OMAHA METROPOLITAN AREA

ITS EARLY DEPLOYMENT PLANNING STUDY, STRATEGIC DEPLOYMENT PLAN

APPENDIX A: INVENTORY REPORT

NOTE TO READER:

THIS IS A LARGE DOCUMENT

Due to its large size, this document has been segmented into multiple files. All files separate from this main document file are accessible from links (blue type) in the table of contents or the body of the document.

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OMAHA METROPOLITAN AREA

Intelligent Transportation Systems

Early Deployment Planning Study

Strategic Deployment Plan

Appendix A
INVENTORY REPORT

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1. INTRODUCTION

The objective of the Omaha Intelligent Transportation (ITS) early deployment study is to develop a strategic plan for the deployment of ITS technologies in the Omaha metropolitan area. The plan will identify the ITS user services that will be most beneficial to the safety and efficiency of transportation in the area. It will define the ITS technologies that are most appropriate for providing these services. The appropriateness of ITS technologies will be based on an assessment of their performance, compatibility, flexibility, and cost. The plan will also define ITS projects for implementation, assess funding and implementation options, and establish project priorities and implementation schedules. Institutional and legal barriers to the deployment of ITS technologies will be identified, and means to resolve them will be recommended.

The ITS early deployment plan developed in this study will provide the frame of reference and direction for the incorporation of ITS technologies into transportation improvement projects in the Omaha metropolitan area. The planning effort will examine the applicability of ITS user services in the areas of traffic management, traveler information, public transportation, commercial vehicle operations, and incident management. The plan will identify ITS deployment opportunities in the short, medium, and long terms. The plan will provide the basis for a phased, coordinated, integrated implementation of ITS technologies which are best suited to the transportation needs of the area. It will also serve as a guide to both public and private involvement in ITS and provide significant input to the congestion management and intermodal planning efforts in the area.

The ITS early deployment plan will be based on a definition of the needs and opportunities for ITS user services in the Omaha metropolitan area. As a first step in defining these needs and opportunities, the existing transportation system in the Omaha metropolitan area was inventoried to determine its physical infrastructure, organizational structure, and transportation demands pertinent to the priority corridors, which are experiencing, and/or are projected to experience, serious congestion and high numbers of accidents. The inventory focussed on the elements of the transportation system relevant to ITS user services in the following areas:

- traffic management,
- traveler information,
- public transportation,
- commercial vehicle operations, and
- incident management.

The inventory included surveys and interviews of key personnel of responsible agencies and representatives of various user groups to obtain their perspectives on problems, issues, needs, and opportunities pertinent to various aspects of ITS deployment.

This report documents the procedures and findings of the inventory of the existing transportation system. The inventories of the five ITS user service areas addressed in the planning study are presented in the following chapters:

- Chapter 2: Traffic Management and Traveler Information
- Chapter 3: Public Transportation
- Chapter 4: Commercial Vehicle Operations
- Chapter 5: Incident Management

The results of the inventories described in this report indicate that there are needs and opportunities for deployment of ITS technologies in each of the five areas. Therefore, the scope of work during the next phase of the planning study will continue to include all five areas.

In order to develop more definitive descriptions of the needs, opportunities, issues, and concerns relative to the deployment of ITS technologies, focus groups will be organized in each of the five areas. Initially, four focus groups will be formed as follows:

- **Traffic Management Focus Group** will address the area of traffic management and driver information. The group will include representatives of the agencies responsible for traffic control in the Omaha metropolitan area.
- **Public Transportation Focus Group** will address the area of public transportation and user information. It will include representatives of public transportation providers and major employers in the Omaha metropolitan area.
- **Commercial Vehicle Operations Focus Group** will address the area of commercial vehicle operations and truck driver information. It will include representatives of the motor carrier and goods delivery industry in the Omaha metropolitan area.
- **Incident Management Focus Group** will address the area of incident management and driver information related to incident management. It will include representatives of the primary emergency response services and traffic control agencies in the Omaha metropolitan area.

The information obtained from these groups will provide input to the articulation of ITS goals and objectives, which will serve as the basis for the identification, evaluation, and selection of ITS technologies for deployment in the Omaha metropolitan area.

2. TRAFFIC MANAGEMENT AND TRAVELER INFORMATION

This chapter of the report documents the results of the inventory of existing transportation-related systems pertinent to traffic operations in the study area and along the priority corridors. It provides an inventory of the physical, operational and travel characteristics of the regional and major local routes within the study area. The overall goal is to identify opportunities for potential ITS deployment within the metropolitan area to improve mobility and quality of travel. The specific objectives of the existing condition inventory are:

- To establish a baseline for assessment of the future ITS benefits and system performance;
- To identify the congested locations within the study area for advanced traffic management system (ATMS) applications;
- To identify the existing communication and computer system assets;
- To identify the current level of travel information systems for potential advanced traveler information system (ATIS) deployment; and
- To define existing institutional opportunities and constraints related to potential ATMS/ATIS deployment strategies.

The inventory of existing systems presents a summary of the area traffic management and traveler information network followed by detailed characteristics of the priority corridors, a summary of traffic control systems, as well as other activities related to the traffic operations in the metropolitan area. In addition, discussion of the existing institutional opportunities and constraints is included. This chapter is divided into the following sections:

- **Highway Network:** This section briefly describes the characteristics of the regional network, discusses the physical and operational features of the freeways and principal arterials within the metropolitan area, and identifies the location and detailed characteristics of the priority corridors.
- **Traffic Control Systems:** This section identifies and describes the existing traffic control systems for freeways and arterials, identifies the signalized intersections and coordinated subsystems, and provides a summary of the existing computerized traffic control and communication systems. This section also provides a summary of the current practices for providing traffic information to traveling motorists.
- **Other Systems and Activities:** This section summarizes an inventory of the existing activity centers, police and fire systems, hospital, medical operations and other elements pertinent to ATMS/ATIS opportunities.

- **Institutional Opportunities and Constraints:** This section presents institutional opportunities and constraints related to implementation of transportation management and traveller information systems in the metropolitan area.

2.1 HIGHWAY NETWORK

Metropolitan Omaha area has experienced significant growth in traffic volumes over the past several years. According to the Metropolitan Area Planning Agency (MAPA), the metropolitan area experienced over 10 million vehicle miles of travel (VMT) per day in 1992 with about 70% of the VMT taking place within the City of Omaha and nearly 42% of the VMT occurring in an area bounded by the Missouri River, 114th Street, L Street, and Blondo Street. Not surprisingly, this area includes the 8 busiest sub-corridors in the city, the top 8 east-west corridors and 6 of the top 8 north-south corridors in terms of observed traffic volumes.

This section of the report provides an overview of the regional and arterial network within the metropolitan area. Following the description of each existing transportation network, priority corridors are identified and characteristics described. Corridors experiencing heavy travel and congestion are also identified.

2.1.1 Freeway/Expressway Network

The primary regional access to the metropolitan area is provided by Interstate 80 (I-80) and Interstate 29 (I-29). I-80 provides service to eastbound and westbound traffic; whereas, I-29 provides service to northbound and southbound traffic in the study area. These facilities serve both the regional (interstate) as well as local (within metropolitan area) traffic. The existing street network is illustrated in Figure 2.1. I-80 passes along the southern portion of the City of Omaha with I-29 (located in Iowa) passing along the eastern edge of the metropolitan area. These two interstate facilities have interchanges with a majority of the other freeways/expressways in the study area. I-80 and I-29 extend through the length of the study area, and several on/off-ramps are provided within the metropolitan area. The number of lanes and traffic volume varies significantly along I-80 within the metropolitan area. I-80 currently carries traffic volumes ranging from approximately 26,000 vehicles per day (VPD) to 126,000 VPD. I-80 generally has 4 to 6 lanes, with 10 lanes between 42nd Street and I-480. I-29 currently carries traffic volumes ranging from approximately 15,000 VPD to 27,000 VPD. I-80 and I-29 have a common segment located east of the Missouri River in the Council Bluffs, Iowa, area which carries daily traffic volumes ranging from approximately 40,000 to 50,000 in 4 lanes of traffic.

In addition to I-80 and I-29, the metropolitan area is served by several freeways/ expressways which primarily serve traffic traveling within the metropolitan area with some traffic bypassing the metropolitan area, such as traffic between I-80 and I-29 via the I-680 Freeway. The following freeways/expressways are located in the metropolitan area:

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Existing Conditions

Street Network

NOT TO SCALE

LEGEND

- FREEWAY
- STREET
- STATE LINE

FIGURE 2.1

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FIG2-1.DWG 12-13-95

- ***I-680 Freeway*** travels in a southwest to northeast orientation connecting I-80 and I-29. The current traffic volumes range from 12,000 to 77,000 VPD. It is primarily a 4-lane freeway, with 6 lanes between W. Center Road and its interchange with I-80.

- ***I-480 Freeway*** serves east-west traffic and extends between I-80 and I-29. The current traffic volumes range from 3 1,000 to 5 1,000 VPD. It is primarily a 4-lane freeway.

- ***North Expressway*** serves north-south traffic and extends north from the I-480 Freeway to the Sorenson Parkway/Arthur C. Storz Expressway interchange. This facility serves downtown Omaha and interchanges with the I-480 Freeway, which is also a major facility serving downtown Omaha. It is primarily a 6-lane facility with traffic volumes ranging from approximately 20,000 to 40,000 VPD.

- ***Arthur C. Storz Expressway*** carries east-west traffic extending from the interchange of Sorenson Parkway/North Expressway to Eppley Airport and is the major transportation facility serving the airport. It is a 4-lane freeway which carries a traffic volume ranging from 6,000 to 15,000 VPD.

- ***Sorenson Parkway*** carries east-west traffic and currently extends from the interchange of Arthur C. Storz/North Expressway to 72nd Street and is ultimately planned to be extended to 90th Street. It is a 4-lane freeway which carries a traffic volume ranging from 14,000 to 18,000 VPD.

- ***Kennedy Expressway*** serves north-south traffic extending south from the interchange of North Expressway/I-80 to Bellevue and communities south. This facility was opened to traffic in late 1994 and is a 6 lane facility from I-80 to L street and changes to 4 lanes south of L Street. Due to its recent opening, traffic volumes have only been recorded during the first quarter of 1995 and range from 25,000 to 30,000 VPD.

- ***South Expressway*** serves north-south traffic and extends between Highway 92/US 275 and 5th Avenue, crossing I-80, serving downtown Council Bluffs, Iowa as a major facility. It is one of the two major north-south facilities east of the Missouri River, the other being I-29. It is primarily a 4-lane facility with traffic volumes ranging from approximately 13,000 to 15,000 VPD.

The ADTs for study area freeways, expressways and arterial network are illustrated in the ADT Figure under Appendix A-l.

There are three freeway crossings over the Missouri River in the metropolitan area that connect to I-29:

- the crossing of the I-680 Freeway in the northern portion of the study area;
- the I-480 Freeway crossing in the mid-section of the metropolitan area; and
- the I-80 Freeway crossing in the southern section of the study area.

The I-480 crossing provides the most direct connection between the downtown areas of Omaha and Council Bluffs. An additional crossing is planned for the Missouri River south of Offutt Air Force Base, however the final location has not been identified.

2.1.2 Arterial Network

Arterial highways are intended to handle the bulk of intra-regional traffic to complement the freeway system and the local street network. As congestion continues to increase on the freeway system, those arterials which are parallel to freeways, serving the same trips as the freeways, suffer an increased traffic volume; consequently, arterials such as Dodge Street and West Center Road are becoming increasingly congested. Access to/from the east is constrained due to the presence of the Missouri River.

The Transportation Master Plan for the City of Omaha depicts the following highway classifications: Interstate, Expressway/Freeway, Major Arterial, Minor Arterial, Collector Street, Local Street and Park Related roadways. Design guidelines and criteria for key roadway classifications from the Omaha Transportation Master Plan are briefly described below:

- ***Interstate.*** The interstate highways are characterized by high speed movement of both regional and national traffic. The facilities are high speed, divided highways with controlled access, grade separated interchanges, with a minimum of 4 lanes of traffic; 6 lanes are common in the Omaha area, and an expansion to 8 lanes plus auxiliary lanes is currently underway.

- ***Expressway/Freeway.*** The expressways/freeways move both inter- and intra-regional traffic, accommodating long distance travel and carrying high volumes of long distance and commuter traffic. The facilities are high speed, divided highways with controlled access and grade separated interchanges. They have a minimum of 4 lanes; however, 6 lanes are common.

- ***Major Arterial.*** The major arterial serves inter- and intra-regional traffic along with local and crosstown traffic. A major arterial can have as many as 6 lanes, preferably 4 lanes, with a center median. They typically consist of a l00-foot ROW, sidewalk on both sides, with parking prohibited.

- ***Minor Arterial.*** A minor arterial interconnects with and augments the major arterial system serving local traffic for moderate length trips. The number of lanes and median treatments are directly related to traffic volumes and abutting land use, but normally have 2 to 4 lanes.

- ***Collector Street.*** A collector street connects local streets to the arterial street system.

The following paragraphs describe the general geometric conditions of the key roadways.

East-West Routes:

- ***Highway 64/Maple Street.*** Maple Street is classified as a major arterial with an east-west orientation. The roadway generally has 4 lanes and a raised median. The daily traffic volume ranges from 17,000 to 35,000 VPD.

- ***West Dodge Road/Dodge Street.*** West Dodge Road and Dodge Street are classified as a freeway and major arterial respectively, and run with an east-west orientation. West Dodge Road west of 120th Street is currently a 6-lane roadway. West Dodge Road east of 120th Street has four through lanes with an auxiliary lane for on/off traffic. From 120th Street east, West Dodge Road is a 6-lane roadway to 78th Street. Dodge Street between 78th Street and 69th Street is a 6-lane roadway. Between 30th Street and 69th Streets, there is a reversible center lane used for peak direction of travel (eastbound during AM peak and westbound during PM peak). Presently, West Dodge Road carries about 34,000 to 66,000 VPD west of I-680, and 58,000 to 63,000 VPD between I-680 and 72nd Street. Dodge Street to the east of 72nd Street carries 35,000 to 57,000 VPD.

- ***Broadway/Kainesville Road.*** Broadway/Kainesville Road is located in Council Bluffs and is classified as major arterial and travels with an east-west orientation. It has 4 lanes and carries approximately 14,000 to 30,000 VPD.

- ***West Center Road/Center Street.*** West Center Road/Center Street is classified as a major arterial, runs with an east-west orientation, and has 4 lanes. It has a two-way left-turn lane in the median between 32nd and 64th Streets and is a 4-lane divided roadway between 64th Street and 171st Street. The street carries approximately 15,000 to 39,000 VPD, with higher volumes observed between I-680 and I-480.

- ***US*** 275***/L Street/Highway 92.*** US 275/L Street/Highway 92 is classified as a major arterial and runs with an east-west orientation and extends between 132nd Street in Omaha to Highway 192 in Council Bluffs. It has a two-way left-turn lane in the median between 42nd and 52nd Streets in addition to 4 travel lanes and is a 4-lane divided roadway between 52nd Street and 144th Street; whereas, east of 20th Street, it is a 2-lane roadway. The street carries approximately 36,000 VPD west of the I-680, approximately 18,000 to 29,000 VPD between I-680 and the Kennedy Expressway, and 6,700 to 11,300 VPD east of the Kennedy Expressway.

- ***Q Street.*** Q Street runs with a east-west orientation and is a 5-lane roadway between 84th Street and 120th Street including a two-way left-turn lane. Between 120th and 132nd Streets it is a 4-lane roadway. It carries approximately 18,000 VPD east of I-80 and approximately 28,000 VPD east of 132nd Street.

- ***Harrison Street.*** Harrison Street runs in an east/west orientation between Highway 31 and Railroad Avenue, south of I-80. Harrison Street between 144th Street and 132nd Street is a 2-lane roadway with approximately 13,000 to 16,000 VPD. From 132nd Street

to 84th Street, Harrison Street is a 4-lane roadway with a raised center median and approximately 14,000 to 20,000 VPD. East of 84th Street to Railroad Avenue it is a 2-lane roadway with 8,000 to 13,000 VPD.

- ***Cornhusker Road.*** Cornhusker Road runs in an east/west orientation between Giles Road and Fort Crook Road in Bellevue. Cornhusker Road is a 2-lane roadway west of 25th Street and carries 5,000 to 18,000 VPD and east of 25th Street it is a 4-lane facility with 15,000 to 20,000 VPD.

- ***Highway 370***. Highway 370 runs in an east/west orientation between Highway 31 and Galvin Road in Bellevue. It is a 2-lane roadway west of 84th Street, and carries 2,000 to 10,000 VPD. East of 84th Street, it is a 4-lane facility with 10,000 to 20,000 VPD.

North-South Routes:

- ***Highway 50/144th Street.*** Highway 50/144th Street is classified as a principal arterial with a north-south orientation from south of I-80 to State Street. It is a 2-lane facility south of Industrial Road with the exception of a short segment near I-80 which is 4-lane, and carries approximately 15,000 to 20,000 VPD. From Industrial Road to West Dodge Road, it is a 4-lane facility and carries 18,000 to 20,000 VPD. North of West Dodge Road, it is a 2-lane facility and carries less than 16,000 VPD.

- ***120th Street.*** 120 Street is classified as a minor arterial with a north-south orientation. The roadway generally has 4 lanes with daily traffic volume ranging from 16,000 to 36,000 VPD.

- ***90th Street/Highway 133***. 90th Street/Highway 133 is classified as a major arterial with a north-south orientation. 90th Street extends from West Center Road to Blair High Road and Highway 133. The roadway generally has 4 lanes with daily traffic volume ranging from 24,000 to 31,000 VPD.

- 72***nd Street.*** 72nd Street is the only continuous north-south major arterial spanning the Omaha city limits. There are 2 travel lanes in each direction with a raised median for the greatest portion of the roadway. Between Cornhusker Road and Highway 370, it becomes a 2-lane roadway. The traffic volume along 72nd Street south of I-80 ranges from approximately 11,000 to 29,000 VPD and from 10,000 to 43,000 VPD between I-80 and I-680.

- ***Saddle Creek Road.*** Saddle Creek Road is classified as a major arterial with a north-southwest orientation, extending from Cuming Street to Center Street. It generally has 4 lanes, with daily traffic volumes ranging from 24,000 to 36,000 VPD. Saddle Creek Road is scheduled to be widened to 5 lanes in 1996.

- ***42nd Street.*** 42nd Street is classified as a major arterial with a north-south orientation. The roadway generally has 4 lanes with daily traffic volumes ranging from 2,700 to 39,000 VPD. The higher traffic volumes were observed near I-80.

- ***30th Street/US* 75**. 30th Street/US 75 is classified as a minor arterial in the study area running in a north-south orientation. The section of the roadway described here is between downtown Omaha and I-680. It generally has 4 lanes and the daily traffic volume ranges from 8,000 to 20,000 VPD.

- ***Fort Crook Road/US* 75**. Fort Crook Road/US 75 is classified as a major arterial with a north-south orientation. The section of the roadway described here extends from Y Street to the south and generally has 6 lanes with a raised median. The daily traffic volume ranges from 13,000 to 32,000 VPD. The traffic volumes and travel lanes decrease as one travels away from the metropolitan area.

- ***NW Radial/Military Road.*** NW Radial/Military Road is classified as a major arterial with a southeast-northwest orientation. It generally has 4 lanes with a third travel lane being added during peak hours in the direction of travel via parking prohibition along the NW Radial. The daily traffic volume ranges from 6,600 to 30,000 VPD for the NW Radial, and from 6,000 to 18,000 VPD along Military Road.

2.1.3 Priority Corridors.

A total of 9 priority corridors in the study area have been identified for the purposes of this study, based on the following factors:

- Studies by MAPA assessing sub-corridors
- Regional and subregional significance of the corridors
- Existing state route network
- Existing average daily traffic volumes
- Location of major activity and employment centers
- Field observation of the existing roadway network

Each designated priority corridor typically contains a primary state route or freeway, as well as parallel principal arterial streets which provide potential alternative routes.

2.1.3.1 Corridor Characteristics.

This section provides a brief description of the major characteristics of the identified priority corridors. The locations of the 9 priority corridors are shown in Figure 2.2.

- ***Z-80 Corridor*** between I-680 west in Omaha to Madison Avenue east in Council Bluffs. This corridor contains the parallel principal arterials of L Street and a portion of Q Street on the south and West Center Road/Center Street on the north.

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Existing Conditions

Priority Corridors

NOT TO SCALE

LEGEND

- PRIMARY CORRIDOR
- FREEWAY
- CITY STREET

FIGURE 2.2

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FIG2-2.DWG 12-13-95

- ***Dodge Street Corridor*** between 132nd Street on the west to I-480 on the east in Omaha. This corridor includes I-480 from its terminus at 32nd Street west in Omaha to I-29 east in Council Bluffs. The Dodge Street corridor includes parallel arterials between Pacific Street on the south and Maple Street on the north.

- ***84th/72nd Street Corridor*** includes 72nd Street between Highway 370 on the south and I-680 on the north. It contains 84th Street from Highway 370 on the south to West Center Road on the north.

- ***I-80/680 Corridor*** begins at the Highway 50 interchange on I-80 and extends north to the Highway 133 interchange on I-680.

- ***Kennedy Expressway Corridor*** between Capehart Road on the south and Storz Expressway on the north. It contains Fort Crook Road from Capehart Road on the south to I-80 on the north and US 75 (30th Street) between I-480 on the south and I-680 on the north.

- ***I-29 Corridor*** is located between Highway 92/Route 275 on the south and I-680 on the north. The corridor runs just west of Council Bluffs in Iowa along the Missouri River.

- ***I-680 (North) Corridor*** begins at I-29 in Iowa on the east and extends west to the I-680/Highway 133 interchange in Omaha, Nebraska.

- ***Sorenson Parkway Corridor*** is located along the Sorenson Parkway from 72nd Street on the east to the North Expressway interchange and continuing as the Storz Expressway east to Abbott Drive near Eppley Airfield.

- ***Highway 370*** begins at I-80 on the west to east of the Kennedy Expressway in Bellevue .

The main characteristics of each corridor are described below:

- ***I-80 Corridor*** includes I-80 as the primary route and parallel arterials as the potential alternative routes (Figure 2.3). I-80 extends from I-680 on the west to Madison Avenue on the east which is in Council Bluffs. The corridor contains West Center Road/Center Street north of I-80 and US 275/L Street and portions of Q Street and Harrison Street south of I-80. The corridor serves east-west travel demand primarily on I-80 and the paralleling arterial streets. I-80 is a 6-lane facility with interchanges at I-680, 84th Street, 72nd Street, 60th Street, 42nd Street, I-480, 24th Street, 13th Street, I-29, 24th Street in Iowa, Highway 192, I-29 and Madison Avenue in Council Bluffs. Average daily traffic volume on I-80 between I-680 and I-480 ranges from 92,000 to 126,000 vehicles and from 45,000 to 51,000 vehicles between I-480 and Madison Avenue in Council Bluffs.

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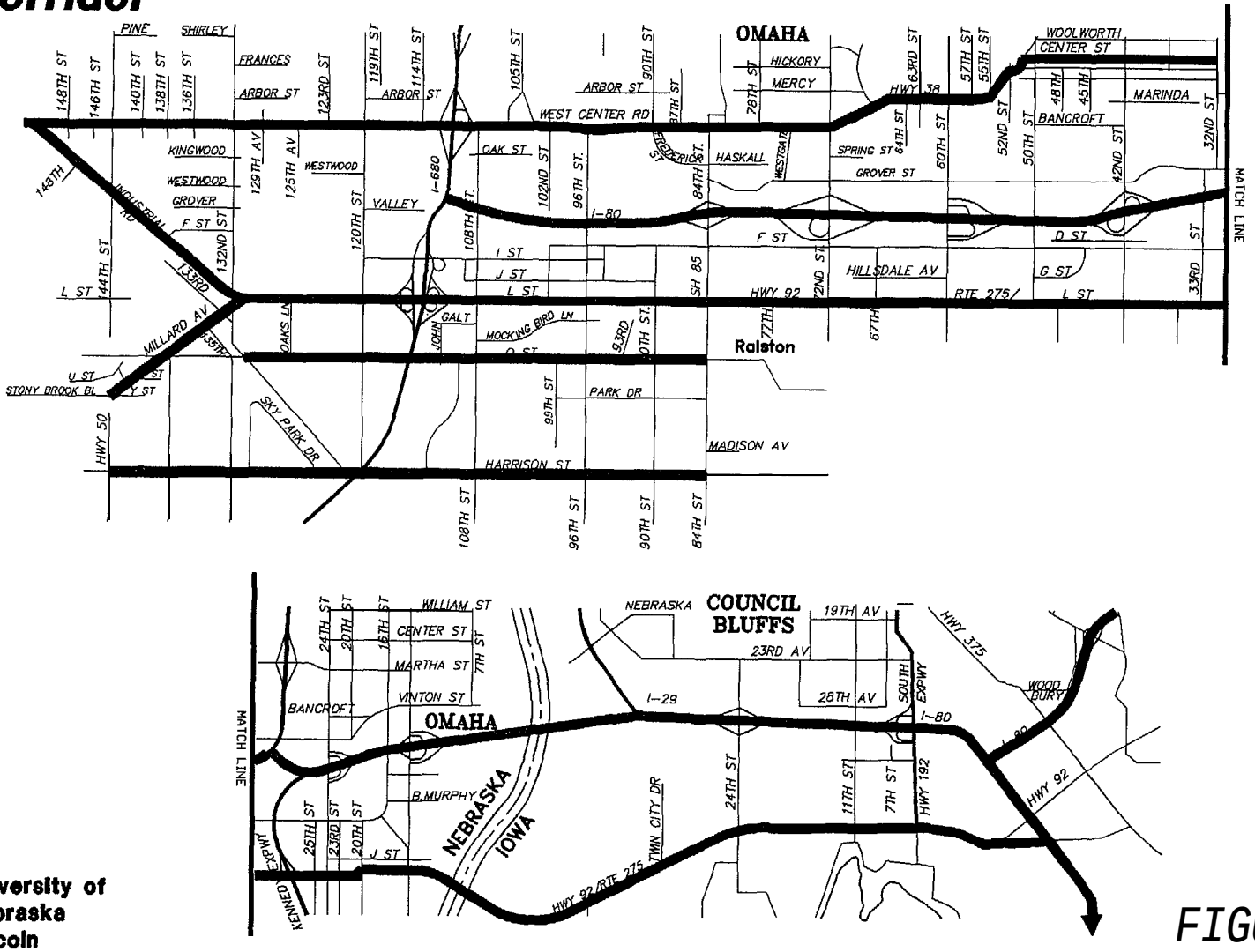
I-80 Corridor



University of Nebraska Lincoln

FIGURE 2.3

West Center Road/Center Street is a 5-lane roadway with a two-way left-turn lane (TWLTL) median between 32nd and 64th Streets and a 4-lane divided roadway between 64th Street and I-680. Average daily traffic volume on West Center Road/Center Street ranges from 15,000 to 39,000 vehicles, with the higher volumes between I-680 and I-480.

US 275/L Street is a 5-lane roadway with a TWLTL median between 42nd and 52nd Streets and a 4-lane divided roadway between 52nd and I-80. It runs east-west from 132nd Street in Omaha to Highway 192 in Council Bluffs. There are three through lanes in each direction west of I-80. US 275 is a 2-lane roadway east of the Kennedy Expressway. US 275/L Street/Highway 92 has an average daily traffic volume of about 36,000 vehicles west of I-80, from 18,000 to 29,000 between I-80 and Kennedy Expressway, and from 6,700 to 11,300 vehicles east of Kennedy Expressway.

Q Street is a 5-lane roadway between 84th and 120th Streets and a 4-lane roadway between 120th and 132nd Streets. The average daily traffic volume on Q Street ranges from 18,000 VPD east of I-80 to 28,000 VPD east of 132nd Street.

Harrison Street is a 4-lane roadway between 84th and 132nd Streets and a 2-lane roadway west of 132nd Street. The volume ranges from 13,000 to 20,000 VPD.

- ***Dodge Street Corridor,*** as shown in Figure 2.4, extends from 132nd Street on the west to I-29 in Council Bluffs on the east. The corridor serves east-west travel demand primarily on Dodge Street/West Dodge Road and I-480 from 32nd Street in Omaha to I-29 in Council Bluffs, with paralleling arterial streets being Pacific Street, Maple Street and Military Road/NW Radial.

  West Dodge Road and Dodge Street are classified as a freeway and major arterial respectively, and run with an east-west orientation. West Dodge Road west of 120th Street is currently a 6-lane roadway. West Dodge Road east of 120th Street has four through lanes with an auxiliary lane for on/off traffic. From 120th Street east, West Dodge Road is a 6-lane roadway to 78th Street. Dodge Street between 78th Street and 69th Street is a 6-lane roadway. Dodge Street is a 5-lane roadway with a reversible center lane between 30th and 69th Streets; therefore, from 69th Street to I-680, Dodge Street is basically a 6-lane divided roadway. Average daily traffic volume on West Dodge Road, west of I-680, ranges from 34,000 to 66,000 vehicles and between I-680 and 72nd Street, the volume ranges from 58,000 to 63,000 vehicles. East of 72nd Street, average daily traffic volume ranges from 35,000 to 57,000 vehicles.

  Pacific Street is a 4-lane undivided roadway between 60th and 72nd Streets; a 4-lane undivided roadway between 91st and 10lst Streets with a TWLTL between 72nd and 91st Streets; and a 4-lane divided roadway between 10lst and I-680. Average daily traffic volume on Pacific Street ranges from 20,600 to 35,800 vehicles between 132nd Street and I-680, and from 18,400 to 38,800 vehicles east of I-680.

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W. Dodge/Dodge/I-480/Broadway Corridor

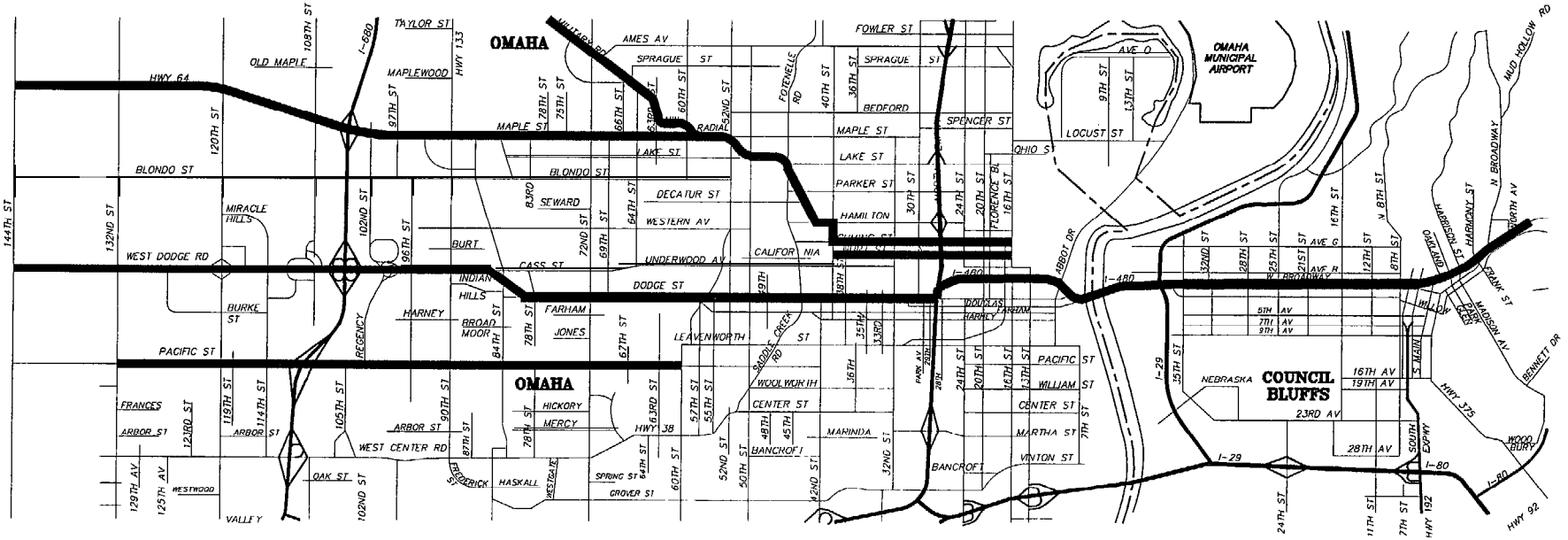

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FIGURE 2.4

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Maple Street is a 4-lane divided roadway throughout the corridor with an average daily traffic volume from 18,000 to 34,000 vehicles west of I-680, and from 17,000 to 35,000 vehicles east of I-680. NW Radial/Military Road runs with a southeast-northwest orientation and generally has 4 lanes. The daily traffic volume ranges from 20,000 to 30,000 VPD for the NW Radial and from 6,000 to 18,000 VPD along Military Road.

- ***84th Street/*** 72***nd Street Corridor*** includes 72nd Street from Highway 370 on the south to I-680 on the north, and 84th Street, south of West Center Road (Figure 2.5).

  The only continuous north-south roadway spanning the Omaha city limits is 72nd Street. This major arterial has a partial cloverleaf interchange at West Center Road, interchanges at I-80 and I-680, and a series of at-grade signalized intersections between West Center Road and I-680. There are two continuous northbound and southbound lanes along 72nd Street with various left-turn median treatments in different segments. Average daily traffic volumes on 72nd Street range from 11,000 to 29,000 vehicles south of I-80 and 10,000 to 43,000 VPD between the I-80 and I-680 interchanges.

  84th Street paralleling 72nd Street is also a major arterial with two through lanes in each direction serving north-south traffic, south of West Center Road. Average daily traffic volumes on Highway 85 range from 19,400 to 37,100 vehicles south of I-80 and 21,900 to 35,300 vehicles north of I-80.

- ***I-80/I-680 Corridor*** contains a portion of I-80 from 144th Street to the I-8011-680 interchange and a portion of I-680 from its interchange with I-80 to its interchange at Highway 133 (Figure 2.6). The corridor also includes the parallel roadways of 144th Street, 132nd Street, 120th Street, 108th Street west of I-680, and Highway 133 (90th Street) east of I-680.

  I-80 is a 4-lane facility with an average daily traffic volume of 47,300 to 74,300 vehicles. I-680 is a 4-lane facility from I-80 to its interchange at Highway 133 with an average daily traffic volume on I-680 ranging from 3 1,700 to 77,000 vehicles.

  Highway 50/144th Street is classified as a principal arterial and has 4 lanes north of Industrial Road to West Dodge Road and carries 18,000 to 20,000 VPD. North of West Dodge Road, it is a 2-lane facility and carries less than 16,000 VPD.

  120th Street is a major arterial with primarily two thru lanes in each direction. The average daily traffic volume on 120th Street ranges from 16,000 to 36,000 VPD. 108th Street is a 4-lane roadway with an average daily traffic volume of 7,900 to 12,800 vehicles.

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72nd St. Corridor

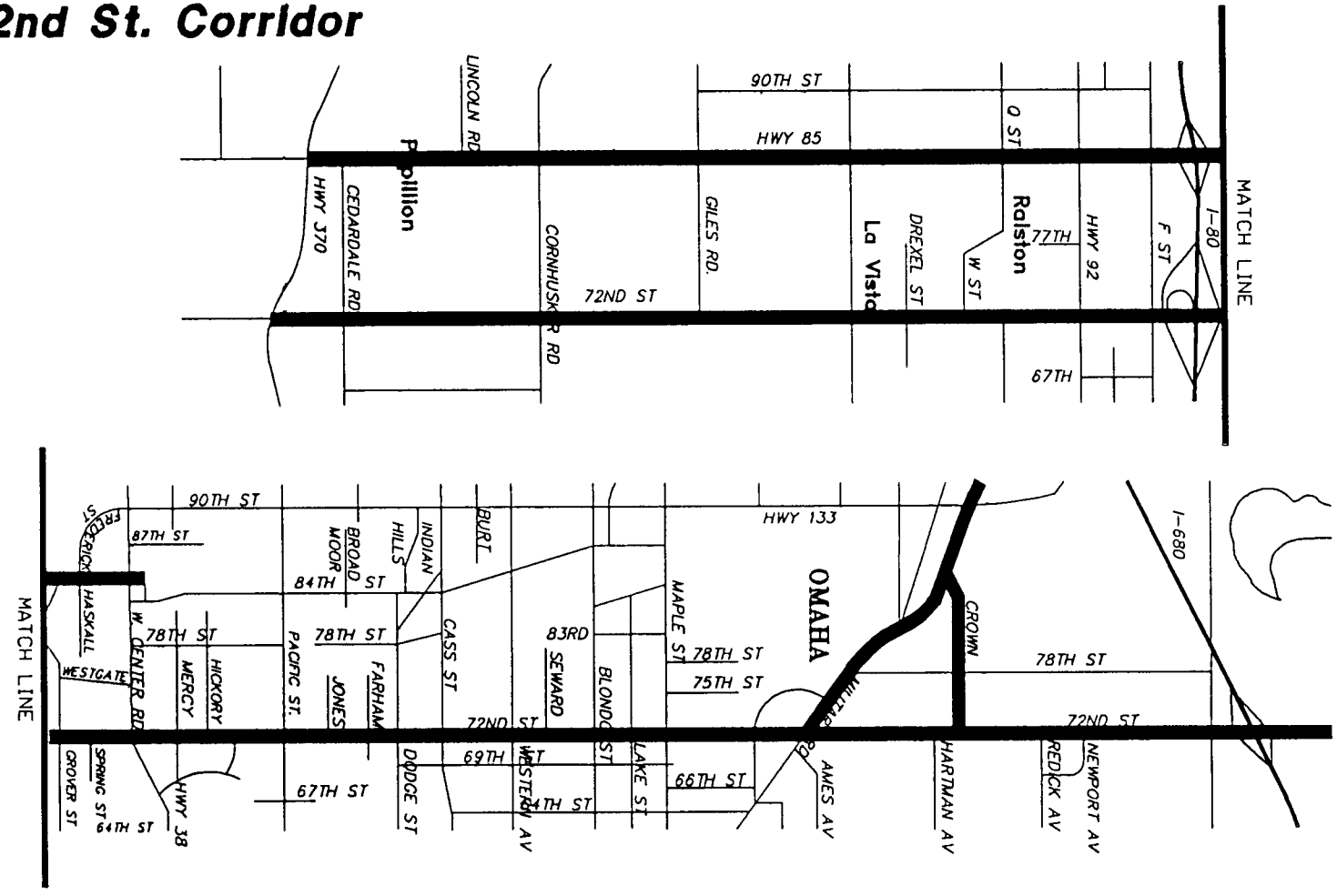

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FIGURE 2.5

OMAHA METROPOLITAN AREA ITS

NDOR
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I-680 Corridor

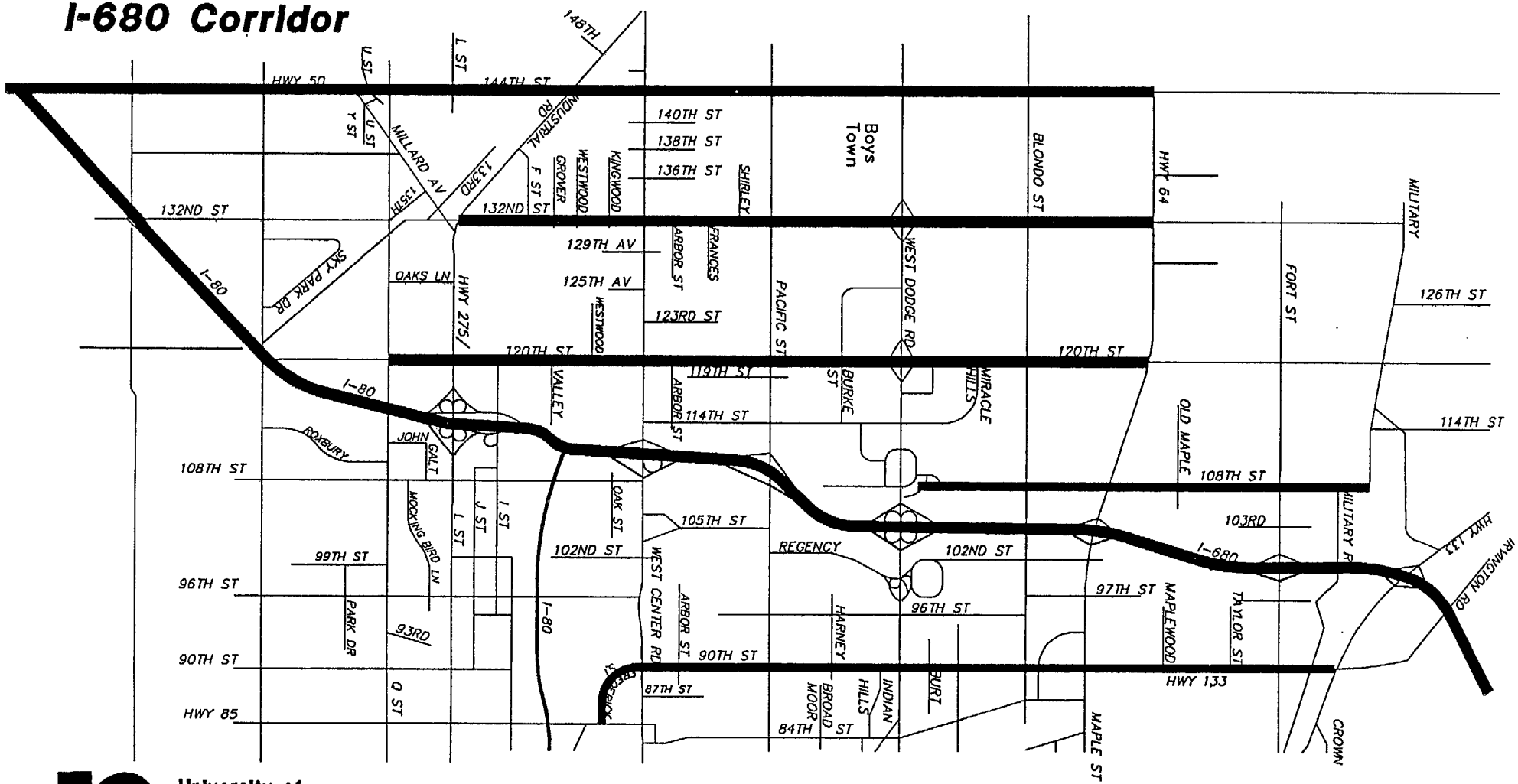

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FIGURE 2.6

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Highway 133 (90th Street) is a 4-lane roadway running north-south from West Center Road to Blair High Road with an average daily traffic volume ranging from 24,000 ***to 3*** 1,000 vehicles.

- ***Kennedy Expressway Corridor*** includes a portion of the Kennedy Expressway, I-480 and North Expressway. It also includes Fort Crook Road/Railroad Avenue/24th Street, from Capehart Road on the south to I-80 on the north, and US 75 (30th Street), between I-480 on the south and I-680 on the north (Figure 2.7). The Kennedy Expressway is a 6-lane facility which runs north-south from Capehart Road to I-80. I-480 is a 6-lane freeway with an average daily traffic volume of 31,000 to 51,000 vehicles. North Expressway is also a 6-lane facility with an average daily traffic volume of 20,000 to 80,000 vehicles.

  Fort Crook Road is a major arterial which runs parallel to Kennedy Expressway with an average daily traffic volume of 13,000 to 32,000 vehicles. US 75130th Street north of I-480, is a 4-lane roadway throughout the corridor with average daily traffic volume on 30th Street ranging from 8,000 to 20,000 vehicles.

- ***I-29 Corridor*** contains I-29 running north-south extending from I-80 on the south to I-680 on the north (Figure 2.8). The corridor runs just west of Council Bluffs, Iowa. The freeway is a 4-lane divided facility with a moderate traffic volume averaging from 15,000 vehicles, north of Council Bluffs to 27,000 vehicles in the vicinity of the city.

- ***I-680 North Corridor*** contains a portion of I-680 from its interchange at Highway 133 in Nebraska to its interchange at I-29 in Iowa (Figure 2.9). I-680 in this area has interchanges at 72nd Street, Mormon Bridge Road, and US 75 in Nebraska. The freeway is a 4-lane divided facility with an average daily traffic volume of 12,000 to 77,000 vehicles per day.

- ***Sorenson Parkway Corridor*** contains the Sorenson Parkway, from North Expressway to Highway 133, and Storz Parkway east of North Expressway to the Eppley Airfield (Figure 2.9). The Sorenson Parkway is a 4-lane facility with a current average daily traffic volume of 14,000 to 18,000 vehicles. Storz Parkway is a 4-lane facility with an average daily traffic volume of 6,000 to 15,000 vehicles.

- ***Highway 370 Corridor*** is the southern most corridor within the study area. Highway 370 connects I-80 and the newly opened Kennedy Expressway, which provides access to downtown Omaha (Figure 2.10). Highway 370 is a 4-lane facility with a current average daily traffic volume of 10,000 to 20,000 vehicles.

OMAHA METROPOLITAN AREA ITS

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Kennedy Expy. Corridor

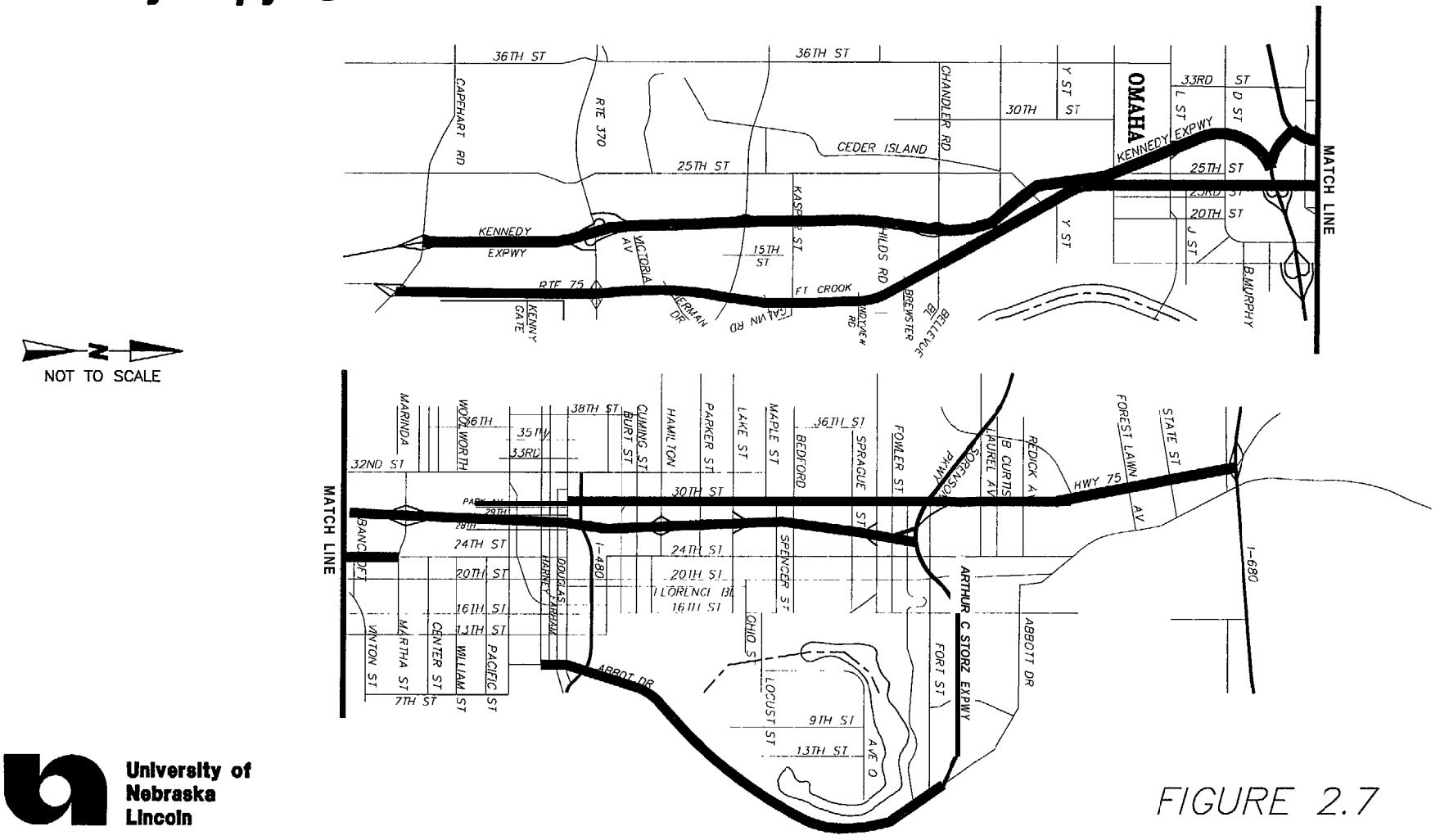

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FIGURE 2.7

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OMAHA METROPOLITAN AREA ITS

NDOR
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I-29 Corridor

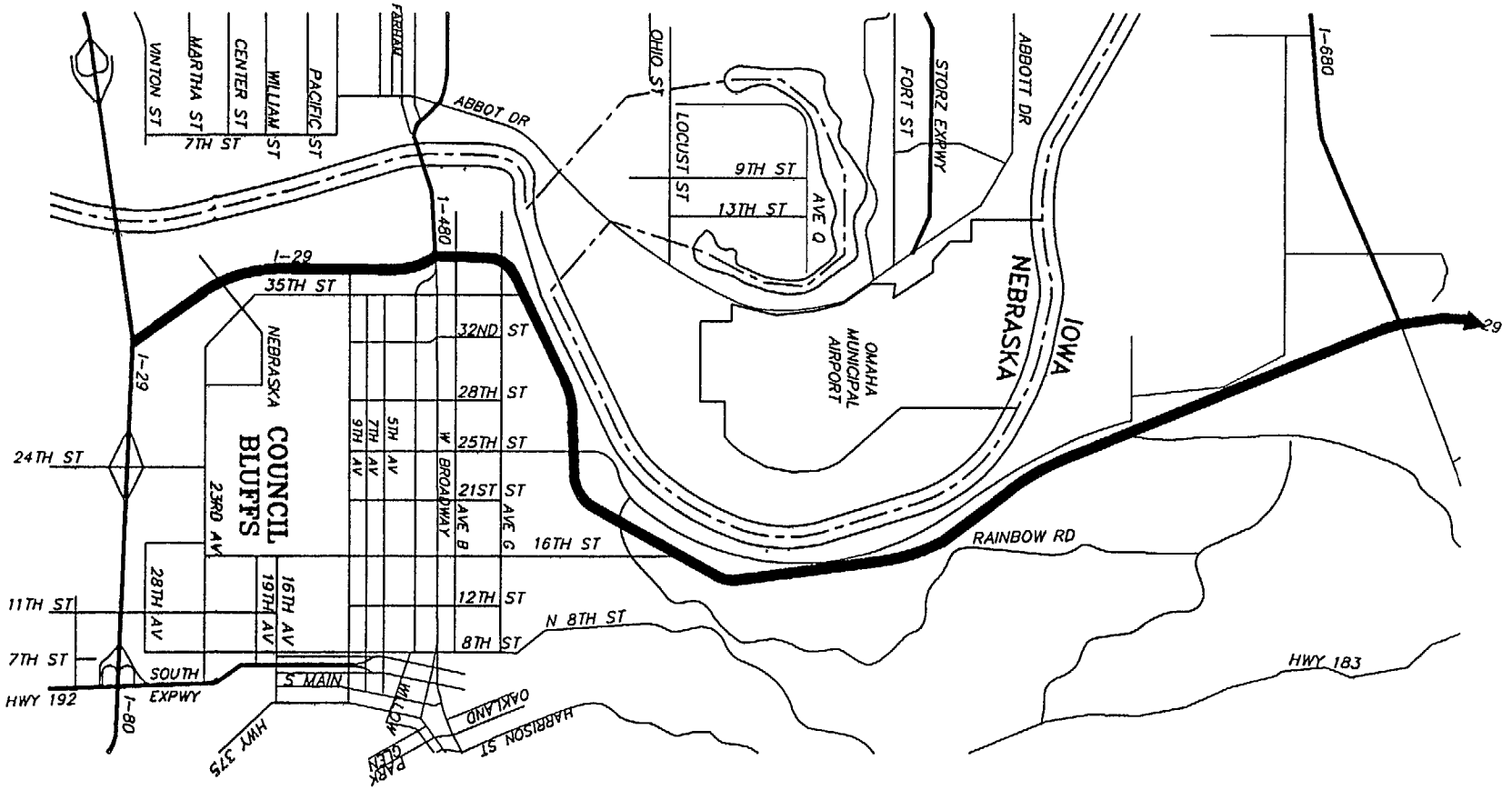

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FIGURE 2.8

OMAHA METROPOLITAN AREA ITS

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I-680 Corridor
Sorenson Pkwy. Corridor

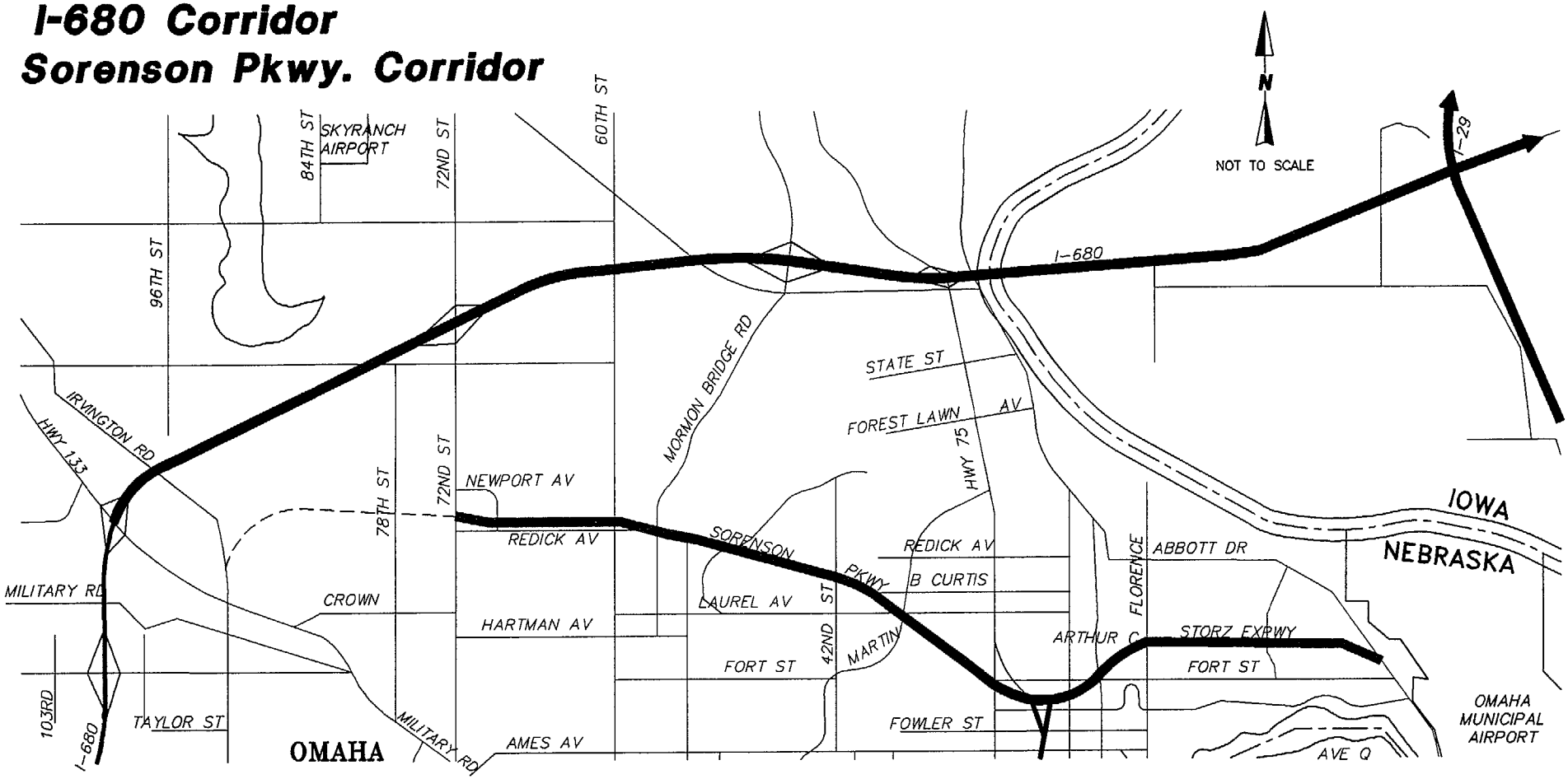

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FIGURE 2.9

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OMAHA METROPOLITAN AREA ITS

NDOR
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Highway 370 Corridor

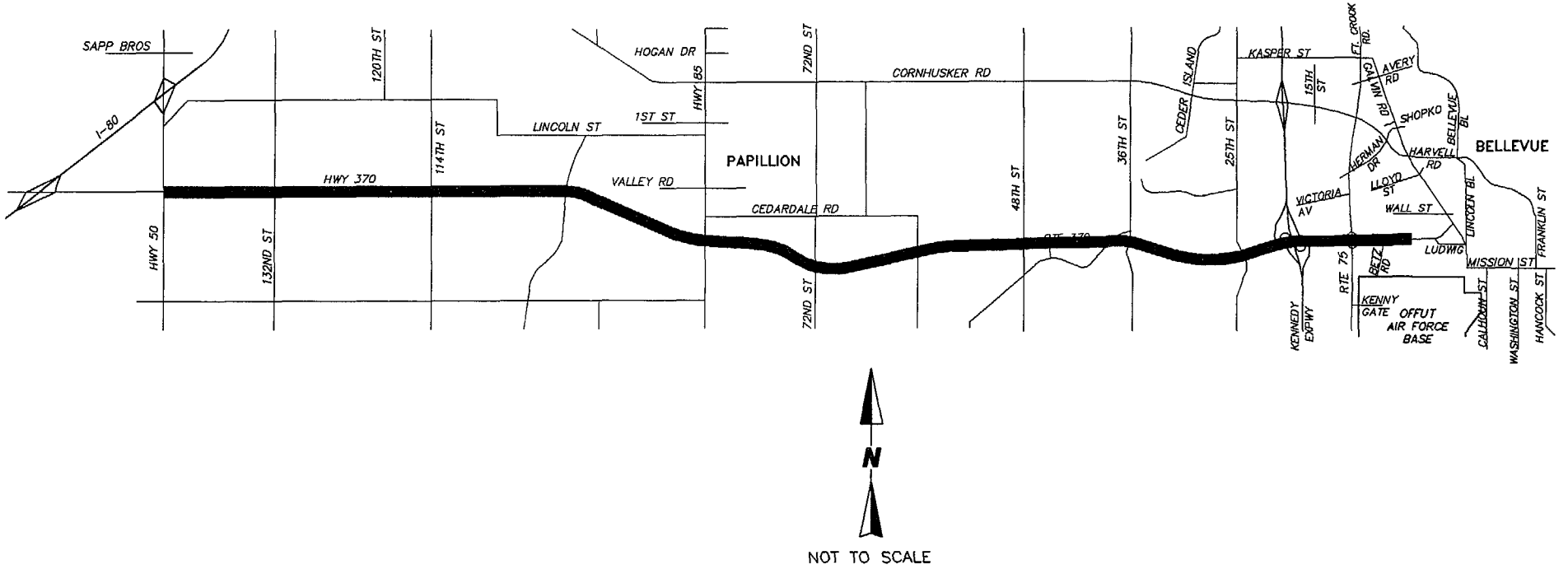

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FIGURE 2.10

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2.1.3.2 Congestion Assessment

An assessment was made of the existing traffic operations in the previously identified priority corridors. In addition, intersection congestion assessment analysis was conducted. The purpose of examining the current condition of traffic operations is to compile relevant information to be utilized for subsequent phases of the study.

Corridor Congestion Analysis

Methodology.

The Metropolitan Area Planning Agency (MAPA) produced a traffic flow map for the year 1993. This map identifies average daily traffic (ADT) flows in the Omaha and Council Bluffs metropolitan area and identifies the key traffic flow and usage patterns. This information was supplemented with the ***1993 Continuous Traffic Count Data and Traffic Characteristics on Nebraska Streets and Highways*** prepared by Nebraska Department of Roads (NDOR) and the November, 1994, 24 ***Hour Two-Way Traffic Volumes*** report from the City of Omaha. While ADT volumes by themselves do not indicate levels of congestion, they do help identify corridors which need to function in a systematic fashion to ensure basic levels of mobility into, within, and through the Omaha metropolitan area. The number of existing lanes on the priority corridors was obtained from aerial photographs of Omaha and Council Bluffs, and Douglas and Sarpy Counties. Some of this information was verified with on-site surveys.

A review was made of the traffic characteristics at the five continuous traffic count stations in the Omaha metropolitan area obtained from the NDOR report mentioned above. Based on those sample data, it was estimated that on major arterial streets, approximately 10% of the ADT volumes occur during the design hour. The design hour corresponds to the 30th highest traffic volume of the year. For freeways, the percentage of design hour traffic was estimated to be 11%. The directional distribution was estimated to be 60/40 for arterial streets and 55/45 for the freeway segments. Using a capacity of 2,000 vehicles per hour per lane for freeways and 1,600 vehicles per hour per lane for arterials, a volume/capacity ratio was obtained and used to approximate peak hour congestion levels on the corridors.

It should be noted that for arterials the assessment is based on ***through traffic*** volumes, and an appropriate estimate is made for each specific link to determine the percent green allocation. For example, a link near an intersection that crosses a similar arterial facility, a 50% green is assumed.

To enhance the congestion assessment along arterials, an intersection congestion assessment was conducted and **is** described in the next section of this report.

Three levels of service were assumed for the corridor congestion analysis as indicated below:

- Congested (volume-to-capacity ratio of 0.90 or more)
- Near congested (volume-to-capacity ratio of 0.70 to 0.89)
- Not congested (volume-to-capacity ratio of less than 0.70)

Table 2.1 shows the result of this analysis for links along each of the priority corridors. This table also shows the two-way ADTs and total number of lanes on the roadway sections used for the analysis. A more detailed illustration of the analysis is provided in Appendix A- 1.

Congestion Levels.

The analysis indicates various congestion levels along several of the corridors. Inadequate capacity for the high demand seem to cause this congestion. This lack of capacity has resulted in poor levels of service, characterized by congestion and low travel speeds during peak periods. Areas of congestion are shown on Figure 2.11. Corridors with notable congestion include:

- I-680.

"Near congested" condition is prevalent along I-680 from around Highway 64/Maple Street to US 275/ L Street. This section includes both the West Dodge Street interchange and the I-80 interchange.

Table 2.1 Principal Corridors Congestion Assessment

Corridor	From	To	ADT	No.	LOS
I-29	I-80	I-480	26,900	4	Not Congested
	I-480	25th St.	15,800	4	Not Congested
	25th St.	I-680	14,400	4	Not Congested
I-29	I-80	Hwy 92	19,200	4	Not Congested
I-80	I-680	SH 85/84th St.	92,200	6	Congested
	SH 85/84th St.	72nd St.	104,000	6	Congested
	72nd St.	60th St.	113,800	6	Congested
	60th St.	42nd St.	121,000	6	Congested
	42nd St.	I-480	126,400	10	Near Congested
	I-480	13th St.	51,000	4	Near Congested
	13th St.	I-29	44,200	4	Not Congested
	I-29	24th St.	51,200	4	Near Congested
	24th St.	Hwy 192	49,100	4	Near Congested
	Hwy 192	I-29	40,600	4	Not Congested
	I-29	Madison Ave.	25,900	4	Not Congested
I-680	Hwy 133	72nd St.	24,500	4	Not Congested
	72nd St.	Mormon Bridge Rd.	21,500	4	Not Congested
	Mormon Bridge Rd.	Hwy 75	19,800	4	Not Congested
	Hwy 75	I-29	12,600	4	Not Congested
I-680	Hwy 133	Military Rd.	31,700	4	Not Congested
	Military Rd.	Hwy 64/Maple St.	39,400	4	Not Congested
	Hwy 64/Maple St.	W. Dodge Rd.	55,300	4	Near Congested
	W. Dodge Rd.	Pacific St.	77,400	4	Congested
	Pacific St.	W. Center Rd.	76,700	4	Congested
	W. Center Rd.	I-80	77,100	6	Near Congested
	I-80	Hwy 275/L St.	74,300	6	Near Congested
	Hwy 275/L St.	Q St.	47,300	4	Near Congested
I-480	Abbot Dr.	I-29	51,200	4	Near Congested
	20th St.	Abbot Dr.	31,700	4	Not Congested
	North Expressway	20th St.	51,500	4	Near Congested
	North Expwy	Martha St.	78,800	6	Near Congested
	Martha St.	I-80	76,900	10	Not Congested
	I-80	L St.	50,100	6	Not Congested
Storz Expwy.	Abbot Dr.	Florence Blvd.	6,100	4	Not Congested

Table 2.1 Principal Corridors Congestion Assessment (continued)

Corridor	From	To	ADT	No.	LOS
	Florence Blvd.	SR-75	14,800	4	Not Congested
Sorenson Pkwy.	SR-75	Martin Ave.	18,300	4	Not Congested
	Martin Ave.	42nd St.	13,600	4	Not Congested
	42nd St.	60th St.	13,900	4	Not Congested
North Expwy.	Sorenson Pkwy	Lake St.	35,900	6	Not Congested
	Lake St.	Hamilton St.	39,600	6	Not Congested
	Hamilton St.	I-480	19,800	6	Not Congested
Kennedy Expwy.	I-80	L St.	28,000	6	Not Congested
	L St.	Capehart Rd.	28,000	4	Not Congested
Hwy 64/Maple St.	132nd St.	120th St.	18,300	4	Not Congested
	120th St.	I-680	39,500	4	Congested
	I-680	Hwy 133/90th St.	39,400	4	Congested
	Hwy 133/90th St.	83rd St.	27,300	4	Near Congested
	83rd St.	72nd St.	28,500	4	Congested
	72nd St.	60th St.	16,800	2	Congested
West Dodge Rd.	144th St.	132nd St.	28,700	4	Not Congested
	132nd St.	120th St.	34,300	6	Not Congested
	120th St.	I-680	65,600	6	Congested
	I-680	Hwy 133/90th St.	59,100	6	Congested
	Hwy 133/90th St.	87th St.	62,000	6	Congested
Dodge St.	87th St.	Beverly Dr.	57,600	6	Congested
	Beverly Dr.	72nd St.	57,900	6	Congested
	72nd St.	Happy Hollow Rd.	57,000	5 (3)	Congested
	Happy Hollow Rd.	52nd St.	57,900	5 (3)	Congested
	52nd St.	Saddle Creek Rd.	42,900	5 (3)	Near Congested
	Saddle Creek Rd.	North Expressway	35,200	5 (3)	Not Congested
	North Expressway	20th St.	18,900	4	Not Congested
W. Broadway/SR-6	I-29	32nd St.	22,000	4	Not Congested
	32nd St.	28th St.	22,700	4	Not Congested
	28th St.	25th St.	24,000	4	Not Congested
	25th St.	21th St.	25,700	4	Not Congested
	21th St.	16th St/Rt. 192	30,300	4	Near Congested
	16th St/Rt. 192	8th St.	38,000	4	Congested
	8th St.	Main St.	22,300	4	Not Congested

Table 2.1 Principal Corridors Congestion Assessment (continued)

Corridor	From	To	ADT	No.	LOS
	Main St.	1st St.	13,500	4	Not Congested
	1st St.	Pierce St.	19,300	4	Not Congested
Kanesville Rd.	8th St.	Main St.	20,000	4	Not Congested
	Main St.	1st St.	23,200	4	Not Congested
	1st St.	Broadway	19,300	4	Not Congested
W. Center Rd.	144th Ave.	132nd St	30,000	4	Near Congested
	132nd St.	120th St	35,000	4	Congested
	120th St	I-680	39,210	4	Congested
	I-680	102nd St.	38,282	4	Congested
	102nd St.	90th St.	27,028	4	Near Congested
	90th St.	72nd St.	26,600	4	Near Congested
	72nd St.	60th St.	22,800	4	Not Congested
	60th St.	50th St.	38,554	4	Congested
Center St.	50th St.	42nd St.	26,800	4	Near Congested
	42nd St.	32nd St.	15,680	4	Not Congested
Hwy 275/L St.	132nd St.	I-680	39,890	4	Congested
	I-680	96th St.	26,228	6	Not Congested
	96th St.	SH 85/84th St.	27,920	4	Near Congested
	SH 85/84th St.	72nd St.	29,050	4	Near Congested
	72nd St.	60th St.	26,700	4	Near Congested
	60th St.	42nd St.	32,500	4	Congested
	42nd St.	Kennedy Expy.	31,800	4	Congested
	Kennedy Expy.	20th St.	13,200	4	Not Congested
Hwy 92/Rt 275	20th St.	13th St.	11,300	2	Not Congested
	13th St.	24th St.	6,700	2	Not Congested
	24th St.	Hwy 192	9,100	2	Not Congested
	Hwy 192	I-29	6,700	2	Not Congested
Q St.	132nd St.	I-680	28,334	4	Near Congested
	I-680	108th St.	17,716	4	Not Congested
	108th St.	96th St.	18,790	4	Not Congested
Harrison St.	144th St.	132nd St.	13,700	2	Not Congested
	132nd St.	72nd St.	15,800	4	Not Congested
	72nd St.	Railroad Ave.	10,600	2	Not Congested

Table 2.1 Principal Corridors Congestion Assessment (continued)

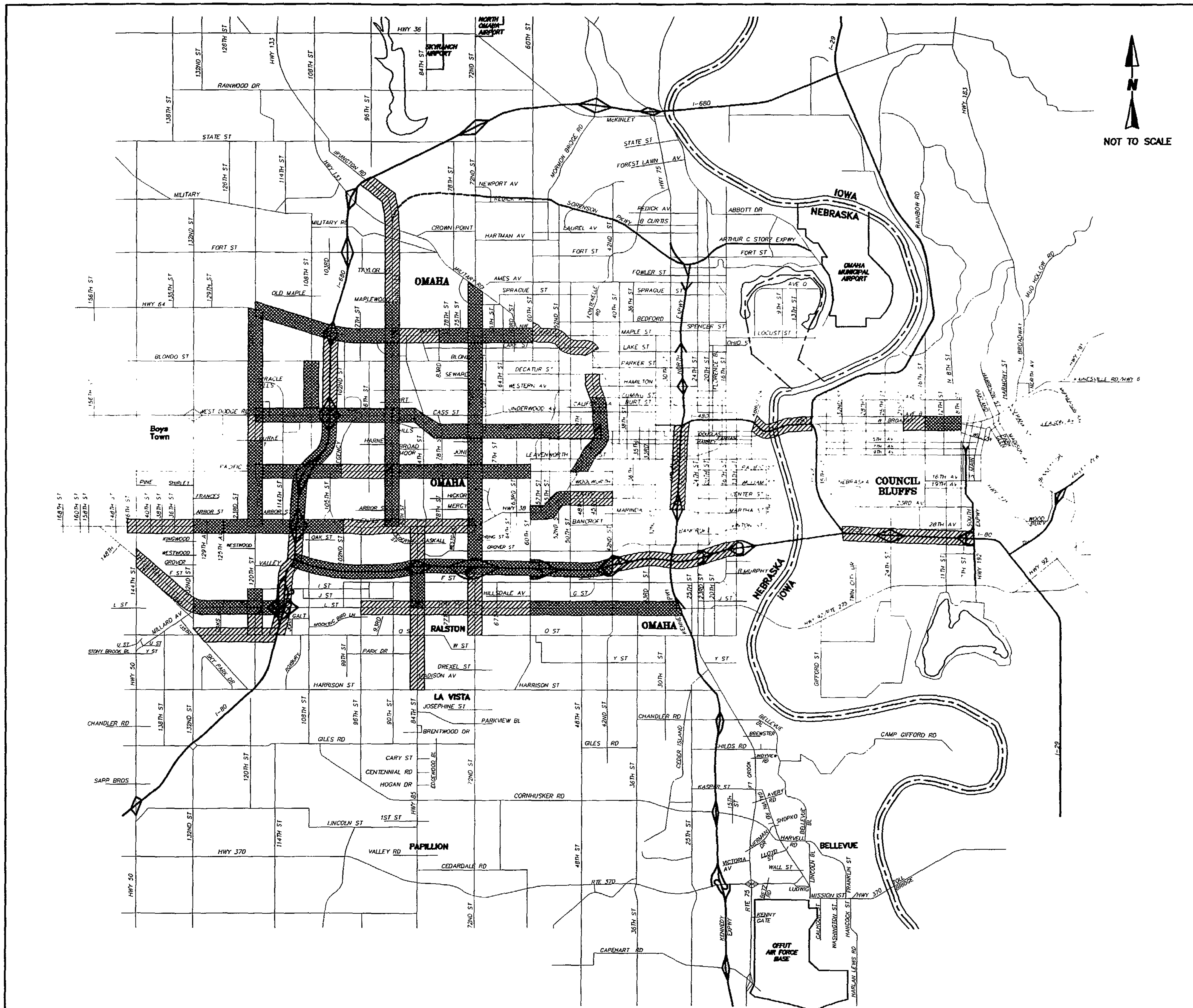
Corridor	From	To	ADT	No.	LOS
Cornhusker Rd.	Giles Rd.	84th St.	3,500	2	Not Congested
	84th St.	25th St.	13,900	2	Not Congested
	25th St.	Ft. Crook Rd.	17,300	4	Not Congested
Highway 370	144th St.	84th St.	8,900	2	Not Congested
	84th St.	36th St.	13,400	2	Not Congested
	36th St.	Kennedy Expwy.	19,900	4	Not Congested
Industrial Rd.	Hwy 275/L St.	144th St.	24,000	4	Near Congested
	144th St.	West Center Rd.	18,500	4	Not Congested
Millard Ave.	Hwy 275/L St.	Hwy 50/144th St.	19,200	4	Not Congested
108th St.	Military Rd.	Fort St.	7,938	4	Not Congested
	Fort St.	Maple St.	9,550	4	Not Congested
	Maple St.	Blondo St.	11,838	4	Not Congested
	Blondo St.	W. Dodge Rd.	12,880	2	Congested
Pacific St.	132nd St.	120th St.	20,600	4	Not Congested
	120th St.	I-680	38,800	4	Congested
	I-680	Regency	38,800	4	Congested
	Regency	Hwy 133/90th St.	28,000	4	Near Congested
	Hwy 133/90th St.	72nd St.	29,400	4	Congested
	72nd St.	63rd St.	25,500	4	Congested
	63rd St.	60th St.	18,400	2	Congested
Cuming St.	40th St.	North Expwy	30,000	6	Not Congested
	North Expwy	16th St.	3,200	3	Not Congested
Burt. St.	North Expwy	16th St.	8,000	3	Not Congested
Hwy 50/144th St.	Hwy 370	I-80	13,800	2	Not Congested
	I-80	Sapp Bros.	14,700	4	Not Congested
	Sapp Bros.	Industrial Rd.	13,800	2	Not Congested
	Industrial Rd.	West Dodge Rd.	18,400	4	Not Congested
	West Dodge Rd.	West Maple Rd.	7,200	2	Not Congested
132nd St.	Hwy 64/Maple St.	Blondo St.	10,200	4	Not Congested
	Blondo St.	W. Dodge Rd.	15,000	4	Not Congested
	W. Dodge Rd.	W. Center Rd.	17,400	4	Not Congested
	W. Center Rd.	Hwy 275/L St.	16,800	4	Not Congested

Table 2.1 Principal Corridors Congestion Assessment (continued)

Corridor	From	To	ADT	No.	LOS
120th St.	Hwy 64/Maple St.	Blondo St.	16,372	4	Congested
	Blondo St.	W. Dodge Rd.	39,992	4	Congested
	W. Dodge Rd.	Burke St.	29,964	4	Near Congested
	Burke St.	Pacific St.	24,172	4	Congested
	Pacific St.	W. Center Rd.	22,226	4	Congested
	W. Center Rd.	Valley	16,384	4	Not Congested
	Valley	I St.	15,742	4	Not Congested
	I St.	Hwy 275/L St.	20,874	4	Congested
	Hwy 275/L St.	Q St.	16,510	4	Near Congested
Hwy 133/90th St.	I-680	Fort St.	24,471	4	Near Congested
	Fort St.	Maplewood	26,538	4	Near Congested
	Maplewood	Maple St.	31,354	4	Congested
	Blondo St.	W. Dodge Rd.	24,794	4	Congested
	W. Dodge Rd.	Pacific St.	27,272	4	Congested
	Pacific St.	W. Center Rd.	24,270	4	Congested
72nd St.	I-680	Redick Ave.	10,126	4	Not Congested
	Redick Ave.	Hartman Ave.	16,168	4	Not Congested
	Hartman Ave.	Military Rd.	16,106	4	Not Congested
	Military Rd.	Maple St.	30,088	4	Congested
	Maple St.	Cass St.	39,481	4	Congested
	Cass St.	Pacific St.	39,138	4	Congested
	Pacific St.	Center St./Hwy 38	39,960	4	Congested
	Center St./Hwy 38	I-80	43,358	4	Congested
	I-80	Q St.	28,728	4	Near Congested
	Q St.	Harrison St.	26,128	4	Not Congested
	Harrison St.	Giles Rd.	18,202	4	Not Congested
	Giles Rd.	Cornhusker Rd.	20,800	4	Not Congested
	Cornhusker Rd.	Highway 370	10,900	2	Not Congested
Hwy 85	W. Center Rd.	I-80	23,268	4	Near Congested
	I-80	L St./Hwy 92	38,078	4	Congested
	L St./Hwy 92	Harrison St.	26,128	4	Near Congested
	Harrison St.	Giles Rd.	18,202	4	Not Congested
	Giles Rd.	Cornhusker Rd.	20,800	4	Not Congested
Saddle Creek Rd.	NW Radial	Decatur St.	29,100	6	Not Congested
	Decatur St.	Cuming St.	**35,400**	**6**	Near Congested
	Cuming St.	Dodge St.	**28,500**	**4**	Congested

Table 2.1 Principal Corridors Congestion Assessment (continued)

Corridor	From	To	ADT	No.	LOS
	Dodge St.	Pacific St.	24,700	4	Congested
30th St.	I-680	State St.	16,892	4	Not Congested
	State St.	Redick Ave.	17,028	4	Not Congested
	Redick Ave.	Sorenson Pkwy.	19,596	4	Not Congested
	Sorenson Pkwy.	Bedford St.	9,218	4	Not Congested
	Bedford St.	Lake St.	11,394	4	Not Congested
	Lake St.	Cuming St.	8,458	4	Not Congested
	Cuming St.	I-480	11,020	4	Not Congested
Military Rd.	90th St.	72nd St.	15,000	4	Not Congested
	72nd St.	60th St.	20,900	4	Not Congested
NW Radial	60th St.	52nd St.	29,600	4	Near Congested
	52nd St.	Fontenelle Rd.	29,600	4	Near Congested
	Fontenelle Rd.	Hamilton St.	6,600	6	Not Congested
Cass St.	87th St.	72nd St.	12,700	4	Not Congested
	72nd St.	Happy Hollow Rd.	13,400	4	Not Congested
SR-6	Broadway	Rt. 191	12,400	4	Not Congested
Abbot Dr.	Storz Expwy	Locust St.	11,500	4	Not Congested
	Locust St.	Harney St.	15,800	4	Not Congested



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Existing Conditions
Congested Corridors

LEGEND

- CONGESTED CORRIDOR
- NEAR-CONGESTED CORRIDOR

FIGURE 2.11

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- ***West Dodge Road/Dodge Street/I-480/Broadway.***

This corridor has been the subject of several studies in the past few years. "Congested" conditions are experienced along West Dodge Road, from 120th Street east to 87th Street, where Dodge Street continues to the east. "Congested" condition continues on Dodge Street from 87th Street to 52nd Street. Congestion is also found on I-480 from the North Expressway east to I-29.

- ***I-80.***

This major east-west interstate route runs through the urban Omaha area. Congestion levels on I-80 appear to be some of the highest in the study area, particularly on the segment from I-680 to I-480. This section of I-80 runs through a major portion of the urban Omaha area. "Near congested" levels are found near the I-29 interchange in Council Bluffs.

- ***Other Corridors.***

Other locations exhibiting "Near congested" condition include Highway 275/L Street near the I-680 interchange and near the Kennedy Expressway interchange. Other "Congested" corridors include portions of the W. Center Road, 72nd Street and Maple Street. "Near congested" condition is also found on the North Expressway near the I-480 interchange.

Intersection Congestion Analysis

Intersection congestion assessment analysis was performed at selected intersections in the Omaha metropolitan area. The analysis was performed at the 100 highest volume intersections in the metropolitan area identified by MAPA based on the total approach volumes at those intersections. The directional approach volumes (Average Daily Traffic) used by MAPA were obtained from the local, state and federal agencies and were seasonally adjusted for the Omaha metropolitan area. The 100 highest volume intersections have been identified based on the average number of vehicles passing through the intersection. The intersections must have an ADT of at least 2,000 vehicles or more for a minimum of three approaches in order to qualify as a high volume intersection.

The locations of the 100 intersections analyzed were reviewed to identify the intersection characteristics. As anticipated, the intersections of major arterials along the priority corridors were among those studied. Furthermore, a vast majority (98 out of 100) of the locations were signalized intersections. In addition, 92 out of the 100 intersections were located along the priority corridors, whereas the remaining 8 intersections are isolated intersections located throughout the metropolitan area.

Methodology.

The congestion assessment at the intersections involved a "planning level" calculation of the volume-to-capacity ratios. The calculation of volume-to-capacity ratios was based on the following assumptions/calculations:

- As described earlier, the design hour traffic for arterial streets is 10% of the ADT.

- Based on previous discussion, the directional distribution was estimated to be 60/40 for arterial streets.

- Signalized intersection capacity is 1,600 vehicles per hour of green per lane.

- The first step in the analysis involved determination of the highest ADT among the approaches to the intersection for each intersecting street. The highest ADT for each street is then multiplied by the directional distribution factor (0.60) and the design hour factor (0.10) and divided by the number of travel lanes for that direction to obtain the design hourly volume per lane for each intersecting street. The sum of the design hourly volumes of the intersecting streets results in the design hourly critical volume per lane for the intersection for a pro rata green time to cycle length (G/C) ratio. The design hourly critical intersection volume per lane is then divided by the intersection's lane capacity (1,600) to estimate the volume/capacity ratio. The volume-to-capacity ratio was used to approximate peak hour congestion levels at the intersections.

Three levels of service in terms of volume-to-capacity (v/c) ratio were assumed as indicated below :

- Congested (v/c ratio of 0.90 or more)
- Near congested (v/c ratio of 0.70 to 0.89)
- Not congested (v/c ratio of less than 0.70)

Table 2.2 shows the result of this analysis for the top 100 intersections in the Omaha metropolitan area. This table illustrates the ADTs by approach and the calculated intersection congestion level. Figure 2.12 illustrates the locations of intersections calculated to be experiencing congested and "near congested" conditions.

In addition, the City of Omaha has prepared level of service analysis at numerous intersections throughout the City. The V/C ratios at those intersections are included as Appendix A-9 of this report.

Table 2.2 Intersection Congestion Assessment

1992 Rank	Intersection Location		Leg Counts (x 100)				LOS
			N	S	E	W	
1	90th St.	W. Dodge Rd.	288	285	620	592	Congested
2	72nd St.	Dodge St.	294	365	516	518	Congested
3	114th St.	W. Dodge Rd.	231	204	655	411	Congested
4	120th St.	W. Center Rd.	277	229	419	487	Congested
5	84th St.	L St.	371	327	311	292	Congested
6	72nd St.	Pacific St.	387	353	255	285	Congested
7	132nd St.	W. Center Rd.	187	245	446	391	Congested
8	76th St.	Dodge St.	95	13	579	574	Congested
9	86th St. (Cass)	W. Dodge Rd.	127	12	498	620	Congested
10	84th St.	W. Dodge Rd.	105	143	506	498	Congested
11	74th St.	Dodge St.	84	57	518	579	Near
12	78th St.	Dodge St.	60	95	574	506	Near
13	120th St.	L St.	184	244	418	361	Congested
14	93rd St.	W. Dodge Rd.	65	2	592	542	Near
15	60th St.	Dodge St.	24	74	573	510	Congested
16	96th St.	W. Dodge Rd.	34	15	542	557	Near
17	132nd St.	Industrial Rd.	251	290	361	243	Congested
18	Dodge St.	Farnam St.	0	124	442	573	Congested
19	Dodge St.	W. Dodge Rd.	15	60	556	506	Near
20	114th St.	W. Center Rd.	113	92	482	439	Congested
21	72nd St.	Maple St.	298	314	211	292	Congested
22	42nd St.	L St.	301	153	335	325	Congested
23	67th St.	Dodge St.	0	81	510	514	Congested
24	90th St.	Pacific St.	261	247	315	280	Congested
25	90th St.	Maple St.	271	256	299	273	Congested
26	84th St.	F St.	463	371	76	171	Congested
27	69th St.	Dodge St.	51	0	514	516	Near

Table 2.2 Intersection Congestion Assessment (continued)

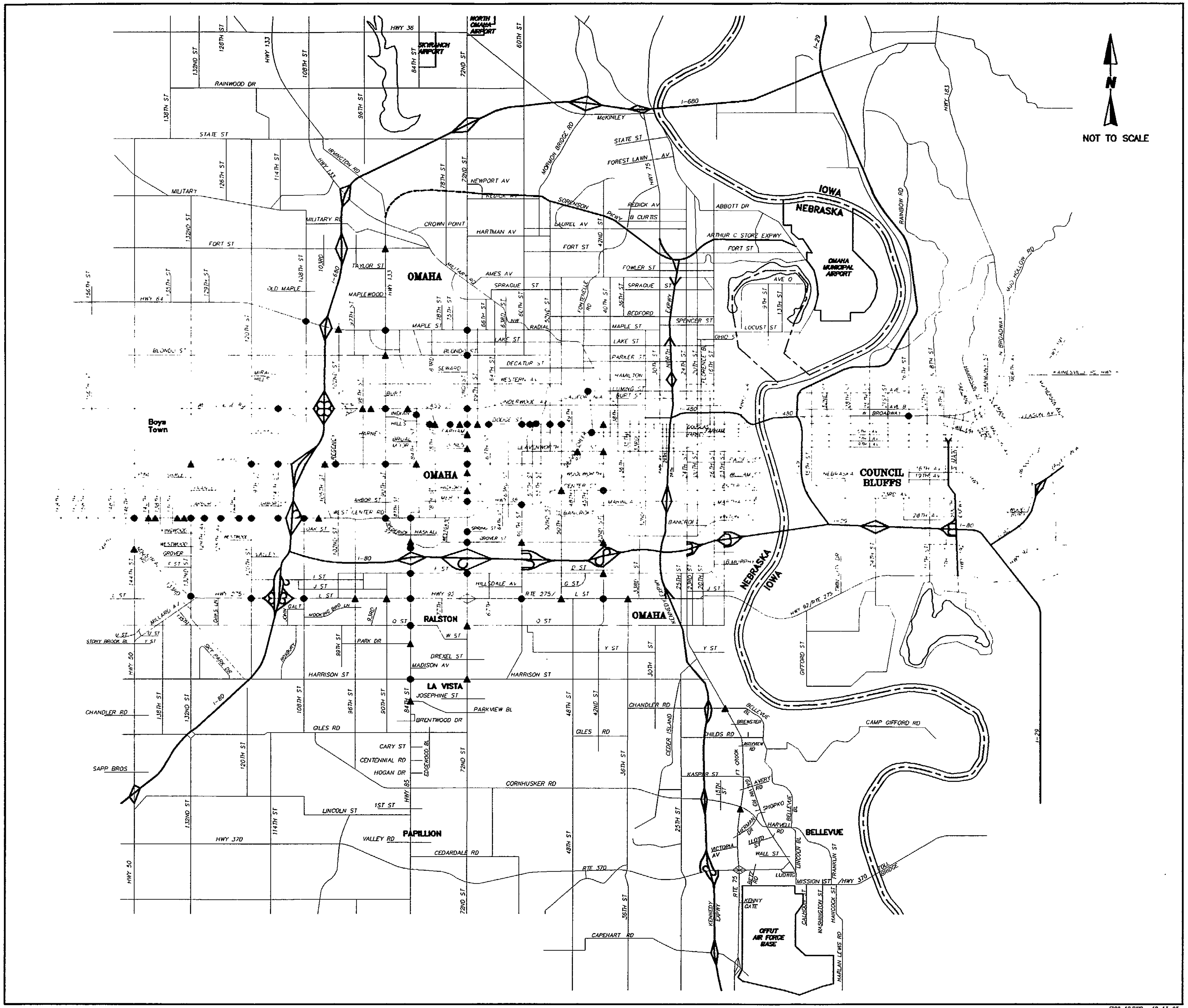
Rank	Intersection Location		Leg Counts 100				LOS
			N	S	E	W	
28	72nd St.	Grover St.	433	470	113	60	Congested
29	122nd Ct.	W. Center Rd.	49	66	487	474	Congested
30	120th St.	Pacific St.	237	240	320	265	Congested
31	72nd St.	Blondo St.	310	319	183	236	Congested
32	72nd St.	Mercy Rd.	396	411	91	139	Congested
33	108th St.	L St.	145	266	275	335	Congested
34	50th St.	Dodge St.	74	72	429	439	Congested
35	Happy Hollow Blvd	Dodge St.	71	57	443	443	Congested
36	52nd St.	Dodge St.	67	60	439	443	Congested
37	129th Ave.	W. Center Rd.	45	42	460	446	Congested
38	125th Ave.	W. Center Rd.	0	45	474	460	Congested
39	NW Radial Hwy.	Cuming St.	354	275	279	63	Congested
40	108th St.	W. Center Rd.	36	187	360	380	Congested
41	72nd St.	Css St.	310	294	152	205	Congested
42	108th St.	W. Maple Rd.	193	144	343	280	Congested
43	90th St.	W. Center Rd.	252	108	281	300	Congested
44	Regency Pkwy.	Pacific St.	194	71	287	389	Congested
45	84th St.	Harrison St.	274	325	166	172	Congested
46	144th St.	W. Center Rd.	230	197	283	225	Congested
47	42nd St.	Dodge St.	33	75	398	425	Near
48	84th St.	W. Center Rd.	79	219	352	281	Congested
49	60th St.	L St.	217	121	303	285	Congested
50	72nd St.	F St.	410	390	44	77	Congested
51	132nd St.	W. Dodge Rd.	134	151	343	290	Near
52	72nd St.	Spring St.	438	428	46	1	Congested
53	46th St.	Dodge St.	25	25	429	429	Not
54	114th St.	Pacific St.	169	92	358	288	Congested
55	Saddle Creek Rd.	Leavenworth St.	247	236	214	208	Near

Table 2.2 Intersection Congestion Assessment (continued)

1992 Rank	Intersection	Location	Leg Counts (x 100) N	S	E	W	LOS
56	40th St.	Dodge St.	67	75	360	398	Not
57	90th St.	Blondo St.	243	237	232	184	Near
58	Saddle Creek Rd.	Farnam St.	271	247	224	150	Congested
59	84th St.	Q St.	327	307	79	175	Congested
60	42nd St.	Leavenworth St.	185	219	252	231	Near
61	133rd St.	W. Center Rd.	50	53	391	384	Near
62	60th St.	Center St.	107	205	281	277	Congested
63	96th St.	L St.	126	167	294	281	Near
64	16th St. (CB)	W. Broadway	144	68	350	303	Congested
65	44th St.	Dodge St.	4	26	408	425	Not
66	Fort Crook Rd.	Cornhusker Rd.	257	259	159	187	Near
67	102nd St.	W. Maple Rd.	43	93	354	367	Near
68	72nd St.	Jones St.	385	387	29	54	Near
69	42nd St.	F St.	383	301	73	76	Near
70	84th St.	Pacific St.	139	90	294	302	Near
71	105th St.	Pacific St.	11	75	389	342	Near
72	60th St.	Grover St.	247	318	100	151	Near
73	134th Ave.	W. Center Rd.	31	21	384	377	Near
74	144th St.	Industrial Rd.	185	187	257	180	Near
75	140th St.	W. Center Rd.	95	59	371	283	Near
76	72nd St.	Harrison St.	286	241	127	146	Near
77	72nd St.	Farnam St.	365	385	8	40	Near
78	84th St.	Papillion Pkwy.	353	353	20	70	Near
79	139th St.	W. Center Rd.	16	31	377	371	Near
80	42nd St.	Center St.	219	252	151	171	Near
81	72nd St.	Hickory St.	353	396	10	29	Near
82	33rd St.	Dodge St.	39	43	352	354	Not
83	72nd St.	Q St.	350	320	80	33	Near

Table 2.2 Intersection Congestion Assessment (continued)

1992 Rank	Intersection Location		Leg Counts (x 100)				LOS
			N	S	E	W	
84	42nd St.	Grover St.	296	355	69	61	Near
85	Fort Crook Rd.	Chandler Rd.	386	323	7	64	Near
86	144th St.	W. Dodge Rd.	116	148	287	227	Not
87	90th St.	Fort St.	137	275	176	185	Near
88	84th St.	Grover St.	353	353	59	2	Near
89	35th Ave.	Dodge St.	15	38	354	357	Not
90	50th St.	Center St.	122	124	265	252	Near
91	105th St.	W. Center Rd.	60	0	340	360	Near
92	50th St.	L St.	149	7	315	286	Near
93	38th St.	Dodge St.	20	17	357	360	Not
94	72nd St.	Woolworth Ave.	353	353	21	19	Near
95	84th St.	Park Dr.	307	301	30	107	Near
96	84th St.	Parkview Blvd.	325	283	81	56	Near
97	36th St.	L St.	1	92	308	335	Near
98	90th St.	L St.	89	60	292	294	Near
99	132nd St.	Pacific St.	162	207	206	157	Near
100	60th St.	Ames Ave.	131	124	239	238	Not



OMAHA METROPOLITAN AREA ITS

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Existing Conditions
Intersection Congestion Assessment

LEGEND

- ● CONGESTED INTERSECTION
- ▲ NEAR CONGESTED INTERSECTION

FIGURE 2.12

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NEBRASKA MOTOR CARRIERS ASSOCIATION

2.1.4 Traffic Safety Assessment.

There were 15,527 accidents at intersections within the Omaha metropolitan area during 1993, resulting in 32 fatalities. Table 2.3 lists the 50 intersections where accidents most often occurred during the period from 1991 to 1993. The locations of these incidents are shown in Figure 2.13. As the table indicates, intersections along 72nd Street, Dodge Street, West Dodge Street and West Center Road experienced a high number of accidents during each of the three years. A total of 8 1 intersections experienced the most accidents within the three year study period. Out of the 81, there are 58 intersections which are located within the priority corridors.

Reported accidents are divided into 10 categories which include: rear end, left, right, and U-turns, cross traffic, side swipes, fixed objects (on and off roadway), pedestrian and miscellaneous. The highest reported accidents for the three study years were rear end collisions totaling 29 % in 1993. Left turns were the second highest category of accidents (19 %), followed by fixed objects (13 %), cross traffic (12 %) and side swipes (9%). Figure 2.13 illustrates the intersection location for the top 50 accident locations in each of the study years 1991, 1992 and 1993.

Table 2.3. Traffic Safety Assessment Top 50 Traffic Accident Locations 1991 - 1993.

Intersection	Traffic Accidents		
	1993	1992	1991
120th St. & West Center Rd.	48	31	38
72nd St. & Blondo	46	34	40
90th St. & Maple St.	41	39	38
42nd St. & L St.	39	23	35
84th St. & L St.	38	33	39
84th St. & F St.	37	25	19
108th St. & L St.	37	32	48
90th St. & West Dodge Rd.	34	36	48
13th St. & Missouri Ave.	31	27	34
72nd St. & Dodge St.	30	37	56
108th St. & M St.	30	23	25
72nd St. & Maple St.	30	23	35
72nd St. Cass St.	29	19	27
132nd St. & West Center Rd.	29	21	29

Table 2.3. Traffic Safety Assessment Top 50 Traffic Accident Locations 1991 - 1993. (continued)

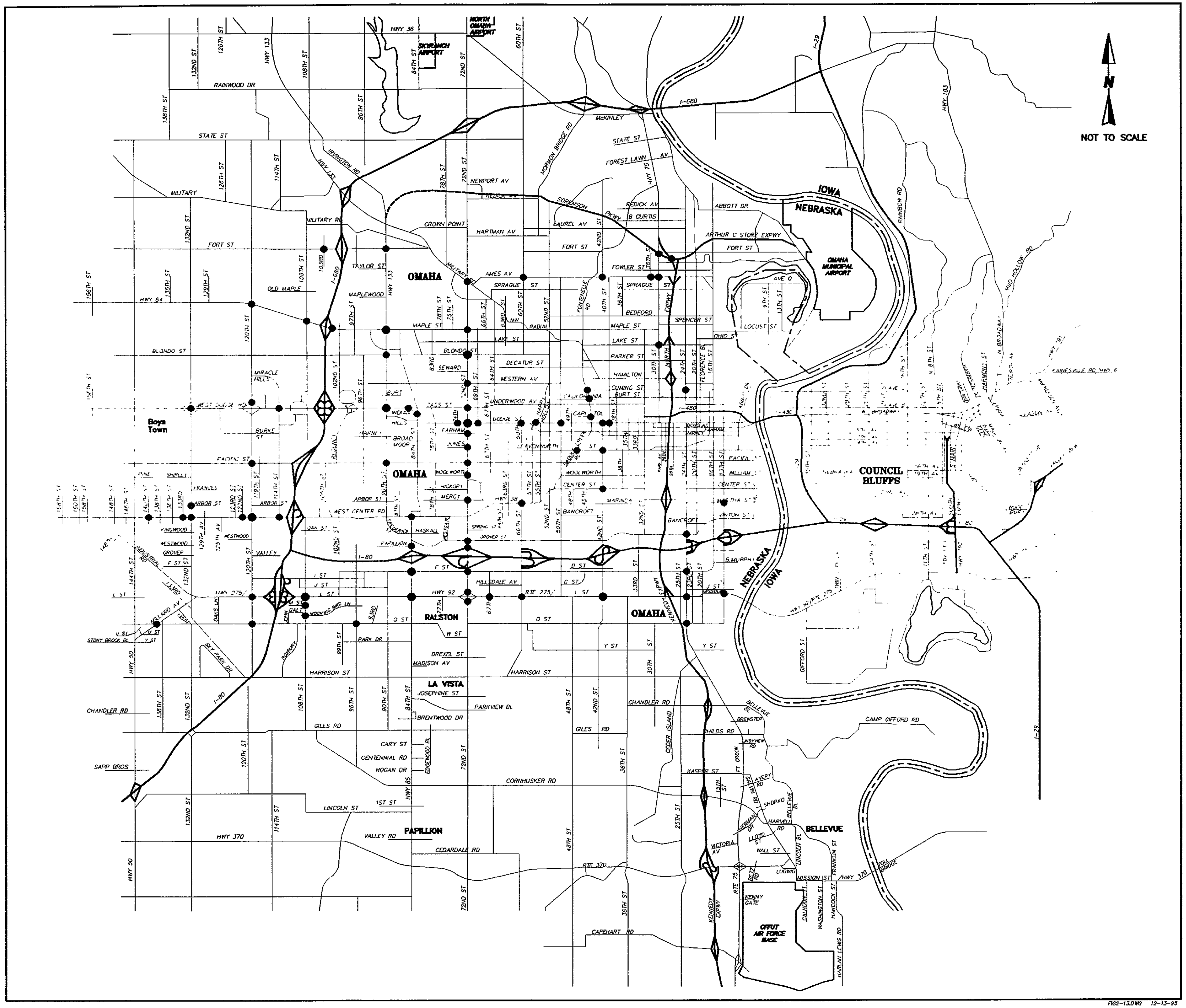
Intersection	Traffic	Accidents	
	1993	1992	1991
120th St. & West Dodge Rd. (WB On/Off Ramp)	29	32	--
72nd St. & Famam St.	28	30	25
50th St. & L St.	27	16	18
24th St. & Vinton St.	27	26	27
108th St. & West Maple Rd.	27	45	35
74th St. & Dodge St.	26	21	23
34th St. & West Center Rd.	26	24	18
140th St. & West Center Rd.	26	--	--
42nd St. & Center St.	25	23	18
24th St. & F St.	25	14	19
120th St. & L St.	25	30	32
72nd St. & Pacific St.	24	29	35
N. Saddle Creek Rd. & Cuming St.	23	20	22
31st Ave. & Ames Ave.	22	16	17
40th St. & Dodge St.	22	23	23
72nd St. & L St. (EB On/Off Ramp)	22	19	38
72nd St. Mercy Rd.	22	15	24
Sorensen Pkwy. & North Freeway	22	18	18
114th St. & West Center Rd.	22	22	20
114th St. & West Dodge Rd.	22	31	34
California St. & N. Saddle Creek Rd.	21	22	--
72nd St. & Western Ave.	21	--	15
24th St. & L St.	21	29	25
96th St. & Q St.	21	--	--
13th St. & Spring Lake Dr.	21	--	--
132nd St. & Arbor Plaza	20	--	--
72nd St. & Jones	20	22	26
42nd St. Leavenworth	20	15	16
120th St. & Pacific St.	20	17	--
133rd Plaza & West Center Rd.	20	19	--

Table 2.3. Traffic Safety Assessment Top 50 Traffic Accident Locations 1991 - 1993. (continued)

Intersection	Traffic Accident		
	1993	. . 1992	1991
84th St. & West Dodge Rd.	20	19	24
42nd St. & Dodge St.	19	--	26
90th St. & Fort St.	19	24	--
72nd St. & L (WB On/Off Ramp)	19	--	30
13th St. & Martha St.	19	14	--
108th St. & Mockingbird Dr.	19	--	--
30th St. Ames Ave.	--	27	18
Millard Ave. & Q St.	--	24	15
122nd St. & West Center Road	--	22	--
42nd St. Ames Ave.	--	21	--
Capitol Ave. & N. Saddle Creek Rd.	--	19	--
Leavenworth & S. Saddle Creek Rd.	--	19	27
90th St. & Pacific St.	--	19	19
30th St. Sorensen Pkwy.	--	19	--
72nd St. & F St.	--	I8	16
103rd St. & Fort St.	--	18	18
30th St. Lake St.	--	18	--
120th St. & West Maple Rd.	17	16	30
60th St. & Center St.	18	14	27
86th St. & West Dodge Rd.	18	18	19
50th St. & Dodge St.	--	15	25
24th St. & Cuming St.	--		24
72nd St. & Grover St.	16	18	24
72nd St. & Woolworth Ave.	17	--	23
72nd St. & I-80 WB (On/Off Ramp)	--	17	23
67th St. & L St.	--	--	23
72nd St. & Military Ave.	16	15	23
132nd St. & West Dodge Rd.	18	18	23
Dodge St. & S. Happy Hollow Blvd.	--	--	22
24th St. & Q St.	--	17	22

Table 2.3. Traffic Safety Assessment Top 50 Traffic Accident Locations 1991 - 1993. (continued)

Intersection	Traffic Accidents		
	1993	1992	1991
120th St. & Q St.	--	16	22
W. Maple Rd. & I-680 (EB On/Off Ramp)	16	--	21
84th St. & Papillion Pkwy.	--	18	21
60th St. & Ames Ave.	--	23	20
90th St. & Blondo St.	--	16	20
60th St. & Dodge St.	--	17	20
69th St. & Dodge St.	--	--	20



OMAHA METROPOLITAN AREA ITS

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Existing Conditions
Top Accident Locations

LEGEND

- ● ACCIDENT LOCATION (Top 50 Locations 1991 – 1993)

FIGURE 2.13

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Iowa State University

Nebraska Motor Carriers Association

2.2 TRAFFIC CONTROL SYSTEMS

2.2.1 Freeway Systems

The Nebraska Department of Roads (NDOR) currently operates a SCAN system, which consists of weather data collection stations, along the freeway system. These weather stations are supported by the U.S. Weather Bureau located in St. Louis, which conforms the data and generates reports to both the NDOR and the airports. Additionally, there are currently two stations in the field capable of color imaging. The SCAN system has been in operation for approximately five years, and the NDOR is investigating the purchase of more stations at a cost of $50,000 to $70,000 each. The NDOR used to operate a "de-icing" program for on/off ramps in poor weather conditions; however, this program is no longer in operation due to technical performance problems of the system.

There are approximately six portable changeable message signs (CMS) currently in use by the, NDOR. The NDOR plans to purchase additional portable CMS units and is considering using closed circuit television (CCTV) for monitoring of freeway conditions; however, these activities are not currently programmed.

2.2.2 Arterial Systems

2.2.2.1 Signalized Intersections.

There are three main types of controllers used throughout the Omaha metropolitan area. They are Type 170, NEMA, and electro-mechanical controllers. The majority of the controllers in the study area are Type 170.

Table 2.4 summarizes the number of signalized intersections within each jurisdiction, and Figure 2.14 shows the location of each signalized intersection.

Table 2.4. Signalized Intersection Location.

Jurisdiction	Number of Intersections
Omaha, NE	792
Bellevue, NE	36
Ralston, NE	2
La Vista, NE	5
Papillion, NE	9
Council Bluffs, IA	52

OMAHA METROPOLITAN AREA ITS

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MAPA — UNL

Existing Conditions

Signalized Intersections

NOT TO SCALE

LEGEND

CITY OF OMAHA

- ■ TELEPHONE DROP
- ▲ MASTER CONTROLLER
- ○ INTERSECTION ON COMPUTER

CITY OF COUNCIL BLUFFS

- ○ SIGNALIZED INTERSECTION

CITY OF BELLEVUE

- ○ SIGNALIZED INTERSECTION

COUNTY OF SARPY

- ○ SIGNALIZED INTERSECTION

STATE OF NEBRASKA

- ○ SIGNALIZED INTERSECTION

FIGURE 2.14

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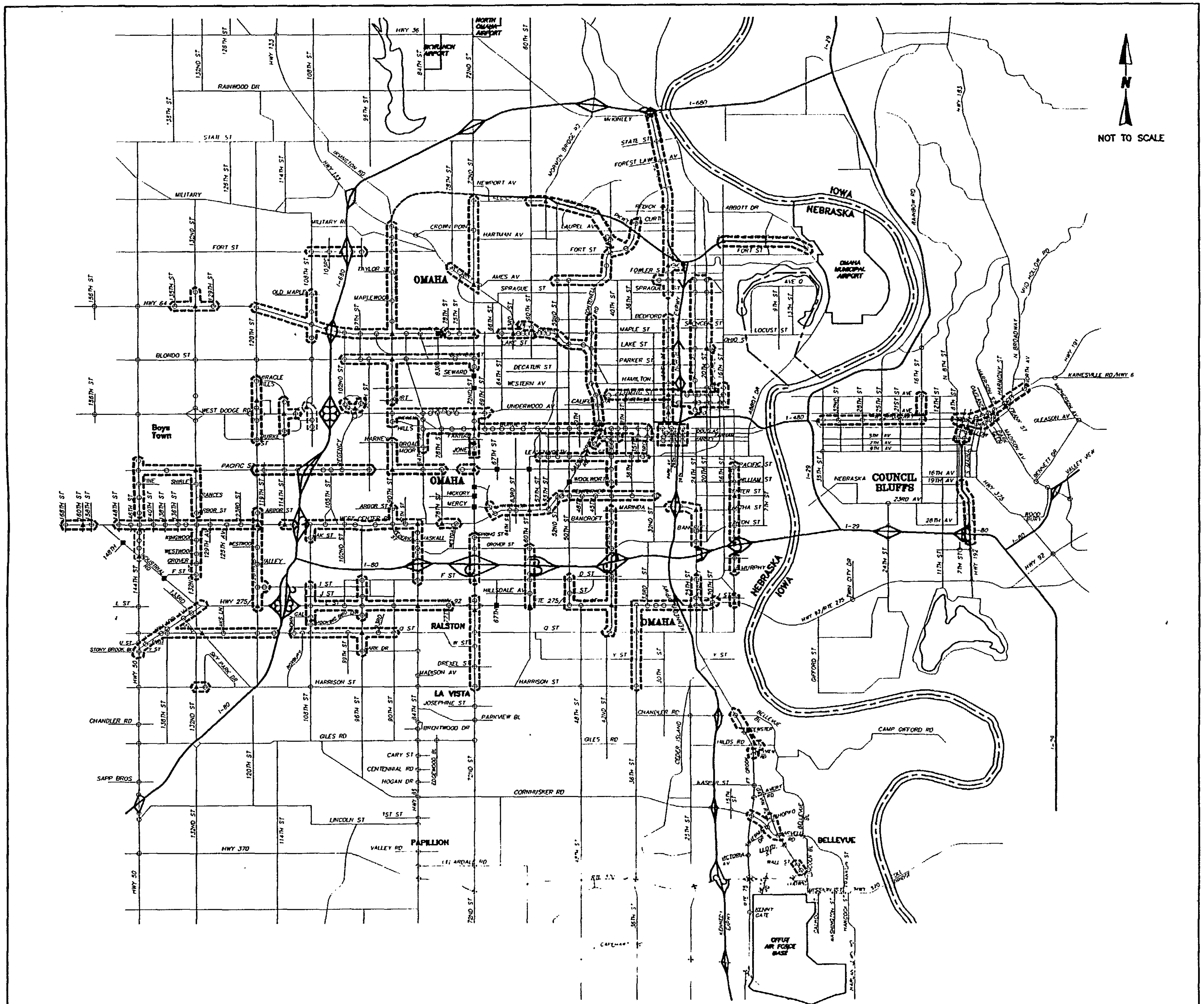
FIG2-14.DWG 12-13-95



OMAHA METROPOLITAN AREA ITS

NDOR
MAPA — UNL

Existing Conditions

Signal Coordination Sub-System Boundaries

LEGEND

SUB-SYSTEM BOUNDARY

CITY OF OMAHA

- ■ TELEPHONE DROP
- ▲ MASTER CONTROLLER
- ○ INTERSECTION ON COMPUTER

CITY OF COUNCIL BLUFFS

- ○ SIGNALIZED INTERSECTION

CITY OF BELLEVUE

- ○ SIGNALIZED INTERSECTION

COUNTY OF SARPY

- ○ SIGNALIZED INTERSECTION

STATE OF NEBRASKA

- ○ SIGNALIZED INTERSECTION

FIGURE 2.15

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OMAHA METROPOLITAN AREA ITS

NDOR

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Existing Conditions

Hardwire Interconnect

NOT TO SCALE

LEGEND

HARDWIRE INTERCONNECT

CITY OF OMAHA

- TELEPHONE DROP
- MASTER CONTROLLER
- INTERSECTION ON COMPUTER

CITY OF COUNCIL BLUFFS

- SIGNALIZED INTERSECTION

CITY OF BELLEVUE

- SIGNALIZED INTERSECTION

COUNTY OF SARPY

- SIGNALIZED INTERSECTION

STATE OF NEBRASKA

- SIGNALIZED INTERSECTION

FIGURE 2.16

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NEBRASKA MOTOR CARRIERS ASSOCIATION

OMAHA METROPOL. AREA IT

NDOR

MAPA — L

Existing Conditi

Top Activity Cer

NOT TO SCALE

LEGEND

(06) *MAJOR ACTIVITY CENTER (Refer to Activity Center T for Location Description)*

FIGURE 2.1

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Meyer, Mohaddes Associates, Inc.

IOWA STATE UNIVERSITY NEBRASKA M ASSOC

- ***City of Omaha, NE.*** The City of Omaha has a total of 792 signal locations within its jurisdiction. Of these, a majority of signals use Type 170 controllers and the remaining signals have either NEMA type controllers, electro-mechanical or flashers. Included within the category of flasher, there are also 16 lane-use lights used to designate use of the peak directional lane along Dodge Street from 70th Street to 3 1 st Street. The City of Omaha also controls and/or maintains 7 signalized intersections within the City of Ralston. The operation of signals is designed in a closed loop formation with a master/slave arrangement. The group master reports to the central office via dial-up modem. The City of Omaha currently operates approximately 47 closed loop systems. The operation of signalized intersections vary from fixed time to fully actuated.

- ***City of Council Bluffs, IA.*** The City of Council Bluffs has a total of 52 signalized intersections. The city primarily uses NEMA type Eagle controllers. The operation of signals along major arterials is a closed loop system with a master/slave arrangement. The group master reports to the central office via dial-up modem with the City of Council Bluffs currently operating 6 closed loop systems.

- ***City of Bellevue, NE*** . The City of Bellevue has a total of 36 signalized intersections within the city limits. The City maintains 29 of the intersections. The City of Omaha maintains 2 intersections within Bellevue, and the Nebraska Department of Roads (NDOR) maintains 5 intersections. The NDOR also controls the timing for 3 of the 29 city-maintained intersections. These three are located along the Kennedy Expressway at Chandler Road, Cornhusker Road, and Capehart Road. In addition to the signalized intersections, the City also maintains 11 signalized mid-block crosswalk locations.

- ***Nebraska Department of Roads.*** The NDOR currently maintains/controls 47 signalized intersections and 3 pedestrian signals within the Omaha metropolitan area. The majority of signals maintained by the NDOR utilize Type 170 controllers. The NDOR level of maintenance responsibility for the signalized intersections also varies, ranging from entirely state-maintained to controller only to none. Table 2.5 illustrates the location of state-controlled signals.

- ***Cities of Ralston, La Vista and Papillion,*** NE. The cities of Ralston, La Vista and Papillion have a total of 16 signalized intersections within their respective city limits. The NDOR controls and maintains all 16 signalized intersections. In addition, the City of Ralston has partial ownership on some signals that are maintained by the City of Omaha.

Table 2.5. NDOR Maintained/Controlled Intersections.

Jurisdiction	Number of Intersections
City of Omaha	11
City of Bellevue	3
City Ralston	2
City of La Vista	5
City of Papillion	9
Douglas County	2
Sarpy County	15
Total	**47**

2.2.2.2 Coordinated Systems.

There are three communities within the Omaha study area which operate closed loop systems. They are Omaha and Bellevue, Nebraska, and Council Bluffs, Iowa. Figure 2.15 illustrates the existing subsystems within each of these cities.

- ***Omaha, Nebraska.*** The City of Omaha operates a closed loop system with on-street masters which communicate with personal computers both at Civic Center and traffic maintenance facility via dial-up 1200 and 2400 baud modems. Each master also communicates with other controllers within its closed loop system via &twisted-pair copper cable. The software used within each controller is developed by Wapiti and forms the common ground for all information and data transfer. The City currently has approximately 60 functioning closed loop systems along major arterials. The closed loop systems currently control the majority of traffic signals throughout the City and the downtown area.

- ***Council Bluffs, Iowa.*** The City of Council Bluffs, Iowa, also operates a closed loop system, similar to that of Omaha, although using NEMA (Eagle) controllers. The city is considering the purchase of the Monarc traffic management system, a product of Eagle Signals. This will allow the city to manage and monitor the traffic signals from a central location. Signalized intersections have been grouped under master controllers along the major arterials. These master controllers transfer timing plans, monitor intersections, check equipment, and detect system failures, and assist in managing traffic flows throughout its main arteries. The city currently operates 6 closed loop systems along West Broadway, Kainesville Boulevard, 16th Street, Willow Street, 5th Avenue, and along the South Expressway. The remainder of signalized intersections are currently operating "'free ", with no coordination between signals.

Table 2.6. Major Activity Centers

No.	Activity Center	Type	No.	Activity Center	Type
1	Offut Air Force Base	Military	28	Oak View Mall	Shopping Center
2	Zoo/Stadium	Zoo/Stadium	29	North Park	Office/Retail
3	Eppley Airfield	Airport	30	132nd St. & Maple St.	Shopping Area
4	Creighton University	University	31	108th St. & Maple St.	Shopping Area
5	St. Joseph Hospital	Hospital	32	90th St. & Fort St.	Shopping Area
6	Riverfront Industrial	Industrial	33	90th St. & Maple St.	Retail/Office
7	Omaha CBD	Office	34	132nd St. & Center Rd.	Shopping Area
8	Mutual/Kiewit	Office	35	120th St. & Center Rd.	Retail/Office
9	NU Medical Center	Hospital	36	84th St.& Center Rd.	Shopping Area
10	Univ. of Nebraska, Omaha	University	37	144th St. & Center Rd.	Shopping Area
11	Methodist/Childrens	Hospital	38	One Pacific Place	Office/Retail
12	Crossroads Mall	Shopping Center	39	Midlands Hospital	Hospital
13	Westroads Mall	Shopping Center	40	84th St. & Giles Rd.	Shopping Area
14	Immanuel Hospital	Hospital	41	Center Mall	Retail/Office
15	Bergan Mercy Hospital	Hospital	42	Council Bluffs Hospital	Hospital
16	Omaha Industrial East	Industrial/Retail	43	Millard	Shopping Area
17	Mall of the Bluffs	Shopping Center	44	108th St. & Q St.	Retail/Office
18	Council Bluffs CBD	Office/Retail	45	Old Mill North	Retail/Office
19	Omaha Industrial West	Industrial/Retail	46	50th St. & F/L Sts.	Retail/Industrial
20	Council Bluffs Industrial	Industrial	47	South Omaha Industrial	Industrial/Retail
21	Southroads Mall	Shopping Center	48	Dodge Rd. & 84th/90th St.	Office/Retail
22	Regency	Office/Retail	49	Manawa Power Center	Retail/Industrial
23	Old Mill South	Office	50	72nd St. & Pacific St.	Retail/Office
24	144th St. & I-80	Retail/Industrial	51	Old Mill West	Retail/Office
25	Miracle Hills	Office/Retail	52	Dodge & 120th/132nd Sts.	Retail/Office
26	Mid-America Etc.	Office	53	Harvell Rd. & Galvin Rd.	Retail/College
27	Vets/Douglas Co. Hospital	Hospital			

2.3. OTHER SYSTEMS AND ACTIVITIES

2.3.1 Other Communications Systems

2.3.1.1 Telephone

- ***US west Communications.*** The US West communications network consists of area-wide fiber optic cable. The fiber optic backbone and hubs are shown in Figure 2.18. US West's private line rate structure consists of DSl and DS3 service which provide a significant communication infrastructure in the metropolitan area at established tariff rates.

  US West and Cox Cable are conducting a fiber optic cable drop demonstration project for approximately 50,000 residential units, providing wideband communication access.

2.3.1.2 Cable TV

- Cox ***Cable.*** Cox Cable has installed a significant network of fiber/coaxial cable, reaching 97,000 homes, primarily in the metropolitan area.

- ***TCI Cable of the Midlands.*** TCI Cable of the Midlands services an area which includes Bellevue, Papillion, Offut Air Force Base. La Vista, Ralston, Milland, and Sarpy and Douglas Counties with a customer base of approximately 35,000 households. The TCI Cable network consists of approximately 560 miles of cable.

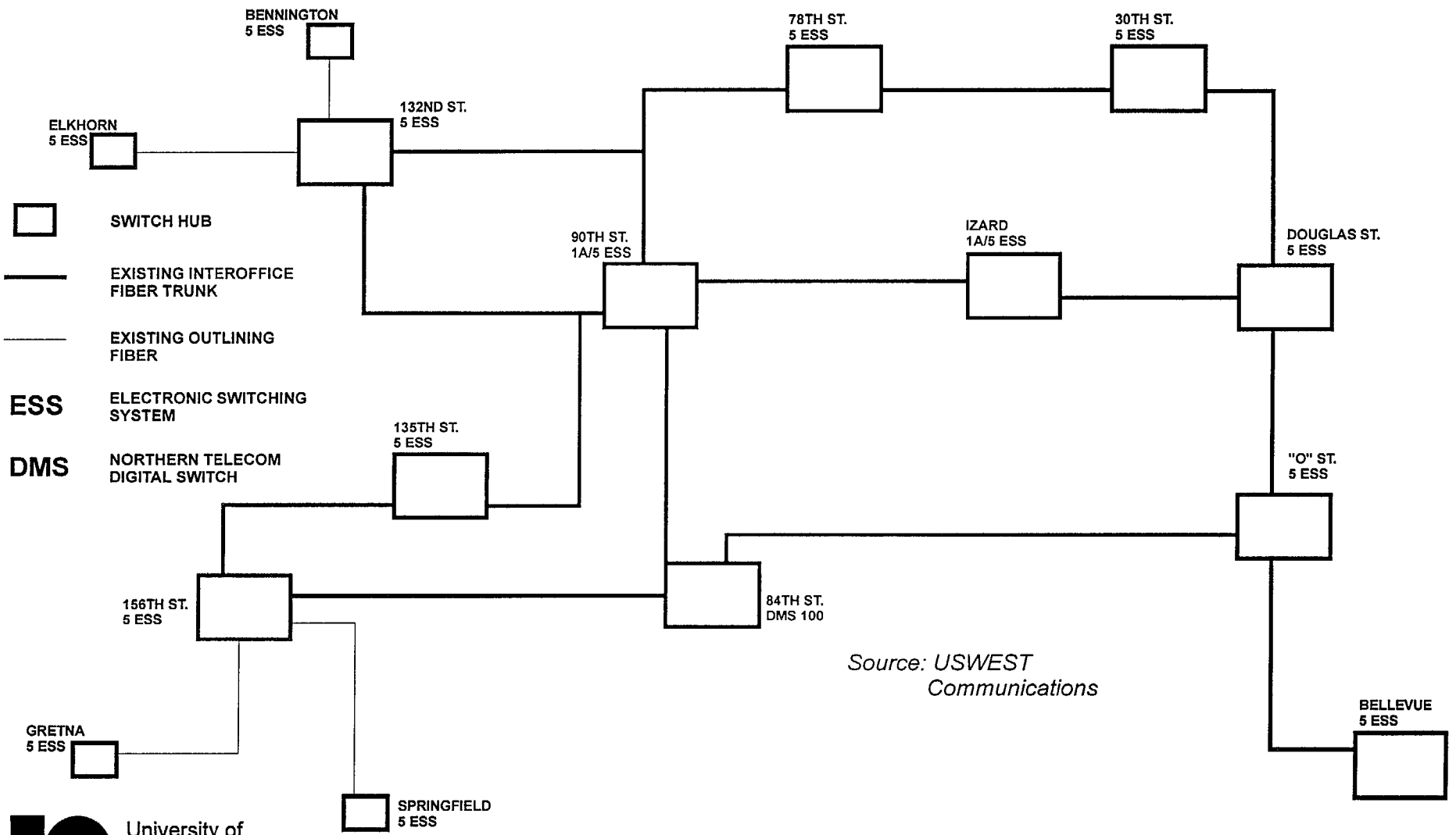
- ***Sky Cable TV.*** The Sky Cable TV System is a relatively new wireless microwave system serving the west Omaha area and the cities of Millard, Ralston, Papillion, La Vista and other communities. The system uses one of two types of antennas at the customer's location, a 16" x 22" parabolic antenna or a yagi antenna with a 12" x 1" waveguide and 6" x 6" reflector. The system has a customer base of between 300 and 400 households.

2.3.1.3 State Communications Network

The State Division of Communications was established in 1967 as one of the first state agencies to manage non-owned communications systems. The division negotiates rates with utility companies (primarily phone) on behalf of groups of agencies. A total of 42 companies are involved in providing services for the state.

Omaha Metropolitan Area ITS

NDOR
MAPA — UNL



University of Nebraska Lincoln

FIGURE 2.18

IOWA STATE UNIVERSITY

Meyer, Mohaddes Associates, Inc.

NEBRASKA MOTOR CARRIERS ASSOCIATION

The overall system includes 473 facility offices, over 800 pagers, and approximately 500 cellular phones. In addition, they operate about 300 CCTV, primarily used for the legislature. In addition to State agencies, customers include the City of Omaha and Douglas County. They also manage Video Conferencing Centers throughout the state for public and private use. Customers include medical facilities, such as the University of Nebraska Medical Center.

Until 1972, the State of Nebraska owned communication facilities (mainly microwave). This was changed to local telephone companies by statute. The Communications Division is working on a "strategic communication project" which will be available by mid-April.

2.3.2 Computer Networks

- ***Omaha Free-Net.*** The Omaha Free-Net will be a service of KVNO-FM 90.7 public radio station operating at the University of Nebraska at Omaha. The station recently received a grant from the Public Broadcasting System (PBS) with assistance from US West. The non-profit Omaha Free-Net is being "designed to develop and encourage free public access to education and on-line information services, using public broadcasting as a nucleus. "

  The Omaha Free-Net will link people by computer with information provided by local schools, hospitals, government, and health and human service organizations. Registered users will be able to obtain an E-mail address and communicate with others who have addresses. Information will be available from city and county government, United Way, and area public schools. In addition, a Help resource for students is being planned. Other specific examples of the types of information planned for the Net include softball schedules, cultural events, and library catalogs. Registered users will also be able to reach the Internet (a nation-wide network) through the Omaha Free-Net. Omaha Free-Net is scheduled to go on-line in July, 1995.

- ***Husker Net and UNO Net.*** Husker Net is a campus computer network restricted to the University of Nebraska-Lincoln. A similar network, "UNO Net", is providing services to the University of Nebraska at Omaha campus. Both of these networks are restricted to the faculty, staff and students of the respective campuses. The UNO Net is known as CWIS/S-CWIS (Campus-Wide Information Service/Student-Campus-Wide Information Service). This service is linked to the Internet and has the capability of sending and receiving electronic mail, access to full length documents and databases, pictures, audio and video recordings. At this time, community information is sparse, and the net is used mainly for University/campus related mail, news, announcements and events Users can also access information from the local office of the National Weather Service to check on local weather conditions.

- ***Applied Information Management Institute (AIM).*** AIM is a non-profit organization created by a consortium of business, education and government to strengthen the information technology infrastructure- equipment, education and employment base- of Omaha and greater Nebraska. This group works with Omaha area business, education and government to improve the information infrastructure. They are involved in applied research, continuing education, and employment services, recruitment and placement of information management professionals for area businesses. They have worked with UNO and US West, among others. AIM's community involvement includes promoting partnerships with sponsors and other institutions in writing grant proposals, promoting alliances among local technology entrepreneurs, and support of other State and local economic development initiatives.

- ***State Central Data Processing Division.*** The Central Data Processing Division (CDPD) is one of the three divisions of the Nebraska Department of Administration Services, the others being IDS (Intergovernmental Data Services) and Communications. CDPD has a $30 million annual budget. Customers are all public agencies at this time, including state and county agencies, cities, etc. They currently have 160 full-time employees and 70 contractors who focus on isolated projects.

  The State uses two mainframe computers (ES570 and ES720) which were installed in 1992 and are linked with Douglas County (IBM 4300) and Sarpy County (Data General). As a result of a grant, they are installing and managing AS400 computers throughout the state for each county seat office. To date, more than half are installed. The application software includes a range of special use software, such as commercial drivers licenses computerized processing and vehicle title processing. All the AS400 computers are networked to the state mainframe computers.

  CDPD's strategic approach to procurement has been acquiring a hybrid of mainframe, mini, and personal computers for appropriate uses. They are prepared to address a variety of database requirements state-wide. Although the State is responsible for the maintenance of all AS400 computers, they make special arrangements with certain agencies for maintenance to be done by their forces.

- ***MidNet.*** MidNet is a computer network serving several midwestern university campuses with the local hub at the University of Nebraska-Lincoln.

- ***Synergy Communications.*** Synergy is a privately owned, Omaha area Internet service provider.

- ***Monarch.*** Monarch is owned and operated by the City of Papillion, and began service in the early part of 1995. Monarch is a multi-user electronic bulletin board and provides local groups, clubs, organizations, churches schools, etc., with the ability to distribute information and schedules to area residents via computer and modem.

- ***Other Omaha-Area Networks.***

Computer Networks
Creighton University
Data Transmission Network Corp.
First Data Resources Inc.
Inacom Corp.
MFS Network Technology
MFS Communications Company
Network Technologies Corp.
Omaha Public Power District
Prairie Systems
Union Pacific Railroad Co.
Univ. of Nebraska Medical Ctr. (UNMC)
World Data Business Systems
World Data Inc.

Telemarketing Systems
Call Interactive
Dial America Marketing
ITI Marketing Services Inc.
IntelliSell Corp.
Matrixx Marketing
May Telemarketing Inc.
Quality Telemarketing Inc.
Reed Telemarketing
SITEL Corporation
Telemarketing Services of Nebraska
Telenational Communications
West Telemarketing Corp.

Reservation Systems
Hyatt Hotels & Resorts
Marriott Worldwide Reservation Center
Omni Hotels Reservation Center
Radisson Hotel Reservation Center
Utell International
Westin Hotels & Resorts

2.3.3 Sarpy County Communications System

Sarpy County is planning a new communications system, which will be a combined county-wide communications system operated on an 800 megahertz trunk communications system. The jurisdictions involved in the system include the cities of Gretna, Papillion, Bellevue, La Vista, Springfield and Sarpy County. The system will consist of portable, vehicular, and data communications. The 800 MHZ system will be used primarily for 911 emergency services, such as fire fighting, law enforcement, ambulance, emergency medical, and other similar emergency services. The cities and the county can also use this system in their governmental departments. The control center and console equipment will be located in the Communications Department at the Sarpy County Courthouse with additional equipment at the Bellevue Police Department. A proposal is being prepared for implementation of the system.

2.3.4 Construction Activities

NDOR prepared a "Needs Study" in 1988 that highlighted the following elements:

- Rebuild interchanges in Omaha area in 10 years
- Complete the state-wide system in 15 years
- Complete all other geometric improvements in 20 years

Although the implementation schedule is somewhat lagging due to reduction in federal funding and construction cost escalation, significant geometric and infrastructure improvements have been made and several projects are in progress.

Improvements to I-480/I-80 were completed in 1994. Current construction activities include I-80 from L Street to I-80/680, including a new bridge at I-80/680 as part of the CD (collector/distributor) road system. A widening project is also in progress along I-80 between 72nd and 42nd Streets, including installation of noise walls and New Jersey barriers along the centerline. Each year approximately 15 to 20 intersections are improved in the City of Omaha.

2.3.5 Planned Geometric and System Improvements

A list of highway system improvements which relate to capacity and traffic signal system management enhancement for the greater Omaha metropolitan area are shown in Tables 2.7a through Table 2.7d. These tables include projects listed within the Nebraska Highway Department, District Two and Interstate Construction and Improvement Program, for Fiscal Years 1995 - 2000 and Beyond, for the Omaha metropolitan area. Although there are numerous projects listed in the Nebraska Highway Construction and Improvement Program document, only those projects which; a.) improved the capacity and/or operation of the roadway and b.) are located within the Omaha metropolitan area were listed.

In addition, the City of Omaha has prepared a Capital Improvement Program for the Years 1995-2000 and documented in Report No. 270 ("Capital Improvement Program, 1995-2000," City of Omaha Planning Department, December 1994). This report provides detailed information on various proposed capital improvement projects. The total estimated cost for the transportation projects for the five-year program is $157 million.

Abbreviations and Definitions Related to Table 2.7a through Table 2.7d.

Br. (Bridge) - Structure over stream or roadway. May include new or reconstruction, widening or rehabilitation of existing structure & reconstruction of approaches.

Culv. **(Culverts)** - Pipes or concrete boxes necessary to carry water under the roadway.

Dr. (Drainage)

Gr. (Grading) - The movement of earth needed to construct the project as designed.

Interchange - Construction or revision of a new/existing interchange and connecting roads.

Resurf. (Resurfacing) - Additional layer of surfacing material placed on top of existing hard-surfaced road to improve rideability and strength of roadway. May include minor widening of roadway and structures.

S. Shld. (Surfaced Shoulders) - Hard surfacing the shoulders of an existing or new hard-surfaced road. May include minor grading and structure widening.

Str. (Structures) - Culverts, bridges and/or viaducts, either new or reconstructed.

Surf. (Surfacing) - Hard surfacing, either concrete or bituminous.

Table 2.7a NDOR District Two Construction and Improvement Program Fiscal Year 1995 (July 1, 1994 - June 30, 1995)'

Highway No.	County	Location	Length (mi.)	Type of Improvement[2]	Est. Cost ($1,000)
US-30	Washington	In Blair	0.0	Traffic Signal	10
N-36	Douglas	Bennington East	0.0	Traffic Signal	40
US-75	Sarpy	In Bellevue	0.0	Traffic Signal Controllers	4
*US-77	Dodge	Fremont North	1.4	Gr., Str., Surf., S. Shld.	4,000
I-80	Douglas	I-80 in Omaha	0.0	Traffic Management FY-95	75
I-80	Douglas	I-80 EB - I-680 NB Ramp #6 Br.	0.0	Br.	5,767
I-80	Douglas	EB C-D Rd., "Q" St. to "I" St.	0.0	Gr., Cul., Surf.	3,467
I-80	Douglas	I-80 ML EB/WB Br. Over UPRR	0.0	Gr., Br.	2,387
I-80	Douglas	108th St. Bridge, Omaha	0.0	Br.	1,954
I-80	Douglas	I-80 ML EB Bridge Over 72nd St.	0.0	Br.	1,809
I-80	Douglas	65th St. Bridges, Omaha	0.0	Br. Widen	4,768
I-80	Douglas	10th St. Bridge, Omaha	0.0	Br.	1,925
N-85	Sarpy	N-85/6th St., Papillion	0.0	Traffic Signal	5
N-85	Sarpy	N-85/Hogan Dr., Papillion	0.0	Traffic Signal	5
N-370	Sarpy	84th St. - 54th St.	2.7	Gr., Culv., Surf., S. Shld.	8,963
I-680	Douglas	NB C-D Rd., to Center Loop	0.6	Gr., Culv., Surf.	2,781
I-680	Douglas	NB C-D Over Center St. Br. #14	0.0	Br.	849

** Total cost is indicated with cost to be shared with State of Iowa.*
1 Projects will be contracted, but construction may not be completed within the fiscal year.
2 Abbreviations used in this table are summarized at the end of Table 2.7d.

Table 2.7b NDOR District Two Construction and Improvement Program Five Year Program (Fiscal Year 1996 thru Fiscal Year 2000)

Highway No.	County	Location	Length (mi.)	Type of Improvement[1]	Est. Cost ($1,000)
US-6	Douglas	"Q" St. to Dodge St.	2.8	Gr., Str., Surf., S. Shld.	10,012
US-6	Douglas	US-6/275 Interchange	1.5	Interchange	7,370
US-6	Douglas	N-31 & West Dodge Interchange	0.0	Interchange	17,599
US-6	Douglas	152nd St. - 162nd St., Omaha	0.8	Gr., Str., Surf., S. Shld.	8,156
US-30	Dodge	Fremont West	8.8	Gr., Str., Surf., S. Shld.	17,519
N-50	Douglas	Millard South	2.1	Gr., Str., Surf., S. Shld.	8,868
N-64	Douglas	Elkhorn West	1.5	Conc. Pvmt.	900
N-66	Cass	Jct. N-66/S-12H	0.0	Lighting	13
US-75	Cass	In Plattsmouth	0.0	Traffic Signals	306
US-77	Dodge	Fremont South	1.4	Gr., Str., Surf., S. Shld.	9,513
*US-77	Dodge	Fremont North	1.4	Gr., Str., Surf., S. Shld.	4,312
US-77	Dodge	Nickerson South	3.2	Gr., Str., Surf., S. Shld.	6,343
US-77	Dodge	Nicker-son North	3.9	Gr., Str., Surf., S. Shld.	9,543
US-275	Dodge	Scribner North & South	8.9	Gr., Str., Surf., S. Shld.	17,610
US-275	Dodge	Hooper East & West	7.4	Gr., Str., Surf., S. Shld.	15,892
US-275	Dodge	Fremont Northeast Bypass	4.0	Gr., Str., Surf., S. Shld.	6,514
US-275	Dodge	Fremont Southeast Bypass	4.0	Gr., Str., Surf., S. Shld.	3,363
US-275	Douglas	Waterloo Northwest	8.6	Gr., Culv., Surf., S. Shld.	10,945
N-370	Sarpy	N-50 to N-85	5.0	Gr., Str., Surf., S. Shld.	8,956

** Total cost is indicated with cost to be shared with State **of** Iowa.*
*1 Abbreviations used in this table are summarized at the end **of** Table 2.7d.*

Table 2.7C NDOR District Two Construction and Improvement Program 2001 and Beyond

Highway No.	County	Location	Length (mi.)	Type of Improvement[1]	Est. Cost ($1,000)
US-6	Sarpy	Platte River - Gretna	6.0	Gr., Str., Surf., S. Shld.	3,784
US-6	Douglas	162nd St. - 201st St., Omaha	3.2	Gr., Str., Surf., S. Shld.	28,981
US-30	Dodge	Rogers - North Bend	5.7	Gr., Str., Surf., S. Shld.	9,165
US-30	Dodge	North Bend East	6.2	Gr., Str., Surf., S. Shld.	12,445
N-31	Douglas	Elkhom South	1.1	Gr., Str., Surf., S. Shld.	5,179
US-75	Cass	Union - Murray	8.7	Gr., Str., Surf., S. Shld.	13,384
US-75	Cass	Murray - Plattsmouth	9.4	Gr., Str., Surf., S. Shld.	10,741
N-133	Douglas	*I-680* to N-36, Omaha	*3.0*	Gr., Str., Surf., S. Shld.	5,932
US-275	Douglas	Waterloo Southeast	4.0	Gr., Culv., Surf., S. Shld.	11,795
US-275	Douglas	172nd St. - US-6	*2.7*	Gr., Culv., Surf., S. Shld.	*7,682*
N-370	*Sarpy*	Gretna East	4.1	Gr., Str., Surf., S. Shld.	7,411
N-370	*Sarpy*	N-50 Interchange	0.9	Interchange	*7,139*

* *Total cost is indicated with cost to be shared with State* ***of Iowa.***
[1] *Abbreviations used in this table are summarized at the end* ***of*** *Table 2.7d.*

Table 2.7d NDOR Interstate Construction and Improvement Program Five Year Program (Fiscal Year 1996 thru Fiscal Year-2000)

Highway No.	County	Location	Length (mi.)	Type of Improvement'	Est. Cost ($1,000)
I-80	Sarpy	Harrison St. - "Q" St.	1.1	Gr., Culv., Surf.	6,382
I-80	Douglas	I-80 in Omaha	0.0	Traffic Management FY-96	75
I-80	Douglas	I-80 in Omaha	0.0	Traffic Management FY-97	75
I-80	Douglas	I-80 in Omaha	0.0	Traffic Management FY-98	75
I-80	Douglas	I-80 in Omaha	0.0	Traffic Management FY-99	75
I-80	Douglas	I-80/I-680 South Approach ML I-80	0.8	Gr., Culv., Surf.	5,739
I-80	Douglas	I-80/I-680, East Approach	0.1	Gr., Culv., Surf.	8,422
I-80	Douglas	WB C-D Rd. Bridge Over Rp. #5, 10, 11	0.2	Gr., Culv., Surf.	6,708
I-80	Douglas	Br. #7E., #7W. EB/WB Over Rp. #10	0.0	Br.	2,461
I-80	Douglas	72nd St. Interchange	1.0	Conc. Pvmt.	9,849
I-80	Douglas	Various Locations in Omaha	0.0	Changeable Message Signs	1,800
I-80	Douglas	60th St. Interchange	1.4	Conc. Pvmt.	11,747
I-80	Douglas	60th St. Bridge EB	0.0	Br. Widen	2,081
I-80	Douglas	50th St. Bridge EB	0.0	Br. Widen	1,882
I-80	Douglas	13th St. Interchange, Omaha	0.7	Interchange	7,918
I-80	Douglas	16th St. Bridge, Omaha	0.0	Br. Widen, Rehab.	1,398
I-480	Douglas	I-480/Dodge St. Interchange	0.0	Interchange	15,918
I-680	Douglas	Rp. #5, Bridge #11 & SB C-D West	0.4	Gr., Str., Surf.	2,183
I-680	Douglas	I-80/I-680, North Approach	1.4	Gr., Culv., Surf.	7,776
I-680	Douglas	SB C-D Rd. & Br. #12/Center St.	0.6	Gr., Br., Surf.	4,653
I-680	Douglas	Br. #13S, #13N Over Center St.	0.0	Br.	2,639
I-680	Douglas	Pacific to Dodge St. & Papio Bridges	1.0	Gr., Str., Surf.	11,066

** Total cost is indicated with cost to be shared with State **of Iowa.***
*1 Abbreviations used in this table are summarized at the end **of** Table 2.7d.*

2.4 INSTITUTIONAL OPPORTUNITIES AND CONSTRAINTS

The purpose of this section is to address the issues, problems, concerns and opportunities pertinent to ITS development identified during the inventory process.

During December, January and February, several meetings were held with representatives of both public and private agencies to gather data and discuss various issues regarding their agencies' operations, and their views relative to ITS development. Operational characteristics of the existing traffic control, communications, and traveller information systems are summarized below. Issues, opportunities and constraints are also identified.

2.4.1 Traffic Control Systems.

NDOR District 2 is the largest district in Nebraska based on population. The district is currently involved in major construction and rehabilitation projects throughout the metropolitan area. A well organized "Transportation Management Systems" committee meets regularly to discuss roadway issues. Members of the committee include involved agencies and entities. Construction activities are organized well in advance and affected parties are informed through publications, newsletters, news releases and special presentations by the committee chair to various interest groups. NDOR performs the required maintenance for freeways and several of the state routes and signalized intersections along those routes. The accidents and incidents clearance and management is performed based on primarily informal arrangements. The freeway police enforcement is provided via the Omaha Police Department.

The City of Omaha maintains the traffic signals within the city as well as Douglas County. City staff work with NDOR and participate in the TMS Committee, coordinating roadway construction, installation of traffic signals and other pertinent projects. The staff also works with various organizations such as the Chamber of Commerce, neighborhood groups, and developers regarding traffic and transportation issues. The city's significant effort has resulted in upgrading the local traffic controllers to Type 170, thus enhancing the reliability of intersection control.

The Missouri River provides a natural barrier between Omaha and Council Bluffs. It is to be noted that the access across the River is limited to vehicular traffic and MAT. There is no pedestrian access across the River. Although not impeding the connectivity of the regional facilities, it does suggest a more independent approach to local traffic control.

Smaller cities with few signalized intersections work with NDOR, Douglas County or the City of Omaha for operations and maintenance of the signalized intersections. Both NDOR and the City of Omaha use Type 170 controllers, which provide the opportunity for equipment compatibility where needed.

Several issues and opportunities are identified, as follows:

- Adequate level of staffing is required to continually update the traffic signal timing optimization. Although the maintenance level was rated as "adequate" by City of Omaha staff, additional staff would enable the City to prepare updated signal timing plans and special event timing plans. In addition, the opportunity exists to review the current systems and subsystems' configurations and evaluate their boundary locations and cycle length.

- Although computerized signal systems may not be needed at this time, planning for such a need in the mid- and long-term future should include consideration of staffing, operations and maintenance requirements. It is important to note that the overall level of maintenance has been reduced in certain jurisdictions when computerized signal systems have been installed. The staffing level for operation of the system should be carefully identified to allow adequate time for day to day operation as well as expansion opportunities.

- Existing traffic control systems could be used as elements of the future ATMS. The architecture for ATMS should be flexible to accommodate existing resources and procedures of the operating agencies and maintenance needs of the infrastructure. The progress of the national system architecture activity should be carefully reviewed at each step to assure concurrence with the architecture development of the ATMS for the Omaha metropolitan area.

- Existing NDOR portable message signs, weather stations, and various types of traffic signal controllers are resources which the future ATMS should be capable of utilizing.

- There exists an opportunity for an organized incident management team concept where, in case of such events, depending upon their nature, pre-existing arrangements and agreements would be made where involved entities would have a clear understanding of their responsibility and their required action plan.

- As traffic congestion increases, especially along the Dodge Street corridor and vicinity, alternative traffic control and surveillance methods should be identified that could be deployed, involving both NDOR and the City of Omaha.

- Review of reliability and adequacy of detection systems along both the freeways and arterial systems should be considered. In conjunction with traditional detection systems, image processing techniques would add a visual surveillance element which enhances the system capability of the agencies. This approach could be used initially in the more critical and congested areas.

- The concept of traffic management center(s) should be discussed. A needs assessment should be performed to determine if and when a management center is required, how

many would be required, what would be their function, who would perform the operation and maintenance, and what would be the staffing requirements.

2.42 Communications and Computer Systems.

The City of Omaha enjoys a significant interconnect network for the operation of the closed loop subsystems. These subsystems are independently linked with the maintenance shop via dial-up telephone. While this strategy adequately addresses the City's current needs, a mid- and long-range communication master plan would enable the City to prepare for future demand.

As surveillance and motorist information needs are assessed for both arterials and freeway systems, communication requirements along the freeway systems become important. This should be addressed early on, as several construction activities are in progress which may provide an opportunity to integrate with the communication implementation process and/or to be included in the future design plans.

Significant existing communication assets, provided by the local telephone and cable companies, are available in the Omaha metropolitan area. The existing communication systems provide a significant capital cost savings for ITS deployment projects. Life cycle cost analysis in subsequent tasks of this project will provide an insight for various communications techniques. The State of Nebraska has adopted a policy of using commercial communication for their needs, in contrast with Iowa, where the State owns its communication system.

The Division of Communications of the State of Nebraska works with both public and private agencies and negotiates bulk rates with over 40 communication service providers throughout the state, This creative approach offers attractive rates for users, This opportunity should be embraced for ITS deployment as it also provides potential cost-effective public/private partnerships.

Although most agencies independently perform their data processing and procure their computer systems tailored to their needs, the Central Data Processing Division of the State of Nebraska provides a comprehensive service to various agencies, including the State, cities, counties and other public organizations. This effort is implemented through both direct connection to the State's mainframe computers in Lincoln and installation of local computers on-site. This asset should be considered as an opportunity for ITS deployment projects, especially since the State has retained its flexibility for procurement and, depending upon the need, it would purchase mainframe, mini, PC, or hybrid computers.

2.4.3 Traveler Information Systems.

The traveler is not fully informed in the Omaha metropolitan area. Although several existing programs and activities provide useful, and in many cases timely, information to motorists, such as the NDOR freeway conditions during bad weather, and construction activity reports and public outreach, few television and radio stations cover live traffic conditions. Pre-trip planning information also is not available. In case of incidents, the motorist might receive the information too late to seek alternate routes.

A traveler information system should be addressed comprehensively. It should focus on the users' needs. Pre-trip information, incident management, en route driver information, and traveller services information are among user services that should be considered for ATIS. Many of these activities should be coordinated with ATMS activities as they may share the same communication and computer network. Several issues should be addressed as part of this process, such as:

- Who is the audience?
- What is the message?
- What are the tools to convey the message (i.e., VMS, HAR, kiosk, etc.) and where should they be located?
- What is the benefit/cost ratio?
- What should be the implementation strategy?

In summary, while a significant infrastructure is available in the metropolitan area in terms of traffic control and communication/computer systems, there is a need to identify and reach consensus on the overall goals and objectives pertinent to these areas. Through the users' needs identification, a correlation will be made with the existing assets which will lead into system architecture and strategic plan.

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3. PUBLIC TRANSPORTATION

The Omaha metropolitan area is largely automobile-oriented. The 193 square miles of the Omaha metropolitan area had a population of 544,292 according to the 1990 census. A total of 488,840 people in 8 different jurisdictions (Omaha, Bellevue, La Vista, Papillion, Ralston, Sarpy County, Council Bluffs, and Carter Lake) are served by the Metro Area Transit (MAT). However, according to the 1993 figures supplied by the U.S. Department of Transportation, Federal Transit Administration, a total of 5,251,294 unlinked passenger trips were performed in that year by MAT. That averaged out to approximately 9.65 transit trips per person per year. Corresponding figures for other midwestern cities are 6 per person in Oklahoma City, 12 per person in Des Moines, 14 per person in Little Rock, 18 per person in Memphis, 30 per person in Kansas City, 31 per person in Rock Island, 32 per person in the Twin Cities, 39 per person in Denver, and 44 per person in Milwaukee. (U.S. DOT, Transit Profiles, Agencies in Urbanized Areas Exceeding 200,000 Population, 1994). These figures do not reflect the number of trips which are made via taxi cabs, shuttles, and car pools. There is little available statistical information to indicate specific ridership levels in these alternative transit modes, but anecdotal information gained from interviews and surveys confirm the perspective that the contribution currently being made by these alternative modes is rather limited when compared to the use of single occupant automobiles.

3.1 PROVIDERS

3.1.1 Bus

MAT operates 28 fixed service routes over 220 square miles and is also responsible for paratransit service through MOBY. MAT service contracts include the following jurisdictions: Omaha, Council Bluffs, Carter Lake, Bellevue, LaVista, Papillion, Ralston and Sarpy County.

3.1.2 Taxi Cab

The Omaha metropolitan area is served by two different cab companies and a limousine service. These include: Checker Cab/Happy Cab/Yellow Cab which serve Douglas and Sarpy County and the City of Council Bluffs; Safeway Cab which serves the same area and beyond; and Star Limousine which will serve anyone in the region who is willing to pay the fare.

3.1.3 Employer Operated Shuttles

In addition to general public transportation services, several employers operate shuttle services for their employees. At least four companies operate a shuttle service from remote parking lots to the work place. For example, the University of Nebraska Medical Center runs two shuttles in the morning and two in the evening to transport employees between the parking lot and various buildings on campus. HDR, Inc. has a limited number of employee

parking places close to the firm. Hence, they subsidize employee parking in a parking garage and contract with Mayflower, a private bus company, to shuttle employees between the parking garage and the firm. About 70 employees regularly use this service. Burger King contracts with MAT to provide a special shuttle service to bring workers to one of its downtown restaurants.

Several companies operate employee shuttles to transport workers to their sites. For example, Millard Processing Services has four pick-up places throughout the city where they run two buses for each of the two shifts. Workers are then transported to the plant, which is located at the western fringe of the Omaha area. About 20% of their employees use this service.

The Omaha Economic Development Corporation also runs a non-profit van service to assist individuals who are registered with the Nebraska Department of Social Services in getting to grocery stores and other key locations. This agency was recently awarded a federal grant to purchase more vans to help with this service. Eligible individuals call in the day before to set up appointments.

3.1.4 Car Pools

There is to date no organized and coordinated car pool arrangement among employers. In fact, the overwhelming majority of firms offer free parking to their employees. Nevertheless, some individuals do participate voluntarily in car pools. Parking areas are available for car pool groups at Cross Roads Mall and West Roads Shopping Center, but these locations are not widely publicized. Bus stops at those locations provide for access to several routes and for transfers. To date, however, there has been limited interest in expanding use of car pools.

3.1.5 Employer Incentives

A few firms do offer incentive systems to their employees to encourage greater use of the MAT buses. For example, Union Pacific offers a discount to employees who use the bus by paying 20 per cent of the costs of a monthly pass. Employees purchase the passes from the Union Pacific Credit Union. In fact, Union Pacific offers two types of passes: the 10 Ride Regular, which costs the employees $9.00 a month and can be used anytime and the 10 Ride Express which costs the employees $10 a month and can be used on express routes. In January, 1995, employees purchased 173 regular passes from the Union Pacific headquarters and 200 from the Brandeis office. In the same month Union Pacific employees purchased 200 Ride Express passes at headquarters and 200 from the Brandeis Office.

3.2 EMPLOYER TRANSPORTATION SURVEY

In an effort to get a broader perspective on passenger transportation needs in the Omaha area, a survey was conducted of the 100 largest employers in the metropolitan area. Names and

addresses were provided by the Omaha Chamber of Commerce. The list of firms with their respective range of employees is included as Appendix A-2.

The focus of ITS is directed to reducing congestion and,providing viable alternatives to the single occupant automobile. Omaha still experiences its major travel peaks in the morning and the evening, times coinciding with the work trip. In fact, the overwhelming majority of firms offer free parking to their employees. Hence, in this study, information from employers was sought in considering travel problems and responses.

Survey questionnaires were mailed to the 100 largest employers in Omaha area during the second week of February, 1995. A cover letter sent out with the survey indicated that it was optional for the firms to include their name with their returned questionnaire. (A copy of the survey and cover letter is included as Appendix A-3). Of the 100 questionnaires mailed out 48 were returned as of February 24 for a 48 per cent return rate. Among those responding, 5 were wholesale/ retail firms, 9 were manufacturing firms, and 34 were service firms. Among the firms responding, 6 (13%) had l00-499 employees, 15 (31%) had 500-999 employees, 20 (42 %) had 1000-2999 employees, and 7 (14 %) had 3,000 or more employees. The wage levels of these firms differed considerably. Five of the service firms indicated that 51-75% of their employees earned less than $15,000 per year. This was true of 4 of the retail/wholesale trade firms and 2 of the manufacturing firms. For all but one of the employers, this lower wage scale was associated with a similar high percentage of part time workers.

Among all respondents, only two (5 %) did not provide at least some free parking for employees. Six (13 %) provided free parking at some but not all of their locations. Nine (19%) of the respondents indicted that their employees frequently experienced problems with parking.

Although all but four (8%) of the respondents reported that their firms were within two blocks of a bus stop, most reported that only a small portion of their employees (5% or less) took the bus. Nine (19 % of the respondents indicated that 6 to 25 percent of their employees took the bus. There was no apparent relationship between income level of employees and proportion of employees using the bus. Of those firms not served by a bus, two were wholesale/retail establishments; the other two were in the service sector.

Only one of the 48 respondents indicated that they had any type of ride sharing program currently operating. One firm had a ride share program which operated on a volunteer basis using a designated coordinator. When asked whether their company sponsored a shuttle service for their employees, 6 responded in the affirmative. Four of the firms provide a shuttle from remote parking lots to the work site. At Saint Joseph Hospital, for example, 20 percent of the employees participate in the shuttle rides. The Veterans Administration Medical Center also provides shuttle rides for their patients from the main parking lots. One of the firms transports workers between various work sites. Millard Processing Services reported that it runs free bus service from downtown and the eastern part of the city to their plant in both shifts. When asked whether they offered any incentive programs to encourage use of public transportation, one firm reported that it had a "Bus Plus" program in which a 20 percent discount was given on 10 ride

ticket books. Boys Town is considering a "private, for profit van" which would serve a predominantly high unemployment area in North Omaha.

Respondents were also asked to respond to an open ended question, "From your perspective, what is the primary transportation problem in the Omaha area?" The responses were wide ranging but can be grouped as follows: concerns about bus routes and schedules; concerns about lack of carpooling; limited transportation for the frail, elderly, and disabled; concerns about congestion; concerns about highway construction; and concerns about downtown parking.

Problems regarding public transportation were:

- There is a lack of bus service to the West and South west Omaha (5)
- There is no evening bus service to meet the needs of the night shift (4)
- Not enough good public transportation from North Omaha to places of employment in mid city or out west (3)
- Not enough public transportation/too much reliance on automobiles (2)
- Not enough bus stops (2) e.g. near the Marriot, near the main site of Boy's Town
- Not enough bus service to Council Bluffs (2)
- Not enough service for people with disabilities (2)
- Need for rapid transit along an East-West corridor, from the airport to downtown and from downtown to the zoo
- Not enough car pool opportunities
- Not enough public transportation to Bellevue and Papillion

Problems associated with construction were:

- Delays (3)
- Interstate construction (3)
- Safety and interstate construction

Issues associated with congestion were:

- Need for stop light controls
- Need for controlled access streets
- Congestion at key locations--72th, 90th, 108th and Dodge (7:30 a.m., 5:00 p.m.) congestion on I-80 at 7:30 and 5:00
- Interstate 80 congestion

Problems associated with parking were:

- Lack of downtown parking

In summary, the survey responses point out concerns about problems with congestion and limitations in alternative forms of public transportation. To date, however, few firms have begun to respond to these challenges. Most respondents are located relatively close to a bus line

and note that a relatively small proportion of their workers travel by bus. Most workers travel to work independently and take advantage of free parking offered by employers. Only a very small proportion of the respondents noted that there was any difficulty in finding parking close to the work site.
The geographic distribution of these 100 large employers is shown in Figure 3.1. The size of the dots indicates the relative number of employees associated with each employer. The number of employees are indicated in the ranges supplied by the Greater Omaha Chamber of Commerce. The intention is to show employment concentrations and the consequent potential for congestion. As is apparent, a number of large firms is concentrated in the Dodge Street Corridor. The single largest employer, Offut Air Force Base, with 10,000 employees, is in Bellevue to the south. Also apparent is the cluster of large employers located west of I-680 in the western suburbs and a cluster of employers in the southwestern suburbs. Firms have moved into these areas because of the opportunity to acquire larger campuses at lower costs. These service sector firms, however, depend on employees who travel a considerable distance to work in these locations.

A telephone interview with the Director of the Labor Availability Council of Omaha underscored problems with transportation to service companies, particularly hotel reservation and Telemarketing firms, on the west side of the city. He pointed out that a number of these companies are located outside the area served by the bus routes and operate shifts late into the evening. The bus service does not operate after 11 p.m.

In general, however, the primary alternative to the single occupant vehicle in the Omaha metropolitan area is MAT. Hence, it is appropriate to highlight MAT in this inventory of public transportation Services.

3.3 MAT SYSTEM

3.3.1 MAT Service Area and Population Served

The overall bus system has been restructured over the past five years to reflect a multi-directional change in ridership patterns. Multi-directional travel was provided with the implementation of a Times-Transfer System utilizing Transit Centers, where buses meet for Timed-Connections, then proceed on route. Currently, MAT has five Transit Centers. (Future plans call for implementation of two additional Transit Centers.)

Prior to implementing the Timed-Transfer System, MAT operated a Central Business District Oriented System. (Current peak hour demand continues to require a high concentration of commuter service.)

OMAHA METROPOLITAN AREA ITS

NDOR

MAPA — UNL

Existing Conditions

Geographic Distribution Of The 100 Largest Employers

NOT TO SCALE

LEGEND

○ RELATIVE NUMBER OF EMPLOYEES ASSOCIATED WITH EACH EMPLOYER

FIGURE 3.1

University of Nebraska Lincoln

Meyer, Mohaddes Associates, Inc.

IOWA STATE UNIVERSITY

NEBRASKA MOTOR CARRIERS ASSOCIATION

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Prior to implementing the Timed-Transfer System, MAT operated a Central Business District Oriented System. (Current peak hour demand continues to require a high concentration of commuter service.)

Transit service availability is measured by how well the transit system "blankets" the populated areas. Transit industry standards establish route spacing patterns that minimize walking time and distance. A reasonable standard is a walk time of no more than five minutes or one-quarter mile. As population densities decrease toward the urban fringe, transit route spacings are generally further apart. An examination of the transit route spacing pattern within the Omaha city limits indicates the service area is well covered by transit. Approximately 85 percent of the people residing within the Omaha city limits are within one-quarter mile walking distance of -a bus route. The areas not well covered by transit are generally the urban fringes with low population density.

Although this population is not the current primary user group for MAT, it is a primary contributor to highway congestion. New strategies would be needed to attract this public to MAT even given its record for efficient, timely service.

Total population served by MAT's Times-Transfer System and service contracts is shown in Table 3.1.

Table 3.1 Population Served

Jurisdiction	1990 Population
Omaha, Nebraska	335,795
Council Bluffs, Iowa	54,315
Carter Lake, Iowa	3,200
Bellevue, Nebraska	40,082
LaVista, Nebraska	9,840
Papillion, Nebraska	10,372
Ralston, Nebraska	6,236
TOTAL	**488,840**

A comprehensive analysis of the MAT system, completed in 1991, evaluated population and development factors which indicate the strongest needs for public transportation at point of origin. The study indicted that household income and population density were the most reliable predictors of transit usage. Generally, lower household incomes and higher population densities correlate to higher transit ridership. Historical ridership data, systematized in this study, reinforced this general trend.

Suburban areas, particularly in northwest and southwest Omaha, display a combination of high income areas and low residential density. These areas have historically demonstrated low boardings as points of origin. Additionally, their demographic and development characteristics predict limited ridership potential. The strongest market in these suburban residential areas will continue to be special peak-hour services targeted for commuters.

A 1991 MAT route study and system redesign included enhanced services to emerging employment centers in suburban Omaha. These services link origins in lower income and/or higher density areas to job opportunities in outlying areas. The maps in Appendix A-4 associate current bus routes with indicators showing average median household income in three sections of the Omaha metropolitan area. The intention is to relate the transit routes with the homes of traditional transit users. A major route and schedule redesign took effect in November, 1994. Changes occurred on many of the Omaha routes, with most changes in west Omaha. Service to Council Bluffs was unchanged. There, service is focused on Broadway and central Council Bluffs with coverage to the Mall of the Bluffs near I-80. There is no bus service to Lake Manawa, Twin City, or Malmore Acres. The map in Figure 3.2 shows current transit routes.

3.3.2 MAT Route Structure

MAT implemented accessible fixed route service on Sunday, January 27, 1991. The Omaha Transportation Coalition (OTC), an advocacy group for disabled transit users, conducted a survey to assist in identifying which routes should provide accessible service. The OTC assisted MAT in announcing the implementation of the accessible fixed route service. The Mayor's Commission for Citizens with Disabilities held a press conference demonstrating "hands-on" accessible service.

Prior to implementing the accessible service, all MAT bus drivers attended training classes on the use of lift equipment, tie-downs, and over the shoulder seat belts. Sensitivity training was included as part of this instruction. In addition, schedules were printed with the international access symbol identifying accessible routes and trips. (Large print schedules are available upon request). All bus stop signs along the accessible fixed routes were identified with the international access symbol. Three eight inch square reflective international access symbols were placed on the curb side front, curbside rear-end, and to the left of the front door of all accessible buses.

Currently, 50% of MAT's fixed routes have limited accessible service providing multi-directional travel throughout MAT's service area.

3.3.3 Paratransit Service (MOBY)

Curb-to-curb demand response service for individuals unable to use MAT's fixed route service because of a physical disability is provided by paratransit service known as MOBY.

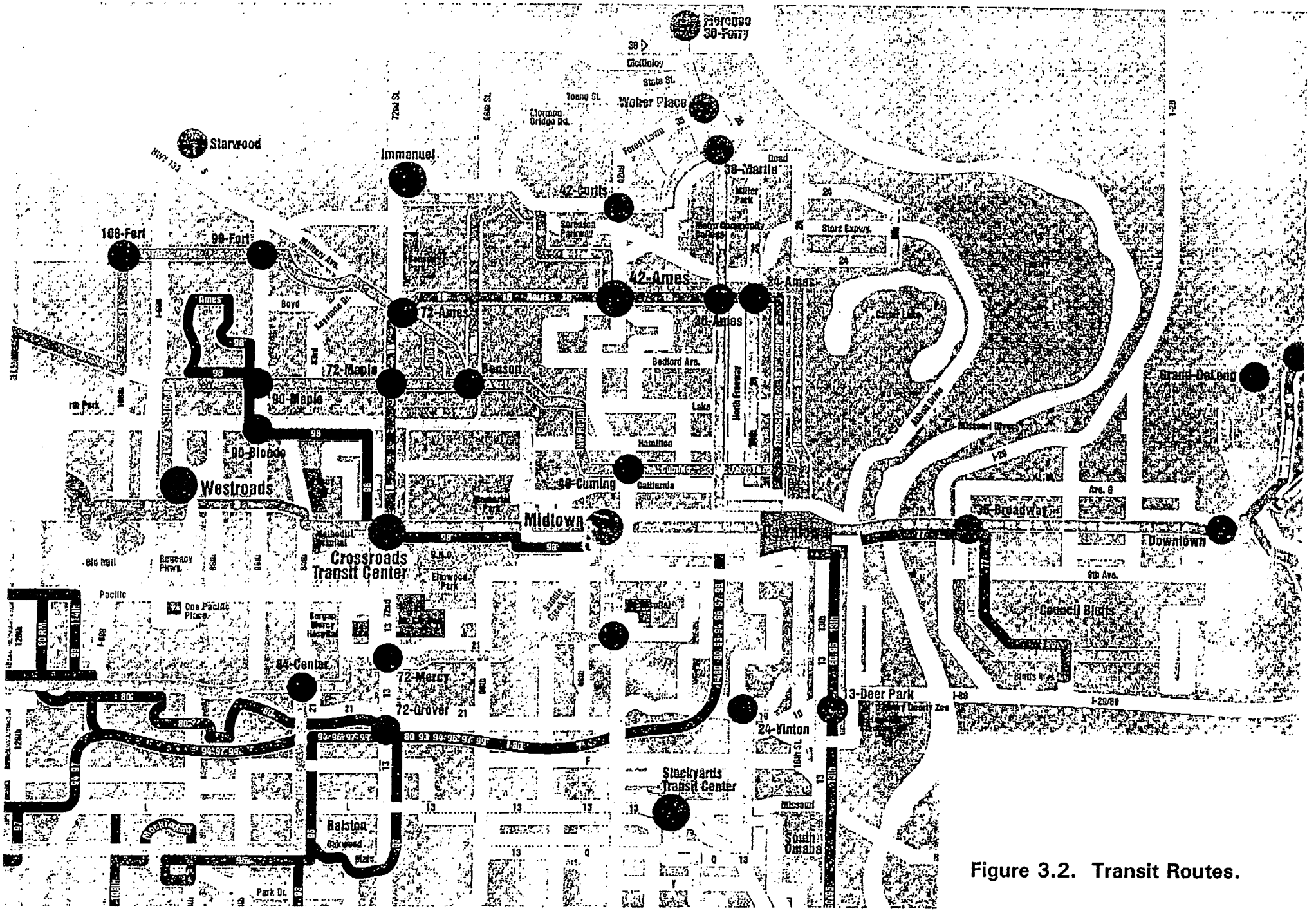

Figure 3.2. Transit Routes.

The MOBY service is operated by MAT. In providing service, MAT complies with ADA Regulation 37.167.

Approximately 0.6 % of the population within the city limits is registered for MOBY.

To be eligible for MOBY service, MAT requires certification from a physician that the individual cannot use fixed route buses, which does not include accessible buses. Individuals may call the certification supervisor for an application form. MAT has a Telephone Device for the Deaf (TDD)

Specific information regarding eligibility and operation for prospective users is provided by MAT's certification supervisor Monday through Friday, 8:00 a.m. to 4:30 p.m. (The hearing impaired can communicate with the certification supervisor via MAT's TDD.) The certification supervisor will fill out an application form for a visually impaired person over the telephone. MAT will mail the application to the physician of the applicant's choice for review and, if appropriate, a certifying signature.

3.3.4 General Description of MAT Service

MAT is responsible for providing public mass transportation in the principal urbanized portion of the Omaha and Council Bluffs metropolitan area.

Summary statistics for MAT in 1995 are as follows:

Statistic	**Approximate Quantity**
Number of Buses	151 active buses & 166 overall
Number of Peak Hour Buses	125
Daily Ridership	17,547
Number of Garages	1
Number of Drivers	185 full-time
Range of Headways	15 minutes peak time/30 minutes normal
Number of Dispatchers	3 each (works an 8-hour shift)
MOBY Paratransit Dispatchers	1 dispatcher/ 1 clerk
Number of Immediate Supervisors	5
Number of Bus Stops	5,000
Number of Routes	28
Basic (Fixed Route Service)	15 routes
Rush Hour (Fixed Route Connector Service)	5
Express (Commuter)	8
Square Miles of Coverage	103 square miles

A description of the MAT bus fleet is included as Appendix A-5.

Service is also provided by MAT under contract with the following entities:

Contract Service	Number of Routes
City of Council Bluffs, Iowa	3 Routes*
City of Bellevue, Nebraska	3 Routes**
Communities (Ralston /LaVista/Papillion, NE)	1 Route**
Bluffs Run, Council Bluffs, Iowa	1 Route**
Total	**8 Routes**

* Fixed Route Service
** Commuter service

Days and Hours of Service

Fixed route service is provided Sunday through Saturday. Days and hours of fixed-route service are as follows:

Weekdays:	4:15 a.m.	to	11:5 p.m.
Saturday:	6:00 a.m.	to	l0:48 p.m.
Sunday:	6:17 a.m.	to	7:56 p.m.

Fixed Route Fare Structure

CASH FARES*:

Adult Regular	$ .90
Adult Express	1.00
Student with Photo ID**	.75
Child (Ages 5-l 1)	.50
Child under 5 with adult	Free
Elderly/Handicapped/Medicare with Photo ID .	.45
Route 93 (Tri-Communities)	1.00
Transfer (Purchase when paying fare)	.05

* MAT PHOTO ID must be shown before paying fare,
**Student Fare in effect before 6:00 p.m. on school days only.

4. COMMERCIAL VEHICLE OPERATIONS

A survey was sent to 86 Nebraska Motor Carriers Association members, either based in Omaha or known to have routes through Omaha. Of the 86 surveys sent out, 25 were returned, a 29% response rate.

4.1 SURVEY RESULTS

In the following results, where the total of the percentages is more than 100 percent for a particular question, one or more of the respondents have indicated more than on answer to the question.

Types of goods transported:

84 % manufactured freight
20 % raw commodities
4 % refuse

Three most common commodities:

1. retail and wholesale/manufactured freight (tie)
2. refrigerated goods
3. "other" -- computers, food stuffs, concrete, refuse, automobiles, general commodities, non-refrigerated/non-bulk food products

Three most used vehicle configurations:

tractor-semi trailer, four axle 35%
tractor-semi trailer, three axle 24%
tractor-semi trailer, five axle 23 %

Percent of truck travel occurring during the following hours:

midnight	-	7:00 a.m.	14%
7:00	-	8:00 a.m.	20%
8:00	-	9:00 a.m.	14%
9:00	-	12 noon	l4%
12 noon	-	4:00 p.m.	12%
4:00	-	5:00 p.m.	8%
5:00	-	6:00 p.m.	9%
6:00	-	12 midnight	l5%

Inbound tonnage: 512.6 million annually

Outbound tonnage: 636.9 million annually

Itra-city tonnage: 2.6 million

Number of trips into Omaha annually: 62,326

Number of trips originating in Omaha to be delivered elsewhere: 34,402

Number of intra-city trips: 136,751

Communicating accidents:

52% did not respond to this item. Of the respondents, seven indicated use of the phone as their primary means of notification; one mentioned a pager, and one a two-way radio.

Who receives first notification was evenly divided between law enforcement and the company's safety department. One respondent indicated the insurance company receives the first call.

Intermodal activities:

76% do not use rail transportation
24% use rail -- about 14 days per month at the Burlington Northern yard and 12 days per month at Union Pacific.

95 tons of freight are received by rail monthly; none are shipped.

48% said the scale of their intermodal activity would stay the same; 4% indicated plans to expand.

Hazardous materials transportation:

56% do not transport hazardous materials.
44% do transport hazardous materials.

Percentage of hazardous materials to total freight:

1 - 5 percent	**20%**
6 - 20 percent	**12%**
21 - 35 percent	**0%**
36 - 50 percent	**4%**
51 - 75 percent	**4%**
more than 75 percent	**4%**

Suggested changes to hazardous materials permitting/registration process:

- Eliminate registering in each state.
- Hazardous materials endorsement included with base state registration.
- Standardize -- like single state registration.

Preferred truck routes:

92% listed I-80
60% listed I-680
48% listed I-480
44% listed I-29
36% listed L Street
32% listed Hwy 73-75
24% listed 72nd Street
20% listed Hwy 275
12% listed Hwy 50, 84th, Dodge, F Street
8% listed Maple, Q Street, Hwy 370, Hwy 92

Roads or bridges that are impediments to freight movement:

- Hwy 50 southbound Giles to I-80 -- no hill climb lane for slower vehicles
- I-80 24th to 120th, and I-680 -- congestion caused by construction
- Need traffic lights at 84th & H and 79th & L
- Low bridge on 20th off Leavenworth
- Hwy 275 needs to be major four-lane between Omaha and Fremont as soon as possible -- extremely busy not to be a four-lane
- Railroad bridge on South 13th--height
- Need better way to get out of airport area
- Low bridge at 29th & C, ConAgra flour mill
- Rough road from Storz Expressway to Pershing on 16th Street
- 79th & L: Over 10 truck terminals in this area, a major area of congestion for trucks and cars. 79th is only entrance from L Street to all truck lines -- should build another access road to J Street.
- Corner of 79th & L never receives plowing when it snows.
- Frontage road & 79th Street -- hill hinders movement onto L Street
- I-80 east L Street -- poor ramp and congestion
- 1-680/L & I Streets -- poor ramp
- 72nd & F -- people run red lights
- I Street off-ramp from I-80 should have left turn and a traffic light
- Many accidents at 72nd & L due to poor visibility of second stoplight

Vehicle restrictions:

- Axle weights and bridge laws
- LCV prohibition
- Restricted access to 72nd Street from our facility

ITS applications used:
If not currently used, do you think it would be beneficial to your company?

Of those who did:

36% use for licensing, permitting, registration; and 50% thought it would be useful.
50% use for mileage/fuel tax calculations and reporting; and 60% thought it would be useful.
41% use for auditing driver logs and trip sheets; and 57 % thought it would be useful.
42% use for reviewing driver records; and 30 % thought it would be useful.
23% use for vehicle/container tracking; and 66 % thought it would be useful.
39% use for load tracking; and 50% thought it would be useful.
18% use for monitoring vehicle/cargo conditions; and 22% thought it would be useful.
83% use for routing and dispatching; and 50% thought it would be useful.
23% use for fleet maintenance scheduling; and 71% thought it would be useful.

Comments:

- I don't know what ITS means (This was from very large company.)
- No benefit (to ITS) -- all done in-house

4.2 CONCLUSION

Among respondents, hours of truck travel are remarkably uniform throughout the day considering the variety of goods hauled. The slight increase in early morning hours may reflect just-in-time deliveries for the start of the business day.

Among respondents, there are almost twice as many truck trips into Omaha as there are trips originating in Omaha.

Among respondents, hazardous materials shipments represent a very small portion of truck freight.

Among respondents, a strong preference for I-80 and I-680 as truck routes conforms to a general sense of more truck traffic being concentrated in south central and southwest sections of Omaha. 79th and L Streets was singled out by several respondents as an area in need of some re-engineering.

A very high percentage of respondents are using a computer application for routing and dispatching.

5. INCIDENT MANAGEMENT

Incidents are non-recurrent events that reduce the capacity of a roadway or abnormally increase traffic demand. Some incidents are predictable, such as maintenance activities, construction, and special events. Other incidents are unpredictable, such as accidents, stalled vehicles, disabled vehicles, spilled loads, roadway debris, and inclement weather. Incidents often cause traffic congestion and delay, and create the potential for secondary accidents. For example, an incident blocking one lane of the Gulf Freeway in Houston for 18 minutes has been estimated to cause 800 vehicle-hours of delay (1); and, in Minneapolis, 13 percent of all peak-period accidents on one freeway were caused by a previous incident (2).

The impact of an incident on traffic congestion depends on the amount by which it reduces the capacity of the roadway and the length of time between the occurrence of the incident and its removal. The reduction in capacity may range from 15 percent for a vehicle stalled on the shoulder to 100 percent for an accident blocking all lanes (3). The duration of an incident depends on how long it takes for it to be detected, responded to, and cleared. Reducing the duration of an incident can greatly reduce its impact on traffic congestion and safety.

The incident management function of ITS is intended to reduce the impacts of incidents by facilitating incident detection, response, and clearance. It includes the identification of incidents, formulation of response actions, and support for the coordinated implementation of response actions (4). The response actions include emergency and service vehicle dispatch, traffic control, and dissemination of incident-related information to travelers and potential travelers.

This report presents the results of the inventory of emergency response services. The purpose of the inventory is to define the problems with respect to incident management in the Omaha metropolitan area. The inventory involved three primary tasks: (1) analysis of the responses to a survey of emergency response agencies conducted by FHWA, (2) interviews with the primary emergency response agencies, and (3) assessment of the impact of freeway incidents in the Omaha metropolitan area. A discussion of the procedures and results of these tasks follows.

5.1 FHWA SURVEY

In April, 1993, the FHWA Incident Management Workshop was held in Omaha. The purpose of the workshop was to enhance the effectiveness of the existing incident management process in the Omaha metropolitan area. Specific objectives of the workshop were:

1. To demonstrate the need for a formalized structure for interagency and interdisciplinary coordination to manage incidents,

2. To demonstrate the various technical and administrative aspects of incident management.

3. To leave participants with a potential course of action for creating an effective incident management program or reaching the next step in improving an existing program.

The workshop was attended by 30 individuals representing 15. state and local agencies and one private towing service involved in emergency response in the Omaha metropolitan area. The agencies represented at the workshop are listed in Table 5.1 .

Table 5.1. Agencies Represented at F'HWA Incident Management Workshop.

Bellevue Police Department	Neff Towing Service
Bellevue Public Works Department	Nebraska Department of Roads
Council Bluffs Police Department	Nebraska State Patrol
Douglas County Engineer's Office	Omaha Emergency Communications Department
Douglas County Sheriffs Office	Omaha Fire Department
Iowa Department of Transportation	Omaha Police Department
LaVista Police Department	Omaha Public Works Department
Metropolitan Area Planning Agency	Sarpy County Highway Department

5.1.1 Questionnaire

Several problems with the existing system of incident management in the Omaha metropolitan area were identified, and some possible solutions to these problems were discussed during the workshop. As the next step in the process of developing an incident management program, the FHWA sent a questionnaire to representatives of 27 state and local agencies in the Omaha metropolitan area in July, 1994. The questionnaire was sent to the representatives of the 15 agencies attending the workshop and 12 other agencies. The agencies receiving the questionnaire are shown in Table 5.2.

The questionnaire was designed to obtain information regarding:

- numbers, types, and locations of incidents;
- types of responses (who, how, when, ***etc.);***
- impacts of incidents on responding agencies; and
- overlap in procedures among agencies.

Table 5.2. Agencies Receiving the FHWA Incident Management Survey Questionnaire.

Bellevue Fire Department	LaVista Police Department
Bellevue Police Department	LaVista Public Works Department
Bellevue Public Works Department	Metropolitan Area Planning Agency
City of Bennington	Metropolitan Area Transit
City of Elkhorn	Nebraska Department of Roads
City of Papillion	Nebraska State Patrol
City of Ralston	Pottawattamie County Engineer's Office
Council Bluffs Communications Department	Pottawattamie County Sheriffs Office
Council Bluffs Fire Department	Omaha Emergency Communications Department
Council Bluffs Police Department	Omaha Fire Department
Council Bluffs Public Works Department	Omaha Police Department
Douglas County Engineer's Office	Omaha Public Works Department
Douglas County Sheriff's Office	Sarpy County Highway Department
Iowa Department of Transportation	

The information obtained from the questionnaire will be analyzed and summarized in a report by FHWA. The report will also contain a summary of the workshop and lay out a proposed course of action. It will be circulated for review by all agencies involved, and the final report will provide a framework for short-term and long-term incident management improvements.

The questionnaire contained seven questions. A copy of the questionnaire and cover letter are shown in Appendix A-7. The first six questions were designed to solicit information relative to the following issues:

- incident response procedures
- availability of incident data,
- impact of incidents on agency resources, and
- problems with present incident response practices.

The last question simply asked for the name of an individual who would be able to represent the agency on an incident management task force.

5.1.2 Response

Of the 27 agencies surveyed, 10 (37 percent) completed and returned the questionnaire. The agencies responding to the questionnaire are listed in Table 5.3. The responses received from the agencies to each question are presented in Appendix A-8. Although 10 agencies responded, only eight responses are shown for each question, because three agencies (Bellevue Fire, Police, and Public Works Departments) completed one questionnaire together. A summary of the responses with respect to the four primary issues addressed by the questionnaire follows.

Table 5.3. Agencies Responding to FHWA Incident Management Survey Questionnaire.

Bellevue Fire Department	Omaha Emergency Communications Department
Bellevue Police Department	Omaha Police Department
Bellevue Public Works Department	Omaha Public Works Department
Nebraska State Patrol	Papillion Police Department
Nebraska Department of Roads	Sarpy County Highway Department

Incident Response Procedures. Nine of the 10 agencies responding to the survey had not changed their incident response procedures since the incident management workshop held in April, 1993. The NDOR indicated that it had tried to have more communication with the Omaha Police Department and the Nebraska State Patrol and offered them the use of message board signs when they request them. However, the Omaha Police Department and the Nebraska State Patrol did not acknowledge this effort in their responses to the questionnaire.

Six of the 10 agencies indicated that they have written descriptions of their incident response procedures. Four of the agencies (Omaha Police and Public Works Departments, Papillion Police Department, and Sarpy County Highway Department) indicated that they did not have written descriptions of their incident response procedures. In the case of major incidents, the Bellevue Fire, Police, and Public Works Departments establish a command center and follow the National Fire Academy Model/Incident Command System for coordinating response units. Similarly, the Omaha Emergency Communications Department uses its mobile command post to establish a command post to serve the Omaha Fire and Police Departments in the case of third alarm or greater fires, or for any incident when requested by the incident commander.

The Nebraska State Patrol responds to calls received via 911) emergency hot line, or officers at the scene. Officers at the scene then advise the dispatcher concerning the nature of additional assistance that may be needed. The NDOR dispatches a supervisor to assess incidents. The supervisor then requests the manpower and equipment needed to clear the incident and/or provide traffic control.

Availability of Incident Data. Most of the agencies indicated that they do maintain a log of all the incidents to which they respond. The Omaha Emergency Communications, Police, and Public Works Departments were the only agencies indicating that they do not keep such a log. Five of the agencies also have additional information available about the incidents to which they respond. These agencies complete an incident report for each incident. The incident reports contain information about the incident, such as location, time of detection, time to respond, type of response, and time when response is completed. The Omaha Emergency Communications, Police, and Public Works Departments, Sarpy County Highway Department, and NDOR do not maintain a file of incident reports. Although the Omaha Communications and Police Departments do not file incident reports as such, they do maintain records of their calls, but these are not readily available.

Impact of Incidents on Agency Resources. Most the agencies were not able to estimate the impact of incidents on their resources. The Bellevue Fire, Police, and Public Works Departments estimated that a major incident involving the hazardous materials unit, police, and street department would cost about $2,500 per hour. The Omaha Emergency Communications Department indicated that the use of off-duty operators would cost from $18 to $30 per person-hour.

Problems with Present Incident Response Practices. The primary problems cited by the responding agencies were communications and limited resources. The communications between responding agencies is difficult. Facilities for direct communications between agencies do not exist, making it difficult for them to coordinate their response efforts. Also, incident management is further complicated **by** the lack of a common source of information about the roles, resources, and command structures of the agencies with respect to incident response. The efficiency and effectiveness of an agency's response to an incident may be hampered by not knowing the types of resources other agencies have available for assisting with incident response and not knowing who to contact to request these resources.

Limited resources add to the difficulties of responding to incidents in a timely and effective manner. Limited resources are also indicative of the need for more coordination and cooperation among the agencies.

5.2 INTERVIEWS

Interviews of representatives of primary incident response agencies were conducted to obtain their perspectives on the problems and issues pertinent to the deployment of ITS incident

management technologies. The agencies and individuals interviewed are listed in Table 5.4. A summary of the views obtained from each agency follows.

Table 5.4. Knterviews with Representatives of Primary Incident Response Agencies.

Bellevue Public Works Department • Dennis Hilfiker, Director	Omaha Emergency Communications Department • Dennis M. McCann, Shift Supervisor
Douglas County Civil Defense • Erik C. Swanson, Public Education Officer	Omaha Police Department, Emergency Response Unit • Lt. Thomas J. Donaghy , Commander
Nebraska Department of Roads • John Jacobsen, District 2 Engineer - Wayne Horn, District 2 Construction Engineer	Omaha Public Works Department - Charlie L. Krajicek, Traffic Engineer • Glenn G. Hansen, Assistant Traffic Engineer
Nebraska State Patrol • Lt. James Parish	

Bellevue Public Works Department. The Bellevue Fire, Police, and Public Works Departments prepared a combined response to the FHWA incident management questionnaire. Mr. Dennis Hilfiier, Director of Public Works, provided the leadership in the preparation of the combined response of the departments. The three departments believe that they have a system that works for incidents which occur within their jurisdiction. Communications problems caused by each agency operating on separate frequencies should be solved by the installation of the Sarpy County 800 mhz communication system, which will be ready in the fall of 1995. However, the City of Bellevue sees the need to improve the coordination of emergencies response services with other jurisdictions, perhaps by means of a MAPA-type regional organization. Suggested opportunities for ITS applications include in the area of incident management include improved traveler information systems involving the use of variable message signs installed at strategic points along major highways and portable variable message signs on trailers at the scene to facilitate traffic control.

Douglas County Civil Defense. Plans are now being formulated by the Douglas County Civil Defense for emergency management, which would coordinate the actions of emergency response agencies in the metropolitan area in the event of a major emergency. The agency has considerable space on the lower level of the Omaha/Douglas Civic Center at 1819 Famam Street. The space includes a command post/information center as well as a number of offices, sleeping quarters, and a cafeteria. The space is currently used by the agency staff and would be occupied by emergency response agencies in cases of major disasters. Plans are being made to renovate the space and update the communication facilities. Development of a plan for deployment of an ITS incident management function should consider opportunities for coordination with this emergency management planning effort.

Nebraska Department of Roads. The Nebraska Department of Roads monitors continuously the radio communications of state and local law enforcement agencies to learn of incidents occurring on state highways in the metropolitan area. When the occurrence of an incident has been determined, the NDOR dispatches a supervisor to assess the incident and determine what NDOR resources may be needed to clear the incident and control traffic. The NDOR sees the need for developing an incident management system to reduce the time to clear incidents, particularly for incidents on the interstate highways. The NDOR has tried to work more closely with the Nebraska State Patrol and Omaha Police Department to improve incident response. The NDOR would be supportive of efforts to continue the incident response planning initiated at the FHWA incident management workshop in April, 1993.

Nebraska State Patrol. The Nebraska State Patrol has a limited force in the Omaha metropolitan area. Therefore, they have a secondary role with respect to incident response. The agency maintains a file of incident reports, which could be made available for analysis. The agency believes that the major problems with respect to incident response are the poor interagency communications capabilities and the lack of incident response planning necessary to coordinate the incident response actions of the agencies. Also, there is a need for more effective means of informing drivers of incidents and providing traffic control at the scene.

Omaha Emergency Communications Department. The Omaha Emergency Communications Department receives the Omaha 911 calls and dispatches fire/rescue units and/or police officers in response. The Department also operates a mobile command post which it dispatches to the scene of all third alarm or greater fires and any other incidents when requested by the incident commander. Dispatch records maintained by the agency could be analyzed to determine incident characteristics, such as location, duration, nature, and response. The agency sees the need for improved communications among incident response agencies to improve the effectiveness of incident response and traffic control at the scene. Traveler information systems, such as variable message signs and radio advisories, are seen as opportunities to improve traffic control.

Omaha Police Department The Omaha Police Department is working with the Omaha Fire Department and the Douglas County Local Emergency Planning Committee to improve incident response practices. The agency is reviewing the incident command structure used by the Omaha Fire Department. Communications with other agencies, which are called on to assist with incidents, is recognized as a major problem. The lack of a central information center makes it difficult to contact the proper authorities to approve the use of their resources. Also, the agency recognizes the need for training to address the traffic impacts of incidents and their mitigation.

Omaha Public Works Department. The Omaha Public Works Department recognizes the needs and opportunities for incident management. The agency does not have an incident management program at this time, but it is supportive of the continuation of the planning efforts initiated at the FHWA incident management workshop in April, 1993.

5.3 FREEWAY INCIDENT MANAGEMENT

Analysis of freeway incidents was conducted to estimate their impact on freeway congestion in the Omaha metropolitan area and to assess the potential benefits of freeway incident management. The only incident data available were accident data. Therefore, it was necessary to estimate the frequency and magnitude of incidents using relationships between accidents and incidents observed in studies of freeway incident management in other cities (5) The procedure and results of the analysis are presented in this section

5.3.1 Accident Data

Freeway accident data were obtained for the 3-year period between July 1, 1991 and June 30, 1994. The data were provided by the NDOR, Iowa DOT, and the City of Council Bluffs. The data were obtained for the sections of I-80, I-680, I-480, and I-29 shown in Figure 5.1. These sections comprise approximately 50 miles of freeway.

A total of 2,171 accidents occurred on these freeways during the 3-year period, for an average of 724 accidents per year. One percent of the accidents were fatal, 43 percent involved non-fatal injuries, and 56 percent were property-damage-only accidents. Nine percent of the accidents involved trucks or buses. Five percent of the truck/buses accidents involved vehicles displaying hazardous materials placards, and one percent involved the release of hazardous materials.

Of the 2,171 accidents, about 60 percent occurred during daylight, 6 percent occurred during dawn or dusk, and 34 percent occurred at night. Approximately 80 percent of the 2,171 accidents happened on weekdays. Of the weekday accidents, 35 percent occurred during the morning and afternoon peak periods from 7:00 to 9:00 am and 4:00 to 6:00 pm; and 27 percent occurred during the daytime off-peak period from 9:00 am to 4:00 pm.

5.3.2 Congestion

Experience in other cities indicates that operation of a freeway incident management system in the Omaha metropolitan area would probably be most practical on weekdays during the morning and afternoon peak periods, and possibly during the daytime hours between the peak periods. Therefore, to provide a basis for assessing the potential benefits of freeway incident management in the Omaha metropolitan area, the impact of incidents on freeway congestion was estimated for the morning and afternoon peak periods and the daytime off-peak period on weekdays. The numbers of accidents occurring on the freeway sections during the peak and off-peak periods on weekdays between July 1, 1991, and June 30, 1993, are shown in Table 5.5.

Table 5.5. Accidents on Freeway Sections from July 1, 1991, to June 30, 1993.

Freeway	Section	ADT	No. of Lanes	Directional Capacity (vph)	3-Year Accident Totals[a]	
					Peak	Off Peak
I-80	Hwy-370- Hwy-50	25,900	4	4,000	2	5
	Hwy-50-Harrison	37,300	4	4,000	22	19
	Harrison-L	47,300	4	4,000	22	17
	L-I-680	74,300	6	6,000	33	30
	I-680-84th	92,200	6	6,000	29	27
	84th-72nd	104,000	6	6,000	30	21
	72nd-60th	113,800	6	6,000	41	27
	60th-42nd	121,000	6	6,000	25	33
	42nd-I-480	126,400	6	6,000	25	24
	I-480-24th	50,000	4	4,000	37	26
	24th-13th	44,200	4	4,000	14	20
	13th-stateline	44,200	4	4,000	13	8
	stateline-I-29	44,200	4	4,000	9	10
	1-29-I-29	50,000	4	4,000	26	23
	I-29-US-6	16,000	4	4,000	9	16
I-680	I-80-W.Center	77,100	6	6,000	55	13
	W.Center-Pacific	76,700	4	4,000	33	17
	Pacific-Dodge	77,400	4	4,000	47	26
	Dodge-Maple	55,300	4	4,000	9	5
	Maple-Fort	39,400	4	4,000	10	8
	Fort-Hwy-133	31,700	4	4,000	2	3
	Hwy-133-72nd	24,500	4	4,000	8	7
	72nd-US-75	21,500	4	4,000	8	2
	US-75-30th	19,800	4	4,000	3	0
	30th-stateline	12,600	4	4,000	0	1
I-480	I-80-Martha	76,900	6	6,000	9	14
	Martha-Leavenworth	76,900	6	6,000	17	12
	Leavenworth-Dodge	78,800	6	6,000	15	11
	Dodge-13th	51,500	6	6,000	8	11
	13th-stateline	31,700	6	6,000	1	7
I-480/29	stateline-I-80	79,000	4	4,000	12	13

a Weekday accidents: Peak (7:00-9:00 am and 4:00-6:00 pm) and Off Peak (9:OO am-4:00 pm).

The frequency of incidents was estimated from the accident data. Previous studies of freeway incident characteristics indicate that accidents represent about 12 percent of the total number of incidents that occur on a freeway (5). Therefore, the number of incidents on each section of interstate was estimated by dividing the numbers of accidents by 0.12.

The normal capacity of the freeway sections was assumed to be 2,000 vehicles per hour per lane. According to continuous traffic count data on I-80 and I-680 (6), the average hourly freeway volume during the four weekday peak hours (7:00 to 9:00 am and 4:00 to 6:00 pm) is about 7.5 percent of the ADT, and the average hourly freeway volume during the seven weekday off-peak hours (9:00 am to 4:00 pm) is 5.5 percent of the ADT. These percentages were used to compute the peak and off-peak hourly volumes on the freeway sections. The ADTs and directional capacities used in the analysis are shown in Table 5.5. The ADTs are the 1992 average weekday traffic volumes, which were obtained from MAPA (7).

The findings of previous studies (5) were also used to estimate the magnitude of the incidents in terms of the number of lanes blocked and the reduction in freeway capacity. The lane-blockage percentages used to estimate the magnitudes of the incidents are shown in Table 5.6. These values indicate that accidents tend to block more lanes than other types of incidents. The capacity reductions associated with the extent of lane blockage are shown in Table 5.7. These values were used to estimate the reductions in freeway capacity caused by the incidents.

Using the lane-blockage percentages in Table 5.6, the number of incidents associated with each level of lane-blockage were computed for the weekday peak and off-peak periods on each freeway section. The resultant freeway section capacities were then computed using the capacity reduction percentages in Table 5.7. The reduced capacities were then compared to the hourly volumes. If the reduced capacity was greater than the hourly volume, it was assumed that the incidents would not cause congestion. But, if the reduced capacity was less than the hourly volume, the incident was assumed to cause congestion.

Table 5.6. Incident Lane Blockage.

Blockage	Percent of Incidents	
	Accidents	Other Incidents
shoulder	47	93
1 lane	43	6
2 lanes	8	.5
> 2 lanes	2	.5

Table 5.7. Capacity Reduction Effects of Incidents.

Blockage	Capacity Reduction (Percent)	
	4-Lane Freeway	6-Lane Freeway
shoulder	30	26
1 lane	65	50
2 lanes	100	79
> 2 lanes		100

The delay resulting from the congestion was computed using the input-output method for the analysis of freeway congestion presented in ***the 1985 Highway Capacity Manual (3).*** The delay calculations used an average incident duration of 50 minutes, which includes detection, response, and removal. Data, provided by the Papillion Police Department in response to the FHWA survey, indicated that the average time for incident response and removal was about 40 minutes. This time did not include incident detection, which was assumed to be an average of 10 minutes.

The estimates of the delay caused by incidents on weekdays during the peak and off-peak periods on each freeway section is shown in Table 5.8. The freeway sections experiencing the higher levels of delay are indicated in Figure 5.2. The estimated total annual delay due to incidents occurring during the weekday peak and daytime off-peak periods is 175,300 vehicle hours. Nearly 80 percent (138,110 vehicle hours) is experienced during the morning and afternoon peak periods, and the remaining 20 percent (37,190 vehicle hours) is experienced during the 7-hour off-peak period between 9:00 am and 4:00 pm. The major delays are on I-80 between I-480 and 84th Street and on I-680 between I-80 and West Dodge Road. In fact, incidents on these sections cause about 80 percent (141,460 vehicle hours) of the delay.

5.3.3 Potential Benefits

Incident management systems can reduce the congestion and delay resulting from incidents in two ways: (1) by reducing the duration of the incidents, and (2) by reducing the traffic demand on the affected freeway sections. Incident management systems reduce the duration of an incident by enabling earlier detection, quicker response, and faster removal. Incident management systems reduce traffic demand via traffic control (e.g., ramp metering) and traveler information (e.g., variable message signs); which will divert traffic to other routes.

The amount by which incident duration and traffic demand can be reduced by an incident management system would depend on several factors, such as:

Table 5.8. Delay Caused by Freeway Incidents.

Freeway	Section	Annual Delay (vehicle hours per year)*		
		Peak	Off Peak	Total
I-80	Hwy-370-Hwy-50	40	70	110
	Hwy-50-Harrison	680	430	1,110
	Harrison-L	1,800	540	2,340
	L-I-680	1,400	740	2,140
	I-680-84th	3,000	1,100	4,100
	84th-72nd	6,100	1,130	7,230
	72nd-60th	13,000	2,660	15,660
	60th-42nd	13,200	4,680	17,880
	42nd-I-480	21,800	4,300	26,100
	I-480-24th	610	240	850
	24th-13th	170	120	290
	13th-stateline	160	50	210
	stateline-I-29	560	300	860
	I-29-I-29	2,700	860	3,560
	I-29-US-6	90	130	220
I-680	I-80-W.Center	25,500	2,800	28,300
	W.Center-Pacific	15,000	3,570	18,570
	Pacific-Dodge	22,100	5,620	27,720
	Dodge-Maple	1,300	320	1,620
	Maple-Fort	340	200	540
	Fort-Hwy-133	50	60	110
	Hwy-133-72nd	150	90	240
	72nd-US-75	120	20	140
	US-75-30th	40	0	40
	30th-stateline	0	10	10
I-480	I-80-Martha	400	380	780
	Martha-Leavenworth	750	320	1,070
	Leavenworth-Dodge	700	310	1,010
	Dodge-13th	140	110	250
	13th-stateline	10	20	30
I-480/29	stateline-I-80	6,200	6,010	12,210
Total		**138,110**	**37,190**	**175,300**

Weekdays: Peak (7:00-9:00 am and 4:00-6:00 pm) and Off Peak (9:00 am-4:00 pm).

- method(s) used to detect and verify incidents,
- proximity and availability of response units,
- level of comnunications among response service agencies,
- equipment available for clearing incidents,
- system(s) for providing traveler information,
- freeway control system, and
- availability of alternate routes.

The potential benefits of freeway incident management in the Omaha metropolitan area were assessed by computing the incident delay for two levels of reduction in incident duration and one level of reduction in traffic demand. In other cities (5), average incident durations have been reduced by as much as 20 minutes, and traffic demands have been reduced by as much as 50 percent. Therefore, for the purposes of this analysis, l0- and 20-minute reductions in incident duration and a 50-percent reduction in traffic demand were used. The potential benefits for these reductions are shown in Table 5.9.

'Table 5.9. Potential **Benefits of Freeway Incident Management.**

Reduction In Incident Duration (minutes)	Reduction In Traffic Demand (percent)	Annual Delay (vehicle hrs)	Annual Delay Costs ($)	Annual Delay Savings (vehicle hrs)	Annual Delay Cost Savings ($)
0	0	175,300	1,753,000	0	0
10	0	111,300	1,113,000	64,000	640,000
20	0	62,000	620,000	113,300	1,133,000
0	50	133,500	1,335,000	41,800	418,000
10	50	86,300	863,000	89,000	890,000
20	50	48,000	480,000	127,300	1,273,000

According to the information in Table 5.9 a freeway incident management system on weekdays, that reduced the average incident duration by 20 minutes and the traffic demand by 50 percent, would save 127,300 vehicle hours of delay per year. At a cost of $10 per vehicle hour, which is a reasonable value for traffic on the freeway in the Omaha metropolitan area (5), the annual delay cost savings would be nearly $1.3 million. A system that only provided a reduction in average incident duration of 20 minutes without a reduction in traffic demand would alone provide an annual delay cost savings of over $1 million; and a system that simply reduced traffic demand by 50 percent on the affected freeway sections would provide an annual delay cost savings of over $400,000. Certainly, these potential savings suggest that further consideration should be given to the deployment of ITS technologies for freeway incident management in the Omaha metropolitan area.

5.4 CONCLUSION

Currently, there is not a formal traffic incident management program in the Omaha metropolitan area. Emergency response agencies are usually notified about the occurrence of traffic incidents by 911 calls, or for other calls for service, received from the drivers(s) involved or other non-involved drivers who observe the incidents. In some cases, incidents are observed by law enforcement officers or road maintenance workers on patrol, who may call for additional assistance if necessary. Verification of incidents and assessing the need for additional assistance are typically done by law enforcement officers dispatched to the scene. Inadequate facilities for interagency communications often cause excessive delays in removing incidents when assistance is needed from other agencies not at the scene, complicating the effective coordination of, response actions by the various agencies.

Traffic control is primarily limited to that provided by law enforcement officers at the scene. There are no motorist information systems for providing warnings and advisories to approaching traffic, or for informing those who are about to begin their trips, other than advisories broadcast by commercial radio and TV stations. These broadcasts are limited to the weekday morning and afternoon peak hours and often not timely enough to maintain their credibility with drivers.

The problems of communications and lack of infrastructure for the purposes of incident management were defined by the participants at the FHWA incident management workshop held in Omaha in April, 1993, and by the respondents to the follow-up survey conducted by the FHWA. The interviews with representatives of the primary emergency response agencies conducted as part of this study also identified these problems and reiterated the desire of these agencies to continue the incident management planning process which began with the FHWA workshop.

In addition, the analysis of freeway incidents conducted as part of this study reveals the substantial impact that these incidents have on freeway congestion and delay. The potential benefits computed in this analysis indicate that opportunities for deployment of ITS technologies

for freeway incident management should be given further consideration. Therefore, in concurrence with NDOR, MAPA, and FHWA, a focus group will be formed to more clearly define the opportunities for the ITS incident management function in the Omaha metropolitan area.

5.5 REFERENCES

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