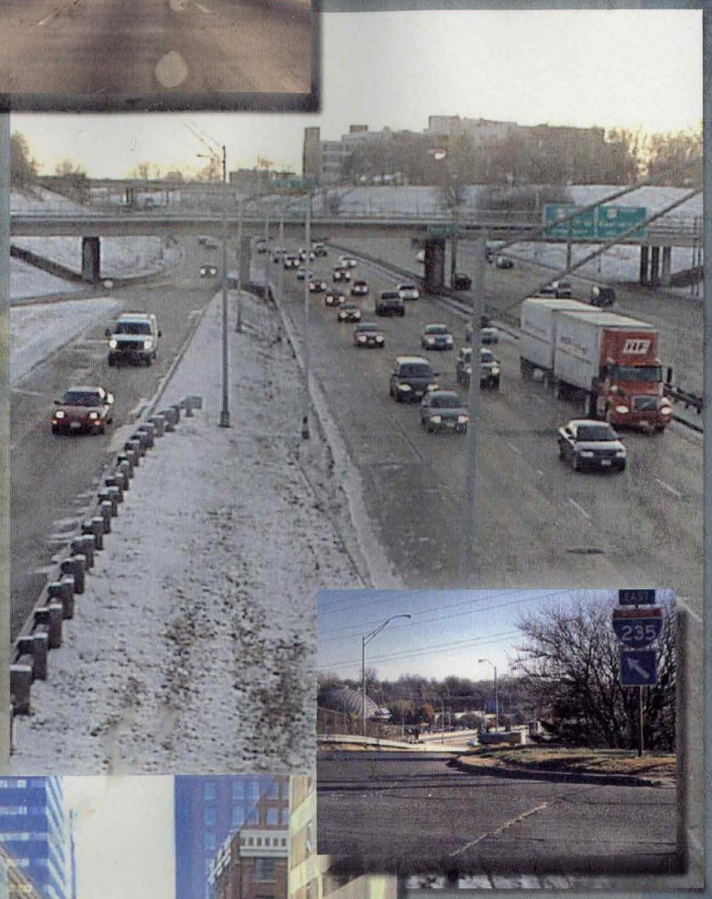
SCOPE OF WORK



SCOPE OF WORK

For

Traffic Engineering and Intelligent Transportation System Services

I-235 Reconstruction

Prepared for

Iowa Department of Transportation

Submitted by

CH2MHILL

In Association With

Howard R. Green

NET

Audino & Associates

CTRE

Strategic America

March 2000

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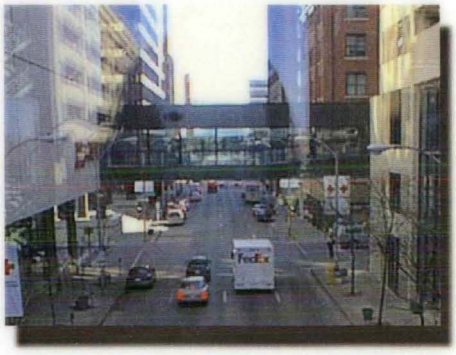

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SCOPE OF WORK

1.0 Introduction

As the Iowa Department of Transportation (DOT) embarks on its largest and most complex project, the Department is seeking a reliable partner to achieve project goals. CH2M HILL has formed a team to specifically address Iowa DOT's needs for a partner to assist in quality, timely, cost-effective solutions for the I-235 traffic engineering and intelligent transportation system services project. CH2M HILL's combination of local transportation professionals supported by national expertise uniquely qualifies the firm to support Iowa DOT in the successful completion of the project. The CH2M HILL team will bring value to the project through

- **An understanding of the mission and goals of the Iowa DOT.** The team's in-depth understanding of the Iowa DOT organization and stakeholders through projects such as I-80, I-35, I-235 Freeway Corridor Study, the I-29 Gateway Interchange, and the I-80 and IA 965 Interchange allows work to begin promptly.
- **Strong knowledge of the Des Moines metropolitan area,** including its transportation challenges, community groups and interests, and business community. Most of the work will be performed in Des Moines with support from national experts in Chicago and San Francisco. This local presence and expertise eliminates the "learning curve" – allowing quick start of the project.
- **Proven ability to meet strict schedules and deadlines.** CH2M HILL has developed and uses the benchmark Project Delivery System (PDS) that ensures the project team delivers quality, responsive services. The PDS guides all aspects of the project and provides a consistent, efficient, and effective means of successful project performance and delivery.
- **Technical expertise to accomplish goals of the Iowa DOT.** Our team has extensive expertise in staging of traffic and construction of major high-volume facilities. We have the ability to identify and implement all the required ITS technologies for this project and to prepare long-term strategies.

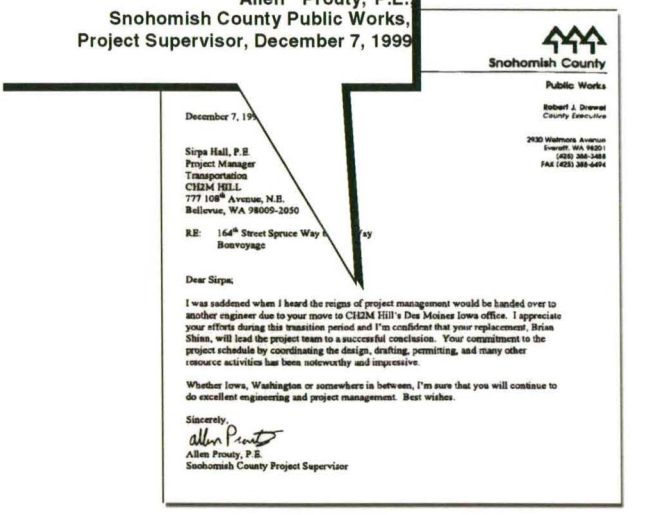
Firm	Previous Projects with Iowa DOT
CH2M HILL	U.S. 18 Mason City Bypass I-80, I-35, and I-235 Freeway Corridor Study, Polk County U.S. 34, Ottumwa Bypass Des Moines Southwest Corridor Study Eddyville Bypass – Environmental Impact Statement I-29 Gateway Interchange Reconstruction Project (Jointly with HRG)
Howard R. Green Company	60th Street Corridor Improvements, West Des Moines U.S. 61 Bypass Study, Muscatine I-80/IA 965 Interchange Reconstruction and IA 965 Widening, Coralville A TEAP Study Consultant (Statewide Traffic Engineering Study) Hazard Elimination Studies
Audino & Associates	Des Moines Metropolitan Area Smart Transportation Conference Intelligent Dissemination of Project Information Intelligent Dissemination of Project Information- Highland Community School Partnering project IDOT Representative to Des Moines Area ITS Early Deployment Study
Strategic America	Iowa DOT, "Know Your Way Around" 1998 Work Zone Program
CTRE	Advanced Transportation Technologies-ITS/CVO Transportation Planning and Information Systems- supports a variety of planning and information systems needs

- **Resources available to deliver successful project.** CH2M HILL project manager, Sirpa Hall, will direct the team from the firm's Des Moines office. She has delivered numerous projects of similar size and complexity and will serve the Iowa DOT for the duration of the project.

As she did with the 164th Street Project in Snohomish County, Washington referenced below, Sirpa Hall will provide clear project direction to keep the team focused on Iowa DOT goals.

"I was saddened when I heard the reigns of project management would be handed over to another engineer due to your move to CH2M HILL's Des Moines, Iowa, office... Your commitment to the project schedule by coordinating the design, drafting, permitting, and many other resource activities has been noteworthy and impressive. Whether Iowa, Washington or somewhere in between, I'm sure you will continue to do excellent engineering and project management."

Allen Prouty, P.E.
Snohomish County Public Works,
Project Supervisor, December 7, 1999



Snohomish County
Public Works

December 7, 19

Sirpa Hall, P.E.
Project Manager
Transportation
CH2M HILL
777 108th Avenue, N.E.
Bellevue, WA 98009-2050

RE: 164th Street Spruce Way
Bonvoyage

Dear Sirpa;

I was saddened when I heard the reigns of project management would be handed over to another engineer due to your move to CH2M Hill's Des Moines Iowa office. I appreciate your efforts during this transition period and I'm confident that your replacement, Brian Shinn, will lead the project team to a successful conclusion. Your commitment to the project schedule by coordinating the design, drafting, permitting, and many other resource activities has been noteworthy and impressive.

Whether Iowa, Washington or somewhere in between, I'm sure that you will continue to do excellent engineering and project management. Best wishes.

Sincerely,
Allen Prouty, P.E.
Snohomish County Project Supervisor

1.1 Project Team

CH2M Hill has chosen our team based on their quality of service and experience with Iowa DOT. Each team member brings specific strengths to the team in their area of experience offering all services necessary to successfully support the I-235 reconstruction.

CH2M HILL
800 Ninth Street, Suite 200
Des Moines, Iowa 50309

CH2M HILL will serve as the prime consultant, responsible for overall project management, transportation planning, and traffic planning and coordination. The firm has provided professional services in the transportation field for more than 40 years and offers a full range of traffic engineering, transportation planning, and highway design services. CH2M HILL ranks 8th among transportation firms in the latest *Engineering News-Record* (*ENR*) rankings. Its Des Moines office has a growing staff of 15 individuals dedicated solely to serving the Iowa DOT and Des Moines area transportation needs. Other offices in the Midwest that will provide transportation services as needed are Chicago, Milwaukee, Minneapolis, St. Louis, Dayton, Peoria, and Detroit.

CH2M HILL's experience in planning, designing, and managing major highway, bridge, traffic system, right-of-way, and public transportation projects includes multidiciplinary studies, design, and construction management projects throughout the nation. Many of these projects were completed in Iowa including the Des Moines area freeway study, the U.S. 18 Mason City Bypass project, and the U.S. 34 and U.S. 63 projects in Wapello, Jefferson, and Davis Counties.

CH2M HILL employs more than 8,000 people who serve clients from more than 200 offices worldwide. Headquartered in Denver, Colorado, CH2M HILL is the largest employee-owned consulting firm in the United States. Employee ownership in the company promotes high staff motivation, a strong commitment to clients, low staff turnover, and continuity in work for its clients.

Project Management

CH2M HILL has developed and uses the benchmark Project Delivery System (PDS) to ensure our project team delivers quality, responsive service. The PDS is a program that guides all aspects of the project. It provides a consistent, efficient, and effective means for successful project performance and delivery.

Embedded within the PDS are all planning and decision elements that affect project technical execution: health, safety, environmental compliance, quality assurance, cost/schedule control, and contract administration including appropriate change management.

Our PDS begins with and continually emphasizes partnering with the client. We believe that developing a partnership relationship with our clients builds consensus and trust while promoting efficient delivery of complete projects.

Howard R. Green Company (HRG)
4685 Merle Hay Road, Suite 106
Des Moines, Iowa 50322

Howard R. Green Company
CONSULTING ENGINEERS

HRG was formed in 1913 and is an Iowa-based firm, which has expanded from its original focus of environmental engineering. HRG is one of the top 500 largest consulting engineering firms within the US, climbing over 100 places from last year. In fact, HRG is the fourth largest engineering consulting firm headquartered in Iowa, with over 30 percent of its revenue coming from transportation projects. HRG is also a firm with a strong commitment to incorporated quality into its work. For example, the US Highway 6/Iowa Highway 965/I-80 Interchange reconstruction project was named the state winner of the National Quality Initiative Awards program (HRG conducted the design for this project). This year, two other HRG-designed projects won awards from the Iowa Concrete Paving Association. One of these was the bridge designed by HRG at the 60th Street Interchange over I-80 in West Des Moines.

Within its municipal business unit HRG has conducted a substantial amount of traffic engineering and roadway design. In 1999, however, the company decided to develop a business unit that solely focuses on transportation. The company made several key hires including Neal Hawkins, formerly a senior traffic engineer for the City of Des Moines, and Tom Maze, former director of CTRE, as well as several supporting staff members. In early 2000, the firm has continued to develop its transportation staff and has hired Gerry Brickell, former vice president of JBM/Transystems. Several more individuals with significant transportation experience will hired in the spring and fall of 2000.

HRG offers a full range of transportation engineering, planning, design, and construction observation services. HRG's has made a significant commitment to incorporating the latest and best use of technology to make more efficient use of staff's time. This includes expertise and experience in operating a variety of traffic software programs (HCS, Synchro, Signal97/Teapac, PreTransyt/Teapac, PreNetsim/Teapac, Transyt7F, and Corsim) HRG has experience in both design and use of 170/270 and NEMA traffic signal controllers and signal control systems, and a thorough knowledge of wireline (including fiber optic) and wireless traffic control communications systems.

NET
121 S. Wilke Road, Suite 300
Arlington, Illinois 60005

NET is a global consulting engineering firm specializing in the design and implementation of area and region wide transportation management systems and advanced state-of-the-art Intelligent

Transportation Systems (ITS). Projects undertaken by NET range from improvement of a single intersection to projects involving system design, implementation, or integration of major transportation management systems. NET has completed major advanced traffic management systems (ATMS) systems in Atlanta, Georgia, Caltrans District 12, Caltrans District 11, and Caltrans District 7. In addition NET is currently building major ATMS systems in Kansas City, Chicago, Portland, and Salt Lake City. NET is a leader in the application of CORBA architectures and distributed object software system development and integration within ITS. Our initial recommendation to the NTCIP committee to implement this growing standard was adopted several years ago, NET has been working with over 30 agencies to integrate both legacy and new systems into this national requirement.

NET places great emphasis on strong project management with clearly stated project goals and objectives; open lines of communication for project personnel; with frequent updates to status reports and schedules. NET has a comprehensive Quality Management Program (internally referred to as "Advancing Quality") which has been developed and refined through the firm's 40 years of professional experience in dealing with complex regional projects. This dedication to quality, team commitment, field expertise and technological know-how has directly contributed to the following engineering awards of excellence for related work:

- 1999 Engineer's Council Distinguished Engineering Project Achievement Award. - Caltrans District 7 Upgraded Transportation Management Center
- Caltrans 1996 Award for Excellence in Transportation Facilities
- Caltrans District 6 - Yosemite Area Traveler Information System
- CELSOC 1995 Engineering Excellence Honor Award
- Northridge Earthquake EPI-Center Project
- Caltrans 1995 Director's Award for Excellence in Project Delivery by a Caltrans/Consultant Team Northridge Earthquake EPI-Center Project

Audino & Associates
913 54th Street
West Des Moines, Iowa 50266

Audino & Associates provides diverse public relations and communication services to clients in the public and private sectors. The company provides community development, transportation, and intergovernmental relations services. Current clients include the Des Moines International Airport Board, the Governor's Strategic Planning Council, the Iowa Chapter of the American Planning Association, the Iowa Housing Corporation, the Heartland Institute for Leadership Development, and the Iowa Public Airport Association. Over his career, Michael Audino, president, has developed relationships with Iowa DOT and Iowa state government staff that will add value to the public communications and intergovernmental relations strategies developed for the I-235 project.

Strategic America
1500 NW 118th Street
Des Moines, Iowa 50325

Strategic America's mission is to build powerful relationships between clients and their publics through measurable, integrated communications solutions. Strategic America is a well-regarded member of the American Association of Advertising Agencies (AAAA), awarded to only 6 percent of the more than 13,000 agencies in the United States. High ethical, financial and professional standards are continuing requirements for membership. Our key competencies include:

- Strategic thinking
- Strong, appropriate design
- Creative advertising solutions
- Public relations counseling
- Database/direct marketing
- Relationship-driven client service

Strategic America's public relations department (named the No. 1 public relations firm in Des Moines by readers of the market's primary business journal) conducts communications audits; media, community and government relations; public affairs; event management/coordination; employee/internal communications; publication and materials development; and research for situation analyses and program evaluation.

Strategic America's efforts on behalf of the Iowa DOT achieved outstanding results. We were pleased to play a role in informing the public of major road work projects, increasing awareness for caution in work zones, and protecting the lives of Iowa DOT workers and the traveling public. In 1998, Strategic America:

- Placed metro (work zone) maps in the Shopper News Network for 15 weeks; in The Des Moines Register for 25 weeks.
- Placed a major cover article in The Des Moines Register's "Metro Business" (now "Work and Money") section. (earned media value: $46,000)
- Negotiated a highly visible work zone PSA in The Des Moines Register's Iowa State Fair tabloid, easing travel into the metro during the state's largest event. In addition, Strategic America arranged for the Iowa DOT's web site to be linked to the FYIowa site (online news for Des Moines and Cedar Rapids), the Iowa State Fair's web site, and the Greater Des Moines Convention and Visitors Bureau's web site during peak tourism time.
- Positioned the Iowa DOT as a credible and accessible resource by distributing more than 100 letters and information packets to Merle Hay Road businesses.

Center for Transportation Research and Education (CTRE)
384 Town Engineering
Ames, Iowa 50011

CTRE
Center for Transportation Research and Education

CTRE is Iowa State University's focal point for transportation research, outreach, and education. CTRE is also a long-term partner of the Iowa DOT, with cooperative agreements covering financial support, sharing of staff members, and sharing of physical assets. CTRE has conducted a multitude of projects related to ITS planning and deployment and projects involving traffic operations and modeling, traffic planning, and transportation planning. Many of these projects were for the Iowa DOT. CTRE led the Des Moines Area Early Deployment Plan (EDP) and was a subcontractor to BRW in the Iowa ITS strategic plan. As a result of the Des Moines EDP and other related research and development studies, CTRE has helped to refine the Des Moines area Travel Demand model, it has developed several traffic operational models using CORSIM in the I-235 corridor, and it has studied many of the issue related to diversion of traffic from I-235 already. As a result, CTRE staff members are very familiar with the relevant databases and will provide this project the head start needed to meet critical construction deadlines.

Through joint ownership with the Iowa DOT, CTRE operates two mobile traffic data collection trailers. These units each have a pneumatic boom, which hoist two video cameras 30 feet above the pavement. These trailers can be used to conduct traffic counts and because they rely on non-intrusive technology, they can be position and conduct counts during traffic operations without the need to

interrupt traffic or place field personal at risk. Because they are mobile, they can be repositioned almost immediately. These trailers would be a valuable asset in collecting data on existing conditions prior to construction and for collecting data and observing traffic patterns during construction. With minor modifications, the trailers could be equipped with wireless transmission capabilities for mobile video monitoring (low frame rate).

Involvement of CTRE in this project provides the Iowa DOT indirect benefits as well. These include:

- The opportunity to train future transportation professionals through student assistantship at CTRE. These students are likely to become future employees of the Iowa DOT or the Iowa DOT governmental or consulting partners.
- As products are developed by the consultant (e.g., a corridor traffic operations model), these models can be given to CTRE for their long-term stewardship. Then when the Iowa DOT needs the models re-run, modified, or updated, CTRE can perform these services through the Iowa DOT/CTRE basic agreement.

1.2 Roles and Responsibilities

Each member of the CH2M HILL team will have a clearly defined role and set of responsibilities on the Iowa DOT I-235 Reconstruction Project. Together, the team will function as an integrated team to efficiently provide quality services to the Iowa DOT. Exhibit 1-2 summarizes each team member's primary role.

EXHIBIT 1-2. Roles and Responsibilities

Firm	Roles and Responsibilities
CH2M HILL	**Prime Consultant**: Project management; technical oversight and overall quality assurance; design review construction staging; demand modeling; TDM, GIS. Support role for incident management, traffic operation center, design for local street systems, and public relations
Howard R. Green Company	**Subconsultant**: Lead role in incident management and local street system design; support role in TDM, GIS, ATLS, traffic operations center, staging review
NET	**Subconsultant**: Lead role in ATLS and traffic operations center; support role in incident management and local street traffic signal systems
Audino & Associates	**Subconsultant:** Lead role in public and intergovernmental relations
Strategic America	**Subconsultant:** Support role in public relations
CTRE	**Subconsultant:** Support role in traffic modeling

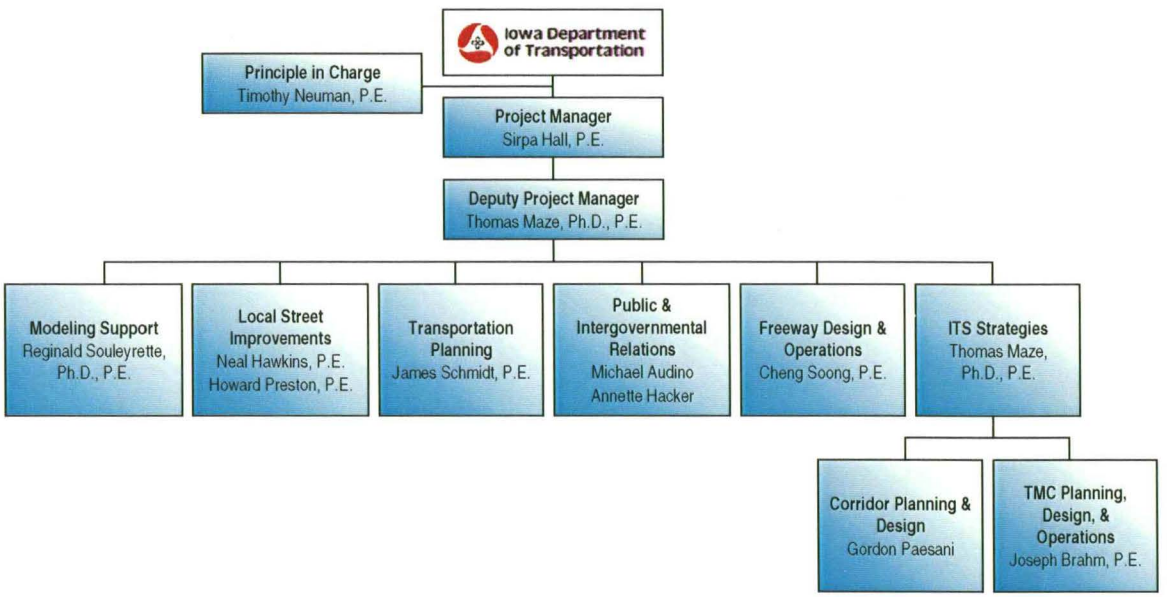
SCOPE OF WORK

2.0 Project Team

CH2M HILL has hand-picked transportation professionals for the I-235 project – ensuring the appropriate expertise to meet Iowa DOT needs. The team's planners and engineers *have the specific skills* required to make the traffic engineering and ITS project a success with experience in planning, system design/integration, system evaluation, construction, and project management.

CH2M HILL's project organization is provided in Exhibit 2-1. Key personnel, based in the Des Moines metropolitan area, will be supported by national transportation experts throughout the country. CH2M HILL will complete more than 75 percent of the project from Des Moines area offices. Because the core team lives and works in the area, each has a personal as well as professional stake in the project.

Exhibit 2-1. Organization Chart
Our transportation experts were chosen to ensure the Iowa DOT of reliable, state-of-the-art services from a locally-based team.



Brief summaries of key personnel experience are provided below. Additional resumes of support staff identified for the project are included in the Section-Resumes.

Sirpa Hall, P.E.
Project Manager

Ms. Hall, manager of CH2M HILL's Des Moines office, will serve as a project manager. She has been with CH2M HILL for 10 years and recently relocated to Des Moines from the Seattle office. Ms. Hall's technical and project management background is extensive; she has managed significant highway planning and design projects in Washington and California including both freeway and arterial facilities. Important aspects of these projects included development of complex traffic maintenance schemes to facilitate reconstruction of existing facilities. Her work has included the following phases: project study; preliminary design; plans, final design; and construction. Her sole responsibilities are focused on the delivery of a quality project to CH2M HILL's primary client, Iowa DOT. She will be available to assist Iowa DOT from the firm's Des Moines office and will be committed 60 percent to the project for the duration. She will have overall responsibility in managing

the project and the administration of the contract. Brief descriptions of Ms. Hall's project experience relevant to the proposed work are provided below.

- **Project Manager, 164th Street Improvements-Ash Way to Bruce Way, County of Snohomish, WA**—Project manager for final design of the $25 million 164th street project. The improvements consisted of adding one lane for an approximately 1 mile section of the road, signal improvements at 3 intersections, bike lanes for the entire length of the road, several retaining walls, right-of-way acquisition, wetland mitigation and illumination design. Key elements of this project were the ***signal priority system*** developed for this project and the ***partnering*** that occurred between Snohomish County and CH2M HILL.

- **Design Manager/Assistant Project Manager, SR 18 PS&E, Washington State DOT, Kent, WA**—Design manager and assistant project manager responsible for design oversight, client coordination, internal project team coordination, construction budget and design budget on the high profile $30 million SR 18 project (PS&E) for the Washington State Department of Transportation. The goal of the project was to solve capacity, operational, safety and access problems by upgrading 3 miles of a two-lane highway to a four-lane divided highway with full access control. The major features of this project included construction of new lanes, median, a new modified diamond interchange, seven new bridges, four at-grade intersections, two retaining walls, and four ramp terminals. ***Design was completed 3 months ahead of schedule through innovative design techniques and efficient coordination with WSDOT, local agencies and support groups.***

  > *"CH2M HILL has provided responsive service to us (WSDOT) on this complex and challenging project. In particular, I would like to point out their efforts in the area of system planning and cost containment."*
  > **Gary McKee, Washington DOT**
  > **SR18 Improvement Project**

- **Main Avenue South Improvement Project, City of Renton, WA**—Ms. Hall was a project manager on Main Avenue South preliminary design, final design and construction management project. This project focused on the rechannelization, and rehabilitation, of the critical downtown area. The proposed $3.5 million improvements widened the existing roadway, built a new soil nail retaining wall, retrofited as necessary the existing storm drainage facility for detention, widened sidewalks, and installed new traffic signals.

- **Project Manager, Hyak Road Improvement District Project, Kittitas County, WA**—The project included formation of the Road Improvement District, assessment calculations, ***coordination with the 350 property owners,*** preliminary roadway design, final design, construction management and final assessment phases. This project consisted of 3 miles of roadway improvements. Construction was completed in one year and under budget.

Thomas Maze, Ph.D., P.E.
Deputy Project Manager

Dr. Maze has more than 20 years of experience leading highly technical and policy-oriented transportation studies and initiatives, including serving as principal investigator for the Iowa ITS Strategic Plan project for Iowa DOT. He has overseen research for a variety of public agencies including the U.S. Department of Transportation, the U.S. Department of Agriculture, and North American's Superhighway Coalition, and he has lead projects involving 23 state departments of transportation, including Iowa DOT. Dr. Maze has also been recognized for his involvement in

the planning and evaluation of emerging ITS technologies, which includes planning studies for ITS systems in urban and rural applications and the field testing of ITS applications to Commercial Vehicle Operations and winter maintenance operations. Dr. Maze's experience on projects relevant to the scope of work include:

- **Founder, CTRE, Iowa State University**—Founded and developed CTRE at Iowa State University. Under Dr. Maze's management, CTRE grew from two part-time employees to program with over 25 employees and 35 affiliate faculty, and supporting as many 100 undergraduate and graduate students. Under his management, CTRE conducted as many as 50 projects per year, which accounted for a budget ranging from $3 to $5 million. CTRE included divisions devoted to Transportation Planning and Information Systems, Advanced Transportation, Traffic Engineering and Traffic Safety, the Local Technical Assistance and Transportation Outreach, Bridge Engineering, and Pavements.
- **Midwest Transportation Consortium**—Director of the Midwest Transportation Consortium and founder of the Midwest Transportation Center. Both were five-year programs of research, education, and outreach funded by the U.S. Department of Transportation involving roughly two million dollars of activity per year.
- **Cleveland Area Rapid Transit**—General Manager of the Cleveland Area Rapid Transit (Cleveland County, Oklahoma). Developed and managed the transit system that serves Norman, Oklahoma and the Campus of the University of Oklahoma.
- **Iowa Department of Transportation**—Manager of the Iowa Department of Transportation basic relationship with the Iowa State University.
- **Iowa Pavement Information Program**—Manager of the Iowa Pavement Management Information Program. This program includes the collection of pavement condition data on the majority of Iowa federal aid-eligible system, the professing of that data, the distribution of the data back to individual jurisdictions, and assisting jurisdictions with the use of the data to manager their pavement system.

Timothy Neuman, P.E.
Principal-In-Charge

Mr. Neuman, who is Chief Highway Engineer and Vice President of CH2M HILL, will be responsible for overall technical quality control and provide technical guidance to the team. He holds a national reputation in freeway and interchange planning and design and in traffic operations and highway safety. He authored the *Roadway Geometric Design* section of the Traffic Engineering Handbook, and various NCHRP research projects. Mr. Neuman is well-known in Iowa as the project manager of the I-80/I-35/I-235 Des Moines area freeway study for Iowa DOT. He also managed a comprehensive traffic study of the Des Moines street system in the late 1980s. Mr. Neuman's relevant project experience includes:

- **Freeway Master Planning Reconstruction Project, Iowa DOT**—Managed a freeway master planning reconstruction project for the Iowa DOT in the I-80, I-35, and I-235 Des Moines Area Freeway System Study in Polk County, Iowa. The study produced recommendations for over $300 million in improvements. The Iowa DOT staff identified savings associated with future right-of-way acquisitions and other construction costs that more than paid for the study. Major portions of the plan are currently being implemented. The plans are also being used for the coordination with local transportation improvements.
- **I-94 Interchange Study, Wisconsin DOT**—Managed a study of thirteen interchanges along I-94 in southeast Wisconsin. Long-range reconstruction plans were developed, incorporating

upgraded geometry, crossroad access control, and new or relocated frontage roads. The project was performed as Wisconsin's first partnering project for a planning study, with partnering involving the DOT, consultant team, and the local communities. The study successfully accomplished development and local acceptance of corridor preservation plans for all thirteen interchanges.

- **I-70/I-75 Interchange Study, Ohio DOT**—Managed a planning and preliminary design study of the reconstruction of the I-70/75 Interchange (referred to locally as the "Crossroads of America") and adjacent service interchange along I-75. CH2M HILL's study produced a locally accepted plan for improvements to an existing outmoded cloverleaf interchange, closure of a service interchange, and replacement of the closed interchange with a compressed tight diamond interchange. The improvements were valued at $110 million. The study included supplying Interchange Modification Reports to FHWA, completing an environmental assessment (EA), and providing engineering documents to support traffic analysis, alternatives, and functional highway geometry.
- **Blue Water Bridge International Crossing Design Improvements, Michigan DOT**—Served as technical director for a study of traffic operational and design improvements to the Toll Plaza and Point of Entry at the Blue Water Bridge International Crossing between Canada and the US. Studied the operations of passenger car and commercial vehicles entering the US; prepared recommendations combining ITS, infrastructure, and operations to facilitate increased traffic expected with the expansion of bridge capacity.
- **Operational Treatment of Tight Diamond Type Interchanges, Michigan DOT**—Managed a research study—Determination of Sight Distance Variances and Related Operational Treatments of Tight Diamond Type Interchanges—of over 200 diamond interchange ramps for the Michigan Department of Transportation. The study determined the location and extent of problems related to sight-distance and modeled intersection crashes as a function of sight-distance and traffic volume. Developed an expert system and applied it to the database to enable programmatic recommendations for safety, traffic control, and other local improvements.

Reginald Souleyrette, Ph.D., P.E
Modeling Support

Dr. Souleyrette is an associate professor of civil engineering at Iowa State University and the associate director of CTRE's Transportation Planning and Information Systems division. He has completed numerous projects for Iowa DOT involving transportation planning, GIS application development, travel demand forecasting, remote sensing, highway safety management systems, and advanced traveler information systems. Some of the tools Dr. Souleyrette has developed that are likely to be employed in the I-235 traffic management project include the development of a interface between the TRANPLAN travel demand models and an interface between CORSIM and TRANPLAN. Other work Dr. Souleyrette has been involved in includes:

- **Transportation Projects**—Has successfully led and completed more than three million dollars of sponsored projects as principal or co-principal investigator. Published more than 75 peer-reviewed journal papers, invited papers, book chapters, editorships, conference papers, and research reports. Having participated in more than 100 workshops, conferences, and transportation forums, he has made over 60 technical presentations. Has directed more than 20 graduate student programs as major professor and many others as committee member.
- **Development of Interactive Visualization Software**—Developed interactive visualization software and procedures to calibrate and validate network systems planning models, as well as contributing to asset management information systems. He has attained a national reputation, demonstrated by his election to secretary of the National Research Council, Transportation

Research Board, Committee on Spatial Data and Information Sciences, and several requests for invited papers, presentations, and book chapters. He has also developed a regionally significant program in the application of geographic information systems to transportation at Iowa State University, which is demonstrated by a continuously high level of sponsored research on the topic and development of CTRE's GIS-T lab and support facility.

Neal Hawkins, P.E.
Local Street Improvements

Mr. Hawkins is a senior traffic engineer with extensive experience in design and planning for traffic signal systems, roadway lighting, signage, pavement marking, work zone signage, parking, traffic signal timing, parking garage operations, and transportation safety studies. Prior to joining HRG, he served as the senior traffic engineer for the City of Des Moines for 10 years. Mr. Hawkins brings an extensive knowledge of local traffic conditions to the project team. Examples of Mr. Hawkins relevant project experience include:

- **Project Manager, I-235 Traffic Signal Projects, Des Moines, IA**—Mr. Hawkins has completed the conception, design, inspection and operations of numerous transportation related improvements. Along University Avenue (parallel arterial to I-235), he has completed the plans and specifications for 16 traffic signal installations.
- **Project Manager, Traffic Engineering Assistance Project, Iowa DOT**—Mr. Hawkins was the project manager for Iowa DOT three year indefinite delivery contract for Traffic Engineering Assistance (TEAP) and additional traffic engineering and safety studies. These studies often require solutions to complex problems in a number of situations which include: Intersection Safety Analysis, Corridor Safety Analysis, Railroad Crossing Safety Analysis, Safe School Routes and Crossing Plans, Traffic Signal Progression Analysis and Design, Traffic Counts, Parking Supply and Demand, Capacity Analysis, Roadway Lighting Analysis, Traffic Control Devices, Inventory and Analysis of resources.
- **60th Street Interchange Project, West Des Moines, IA**—Project Manager for roadway detour/signage 60th Street Interchange Project, West Des Moines, IA. Perform review and develop staging scenarios for construction of half diamond for I-80 at 60th Street. Managed all modifications to new and existing traffic signals.
- **Project Manager, Main Street at Trunk Highway 10, Elk River, MN**—Project Manager for traffic signal improvements to Main Street at Trunk Highway 10, Elk River, MN. Project involves modeling of the existing roadway and recommending improvements to accommodate traffic during reconstruction of a Mississippi river bridge.

Howard Preston, P.E.
Local Street Improvements

Mr. Preston is a senior project manager in HRG's transportation services group with more than 27 years of experience. Mr. Preston's experience is primarily in the areas of preliminary engineering activities for intersection and roadway improvements, traffic engineering and impact studies, transportation and parking plans, and plans and specifications for traffic signal, signing, and roadway construction projects. He has particular expertise in traffic engineering research. Relevant experience includes:

- **Project Manager, Corridor Studies, MN, NE, IA**—Managed corridor studies and the corresponding environmental documentation, involving development and evaluation of alternatives and documentation of potential social, economical and environmental impacts for a variety of major highway projects including:

  - The 18-mile TH 169 Cross Range Expressway (EIS) and the 30-mile TH 14 Expressway (EIS) for the Minnesota Department of Transportation
  - The 44-mile U.S. 81 Expressway (EA/FONSI) for the Nebraska Department of Roads
  - The Melrose Avenue Urban Arterial Study (EA/FONSI) for the City of Iowa City, IA

  Additional studies involving documenting the operational and safety benefits associated with roadway widening versus implementing access management strategies include:

  - TH 7 (a 40-mile rural corridor)
  - CSAH 42 (a 30-mile suburban corridor)

- **Preliminary Engineering, MN, ND, SD**—Preliminary engineering, involving the preparation of geometric layouts with features consistent with appropriate state and federal guidelines include:

  - The TH 7, TH 14 and TH 169 Corridor Studies for MnDOT
  - Pilot Knob Road in Dakota County
  - White Bear Avenue and Silver Lake Road in Ramsey County
  - TH 101 realignment in Chanhassen, MN
  - The Memorial Interchange Area in Bismarck, ND
  - The Regional Arterial Corridor Route Location project in Sioux Falls, SD

- **Traffic Engineering Studies, IA, NE, MI, MN, SD**—Prepared traffic engineering studies dealing with traffic safety and operations issues and the identification of hazardous intersections, traffic control devices, pedestrians, residential area traffic control and assessments of the traffic impacts associated with commercial, industrial and recreational developments (including race tracks and a variety of sports stadia). Some of these projects include:

  - N-15 Traffic Engineering Study, Nebraska Department of Roads
  - Melrose Avenue Corridor Study, Iowa City, IA
  - Elwood Drive and Scholl Road Corridor Studies, Ames, IA
  - Woodcreek Area Circulation Study, Ann Arbor, MI
  - Sioux Falls Outer Beltway Study, Sioux Falls, SD
  - University of Michigan East Medical Center Circulation Study, Ann Arbor, MI
  - Lake Street/Lagoon Avenue one-way operation, Minneapolis, MN

- **Traffic Signal Systems, MN, WI, ND**—Mr. Preston has supervised the preparation of traffic signal operation analyses, signal justification analyses and reports, plans and specifications for isolated fully actuated traffic signal systems, coordinated arterial systems and computer controlled CBD grid systems. Traffic signal operations analyses using TRANSYT, PASSER, CORSIM and SIGNAL94 computer software have been completed for systems in: Brooklyn Park, MN; Richfield, MN; Maple Grove, MN; Minnetonka, MN; Maplewood, MN; Waseca, MN; Fargo, ND; and Fond du Lac, WI.

- **Intelligent Transportation Systems**—Managed the traffic engineering (operations, safety and geometric design) work tasks associated with projects that evaluated the application of advanced traffic management and control technologies to both freeway and arterial street systems.

James Schmidt, P.E.
Transportation Planning

Mr. Jim Schmidt is CH2M HILL's Chief Transportation Planner. Mr. Schmidt has more than 30 years of experience in transportation planning, transportation systems evaluation and analysis, technology assessments and applications, policy evaluation, and transportation-related computer applications design and development. He directs all transportation demand modeling work for CH2M HILL. Mr.

Schmidt is leading CH2M HILL's transportation group efforts and developments to support Sustainable Development. He is orchestrating the firm's initiatives ranging from traffic calming to context sensitive design to transportation operations simulation and visualization, integration of GIS and community modeling, and livable communities. He served as transportation system and strategies advisor for a major private client's sustainable, mixed used community development planning. Descriptions of relevant projects are as follows:

- **Principal Investigator, Transportation Modeling, Los Angeles County Transportation Commission**—Principal investigator on a project for the Los Angeles County Transportation Commission to evaluate and specify transportation models for the Commission's use in meeting its Congestion Management Agency responsibilities.
- **Project Director, Lake County (IL) Travel Model and System Evaluation**—Directed development of the travel modeling and system evaluation process for assessing alternative multi-modal system options (arterial, tollway, parkway and freeway, commuter rail, light rail, bus and non-traditional services) for Lake County, IL, located immediately north of O'Hare Airport within the Chicago metropolitan region. Also directed definition and analysis of the commuter rail, bus, light rail transit and related non-auto alternatives elements of the transportation system.
- **Key Contributor, Safety Conscious Transportation Planning and Design, Context Sensitive Design**—Key contributor to an internal CH2M HILL team developing improved processes and methods to make transportation solutions more response to community goals and sensitive to environmental settings in which they are located. One facet of these programs – *Safety Conscious Design* – addresses more effective and explicit consideration of safety in transportation system planning and facility design by incorporating formal safety audit reviews and utilizing state-of-the-art safety predictive modeling techniques to assess design features. A second component – *Context Sensitive Design* – embodies community-based involvement in the transportation development and design process and adaptation of design treatments and standards to the environment in which the transportation facility or system will operate. This design approach recognizes that a "one size fits all" design standards approach may not always be responsible nor reasonable for every setting and circumstance.
- **Project Manager, Planning Transportation Alternatives for the Sierra Nevada Region**—Facilitated a workshop for community planners, Planning Commissioners, and decision- makers sponsored by the Sierra Business Council on transportation alternatives and sustainable development strategies for the 12-county region in the Sierra range from Plumas to Inyo counties. A significant issue for this region is the very large number of visitors and the impact of these visitors on the economy, the community infrastructure systems and preservation of community character and boundaries.

Michael Audino
Public and Intergovernmental Relations

Mr. Audino is president of Audino & Associates, an Iowa-based public relations firm. He spent eight years as a division director with Iowa DOT, first as Director of the Air and Transit Division and subsequently as Director of the Field Services Division. Mr. Audino also directed the Department's strategic planning efforts and served as a member of the Department's management team. His current clients include the Des Moines International Airport Board, the Governor's Strategic Planning Council, the Iowa Chapter of the American Planning Association, the Iowa Housing Corporation, and the Iowa Public Airports Association. Prior to starting Audino & Associates, Mr. Audino had the following project experience:

- **Director, Field Services Division, Iowa Department of Transportation**—Responsible for a professional staff of 7 and an annual operating budget of $600,000. Major accomplishments included: developing the Department's first comprehensive program funding guide, facilitating the Department's first strategic plan, developing a Highway Signage manual, implementing a geographic information system-based construction information program, and facilitating statewide customer focus groups.
  Also served as a member of the Department's management team and implemented special projects as determined by the Department director.

- **Director, Air and Transit Division, Iowa Department of Transportation**—Responsible for a professional staff of 22, an annual operating budget of $1,000,000, and annual public transit and aviation program budgets approximating $6,000,000. Developed and implemented the Department's air service marketing program. Secured a $1,000,000 Federal Aviation Administration grant to implement the Department's statewide automated aviation weather observation system. Developed a new airport in Belle Plaine. Implemented the Department's intercity bus program. Served as a member of the Department's management team and implemented special projects as determined by the Department Director.

- **Executive Director, Southwest Iowa Planning Council**—Responsible for a regional planning organization and public transit agency serving eight counties and 54 cities in southwest Iowa, a full-time staff of 5, part-time staff of 15, annual operating budget approximating $400,000, and a 33 vehicle transit system. Major accomplishments included: authoring and administering over $3 million in community and economic development grants, implementing the state's first regional ridesharing program, implementing the state's first rural transit vehicle rehabilitation program, facilitating a 10 county solid waste management plan, and developing the region's initial overall economic development plan.

Annette Hacker
Public and Intergovernmental Relations

Ms. Hacker brings diverse skills in media relations, issues management, community relations, and strategic planning to the team. She began her career as a newspaper reporter, radio copywriter, producer and sales assistant and has worked as a public relations practitioner since 1990. Ms. Hacker was a communications specialist/associate editor for the Iowa Association of Electric Cooperatives and served six years as Director of Communications for the Greater Des Moines Convention and Visitors Bureau. Her work has received state, national, and international awards. Projects Ms. Hacker has been involved with include:

- **Project Manager, Iowa Department of Transportation,** *"Know Your Way Around"* **1998 Work Zone Program**—Developed a media relations and public information program to increase awareness of the location of work (construction) zones and decrease work zone accidents. The campaign included brochures, posters and newsletters that were sent to area businesses, attractions, welcome centers, transportation companies and truck stops. Content analysis (scientific measurement of media coverage) proved the Iowa DOT was concerned about the safety of motorists and its work zone employees. Strategic America achieved nearly $700,000 in earned media coverage for the Iowa DOT in 1998, more than tripling our excellent results from the previous year. The Iowa DOT confirms major diversion of traffic from work zones and a decrease in work zone fatalities. These work zones typically have carried some of the state's heaviest traffic. Not one business in a work zone publicly complained, an indication our "heads-up" material helped them prepare for road blockages.

- **Project Manager, Allied News Conference**—Worked with Allied Insurance to unveil plans for relocation of the company's headquarters to the Gateway West District in downtown Des Moines.

Contributed in every capacity of the announcement, including planning the news conference and luncheon, developing a media kit, conducting media training for company leaders, and preparing for issues management. The Creative department also developed the Allied Gateway Campus logo for the letterhead, podium signs and banners. Efforts resulted in two front-page stories in *The Des Moines Register*, numerous supporting stories, and a *Register* editorial applauding Allied's move. Des Moines' three TV stations and the radio stations gave the story complete coverage.

Cheng Soong, P.E.
Freeway Design and Operations

Cheng Soong has more than 25 years' experience in transportation planning, conceptual design, preliminary design, construction staging, and final-contract plan preparation for major highway projects. He has extensive national experience on complex interchange projects such as the I-70/75 Interchange and the Marquette Interchange projects. For the I-70/75 project, he led the effort to develop interchange concepts and prepare functional plans. The improvements were valued at $110 million. As project engineer for the Marquette Interchange in Milwaukee, he supervised the rehabilitation of 10 major highway interchanges. On both projects, Mr. Soong made recommendations for construction staging and traffic maintenance. Mr. Soong also has key local experience and is thoroughly familiar with Iowa DOT design procedures and standards. Project experience Mr. Soong has that is relevant to this project includes:

- **Project Engineer, U.S. 18, Mason City Bypass, IA**—Key team member on the preliminary design for the US 18, Avenue of the Saints, Mason City Bypass (a five-interchange freeway project) project in Cerro Gordo and Floyd Counties for the Iowa Department of Transportation. Extensive responsibilities covered project control, supervision and training, general layout, geometric design, intersection channelization, sequence of construction and traffic control, expressway and local street signing, drainage improvements, and cost estimating.
- **Project Engineer, Interstate 74, Corridor Study, IL**—Project engineer for the Interstate 74 corridor study, a 14-interchange, 11-mile rehabilitation project for the Illinois Department of Transportation in Peoria, Illinois. The goal was to develop a staged improvement program that would address and improve design, operations and safety features. Total costs of the feasibility study were 6 percent below budget. A successful aspect of the plan was the dynamic involvement programs involving the public and respective agencies. Orchestrated public meetings and supplied project information in an accessible format. Other responsibilities centered on project control, general layout, alternative study, geometric design, and capacity analysis.
- **Project Engineer, Illinois Route 56 Improvements, IL**—Assisted in design of Illinois Route 56 improvement in Downers Grove, IL, where an interchange replaced existing intersection. His work included project control, supervision and training, layout, geometric design, intersection channelization and capacity analysis, construction staging, traffic control, expressway signing, pavement marking, drainage improvements, utility adjustments, right-of-way determination, and cost estimating.
- **U.S. 67 Expressway Preliminary Design Study, IL**—Project engineer for the U.S. 67 Expressway Preliminary Design Study. U.S. 67 is a 160 km expressway between Jacksonville and Macomb, Illinois and is a vital transportation link in southwestern Illinois. Responsible for task control and overall technical quality of the project.

Gordon Paesani
Corridor Planning and Design

Mr. Paesani has over 30 years experience in ATMS and ATIS for freeways, virtually from the inception of the field. He has a strong background in freeway operational concepts and all aspects of hardware and software subsystems for ATMS and ATIS. He has strong capabilities in management, organization, analysis, and system design. Mr. Paesani served as senior engineer contributing to the conceptual design of the City of Atlanta's $7.1 million ATMS (1996 Olympic Games), the design of the traffic management center and its staffing requirements, and the development of the regional incident management program. Other projects Mr. Paesani participated in include:

- **Project Manager, Illinois DOT, Traffic Systems**—Mr. Paesani was the project manager for the Illinois DOT Traffic Systems Center Central Computer and Control Room Design. He was responsible for implementation of the project.
- **Project Manager, Illinois DOT, Traffic Systems**—Mr. Paesani was the project manager for the Illinois DOT Traffic Systems Center Central Computer System Needs Assessment.
- **Lead Design Engineer, Caltrans District 12, CA**—Mr. Paesani was the lead designer for the development and implementation of the Caltrans District 12 system-wide adaptive ramp metering system. He was also the lead designer adapting the Caltrans District 12 system-wide adaptive ramp metering system to the Caltrans District 7 traffic management system.
- **Project Manager, Atlanta Regional Transportation Management System, GA**—Mr. Paesani was the project manager for NET's activities in the design of the Atlanta Regional Transportation Management System including preliminary design for ramp metering and ATIS.
- **Project Manager, Highway 403, Toronto, Canada**—Mr. Paesani was the project manager for the preliminary design of a freeway traffic management system for Highway 403 in Toronto, Canada.
- **Project Manager, Highway 401, Toronto, Canada**—Mr. Paesani was the project manager and Lead Designer for the development of the highly successful congestion management system for Highway 401 in Toronto.
- **Technical Advisor, Korea and Taiwan, Technical Advisor**—Mr. Paesani was a technical advisor for the development of an Advanced Traffic Management System (ATMS) for Seoul, Korea and the Ramp Metering System for Taiwan.

Joseph Brahm, P.E.
TMC Planning, Design, and Operations

Mr. Brahm is a transportation systems engineer with 13 years' experience, including ITS operation and design. He has managed large and small ITS projects for both the public and private sector, including award winning projects, such as the Caltrans District 7 Upgraded Transportation Management Center, which won the ***1999 Engineer's Council Distinguished Engineering Project Achievement Award.*** He has extensive experience relating to ATMS, Advanced Traveler Information Systems (ATIS), Electronic Toll Collection Systems (ETC), freeway tow service operations, and ETC violation enforcement systems. He was responsible for oversight of all roadway operations, maintenance, and engineering activities of the world's first fully automated toll collection system in California, including an automated traffic operations center that operates 24 hours per day, 365 days per year. In his work with California Private Transportation Company, LP. (CPTC), Mr. Brahm served as Operations Manager for the world's first totally automated toll road (91 Express Lanes). His responsibilities with CPTC included:

- **Traffic Operations Center (TOC)**—Provided oversight for the TOC, which includes a state of the art ETC System and Traffic Management System. The center is open 24 hours per day, 365 days per year.
- **Customer Service Center (CSC)**—Managed operations for the CSC, which handles about 1,000 calls per day from customers and potential toll violators. Total of 12 telephone stations and three front counter stations for walk in traffic. The CSC utilizes an Integrated Voice Response (IVR) system, a state of the art Automated Call Distribution (ACD) system, and voice mail.
- **Customer Processing Section**—Provided oversight for this section, which handles all back room processing of customer transactions and inquires via mail, email, and IVR.
- **Violation Processing Section**—Provides oversight for violations processing including payments and all correspondence (in and out) regarding potential toll violations.
- **Customer Assistance Patrol**—Customer Assistance Specialists respond to incidents, clear lanes and provide free tow service to motorists.
- **Civil Engineering Activities**—Responsible for oversight of all roadway operations, maintenance, and engineering activities.
- **Traffic and Toll Analysis**—Responsible for analyzing all traffic and toll data including all toll adjustments.
- **Public Agency Relations**—Works closely with Caltrans, TCA, CHP, and other local emergency responders regarding policy issues and roadway operations.
- **Public Relations**—Handles facility tours and presents the 91 Express Lanes Project to local and international conferences and to local community groups.

RESUMES

Loren Bloomberg

CH2M HILL

Senior Transportation Planner/Traffic Operations Analyst

Summary of Qualifications

Mr. Bloomberg is an expert in traffic simulation modeling who has led or played a key role in numerous planning and operations analyses. He has developed models for local areas, corridors, and entire regions, and is often called upon as technical expert for CH2M HILL's modeling projects. Mr. Bloomberg also has a broad base of experience in corridor and regional planning, transportation system evaluation policy, and design.

Education:

MS, Civil Engineering, University of California, Berkeley
BS, Civil Engineering, University of Virginia

Registrations:

N/A

Relevant Project Experience:

I-75 Corridor Study, Dayton, OH—Project technical manager for a planning and operational study of an 11-mile section of the I-75 corridor through Dayton, OH. Assessed operational and safety limitations through field review, interviews, and data analysis. Developed and conducted a technical workshop with local traffic engineers to discuss corridor issues and potential solutions. Working with local agency staff, developed a CORSIM model of the freeway to assess operational issues and improvements.

I-84 Interchange Design, ID—Modeling expert for traffic operations analysis of design alternatives for three interchanges in Boise, Idaho. Updated CORSIM models for multiple alternatives including SPUI, parclo, diamond, and other interchange options. Developed and applied a performance evaluation approach. Project description

Year 2000 Highway Capacity Manual—Capacity and Level of Service Analysis of Freeway Systems - Played a key role in this project to develop a new freeway systems chapter for the Year 2000 Highway Capacity Manual. Lead on simulation analysis using CORSIM, INTEGRATION, and FREQ. Participated in key project team meetings, advising on technical and management issues. Project description

Salt Lake City Advanced Traffic Management System (ATMS)—Project manager for the development of a region wide (400 square miles) simulation model using INTEGRATION. Managed project with staff in California, Salt Lake City, Virginia, and Canada. Led all technical work throughout the project. Reported results to Utah Department of Transportation (UDOT) through regular status meetings throughout the project. Conducted a final project summary and daylong training session for UDOT and Wasatch Front Regional Council staff. Planned and led incident management strategy, and conceptualized an approach for analyzing traffic management strategies for construction evaluation. Lead author on two summary papers, presented at ITE District Conference (July 1997) and Transportation Research Board (January 1998).

SH 58 Traffic Analysis—Task manager for operational simulation analysis to support the design of a new system interchange at SH 58/I-70 in Denver. Led a team that developed a CORSIM model of the freeway system and major arterials for a calibrated base year (1999) and horizon year (2020). Led investigations for design options for the system interchange, local interchanges, and surface street alignments.

Douglas Brazelton, P.E.

NET

Traffic Systems Engineer

Summary of Qualifications

Mr. Brazelton has over 11 years of experience and is actively involved in most traffic engineering activities for the company. He is currently project manager for the Signal Coordination and Timing Projects with the Illinois Department of Transportation. His overall responsibilities include project management, technical direction, and direct involvement with signal timing plan development, implementation, and evaluation.

Education:

MS, Civil Engineering (Transportation), University of Wyoming
BS, Civil Engineering, University of Wyoming

Registrations:

Professional Engineer, Illinois

Relevant Project Experience:

Ramp Metering Needs and Feasibility Assessment, Kansas City, KS—Project engineer for the Ramp Metering Needs and Feasibility Assessment for the Kansas City area Advanced Transportation Management System. Responsible for data collection, needs assessment, feasibility assessment, and final report documentation for ramp metering on Kansas City area freeways.

Atlanta Olympic Signal Timing Project, GA—Project engineer for Atlanta Olympic Signal Timing project. Technical advisor for all aspects of project, including data analysis, timing plan development, and plan implementation. Responsible for technical training of Georgia Department of Transportation staff in the use of PASSER-II/90 and TRANSYT-7F.

SCAT, Illinois DOT—Project manager for the 1994 SCAT project Districts 2-9, 1995, and 1997 SCAT projects for District 1. Responsible for all technical aspects of the project including data collection, data analysis and timing plan development. Responsible for implementing the optimized timings and fine tuning operations as well as assuring the systems are operating properly under traffic responsive operation. Assumed full duties as project manager in tracking costs and assuring that the project will be done in a timely and cost effective manner. Project engineer for the Illinois Department of Transportation 1993 Signal Coordination and Timing project (SCAT).

Illinois Department of Transportation Projects—Team leader for the Illinois Department of Transportation Route Signal Coordination and Timing Project (SCAT) for the Chicago metropolitan area. Scheduling and supervision of manual and automatic traffic counts for Illinois DOT Signal Coordination and Timing Project. Also participated in the following:

- Computer analysis, implementation and fine-tuning of approximately 200 intersections in greater Chicago area, using the Highway Capacity Software (HCS) and 50 closed loop systems using optimization software including PASSER II and PASSER III, and TRANSYT-7F.
- Before and after speed/delay comparisons on 50 closed loop systems in the Chicago metropolitan area, to evaluate the affect of optimizing signal timings.
- System monitoring on a daily basis of all IDOT District 1 signal systems including reporting of system failures and changes in data base programming to the responsible maintenance contractors. Towards this end, established a good working relationship with the various maintenance contractors.

Gerald Brickel, P.E. HRG

Senior Project Manager

Summary of Qualifications

Mr. Brickel recently joined Howard R. Green Company as senior project manager for the Transportation Services Sector. Mr. Brickel brings over 30 years of distinguished transportation and traffic engineering experience to his new position at Howard R. Green Company.

Mr. Brickel is recognized professionally as one of the top senior leaders in traffic engineering within the State of Iowa. He has been involved in planning and/or design, of the majority of the current transportation system in use within the Des Moines, Iowa metro area.

Education:

BS, Civil Engineering, Kansas State University

Registrations:

Professional Engineer, Iowa, Kansas Missouri, Colorado, Minnesota, Nebraska

Relevant Project Experience:

Bridges and Structures, Geode State Park Bridge Modifications, Henry County, IA—Provided design of bridge modifications which included new railing, removal of pedestrian curb, and bridge approach guardrail. Drainage and erosion control improvements included design of gutter sections with flumes to eliminate ditch erosion, erosion repair at bridge abutments, and erosion control and repair of existing ditch erosion.

Construction Inspection Management, I-35 Rest Area, Polk County, IA—Provided inspection of rest area improvements. The full-time inspection services were for the remodeling of the rest area and facilities and included the re-roofing of the structure(s) and picnic facilities, replacement of plumbing, electrical, and HVAC equipment in the rest area structures, sidewalk improvements, and lagoon cleanout.

Pella Construction Observation Services, Pella, IA—Performed construction surveying and observation services with regard to street and traffic signal improvements. The project included widening of Main Street (Iowa Route 163) and University Street, drainage improvements, and traffic signal improvements.

Highway/Street Design—Mr. Brickel's background includes concept plan development; analysis of alternatives for street and highway improvement plans; roadway and traffic control design; right-of-way and utility coordination; and presentation of programs to responsible authorities and the general public. He has experience in engineering design and project management for arterial roadways, connector roadways, and alignment studies as well as benefit-cost analysis.

Madison Avenue Improvements, Council Bluffs, IA—Provided design and construction services for a mile of urban arterial which included widening and reconstruction of I-80 ramp, traffic signals, street lighting, drainage, and railroad crossing improvements.

Main Street and University Intersection Improvements, Pella, IA—Design included complete reconstruction of 700 linear feet of University and widening of Highway 163, including drainage.

90th and 84th Street Connection Study, Omaha, NE—Analysis of eight potential alternative alignments for a proposed connector roadway between 90th Street and 84th Street in the vicinity of Interstate Route I-80. Work included the development of preliminary engineering design, traffic forecasts, alternative alignments, and cost estimates for the proposed connector. Studies included cost benefit analysis of alternate alignments, an analysis of corridor signal operations, and intersection

capacity analyses; and project management and administration.

First Avenue East (U.S. 6) and East 17th Street Improvements, Newton, IA—Designed intersection geometric improvements to include realignment of East 17th Street to remove an offset of the facility's approaches to the intersection. Traffic signal improvements were also included as part of the project.

1988 Institutional Roads Project, Ames, IA—Conducted a study of improvement options and priorities for six roadway improvement projects. Developed final plans and provided construction management services for reconstruction of the intersection of 13th Street and Stange Road. Improvements consisted of removal/replacement of 3,200 square yards of P.C.C. pavement and median, replacement of traffic signal detector loops, and extensive traffic control.

6th Street (U.S. 30) Corridor Intersection Improvements, Carroll, IA—Provided design services for improvements of seven intersections along U.S. Highway 30 (6th Street) within Carroll, Iowa. The project included the widening of U.S. Highway 30 to accommodate turning lanes and the construction of a raised median at three intersections. Drainage improvements included relocating existing structures and addressing drainage problems at one intersection.

U.S. 71 Reconstruction, Phases I & II, Carroll County, IA—Subconsultant for the design of 14 miles of reconstructed rural primary highway. Services included the design of intersection geometrics, drainage structures, earthwork, ditch grades, paving, construction staging and traffic control.

Lincoln Way and Clark / South Walnut Avenue Improvements, Ames, IA—Design right-of-way acquisition and construction observation for intersection realignment, channelization, and traffic signal improvements.

Ames Street Condition Survey, Ames, IA—Performed a study that assessed the condition of the entire street system and extensive data analysis. Maintenance categories were determined and a system of assigning unit costs per square yard was developed. System wide priorities and specific system goals were developed with the city and applied to the collected data to develop a priority ranking system and a five-year maintenance and reconstruction program.

Traffic Engineering—Mr. Brickel's experience includes traffic signal improvements, forecasts, street inventories, and funding studies. In addition, his capabilities include analysis of pavement management, traffic volume, accident records, and volume capacity. His experience and knowledge enable him to identify necessary improvements and develop priorities.

U.S. 6 Signal System Design, Iowa City, IA—Two-phase project involved first conducting a feasibility study to determine the potential benefits of coordination of the eight existing signalized intersections. The second phase included the development of specifications for the traffic responsive on-street arterial master and controllers to enable the city to receive bids on the project.

35th Street Improvements, West Des Moines, IA—Prepared traffic signal plans and interconnection system to coordinate seven existing signalized intersections by a computerized traffic responsive on-street arterial master with remote dial-up control capabilities. The work included collection of traffic count data, development of traffic signal design plans, cost estimates, and specifications. Timing plans for the traffic responsive system were also developed as part of the project.

Pella Signal Design, Pella, IA—Provided plans and specifications for major modifications to three signalized intersections around city park in Pella. The project also included design of a new signal installation at an additional intersection location as well as a signal installation at mid-block school crossing location. Responsibilities also included assisting the city in obtaining project funding from two separate state funding sources as well as project construction observation.

William Crystal

CAD/CADD Expert

CH2M HILL

Summary of Qualifications

Mr. Crystal is an experienced graphics and drafting lead, whose work has focused mainly on the transportation sector. He is responsible for all phases of graphics produced both manually and with Computer-Aided Drafting and Design (CADD) system. While with another firm, he was CADD Department Head and was responsible for the administration and supervision of drafting technicians, system management, database application, software development, and system support. His professional experience encompasses graphics, coordination with local and government officials, and management of all phases of drafting from preliminary planning and design to final drawings. He has prepared graphics for public hearings and coordinates with clients on their standards and policies.

Education:

AA, Mechanical Drafting, Iowa Central Community College

Registrations:

N/A

Relevant Project Experience:

Road Design, U.S. Highway 71 Bypass, Spencer, IA—Graphics Lead for the preliminary and final road design on U.S. Highway 71 Bypass of Spencer for the Iowa Department of Transportation, Clay County, Iowa. Design layout for 11.2 km of 4-lane divided roadway and relocated alignment. Estimated construction cost is $16 million.

Fort Drum Runways and DAB Facilities, NY—Graphics Lead for Fort Drum Runways and DAB Facilities, U.S. Army Corps of Engineers, New York District in Fort Drum, New York. Work included sheet development coordination for horizontal and vertical layout, drainage design layout, boundary fence design, and final construction phase. The project also included the relocation of approximately 1-km of existing county roadway.

86th Street, Phase III, Polk County, IA—Graphics Lead for preliminary design of 8.5 km NW 86th Street Phase III, a two-lane arterial roadway, for the U.S. Army Corps of Engineers, Rock Island District in Polk County, Iowa. Design features included three bridges, multiple culverts, and excessive borrow with alignment passes through Camp Dodge, a National Guard Training Center. Design provides for tank, vehicular, and troop crossings (grade operation) and isolates the roadway from camp. Researched right-of-way history for central project. Developed the layout for horizontal and vertical alignments, drainage design, right-of-way needs, and detailed construction quantities. Estimated construction cost is $10 million.

54th Avenue/N.W. Beaver Drive, Johnston, IA—Graphics lead for the layout of a new 3-mile arterial urban roadway for the NW 54th Avenue/N.W. Beaver Drive project for City of Johnston, Iowa. Also researched right-of-way history as part of this project. Construction cost is $3.5 million.

U.S. 30, Crawford County, IA—On U.S. Highway 30 in Crawford County for the Iowa Department of Transportation, served as graphics lead for 12 miles of grading and reconstruction. Project included design issues related to right-of-way constraints due to an adjacent railroad for the majority of the project. Design featured joint drainage structures for railroad and U.S. Highway 30.

State Highway 28, Polk County, IA—Graphics and engineering technician on Iowa Highway 28 in Polk County for the Iowa Department of Transportation, Ames, Iowa. Project was for the final design of 4 miles of grading and reconstruction of a 4-lane divided Iowa Highway 28 between 63rd Street and Army Post Road in Des Moines, Iowa. Major

design issues were traffic control, right-of-way, and access problems.

Highway 28/Highway 5, IA—On the Iowa Highway 28/Iowa Highway 5 Iowa DOT project in Polk County, served as graphics and engineering technician. The project involved the conceptual design of the bypass of Des Moines and the interchange of Iowa Highway 28/Iowa Highway 5. Project included preliminary design of horizontal and vertical alignments.

Reconstruction Highway 83, IA—For the Iowa Department of Transportation, Ames, Iowa, design technician for 4 miles of grading and reconstruction of Iowa Highway 83 near Atlantic, Iowa. Design issues were realignment of roadway due to right-of-way constraints and upgrading of the facility to current design standards. Estimated construction cost is $2.8 million.

U.S. 30, Harrison County, IA—Design Technician for three bridge replacements as part of the U.S. Highway 30 project, Harrison County, for the Iowa Department of Transportation in Ames, Iowa. Design issues were to develop on-site detours to minimize traffic congestion for each bridge replacement.

Hemlock Lane HOV Bypass, MN—Graphic supervisor for the Minnesota Department of Transportation's Hemlock Lane HOV Bypass project in Maple Grove, Minnesota. In charge of graphics for the final design of a high occupancy vehicle (HOV) ramp meter bypass lane at the entrance ramp from Hemlock Lane to eastbound I-94. I-94 is the main arterial connecting the northwest suburbs of Minneapolis to downtown. In the vicinity of the ramp, complexities with the project included proximity of wetland (south of ramp); requirement to maintain traffic during construction; and limited time to prepare construction documents. Scope of services for the HOV bypass lane project included final design and preparation of construction plans and related construction documents.

Harlan Municipal Utilities, IA—For Harlan Municipal Utilities in Harlan, Iowa, design technician for the layout of a new 750,000 gal clearwell facility for the Water Storage System Improvements project at the Harlan Water Treatment Plant. Project included a 93' diameter cast-in-place concrete underground clearwell with 1,600' of site piping ranging in size from 8" to 16" in diameter. Researched the clearwell site location for existing construction and utilities.

Phase IIIA, West Des Moines Project, IA— For the Central Drainage Basin—Phase IIIA project for the City of West Des Moines, Iowa, lead the graphics for entire project. Project involved the preparation of final plans and specifications for 5200' of storm sewer improvements. Project included various drainage structures, 2,500' of water main, street replacement, and coordination with residents and utilities in West Des Moines. Construction cost is $1 million.

Raccoon River Park, West Des Moines, IA— Graphics Lead for the final plan development on the Raccoon River Park—Soccer Complex; City of West Des Moines; West Des Moines, Iowa. Project included the final design and construction of a six-field soccer complex. Design included grading, access roads, parking lots, and utilities. Construction cost is $300,000.

North Coast Development, Jamaica— Graphics lead on the North Coast Development—Montego Bay Development Road project for the Ministry of Construction and Planning Institute of Jamaica, Kinsten, Jamaica. Responsible for graphics on the preliminary design of 11 km bypass of Montego Bay, Jamaica. Project includes determining horizontal and vertical alignment and providing uniform design speed adequate site distance, climbing lane capabilities for trucks, and access to the Saugster International Airport.

Michael Doleac, P.E.

CH2M HILL

Value Engineering

Summary of Qualifications

As a senior project manager for CH2M HILL, Mr. Doleac draws on his experience in planning, design, construction management, and managerial skills to lead large, complex multidisciplinary projects. His project experience encompasses a cross-section of related technical and managerial issues including planning, permitting, design, construction, value engineering, and project management. Mr. Doleac is a Certified Value Specialist (CVS) who has led more than 160 value engineering studies on a wide variety of projects. He developed the value engineering program for schools in the State of Washington and developed a training manual for both the EPA and the U.S. Navy for use on remedial hazardous waste projects.

Education:

BS, Mechanical Engineering, Oregon State University

Registrations:

Professional Engineer, Washington

Relevant Project Experience:

Colman Dock Ferry Terminal, Slip No. 1 Passenger Overhead Loading Design and Construction, WA—Project manager for the design and construction of the repairs to mechanical, electrical, and hydraulic systems for this $4 million project. Construction at this high-capacity ferry terminal is being conducted so that ferry service continues uninterrupted and schedules are maintained.

196th St. Bridge and Corridor Project, City of Kent, WA—Project manager for this project that evaluated the design of an urban arterial roadway along South 196th/ South 200th St. extending from East Valley Highway to the West Valley Highway in the City of Kent. The corridor follows the existing alignment and widens the road to four lanes plus a center turn lane in the at-grade sections. The project includes a center bridge section that is approximately 1,500 feet long that spans the Burlington Northern and Union Pacific Railroad tracks, the Weyerhaeuser paper recycling center, the Western Processing hazardous waste site, and Mill Creek.

Overlake Access Interchange, City of Redmond, WA—This project's major improvements include constructing a new full-diamond interchange at NE 40th Street to SR 520; widening the existing NE 40th Street undercrossing; constructing collector-distributor (CD) lanes in each direction of SR 520, extending from the on/off ramps South of NE 40th to the on/off ramps North of NE 51st Street; modifying all existing ramps to accommodate the CD lanes; constructing retaining walls; modifying the existing bike path; and adding High Occupancy Vehicle (HOV) bypasses with ramp meters on all proposed ramps.

King Street Area Improvements, City of Seattle, WA—Project manager for this project for the King Street Area Improvements. The project overlaps both Pioneer Square and the International District in downtown Seattle. It forms a district boundary between these districts along 4th Avenue South. To the North is bounded by Yesler Way, and to the South by 4th Avenue South and Airport Way. Landmarks such as King Street Station, Union Square, and the Kingdome stadium complex redevelopment define the geographic area that this project addresses. Light rail, heavy rail, bus and peak vehicular traffic patterns run through this area as well as it being a Southern Gateway to the Seattle downtown area.

Edward Granzow

Transportation Planner

CH2M HILL

Summary of Qualifications

Mr. Granzow's expertise is in developing travel demand models and demand modeling software. He has extensive background in geographic information system (GIS), including developing interfaces to the URBAN/SYS software suite for integrated travel demand models and other applications. Ed also developed a prototype of a network traffic forecasting model for the airline industry.

He has served on the Institute of Transportation Engineers, the National Research Council/Transportation Research Board, and the Urban Regional Information Systems Association. Ed is a research associate at the International Institute of Surface Transportation Policy Studies at San Jose State University.

Education:

BA, Social Ecology, University of California, Irvine

Registrations:

N/A

Relevant Project Experience:

Alabama Department of Transportation Travel Modeling Software, AL—Managing implementation of new travel modeling software for the Alabama DOT and development of a new graphical user interface (GUI) product to simply the use of travel models and related tools.

Florida Department of Transportation Infrastructure Management and Planning—Designed and scoped a work program to develop a database for infrastructure management and planning for the Turnpike Office of FDOT. The project will support superregional travel forecasting models used in planning the statewide toll road system and includes implementation of interfaces to a GIS for turnpike infrastructure management.

Strategic Transport and Environment Planning System Development—Responsible for the joint Urban Analysis Group/VTS Systems AB (a company of the Volvo Group) development project Strategic Transport and Environment Planning System (STEPS). The goal of this project was to provide an integrated analysis framework for examining transport influences and impacts. The project involved integrating the VTS public transport model VIPS II with URBAN/SYS travel demand and roadway network models, as well as development of a common user interface shell and integration of the system with air quality evaluation models. A prototype model for the Gothenburg, Sweden, region was developed and demonstrated as part of the project.

Alternative Urban Transport Technologies Study—In his capacity as university research fellow, Mr. Granzow recently participated in the Alternative Urban Transport Technologies Study conducted for the Belfast, Northern Ireland region. For this study, Mr. Granzow acted as a senior advisor for model development and implementation. A primary activity was to take already existing travel models from a previous study and develop an integrated network of roadway and public transport network operation. The study also included implementation of a supplemental modeling capacity to reallocate development intensities on the basis of network accessibility measures. Mr. Granzow is currently participating in a study to examine sustainability of energy consumption patterns based on land use settlement and transportation behavior. Mr. Granzow is assisting in developing computer data transfer linkages and user interface to support such linkages between GIS, travel forecasting models, and domestic energy consumption models.

Theodore Hancock

NET

Software Engineer

Summary of Qualifications

Mr. Hancock has extensive experience in the design, development, testing and implementation of software systems. He has lead the software development efforts for urban traffic signal system and freeway advanced traffic management system projects. As senior software engineer, he is responsible for managing the software development process in NET's Chicago office. This includes system design and implementation, staff development and allocation, and overall technical direction.

Education:

BS, Electronics Engineering, DeVry Institute of Technology, Chicago, Illinois

Registrations:

N/A

Relevant Project Experience:

Atlanta Regional Advanced Transportation Management System (ATMS), GA—Responsible for design, implementation, and integration of software for the freeway subsystems in Atlanta ATMS. ATMS utilizes an object-oriented design in a heterogeneous, client-server Unix environment. Major design aspects included overall freeway process specification and object layout, database design, and a user-interface design that encompassed full GIS integration. The software NET developed for the Atlanta freeways included data collection with an intelligent dissemination/throttling mechanism, automated incident detection and management, automated response plan selection and implementation, congestion detection and management, ramp metering control, and variable message sign control.

Illinois DOT Traffic Systems Center Central Computer Needs Assessment Project—Responsible for development of system requirements, architecture, and specifications for system upgrade of IDOT traffic management system. Upgrade was to include enhanced system functionality, integration of existing subsystems, integration of system standards, and integration into the Gary/Chicago/Milwaukee ITS Priority Corridor Traveler Information System.

MN/DOT TMC Operator Interface Prototype and Specification—Project manager responsible for the refinement of user requirements and the development of operator interface prototypes and subsequent interface specifications to integrate five different operational systems into one PC based operator workstation.

DuPage County DOT Signal Control Project, IL—Designed and implemented a 1.5 Generation Control program on a Windows 3.1 platform to enhance the process of developing traffic signal timing plans in DuPage County. This project utilized an object-oriented design and implementation as well as an object database (OODB) to achieve the required performance. Software developed for this project included serial communications for data acquisition, user interface design and development, and a variety of interfaces to various traffic analysis tools for timing plan analysis and optimization.

Grumman Technical Services, IL—Responsibilities included design, implement, trouble-shoot and maintain control and data acquisition systems for the Continuous Wave Deuterium Demonstrator (CWDD) project. CWDD was a DoD sponsored linear accelerator designed to prove out the technology for a portion of the SDI program. Experience included software design in a Unix, OS-9 and DOS based real-time control system. Control systems development experience consisted of device drivers and system process software for both open and closed loop operations, hardware development for interfacing requirements, and integration of the overall system.

Paul Johnson

Value Engineer

CH2M HILL

Summary of Qualifications

Mr. Johnson is a recognized expert in value engineering (VE), the identification of cost savings early in the design process. These efforts typically provide a better value, higher quality product by meeting or exceeding client needs and specifications at a lower cost. To date, he has led VE studies for more than 56 projects, including numerous transportation facilities. The total value of construction for these projects exceeds $251 million. Accepted savings for these projects totaled $13 million, representing 5.2 percent of the construction cost.

Education:

BS, Construction Engineering, Arizona State University

Registrations:

Engineer-In-Training, California

Relevant Project Experience:

Parker Road/I-225 Interchange VE Study, CO—Mr. Johnson participated in this VE study, which was conducted at the 40 percent design stage of this $43.1 million improvement project. The VE team calculated 16 cost saving proposals and recommended a combination of 10 proposals for a potential savings of $11.6 million, approximately $6 million of which were implemented by CDOT.

New Mexico Highway 44 VE Study, NM—Mr. Johnson led two VE studies on the $178 million New Mexico Highway 44 project, involving reconstruction of 120 miles of rural state highway from 2 to 4 lanes. A total of $31 million in cost saving proposals were recommended in the VE studies and are now being considered for implementation by the state and design/construction management team.

Bluff St. (SR-18) and Sunset Blvd. (SR-8) Intersection VE Study, St. George, UT—Mr. Johnson led a concept-level VE study of this intersection reconstruction project. Twelve preliminary alternatives were considered and rated against project criteria developed during the VE study. Two top alternatives supported by all project stakeholders were recommended for further refinement by UDOT, prior to selection of the final alternative for design.

I-15/Rose Road Underpass Value Engineering Workshop, Bingham County, ID—Mr. Johnson led a VE study to select a concept-level design to replace a washed-out bridge crossing. Several design alternatives were evaluated for this $3.7 million project, including reconstruction in another location. Overwhelming community support and funding and schedule implications led to reconstruction of the crossing in its former location.

Cherry Hill/US 89 Interchange VE Study, UT—This $41 million project included reconstruction of 2.0 km of along existing US 89 and 0.9 km along Farmington Main Street, a new bridge crossing over the highway, frontage roads and on/off ramps. The VE team developed 14 proposals and recommended 7 for implementation. Several million dollars in cost-savings suggestions were accepted, including significant savings in earthwork as a result of adjustments to the highway profile.

I-84/US 89 Interchange, and US 89/South Weber Interchange VE Study, UT—This concept-level VE study was conducted during the preliminary design phase to help UDOT and the lead design firm evaluate and select an optimum design concept for the two interchanges, estimated to cost $68.7 million. For the main interchange (I-84/US 89), the VE team evaluated seven options previously developed by the design team, and three additional options.

Scott Lee, P.E.

NET

Traffic Engineer

Summary of Qualifications

Mr. Lee has over six years experience in Traffic Engineering activities. His work includes both signal timing and other traditional traffic engineering tasks, along with significant ITS experience. Mr. Lee's involvement in ITS work has focused on the design and operation of ATMS systems.

Education:

BS, Civil Engineering, University of Illinois

Registrations:

Professional Engineer, Illinois

Relevant Project Experience:

Illinois DOT, Traffic Systems Center (TSC) Central Control Room Design & Implementation Project—Involved in all traffic engineering aspects of the TSC upgrade project, including cataloging of existing field infrastructure development of operational response plans. Developing databases for traffic management components. Building changeable message sign and highway advisory radio message structures to be used for response plans.

Port Authority of New York and New Jersey, George Washington Bridge Intelligent Transportation System—Prepared design document for developing operational response plans for the system. Developed Operational Response Plans including incident, congestion, weather, and some predefined plans. Assisted in evaluation of detector placements for the system.

Orlando-Orange County Expressway Authority (OOCEA), Systemwide ITS Master Plan and Concept Study—Developed the Expressway Management Concept Plan for OOCEA, which included deployment scenarios, analysis of technology options, operational strategies and issues, and cost estimates for an expressway management system including field infrastructure and system costs.

Illinois DOT, Traffic Systems Center Computer Needs Assessment Study—Performed current operations review for IDOT Traffic Systems Center in Oak Park, IL. Assisted in developing operational requirements and system functional requirements for the TSC's second-generation system.

Atlanta Olympic Signal Timing Project—Traffic engineer on project to develop signal timings for over 250 traffic signals during the 1996 Olympic Games. Coordinated the collection of all field data required to develop signal timings. Performed optimization analysis and developed signal timings using Passer II-90. Implemented, fine-tuned and monitored timings for various signal systems before and during the Olympics.

Illinois DOT, Signal Coordination and Timing Project, District 2-9—Traffic engineer on project to development signal optimization plans for several signal systems in Districts 2-9. Responsible for data collection including turning movement counts and automatic traffic recorders. Directed, scheduled, and coordinated subconsultant in the field and oversaw subconsultant quality control. Also performed optimization analysis using HCM Cinema and Passer II-90. Assisted in implementation of new timings and suggested timing alterations based on field judgements. Performed speed and delay and stopped delay studies.

Glen Murphy, P.E.

NET

Systems Engineer

Summary of Qualifications

Mr. Murphy has twelve years of experience in the Southern California area with the development and operation of Intelligent Transportation Systems including ATMS and ATIS, and advanced communication systems. He brings with him, extensive knowledge in the design, implementation, and support of fiber optics, closed circuit television (CCTV), data communications, ramp metering and traffic signal systems, changeable message signs, and video surveillance equipment expertise. Mr. Murphy also has experience in transit management systems that utilize GPS tracking systems.

Education:

BS, Electrical Engineering, University of California, Santa Barbara

Registrations:

Professional Engineer, California

Relevant Project Experience:

TravelTIP System—Project manager for the TravelTIP System. This is an ITS information system that collects data from various transportation modes such as freeway and arterial congestion and advisories, as well as bus, rail, and air transit schedules and status. This data is then processed into traveler and traffic management information and disseminated to various destinations such as radio, advisory telephone, cable television, remote computers, the Internet, kiosks, and value-added resellers. TravelTIP interfaces with four Orange County agencies' TMCs including Caltrans District 12, Anaheim, Garden Grove, and Irvine. It will also interface with OCTA's Transit Probe System and the Showcase network.

OCTA Transit Probe System Integrator Deployment—Project manager responsible for day-to-day project management activities for the deployment of an AVL system for transit vehicles and the development of software algorithms for buses to be used as traffic probes.

Caltrans District 12/City of Anaheim Fiber Optic Intertie—Project manager for this project that included design of an intertie communication system that will support traffic management information exchange between agencies. Also includes technical assistance during the construction phase.

City of Santa Ana Construction Inspection for IVHS Elements and Communications Network—Project manager responsible for providing technical assistance to City staff during the installation of fiber optic cable, CCTV equipment, and system detection.

I-5 CCTV and Caltrans District 12/City of Mission Viejo TMC Intertie—Project manager responsible for overseeing the design of a CCTV and fiber optic communication system within the City of Mission Viejo. This project also develops and implements an integrated traffic management workstation as well as an intertie with Caltrans District 12.

Caltrans District 7-TOS Integration—Responsible for development of maintenance master plan to support new CCTV and fiber optic communication system.

Caltrans District 12-CCTV and Fiber Optic Communication System—Project engineer responsible for development, integration, and the implementation of a fiber optic communication system for electronic traffic management field elements along all Orange County freeways

John Narigon, P.E.

Transportation Engineer

CH2M HILL

Summary of Qualifications

Mr. Narigon has over 13 years of roadway design and management experience. Formerly with the Iowa Department of Transportation, he has a thorough understanding of Geopak and AASHTO igRDS softwares and Iowa DOT's design standards. Mr. Narigon has assisted in the implementation of Geopak in the Boise, Saint Louis, and Chicago offices of CH2M HILL utilizing State DOT specific requirements for Montana and Missouri. His highway improvement project experience includes managing, coordinating, and designing a wide variety of projects such as interstate inlay, overlay and resurfacing projects; shoulder widening projects; intersection improvement and reconstruction projects; roadway portions of bridge replacement projects; and miscellaneous other projects.

Education:

BS, Civil Engineering, Iowa State University

Registrations:

Professional Engineer, Iowa

Relevant Project Experience:

U.S. Highway 63, Ottumwa, IA—Project manager for a 17.2 -kilometer segment of US 63 from just south of the Davis County line to the south side of Ottumwa for the Iowa Department of Transportation (DOT). The design, which will increase the capacity of a major highway corridor, includes reconstruction of a four-lane highway and expansion of 9.1 kilometers from two to four lanes. Key project elements include cultural resource investigation and report development, wetland delineation and mitigation, geotechnical analysis and design, and right-of-way establishment and development. Responsible for the management of the roadway geometric design using Geopak software and coordinating the design effort and plan preparation with the Iowa DOT Access Policy Administrator, the Iowa DOT Office of Design's Methods section, and CH2M Hill's drainage design staff.

U.S. 34, Batavia to Fairfield, IA—Lead roadway designer for a 12.8-kilometer segment of US 34 from Batavia to the Fairfield Bypass for the Iowa Department of Transportation (DOT). The design, which will increase the capacity of a major highway corridor, includes reconstruction of a four-lane highway and expansion of 4.8 kilometers from two to four lanes. Key project elements include the design of a diamond interchange for the Batavia Bypass, cultural resource investigation and report development, geotechnical analysis and design, and right-of-way establishment and development. The field exam was completed one year ahead of the Iowa DOT proposed schedule. Responsible for the roadway geometric design using Geopak software and coordinated the design effort and plan preparation with the Iowa DOT Access Policy Administrator, the Iowa DOT Office of Design's Methods section for interchange geometry, and CH2M Hill's drainage design staff.

U.S. 63, Ottumwa Bypass Project, IA—Lead roadway designer for a 12.0-kilometer segment of US 63 from the north side of Ottumwa to the east side of Ottumwa (Ottumwa Bypass) for the Iowa Department of Transportation (DOT). Key project elements include four interchanges, avoidance of state-threatened plant species and abandoned coal mines, challenging terrain, cultural resource investigation and report development, geotechnical analysis and design, and right-of-way establishment and development. Responsible for the roadway geometric design using Geopak software and coordinated the design effort of five designers in two offices and plan preparation with the Iowa DOT Access Policy Administrator, the Iowa DOT Office of Design's Methods section

for interchange geometry, and CH2M Hill's drainage design staff.

U.S. 34, East of Agency Project, IA—Lead roadway designer for a 8.1-kilometer segment of US 34 from the east side of Ottumwa to east of Agency for the Iowa Department of Transportation (DOT). The design, which will increase the capacity of a major highway corridor, includes reconstruction of a four-lane highway. Key project elements include the design of a diamond interchange for the Agency Bypass, development of 2 kilometers of 4-lane roadway within the existing corridor while maintaining the existing road, cultural resource investigation and report development, geotechnical analysis and design, and right-of-way establishment and development.

Polk County Interstate 35/80 Merle Hay Interchange, IA—Project provided for the reconstruction of 2.2 miles of four-lane urban interstate to a proposed six-lane section with full-lane width shoulders on both sides of each roadway to allow for future expansion to an ultimate ten-lane section. The project includes complex staging to maintain four lanes of traffic while achieving grade changes of up to 6 feet within the existing right-of-way corridor. This was the first Iowa DOT project utilizing breakline survey and a Digital Terrain Model. The approximate cost of this project is $33 million.

Iowa County Interstate 80—Project was originally developed in two 8-mile pieces to be constructed over two years. Due to concerns of a major commercial interest, the second 8-mile piece was added belatedly allowing for only three months design time. Project construction was completed in one year; approximate cost was $11.9 million.

Chickasaw, Bremer and Floyd Counties U.S. 218, IA—These projects will provide increased capacity and a final four-lane section for 23.3 miles, including the bypasses of the communities of Plainfield and Nashua. These projects entail approximately $26.5 million worth of grading and paving.

Henry County U.S. 218 and U.S. 34, IA—These projects will provide increased capacity and a final four-lane section for 20 miles, bypassing the community of Mount Pleasant on the north and east. These projects total approximately $31.5 million worth of grading and paving.

Section Engineer at Iowa DOT—Responsibilities included providing design decisions, supervising twelve technicians and engineers, managing the project schedules, representing the DOT at public hearings and serving on several task forces and teams. Some of his work as a member of these teams included defining the appearance of and procedures for producing CAD hearing displays, selecting a project scheduling software, defining the Iowa DOT's approach to partnering.

Iowa DOT, Assistant Design Section Engineer and Transportation Engineer Associate—In these positions, prepared several plans for Interstate 80 improvements in the western portion of Iowa including reconstruction projects in Cass County and bonded overlay and reconstruction projects in Pottawattamie County. Lead designer on the Polk County and Henry County projects described above utilizing AASHTO igRDS software as well as providing design software support for the remainder of the design section. Also provided training for Microstation drafting software and igRDS roadway design software.

Ames Area Staff Maintenance Engineer, IA—Resolved drainage complaints, approved entrance, work in right of way, planting and utility permits, recommended rehabilitation projects and coordinated city and county work on a portion of the state roadway system. Gained a better understanding of the importance of drainage design as well as a thorough understanding of the Iowa DOT Utility Policy and the Iowa Primary Road Access Policy.

Milagros Ortiz

HRG

Transportation Planner

Summary of Qualifications

Ms. Ortiz is a transportation planner for Howard R. Green Company's Transportation Services Group. Her experience includes transportation planning for the Des Moines Area Metropolitan Planning Organization (MPO). She also oversaw operation of the Central Iowa Regional Transportation Planning Alliance (CIRTPA), that works with local and state officials in the eight county central Iowa region on transportation planning issues.

Education:

MS, Community and Regional Planning, Iowa State University
MBA, Economics, Inter American University, San Juan
BBA, Business, University of Puerto Rico, Humacao

Registrations:

N/A

Relevant Project Experience:

Des Moines Metropolitan Planning Organization, IA—As a transportation planner for the Des Moines Metropolitan Planning Organization (MPO), worked on the following projects:

- Interstate 235 Reconstruction Aesthetics Subcommittee member
- Public Participation Activities including conference planning, production of the MPO Annual Report and newsletters.
- Working on the update to the MPO Long-Range Transportation Plan. Developed the Base Year 1995 Population Estimates for the MPO's Planning Area.
- Participated in the new Federal Welfare to Work Program, focusing on transportation resources available to TANF families.
- Worked on the following projects overseeing operation of the Central Iowa Regional Transportation Planning Alliance (CIRTPA):
- Developed the CIRTPA Transportation Improvement Program (TIP) and Unified Planning Work Program (UPWP)
- Worked on budgetary issues such as reimbursement requests to the Iowa Department of Transportation, financial statements and quarterly progress reports.
- Supervised the Surface Transportation and Transportation Enhancement Programs, which are the mechanisms for distributing federal transportation monies to the CIRTPA member governments
- Census 2000 activities including the Local Areas Statistical Update and LUCA Programs

Ames Transit Agency, IA—While with the Ames Transit Agency (CYRIDE), in Ames, Iowa, worked on the following projects:

- Various transit planning activities
- Marketing plans and strategies for the transit agency

Sujay Rathi

HRG

Transportation Planner

Summary of Qualifications

Sujay is a transportation planner for Howard R. Green Company's Transportation Services Group. Her experience includes transportation research for the Center for Transportation Research and Education at Iowa State University involving development of various transportation models with economic impact and investment feasibility analyses.

Education:

MS, Community and Regional Planning, Iowa State University
MA, Economics, Jadavpur University, Calcutta, India
BA, Economics, Jadavpur University, Calcutta, India

Registrations:

N/A

Relevant Project Experience:

Research Analyst, CTRE, Iowa State University—As a transportation research analyst for the Center of Transportation Research and Education at Iowa State University, developed various comprehensive transport models addressing both passenger and freight transportation along with economic impact analysis and investment feasibility analysis. Integrated these components with GIS modeling capabilities.

Graduate Research Assistant, CTRE, Iowa State University—Graduate research assistant for the Center of Transportation Research and Education at Iowa State University in conjunction with the Iowa Department of Transportation on a Multi-Modal Transport System Investment Analysis. Collected data for conversion to GIS format. Also developed intercity passenger and freight transportation models.

Executive Consultant, Indian Industry, Calcutta, India—As an executive consultant to the Regional Director, Confederation of Indian Industry, Calcutta, India, served as a representative of industry for addressing and analyzing problems related to the State Committee, Transport & Infrastructure, Environment and Economic Affairs Subcommittees. Responsible for making recommendations on policies and issues to the government agencies and communicating with them, on behalf of the regional industry. Organized and conducting meetings, seminars and conferences related to contemporary issues and problems associated with transportation and related infrastructure.

Jon Resler, E.I.T.

HRG

Staff Engineer

Summary of Qualifications

Mr. Resler has experience with roadway design, traffic engineering, geographic information systems, and pavement management. He has worked for such clients as the City of Overland Park, Kansas, the Iowa Department of Transportation, the Iowa County Engineers' Association and several Iowa cities.

Education:

MS, Civil Engineering, Iowa State University
BS, Civil Engineering, University of Wisconsin

Registrations:

Engineer-In-Training, Iowa

Relevant Project Experience:

Traffic Signal Design, 86th Street/Birchwood Court/Chambery Boulevard, Johnston, IA—Civil engineer for the design of traffic signals along 86th Street at Birchwood Court and Chambery Boulevard. Project included determining existing and future capacity, determining timing and phasing, developing traffic signal plans, and the designing of intersection geometrics.

Traffic Signal Design, Mormon Trek Boulevard/Highway 1, Iowa City, IA—Civil engineer for the design of traffic signals along Mormon Trek Boulevard at Highway 1. Project included developing traffic signal plans. Tasks included determining existing and future capacity, determining timing and phasing, designing geometric aspects of the intersection, and determining traffic signal quantities.

Traffic Safety Study, Blairs Ferry Road/Lindale Drive/West 8th Avenue, Marion, IA—Civil engineer for Traffic Engineering Assistance Program studies (TEAP) funded by the Iowa DOT. Project included the study of the two intersections to determine safety related problems. Tasks included accident analysis, capacity analysis, studying traffic signal timing and phasing, and examining geometrics.

Traffic Safety Study, U.S. Highway 20/Sundown Road, Peosta, IA—Civil engineer for Traffic Engineering Assistance Program studies (TEAP) funded by the Iowa DOT. Project included the study of the intersection to determine alternatives for improving capacity.

Traffic Study, Mercy Clinic Development, Johnston, IA—Civil engineer for a traffic impact study of a proposed Mercy Clinic development along 86th Street at Chambery Boulevard in Johnston. Tasks included trip generation, capacity analysis of entrances to the facility and the signalized intersection of 86th Street and Chambery Boulevard, and determining both the need for and length of turning lanes associated with the facility.

Traffic Study, South Drive/62nd Avenue, Johnston, IA—Civil engineer for a capacity and signal warrant analysis of the intersection of South Drive and 62nd Avenue in Johnston. Tasks included a signal warrant analysis for existing and proposed geometrics of the intersection and a capacity analysis of several scenarios.

Pavement Management, Davenport, IA—Civil engineer for the implementation of pavement management software for the City of Davenport. Tasks included compiling pavement history and condition data, developing pavement performance equations, developing treatment strategies and their costs, determining performance values to trigger the treatments, determining various budget scenarios, performing the pavement management analysis, and compiling a report of the results.

Barbara Sanders-Urein

NET

Systems Administrator

Summary of Qualifications

Ms. Sanders-Unrein has ten years experience in the design and developed of system software, requirements definition, design, implementation and testing. She has developed diagnostic software for a Digital High Volume Copier/Printer using Client/Server Model architecture in Java 1.0.2 under Sun/Solaris 2.6. Development included detailed design, implementation, and unit and system level test. She provides technical leadership and software development at NET.

Education:

BS, Computer Science, University of Kansas

Registrations:

N/A

Relevant Project Experience:

Traffic Systems Center (TSC) Upgrade Project, Illinois DOT—Senior software engineer providing technical leadership and software development. The system software will follow Client/Server Model architecture, will be developed in C++ and Java under Sun/Solaris 2.6 using TCP/IP and CORBA IIOP protocols. Software development includes design, implementation, unit test and system integration and test.

Eastman Kodak Company, Rochester, NY—Developed diagnostic software for a Digital High Volume Copier/Printer using Client/Server Model architecture in Java 1.0.2 under Sun/Solaris 2.6. Clients ran as applets in a Web browser communicating to the Server application written in Java using TCP/IP sockets. Development included detailed design, implementation, and unit and system level test.

Jet Propulsion Laboratory, Pasadena, CA—Was a member of the Graphical User Interface (GUI) team responsible for the software upgrade to the Deep Space Communications Complex (DSCC) Monitor and Control Subsystem. Software was written in Snap and C using X/Motif under Sun/Solaris.

Northrop Grumman Corporation, Pico Rivera, CA—Was responsible for software development of the GUI portion of a B2/JSTARS Simulation that was designed using the Object Oriented Paradigm written in C++. The primary platform was Silicon Graphics with portions on a Sun. Participated in the development of this simulation for two and half years. Worked on various Internal Research and Development (IRAD) projects developing software in "C" under Silicon Graphics/IRIX to enable real-time interprocess communication in a distributed environment using System V Shared Memory and SCRAMnet. Also responsible for integration and test of software written in Ada.

Jet Propulsion Laboratory, Pasadena, CA—Worked as a consultant where I was responsible for the design and development of software enhancements for the Logistics subsystem of the Corps Battle Simulation, an Operational Level training simulation written in SIMSCRIPT II.5. Responsibilities included requirements definition, design, implementation and test. Provided user support and problem resolution at several exercise locations in the United States and Europe.

The BDM Corporation, Leavenworth, KS—Was responsible for detailed design, implementation and test for the Logistics subsystem of the Corps Battle Simulation. Also, Worked on other software projects involved in modeling and simulation for the Army Logistics Center.

Jerry Shadewald

HRG

Staff Engineer

Summary of Qualifications

Mr. Shadewald is a staff engineer for Howard R. Green Company's Transportation Services Group. His experience includes graduate research experience for the Center for Transportation Research and Education at Iowa State University. Jerry also worked as an intern for the Wisconsin Department of Transportation which included construction inspection, surveying, and field testing of paving materials.

Education:

BS, Civil Engineering, University of Wisconsin

Registrations:

Engineering Intern, Iowa

Relevant Project Experience:

CTRE, Iowa State University, IA—As a graduate research assistant for the Center of Transportation Research and Education at Iowa State University, created GIS-Tranplan interface using Visual Basic, Avenue Script and MapBasic. Also responsible for writing code and documentation to accompany the GIS-Tranplan interface.

Wisconsin Department of Transportation, District 5, WI—As an intern for the Wisconsin Department of Transportation, District 5 (La Crosse, WI), conducted contract administration duties, served as construction inspector on excavation, subgrade, paving, culvert, and bridge projects. Also conducted field surveys and staking, and was responsible for field-testing concrete and aggregate materials for highway projects.

John Zeitlow, P.E.

NET

Chief Systems Engineer - Communications

Summary of Qualifications

As Chief Communication Engineer, Mr. Zietlow is responsible for the technical direction of the NET communications group and brings 26 years of communications experience to the team. His vast technical experience and expertise includes the evaluation and design of fiber optic, microwave, satellite, and UHF/VHF band radio systems. He has been responsible for the successful delivery of a number of communications evaluation and design efforts since joining NET.

Education:

BSEE, University of Wisconsin, Madison, Air Force Institute of Technology - Dayton

Registrations:

Professional Engineer, Illinois, Wisconsin, Arizona

Relevant Project Experience:

Southern California "Showcase" - Chief Communications Engineer—Responsible for the development of a Southern California corridor wide preliminary communications design. This design will include a Southern California Inter-district TMC to TMC communications network.

Caltrans EPI-Center Design/Build—Responsible for the fast track six month design/build of this $13 million traffic management system designed to relieve congestion caused by the January 17, 1994, Northridge Earthquake. The system included Changeable Message Signs (CMS), Closed Circuit Television Cameras (CCTV), Highway Advisory Radios (HAR), Vehicle Detection Stations (VDS), and Video Image Processing Systems (VIPS). The communications media selected for system design and implementation included a hybrid of media including cable for communications at the field sites, cellular for communication with the HAR signs, and VSAT as the backbone for transmission of the data between the field sites and the management center.

Caltrans 07G343 Traffic Operations System Design—Responsible for the design and preparation of plans, specifications, and cost estimate for freeway traffic management system hardware and communications system on freeways in Los Angeles County for Caltrans District 7. The effort included the development of a communications architecture using SONET based networks, and included the design of TOS elements such as CCTV, Highway Advisory Radio (HAR), Variable Message Signs (VMS), and Ramp Metering Systems (RMS).

Caltrans Fiber Optic Communication Network and CCTV Installation Project—Responsible for design and preparation of plans, specifications, and cost estimate for 47 CCTVs and a fiber optic communication network for data transmission from the CCTVs, HAR, VMS, RMS, loop detector stations, and pump station on a 35 mile portion of the Golden State freeway in Los Angeles County for Caltrans District 7. The communications design included a trunk communication line, field and central communications, integration with existing field hardware, and design of building modifications to accommodate equipment at the Traffic Operations Center.

Caltrans Fiber Optic Communication Network and CCTV Installation Project—Responsible for design and preparation of plans, specifications, and cost estimate for 12 CCTVs and a fiber optic communication network for data transmission from the CCTVs, HAR, VMS, RMS, and loop detector station on a 10 mile portion of the Santa Monica freeway in Los Angeles County for Caltrans District 7.

SCOPE OF WORK

3.0 Scope of Work

CH2M HILL has a detailed understanding of the I-235 reconstruction project, as well as the specific traffic engineering and intelligent transportation system (ITS) service required. Using our experience for Iowa DOT and expertise on similar projects, we have developed the following scope of work to successfully meet Iowa DOT's needs.

We have organized our scope of work to include a section covering each scope component requested by the Iowa DOT, as shown below:

- 3.1 Project Management
- 3.2 Core Tools
- 3.3 Traveler Information/Public Involvement
- 3.4 Traffic Operations Analysis
  - impact of reconstruction
  - TOA on freeway
  - TOA on supporting street system
- 3.5 Traffic Management Center (TMC) and Incident Management Plan
- 3.6 Transit/Rideshare/Traveler Demand Management

For each component, the goals, assumptions, tools needed, public involvement, a detailed scope of work, and the deliverables are presented. Note that we have identified some tasks as "supplemental." These tasks have not been specifically requested by the Iowa DOT, but we believe they may prove to add value to the project. We would be prepared to negotiate such tasks initially, or conduct them if and when the Iowa DOT deems them necessary.

3.1 Project Management

In addition to the tasks specifically requested by Iowa DOT, outlined in this SOW, CH2M HILL offers project management services that will ensure our team partners with our client and stakeholders. This partnering process has proven to be effective on other CH2M HILL projects and is preferred by our key clients.

Goal

✓ CH2M HILL's project management ensures excellent client service and quality products to the Iowa DOT. We will use our Project Delivery System (PDS) to effectively manage the contract time schedule as well as budget, project team, and staff resources.

Assumptions

CH2M HILL will provide the following services:

- Monthly invoicing
- Weekly coordination meeting with the Iowa DOT
- Partnering meetings with the stakeholders
- Continuing oversight of coordination with project stakeholders

Tools Needed

All the team members will use CH2M HILL's project delivery tools – including our benchmark project delivery system, project website (for project communication and management as well as for public information elements), decision facilitation, and information management.

Public Involvement

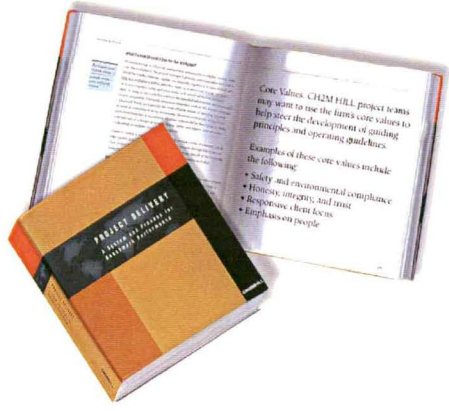
The project manager will provide oversight for all project activities including facilitating public meetings as requested.

Scope of Work

CH2M HILL will effectively administer the contract, manage the consultant team, schedule tasks, coordinate with the Iowa DOT, and provide monthly progress reports and invoicing. We will conduct partnering meetings to develop a cohesive relationship among the stakeholders to merge diverse interests and create common vision.

Our project manager, Ms. Sirpa Hall, will be responsible for leading and managing the project team, managing the staff resources within the team, providing effective client service, and providing quality product to the Iowa DOT.

Ms. Hall will use CH2M HILL's benchmark PDS to ensure the project team delivers quality, responsive service. The PDS is a process that guides all aspects of the project. It provides a consistent, efficient, and effective means for successful project performance and delivery. Embedded within the PDS are all planning and decision elements that affect project technical execution: health, safety, environmental compliance, quality assurance, cost/schedule control, and contact administration including appropriate change management.



Clients, including Washington State Department of Transportation, City of Portland, Port of Seattle and Pierce County, believe that CH2M HILL's project delivery system provides such value to their existing systems that they have had the firm provide training for their employees.

Partnering

The methods that CH2M HILL has used to successfully complete complex multi-agency projects and other projects will be applied to this project. A partnership team is proposed to be organized for this project. A partnership team will consist of key Iowa DOT staff, members of the consultants delivery team with experience working on recent Iowa DOT projects and, local agency, and other local stakeholders (MPO, MTA, The Greater Des Moines Partnership etc.).

The Consultant will conduct a partnering meeting with the stakeholders to create an effective communication plan and decision making process for the project. Our proposed partnering process will include the following elements critical for project success:

- Definition of the project team and stakeholders
- Clarification of the team purpose
- Definition of team members responsibilities
- Development of team operating guidelines
- Development of interpersonal behavior guidelines

We propose using "mind mapping" technique as a partnering tool to identify the project issues. It is a technique of creative brainstorming that captures all the ideas and issues in an organized fashion. This session focuses the energy and attention of the team on the items most critical to the completion of the schedule. Each element will have the most appropriate member of the team assigned to ensure that the individual tasks are successfully accomplished.

Partnering concepts will be used throughout the project to ensure success. A successful project will be the result of open, timely, and consistent communication among CH2M HILL, Iowa DOT, and each of the other major stakeholders. Without this type of communication and associated actions, the goals set for the project cannot be met, or the goals may not meet the needs of Iowa DOT.

Similar partnering was successfully utilized last year on the 164th Street project for the Snohomish County, managed by Ms. Sirpa Hall, our proposed Project Manager. The partnering created a positive direction to the project by defining clear lines of communications and discussing each team member's responsibilities. Partnering was also a key component to the successful completion (two months ahead of schedule and under budget) of the SR 18 project she was responsible for as a design manager.

Deliverables

- Project instructions and workplan (including: communication plan, contingency plan, subcontract plan, database management plan, graphics plan, document production plan, change management plan, project close out plan)
- Project schedule and schedule updates
- Partnering plan
- Meeting minutes in action item format
- QA/QC plan for the project

3.2 Core Tools

Completing the project work will require the development and/or use of a number of "core tools." These include a geographic information system (GIS) to manage and display data, a travel demand model of sufficient detail and functionality to provide construction traffic demand, and a traffic operational simulation package to analyze freeway and arterial traffic operations. This first work component includes developing or refining existing tools for use throughout the project.

The reconstruction of I-235 clearly will have areawide impacts on travel patterns (diversion) and associated traffic operations on freeways and surface streets. While the general nature of these impacts can be predicted using judgment and sketch level techniques, a more thorough, quantitative analysis requires more systematic and sophisticated procedures and software tools. Our ongoing work in the Des Moines area has suggested that travel demand and traffic operations analysis tools and software are valuable assets for planning and traffic operations analysis for this project.

However, there are limitations to the current tools used in the region; they need refinement and improvement to meet requirements for supporting traffic analysis for the I-235 project.

To address these needs, we have included the core tools component to develop appropriate models and databases to support continuing project quantitative analyses. We have labeled these as the "core tools," because these will support the technical work throughout the project. For example, these tools will be used as part of:

- Traffic Operations Study task to estimate traffic diversion due to closures (mainline lanes, ramps, and cross streets)
- Traffic Operations Study task to evaluate the details of the traffic handling plans (e.g., phasing, sequencing) and evaluate freeway operational strategies (e.g., ramp metering)
- Traffic Operations Study task to identify and evaluate mitigation strategies for surface streets (e.g., turn bays, signal timing)
- Incident Management task to predict traffic impacts for special events and during incidents and to design appropriate responses
- Traffic Management Center task to evaluate operations strategies; the Transit and Travel Demand Management task to evaluate potential TDM strategies and the Traveler Information Plan and Public Involvement task to provide presentation materials and traffic management information

For the I-235 reconstruction analysis, the elements in the core tools will be used to predict the diversion due to construction activities and assess mitigation strategies. The specific elements of the toolset will include the GIS and associated database management, refinements to the MPO's travel demand model (TRANPLAN) and a traffic operations simulation model (CORSIM), as well as other supporting software tools. A framework will be developed for continued refinement and support of these tools and, at Iowa DOT's direction, their incorporation into the region's transportation planning and analysis process.

We will have a team charged specifically with developing and applying the core tools to support these activities throughout the project. This section outlines the steps the team will follow.

Goal

✓ The goal for this task is to develop a validated set of analytical tools for predicting travel demand, assessing traffic operations during construction, and managing database information and mapping systems. These tools will be used to assess construction impacts and evaluate mitigation strategies throughout the project, as well as support pubic information activities.

Assumptions

Our team's experience with the current databases, models, and traffic analysis tools in the Des Moines area enables us to develop a detailed scope for this task without substantial assumptions. Because the core tools will build upon previous work (e.g., the TRANPLAN model) and other off-the-shelf analysis software, there will be no risk in using unproven approaches. The "Tools" section below describes the specific models and software that will comprise the core tools.

By their nature, the core tools are data intensive, so the first step will be a comprehensive reconnaissance and assimilation of available data. The data needed will include general geographic and roadway features, indirect measures of travel demand (e.g., employment data, commuter travel surveys) and direct measures of traffic (from street counts). As they are available, these data will include:

- Existing traffic counts, from a variety of sources, including:
  - 1996 and 1998 daily counts on I-235 ramps
  - 1996 daily and turning movement counts on surface streets near freeway interchanges, and on state routes
  - Automated Traffic Recorder (ATR) data from locations underneath the Penn Avenue Bridge, and south of the Guthrie Avenue Interchange
  - automated intersection traffic counts at signalized intersections (West Des Moines)
  - bi-annual cordon counts (Des Moines)
  - individual traffic counts from specific studies
- Traveler survey (1000 samples): the travel behavior data set used to develop the MPO's current TRANPLAN model and relationships
- CTRE employee workplace and residence data (1997): analysis by CTRE of Iowa unemployment insurance records matched to employee residences from driver license records for approximately 50,000 employees
- MTA Western Suburbs Transit Study (1999): survey of selected employers in downtown Des Moines and West Des Moines suburbs, and employee residences for approximately 12,000 employees
- Planned event database at the City of Des Moines
- Crash databases, including the City of Des Moines accident database, and the state GIS-ALAS crash database
- Signal database at the City of Des Moines
- GIS data from Coordinated Transportation Analysis and Management Systems (CTAMS) database, the Des Moines MPO, the City of Des Moines, Polk County, and other sources (local governments, schools, utilities, etc).

As noted in our original proposal, we will coordinate and add appropriate data to the CTAMS database for the project.

Tools Needed

As noted above, the existing systems and models that are currently used in the Des Moines area will be the foundation for the work in this task. The Core Tools effort will bring proven tools and techniques together for a reliable methodology to assess travel demand and traffic operations. We expect that the specific software packages included will be the following:

- **GIS Tools.** GIS will be the platform tool for storing and integrating a wide variety of information databases and for geospacial mapping. GIS will provide consistent and high quality mapped materials for public information, public presentations, and visualization of complex relationships for technical staffs. For this project, the ArcInfo and ArcView software packages will be the GIS platform for storing and presenting map-based data.
- **Travel Demand Modeling Tools.** The regional travel demand model, using the TRANPLAN package, will be a core tool. This model and travel data sets developed and maintained by the

MPO consists of 1995 base year and 2025 forecasted daily travel and networks for the region. The model will need refinements to use to estimate construction year travel and peak hour traffic.

We will apply and supplement the base TRANPLAN model with state-of-the-art techniques that we have applied throughout the country, including selected link analysis, a network comparison and performance measure module (to compare alternatives), and a dynamic arterial intersection V/C allocation module (to represent intersection performance). We will also use data management and graphic presentation tools to support our TRANPLAN work. These will enable us to work efficiently with a data-intensive model, and produce quality interim and final presentation materials. These support tools will include the GIS and CORSIM interfaces for the Des Moines model that are described below, as well as VIPER, for network alternatives data management and editing and visual analytical work.

- **Traffic Operations Analysis Tools.** CORSIM will likely be the key model used for detailed traffic analysis. CORSIM is a microscopic traffic simulation model, developed and supported by FHWA, that is the most reliable and proven general network operations analysis software. As appropriate, we will supplement CORSIM with other proven traffic tools for freeways and intersections, including the Highway Capacity Software, PASSER, TRANSYT-7F, Synchro, and FREQ. In many cases, we will be able to build on the existing traffic analysis work already completed by Des Moines area agencies. For example, the city of West Des Moines has developed intersection analyses using Synchro. More information on the approach to select traffic operations analysis tools is given in the scope section below.

- **Interface Tools.** One challenge in using multiple models in the set of core tools will be data management. Each of the software packages uses unique (although open and non-proprietary) input and output data formats. Where appropriate we will leverage existing tools to manage data transfer between software. For example, CTRE is working with Iowa DOT and the MPO to improve a previously developed interface between Tranplan/ArcView and Tranplan/MapInfo. CH2M HILL has also developed a spreadsheet interface to CORSIM that greatly improves productivity with the model, and has been successfully applied on CORSIM projects throughout the country.

  To meet the time schedule and analytical needs of this project, we envision developing improved and more-automated software interface tools. We believe these interface enhancements can be used in the region in the future. Given the project technical and schedule requirements, our focus will be on tools that can immediately increase productivity and improve analytical quality. For example, as part of CTRE's work on evaluating ATIS in the I-235 corridor, an interface to allow data transfer between TRANPLAN, CORSIM, and MapInfo was developed for a research effort. This is a powerful capability for the I-235 project; we expect to apply and refine it to assist the traffic demand and operations analysis application in this project. We believe that automated feedback links between GIS, TRANPLAN, and CORSIM will improve the accuracy of the demand forecasts and the relevancy of the traffic operations analysis. We expect to collaborate closely with the Iowa DOT and the MPO so that the procedures and capabilities used on the I-235 reconstruction project can be transitioned and integrated with MPO and state processes for longer-term value.

Public Involvement

The tools developed for this task can effectively support the public involvement activities that will be critical to the project success. At one level, the modeling process will produce a set of tools to quantify and illustrate analysis findings for review and presentations. Outputs from the GIS and from CORSIM's animated traffic display are highly effective ways to communicate results and alternatives to the public. We have used and demonstrated travel demand analysis and traffic simulation at public

meetings throughout the country, and have learned which approaches are most effective. For example, an extensive policy, technical, and public outreach program for the Lake County (IL) Transportation Improvement Program is effectively applying these techniques for successful public involvement results.

Scope Of Work

The following sections outline the scope of work for the core tools. Separate sections describe the work tasks and approach for applying GIS tools, refining the travel demand model, and developing traffic simulation models.

Geographic Information System (GIS)

We will use GIS as a platform for the information management and for distributing information to project stakeholders. GIS and the map databases we create are considered a core resource for all elements of the project. GIS mapping and database resources will support multiple activities for all project components.

As appropriate, the GIS databases can be converted into clickable maps for display over the Internet or Extranet (password protected internet pages). GIS will be a very useful tool for simultaneously sharing information with several agencies/organization. We can also make special provisions if there are important stakeholder agencies that do not yet have access to the Web.

Task 1. **Establish Project GIS Platform and Database:** We plan to use the database created for the Coordinated Transportation Analysis and Management Systems (CTAMS). The CTAMS data source is the Iowa DOT's roadway base records. Therefore, as changes are made to roadway inventory or new data are added to the base records (e.g., traffic counts), these data can be used to update CTAMS.

CTAMS resides in an Oracle database and is accessed through GIS software such as GeoMedia and ESRI products. The CTAMS database contains base records information for the existing street system and many attributes for individual links (e.g. lane widths, segment length, recent traffic count, vehicle classification, etc.).

Task 2. **Augment GIS database layers:** We will augment the CTAMS database elements with layer coverage for other data sets. As part of this effort we will identify key information needed and will conduct a coordination reconnaissance of state, county and local governments to assimilate relevant GIS data resources wherever possible. For example, to support incident management, we will identify the location of emergency service responders (hospitals, police stations, and fire stations), the location of event venues and key venue attributes, emergency service routes, and emergency service coverage areas. Other layers will contain school sites, the capital improvement program (CIP) for arterial street improvements, and wire line communication systems and traffic control systems. Yet another layer will include highway signage and signage used to divert traffic during reconstruction.

For routes identified as carrying significant traffic diverted from I-235, we will incorporate specific inventories of signage, parking, markings, geometric features, land use, etc., which are critical to the design of traffic management and mitigation improvements to the local street system.

The GIS database will also be the repository for public information elements, including committee rosters, key stakeholders, mailing lists, meetings, schedules, presentations, information packets, reconstruction schedules and closures, etc.

Task 3. Create Project Website and Iowa DOT Interface: The I-235 Project Website will have two partitions – one "internal" to the project partners for project management, communications, and coordination uses, and a second for public access.

A feature that we are proposing to incorporate is sharing of data through web page applications. The software selected for developing web applications must be compatible and interfaced with the project GIS software. One web application requiring attention and development is the provision of traveler information (presumably over Iowa DOT's web page). Our CTRE team members are the developer of the Iowa DOT's "Weatherview" web page and will assist in enhancing the functionality of this DOT web page using either Intergraph's GeoMedia Webmap or ESRI's Map Objects Internet Map Server (IMS).

Task 4. Create I-235 Project Reconstruction Data Sets and Maps: This activity will create and maintain the master database and schedule for I-235 construction activities, lane configurations, closures and related information. It will be the source reference for coordinating mapping, public information, presentation materials and related content regarding the construction program

Travel Demand Model Refinement

The regional TRANPLAN model is a key foundation and part of the core tools. The MPO and CTRE have invested significant effort into developing the model and it is well suited for regional planning analyses. At the same time, there is general recognition that the model functionality needs to be enhanced for this project.

We have two goals for the travel demand tasks. The first is to make focused improvements to the TRANPLAN model to enhance its utility for the more specific corridor and route analyses needed for this project. Secondly we expect that the modeling directions needed to perform traffic analyses for the I-235 reconstruction project will have lasting value to the region; therefore, we intend to coordinate closely with the MPO and Iowa DOT to ensure that model improvements can be transitioned into continuing use after this project is complete.

CTRE is a key CH2M HILL team member to assist with refining the model. We will define and develop improvements to the TRANPLAN model with CTRE staff and collaborate with the MPO throughout that process. Our objective is to ensure that the modeling improvements architecture is consistent with the travel model evolution objectives of Iowa DOT and the MPO.

The specific steps for refining the travel demand model are as follows:

Task 1. Review and Assess Current Model and Procedures: The first step will be a focused assessment of the current model. This evaluation will include a process review and a reasonableness test of the model outputs. This assessment of the 1995 model will help us identify areas where it may be necessary to recalibrate, validate, and improve the base model. Our work with the model suggests that several quick tests would help to focus our assessment.

- Review and compare ground counts (1996) vs. traffic assignments (1995 model). Screenline and selected link/corridor comparisons are useful to detect biases in the traffic assignment model results
- Compare CTRE's 1997 home-work data analysis and MTA employer/employee work-residence surveys with home-based work (HBW) trip patterns (1995 model)

- Compare trip length frequencies from these independent sources (the CTRE and MTA survey data) with (HBW) trip lengths for the (1995 model)
- Examine network attributes, capacity calculation methods, and reasonableness of network routing paths and travel speeds/times

Beyond these specific tests and validation assessments, we will also conduct a general review of the model components, process, parameters, and functionality. This review will focus on the model requirements for the I-235 construction applications. We will prepare a technical memorandum summarizing the results of our analysis, and recommendations for immediate and longer-term enhancements to the model.

Task 2. **Validate and Improve the 1995 Base Model:** In this step, we will implement and exercise the model enhancements identified in the previous steps to improve the 1995 base model. This step will focus upon adjustments to refine work trip patterns and traffic assignment methods and results for peak hour analysis use.

Task 3. **Develop 2005 Daily Travel Forecast:** This work step will develop forecasts that reflect travel patterns during the I-235 reconstruction. We understand that the MPO has developed socioeconomic forecasts for year 2005 by traffic analysis zone (TAZ) for the Iowa DOT. We will review these forecasts and allocations with the MPO and Iowa DOT to assess any updates which are deemed appropriate. For example, our team's travel analysis for a major regional mall in West Des Moines may require some updating to the earlier 2005 forecast allocations. Once consensus is reached on land use/socioeconomic allocations, trip generation rates will be applied to develop 2005 trip production and attractions by purpose (including external area interchanges).

We will update the coded highway network to reflect changes through 2005. Concurrently we will incorporate link attributes and capacity calculations to enable peak period analysis and we will generate network files for peak hour and off peak travel conditions. Next, the TRANPLAN trip distribution model will be run for each trip purpose to produce projected 2005 trip tables[1]. Traffic assignments (link volumes) will be made and compared to two independent sets of traffic estimates for 2005:

- Recent traffic counts data (1996 through current), extrapolated to 2005 with generic or area-based factors
- 1995 model traffic demand assignments, extrapolated to 2005 with these same factors

These comparisons will be used to provide reasonableness checks to the 2005 forecasts. CTRE staff and modeling experts on the CH2M HILL team will review the forecasts with Iowa DOT and MPO staff to obtain input. This "professional review" input will help to avoid critical inconsistencies in the 2005 forecasts. As necessary, we will revise the input data and parameters for the 2005 model until a reasonable set of traffic assignments is produced.

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[1] There are two methods which could be used. The first would be to partition the trip productions and attractions into peak and off peak periods and run the trip distribution model separately for peak and off peak networks. In this process the peak period trip distribution and traffic assignment would need to be iterated to an equilibrium state (that is, the network times and speeds assumed as input for trip distribution must approximate the network times and speeds after peak period traffic assignment). The off peak trips would be distributed using off peak network conditions.
The second approach is to distribute all trips using a single network as input to trip distribution. The resulting trip tables for each purpose are then factored to estimate the proportion of all trips which occur in a peak hour or other time period.

Task 4. Develop 2005 Peak Hour Travel Forecast: Daily traffic forecasts are useful for general planning, but analysis of construction impacts requires traffic data on a finer-grain basis. For these applications, a peak hour analysis is needed to assess the worst-case impacts. For construction impact analysis, when construction activities could vary by time of day, it may be necessary to estimate traffic for multiple time slices, including other periods of the day as well.

Our approach to meet these requirements will be to refine the 2005 travel forecast to reflect peak hour volumes, and also develop a set of factors for predicting traffic volumes during other hours (mid-day and weekend). Specific steps are as follows:

- Using traffic count field data collected in previous steps, calculate hourly factors (as a percentage of daily volumes) for the peak hour and other time slices. Recent data suggest that a 10 percent peak hour factor is appropriate for the Des Moines area.
- Apply peak hour (or other time-period) factors to the TRANPLAN model total vehicle trip table. (Note that network link capacities must be similarly adjusted to reflect corresponding hourly values.)
- An alternate approach is to apply time factors for each trip purpose by time-of-day and direction to create peak trips by purpose and a composite summed for all purposes. Use the composite (e.g., aggregated) peak period trip table for traffic assignments to the entire highway network.
- Generate 2005 traffic assignment by running the updated 2005 hourly model.
- Assess the 2005 hourly forecasts, using factored 1996 hourly ground counts. As in Task 3, we will use experts' review to confirm that the forecasts are reasonable.

Task 5. Test 2005 Peak Hour Forecast and Traffic Assignment on Construction Scenarios: To confirm that the model refinements completed in the previous step will result in a reliable model for construction analysis, we will complete a testing phase. In this task, we will run a sample scenario (likely a lane closure on I-235 with interchange closures) using the 2005 travel demand model. Then, we will generate peak hour forecasts for the freeway and surface streets. These will be compared against the base (no construction) 2005 forecasts. As in the previous steps, we will evaluate the reasonableness of the resulting diversion patterns and hourly traffic volume patterns and make any necessary adjustments.

Task 6. Identify Further Improvements: Throughout this process, we will continue to identify opportunities for improving the travel demand model and associated processes. Our focus will be on refinements to the model to support the traffic operations analysis and traffic impacts due to construction, but we will remain cognizant of continuing general modeling process enhancements.

The above sequence of work will be completed within the first four months to enable timely analysis of the I-235 construction staging schemes.

Simulation Tools

While the travel demand model (refined as described above) will give us a working estimate of the traffic under construction scenarios, additional tools will be needed to assess traffic operations and analyze potential mitigation. More specifically, the TRANPLAN model does not provide robust analysis at signalized intersections, or capture queues on the freeway. To do so, we will need to include traffic simulation as part of the core tools. Our proposed approach is outlined below:

Task 1. Identify Traffic Operations Analysis Software: There are a variety of traffic analysis and simulation models; we use a wide range of these tools on our projects throughout the country. There is no single tool that can be used for all applications. To be able to select the right model, we frequently evaluate the various traffic packages (both as part of projects and independently).

For this effort, we will draw upon our experience with a range of candidate models to select the most appropriate for the I-235 project use. Three categories of models will be considered: facility-specific tools (e.g., for analyzing signalized intersections), arterial network software packages, and general network simulation models. Table 3-1 is an overview of the features and strengths of the various models.

TABLE 3-1
Traffic Model Comparison

Model	Area of Application	Appropriate-ness for I-235	Flexibility	Graphics and Animation	Proven History	Cost	Proprietary
Facility-Specific							
Highway Capacity Software (HCS)	Signalized Intersections, Ramps, Freeway	Moderate	Low	Low	High	Low*	No
FREQ	Freeway	High	Low	Low	High	Moderate*	No
Arterial Network							
Synchro	Intersections, Network	Moderate	Moderate	Moderate	Moderate	High	No
TRANSYT-7F	Arterials	Moderate	Moderate	Low	High	Moderate	No
PASSER	Arterials	Moderate	Moderate	Low	Moderate	Moderate	No
General Network							
CORSIM	Freeways and Arterials	High	High	Moderate	High	Moderate*	No
VISSIM	Freeways and Arterials	Moderate	High	Moderate	Moderate	High	No
INTEGRATION	Freeways and Arterials	High	High	Moderate	Moderate	High	No
WATSIM	Freeways and Arterials	High	High	Moderate	Low	N/A	Yes
MITSIM	Freeways and Arterials	High	High	Moderate	Low	N/A	Yes
Paramics	Freeways and Arterials	Moderate	High	High	Low	High	No

*CH2M HILL has a firm-wide license for these tools.

For this task, we will discuss options with Iowa DOT (and others as appropriate) to reach concurrence on final selection of specific models to be applied. At this point, it seems clear that CORSIM will be used. Other likely tools will be Synchro and HCS.

Task 2. Data Gathering: Once the software models are selected, reliable data will be needed to support the modeling process. Data gathering can require significant resources, so we have developed a plan to pull together the required data expeditiously.

The first step will be to assemble existing reports and data to create a base of existing information about plans, programs, and data that are relevant to the I-235 study. Our team's ongoing work with Des Moines agencies and data stores area will allow us to complete this task efficiently and quickly. For example, HRG's work on the regional mall project in West Des Moines will provide a rich base of traffic data for that area.

Next, we will review available data assembled in the first step, and identify if and where additional data collection may be necessary. There is always a tradeoff between the depth of data available for modeling and the resources and time available. Our experience on hundreds of modeling projects will enable us to develop a data collection effort that is appropriate for the models used as core tools. For example, Table 3-2 is a first cut summary of the data requirements for developing a CORSIM model of the I-235 corridor area. It reflects the balance between data needs and collection resources, and will be revised once our assessment of available data is complete.

TABLE 3-2
CORSIM Data Requirements

Data	Description
Traffic Counts	Turning movement counts (hourly) at 75% or more of the major signalized intersections in the study area. Screenline volumes at all key cordon points, freeway ramps, and major arterials.
Geometric Data	Roadway network (base map), number of lanes, turn bays
Signal Data	Traffic signal timing plans at all signalized intersections, for AM and PM peak periods. Green splits can be estimated if necessary.
Travel Time	Multiple runs on specific routes, for model calibration.
Queuing and Congestion	Estimates of the intensity and duration of queues and congestion on I-235 during typical a peak period

The next step will be to execute the data collection plan completed in the previous step to obtain new field data. Ideally, field data collection will be conducted in May 2000. Based on our knowledge of the available traffic data and the requirements of the models, we anticipate that the data collection focus for this step would be a selected set of turning movement counts, some 24-hour tube counts, and selected freeway and arterial travel time data for model calibration.

At the end of this task, we will produce a technical memorandum that summarizes the data assembled and collected. We will also provide copies of any new data collected to Iowa DOT or other interested agencies.

Task 3. **Code Baseline Models:** Once the models are selected, they will be populated with the data from the traffic model. The models will be coded and calibrated to reflect year 2000 traffic conditions. We use the interface tools and other productivity aids described in the "Tools" section to expedite and document the work in this step.

Task 4. **Validate/Calibrate Current Year Models:** Calibration is a critical step, and one that is done on most modeling projects. Sometimes, however, little thought is given to what actually occurs during calibration. We have a proven approach for model calibration that is tailored to each project. As in any modeling project, calibration is a critically important undertaking, and needs to be planned carefully. The proposed approach is as follows:

- Before beginning calibration, specific quantitative measures and goals for calibration will be identified. These will include traffic volumes and travel time.
- Predicted-to-actual performance will be compared. We will observe general traffic performance. The animation features in models like CORSIM and Synchro provide an excellent way to compare queues and congestion to existing conditions. Model modifications will be made as appropriate to achieve the calibration goals.
- Once the model is calibrated to the satisfaction of the CH2M HILL team, a meeting will be held with Iowa DOT staff to review the model inputs and outputs, and get signoff that the model is complete. Model updates will be made to reflect changes suggested by Iowa DOT.

Task 5. **Develop Future Year (2005) Models:** The geometric and signal timing data coded in the models will be updated to reflect expected 2005 conditions. Traffic volumes for 2005, on an hourly basis, will be developed from the travel demand model estimates.

Task 6. **Develop Simulation Interface Tools:** If desired, we will use previous research work that developed a prototype interface between the TRANPLAN, CORSIM, and ArcView software packages, and update it to a production system. The tools would provide an automated data interface between the models in the core tools, greatly enhancing productivity for this project. Specifically, it will allow the technical team to quickly test and evaluate alternative strategies for traffic management and mitigation, eliminating much of the data management tasks inherent in working with multiple models. These tools will also be available to Iowa DOT and other regional agencies for application on other planning efforts.

Task 7. **Validate Future Year Models with Agency Staff:** At the end of this task, the goal is to have a set of fully functional models with realistic traffic predictions. The future year models developed in the previous step will be run for the 2005 scenarios. Iowa DOT staff will be presented with the results, and given the opportunity to identify inconsistencies or areas of concern. Where feasible, improvements to the simulation tools will be implemented based on this feedback. Once these improvements are complete, the models will be ready for application on other tasks.

Deliverables

- Data collection technical memorandum that summarizes the data assembled and collected.
- Technical memorandum assessment of current travel demand model and procedures.
- Updated 1995 TRANPLAN travel demand model.
- New 2005 daily and peak hour travel demand model.

- White Paper on opportunities to improve the travel demand model and process ***(if requested by Iowa DOT as a "supplemental" task).***
- Calibrated base year (2000) simulation models, and validated 2005 models

3.3 Traveler Information /Public Involvement

The CH2M HILL team recognizes the importance of providing information to travelers during the I-235 reconstruction as well as developing a well-conceived and executed public involvement program. We bring a strong and unique combination of traveler information dissemination skills and experiences in public input and outreach initiatives to the project. We're able to combine expert technical knowledge and understanding of project reconstruction and traffic management requirements with an ability to meaningfully communicate with key public at all levels. We have established pre-existing dynamic relationships with local and state interest groups and decision-makers. Our team's significant public relations experience—including competencies in issue management, media relations, government relations, research and consumer affairs—has provided solutions in both private and public sector environments. We believe these combined assets and resources will provide the Iowa DOT and the citizens of Iowa with the best traveler information program and public involvement process possible.

The CH2M HILL team wants to help the Iowa Department of Transportation fulfill its vision of being the "Best DOT in the World" by:

- Partnering with the DOT and working collaboratively to develop and implement a Traveler Information Program
- Partnering with the DOT and working collaboratively to inform, influence, and involve citizens in the I-235 project

The CH2M HILL team will create and nurture these partnerships by applying an integrated marketing approach to the development of a Traveler Information Program and implementation of a Public Involvement Process. Our approach incorporates an orientation to the customer, an emphasis on communication, a commitment to "high tech and high touch," and a passion to help the Iowa DOT lead the citizens of Iowa through this exciting and historically significant project.

We propose a traveler information and public involvement process that includes ongoing traveler and community issues research; identification of target audiences; development of objectives, strategies and tactics; and optimization of the most effective communication channels to help the Iowa DOT implement both pre-trip and en-route travel information systems.

Goals

- ✓ To help customers understand the positive aspects of the I-235 project.
- ✓ To promote the safety of the traveling public, Iowa DOT workers and contractors throughout the project.
- ✓ To provide users of the system with choices and options to satisfy their travel needs.
- ✓ To promote Iowa DOT's project leadership through strategic planning, responsive communication and responsible actions.
- ✓ To help foster more metropolitan and regional cooperation.
- ✓ To position the I-235 reconstruction as a primary project in the "revitalization" of the Des Moines metropolitan area.

- ✓ To maximize the involvement of stakeholders in the project.
- ✓ To create strategic partnerships with business owners, neighborhood leaders, government officials, and educational institutions.
- ✓ To integrate intelligent transportation systems tactics in our communications in order to provide travelers accurate and timely information 24 hours per day, 7 days per week.
- ✓ To maximize opportunities for citizens to share their ideas.
- ✓ To develop an integrated communications approach that includes law enforcement, contractors, public safety officials, and other key stakeholders to present a united front to citizens.
- ✓ To establish and maintain the highest level of trust between Iowa DOT and citizens.
- ✓ To establish relationships with homeowners and businesses to implement issue management strategies, to gain feedback and support, and to protect the integrity of the project and Iowa DOT.
- ✓ To let citizens know who's in charge and where to go for help.

Assumptions

- A Traveler Information Program is one component of a broader Public Involvement Process.
- Citizens need and desire more information about the I-235 project.
- Providing traveler information and communicating with customers will benefit both the users and Iowa DOT in terms of money and time saved.
- Providing project and traveler information will positively impact the regional economy.
- Citizens will continue to adopt and embrace technology in their daily activities.
- The business community, neighborhoods, and government want to participate and help disseminate traveler information.
- The Iowa DOT is committed to providing exceptional customer service, a high quality transportation system, and a high level of operational efficiency.
- A negative perception and/or lack of perception regarding the project currently exists among some individuals, businesses, and organizations.
- The project will impact citizens and businesses throughout the entire state.

Data Needed

The following data is required in order to effectively implement the Traveler Information and Public Involvement process:

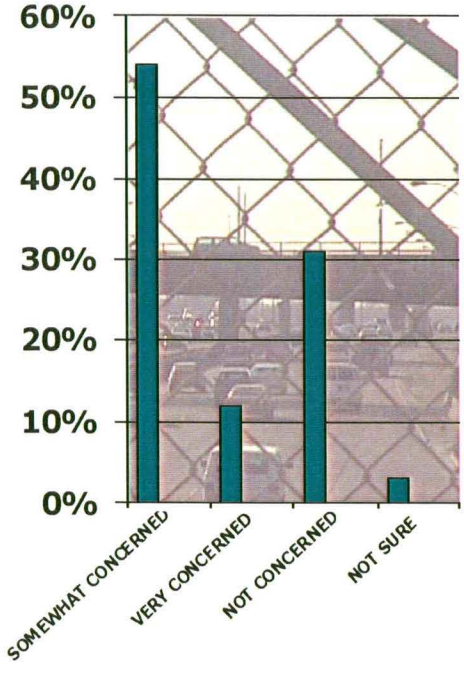
- I-235 Steering Committee Minutes
- I-235 Subcommittee Meeting Minutes
- Identification of Key Stakeholders and customer input
- I-235 project background information
- I-235 project schedule information

Scope Of Work

The work tasks for this component are described below:

Task 1. Gather the voice of the customers: The CH2M HILL project team will help the Iowa Department of Transportation gather the voice of the customer. Consistent with our customer orientation, we will begin our traveler information and public involvement efforts by determining:

- What customers do know about the I-235 project.
- What customers want to know about the I-235 project.
- What customers need to know about the 1-235 project.
- How we can best share I-235 project information.
- We will obtain this information through a structured research effort. We will leverage prior work to the maximum extent and organize our research efforts around the various customer groups, including citizens of the metropolitan area, the business community, major employers, local governments, and professional trade associations.



Understanding customer needs through research like employer surveys (above) allows Iowa DOT to formulate and disseminate messages appropriately. (Survey of West Des Moines Employers about Planned Construction of I-235 for the MTA)

- We will begin to understand our customers by reviewing current research, such as the employer, employee, and citizens' surveys recently conducted by the Des Moines Metro Transit Authority (MTA). We will seek out additional secondary research data that may be available from the Iowa DOT, the Iowa Motor Truck Association, the Greater Des Moines Partnership, the Des Moines Metropolitan Planning Organization, and other organizations that may have customer travel data available.
- We will conduct primary research as needed. We suggest a random telephone and/or mail survey of citizens and businesses to provide the answers to our basic questions. We also propose focus groups to examine customer issues in more detail and to test messages and graphics as the program continues.
- We will work with the Iowa DOT to gather and monitor the voice of the customer throughout the entire project to identify opportunities for continuous improvement in our traveler and project information process.

Task 2. Develop Strategic Relationships: The CH2M HILL project team will help the Iowa DOT develop strategic relationships.

- We will use our knowledge of the community to help identify key stakeholders. We will work with the Iowa DOT I-235 project staff and the Iowa DOT Management Team to develop and solidify strategic relationships with key project stakeholders throughout the Des Moines metropolitan area.

- We will leverage strong relationships with community leaders and organizations including the Greater Des Moines Partnership, Downtown Partnership, Des Moines Neighbors, the Greater Des Moines Convention and Visitors Bureau, Iowa Division of Tourism, the Des Moines MTA and metropolitan mayors. We will establish frequent meetings with leaders of these and other key groups, to provide information about the I-235 project and determine information needs from each of the organizations. These work sessions will help us to identify organization-specific tactics for disseminating traveler information and implementing travel demand management tactics.

- Because this project impacts travelers from throughout Iowa, we will work with the Iowa DOT to develop and strengthen relationships with stakeholders from Ames, Ankeny, Newton, and other outlying areas. We will also work with the Iowa DOT and statewide trade associations, such as the Associated General Contractors, the Iowa Association of Business and Industry, the Iowa Motor Truck Association, the Iowa Public Transit Association, and others to aid in the dissemination of traveler and project information.

- We have commitments from several key stakeholders to assist in any manner as we work with the Iowa DOT. The Greater Des Moines Partnership has agreed to provide ongoing traveler information to its members. Downtown Partnership has offered to create a core task force of its Board of Directors to assist our team. And Des Moines Neighbors is willing to facilitate neighborhood-specific meetings and provide space in its newsletter to share information about this project.

- We will meet with human resources personnel from central Iowa's major employers, including the largest insurance companies, Hy-Vee, the State of Iowa, and others to identify employee relations opportunities and company-specific strategies for disseminating traveler information and implementing travel demand management tactics.

- There are numerous opportunities for businesses and organizations to aid in the dissemination of traveler information, including:

  - Placement of project information kiosks
  - Links between corporate web sites and the I-235 project web site
  - Email or Intranet messaging

- We will be strategic in our approach to this task by focusing our efforts on central Iowa's largest employers.

- As ITS field elements are deployed, we will combine the outputs of the Traffic Management Center with our strategic partnerships to provide employers and their employees' "real time" traveler and project information. We will also utilize these strategic relationships to help the Iowa DOT and the Des Moines metropolitan area develop a comprehensive travel demand management strategy that may incorporate

flexible work schedules, financial incentives for transit usage, incentives for telecommuting, and cooperative advertising initiatives with local retailers.

Task 3. **Partner with local media:** The CH2M HILL project team will help the Iowa DOT partner with local media. Initially, we recommend holding a "media focus group," comprised of central Iowa print and broadcast assignment editors. By establishing and strengthening these relationships early in the project, we will be able to:

- Determine the media's current knowledge and interest level regarding the project;
- Determine the amount and types of traffic/travel information they want to provide their viewers, listeners and readers;
- Pursue possible long-term opportunities (i.e., inclusion in daily traffic reports, web site links or special news segments developed specifically for the project);
- Establish credibility for the I-235 spokesperson (post-news conference) as an available and trusted source for news and information;
- Determine the preferred dissemination method (and deadlines) for each news organization.
- Position the Iowa DOT as a proactive state agency working to provide central Iowans with vital, accurate information. (Due to the competitive nature and frantic pace of the news business, some of this information may need to be obtained one-on-one rather than in a group setting.)
- Provide regular traveler information and updates to local media through:
  - News releases
  - Media kits
  - News conferences
  - Interview opportunities
  - An online press room and information archives
  - Public service announcements
  - Guest articles and/or letters to the editor
  - Other tactics as appropriate
- Establish a designated I-235 spokesperson(s) who will serve as the face and voice of the project.
- Provide media training to Iowa DOT personnel as appropriate.

Task 4. **Create a project identity:** The CH2M HILL Project team will help the Iowa DOT to create a project identity. We will work with the Iowa DOT to establish an I-235 project identity, theme, and logo that clearly communicate the positive and progressive nature of the project. We will create I-235 project "top-of-mind" awareness by incorporating the project theme and logo on all traveler information, promotional materials and safety messages.

Task 5. Disseminate traveler and project information: The CH2M HILL project team will help Iowa DOT to disseminate traveler and project information.

- We will develop a variety of tools to communicate traveler and project information that are responsive to our customer needs and will place the Iowa DOT in a proactive position.
- We will implement an I-235 project web site with up-to-date project information and "real time" video displays of the I-235 corridor. We will encourage and develop web site links with numerous private and public sector entities.
- We will establish a user registration process on the web site, which will allow the Iowa DOT to capture customer names, addresses, email addresses and other information that can be used to provide targeted traveler information.
- We will work with the Iowa DOT to publish a monthly I-235 traveler and project newsletter that will be distributed via mail, in high traffic locations (such as welcome centers and key businesses) and through the project web site.
- We will work with our strategic partners to include I-235 traveler and project information in their newsletters.
- We will work with the Iowa DOT and our strategic partners to establish a speakers' bureau to share information about the I-235 project with citizens throughout the metropolitan area. The speakers' bureau will consist of Iowa DOT representatives, as well as key spokespersons from the private and public sectors.
- We will provide traveler and project information for distribution via public access television.

Our integrated team management approach to this project will ensure that critical traveler information, such as current and upcoming lane closures, restrictions, and detours are communicated in a timely manner. Our customer orientation will ensure that information dissemination tools are tailored to the needs of specific user groups, such as local businesses, residents, neighborhood groups, hospitals, fire, police, and the trucking industry.

Out integrated team management approach will also ensure that the technical analysis tools we develop become the basis for effectively communicating information to the customers. For example, the modeling process will produce a set of tools that will illustrate analysis findings and support presentations. Outputs like the GIS and CORSIM's animated traffic display can be highly effective ways of communicating complex concepts to the public.

Task 6. Maximize customer "buy-in": The CH2M HILL project team will help the Iowa DOT to maximize customer "buy-in" to the project.

- We will help the Iowa DOT create I-235 "Project Champions," citizens who strongly support and advocate the I-235 project. We will meet with leadership of our strategic public sector partners, including the mayors of Des Moines, West Des Moines, and Windsor Heights, and invite them to be project champions. We will meet with our strategic private sector partners, including the president of the Greater Des Moines Partnership, the president of Des Moines Neighbors, CEOs of the Principal Financial Group, Hy-Vee, and other major central Iowa employers and personally invite them to be project champions. We will work with the Iowa DOT to personally invite Governor Tom Vilsack to be the "Champion of Champions."

- We will work with the Iowa DOT to provide vital information to DOT employees and road workers, the front line and key champions for the I-235 project.
- We will develop a recognition program, rewarding businesses and organizations that demonstrate leadership in the implementation of travel demand tactics, such as flexible work schedules, telecommuting, carpooling, van pooling, and transit usage.

Task 7. Maximize utilization of the existing I-235 committee structure: The CH2M HILL project team will help the Iowa DOT to maximize utilization of the existing I-235 committee structure.

- We will work with the Iowa DOT to conduct regular meetings of the I-235 Steering Committee and its various subcommittees. We will provide the committees with staff and logistical support, if desired. We utilize the committees to assist in implementing the "Project Champions" concept. We will help the I-235 Communications Committee develop an overall I-235 Project Communications Plan and we will ensure that key messages from other subcommittees, such as traffic management and incident management, are incorporated in the traveler information process.
- We will utilize the I-235 Steering Committee in a collaborative manner and seek feedback to our ideas and suggestions to enhance our traveler and project information ideas.

Task 8. Engage citizens in the project (SUPPLEMENTAL): The CH2M HILL project team will help the Iowa DOT to engage citizens in the project.

- We understand the Iowa DOT has devoted significant energies to public participation throughout the I-235 project. The CH2M HILL project team has extensive public participation experience, ranging from metropolitan area interstate highway construction projects to statewide strategic planning initiatives.
- Should the Iowa DOT desire our assistance with public involvement, we will help develop and implement an effective initiative that is predicated on two fundamental concepts:
  - Developing and sustaining constructive relationships
  - Creating opportunities for frequent two-way communication
- We will help the Iowa DOT to maximize opportunities for the citizens of Iowa to understand, respond to, and learn more about the I-235 project. We will help the Iowa DOT ensure that customers are informed of the project, are listened to before decisions are made, are offered the opportunity to influence choices and decisions, and agree to certain decisions. We will build on the many public participation techniques utilized by the Iowa DOT during the public participation phase of the Iowa in Motion Study, including:
  - Direct mail
  - Public group meetings
  - Individual meetings
  - Public presentations
  - Videos
  - Brochures
  - The Internet

  - The Iowa Communications Network

- We will not overlook the role of individual customers and coalitions of customers. The successful implementation of an I-235 public participation process requires long-term commitment and broad-based support.

Deliverables

- An I-235 Customer Research Report
- An I-235 Traveler Information Plan
- An I-235 Project Theme and Logo
- An I-235 Media Partnering Charter
- An I-235 Project Champions Program
- An I-235 Project Communications Plan
- An I-235 Citizen Engagement Plan

3.4 Traffic Operations Analysis

This traffic operations analysis component will produce the traffic management strategies and plans for the reconstruction program. Thus, it is a very important project element. Because of the breadth of this task, our scope of work activities for traffic operations analysis have been divided into the following three parts:

- The tools and procedures used to evaluate the impact of reconstruction of I-235, in each construction phase, on traffic on both the freeway mainline and the supporting street system
- Traffic operational analysis on the freeway mainline
- Traffic operational analysis on the supporting street system

To minimize diversion and disruption to normal travel patterns, the Iowa DOT plans to stage I-235 construction activities so that a minimum of two travel lanes are provided on I-235 for the duration of the project. With one less lane available, the capacity of the facility will be reduced by at least one-third. Beyond the lane closure, additional turbulence in the traffic stream will result from transition tapers, reduced shoulder widths and lateral clearances, changes in vertical profile between old and new driving surfaces, and basic construction activities near and around the travel lanes.[2] As a result, during periods of peak travel volume, traffic on I-235 will be more congested than current conditions and some traffic will be diverted, shifting from the freeway to the supporting street system.

The ultimate goal of this task is to facilitate safe and efficient operation of traffic on the mainline freeway, on the ramps and interchange facilities, and on diversion routes on the supporting street network. Although the freeway and the supporting street system operate as an integrated highway network, in our proposal we have described the proposed scope of traffic operations analysis work for each separately. We consider them separately in our discussion because of the different political jurisdictions involved and the construction issues related specifically to the freeway.

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[2] For example, information from CH2M HILL's construction area synthesis published in NCHRP Synthesis Report 273 suggests that the median capacity of a freeway segment narrowed from three lanes to two is about 1500 vphpl. The capacity flow reduction is much more than implied by a one-third reduction in lanes available.

The need for traffic operations analysis is driven by freeway reconstruction activities and the reconstruction schedule of events, the location of bridges, interchanges, and ramp closures, and the location of capacity reductions on the mainline. The construction scheduling and phasing drives all other traffic operation analysis issues, therefore, our scope of services starts by reviewing the Iowa DOT's plans for the I-235 construction schedule and phasing.

Activities common to the analysis of traffic operations on the mainline and on the supporting street system include application of the models used to forecast traffic volumes during the peak period and the model used to analyze traffic flow performance on the network corridors and segments.

Tools and Procedures to Evaluate the Impact Construction Phases on the Transportation Network

This element deals with evaluating the schedule and phasing construction activities and applying core tools (developed in other tasks) to assess traffic demand and traffic flow performance both on the mainline and on routes of the supporting street system which receive traffic diverted from the freeway.

Goals

- ✓ To confirm or enable the safe and cost-effective constructability of each segment or construction project along the I-235 corridor.
- ✓ Develop accurate estimates of the impacts on traffic volumes and traffic operations remaining on the mainline and traffic diverted to the supporting street network during each phase of I-235 reconstruction.
- ✓ Support the Iowa DOT, the MPO, and local governments with timely and accurate estimates of traffic volumes and traffic operation over regional transportation system for public involvement meetings, policy-making meetings and for other internal purposes.
- ✓ Provide consistent and useful guidance to motorists on the freeway and supporting street system.

Assumptions

N/A

Data Needed

- Maps, reports, memoranda, and other documentation on phasing plans and planning criteria that have been developed by the Iowa DOT and communicated to external groups (media, local governments, neighborhood groups, etc.).
- Existing truck routes, load restrictions on facilities adjacent to I-235, and clearance restrictions.
- Locations of material and production/plant sites.
- Peak period traffic counts for mainline segments, ramps, crossroads, and selected diversion routes (developed for the core tools)

Tools Needed

- TRANPLAN peak period travel demand model
- Traffic operations models (CORSIM and others) for the region, with detail in the influence of the corridor.

- Interfaces between TRANPLAN and CORSIM and with GIS.
- Iowa DOT policies on detours.
- Highway Capacity Manual (HCM) procedures

Public Involvement

The work in this task will benefit public and community input regarding specific corridors and will in turn contribute to the traveler information and public information process.

Scope of Work

The purpose of this element is to evaluate (value engineer) the construction phasing and schedule and to estimate the traffic carrying capacity impacts of the construction activities. I-235's capacity reduction drives the impacts on the operation on the mainline and diversion of traffic on the supporting street system. These impacts will be measured through the use of the regional travel demand model and regional traffic operations model. Specific activities included are:

Task 1. **Value Engineering Review of Overall Proposed Phasing Plan and Schedule:** We will conduct a Value Engineering (VE) workshop to study the overall construction phasing plan and schedule. The VE study will look for methods to shorten the construction schedule, improve the overall constructability of the program, address potential schedule and activity conflicts, and identify methods to reduce the duration of lane, ramp, interchange, or bridge closures. Also, we will evaluate the efficiency and ability to deliver materials, sequence construction events, schedule equipment operations, and other construction site considerations The study will examine the overall phasing plan, sequencing of projects, proposed schedule, and construction limits.

This task will result in a final phasing plan and schedule for the I-235 project. The plan and schedule will be used to drive the traffic operation analysis.

CH2M HILL has conducted numerous VE studies for DOT on major projects. Resumes of experienced VE staff are included in 2.0 Project Team.

Task 2. **Develop Mainline Capacity Estimates by Construction Stage and Schedule:** For each construction phase, we will determine the capacity impacts of lane closures using Highway Capacity Manual techniques described in chapter 6 of the manual and based on our own experience with freeway lane closures in Iowa.

Task 3. **Estimate the Impact Mainline Capacity Reductions on Traffic Volumes and Flow Performance:** Using the core tools updated TRANPLAN model, we will develop estimates of traffic volumes and operations for multiple construction scenarios and stages. The traffic assignment output from TRANPLAN will be translated into traffic operations simulation models and performance will be assessed. As appropriate, the resulting simulation model estimates of traffic performance levels (e.g., speeds and travel times) will be fed back to TRANPLAN and new traffic assignments will be created using the revised speeds and travel times.

Next, the traffic operations models will be updated to reflect the reduced capacity of links on and around I-235 that will be impacted by construction. This will be done successively one phase at a time, and for each phase we will follow the same iterative process between TRANPLAN and the traffic operations models. The last step will compare the traffic volumes (output from TRANPLAN) and traffic flow performance (output from the traffic

operations simulation model) for the modified network to those of the base-line network and display the results using GIS maps. The maps will graphically illustrate the impact of diversion. We will exercise a continuing QA/QC analysis to make sure the estimates are as accurate as possible.

Task 4. Review Traffic Operations Results with Iowa DOT and Others: We will coordinate regularly with Iowa DOT (and others such as MPO and local government staff members as guided by Iowa DOT) to review our processes and the results of the impact analysis. Once consensus is reached with the Iowa DOT, we will develop maps for each phase of reconstruction, indicating the estimated traffic volume change on supporting streets and volume decreases on the mainline and significant changes in traffic flow performance (e.g., link speeds, delay, etc.). We understand the sensitivity of this information and the importance of credible procedures and professional quality of the work. Therefore, we will be guided by consultation and guidance from the Iowa DOT staff in determining appropriate processes and mechanisms for release of information.

Deliverables

- A value engineered construction phasing and schedule plan.
- Estimates of the mainline capacity impacts of each phase of the construction.
- GIS maps indicating the traffic volumes and changes in traffic volumes and traffic flow performance due to construction during the a.m. and p.m. peak period on the mainline and the support street system for each construction phase.

Traffic Operational Analysis on the Mainline

In this element we will evaluate of the performance of traffic on the I–235 mainline. Where possible, we will determine plans to mitigate congestion and queuing, and review and refine plans for maintenance of traffic. We will maximize the efficiency and safety for the plan for work zones and work areas. Operational efficiencies and management of traffic during construction will be administered during construction through the Traffic Management Center (TMC) described later.

Goals

- ✓ Develop a plan for the safe and efficient movement of traffic through I-235 during all construction phases.
- ✓ To the degree possible, identify procedures or plans to mitigate congestion and queuing.

Assumptions

N/A

Data Needed

- Iowa DOT work zone traffic signing standards.
- Peak period mainline traffic volumes for each construction phase.
- Capacity of mainline throughout the area of the construction.
- Geometry of the mainline upstream, through the work zone, and down stream.
- Available traffic maintenance plans.

Tools Needed

- Traffic operations models (from the Core Tools)

Public Involvement

N/A

Scope of Work

The scope of work for this element will involve a review of traffic operation on the mainline and the maintenance of traffic plans to improve safety and enhance traffic flow performance during each of the construction phases.

Task 1. **Characterize Operations and Identify Problems and Deficiencies:** We will analyze the expected quality of traffic operations on the freeway, ramps (including ramp terminal intersections), and crossroads. CH2M HILL has developed a maintenance of traffic operations analysis methodology, that will use the traffic operations model developed as part of the Core Tools for this project. The analysis methodology provides dynamic estimates of traffic, including queue formation, and bottlenecks and their upstream impacts along the freeway. For example, the model will reflect the specific effects of narrow lanes or close obstructions in work zones.

This task will provide a clear picture of the quality of corridor traffic flow during each planned construction phase, as well as guidance to the project team for recommended improvements or other measures to mitigate adverse traffic impacts.

Task 2. **Traffic Mitigation Plan:** Based on the results of the previous task we will identify locations where special attention is required to mitigate expected traffic congestion and queuing. Problems may be found at both entrance ramps (e.g., excessive entering traffic creates unacceptably long queues) and exit ramps (queuing backing up onto the mainline). Solutions could include ramp metering, temporary lane construction or lane widening, ramp terminal re-striping or temporary channelization, temporary signals or signal re-timing at ramp terminal intersections.

Task 3. **Prepare Corridor Guide Signing Plan:** Each major construction phase will involve one or more ramp closures. In this task, we will prepare an overall plan for freeway guide signs. This will include necessary changes to existing signs to note closures and sign detours; and temporary signs to replace those removed because of construction. Note that this plan will address necessary signing changes both within and outside the actual construction limits. Note also that a plan specific to each construction phase will be necessary.

Task 4. Provide Input to Refine Maintenance of Traffic Plans: The results of the above tasks may suggest revisions to the staging or maintenance of traffic plans under development. We will work closely with Iowa DOT designers to bring suggested changes to the plan that would improve traffic flow during construction.

Task 5. Prepare Maintenance of Traffic Plans (SUPPLEMENTAL): Preparation of MOT plans is properly done by the final designers of the facility, in this case the Iowa DOT staff. We recognize that time is short, that changes in the design as a result of the above tasks may occur, and as a result, the Iowa DOT may need assistance to complete the plans. As full partners with the Iowa DOT, the CH2M HILL team is prepared to offer whatever assistance is requested in the preparation of MOT plans and specifications.

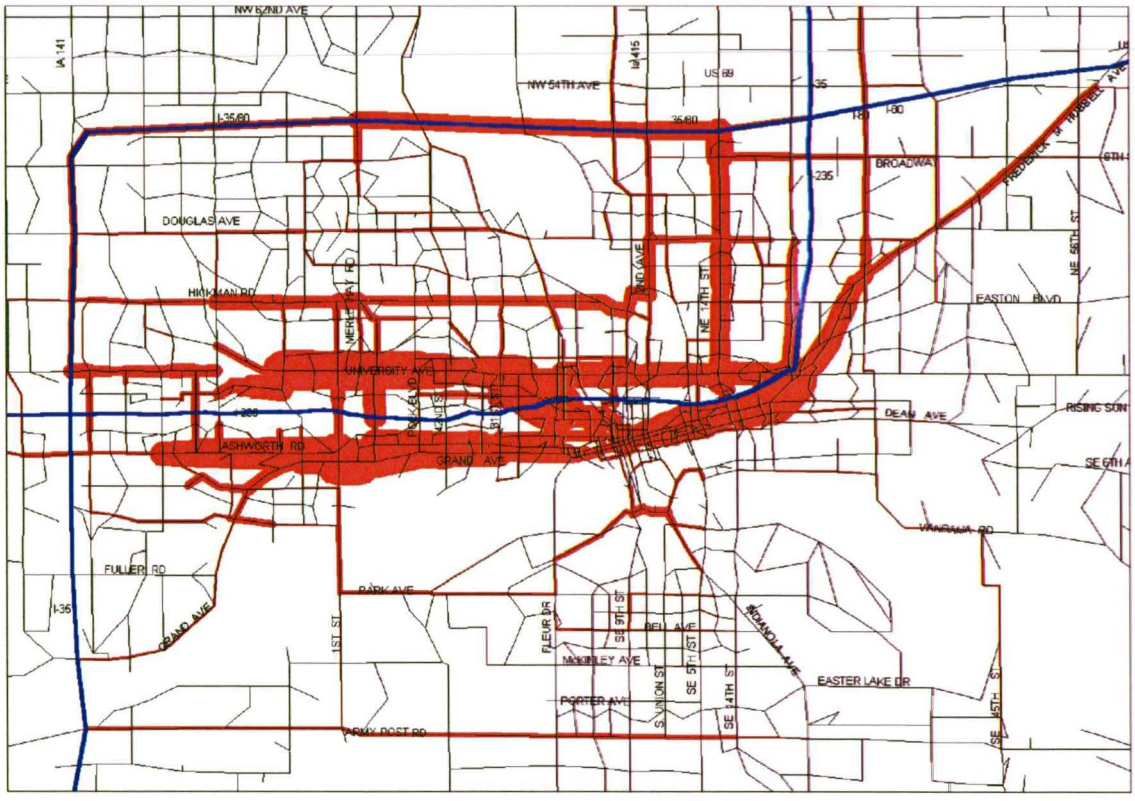
Deliverables

- Traffic operations model output (e.g., core tools application output) documenting the traffic operations for each construction phase and scenario studied
- GIS-based maps of each interchange showing closures, detours and noting operational issues
- Memoranda outlining locations requiring traffic or design mitigation.
- A GIS-based plan that will outline location, general size of sign, message, and timing or stages during which the sign is to be in place. The overall guide-signing plan will be provided to Iowa DOT designers for incorporation in construction plan packages.
- Plan sets or GEOPAK files with recommended changes to maintenance of traffic plans and minutes from meetings where changes were discussed with Iowa DOT staff.

Traffic Operational Analysis on the Supporting Street System (Diversion Routes)

The CH2M team has prior experience in modeling I-235 construction traffic shifts for the Des Moines ITS Early Deployment Study. That modeling showed that traffic diverted from I-235 will increase volumes on many links of the arterial street network throughout the Des Moines metropolitan area. A 24-hour traffic assignment model was used in the ITS early deployment study to show the effects of reduced capacity on I-235. Then a GIS visual display was created to portray the paths taken by traffic diverted from I-235. The resulting map is shown below with red lines representing diverted traffic; the width of the red line indicates the estimated magnitude of diverted traffic on roadway segments.

Limitations of a 24-hour traffic assignment model precluded providing specific information on peak-hour diversion volumes. Nonetheless, the model does generally indicate where diverted traffic is most likely to flow. It can be seen that parallel routes closest to I-235 receive the brunt of the diversion; but note also that traffic is diverted to paths as far away as Hickman and Douglas. This example illustrates that traffic diverted from I-235 will appear throughout the system and, like water molecules flowing through a network of pipes, motorists will attempt to find and use the path of least resistance. The distribution of traffic shifts will change as different stages of the I-235 construction are implemented. The example challenges preconceptions that diverted traffic will appear only on a few designated routes.



Creating and implementing traffic management strategies to accommodate diverted I-235 traffic on supporting streets is going to be a continuous changing activity throughout the course of I-235 construction. It appears unlikely and unreasonable to expect that local government traffic engineering and public works staff will be able to accomplish these traffic management requirements on their own. This is simply an assessment of the workload faced by City staff and the limitations imposed in hiring additional staff. As a result, we anticipate that the consultant's relationship with the Iowa DOT will be extended to a similar relationship of the consultant acting as an extension of staff for local governments or at least in a close partnership with the appropriate staff from each community.

Our approach to traffic operations analysis and management on the supporting street system includes an additional six tasks, starting with identifying diversion routes during various stages or phases of the reconstruction and working our way down to tactical activities like designing the signing and pavement marking plans and system monitoring.

Goals

- ✓ Maintaining accessibility to all points along the corridor and particularly into and out of downtown Des Moines.
- ✓ Minimizing the impact of diversion traffic on the supporting street system with respect to noise, congestion, safety, and preserving the contextual integrity of adjacent neighborhoods.
- ✓ Providing quick and sound engineering and planning solutions to problems created by diversion to support the Iowa DOT's public involvement activities with neighborhood groups and other constituents.
- ✓ Providing safe and efficient off-system improvement recommendations and designs that accommodate dynamic conditions and meet the diversion requirements of the current construction phasing.

- ✓ Developing and promoting interjurisdictional solutions to minimize the impacts of diverted traffic.
- ✓ Incorporating appropriate technology (ITS or otherwise) that can and will be sustained by the local jurisdictions.

Assumptions

- Local governmental agencies will approach the issue of mitigating traffic diverted with a sense of urgency, with a cooperative spirit, and a willingness to achieve traffic flow efficiency and safety through investment in diversion routes.
- The Iowa DOT in partnership with local governments will be successful in promoting compromises between the interests of interest groups and the pressure to make improvements to diversion routes.
- The enforcement community will enforce modifications to traffic regulations to promote efficiency along diversion routes.

Data Needed

- Traffic counts on the supporting street system
- Traffic volumes predicted at each construction phase
- Traffic sensitivity results provided by the traffic operations models

Tools Needed

- Traffic operations models (CORSIM) of surface streets developed as part of the Core Tools
- Mobile video surveillance cameras
- GIS for recording information and presenting map data

Public Involvement

- Participation in public involvement meetings
- Interactions with an Intergovernmental Committee on traffic operations

Scope of Work

We will support the Iowa DOT and local governments when they make public involvement presentations to groups of all types. This will include the development of graphical aids (videos, animations, poster boards, and slides), making presentations and scripting presentation, developing press releases, organizing meetings and managing meeting logistics, and other support activities related to support this task.

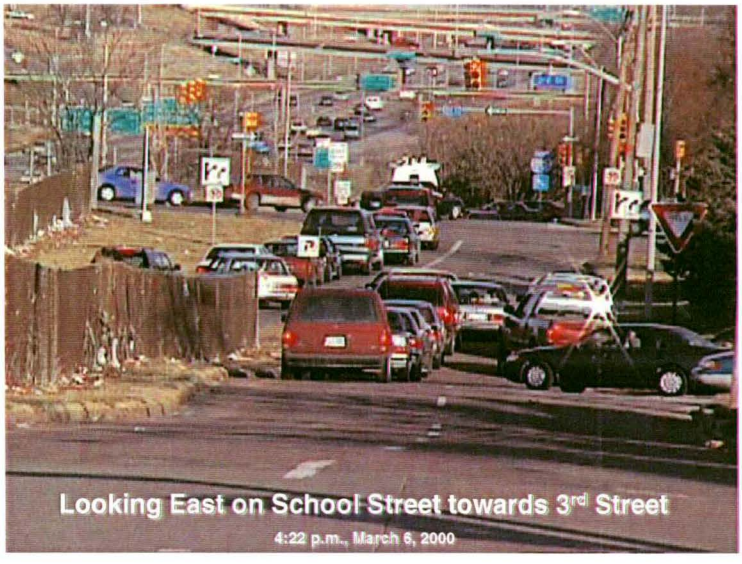
Task 1. Develop an Intergovernmental Steering Committee: The purpose of this committee will be to operate as a conduit between the consultant, Iowa DOT, and local governments. If appropriate, the existing I-235 traffic management subcommittee can be utilized for this task. The committee will largely focus on traffic management and traffic control issues that require cooperation across political boundaries. The subtasks to be included are:

- At the outset of this task, we will work with the Iowa DOT to identify the candidate members for the committee from the impacted jurisdictions. It is our desire to have a minimum of two representatives from each government; one representing public works

and one representing enforcement. As the process evolves, we may wish to interact with others through our Traveler Information/Public Involvement component to include representatives of commuters, business interests, trucking interests, neighborhood groups, etc.

- At the initial meeting of the committee and in cooperation with Iowa DOT staff, we will describe the scope of our activities for planning and managing traffic diversion routes, ask them to review our task objectives, and ask them to add, delete, or revise the list of objectives we have created.

- Our discussions with members of government in the Des Moines metropolitan area indicate that there is already a sense of urgency among the transportation professionals to start planning for traffic during I-235 construction. Therefore, we do not believe that it will be difficult to convene this committee or to adopt an aggressive schedule with frequent meetings.



Operations knowledge of supporting street network allows team to progress quickly.

Task 2. Identify Diversion Routes: In this task we will use the results of our core tools applications (TRANPLAN traffic assignment model runs and corresponding traffic operations simulation runs) with the capacity on the I-235 mainline constrained to reflect conditions during each phase of construction. We will determine the sensitivity of traffic volumes to construction activity and traffic performance conditions. As appropriate, we will perform selected link analyses to determine origin-destination patterns and the character of trips using certain routes and facilities; and we will use this information to help mitigate adverse traffic diversion impacts.

Special attention will be paid to locally sensitive facilities and locations such as schools, parks, hospital zones, fire houses and other special land uses. Diversion routes need to be identified to both serve traffic needs as well as to protect neighborhoods and specific local land uses from undue traffic intrusion.

Findings from this analysis process will be summarized on GIS maps showing expected changes in traffic flows for the various construction phase scenarios. We will use the data and GIS maps with the intergovernmental steering committee to define traffic management plans and mitigation actions for the diversion routes. Although traffic will naturally seek the quickest path around the construction regardless of whether a route is designated as a diversion route, we believe that it will be possible to exert traffic control strategies to

channel traffic along acceptable diversion routes. Guide signage, signalization control, provisions and prohibitions for turns, markings, channelization, and enforcement actions are some of the tools than can be invoked along the designated diversion routes as well as to mitigate traffic intrusion on undesirable routes. Using the traffic analysis reference data, GIS maps of diversion traffic volumes on the supporting street system, and corollary traffic management principles, we will seek agreement on which routes should be identified as diversion routes.

Task 3. **System Wide Improvements and Recommendations:** The results of the prior tasks will determine the location, extent and character of the critical issues regarding diversion traffic. We believe that the greater the impacts of diversion traffic on supporting streets, the greater the motivation will become to promote systematic improvements across jurisdictional boundaries.

- Using the interjurisdictional government steering committee, we will identify improvements for diversion routes that cross political boundaries. Some of the more likely issues to be identified are signal coordination, street lighting illumination standards, signage and markings uniformity, and signage of diversion routes. Through the representatives on the committee, we will seek interjurisdictional agreement on actions to deal with problems that impede efficient traffic flow and traffic safety along diversion routes. Our objective will be to obtain an intergovernmental memorandum of understanding on actions to improve the performance of traffic flow along diversion routes.

- If requested, we will conduct traffic planning and engineering studies and designs to support the implementation of interjurisdictional improvements. This may include such tasks as signal retiming and implementation of new signal timings and phasing. We know that due to new ITS technology currently available, it is possible to coordinate signal timings across the City of Des Moines' 170 based controllers and the suburban NEMA controllers, thus allowing interjurisdictional coordination between heretofore incompatible systems.

Task 4. **Develop a detailed diversion route inventory:** Along the identified diversion routes, we will identify roadside feature, traffic control devices, geometric features, and sensitive land-uses. This data will be assimilated in our GIS database system and mapping coverage. The specific activities will involve:

- Identify the data elements to be collected along routes through discussions with local traffic engineering personnel and enforcement officials. Some of the elements that we have initially considered include signs, markings, parking, off-street parking access, lighting, pedestrian crossings, trails and walkways, school zones and sites signal locations, bus routings and loading/unloading zones.

- Manually collect the data and geo-code the information into the GIS coverage.

- Obtain a video inventory conducted by the Iowa DOT of diversion route.

- Establish a TMC workstation with software capable of playing back the diversion route video inventories.

Task 5. Spot Improvements: Spot improvements may be needed for reasons of traffic operations and traffic safety. Higher traffic volumes on diversion routes are likely to necessitate changes in the operation of these facilities. This subtask will include the following activities:

- Investigate locations where the corridor traffic operations models (e.g., CORSIM) indicate there will be significant congestion and delay. Investigate potential alternatives for improvements. Improvements may include changing signal timing or phasing, or cycle lengths, creation of one-way street pairs, use of contra-flow lanes, restrictions on turning movements, etc. These will be modeled and evaluated, and recommendations will be made to jurisdictions regarding the improvements.

- Conduct operational studies of critical intersection locations along diversion routes. As an example, allowing permissive left hand turns may no longer be safe at some arterial street locations due to heavier traffic volumes. It may also be necessary to remove parking near intersections to allow more left turn storage or to provide a right turn lane. Bus stop locations may need to be relocated to improve the bus flow and intersection operation. Based on the results of such analysis, we will make recommendations to each jurisdiction.

- Conduct corridor studies for safety of non-motorized transportation along diversion routes. This would include examining safe school routes, school bus loading and unloading areas, mid-block and corner pedestrian cross walks, locations of heavy incidences of jaywalking, and bike trails and routes. Based on the results of our analysis, we will make recommendations to jurisdictions.

- Design changes for and implementation where requested. We will also help local jurisdictions identify funding sources and apply for funding, if requested.

Task 6. Tactical and Operational Activities: During the course of reconstruction, it may be necessary to make improvements or changes as we find operational problems. Activities in this subtask will include:

- Observing traffic operation on diversion routes. Depending on the circumstance, this may involve driving the route during peak periods, surveillance using temporary video cameras (using wireless spread spectrum communication), spot speed studies, personal observation, and other traffic engineering studies.

- Recommending and requesting enforcement assistance. We will request assistance of enforcement officials in cases where there is no engineering remedy and enforcement can alleviate problems more efficiently. For example, police may need to beef-up enforcement of no parking restriction, turn prohibitions, and speed enforcement; in some cases enforcement officials may be need to direct traffic at particularly problematic locations during peak hours.

- Recommending and/or making engineering improvements to diversion routes. In some cases, it may be possible to make temporary or permanent modifications to improve traffic flow. For example, intersection operation may be improved by making minor adjustments to traffic signal timings.

- Investigate and make recommendations to accommodate traffic related special events. In addition to traffic management, parking strategies, TDM initiatives, and transit services may be included in such circumstances.

Deliverables

- Development of an intergovernmental steering committee to work on interjurisdictional issues
- Identification of diversion routes and estimates of the impact of diversion traffic to those routes
- Interjurisdictional memorandum of agreement on uniformity and standards along diversion routes
- Engineering studies and designs of signal systems, geometry, and traffic control along diversion routes as requested
- Detailed diversion route inventory of roadside features, traffic control, and sensitive land uses
- Spot improvement investigations, recommendations, and designs as requested
- Field observation of diversion route operations
- Traffic management planning and execution for special events
- Modifications to the operation of diversion routes

3.5 Traffic Management Center (TMC) and Incident Management Plan

In this activity, we have linked together the development of a TMC with the development of an incident management plan. This was done for the following reasons:

1. Nationally, it has been estimated that roughly 60 percent of traffic delay and congestion is induced by incidents. In medium sized urban areas like the Des Moines metropolitan area, incidents are the cause of a higher proportion of delay, simply because reoccurring congestion is not as pervasive as it is in large urban areas. For example, the Des Moines Metropolitan ITS Strategic Planning study estimated that on the Des Moines area interstate system in 1993 incident induced delay during the peak-period totaled over 640,000 hours per year and off peak-period totaled over 325,000 hours per year. One of the primary purposes of the TMC is to reduce/manage congestion and to facilitate the efficient management of incidents.

2. A principle objective of a TMC is supporting the management of incidents through early identification of incidents, supporting the verification of incidents, managing traffic in the support of incident clearance, communications with and between responding agencies and provide responding agencies with updates on day-to-day changes that may effect their routes to the site of an emergency (e.g., a bridge closure). In many cases where a Motorist Assistance program exists to clear minor incidents, the Motor Assistance program is controlled from the TMC. This integral linkage between a TMC and incident management activities makes it inefficient and unpractical to consider either in isolation.

The scope of work described in this element covers the evaluation, development, and operation of a TMC and the development of an incident management plan. However, if at some point it was recognized that the TMC was not needed or that it was not needed past the I-235 reconstruction period, then the process described would still result in an incident management plan.

Incident Management Plan

Nationally, it is estimated that 60 percent of all delay is caused by incident induced congestion. The Des Moines Metropolitan ITS Strategic Planning study estimated that on the Des Moines area interstate highway system in 1993, the total incident induced delay during the peak-period totaled over 640,000 hours per year and in the off peak it totaled over 325,000 hours per year. Clearly

incident induced delay has only increased in the intervening years indicating the existence of significant levels of incident induced delay. The diversion of traffic off of I-235 during reconstruction and work zone related reductions in shoulder/lane widths will only exacerbate the level of delay and make incident management and emergency response more critical and more complex.

Experience with traffic operation during planned and unplanned events in Des Moines, coupled with knowledge of local street system, helps minimize event induced delay - maximizing traffic safety.

In this task, we are considering both planned and unplanned incidents. Planned incidents might involve special events (e.g., the state fair) or a planned event effecting the capacity or services on the transportation network (e.g., maintenance activities on an arterial street parallel to I-235). Unplanned incidents may involve minor events, e.g., malfunctioning vehicles and debris on the highway) and major events may range from an automobile crash to an overturned and burning gasoline tanker. Unplanned incidents may result from meteorological events (e.g., thick fog or blowing snow).

Nationally, it has been found that only 10 percent of all incidents involve property or personal injury crashes. The majority of incidents are caused by other factors and can mostly be cleared by motorist assistance services. Therefore, we are pleased that the Iowa DOT is planning to deploy a motor assistance program in the Des Moines metropolitan area. This will be a highly beneficial asset for reducing congestion during the I-235 reconstruction and beyond.

Goals

- ✓ Facilitate the most efficient use of the transportation system during unplanned and planned events/incidents.
- ✓ Develop an incident management plan for planned and unplanned events for the freeway system and parallel arterials.
- ✓ Develop a plan for the management of the incidents in the I-235 corridor during various phases of reconstruction.
- ✓ Develop a plan to mitigate any disruption to emergency vehicle routes or emergency services due to I-235 reconstruction activities.
- ✓ Integrate ITS services and the Iowa DOT's (planned) motor assistance program into existing and traditional incident response and management programs.

Assumptions

- The availability of Cy Quick and other members of the Des Moines Area Freeway Incident Management Committee as a steering committee to support the development of an incident plan.
- The availability of a sketch level CORSIM model (or similar model) of the metropolitan area for peak period analysis of the impacts of restricting flow on links in the network due to incidents.

- The availability of a Traffic Management Center (TMC) to assist in the identification and verification of incidents and to coordinate incident response and provide communication links between and among first responders.
- The Iowa DOT will establish its Motor Assistance Program in advance of the I-235 reconstruction.

Scope of work

An activity we propose that will support all the subtasks described below is the production of a quarterly newsletter (we will judge later whether quarterly is the appropriate frequency). The newsletter will describe the progress of the I-235 reconstruction over the next quarter and describe any activities that can be expected to disrupt traffic, accommodations for diversion routing, and accommodations made to manage traffic. All articles will include map illustrations. Also included will be articles on the management of traffic in the prior quarter, ITS and non-ITS traffic management improvements, and the adoption of improved incident management processes. The newsletter will provide stakeholders with knowledge of what they can expect in the way of disruption of services and at the same time with the confidence that actions are being taken to manage traffic efficiently. This newsletter will be mailed, emailed, and posted to web site for all traffic management stakeholders.

The four incident management tasks are described below:

Task 1. Preparation of a Traditional Incident Management Plan for Des Moines Metropolitan Area: In the Des Moines metropolitan area, many different agencies are responsible for managing incidents. Each local government that flanks the freeway, the Iowa Highway Patrol, and the Iowa DOT all have incident management responsibilities and each has its own process for dealing with incidents within its jurisdiction. In 1989, to promote intergovernmental cooperation among those agencies, the Des Moines Area Freeway Incident Management Committee was formed. The purpose of the committee was to discuss and solve interjurisdictional issues, to share experiences, and to promote improved incident management practices. Although this interjurisdictional and interdisciplinary group has done much to promote intergovernmental cooperation, no formal agreements exist and there is no current, written incident management plan.

To develop an incident management plan based on existing conditions, we will do the following:

- Develop a process map for incident management in each jurisdiction. Data will be collected by interviewing each jurisdiction (including the Iowa Highway Patrol and the Iowa DOT). We expect that this will provide us with a two-way flow of information, both in regards to the jurisdiction's process and with respect to possible changes in processes resulting from the Iowa DOT's motorist assistance program, the reconstruction of I-235, and the development of a TMC. If requested, we may work directly with the Iowa DOT motorist assistance program to help them to determine their internal processes for management and operation of the motorist assistance program.
- Working with the committee, describe intergovernmental processes for dealing with incident management on the freeway, including:
  - Communications systems and interagency field communication
  - Site management processes
  - Administration over incident management cooperation
  - Legal ramifications of incident response

  - Equipment, staffing and funding available to incident management responders
  - Agreements for the sharing of resources
  - Training and certification that is available to incident responders
  - Geographical constraints on agency responses
  - Identifying administrative resources available to maintain, administer, and modify the plan
  - Identifying existing and desirable traffic diversion routes
- Document current processes in a draft report documenting the current status of incident management.
- Review the current process with the Committee to define possible improvements and changes to current practices and changes to practices that should result from new functions being introduced (e.g., the motorist assistance program and the possible TMC). Modify the draft report to include any changes made.
- Based on the draft report, define very clear processes for communication, incident identification, incident verification, incident response, and management of the incident site.
- Hold outreach programs involving all jurisdictions and emergency responders in the metropolitan area to describe the plan, gain input into the plan, and to gain buy-in from the jurisdictions and emergency responders.
- Refine the plan with respect to what information is gained at the outreach sessions and publish a final metropolitan incident management plan. Electronic copies of the documents will be provided to the members of the committee so they may update the plan in the future.
- Develop written agreements for each of the participating jurisdictions indicating their commitment to supporting the plan and providing interjurisdictional support and cooperation. Each organization's policymaking body must adopt these agreements.

Task 2. Development of a Dynamic I-235 Corridor Planned Event Management Plan: This task will focus on I-235 and on parallel facilitates that are likely to carry traffic diverted from I-235. We will also involve agencies and organizations that are not commonly involved in incident management activities (e.g., event venue managers, public works organizations, and local governmental offices that provide permits for events). This subtask will specifically focus on the agencies, organizations and events that may cause or exacerbate incidents in the I-235 corridor. Task 4 will focus on organizations that will respond and manage incidents specifically in the I-235 corridor.

The purpose for providing managers of planned events with information on the corridor construction and phasing plans is so they shall understand how their plans may be impacted by reconstruction and how the traffic they generate may impact traffic flow. The second purpose is to generate an understanding of the need to exchange information and to determine the preferred information exchange channel for each organization (e.g., telephone, FAX, email, or the Web).

Individual activities for Task 2 include:

- The first activity will be to perform outreach and partnering forums with effected groups. The purpose of the meetings will be to discuss the I-235 reconstruction program, its phasing, the implications on traffic congestion and traffic diversion and

timing issues (time of the day, day of the week and day of the year). The two principle groups we plan to meet with are public works officials in cities that contain the principle diversion routes and managers of major venues (e.g., Vet's Auditorium, Sec Taylor Stadium, the State Fair Grounds, Drake University, the Des Moines Convention Bureau, etc.). The principle theme will be to share information and to develop a shared buy-in or work together to reduce the impact on traffic due to planned events during reconstruction. On a regular basis (possibly every 6 months), additional outreach meetings will be held to inform these planned event stakeholders of current plans or changes to plans. On an as- needed basis, we will hold meetings with specific stakeholders to plan significant events. For example, a significant level of dialogue will be required for tactical plans for handling state fair traffic.

- The second activity will be to establish a channel of communication between and within these generators of planned events. Although we would prefer to work through an automated system (e.g., entering data through a GIS map over the internet), we understand that the best lines of communication may be by telephone, FAX, and the mail. We assume that it will be possible to reach an agreement with each agency regarding a protocol for information exchange.

- On a continuing basis, information will be gathered from each organization generating planned events. The data collected will include the nature of the planned event, the location, magnitude/extent of the event (traffic the event is likely to attract or level of disruption to the street system), and the event schedule. This data will be placed in a GIS map database. The map identifies the location of the event and the layers represent the time dimension of the event. For example, one layer may represent all the events that are planned to occur in March 2002 and locations may represent the street maintenance in the corridor planned for March. This map database will be shared with Iowa DOT and other officials and it will be posted to a password protected extranet site.

- On a continuing basis, we will review these planned events, contrast them with the reconstruction schedule and, in consultation with Iowa DOT and local agency staff, develop tactical plans for mitigating congestions. In some cases, the tactical plans may be quite simple (e.g., developing a message for existing Changeable Message Signs) and in some cases, the plan may be quite complex and require a great deal of coordination with local officials and the event manager (e.g., managing traffic during the State Fair).

Task 3. Planning for Emergency Services Disruptions During Reconstruction: I-235 reconstruction will cause disruption in emergency services routes and services as construction cuts through the city. To minimize the disruption to services, we will work with the local emergency services providers to inform them of reconstruction changes to the street and highway system and to help them to redesign services to minimize disruption. To do this, we will perform the following activities:

- Hold outreach and partnering forums inviting all emergency service providers to attend meetings. Through the meetings, we hope to promote a general understanding of the phasing of the project and an agreement on a communications protocol.

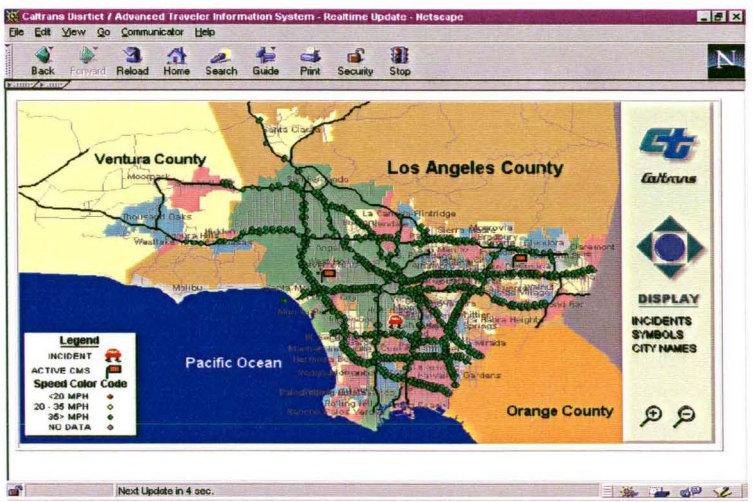
- Develop a GIS database containing locations of emergency response facilities (e.g., fire house, police stations, emergency medical vehicle staging locations, etc.), planned emergency vehicle routes, and locations of strategic facilities (e.g., schools, fuel

storage depots, the airport, etc.). The GIS database will be used to identify when activities related to I-235 reconstruction will impact emergency services.

- Review the progress of the I-235 project on a continuing basis and contrast this with the emergency services GIS database. When it appears that a conflict will arise, we will work with the emergency service provide to minimize the disruption.

Task 4. Define Incident Management Practices and a Plan During I-235 Reconstruction: This task deals with the development of incident management practices and plans along diversion routes and on the I-235 mainline. This involves focusing the effort in Task 1. Activities included in this task include:

- As specific reconstruction phasing and maintenance of traffic plans are developed and finalized, we will develop specific incident management plans for the work zone. We will also involve the construction contractors or their traffic control subcontractor and the Iowa DOT site manager. The purpose will be to develop a very specific incident management plan for the site. This will include at least the following:
  - The location where motorist assistance vehicles are to be positioned or their routes near the work zone,
  - The location of spaces off the mainline for positioning disabled vehicles,
  - Access plans into the work zone for emergency vehicles, and
  - Protocols for establishing a diversion and diversion routing.
- Meetings with effected local governmental emergency groups and motorist assistance program manager to review plans and provide feedback regarding plans.



Because we (NET) have developed an extensive library of open and non-proprietary ITS modules, the team can quickly customize systems to fit the needs of the Des Moines metropolitan area and the Iowa DOT. (Web-based traffic conditions for Los Angeles County)

Deliverables

- A Traffic/Incident Management Newsletter
- A Metropolitan Area Incident Management Plan with agreements for interjurisdictional cooperation
- A map database of planned events (both large-scale attractions and street maintenance activities)
- A process for managing traffic during planned events
- A map database of emergency routes and services along the I-235 corridor
- A process for mitigating I-235 reconstruction disruption of emergency services (nightly closures information to and from the TMC)
- A plan for mitigating incidents in the I-235 construction work zones

Traffic Management Center

The CH2M HILL team has in-depth local knowledge and extensive experience working with agencies in the successful deployment of ITS strategies. Section 4.0 provides a partial list of related ITS projects. Our team has extensive experience in the entire process from preliminary deployment studies through operations and maintenance.

The team provided for this project has over 35 years of ITS operational experience and has operated TMCs in both the public and private environment. This team has also played key roles in the deployment and operation of ITS systems during extensive reconstruction efforts. Some examples include The Northridge Earthquake Reconstruction, preparation for the Atlanta Olympics, and current Salt Lake City TMC system upgrades. Because of our experience in development and operation of TMCs, we can efficiently develop a TMC for Des Moines using concepts and modules developed elsewhere, we can operate a TMC, and train Iowa DOT staff or other local staff to operate the TMC.

Goals

- ✔ Determine the most efficient way to use ITS traffic management techniques to minimize the impacts of the I-235 reconstruction.
- ✔ Assess the latest ITS technologies and an evaluation of which elements are best suited for the local circumstance with a consideration of the affects of the I-235 reconstruction and the potential need for a Traffic Management Center following reconstruction of I-235.
- ✔ Coordination and development of TMC responsibilities and operational Policies and Procedures (including incident management).

Assumptions

- Based on our preliminary assessment of the local needs, it appears very likely that a Transportation Management Center (TMC) would provide a significant benefit to the region during reconstruction and in future years. The scope of work provided in this section assumes this need is justified during the initial assessments.
- The Iowa DOT would like to take advantage of prior ITS system developments to minimize software development costs. Our Team has an expansive library of ITS components (modules) that can be brought together to provide a cost affective, yet customized solution to your local needs.
- The Iowa DOT would like an ITS system that can be used throughout construction and beyond, and one which is open, modular and expandable as needed in the future. Our team's ITS lead (NET) has been instrumental in the push for open systems in ITS development. NET is known for their development of open and modular systems. Their systems have spurred the implementation of ATMS user groups to share costs and resources relating to ITS deployments.
- The availability of members of the Des Moines Area Freeway Incident Management Committee and the I-235 Reconstruction Incident Management Subcommittee to serve as a steering committee to support the development of an incident management process and procedures for the TMC and for incident responding agencies throughout the metropolitan area.
- The Iowa DOT Motorist Assistant program will be implemented and managed through the TMC. NET staff members have operated Motorist Assistance programs in the past, and have observed the operation of many more that operate in conjunction with ITS installations. Given NET's experience, it may be beneficial for NET to assist the Iowa DOT in the design of the services and processes used to manage the Motorist Assistance services.

- The timeliness of the initial assessment and planning is important to meet the construction schedule. The team members provided for this project have worked on tight schedule projects and system startups. Our extensive operational experience helps to ensure that our activities are focused on solving true operational needs instead of ITS theory. However, we need quick turn around from government agencies to meet the schedule.
- The successful deployment of any ITS system is highly dependent on the development of the appropriate institutional policies and procedures. The scope provided in this section assumes that we will provide assistance in this area. The successful operation of the Des Moines TMC will require efficient communications between several agencies. The most practical solution will most likely include a combination of automated and manual communications. Our experience has shown that simply providing remote systems at various agencies does not ensure that the system will be utilized as required to provide optimal benefits to the motorists. In providing assistance in this area, there is no substitute for operational experience.

Data Needs

- GIS Map Database.
- Prior traffic management and incident management plans including the plan prepared in the late 1980s, in conjunction with the freeway construction in West Des Moines.
- Minutes from the meetings of the Des Moines Area Freeway Incident Management Committee.
- Minutes from the I-235 Reconstruction Incident Management subcommittee.
- Output from Traffic Operations Studies.
- Construction phasing and schedules.
- Planned event response plans.
- Specifications for any existing ITS field assets.
- Wireline and wireless communication plans from the Iowa Communication Network, local governments, the Iowa DOT, and the location of existing conduit in the right-of-way. HRG's staff has extensive experience in and knowledge of wireline communication systems in the metropolitan area which will be quite beneficial in understanding the existing communication system.
- Metropolitan emergency response agency related policies and procedures.
- Existing communications protocols.
- Stakeholder input, review and buy in.
- Iowa DOT's statewide Integrated ITS and Service Development Plan.
- Des Moines Metropolitan Area ITS Strategic Plan.
- Plans for local government traffic control systems and traffic control centers (e.g., the City of Des Moines Traffic Operation Center currently in development).
- Capital improvement plans from cities that contain identified diversion routes.

Scope of Work

The following provides our recommended scope of services to be provided for development of a TMC system. This list of tasks represents a practical common sense approach to the implementation of a TMC system that will move the Des Moines area ITS planning efforts to implementation quickly and efficiently. The list of tasks is based on many years of experience in the development and implementation of ITS systems. As a result of our experience, we can provide the Iowa DOT with significant cost and timesaving throughout this process while assuring a quality efficient end product. Instead of starting from scratch, many of the deliverables for this section will be modifications of existing material that will be adjusted to meet the local needs. As mentioned earlier, we anticipate system software will be based on existing modules packaged to best meet your local needs. This approach allows us to provide a customized solution at a fraction of the usual cost **without** restricting Iowa DOT to a proprietary and closed system that would not easily allow for future modifications or expansion.

Work Tasks

Task 1. **Develop an Understanding of the Local Plans and Requirements and developing a draft TMC operational plan:** We will review all existing plans/studies related to ITS deployment in Iowa and/or the metropolitan area. This includes meeting with appropriate Iowa DOT and FHWA staff, reviewing existing incident management processes and procedures, meeting with municipal and county transportation professionals in the metropolitan area, and receiving input from the MPO's ITS deployment committee. Following the data and information gathering, we will draft a TMC Operational Plan. The draft plan will be circulated to the appropriate individuals for review and modified appropriately.

Task 2. **Conduct a TMC Operation Workshop:** We will hold a workshop that will involve all the local emergency response officials in the metropolitan area. Prior to the workshop, we will address and seek answers to the items listed below. During the workshop, we will present our findings on each of these issues and ask attendees to clarify them. We will review the following items:

- Communications systems and interagency field communications
- Site management processes
- Chain of command over incident management cooperation
- Legal ramifications of incident response (this was a concern we had when Rescue Bob was performing incident response in Des Moines)
- Equipment, staffing and funding available to incident management responders
- Agreements for the sharing of resources
- Training and certification that is available to incident responders
- Geographical constraints on agency responses
- Administrative resources available to maintain, administer, and modify the plan
- Identifying existing and desirable traffic diversion routes

We will also present the draft TMC operations plan at the workshop and ask for input.

Task 3. **Draft final TMC Operational Plan:** With the input from the workshop, we will revise and add the materials covered in the workshop to the draft Operational Plan, including the incident response information. The final TMC Operation Plan will be printed and disturbed.

Task 4. **Traffic Operations Workshop:** The purpose of this workshop is to facilitate the development of ITS traffic management strategies. In addition, the outcome of the workshop will identify how ITS technology may be incorporated in incident response to re-engineering existing processes. The focus of this workshop is providing a coordinated traffic management response with respect to traffic signal operations, changeable message signs (CMS), highway advisory radio (HAR), advanced traveler information system (ATIS), ramp metering, advance public transportation systems (APTS), etc. Invited to the workshop will be all local agencies that manage transportation facilities and services. The workshop will focus on the operation of ITS elements. The following is a list of elements to consider:

- Incident detection issues
- Reoccurring congestion strategies
- Ramp metering strategies
- Use of changeable message signs
- Use of highway advisory radio
- Use of highway advisory telephone (HAT)
- Use of Roadway Weather Information Systems (RWIS) and ice detection systems
- Freeway service patrol
- Coordinated traffic signal systems
- Interoperatability of field elements
- Traveler information systems
- Interface with information service providers (ISPs)
- Central VS distributed system consideration
- ITS system element control issues
- System security
- Incident
- Changes in incident response given the abilities of the TMC
- Incident response plan strategies
- Strategies for responding to planned events
- Capacity reductions due to street maintenance or other planned events
- Special events
- New technology (e.g., wireless options)
- Special requirements during I-235 reconstruction

The output of the Traffic Operations Workshop will support the re-engineering of incident management plans and protocols and a draft incident management plan. The workshop will also support the development of system requirements for field devices and TMC traffic management strategies. Because of the team member's prior involvement in the Des Moines Area Early Deployment Study and first hand knowledge of the communications

system in the Metropolitan area, we are very knowledgeable of issues being faced with the location of field units and we can very quickly move to make solid recommendations. We will also identify strategies for the TMC's role in diversion routes on the supporting street and traffic management on the supporting street system. It is anticipated that the TMC will help mitigate traffic congestion on the supporting street system during phases of I-235 construction.

Task 5. **Presentation of The Incident Management Plan and Final Draft:** We will ask to present the incident management plan at a normally scheduled meeting of the Des Moines Area Freeway Incident Management Committee. The plan will include GIS maps of diversion routes, flow diagrams of the processes used for identification, verification, response, and clearance of incidents or varying levels of severity. It will also identify the role of the TMC and the Motorist Assistance program in incident management.

Task 6. **Assess Data Collection and Retention Needs:** The intent of this task is to determine what information collected from ITS field assets should be shared with which agency or office, what data should be saved for how long and by whom. We will discuss this with at least the following agencies:

- Iowa DOT Engineering Division
- Iowa DOT Office of Transportation Data
- Des Moines Area MPO
- Cites
- Iowa Highway Patrol
- CTRE for educational and research purposes

Task 7. **TMC Site Analysis:** The Des Moines Area Early Des Moines Deployment Study provided evaluation of some sites for a TMC. We will conduct a more thorough investigation and make specific recommendations. Given the scale of the TMC, building a separate building is probably not warranted. Instead, the TMC is likely to be co-located with some related existing service. To research a recommendation we will:

- Review the existing and planned communication system available for use by the TMC
- Visit potential sites with existing facilities and new facilities
- Draft site analysis report
- Circulate and revise

Task 8. **Develop Field Element Implementation Phase Plan:** The purpose of this task is to develop a high level deployment plan including a deployment schedule. This plan will identify short-, mid- to long-term field element deployment plans, identifying which field elements will be installed at what time and how this will be coordinated with other construction activities. Emphasis will be placed on installing field elements that will provide the most benefit during the construction period or that can be installed during construction. Key input into the development plans will include:

- NET staff site visits
- The Des Moines ITS strategic plan
- I-235 construction phasing plans
- The traffic operations staff input and results of the Traffic Operations Workshop

- Status of the communications system in the metropolitan area
- Funding sources available

We understand that the Iowa DOT has a project underway or will soon start a project to develop a statewide communication plan. Since the communications are critical to the development of the ITS system, we will have to identify the relationship between the progress of our analysis and the statewide communication plan.

The Implementation Phasing Plan will include a detailed schedule and cost estimates for each phase. Once the Iowa DOT has made a review and comments have been received, the plan will be finalized.

Task 9. Develop Plans, Specifications, and Estimates (PS&E) for Field Devices and Communications: The actual PS&E for each field element deployment phase can be developed by the CH2M HILL team, in conjunction with the general construction plans or by a separate engineering firm. The level of effort required to complete these PS&E packages will depend on the field elements selected.

ITS field element construction can be included with existing contracts, contracted separately, or provided through the CH2M HILL team as appropriate. The plan for the design and deployment of each phase will be addressed in the Implementation Phasing Plan. The CH2M HILL team has extensive experience relating to the deployment of ITS field devices and we are prepared to provide the support as needed in accordance with the Implementation Phasing Plan.

Task 10. Draft User Requirements Document for TMC Software: The development of user requirements is intended to identify the long-term needs (10 to 15 years). The initial system will provide the functionality to satisfy a subset of these user requirements based on the output of the Software Implementation Phasing Plan. This step ensures that the initial system developed has the opportunity to increase in functionality to meet long-term, as opposed to short-term, user requirements. Developing the user requirements document will include the following steps:

- To minimize costs, we will not start from scratch. User requirements will be based on the best fit from existing system developed by NET.
- The user requirements will reflect the input gathered at the Traffic Operations Workshop and the TMC Operations Workshop.
- The draft user requirements documents will be circulated, revised, and a final draft will be prepared.

Task 11. Development of System Requirements: System requirements are based on identified User Requirements. The system requirements identify the actual functionality of the system needed to satisfy the User Requirements. This document also provides Use Case diagrams that show the relationship between functions and Traceability Matrix that provides for requirements tracking throughout the development process and for final acceptance testing.

The steps to develop the system requirements will include the following:

- Again, we will not start from scratch. System requirements will be based on the best-fit modules from existing system developed by NET.
- System requirements will be designed to reflect the user requirements.
- A draft systems requirement document will be circulated, revised, and a final draft will be prepared.

Task 12. High Level System Design: The high-level design provides the optimal system architecture based on the selected system requirements and other controlling factors such as communications and available funding.

- Again, we will not start from scratch, high level system design documents will assume the system will be based on the best fit from existing system modules developed by NET with modifications to fit the local conditions.
- The high-level system design will support the system and user requirements.
- A draft high-level system design document will be circulated, revised, and a final draft will be prepared.

Task 13. Develop Software Implementation Phasing Plan: The Implementation Phasing Plan defines what functionality the initial system will have and how future versions of the system will be phased. The Implementation Phasing Plan is intended to be a living document that will be modified as the Iowa DOT gains operational experience and develops greater requirements.

- Base functions first – high level functions to be provided in future phases.
- Focus on features with highest benefit during construction period.
- To minimize initial costs we anticipate that the first build will include selected functionality from existing NET system modules with little custom software development.
- Implementation Phasing Plan Document will be circulated for review, revised and a final draft will be prepared.

Task 14. Detailed Design: The detailed design provides the level of detail required by system programmers to ensure that everyone involved is working toward the same goal in a coordinated effort. The detailed design document is also very valuable in the future as the system is modified or upgraded.

- To the extent possible, NET will base detailed design on best fit from existing system modules developed. The closer we match existing systems the lower the initial costs will be.
- Detailed design document will be circulated and revised as needed.

Task 15. Procure TMC hardware: The CH2M HILL team will follow the Iowa DOT's standard procurement process to obtain any needed TMC equipment. We will assist in the development of any specifications or sole source justifications that may be required. Members of our team (i.e., CTRE staff and former CTRE staff) have worked with the Iowa DOT's purchasing section in the past to procure hi-tech equipment. This knowledge will help us to fast-track the procurement process. The following are examples of items that may need to be purchased:

- Computers, Switches, hubs, routers, monitors
- Office equipment
- Minimal Office Modifications
- Communications Equipment

Task 16. Implementation and custom coding for the initial build based in Implementation Phasing Plan: This task involves development of elements in the system that are unique to the Des Moines metropolitan area or unique to the Iowa DOT's requirements. This includes localizing existing software modules:

- Attaching local base map and populate the base map
- Write any new code required to interface with existing or proposed field elements
- Build in appropriate response plans based on the determined level of automation and response plans developed in tasks 1 through 5
- Development of Inter Process Communications (IPC) based on selected modules
- Coding of any custom software development requirements. We recommend limiting the custom development during the first build. This will keep the initial software development costs down and allow Iowa DOT base future needs on real operational experience.

Task 17. Initiate Change Control Board and Revision Control Policies and Procedures: Revision control policies and the implementation of a Change Control Board is an essential part of any software development. Revision control policies ensure that any changes made to the base code are tracked so any changes to the system can be easily backed out if they cause problems. The Change Control Board ensures that changes are made to the system in an orderly and structured manner based on Iowa DOT priorities. Without a Change Control Board software developers can waste a lot of time implementing code that does not help the Iowa DOT develop the system that they are looking for. The Change Control Board also ensures that software builds are developed in a structured fashion that helps minimize software development costs.

We recommend a Change Control Board that consists of an Iowa DOT ITS lead person, Joseph Brahm (NET) or Gordon Paesani (NET) and lead software engineer. The change control board will approve any changes made to the system once the first operational build has been completed.

Task 18. System Testing: System testing is performed at various times throughout the development process. For this project we recommend the following tests scenario:

- Unit level testing by software engineers as software units are developed.
- System level testing to be performed by independent test group for each major software build.
- Customer acceptance testing based on System Requirements Traceably Matrix for each major deliverable build based on Implementation Phasing Plan outline.

Task 19. TMC Operator Training: Training will be provided for users and the System Administrator. The extent and location of training will depend on who is operating the system. (See the TMC Operations task). Training will include:

- User training
  - A Users Manual will be provided to trainees.
- System Administration training
  - System Administrators Reference Guide will be included as part of the training module.

Task 20. Maintenance: We are assuming that NET will provide maintenance support throughout the construction period. Support will be provided in coordination with the TMC Operations supervisor. Maintenance activities will include:

- **Field element maintenance**. The TMC supervisor will be responsible for system troubleshooting. When field element maintenance or repairs are needed they will be contracted through a local firm. The TMC supervisor will be responsible for oversight of this work and will work closely with Iowa contracts section to assist in contract administration.
- **TMC hardware**. We anticipate that TMC hardware will be supported by NET staff throughout the construction period in coordination with the TMC supervisor. The TMC supervisor will have the skills required to perform most troubleshooting and work with remote NET staff to correct problems.
- **Ongoing software support.** We anticipate a phased building of the Des Moines TMC software based on the Implementation Phasing Plan. We expect this development to last throughout the construction period. Minor system problems will be included in future software builds. Major problems can be backed out if needed when software is modified through a Change Control Board and Revision Control Policies and Procedures.

Task 21. TMC Operations: The operating requirements of the TMC will be based on the Operational Plan. Staffing needs are highly dependent on the following items:

- Scope of work in and out of TMC. This would include responsibility for:
  - Ramp metering
  - Freeway Service Patrol dispatch
  - Maintenance crew dispatch
  - Incoming calls from public
  - Other public relations activities
  - WEB page support and response to email
  - Relations with traffic reporters
  - Coordination of planned lane closures
  - Construction, Maintenance, Permit and other local agencies
  - Coordination with Public Affairs
  - System Automation VS manual operations
  - Contract oversight for ITS field element maintenance
  - Interactions between TMC and other emergency responders
  - Level of involvement from Iowa DOT
- The need for system support contracts will depend upon system platform design elected.
- A likely operational staffing scenario could include a full time TMC supervisor and part-time staff that work primarily during peek period. We have found that college students make very good operators. We are assuming that any additional staff needed to operate the TMC will be provided through the CH2M HILL team. The TMC Operations Plan will address the division of operational responsibilities between Iowa DOT staff, other agency staff, and CH2M HILL team members.

Task 22. Future phase software upgrades: The Implementation Phasing Plan will define the software build development schedule. Future upgrades can be based on individual task

orders or grouped system builds. The CH2M HILL team is prepared to provide software development services through construction and beyond, if requested by the Iowa DOT. However, the systems developed by NET are based on open standard so the Iowa DOT will not be forced to work with CH2M HILL or NET if we do not perform to your satisfaction.

Task 23. Future phase field element deployments: We anticipate that the installation of ITS field elements will last throughout the construction period and beyond. The field element Implementation Phasing Plan will provide the initial schedule. Throughout the ITS deployment process as will be defined in the Implementation Phasing Plan We are prepared to provide full PS&E or oversight services as needed. We can also provide construction oversight for ITS elements if requested.

Deliverables

- TMC Operations Plan / Recommendation
- Incident Management Plans
- Field Element Implementation Phasing Plan
- User Requirements Document
- System Requirements Document
- Software Implementation Phasing Plan
- TMC Site Analysis Report
- High Level Design Document
- Detailed Design Document
- System Administrators Reference Guide
- Users Manual
- System Test results
- Operational TMC System including hardware and software
- System Operational Agreements
- Staffing as indicated in the TMC Operational Plan

3.6 Transit/Rideshare/Traveler Demand Management

Goals

✓ The goal of this component is, threefold: first, to avoid existing transit customer disruptions during I-235 construction then, to find niche markets to expand transit and rideshare use during construction, and, lastly, to proactively pursue viable options that maximize traveler usage of transit, rideshare and TDM alternatives to single occupant auto trips.

Assumptions

Our premises and assumptions underlying the work plan for this component include:

- We will utilize and leverage all prior studies, research, and information resources.

- Work activities for this element will be closely integrated with the Traveler Information / Public Involvement outreach efforts.
- Active endorsement and support of transit and TDM programs by employers, government agencies, and the public is critical to their success.
- Effective auto-alternatives programs are distinguished by a Champion who provides strong and focused leadership.
- The envelope of strategies to shift travelers from single-occupant autos must stretch beyond traditional concepts and strategies.
- Some will view the TDM-10 goal as very ambitious, but I-235 construction offers a window of opportunity to progress the goal. Strong leadership, business and government endorsement, continuing promotion, and imaginative initiatives will make a difference.

Data Needed

The CH2M HILL team will draw upon existing data resources and undertake work to obtain and assimilate the following data assets for this task:

- GIS mapped layout of MTA transit routes, major activity centers, major employers
- Inventory of transit route service levels, operating statistics, cost revenue relationships, fleet, and ridership boarding data
- Transit operations costing model
- Synthesis of work trip travel patterns
- Identification of key stakeholders for transit, ridesharing and TDM activities
- CH2M HILL's December, 1999 CBD Parking Study, particularly the study section addressing TDM
- MTA's December, 1999 Western Suburbs Transit Study (Park 'n Ride Study) by TransSystems Corporation in association with ETC Institute
- June, 1999 Survey of Employers about Planned Construction on I-235 West of Des Moines by ETC Institute
- June, 1999 Impact of Planned Construction on I-235 - Citizen Survey and Focus Groups by ETC Institute
- Travel models & sensitivity analysis

Public Involvement

- In collaboration with MTA, the MPO, and the Traveler Information/Pubic Involvement component, identify key community stakeholders and appropriate transit and TDM working groups.
- Meet with key associations, business groups, government agencies, neighborhood associations.
- Work with established Transit and TDM Community Working Groups.

Scope of Work

Task 1. Data Gathering and Existing Conditions Assessment: The purpose of this initial task is to assemble and synthesize available information regarding current transit services, ridesharing, TDM programs, ridership, travel patterns, employers, organizations, and travel generators in the study area. Synthesis of this information provides a benchmark for examining options and action programs.

The approach will be to leverage all available information from prior and on-going studies, research, and data resources. We will first meet with MTA, MPO, City and State representatives to begin identifying and assembling key inputs, information, and knowledge base. In the course of this effort we will identify knowledge gaps and design work activities to fill in these gaps.

The specific work tasks will include:

- Working with MTA, create an updated inventory of current transit routes, service levels, rider boarding data, route operating performance measures, fleet statistics, and financials
- Map transit routes and service descriptions into the GIS database; include major activity centers, employers (by size), trip generators
- Review MTA studies and other market research studies. Synthesize findings, data, transit ridership, ridesharing, commuter patterns, related opinion/attitude data, and recommendations from recent TDM, transit, and park 'n ride studies.
- Identify key stakeholders among business, government, citizen groups, and neighborhoods of the study area. Synthesize information for established stakeholder groups that exist or have been organized around transit issues in the past.
- Conduct a workshop with MTA (and others as appropriate), to assess and synthesize the current status, key market research findings, MTA plans and proposals in progress, outstanding issues, and avenues for funding. Formulate strategies/directions to advance the transit and TDM program.
- Summarize the task effort into a current conditions assessment and database of transit services, usage, stakeholders, and program. The data and map resources will form the foundation for sustaining transit ridership during construction and for defining and transit, ridesharing and TDM strategies and directions.

Task 2. Traveler Markets Analysis:

- Assemble and create a GIS database of composite information from multiple sources (MPO, MTA, CTRE, business surveys, etc.) to identify commute to work travel patterns, travel to selected major destinations, and existing transit rider trip patterns and purposes.
- Assemble a database of major employers by size and location, including estimates of employee/visitor mode split as available.
- Assemble socioeconomic profile data for the region and census/TAZ areas.
- Using the MPO travel model data, translate home-based work vehicle trips into auto person trips as a "potential market" for transit. Evaluate and screen the work trip

information to rank highest trip attraction concentrations and identify travel demand corridors for possible transit market penetration.

The output of this task will a commuter travel market database and associated profiles of employer and household socioeconomic characteristics by location. The data resources will form the foundation for evaluating transit and TDM expansion opportunities.

Task 3. Continuity of Transit Services during I-235 Construction: Construction phases on I-235 will restrict travel lanes and cause some traffic to shift to arterial streets. Existing transit service on I-235 and on nearby roadways could be adversely impacted. This task is to examine and propose traffic management and transit operations actions to assure continuity of transit service schedules.

When I-235 construction shifts traffic from the freeway to surface streets such as University Avenue, Ashworth Road, and Ingersoll Avenue, bus services on to those routes could be slowed. Similarly, reconstruction of interchanges and bridges across I-235, such as 35th, Street, 24th Street, 9th Street, and 6th and 7th Avenues, could affect maintenance of transit service schedules on those corridors.

This ongoing task will examine transit service continuity as part of the traffic management plan formulation on I-235 and surface streets for each phase and element of the reconstruction program. The traffic modeling and traffic operational simulation analysis output results for each stage of construction phasing will be examined for its impact on bus operations. Resulting traffic speeds will be evaluated with respect to implications for bus travel times and schedule adherence. Working closely with the MTA and local agencies, a variety of actions will be considered to optimize bus operations. These may include placing or shifting bus stop locations to minimize delay and queue blocks at intersections, traffic signal preemption, priority for bus movements, passenger loading pull-outs, parking restrictions and related measures to facilitate bus operations.

Some temporary bus re-routing may be inevitable, but such action should be minimized to avoid disruption to established transit customers. Traffic management planning for the reconstruction program will be executed so that maximum lead time is available to anticipate and review transit impacts, develop viable operating strategies, execute advance passenger notification, and create public information programs.

Task 4. Transit, Ridesharing and TDM Enhancements Evaluation: This task will address candidate strategies and implementation actions to expand transit and ridesharing usage.

This effort will use the database resources assembled in earlier tasks and will build upon the prior work by others. It will start with a systematic review of concepts and proposals that have been screened and proposed through prior studies and investigations.

We will incorporate our synthesis of positions of the business community, employers and other stakeholders from research survey evidence with respect to potential TDM, transit, park 'n ride and ridesharing proposals. The results of CH2M HILL's recent downtown parking study and TDM element will be incorporated in this work.

Additional alternatives will be defined and delineated from the research and analysis carried out in earlier tasks of this project as well as from interactions with community groups. From this initial screening effort we will specify preliminary packages of candidate strategies and enhancement alternatives. The specification will incorporate input from national best practices with various concepts and operational strategies.

We will coordinate closely with MTA throughout this process. The traveler markets database and socioeconomic profiles database from earlier tasks will be used to estimate ridership performance for a variety of strategies and service proposals. Screening evaluation of the candidate strategies and enhancement alternatives will be an interactive process.

Initial assessments of alternatives will be performed by the CH2M HILL team to provide as much quantitative information as possible. We will review findings with MTA, Iowa DOT, and others. We will interact with community stakeholders to discuss and solicit ideas and concepts for consideration, to discuss evaluation findings, and to refine those that show promise of attracting ridership to transit, ridesharing and TDM services. Successive screening and refinement cycles will be conducted and shared with partners and stakeholders to continuously evolve the most effective options.

Our screening and evaluation process will include use of sophisticated GIS tools to delineate and measure performance of the candidate strategies. We will perform transit and TDM market capture analyses of study area trip patterns to estimate expected ridership responses to candidate alternatives. We will also make use of FHWA-published TDM analysis methods as well as experience elsewhere to check results. Sensitivity analysis will be conducted to help bound the estimated ridership response.

A transit/TDM-costing model will be created to estimate cost, revenue and financial performance metrics. Results will be reviewed with Iowa DOT and the MTA. As appropriate, workshops with key employer groups, the business community, and others will be designed to gain feedback and endorsement support for recommendations and proposed actions.

Task 5. **Funding:** Funding resources will likely be one of the most important issue and/or determinants for implementing expanded transit, ridesharing and TDM options. Because funding is such a pivotal issue, the CH2M HILL team proposes to devote priority attention and effort to creative initiatives and actions to identify and obtain financial resources to support transit and TDM programs. This effort will be carried out with continuing input from the MTA, Iowa DOT, the business community and local governments. Close collaboration will be maintained with the MTA and Iowa DOT assessment of candidate funding mechanisms.

There are a variety of potential sources for funding pieces of the modal options program during I-235 reconstruction and for pursuing the Des Moines TDM-10 initiative. We will draw upon the collective knowledge, relationships, and experience of the CH2M HILL team—including CTRE's Executive Director, Michael Audino, CH2M HILL's transportation planning manager, and government relations staff—in collaboration with Iowa DOT and MTA and business leaders to identify possible sources. Periodic brainstorming and strategy sessions will be convened to develop and refine funding acquisition strategies, to report on investigations, and to review additional initiatives. Development of transit and TDM-10 funding will be an on-going activity throughout the course of the project work. Selected example funding concepts and/or strategies may include:

- MTA collaboration with the Ames Transit System and 8-County Heartland Iowa Regional Transit System (HIRTA) to pursue Federal rolling stock funds
- Investigating IOWA DOT "project funds" for public relations, advertising, and public information support activities

- MPO earmarking for transit funds in Des Moines
- CMAQ funding
- FTA or other federal "demonstration funding" to integrate transit with TDM program elements
- FHWA and FTA funds for transit elements linked to ITS traffic and transit management center(s) and traveler information services
- Pursuing "transportation and livable communities" funds for selective transit elements and mobility services
- Pursuing "welfare-to-work" funds for planning and introducing selective transit mobility access services
- Developing strategic partnership initiatives with the Des Moines Partnership and/or others
- Developing matching grant incentive programs to encourage business community, local government, and public transit, ridesharing and TDM participation
- Pursuing various state initiatives designed to assure continued economic development and successful execution of the I-235 modernization program
- Pursuing congressional earmarking for transit and TDM initiatives, including potentially the 2003 Transportation Re-authorization Act

Task 6. Evaluate longer-term TDM-10 alternatives to reduce auto use in the I-235 corridor: This task will continue prior work and begin to develop the requirements and framework for longer-term programs and actions to shift single-occupant auto users in the I-235 corridor to other options. An early work activity will be to design a monitoring process to track mode use and modal shifts during the construction program. These findings will form the basis for additional steps and analyses toward the TDM-10 goal for I-235.

A variety of further strategies toward the TDM-10 goal will be defined in this task. Preliminary specifications and course evaluations may include all or some of the following potential strategies and approaches – based on outcomes and conclusions determined in earlier analysis stages.

Potential Candidate TDM-10 Strategies and Alternatives Packages

Transportation System Management

- Freeway reliever routes
- SRA plan for urban area
- Signal coordination
- Bus signal priorities
- Parking management
- One-way streets
- Intersection improvements
- Incident detection and management system and processes
- ITS deployments and traveler information systems

Employer-Based

- Custom employee services, van pools, ridesharing, priority parking allocation
- Promotion, advertising, business community backing,
- Transit tax incentive support
- Parking priorities, subsidies, incentives
- Flex-schedules
- Telecommuting
- Direct service subsidy – bus, contract operations, other

Service Provider-Based

- Transit routes and services
- Park 'n Ride/ Pool facilities
- Contract services
- Advocate/ Champion for alternative modes & services

Government-Based

- Funding support
- Promotion, advertising, government policy and program backing
- Transit tax incentive support
- Parking priorities, subsidies, incentives
- Priority right-of-way allocation/use
- Railroad corridor use for transit services on separate ROW
- Transit infrastructure and signal priority

Deliverables

- Current transit service inventory and conditions assessment
- Traveler markets and socioeconomic profile databases
- Transit elements for freeway and arterial traffic management plans
- Analysis of transit/ TDM strategies, options and actions
- Proposed transit service adjustments to mitigate I-235 construction
- Proposed rideshare and TDM initiatives to mitigate I-235 construction
- Analysis of funding sources and strategies
- Proposed transit, rideshare and TDM initiatives to progress TDM-10 goal

SCOPE OF WORK

4.0 Project Experience

This section demonstrates the CH2M HILL's ability to provide fast-track, technically appropriate transportation solutions for Iowa DOT's I-235 reconstruction project. To meet schedule demands, the team will use its knowledge of transportation systems, processes, and issues in the metropolitan Des Moines area, its proven record in the delivery of fast track projects, and its depth of resources available to support the project. The team will rely on its vast experience in the successful execution of projects similar in scope and complexity to address technical issues and challenges. These attributes, coupled with an environment of trust and partnership, equate to the timely delivery of the I-235 reconstruction project.

Table 4-1 highlights the CH2M HILL team's experience in transportation engineering and ITS projects. Representative projects are featured, and corresponding services are noted accordingly. Detailed descriptions of projects with elements similar to Iowa DOT's I-235 effort are provided below.

TABLE 4-1 Project Experience Summary
Extensive experience with projects similar in scope ensures smooth delivery.

Project and Location	Firm	Traffic Operations Study	Incident Management Plan	Traffic Management Center	Transit/Rideshare	Travel Demand Management Alternatives	Traveler Information Plan	Supplemental-Public Involvement
U.S. 18 Mason City Bypass, Iowa	CH2M HILL	●	●			●	●	●
I-80, I-35, and I-235 Freeway Corridor Study, Polk County, Iowa	CH2M HILL	●				●		●
U.S. 34 Ottumwa Bypass, Iowa	CH2M HILL	●					●	●
Des Moines Southwest Corridor Study, Iowa	CH2M HILL	●						●
Eddyville Bypass, Environmental Impact Statement, Iowa	CH2M HILL	●						●
Argonne Road Grade Separation, Spokane County, Washington	CH2M HILL	●	●			●	●	●
I-15 Rose Road Highway Crossing, Idaho	CH2M HILL	●						●
I-70/I-75 Interchange, Montgomery County, Ohio	CH2M HILL	●	●				●	●
I-74 Corridor Study, IDOT, District 4, Illinois	CH2M HILL	●						●
SR 18 SE 312th Way to SE 304th St., Washington	CH2M HILL	●	●			●	●	●
U.S. 30/U.S. 67 Improvements, Clinton, Iowa	CH2M HILL/HRG	●						●
I-29 Gateway Interchange Reconstruction, Iowa	CH2M HILL/HRG	●						●
60th St. Corridor Improvements, West Des Moines, Iowa	HRG	●					●	●
86th St. Corridor Study, Johnson, Iowa	HRG	●	●					●

Project and Location	Firm	Traffic Operations Study	Incident Management Plan	Traffic Management Center	Transit/Rideshare	Travel Demand Management Alternatives	Traveler Information Plan	Supplemental-Public Involvement
U.S. 61 Bypass Study, Muscatine, Iowa	HRG	●	●			●	●	●
I-80/IA 965 Interchange, Coralville, Iowa	HRG	●	●			●	●	●
TCS Computer and Control Room Upgrade, Illinois	NET	●	●	●		●	●	
Signal Coordination and Timing Program, Illinois	NET	●	●			●	●	
Salt Lake City ATMS, Utah	NET	●	●	●	●	●		●
St. Louis ATMS, Missouri	NET	●	●	●		●	●	
IDOT TSC Feasibility Study, Illinois	NET	●	●			●	●	
Orange County, MDI, California	NET	●	●					
Atlanta Advanced Transportation Management System, Georgia	NET	●	●			●	●	
Governor's Strategic Planning Council, Iowa	Audino							●
Des Moines Metropolitan Area Smart Transport, Iowa	Audino	●						●
Intelligent Dissemination Project Information, Iowa DOT	Audino	●	●	●				●
Des Moines Metropolitan Area Planning Organization, Iowa	Audino	●	●	●		●	●	●
Des Moines International Airport, Iowa	Audino	●	●	●	●	●	●	●
Intelligent Dissemination-Highland, Iowa	Audino	●			●		●	●
Iowa DOT "Know Your Way Around, Iowa	SA					●	●	●
The Des Moines Art Festival, Iowa	SA						●	●
Allied News Conference, Iowa	SA							●
Clear Lake, Iowa	SA						●	●
The Iowa Events Center, Iowa	SA						●	●
Improved Employment Data for Transportation Planning, Iowa	CTRE	●						
Transportation Planning and GIS, Iowa	CTRE	●	●			●	●	
Evaluation of Work Zone Speed Reduction Measures, Iowa	CTRE	●				●		
GIS/TRANPLAN Enhancement Project, Iowa	CTRE	●	●			●	●	

U.S. 18 Mason City Bypass — Iowa

The U.S. 18 Mason City Bypass project opened on December 6, 1999. On hand to commemorate the event were the Mayors of the local communities of Mason City and Clear Lake as well as the Iowa Transportation Commission Chairperson and the Director of the Iowa Department of Transportation. This opening completes a major 24 mile link in the Avenue of the Saints corridor, which will be a major transportation connection between St. Paul, Minnesota and St. Louis, Missouri. The Avenue of the Saints corridor is scheduled to be completed in 2004.

CH2M HILL began the project in 1992 with the corridor location study performed in the Chicago office and proceeded into the preliminary and final design efforts in the Milwaukee and Denver offices. The project included 24 miles of new four-lane highway, five interchanges, and over 30 bridges. Construction began in 1996, ***three years ahead of the initial schedule.***

The project was one of the first in Iowa to use the international system of units in the design process. The CH2M HILL project team worked closely with the Iowa DOT in developing and implementing metric design and detailing standards for roadway design and construction.

CH2M HILL conducted three project development phases from location study through design. The project scope involved: Phase I—Location Study and Environmental Assessment, Phase II—Preliminary Surveying and Mapping, and Phase III—Preliminary and Final Design. To accommodate local highway construction contractors, the project was separated into nine grading and four paving contracts. The construction cost of the project was more than $65 million.

Because the project was performed on an accelerated schedule, a rigorous screening process was used to eliminate undesirable alternatives during the location study phase. CH2M HILL also conducted a public and agency involvement program to keep interested parties informed and to build consensus.

I-80, I-35, and I-235 Freeway Corridor Study, Polk County — Iowa

CH2M HILL conducted a comprehensive freeway planning study of the interstate highway system serving the Des Moines metropolitan area for the Iowa DOT. More than 43 miles of freeway, including 33 service interchanges and two system interchanges, were evaluated as part of a three-phase study.

Key Features

- Urban freeway planning study for over 43 freeway miles
- Complete freeway improvement functional design

Phase I consisted of a thorough review of the existing traffic operational and capacity problems on the freeway mainline, ramps, and crossroad intersections at interchanges. CH2M HILL transportation engineers evaluated historic accident records to determine overall system safety and to identify high accident segments. They then compared the geometric features of the freeway, which was constructed in the early 1960s, to current design practice and identified deficiencies noted. The physical condition of the freeway pavement and structures was also studied.

In Phase II, CH2M HILL prepared long-range travel forecasts for the freeway and interchanges. The forecasts were translated to increased capacity requirements using Highway Capacity Manual

techniques, including basic lane, auxiliary lanes, and increased interchange capacity. Schematic sketch planning techniques were used to develop multiple design alternatives for consideration by the DOT. The alternatives reflected local land use plans and addressed the needs identified in Phase I. Interchanges to accommodate local growth patterns were proposed as part of the Phase II work.

For Phase III, CH2M HILL prepared functional geometric plans, profiles, and other supporting information for a heavily traveled 13-mile segment of I-235 serving downtown Des Moines. Detailed conceptual design plans were of sufficient detail to estimate future right-of-way requirements, determine construction costs, and highlight environmental issues for future environmental and freeway planning study. A phased program of interchange and mainline reconstruction was developed for I-235, addressing expected priorities with respect to capacity, safety and physical needs, and financial constraints. The Phase III study efforts identified a $370 million program of reconstruction for I-235.

The study provided immediate benefits to the DOT. Future right-of-way requirements were identified so that local development plans could be revised to avoid conflicts with DOT freeway needs. Plans for construction activity along the corridor were deferred and subsequently revised to be compatible with the long-range plans as provided by the study. Following completion of the corridor study, the DOT performed a comprehensive public involvement effort and environmental impact study. Local community support for reconstruction of I-235 was primarily due to the comprehensive analyses performed as part of the corridor study.

U.S. 34 Ottumwa Bypass — Iowa

Key Features

* Final planning and design, including new freeway interchanges for a new 40-kilometer freeway and expressway type highway on partial new alignment
* Comprises 10 bridges and 15 reinforced concrete box culverts crossing railroads, rivers, and highways

The Ottumwa Bypass and US 34 make up part of the connecting link for an updated high type roadway from Des Moines to the eastern Iowa border. The Iowa DOT selected CH2M HILL to conduct the surveys of cultural resources, final planning, soils design, preliminary and final design, and development of the plans, specifications, and estimate (PS&E) for a 40-kilometer segment of the proposed highway. This segment begins at US 63, north of Ottumwa, and extends east along US 34 through Agency and Batavia to Fairfield. The new roadway will be a four-lane expressway except for a segment of limited access freeway along the Ottumwa Bypass that will have four access interchanges. It may include an interchange at IA 16 and a bypass of both Agency and Batavia.

The western one-third of the highway runs through fairly hilly terrain on a new route alignment. Land east of Agency is fairly flat. Two alternative alignments were studied for the Ottumwa Bypass, and two public meetings were held to present the proposed alignment. Both meetings were attended by more than 100 citizens.

Des Moines Southwest Corridor — Iowa

CH2M HILL performed a study of alternative highway corridors extending from SW 7th Street to the city limits at SW 63rd Street. Three potential corridors were considered and evaluated in terms of traffic service, environmental effects, cost, operational safety and efficiency as well as other factors. Based on input from neighborhood and an open public meeting, a preferred alternative was selected for further development of functional plans and estimates.

Eddyville Bypass – Environmental Impact Statement — Iowa

CH2M HILL was selected by Iowa DOT to prepare a draft and final environmental impact statement (EIS) for the Eddyville Bypass project in Mahaska and Wapello Counties, Iowa. The Eddyville Bypass is part of the Des Moines to Burlington route. The draft EIS evaluated the project's impacts, particularly impacts to the state-endangered tubercled orchid and the state-threatened ornate box turtle. These species were discovered in the proposed roadway alignment late in the project development process.

To meet the Iowa DOT's project development schedule, CH2M HILL completed alternative analysis, traffic analyses, natural resource surveys, cultural resource surveys, and an economic impact study on an accelerated schedule. The draft EIS and the above-mentioned studies were completed approximately two-and-a-half months after the project kick-off meeting.

Additional work includes coordinating with the roadway designers so that they clearly understand the special nature and location of the environmental mitigation proposals.

Argonne Road Grade Separation, Spokane County — Washington

Spokane County, Washington, is built around the main east-west tracks of the Burlington Northern Railroad (BNRR). Argonne Road was a four-lane arterial crossing the railroad at-grade with two railroad tracks 200 feet apart. A state highway parallels the railroad and intersects with Argonne Road 150 feet north. A grade separated crossing of the tracks had been proposed for many years to lessen traffic congestion caused by heavy commuter use and 75 trains a day crossing the arterial.

CH2M HILL performed a corridor analysis, preliminary and final design, and services during construction for a cast-in-place post-tensioned box girder railroad bridge, reconstruction of Argonne Road as an underpass and 1,000 feet of Trent Avenue, 230 feet of soldier pile tie-back retaining walls under a restaurant, conformance to local water quality standards, infiltration basins, utility relocations, a pump station, intersection modifications, and major detour and staging plans.

The corridor analysis evaluated delay and accident costs, along with travel times associated with the BNRR crossing. Consensus workshops were organized for generating and comparing corridor alternatives and for developing staged implementation strategies for a preferred corridor option. Grade separation alternatives were also evaluated. The project was complicated by heavy automobile and train traffic volumes and complex construction staging and coordination among four affected agencies: Spokane County, BNRR, City of Millwood, and Washington DOT. Resolution of right-of-way and railroad issues involved difficult negotiations. The project included temporary shooflys for the railroad. The design accommodates a 50 percent increase in traffic to 55,000 AWDT. Construction was completed in October 1996 for $11 million ($4 million less than the original estimate) and the facility is now open to vehicle and train traffic.

Key Features

* Coordination and achieving consensus between the multi-agency and private stakeholders of the project
* Staging of construction to maintain traffic flow and commercial access

I-15 Rose Road Highway Crossing — Idaho

Flood flows from the Snake River in the spring of 1997 inundated Interstate 15 and eroded the foundation of the Rose Road grade separation bridge, just north of Blackfoot, Idaho, causing the structure to fail. In response, the Idaho Transportation Department awarded the Rose Road Grade Separation emergency reconstruction project to the CH2M HILL transportation group. This project combined our expertise in bridge design and hydraulics to develop a replacement structure. This project also repaired and modified the dike that separates I-15 and Rose Road from the Snake River. An additional but separate task is to conduct hydrology and hydraulic studies to evaluate the effectiveness of adding another span to the bridge carrying US 26 across the Snake River to increase its hydraulic capacity and minimize flooding in that area.

Key Features

* A VE study allowed stakeholders to concur on a design concept and determine the best use of FHWA emergency repair funding.

This study was a concept-level VE study, focusing on alternative design concepts to replace the washed-out Rose Road Bridge crossing in Bingham County, Idaho. City and county representatives preferred to shift the crossing to a new location along the interstate as a first step to allow the possibility of constructing a new interchange at that location in the future. Emergency Response (ER) funding from FHWA was limited only to the amount required to replace the Rose Road crossing in its former location.

After careful consideration of eight conceptual design alternatives during the VE study, and cost and schedule implications, the community representatives opted to support the reconstruction of the Rose Road crossing in its former location. This decision was made primarily because of funding constraints. Because of the VE study, project stakeholders who had diverse points of view prior to the study were able to concur and support one concept following the study; this allowed the design to proceed based upon the selected alternative.

I-70/I-75 Interchange Reconstruction, Montgomery County — Ohio

CH2M HILL prepared the Preliminary Development Phase Studies of the reconstruction of the I-70/I-75 Interchange near Dayton, Ohio. When constructed in the late 1950s, the interchange, known as the "Crossroads of America," was the first full cloverleaf interchange in Ohio. Increased traffic volume and related congestion, and a poor safety history typical of cloverleaf interchanges demonstrated a need for it to be replaced with a more modern freeway-to-freeway (system) interchange. This task was further complicated by the need to consider a nearby, congested service interchange between I-75 and Little York Road. The Ohio Department of Transportation (ODOT) selected CH2M HILL to prepare the preliminary and final development of the interchange and adjacent highway system.

Key Features

* Utilized latest computer technologies to support analysis and production of alternative plans. NETSIM and TRANSYT-7F traffic models were used.
* Functional plan geometry produced using INROADS and Microstation
* For the public hearing, used 3D computer graphics to depict the visual effects of highway and structures.

The Preliminary Development involved the study of replacement alternatives for the interchange, relocation alternatives for the existing local service interchange at Little York Road and I-75, and preliminary design of the preferred alternative. Major tasks included analysis of existing freeway and highway traffic and geometric conditions; development of a future planning framework; development of conceptual design alternatives; evaluation, testing, and screening of freeway alternatives; preparation of conceptual line, grade, and typical sections; and preparation of an Interchange Modification Study for FHWA approval.

CH2M HILL's work was reviewed and discussed with a Project Advisory Committee comprised of local officials, ODOT staff, and the Miami Valley Regional Planning Commission. CH2M HILL also prepared the environmental assessment (EA) with technical support from ODOT. CH2M HILL provided support to ODOT for the public involvement activities. For the two public meetings, CH2M HILL prepared exhibits depicting existing conditions, conceptual alternatives, and preferred solutions.

CH2M HILL utilized the latest computer technologies to support analysis and production of alternative plans. NETSIM and TRANSYT - 7F traffic models were developed at the Benchwood/Wyse Road service interchange for two alternative diamond interchange designs. The models assisted CH2M HILL in assessing the operational characteristics of the single point and a compressed diamond interchanges and ultimately selecting a preferred configuration. Computer raster images were used to develop early concept plans over aerial photography. Concept plan geometry was readily transferred to computer based topographic mapping and functional plan geometry was produced using INROADS and Microstation. For the public hearing, CH2M HILL used three dimensional computer graphics to depict the visual effects of the highway and structures. Oblique aerial photography with computer-generated overlays showed the proposed interchange from several perspectives, and 3-dimensional simulations from the drivers perspective were prepared of the final conceptual alignment along I-70 and I-75.

I-74 Corridor Study IDOT, District 4 — Illinois

Portions of I-74, one of Illinois' oldest freeways, were designed and built in the 1950s before the advent of the interstate highway system. Severe peak period traffic congestion and high accident rates characterize the through-Peoria segment of I-74. The Illinois Department of Transportation retained CH2M HILL to evaluate existing conditions, make travel forecasts, and prepare a transportation improvement program for 11 miles of I-74.

The study represents the first comprehensive, systematic look at this full freeway corridor and also addressed environmental effects of various transportation alternatives. The study included analysis of existing conditions, travel forecasts, and systematic development of geometric highway alternatives followed by preparation of functional plans, profiles, and estimates for the mainline and nine freeway interchanges.

Comprehensive, focused public agency involvement was key to the success of the project. Right-of-way was limited or unavailable. The freeway passed through a historic district, with concerns over visual, noise, and right-of-way impacts. Communities were concerned with effects of changes in access roads on existing businesses. CH2M HILL conducted more than 40 meetings with local agencies and interest groups. Public information meetings, a public hearing, and senior DOT staff executive briefings were held. Final improvements for I-74 will cost $82 million. A four-phase development plan was proposed to afford flexibility in funding the improvements and provide for traffic maintenance during conduction.

SR 18 SE 312th Way to SE 304th Street — Washington

After working with WSDOT to develop a long-term plan and prioritize projects for SR 18, CH2M HILL provided complete highway, structural, traffic, drainage, and environmental engineering design services for a segment of SR 18 near Auburn. The project improved capacity, operational safety, and access problems by upgrading 2 miles of two-lane highway to a four-lane divided highway with full access control, retaining walls, nine bridges (designed by WSDOT), improvements to an existing interchange, and the addition of a new interchange.

Work on this project involved clearing, excavation of approximately 1.2 million cubic yards of soil, dewatering, grading, asphalt paving, and stream restoration. Other major elements of work performed consisted of constructing six span bridges, numerous structures, and retaining walls. This local project included design and construction challenges such as road design and construction, excavation, drainage, grading, paving, utilities, and signalization. All work was performed with minimal impact to traffic on this heavily traveled route.

U.S. 30/U.S. 67 Improvements — Iowa

CH2M HILL and Howard R. Green Company (HRG) were retained by the City of Clinton and the Iowa DOT to design improvements to a segment of U.S. 30/U.S. 67, a primary highway through the heart of the City. Several goals were identified for the project including developing a safe and efficient roadway, enhancing the community image with streetscaping improvements, supporting existing commercial enterprises, and providing opportunities for future development along the corridor. The final design is split into two sections. Section I includes a 1.4 mile portion of the corridor from the intersection of U.S. 30 and U.S. 67 easterly to South 14th Street. Section II includes a 1.8 mile portion of the corridor from the intersection of South 14th Street easterly to South 4th Street. The design incorporates pavement widening and addition of exclusive left turning lane, bridge widening, ramp widening, signalization, and intersection improvements.

Key Features

- Coordination with Union Pacific Railroad
- Preparation of Environmental Assessment
- Public Involvement Process – 120 Property Owners

I-29 Gateway Interchange Reconstruction Project — Iowa

The Iowa Department of Transportation selected the team of HRG and CH2M HILL to complete the I-29 Gateway Interchange Reconstruction Project in Woodbury County on a "fast-track" schedule. The project consists of completing an Environmental Assessment Report, Interchange Justification Report, preliminary and final design for the roadway, signalization and multiple bridges.

Key Features

- Project demonstrates our ability to work together as a team
- Also demonstrates the teams ability to meet or exceed aggressive schedules
- Ability to work with multiple agencies.

The most challenging aspect of this project was the public and local agency coordination. The City of Sioux City, City of Sergeant Bluff, Sioux Gateway Airport, FAA, Iowa Air Guard, Woodbury County, Union Pacific Railroad, and the public are all stakeholders in this project. Each has different concerns and constituents. The team of HRG and CH2M HILL has extensive experience working together on this type of project.

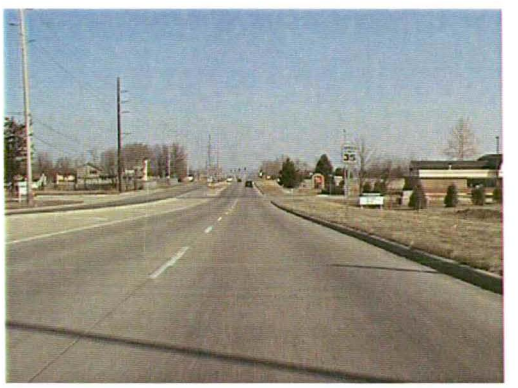
60th Street Corridor Improvements — Iowa

HRG was selected by the City of West Des Moines and Iowa DOT to complete design and resident engineering services for the completion of the I-80 and 60th Street Interchange. The construction of this project had to be completed quickly in order to maintain the I-235 construction schedules. Design of this $6 million interchange was completed in three months.

The I-80/60th Street Interchange is located just west of the I-80/I-35/I-235 mix-master in West Des Moines. Because of this close proximity, ramp weave analysis calculations were completed to justify the proposed interchange location and configuration. The design of this $6 million project was completed in 3 months. Design included two span bridges over I-80 to accommodate 5 lanes of traffic. Project involved close coordination between City of West Des Moines, Iowa DOT and the Federal Highway Administration. It also incorporated a bike/pedestrian trail design on bridge.

86th Street Corridor Study — Iowa

HRG was retained to perform this work in the City of Johnston. The scope of this Corridor Study involved developing a transportation model for the city using the Federal Highway Administration's (FHWA) microscopic CORridor SIMulation (CORSIM) model. CORSIM combines two of the most widely used traffic simulation models, NETSIM for surface streets, and FRESIM for freeways. CORSIM is distributed with the Traffic Software Integrated System (TSIS), which integrates FHWA traffic engineering tools into a single user interface. This study also reviewed the accident experience, roadway lighting and pedestrian needs of each location.

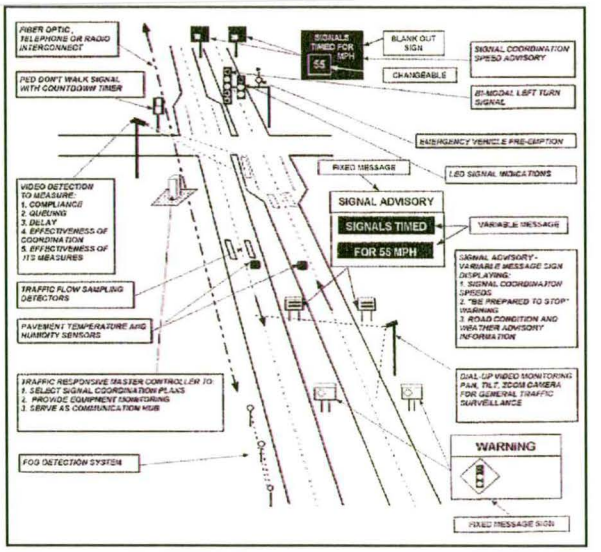


A number of models were developed for this project. These included: existing geometrics and simulated conditions under year 1999, 2005, and 2020 traffic volumes. Additional models included proposed geometrics and simulated conditions under year 2005 and 2020 traffic volumes.

U.S. 61 Bypass Study, Muscatine — Iowa

HRG teamed with SRF Consulting on this unique project for the Iowa DOT and the City of Muscatine. Existing traffic and safety problems were identified, and accident data was analyzed to identify crash types and accident patterns. Appropriate improvements that would reduce those problems were determined by comparing the two analyses and identifying correctable situations.

Existing traffic operations were analyzed using SYNCHRO and CORSIM to determine existing delays, queuing and overall performance of the corridor. Based on traffic operations and safety issues, a full range of alternatives was developed.



The proposed improvements were tested and analyzed to determine effectiveness and expected benefits. The community of Muscatine was informed through public meetings of the existing problems and they were presented with the proposed recommendations. Community feedback was considered in the final development of the recommended improvements.

Other possible Intelligent Transportation System (ITS) measures that could be used to further enhance traffic operations and provide motorist information along the corridor were also identified. These ITS measures were also analyzed to determine their likely benefits and success if used at other locations within Iowa. These ITS applications included: end of green advance warning flashers; and switching between protected-permissive and protected only left turn control.

I-80/IA 965 Interchange Reconstruction and IA 965 Widening — Iowa

In spring of 1996, General Growth Properties announced plans to construct the Coral Ridge Mall. The Mall opening was scheduled for March 1998. This new development will translate into great economic benefits for the City of Coralville. The new mall will spur additional development in the area, attract shoppers from miles away, and generate a larger tax base for the City. It will also increase traffic volumes on already heavily traveled roads.

The City of Coralville took a proactive approach to the future traffic demands and decided to construct the roadway improvements before the Coral Ridge Mall's Grand Opening. By June 1996, the City of Coralville had hired the design team lead by HRG and the roadway design development was under way.

The goals of the project were to develop a roadway design to address the future needs of the area, prepare a cost sharing model which would assess impact fees to current and future development along the project corridor, complete design quickly to reap the benefits of an early bid letting, and complete roadway construction on time, prior to the Grand Opening of Coral Ridge Mall.

The $10 million roadway project included reconstruction of the I-80 / Hwy 965 interchange, reconstruction of Hwy 965, and the widening and reconstruction of US 6. The I-80/Hwy 965

interchange was partially reconstructed to increase its capacity. Two ramps were added to complete the Partial Clover design for the interchange. Additional lanes were added at the ramp terminals to further increase capacity. Hwy 965 was completely reconstructed. Its current four-lane, rural section was replaced by a six-lane, urban section roadway. Three intersections were constructed with dual left turning lanes and traffic signals. Half of US 6 was reconstructed while the other half was widened. The reconstructed portion was a divided, four-lane roadway with left-turn lanes. This first portion also included two traffic signals. The second portion of US 6 was widened to accommodate a continuous left turn lane to the current four-lane configuration.

Other project services included: utility coordination and relocation, right-of-way design, preparation of Acquisition Plats, and traffic projections. The project was completed on time to meet the goal of a March 17, 1997 Bid Letting. The bid was well under the Engineer's Estimate. Contributing factors to the success of this project included:

- Prior to beginning the design, a project design schedule was developed showing tasks and project milestone dates. This schedule was strictly implemented.
- The Team's character, attitude, and commitment to the project were one of the main reasons for the project's success. Team members worked many long hours to ensure a quality product, submitted on schedule.
- Monthly progress meetings were held to monitor the progress of the project and to coordinate with Mall Developers. Members present at the meetings included: City Officials, IDOT Officials, Developers, and the Design Team. The progress meetings were supplemented with Weekly Progress Reports.

TSC Computer and Control Room Upgrade — Illinois

The Illinois Department of Transportation's Traffic Systems Center (TSC) has been in operation for over 35 years. The TSC currently operates 150 centerline miles of Chicago area freeways and includes over 100 ramp meters, 20 changeable message signs, 11 HAR transmitters, and 2200 loop detectors. The central computer system is over 13 years old and is fast approaching obsolescence.

In June of 1997, NET completed a study of the needs of the TSC in regards to the emerging ITS initiatives taking place in the Gary-Chicago-Milwaukee Priority Corridor and provided a high level design to upgrade the existing computer system. In January of 1997 NET was awarded a contract to continue the work of the Needs Study. This new project utilizes the user requirements, system requirements, open system profile, and high level design completed in the Needs Study to provide a detailed design and integration of the new system.

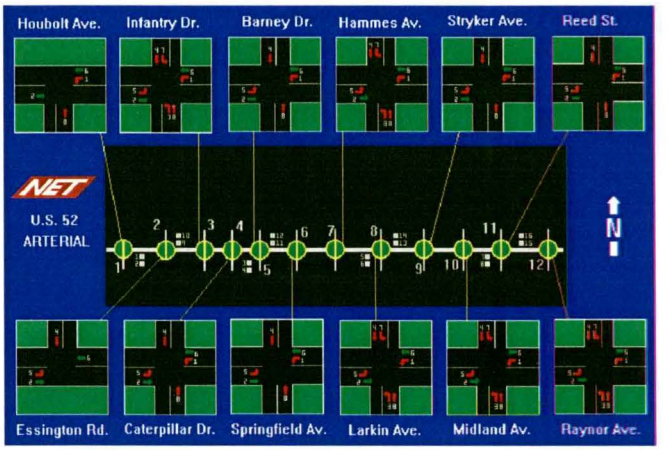
Consoles and Digital Image by Tresco Consoles

The most important goal/initiative in the design of the upgraded TSC computer system is to maximize the level of automation throughout the traffic management tasks for which the TSC is currently responsible. These include: Congestion Management (Ramp Metering and Changeable Message Signs), Incident Detection and Management, and Data Dissemination and Management.

Currently the TSC provides 18 network links over which traveler information is disseminated to various public and private agencies. Several of these network links act as outlets to media throughout the Chicago area and sections of the priority corridor. A critical requirement of the design of the Upgraded TSC Computer System is to preserve this ATIS component either through the Upgraded TSC or through a dedicated system at another IDOT Traffic Management installation.

Signal Coordination and Timing (SCAT) Program — Illinois

The Illinois Department of Transportation has maintained an on-going SCAT Program since the late 1980's. NET has been involved in 5 projects since 1989. IDOT began the program to increase the capacity of its roadways by optimizing signal timings along with signal equipment enhancements to make the best use of available roadway capacity.

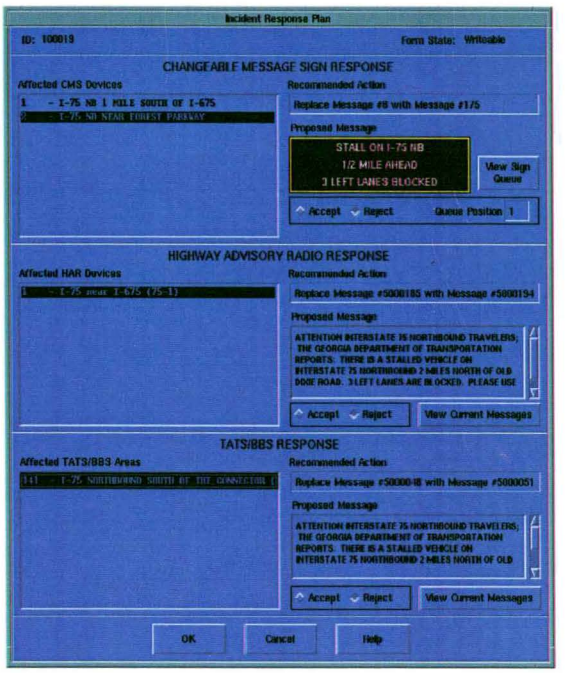


The SCAT program has been effective in optimizing hundreds of signal systems in IDOT District 1. Work elements include:

- Data collection of turning movements and automatic traffic recorder counts at every intersection assigned
- Capacity analysis of every intersection during all time periods under consideration
- Optimization analysis to develop ideal timings for all time periods under consideration
- Implementation of the optimized timings and fine tuning of the parameters to ensure proper signal operation under real world conditions
- Before and after evaluation of the signal timings to determine the benefits of the optimized timings
- Complete documentation of each system in a notebook
- Development of state-of-the-art graphics for user interface with the signal systems
- Development of traffic responsive operation to ensure that the proper timing plans are utilized in the most efficient manner possible

The benefits of the SCAT program include reduced travel times for motorists including reduced stops and delay and a reduction in the overall emission of pollutants. NET has optimized over 50 signal systems under the program.

Atlanta Advanced Transportation Management System Incident and Congestion Response Plans — Georgia



One of the major goals of the Atlanta ATMS is to utilize vehicle detection systems, cameras, cellular telephone, and other devices to detect incidents as soon as possible after they occur. Once the incident has been detected and confirmed by an ATMS operator, it is the responsibility of the operator to take the necessary steps to disseminate information to the proper authorities so that they may react in the appropriate manner. It is also necessary to provide traveler information to motorists through means such as Changeable Message Signs and Highway Advisory Radio to reduce the impact of the incident on travel conditions. Since time is an important factor in incident response, it is necessary to explore possible scenarios for incidents that may occur on the freeway system and develop plans to assist the ATMS operators in their effort to respond to these incidents.

The objective of this project was to devise response plans for incident, congestion, construction/maintenance, and special event management that will aid the ATMS operators as they select the appropriate responses to incidents. To accomplish this task, NET developed incident response plans for the portions of Interstates 75 and 85 within and one mile beyond the Interstate 285 ring and the viable diversion routes that support the specified Interstate segments. During the project NET developed a time saving methodology that also allowed for the provision of response plans for 60 miles of Interstate 20 within the project budget and time frame.

The project is complete and the final product consists of two automated systems. The first, the Incident Management Response plans and Congestion Management automated plans for accidents, roadwork, debris, and other incidents have been developed for over 200 directional freeway miles. This effort consisted of developing over 35,000 fully automated plans consisting of over 400,000 CMS, HAR, and MEDIA messages. Planning for the project included: a complete event/scenario matrix, development of message structures, definition and location of freeway segments, creation of message templates, and an exhaustive set of diversion route plans.

The Congestion Management system provides an automated set of congestion related CMS messages based upon real time traffic data. The system provides for four levels of information based upon traffic conditions downstream of each CMS.

Governor's Strategic Planning Council — Iowa

In 1999, Iowa Governor Tom Vilsack appointed a group of 37 local citizens from all corners of the state to "create a vision of what kind of place we want Iowa to be in the year 2010 and create a statewide strategic plan to move Iowa from where we are now to that vision by the year 2010." The Governor challenged the Council to not work in a vacuum, but seek assistance from citizens across the state. With input from Iowa citizens, Council Chair David Oman of Des Moines, and co-chair

Betsy Brandsgard of Davenport, are leading the Council through a process to develop a strategic plan for the state.

Michael Audino was retained by the Governor's Strategic Planning Council to lead the public involvement and outreach efforts of the process. Under Mr. Audino's leadership, the public outreach component of the 2010 process has successfully generated interest in Iowa's future and has helped capture the ideas and dreams of many citizens. Mr. Audino helped organize 15 town meetings across Iowa, helped promote the Iowa 2010 website, and helped develop and promote a 30-minute television program on the 2010 project. He has helped numerous public and private sector organizations, trade associations, and businesses involve their employees and members in the 2010 process, and he conducted Iowa 2010 public outreach presentations all across Iowa.

The results—over 2,000 citizens attended the 15 town meetings, over 10,000 are accessing the 2010 website on a monthly basis and over 1,000 have either submitted comments in writing or via the telephone. Mr. Audino also initiated a unique process that helped the Iowa2010 Council share information with youth throughout Iowa and will allow the Council to gather feedback from Iowa's youth once a draft plan is developed.

Des Moines Metropolitan Area Smart Transportation Conference — Iowa

In 1997, Michael Audino led the Iowa Department of Transportation's efforts in planning and implementing a one-day conference designed to highlight the major transportation projects and issues in central Iowa. The conference was jointly sponsored by the Iowa DOT, the Greater Des Moines Chamber of Commerce Federation (now the Des Moines Partnership), the Iowa Motor Truck Association, the Des Moines Metropolitan Area Planning Organization, and the Des Moines Metro Transit Authority. The conference brought together more than 300 business and government leaders from central Iowa to learn about and discuss major transportation policy issues. Mr. Audino was responsible for establishing the conference theme, coordinating the agenda development, and facilitating the presence of several conference speakers.

Intelligent Dissemination of Project Information — Iowa

Mr. Audino spearheaded the Iowa Department of Transportation's initiative to disseminate project and traveler information utilizing intelligent transportation systems. In an initiative to utilize Geographic Information System (GIS) mapping and the Internet to provide a display of work zone construction information, Mr. Audino led an inter-divisional team consisting of representatives of the Director's staff, project development division, and maintenance division, along with representatives from the Center for Transportation Research and Education (CTRE), This project was implemented during the 1997 construction season and covered construction projects in the Des Moines metropolitan area. As a result of Mr. Audino's leadership, motorists received timely and accurate information regarding construction delays and detours.

Des Moines Metropolitan Area Planning Organization Process Facilitation — Iowa

At the request of the Des Moines Metropolitan Area Planning Organization (MPO), Mr. Audino facilitated a series of meetings between the Iowa DOT, the Des Moines Metro Transit Authority, the Des Moines MPO, and Five Oaks Bus Company. A series of meetings were conducted over a period of six months and resulted in an agreement among all parties concerning how and where the Des Moines Metro and Five Oaks provided their respective public transit services. In addition to facilitating and leading each of the meetings, he provided periodic updates to the MPO Policy Board and conducted a final report regarding the process outcomes.

Intelligent Dissemination of Project Information — Iowa

Michael Audino served as the Iowa Department of Transportation's lead representative in the Highland Community School Partnering project. This initiative involved several representatives from the Iowa Department of Transportation, the Highland Community School District Board of education, and the Washington County Board of Supervisors. The committee was convened as a result of safety concerns expressed by residents in and around Washington County and Highland School, which is located ¼ mile east of a four lane, limited access-controlled highway.

Mr. Audino convened and led the partnering meetings. He coordinated development of the committee's final report. And he presented the committee's finding to a group of state legislators from southeast Iowa. As a result of Mr. Audino's efforts, several highway safety measures were implemented in and around Highland School and relationships between the Iowa DOT and the residents of Washington County were significantly improved.

"Know Your Way Around" 1998 Work Zone Program — Iowa

Strategic America developed a media relations and public information program to increase awareness of the location of work (construction) zones and decrease work zone accidents for Iowa DOT. The campaign included brochures, posters, and newsletters that were sent to local businesses, attractions, welcome centers, transportation companies and truck stops.

Content analysis (scientific measurement of media coverage) proved the Iowa DOT was concerned about the safety of motorists and its work zone employees. Strategic America achieved nearly $700,000 in earned media coverage for the Iowa DOT in 1998, more than tripling our excellent results from the previous year. The Iowa DOT confirms major diversion of traffic from work zones and a decrease in work zone fatalities, in work zones with some of the state's heaviest traffic.

The Des Moines Arts Festival — Iowa

Strategic America, an official sponsor of the Des Moines Arts Festival, spearheaded an integrated marketing communications campaign to build brand identity. The Des Moines Arts Festival, known as Art in the Park for 40 years, had undergone several changes, including a new name, location, moved outdoors, added different types of arts, and free admission.

To build strong recognition for the festival, Strategic America developed everything from the event logo and brochures to media kits and news conferences. They also worked closely with the festival staff in securing media partnerships with *The Des Moines Register*, the Des Moines Radio Group, and WHO-TV 13 (the local NBC affiliate) to generate a solid promotional program.

In 1998, more than 75,000 people attended the event—far exceeding the previous record of 20,000 people. Media partners covered the event extensively before, during, and after the festival. An independent research study proved the targeted media relations was a hit—77 percent of those attending learned of the event from the newspaper; 45 percent from television; and 39 percent from radio. Fine-tuning of the event, based on the market research conducted on site in year one, yielded even greater results. Des Moines Arts Festival attendance in 1999 totaled 125,000.

Allied News Conference — Iowa

Strategic America worked with Allied Insurance to unveil plans for relocation of the company's headquarters to the Gateway West District in downtown Des Moines. Strategic America contributed in every capacity of the announcement, including planning the news conference and luncheon,

developing a media kit, conducting media training for company leaders, and preparing for issues management. The firm's creative department also developed the Allied Gateway Campus logo for the letterhead, podium signs, and banners. The news conference guest and speaker list included Governor Tom Vilsack, Des Moines Mayor Preston Daniels, and a host of business and community leaders.

Strategic America's efforts resulted in two front-page stories in *The Des Moines Register*, numerous supporting stories, and a *Register* editorial applauding Allied's move. Des Moines' three TV stations and the radio stations gave the story complete coverage. Thoughtful crafting and delivery of Allied's message—continuing its strong ties with downtown and creating 400 new jobs for Iowans—led to an unarguable success in the media and community.

The Iowa Events Center — Iowa

Polk County and Des Moines Development Corporation officials are benefiting from Strategic America's counsel in regard to the proposed Iowa Events Center. From the early meetings, in which the Polk County Board of Supervisors gained feedback from facility tenants, to recent public meetings and news conferences, Strategic America has played a lead role in creating support and significant media coverage for the project. Since legislation has been introduced, Strategic America continues to work with the Iowa Events Center team and government relations staff to communicate with key audiences and lend support through media relations, collateral development, and event management.

Improved Employment Data for Transportation Planning

A major, recurring problem with modeling transportation flow is the lack of quality employment data. The Census Transportation Planning Package (CTPP) used by many transportation planners does not reflect changes in the work force quickly enough, and the scope of the decennial census is being reduced to save costs. Transportation planners must therefore develop other affordable and current data sources.

The project explored the use of primary, nonfarm employment data (generally known as ES202 data) as well as local area labor supply data and occupational labor demand projections held by the Iowa Department of Work Force Development to supplement the CTPP data. The project concentrated on systematically developing an improved employment database and using the database in selected pilot settings to improve models and predictions of transportation needs from both a commuter and business viewpoint. The project represents a proof of concept and a pilot study for what could eventually become a statewide database.

A new employment database was created for a large-multi-county region in central Iowa. When evaluated against the estimates of a metropolitan planning organization, the new database allowed for a one to four percent improvement in estimates over the traditional approach. While this does not sound highly significant, the approach using improved employment data to synthesize home-based work trip tables was particularly beneficial in improving estimated traffic on high-capacity routes. These are precisely the routes that transportation planners are most interested in modeling accurately. Therefore, the concept of using improved employment data for transportation planning was considered valuable.

Transportation Planning and GIS

Some commercially available transportation modeling programs incorporate both modeling and GIS capabilities, but many agencies continue to use stand-alone modeling packages or both GIS and modeling packages independently. The goal of this project was to develop user-friendly windows

programs capable of combining urban planning models and desktop GIS packages for a smaller urban audience; although the tools are also applicable to larger urban areas.

Four modeling environments were developed using Tranplan and four GIS packages, including Tranplan/ArcView, Tranplan/AtlasGIS, Tranplan/MapInfo, and Tranplan/Maptitude.

CTRE conducted a six-month beta test of one interface (Tranplan/MapInfo) at three Iowa MPOs and one city traffic engineering department. Overall response from the test sites was favorable. Weaknesses were addressed and the interfaces modified according to the suggestions of the beta testers. Completed versions of the four interfaces, documentation, and the final project report are available for downloading from http://www.ctre.iastate.edu/fhwa/.

Evaluation of Work Zone Speed Reduction Measures — Iowa

The Iowa DOT has made improving work zone safety a very high priority. One of the most problematic issues for improving work zone safety is controlling vehicle speeds through work zones. A number of new technologies are being marketed that are reported to control speeds and reduce variation in speeds, and some agencies are exploring low-technology strategies (e.g., enforcement, new uses of conventional traffic control devices, education) as a means to reduce speeds through work zones.

This project is exhaustively researching existing and proposed methodologies being applied to control speeds in work zones throughout the U.S. and the world in long-term, short-term, and moving work zones. The results of the research will be used as a basis for recommending a limited number of field trials and evaluations of low- and/or high-technology solutions.

This work piggybacks on work currently being conducted by CTRE on the capacity of interstate reconstruction work zones and a future project to evaluate work zone traffic control technologies as part of the Region 7 "smart work zone" technology evaluation. Together these studies should provide the investigators with a thorough understanding of the state-of-the-art and practices.

GIS/TRANPLAN Enhancement Project — Iowa

Current Iowa urban transportation planning models focus on regional 24-hour modeling and forecasting. However, studies of localized project development need estimates of traffic during periods of peak flow more than average daily traffic counts. For nearly all Iowa cities under 50,000 population, no current traffic models exist. In many of these locations, studies of the traffic impact of road and development projects must be conducted without the aid of modeling techniques. A procedure for developing travel models for smaller urban areas has already been developed which uses Tranplan and MapInfo GIS. A current project is porting this system into other desktop GIS platforms and is assessing the usefulness of the tool to state and local planning.

CTRE is working with the Iowa DOT and area Metropolitan Planning Organizations to improve the interface between Tranplan/ArcView and Tranplan/MapInfo. The team at CTRE will first develop

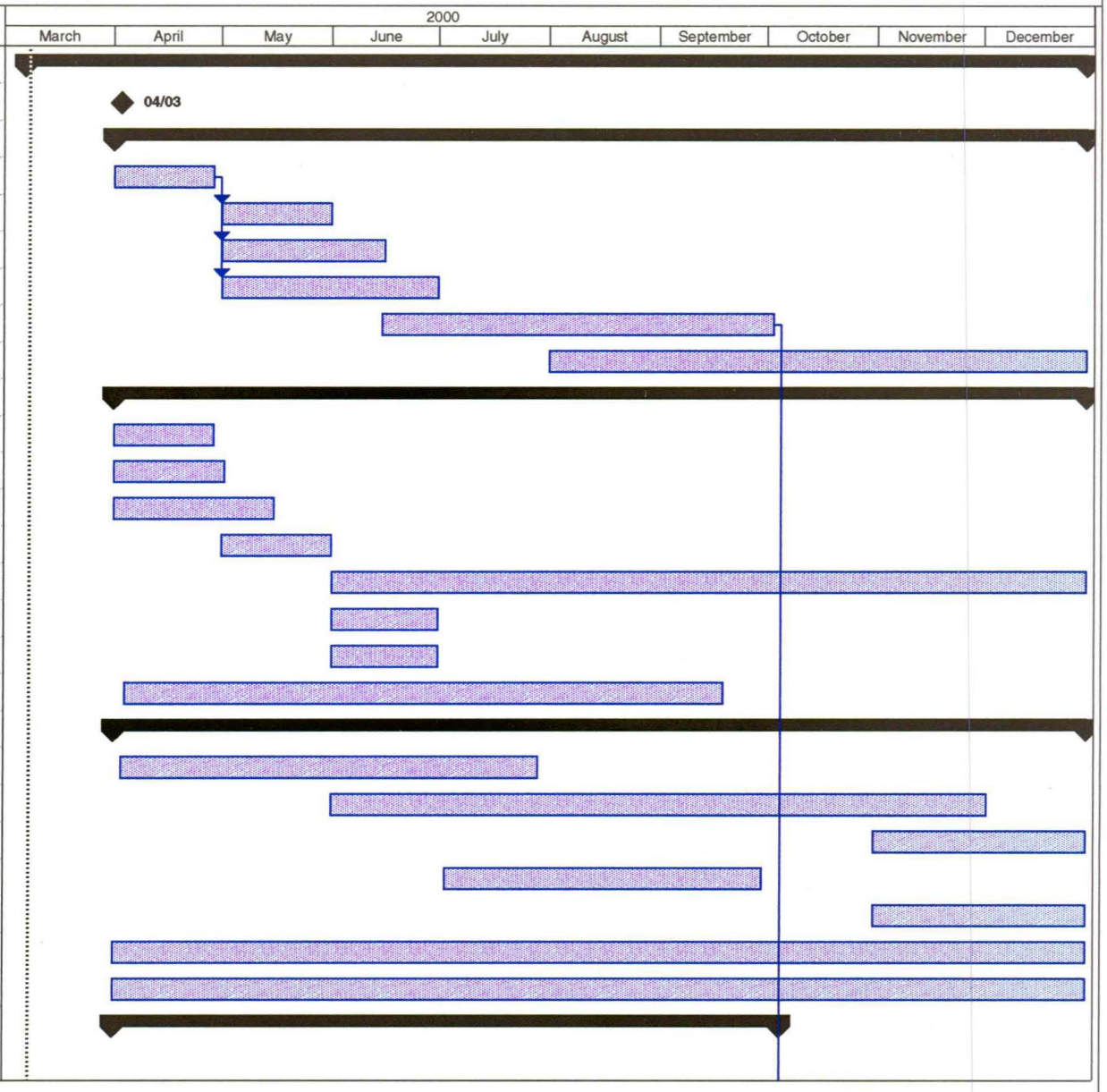
additional functionality for the ArcView interface (based on requirements specified by MPO/DOT modelers). Examples of functionality to be developed may include select link analysis, display turning movements, capability of screenlines and cutlines, and visualization/calibration plotting capability. Depending on direction provided by the project advisory committee and availability of funds, CTRE will then enhance the MapInfo/Tranplan interface programs to include some or all of these capabilities.

SCOPE OF WORK

SCHEDULE

I-235 Traffic Engineering and Intelligent Transportation System Services

ID	Task Name
1	**Project Management**
2	**Notice to Proceed**
3	**Travel Demand Model Refinement**
4	Review and Assess Current Model and Procedures
5	Validate and Improve the 1995 Base Model
6	Develop 2005 Daily Travel Forecast
7	Develop 2005 Peak Hour Travel Forecasts
8	Test 2005 Peak Hour Model on Construction Scenarios
9	Identify Further Improvements
10	**Simulation Tools**
11	Identify Tools
12	Data Gathering
13	Code Baseline Models
14	Validate/Calibrate Current Year Models
15	Develop Simulation Interface Tools
16	Develop Future Year (2005) Models
17	Validate Future Year with Agency Staff
18	**Geographic Information System**
19	**Traveler Information Plan/Public Involvement Plan**
20	Gathering the Voice of the Customer
21	Develop Strategic Relations
22	Partner with Media (will continue for construction duration)
23	Create Project Identity
24	Disseminate Information (will continue for construction duration)
25	Maximize Customer "buy-in"
26	Engaging the Citizens (will continue for construction duration)
27	**Traffic Operations Analysis**
28	Impact Analysis

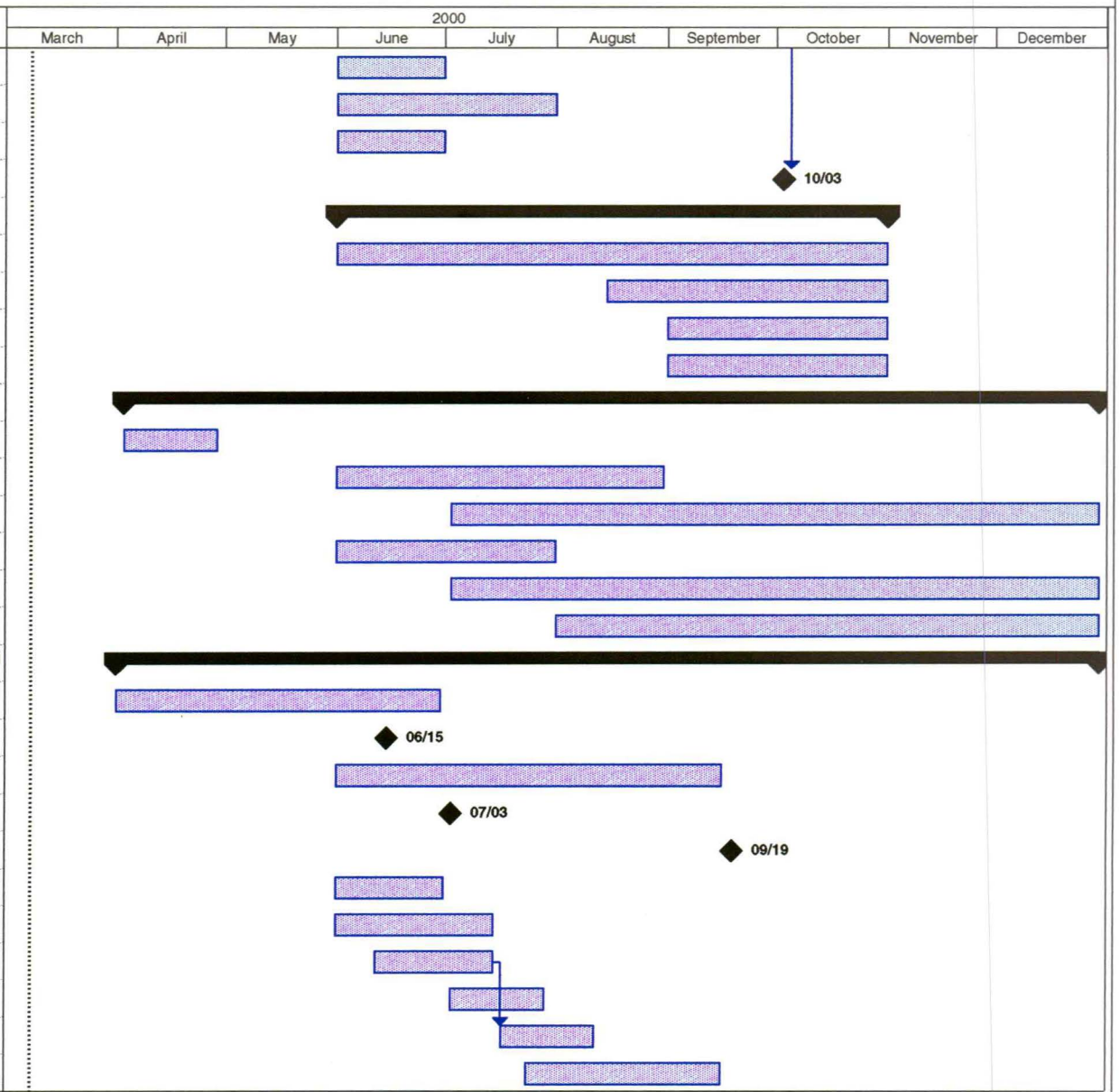


Project: I-235 Schedule
Date: Wed 03/08/00

Task
Split
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Split
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary

I-235 Traffic Engineering and Intelligent Transportation System Services

ID	Task Name
29	Value Engineering Review
30	Develop Mainline Capacity Estimates by Construction Phase
31	Estimate the Impact on Mainline Capacity Reduction
32	Review the Results with the Iowa DOT and MPO Staff
33	**Traffic Operations on the Mainline**
34	Characterize Operations and Identify Problems and Deficiencies
35	Traffic Mitigation Plan
36	Prepare Corridor Guide Signing Plan
37	Provide Input to Refine Maintenance of Traffic Plans
38	**Traffic Operational Analysis on the Supporting Street System**
39	Developing an Intergovernmental Steering Committee
40	Identify Diversion Routes
41	System Wide Improvements and Recommendations
42	Develop a detailed diversion route inventory
43	Spot Improvements
44	Tactical and Operational Activities
45	**Traffic Management Center (TMC) and Incident Management Pl**
46	Developing a draft TMC operational plan
47	Conduct a TMC Operation Workshop
48	Draft final TMC Operational Plan
49	Traffic Operations Workshop
50	Presentation of The Incident Management Plan and Final Draft
51	Assess Data Collection and Retention Needs
52	TMC Site Analysis
53	Develop User Requirements
54	Develop System Requirements
55	High Level Design
56	Develop Software Implimenation Phasing Plan



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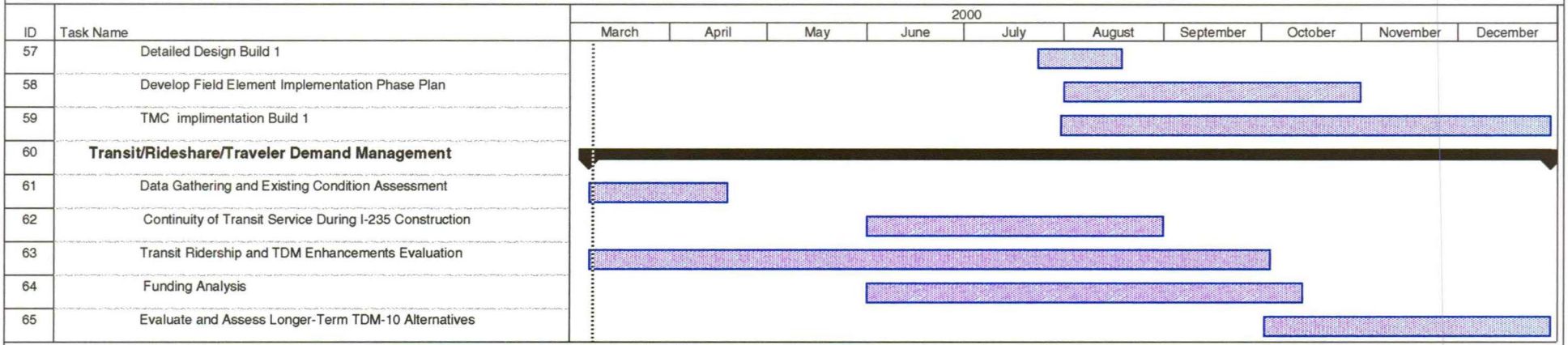
I-235 Traffic Engineering and Intelligent Transportation System Services



ID	Task Name
57	Detailed Design Build 1
58	Develop Field Element Implementation Phase Plan
59	TMC implimentation Build 1
60	**Transit/Rideshare/Traveler Demand Management**
61	Data Gathering and Existing Condition Assessment
62	Continuity of Transit Service During I-235 Construction
63	Transit Ridership and TDM Enhancements Evaluation
64	Funding Analysis
65	Evaluate and Assess Longer-Term TDM-10 Alternatives

Project: I-235 Schedule
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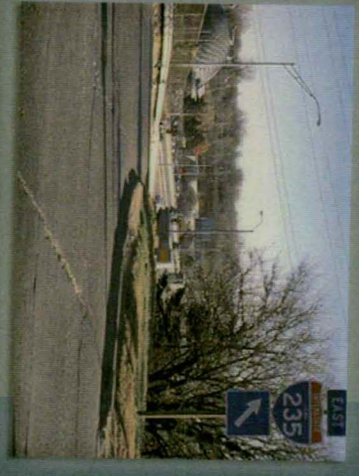

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