ARIZONA DEPARTMENT OF TRANSPORTATION

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INCIDENT MANAGEMENT SYSTEMS AND STRATEGIES

TRAFFIC OPERATIONS CENTER OPERATIONS MANUAL

Final Report

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16. Abstract

The Arizona Department of Transportation (ADOT) Traffic Operations Center (TOC) opened during 1995 in Phoenix. Procedures for its operation were developed on an informal basis and copies were maintained by each operator.

In late 1997, the firms of Lima & Associates and PB Farradyne were retained to research existing programs in three states. This was done to determine if the procedures at the Phoenix TOC were adequate and whether additional procedures needed to be implemented. The team interviewed customers and staff members of TOC and reviewed all policies then in place. Its findings were presented to the Technical Advisory Committee (TAC). Using this information the TAC provided guidelines for development of a TOC Operations Manual.

All TOC staff and each TAC member reviewed the manual draft. The end product has resulted in a comprehensive operations manual for daily use by the TOC staff and in an excellent training tool for new employees.

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METRIC (SI*) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	2.54	centimeters	cm
ft	feet	0.3048	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	6.452	centimeters squared	cm^2
ft^2	square feet	0.0929	meters squared	m^2
yd^2	square yards	0.836	meters squared	m^2
mi^2	square miles	2.59	kilometers squared	km^2
ac	acres	0.395	hectares	ha
		MASS (weight)		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.0328	meters cubed	m^3
yd^3	cubic yards	0.765	meters cubed	m^3

Note: Volumes greater than 1000 L shall be shown in m^3.

		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

These factors conform to the requirement of FHWA Order 5190.1A

*SI is the symbol for the International System of Measurements

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
yd	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
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yd^2	kilometers squared	0.39	square miles	mi^2
ha	hectares (10,000 m^2)	2.53	acres	ac
		MASS (weight)		
g	grams	0.0353	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams (1000 kg)	1.103	short tons	T
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	meters cubed	35.315	cubic feet	ft^3
m^3	meters cubed	1.308	cubic yards	yd^3

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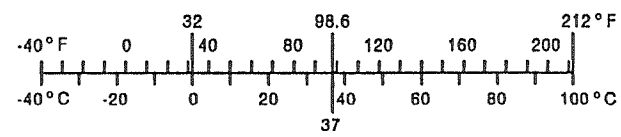

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I. INTRODUCTION

The Arizona Department of Transportation (ADOT) Traffic Operations Center (TOC) began operation in its current facility in 1995. The center utilizes some of the latest technologies including closed circuit television, loop detection, variable message signs, and ramp metering to monitor and manage traffic. In addition, the center has taken on a statewide role that will expand as additional traffic management systems are implemented outside of the Phoenix area.

As the center expanded its control of freeway operations, traffic management operating policies and procedures were developed on an "as needed" basis. The Operations Supervisor and Intelligent Transportation Systems (ITS) Manager, who considered all information and comments, determined the policy process. Internal input came from the operators regarding the challenges they encountered in delivering services. In addition, external input was received from customers of the TOC, such as the Department of Public Safety (DPS), ADOT organizations, cities, and counties.

The Technical Advisory Committee (TAC) for the center identified the need to research the policies and procedures in place and evaluate them against those in other states. The information obtained would be used in developing an operations manual for the center.

The consulting firms of Lima & Associates and PB Farradyne were selected to conduct research and to develop the manual. The specific tasks for this project were:

1. Meet with the TAC to review the scope of work and the proposed work plan.

2. Review the Phoenix Freeway Management Systems (FMS) concepts, components, and the Phoenix TOC in particular. Review existing operational procedures for incident management in the TOC. Interview Phoenix TOC staff and the first responder agencies to confirm current procedures, activities, logic, efficiency, and any perceived shortfalls.

3. Perform a brief review and summary of three existing freeway incident management programs in urban freeway systems located in western or midwestern states. Contact key parties both within and in support of these other FMS facilities to review their procedures, problems, and degrees of success. The goal was to identify the critical elements in successful operations, and to identify the problems and lessons learned in development of those incident management programs. The model systems are to be selected in a team effort with the Technical Advisory Committee (TAC) members.

4. Develop the draft ADOT Operations Manual for Freeway Incident Management. This manual will serve as a comprehensive document of all operating procedures related to freeway incident management which are carried out and coordinated by the Phoenix FMS TOC. Recognize the need to consistently address both urban and rural incident situations and responses. The preceding tasks may have identified areas that are not adequately addressed by current procedures, and such concerns will be addressed by developing new procedures in consultation with TOC staff and all pertinent local agencies. Lessons learned, new concepts, and policy recommendations from the three FMS sites reviewed during Task 2 will be incorporated during all stages of this task.

5. Consolidate all the comments and recommendations after the draft manual has been reviewed in detail by the TAC members. The suggestions and comments will be addressed by the TAC and final recommendations made. Upon completion, the second draft will be reviewed by key TOC members for their final comments. This task replaces review by a focus group.

6. Incorporate the final comments into the manual and provide the necessary support for its publication.

7. Write a summary Final Report and Research Note on the project in accordance to the Arizona Transportation Research Center (ATRC) guidelines for research publications.

This report contains a short summary of the three programs reviewed by the TAC followed by a description of the process used to develop the Operations Manual. Finally, the report contains conclusions and recommendations.

The manual has been published separately, as a controlled document entitled *Arizona Department of Transportation - Traffic Operations Center - Operations Manual*, October 1998. This manual is expected to be periodically reviewed and updated as new circumstances warrant.

For the reader's reference, only the Table of Contents for the operations manual has been provided in the Appendix of this report. However, sample copies of the initial version (October 1998) of the operations manual may be requested from the Arizona Transportation Research Center.

II. REVIEW OF THREE SUCCESSFUL TOC PROGRAMS

The consultant team reviewed several programs in other areas and selected three for approval by the TAC for a detailed presentation.

SAN DIEGO, CALIFORNIA

This TOC was selected because it is a successful model for consolidating services. The California Department of Transportation (Caltrans) and the California Highway Patrol (CHP) have combined resources and operations in the San Diego center. This center provides real time information 24 hours per day and uses a wide range of traditional methods and Intelligent Transportation Systems (ITS), such as: freeway call boxes, electronic sensors in the pavement, video monitors, 911 calls, officers on patrol, service patrols, Caltrans highway crews, ramp meter sensors, earthquake monitors, motorist cellular calls, and commercial traffic reporters input.

The center's staff, Caltrans and CHP personnel, have developed a coordinated approach to incidents that has resulted in improved detection, verification, response, and clearance of most incidents. An Incident Management Working Group meets on a regular basis to review incident procedures, critique major incidents, and develop recommendations for improvements.

With all the success they have experienced, the TOC is still working to improve management of truck or hazardous materials incidents so that the long delays associated with these types of incidents are reduced.

CHICAGO, ILLINOIS

This location was selected for its long-standing reputation as having one of the most effective incident response programs of any city. It was also selected because the Illinois Department of Transportation (IDOT) has taken a different approach for managing incidents.

The Chicago area freeways are among the oldest in the country. High occupancy vehicles (HOV) and regular lanes have been added, resulting in the loss of shoulders in several areas. The number of low railroad overpasses that preclude large truck traffic reduce alternate route possibilities. Inclement weather contributes to a large number of incidents. Truck traffic is extremely heavy at all times.

The Illinois Department of Transportation (IDOT) developed a large and aggressive incident management team called the "Minute Men." They patrol the freeways and take immediate action to clear whatever incidents occur, including overturned trucks. The team operates its own heavy equipment and uses a quick clearance policy that allows them to push or drag vehicles clear of the roadway. What the area lacks in ITS is made up for by the large fleet of incident response vehicles operated by IDOT

employees. ITS programs are being implemented, but IDOT and the Illinois State Police have not consolidated centers.

There are some delays and miscommunication between the two agencies, even though they have a very good working relationship. Their field operations procedures are very comprehensive, but their policies and procedures for TOC operations are basic.

SEATTLE, WASHINGTON

Seattle has one of the nation's oldest and most comprehensive TOC programs. Their center is in its third location since it began operations in 1973. Seattle, like Phoenix, was selected as a "Model Deployment Initiative" site by the Federal Highway Administration (FHWA). It is improving its system by electronically connecting with city and county signal systems, media outlets, the trauma hospitals, and public transit providers.

The Seattle TOC has developed its operations procedures over the years and has comprehensive directives for all phases of its operation. The center uses a large variety of ITS and has a very responsive motorist information program, which is accomplished through a public-private cooperative effort with the media and industry. When a blocking incident occurs on a Seattle area freeway, detection occurs within two minutes and the Computer Aided Design (CAD) system electronically transfers the information from the Washington State Patrol to the TOC, which takes immediate action. Response to the incident scene averages six minutes. Motorist information is usually on the internet, camera feeds to the media, and Variable Message Signs (VMS) before the first responder arrives.

Seattle has successfully blended the systems with excellent results. They are planning a roving service patrol program to augment their bridge tow trucks and incident response trucks as the final piece to complete their program.

III. PREPARATION OF THE OPERATIONS MANUAL

After the TAC reviewed the three programs presented in the previous section, a proposed outline of procedures was presented to the TAC. With their input, a Table of Contents (Appendix A) was completed. Procedure and policy content was derived from the draft policies and notes from the TOC. Policy manuals from the ALERT program and DPS were reviewed as well as manuals for the Highway Closure and Restrictions System, Emergency Operations Center, Phoenix Fire Department Freeway Response, and Tunnel Procedures. Information taken from TOC employees and TAC member interviews and other states' manuals were also used. Historical information from letters and E-mail management guidelines were also considered in drafting policies.

Several frequently used policies from other manuals used by the TOC staff were incorporated into the draft manual. Those manuals are referenced in the Operations Manual, rather than repeating the entire policy.

Draft policies were formatted and forwarded for TOC staff review. Comments were incorporated before the draft was printed. Some of the requested policies were not found in other manuals and original policies were written after interviews with the staff and TAC members.

When the draft was completed, copies were provided to each TAC member and all TOC operators for review. A summary of concerns and questions were also developed for review by the TOC staff and TAC committee. When the material was presented, it also provided an opportunity to have more in depth discussion of key issues. Based on the comments, the manual was finalized.

IV. CONCLUSIONS

This project provided an opportunity to compare how the Phoenix TOC is doing in relation to similar centers in three other states. It also gave the TAC and TOC staff ideas and suggestions for methods of improving service and provided the TAC with information on programs that are effective in supporting the TOC, such as service patrols.

The review of Arizona's and other states' experiences demonstrated that procedures already in place were adequate for providing service to TOC clients. A need was identified for pulling all the policies together into one format and additional policies were developed to augment the existing information.

Since the TOC is relatively new, it has not completely established its place in the process of managing the freeway system. Communications between response agencies and the TOC are sometimes slow or sporadic but are being improved by the increased coordination that is taking place. Direct electronic links and/or direct telephone lines will assist in reducing delays, improve frequency of contact, and increase accuracy of communications.

Communications with ADOT divisions can also be improved as they become accustomed to working through the center for all types of roadway system responses. For the TOC to be totally effective, its staff must be aware of all activities taking place on the system.

The Operations Manual is written keeping the operators in mind. Information contained in other documents used by the center has been consolidated or streamlined to eliminate extraneous material. One area that will require a continued updating effort is the district section for various ADOT engineering districts. As new systems are installed, the district section should be updated to include the district procedures as well as guidelines for the TOC staff during non-business hours.

Overall, it is evident that improvements are constantly being made and the TOC staff is working together to further develop and strengthen working relationships with key agencies and personnel.

V. RECOMMENDATIONS

The ability of the TOC to be effective is directly related to the process of incident detection, verification, response, and clearance. TOC effectiveness is also directly related to its ability to work effectively with other agencies. The TOC identifies incidents, verifies the details, and contacts the appropriate response agencies -- usually through DPS. If an ADOT response to an incident is required, the TOC initiates and coordinates that response. The following recommendations are presented as methods of enhancing TOC effectiveness. They are based on the experience of the three states reviewed and of other states that operate Traffic Operations Centers.

- To increase the visibility of the TOC and its capabilities, it is recommended that the center sponsor and facilitate emergency training exercises on a regular basis. By showcasing the center's capabilities in this manner, the staff can demonstrate how they can support emergency operations. This program will also improve working relationships and will lead to more frequent coordination. The TOC staff will benefit from the training by being better prepared for actual emergencies.

- The close association of DPS with the TOC is absolutely essential in providing efficient and timely response. The ongoing effort to put the DPS dispatch operation into the TOC is a major step toward substantial improvement in the delivery of services by both agencies. To strengthen this effort, it is recommended that this initiative receive high priority and strong support.

- The TOC is the key link in effective freeway management. An array of tools must be made available for TOC use so that the operation may be totally effective. One tool, that nearly every other area with similar problems has, is service patrols. Therefore, it is recommended that a service patrol program be implemented soon to augment the efforts of DPS. There will be resistance to this process which will require developing a cooperative effort with key stakeholders to gain the support required to get the resources required.

- Any ADOT resources that are used for incident response must be coordinated by the TOC. Lack of information or directives at the operational levels in ADOT regarding how to work with the TOC can reduce the effectiveness of the agency overall. To improve overall coordination, it is recommended that a review of polices and procedures at operational levels are conducted to ensure they are compatible with the TOC and provide consistent guidance for a coordinated effort.

- To further improve the TOC operation, incident management overall policy, procedures, and coordination must be addressed. At the current time, there is a lack of a single contact point for ADOT for incident management issues. Other states have established an "Incident Response Coordinator" to carry out these efforts with significant success. This study recommends establishing a position and assigning that person to the TOC staff.

- Staffing issues in the TOC can significantly impair operations. Minimum staffing must be a priority of ADOT to ensure 24 hour coverage is maintained and the staff is not over worked with excessive overtime. Compensation for operators will also be an issue if there is a large disparity between the ADOT operators and those in similar positions in City, County, or State centers. States that have addressed these issues have better qualified personnel and retain them longer. The responsibility placed on operators during emergencies mandates that they be highly competent and experienced.

- As ITS is deployed and additional systems are brought on line, the TOC should be prepared to take management of those systems. Staffing and training for these additional duties must be addressed prior to implementation. Further, a review of existing systems, such as signals that are not operated by the TOC, should be conducted to determine if the TOC should assume those responsibilities.

- Continuous review and updates will be required to keep the TOC Operations Manual current. An electronic copy and policy change approval at the TOC level will facilitate this process. It is recommended that the manual have regularly scheduled updates with due dates for input from the staff.

APPENDIX

(SAMPLE) TABLE OF CONTENTS

ARIZONA DEPARTMENT OF TRANSPORTATION
TRAFFIC OPERATIONS CENTER
OPERATIONS MANUAL

Revision 0 - October 1998

Note: A Sample copy of the original version of this TOC Operations Manual can be obtained by contacting:

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Arizona Transportation Research Center
602 - 255 - 6910

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