day-to-day operations as well as emergency operations.

Statement of the Issue

Recent events, both locally and nationally, have demonstrated time and time again that all too often public safety agencies cannot talk to one another. This inability to communicate over two-way radio systems is because of separate

and distinct communications systems that are incompatible with one another or systems that are on different bands of the voice communications spectrum. The consequences are uncoordinated and ineffective public safety services. The National Institute of Justice has been researching this issue and in a 2003 report released the following:

Five years to the day before the 9/11 terrorist attack, the Public Safety Wireless Advisory Committee (PSWAC) reported that unless immediate measures are taken to alleviate spectrum shortfall, public safety will not be able to adequately discharge their obligations to protect life, and property in a safe, efficient and cost-effective manner.

Several years later public safety is still grappling with inadequate spectrum and communications systems that do not communicate with one another.¹³

In the 1980s, manufacturers of communications equipment released a new technology known as “trunking.” This technology used a limited number of radio channels (frequencies) and shared these channels amongst a group of users, called “talk groups.” Users accessing, or talking, on the system were prioritized through a computer-controlled system that assigned the channel based on user priority and availability.

In effect, the system allowed more users on fewer channels than the old technology that required a user to have a channel of their own. The new technology took advantage of the time when a channel was not being used and would route another user or agency to that channel, making the system far more efficient. By increasing the number of users who could be on a system with fewer channels, multiple agencies could take advantage of technology and develop more efficient systems. The efficiency of these system would allow

entire counties the ability to be on one system, using far fewer channels than if each agency within the county licensed and operated its own independent systems.

The FCC looked to this technology to promote spectrum efficiency and opened additional spectrum to public safety in the 800 MHz band. The FCC hoped to encourage agencies to develop large systems that would promote the efficient use of the spectrum and promote interoperability among the participants in these systems. It was not anticipated that the manufacturers of this type of communications technology would develop three separate closed architecture systems. Each system that had proprietary values specific to each individual manufacturer's equipment, making the systems incompatible with one another.

Since the release of the 800 MHz spectrum, a number of law enforcement agencies across Southern California have developed trunked 800 MHz systems. Entire counties have formed joint power agreements and developed 800 MHz systems. The Counties of San Bernardino and Orange have developed systems that have joined all public safety entities (municipal police, county sheriff, and municipal/county fire) within the county. The County of Riverside also developed an 800 MHz system, but local municipal agencies are not part of the system. Therefore, there still exists a significant interoperability issue.

Los Angeles county has a mixture of users in each of the different spectrums set aside for public safety use. The dominant group is the Ultra High frequency (UHF) users, followed by the Very High frequency (VHF) users, and there is a scattering of 800 MHz and High Frequency (HF) users. There has not

been a driving force, either from the sheriff's department, the chiefs' of police organization, or the League of Cities to develop a countywide system, as there has been in the jurisdictions that have implemented large-scale trunked radio systems.

Since the release of 800 MHz, a number of state and federal agencies, and public safety and communication organizations, have been working in cooperation with manufacturers. Their combined efforts resulted in the development of "Project 25." Project 25 defines standard definitions, interoperability, and compatibility and compliance requirements for developing future radios and communications equipment.¹⁴

End users, including the Association of Public Safety Communications Officials International (APCO), selected state and federal agencies, as well as manufacturers representatives have formed project groups. These groups have developed voluntary compliance standards, referred to as Project 25 that established certain standards that will make communications equipment compatible with one another and specifically address interoperability issues.

In 1998, the FCC set aside new spectrum in the 700 MHz band to address the issues of interoperability and the lack of spectrum available to and for public safety. The FCC ruled that the spectrum would come available as soon as the television stations vacate the spectrum or December 31, 2006. However in a later FCC decision, the Commission stated:

It will be available as soon as existing TV stations vacate the spectrum, which is targeted for no later than December 31, 2006. (This date may be extended under particular circumstances set forth in 47 U.S.C. § 309(j)(14)(B) including for those markets where 15 percent or

more households do not have access to either DTV-equipped receivers or multi-channel video.)¹⁵

In essence, the Commission may allow the date to be extended until such time that 85% of the households in the markets using this part of the spectrum are using high definition television (HDTV). There is no real push from the television stations to encourage the purchase and use of HDTV systems in the markets necessary to meet the initial deadline. Since the FCC published the deadline, television stations have started to use their political clout to try and extend the date even further.¹⁶

Description of the Model

Los Angeles is an urban county, consisting of 4,084 square miles of land, including 81 miles of coastline and 1,875 square miles of mountains. The county is home to over 10,000,000 residents, or 28% of the population of the state of California. There are 88 incorporated cities in the county, each with its own city council. Each of these cities operates its own police department or contracts with the county sheriff for law enforcement service.

The city of Claremont is located on the eastern edge of Los Angeles County. Claremont is primarily a residential community with a population of 36,337 spread out over 14 square miles. Claremont operates its own police department and primary public safety voice communications take place on the city's UHF radio system.

The County of San Bernardino and the cities of Upland and Montclair border Claremont on the east. The county and cities in San Bernardino operate an 800 MHz radio system for public safety communications. Claremont borders

the cities of Pomona and La Verne on the west. These two cities have their own police departments and both have independent public safety communications systems in VHF band.

The Claremont Police Department's original communications systems operated in the VHF band and the city shared its FCC assigned frequency with the cities of La Verne, Glendora and Azusa. In the years prior to 1980, this system provided each of the cities with ample communications. It allowed for interoperability since each of the four cities could hear one another's radio transmissions. For example, if a robbery occurred in one jurisdiction and the suspect fled in a vehicle, each of the four cities immediately had a description of the suspect, the suspect vehicle and the crime classification.

By 1983, the growth of the four jurisdictions caused the system to be overburdened. The cities of Azusa and Glendora applied to the FCC for a VHF license and, once it was approved, developed their own two-city system while Claremont and La Verne remained on their own systems.

By 1990, technology had improved and Claremont's VHF system was outdated and in need of replacement. LASD had changed to a UHF system and the initial direction other law enforcement agencies, replacing their communications systems within the county, appeared to be moving towards UHF systems as well. However, a number of agencies did not have the funding to replace their existing systems and did not move to UHF. Claremont changed to a UHF system and immediately became an island when it came to public safety communications. The agencies to the east had changed to an 800 MHz system

a year or two prior, and the cities of Pomona and La Verne had decided not to change out their VHF systems because of the significant cost.

Today, there are 19 agencies scattered throughout the county that still operate in the VHF spectrum. There are three agencies that operate in the VHF (HF) or 800 MHz systems. The remaining agencies operate in the UHF spectrum.

Currently, the LASD has contracted for a study of their communications system so they can develop a strategy for their immediate and long future communications needs. Their communications system has been in place for well over fifteen years and is past its useable life cycle. There have been discussions about the sheriff going to its own trunked system in the UHF band, and/or developing a countywide trunked system similar to the 800 MHz systems in San Bernardino and Orange Counties, but in the UHF band. The sheriff's department has also applied for licensing in the 700 MHz band.

While the sheriff's department is studying its options, which may or may not impact cities throughout Los Angeles county, the city of Glendale has started a project called the Interagency Communications Interoperability System or ICIS. Eight cities and a five-city communications authority have formed a Joint Powers Agreement (JPA).

The main concept of ICIS is the development, by the JPA cities, of a trunked, Project 25 compatible, communications system in the UHF band. The system would work in a dual mode (analog/digital). The system would allow users of the system to "roam" throughout the coverage area (Los Angeles

county) much in the same way a cellular phone uses cell sites as it moves from area to area. In this roaming mode, the user would still be able to communicate with their dispatch center even if the user were on the other side of the county. The ability to communicate with a user's primary communications center, regardless of the user's location in the county, is an advantage in overcoming range issues and separate and often incompatible communications systems.

Members of the ICIS system give their UHF frequencies to the ICIS project to expand the number of channels and talk groups to support the large group of users on the system. Agencies that still operate in the VHF spectrum can join ICIS, but pay a monthly "airtime" charge since they have not contributed to the overall system by donating their UHF frequencies.¹⁷

The ICIS JPA is not looking at 700 MHz in the future to replace their current UHF infrastructure. While they may utilize 700 MHz for data communications, ICIS is placing a significant amount of funding towards building out their current UHF infrastructure. While any public safety agency can join the JPA of ICIS, currently there are only municipal police and fire departments in the JPA. No state or federal agencies have joined. The sheriff's department and a number of cities within the county have elected not to join the system, which may limit the overall effectiveness and true interoperability that is a cornerstone of the ICIS project.

The Claremont Police Department, the model agency for this futures project, will face a communications crossroad in the next 5 years. The current existing system is outdated from the standpoint that parts are no longer made for

some of the existing infrastructure and the manufacturer is not offering support for much of the systems hardware. With its current outdated UHF infrastructure in need of replacement, major decisions and a strategic plan must be developed to address the future voice communications needs for not only the police department, but the city government as well.

A number of questions and their associated variables must be answered before the department can proceed in any given direction. For example, can the department wait for the release of the 700 MHz spectrum and will it be released on time? If Claremont goes to 700 MHz, will other L.A. County agencies plan on moving or will Claremont be an island of sorts if it chooses the 700 MHz technologies? Will or should the continued development of ICIS impact Claremont's plans? How will the development of a county system impact Claremont and its adjoining neighbors? Finally, will the 700 MHz spectrum live up to what it is intended to be? Will it provide sufficient spectrum for public safety and the much needed interoperability?

How and when will 700 MHz spectrum be released for public safety use and how will voice communications interoperability for a small law enforcement agency, such as Claremont, be impacted. There are several immediate variables that surface. The first, and perhaps the most significant being: when will the spectrum be released. Second, will a large enough grouping of agencies within Los Angeles county move to the 700 MHz spectrum when it is released to meet the demands for interoperability? Next, is the commitment to move time and funding sensitive? Will agencies only move if forced to move by the Federal

Communications Commission or will federal funding make the move to 700 MHz attractive to agencies?

Having identified the issue, it is necessary to look at the alternatives and possible solutions, and to look to the future and prepare for it. One method is literature research and review. A second method is the Nominal Group Technique (NGT). The NGT is one method of soliciting ideas, input, and solutions through a brainstorming technique that involves a group of people who have some subject matter expertise. The research for this project, as well as the NGT panel, did not paint a favorable picture of 700 MHz and its ability to mitigate or resolve current and long-term interoperable communications issues. The most significant hurdle presented by the NGT panel is the release date of 700 MHz being in state of flux because of the significant political power that the television broadcast stations currently using that spectrum has. Without a firm release date, agency executives and planners are hesitant to commit to new communications projects that cost millions.

In Chapter two, the NGT process will be described. The NGT was initially utilized to look at the future issue of how will 700 MHz impact voice communications interoperability for a small law enforcement agency in an urban county by the year 2009 and what should be done to anticipate the impact and prepare for it. However, based on the literature review and research, as well as the input derived from the NGT panel, 700 MHz does not appear to be the best way to achieve interoperability and it will impact a small organization negatively from an interoperability standpoint. Therefore, following the research and the

NGT, the issue statement for this project was changed to, “How will a small agency accomplish countywide radio interoperability by 2009?”

The next chapter will address trends and events that could impact this issue over the next 10 years and will offer alternative future scenarios based on that data.

CHAPTER II

FUTURES STUDY

Introduction

No one can completely and accurately predict the future. However, in an attempt to provide a possible futures related scenario and solution towards the issue, an attempt must be made to forecast the future. One method of obtaining the necessary information to begin the process of futures forecasting is a Nominal Group Technique (NGT). The NGT and the resulting data will be described and analyzed in Chapter two.

Forecasting the Future

In April 2004, a Nominal Group Technique (NGT) was conducted. The Nominal Group Technique was used to generate ideas in a controlled, non-threatening environment. The Nominal Group Technique is a form of brainstorming, where ideas produced by the group are equitably prioritized. A diverse group of individuals was brought together to discuss the issue, which will likely have a significant impact on law enforcement in the future. Initially, the issue that the group considered was "How will 700 MHz impact voice communications interoperability for a small law enforcement agency in an urban county by the year 2009?" The approach of this project was to pursue 700 MHz. However, as noted, when the panel convened it became apparent that 700 MHz was not the best way to achieve interoperability. The group continued with the first issue statement and also discussed the impacts of 700 MHz and other

alternatives. All of the comments, ideas and opinions contained in this chapter came from the panelists during the NGT discussion.

The Nominal Group Technique

To develop future scenarios for this project, the Nominal Group Technique was used for the purpose of generating and clarifying differing ideas or opinions by people with a wide range of knowledge and expertise in the issue. The panel was comprised of eight individuals and stakeholders whose varying backgrounds offered expertise in areas that could impact communications interoperability and the coordination of the 700 MHz frequency spectrum (see Appendix A). The panel identified trends and events they believed could impact the issue in the future.

Each NGT participant received literature outlining the process and clarifying the issue. They also received definitions of trends and events. This information was provided to each participant before the actual date of the NGT. Each participant was asked to bring a list of trends and events with them to the NGT. At the start of the NGT, trends and events were defined again for each of the participants. Once the NGT process began, participants were asked to provide events and then trends in separate round robin discussions. Each participant was allowed ample time to clarify their suggested events and trends for the group. However, discussion beyond clarification was discouraged.

The panel provided a candidate list of twenty-nine trends (Appendix B) and twenty-nine events (Appendix C). From these lists, the group reached a

consensus and selected eight trends and eight events they felt could have a significant impact on the issue.

Trend Summary

A trend is a series of incidents taking place that have a past, present and future and can have either a positive or negative impact on the issue. The Trend Summary Table is comprised of six columns and nine rows. The trends identified by the NGT panel are listed in the first column. Column two represents five years in the past. Column 3 represents today with a baseline value of 100 assigned to present day. Column four represents five years into the future, and column five represents ten years in the future. Finally, column six represents the level of concern the panel placed on a particular trend. A ten signifies a great deal of concern and a one signifies little concern on the impact the trend has on the issue.

The purpose of this exercise was to have the panel indicate the level or state of the trend five years ago, today, five and ten years in the future. The panel members were asked to make projections based on their own personal opinions as to where the trend has been and where it is headed within certain time frames. Once all the data was collected, median values were determined for each trend.

Table 2. Trend Summary Table

Trends	-5 years	Present	+5 years	+10 years	Concern (1-10)
(1) Use of Digital Communication	25	100	200	500	5.5
(2) Regional Dispatch Centers	25	100	145	200	2
(3) Single Regional Radio Systems	50	100	200	200	10
(4) Technology Advancements	50	100	187.5	300	9.5
(5) Mutual Aid	25	100	250	650	8
(6) Available Funding	25	100	117.5	150	8
(7) Number of events that spotlight Interoperability	50	100	200	400	9
(8) Shared Regional Resources	30	100	200	212.5	5

The NGT panel members offered the following opinions and ideas concerning the eight trends they felt will most likely have an impact on how 700 MHz will impact voice communications interoperability for a small law enforcement agency in an urban county in the future.

Trend One, Use of digital communication

Currently, there is a mix of analog and digital voice communications users in the law enforcement community. Some law enforcement agencies in the previous five years have already made the switch to digital. The panel recognizes that the FCC is requiring all 700 MHz licensees to operate in a digital format, and as analog license in the other spectrums come up for renewal, they will also be

required to conform to digital operations. A mixture of analog and digital users presents a problem for interoperability. Analog users cannot communicate with digital users and vice versa. It is the same impact experienced currently by users in different spectrums. Based on these FCC requirements, the number of licensees that are operating their communications in a digital environment is project to increase dramatically over the next ten years. The panel expressed concern (5.5) over the FCC forcing agencies to digital communications so it can increase the number of users in certain spectrum.

A number of public safety agencies have expressed concern about the ability of digital communications being able to penetrate buildings and the complete loss of signal in some instances. The panel felt that some users might not move to 700 MHz because of the digital requirement. The panel also recognized that the FCC is requiring narrow banding on the other spectrums available to public safety. As narrow banding moves frequencies closer together, licensees will have no other alternative but to go digital because analog frequencies will interfere with one another as the separation between them is narrowed. There is a belief that some agencies will try to prolong having to go to digital as long as the FCC will allow and therefore will not go to 700 MHz.

Trend Two, Regional dispatch centers

The panel recognized that regional dispatch centers, serving a number of different law enforcement agencies within a given geographical area, are nothing new to law enforcement. In some areas they have worked extremely well. In some areas they have had limited success, and some have even disbanded.

The panel believes that the number of regional dispatch centers, that is centers that provide communications services for multiple law enforcement agencies within a county, will perhaps double in the next five to ten years and this trend is more for financial reasons than having to do with the 700 MHz spectrum and interoperability. The concern this trend caused the group to discuss is that regional operations still use separate and distinct systems. Because of this, they may be less likely to embrace 700 MHz because they offer interoperability already to each of the users of their regional system. 700 MHz may not be viewed as beneficial. The lack of acceptance of 700 MHz would contribute further to a piecemeal approach and there would be no increased interoperability. Things would remain status quo.

Trend Three, Single regional radio systems

The panel defined single regional radio systems as countywide systems that served both county and city communications needs. These systems provide communications throughout the entire county from a single communications network. Examples of these included the County of Orange and the County of San Bernardino. Both of these counties operate single 800 MHz systems for all of the county and city law enforcement agencies. The panel recognized the successes of several single regional radio systems covering an entire county and in some cases states. These systems, unlike the regional systems that combine several law enforcement agency communications services, allow each agency to have their own communications centers. The centers are tied into one large regional system. These systems have been proven very effective in voice

interoperability. Two panel members expressed that in these cases there was support from the chiefs/sheriff as well as the political bodies in each of the jurisdictions that made these systems possible. One panel member pointed out that in Los Angeles County, there are eighty-eight cities, each with its own city council, as well as the County Board of Supervisors. It is difficult for so many political bodies to work towards an agreement of this magnitude. In addition to the political bodies, there are also numerous law enforcement executives, who also have to agree. Several panel members agreed that there is a potential in the next five to ten years to see the number of regional systems double. With the ICIS system and talk of a county system under the sheriff's department, there is the potential to double the number of current regional systems.

The panel expressed a high level of concern that development of single regional systems today and five years out could significantly impact the viability of 700 MHz. Since it is not currently available and the timetable for release is in state of fluctuation, agencies may proceed with the development of UHF or VHF systems and not utilize 700 MHz for voice communications.

Trend Four, Technology Advancement

With the constant advancements in technology, the panel was concerned (9.5) that advancements made in the coming years may significantly impact the ability of end users to take advantage of 700 MHz spectrum when it is released. The panel expressed concern over constant change in technology and if the development of new technology would cause law enforcement administrators to take a wait and see attitude. Currently, one manufacturer is about to debut a

single 700 MHz radio in anticipation of the future, but this manufacturer and the other public safety radio manufacturers have held back on the development and release of this technology until they see what the future brings in the 700 MHz arena. Change in technology, it was agreed, hinges on demand by users and profit to manufacturers.

One panel member expressed that if the manufacturers were to develop the technology for one radio to reach the entire public safety spectrum then there would be no need for additional spectrum. The manufacturer representatives sitting on the panel agreed, but pointed out that such a radio “would be suicide for the manufacturers because of the loss of revenue.” Discussion also took place regarding television technology that impacts the future of 700 MHz. The acceptance and purchase of HDTV (High Definition Television) systems by the public plays a significant role in the viability of 700 MHz.

The release of the 700 MHz spectrum to public safety is tied to the FCC requirement that the television stations that currently operate in this spectrum do not have to vacate the spectrum until December 31, 2006. Recent discussions taking place with the FCC are leading towards a mandatory date in 2009 for broadcasters to vacate their channels in the 700 MHz spectrum.

The FCC can extend this date where 15% or more the households do not have access to HDTV. The panel equates this FCC ruling to mean that unless 85% of the households have changed to HDTV, the FCC will not release the 700 MHz spectrum. Panel members expressed concern that the development and release of HDTV systems and their associated cost has significant impact on this

issue. This technology is relatively new and the cost, or affordability, may significantly impact the number of households that can afford, or choose to afford new televisions that are HDTV. The fewer number of HDTV systems purchased impact the ability to get the 85% market use that the FCC has established as the criteria for releasing the 700 MHz spectrum to public safety. The panel believes the technology advancements will double and triple over the next ten years. This will cause the price of HDTV systems to come down and impact the household markets. The HDTV situation plays a significant impact on the release of the 700 MHz spectrum.

Trend Five, Mutual aid (law enforcement)

The panel expressed that they have seen a significant increase in mutual aid between law enforcement agencies. The term mutual aid refers to one or more agencies providing personnel and resources to another agency to handle law enforcement related responsibilities in that agency's jurisdiction. The panel discussed different scenarios where mutual aid is utilized. Normally, mutual aid is requested by an agency when they don't have sufficient resources to deal with a particular problem, although there has been a trend of agencies developing mutual aid agreements for long-term special assignments of teams to work with one another to impact an issue on a regional or countywide level. Examples of this include drug, gang, auto theft task forces, anti terrorism units.

The perception is that this is going to continue to increase significantly as agencies are asked to do more with less and crime is viewed more in geographical terms. The panel expressed this as one of the driving forces

behind the need for interoperability and the FCC releasing additional spectrum to public safety. As these mutual aid responses or task force style entities increase, so will the need for interoperable communications. Mutual aid responses will also see a significant increase due to mutual reliance in this age of terrorism.

Detailed panel discussion concluded that with the increase of mutual aid and the lack of interoperability that exists today, public safety is compromised in these operations. As the public and political bodies become increasingly aware of these communications gaps, pressure may come to bare on the FCC or manufacturers.

Trend Six, Available funding for communications

The panel believes that a significant roadblock to a majority of agencies moving to the 700 MHz spectrum is available funding. Communications systems typically last 10-15 years. Agencies don't normally coordinate their communications system purchases with one another. There is no master replacement cycle for agencies to work from. Agencies purchasing a system now or in the immediate future will not have the funds or the interest to move to a system (700 MHz) that will require the replacement of the system they just purchased and may not have even paid for yet.

The panel expressed a need for funding at state and federal levels. Several panel members believe that a number of law enforcement agencies would move to the 700 MHz spectrum immediately upon it being released if funding were available from the state or federal level. This funding will allow a coordinated effort by a majority of law enforcement agencies at the same time.

This would address interoperability concerns since a majority of users would be designing systems at the same time. Past systems have been developed agency by agency with little to no cooperation or input from other agencies because the financing of the agency specific systems were internal and rarely were a majority of systems replaced simultaneously.

Panel members also expressed doubt on any significant funding level increases that would provide the necessary funding to encourage agencies to move to 700 MHz simultaneously. If there is not outside funding sources, several panel members expressed concern that a majority of agencies would not move their communications system to 700 MHz.

One panel member pointed out that within Los Angeles county there is no indication that the sheriff's department or ICIS will be moving to the 700 MHz for voice communications. Instead, both are looking to invest heavily in their existing UHF infrastructure. These are the two largest voice communication operations in the county and a lack of support for 700 MHz by these two groups may seriously limit other agencies from looking at 700 MHz for communications and interoperability. The panel projected that funding from the state or federal government will not increase significantly above today's level in five years and will increase by 50% in ten years. Discussion amongst the panel viewed the lack of significant outside funding sources, as a significant impact on the number of agencies will to commit to 700 MHz.

Trend Seven, Number of events that focus on interoperability

The panel defined this as events that have driven the media and the public to question interoperability for public safety and the lack of it. Events such as 9/11 were discussed and how the media focused on the inability of first responders to communicate with one another.

The panel expressed that there will continue to be events that will bring focus on interoperability. They will increase over the next five years and possibly double from five to ten years out. At the ten-year mark, the panel felt that focus would level out either because the problem of interoperability became an old issue or the problem was resolved. The concern was that unless there were ongoing significant incidents, of the magnitude of 9/11 or the Oklahoma City bombing, the media would not focus on public safety communications and the public would lose interest in supporting interoperability.

Trend Eight, Shared regional resources

The belief expressed was that there will be some shared communications infrastructure, shared communications systems and sites that will lead to a more enhanced level of shared regional resources as it pertains to communications and interoperability. A few of the panel members expressed a belief that there will be a doubling of the shared resources that will impact this trend over the next five years and after that it will level off somewhat. This could impact 700 MHz on the positive side if a number of agencies decided to pool resources and enter the 700 MHz spectrum or it could be a negative impact if a majority of the agencies don't embrace 700 MHz and/or include it in their planning for shared voice communications resources. Again, the concern that was a focus of each of the

panel members was the lack of defined planning to move to 700 MHz and how this will impact each of the trends in varying degrees.

Event Summary

An event can have either positive or negative impact on the issue. Events were defined to the panel as a singular occurrence. An event occurs at a specific time and date. Events may be internal or external to the organization.

The panel used the same round robin process to identify potential events. The NGT panel identified twenty-nine events that it felt would impact the issue (Appendix C). The panel came to a consensus regarding the eight events most likely to impact the issue.

The top eight events are listed in the Event Summary Table. The table is comprised of five columns and nine rows. The events identified by the NGT panel are listed in column one. Column two represents the panel's belief of when the probability of the event, even if the probability is only one percent, is first likely to occur. The third and fourth columns are the probability that the event would occur within five years and ten years, respectively, expressed in a percentage. Column five is the level of impact that the panelists' believe the event will have on the issue statement, measured as either a positive or negative on a scale of 1-10. All numbers are a median of the panelists' individual ratings. The purpose of this exercise was to have the NGT panel project when the event would most likely occur in the future, and what impact the event would have on the issue.

Table 3. Events Summary Table

Events	Years > 0	+5 years	+10 years	Impact
(1) 700 MHz spectrum becomes available	2	25	75	2.5
(2) State adopts statewide 700 MHz plan	3	25	75	5
(3) State turns on 700 MHz backbone	10	0	20	8.5
(4) Software-defined radios debut	4	27.5	75	10
(5) DHS discontinues Homeland Security Grants	2	50	85	-3.5
(6) Federal Government funds Countywide Radio Systems	10	0	12.5	10
(7) Urban Areas Reject 700 MHz Plan	2	72.5	50	-10
(8) Manufacturer builds 700 MHz Module into Public Safety Radios	1	17.5	37.5	7

Event One, 700 MHz spectrum becomes available

The panel, as a whole, does not believe that the 700 MHz spectrum will become available at the end of 2006, the tentative move date established by the FCC rule. Different panelists had different conclusions as to when it would become available and recognized there are two variables involved. First, when will 85% of the households in the urban areas make the move to HDTV? Second, will the major television broadcasters be successful in using their political influence to push the spectrum release date even further into the future?

There has already been an extension granted to the broadcasters and the more time that goes by before the 700 MHz spectrum is released, the less likely

it will be utilized in the way envisioned by the FCC, to meet the urgent interoperability needs of law enforcement. The group questioned whether there would be a significant move by law enforcement agencies to move to 700 MHz when it does become available because of interoperable and economic reasons. The panel projected that there will be some movement to 700 MHz in five years, as the spectrum is released by the FCC. The panel sees the probability of this occurring as minimally possible in the next five years because of the spectrum release issues. After ten years, the panel believes that the spectrum will be released and some agencies will move to 700 MHz because there will be access to frequencies. The panel did not see this as a significant impact (2.5) because the general projection was this would be too late for 700 MHz to play a significant role in interoperability.

Event Two, State adopts statewide 700 MHz plan

The panel believes that if the state were to adopt a statewide plan and strategy for implementation this would encourage other law enforcement agencies throughout the state to not participate in the 700 MHz project. A majority of the panelists, however, believe that this will not happen for several years, if it at all. With the release date of 700 MHz fluctuating, the panel did not anticipate this event had much of an opportunity of occurring. The panel believes that this event will have as significant an impact on interoperability as many may think at first glance. The state adopting a plan is a positive step, but without the release of spectrum the plan will just sit idle until the spectrum is released. By that time, agencies may go elsewhere to solve their interoperability issues.

Event Three, State activates statewide 700 MHz backbone

The state activating a statewide 700 MHz backbone would mean that the state financed and built a communications infrastructure that would support all law enforcement agencies within California. The state “turning it on” would mean the infrastructure was active and in place for other agencies to simply plug into. Agencies would simply have to construct their connecting infrastructure to the system and purchase portable and mobile radios to meet their needs.

The panel saw this as one of their top eight picks for events, but they also believe that it has limited potential of occurring. If it happened, it would have a significant impact (8.5) on 700 MHz and interoperability for law enforcement agencies. If this were to occur, law enforcement would only have to build connecting infrastructure and purchase radios. The state would have constructed and built the critical infrastructure needed.

One panel member expressed that there would not be enough 700 MHz spectrum to meet the needs of all law enforcement agencies in California, something the FCC has not planned for. If the state did develop the backbone infrastructure, law enforcement would be back to where they are currently with not enough spectrum to support their communications needs.

Event Four, Software-defined radios debut

Software defined radios are currently available to the military only. These radios can be tuned to wide ranges of spectrum and across different spectrum bands through software programming. These radios are not available to anyone except the military and their use by the military is limited.

The panel saw this event as having a low probability, 75% in 10 years, of occurring. While the technology exists for a radio to be produced that can in effect talk on any of the frequencies in any spectrum, manufacturers are less likely to produce this radio because of the financial crisis it would impose on them.

If the radio were produced for sale in the public market, the panel saw this as one of the most significant impacts on the issue in a positive manner. 700 MHz would provide additional spectrum for law enforcement and the software-defined radios would allow law enforcement to continue using the current spectrum as well new spectrum. Existing communication systems could be maintained in the various spectrum bands and software-defined radios would allow law enforcement users to operate across all of the different spectrum bands that are currently licensed to law enforcement.

Event Five, Department of Homeland Security discontinues security grants

The panel believes that if the federal government were to provide a large funding source for development of 700 MHz systems, this would be one of the primary funding sources and could be a catalyst for agencies to be willing move to 700 MHz systems. However, the panel believes that funding for interoperable

communications from the Department of Homeland Security, while currently stable, is at risk of being discontinued in five years. There is an even greater risk of being cancelled after 10 years, unless law enforcement is able to leverage political allies to continue this funding source.

Event Six, Federal government funds countywide radio systems

The panel discussed the federal government funding a 700 MHz countywide radio system in Los Angeles County. The panel does not see this event having much potential of occurring in less than ten years and gives it a low probability of occurring after that. If it did occur, it would have a significant impact on the issue in a positive manner. In effect, it would provide a local, fully funded system that law enforcement agencies could connect to directly.

Event Seven, Urban areas reject 700 MHz plan

The panel discussed at length the potential for law enforcement agencies to reject the 700 MHz plan altogether. The panel clarified this to mean that while agencies would not outright reject the FCC planning, release and availability of the spectrum, they would passively reject it by building systems that remain in the UHF, VHF and 800 MHz spectrums.

The panel believes there is a real possibility that law enforcement agencies will not dedicate funding sources to build 700 MHz systems. The perception is that without a commitment by most, if not all, of the law enforcement agencies within the county to move to 700, there will be a patchwork of systems that includes the spectrum that is in use today, along with 700 MHz. This would provide no real benefit over what exists today.

Event Eight, Manufacturer builds 700 MHz module into public safety radios

A few panel members expressed the potential for this to occur in the future, while at the same time panel members who are manufacturers' representatives did not believe this would occur anytime soon. The manufacturers' representatives equated this to causing a similar situation as software-defined radios, but with less overall financial impact to the manufacturers. These panelists emphasized again that their industry is user driven.

Currently, and in the near future, manufacturers are not expending a lot of research and development to take place in 700 MHz technologies, until they see what the FCC does with the 700 MHz plan. Once the FCC commits to the overall plan and then a firm release date, manufacturers will be able to gauge levels of interest by the customer. This impacts agencies' view of 700 MHz as a viable interoperability platform. If there is no market and the manufacturers are slow to develop 700 MHz capable products, agencies will not be committed to moving to a new spectrum with limited or no support.

Cross Impact Analysis

A Cross Impact Analysis is a method to determine the effect one variable will have on another variable and whether that affect or relationship will influence the outcome.

This cross impact analysis was conducted by three panel members of the original NGT panel and was based upon the entire NGT panel's discussion and identification of trends and events. During the Cross Impact Analysis, panel

members assessed and offered their opinions of how each event impacted each identified trend.

For example, during the Cross Impact Analysis panel members considered how Event 1, 700 MHz becoming available, might impact use of digital communications, Trend 1. This process was repeated until the panel members had assessed each event against each trend.

After conducting their assessments and discussion, each member of the Cross Impact Analysis panel rated the relationship between the events and trends as they impacted the issue statement with a score ranging from +5 to -5. A score of +5 indicated that panelist recognized a significant and positive impact on the issue statement, whereas a score of -5 was perceived as having a significant negative impact on the issue. A score of zero indicated there was likely to be no impact on the issue.

In the Cross Impact Analysis table, the rows reflect the eight events and the columns reflect the eight trends identified during the NGT panel discussion and discussed earlier in this chapter. The numbers reflect a median of the panel members conducting the Cross Impact Analysis assessment of the impact each event might have upon each trend.

Table 4. Cross Impact Table

Trends/Events	T1 Use of Digital Communication	T2 Regional Dispatch Centers	T3 Single Regional Radio Systems	T4 Technology Advancements	T5 Mutual Aid	T6 Availability of Funding	T7 Number of Events Spotlight Interoperability	T8 Shared Regional Resources
E1 700 MHz Spectrum Becomes Available	+5	+1	+4	-2	0	+3	+4	0
E2 State Adopts Statewide 700 MHz Plan	+4	+4	+4	-1.5	0	+3	+5	0
E3 State Turns on 700 MHz Backbone	+5	+5	+5	-5	+3	+5	+5	+5
E4 Software Defined Radios Debut	+4	0	+3	-5	+5	+5	+5	+5
E5 DHS discontinues Homeland Security Grants	+1	-3	-3	-3	-3	-5	-5	-4
E6 Federal Government funds Countywide Radio Systems	+5	+5	+5	-5	+5	0	+5	+5
E7 Urban Areas Reject 700 MHz Plan	-5	0	-1	0	0	0	-5	0
E8 Manufacturer builds 700 MHz Module into Public Safety Radios	+4	0	0	0	0	+4	+5	+3

Legend T = Trend

E = Event

The purpose of the cross impact analysis is to determine what combination of trends and events will have a negative or positive impact on 700 MHz voice communications interoperability for a small law enforcement agency in an urban county in the next five years. Once this is determined, an analysis can be made of the ability to influence trends and events toward desired outcomes and away from negative ones.

For example, the panel believes that Event 1 (700 MHz spectrum becomes available) will have a major, positive impact upon Trend 1 (use of digital communication). The current requirements by the FCC is that, when released, the 700 MHz spectrum will require users to go digital. With the trend increasing and the requirements of the FCC to narrow band other available spectrum, this should be an easier transition for law enforcement.

Panel members generally agree that Event 2 (state adopts statewide 700 MHz plan) would have a minimal impact on Trend 1 (regional dispatch centers). The belief was that the development of regional centers would not depend on the release of 700 MHz spectrum and that these centers would either be designed to incorporate 700 MHz from their development stage or they would be using existing systems and spectrum.

Panel members agreed that Event 3 (state turns on statewide 700 MHz backbone) would have a significant, positive impact on Trend 3 (single regional radio systems). Generally, the belief was that these systems would proliferate with a state, funded and built, infrastructure in place. Joint Powers Agreements (JPA) would form and take advantage of the State build system. One panel

member drew the analogy of cities building roads that lead to freeways. JPAs would build single regional radio systems with shared building and development costs and then connect them to the state freeway system, in this case the 700 MHz backbone.

Futures Scenarios

After a review of the trends, events and cross impact analysis, potential or imaginary scenarios can be developed that could happen in the future. The following three scenarios provide an optimistic, normative and pessimistic view at the possible impact that 700 MHz may have on communications interoperability on a small law enforcement agency in an urban county in the future. The small law enforcement agency or “model” in this project is the Claremont Police Department and the urban county of Los Angeles.

Optimistic Scenario

The year is 2009, and since 2004, the Claremont Police Department has been working diligently to ensure that its communications system gives its officers the ability to communicate with law enforcement agencies throughout Los Angeles County. In the past, there was a patchwork of spectrum and different frequencies that prevented Claremont officers from communicating over their radios with their counterparts in neighboring jurisdictions.

Years of political maneuvering by the sheriff’s department and the eighty-eight cities in Los Angeles County resulted in the formation of a joint powers agreement and the federal government funding the first 700 MHz trunked

systems in 2006. In 2007, under mounting pressure by Los Angeles County and its political support, the FCC finally released the 700 MHz spectrum set aside for public safety use with more than 85% of the household television markets moving to HDTV.

These two milestones, federal funding and the release of the spectrum, paid off significant dividends in all of the spectrum planning sessions throughout the county over the last five years.

Today, July 10, 2009, Officer Johnson has just finished transporting a prisoner to the men's central jail in downtown Los Angeles. In the past, Johnson would have not been able to directly talk to his agency's dispatcher over Claremont's radio system because he would have been outside of the repeater's service area, but all that has changed. He picks up the radio microphone as he pulls on to Soto Street and tells the dispatcher that he is clearing the jail and on his way back to Claremont.

It's a Thursday night, and it will take Johnson almost an hour to drive the thirty-five miles back to Claremont. While he enjoys a new radio system that gives him countywide coverage, he wishes the planners could do something about traffic.

As Johnson waits at a signal two blocks from the freeway, shots suddenly ring out. His attention is drawn to a small liquor store less than fifty yards away. A subject with a gun runs to a waiting vehicle which speeds off. The store clerk comes outside and waves at the officer. Johnson is out of his element, his natural surroundings. He is in a community far from the streets of Claremont. In

the past, this would have presented a significant problem for Johnson. He would have been alone and without radio communication.

Johnson turns his radio to the emergency channel and depresses the microphone. He transmits his location and that he is in pursuit of two robbery suspects, in a gold, colored sedan. The countywide emergency dispatcher immediately copies the call and starts to broadcast the pursuit. The Claremont dispatcher hears the radio traffic and notifies the on-duty watch commander. He can listen to and manage the pursuit from Claremont.

Officer Wills from the Los Angeles Police Department and Deputy Way from the Los Angeles County Sheriff's Department hear the pursuit on their radios over the emergency channel. They are two blocks away, and the pursuit is coming their way. They call Officer Johnson and let him know they are responding to help him. It was not that long ago, Johnson thinks to himself, that there was no countywide radio system and or the ability for him to talk to Officer Wills and Deputy Way immediately. It was a great feeling for Johnson to know he had the ability to call in the troops from wherever he was to act quickly and take action.

The suspects suddenly lose control of their car and crash. They start to flee from their vehicle in separate directions, but Wills and Way have arrived and it's too late. Three police officers, two bad guys and nowhere to run. The chase lasted less than two minutes. With the new 700 MHz radio systems and the ability to communicate immediately with different law enforcement agencies

anywhere in the county, law enforcement agencies large and small are now connected to one another.

Normative Scenario

It's October 2009. The FCC finally forced television stations off the 700 MHz spectrum last year, but there has been no effort by any of the agencies in Los Angeles County to build 700 MHz voice communications systems. Sure, a couple have licensed data systems, but agency executives got tired of sending their personnel to all those planning and coordination meetings that started in late 2003 and, with no tangible results, the meetings were cancelled altogether in 2006.

The goal of putting public safety agencies on the same 700 MHz radio spectrum died before ever getting out of the starting gate. The dreams of building 700 MHz interoperable communications for agencies throughout the county, from small to large, has all but disappeared with the end of the planning and coordination meetings in 2006.

Everyone said that the FCC would continue to stall taking the spectrum away from the television stations, and with the lack of movement towards 700 MHz, the sheriff's department decided to move forward by establishing a trunked radio system in the UHF spectrum. The Sheriff is offering to allow the other law enforcement agencies in the county to participate in the system by including their licensed UHF channels in the system so it will support more users.

While this is not the 700 MHz spectrum that had been promised more the five years ago, it does offer hope to true interoperable communications for a majority of Los Angeles County law enforcement.

It took the inability of the different political jurisdictions to reach consensus on a countywide trunked system in the UHF spectrum in the past that got the FCC to force the television stations off of 700 MHz. However, the time it took for the FCC to finally force the stations off drove the various jurisdictions to band together with old technology to meet their needs for interoperable communications, something that could have occurred five years ago.

Pessimistic Scenario

It is November 2009. Lieutenant Smith has worked for Claremont for twenty-three years. He's seen a lot of officers come and go and a lot of changes in those twenty-three years. He's made a lot of friends along the way. One such friend is Lt. Thompson at Pomona Police Department. Thompson started at Pomona just about the time that Smith did at Claremont. They have both risen through the ranks and become good friends along the way. They meet for coffee on the nights they work the same shift.

It's about 9:30 pm when Thompson pulls up to the Starbuck's parking lot. They start to talk about the new computers that Claremont has installed in their cars and their ability to share information over the computers with different agencies. Thompson says he wished that were true with their radio systems. Claremont has maintained its UHF system and Pomona has maintained their VHF system for the last five years. Technology has changed but the FCC still

hasn't released the spectrum in the 700 MHz band for public safety to use. The local television stations have been successful through their political circles in delaying the release of the spectrum they currently hold license to.

Suddenly, a radio broadcast rings out of a Claremont officer in foot pursuit of a rape suspect. Officer Barnes yells over the radio that he is running east on American Avenue. Both Thompson and Smith recognize the street name. It's the dividing street between both cities. Claremont is on the north and Pomona is on the south. As they drive away in their separate cars, only Smith can still hear the officer in the foot pursuit over his radio. Johnson is asking his dispatch to call the Claremont dispatcher on the phone to get an update on the chase while he and several other Pomona officers are driving to the area.

Pomona police officer Jones is writing a parking citation to a vehicle parked on American Avenue, eight blocks away from where Barnes started chasing the rape suspect, but Jones doesn't know anything is going on. His attention is momentarily drawn to a red pick-up truck he sees driving rather fast on American. It slows and passes by him and then drives out of sight south on Mills. He doesn't think anything of it at first and then he hears Lt. Johnson over the radio asking the Pomona dispatcher to call Claremont to find out where their officer in foot pursuit is. As Jones finishes writing the citation, he listens to the radio and hears only American Avenue. He quickly runs back to his car and speeds off to the last known location of the Claremont officer. He finds officer Barnes, out of breath and trying to tell the Claremont dispatcher that the suspect made it to a vehicle, a red pick-up truck last seen going east on American.

Jones realizes the truck passed by him a minute or so ago. Lt. Smith and Lt. Johnson arrive seconds later, and as Jones tells them about the truck, they both wonder aloud. When will the FCC release the 700 MHz spectrum to public safety so we can do our jobs more effectively? How much longer can they continue to put off forcing the television channels to vacate the channels in 700 MHz? As long as the television stations have the political clout, they both agree.

Summary

These scenarios depict potential outcomes based on an interpretation of the data and analysis of trends and events compiled during the NGT process. By creating a vision or idea of the future based on trends, events, and cross impact analysis one can actually express potential outcomes and start to build a shared vision amongst stakeholders in a particular issue.

As discussed in Chapters I and II, the initial approach and issue statement for this project was how will 700 MHz impact voice communications interoperability for a small law enforcement agency in a urban county by the year 2009. The Claremont Police department was, and continues to be, the model small law enforcement agency in this project and Los Angeles is the urban county. The research and literature review, as well as the NGT panel, made it abundantly clear that 700 MHz is not the best way to achieve interoperability.

In Chapter III, a strategic plan will be developed to assist law enforcement executives in facilitating a path for interoperability utilizing UHF spectrum.

CHAPTER III
STRATEGIC PLANNING AND TRANSITION MANAGEMENT

Introduction

Strategic planning is a process that allows organizations to look into the future and anticipate environments, trends, and events that may impact the organization at different levels. The world is a constantly changing environment. By anticipating and planning for those changes, organizations can use the three C's of the future: certainty, choice, and chance, to identify potential futures and critical issues. Once these futures are identified, an organization can then identify which may negatively or positively impact an organization, and then plan for them.

This strategic plan will define strategies, which are important in forecasting how accomplish countywide interoperability by 2009.

Organizational Analysis

Many factors affect the desired outcomes that an organization is looking for. In order to identify these factors, a "SWOT" analysis was utilized. SWOT looks at the organization's strengths, weaknesses, opportunities and threats, and assesses the organization's current position and readiness regarding the proposed change.

By looking at the organization internally from a strengths and weakness analysis, an organization can begin to design a strategic plan to move the organization in the desired direction of interoperability. Potential external threats and opportunities from outside the organization must be identified. For example,

the FCC has set aside spectrum in 700 MHz for future use by law enforcement for interoperable communications, but has moved the date that the current users, television stations, must vacate the spectrum. The FCC has now established that 85% of the households in a given market area must move to high definition television (HDTV) before the FCC will release the 700 MHz spectrum. The variables involved in the FCC decision could potentially put the availability of 700 MHz for law enforcement use well past 2009. This variable alone may suggest that 700 MHz is not a viable option for interoperability.

A SWOT analysis was conducted using Claremont as a small law enforcement agency in a large urban county (Los Angeles). As noted in Chapter I, Claremont is located on the eastern edge of Los Angeles County and borders San Bernardino County. The Police Department consists of 63 full-time employees, including 40 sworn police officers and 23 support staff. The department operates its own communications center that operates twenty-four hours a day, 365 days a year. The department holds an FCC license to operate on two UHF channels. The department's current communications system has reached the end of its service life. Replacement equipment is not longer available and the manufacturer no longer offers support. The department currently has limited interoperable communications with outside agencies. San Bernardino County agencies are all on 800 MHz and the Los Angeles county agencies adjacent to Claremont are VHF users and these systems are incompatible with one another. The department is faced with making some strategic long-term decisions and how to proceed. Obviously, one of those

decisions is the purchase of a new communications system. An analysis of 700 MHz, as part of this project, revealed that it is not the best way to achieve interoperability, which is key to the deployment of any new system purchased.

A review of the various voice communications systems within Los Angeles County show that nineteen law enforcement agencies operate in the VHF range, one operates in the 800 MHz range and the remaining operate throughout the UHF spectrum.

The decisions Claremont makes have ramifications that impact not only Claremont, but surrounding agencies as well. Currently, Claremont has limited capabilities to communicate across the different spectrums and can maintain most of its present ability if it purchases a new, stand-a-lone, UHF system.

However, other agencies decisions impact the overall interoperability picture for Claremont. If a significant number of law enforcement agencies in the county change over to 700 MHz, when it is released, and Claremont has already purchased a new UHF system, Claremont will find itself an island of sorts in the communications venue. Claremont will lack interoperability until another 10-15 years elapses and its time to purchase a new communications system. If a number of agencies don't go to 700 MHz, but elect to join the ICIS system or the county trunked system, Claremont would find itself in a similar situation of being the lone agency, or amongst a patchwork of agencies that cannot easily communicate with other non-700 MHz users. Finally, if the release date of 700 MHz continues to be pushed further and further away the impact of 700 MHz becomes negligible because of the need to replace the existing communications

system. The decisions or direction of other agencies, including the FCC, and how they fit in the bigger county communications picture directly impacts Claremont's future decision.

Vision

The need for communications interoperability for law enforcement has never been greater. This is especially true in an urban county such as Los Angeles where the threat of natural and manmade disasters is a constant threat. The need for law enforcement agencies to quickly and efficiently communicate with one another to deal with wildfires, floods, earthquakes, and crime and to manage issues of Homeland Security require communications interoperability.

The vision is to achieve radio interoperability on the countywide basis. The reality is that Claremont is a small department and one of 88 cities that make up the county of Los Angeles. However, based on a combination of independent and joint planning, Claremont and the other cities can work towards and achieve countywide interoperability. Therefore the vision of a small agency (Claremont) achieving countywide interoperability by 2009 can be achieved. The goal of the remaining chapters of this paper is to explore how to make that vision a reality.

Internal Strengths

- The existing communications system, although outdated, has a limited capacity for interoperable communications and was developed with the support of the leaders of the organization who recognize the importance of interoperable communications.

- The various stakeholders of the organization recognize the inner workings of the communications system and the need for all law enforcement agencies to possess interoperable communications.
- The department has demonstrated time and time again its ability to provide limited interoperable communications to surrounding law enforcement agencies. The department is viewed as very progressive and an agency that should be listened to when discussing regional communications.
- The department aggressively seeks out funding from outside sources to enhance the interoperable communications and has established initial lines of communication with neighboring agencies on joint communication systems.

Internal Weaknesses

- Claremont does not possess sufficient funding to develop a truly interoperable system that has countywide capabilities.
- Claremont is at a crossroad in replacing their existing, outdated system or trying to hold onto the development of a countywide system.
- Claremont must compete with other agencies for outside grants.
- Claremont, being a small agency, does not have the voice that's always heard in political circles.

External Opportunities

- The various law enforcement executives throughout the county recognize the need for interoperable communications.

- Law enforcement executives see that the neighboring counties of Orange and San Bernardino have countywide trunked systems that provide interoperable communications to the various law enforcement agencies throughout both counties.
- The federal government is releasing grant funding for interoperable communications and a consortium of agencies is more likely to receive funding consideration before single agency applications.
- Manufacturers recognize the need for interoperable communications systems.

External Threats

- Political infighting between some cities and the county prevents them from seeing the advantages of a countywide trunked system.
- Sheriff's department funds their own system and does not include other cities in their system.
- Federal government selects certain areas of the country for communications grant funding and does not look at smaller agencies to have formed the necessary partnerships for interoperable communications.

Stakeholder Identification

Stakeholders are individuals, groups or organizations that can lay claim to having influence over the organization's resources and outputs. Stakeholders have an interest or expectation in an organization. The interest or expectation is often different based on where the stakeholder is sitting and seeing things about

the organization. Stakeholders views are an important part of developing a strategic process and should not be discounted when developing the strategic planning process or during the implementation of the finished strategic plan. A buy-in from the different stakeholders, whether they be individual, groups or organizations is often the difference between successful implementation and a failed opportunity. Stakeholders for this project include:

General Public

- This group will benefit from law enforcement agencies being able to effectively communicate with one another in real time.
- Generally, citizens believe that law enforcement can effectively communicate with each other now, but grew concerned in the aftermath of 9/11 and the communications tragedies that were reported.
- Citizens can influence the political bodies.
- Citizens can influence the spending of public funds or tax themselves.
- Citizens have high expectations of law enforcement.

Police Department Personnel

- Employees provide service to other stakeholders.
- Employees have high expectations of themselves.
- Rely on communication equipment and technology to do their job.
- Tend to think about their organization rather than how they (employees) fit in the bigger picture.
- Less than pleased with communications equipment that does not meet their needs.

- Can be influenced by what they see on television, just like the public stakeholders.
- Different generations within the law enforcement community are at odds with change. Some embrace technology while others are less than enthusiastic.

Law Enforcement Leaders

- Don't always plan for the future. Look too closely at the organizations immediate needs of today, next week, this year. Don't anticipate communications needs and how they fit in with agencies outside of Claremont.
- Realize the needs of the agency, but may not know or care about the surrounding agencies or how they fit into a larger perspective.
- Don't realize the communications needs of other agencies and how they impact their own agency.
- Don't always see how their internal decisions on planning, purchasing, and implementation of technology, especially communications, has significant impact on interoperability outside their organization.
- Often feel intimidated with technology or the speed at which technology is changing.
- Don't have the information or time to make informed decisions. Often have to rely on consultants.

- Don't seek out the other agency executives and planners to plan internal projects so they can fit into the "big picture" and spend money on projects that work in conjunction with surrounding or allied agencies.

Other Law Enforcement Agencies

- Can develop strategies in a vacuum that impact other agencies without realizing it.
- Create partnerships with other law enforcement agencies out of need or a desire to have a bigger voice/impact to be heard.
- By working together, have the ability to reduce costs on joint projects that are of benefit to one another.
- Can negatively or positively influence political leaders.
- Have difficult time buying interoperable communications projects that may be beneficial to their agency, because of egos of the organizations' leaders.

Elected Officials

In order for the model agency to achieve its vision of countywide interoperability, this group of stakeholders represents the funding sources, are most often the final approval stage and can move the project forward or keep it from moving forward. The success of their department in achieving interoperability means the model agency can provide the best possible services to the community.

Are elected to represent the first group of stakeholders.

- Can be influenced by special interest groups.

- Decision can be based on political gain rather than needs of a community or county.
- Have the ability to influence and direct law enforcement leaders.
- Can place hurdles and roadblocks in front of efforts towards interoperability.
- Don't understand that pieces of the puzzle interact and depend on one another. See only their law enforcement agency.
- Have political clout to secure federal and state funding.
- Can influence changes in the way spectrum is licensed.

Private Vendors

- Provide equipment and support to law enforcement.
- Bottom line is the profitability margin for their stakeholders.
- Market driven.
- Able to influence political leaders, not always in the best interest of the end user.
- Can develop equipment to meet law enforcement needs, but R&D is looked at from a profitability margin.

State & Federal Governments

- Can be influenced by special interest groups.
- Have the ability to provide funding for interoperable communications projects.
- Have the ability to change how the FCC licenses or releases spectrum to law enforcement.

- Able to mandate manufacturers to develop equipment that meets government designed standards or certifications.

Federal Communications Commission (FCC)

- Sets rules and policies on communications, licensing, standards and interoperability.
- Makes recommendations to elected federal government officials.
- Sets standards for private radio manufacturers.

Office of Homeland Security

- Provides most of the federal grant funding for city, county and state communications systems.
- Has political interaction with elected officials to affect interoperability solutions.
- Sets standards on how federal grant funds can be utilized.

As discussed previously, it is an important component of the strategic planning process to identify known and potential stakeholders to help ensure that this project is successful. Reviewing the list of identified stakeholders, it is important to note that they have different levels of impact at the local level. For example, a small law enforcement agency, such as Claremont, has limited ability on its own to influence the FCC or the Office of Homeland Security when it comes to issues of interoperability. In the context of the strategic planning for this issue, Claremont would have a smaller voice than the sheriff's department or

a joint powers agency that is made up of several agencies with a similar vision of interoperability.

As stakeholders, these larger entities, such as the federal government or select branches such as the FCC are snail darters. Snail darter is a fish. The term snail dater has come to mean a stakeholder who has an interest in the outcome of the analysis and who can also intentionally or unintentionally subvert the implementation. While it is easy to exclude snail darters from the SWOT analysis, their impact should always be considered in the planning process.

Strategy Development

It is important to develop key strategies and to closely examine how they will impact the stakeholders. Again, the futures issue is how will a small agency accomplish countywide interoperability by the year 2009?

Based on the research, scanning and NGT process it became apparent that 700 MHz was not the best way to achieve interoperability. With the significant number of UHF users in Los Angeles County, a coordinated effort to develop a countywide trunked system will have more chances of success than individual agencies purchasing new systems or updating old systems and selecting on their own whether to go to 700 MHz or to stay in the VHF or UHF spectrum they are currently licensed to operate in.

Summary

The vision is to achieve countywide interoperable communications for a small agency (Claremont) by 2009. Through a phased approach individual agencies can place themselves into a position, as stakeholders, to be a part of

an overall project that meets the interoperability needs at a local (small agency) and regional (urban county) level. 700 MHz is too far off into the future to be counted on as a fix all. The interoperability solution is for small agencies to develop their systems as puzzle pieces that fit into a larger system. The strategies outlined below provide alternatives to either solving the problem and achieving the vision or doing nothing, which is not acceptable.

Strategy One

Apply for licensing with the FCC for a sufficient number of 700 MHz channels to meet the model agency needs and build a new communications system. This would provide Claremont with current communications technology, but at the same time Claremont would not be able to communicate with the surrounding law enforcement agencies that are not planning on going to 700 MHz.

Strategy Two

This strategy requires the forming of a steering committee to plan and organize the strategy. The steering committee would have several sub-committees including a JPA and working group, each with specific tasks developed from the steering committee. The steering committee itself would be comprised of members from the sheriff's department and the agencies immediately surrounding Claremont. They would develop a plan and overview of what a countywide trunked system would look like and what it would achieve. Develop a blue print for agencies that are ready or need to build new

communications systems so they can be a piece of the puzzle that can fit at a later time when a countywide system becomes a reality.

The joint-powers-agency (JPA) committee would consist of representatives at both the executive, technical, and user levels. These groups would address interoperable communications from an individual, internal agency standpoint, a countywide standard, and then interoperability with other counties, state and federal law enforcement entities.

This committee would be empowered to look at the impacts first at a city-by-city level, then a countywide level and make recommendations for the benefit of everyone involved. Through this committee, agencies' voices will be heard, regardless of size. Their agency executives can have the confidence of a buy-in by some of the initial stakeholders before moving forward with recommendations to their city managers and chief executives offices and, ultimately, their elected political bodies. This group would be utilized to educate the state and federal political groups about this regional solution for communications and inclusion of state and federal agencies in the interoperable solutions. This group will be tasked not only with education the political bodies, but seeking financial support at the state and federal levels.

The working group within the Claremont Police Department would consist of various users from sworn staff to dispatchers, to volunteers to technical support. This group would be tasked with developing a needs list both internal to the organization as well as external with a focus on meeting the needs of the department and providing true interoperability. This group would also develop an

external group to meet with other cities and the county. They would look at their needs and work towards developing a list of outside needs to see how they work or conflict with the model agency needs. This information would also be shared with the JPA group. The overall strategy is to have a main group that develops the strategy and the sub-groups provide the follow through and report back to the steering committee.

Strategy Three

One strategy that must be considered is to do nothing and remain at status quo. This is not a viable option because the vision of countywide interoperable communications cannot be met using this strategy. Claremont's current communications system must be replaced. The replacement cannot be deferred any longer.

Strategy Four

There is current technology that exists that will allow region interoperability. The technology could be employed at different sites within the county to form interoperable regions. This technology will not meet the vision of true countywide interoperability by itself. Users on repeated systems would not be able to use this technology outside of the service area of their repeaters.

The need for interoperable communications is immediate. 700 MHz cannot meet that need for years to come, nor can the existing systems that are in place. In order to meet the needs of today and the needs of the future, a combination of strategies has been selected to meet current and future needs.

The recommendation is to use strategy two and four and will be discussed further in the following chapter. Strategy two will meet the future needs and will take years to develop and bring to fruition. Strategy four will provide limited, regional interoperability for Claremont and the other agencies in Los Angeles County.

Chapter IV will discuss transition management and take the vision and strategies through organization change, assessment, critical mass, and responsibility charting.

CHAPTER IV
TRANSITION MANAGEMENT

Commitment Planning

There is no single model or strategy that fits all problems or organizational change situations. Transition managers must be adept at diagnosing change situations, skilled at choosing among different models, and have the ability to use the tools best suited to the moment.¹⁸

In any change, there are always three states: the future state – a place or condition one wishes to achieve; the present state – the current condition in relation to the desired state; and the transition state – the getting from the past to the present place.¹⁹

Change is difficult for many and welcomed by few. Resistance to change is a natural reaction learned early in life. It has been the pitfall to many projects that involve change and transition. Change for the sake of change alone is not viewed by many as a positive. Change that involves those who will be impacted by the change, such as stakeholders, can be the difference between failure and success.

In order to convey the need for change, management must create a sense of urgency and convey a direction and need for change to all the members of the organization that may, or will, be impacted by the change. By conveying the need for change and the eventual benefits to the organization, some members of the organization will support the change from knowing the facts. Other members of the organization may still be resistant to change even after the needs for

change and benefits are identified. Often a delicate balance can be achieved with this group by involving them directly in the change process and obtaining buy-ins at the earliest stages of the proposed change.

In order to accomplish this sense of urgency, management and leaders within the organization must convey the need for change and open lines of two-way communication not only with the internal stakeholders, but with external stakeholders as well. Open dialogue, even with opposing groups may minimize resistance to the proposed changes and mitigate concerns about the impacts of the change.

Management needs to seek out leaders within the groups of stakeholders to create broad base support. By seeking out the identified leaders within these groups, concerns, issues, and perceptions can be identified early on and can then be addressed and in some cases mitigated. By developing the broad base of contacts and seeking input, both positive and negative, the complex process of change is more easily identified and internal and external support groups start to form.

There is a critical mass (minimum number of stakeholders necessary to make change) to any complex change process. These are the persons who are supportive of the change and are willing to commit time, energy, and involvement to make the change happen.

In order to develop these persons/stakeholders there must be ongoing open communications. These communications minimally should include:

1. Identification of the need for change

2. Understanding of the change
3. Benefits of the change to various stakeholder groups
4. Vision
5. Sense of urgency and need
6. Support (internal and external)
7. Roadmap
8. Ongoing communication

The following is a list of the individuals and groups whose support is necessary for the successful implementation of radio interoperability for a small law enforcement agency in an urban county.

- Police Chief
- Police Management
- Federal Communications Commission (FCC)
- Elected Officials in other municipal and county levels of government
- County chiefs of police organization

Table 5 lists where each identified critical mass member is located today in the model of a small law enforcement agency accomplishing countywide radio interoperability by 2009, and where the commitment by these stakeholders needs to minimally be.

Table 5. Critical Mass Chart

Key Players	No Commitment	Let it Happen	Help it Happen	Make it Happen
Police Chief			X	O
Police Management			X	O
FCC			X	O
Outside Elected Government Officials		X	O	
County Chiefs of Police/Sheriff Organization			X	O

X = Present commitment

O = Minimum commitment required

In order for change of any magnitude to occur in an organization, there must be support from the lead policy maker in the organization. In this proposal, the Chief of Police is the person who has the authority and ability to make the vision of interoperability a reality. By establishing the goals that will form the path to seeing the vision become a reality, the Chief sets policy and also must garner the support of his management team who ultimately will be tasked with the follow through. The project manager would prepare an agenda report for the Chief and present sufficient research to garner the Chief's support in the interoperability vision.

Police management form the nuts and bolts of the organization. They are the movers and shakers who take policy direction and transform it into goals and objectives. They assign staff and work with their counterparts at other agencies. Without their buy-in and support of the vision, the project will have a difficult time in succeeding. Police management is the group that can take the vision from

“letting it happen to making it happen.” Their buy-in and support is also important at the rank and file levels of both the sworn and non-sworn levels of the organization. By giving these groups a stake in what happens, they will move to make it happen.

The FCC has the ability to bring this proposal to a complete stop. Without their on-going support the proposal goes nowhere. The FCC has the authority to approve the proposal or reject it by not issuing required licensing. The FCC can help this proposal through to the stage of making it happen, by supporting the concept of the proposal of countywide interoperability first at a small agency level and allowing the other agencies that make up the county use the vision template completed by the model agency (Claremont). Working with the FCC in the early development stages of the planning and showing them that this planning fits in the FCC’s master communications strategy for interoperability will encourage them to want to make it happen.

Outside elected officials can also stop this proposal dead in its tracks by exerting their political influence over the FCC or other political entities such as the City Council or the County Board of Supervisors if they don’t support the vision. This group can let it happen by not participating in the process and taking a passive approach, or they can be active participants in helping it happen by showing support at the local, state and federal levels.

The County Chiefs of Police and Sheriff’s organization plays an important role in this proposal. Much in the same way the model agency’s Chief plays a significant role in setting policy and direction, these same players must be

supportive of the initial vision of a small agency accomplishing countywide interoperability by 2009. This support is a must to making the vision happen. This vision needs the support of these agency executives to buy into and see the larger countywide interoperability plan. If they don't set policy and direction with their management teams, with the vision in mind, the vision may be negatively impacted from the standpoint of agencies failing to work together on this interoperability vision. The project manager must sufficiently demonstrate to these stakeholders the importance of the vision and how their helping to make it happen is imperative to the overall success and benefits their organization.

Part of the process in moving the key players to roles of making it happen is through information. Information can be presented in various formats, including agenda reports, public meetings, and newsletters to the community leaders, media coverage and providing information to the public at gatherings.

Responsibility

Table 6 is a responsibility chart. The first row lists the "actors" or stakeholders. The first column lists the decisions/acts for which these individuals or groups may have direct responsibility in the decision making process. They may also have approval or support capacity, or if they simply need to be informed. In some cases groups are not impacted (N/A) by the decisions or acts.

The responsibility chart outlines general responsibilities for each stakeholder so that the interoperability vision can be accomplished. Each stakeholder knows who has responsibility for which tasks.

Table 6. Responsibility Chart

Decisions or Acts	1	2	3	3	4	5	7	8	9
	Police Chief	Proj. Mgr.	Police Mgt.	Police Officers	Police Disp.	FCC	Elected Officials	Community	Chief's Organization
Create Countywide Committee	R	S	S	S	S	N/A	S	I	S
Complete Frequency Assessment	S	R	S	S	S	S	I	N/A	S
Complete Equipment Assessment	S	R	S	S	S	N/A	I	I	S
Complete Real Estate Assessment	S	R	S	I	I	N/A	I	I	S
Complete Needs Assessment	S	R	S	S	S	N/A	I	S	S
Create JPA	R	S	S	I	I	I	R	I	S
Create Political Support Committee	A	S	S	S	S	I	A	S	R
Apply for FCC licensing	A	R	I	I	I	A	S	I	S
Create Funding Group	A	R	S	S	S	N/A	S	S	S

R=Responsibility A=Approval S=Support I=Inform N/A=Not Applicable

Analysis of the Responsibility Chart

Create a Countywide Committee

The chief of police working with the other municipal chiefs, sheriff, and the various state, county and city chief/sheriff organizations would be responsible for forming the committee and assigning staff to support the concept of interoperable communications. The committee would be tasked with helping to create a vision

and a roadmap for all of the organizations to follow. The vision would be accomplishing countywide interoperability for a small agency by 2009. A future roadmap would then be created that provides each agency with how they fit into the larger countywide interoperability puzzle.

This would allow agencies to plan their future purchases of communications systems and hardware based on this countywide concept of one system made up of satellite systems. This would need support from the police management, police officer and police dispatcher groups as major stakeholders. Both local and county elected officials would also need to support this concept for future agreements and funding concepts. State and federal political figures, as well as the various communities would need to be informed for future support.

Complete Frequency Assessment

As identified earlier in this project, the law enforcement agencies (municipal and county) throughout Los Angeles County are spread across the UHF, VHF, and 800 MHz frequency spectrums, with a majority of users licensed to operate in the UHF spectrum. A frequency assessment group would be formed to identify the UHF spectrum to determine if it is of sufficient size to support a countywide interoperable communications system. Agencies from small to large would need to be polled to document current spectrum use, as well as current and future voice communications needs. This assessment group would need support by the chiefs. Police management, police officers and dispatchers would be responsible for staffing, researching and assessing needs. The FCC would need to offer support to this group in the form of research and

addressing whether additional UHF spectrum could be made available to support this undertaking. Political bodies would only need to be informed of the progress and communities would not have a stake in this part of the overall process.

Complete Equipment Assessment

Law enforcement agencies (municipal and county) throughout Los Angeles County would need to identify current equipment that is in use as well as future planned purchases or upgrades. Agencies from small to large would need to be polled to document the equipment on hand and the condition and potential for re-use in a countywide infrastructure. Equipment that would not be compatible would also need to be identified. From this, a list of necessary equipment and the associated costs can be developed. This list can also identify what hardware and software purchases can be made in phases as regions in the county go up on a countywide system. This would allow individual agencies, regardless of size, to plan their purchase to fit into the larger picture. A “plug and play” concept could be achieved. Plug and play is a term that describes the ability of groups to connect their communications systems to a larger system. They take their communications connections and connect (plug) into the larger system, which is designed to allow multiple groups to operate on an open architecture. The responsibility for this assessment would fall on police management; police officers and dispatchers would be responsible for staffing, researching and assessing needs. The chiefs and sheriff would fall into a support role. The FCC is not impacted under this area of responsibility and political leaders would only need to be informed of the progress.

Complete Real Estate Assessment

Law enforcement agencies (municipal and county) throughout Los Angeles County would need to identify the real estate holdings currently housing on-site and off-site communications equipment. This would include remote repeater sites, microwave systems, as well as real estate holdings that are not currently used for communications system infrastructure. The assessment would include looking at current real estate holdings that could be used in the future as a countywide system is developed.

The responsibility for this assessment would fall on police management, who would be responsible for working with the various city and county offices to determine what exists in the real estate holdings, from developed properties to undeveloped land that could be utilized for part of the infrastructure development.

Agency executives, the chiefs/sheriff and their organizations would be responsible for lending support and the other groups would fall into a grouping of needing to be informed. Again, communications and keeping the various stakeholder groups informed gives them the perception that they are part of the entire process and develops the necessary support that directly impacts the success or failure of change.

Complete Needs Assessment

The complete needs assessment is required so that systems and system needs are looked at from top to bottom and side-to-side. What do agencies need now and what might they need in the future? What are the expectations of the various departments in the area of voice communications interoperability and

what are the various communities' expectations? In order to accomplish this, a needs assessment must be completed. This assessment or component to the process needs the support of the chiefs/sheriff and their groups. The overall responsibility falls on police management for coordinating and on police officers, police dispatchers and the community to provide the necessary list of needs, desires and wish lists to the police managers. The FCC is not impacted by this component and elected officials need to be informed.

Create Joint Powers Agency

Once a countywide committee and frequency, equipment, real estate, and needs assessments have been completed, a joint powers agency (JPA) needs to be created to carry on the vision into the legal arena. The countywide committee is still responsible for assimilating all of the data collected thus far and organizing it into options and phases.

With these options and phases comes cost analysis and a roadmap of sorts that outlines what is needed, how it can be accomplished, the parts each agency plays in the overall system.

The JPA takes information that is given to it by the countywide committee and feeds it into legal contracts, MOU, joint powers agreements, purchasing agreements and contract negotiations. For the JPA to be successful, it's the responsibility of the chiefs/sheriff, their organizations, and the elected officials to give the members of JPA authority to enter into these agreements since they are legally binding on the individual entities. The police management, officers, dispatchers, FCC, and the community need to be informed of the JPA's actions

prior to and following so additional input can be offered and final decisions are not made in a vacuum.

Create Political Support Committee

Simultaneous to the creation of the JPA, a political support committee needs to be formed to act as an information body to local, state and federal political groups and elected officials. A project of this undertaking will no doubt require state and federal approvals and funding sources. The Chiefs and Sheriff's organizations are responsible for forming this committee. Elected officials must support forming this group. In some cases, that support means they bear the responsibility of going to Sacramento and Washington to contact the state and federal elected officials to garner support for the change.

Apply for FCC Licensing

The project manager and/or police managers and the FCC are responsible for this item. Police chiefs/sheriff must approve final licensing applications, but the overall management of this change is that of the police managers.

Create Funding Group

Chiefs/sheriff and the police management are responsible for the creation of this group. It should include members of the Police Associations, communications groups, elected officials and the community to support identified funding mechanisms that may fund the desired change.

There may be some crossover in groups, such as the JPA group who can develop contracts or grant applications that help the funding group in their

decisions and goals. Often, large public projects such as this one require voter approval for portions of the funding. The community segment is responsible, along with the elected officials and the various police group to educate the public and to create the vision and the sense of urgency (to the public) for the need to fund this project.

Implementation & Budget Considerations

The implementation of change in this project is considerable and must be looked at in phases. Initially, the issue is how to accomplish countywide interoperability for a small agency by the year 2009. Since the small agency is one piece of the larger puzzle of countywide interoperability, a countywide committee develops a vision of what an interoperable system should be when completed. Next, focus is on how the components of the different systems would be pieced together to make the entire system. The small independent systems would be built at different time periods, as funding and changeovers occur, and they would become part of the larger system. As smaller systems increase the size of the larger system, the interoperable geographical coverage areas would also increase.

Looking at a five-year window, the initial phase would require chiefs/sheriff throughout the county to form the countywide committee. They would represent the law enforcement agency executives and their communities in developing the initial vision of a small agency accomplishing countywide interoperability by 2009. This group would need to work with industry experts, technical experts and consultants to develop that vision into a reality.

From the vision, come the teams of assessments (frequency, equipment, and needs). These assessments take the vision to needs and planning stages to develop a real picture of the what, how, and how much that must occur.

Year One-Two

Cost: Estimated to be \$2,000,000, these funds would be for the initial phase of the interoperability project. It would fund a consultant group to work with the model City as well as the other cities in Los Angeles County in developing the steering committee and the initial roadmap. This roadmap would include a needs assessment of equipment and infrastructure, creation of sub-committees for the eventual JPA and funding sources for further phases, and the final vision of what is needed to accomplish the vision of countywide interoperability by 2009.

The Police Chief and Chief's Organizations would be responsible for setting policy to establish the initial funding to hire the consultant group and also for forming the steering committee and project manager(s). The project manager(s) and police management would be responsible for ensuring that the necessary equipment, infrastructure, and needs assessments were completed.

Tasks:

- Identification of countywide committee members and their roles
- Selection of a consultant group to work with committee in first developing the vision, defining the needs, and assessing, based on the needs, what is needed to make the vision a reality.

- Establish the project phases in which law enforcement agencies can be brought into the system by year and funding mechanisms (planned expenditures)
- Utilize police department staffing to work with the consultant group to identify infrastructure and real estate availability (existing and future). This can be soft dollar cost at the agency level if it can devote staff to this objective.
- Create framework for a JPA
- Create framework for political and funding committees
- Consultant conducts public meetings in each city throughout the county to assess needs and support.
- Consultant group and agency executives brief local and county elected officials on vision, needs, and initial cost estimates.

Year Two-Three

Cost: Estimated to be \$2,000,000, these funds would be utilized by the JPA (steering committee) to develop the necessary MOU's and to pay for the consultants hired to work with and garner the support of the FCC in approving this interoperability plan. The consultants would also work with the funding groups to identify grant funding for the project and potential bond support from the public.

Tasks:

- JPA is formed and starts to develop MOU's.

- Consultant works with agencies and the FCC to identify needs and support for additional UHF spectrum.
- Initial temporary applications for licensing submitted.
- Funding committee and political committee contract with consultant groups for grant writing and political lobbyists to start tracking down outside funding sources.
- Submit grant funding applications to state and local agencies.
- Develop countywide bond measures to meet shortfalls in funding.
- Phasing plan is completed.
- Place on ballot bond measures or countywide tax initiatives to fund project where state and federal funding was not achieved.

Year Three-Four

Cost: Estimated to be \$15,000,000 will fund the purchase of the initial infrastructure and equipment. The project manager(s), and JPA are responsible for managing the project, hiring the long-term project manager, and developing the purchase contracts. Agency executives and elected officials are tasked with supporting this phase. Claremont's project manager would work closely with all facets since this is the phase where Claremont's system would be built alongside the countywide system and then be plugged in.

Tasks:

- Conduct purchases of identified real estate needed for system's initial implementation and future growth.
- Develop final agency cost and schedules for implementation

- Develop final JPA contracts
- Submit final FCC licensing with slow growth plan
- Purchase initial countywide infrastructure sites
- Purchase equipment for remote sites
- Develop master equipment list and costs for individual agency infrastructure purchases.
- Hire project manager and technical staff. Salary and benefits to be shared by the 88 member agencies.
- Make initial selection of communications vendor and develop equipment purchase/installation contracts for initial communications network system.
- Claremont's system is plugged in and goes live countywide.

Year Five - Ten

Cost: Estimated to be \$80,000,000, these funds would be used to purchase individual agency systems and equipment to plug into the main system. The project manager hired in the last phase would coordinate these purchases. Each agency would define individual project managers to be responsible for coordinating with the system project manager to facilitate purchases, system connection and agency training.

Tasks:

- System-wide integration starts.
- Initial agencies purchases filled and installed.
- Initial participating agencies develop internal training programs for end users based on criteria established by the countywide committee.

- First countywide users go live.
- Future schedule of users to add to the system is integrated into formal strategic plan and users are added under the schedule.
- Initial infrastructure allows for interoperable communications countywide on mutual aid channels only in year four and five. As additional users and their infrastructure are added to the system, more countywide capable channels, both primary agency and mutual aid are incorporated to the system. By year 8-10, the entire county has moved to a network that allows full county coverage.

In Chapter four, there was discussion of commitment planning by the organization, identification of stakeholders and discussion of critical mass, as well the movement by the critical mass members, an analysis of responsibility, and finally an overview of an implementation plan. In Chapter five, there will be a summation and final recommendations.

CHAPTER V

CONCLUSION

Summation

The initial issue of this project was to look at how 700 MHz will impact voice communications interoperability for a small law enforcement agency in an urban county by the year 2009. 700 MHz represents radio spectrum that is currently licensed to television broadcasters for use in sending their broadcast signals out.

The Federal Communications Commission (FCC) recognizes the lack of frequency spectrum to law enforcement across the United States. Law enforcement agencies throughout the United States and even with the model county (Los Angeles) are spread across four different spectrums that make interoperable voice communications nearly impossible.

700 MHz is the FCC's answer to interoperability and to address incompatible radio systems, and the significant difficulties they cause law enforcement. These difficulties translate into significant obstacles when dealing with the emergencies encountered in events such as the bombing of the Federal building in Oklahoma City, the World Trade Center disaster on 9/11. In addition to large scale, national incidents, local law enforcement must deal with communications incompatibility issues on a daily basis at fires, floods, earthquakes, pursuits, and mutual and civil unrest.

Before law enforcement agencies can move to the 700 MHz spectrum however, television broadcasters have to move off the frequencies they are

currently licensed to operate. The initial time given by the FCC for the broadcasters to move their operations and use of 700 MHz has changed several times, advancing into the future the time that law enforcement agencies will have this spectrum available to them. Currently, the FCC has set December of 2006 for the release of the 700 MHz spectrum, but the language contains an escape clause: 85% of the households in a given market area must be using high definition television (HDTV) services. The FCC has publicly stated that it may be 2009 before the 700 MHz is available. In addition to the lack of a real drop-dead date, the 85% of HDTV portion of the rule will cause a piecemeal process of 700 MHz becoming available, when it does.

This uncoordinated approach and shifting time delays has caused significant concern in law enforcement circles. Agency executives needing to replace existing, outdated systems are trying to decide if they should wait or purchase a new system now that will be incompatible with 700 MHz.

Some agency executives in Los Angeles County have decided not to move to 700 MHz regardless of the future availability and to stay on the UHF spectrum. This creates interoperability issues as well since, currently, there are agencies spread across UHF, VHF, and 800 MHz spectrums that cannot communicate with one another because of incompatible systems.

Based on the research conducted in this project and a significant amount of discussion with NGT panel members, the inconsistent approach that the FCC is using in releasing 700 MHz leaves law enforcement executives and communications planners in a difficult situation when it comes to future

communications planning. The non-committal approach of the FCC and the potential for the release of 700 MHz being up in the air has caused law enforcement executives in Los Angeles County to turn to their communications planners and consultants for alternatives to 700 MHz and alternatives for interoperability. The safe approach and response is to stay with what the majority of the users are currently licensed on, and that is UHF.

Based on this, 700 MHz will have a negative impact on voice communications interoperability for a small law enforcement agency in an urban county by the year 2009. With the information garnered from the research and the NGT panel's beliefs and input, it is apparent that 700 MHz is not the best way to achieve interoperability. Based on this, the focus and issue statement of this project have shifted to: "how will a small law enforcement agency accomplish interoperability countywide by 2009?"

The strategic planning and transition management plan look towards the vision of creating countywide interoperability for a small law enforcement agency (Claremont) in an urban county (Los Angeles). Some of the issues and concerns with 700 MHz being a viable option for small law enforcement agency in an urban county include agencies replacing their existing systems on different schedules, moving to alternative spectrum, coverage issues, costs, and coordinated effort was taken into account in the new vision and approach.

Smaller agencies often have less of a voice than the larger agencies in regional issues and areas such as this. That creates an atmosphere where the smaller agencies make decisions on purchasing communications based on their

agency needs and funding only. In order for a truly interoperable solution to work, agencies must work through coordinated and combined efforts.

With the proposed vision, strategic planning and transition management plans Claremont can achieve countywide interoperability by 2009. More importantly though, is that by following these plans a blueprint is created for a master system that any agency, small or large, can follow. This system allows agencies to build and connect their systems to the larger system as funding, timing and needs dictate. The end result is that by 2009, Claremont will have accomplished countywide interoperability and set a path for others to follow and accomplish the similar results, thereby overcoming the many challenges that radio communications present today.

Appendix A
Nominal Group Technique Panel Members

1. Dave Buchanan, County of San Bernardino Information Services Department, APCO Representative and 700 MHz Frequency Coordination Committee Chair
2. Tom Tillman, Motorola Inc., Southern California Engineering Manager
3. Tim Trager, County of San Bernardino, Information Services Department, Wireless Operations & 800 MHz Operations
4. Barry Morris, Kenwood USA Corporation, Communications Division, Public Safety Manager
5. Mark Herzog, Motorola Inc., Public Safety Accounts Manager
6. David Ping, The Aerospace Corporation, Communications Systems Subdivision, Research Associate Senior
7. Frank Mankin, Lieutenant, San Bernardino Police Department
8. John Penido, Fire Chief, San Marino Fire Department, Vice-Chairperson, Los Angeles Regional Tactical Communications Executive Committee

Appendix B
List of Potential Trends
Identified by NGT Panel

1. Use of Digital Communication
2. Perceived need for use of 700 MHz
3. Simple firmware upgrades
4. Software defined radio
5. Movement to digital TV
6. Regional dispatch centers
7. Single regional radio systems
8. Propriety devices
9. Technology changes
10. Hi-tech cops
11. Standards
12. New applications
13. Standards Based Radios (project 25)
14. Mutual aid
15. Other Interoperable devices (i.e. voice over IP)
16. Dependence on voice communications
17. Dependence on data communications
18. Available funding
19. Complexity of communications technology
20. Spectrum efficiency
21. Spectrum demand
22. Hardware life spans
23. Software life spans
24. Upgrading systems
25. Experience with large scale interoperability events
26. Spotlight on interoperability
27. Shared region resources
28. Mobility of criminals
29. Interaction with federal agencies

Appendix C
List of Potential Events
Identified by NGT Panel

1. 700 MHz spectrum becomes available
2. State adopts 700 MHz plan
3. State turns on statewide 700 MHz backbone
4. Broadcasters recapture 700 MHz
5. Software defined radios debut
6. LA County turns on countywide UHF system
7. LA City Fire Department moves from 800 MHz to 450 MHz
8. Department of Homeland Security discontinues security grants
9. HDTV readily available to all households
10. Smaller police departments merge/regionalize
11. Cities discontinue contracts with regional law enforcement agencies
12. Federal government funds countywide radio systems
13. Interference with Mexico hampers domestic communication
14. State legislature mandates unfunded conversion to 700 MHz
15. Failure of major public radio system
16. Urban areas reject 700 MHz plan
17. Countywide full scale evacuation
18. Large scale disaster requires more spectrum than currently available
19. FCC opens 700 MHz to private sector
20. Private sector partners with governmental agencies
21. Manufacturer builds 700 MHz module into public safety radios
22. Legislature mandates all public safety radios include 700 MHz band
23. OSHA mandates radio coverage
24. Lawsuit results in agency liability reference communications
25. Manufacturers refuse to produce 700 MHz equipment
26. State or Federal government mandates open architecture
27. Manufacturers discontinue support for a non 700 MHz public safety band
28. Congress opens 700 MHz to all users
29. 700 MHz spectrum becomes available

NOTES

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