Vision 2000

Consolidation Study - Public Safety Communications
Draft Report

Presented to:

Chittenden County, Vt. Regional Planning Commission

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Executive Summary

- The concept of a regional consolidated communications center and system is feasible. Long term cost savings can be realized and public safety services productivity can be increased.
- The greatest savings will be achieved by communities that abandoned the most amount of their communications infrastructure and staff.
- RCC prepared three configuration models. If the RCC recommended model is adopted the cost of personnel will be $755,909.00 as opposed to the current expenditure of $1,092,665.00, as savings of $336,756.00 per year.
- Local communities that move communications to the consolidated center must determine if they need to have a service window operation during all or part of the day.
- RCC recommends the consolidated communications center be organized under Vermont law which allows for joint municipal operations.
- Going to a consolidated communications center will have an impact on both dispatch and field staff. Human factors and relationship issues must be recognized.
- Public Safety planners will need to rethink the way in which information and non-emergency calls for service are processed.
- It is vital to the successful operation of the consolidated center to direct non-calls for service telephone traffic to the proper department or individual through the use of Direct Inward Dialing and Voice Mail Box technology.
- A single consolidated center places a heavy emphasis on redundant no-single point-of-failure design or having a back-up facility.
- RCC inspected five potential sites. None meet the design criteria for the consolidated communications center. RCC recommends, and desires, an evaluation of additional facilities.
- A consolidated center must incorporate the use of computer aided dispatch (CAD) technology.
- A strong commitment to training, for both staff and system users, will be required.

- RCC recommends a phased approach to developing a consolidated communications center. Mobile data terminals, automatic vehicle location applications, and trunked radio should be implemented in later phases.

Introduction

Public Safety Communications is but a single process in the delivery of police, fire, and emergency medical services (EMS). It is, however, a vital link in receiving information and calls for assistance from the public and in informing those who will render assistance: police, fire, and EMS agencies.

As a function of public safety services, communications must be accurate, reliable, rapid, and dynamic to meet rapidly changing needs. As a function of government public safety organizations, this quality service must be provided at the lowest possible cost.

Both the public and private sectors have realized the need to obtain the greatest amount of effort for the least amount of cost. Private investors expect a maximum return on their investment in a private company. Likewise, taxpayers expect, and demand high quality public services while holding, or reducing, taxes. To make an organization perform better than before at less cost is, indeed, a challenge.[1]

Many private and public organizations try to achieve the goal of reduced operating costs and greater productivity from systems and staff. Consolidations in the banking, airline, and entertainment/media industries have met with mixed results. Likewise, various consolidations in government services have met with limited success. Often, consolidations do not focus on increased productivity and cost containment but, rather, on shifting the cost of doing business from one entity to another. In RCC's opinion, consolidation should not occur unless long-term cost savings are realized and/or public safety productivity improves. The end result, as it is with nearly every consolidation, is change.

Change can be viewed as a problem or as an opportunity, or it can be both. Sometimes, organizations change, and the end result is worse. Companies change with the expectation of increasing business or reducing costs, but the change creates situations that are unworkable, knowledge and talent is squandered, or automated systems simply perform needless tasks more quickly.

Conversely, changes which capitalize on shared values and talents, increase

[1] "In Hard Times, Even Government Must Share." Governing September 1993: 26-27.

productivity, eliminate needless tasks, and enhance the quality of service are a benefit to all.

The Vision 2000 study is an opportunity. The study committee has the opportunity to learn from the experiences of others - what has worked, what has not worked, and why. The opportunity now exists to analyze the process of public safety communications in the Chittenden County region. The opportunity exists to create a new, cost-effective, and responsive public safety communications system.

Additionally, since any successful consolidation of public safety services will be a result of shared values of existing local governments, the conditions exist for these governments to continue to function locally but to work collectively to improve services and share costs.

This feasibility study will examine management theory on consolidation, discuss what is now being provided, and, in response to the request for proposal, demonstrate what a consolidated system could be.

SECTION I

Analysis and Theory of Consolidation Efforts

Vision 2000, an ad hoc group of _____, was created to evaluate the delivery of public safety services. The members of the Vision 2000 Committee share a belief that there is a better way, one that is more cost efficient, makes better use of public safety resources, and provides a platform for better service to the public.

{ HISTORY OF THE VISION 2000 GROUP}

The Vision 2000 study group was keenly aware that consolidated communication centers (C^3) and systems do not just happen. There are successes and failures. Consolidation does not always work. There is no guarantee that a consolidation will work or that the key players will cooperate.

Section I. 1 - Elements of Successful Consolidations

RCC has observed that successful consolidations have common elements: shared values/mission, commitment, desire, a project champion, training and education, and the use of teams.

For a consolidation to be successful, the various units need a shared vision. They must mutually see the benefits to their organization. Therefore, a department that already has a communications center must see advantages to relinquished their communications operation.

In Onondaga County and Monroe County, both in New York State, consolidated communications systems have been developed. However, the route that each county took is really quite different.

In the case of Onondaga County, the move to consolidated services was driven by the implementation of enhanced 911 service and the consolidation occurred rapidly. While there was a shared county-wide records management system and consolidated fire/EMS dispatch function, the decision to consolidate all public safety communications

functions was made within months with the actual implementation of consolidation and E 9-1-1 following immediately.

Monroe County's communications center started as a 911 center in 1980. The county, by arrangement with the City of Rochester, took 911 calls and dispatched city units. The county 911 center also took 911 calls for all other municipalities in the county. In some instances, the 911 call was transferred to a local dispatch operation (some 911 calls were dispatched either full-time or part-time by the county), while some communities discouraged residents from using 911, preferring the public use of a seven-digit number to report incidents directly to the local communications center.

However, in the early 1990's, Monroe County local governments felt the impact of the recession. Looking for ways to cut costs, local governments looked to the county's communication center for assistance. Today, a new, modern communications center serves nearly all of Monroe County's police, fire, and EMS agencies.[2]

Frequently, "turf" issues between departments drive a wedge into consolidation efforts. This is especially true where certain areas are served by more than one provider. In these cases, some public safety officials believe that to lose the communications function will result in the loss of calls for service and control.

In successful consolidations, there needs to be a common desire. While the economic and operation benefits may suggest consolidation, if there is no desire, the project will not move forward well. RCC has observed communities that have had to consolidate because of political mandates. While the consolidation has occurred, unwilling participants often slow or thwart the process.

RCC has also observed that every successful project has had a project champion or champions. They are high-level, respected, and dedicated officials. They not only support the goals, but they are also instrumental in knocking down roadblocks and keeping the project focused.

The effort to consolidate services in Chittenden County is similar to efforts by

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[2]Togeldin Shaden. "City/County Partnership Spawns High-Tech 911 Center." Nation's Cities Weekly October 24,1994, pp 13 - 14.

industry to analyze existing methods and practices to find better and less expensive ways to do business. The California Management Review [3] recently surveyed and analyzed firms that had undergone a significant change in their business process. Some of the firms had been faced with near crisis situations, while others desired to stay ahead of the competition and began the change themselves without external stimuli. The conditions that necessitated the consolidation/down sizing did not change the intangible elements that were considered vital to success.

These elements were identified as:

1. Use of a Team,
2. Identifiable Project Champion,
3. Training, and
4. Trust, Commitment, and Communications.

1. Teams are necessary because they bring to the project a cross section of talents, knowledge, and viewpoints. In this consolidation, police, fire, EMS, department of public works (DPW), local government administration, and the public must participate. Each is important, each brings a point of view to the table, and each has issues to learn from the others. It is also important to have outsiders participate, those who do not have a vested, in a particular field, interest. One part of the team must challenge or ask the question, "why?" The use of teams can provide dynamic results, but teams must have goals and positive leadership. Teams are best used when: The costs of being wrong are high; there is uncertain or inadequate information; numerous alternatives exist but are difficult to identify; no single best decision exists; and information of success or failure will not be available for some time.[4]

Consultants can be useful, but their role must be identified. Consultants are usually best used in technical or resource-gathering functions.

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[3] Dixon, Arnold and Helneke. "Business Process Reengineering: Involving in New Strategic Directions." California Management Review Summer 1994, pp 93-108.

[4] Notes: "Management Development Program," Rensselaer Polytechnic Institute, April 1989.

2. An identifiable project champion has been mentioned in numerous business management texts, workshops, and classes. [5] The project champion is not the project leader but, rather, a person with the status, knowledge, and authority to clear roadblocks and to keep a project on track.

3. Training was identified for everyone in the process. Team members need to be retrained on technologies and methods, while participants (in this case, dispatchers, police, fire, EMS members, along with local government officials) need to be retrained as is appropriate for their jobs. The failure to retrain will nearly assure early frustration to a consolidation effort.

4. Trust, Commitment, and Communications were also identified as being elements vitally important to a project. The players and team members must understand their relationships with one another in order to be successful. If there are nagging issues which affect trust and commitment, these issues must be resolved before the work of developing a new process begins.

Throughout the process, individuals and organizations must be treated as equals, with a commitment to professionalism. At all times, communications must be open and direct.

Using the techniques which have been learned and developed in the public and private sectors, it is possible to examine how to re-think public safety communications.

Section I. 2 - Re-Thinking Public Safety Communications

Public Safety Communications is a process that has life-and-death ramifications. The purpose of the communications center is to receive information, determine the necessary public safety resources that are needed by the caller, and, then, dispatch those resources.

There was a time when communications was considered an ancillary function to public safety services. That is no longer true. A poorly run communications center can

[5] Ibid.

set the stage for litigation[6] or, at the least, a negative public image, regardless if it is rightly or wrongly deserved.

It is not unusual for a public safety communications center to serve other functions. These functions include taking messages for patrols, investigative and administrative police personnel, fire officers, EMS officers and for after-hours telephone answering for town, City Hall, DPW, and highway offices. RCC is also familiar with communications centers that page non-public-safety government employees. Sometimes, dispatch staff also perform record keeping and administrative tasks.

There are departments in the Country that use the communications center as the "Command and Control Center." From RCC's observations, command and control functions should be performed by field officers who have the knowledge, responsibility, and authority to direct public safety resources within their jurisdictions.

C^3 is a support function of field oriented command and control.

In RCC's opinion, it is important to identify the function of the public safety communications center and, then, to keep it true to its mission.

If the consolidated center is to receive, process, and disseminate information rapidly, these elements must exist:

- Leadership with a stated and demonstrated desire and ability to provide a quality product at a low cost.
- Clear mission statement.
- Oversight and direction from a Board of Directors.
- Input and feed back from users and public.
- A facility designed specifically for public safety communications.
- An adequate number of staff.
- Hiring practices tailored to public safety communicator selection.
- Staff (internal and external) training.
- Well prepared policy and procedures document.
- Professional and consistent supervision and management.

[6] Delong v County of Erie, [60 NY2d 296] November 1, 1983.

- Appropriate use of technology, including radio, telephone, and computer systems.

If the goal of the communications center is to transmit messages efficiently, it must be designed and operated with the fewest impediments to information flow. Inbound information must be received promptly. There must be an adequate number of calltakers and telephone sets/call-taking positions, caller ID, and enhanced 911 utilized to facilitate caller identification, features such as voice mail boxes to avoid the necessity of taking messages, enhanced radio systems, computer aided dispatch (CAD), and a computer wide area network (WAN) for distribution of information and messages to participating agencies.

In addition to the effective use of technology, the staff must be highly trained, and routine and emergency procedures must be practiced and reviewed constantly. In addition, common policy and procedures will be necessary.

Policy and procedure development guidelines are available from commercial printers and Association of Public Safety Officers Association (APCO). The policy and procedures document must address issues of commonality such as what call information is given initially, how E 911 hang ups are handled, multi unit/agency/services responses, canceling a response, pre-arrival information, and special channel assignments for unique incidents.

While C^3 must be driven to meet the needs of its users, the users will be best served if the communications staff does not have a multitude of different procedures to follow.

Once the call information has arrived in the communications center, the information needs to be prioritized. Incidents identified as, or suspected to be, emergencies must receive immediate processing, while non-emergencies should be processed when units are available. The staff must be trained to identify emergency incidents, even when they are not reported as an emergency. Staff must know the correct response according to the policy and procedures adopted by the Board of Directors. The staff also needs the tools which will allow them to alert, contact, and communicate with the response units.

Unlike a 911-only communications center, a consolidated communications center needs to be able to process 911 calls, as well as emergency and non-emergency seven-digit calls. Alarms and alarm boxes will also need to be handled.

The telephone system's performance must be good, very good. It must allow 911 calls to be answered first. Seven-digit emergency numbers are typically used less as the use of 911 increases. However, from the time of 911 implementation to the phase-out of existing seven-digit emergency numbers, both will need to be maintained. Emergency telephone communications constitutes only about 10-15% of telephone workload; therefore, careful workload analysis of the remaining seven-digit telephone traffic is necessary.

Ideally, only seven-digit calls that require a unit to be dispatched should be answered at the communications center. However, this will not always occur. A telephone system at the communications center should include the following features.

- o Ability to accept all existing seven-digit published numbers.
- o Ability to transfer a non-emergency, or non-call-for-service caller, to a specific department.
- o Ability to transfer a non-emergency, or non-call- for-service, caller to a voice mail box.

Individual departments, particularly police, must capitalize upon the use of Direct Inward Dialing (DID). DID will assist in keeping messages out of C^3. Administrative calls for specific departmental functions,such as records, traffic, investigations, and general information,should not be routed through C^3.

Alarms are typically associated with the following: Street pull box, elevator telephones, direct alarms from a bank, hospital, school, specialty retail (such as a liquor or gun store), nursing home, or governmental operation (such as a water or sewer plant), and automatic dialers.

Pull boxes and direct alarms are terminated on an annunciation panel. Elevator telephones and automatic dialers arrive in the communication center by telephone.

Alarms of all types can be time consuming. Periodic service and maintenance is

required by an alarm company. When the alarm is disabled or tested, the communications staff must assist. Alarms of all types are subject to failure and faulting. When an alarm annunciates, there may be special procedures, such as contacting a key holder or making a notification to verify that a condition exists. All of these tasks require work on the part of the communications staff.

RCC believes that alarm companies are better prepared to monitor alarms than is a communications center. Once the alarm company has confirmed that a condition exists or that a certain procedure is to be followed, C^3 should be notified with the call for service. The function of C^3 is to rapidly receive and send information; dealing with alarms slows this function.

The use of automatic dialers is difficult to control. A person or business simply purchases the automatic dialer, installs one to an existing telephone line, records a message, and usually forgets about it. When the automatic dialer is activated, it will dial a pre-programmed telephone number and play a pre-recorded message, usually several times. Once the dialer has been activated and has called the communications center, there may not be any way to disconnect from the call until the dialer has completed its program.

Automatic dialers can not be allowed to use 911 trunks. The lack of supervision of these devices makes them susceptible to faulting. During an electrical storm, several could fault at nearly the same time, thus tying up 911 trunks. If dialers are allowed to call C^3, they should be given a special telephone number. Owners of automatic dialers that use 911 or have devices that fault more than once a year should be subject to civil fines and punishment, since their devices are causing a needless use of public safety services and may jeopardize public safety personnel and the public during the response.

Section I.3 - Impact on the Public

The desired impact on the public will be prompt handling of emergency and non-emergency calls for service.

The public, via telephone book listings and department business cards, will need to be guided on which telephone number to use. 911 is for emergencies only, and other numbers should be used to obtain direct service from a specific officer or department. C^3's telephone system should be robust enough to handle calls for service which are incorrectly placed.

Section I.4 - Impact on Dispatchers

The existing dispatch staff will be affected if consolidation occurs. In all but one of the existing communication centers, dispatchers also serve in a clerical, front-desk, administrative-assistant role. RCC calculated the number of staff needed in the possible consolidated center. The number will be less than the full-time and part-time staff now used by the separate departments.

To transition the existing dispatch staff into a new center will take planning and retraining. From RCC's experience with other consolidations, some of the issues to be resolved include:

- Salary and benefits.
- Bargaining unit representation.
- Seniority.
- Job descriptions.
- Loss of contact with patrol/field personnel.
- Loss of identification with a specific department.
- Loss of direct contact with the public.
- Concentration on communications only - no other tasks to break up the work period.
- At times, a more intense work environment - less down time.
- Need to forget old procedures and to learn new ones.
- Need to become familiar with entire service area.

- More reliance on technical systems such as wide area radio, information management systems/databases, and CAD.
- Working with other shift members.
- Working different hours, perhaps rotating shifts.
- Longer commute.

RCC assumes that existing dispatch personnel will be given first refusal to the consolidated communications center jobs. The impact on existing communications personnel can not be treated lightly. The communications staff is key to the success or failure of the effort.

The creation of a consolidated communications center will have an impact on the workload of existing police, fire, and EMS communications centers. Those departments may be faced with moving some of the existing dispatch staff into other jobs at the local level, losing them to a regional dispatch center, or terminating them because of lack of work.

Generally, laws and courts have upheld the abolition of civil service positions when the removal or abolition is based on good faith economic reasons.

Although the contrary has also been held, the general rule seems to be that the restrictions against summary removal of civil service employees do not apply where the removal in made in good faith for reasons of economy [7] or where an office is abolished is good faith. Of course, such actions cannot be taken to cover up the discharge of an employee in contravention of the law.

Specific Vermont statues should be researched for specific application of state law regarding the abolition of positions. Collective bargaining agreements, which may vary according to bargaining units, may also contain language which will impact employees and municipalities. A civil service employee separated for economic reasons may be statutorily entitled, whenever possible, to be demoted to some lesser office and have his or her name placed upon a special re-employment list.

Some employee actions have been brought against a municipality because of loss

[7] Municipal Corporation Law Review § 12.248.40: pp. 491 - 492.

of work from a work force reduction. The burden of proof is on the employee to demonstrate that he or she is being removed in bad faith and for a reason that is a mere pretext for an improper motive for removing employees by the municipality.[8]

RCC and the CCRPC staff prepared and distributed a questionnaire to the current dispatch staff. (See Appendix I)

Twenty four of the surveys were returned. In order of importance, the following issues surfaced:

1. Salary.
2. Shift assignment.
3. Fringe benefits.
4. Training.
5. Location of work assignment.
6. Equipment.
7. Career ladder.
8. New CAD system.

In general, the dispatchers who responded were positive to the notion of C^3. From the survey comments and casual interviews during site visits, most dispatchers know there will be a reduction in the total number of communications staff needed, and that terminations or re-assignments are a real possibility. The current lack of training was a common expression. Dispatchers also wanted to represented on the Vision 2000 committee.

The following tasks represent tasks which dispatch personnel would likely perform within C^3.

- o Implement operational policy and procedures as per adopted guidelines.
- o Answer seven-digit and E-911 telephone lines.
- o Monitor radio frequencies/channels.
- o Answer radio calls from field units.
- o Monitor status of field units.

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[8] Ibid.

- o Activate, per procedures, automatic mutual aid plans.
- o Alert fire/EMS personnel via pagers for an alarm.
- o Provide information to field units on calls for service.
- o Provide emergency medical dispatch/pre-arrival instruction to EMS calls.
- o Create or update CAD or other database files:
  - Complaint information,
  - Stolen vehicles information,
  - Felony crime information,
  - Missing persons,
  - Hazardous Materials,
- o Facilitates request from field units for motor-vehicle checks, wants, warrants, and NCIC.
- o Facilitate requests by field units and officials.
- o Conduct certain C^3 and system tests.
- o Keep logs, records, and file reports, as necessary.
- o Make notifications on certain types of C^3 and system failures.
- o Make notifications, per procedures, to State Emergency Management Agency, Amateur Radio Civil Emergency Service (RACES), Red Cross, Coast Guard, Vermont Air National Guard Crash-Fire-Rescue Department, arson squad, hazardous materials incident team, medical examiner or coroner, and other officials and agencies as required.

Section I.5 - Impact on Users

Moving into a consolidated system also has impacts on the users: police, fire, EMS, and DPW agencies.

The impact on users will depend, in part, on the size and scope of their current operation. RCC's experience suggests the following may be issues:

■Increase or decrease in radio traffic.

- Use of channels with other agencies.
- Need to listen for radio call signs.
- Need to change channels to get specific services.
- Need to transmit messages concisely.
- Different dispatcher voices.
- Greater capability to talk with similar agencies.
- Ability to monitor an adjacent municipality's calls for service.
- Ability to get real time information from officers/departments.
- Opportunity to abandon previous operating practices such as using "code words" for a certain location.

End users, as much as dispatch staff, will need to be trained. A comprehensive training program, before the move to consolidation, will create a positive starting point.

Section I.6 - Applying Technology to Consolidation

From a review of the literature, there is little question that technology plays a large role in increasing functional productivity.[9] As technology is applied to specific tasks and functions, the cost per unit usually decreases. Additionally, municipalities can collectively afford systems where individually they would not be able to consider them.

There are pitfalls, however, to using technology incorrectly or inappropriately. In RCC's opinion, technology should be applied only to processes which are essential to the success of an organization. Technology should not be used to automate a task that is not needed in the first place.[10] Additionally, technology in the communications center should be used where the greatest cost benefit can be achieved.

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[9] Denton, D. Keith. "Creating a System for Continuous Improvement." Business Horizons January - February 1995, pp.16-21.

[10] Ibid.

Section I.6.1 CAD

Computer Aided Dispatch systems provide a tool for dispatchers to maintain real time records of incidents and unit status, and to use that information, along with a variety of databases, to provide more effective dispatching.

A CAD system typically consists of a PC or Unix network or server with mass storage and a group of user terminals. Each dispatcher normally has both an incident screen, with detailed information about each incident, and a status screen, providing the availability status of each field unit.

CAD systems are useful to facilitate operations. While technically, not a part of the radio system, they are important in managing the flow of information and the allocation of resources. CAD also can provide real time data to remote terminals, such as the police chief or operations officer, and can monitor the activities of field units.

Section I.6.2 Mobile Data

Mobile Data Terminals (MDT) are being used increasingly by public safety departments and utilities. A MDT system allows units within the system to communicate via keyboard or preselected function keys in a text mode which uses wireless digital technology.

In a public safety application, the MDT system is connected to remote data bases such as NCIC, state department of motor vehicles (DMV), and local databases. In a police environment, an MDT system allows a police officer to run vehicle registrations checks, operator license checks, and stolen property inquiries, and to obtain wants and warrants on an individual without relaying the message through a communications center dispatcher who would have to enter the data into a terminal, wait for a response, and relay it back to the police officer.

Because of the time-consuming way in which data is currently obtained, typically only what is absolutely needed is requested. However, experience has shown that officers randomly checking vehicles in a hotel or airport parking lot find vehicles whose owners are wanted.

One study found that officer productivity increased by more than 500%.[11]

Other cost-saving and productivity factors have been identified[12]: These include:

- Reduced radio traffic on voice channels.
- Fewer human errors (Fewer points of error introduction).
- Increased communications security.
- Improved officer safety.
- Reliable (error correcting) communications.

MDT systems and the necessary field equipment can either be purchased or the air time and the equipment can be leased.

Field equipment is available in portable or mobile units. MDT is a powerful tool which allows the user to access vast amounts of data on individuals and organizations.

A case study[13] of MDT operations in the Las Vegas Metropolitan Police Department found that from a police officer's viewpoint, MDT's increased officer productivity resulted in a greater number of license checks and traffic stops. In this analysis, the MDT was rated third in importance after the pistol and the car radio.

In another article,[14] a panel of police officials estimated that mobile computing systems reduced overall departmental costs by 30% and increased officer productivity by 15%. If, in fact, individual officer productivity can be increased by half that amount, what would be the savings to any community's police budget?

MDT systems, unless designed with open architecture, have proprietary signalling. Therefore, equipment from different vendors can not be used interchangeably. Potential MDT users also need to appreciate that MDT screens may not be like laptop computers. Rather, the MDT screen is smaller, and the print may be larger.

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[11]Gallelli,J. "Mobile Data: An Essential Tool for Public Safety." APCO Conference, New Orleans, La., August 11, 1993.

[12]Patterson,R.M,Jr. Ph.D.,(Manager, Staff and Auxiliary Services) Kent State University Police Department." Mobile Data: Benefits, Alternatives, and the Future." The Police Chief August 1994, pp. 23 - 26.

[13]Layne and Rucker. "A Case Study of In-Car Terminals in the Las Vegas Metropolitan Police Department." Circa 1992.

[14]Rouleau, Robert. "Mobile Computing Systems Are the Future".

Prior to implementing MDT, a needs assessment, which includes data requirements, signaling capabilities, and physical requirements, must be done. Should MDTs be used as a data tool or should they be incorporated into the dispatch function? MDT technology allows various configurations.

MDT is a powerful tool. It is RCC's observation that complaints come only from users of systems that were poorly planned and engineered.

Section I.6.3 - Trunked Radio

Trunked radio systems are processor/software driven to give the users enhanced features that are not available in traditional simplex or repeated systems. By their design and by Federal Communications Commission regulations, the frequencies used by an 800 Mhz trunked radio system user are "protected" from co-channel interference. Therefore, reports of interference are rare and usually not from other co-channel users.

The software that drives the trunked radio system allows various configurations. These configurations can be changed as communication system needs change. A feature of a trunked system is the "sub fleet or talk group." This feature allows for units with a common function, such as a specific police dispatch, fire control, and EMS, to communicate freely. However, other groups, such as local or regional hazardous materials teams, drug squads, K-9 groups, traffic divisions, surveillance, and command functions, can also be created to meet specific needs.

Additional 800 Mhz trunked radio features are described in "Trunked Radio - An Overview" in appendix II.

Section I.6.4 - Automatic Vehicle Location (AVL)

AVL allows a dispatcher to constantly know the location of each of the field units that are working. It allows, in some cases, for the timely dispatch of the nearest unit, one with the least travel time, or one equipped with the staff and equipment required for a specific assignment.

Most AVL systems employ radio signaling from the mobile unit to a fixed control site.

Typically, AVL signaling uses mobile data technology. To acquire the location of the field unit, various technologies have been used including: dead reckoning, signpost, LORAN-C, and Global Positioning System (GPS). The most practical is GPS. This system uses a series of satellites which have been placed in earth orbit. By knowing the precise location of the satellites in space, the mobile unit can calculate its location within a few meters. Once the location of the unit has been determined, the data is digitally sent to a processor at the communications center. The unit's location can be updated at various time intervals. At the communications center, the location of the unit, the direction of travel, and the speed are displayed on a map. The data may be stored for later review and analysis. When associated with a CAD system which supports AVL, automatic selection of a unit based upon the enhanced 911 automatic location information (ALI), derived from the E 911 database, is possible.

AVL systems are becoming increasingly popular with public safety, public transportation, and utility companies. Typically, AVL is used in systems where there are a large number of units that need to be tracked or where vehicle performance or conduct data is needed.

AVL system users are, at times, faced with employee hostility over the implementation of AVL. If improperly implemented or used, AVL is seen as a weapon against employees. Employees complain that they are being constantly watched and monitored - and they are. A police officer may feel that if he or she is responsible enough to be a cop why does his or her every move need to be monitored and recorded?

Section I.7 - Organization

A consolidated communications center can be organized in the following ways:

- o As a private for-profit business with contracts with the participating local governments.
- o As not-for-profit corporation.
- o As Union Municipal District or Interlocal contract.

As privatization is increasingly used to provide government services, such as

prison operations, facility maintenance, and data processing, RCC has seen private companies express an interest in operating communications centers and managing the associated radio systems.

RCC is not aware of any privatized communication center operating in the northeast; however, there are similarities between the operations of a public safety communications system and those of utilities, transportation companies, and rapid delivery services. Likewise, with the development of cellular telephone and special mobile radio (SMR) systems, there are private firms with the expertise to develop and manage radio systems.

The contractor would provide labor and management. The contract could, but wouldn't necessarily have to, provide the communications center equipment. If equipment were to be provided by the contractor, its cost plus the cost of money would be reflected in the contract fee. Some governmental agency would need to acquire and be responsible for the necessary FCC radio licenses.

An unanswered question is how to deal with sensitive information, investigations in progress, and the potential access to numerous government databases.

It must be remembered that the reason a company enters into a contract of this type is to produce a return on investment.

A not-for-profit would have many of the same issues to deal with as a for-profit corporation. However, a not-for-profit would only need to cover costs, not achieve a return on investment.

Under Vermont law, Chapter 121, Inter-municipal Cooperation and Services enables local governments to work cooperatively for joint projects. The statute provides for the powers and duties, enables them to hire employees, to conduct studies, and to adopt rules, regulations, and bylaws, as necessary.

By using this form of organization, the management of any regional entity is by those municipalities that participate.

This approach seems reasonable. It does not create a new layer of bureaucracy, and it keeps those providing the service very close to those paying for the service.

Section I.8 - Work Force Productivity Considerations

An emergency communications center is a 24-hour-per-day, 365-day-per-year operation. Certain rules of thumb are used to estimate the staff necessary to achieve adequate staff.

It takes 4.9 to 5.2 Full Time Equivalent (FTE) to staff 1 position 24 hours per day, 365 days per year.

If:

365 days X 24 hours per day = 8,760 hours per year

One full time employee equals:

40 hours per week X 52 weeks per year = 2,080 hours per year

2,080 hours per year - 80 hours vacation = 2,000 hours per year

2,000 hours per year - 80 hours training = 1,920 hours per year

1,920 hours per year - 80 hours sick/personal time = 1,840 hours per year

1,840 hours per year - 40 hours administrative = 1,800 hours per year

Equals 4.86 ≈ 4.9/5.0 FTE to fill one 24- hour position for a year.

As staff accrue more seniority and acquire more vacation per year, or the use of sick time increases, the number of FTE's required will increase.

It is also necessary to estimate how much work a communicator/dispatcher can perform in one hour. It is necessary to accept the fact that public safety communications activities are dynamic. While planners will use average-hour and busy-hour estimates to base predications on, and to a great degree such planning tools will achieve good planning numbers, this is not an absolute science.

If:

One eight-hour shift = 480 minutes

480 minutes - 30 - minute meal break = 450 minutes

450 minutes - 2 - 15 - minute breaks = 420 minutes

420 minutes - 2 - 10 - minute personal breaks = 400 minutes

400 minutes - 30 - minutes inter-task recovery & dwell time = 350 minutes

Equals average of 43.75 (45) minutes of work per hour.

As aptly stated by Tucker in "Communications Center Workload Analysis," "The management of a communications center dedicated to public safety operations is neither routine nor simple. Evaluation of dispatch center operations reveals that, no matter what the technology, the most important factor is the efficient performance of personnel."[15]

[15]Tucker, Richard S. "Communications Center Workload Analysis." APCO Conference, August 30, 1990, p. 1.

Section II

Section II.1 - Existing Public Safety Communications Systems

To be able to compare a consolidated system with current operations, RCC has prepared a composite view of existing operations.

In addition, according to the CCRPC there are estimated to be 25 local police radio frequencies, 17 fire radio frequencies, and three EMS radio frequencies used in Chittenden County for public safety purposes.

There are a total of 65 people, not including administrators, involved in the delivery of communications. Thirty-four are full-time employees, while 31 are part-timers.

From the data available, it is difficult to accurately determine how much of each employee's time is dedicated to communications, administrative tasks, and other non-communications tasks. Nearly all of the departments that had window operations indicated the communications staff spent very little time on window or non-communications activities.

From the data available, it is difficult to determine how much of the cost of operations goes to support the communications center and how much goes to support portable and field equipment. Additionally, the cost of overhead, administration, and supervision have not be identified.

In both cases, estimates can be made, but precise amounts can not be obtained.

There are approximately 27 - 34 patrol units assigned within the region during each shift.

RCC estimates that to staff the existing communications centers, as indicated in the survey, it takes 56 full-time equivalent (FTE) staff. FTE is the total of full-time and utilized part-time staff required to fill the necessary positions.

The total spent on personnel is $755,909 which includes salary, overtime, and benefits. It does not include administrative and supervision costs.

The total spent on communications systems operations is $61,336 this includes not only communications centers' equipment, but, also mobile and portable units and maintenance. Again, it is RCC observation that the data is incomplete.

The capital expenses for equipment are $221,700.

From a review of the survey information, only personnel costs appear to be complete.

Section II.2 - Full Time Dispatch Operations

See appendix III.

Section II.3 - Configuration Matrix

See appendix IV.

Section II.4 - RCC Observations and Comments

From RCC observations and interviews, the following issues have been noted and/or identified:

- Except for the City of Burlington, all full communications centers also provide window service.
- The Spillman CAD system is most commonly used.
- Interoperability between departments has been stated to be poor because of system configuration. Only through the use of scan radios and channel hopping do units achieve interoperability.
- There is no one place in the region that has the real time public safety big picture of what is occurring, what units are available, and which are out of service or unavailable.
- Many of the calls for service which require a multi-agency response are processed sequentially rather than simultaneously.
- Most noticeably in fire and EMS operations, it is difficult for a chief or command officer to get information to incoming units early in an incident. Chiefs have commented that it is very difficult to cancel a response once a size-up has determined that dispatched resources are not needed.[16]

[16]Comments. County Fire Chief's Meeting. Williston Fire Department, May 18, 1995.

- RCC believes that most of the existing radio systems do not have a high degree of redundancy. Agencies are served by a single base station. Such a situation suggests that during a critical incident, communications could be lost until a back-up radio is installed. In public safety, radio coverage should be provided by stations which provide overlapping coverage and provide for automatic back-up.

Section III

Section III.1 - Consolidation Feasibility in Chittenden County

Section III.1 - Structure and Organization

RCC recommends that the preferred organization structure would be to form a "Council of Governments or Union of Governments" as provided under Vermont law. This type of organization has been established pursuant to statute, sets forth powers and authorities. It also provides guidelines for its creation, operation, and organization.

The center needs to be governed by a Board of Directors who shall consider service to the public and client agencies, costs and expenses, productivity, and policy. Therefore, RCC suggests a three-member board with a representative from the local governments and two citizens at large. Sub-committees to the Board of Directors would be the Town/City Managers Committee, which would review and make recommendations on personnel and fiscal issues and an Operations Committee, made up of all participating police, fire, and EMS chiefs, which would review and provide recommendations on operational issues which affect the police, fire, and EMS organizations. There is a tendency in organizations to build chimneys. These chimneys do not allow for outside groups to look in or for the inside group to look out. Information, problems, resources, and ideas are not shared. For example, police only look at police communications and associated issues. The same can be said for fire and EMS. The organizational goal of the governing structure should encourage public safety agencies to work as a team.

Section III.2 - Equipment and Technology

A. Number and Type of Telephone lines

The existing publicized seven-digit agency telephone numbers should be transferred, using remote call forwarding, to C^3. C^3 and participating agencies would be equipped with telephone features similar to those of Centrex or Private Branch Exchange (PBX) which allow for call transfer, call forwarding, voice mail boxes, and speed dialing.

The telephone system which will support non-emergency traffic must allow for the rapid flow of information, using a minimum of the communications center's staff time.

The telephone system should have the following features:

- o Accept 911, emergency, and non emergency calls within the same instrument.
- o Automatically recognize a Telecommunications Device for the Deaf (TDD) request.
- o Provide caller ID on non E-911 lines.
- o Accommodate seven-digit fire and EMS emergency lines during the transition to E-911- only reporting.
- o Accommodate the current seven-digit police emergency numbers.
- o Have PBX or Centrex features which allow the rapid transfer of calls to specific departments or individuals.
- o Provide voice mailbox service to participating agencies.
- o Provide for the use of radio console/telephone headsets.
- o Be designed with its own UPS and redundant features.
- o Meet American's with Disabilities Act (ADA) criteria for the hearing impaired.

The design goal of the telephone system must be to get information from external and internal sources to the designated recipient as quickly and directly as possible.

The telephone system should support direct inward dialing (DID) for designated individuals, along with automatic referral to voice mail if the phone is not answered in a predetermined number of rings.

There are currently 43 telephone numbers associated with fire, police, and EMS agencies. Some of the numbers are single-line terminations, while others are configured in a hunt group.

A telephone layout and configuration must be conducted. For each department, the plan would include:

Which seven-digit lines are moved to C^3.

Which seven-digit lines are left in the local station.

What the estimated traffic loads will be.

How administrative traffic can be routed directly to the recipient and not via C^3.

Features necessary such as call transfer, caller ID, and voice mail.

Lines that should be recorded.

Policy and procedures.

Training program for C^3 and field personnel.

There should be, initially, at least 10 unlisted numbers, in a hunt group, for outbound and selected traffic. As usage becomes more defined, lines can be added or deleted.

In a 24-hour period, CCRPC staff estimates there are 27 to 34 police officers working per shift. If each officer receives 5 messages, it takes approximately 4.25 hours of dispatcher time to receive and copy down the information. The dispatcher then has to either contact the officer by pager, radio, or telephone to relay the message in a timely way.

Therefore: Estimated message-taking costs per day.

150 officers x 5 messages each @ 90 seconds per message = 1,125 minutes/18.75 hours of time. The approximate value of this time is $187.50 assuming dispatchers are paid an average of $10.00 per hour. Therefore, the average cost per message is $0.25 or $7.50 per month.

Voice-mail rates, from commercial vendors, are estimated to be $7.00 to $10.00 per month per voice mail box. It appears for a similar expense, voice mail provides increased flexibility to field personnel and relieves C^3 staff from message taking to a large degree.

There will be exceptions and deviations; however, the analysis provides an order of magnitude of savings.

It is RCC's opinion that telephone operations make up the largest work segment of a C^3.

Therefore, appropriate telecommunications engineering and design will be necessary to ensure functionality.

Existing municipal telephone systems can, in most cases, accept PBX or Centrex

functions originating from the consolidated communications center. Costs will be driven by the age of local equipment, by whether all participating agencies are served by a common telephone central office, and by the features desired.

Supplying a telephone system with additional features will also require education and training for police, fire, and EMS agency personnel.

At some time after enhanced 911 service is provided, the existing seven-digit emergency telephone numbers for fire and EMS agencies can be abandoned. The use of the seven-digit emergency telephone will depend on 911 public education. Activity should be carefully monitored prior to abandoning lines. Agencies, particularly fire and EMS, may find it beneficial to use a common seven-digit non-emergency number for department administrative purposes. This number would support the public calling an agency for a non-emergency purpose, such as a burning permit or requesting a call from a department official. The departments could collectively use the same number(s) to achieve a cost savings.

The following operating scenario is envisioned:

E-911 call for service - The call arrives at C^3. Information is confirmed and incident information obtained. Per procedures, appropriate units and agencies are dispatched.

Seven-digit emergency call for service - The call arrives at C^3. Location, incident, and other information is obtained. Per procedures, appropriate units and agencies are dispatched.

Seven-digit non-emergency call for service - The call arrives at C^3. Location, incident, and other information is obtained. Per procedures, appropriate units and agencies are dispatched.

Seven-digit administrative call - The call is transferred to the appropriate person or department. If the call is not answered within a certain number of rings, the call automatically goes to a voice mail box.

RCC estimates the termination of up to +/- 43 incoming seven-digit numbers. Ten out- bound lines are recommended. A voice mail box system that would accommodate 150 users is estimated.

Both Centrex and PBX solutions should be analyzed. Both could provide similar services. PBX systems are provided by private vendors. System features can be simple or extensive. To connect off-premise extensions, if desired, lines would need to be obtained from the telephone company.

Typically, Centrex service is provided by the telephone company. Centrex service selling points would be: smaller capital investment, no on-site switch equipment, 24-hour security at the telephone central office, 24-hour maintenance by the phone company, and automatic upgrades. Providing Centrex service region-wide would require interconnections between NYNEX and Champlain telephone companies.

PBX service selling points are: smaller long-term investment (larger up-front capital cost, but lower ongoing cost; typically breaks even financially at 7 years or so). Control - no need to wait for service orders to be queued at the phone company.

Until desired features and location of terminations is known configuration can be but conceptual.

RCC estimates a PBX system (small electronic key system) for C^3 would cost $15,000 - $25,000 with an additional $28,000 - $35,000 for voice mail. These estimates do not include telephone company line charges.

RCC estimates Centrex costs to be ≈$25.00 per line, per month while voice mail would be ≈$10.00 per mailbox, per month.

B. Enhanced 911 Equipment and Costs

From discussion with officials of the Vermont Enhanced 911 Board, it is not clear if there will be a single state-wide Public Safety Answering Point (PSAP) or if there will be multiple PSAPs. Regardless, it appears that all 911 equipment will be provided, and costs will be paid by the State.

It is RCC's opinion that the regional communications center should be a primary PSAP and not have to receive calls from a statewide PSAP. As a primary PSAP, the regional center will have control on the handling of 911 calls, time will not be lost in transferring calls, and callers will not have to experience transfers during a crisis or

emergency situation.

The Chief of Police at UVM, while supporting the regional communications concept, does not believe that UVM would participate. In his opinion, public safety issues on the UVM campus are unique, and if outside resources are needed, they will call. RCC believes a strong argument can be made for making the UVM public safety communications center a primary PSAP which will take 911 calls from the on campus PBX and pay telephones. The State University of New York at Albany (SUNYA) and the New York State Office of General Services, both operators of large PBX systems, recently modified their telephone systems so that both users of plain old telephone service (POTS) lines and PBX lines would have access to 911. At SUNYA on campus PBX 911 calls are routed to campus security, while 911 calls from pay telephones are routed to the designated primary PSAP. At OGS both POTS and PBX systems route 911 calls to the Capitol Police PSAP. The PSAP is capable of using the data bases of both NYNEX and OGS to provide ANI and ALI.

RCC has estimated the number of calls for service which C^3 will have to handle in an average and peak hour.

RCC uses a formula[17] which estimates there will be 3.0 911 calls per day per 1,000 telephone access lines for a population base of over 150,000.

70,000 access lines ÷ 1,000 x 3-911 calls per day = 210 911 calls per day

Using a distribution of 40% of the calls during the 7 am to 3 pm shift, 40% during the 3 pm to 11 pm shift, and 20% during the 11 pm to 7 am shift, RCC estimates there would be, on average, 9 911 calls per hour. The busy-hour volume would be 21 calls per hour. Planners must remember that these are estimates only. During a severe storm or major, incident the call volume could exceed the busy-hour estimates many fold. Typically, busy-hour estimates[18] are 10% of a single-day total.

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[17] "Standard Guide for Planning and Developing 9-1-1 Enhanced Telephone Systems." American Society for Testing and Materials, Philadelphia, Pa., April 1992.

[18] Ibid.

C. Number and type of alarms to terminate at the site

There are estimated to be 776 hard-wired alarms circuits terminated in existing communication centers. RCC can not find any mandate that requires certain types of alarms, hospital, bank, or school, to be terminated directly in a central dispatch. Alarm circuits can be time-consuming. They require attention when maintenance is being performed, occasionally fault during electrical storms, and are accidently tripped by card holders. To keep needless tasks out of C^3, RCC recommends that no alarms, including elevator telephones, be directly terminated. Automatic alarms should be terminated in and screened by an alarm service company. Municipal alarms, such as those used in water and sewer operations, street fire call boxes, and court operations, could be monitored by C^3 for an additional fee.

D. Radio services, including remote repeater sites and trunked frequencies

The existing radio systems used by police, fire, and EMS could be terminated in C^3. It is RCC's opinion that such a radio configuration would not be productive. More channels would need to be monitored by dispatch staff, therefore increasing the number of staff but reducing their amount of productive time. RCC has observed that one dispatcher working several low-traffic volume channels provides a lower level of service in the view of field personnel. This occurs because the dispatcher can only work one unit on one channel at a time. If another unit calls on another channel, there will be a delay in response. Typically, when emergency service personnel call a dispatcher, they want an immediate reply.

Additionally, RCC suggests that all frequencies be licensed and equipment owned by the C^3 organization. This will keep all participants equal. If a participant were to hold the FCC licenses and decided to pull out of C^3, the remaining members would be critically restricted.

There are two options to consider in radio configuration:

1. Use existing frequency bands: UHF for police, Cochester fire, and VHF for remaining fire and EMS.

2. Install a 800 Mhz trunked radio system.

To provide regional coverage, 3 remote base station sites, along with remote receivers at critical locations, would be needed. RCC suggests consideration be given to locating the equipment at existing commercial or public communications sites such as a cellular telephone or special mobile radio (SMR) facility. If these sites already exist in the correct locations for optimum radio propagation, antenna variances would not be needed, and redundant power may exist.

UHF/VHF Concept - C^3 would support the following:

Police 1 UHF channel for primary dispatch.
1 UHF channel for dispatch (back up).
1 UHF channel for voice data only.
1 UHF channel for special operations.

These channels would be repeated and voted.

Police departments could, at their choosing and expense, keep their own radio system's unique purposes.

Fire 1 VHF channel for alert only.
1 VHF channel for fire control.
1 VHF channel for tactical operations.

These channels would be repeated and voted.

3 VHF channels for fire ground/simplex are recommended.
1 VHF simplex channel for joint fire/EMS operations.
1 UHF channel for alert and fire control.

EMS 1 VHF channel for alert only.
1 VHF channel for EMS control.
1 VHF channel for tactical operations.

These channels would be repeated and voted.

Maintain 2 existing HEAR channels.
1 VHF simplex channel for joint fire/EMS operations.

Radio system operational concept:

Police

All dispatches originating from C^3 would occur on one of two UHF channels. Depending on workload, number of units out and about, and other factors, a single or two dispatch channels would be open. The dispatch channel would be for the assignment of calls for service and coordination for calls for service for incidents that require multi-unit or agency response. Units requesting data, assuming MDT is not available, would make their request on the "data channel." For operational traffic, relay of information, or administrative traffic, units would move to the special operations channel. If departments desired to maintain their existing systems, units would advise dispatch they were going off channel; i.e. unavailable for an assignment. They would check in with C^3 when again available. If an officer at a local police station wanted to talk to a field unit, he or she would use his or her hand-held and request the dispatcher to allow him or her to talk with the desired unit on the special operations channel or move to the municipal channel.

Police units could still use State of Vermont law enforcement channels as they now do for interagency communications with units outside C^3's service area.

Fire and EMS

Fire and EMS would work similarly. All existing equipment would have an alert-only channel added. This would be a one-way alerting-only channel. No two-way traffic would be handled on this channel. In instances where more than one agency is dispatched or where fire and EMS are both needed, the dispatch would occur parallel on both the fire and EMS alert channels. This would allow for rapid alerting, and members would know that other agencies are also responding.

Two-way communications would occur on the respective fire control and EMS control channels. A common multi-agency channel would be available for fire and EMS units to coordinate activities in instances such as mass-casualty incidents (MCI) or wide-area incidents such as flooding, severe weather, or hazardous-material incidents.

The Colchester Fire departments use UHF channels. Some accommodation for

these departments would need to be made by temporary or permanent patches.

RCC has conducted a propagation coverage for UHF and VHF High Band use. Propagation used known, existing sites and is for conceptual purposes only. However, it can be seen that, with a few exceptions, good UHF portable and good VHF High Band pager coverage can be achieved if remote base stations are properly located. (See Appendix VII)

Regional public safety planners need to remember that the FCC is in the process of "refarming" the existing VHF high band and UHF frequencies. (See Appendix V.) The end result, when it does occur, will be that all existing equipment will be obsolete; however, that may not occur for many years, perhaps two decades or more. At that time, UHF trunking may be an option.

800 Mhz Concept

The operational concepts that were discussed previously still apply with some exceptions.

Three sites would be needed for adequate coverage, alerting would still occur on existing or new, non 800 Mhz frequencies, and ALL public safety radios that would be used in C^3 would need to be replaced. Agencies that did not participate in C^3 would not be able to communicate. However, agencies which shared in the 800 Mhz trunked service would have a highly redundant, efficient, and reliable radio system. (See appendix II for 800 Mhz trunked radio features.) A trunked radio system, if properly designed, could provide radio communications for all government services in the region, including public safety, transportation, DPW, highway departments, local government operations (such as code enforcement, animal control, parks and recreation, probation, court security and administration, public health, social services, and housing), and any other governmental function that uses, or could benefit from, the use of radio.

Another consideration which should be further studied would be the joint purchasing of mobile and portable radios, pagers, and supplies such as microphones, batteries, and equipment maintenance. RCC estimates there are 300 police, fire, and

EMS radios and pagers.

Additionally, the option of leasing equipment, as opposed to ownership, should be investigated. Government leases are commonly regulated by state statute. Some states do not allow lease-purchases, only a true lease, while other states do allow lease-purchases. A lease should include maintenance on all leased equipment and the ability to add or delete equipment within prescribed limits. Lease periods for up to five years are common. One of the advantages of a lease is the regularity and predictability of monthly payments. There may be no, or only a small, up-front fee. A lease also makes the governmental unit take a look at the condition and usefulness of the equipment prior to the end of the lease.

Radio Frequency Availability

RCC has conducted a preliminary search of available 800 Mhz frequencies and finds that there are no VHF highband frequencies available, five UHF frequencies, and five 800 Mhz channels. The actual availability of new frequencies would be driven by issues of coordination with Canada. Additionally, there may be out-of-service band frequencies available; however, the FCC has placed a moratorium on out-of-service licenses until further notice.

RCC recommends that the current radio bands, UHF for police, VHF High Band for Fire, and EMS, be continued. Additionally, RCC recommends that agencies pool existing frequencies for C^3 operations.

Migration

A reasonable approach would be to develop C^3 using the existing mobile and portable radio equipment. After conducting a trunked radio feasibility and cost-benefit study, consider that option.

E. Facsimile machines

Facsimile machines are a necessary part of commercial and government business. RCC does not see any special role for facsimile. There are systems which allow E911 address data to be sent via fax. Unless there is a pressing need, not observed at this time, CAD, MDT, and a good radio systems will supply the necessary information.

F. Computer Aid Dispatch (CAD)/Records Systems

C^3 System

A CAD system would be an integral part of C^3. The system would log calls for service, show units available, show proper multi-jurisdiction responses for large fires or responses to schools, hospitals, or MCIs. The CAD system would nearly eliminate card-file response procedures. The CAD, if connected to E-911, and/or other types of geo files could also give information on previous public safety activity at a specific address. This is beneficial to officer safety. For example, the police are called to a domestic dispute. Upon arrival, the police units are told by a subject that if they ever come back, they will be shot. Officers responding to that address 12 hours later should know what went on during the previous calls, CAD can provide this type of information.

CAD can also provide management reports for participating agencies. Information that could be provided includes:

- Number and type of call for service.
- Location.
- Units responding.
- Response times.
- Unit Status.
- Pre plan/mutual aid alerting.
- Alerts on wants and warrants.
- Geobase verification of address.
- Radio Log.
- Premise notification lists.

- Radio log searches.
- Hazardous materials information and location.

As calls for service for a particular department arrive, CAD systems will allow them to be processed based on their priority. Likewise, units available for a particular department, be it police, fire, or EMS, are quickly seen.

Estimated cost for a stand-alone CAD system varies as to features, number of terminals, size of data storage, and redundant systems. Estimated costs range from $225,000 to $500,000.

WAN System(Additional Feature)

If, for example, the Spillman CAD system were selected for use in C^3, the system could be configured to allow each department to see the status of their units and calls in queue on a station monitor. Additionally, each department could use the CAD, and its various features, from a single server. Features could include:

- NCIC and other database support.
- Wanted persons.
- E-Mail interface.
- Case management.
- Field interviews.
- Traffic information.
- Personnel management for participating departments.
- Inventory management.
- Premise information.
- General ledger.
- Civil process tracking and administration.
- Prosecution management.

Perhaps by using C^3 as the single point of contact, with individual departments being terminals of the primary server, the State DPS would negotiate a lower fee to

individual departments or negotiate a fee for C^3 which would be jointly shared. (See Letter from DPS relative to CAD - Appendix VI)

G. Mobile data terminals i) access to VDMV and VIBRS ii) Real time GIS

C^3 would have access to VLETS, NLETS, NCIC, III and other Vermont databases according to a letter received from Max Schlueter, Director, VCIC, NCIC Control Terminal Officer. "Under NCIC regulations, the Chitt Dispatch Center would need to have a Management Control Agreement with the Department of Public Safety (DPS) before access to the above mentioned services could be allowed. The Dispatch Center would then need to have User Agreements with all criminal justice agencies which were served."

As previously discussed, MDT can be a powerful public safety tool, particularly to police. It is RCC's experience that strict protocols and management safeguards need to be in place. Some MDT system managers and users have stated there needs to be a balance between quantity and quality.[19] MDT would allow officers in the field to directly access the above databases.

RCC believes the only cost-effective way for regional municipalities to enjoy the benefits of MDT is through a shared system. There is little reason for each community to secure an MDT frequency, develop its own transmitter sites, obtain a message switch which allows access to remote databases, manage the system, and obtain mobile equipment.

MDT systems are based on 9,600 - 19,200 baud rate. Effective through put is, at times, half of rate. NCIC 2000 proposes to send photographs in addition to text messages via MDT. Typical GIS files consist of hundreds of bits. The bit rate is a function of radio band width. Radio band width is limited Therefore, to receive a GIS map, it may take several minutes to receive a compressed file and then even more time to expand it. The application of GIS mapping data in the field needs to be determined closely and would not be recommended at this time. The most common GIS information originating from a MDT

[19] Layne and Rucker, p. 7.

is point coordinate data which is received from a Global Positioning System (GPS) receiver. The GPS coordinate data is transmitted periodically to an Automatic Vehicle Location (AVL) system. AVL systems, when working in conjunction with CAD, can provide instant information as to the location and availability of every car in the system.

Once MDT and CAD systems have been established, adding AVL requires adding GPS receivers to mobile equipment, and mapping and software enhancements to the CAD.

Mobile mapping systems supported by vehicle CD systems have been introduced. They allow maps and other GIS types of products to be used in the field. They are not "real time" systems.

As with any technical system, the cost of providing real time GIS and AVL needs to be evaluated with the productivity gains anticipated.

H. Back-up power systems

C^3 should have two levels of back-up power. Telephones, computers, consoles, specific lights, and other critical components must be connected to an uninterruptible power supply (UPS) system. A UPS has sensing circuits that can detect voltage changes and which will instantly disconnect certain equipment from the commercial power source and begin providing power. The switch to UPS power must be so fast and smooth that telephone calls in progress will not be affected or computer systems compromised.

The UPS is a temporary power source. A generator powered by an independent fuel source, bottled gas or diesel, is also required. The UPS provides power while the generator motor is starting and bringing the generator up to speed, which may take several seconds. All switching from commercial power mains to UPS to back-up generator must be automatic.

UPS and generator systems need to be tested, under load, frequently. Fuel sources must be monitored and the generator motor kept in good condition.

How large a UPS and how much fuel is needed at C^3? In a perfect world, the UPS would need to last only long enough to allow the generator to start and come on line.

However, generator motors occasionally do not start when needed. Therefore, RCC recommends a UPS of not less than 30 minutes endurance under full load; however, more would be better. The generator's independent fuel supply, in RCC's opinion, should provide full power to C^3 for a period of not less than five days.

Remote sites also need back up-power. Some remote equipment may require UPS while other equipment needs only a back-up generator.

In all cases, the power draw must be calculated before UPS and generators are specified.

Section III. 3 - Personnel

C^3 should be comprised of the following job categories:

Director

Technical Coordinator

Administrative Aid

Supervisors

Dispatchers

Job descriptions should be broad and encompassing. Hiring criteria should be based on factors such as:

- Demonstrated ability to deal with stress, such as working in retail, human services, or jobs with direct customer contact.
- Demonstrated ability to perform multiple tasks and to set priorities.
- Ability to hear and speak clearly.
- Willingness to work rotating shifts, week-ends, and holidays.

Having experience in public safety should not be the sole criteria for dispatcher selection.

The following workload analysis will assist planners in determining the number of staff necessary. Various deployment (shift) patterns are available. Three eight-hour shifts, staggered 12-hour shifts, or variations.

The following values have been assigned to certain tasks, but it must be

remembered that these are estimates only; actual times are factors of each call, staff training, the appropriate use of technology, and on-going workload.

A C^3 workload analysis is driven more by the number of times the telephone and radio must be answered, rather than number of incidents.

There will be 3 911 calls per day per 1,000 telephone access lines.

Busy hour is 10% of daily total.

There are estimated to be 70,000 telephone access lines.

It will take 60 seconds to answer and process each 911 call.

It will take 60 seconds to dispatch and process each 911 call.

There will be 3.5 seven-digit telephone calls for each police incident.

Calls for service are estimated to be 125,000.

One-third will result in a radio dispatch.

Police data checks is two times the rate of 911 calls.

Data request take 60 seconds.

Lengthy pre-arrival emergency medical dispatch is 2.5% of total EMS calls.

Pre arrival is estimated to be 10 minutes per call.

40% of calls arrive 7 am - 3 pm.

40% of calls arrive 3 pm - 11 pm.

20% of calls arrive 11 pm - 7 am.

I F :

70,000 lines ÷ 1,000 * 3 911 calls per day = 210 911 calls per day.

210 911 calls * 60 seconds for call taking = 12,600 seconds or 210 minutes per day.

210 911 calls * 60 seconds for dispatching = 12,600 seconds or 210 minutes per day.

3.5 * 125,000 calls for service * 60 seconds for call taking = 26,250,000 seconds or 437,500 minutes per year ≈ 1,200 minutes per day.

0.33 * 600 minutes per day = 198 minutes of dispatching

210 911 calls * 2 = 420 data request per day.

420 data request * 60 seconds = 25,200 seconds = 420 minutes.

210 - 911 calls * 10% * 2.5% = 0.525 calls for pre arrival.

0.525 calls for pre-arrival instruction * 10 minutes = 5.25 minutes

Calculations assume the length of a major incident (fire, MCI, hostage situation) will be balanced by more frequent but less time-consuming calls.

Estimated Daily Activity:

911 call taking	210 minutes
911 dispatching	210 minutes
Seven-digit call taking	1,200 minutes
Non-emergency dispatching	396 minutes
Data requests	420 minutes
Pre-arrival instruction	2 minutes
Total daily effort	2,438 minutes

Estimated Shift Activity:

7 am - 3 pm	975 minutes
3 pm - 11 pm	975 minutes
11 pm - 7 am	488 minutes

Estimated Hourly Activity:

7 am - 3 pm	121 minutes
3 pm - 11 pm	121 minutes
11 pm - 7 am	61 minutes

Estimated Shift Staffing:

7 am - 3 pm	3 dispatchers plus 1 supervisor
3 pm - 11 pm	3 dispatchers plus 1 supervisor
11 pm - 7 am	2 dispatchers plus 1 supervisor

Bases on the available data from the CCRPC Communications Survey and RCC's projections based on estimating methods. However, there will be variations in these projections.

Therefore, the dispatcher work force would be 13.4 FTE (14) plus 5.1 (5) FTE for supervisors.

Total dispatch and supervisory staff would be 18.5 FTE as compared to the 46.9 FTE currently in place or a reduction in staff of 60%.

The call-volume analysis suggests that a modified two-stage dispatch operation will be desirable. In a two-stage center, one group of dispatchers or one person is primarily dedicated to answering incoming telephone calls. 911 trunks receive first priority. Calls are most efficiently entered into a CAD system which directs calls to the appropriate dispatch console: police, fire, or EMS. C^3 will not be a large communications center. There should be time for fire/EMS, police/data dispatcher, and supervisor dispatchers to take telephone calls during periods of inactivity.

Dispatchers and supervisors should be trained and competent on all positions. A CAD system is almost a must with a two-stage dispatch operation. Additionally, the implementation of MDT could reduce the work force by one person per shift.

Dispatchers and supervisors must be initially trained on procedures, equipment operations, Emergency Medical Dispatch, and emergency operations. Courses such as APCO's 40-hour dispatcher training program and EMD program would be sound choices.

Dispatchers and supervisors must receive continuous training and periodically demonstrate competency.

The C^3 director would be responsible for operations and for fulfilling Board of Directors directives.

An administrative aid would support the director and staff in administrative/clerical tasks. The administrative aid should also be trained to take telephone calls.

Dispatchers would be trained in all operations, including telephone answering, pre-arrival instructions, dispatching, CAD operation, routine and emergency procedures, and implementing policy and procedures.

Supervisors or lead dispatchers would be working positions. They would assist the dispatch staff during busy hours, perform all dispatcher functions, and be responsible for the actions and activities of their shifts. Supervisors should also be given additional duties such as training coordinator, public education liaison, and other administrative tasks.

RCC recommends rotating shifts so that all staff become familiar with regional activities throughout the day.

The dispatch center staff should be lean. If outside services for training, MIS management, or special operations is needed, these services should be contracted.

Compensation

The work required of staff in C^3 will be different than what is currently being performed. RCC has reviewed salary data for the CCRPC survey and combined that with compensation data from similar C^3 operations.

Position	Salary	Fringe Benefit @ 33% of Salary	TOTAL
Director	$46,500	$13,950	$61,845
Administrative Assistant	$32,000	$ 9,600	$42,560
Part-Time Information/Technology Coordinator	$15,000		$15,000
Dispatcher Entry	$19,472	$ 6,425	$25,897
Dispatcher - Mid Level	$21,023	$ 6,938	$27,961
Dispatcher - Senior	$23,125	$ 7,631	$30,756
Supervisor	$26,300	$ 8,679	$34,979

It appears that most of the dispatch staff will come from existing communications operations. Therefore, RCC estimates 5 at Dispatcher - Senior pay and 9 at Dispatcher - Mid Level pay.

Supervisors	5 * $34,979 =	$174,895
Dispatchers	9 * $30,756 =	$276,804
Dispatchers	5 * $27,961 =	$139,805
Total		$591,504

Administrative Staff	$119,405
Overtime	$ 45,000

TOTAL ESTIMATED PERSONNEL COST $755,909

Current personnel cost, excluding VSP, is $1,092,665.

Current personnel cost, including VSP, is $1,273,076.

Section III.4 - Site Selection

RCC inspected the following sites for possible consideration as a location for C^3:

- Fort Ethan Allen
- Water Tower Hill
- Area adjacent to Williston VSP Station
- Camp Johnson
- NYNEX Building - downtown Burlington
- IBM Building 803

RCC recommends consideration of the following items relative to locating a public safety communications facility.

1. Local zoning or planning laws are not restrictive in use; i.e., construction of towers, external lighting, generators, 24-hour operation.
2. Not within one mile of potential RF noise generators; i.e., electrical power stations, radio/TV broadcast facilities, certain types of manufacturing operations which may use RF energy.
3. In a light or non-residential area.
4. Not in a flood plane, fault zones, or area of unstable soils.
5. Soil should have good conductivity - able to install halo ground system.
6. Not located adjacent to down wind to the generally prevailing winds of hazardous materials facilities or high-use transportation corridors.
7. Not under an airport final approach to landing path.
8. Access to adequate water, sewer, and storm water drainage.
9. Access to natural gas service.
10. Access to telephone service provided by fiber optic, preferable to be located in an area that could be served by two central offices or by Synchronous Optical Network loop.
11. Building should be on a single floor (minimum of 4,500 SF), capable of modifications such as: computer floor, sound proofing, men's and women's locker rooms, kitchen/rest area, secure/fire proof tape storage, administrative offices, training/teaching areas, conference room, telephone room, radio room, computer room, cable paths, exterior security lights, controlled access, exterior-entry point CCTV, location for large external generator and fuel supply, and microwave/radio tower.
12. Access to diverse electrical feeds.
13. Building construction should be masonry, good natural light.
14. Secure parking for +/- 20 vehicles.
15. If not purchased, available for long-term lease, preferably already public owned.

None of the sites appear to have ready-for-occupancy facilities without extensive renovation or major construction.

General Comments:

Fort Ethan Allen

Old buildings, could be renovated, availability unknown, unknown sources of radio frequency interference (RFI), on site commercial broadcast station.

Water Tower Hill

Good site elevation, no public owned facilities.

Area adjacent to Williston VSP Station

Vacant land, may be tied to development approval, good access.

Camp Johnson

Vacant land, availability questionable.

NYNEX Building - downtown Burlington

Basement area unused, excellent location for telephone reliability, parking very limited, NYNEX typically does not allow outside towers or antennas, NYNEX may not want outside tenants in building.

IBM Building 803

Old farmhouse, elevation good, availability unknown, appears to need renovation - currently used for storage.

CCRPC has conducted a GIS analysis of sites using the design criteria given. The results of the analysis reveals there are other areas and sites to be evaluated. (See Appendix XI)

RCC would suggest further consideration of other sites. Operationally, RCC did not see any existing communications center which could be refurbished to adequately function as C^3.

A C^3 facility would need to meet ADA requirements.

Back-up site considerations

Is a back-up C^3 needed? Part of the answer is in how secure and redundant C^3 is designed and constructed. An analysis of likely failures of C^3 is needed. The following must be considered:

What man-made or environmental hazards exist?

Is the building fireproof?

Is it secure from sabotage or attack?

Are there diverse telephone feeds?

Is the radio system and microwave redundant?

Most regions with C^3 can not afford to have a duplicate back up facility. However, they do have an emergency action plan to deal with the loss of C^3.

Section III.5 - Funding

To determine the funding, a review of capital and operational costs is required.

Section III.5.1 - MODEL ONE

Capital Expenses - Summarized

	Quantity	Price per unit	
Facility	4,500 SF	$100.00	$450,000.00
Communication Consoles	6	$83,000.00	$498,000.00
Office Furniture		$15,000.00	$ 15,000.00
PC's and printers		$10,000.00	$ 10,000.00
Logging recorder - 32 channels each	2	$35,000.00	$ 70,000.00
UHF/VHF/Microwave-associated equipment		$1,982,400.00	$1,982,400.00

Modify existing mobile/portables/pagers			
	400	$50.00	$ 20,000.00
Voice Mail Box System	1	$32,000.00	$ 32,000.00
Telephone System	1	$25,000.00	$ 25,000.00
MDT System		$721,850.00	$721,850.00
CAD System	1	$300,000.00	$300,000.00
Generator at C^3	1	$35,000.00	$35,000.00
UPS	1	$25,000.00	$25,000.00
Engineering/Consulting		$80,000.00	$80,000.00
Contingency @ 15%			$639,638.00
TOTAL			$4,903,888.00

Yearly operational costs, after warranty periods have expired, are estimated as follows:

Radio System including Microwave	$99,000
Console Equipment	$19,500
Logging Recorders	$ 3,500
MTD	$36,092
CAD	$30,000
Legal	$10,000
Board Operations	$ 5,000
Engineering	$15,000
Payroll Service	$ 5,000
Utilities @ $2.50 per SF (4,500 SF)	$11,250
Telephone	$12,000
Voice Mail System	$ 1,250
Facility Maintenance	$10,000
Office Supplies	$ 5,000
Training	$15,000
Total	$277,592

Total Estimated Personnel	$755,909.00
Total Estimated Operations	$277,592.00
TOTAL ESTIMATED YEARLY BUDGET	$1,154,001.00
TOTAL CURRENT COST	$1,154,001.00
CAPITAL COST	$4,903,888.00

SECTION III.5.2 - MODEL TWO

In Model Two, the same operational capabilities are available; however, various economies have been achieved including:

Lease telephone and voice mail.

Use the State of Vermont Spillman CAD

Lease MDT service

Use existing radio tower sites that meet redundant and location criteria

Capital Expenses - Summarized

	Quantity	Price per unit	
Facility	4,500 SF	$100.00	$450,000.00
Communication Consoles	6	$83,000.00	$498,000.00
Office Furniture		$15,000.00	$15,000.00
PC's and printers		$10,000.00	$10,000.00
Logging recorder - 32 channels each	2	$35,000.00	$70,000.00
UHF/VHF base stations		$1,364,200.00	$1,364,200.00
Microwave		$660,000	$660,000
Modify existing mobile/portables/pagers	400	$50.00	$20,000.00
Generator at C^3	1	$35,000.00	$35,000.00
UPS	1	$25,000.00	$25,000.00

Engineering/Consulting	$80,000.00	$80,000.00
Contingency @ 15%		$375,060.00
TOTAL		$3,602,260

Yearly operational costs, after warranty periods have expired, are estimated as follows:

Radio System	$68,210
Microwave	$33,000
Console Equipment	$19,500
Logging Recorders	$ 3,500
Voice Mail Box System 150 @ $10 per box, per month	$18,000
Telephone System 10 lines @ (25 + usage) per mo.	$3,000.00
MDT System 64 units @ $200/unit/month	$153,600
CAD System	$??
Legal	$10,000
Board Operations	$ 5,000
Engineering	$15,000
Payroll Service	$ 5,000
Utilities @ $2.50 per SF (4,500 SF)	$11,250
Facility Maintenance	$10,000
Office Supplies	$ 5,000
Training	$15,000
Total	$375,060

Total Estimated Personnel	$755,909
Total Estimated Operations	$375,060
TOTAL	$1,128,614
Capital Budget Model Two	$3,602,260
Current Total	$1,154,001

SECTION III.5.3 - MODEL THREE

Summarized Capital Costs

	Quantity	Price per unit	
Facility	4,500 SF	$100.00	$450,000.00
Communication Consoles	6	$83,000.00	$498,000.00
Office Furniture		$15,000.00	$15,000.00
PC's and printers		$10,000.00	$10,000.00
Logging recorder - 32 channels each	2	$35,000.00	$70,000.00
UHF/VHF base stations		$1,364,200.00	$1,364,200.00
Modify existing mobile/portables/pagers	400	$50.00	$20,000.00
Generator at C^3	1	$35,000.00	$35,000.00
UPS	1	$25,000.00	$25,000.00
Engineering/Consulting		$80,000.00	$80,000.00
Contingency			$385,080.00
TOTAL			$2,952,280

Yearly operational costs, after warranty periods have expired, are estimated as follows:

Radio System	$68,210
Console Equipment	$19,500
Logging Recorders	$ 3,500
Voice Mail Box System 150 @ $10 per box, per month	$18,000
Telephone System 10 lines @ (25 + usage) per mo.	$3,000
Leased radio tie lines(39 @ $200/month)	$93,600
CAD System	$??
Tower Lease	$36,000
Legal	$10,000
Board Operations	$ 5,000
Engineering	$15,000

Payroll Service	$ 5,000
Utilities @ $2.50 per SF (4,500 SF)	$11,250
Facility Maintenance	$10,000
Office Supplies	$ 5,000
Training	$15,000
Total	$318,060

Total Estimated Personnel	$755,909.00
Total Estimated Operations	$318,060.00
TOTAL	$1,073,9769

RCC recommends model three. It provides a basis to begin quality service. It is a redundant and capable radio system. It achieves cost savings and will not burden local governments with high levels of long-term debt.

Funding mechanisms should reflect a two-stage approach. One stage would reflect the annual operating cost while the other retirement of long term obligations.

The basis which to assess member communities could be on the following:

Funding Models

1. Rate per capita.
2. Rate per assessed value.
3. Rate based on calls for service.
4. Outside Funding

One of the most controversial aspects of any quasi-governmental undertaking is determining the costs of the operation and who will share in that cost. Determining not only who will share in the cost of operation, but to what level each participant must contribute toward the cost.

In many instances, the determination of participant's contribution toward costs is governed by state law. Additionally, the ability of a group or organization such as the

Council of Governments (COG) to raise revenues through the creation of special tax levy districts is governed by state law. By example, in the State of Washington the County Commissioners can create a special emergency communications district for the purpose of raising tax revenue to offset the cost of providing emergency communications. The County Commissioners would sit as the "official" Board of Directors of the special tax district but would form other operational groups to oversee the day-to-day aspects of the system. The County Commissioner's role is to review the annual budget submission prior to adoption to officially sponsor votes on raising the levy to cover increased costs. This is similar to the method as is employed in weed control, irrigation and health districts.

In Vermont, while county does not exist, local governments could provide this frame work. While this method tends to provide a more stable flow of income, it can potentially be the most difficult to control and manage. There is always the potential for the County Commissioners to want to budget one way, while the management groups want to go in another direction. Also, with the current political climate there is concern as to whether or not another levy initiative would be passed by the voters.

Successful initiatives have incorporated local volunteer fire and EMS organizations "lobbying" their local constituents to support the referendum, as with a higher level of government support (local mayors, councils, commissioners, countywide elected officials). Clearly, the more successful initiatives had very strong grass roots support not only from larger population centers but also in the small townships, villages, hamlets and rural county areas.

Other methods of revenue generation which have been employed center around the participant's level of participation and the general population or assessed value of the area served. In this manner each potential member is assessed a fee based on the amount of activity. Sometimes a per capita cost is used to calculate contribution rates. The rationale is the larger the value of the property protected or the large the number of people within the district the more service the participant will require from the communications center.

RCC has seen some contribution rates based on a billing system. This allows for

participants to be billed for the exact number of times calls were dispatched. A cost per dispatch is calculated by calculating all appropriate costs such as personnel, operation expenses, administrative expenses and debt. Then dividing that cost against the total number of the dispatches expected to be made in a year. A cost per dispatch is arrived at and all participants are assessed the same amount per dispatch. RCC has seen these costs range from about $5.00 to $14.00 per dispatch. Participants are generally billed on a quarterly basis. This quarterly billing cycle will allow both system users and administrators to monitor costs and revenues.

In some cases, there is a reserve pool which would be used in the event of some unforeseen incident (flood, tornado, major fire, etc.) which created an unusual amount of calls in a year for a participant. This is similar to an insurance policy which would provide protection for all participants in the event a large incident(s) occurs and protects the participants from having to pay large unanticipated bill to the communications center.

The reserve pool is calculated in the administrative budget of the center and this reserve fund is just that, a reserve fund to be used only in the event of such incidents. The amount in the fund is not used for general system operations but is encumbered each year and rolled over. Typically, this amount is about 5% of the general operating budget. If after several years an incident has not occurred, this amount can be reduced as long as the administrators of the system are comfortable there is a sufficient amount in the reserve fund to cover unanticipated charges.

Some systems are funded through a mix of various methods of revenue generation. In some cases costs associated with the delivery of E 9-1-1 is covered by telephone access line surcharges or tax. In some cases, states will provide some funding based on a state imposed E 9-1-1 surcharge. This revenue can be either a one time grant of money to cover capital costs with potential subsequent grants in later years or on-going revenue would be funneled to an agency on a quarterly or annual basis.

Some of the formulas will call for participants to pay a base amount which is usually set based on either population or assessed value (usually charge based on a per $100,000 of assessed valuation) of the area serviced by the agency. In some cases,

there is a sliding scale of base payments which is dependent upon not only population served but also anticipated workload which will be created by the participant.

Usually the base payment reflects the amortizing of long term debt, a portion of personnel costs and other standard costs which have a somewhat steady level. The other charge paid by participants is then based on the number of calls which are handled during the year. The rationale is there is a cost in merely having available a center to take calls whether or not a participant received any calls for service.

This methodology reflects somewhat the same rationale many power utilities use for commercial users, it is called "demand" charges. Its premise is that at sometime a business used a certain amount of power therefore, we as a utility must be prepared to deliver that level of electrical supply at any time during the year. In order for the utility to maintain an infrastructure to deliver the load, customers were expected to contribute to simply have an infrastructure available to deliver it. Every year your demand costs are re-calculated based upon your greatest demand in the past 12 months.

Communication participants would receive an invoice in January for their base payment. When the agency received these base payments it would provide for a fund balance to commence operations and have some operating capital. Participants would be billed quarterly for the numbers of calls dispatched.

An example of a possible revenue generation formula:

Operating budget encompassing personnel, operational costs and long term debt:
$1,000,000
$1,000,000 - $500,000 (amount to be covered by a base assessment) = $500,000
$500,000 ÷ 66,000 population = $7.58 per capita (each participant pays accordingly)*
$500,000 (amortized on per call basis) ÷ 74,000 anticipated calls for service = $6.75 per call.

An agency serving 15,000 population, handling 2,500 calls per year would be charge approximately $113,700 + $16,875 = $130,575 per year for service.

An agency serving 1,500 population, handling 1,000 calls per year would be charges approximately $11,370 + $6,750 = $18,120 per year for service.

* Populations are usually separated, i.e. police, fire and EMS portion where districts are not the same.

The rate per capita assumes that population will be the primary variable in calls for service. While population is certainly a large factor other factors such as, commuting population, socio-economic make-up of the population, and transportation also will impact a communities calls for service.

In the Vision 2000 area, using a population of 133,000 the operational costs per capita is $8.07. While the long term capital costs, assuming a $3 million ten year BAN @ 6% would be $407,603 annually or $3.06 per capita. Thus the total would be $11.13 per capita

Federal grants have been used by the State of Vermont to develop the Spillman CAD system. According to DPS officials Chittenden County communities have been the beneficiaries of these grants. CCRPC staff could identify other local grant-in-aid sources. Other areas to investigate are: Federal Emergency Management Agency (FEMA) communication grants, Health Department Funding, and federal anti-crime programs.

SECTION III.6 - Analysis of Communications System Costs

The costs of operating a public safety communications system are similar to those of other governmental services. There are capital expenses for buildings and equipment which have an expected useful life of several years. Operational expenses include utilities, equipment maintenance, training, outside engineering and specialized services, and supplies. Personnel costs include those of administrators, staff, and benefits.

It is RCC's experience that the greatest productivity of investment is achieved

when the following elements are realized:

Capital Expense

Buildings are designed for use specific tasks with attention to work place ergonomics and environment.

Radio systems are engineered with a high degree of reliability and coverage is superior.

Equipment needs are determined to expedite the processing of tasks, and specifications for that equipment are developed, and competitively bid.

Purchase high quality products - particularly chairs. Chairs are a dispatcher's companion for an entire shift - they need to be comfortable.

Operational Expense

Use out sources for tasks such as payroll administration, equipment maintenance, custodial services, building maintenance, and professional services. Prepare specifications which will be re-bid periodically.

Place a high emphasis on training. Train staff on dispatcher and EMD skills, equipment operation, failure recovery, and other tasks. Train managers on appropriate management/administrative skills. Seek to develop a training relationship with a local college, training institute, or individual specializing in public safety communications training.

Personnel Expense

Personnel expenses will be the greatest cost in operating a consolidated system. Therefore, fundamentally, use the fewest number of people who will do the greatest number of *necessary* tasks. As discussed by Champey and Hammer[20] one of the greatest impacts on reducing costs is the reluctance of organizations to scrutinize their processes and to eliminate functions which do not contribute to the mission of the organization.

Therefore, to achieve productivity gains, staff must function efficiently. This can only be achieved by:

[20] Hammer, Michael and Champy, James, Reengineering the Corporation, New York, 1993.

- Using technology as appropriate
- Training and education
- Positive work place environment
- Positive management and leadership
- Identifying center functions and goals and sticking to them

Each task performed in a communications center takes time and, therefore, has a cost associated to it.[21] Simply put, reduce the number of tasks and you can reduce the cost of doing them. Get technology to help do the tasks and the cost will drop even more.

Personnel should be cross trained to perform all, or nearly all, functions within the communications center. Creating very specific classes of employees that can only perform specific or limited tasks leads to poor staff productivity.[22] Therefore, job titles and descriptions such as police dispatcher, fire dispatcher, and emergency call taker, must be avoided.

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[21] Tucker,R.S. August 30, 1990.

[22] Discussion: Murrary,Sharon. (Director Monroe County Emergency Communications Center) Rochester, NY. April 5, 1995.

APPENDIX I
DISPATCHER QUESTIONNAIRES AND COMMENTS

24 TOTAL SURVEYS RETURNED

Vision 2000 Communications Planning Group
Regional Emergency Communications Center Feasibility Study
Dispatcher Questionnaire

General Information—In an effort to obtain valuable information from system users, the Vision 2000 group developed this questionnaire to solicit information and suggestions from dispatchers currently providing emergency communication services within Chittenden County. Your answers will remain anonymous, unless you indicate otherwise. As soon as possible, please complete the form and return it to Herb Durfee at the Chittenden County Regional Planning Commission, PO Box 108, 66 Pearl St., Essex Junction, Vermont 05453 (facsimile: 802-879-3610). If you have questions please call Herb at 658-3004. Thank you for your participation!

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1. Please indicate the length of service you have with your current employer:

   [11]0-5 years [5]6-10 years [6]11-15 years [2]16 years or more

2. Please indicate your **total** dispatching experience: AVG 9 Years 4 Months

3. Are you satisfied with the career ladder available to you within your current work assignment?

   [ ]Yes [ ]No 9--Y 14--N 1-- NO RESPONSE

4. Are you satisfied with your current training opportunities?

   [ ]Yes [ ]No 6--Y 18-N 0--NO RESPONSE
   If, "No," please explain on the back of this sheet.
   SEE ATTACHED

5. Does your current salary and fringe benefit package fairly compensate you for your work?

   [ ]Yes [ ]No 14--Y 8--N 2-- NO RESPONSE
   If, "No," please explain on the back of this sheet.
   SEE ATTACHED

6. Assuming the salary and benefits meet your expectations would you anticipate moving to any proposed regional emergency communications center (i.e., one with regional dispatching)?

   [ ]Yes [ ]No

7. In order of impor
   being the mos

RANKING OVERALL BASED ON AVERAGE

[1]Sala
[4]T
[

QUESTION 4 DETAIL

RECORD_NO 1
TRAIN_IFNO Never enough # to allow for training dispatchers and liability issues prohibit opportunities even more!

RECORD_NO 2
TRAIN_IFNO There is not much training for us. If we get new equipment yes, other than that or a few communications classes. We don't deal with on road things so things at the desk don't change.

RECORD_NO 3
TRAIN_IFNO Could have more.

RECORD_NO 4
TRAIN_IFNO No training program in place.

RECORD_NO 5
TRAIN_IFNO

RECORD_NO 6
TRAIN_IFNO

RECORD_NO 7
TRAIN_IFNO There isn't much training for dispatchers offered in state. Our department is pretty good about sending us to things offered in state/locally.

RECORD_NO 8
TRAIN_IFNO As far as training in the area there is very little dispatch training available anywhere in the state. [Municipality] is very good about sending dispatchs to what is available, but there is very little in this area.

RECORD_NO 9
TRAIN_IFNO Training appears to be a very low priority with management.

RECORD_NO 10
TRAIN_IFNO In the department there is virtually no training available. This tends to create stagnant workers. Training gives people the impetus to change for the better.

RECORD_NO 11
TRAIN_IFNO

RECORD_NO 12
TRAIN_IFNO Training Availability: Due to the lack of financing, lack of budget funds, and shortage of manpower, we are not given the opportunity for hardly any training. Unless the school is local and not very expensive for the class or free

RECORD_NO 13
TRAIN_IFNO There have been no training opportunities offered in approximately 3 years.

ECORD_NO 14
RAIN_IFNO

ECORD_NO 15
RAIN_IFNO Frequent requests for training are denied for lack of funds that are not allocated for police dispatchers. Only for policemen.

ECORD_NO 16
RAIN_IFNO There has been little to no training made available to us, either for budget reasons, manpower or status. We are currently in with new system and/or moving locations.

ECORD_NO 17
RAIN_IFNO We very rarely get any training. Period! Just learn as we go!

ECORD_NO 18
RAIN_IFNO

ECORD_NO 19
RAIN_IFNO

ECORD_NO 20
RAIN_IFNO Not enough money in the budget for training.

ECORD_NO 21
RAIN_IFNO

ECORD_NO 22
RAIN_IFNO

RECORD_NO 23
TRAIN_IFNO There doesn't seem to be a lot of training out there for dispatchers.

RECORD_NO 24
TRAIN_IFNO There is not enough dispatch training offered in VT. If we do get an independent company in, they are not familiar with the way VT dispatchers work. We are not just call-takers or dispatchers--we do both, and do not have the luxuries of being able to deal with just one incident (major call) at a time.

We attended the NCIC training course a few years ago. We were supposed to be offered refresher courses every 6 months to a year. This has not happened to date.

When the state went to criminal v. civil suspensions our department did not make sure that we could attend the training. Most of us are self taught.

QUESTION 5 DETAIL

RECORD_NO 1
SALRY_IFNO

RECORD_NO 2
SALRY_IFNO

RECORD_NO 3
SALRY_IFNO

RECORD_NO 4
SALRY_IFNO Pay is low (compared to other towns) for part-time dispatchers.

RECORD_NO 5
SALRY_IFNO

RECORD_NO 6
SALRY_IFNO I receive $2.00/hour more at [another] PD for the same work.

RECORD_NO 7
SALRY_IFNO With the responsibilities that go with this job I feel it will be difficult to ever fairly compensate a dispatcher.

RECORD_NO 8
SALRY_IFNO

RECORD_NO 9
SALRY_IFNO I would like to see fewer years of service to meet full retirement eligibility. Dispatching can be as stressful as working in the field, i.e., officer, etc. Burn out can come as quickly for dispatchers as it does other law enforcement, fire and rescue personnel.

RECORD_NO 10
SALRY_IFNO

RECORD_NO 11
SALRY_IFNO

RECORD_NO 12
SALRY_IFNO

RECORD_NO 13
SALRY_IFNO The benefits are OK, but for the type of work and stress the salary is not compatible.

RECORD_NO 14
SALRY_IFNO

RECORD_NO 15
SALRY_IFNO

RECORD_NO 16
SALRY_IFNO

:ECORD_NO 17
:ALRY_IFNO

:ECORD_NO 18
:ALRY_IFNO

:ECORD_NO 19
:ALRY_IFNO

:ECORD_NO 20
:ALRY_IFNO Other departments are making more money and have better benefits.

:ECORD_NO 21
:ALRY_IFNO

:ECORD_NO 22
:ALRY_IFNO

:ECORD_NO 23
:ALRY_IFNO

:ECORD_NO 24
:ALRY_IFNO I left the department in 90 because of husband's job transfer. In 1991, I moved back to the area and was rehired by [municipality] due to association contract. I had to start at level 0 with no credit for experience. Besides dispatching, I am responsible for training new hires and completing a lot of the court paperwork and other misc. duties. I am still making less money than the woman I trained prior to leaving in 1990.

Training officers receive a $500 check once a year, regardless of the amount of people trained. (Not enough for the amount of work that is involved.)

QUESTION 8

RECORD_NO 1
CAD NAME Spillman--State System
EXCELLENT 0
GOOD 1
FAIR 0
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

RECORD_NO 2
CAD NAME Spillman with Wordperfect 5.0
EXCELLENT 1
GOOD 0
FAIR 0
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

RECORD_NO 3
CAD NAME Spillman.
EXCELLENT 0
GOOD 1
FAIR 0
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

RECORD_NO 4
CAD NAME DCS
EXCELLENT 0
GOOD 1
FAIR 0
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

RECORD_NO 5
CAD NAME Diversified Computer S.E.A.R.C.H.
EXCELLENT 0
GOOD 1
FAIR 0
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

RECORD_NO 6
CAD NAME Diversified Computer Search Program (AS-400).

EXCELLENT 0
GOOD 0
FAIR 0
NEEDS IMPV. 0
POOR 1
RPLC. IMM. 0

ECORD_NO 7
AD NAME S.E.A.R.C.H.
XCELLENT 0
OOD 0
AIR 0
EEDS IMPV. 1
OOR 0
PLC. IMM. 0

ECORD_NO 8
AD NAME
XCELLENT 0
OOD 1
'AIR 0
EEDS IMPV. 0
OOR 0
PLC. IMM. 0

ECORD_NO 9
AD NAME Police Information Management System.

EXCELLENT 0
GOOD 0
FAIR 0
NEEDS IMPV. 0
POOR 1
RPLC. IMM. 0

RECORD_NO 10
CAD NAME Police Inf. Management System.
EXCELLENT 0
GOOD 0
FAIR 0
NEEDS IMPV. 1
POOR 0
RPLC. IMM. 0

RECORD_NO 11
CAD NAME BPD
EXCELLENT 0
GOOD 0
FAIR 1
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

RECORD_NO 12
CAD NAME
EXCELLENT 0
GOOD 0
FAIR 0
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

RECORD_NO 13
CAD NAME
EXCELLENT 0
GOOD 0
FAIR 0
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

RECORD_NO 14
CAD NAME PIMS
EXCELLENT 0
GOOD 1
FAIR 0
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

RECORD_NO 15
CAD NAME
EXCELLENT 0
GOOD 0
FAIR 0
NEEDS IMPV. 1
[illegible] 0
RPLC. IMM. 0

RECORD_NO 16
CAD NAME BMSI Police Info. Management System.
EXCELLENT 0
GOOD 1
FAIR 0
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

RECORD_NO 17
CAD NAME VGA BIOS v1.05 (SWLS)
Oak Tech., Inc.
ROM BIOS (c) 1991
America Megatrends, Inc.
EXCELLENT 0
GOOD 0
FAIR 1
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

RECORD_NO 18
[illegible] NAME
[illegible]ELLENT 0
GOOD 0
FAIR 0
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

ECORD_NO 19
AD NAME Spillman
XCELLENT 0
OOD 1
AIR 0
EEDS IMPV. 0
OOR 0
PLC. IMM. 0

ECORD_NO 20
AD NAME
XCELLENT 0
OOD 0
AIR 0
EEDS IMPV. 0
OOR 0
PLC. IMM. 0

ECORD_NO 21
AD NAME
XCELLENT 0
OOD 1
AIR 0
EEDS IMPV. 0
OOR 0
PLC. IMM. 0

RECORD_NO 22
CAD NAME Computer Assisted Public Protection System on a AS/400.
EXCELLENT 0
GOOD 1
FAIR 0
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

RECORD_NO 23
CAD NAME Computer aided dispatch.
EXCELLENT 0
GOOD 1
FAIR 0
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

RECORD_NO 24
CAD NAME
EXCELLENT 0
GOOD 0
FAIR 0
NEEDS IMPV. 0
POOR 0
RPLC. IMM. 0

QUESTION 9 DETAIL

RECORD_NO 1
AWREOTHCAD No.

RECORD_NO 2
AWREOTHCAD No.

RECORD_NO 3
AWREOTHCAD

RECORD_NO 4
AWREOTHCAD

RECORD_NO 5
AWREOTHCAD State Spillman System.

RECORD_NO 6
AWREOTHCAD Spillman

RECORD_NO 7
AWREOTHCAD No

RECORD_NO 8
AWREOTHCAD

RECORD_NO 9
AWREOTHCAD Not familiar with but am aware of the CAD system.

RECORD_NO 10
AWREOTHCAD There are many available that should be looked at (with dispatchers helping with the evaluation).

RECORD_NO 11
AWREOTHCAD

RECORD_NO 12
AWREOTHCAD

RECORD_NO 13
AWREOTHCAD No

RECORD_NO 14
AWREOTHCAD No

RECORD_NO 15
AWREOTHCAD

RECORD_NO 16
AWREOTHCAD

RECORD_NO 17
AWREOTHCAD No

RECORD_NO 18
AWREOTHCAD No

RECORD_NO 19
AWREOTHCAD

RECORD_NO 20
AWREOTHCAD

RECORD_NO 21
AWREOTHCAD

RECORD_NO 22
AWREOTHCAD

RECORD_NO 23
AWREOTHCAD

RECORD_NO 24
AWREOTHCAD

QUESTION 10 DETAIL

RECORD_NO 1
OTHERCOMME

RECORD_NO 2
OTHERCOMME

RECORD_NO 3
OTHERCOMME

RECORD_NO 4
OTHERCOMME Answers based on my perspective as a part-time employee. Many would be different if this was my primary source of income!

RECORD_NO 5
OTHERCOMME

RECORD_NO 6
OTHERCOMME

RECORD_NO 7
OTHERCOMME

RECORD_NO 8
OTHERCOMME I have a couple of comments about this project. This project will effect a great many people, most of which don't have the foggiest idea of what is going on and how it will effect us. Some of the chiefs in the county, mine included, have not taken the time to sit down and explain to the dispatchers what the goal is of this project, what kind of ramifications it will have and what we should expect from it.

This project will not work well without the cooperation of the dispatch staff throughout the county. I think the dispatchers feel alienated and left out of the process up to this point and even now we are not being given a chance for much input. This Vision 2000 committee, as far as I can tell, does not include any member of the dispatch community, other than chiefs and supervisors. If the lives and working situations are going to be disrupted for a fairly substantial amount of people they should have been included in this process from the beginning.

Also, it will change the way dispatching is handled. All of the dispatchers in this area are very familiar with their communities and know the people and businesses located there. I feel that each community is going to lose in this process. WE may end up with up to date equipment and more people working, but the people we service are going to lose the more personal approach they receive when calling their local police department. Bigger is not necessarily better and I this this holds true with this entire project.

RECORD_NO 9
OTHERCOMME

RECORD_NO 10
OTHERCOMME

RECORD_NO 11
OTHERCOMME

RECORD_NO 12
OTHERCOMME

RECORD_NO 13
OTHERCOMME

RECORD_NO 14
OTHERCOMME

RECORD_NO 15
OTHERCOMME

RECORD_NO 16
OTHERCOMME My number one concern is my job, salary, and benefits. As far as a regional dispatch center goes, I believe it is a step backward. Each individual city has established their own unit specialized for their area. Services are quick, the dispatchers can be more personable and usually know exactly where the caller is calling from with little description. The public also is more comfortable knowing their dispatcher, or location where there call goes, is right in their city. I live in a town covered by the State Police. I have no idea where my 911 call goes and the dispatcher had absolutely no clue as to where I was calling from. This occurred on two occasions, one for a heart attack and one for a car fire.

The department I work for would improve greatly with a different phone system and Enhanced 911 (as well as completely new radio equipment). I enjoy the teamwork with the officers and being able to assist them, as well as the individual and specialized services we provide to our community.

I have visited dispatch centers in Arizona which are so technically advanced it makes you speechless. They are individualized and specialized. Their emphasis is placed on their operation and equipment. The larger cities go so far as to break dow their city into districts, each having its own smaller unit, and other cities have their own departments.

Dispatchers have very important jobs that go hand in hand with police officers. From what I hear, the regional center sounds like a call taking warehouse. That's not what I would want as a resident nor as a policeman or firefighter on the other end of the radio. Unfortunately, people who are doing the jobs directly effected have no influence on what will take place, this is all a political money issue.

RECORD_NO 17
ERCOMME

RECORD_NO 18
OTHERCOMME

RECORD_NO 19
OTHERCOMME

RECORD_NO 20
OTHERCOMME

RECORD_NO 21
OTHERCOMME

RECORD_NO 22
OTHERCOMME

RECORD_NO 23
OTHERCOMME

RECORD_NO 24
OTHERCOMME No comments at this time. I have your number if any come up. Thank you for your time.

APPENDIX II
OVERVIEW OF 800 MHZ TRUNKED RADIO SYSTEMS

TRUNKED RADIO TECHNOLOGY

An Overview

The release of the 800 mhz spectrum was intended to be used in technology base systems that contribute to spectrum conservation. Trunked radio systems fit this philosophy and Federal Communications Commission mandates trunking, should a licensee apply for five or more 800 mhz frequencies.

Trunked radio uses multiple transmitters controlled by a microprocessor. The technology makes efficient use of frequencies by establishing multiple radio channels that allow simultaneous mobile and portable communications. In a conventional system, each subgroup of users is assigned a particular channel. If a user's channel is already in use, that user must wait until it becomes clear before gaining access for communications, though other channels in the system, dedicated to other subgroups, may be clear.

Trunked radio systems use multiple 800 Mhz channels (up to 20) in a shared pool arrangement. In a trunked system, if any of the channels are clear, it is assigned to the next user requesting a channel. For an example, each trunked mobile radio unit has a digitally addressed unique ID that radio unit can talk with. When a user depresses the push-to-talk switch the trunked computer identifies who is calling and to whom the call is intended. It then assigns a channel, and communications are carried on that channel.

The second level is called the fleet and the third level is called a subfleet. For example, a fleet could be DPW and the sub-fleet with DPW could be the water department. Each fleet may have several subfleets. From an operational or user perspective, the subfleets are synonymous with channels in a conventional system. Each unit is assigned a unique ID code, thus allowing the system to recognize and manage frequency assignments. Frequency assignments are transparent to the user; all users in the same subfleet will be assigned the same frequency during a transmission made by any unit in their subfleet.

When communications are ended, the channel is returned to the pool for another assignment. No channel is dedicated for use to any specific department. Also, radio users can be prioritized so that if all channels are busy, the less critical user is dropped off the channel to accommodate a higher priority unit. This is an important feature for public safety communications.

The application of the trunked system concept to land mobile radio optimize the use of few radio channels. This allow many more users to enjoy the same grade of service than a smaller group could obtain with the same number of channels assigned in a conventional, dedicated manner.

Access to the trunked system is further enhanced by providing an automatic queuing and call back feature. Because trunking technology makes efficient use of frequencies, channel traffic is uniformly distributed among multiple repeater stations. Should all voice channels be busy, the system places the call in queue and immediately assigns a channel when it becomes available.

To add new departments or users to the radio system only requires a simple software change, and no frequencies or additional repeater stations are required. This is done by programming a common ID to a particular talk group so the computer know, which units general talk with each other.

The shared pool arrangement significantly increases system throughput. For an example, assume a single frequency repeater station system that is loaded 50%, which means that any other mobile unit is the system is going to be blocked from the system 50% of the time. In a trunked system, if each channel is 50% loaded, then blocking is significantly reduced to 12% in a 5 channel system and less than 1% in a 20 channel system.

In order for a trunked system to be capable of fulfilling the communications requirement of departmental and emergency response groups, it must meet certain functional requirements and incorporate many desirable features. In 1978 APCO (Associated Public-Safety Communications Officers International) began to develop standards for trunked radio systems planned for public safety (Project 16). These specifications characterizes the required and desirable features necessary in a public safety radio trunked system. The following summarizes some of these features:

- Simple to operate Interference free channels
- Efficient system design, no channel blockage
- Common radio backbone and capacity to support multiple departments.
- Dynamic regrouping of units.
- Central network control and system redundancy.
- Emergency access, multiple priority levels for system access.
- Telephone interconnect.

TRUNKED SYSTEM FEATURES

The trunked radio system employs digital addressing techniques and either centralized or distributed, intelligent switching units. This control intelligence identifies unused channels upon requests for service from the users. A signalling system directs all the units in that talk-group to switch to the selected channels.

Because each unit's address includes both group and discrete elements, groups of units can be switched to the selected channel if desired. By assigning different talk-group (subfleet) addresses to different functions within a department, separate user talk-groups can maintain the required level of communication privacy.

This addressing technique greatly enhances system flexibility. The number of individual, functional assignments can be determined by the number of addresses uses, rather than by the number of frequencies assigned to the system.

One type of system uses a single trunked channel dedicated for signalling function.

It is called a control channel. This method is used by Ericsson and Motorola. Therefore, for a five channel trunked system, only four of the channels are available for voice communications.

Further, a five channel trunked system can support a maximum of four simultaneous conversations, one in each available voice channel.

The operation of a trunked system is controlled by the system controller. The protocols of this switch may be altered to fit differing operational needs. Talk-group addresses that normally operate independently of each other can be combined for emergency actions. Message priorities can be automatically assigned (or reassigned) to specific talk-groups. Features such as automatic status reporting and mobile digital access can be included at the choice of the procuring department.

Trunking provides users with the opportunity to divide their personnel or radio users into groups. Grouping is commonly threefold; a hierarchy on the system, fleet or subfleet levels.

FEDERAL COMMUNICATIONS COMMISSION

The Federal Communications Commission (FCC) is the regulatory agency that is empowered to grant licenses and allocate regions of the radio spectrum for specific purposes. In metropolitan areas VHF low, high, and UHF channels have all been allocated. In most metropolitan area 800 Mhz channels have also been used up. In an effort to create more channels with in the limits of the RF spectrum the FCC has proposed to change the technical operating standards under which transmitters and receivers operate. The proposed changes will affect the VHF high and UHF bands only. The 800 Mhz bands which are typically using more efficient management tools, such as trunking, are not affected.

APPENDIX III
EXISTING PERSONNEL SPREADSHEET

Chittenden County Consolidation Feasibility Study													
Existing Operations													
	Burlington	*Cochester*	*Essex*	*Milton*	*Shelburne*	*S.Burlngtn*	*VSP*	*Williston*	*Winooski*	*St. Mikes*	*UVM*	*Total*	*Total less VSP*
Personnel													
Postions Covered	2.3	1	1	0.6	1	1	1	0.3	1	1	1	56	55
Full Time Staff	10	3	3	2	4	3	6	1	4	0	0	36	30
Part Time Staff	0	8	7	4	5		3	1	3			31	28
Operations Costs													
Staff Salary + Benefits	$432,788.00	$138,407.00	$89,154.00	$49,982.00	$125,735.00	$107,559.00	$180,411.00	$23,400.00	$125,640.00			$1,273,076.00	$1,092,665.00
Utilites	$18,816.00	$230.00	$1,390.00									$20,436.00	$20,436.00
Radio Maintenance	$10,000.00	$2,250.00	$5,000.00		$10,000.00	$11,000.00		$1,450.00	$1,200.00			$40,900.00	$40,900.00
Total Ops Costs	$461,604.00	$140,887.00	$95,544.00	$49,982.00	$135,735.00	$118,559.00	$180,411.00	$24,850.00	$126,840.00	$0.00	$0.00	$1,334,412.00	$1,154,001.00
Capital Costs													
Capital - Police (consoles)	$24,000.00	$26,000.00	$32,000.00	$1,500.00	$2,000.00	$100,000.00			$16,000.00			$201,500.00	$201,500.00
Capital - Fire		$2,000.00	$1,500.00									$3,500.00	$3,500.00
Capital - EMS		$1,200.00	$1,500.00									$2,700.00	$2,700.00
Other - fire		$7,000.00	$7,000.00									$14,000.00	$14,000.00
Other- EMS													
Total Capital Cost	$24,000.00	$36,200.00	$42,000.00	$1,500.00	$2,000.00	$100,000.00	$0.00	$0.00	$16,000.00	$0.00	$0.00	$221,700.00	$221,700.00
Operations													
Alarm Circuits	150	100	150	0	176	140	900	0	60			1,676	776
B911	Yes		Yes		Yes								
No. of 7 Digit Lines	11	2	6	3	9	4		2	4	1	1	43	43
Total Calls for Service	45,000	10,000	20,000	4,800	9,000	17,000	16,645	4,500	10,000			136,945	120,300
Police Radio Units(Patrol & Inv)	21	13	11	2	19	8	8	3	6			91	83
Fire Radio Units	9	15							9		4	37	37
EMS Radio Units	0	3		1	3					1	2	10	10
Ave. Cost per Call (ops cost/calls	$10.26	$14.09	$4.78	$10.41	$15.08	$6.97	$10.84	$5.52	$12.68			$10.07	$9.97
Prepared: June 15, 1995													
Notes:													
	Blank Indicates data missing or not available.												
	UVM answers for Richmond Fire and Resue.												
	St. Mikes Switch Board Answers emergency phone.												
	UVM uses Volunteer call takers.												
	Call for service obtained from CCRPC survey forms.												
	Cost estimates do not include supervision, overhead, administration.												
	Burlington has 150 street alarm boxes.												

APPENDIX IV
CURRENT CONFIGURATION MATRIX

Milton	Shelburne	South Burlington	Vermont SP	Williston	Winooski
Part Time	Full	Full	Full	Part Time	Full
Milton Police ilton Fire (Red Phone) n Rescue (Red Phone) Dpw	Shelburne Police Hinesburg Police Shelburne Fire Hinesburg Fire Charlotte Fire Ferrisburg Fire Shelburne Resuce Charlotte Rescue Vergennes Rescue Town Sewer Town Water Town Highway	So. Burlington Police So. Burlington Fire TOT EMS calls to UVM DPW School Buses	VSP Hinesburg Police (Shelburne) Richmond Police Milton Police Part Time Jerricho Fire# Undershill Fire# Fire & Wildlife Motor Vechicle State's Attorney Liquor Control # Proposed	Williston PD	Winooski Police Winooski Fire TOT EMS calls to St. Michaels
NA	Vergennes - NA Charolette - 74 Hinesburg - 98 Shelburne - 180	384			185
Milton - 519	Charlotte - 186 Iroquois - 136 St. Miles - 134 Shelburne - 346 Ferrisburg - NA	FD Assist - 697			
8,404	Shelburne 5,871 Ferrisburg 2,317 Hinesburg 3,780 Charlotte 3,239 Vergennes 2,578 Total - 17,785	12,809		4,887	6,649

ington Fire - Red Phone

NG - Airport CFR - Mutual Aid

Heavy Rescue

Chittenden Co. 131,761 - 1990
Est. 150,759 - 2000
Est. 168,995 - 2010

APPENDIX V
FCC RE-FARMING PLAN (TENTATIVE)

The FCC has proposed sweeping technical changes that will affect these bands. While the Final Report and Order (FRO) has not been published it appears the following elements, or some form close to this, will be included. Additionally, an industry group has offered an alternative proposal that would have a shorter time frame.

After 2 Years from FRO

New equipment must be 12.5 KhZ compatible (Existing is 25 Khz)

Dual Mode 12.5/25 Khz is acceptable

New systems have to be 12.5 Khz for primary status

After 12 Years from FRO

Urban systems must be 12.5 Khz

After 16 Years from FRO

New equipment must be 6.25 Khz

Dual mode 12.5/6.25 Khz is acceptable

New systems have to be 6.25 Khz for primary status

After 26 Years from FRO

All system have to be 6.25 Khz

Other major issues not clarified that will impact systems:

1) Antenna height limitations
2) Transmitter effective radiating power (ERP) limitations

It is not prudent to attempt to second guess the FCC. However, given the problems with co-channel interference and the demand for additional channels it is reasonable the Commission will enact some technical modifications to existing spectrum management.

APPENDIX VI
VERMONT DEPARTMENT OF PUBLIC SAFETY CAD
ACCESS TO DATA COMMENTS

RAM Communications Consultants, Inc.

Clifton Park, New York 12065
(518) 383-7880
(518) 383 - 1280 FAX

June 19, 1995

To: Phil Colby - Special Projects Coordinator

From : Lee Palmer

Re: Spillman CAD - Chittenden Co. Regional Communications Project

Phil - Thanks for the information on the Spillman CAD services offered by the DPS.

We are putting together a preliminary budget for the Vision 2000 committee. One numbers we need is the estimated monthly fee and start up costs for the proposed regional center to be part of the DSP CAD system.

We are only in the feasibility phase so a range would be acceptable.

I should be in the office this afternoon and all day tomorrow.

Thank You

COMMISSIONER
(802) 244-8718

DIRECTOR OF STATE POLICE
(802) 244-7345

LEGAL COUNSEL
(802) 244-6941

TELEFAX NO.
(802) 244-1106

ADMINISTRATIVE SERVICES
(802) 244-8763

EMERGENCY MANAGEMENT
(802) 244-8721

INTERNAL AFFAIRS
(802) 244-6941

STATE OF VERMONT
DEPARTMENT OF PUBLIC SAFETY
103 SOUTH MAIN STREET
WATERBURY, VERMONT 05671-2101

June 12, 1995

Mr. Lee Palmer
RAM Communications

VIA: FAX

Lee,

Accompanying this is a list of the modules and services provided for and to the participants in the Vermont Incident-Based Reporting System (VIBRS). Not listed is the fleet maintenance module from Spillman. That is on the system, but was purchased by the Vermont State Police and they are the only users. As I noted during our phone conversation, I don't know if that module supports "agency partitioning" like the CAD and RMS applications from Spillman.

A grant award to Vermont was supposed to have been announced today that will, we believe, allow us to add the Burlington, South Burlington and Essex police departments to the VIBRS network before the end of the year. (The announcement of the grant is being made by the U.S. Attorney General and had to be postponed due to higher priorities on her schedule.) The total dollars involved we estimate will be in the $150,000 to $170,000 range to provide equipment to those three departments and install the network connections. We expect to be using frame relay service from NYNEX to link the remote sites to the central servers in Waterbury.

I believe that much of the dispatch equipment that would be purchased with federal grant money this year for the three departments in Chittenden County could be fairly easily re-deployed to a regional dispatch center. Workstations and other peripherals used by officers and support personnel in the individual police departments would, for the most part, stay in place but would be connected to the regional center as needed.

I expect you'll have more questions, so please call me. I can, for example, crystal ball some operating expenses for you.

Sincerely,

Philip Colby
Special Projects Coordinator
Criminal Justice Services Division

VIBRS PARTICIPATION INCLUDES.....

1. The "HUB": Shared Names, Vehicles, Property Tables
2. Computer–Aided Dispatch (w/Geo–based Capabilities when statewide addressing in place)
3. Records Management (Incident/Investigation Reports, etc.)
4. Traffic Records (MV Accident & Citation Database)
5. NIBRS Repository
6. e–Mail & Internet Service
7. Future merged VLETS service (now estimated for June–July '95)

From: mschluet@dps.state.vt.us (Max Schlueter)
Subject: Chitt Count Dispatch
Date: Mon, 22 May 1995 13:13:11 -0400 (EDT)
[illegible]ly-To: mschluet@dps.state.vt.us
plent@ram.net
Cc: tdavis@dps.state.vt.us (Tom Davis)

Mr. Lent

Tom Davis asked me to respond to your question regarding agreements which would have to be in place with a regional dispatch center in order to have access to VLETS, NLETS, NCIC, III, and other Vermont databases.

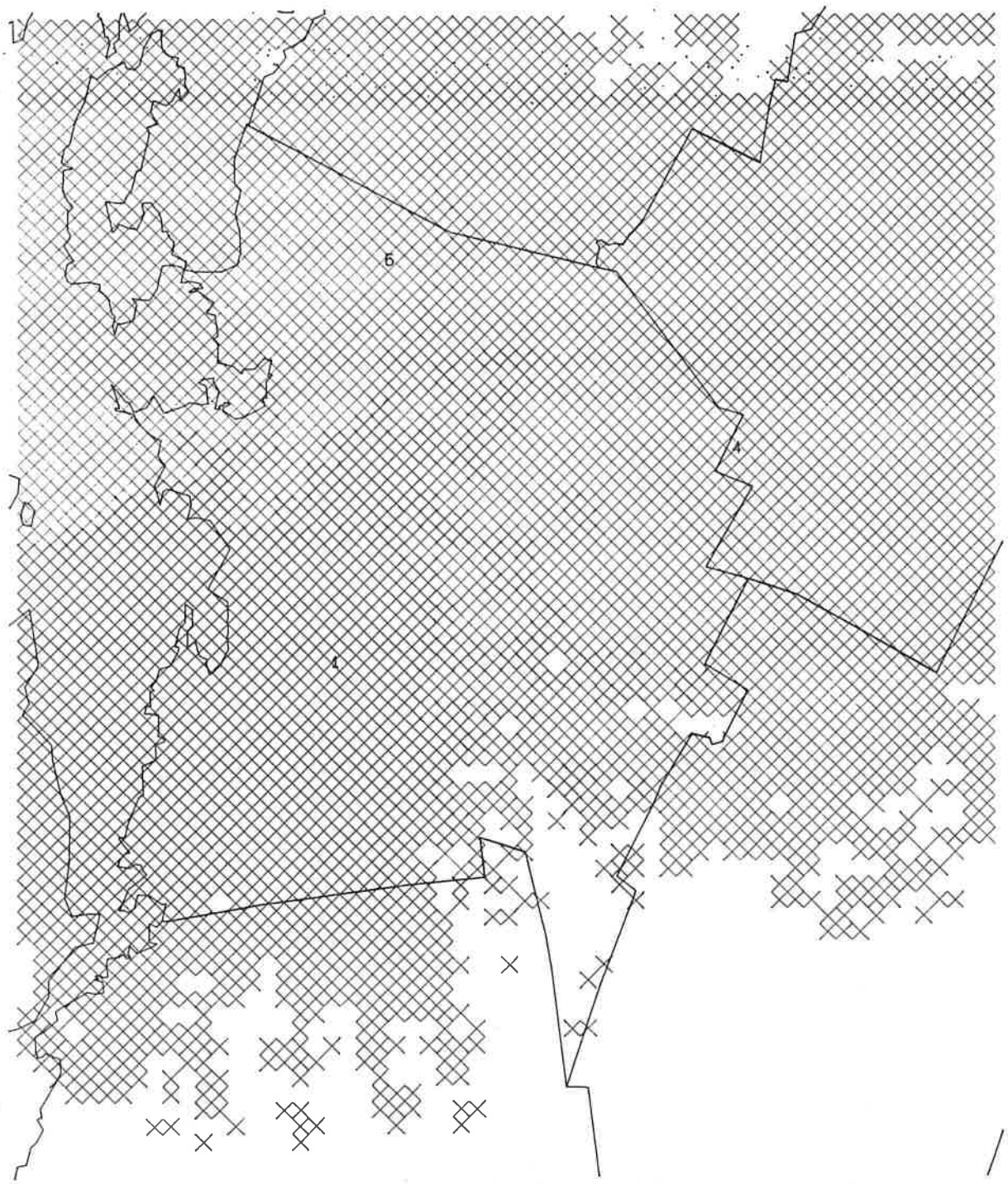
Under NCIC regulations the Chitt Dispatch Center would need to have a Management Control Agreement with the Department of Public Safety (DPS) before access to the above mentioned services could be allowed. The Dispatch Center would then need to have User Agreements with all criminal justice agencies which were served.

The Management Control Agreement would stipulate that DPS has the authority to set and enforce: 1) priorities; 2) standards for the selection, supervision and termination of personnel; and 3) policy governing the operation of computers, circuits and telecommunications terminals used to process, store, or transmit III record information and guarantees the priority service needed by the criminal justice community. Management Control Agreements also specify that the regional dispatch center will agree to security standards, auditing, and recordkeeping [illegible]cedures as specified by DPS.

Should you have any questions, please do not hesitate to call me.

Max Schlueter
Director, VCIC
NCIC Control Terminal Officer

APPENDIX VII
RCC PROPAGATION PROJECTIONS



Chittenden County UHF 95 % Mobile Radio Coverage

Location: ;
Engineer: Ivan Pagacik;
Date: Thu Jun 15 16:14:37 1995;

Scale: 1:400000;
Frequency: 450 MHz;
Number of sites: 3;

Type: Most Likely Server
Prepared for: ;
File: /sg1b/home/vega/pagacik/chit.hpgl;

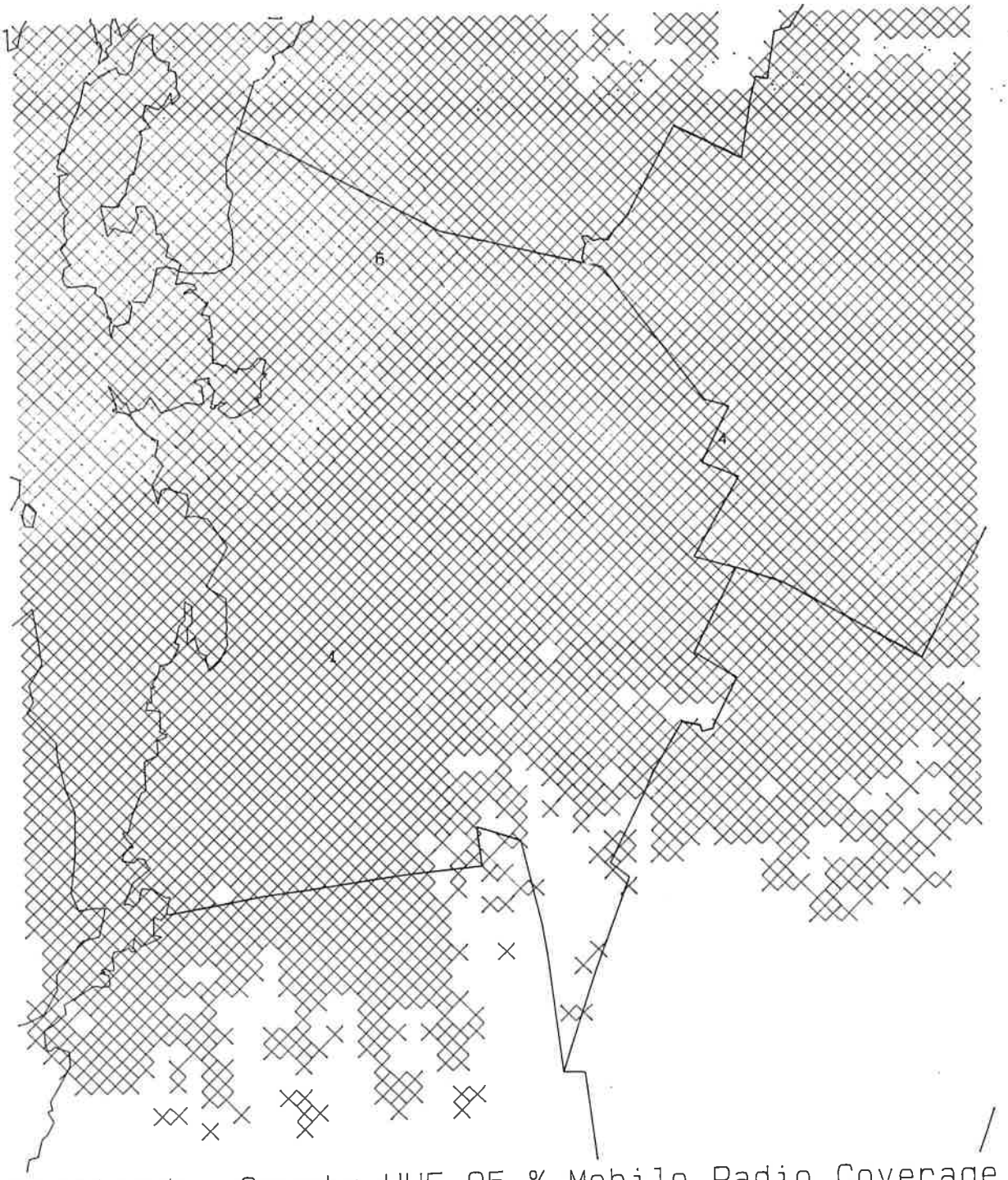
1; Brownell Mtn;
4; Mt. Mansfield;
6; Westford Reservoir;

SIGNAL STRENGTH RANGES: ;

> -115.0 dBm;

< -115.0 dBm;

RAM
10 NEW ENGLAND BUSINESS CENTER
ANDOVER, MA 01810 SUITE 102
COMMUNICATIONS CONSULTANTS, INC.



Chittenden County UHF 95 % Mobile Radio Coverage

Location: ;
Engineer: Ivan Pagacik;
Date: Thu Jun 15 16:14:37 1995;

Scale: 1:400000;
Frequency: 450 MHz;
Number of sites: 3;

Type: Most Likely Server
Prepared for: ;
File: /sg1b/home/vega/pagacik/chit.hpgl;

1; Brownell Mtn;
4; Mt. Mansfield;
6; Westford Reservoir;

SIGNAL STRENGTH RANGES: ;

> -115.0 dBm;

< -115.0 dBm;

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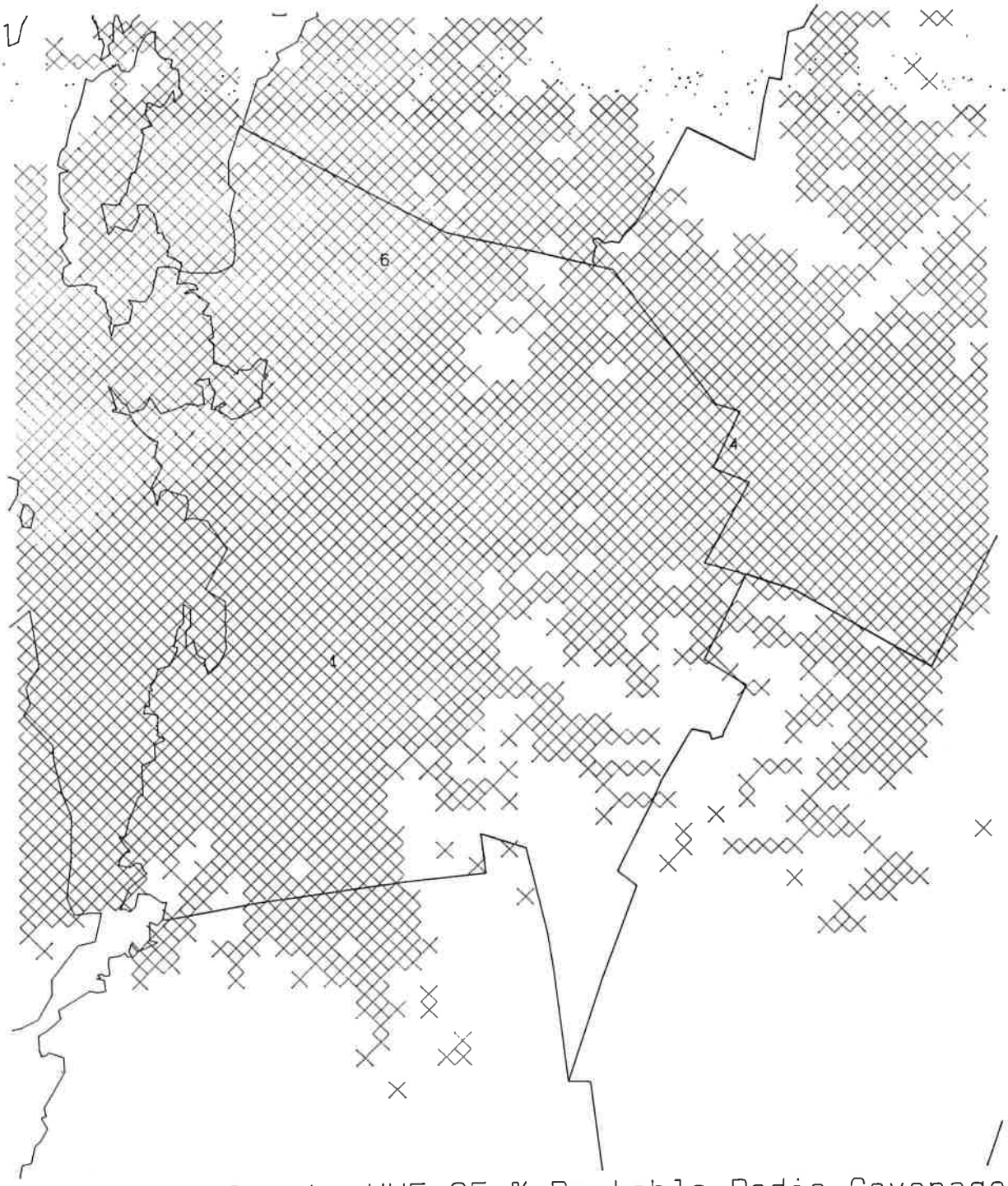
ANDOVER, MA 01810
COMMUNICATIONS CONSULTANTS, INC.



Chittenden County UHF 95 % Portable Radio Coverage

Location: ;
Engineer: Ivan Pagacik;
Date: Thu Jun 15 17:00:27 1995;

Scale: 1:400000: ,
Frequency: 450 MHz;
Number of sites: 3;

Type: Most Likely Server
Prepared for: ;
File: /sg1b/home/vega/pagacik/chit.hpgl;

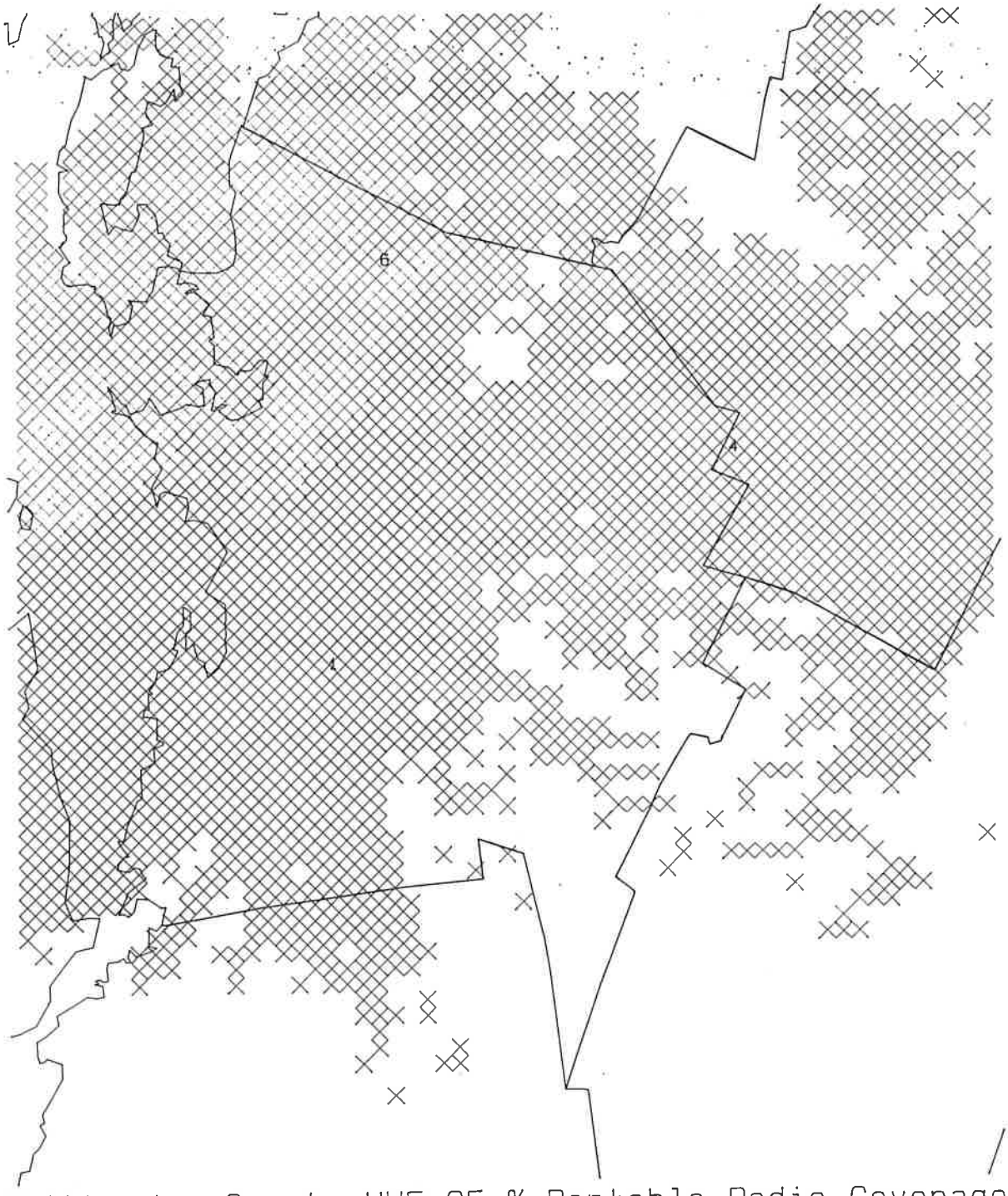
1; Brownell Mtn;
4; Mt. Mansfield;
6; Westford Reservoir;

SIGNAL STRENGTH RANGES: ;

> -104.0 dBm;

< -104.0 dBm;

RAM COMMUNICATIONS CONSULTANTS, INC.
10 NEW ENGLAND BUSINESS CENTER
ANDOVER, MA 01810 SUITE 102



Chittenden County UHF 95 % Portable Radio Coverage

Location: ;
Engineer: Ivan Pagacik;
Date: Thu Jun 15 17:00:27 1995;

Scale: 1:400000;
Frequency: 450 MHz;
Number of sites: 3;

Type: Most Likely Server
Prepared for: ;
File: /sg1b/home/vega/pagacik/chit.hpgl;

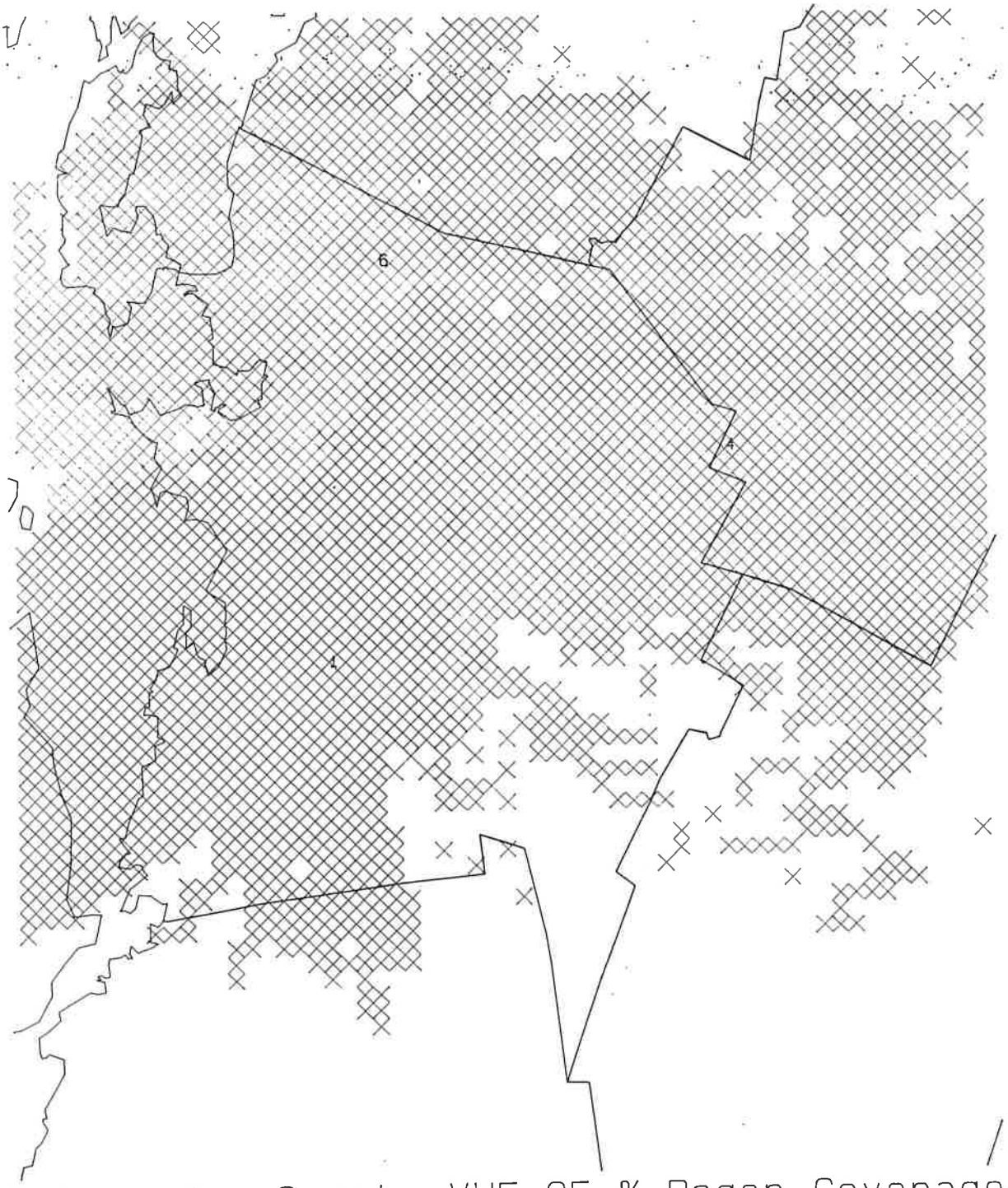
1; Brownell Mtn;
4; Mt. Mansfield;
6; Westford Reservoir;

SIGNAL STRENGTH RANGES: ;

> -104.0 dBm;

< -104.0 dBm;

RAM COMMUNICATIONS CONSULTANTS, INC.
10 NEW ENGLAND BUSINESS CENTER
ANDOVER, MA 01810 SUITE 102



Chittenden County VHF 95 % Pager Coverage

Location: ;
Engineer: Ivan Pagacik;
Date: Thu Jun 15 17:27:56 1995;

Scale: 1:400000;
Frequency: 150 MHz;
Number of sites: 3;

Type: Most Likely Server
Prepared for: ;
File: /sg1b/home/vega/pagacik/chit.hpgl;

1; Brownell Mtn;
4; Mt. Mansfield;
6; Westford Reservoir;

SIGNAL STRENGTH RANGES: ;

> -98.0 dBm;

< -98.0 dBm;

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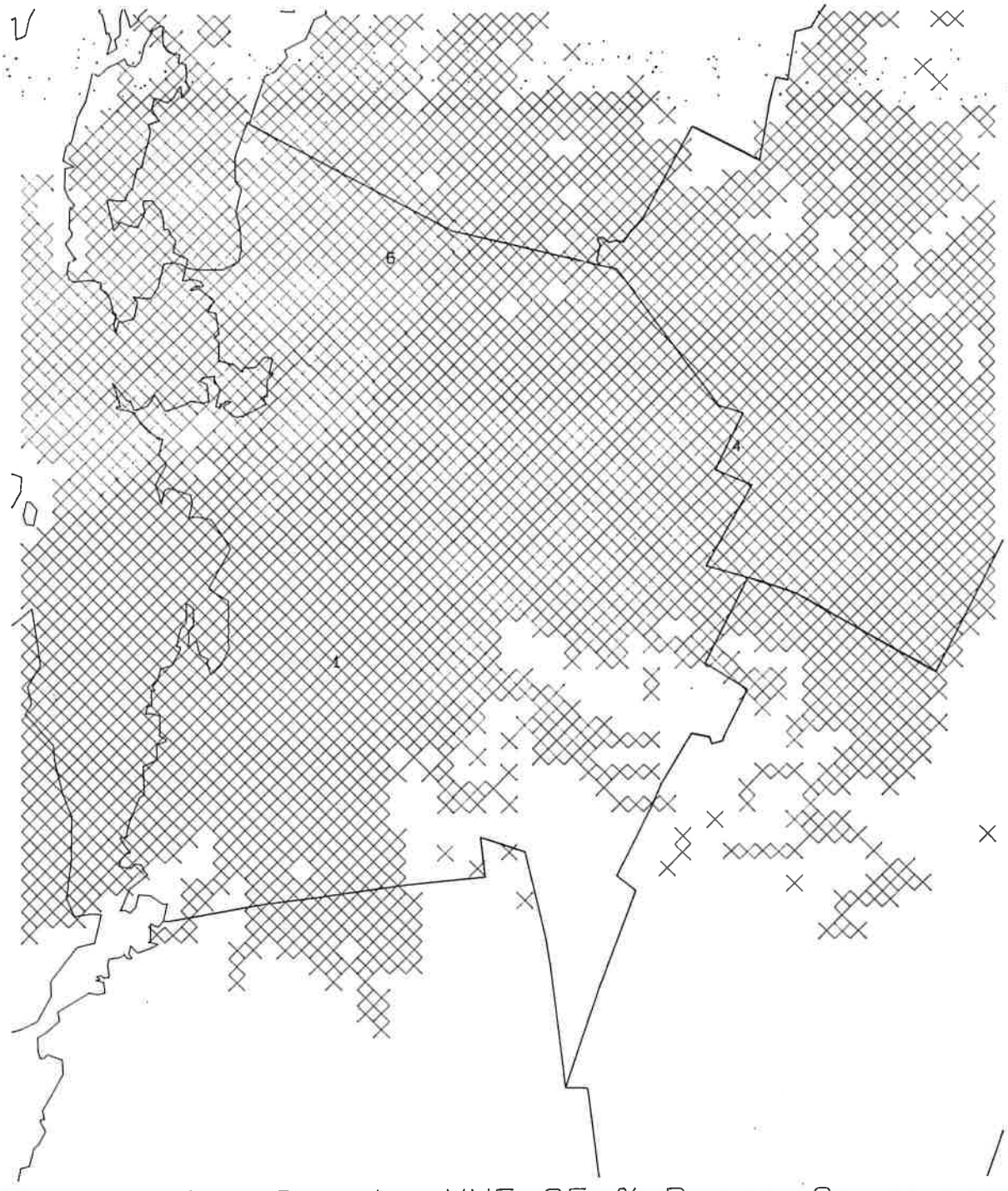
COMMUNICATIONS CONSULTANTS, INC.



Chittenden County VHF 95 % Pager Coverage

Location: ;
Engineer: Ivan Pagacik;
Date: Thu Jun 15 17:27:56 1995;

Scale: 1:400000;
Frequency: 150 MHz;
Number of sites: 3;

Type: Most Likely Server
Prepared for: ;
File: /sg1b/home/vega/pagacik/chit.hpgl;

1; Brownell Mtn;
4; Mt. Mansfield;
6; Westford Reservoir;

SIGNAL STRENGTH RANGES: ;

> -98.0 dBm;

< -98.0 dBm;

RAM COMMUNICATIONS CONSULTANTS, INC.
10 NEW ENGLAND BUSINESS CENTER
ANDOVER, MA 01810 SUITE 102

APPENDIX VIII
EXISTING RADIO FREQUENCIES

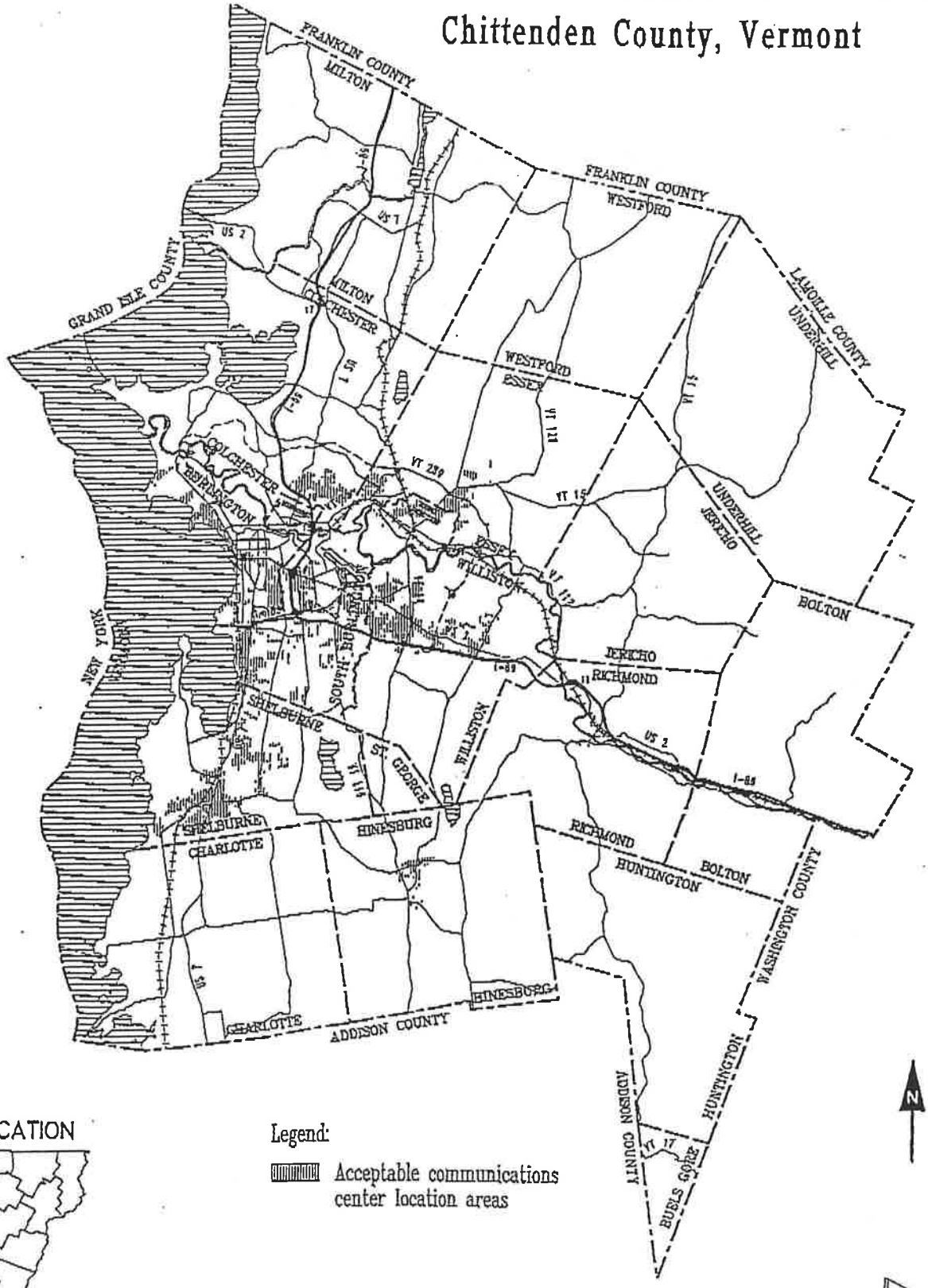
TOWN	FREQUENCY	TYPE OF STATION	USER
BURLINGTON	460.625 Tx/465.625 Rx	REPEATER	FIRE
	33.78	BASE	FIRE
	154.385	MOBILE	FIRE
	155.415	BASE	POLICE
	460.125	BASE	POLICE
	453.725	BASE	POLICE
	465.025 Tx/460.025 Rx	BASE(CONTROL ST.)	POLICE (STATE CH 3)
	460.150	BASE	POLICE
	460.500	BASE	POLICE (STATE CH 2)
SOUTH BURLINGTON	465.025 Tx/ 460.025 Rx	BASE (CONTROL ST)	POLICE (STATE CH 3)
	465.175 Tx/ 460.175 Rx	BASE (CONTROL ST)	POLICE
	460.150	BASE	POLICE
	460.500	BASE	POLICE
	460.175 Tx/465.175 Rx	REPEATER	POLICE
	154.115	BASE	??
	154.965	BASE	??
	155.025	BASE	??
	155.145	BASE	??
	154.205	BASE	FIRE
	154.355	BASE	FIRE
SHELBURNE	453.150 Tx/458.150 Rx	REPEATER	POLICE
	460.150	BASE	POLICE
	460.500	BASE	POLICE
	458.150 Tx/453.150 Rx	BASE (CONTROL)	POLICE
	465.025 Tx/460.025 Rx	BASE (CONTROL)	POLICE
	154.370 Tx/ 153.770 Rx	REPEATER	FIRE
	154.965	BASE	LOCAL GOV
	155.715	BASE	LOCAL GOV
	10GHZ		

TOWN	FREQUENCY	TYPE OF STATION	USER
OLCHESTER	453.750 Tx/ 458.750 Rx	REPEATER	POLICE
	458.750 Tx/ 453.750 Rx	BASE (CONTROL ST)	POLICE
	460.075	BASE	POLICE
	460.175	BASE	POLICE
	460.500	BASE	POLICE
	465.175	BASE	POLICE
	465.025	BASE (CONTROL)	POLICE (STATE CH3)
	465.100	BASE (CONTROL)	POLICE (ESSEX RPTR)
	155.055	BASE	RESCUE
	453.525 Tx/ 458.525 Rx	REPEATER	FIRE 1
	453.350 Tx/ 458.350 Rx	REPEATER	FIRE 2
WINOOSKI	460.200	BASE	POLICE
	460.500	BASE	POLICE
	154.115	BASE	FIRE
	154.025	BASE	HIGHWAY
WILLISTON	154.175	BASE	FIRE
	155.025	BASE	POLICE
MILTON	460.400 Tx/ 465.400 Rx	REPEATER	POLICE
	460.150	BASE	POLICE
	460.500	BASE	POLICE
	465.025	BASE (CONTROL)	POLICE
	465.400	BASE (CONTROL)	POLICE
CHARLOTTE	154.325	BASE	FIRE
	154.325	BASE	FIRE
	460.5875 Tx/ 465.5875 Rx	REPEATER	UHF LINK FOR FIRE
	155.715	BASE	RESCUE
FERRISBURG	155.715	BASE	FIRE
	155.955	BASE	FIRE
VERGENNES	155.265	BASE	RESCUE
	155.340	BASE	RESCUE
RICHMOND	154.310	BASE	FIRE

TOWN	FREQUENCY	TYPE OF STATION	USER
ESSEX	460.100 Tx/ 465.100 Rx	REPEATER	POLICE
	460.500	BASE	POLICE (STATE CH 2)
	155.205	BASE	RESCUE
	154.130	BASE	FIRE (ESSEX)
	155.355	BASE	FIRE (ESSEX JUNCTION)
	155.025	BASE	FIRE (WILLISTON)
	154.235	BASE	FIRE (WESTFORD)
	156.225	BASE	PUBLIC WORKS
	155.085	BASE	VILLAGE PUBLIC WORKS

APPENDIX IX
POTENTIAL COMMUNICATIONS CENTER SITES

Public Safety
Communications Center Site Potential
Chittenden County, Vermont



LOCATION

VERMONT

Legend:

Acceptable communications center location areas

0 2 4 6 miles