Kiewit

AECOM

Interstate 270

INNOVATIVE CONGESTION MANAGEMENT PROJECT

MDOT/STATE HIGHWAY ADMINISTRATION
CONTRACT NO. M O 0 6 9 5 1 7 2

STATEMENT OF QUALIFICATIONS

Table of Contents


60
60
60


60
60
60

G.2.I. DESIGN KEY STAFF

PROJECT DESIGN MANAGER - CHRISTOPHER MCGUIRE, M.B.A., PE

Chris has expertise in managing design-build and traditional design-bid-build projects involving planning, preliminary and final design contracts for SHA, MdTA, PADOT, DelDOT, VDOT, DDOT and other local agencies. His experience includes providing design, rehabilitation, cost estimating and inspection of highways, structures and traffic systems. Chris is also responsible for project management and the development of all contract documents; roadway/bridge construction plans, specifications, and estimates, which enhance mobility and safety. These responsibilities entail all highway design elements including mainline horizontal and vertical alignments, interchange design, structures, cost estimates, construction scheduling, utility coordination, SWM & E&S compliance, ITS, toll systems, MOT phasing, traffic signal analysis and design, typical section preparation, site design for facilities, noise barrier analysis/design, signing/marking for toll facilities and plazas, ROW, and construction details. He has effectively managed task orders of various size and complexity involving interstates, tolling facilities, local roadways in rural and urban settings.

Chris has 23 years of proven leadership in multidiscipline design, including 3 design-build projects.

Professional Engineer, Maryland, #29379, 1998, Virginia, #402043452, 2007, District of Columbia, #PE904684, 2007 | 23 years experience
B.S., Civil Engineering, Catholic University of America, 1993; M.B.A., Finance, Temple University, 2001

I-70 Phase 2D Stipulated Sum Design-Build | SHA | Frederick, MD | $30M

Project Design Manager. Responsible for all design disciplines and design subconsultants and for developing construction documents and contractor's conformance with design and IFB. Project was one mile of mainline I-70, the Monocacy Boulevard/South Street interchange and adjoining local roadways. The project required raising I-70 mainline profile, ramp profile adjustments, replacing existing bridges over South Street and MTA tracks. Congestion relief project goal was attained through widening to add a lane of capacity.

Relevant items of work similar to the IS 270 project:

Maryland project, design-build, Vissim analysis and simulations; design coordination; estimating; scheduling; partnering; public outreach; permitting; quality management; NEPA; ITS; ROW; electrical; stakeholder coordination; multidiscipline; MOT; MDE coordination; USACE coordination; MHT coordination; culverts; drainage; E&SC; geotechnical; H&H; intersections; lighting; asphalt/concrete paving; pavement markings; retaining walls; roadway; signing; SWM; traffic signals; utilities; wetland mitigation; as-builts; shop drawings; special provision development.

11th Street Corridor Design-Build | DDOT | Washington, DC | $260M

Design Manager. Oversaw AECOM's design-build role for stipulated sum expressway reconstruction and Anacostia River bridge replacement.

Relevant items of work similar to the IS 270 project:

Design-build, Vissim analysis and simulations; Synchro/Sim traffic; design coordination; scheduling; partnering; quality management; NEPA; ITS; electrical; multidiscipline; MOT; culverts; drainage; H&H; IAPA revisions; intersections; landscaping; asphalt/concrete paving; pavement markings; roadway; signing; SWM; traffic signals; utilities; as-builts; shop drawings; special provision development.

Nebraska Avenue Design-Build | GSA |Washington, DC | $10M

Design Task Manger. Responsible for design-build project involving significant infrastructure improvements for a new electrical power distribution system (manholes, ducts and substation vaults) for the Nebraska Avenue Complex. Worked in support of Singleton Electric Company.

Relevant items of work similar to the IS 270 project:

Design-build, Design coordination; estimating; scheduling; partnering; NEPA; electrical; MOT; culverts; drainage; E&SC; H&H; landscaping; lighting; asphalt/concrete paving; pavement markings; SWM; traffic signals; utilities; as-builts; shop drawings; special provisions development.

Planning, Preliminary, and Final Engineering Design and Construction Management Services | SHA | Statewide | $(varies per assignment)

Project Design Manager. Responsible for contract management and supervision of 23 active tasks. Performed as lead highway engineer for the US29 (South of ICC) Value Engineering study, which recommended major changes to the project. Also performed as supervisor responsible for project management and QA/QC reviews of the following tasks: District 6 ADA upgrades; Pedestrian Safety Audits; Anne Arundel County outfall stabilization; MD175 Reconstruction and widening; Grass Channel Credit (GCC) protocol and inventory, for Howard and Anne Arundel Counties.

Relevant items of work similar to the IS 270 project:

Maryland project, constructability reviews; practical design; design coordination; estimating; scheduling; value engineering; permitting; quality management; NEPA; ROW; multidiscipline; MOT; MDE coordination; USACE coordination; culverts; drainage; E&SC; H&H; intersections; landscaping; asphalt/concrete paving; pavement markings; roadway; signing; SWM; traffic signals; utilities.

CHRISTOPHER O. MCGUIRE, PE, MBA - Con't

FT-3003, I-95 Moravia Road to FMT (Section 0), Restriping to Add Capacity, Comprehensive Preliminary and Final Engineering Design Services, AE 2797-000-001/6 | MdTA | Baltimore, MD | $39M

Project Manager. Provided project management oversight of a multidiscipline team. Coordinated design reviews for milestone submittals (60%, 90% and PS&E).

Relevant items of work similar to the IS 270 project:

Maryland project, constructability reviews; practical design; design coordination; estimating; scheduling; value engineering; permitting; quality management; NEPA; ITS; adjacent construction; multidiscipline; MOT; MDE coordination; CCTV; culverts; DMS; drainage; electronic tolling; E&SC; geotechnical; H&H; landscaping; noise walls; asphalt/concrete paving; pavement markings; roadway; signing; SWM; utilities.

Comprehensive Preliminary and Final Engineering Design Services, AE 2347-000-002/6 | MdTA Baltimore, MD | $varies by project

Project Design Manager. Responsible for on-call task order contract administration for overall contract management, JV administration and subconsultant management. Served as project manager responsible for maintaining schedule and budgets for system's preservation projects including Bay Bridge Cable Dehumidification, Patapsco Flats Rehabilitation, FSK Rehabilitation, Nice Bridge Rehabilitation and supporting tasks. Management administered 45 task assignments involving multiple disciplines including: structural, highway, electrical and mechanical engineering, roadway, structures.

Relevant items of work similar to the IS 270 project:

Maryland project, design coordination; estimating; scheduling; NEPA; electrical; multidiscipline; MOT; MDE coordination; culverts; drainage; E&SC; H&H; pavement markings; roadway; signing; SWM; utilities; as-builts; shop drawings; special provision development.

I-895/I-95 Interchange (I-95 ETL Project) NB General Purpose Bridge over I-95 and Approach Roadways | MdTA | KH-1501 and 1502 | Baltimore, MD | $60M

Project Design Manager. Responsible for two construction contracts (other firms performed the I-95 portion of Segment 1): I-895 NB General Purpose Roadway connection to I-95 NB; and I-895 Managed Roadway and I-895 SB General Purpose Roadway connection to I-95 NB. The projects consist of expanding I-95 for 1.5 miles of two-lane highway, 0.7 miles of managed lane highway, and the Moravia Road Interchange. Chris' responsibilities also included coordinating installation of ITS, toll road and DMS signage.

Relevant items of work similar to the IS 270 project:

Maryland project, design coordination; estimating; scheduling; public outreach; permitting; quality management; NEPA; ITS; ROW; electrical; adjacent construction; multidiscipline; MOT; MDE coordination; USACE coordination; CCTV; culverts; DMS; drainage; electronic tolling; E&SC; H&H; intersections; landscaping; lighting; asphalt/concrete paving; pavement markings; retaining walls; roadway; signing; SWM; utilities; as-builts; shop drawings; special provision development.

HIGHWAY ENGINEER - JOHN HAYTER, PE

John has managed multiple engineering projects involving small to large scale project types including freeway and interstate design. His projects include multidiscipline designs of new roadways and the rehabilitation of existing facilities. John has and continues to successfully provide project management and highway design services on an ongoing and continuous series of task order contracts for various clients including SHA and the Eastern Federal Highway Administration (EFHWA). He is a charter and continuing member of the MdQI/SHA Partnering Subcommittee and was heavily involved in the development of the Partnering Manual and subsequent updates.

John has 38 years of roadway design experience and is a charter member of the MdQI partnering subcommittee.

Professional Engineer, Maryland, #13460, 1983, District of Columbia, #PE905269 | 38 years experience |
B.S., Civil Engineering, University of Delaware, 1978

I-695 Inner Loop over Benson/Amtrak/US1/Leeds | SHA | Baltimore County, MD | $37M

Lead Highway Engineer. Responsible for task to replace the I-695 Inner Loop Bridges over Benson Avenue and Amtrak/US 1/Leeds Avenue under Open-End contracts with SHA Office of Structures (OOS) (Design) and Office of Highway Development (OHD) (Construction). Also responsible for preliminary and final design for roadway widening, horizontal and vertical alignment (5'± grade change to provide vertical clearance).

Relevant items of work similar to the IS 270 project:

Maryland project, design coordination; estimating; partnering; public outreach; NEPA; ROW; stakeholder coordination; multidiscipline; MOT; MDE coordination; culverts; drainage; E&SC; H&H; IAPA revisions; intersections; retaining walls; roadway; SWM; shop drawings; special provision development.

I-695 @ MD 144 Interchange Improvements | SHA | Baltimore County, MD | $13.7M

Lead Highway Engineer. Responsible for preliminary/final engineering and technical design and construction phase services for this project to replace the existing MD 144 bridge over I-695 and interchange reconstruction. Due to lack of access to I-695 median drainage structures that were paved over, CCTV inspections were used to evaluate conditions and construction alternatives. This project operated under an OHD Open-End contract.

Relevant items of work similar to the IS 270 project:

Maryland project, Vissim analysis and simulations; design coordination; estimating; partnering; public outreach; permitting; NEPA; ROW; stakeholder coordination; multidiscipline; MOT; MDE coordination; USACE coordination; CCTV; culverts; drainage; E&SC; H&H; IAPA revisions; intersections; landscaping; lighting; pavement markings; retaining walls; roadway; signing; SWM; traffic signals; utilities; shop drawings; special provision development.

Replacement of I-695 Inner/Outer Loop Bridges over Milford Mill Road | SHA | Baltimore County, MD | $22.4M

Lead Highway Engineer. Responsible for the development of contract documents for the replacement of the I-695 Inner and Outer Loop bridges over Milford Mill Road. This design and construction task operated under an SHA OOS Open-End contract.

Relevant items of work similar to the IS 270 project:

Maryland project, design coordination; estimating; partnering; public outreach; permitting; NEPA; ROW; stakeholder coordination; multidiscipline; MOT; MDE coordination; drainage; E&SC; H&H; intersections; landscaping; lighting; pavement markings; retaining walls; roadway; signing; SWM; traffic signals; utilities; shop drawings; special provision development.

I-695 at MD 140 Interchange Improvements | SHA | Baltimore County, MD | $13.5M

Project Manager. Managed the replacement of the existing full-diamond interchange with a single point urban interchange (SPUI). This design and construction task operated under an SHA OOS Open-End contract.

Relevant items of work similar to the IS 270 project:

Maryland project, Vissim analysis and simulations; design coordination; estimating; partnering; public outreach; permitting; ROW; multidiscipline; MOT; MDE coordination; drainage; E&SC; H&H; IAPA revisions; intersections; landscaping; lighting; pavement markings; retaining walls; roadway; signing; SWM; traffic signals; utilities; shop drawings; special provision development.

I-695 Outer Loop Widening, MD 144 to US 40 | SHA | Baltimore County, MD | $60M

Lead Highway Engineer. Responsible for preliminary/final design for widening this 1.6 mile section of the I-695 Outer Loop under an expedited schedule. Provided turnkey management of the overall project and design services including environmental permitting; roadway widening and realignment; reconstruction of two interchanges; and structures. This design and construction task operated under an SHA OHD Open-End contract.

Relevant items of work similar to the IS 270 project:

Maryland project, Vissim analysis and simulations; design coordination; estimating; partnering; public outreach; permitting; NEPA; ROW; stakeholder coordination; multidiscipline; MOT; MDE coordination; USACE coordination; culverts; drainage; E&SC; H&H; IAPA revisions; intersections; landscaping; lighting; noise walls; pavement markings; retaining walls; roadway; signing; SWM; traffic signals; utilities; shop drawings; special provision development.

JOHN E. HAYTER, PE - Con't

US 40 at MD7/MD159 Intersection Improvements | SHA | Harford County, MD | $18M

Lead Highway Engineer. Responsible for development of horizontal and vertical alignments, intersection improvements, roadway widening, Traffic Control Plans, H&H analyses, drainage, SWM, MDE Dam Safety Division coordination, E&SC, bridge widening, support of Maryland Historical Trust coordination (including AMMR studies), right-of way, utility coordination, permitting, and preparation of Contract Documents. This Base Closure and Realignment Commission (BRAC) intersection project improved Aberdeen Proving Ground access. Design and construction performed as tasks under an SHA OHD Open-End contract. Due to funding constraints, the project was designed in two phases. Phase 1 included widening of MD 7 to provide additional turn lanes and interim improvements to US 40. Phase 2 included ultimate widening of a 1 mile section of US 40 and widening of MD 159 for SHA.

Relevant items of work similar to the IS 270 project:
Maryland project, design coordination; estimating; scheduling; public outreach; permitting; ROW; stakeholder coordination; multidiscipline; MOT; MDE coordination; MHT coordination; drainage; E&SC; H&H; intersections; landscaping; roadway; SWM; utilities; special provision development.

US 40 at MD7/MD 715 Interchange Improvements | SHA | Harford County, MD | $25M

Project Manager. Responsible for development of horizontal and vertical alignments, interchange geometry, roadway widening, Traffic Control Plans, H&H analyses, drainage, SWM, E&SC, bridge design, right-of way, utility coordination, and permitting. This BRAC-related hybrid design-build project reconfigured the US 40 at MD 715 interchange and widen MD 715 and US 40 to improve access to the main gate at Aberdeen Proving Ground. Provided design and construction phase services as tasks under an SHA OHD Open-End Contract. To expedite construction, the project was divided into two phases. Phase 1 included providing a conventional design-bid-build roadway segment to enable the contractor to have "shovels in the ground" upon notice-to-proceed. Phase 2 included providing concept plans for use by the contractor's design-build team for the remainder of the project.

Relevant items of work similar to the IS 270 project:
Maryland project, design coordination; estimating; public outreach; permitting; ROW; multidiscipline; MOT; MDE coordination; drainage; E&SC; H&H; intersections; roadway; stream restoration; SWM; shop drawings; special provision development.

Replacement of Humpback Bridge, George Washington Memorial Parkway | EFHWA | Arlington County, VA and Washington, DC | $18.5M

Project Manager. Provided design phase services under an FHWA Open-End contract for the rehabilitation of the George Washington Memorial Parkway and the replacement of the bridge over the Boundary Channel (Hump Back Bridge).

Relevant items of work similar to the IS 270 project:
Design coordination; estimating; multidiscipline; MOT; drainage; E&SC; geotechnical; H&H; intersections; landscaping; pavement markings; retaining walls; roadway; signing; special provision development.

TRAFFIC ENGINEER - TIMOTHY RYAN, Ph.D., PE, PTOE

Timothy has extensive experience in traffic analysis, ranging from capacity analyses of individual intersections using Highway Capacity Manual techniques to complex corridor analyses using computer traffic simulation and optimization models. He also is well-versed in traffic engineering design including traffic control signal design, signing design, highway lighting, pavement marking design, preparation of traffic control plans and preparation of freeway incident traffic management plans. Timothy also has extensive experience in the planning, design, construction and operation of Intelligent Transportation Systems and All-Electronic Tolling, including several major facilities in Maryland.

Tim has 35 years of traffic engineering and analysis experience, including several congestion relief projects.

Professional Engineer, Maryland, #13271, 1983; Professional Traffic Operations Engineer, Certificate No. 534 | 35 years experience
Ph.D., Transportation Engineering, University of Maryland, 1988; M.S., Transportation Engineering, University of Connecticut, 1979;
B.S., Civil Engineering, University of Connecticut, 1977

ICC Vissim Analyses | MdTA | Montgomery and Prince George's Counties, MD | $100K

Traffic Engineer. Participated in the development of the Vissim model for the 18-mile roadway network surrounding implementation of the Intercounty Connector from Metro Access Road to I-95 for the MdTA. Also responsible for development of balanced traffic volume forecasts, production of AM and PM peak-hour base conditions Vissim models, analysis of the results of the simulations (including qualitative verification), production of summary reports, project management and presentations to client.

Relevant items of work similar to the IS 270 project:
Maryland project; Vissim analysis and simulations.

I-95 Express Toll Lanes Vissim Analyses | MdTA | Baltimore, MD | $100K

Traffic Engineer. Responsible for overseeing the firm's efforts in the development of the initial Vissim model, including adjustments of volume forecasts, obtaining field data for calibration, and qualitative validation of results. Also provided identification, development and analysis of additional scenarios, including a full ramp closure scenario, future no build conditions, and a temporary early opening ramp scenario, documentation of results and presentation to client and other stakeholders. The I-95 Express Toll Lanes extend for approximately 8 miles in the median of I-95 in suburban Baltimore.

Relevant items of work similar to the IS 270 project:
Maryland project; Vissim analysis and simulations.

I-95 Express Toll Lanes Vissim Model Update | MdTA | Baltimore, MD | $35K

Traffic Engineer. Responsible for the overseeing the firm's efforts to calibrate the previously-developed Vissim model of the ETLs, now that the facility has been open for over a year. Efforts include updating geometry of MD 43 interchange and its approach roadways to reflect late design changes, and verification of model outputs using a variety of data sources, including INRIX and RITIS.

Relevant items of work similar to the IS 270 project:
Maryland project; RITIS

Intercounty Connector Design-Build | MdTA | Prince George's Counties, MD | $62M

Traffic Engineer. Participated in the ITS and ETC elements of the Intercounty Connector. ETC work included supporting MdTA in development/ refinement of open-road tolling policies, development of preliminary toll gantry designs, development of signing concepts and assistance with field deployment. Non-toll ITS work included development of conceptual plan for CCTV, DMS, detectors, roadway/weather information systems, and synchronized HAR, along with oversight of design plans to implement the conceptual plan. Project also included oversight of the ITS/ETC related construction work of multiple design-build teams working on different sections of the proposed roadway, including field verification of the operations of various ITS devices.

Relevant items of work similar to the IS 270 project:
Maryland project; design-build; ATCs; partnering; ITS; CCTV; DMS; roadway/weather systems.

I-95/Carroll Camden Access Study | MdTA | Baltimore, MD | $150K

Traffic Engineer. Responsible for development of conceptual alternatives, travel demand forecasting and traffic analyses (using Vissim) for this MdTA project. Study included the evaluation of the engineering feasibility, costs, and impacts of new or modified access to I-95 from the Carroll Camden development area in Baltimore City west of the Central Business District. The results of the study were used to prepare a draft preliminary Interstate Access Point Approval (IAPA) for consideration by the FHWA before embarking on a full-fledged NEPA study.

Relevant items of work similar to the IS 270 project:
Maryland project; estimating; NEPA; IAPA revisions.

TIMOTHY RYAN, Ph.D., PE, PTOE - Con't

Travel Forecasting Services and Traffic Engineering Analysis | SHA | Baltimore, MD | $1M

Traffic Engineer. Participated in travel forecasting, traffic analyses, and preparation of supplemental studies for transportation projects during the project planning, and the preliminary and/or final design phases of SHA's project development process. Operational analyses included a broad range of techniques, from critical lane analysis to Synchro/SimTraffic to Vissim. Assignments included BRAC studies for Aberdeen Proving Ground, Fort Meade and Andrews Air Force Bases; travel forecasting for MD198 and for MD 175; and development of a balanced traffic volume set for I-695.

Relevant items of work similar to the IS 270 project:
Maryland project; Vissim analysis and simulations; Synchro/SimTraffic

Bay Bridge Open-Road Tolling Studies | MdTA | Baltimore, MD | $40K

Traffic Engineer. Responsible for assessing the traffic engineering implications of implementing full open-road tolling at the Bay Bridge. Using a previously-developed Vissim model of the existing toll plaza, the firm analyzed peak hour queuing for no-build and build conditions for several future years. In addition, since queuing was expected to extend beyond the peak hour in several scenarios, the firm modified its previously developed spreadsheet queuing procedure for the Bay Bridge to estimate queue lengths and queue durations for multiple design years.

Relevant items of work similar to the IS 270 project:
Maryland project; Vissim analysis and simulations

I-95 Express Toll Lanes Section 100 Planning/Traffic Engineering Final Design | MdTA | Baltimore, MD | $100M

Traffic Engineer. Oversaw complex traffic analyses (using Synchro and Vissim), developed a concept of signing for all roadway approaches to the managed lanes and for development/analysis of concepts for transitioning from the ETLs back to the existing section at the northern terminus of the project. Also responsible for preparation of final signing, pavement marking and maintenance of traffic plans. Project consisted of the design of widening of several miles of I-95, including the MD 43 interchange. The purpose of the project was to construct four managed lanes, with access provided to both general purpose lanes and managed lanes at the MD 43 interchange.

Relevant items of work similar to the IS 270 project:
Maryland project; Vissim analysis and simulations; Synchro/SimTraffic; MOT; pavement markings; roadway; signing.

MD 355 Crossing (BRAC) Design-Build | Montgomery County DOT | Montgomery County, MD | $50M

Traffic Engineer. Developed the design-build procurement documents for this pedestrian underpass of MD 355 at the WMATA Metrorail Medical Center Station in Bethesda. Efforts included capacity analyses of each hour of a 24-hour weekday, for each hour of a weekend. Identification of impacts of various lane closure strategies on traffic operations, development of performance specifications/special provisions for inclusion in a Request for Proposals, extensive coordination with other disciplines, and extensive coordination with multiple stakeholders (including WMATA, National Institutes of Health and Naval Support Activity Bethesda).

Relevant items of work similar to the IS 270 project:
Maryland project; design-build; Vissim analysis and simulations; constructability reviews; stakeholder coordination; multidiscipline; special provision development.

Automated Traffic Vehicular Enforcement System (ATVES) Program Management Support | City of Baltimore | Baltimore, MD | $100K

Traffic Engineer. Supported this multi-faceted effort to provide program management for Baltimore City's speed camera and red light camera program. Responsibilities included a performance review of citations issued, refinement of field inventory guidelines, review of equipment deployments, review of field testing results, review of Standard Operating Procedures and review of Business Rules.

Relevant items of work similar to the IS 270 project:
Maryland project, Vissim analysis and simulations

ENVIRONMENTAL COMPLIANCE MANAGER - WARREN GRAY, PWS, PWD, LPF

Warren's experience includes environmental planning for major public-sector infrastructure improvement projects including NEPA documentation, transportation-related corridor studies, feasibility analyses, design-build, water quality permitting, and compensatory mitigation planning/design. He has managed projects and tasks for a variety of federal and state agencies (SHA, FRA, FTA, FHWA, VDOT, Surface Transportation Board, DoA) including NEPA document preparation (CE/CX, EA, EIS). Warren has extensive experience in wetland/stream mitigation planning/design/post-construction monitoring, watershed studies, MD Forest Conservation Act compliance, federal and state water quality permitting, permit compliance monitoring, federal and state agency coordination (USACE, EPA, USFWS, NMFS, MDNR, MDE, MHT), Chesapeake Bay Critical Area Act compliance, threatened/endangered species surveys, Section 106 consultation, Section 4(f)/6(f) evaluations, indirect and cumulative effects analyses, project air quality assessments and public involvement programs.

Warren has 27 years of experience in NEPA documentation and permit compliance monitoring on major infrastructure improvement projects in Maryland.

27 years experience | B.S., Forest Biology, University of Vermont, 1988

Intercounty Connector | SHA | Prince George's and Montgomery Counties, MD | $62M

Environmental Compliance Manager. Responsible for maintaining compliance in various wetland mitigation, stream restoration, and stormwater management retrofit projects, ESCM throughout Montgomery County as part of SHA's Environmental Stewardship and Compensatory Mitigation Program. Also prepared NEPA environmental documentation/studies, federal and state water quality permitting, Forest Stand Delineations/Forest Conservation Plans, Forest Conservation Act clearances, forest conservation easement agreements, endangered species surveys and provided coordination with MDNR/USFWS, invasive species monitoring and management, agency coordination, roadside tree permits and NEPA Environmental re-evaluations for ESCM projects. Duties also included design plan development, ROW acquisition, cost estimates, construction bid documents, milestone review coordination, permitting, contract document modifications, and contractor coordination. Projects included PB-1 Wetland Mitigation Design and Reforestation, PR-257 Stream Restoration Design, SC-19 Wetland Mitigation Design, NW-35 stormwater retrofit, NW-47 stormwater retrofit, and NW-39 stormwater retrofit. NEPA documentation and coordination with agencies and stakeholders.

Relevant items of work similar to the IS 270 project:
Maryland project; design-build; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; permitting; NEPA; ROW; E&SC; stream restoration; SWM; wetland mitigation; special provision development.

PB-1 Wetland Mitigation/Reforestation, ICC | SHA | Spencerville, MD | $2M

Environmental Compliance Manager. Responsible for coordinating the wetland/stream mitigation design, permitting, and plan development process for a 140-acre property in the Upper Right Fork of the Paint Branch as compensatory mitigation for the ICC. Project included wetland creation, stream restoration, surface water infiltration, reforestation, and invasive species removal.

Relevant items of work similar to the IS 270 project:
Maryland project; constructability reviews; permitting; reforestation; stream restoration; wetland mitigation.

SC-19 Wetland Mitigation, ICC | SHA | Damascus, MD | $2M

Environmental Compliance Manager. Responsible for coordinating the wetland/stream mitigation design, permitting, and plan development process for a 43-acre property along Great Seneca Creek as compensatory mitigation for the ICC. Project included wetland creation, stream restoration, riparian reforestation, stream bank live-staking, and invasive species removal. Coordinated design reviews (PI, Semi-Final, Final, PS&E) with agencies and MD SHA, permitting (JPA and FCA approvals), agency reviews (MDE, USACE, USFWS, and MDNR), plan development, construction bid document preparation, cost estimates, and contractor coordination in accordance with MD SHA process.

Relevant items of work similar to the IS 270 project:
Maryland project; constructability reviews; estimating; permitting; MDE coordination; stream restoration; wetland mitigation; special provision development.

PR-257 Stream Restoration, ICC | SHA | Olney, MD | $1M

Environmental Compliance Manager. Responsible for coordinating the stream restoration design, permitting, and plan development process for an unnamed tributary of Reddy Branch in the Patuxent River watershed as part of the ESCM package for the ICC. Also coordinated design review (P1, SF, Final, PS&E), contract documents, stakeholder coordination (MNCPPC), permitting, public involvement, and post-award services. Project included restoration of stream through an in-line SWM pond, enhancement of floodplain wetlands, meadow restoration, and invasive species removal.

Relevant items of work similar to the IS 270 project:
Maryland project; constructability reviews; public outreach; permitting; stakeholder coordination; stream restoration; SWM; wetland mitigation.

WARREN GRAY, PWS, PWD, LPF - Con't

NW-39 Stormwater Management Retrofit Project, ICC | SHA | Silver Spring, MD | $0.6M

Environmental Compliance Manager. Responsible for coordinating the retrofit design, permitting, and plan development process for an existing stormwater management facility in the Northwest Branch watershed. Project included extension of an existing storm drain system, creation of wetland benches, and replacement of the existing riser structure.

Relevant items of work similar to the IS 270 project:
Constructability reviews; drainage; wetland mitigation.

MD 355 Multimodal Crossing Study, Design-Build | SHA | Bethesda, MD | $50M

Environmental Compliance Manager. Performed a NEPA study to examine potential improvements to the crossing between the west and east sides of MD 355/Rockville Pike at its intersection with South Wood Road and South Drive. Also prepared a Purpose and Need Statement, data collection and inventory, travel demand forecasts, traffic analyses, developing and implementing a public involvement plan, project scoping, development of preliminary alternatives, environmental and engineering technical studies, and production of a draft and final CE.

Relevant items of work similar to the IS 270 project:
Design-build; Vissim analysis and simulations; constructability reviews; estimating; public outreach.

Woodrow Wilson Bridge Improvement Study | MdTA | Maryland/Virginia | $15M

Environmental Compliance Manager. Managed the natural resource investigations and agency coordination efforts concurrent with the preparation of the DEIS/Supplemental DEIS/FEIS, public involvement, and wetland compensation site searches. Also prepared NEPA documents, (DEIS/FEIS/ROD), and supporting technical reports, Section 404/10 permit application, permit support documentation, delineated waters of the U.S., prepared the Aquatic Resources Conceptual Mitigation Plan. Agency/stakeholder coordination, public involvement program and water quality permitting.

Relevant items of work similar to the IS 270 project:
Design-build; constructability reviews; partnering; public outreach; permitting; NEPA; stakeholder coordination.

ICC Western Operations Center | SHA | Montgomery County, MD | $3M

Environmental Manager. Reviewed NEPA re-evaluation documentation on behalf of MdTA/SHA, prepared water quality permit modification, obtained Forest Conservation Act approval, coordinated with MDNR Forest Service for a new five acre maintenance and police facility. Prepared forest stand delineation, Forest Conservation Plan, maintenance and monitoring agreement, long-term protection agreement, and obtained Forest Conservation Act approval.

Relevant items of work similar to the IS 270 project:
Maryland project; design-build; constructability reviews; partnering; permitting; NEPA; stakeholder coordination; MDE coordination; reforestation; SWM.

ICC Eastern Operations Center | SHA | Prince George's County, MD | $3M

Environmental Manager. Prepared the forest stand delineation, Forest Conservation Plan, maintenance and monitoring agreement, and long-term protection agreement for a new 25-acre maintenance and police facility. Coordinated with MdTA and MDNR during the FCA approval process.

Relevant items of work similar to the IS 270 project:
Maryland project; design-build; constructability reviews; partnering; permitting; NEPA; stakeholder coordination; MDE coordination; reforestation; SWM.

Dorsey Run Road Extension | Howard County DPW | Howard County, MD | $15M

Environmental Manager. Prepared wetland delineation and supporting documentation, Joint Permit Application, conducted field review of affected resources with MDE and the USACE Baltimore District, conducted comprehensive site search for both wetland and stream compensation sites in the Patapsco and Patuxent River watersheds, developed Phase I Mitigation Plan, and assisted MDE with coordination and documentation requirements as part of the MDSPGP-3 public hearing for extension of Dorsey Run Road from MD 175 to the Dorsey Run Industrial Center. Acquired the requisite water quality permits for project construction from MDE and the USACE under the MDSPGP-3 process.

Relevant items of work similar to the IS 270 project:
Maryland project; constructability reviews; partnering; permitting; stakeholder coordination; MDE coordination; USACE coordination; stream restoration; SWM; wetland mitigation.

ITS SPECIALIST - ERIC W. METHENY

Eric has extensive experience in traffic engineering analysis/design and in the planning/design/construction/operation/maintenance of Intelligent Transportation Systems. His experience ranges from small traffic engineering projects to major ITS deployments.

Eric has more than two decades of relevant ITS and electrical design experience, including development of the ICC ITS master plan.

25 years experience | B.S., Civil Engineering, The Pennsylvania State University, 1982

MdTA | Baltimore, MD | $100K

Acting ITS Lead Engineer. Responsible for planning, design, construction, operation and maintenance of the Authority's ITS deployments Also responsible for coordination with other divisions of the Authority, ensuring the ITS is supportive of the initiatives of those divisions and that existing/proposed ITS are not negatively impacted by those initiatives.

Relevant items of work similar to the IS 270 project:
Maryland project; constructability reviews; design coordination; ITS; multidiscipline.

ICC Design-Build, Maryland ITS Design | SHA | Prince George's and Montgomery Counties, MD | $62M

Project Engineer. Provided oversight for ITS and ETC design and construction. Responsibilities included development of concepts and specifications for design-build procurement/construction, and coordination of program objectives between the various agencies for the new ICC toll facility. Developed ITS concept plan for incorporation into design-build program. ITS and ETC elements included in the project include roadway weather information systems, highway advisory radio, dynamic message signs, Shazam motorist information signs, CCTV, toll rate signs, as well as the power and communication systems required to support the program.

Relevant items of work similar to the IS 270 project:
Maryland project; design-build; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; ITS; electrical; TMC integration; CCTV; DMS; roadway/weather systems; special provision development.

I-95 Express Toll Lanes | MdTA | Baltimore, MD | $150K

Project Engineer. Responsible for overseeing and managing ITS elements and fiber optic program during design and construction. Served as ITS construction coordinator, which involves acting as the MdTA's representative to multiple design teams and up to nine construction teams. Duties included coordinating design and construction modifications to provide a cohesive and complete ITS communication and operating system, totaling 21 CCTV, 18 DMS, 7 toll rate signs, 8 ATRs, 2 RWIS, 2 overheight detection systems, and 2 AET field facilities. Coordinated the completion of a project-wide communications system, including the deployment of a redundant fiber optic communication system, incorporating numerous Layer 2 and Layer 3 deployments, and numerous wireless and telecommunication alternatives. In addition, he assists with coordinating ITS and ETC elements between the I-95 ETL project and the Authority's ICC project design.

Relevant items of work similar to the IS 270 project:
Maryland project; constructability reviews; design coordination; estimating; partnering; ITS; electrical; TMC integration; CCTV; DMS; electronic tolling; overheight detection; RWIS; ATR's.

I-95 Express Toll Lanes Travel Time Project | MdTA | Baltimore, MD | $50K

Project Construction Coordinator. Coordinated the implementation of the travel time technology to support data collection and distribution of toll system transponder data for the purpose of clarifying travel time differential between MdTA's general purpose I-95 lanes and the recently opened I-95 Express Toll Lanes. Project involved the design, review and implementation of toll tag technologies and communications using RF communications to the owner's fiber optic network.

Relevant items of work similar to the IS 270 project:
Maryland project; ITS; electronic tolling.

District 6-0 I-95 ITS Design | Pennsylvania Department of Transportation | Philadelphia, PA | $50M

Project Coordinator. Coordinated the installation of ITS field devices in the vicinity of I-95 in Philadelphia for use during construction, communications for these devices to both PaDOT and City of Philadelphia traffic management centers. Efforts have included field checking of existing equipment/proposed designs, review of design plans and coordination with both PaDOT and the City of Philadelphia.

Relevant items of work similar to the IS 270 project:
Estimating; ITS; TMC integration.

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ITS Design and Consultation Services (MdTA 2009-02) | MdTA | Baltimore, MD | $5M

Project Manager. Provided ITS coordination services for this task order based contract, design of supplemental E-ZPass readers for the Childs Street ramps on the Baltimore Harbor Tunnel Thruway and evaluation/design of UPS replacements at many MdTA facilities.

Relevant items of work similar to the IS 270 project:
Maryland project; electrical; electronic tolling.

US 1 Signal System Analyses | SHA | Prince George's County, MD | $20K

Project Manager. Responsible for analyzing the coordinated traffic signal system along US 1, which involved data collection and analysis of existing signal timings and coordination through the use of Synchro models, and the analysis of modified signal timings resulting from the initial delay analysis.

Relevant items of work similar to the IS 270 project:
Maryland project; Vissim analysis and simulation; Synchro/Sim Traffic; traffic signals.

Roadway and Bridge Reconstruction from milepost A-25.67 to milepost A-31.34 | Pennsylvania Turnpike Commission (PTC) | Montgomery County, PA | $30K

Project Engineer. Coordinated the design of AET gantries for two new ramps at Sumneytown Pike. Work included development of plans and specifications for adding capacity ramps using AET gantry and weigh-in-motion (WIM) scales, toll gantry building and parking, and utility services for each ramp.

Relevant items of work similar to the IS 270 project:
Constructability Reviews; estimating; utilities; special provision development.

Francis Scott Key Bridge All-Electronic Tolling/Virtual Weigh Station | MdTA | Maryland | $1M

Lead ITS Field Integrator. This project will remove a traditional toll plaza, install AET equipment and install a virtual weigh station (VWS) and inspection facility at the Francis Scott Key Bridge on I-695. Project includes the integration of AET into existing toll collection system including integration into the existing fiber optic communication system, and integration of the VWS into the client's communications systems using cellular technologies.

Relevant items of work similar to the IS 270 project:
Maryland project; constructability reviews; estimating; ITS; electrical; electronic tolling.

M-Tag Airport Parking Feasibility Study | Baltimore/Washington International Airport (BWI) | Baltimore, MD | $10K

Project Engineer. Responsible for reviewing and assessing the potential for use of electronic payment strategies for payment of parking fees at BWI Airport. Provided operation case studies on corridors, intersections, signal phasing and timing studies, safety analyses, access control, school zones, and signing and pavement marking designs.

Relevant items of work similar to the IS 270 project:
Maryland project; intersections; pavement markings; signing; traffic signals.

G.2.II. CONSTRUCTION KEY STAFF

DESIGN-BUILD PROJECT MANAGER - FRANK DIGILIO

Frank has been an integral part of multiple projects during his career at Kiewit. His experience includes serving as a senior manager on several fast-paced alternative delivery projects including roadway widening, bridges, and storm drain installation in highly environmentally sensitive areas. Ranging in value from $7M to $360M, the projects involve elements such as tight timetables and extensive permitting. Frank brings a wealth of knowledge relating to budget development and oversight, issue resolution, project scheduling and phasing, operations management, and DBE outreach assistance. His success on the Bear Cut and SR 90 Tamiami Trail projects translates into strong leadership and management skills on upcoming projects. Frank's commitment, attention to detail, and high expectations will ensure that all engineering and cost control functions are accomplished with team goals in mind.

Frank has nearly 30 years of experience of managing successful design-build projects ranging in value up to $360M.

27 years experience | B.S., Civil Engineering, Drexel University, 1991

Bear Cut and West Bridges Rehabilitation Design-Build | Miami-Dade County Public Works Dept. | Miami, FL | $33M

Design-Build Project Manager. Managed this fast-track project, which involved removing, rehabilitating and replacing sections of the Bear Cut and West bridges on Rickenbacker Causeway in Miami and widening the Bear Cut Bridge. Located in the highly environmentally sensitive Biscayne Bay, the design, permitting, and construction was completed in just under 12 months. Responsibilities included managing the entire project including the design development, permitting, planning, scheduling, and field execution. Located in a high traffic area, the project was highly political, which required close coordination with the Village of Key Biscayne and the City of Miami to keep the public informed. Project included utility coordination including installation of new 18" waterline while maintaining existing service, two bridge rehabs and widening totaling 2,900 LF designed and constructed in less than one year, segmented and phased construction, milling and resurfacing, protection of waterway and protection of endangered species including Manatees and Seagrass.

Relevant items of work similar to the IS 270 project:

Design-build; ahead of schedule/under budget; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; public outreach; value engineering; acquired USACE, FDEP ERP, DRER, SFWMD, Department of Health, and City of Miami permits; quality management; electrical; multidiscipline; MOT; bridge rehabilitation; drainage; E&SC; geotechnical; lighting; asphalt/concrete paving; pavement markings; roadway; signing; utilities; as-builts; shop drawings; special provision development.

SR 90 Tamiami Trail | U.S. Army Corps of Engineers | Miami, FL | $108M

Project Manager. Managed this environmentally sensitive project to revive over 63,000 acres of land and natural habitat in the Florida Everglades. Scope included demolition of one mile of existing roadway and the construction of a new, two lane one mile bridge, and the rehabilitation of a nine-mile segment of existing two lane roadway, all while maintaining existing traffic. Responsibilities included providing oversight of the project and ensured the project was built according to the strict USACE and FDOT specifications and in full compliance with all regulatory and environmental requirements. Project elements included utility coordination with AT&T and Bell South, highly environmentally sensitive through the everglades, environmental windows for Woodstorks and Snail Kites, 11 mile length including one mile of bridge and ten miles of roadway, constructed in segments and phases, 300,000 CY of earthwork, milling and resurfacing, storm water management, 13,000 LF of drainage pipe, protection of wetlands, 130,000 tons of asphalt paving, conduit installation for fiber line.

Relevant items of work similar to the IS 270 project:

Design-build; ahead of schedule/under budget; estimating; scheduling; partnering; value engineering; quality management; electrical; multidiscipline; MOT; USACE coordination; bridge rehabilitation; culverts; drainage; E&SC; landscaping; asphalt/concrete paving; pavement markings; roadway; signing; SWM; utilities; as-builts; shop drawings.

I-95 Widening and Rehabilitation (Cocoa) Design-Build | FDOT | Cocoa Beach, FL | $173M

Operations manager. Responsible for reviewing all work plans and operations, managed overall safety and quality, managed deck pours and concrete paving, and coordinated craft and equipment resources. Project included the widening and reconstruction of 10 miles of the existing I-95 from four to six lanes of interstate with bridges widened along the mainline and on the intersecting roadway. Aggressive schedule required the design and construction of the entire project in 28 months, which equaled one lane mile every two weeks. Work was constructed with adjacent live traffic and required extensive MOT efforts finishing the project 107 days early. Project elements included 4 bridge widenings, 585,000 CY of embankment, 390,000 SY of 13-inch PCCP, 203,000 tons of asphalt paving, pedestrian & bicycle accessibility, auxiliary lanes, on/off ramps, striping, water line mitigation, natural resource mitigation, endangered species, freeway widening and traffic detection.

Relevant items of work similar to the IS 270 project:

Design-build; ahead of schedule/under budget; Vissim analysis and simulations; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; public outreach; value engineering; acquired USACE, FDEP ERP, DRER, SFWMD, Department of Health, and City of Miami permits; quality management; ITS; ROW; electrical; TMC integration; stakeholder coordination; multidiscipline; MOT; bridge rehabilitation; CCTV; culverts; DMS; drainage; E&SC; geotechnical; intersections; landscaping; lighting; noise walls; asphalt/concrete paving; pavement markings; retaining walls; roadway; signing; SWM; traffic signals; utilities; wetland mitigation; as-builts; shop drawings; special provision development.

CONSTRUCTION MANAGER - KENT OBERLE

Kent has overseen projects in the Maryland area for 15 years. As construction manager, Kent has managed major earthwork operations totaling millions of CY, miles of asphalt and concrete paving, constructed drainage and utility work, and managed multiple subcontractors including electrical and controls for major systems. Kent has been on multiple design-build projects and has helped manage the design schedule and constructability reviews to ultimately deliver successful projects.

Kent is a design-build expert with 15 years of managing major earthwork operations totaling millions of CY, miles of asphalt and concrete paving.

15 years experience | B.S., Civil Engineering, University of Wisconsin-Platteville, 2002

Dulles Corridor Metrorail (Silver Line) Phase 2 | Metropolitan Washington Airports Authority | Washington, DC | $1.2B

Civil Design Coordinator/Construction Manager. Manages all grading work in the 11-mile corridor including earthwork, utilities, drainage, roadway, ITS, systems, and other trade and subcontractor coordination. Responsibilities includes working on site and acting as an interface with the design team as they complete the civil design package. Project consists of more than 11 miles of a new double track rail line, 5 ground-level stations and 1 aerial station, pedestrian bridges and tunnels, access roadways, surface parking and bus facilities, and all supporting infrastructure work. Project elements include 50,000 tons of asphalt, 10 SWM ponds, 65,000 LF of storm drain, guardrail, striping, and seeding.

Relevant items of work similar to the IS 270 project:

Design-build; ahead of schedule/under budget; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; public outreach; value engineering; permitting; quality management; ROW; electrical; TMC integration; stakeholder coordination; adjacent construction; multidiscipline; MOT; culverts; drainage; E&SC; geotechnical; landscaping; lighting; asphalt/concrete paving; pavement markings; retaining walls; roadway; signing; SWM; traffic signals; utilities; as-builts; shop drawings; special provision development.

ICC-B Design-Build | SHA | Montgomery County, MD | $560M

Grading Construction Manager. Duties included managing all construction activities in his area, as well as managing the quality control process and verifying his crews only used "approved for construction" drawings. Oversaw all work relating to the relocation and installation of all utilities including electrical power, water, sanitary sewer, and gas lines. Also assisted in the field coordination of 300 craft ensuring that existing and newly placed utility packages were correctly identified and protected and managed the work of 20 subcontractors and third party utilities along the project. Project elements included 8 storm water management ponds, 2.4 mil CY of earthwork, 54,000 LF of drainage, 500,000 Tons of asphalt pavement and 65,000 of MSE walls.

Relevant items of work similar to the IS 270 project:

Maryland project; Design-build; ahead of schedule/under budget; Vissim analysis and simulations; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; public outreach; value engineering; permitting; quality management; NEPA; ITS; ROW; electrical; TMC integration; stakeholder coordination; adjacent construction; multidiscipline; MOT; MDE coordination; USACE coordination; CCTV; culverts; DMS; drainage; electronic tolling; E&SC; geotechnical; H&H; landscaping; lighting; noise walls; asphalt/concrete paving; pavement markings; reforestation; retaining walls; roadway; signing; stream restoration; SWM; traffic signals; utilities; wetland mitigation; as-builts; shop drawings; special provision development.

I-95 at Telegraph Road Interchange | VDOT | Alexandria, VA | $265M

Construction Manager. Responsible for managing the construction and the quality control process for the grading, drainage, aggregate base, asphalt, and concrete barrier wall. Coordinated the grading, drainage, aggregate base, asphalt, and concrete barrier wall. Also instrumental in the successful planning, owner coordination and execution of several complex traffic switches that involved tight work windows and significant liquidated damages if not completed on time. Project scope consisted of the reconstruction and widening of 2.5 miles of I-95, along with a new fly-over bridge at the Telegraph Road interchange. Project elements included 22 retaining/MSE walls, 4 sound barrier walls, 6 SWM ponds, 5 flyover ramps, 1 bridge widening, 9 new bridges, 1 bridge repair, 5 bridges demolished, 7 bridges constructed over traffic, express and local lanes, auxiliary lanes, pedestrian & bicycle accessibility, interstate widening, striping, on/off ramps and natural resource mitigation.

Relevant items of work similar to the IS 270 project:

Ahead of schedule/under budget; estimating; scheduling; partnering; public outreach; value engineering; quality management; ITS; electrical; stakeholder coordination; multidiscipline; MOT; culverts; drainage; E&SC; intersections; landscaping; lighting; asphalt/concrete paving; pavement markings; retaining walls; roadway; signing; SWM; traffic signals; utilities; wetland mitigation; as-builts; shop drawings.

COST ESTIMATOR - TOM BOYLE

Tom has managed estimating, design management and played an important role in developing the subcontractor bid packages for a number of transportation jobs in his 22 years with Kiewit. He ensures that subcontractor interests are maximized from quality firms, creates cost models and develops all GMPs. Tom is a key player during value engineering discussions. His work on ICC-B in Maryland and Dulles Metrorail in Virginia has given him the experience to facilitate bid package development, and provide material and equipment life-cycle and procurement analysis.

Tom's ability to facilitate bid package development, and provide material and equipment life-cycle and procurement analysis has proven successful on the ICC-B Design-Build project.

22 years experience | B.S., Civil Engineering, Drexel University, 1997

ICC-B Design-Build | SHA | Montgomery County, MD | $560M

Cost Estimator/Quality Manager. Duties included preparing the cost estimate and proposal as part of the pursuit process. Served as an integral part of all design development, constructibility reviews, value engineering, and ensuring the design met all RFP and SHA requirements. Managed the QC for the entire project, ensuring the work was built right the first time as well as implementing and managing the project quality plan. Duties also included issue resolution with both designers and owner representatives. Project elements included 8 storm water management ponds, 2.4 mil CY of earthwork, 54,000 LF of drainage, 500,000 Tons of asphalt pavement and 65,000 of MSE walls.

Relevant items of work similar to the IS 270 project:

Maryland project; Design-build; ahead of schedule/under budget; Vissim analysis and simulations; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; public outreach; value engineering; permitting; quality management; NEPA; ITS; ROW; electrical; TMC integration; stakeholder coordination; adjacent construction; multidiscipline; MOT; MDE coordination; USACE coordination; CCTV; culverts; DMS; drainage; electronic tolling; E&SC; geotechnical; H&H; landscaping; lighting; noise walls; asphalt/concrete paving; pavement markings; reforestation; retaining walls; roadway; signing; stream restoration; SWM; traffic signals; utilities; wetland mitigation; as-builts; shop drawings; special provision development.

Dulles Corridor Metrorail (Silver Line) Phase 2 | Metropolitan Washington Airports Authority | Washington, DC | $1.2B

Cost Estimator/Design Coordinator. Managed a team of estimating staff, assisted with the proposal, developed ATCs and provided detailed coordination with our JV partner during the pursuit phase of the project. Involved in design coordination, providing oversight at task force meetings, managing the design schedule, addressing comments, providing value engineering analysis, and coordinated between disciplines once construction began. Project consists of more than 11 miles of a new double track rail line, 5 ground level stations and 1 aerial station, pedestrian bridges and tunnels, access roadways, surface parking and bus facilities, and all supporting infrastructure work.

Relevant items of work similar to the IS 270 project:

Design-build; ahead of schedule/under budget; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; public outreach; value engineering; permitting; quality management; ROW; electrical; TMC integration; stakeholder coordination; adjacent construction; multidiscipline; MOT; culverts; drainage; E&SC; geotechnical; landscaping; lighting; asphalt/concrete paving; pavement markings; retaining walls; roadway; signing; SWM; traffic signals; utilities; as-builts; shop drawings; special provision development.

Miami Intermodal Center at Miami International Airport (MIC/MIA) | FDOT | Miami, FL | $81M

Cost Estimator/Contract Administrator. Served as cost estimator during the pursuit phase, managing a team of estimators to develop the most cost-effective estimate and achievable schedule for the bid. Served as contract administrator, leading the estimating on owner requested changes, working thorough project issues and resolution, provided value engineering, and scheduling oversight once construction began. Project entailed the complete reconstruction of 3 miles of Le Jeune Road and NW 21st Street, which is located in front of Miami International Airport. It also included the construction of 11 bridges and associated ramps, which gave traffic direct access to SR 836 and SR 112.

Relevant items of work similar to the IS 270 project:

Ahead of schedule/under budget; estimating; scheduling; partnering; public outreach; value engineering; quality management; electrical; adjacent construction; multidiscipline; MOT; bridge rehabilitation; culverts; drainage; E&SC; landscaping; lighting; asphalt/concrete paving; pavement markings; retaining walls; roadway; signing; as-builts.

CONSTRUCTABILITY REVIEW MANAGER - JOE CHANG, PE

Joe is a civil design technical expert. He combines his design and construction background on all technical peer reviews incorporating safety and constructability into his design reviews and recommendations. Besides peer reviews, Joe also develops cost saving innovative geometric and construction sequence designs. His experience has helped him develop the correct, low-cost design and construction solutions efficiently.

Joe has nearly 20 years of experience providing technical peer reviews incorporating safety and constructability into his design reviews and recommendations.

Professional Engineer, Alaska, Arizona, Colorado, and Texas | 18 years experience | B.S., Civil Engineering, University of Arizona

I-405 Sepulveda Pass Improvements Design-Build | CalTrans | Los Angeles, CA | $1.1B

Roadway Designer. Responsible for assisting the design team to help resolve design fact sheets (geometric design exceptions) and coordinating independent peer reviews to develop objective solutions. Duties also included peer reviews, designs, and presenting solutions to the DOT. Scope included demolishing and reconstructing 3 major bridges, realign 28 on-and-off ramps, widen 20 existing underpasses and structures, and build 18 miles of retaining and sound walls. Efforts led to achieving the project goal of improving travel times for the 300,000 vehicles that use I-405 daily.

Relevant items of work similar to the IS 270 project:

Design-build; Vissim analysis and simulations; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; public outreach; value engineering; permitting; quality management; ITS; ROW; electrical; TMC integration; stakeholder coordination; multidiscipline; MOT; bridge rehabilitation; CCTV; culverts; DMS; drainage; E&SC; geotechnical; intersections; landscaping; lighting; noise walls; asphalt/concrete paving; pavement markings; retaining walls; roadway; signing; SWM; traffic signals; utilities; as-builts; shop drawings; special provision development.

SR 202 | Arizona Department of Transportation | Phoenix, AZ | $190M

Lead Roadway Designer. When awarded, this was the largest design-build project ever undertaken by ADOT. This fast-tracked project involved widening 10 miles of heavily traveled urban freeway, widening 22 bridges, reconstructing 18 on-and-off ramps, and adding general purpose and auxiliary lanes.

Relevant items of work similar to the IS 270 project:

Design-build; ahead of schedule/under budget; Vissim analysis and simulations; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; public outreach; value engineering; permitting; quality management; ITS; ROW; electrical; TMC integration; stakeholder coordination; multidiscipline; MOT; USACE coordination; bridge rehabilitation; CCTV; culverts; DMS; drainage; E&SC; geotechnical; intersections; landscaping; lighting; noise walls; asphalt/concrete paving; pavement markings; retaining walls; roadway; signing; stream restoration; SWM; traffic signals; utilities; as-builts; shop drawings; special provision development.

Foothill Goldline Extension Design-Build | Metro Gold Line Foothill Extension | Montclair, CA | $50M

Roadway Design Coordinator. Provided technical oversite of the rail, roadway, walls and drainage design development during the pursuit phase assisting the team develop the low-cost solution and optimizing the construction sequence. Responsibilities also include providing a technical peer review of the wall and drainage design to help lower project costs by reducing quantities during the final design and construction phase. This bridge along the 12.3-mile Goldline alignment will increase the freight capacity of the Montclair area. Besides the 12 miles of LRT alignment, the project required the design several at-grade crossings that needed coordination with five different cities.

Relevant items of work similar to the IS 270 project:

Design-build; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; public outreach; value engineering; permitting; quality management; ROW; electrical; TMC integration; stakeholder coordination; multidiscipline; MOT; drainage; E&SC; geotechnical; landscaping; lighting; asphalt/concrete paving; pavement markings; retaining walls; roadway; signing; SWM; traffic signals; utilities; as-builts; shop drawings; special provision development.

ENVIRONMENTAL SUPERVISOR - BILL PARK

Bill has extensive experience with SHA, MdTA and various county governments performing compliance inspection, coordinating with parkland stakeholders; maintaining MDE/USACE permit compliance during construction; and is familiar with the current regulations, policies and procedures.

Bill was the environmental manager on SHA's ICC-B project, achieving compliance from design through construction.

25 years experience | B.S., Environmental Analysis and Planning, Frostburg State University, 1992

ICC-B Design-Build | SHA | Montgomery County, MD | $560M

Environmental Supervisor. Responsible for managing all environmental issues through predesign, design, construction and post construction including a 15-person environmental construction compliance team to monitor contractor activities, E&S Controls, natural resource protection, water quality monitoring, fish and box turtle relocation, wetland/stream designated specialists and landscape inspections. Duties include overseeing compliance inspections for wetland and waterways, temporary E&SC and SWM facilities, FIDS habitat, work within the Paint Branch Special Protection Area, time-of-year restrictions while supporting SHA in public outreach activities. Responsibilities also included reviewing all design plans for constructability, permit compliance and obtained authorizations from MDE and USACE and providing avoidance and minimization recommendations and reporting. Managed compliance with Reforestation Law, Roadside Tree Permits and Section 120-Tree Preservation and the document preparation for the NEPA Reevaluation process, Section 4(f) and obtained MNCPPC Park Permits. Duties also included managing the As-Built Certification of over 300 SWM facilities, inspecting the site and reviewed all environmental reports to determine if any actions are needed and/or warranted and assisted in the preparation of the 00C062 Modifications to Erosion and Sediment Control and obtained authorizations.

Relevant items of work similar to the IS 270 project:

Maryland project; design-build; ahead of schedule/under budget; Vissim analysis and simulations; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; public outreach; value engineering; permitting; quality management; NEPA; ITS; ROW; electrical; TMC integration; stakeholder coordination; adjacent construction; multidiscipline; MOT; MDE coordination; USACE coordination; CCTV; culverts; DMS; drainage; electronic tolling; E&SC; geotechnical; H&H; landscaping; lighting; noise walls; asphalt/concrete paving; pavement markings; reforestation; retaining walls; roadway; signing; stream restoration; SWM; traffic signals; utilities; wetland mitigation; as-builts; shop drawings; special provision development; forest impact analysis, development of forest impact plans, tree preservation plan; reforestation mitigation design

US 29/MD 198 Design-Build | SHA | Montgomery County, MD | $85M

Independent Environmental Monitor and SHA Independent Quality Assurance E&S Control Inspector. Performed daily environmental monitoring and weekly E&SC inspections on this two-mile roadway project. Responsibilities included ensuring compliance with all environmental permits; facilitating approval of field changes with regulatory agencies; recommending methods and means to reduce environmental impacts; and assisting with SHA E&SC construction team in ensuring compliance. Duties included reporting to SHA, USACE, MDE, HHD and coordinating with the CMI personnel and contractors on a daily basis. Also designed and directed the remediation of impacts to 130 LF of stream and 0.3 acres of non-tidal wetlands caused by unpermitted discharge and the removal of culvert for fish passage. Perform environmental construction compliance services in accordance with approved plans and permits. Coordinated with design engineer and contractor to resolve issues. Facilitated and prepared 00C062 Form for E&S Control Modifications with MDE Plan Review. Wetland and Stream Designated Services.

Relevant items of work similar to the IS 270 project:

Maryland project; design-build; ahead of schedule/under budget; Vissim analysis and simulations; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; public outreach; value engineering; permitting; quality management; MDE coordination; USACE coordination; E&SC; stream restoration; SWM; wetland mitigation.

MD 216 | SHA | Howard County, MD | $50M

Environmental Supervisor. Performed daily environmental monitoring of the two-mile roadway relocation construction project. Responsibilities included ensuring compliance with all environmental permits; facilitating approval of field changes with regulatory agencies; providing recommendations to reduce environmental impacts; and coordinating with E&SC construction team. Duties included reporting to SHA, USACE, MDE and coordinating with the contractors daily. Perform environmental construction compliance services in accordance with approved plans and permits. Coordinated with design engineer and contractor to resolve issues. Facilitated and prepared 00C062 Form for E&S Control Modifications with MDE Plan Review.

Relevant items of work similar to the IS 270 project:

Maryland project; ahead of schedule/under budget; estimating; scheduling; partnering; value engineering; quality management; MDE coordination; USACE coordination; E&SC.

ITS SUPERVISOR - SCOTT SETCHELL

Scott is a skilled project manager with experience in the electrical work for large-scale transit and transportation projects across the country. His project management experience with SHA design-build projects has given him the ability to use design reviews, oversee crews and coordinate with owners, subcontractors, agencies and third parties for a successful project.

Scott is essential to the success of I-270 due to over a decade of lessons learned and his PM experience with the SHA.

10 years experience | B.S., Industrial Engineering, Wichita State University, 2006

ICC-B Design-Build | SHA | Montgomery County, MD | $560M

ITS Supervisor. Responsible for design reviews, safety, quality, schedule, staffing, equipment, compliance, training, and assisting superintendents and crews. Oversaw daily activities for all operations related to the corridor construction, including access, schedules, crews, production, equipment needs, public notices, coordination with subcontractors, and track access. Also responsible for communications with Owner, agencies, and third-parties on all aspects the electrical portion of the project. Duties also included oversight of the $11M electrical and ITS subcontract portion. Project elements included 8 SWM ponds, 2.4 mil CY of earthwork, 54,000 LF of drainage, 500,000 Tons of asphalt pavement, 65,000 of MSE walls.

Relevant items of work similar to the IS 270 project:

Maryland project; design-build; ahead of schedule/under budget; Vissim analysis and simulations; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; public outreach; value engineering; permitting; quality management; NEPA; ITS; ROW; electrical; TMC integration; stakeholder coordination; adjacent construction; multidiscipline; MOT; MDE coordination; USACE coordination; CCTV; culverts; DMS; drainage; electronic tolling; E&SC; geotechnical; H&H; landscaping; lighting; noise walls; asphalt/concrete paving; pavement markings; reforestation; retaining walls; roadway; signing; stream restoration; SWM; traffic signals; utilities; wetland mitigation; as-builts; shop drawings; special provision development.

Sound Transit U830 TES and Signaling Contracts | Sound Transit | Seattle, WA | $35M

ITS Supervisor. Directly responsible for project success. Served as major point of contact between GC/CM, Sound Transit and other contractors. Maintained daily oversight of all preconstruction and construction activities from cost estimating and schedule to Owner, team and stakeholder coordination. Project extends the existing light rail service to the north connecting the University of Washington and Capitol Hill to downtown Seattle and the airport. Scope of this CMGC project includes 3.15 miles of new tunnel track and two underground stations. All direct labor work was negotiated with Sound Transit. Review of design drawings for constructability reviews and development of Value Engineering solutions. Responsible for installation of extensive electrical distribution network in Sound Transit's new tunnels for emergency backup power.

Relevant items of work similar to the IS 270 project:

Ahead of schedule/under budget; constructability reviews; design coordination; estimating; scheduling; partnering; public outreach; value engineering; permitting; quality management; electrical; TMC integration; adjacent construction; utilities; as-builts, shop drawings; special provision development.

DART Orange Line | DART | Dallas, TX | $60M

ITS Supervisor. Managed a team that provided careful engineering review, which resulted in the ability to accelerate project delivery to maintain project completion date and tie-in to DART's revenue service system. Responsibilities included providing oversight for the OCS/TPSS, signals, communications, stations and traffic engineering work as well as maintaining compliance to the schedule demands. Served as main point-of-contact for the prime contractor and Owner and responsible for review of project costs and billing. Duties included providing oversight of integrated dynamic testing of newly installed traffic signal system with train traffic and installation and testing of extensive system-wide fiber optic cable and communications system. Worked with community relations manager to communicate schedule of work and any traffic impacts to local stakeholders and business owners. Project consisted of a 9.1 mile design-build light rail extension to DART's existing system. Scope of work included the installation of the overhead catenary system, six traction power substations, train signal system, communication system with integration into DART's existing head end, station electrical, and traffic engineering. Project elements included installation of 12 railroad signal crossings, 6 of which were fully integrated with newly installed traffic signalized intersections.

Relevant items of work similar to the IS 270 project:

Design-build; ahead of schedule/under budget; constructability reviews; ATCs; design coordination; estimating; scheduling; partnering; public outreach; value engineering; permitting; quality management; electrical; multidiscipline; MOT; lighting; traffic signals; utilities; as-builts, shop drawings; special provision development.


STOP
Genie S-80


STOP
Genie S-80

G.3 Project Understanding and Progressive Design-Build Approach

G.3.1. SIGNIFICANT ISSUES AND RISKS

The IS 270 Innovative Congestion Management project is the first Progressive Design-Build (PDB) contract advertised by SHA. Kiewit and our design partner, AECOM, understand that to meet the project goals we will form a partnership with SHA, in which risks can be mitigated through open and honest communication, where design processes are streamlined and budgets optimized by implementing the Practical Design process.

The IS 270 corridor has been the subject of numerous transportation improvement studies since the 1970's. SHA and its partner agencies have developed master plan recommendations, environmental documents for highway and transit alternatives, and implementation of major and minor infrastructure improvements in the corridor. Yet, the demand for multimodal travel in the corridor continues to outpace the available capacity. For example, the 2002 I-270/US 15 Multi-Modal Corridor DEIS documented the development of several highway and transit alternatives, including adding HOV and general purpose lanes, new and upgraded interchanges, as well as the Corridor Cities Transitway, which is still part of an active MTA planning study, which AECOM has prepared. The highway alternative costs ranged from $200M to nearly $5B and included significant environmental impacts, public opposition, and constructability challenges. Today, SHA is taking a different approach to addressing the significant mobility and safety challenges in the corridor.

The purpose of this project is to reduce recurring and non-recurring congestion, improve safety and improve travel time reliability along the IS 270 corridor. Improving the existing conditions along the corridor requires a thorough understanding of congestion causes and high accident areas. From our knowledge of the study area, augmented by our initial review of the information provided by SHA and past studies of the corridor, we have identified key risks and will address them in our discussion on the project goals:

GOAL #1: MOBILITY – PROVIDE IMPROVEMENTS THAT MAXIMIZE VEHICLE THROUGHPUT, MINIMIZE VEHICLE TRAVEL TIMES, AND CREATE A MORE PREDICTABLE COMMUTER TRIP ALONG IS 270

Effective and reliable traffic flow along IS 270 is necessary for regional commerce and as a primary commuter route supporting local economic development. In Section G.4, we describe the team's ability and experience, which describes many potential solutions that may be applicable to the IS 270 corridor. Our travel demand modelers and VISSIM experts will work with the engineering team to apply numerous solutions and evaluate traffic operational improvements. Our solutions will address this critical goal by reducing delay and increasing reliability, reducing recurring congestion in terms of travel time, vehicle throughput, density, intersection operations, queues and vehicle network performance.

IS 270, through its entire length, is subject to recurring congestion. The interstate runs at full capacity during peak hours, without a viable alternative route. The congestion occurs not only at the corridor's endpoints at I-495 on the southeast and at IS-70/US 15 in Frederick on the northwest, but also at several locations, of varying length, through both Montgomery and Frederick Counties. This correlates to a review of the number of traffic events that have occurred over the last 3 years, as shown in the heat map to the right. We have already organized our technical teams and have begun analyzing traffic and safety improvements to improve these areas.

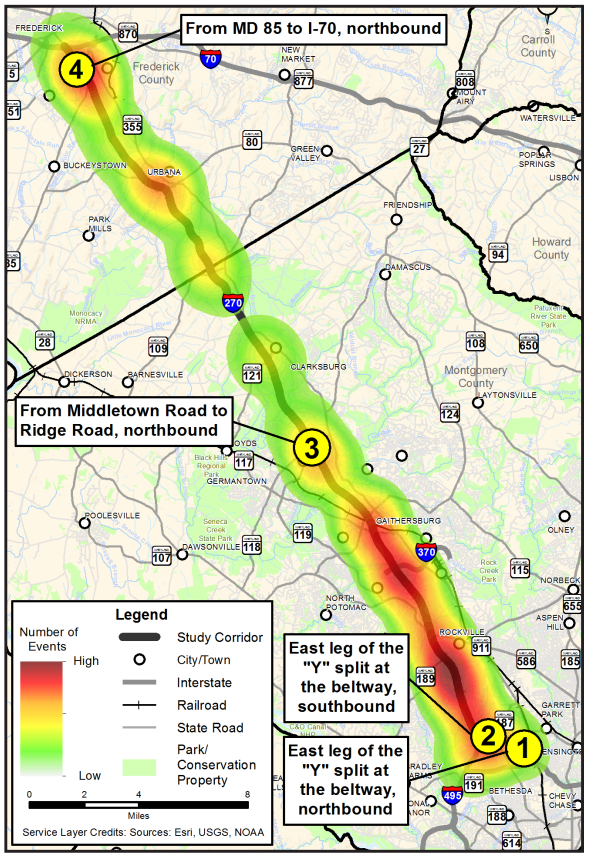
AECOM has an office that overlooks the IS 270 corridor in Germantown. Our pursuit team has already hosted a cross section of their employees, all of whom are regular 270 commuters to gain their perspective on problems leading to congestion. Anecdotally, a few of the items we learned of are that most drivers' experience significant weave issues at Montrose Road/Falls Road, the truck inspection stations located just south of MD 80 impact traffic flow every day in each direction and that many of the merge lanes are too short.

GOAL #2 SAFETY – PROVIDE FOR A SAFER IS 270 CORRIDOR

Safer flow of traffic will increase mobility along IS 270 by reducing non-recurring congestion caused by incidents that increase delay and reduce travel time reliability. IS 270 is noted for particularly high collision rates. The last 3 years of incident data from CHART indicates a steady increase in property damage and personal injury collisions. There were also 8 fatal collisions.

The four segments shown on the graphic had total crash rates significantly above the statewide average (SASA).

With the SHA's focus on a strategic highway safety plan moving 'Toward Zero Deaths' we recognize the critical need to improve roadway characteristics that provide for a safer traveling experience. For those collisions and unplanned events that still occur, we will also propose creative ideas for incident management that we have successfully implemented on other projects, like Safety and Congestion Predictive Modeling.



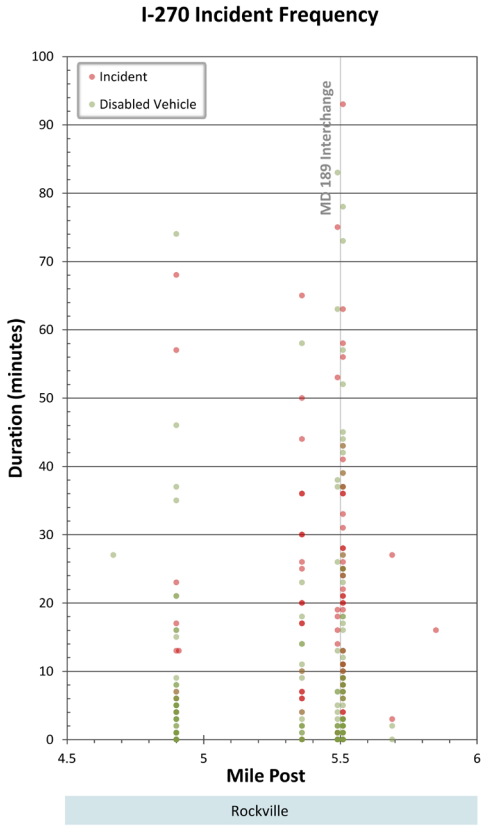
Heat Map of traffic events 2013-2015.

GOAL #3 OPERABILITY/MAINTAINABILITY/ ADAPTABILITY

The IS 270 corridor has been named the "IS 270 Technology Corridor" and is one of the key economic engines for Maryland and one of the fastest growing areas in the state. Therefore, solutions that can adapt to future growth and development will be considered. Kiewit and AECOM are focused on delivering solutions to SHA that minimize SHA operations and maintenance activities while being adaptable to future transportation technological advancements. We are cognizant of the ever-increasing pace of emerging technologies available to the driver, including connected vehicles and automated vehicle advancements. We will collaboratively work with SHA to minimize the longer-term costs to maintain our proposed solutions which are scalable to tomorrow's trends.

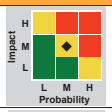
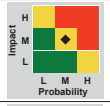
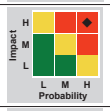
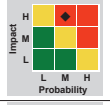
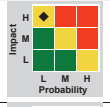
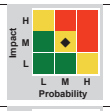
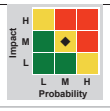
GOAL #4 WELL-MANAGED PROJECT

We have assembled a project management team with experienced managers for each phase of the project: traffic analysis, planning, design and construction. The work plan will address communications, coordination and risk management, achieves a collaborative partnership with all members of the project team and stakeholders, and successfully advances the project goals. We have already begun to discuss the more significant potential risks and mitigation strategies, which are summarized in the table below.



Over the 3-year period from 2013-2015 in the MD 189 interchange area, there were 365 total incidents with an average incident time of 51 minutes. The darker the color, the more frequently this type of event of this duration occurred. This is an example of the ability of the Kiewit Team to view data in innovative ways, leading to innovative solutions.

Preliminary Risk Register

Potential Risk	Risk Level	Risk Mitigation
Developing technology solutions in the field without investing in complementary improvements in the State Operation Center (SOC)		Reconfigure the CHART SOC to provide needed improvements (e.g., video wall, work stations, software upgrades) to complement the IS 270 improvements
Developing technology solutions that result in high O&M costs		Identify and prioritize technology solutions that exhibit relatively low O&M costs or implement alternative strategies (e.g., utilize 3rd party sources to collect real-time data)
Developing traffic operational improvements without providing incentives for managing trip demand		Implement Transportation Demand Management strategies during the construction phase to minimize work zone impacts as well as after construction to curb latent traffic demand
Providing capacity solutions without addressing non-recurring congestion, thereby resulting in congestion due to lane-blocking incidents		Implement Traffic Incident Management strategies (e.g., safety service patrols, severe incident response vehicles, rapid incident scene clearance, staged flatbeds) to complement the IS 270 improvements
Implementing emerging technologies that do not have significant operations experience		Utilize technologies that either are on an approved product list or have been properly tested within a test lab and have an operational history of at least 2-3 years
Deploying ITS devices that may be outdated with emerging trends in connected and automated vehicles		Balance the need to add needed ITS infrastructure along the IS 270 corridor with the potential that certain devices (e.g., DMSs, HARs, vehicle detectors) may be replaced with in-vehicle systems in the near future
Potential system integration problems after the technology construction is complete		Implement a structured systems acceptance testing plan utilize a firm that has extensive TOC operational experience (like AECOM) to design and integrate systems from an operational perspective

We will accomplish this by following a philosophy of: analyze, interpret output, propose solutions to meet project goals, apply practical design process and **BUILD IT RIGHT THE FIRST TIME**. This philosophy will be ingrained into our team from day one.

G.3.II. PROGRESSIVE DESIGN-BUILD APPROACH

Our management team has SHA, design-build, CMAR and conventional design-bid-build experience as well as design-build experience with several other clients. The following are key elements of our design-build best management practices. We will:

- Apply partnering principles using SHA's Partnering Manual to integrate the entire team and establish common project goals
- Co-locate the entire design, construction, and SHA team to enhance communication
- Use the task force concept with experienced leads to:
  - Design in contractor, SHA, and stakeholder requirements
  - Establish a "bridge" between SHA and our design and construction teams
  - Provide a conduit to disseminate information between disciplines, segments, and teams
  - Facilitate interdisciplinary coordination
  - Streamline OPCC and CAP development
- Use a rigorous project controls system to manage the design schedule of multiple concurrent CAPs

Approach to Progressive Design-Build Contracting

The following is a timeline of how we view the PDB process taking place.

1. Pre-Bid

During the pre-bid stage, our key team members have already been assigned to this project, and they are developing comradery, reviewing the information provided, and have started performing traffic analysis. We have also performed roundtable meetings with daily IS 270 commuters to identify additional problem areas, and ideas for improvement. Utilizing the data and commuter feedback, we are starting to develop several innovative concepts to alleviate congestion on the corridor. Upon shortlist, our team will be prepared to discuss a range of solutions at the first proposed technical concept meeting. After the first meeting, we will continue to dial in solutions that are acceptable to SHA to ensure we are providing the most congestion relief for the advertised budget. Our estimating team will develop a cost estimate and compare the design solutions against the overall project budget. Once our final proposal is submitted, we will have preliminary design completed and confirmation that our solutions will meet SHA's budget.

2. Day One

Our team will work with SHA management to conduct the partnering kickoff meeting which will reinforce project goals, address any project concerns, clarify all roles and responsibilities, and further expand upon the proposed technical concepts. All of our key staff proposed for this project will be in attendance. We will also set regular meeting dates for all design activities. These meetings will include future partnering meetings, task force meetings, and design status meetings. Similar to the MD-97 and Greenbelt projects, our team realizes how important it is to comprehend the project needs, understand challenges, propose solutions, and add value throughout the preconstruction process. On both projects, our team regularly suggests and attends issue resolution meetings to solve problems, and coordinates with multiple stakeholders to coordinate each specific need.

3. Day 2 – 60

After the kickoff, we will begin co-locating staff to a centralized location, to aid in collaboration and communication. In order to aid in the exchange of information, we will provide and setup Aconex project management software that will be utilized by all parties for the duration of the contract.

Our plan is to hold multiple **design workshops** or charrette meetings where all project team members collaborate on a vision for development. We will inventory and evaluate the ITS elements that currently exist and determine which can remain in place, be relocated, or decommissioned, which will aid in our workshop discussions. We will discuss the several available solutions for various hot spots throughout the corridor. These meetings will all occur before any design is started. Our design team will dive deeper into the traffic modeling with specific variables and run simulations for extended periods of time to gain better knowledge of project issues. During this period, there will also be regular coordination with the dozens of project stakeholders to understand concerns, gather information about existing ITS infrastructure, and to build relationships. We will also begin to discuss early integration planning to evaluate the steps required to implement the various concepts within SHA's and adjacent stakeholder's current systems.

Our team will begin developing a **fully integrated design and construction schedule**, with milestone dates that are agreed to by SHA. Our schedule will include all key activities including permitting, ROW, procurement, utilities, construction NTP, a preliminary construction schedule, and 30% and 60% design packages to establish the Construction Agreed Price (CAP). Once agreed to, our team will develop a

PRE-BID

- Community Input
- Traffic Analysis
- Proposed Technical Concept Development
- Budget Validation

DAY ONE

- Partnering kickoff meeting
- Develop meeting schedule
- Discuss proposed concepts
- Schedule site visit with SHA

design tracking system to track design on an earned value basis. This tracking system will ensure the design is continuously tracking on time, and on budget.

Our team will complete all **preconstruction surveys** beyond the limits already obtained in accordance with SHA's Survey Field Procedures Manual, including topographical surveys; location of property corners; flagging for wetland areas and forest stands; floodplain and/or stream cross-sections as required for hydrologic/hydraulic modeling and wire heights for signal designs.

For **right of way**, we will coordinate with Plats and Surveys Division. Depending on the ultimate solutions and subsequent ROW needs, we will obtain the metes and bounds survey, develop the ROW needs, create a right of way matrix, and generate all plats. We will prepare all ROW related information using Inroads add-on MCPC program, Plats and Surveys Plats Guidelines and CADD notes in accordance with Plats and Surveys' CADD Standards. All Plats will be signed and seal with a PLS registered in Maryland.

All **utility coordination and design** will be performed in accordance with SHA's Utility Policy. We will begin coordinating with utility companies to review the utility designation provided by SHA and begin discussing potential field conflicts and relocations. Our goal is to minimize utility conflicts through our design development, therefore reducing cost and schedule to the project. Each utility located within the project limits will be identified and a responsibility matrix developed. Similar to the sanitary sewer line coordination performed at MD-97 CMAR, our team will hold task force meetings with the utility companies and their designers to help coordinate design and construction efforts, and integrate their work into our project schedule.

For **geotechnical investigation**, preliminary data has already been obtained to begin developing design solutions. Upon award, our team will begin the additional geotechnical investigation and our laboratory testing will include R-value, gradation analysis, plasticity index, in-place moisture/unit weight, consolidation, and chemical testing to meet the requirements of OMT. If new pavement is part of the project solution, the team will prepare the Initial Pavement Design Summary and Materials Design Report concurrently with the investigation, based on the initial assumption that any new pavement section or rehabilitation will match existing mainline pavement. As more data is collected and analyzed, adjustments to pavement structural sections may be made to meet SHA's design parameters.

Our team will support all of the necessary permits and approvals and ensure SHA has the required supporting documentation for the efforts including avoidance and minimization measures. The number of permits required will be based on the type of work proposed for each CAP project. Federal actions (e.g., ROW and 4(f) impacts) will require National Environmental Policy Act (NEPA) compliance and also adherence to Maryland Environmental Policy Act (MEPA). We will coordinate with the Department of Natural Resources to align federal and state review processes and strategically organize CAP projects with minor impacts to avoid a lengthy NEPA permit review process and get them into construction sooner. We anticipate that some of the permits will include storm water management, Erosion Control, USACE, MDE, Maryland Reforestation Law Approval, and Department of the Environment Water Appropriation. Our environmental team will partner with SHA and coordinate with each agency to understand their needs to expedite approval, recommend phased design packages, perform joint reviews and track the permits on an integrated schedule. We will also use MDE-certified reviewers during the design phase as well as QC prior to package submittals to expedite the review and acceptance process for permitting. Lastly, we will design and implement any mitigation required for the project. Additionally, our environmental supervisor, Bill Park, and environmental compliance manager, Warren Gray, will be involved during constructability and interdisciplinary reviews ensuring environmental compliance.

We will develop a **Design and Construction Quality Control Plan** to ensure detailed processes are followed throughout design development. AECOM is ISO Certified and all services for this project will be performed in accordance with their ISO:9001-2008 certified Quality Management Systems. All of our calculations, reports, plans, specifications, and estimates will be subject to our comprehensive internal ISO technical review procedures prior to submission and will be reviewed by our QA/QC Managers prior to submissions to SHA.

DAY 2 – 60

- Co-location
- Design charrette workshops
- Existing ITS and drainage inventory/ inspection
- Operational needs assessment
- Life cycle cost analysis
- Stakeholder coordination
- Public outreach
- System integration planning
- Develop fully integrated schedule
- Implement project management software
- Preconstruction survey
- Identifying long lead items
- ROW coordination
- Utility coordination
- Geotechnical investigation
- Permit coordination (MPDES, MDE, MPA, MDNR, etc.)
- Quality plan development

4. Day 60 - 180

At this point, the design workshops and field investigation efforts will begin guiding the entire team towards the appropriate solutions for this project. Our team will begin advancing design packages in preparation for the first design milestones. As part of design progression, we will continue our weekly task force meetings, design status meetings, and ensure that all team members including SHA, ICE, stakeholders, and the GEC are included in all of these meetings.

Once 30% design is available, all team members (construction, SHA, stakeholders) will be able to **provide constructability comments to the design**. All comments will be tracked on comment forms, and the resolution will be tracked for every team member's review. During this period, we will also perform value engineering analysis on any concepts that result from the reviews, and develop feasibility studies for each idea. We will evaluate cost, design effort, long term maintenance, and schedules in these analyses.

During the pre-bid stage, our team will already have cost models developed on several proposed solutions for the corridor. Now that the 30% design is available, we will begin coordination with SHA and the ICE for further **cost evaluation**. The first step is to create and distribute a detailed estimating coordination letter to all team members. This tool details all SHA bid items that will be required for the project, what cost goes into which item, how indirect vs. direct items are carried, equipment rates, staff rates, subcontractor and supplier plugs, key dates, contact information, and several other pieces of key information. We then setup multiple meetings with the estimating team to coordinate quantities, review each bid item and what cost should be included, and perform any other key coordination activities. Finally, at each milestone, we will setup an Opinion of Probable Construction Cost (OPCC) meeting to review each item, and identify similarities and differences between the design-build er and ICE estimate. This process ensures that as the project progresses, both teams are better aligned, while still maintaining full independence. Many of these best practices have been developed in collaboration with SHA and the ICE on MD-97 and Greenbelt, and we anticipate that we will implement the same concepts on IS 270.

For the **Risk Management Plan**, we brainstorm potential risks by performing an initial plan flip with all team members involved in the project including the client, designer, estimators, superintendents, internal professional engineers and managers. Every potential risk is added to the initial risk register similar to what was provided in G.3.i. This risk register will be a living document, updated throughout the development of the design, and into the construction period, until final completion is achieved. Our goal is to develop plans to minimize or completely mitigate risk to help meet project goals.

Our **public outreach program** will provide a framework for all stakeholder interaction, including property owner coordination. We will identify and implement all outreach tactics in line with the desired outcomes of the program, with an overarching goal to ensure the public is given access to information to be consistently aware of progress on the project.

5. Day 180 – NTP

Our design team will continue to advance design packages, and complete the 60, 90 and PS&E packages. During this time, our design and construction teams will continue coordination, constructability reviews, and comment resolution. In addition, we also continue to keep our cost models updated, in preparation for the final CAP. We typically feel confident providing this firm pricing after 60% design is complete which is consistent with the RFQ. During this period, we may also determine that multiple CAP's be provided to improve schedule, or aid in long term procurement.

While subcontractors will be involved in the early design to provide constructability support, the **subcontractor procurement process** will be performed during this stage of preconstruction. We will create bid packages, prequalification of subcontractors and the identification of long-lead items. We believe it is critical to establish a detailed procurement plan with SHA at the onset of the project, and our plan is in full compliance with COMAR 21.05.10.05.

Day 60-180

- 30% design creation
- Constructability reviews
- Comment resolution
- H&H analysis
- HOV equivalency analysis
- Mitigation site coordination
- Value engineering
- Estimate coordination
- Risk management
- OPCC development
- DBE contracting plan
- Continued public outreach

Day 180 – NTP

- 60, 90, and PS&E design and specification development
- Constructability reviews
- Stakeholder input
- OPCC development
- DBE goal evaluation
- Subcontractor coordination
- CAP development and submission
- Change order execution and NTP
- Work planning
- Systems integration planning

Lastly, our construction team will begin **developing detailed work plans** for all construction operations. Our work plans include all quality requirements, the latest RFC documents, step by step instruction to build the work, budgets, and other applicable information for field crews.

6. Construction Notice to Proceed

When construction in the field begins, we use several scheduling tools that have ensured on-time delivery on past projects.

- **CPM Schedule.** This schedule is a look at the entire project and is updated monthly or as required.
- **90-Day Schedule.** This schedule is a more detailed look at the next 90 days to ensure every detail of the project is planned out.
- **3-Week Look Ahead Schedule.** This schedule is developed weekly and is the primary tool to communicate upcoming activities to the project team, client, stakeholders, and the local community.
- **Play of the Day.** The team will hold a daily schedule meeting to discuss the next day's events. This meeting discusses safety and quality for the operations, ensures the proper resources are available, communicates any key restrictions, and lays out the required production for the day.

Our design team will continue to support construction with post design services including submittals, shop drawings, as-builts, and system integration.

Based on potential geometric solutions, we will develop a construction sequence plan that is fully coordinated with the Watkins Mill project including items such as MOT and underground utility installation, along with incorporating key milestones from the Watkins Mill project into our schedule.

A key goal for our team is to maintain existing electrical and communication systems with the SOC (CHART) and District 3 traffic engineer. This will ensure no loss of response time for incident management during construction. We will supplement existing DMS with PVMS to notify travelers of temporary lane closures and traffic conditions.

We will utilize an experienced Environmental Compliance Team during the construction phase to assist with technical issues, especially when working near wetlands and waterways, floodplains, trees, cultural resources and facilitate the preparation and approvals of 00C062 Plan Modifications through OED Toolkit and minimize the potential for non-compliances and stop work orders. Environmental specialists will be deployed throughout the construction phase to ensure compliance with the approved plan, environmental commitments and performance specifications, special provisions, and standard provisions are being implemented. The environmental personnel serve as a technical resource to the contractors by providing recommendations or plan interpretations in the field when questions arise. This is a key element in successfully minimizing risk to the schedule because of the instantaneous resolution of a potential issue.

We will conduct systems acceptance testing during all phases of technology deployment. This will include factory acceptance testing; standalone testing for each system component; subsystem testing for each deployment project; end-to-end system testing from the CHART SOC; and system burn-in for a specified period of time (e.g., 30-60 days). We will collaborate with CHART's ATMS software provider during the system testing phase and support the Department in identifying functional requirements that may be needed to support the integration of new technologies to be implemented as part of the IS 270 improvements.

Construction NTP

- Scheduling
- Construction Planning
- Field Execution
- System Integration

G.3.III. DESIGN-BUILDER COMPOSITION

Located on the following two pages are our major participants and graphical organization chart, complete with working titles for the design-builder in both the design and construction phases, and showing the lines of communication. All key staff is indicated and the number of hours per week that the staff will be dedicated to this contract during the design and during the construction.

Kiewit Infrastructure Co.

Kiewit Infrastructure Co., as the design-builder, is the contracting entity that will work jointly with our designer, AECOM and SHA. Kiewit will provide executive oversight, key personnel, equipment, materials and craft on all preconstruction and construction phases for this project. Based on our recent successes on the ICC-B, MD-97 and Greenbelt projects, our team understands SHA's processes and expectations, and will be able to implement best practices and lessons learned into the 270 project. Kiewit utilizes a decentralized network of district and area offices located across the country that allows operating subsidiaries to act as competitive local contractors with the backing of a financially stable, national firm. This nationwide network is based on geography and market type that optimizes the allocation of resources, including people and equipment, to best utilize the company's expertise and give our clients the best product. On this project, Kiewit will be supported by four districts: Southeast District, Eastern District, Kiewit Infrastructure Engineers and Mass Electric.

AECOM

AECOM will serve as the lead design firm for the project. AECOM employs over 22,000 people in North America and has 240 local Maryland transportation engineers. AECOM has been a preferred provider of engineering services to MDOT across all business units for decades, is a leader in alternative delivery, and has provided virtually every technology solution throughout the world. Specifically, AECOM has provided Intelligent Transportation Systems on the ICC project, worked with the Managed Motorways program in the United Kingdom for over 10 years, and has been the lead designer on several other congestion management design-build projects. AECOM will provide all design services, develop the optimal solution for this project, and ensure the design meets all of SHA's standards and requirements. Kiewit and AECOM have partnered on multiple projects throughout the US, and will bring our proven processes to the IS 270 project.

Mass Electric Construction Company

Mass Electric Construction Company (MEC) will be the electrical contractor firm for this project. In 1997, Mass Electric Construction Company (MEC) became a wholly owned subsidiary of Kiewit. With 83 years of continuous service, MEC has grown to be a national contractor with 17 offices throughout the United States. MEC specializes in electrical transportation systems and consistently ranks among the 20 largest electrical contractors by Engineering News Record. MEC will be an exclusive internal partner to the project team and will provide any electrical system services for the project. They will be heavily involved in the project solution development, design development, and electrical construction. MEC was the lead electrical contractor on ICC-B, and has provided electrical services on several design-build projects throughout the Mid-Atlantic Area.

Greenman-Pedersen, Inc.

The environmental expertise of Greenman-Pedersen, Inc. (GPI) has proved a valuable resource in Maryland in the past, so we have asked them to once again join our team for both preconstruction and construction phases. The Environmental Compliance Team that exceeded the requirements on the ICC-B and MD-97 will be supporting this project as well. Their staff is not only expertly experienced in the federal, state, and local environmental regulations, but are experienced in the requirements of SHA through their tenure on the ICC-B project, where our team averaged E&S scores of 91% and greatly reduced permanent wetland, stream and forest impacts.

CATT Lab from University of Maryland

Michael L Pack and the University of Maryland CATT Laboratory develop, deploy, and support transportation big-data fusion systems, TSM&O real-time systems, performance management solutions, and visual analytics that are used by thousands of decision makers, researchers, planners, operations specialists, and homeland security officials in all 50 states and internationally. The use of these systems, services, and their expertise has reduced transportation research costs by as much as 50% nationally; enabled regional response and coordination among hundreds of agencies; provided for transparent decision making through data-driven approaches to prioritizing and justifying projects; provided for better communication to decision makers and the public; reduced private sector traffic information integration costs by millions; trained over 1,000 undergraduate students in transportation operations; significantly reduces agency analysis costs while increasing capabilities; dramatically increased the ability of agency staff to respond to media and decision maker inquiries quickly; they also provided 24/7 real-time situational awareness to FEMA, the National Guard, Emergency Management Agencies, law enforcement, & transportation officials for every major event in and around Washington, DC since the 2009 Presidential Inauguration.

Kiewit/AECOM Executive Commitee
Ben Carnazzo
Alan Straus

SHA QC/QA

Maryland Department of Transportation State Highway Administration

Stakeholders

- Permitting Agencies
- Maryland Motor Truck Association
- Utilities, Local Residants and Businesses
- FHWA
- Montgomery County DPW&T
- WMATA
- Bethesda
- City of Gaithersburg
- City of Rockville
- Commercial Vehicle Companies
- CSX Rail
- Event Promoters
- Federal Emergency Management Agency
- Frederick County DPW&T
- General Public
- MEMA
- MSP
- MdTA
- Metro Transit Police
- Montgomery County Police
- Montgomery County Fire and EMS
- Montgomery County School Districts
- National Capital Region TPB
- North Bethesda TMD
- Private Sector ISPs
- Regional Media Outlets
- Towing Industry

Project Quality Manager

D/B Project Manager
Frank Digilio
40 / 40

Design QA/QC

Design Manager
Chris McGuire, P.E.
40 / 10

Envir. Compliance Manager
Warren Gray, P.E.
40 / 40

D/B Coordinator/Cost Estimator
Tom Boyle
40 / 5

Construction Manager
Kent Oberle
20 / 40

Public Information Officer

Permit Coordinator

Safety Manager

Schedule Manager

DBE Coordinator

Traffic Analysis and Solution Development

Traffic Engineer
Tim Ryan, P.E., PTOE
30 / 5

Traffic Data Analytics
Michael Pack, P.E.
10 / 1

Traffic Modeling
VISSIM Analysis
Conceptual Design
Active Traffic Management
Dynamic Ramp Metering
Integrated Corridor Mgmt.
Reversible Lanes
Traffic Incident Management
All Analysis 30 / 5

Preliminary and Final Design

Highway Engineer
John Hayter, P.E.
40 / 10

ITS Engineer
Eric Metheny
20 / 20

MOT
Structures
E&SC
SWM
Traffic Modeling
Noise
Right of Way
Geotech
Utilities
All Design 40 / 5

OPCC/CAP/ Constructability

Constructability Review Manager
Joe Chang, P.E
10 / 10

Roadway
Drainage
E&S/SWM
Traffic
Permitting
ITS/Electrical
All Support 20 / 5

Construction

Environmental Supervisor
Bill Park
20 / 40

ITS Supervisor
Scott Setchell
5 / 40

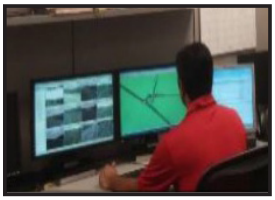
Roadway Supervisor
Paving Supervisor
E&S/SWM Supervisor
MOT Supervisor
Survey
Equipment Maintanance
Field Engineers
Subs
Suppliers
All Construction 10 / 40

LEGEND

- Key Staff
- 40 / 40 — Preconstruction/Construction hours per week
- Kiewit / Mass Electric
- AECOM
- Team Member

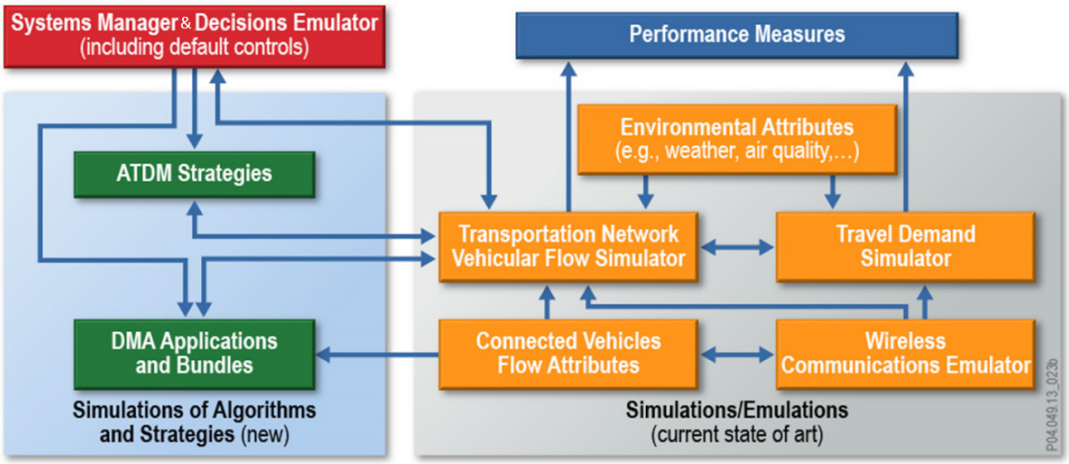
G.4. Design-Build Teams Ability and Experience

This section presents our qualifications in alignment with potential solutions to solve the traffic operations and safety problems along the IS 270 corridor while improving vehicle throughput, safety and reliability. These preliminary solutions were developed based on our understanding of current traffic issues identified by our local staff who use IS 270 as part of their daily commute; application of the regional VISSIM models; review of crash data; as well as review of RITIS information provided by our team partner Michael Pack, from the University of Maryland CATT Lab. These candidate solutions provide a starting point in collaborating with SHA in identifying the most appropriate traffic management strategies for the IS 270 corridor which meets the project's goals while enabling emerging technologies to be accommodated in the short, medium and long-term future. These concepts will be advanced through the systems engineering process in terms of master planning, concept of operations, functional requirements, design, construction, systems testing and operational start-up. Throughout this process we will develop and apply a Requirements Traceability Matrix to make sure that the deployment projects are consistent with the goals, objectives and functional requirements of the overall project. Each of the sections below begins with an overall introduction of the strategy, followed by our specific qualifications.



TRAVEL DEMAND FORECAST EXPERIENCE

An initial step in identifying current and future traffic problems along IS 270 is the application of the VISSIM models. The two VISSIM models provided by SHA (the Base and the 2040 No-Build) will be used extensively in the development and quantitative assessment of potential geometric and operational improvements to IS 270. We have extensive experience with VISSIM throughout the country, but particularly in Maryland, where we have participated in the development and extensive use of models for MD 200 from I-370 to I-95, for the I-95 Express Toll Lanes from I-895 to MD 43, and for MD 355 throughout the length of this corridor. The development and calibration of this last model has given us unusual insights into the operations of the non-freeway network near IS 270 in both Montgomery and Frederick Counties. In addition to the VISSIM models, we expect to make extensive use of the RITIS database compiled and maintained by the University of Maryland CATT Lab. This database will provide "ground truth" for the model's outputs, and will confirm the 2014 speed data as well as the anecdotal reports of problem areas. The RITIS database has been used extensively by CATT Lab staff to examine operations throughout the State, but particularly IS 270 and I-495.



Analysis Modeling and Simulation (AMS) testbed framework for evaluating DMA and ATDM concepts

We also have extensive experience in the development and application of travel forecasting techniques in the Metropolitan Washington area and regions across the nation. We have a solid understanding of the MWCOG regional model which actually uses a mode choice program developed at AECOM. In addition, we have also developed automated highway assignment procedures to do toll-setting for dynamically priced facilities that are currently being studied at MWCOG. We routinely work in developing travel forecasts for several corridors in our region, such as the MD 355 BRT study, where we are studying alternatives that maximize the total person throughput on the 22-mile parallel roadway to IS 270.

In addition to the more aggregate regional models, we also have experience in the development and application of mesoscopic travel models to perform multi-modal Dynamic Traffic Assignment for large and complex regions, such as ours. Such intermediate modeling helps better translate data from the coarser regional model to the VISSIM microsimulation model, while providing insights into travel patterns and impacts of local shifts at a regional scale by tracking individuals and vehicles continuously throughout the day in the region. Such analysis is especially helpful in studying how the IS 270 corridor is influenced by and influences the Capital Beltway and other major roadways in the region. We have developed software tools on one end to interface with VISSIM and Synchro to provide them with richer datasets, and on the other with the regional model to derive regional travel demand and network data.

AECOM is also currently helping FHWA in developing multiple AMS Testbeds that will serve as virtual computer-based simulation environments and support a detailed and integrated evaluation of dynamic mobility applications an active transportation and demand management concepts, before initiating costly large-scale field deployments and testing. The testbeds provide a state-of-the-art modeling and analysis platform that will

be a valuable asset not only to the USDOT and its contractors, but to the entire transportation community and researchers to support rigorous and practical analysis, testing, and evaluation of the impacts and benefits of applying various DMA and ATDM applications and strategies. The DMA/ATDM programs are considering investments in vehicle-to-vehicle or vehicle-to-roadway communications technology and dynamic traffic control strategies for improving traffic flow and reducing congestion. They include active traffic, demand, and parking management programs using real time information and short-term predictions under various operational conditions such as high demand, incidents, bad weather, and work zone situations.

INTELLIGENT TRANSPORTATION SYSTEMS

The SHA CHART program includes traditional ITS devices and communications infrastructure along the IS 270 corridor. CHART currently has 15 CCTV cameras along the corridor, with all of them concentrated in Montgomery County. There are eight DMS, though none of them are on either leg of the Y split. Four provide information to northbound drivers, with the other four are facing southbound traffic. Only one of the DMS is in Frederick County (northbound, approaching IS 70). Two RWIS stations exist in the corridor, one at I-370 and the other at MD 109. Fiber optic communications already exists along the IS 270 corridor having been installed as part of a resource sharing agreement. The fiber runs the entire corridor, from Frederick to the Capital Beltway (then to Virginia around the Beltway). Our designers will analyze the need for additional ITS infrastructure to close the gaps in coverage while enabling it to support new technology. Consideration will be afforded to the trade-offs in applying alternative operational strategies as emerging trends indicate that deployment of certain ITS devices may be scaled back as connected and automated vehicles will be more prevalent in future generations.

Our team also has extensive experience in the deployment of ITS infrastructure within Maryland as well as throughout the nation. Our design staff provide an integrated approach from ITS architecture development, master planning, concept of operations, functional requirements, design, construction, systems integration, and systems acceptance testing for CCTV cameras, DMSs, vehicle detectors, RWIS, lane use control signals, variable speed limit signs, toll systems, connected vehicle roadside devices, and communications systems (i.e., wireline and wireless). Representative project experience of our design team is presented below.

- **Intercounty Connector, from IS 270 to US 1, Maryland ITS Design, Prince George's and Montgomery Counties, Maryland** – The Intercounty Connector is an 18-mile, 6-lane open-road toll expressway connecting the IS 270 and I-95/US 1 corridors north of Washington, DC AECOM's involvement with this project began with the planning phase, and continued with the firm being part of the General Engineering Consultant team, overseeing four major design-build construction contracts totaling over $1.5 billion. All four contracts were completed by 2014. With regard to the ITS component of the project, AECOM was instrumental in developing the Transportation Systems Management and Operations (TSM&O) elements, including project development, and preparation of an ITS Concept Plan, showing the types of ITS field devices needed on both the ICC mainline and its interchanging roadways for a complete traffic and roadway monitoring system and traveler information system, including DMS, CCTV cameras, RWIS, toll rate signs, travel/toll information signs, HAR, and vehicle detector systems, as well as the communications network to tie all of these components together. In addition, AECOM developed the conceptual designs for the ITS devices required for a deck-over structure, including lane use-control signals, CCTV cameras and DMS. AECOM also provided systems integration support, which identified the need for a redundant power system and special requirements regarding communication with multiple traffic operations control centers (the Authority Operations Center (AOC) and the ICC Operations Center). Kiewit served as the lead contractor and Mass Electric served as the electrical contractor on Segment B. Refer to complete project summary sheet for more details.
- **ITS Design/Construction Services for I-95 Express Toll Lanes, Section 100, Baltimore County, Maryland** – AECOM, as part of a joint venture, is involved in a six year open-end contract to provide preliminary and final engineering services for widening and improvements to I-95 from south of the I-895 split to north of MD 43. The project includes widening existing I-95 from eight lanes to 12 lanes, via multiple construction contracts. The new I-95 typical section includes two express toll lanes and four local, free lanes in each direction separated by a concrete barrier. AECOM's services specifically related to the ITS design and construction activities include development and coordination with the construction, testing & acceptance, and activation of a redundant fiber optic communication system. The network consists of a 48-count FO ring featuring redundant Layer 3 Ethernet switches and over 45 field deployed Layer 2 Ethernet switches operating over the MDTA's local area network. AECOM also coordinated the site design, construction and activation of the various traffic management and traveler information systems including: 21 CCTV camera locations; 18 DMS installations; 7 electronic Toll Rate Signs (TRS); 4 sets of automatic gates with access control; 2 RWIS locations; 8 Automated Traffic Recorder (ATR) stations; 2 sets of Overheight Vehicle Detection Systems (OVDS); HAR system consisting of 3 synchronized stations; 2 active ORT gantry locations; site work for two future ORT gantry locations; and Travel Time System for the ETL limits utilizing toll transponders for collecting probe data in the system. AECOM coordinated with MDTA and SHA/CHART to implement operational strategies for effective use of the ITS field devices. This included coordination of message development for the traveler information systems for the various stages of construction, up to and including final operation for the completed ETL system.

- **Route 309-104 ITS Design-Build, Montgomery County, Pennsylvania** – AECOM, as part of a design-build team, was responsible for providing engineering services for the design, installation, testing and integration of the Advanced Transportation Management System along a 15-mile-long segment of Route 309, an expressway/major arterial roadway in eastern Pennsylvania. The ITS field devices included 21 CCTV cameras, 9 DMS, advanced detection systems (21 vehicle video and tag readers), and one RWIS station. Communications among these devices and the traffic operations center consisted of a SONET OC-48 fiber optic network. This contract was divided into three phases of ITS deployment, each of which followed the roadway reconstruction projects. As the roadway reconstruction was performed under four individual contracts, this necessitated extensive coordination efforts to ensure that the construction, testing and integration of the ATMS were performed smoothly and in accordance with PADOT standards. In particular, it was imperative that the design/installation of the ITS field devices and the fiber optic communications system at the borders between adjacent roadway construction projects be coordinated and unified. AECOM's coordination, communication, and cooperation were integral to the successful completion of this contract.

ACTIVE TRAFFIC MANAGEMENT / SMART MOTORWAYS

While the primary focus will be to fill the gaps along the IS 270 corridor with the required ITS infrastructure to improve system coverage, ATM / Smart Motorway projects may also be considered to improve vehicle throughput and travel time reliability, particularly within congested segments and during peak periods. These systems will require additional ITS infrastructure in terms of detection, DMS, CCTV cameras, lane use control signs, queue warning signs, and variable speed limit signs. We have experience in the research, planning, design, and operational assessment of ATM / Smart Motorway systems in the US and abroad. These systems include hard shoulder running, all lanes running, as well as other strategies not using the shoulder lane (e.g., speed harmonization). Representative project experience of our design team is presented below.

- **M4 ATM / Smart Motorway, London, England** – AECOM was tasked to deliver a "target cost" package on the M4 Smart Motorway between London and Reading (e.g., Junctions 3 – 12). This included technical project management, developing departures from standards, project controls, site data design, and liaison with third party stakeholders. The Smart Motorway "all lanes running" scheme included lane control signs (e.g., cantilever and portal gantries), emergency telephones, CCTV cameras, Motorway Incident Detection and Automatic Signaling, and an upgrade of the hard shoulder to achieve a permanent running lane. AECOM provided innovative designs that were presented at Highways England Technology meetings which challenged the design guidelines. This resulted in departures from standards being approved by Highways England with a view towards issuing these as best practice solutions to the wider consultancy community for the Smart Motorways Program. Further, AECOM played a key role in the ongoing Smart Motorways and Expressways standards development for future scheme adoption. Refer to complete project summary sheet for more details.
- **M6 ATM / Smart Motorway, Midlands, England** – AECOM designed improvements to the M6, between Midlands and Birmingham (Junctions 10a – 13), by transforming it to a Smart Motorway. This section of roadway is a heavily congested strategic route along England's motorway network. AECOM prepared the detailed design; plans, specifications and cost estimates; conducted construction engineering and inspection; and provided commissioning and handover services for this project. The M6 Smart Motorway will provide improved traffic flow, increased capacity, improved air quality, smarter operations and improved compliance through new lane control signs mounted on gantries, DMS, vehicle detection systems, 100% CCTV camera low light coverage, emergency telephones, emergency refuse areas, speed detection systems for speed compliance of variable speed limits control, and traffic management signage for establishing maintenance closures. Refer to complete project summary sheet for more details.
- **M42 ATM / Smart Motorway, Birmingham, England** – AECOM has been involved in the M42 ATM program since its inception with responsibilities including: establishing benefits of operational regimes; defining monitoring requirements; supporting business & safety cases; identifying fixed signs and markings; and addressing departures from standards. Since the pilot phase, AECOM has continued supporting the development of the Smart Motorways program, helping Highways England Network Operations to identify how they can be deployed in congested locations and further develop the wider concept of Integrated Demand Management that includes Smart Motorways as a principal strategy. AECOM also developed the Network Advisory Sub System as part of the ATM pilot project deployed between Junctions 3a and 7 of the M42, around the eastern perimeter of Birmingham. The NASS reduces the impact of congestion, incidents and construction within the NASS network area. NASS uses congestion patterns to compare traffic conditions to a set of pre-defined thresholds. Thresholds can relate to one or more locations and can take the form of one or more of the following measures: congestion index; traffic flow; traffic density, or travel speed. Congestion patterns can also be linked to detected incidents generated from MIDAS (i.e., loop detection) alerts. MIDAS is a queue-protection system, which will raise an alert, if it detects an incident from the MIDAS induction loops mounted in the carriageway.
- **Ohio DOT, Statewide ATM Program** – AECOM is supporting the Ohio DOT in applying ATM strategies to address growing congestion within their major regional networks (i.e., Cincinnati, Columbus, Cleveland, Akron, Dayton, Toledo). The overall effort includes developing and applying a multi-tiered screening methodology to assess and recommend strategies; preparing an implementation plan for the selected strategies; and developing a pilot program to be implemented in the near-term. AECOM evaluated a broad range of ATM strategies including the following: ramp

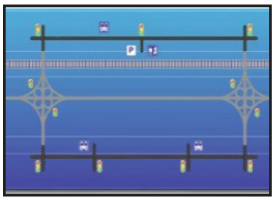
metering, hard shoulder running, speed harmonization, managed lanes, dynamic merge control, queue warning, dynamic lane assignment, etc. Refer to complete project summary sheet for more details.

- **Florida DOT, ATM Guidelines, Fort Lauderdale, FL** – AECOM developed guidelines to share best practices of ATM deployments within Europe and the US; provide a template summarizing typical design concepts, costs and benefits; and address implementation considerations. The ATM guidelines were then presented to a diverse group of FDOT management to address the following: planning & institutional issues; design & construction issues; and operations & maintenance issues.
- **Illinois Tollway I-90 ATM, Chicago, IL** – AECOM is supporting the Illinois Tollway in the design and construction of an ATM along 17 miles of I-90. This will include hard shoulder running and lane control signals used for both speed harmonization as well as incident management. The ATM system will also include video incident detection to automate activation of incident alarms so TOC operators can dispatch emergency vehicles in a timely manner.

DYNAMIC RAMP METERING

Dynamic ramp metering is the use of traffic signals deployed on a ramp to control the rate at which vehicles enter a freeway. In this manner, the flow of traffic onto the freeway becomes more consistent, smoothing the flow of traffic on the mainline and allowing more efficient use of existing freeway capacity. Several cities have deployed ramp metering within the United States, including Chicago, Los Angeles, Minneapolis, Phoenix, Fresno, Sacramento, San Francisco, San Diego, Denver, Atlanta, Las Vegas, Long Island, New York, Cleveland, Philadelphia, Houston, Milwaukee and Miami. In addition to crash reductions, these programs have realized significant travel speed improvements: Long Island: 16%; Houston: 29%; Denver: 36%; and Minneapolis: 15%. Dynamic ramp metering systems may be considered along the IS 270 corridor to improve vehicle throughput and travel time reliability along the mainline. Our team has the complete life-cycle of experience in dynamic ramp metering systems. This includes research, development of guidelines, planning, design, construction, systems integration, development of software tools, and operations. Representative project experience of our design team is presented below.

- **Florida DOT, I-95 Ramp Metering, Southeast Florida** – AECOM prepared a feasibility study and preliminary design of a ramp metering system along I-95 within Broward and Palm Beach Counties, Florida. A total of 67 entrance ramps were analyzed, over the 40-mile corridor, to determine if they meet warrants in accordance with a methodology developed by AECOM. Specifically, the project included the following tasks: data collection; development of future traffic volumes; pre-selection of preliminary ramp metering locations; development of diverted traffic volumes; preparation and validation of traffic simulation models; detailed analysis of pre-selected ramp metering locations; preparation of an enforcement plan; development of 30% design plans; benefit-cost analyses; implementation and roll-out plan; concept of operations; ramp metering systems integration plan; public outreach plan; and presentations to the FDOT, MPO and municipalities. The recommended locations for ramp metering are being integrated into the I-95 Managed Lanes Expansion Program. AECOM has also supported FDOT District 6 (Miami) during the implementation and operation of the first ramp metering program in the state (I-95) where our role included the following assignments: ramp metering best practices, construction engineering & inspection, systems acceptance testing, operations, warrant analyses, and public outreach.
- **Pacific Motorway (M3) Ramp Metering, Queensland, Australia** – AECOM developed a ramp metering operations strategy reference document for use on the Pacific Motorway (M3). While this reference document is specifically tailored to the M3, it is expected that many elements will be applicable to all motorways and will serve as a prototype for the development of ramp metering for other managed motorways. This document addresses the need to work seamlessly and synergistically with other ITS technologies such as Lane Use Management Signs, Variable Speed Limit, Variable Message Signs, and CCTV cameras.



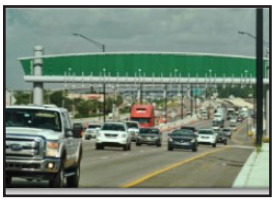
INTEGRATED CORRIDOR MANAGEMENT

Another strategy that may be considered along the IS 270 corridor is the application of Integrated Corridor Management. This strategy would provide a higher level of operational integration between IS 270, parallel collector-distributor roads, as well as possibly transit (and park & ride) connections. This ICM deployment may result in connecting the individual network-based transportation management systems (complete with central hardware and servers, data base, decision support software, joint sharing of command and control activities, etc.); or may just be a set of operational procedures agreed to by the network owners with appropriate linkages between their respective systems. Our team has relevant experience in the development, design, and evaluation of ICM systems. Representative project experience of our design team is presented below.

- **I-880 Integrated Corridor Management, Alameda County, CA** – The Metropolitan Transportation Commission contracted with AECOM to perform Systems Engineering and preliminary ITS design for the I-880 ICM program. AECOM worked with MTC and local agency staff to develop a system that provides integration of multiple existing operations components (traffic signal systems and Alameda County Smart Corridor systems), as well as new operations and ITS components. AECOM prepared the following project documents: Project Study Report/Project Report; multiple systems engineering documents (Systems Engineering Management Plan, Concept of Operations, High-Level and Functional Requirements,

Performance Evaluation Plan, and Detailed Design Requirements); preliminary ITS component layouts (DMS, fiber optic communications, wireless communications, CCTV cameras, microwave vehicle detection, and upgraded controller cabinets).

- **FHWA Integrated Corridor Management Pilot Program, San Diego and Dallas** – AECOM has supported FHWA on the evaluation of the two initial pilot programs for ICM in San Diego and Dallas. The evaluation focused on documenting the benefits of ICM through improvement in corridor performance using realistic and useful metrics. AECOM focused on the following analysis areas: capability to monitor, control, and report on the status of the corridor; corridor mobility performance, and evaluation of decision support system; and provided support to the evaluation of other areas. The scope of this project included stakeholder meetings and workshops held at the demonstration sites to gather information used to develop evaluation test plans; identification and definitions of performance measures; identification of data needs and sources; development of evaluation methodologies; development of site specific evaluation test plans; data collection; conducting evaluation; and development of the evaluation report.
- **I-95 Integrated Corridor Management, Fort Lauderdale, Florida** – AECOM prepared the Concept of Operations for the 25-mile corridor within Broward County. The ConOps provides an overview of the I-95 ICM concept within Broward County, describes current operations within the corridor, how they will function in the near term once the ICM concept is operational, and identifies current and future responsibilities of stakeholders. AECOM subsequently prepared the successful FHWA grant application which was awarded to the Broward MPO and the project is currently being advanced.



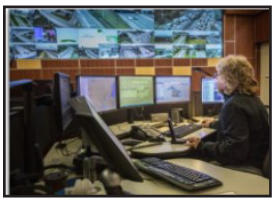
REVERSIBLE LANES

Reversible lanes allow one or more lanes on a facility to shift direction throughout the day to accommodate traffic patterns such as morning and evening peaks. There needs to be a large directional flow during peak periods to make this a viable solution (e.g., minimum 60% peak direction). Lane control signals, special pavement markings, and sometimes automated gate systems are used to inform motorists of lane direction and movements. The existing HOV lanes, within the middle of the IS 270 corridor, may be considered for reversible operation by utilizing the existing northbound HOV lane as an additional southbound lane during the AM peak period and using the existing southbound HOV lane as an additional northbound lane during the PM peak period. We have already begun a dialogue with providers of movable barrier systems to explore the idea of using a reversible lane system. Engineering analyses will need to be conducted to determine how to design and build these lanes without impacting the existing piers supporting bridge overpasses; whether a zipper lane with movable barriers is a viable solution; whether automatic gate systems would be effective; whether one lane can be designated HOV and the other lane designated as a General Purpose Lane; whether the reversible lanes should be considered express lanes and what are their project limits; as well as the need to address enforcement and incident management issues. Our design team has designed and operated reversible lanes projects for freeway, HOV, managed lanes and tunnel facilities. Representative project experience of our design team is presented below.

- **I-595 Reversible Lanes, Fort Lauderdale, FL** – The I-595 Corridor Roadway Improvement project consists of the reconstruction of the I-595 mainline and all associated improvements to frontage roads and ramps for a total length of approximately 10.5 miles. The design and construction cost of the project was approximately $1.2 billion. One of the major project components included the construction of three ground level reversible express toll lanes with a direct connection to the Florida's Turnpike. These lanes are operated as managed lanes with dynamic tolls to optimize traffic flow, and reverse direction during peak travel times (eastbound in AM and westbound in PM). AECOM, serving as the lead engineering firm as part of a Public-Private Partnership team, was responsible for overall management of all aspects related to the design and coordination with the Concessionaire. AECOM provided design services associated with a toll equipment building and three ITS communication hubs, and ITS infrastructure design services for the deployment of various ITS elements for the Managed Lanes and general purpose lanes. The ITS devices deployed as part of the project included 35 CMS, 7 Lane Control Signs, 52 CCTV cameras, 8 Freeway DMS, 7 Arterial DMS, 93 Microwave Vehicle Detectors, 6 HAR signs, 3 warning gates and a barrier gate at every access point to the Reversible Lanes. Refer to complete project summary sheet for more details.
- **I-64 Reversible Lanes, Hampton Roads, VA** – AECOM was involved in virtually all phases of the I-64 HOV Reversible Roadway system in Hampton Roads, Virginia. The HOV Reversible Roadway system operates along eight miles of I-64 on the approach to the Norfolk Naval Base - one of the largest naval bases in the world. AECOM prepared the design, provided construction engineering & inspection and provided operations & maintenance services for 21 years. This included the design of the system that was constructed within the median of the existing roadway as well as the intelligent transportation surveillance and control system for the remaining general purpose lanes on both sides of the reversible roadway. AECOM prepared the system specifications; oversaw the software installation and subsequent upgrades; and conducted system acceptance

testing. The HOV Reversible Roadway consists of five gate sets. Each gate set has six gate arms and one or more DMS associated with it. Each gate set also has several CCTV cameras to provide a view of the gate set and its access point.

- **PennDOT, I-279 HOV Lane Surveillance and Traffic Control System, PA** – AECOM was responsible for the planning and design of a barrier separated 6 mile reversible HOV system. The design of the barrier separated HOV facility required the installation of both shared entrance/exit ramps and separated entrance/exit ramps based on the physical feature of the adjoining Interstate and major arterial roadway. AECOM designed a custom HOV Software Platform to allow TMC Operators to easily manage and control the operation of the HOV Facility. A wrong way detection system was designed and implemented for the entire system with wrong way detectors at each entrance/exit gate location. Each gate location makes use of a traffic controller which is interconnected fiber optically to all gate locations in addition to the TMC.



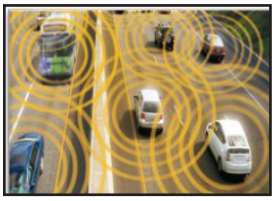
TRANSPORTATION OPERATIONS CENTERS

It is assumed that operations of the technologies to be included as part of the IS 270 project will be conducted from the CHART State Operations Center. The SOC is in need of improvements with or without the IS 270 project. Consideration should be made to include SOC upgrades as part of this project such as: installation of new workstations and furniture systems; upgrade of the video wall system including back end software; stand-alone software tools to ultimately be integrated with the existing CHART ATMS software to operate these new technologies; development of SOPs and training materials to operate the new technologies; and operational support at the TMC during the last few months of the design-build contract to ensure a proper transition to SHA staff.

Our team has experience in Transportation Operations Centers. AECOM is a global leader in the design, construction, and operations of TOCs. AECOM has provided ITS operations in over 40 TOCs, thereby providing an end-user perspective as to design and integration requirements. Specifically, they provide needs analysis, functional layouts, architectural/engineering and systems design, construction inspection, managing and staffing, assessments of existing facilities, standard operating procedures, training, certifications, IT/Network management, public outreach, and performance management. Representative project experience of our design team is presented below.

- **CHART SOC Reconfiguration, MD** – SHA retained AECOM to assess the existing layout of the State Operations Center and recommend alternative control room configurations to address current and future operational needs. Specifically, the following issues were addressed: console types and layout; video wall usage and configuration; scalability to accommodate future growth; system redundancy; security issues; lighting; continuity of operations; and other control room space needs.
- **Georgia DOT, Navigator TMC Reconfiguration, Atlanta, GA** – GDOT retained AECOM to design the reconfiguration of the TMC control room and associated support spaces to accommodate the growing express and reversible lanes regional network within the Atlanta metropolitan area. Specifically, AECOM was responsible for the following tasks: concept of operations; functional requirements; construction drawings, specifications & estimates; and construction services. AECOM used workshops between GDOT and the State Road Toll Authority to build consensus on the approved design concept, then prepared the design and construction drawings addressing all required disciplines (i.e., architecture, furniture, mechanical, electrical, communications, systems).
- **Florida DOT, TMC Reconfiguration, Miami, FL** – FDOT retained AECOM to redesign the existing TMC to accommodate the growing managed lanes regional network as well as the evolving TSM&O program. AECOM prepared design drawings that accommodated the growth in workstations from eight to 24 within the control room; developed specifications of the various types of work stations; prepared specifications of the video wall replacement; and provided construction engineering & inspection of all work.

In addition, AECOM has designed new TMCs in Los Angeles, Orange County, and Irvine, California; Austin, Texas; Harrisburg, Pennsylvania; Fort Lauderdale, Florida; and many other similar facilities. Furthermore, AECOM has a staff of software developers that are dedicated to their ITS practice that develop software applications and ATMS software to improve operations.



CONNECTED VEHICLES

Connected Vehicle applications may be considered as part of the IS 270 project to improve travel time reliability, safety, mobility, performance measurement, and asset management. We would need to first carefully assess the needs of the IS 270 corridor to determine its justification and how it may support other strategies (e.g., ATM, Smart Motorways, ICM, Reversible Lanes). Subsequently, we would identify connected vehicle infrastructure needs in terms of the communications infrastructure, roadside devices, and back office hardware and software. This may include installation of Dedicated Short Range Radio Communications equipment (transmitters/receivers) on SHA vehicles as well as installation of DSRC readers at a few critical locations along the IS 270 corridor. AECOM is playing an important role in the connected vehicles space. Specifically, AECOM has supported their clients in the areas of Connected Vehicles in a number of ways provided on the next page.

- **Illinois Tollway Connected Vehicles, Chicago IL** – AECOM is supporting the Illinois Tollway with designing receiver spots along their system where they will collect vehicle data (e.g., speed, windshield wiper, location, etc.) and initially use it for ramp queue detection and smart work zones. AECOM's services include developing a connected vehicle vision, communications (including DSRC) installation, coordinating with stakeholders for probe vehicle opportunities, and outfitting Tollway vehicles with aftermarket connected vehicle devices.
- **Colorado DOT, C-470 Design-Build, Denver, CO** – AECOM, as part of a design-build team, is designing the ITS and connected vehicle infrastructure as part of improvements to the C-470 corridor. C-470 is a 12 mile corridor that will expand and establish an express toll lane in each direction. AECOM is responsible for the design of the Connected Vehicle/ITS/Tolling systems including: 33 DSRC Sites; 7 Cashless Tolling Points; 30 CCTV Cameras; 3 VMS;16 Tolling VMS; 28 Microwave Detectors; 17 Travel Time Indicators; 28 AVI Antennas; 7 AVI Readers; and 12 Ramp meters VMS. Refer to complete project summary sheet for more details.

- **Michigan DOT, Connected Vehicles, MI** – AECOM has supported the Michigan DOT with developing connected vehicle guidance documents that include procurement, design, testing, and maintenance. AECOM is also conducting a study for the Michigan DOT to address Connected Vehicle Data Applications for TOCs to evaluate data sets available from the MDOT Connected Vehicle Program and how they may be directly applied to support the functions of MDOT TOCs. MDOT TOCs utilize a variety of data and systems to support the execution of the following primary TOC operational objectives: incident management (locate, confirm, respond and safely clear roadway incidents to maintain normal operations); system performance monitoring and forecasting (measure and monitor real-time roadway and ITS system performance to understand when, where and how travel conditions may change; and traveler Information dissemination (disseminate timely, accurate and reliable travel data to stakeholders).

AUTOMATED VEHICLES

As part of the IS 270 project, automated vehicle test beds may be considered, particularly if implemented as part of the reversible lanes strategy. Public-Private Partnerships may be considered where the auto manufacturers use one of the reversible lanes not assigned to HOV to accommodate autonomous vehicles. As the penetration of autonomous vehicles grows over time, more vehicles would likely use this dedicated lane thereby increasing vehicle throughput. The OEM may assess a user fee which would generate revenue to offset the costs of construction, operations and maintenance. As the safe driving distance can be much closer than human driven cars, the capacity and revenue generation would likely increase over time. A revenue sharing arrangement may be negotiated between the OEM and the DOT over a certain concession period (e.g., 35-50 years). This strategy would enable the OEMs to phase in autonomous vehicles at a faster rate while generating revenue for both parties.

Our team is providing guidance to both national and international clients on automated vehicles. For example, AECOM is investigating New Zealand's technical readiness to support the deployment of automated and connected vehicles. This research is focused on the necessary infrastructure, technologies and systems to support level three and four vehicle automation and connected vehicles. Automated and connected vehicles rely on a combination of mapping, sensor and communication technologies, including, but not limited to, global navigation satellite systems (GNSS), radar, stereo cameras, Lidar, cellular and direct short range communication. As part of this research, estimates are made with regards to automated vehicle penetration within different timeframes as well as roadway infrastructure requirements.

TRAFFIC INCIDENT MANAGEMENT

While it is recognized that Traffic Incident Management is not a technology solution, it can play an important role in achieving the goals of the IS 270 project in terms of improving vehicle throughput and travel time reliability. Innovative TIM strategies, such as the Severe Incident Response Vehicle program developed by AECOM (described below), may be considered in addressing non-recurring congestion within the IS 270 corridor. We would be available to organize, implement, and operate a similar program during the Design-Build contract period. The design team has extensive TIM experience at the Federal, State and regional levels. This experience encompasses the preparation of incident management manuals; training; operating service patrols; start-up of new TIM teams and conducting meetings; preparing TIM strategic plans; etc. Representative project experience of our design team is presented below.

- **Florida DOT, Severe Incident Response Vehicle (SIRV) Operations, Southeast Florida** – AECOM developed the pilot program, then subsequently has provided continuous operational services on the successful SIRV program during the past ten years. Specifically, AECOM represents FDOT at Level 2 and 3 incidents along the interstate highways within Broward and Palm Beach Counties. AECOM developed and implemented SOPs; interviewed and hired Traffic Incident Managers; designed and oversaw the building of the initial SIRV Command Vehicle and future upgrades; held intra-agency informational meetings; made presentations at Local and State TIM meetings; developed training modules and participated in training service patrols and TMC staff. AECOM brings innovations and improvements to the incident management program. Specifically, AECOM's innovations contributed to improving SIRV, including: small spill cleanup absorbent materials; bleach spray containers;

strategic truck staging to save fuel; traffic signal control "pickles" for law enforcement officers; and AECOM exclusive authorization for "Code 3" lights and siren response. The SIRV program started as a one-year pilot project in 2005. Upon an independent assessment documenting a BCR=42.75, the program was made permanent, expanded and continues to be a critical component of ITS operations within Southeast Florida.

- **Florida DOT, Traffic Incident Management Consultant, Southeast Florida** – Over the past decade, AECOM has provided TIM services to FDOT Districts 4 in five counties: Broward, Palm Beach, Martin, St, Lucie and Indian River. These services focus on a variety of activities relating to incident management on the interstate highway system, primarily I-95, I-75 and I-595. AECOM is responsible for developing TIM team meeting agendas; facilitating and documenting meetings; identifying and researching team issues; acting as liaison between the teams and various governmental agencies and legislatures; attending various TIM-related meetings, workshops, etc. throughout the state; and providing incident management training. AECOM also provides training to the Safety Service Patrol to raise the level of their expertise by introducing best practices in service patrol and incident management operations. The project was very successful in taking TIM to the next level by applying the FHWA Self-Assessment tool and using it as a guide in developing a TIM Strategic Plan to address the legacy program's deficiencies.
- **Virginia DOT, Safety Service Patrol Operations, VA** – AECOM provided Safety Service Patrol Operations within four of the five regions across the Commonwealth. Specifically, AECOM provided 144 trucks, equipment and operators for the Eastern Region; Central Region; Southwest Region; and Northwest Region. During the multi-year contracts, AECOM developed SOPs; provided training and certifications; and implemented several innovations. One innovation was "SSP in a Box" - a modular approach to installing and supporting the equipment that needs to be externally mounted in an SSP truck, which can be easily shifted between trucks. Another innovation was the "Hot Spot Analysis Tool" to assign SSP coverage in the most cost-effective manner.

EMERGING TECHNOLOGIES

Our team will consider other innovations to address the goals of the IS 270 project. These may include emerging technologies such as dynamic lane assignment, electric vehicle recharging lanes, solar panel systems, etc. some of which may feature cost-sharing agreements to possibly offset O&M costs. AECOM was recently selected by the Colorado DOT for the RoadX contract. AECOM will be supporting the Department to assess the viability of emerging technologies for integration with their transportation system. The goals of the RoadX project is to improve vehicle throughput and reliability; reduce crashes; incentivize the use of automated vehicles and accelerate their market penetration; provide safety and mobility benefits on roads other than the RoadX Corridor; and showcase the potential of a highly technologically advanced vehicle fleet and transportation infrastructure to improve safety, reliability and efficiency. To date, potential projects proposed by AECOM include the following: Dynamic Lane Assignment; Dynamic Roadway Electrification and Partnerships; Integrated Situational Awareness and Operational Systems; Tethered Semi-Autonomous Snow Plows; Smart Freight Data and Systems; Freight Permitting and Security; and Safety and Congestion Predictive Modeling.

ITS CONSTRUCTION

Our team also has experience incorporating highly technical electrical systems into many large scale design-build projects throughout the country. While ITS is typically one of the last activities to fully function on a project, much of the critical infrastructure is completed early on such as conduit, fiber, foundations, equipment procurement, and significant coordination. Once the key infrastructure is installed, our team has done an excellent job providing multi-discipline coordination to ensure new and existing infrastructure is not damaged during excavation and drilling operations, and design is coordinated to avoid conflicts. Mass Electric, a wholly owned subsidiary of Kiewit, has been a key partner on multiple design-build roadway projects involving ITS.

SR 202L Widening Design-Build – The SR 202L Widening Design-Build project was completed in 2011, with Kiewit serving as the lead contractor and URS, now part of AECOM, was the lead designer. This 12-mile widening had a substantial ITS component as part of the project scope. Kiewit held various ITS design workshop at the start of the project that included personnel involved in the design, construction, testing and maintenance of the ITS system. Our team also performed an early inventory and evaluation of the elements that existed preconstruction. The final FMS system was supported by a new fiber optic trunk line that ran the entire length of the project that required significant splicing efforts on a circuit by circuit basis. Existing devices were maintained at their existing locations until the new system was functional. The conversion of device from one media to another was coordinated with the ADOT personnel so that they could make any changes to the node equipment. The project included new CCTV cameras, six new DMS Daktroniks signs, loop detection with and pole mounted detection and ramp metering. Before substantial completion, our team began the final testing of the entire system. ADOT commented that the Kiewit team was the first contractor in ADOT's history to complete the testing in the first attempt.

ICC-B – The ICC-B design-build project was completed in 2011, with Kiewit serving as the lead contractor. Kiewit installed 6 tolling gantrys, 714 miles of conduit and fiber installation, coordinated fiber installation and testing with neighboring contracts and SHA's ITS subcontractor. The electrical system was a schedule critical component of the project to balance SHA's consultant resources. Mass Electric was brought to the project during preconstruction to aid to design development and constructability. Once construction began, Mass Electric participated in long term scheduling, daily coordination, and self-performed the major electrical work on the project.

INTERCOUNTY CONNECTOR, MDSHA
Prince George's and Montgomery Counties, MD

The Intercounty Connector (ICC) is an 18-mile long multimodal highway, connecting the IS 270 and I-95/US 1 corridors north of Washington, D.C. The selected alternative included a six-lane section with variable width median, 60 mph design speed, open-road tolling, and extensive environmental mitigation and enhancement.

Design: As a consultant to SHA during the NEPA Planning Study, AECOM's responsibilities included project management, co-general engineering consultant, and technical lead for the Human Environmental Impact Studies. In these roles, AECOM either led or coordinated the efforts of other consultants to prepare detailed planning, transit ridership projections, traffic analysis, environmental documentation, air and noise analyses, socioeconomic studies, cost estimates, public involvement, and public hearing displays.

As part of the ICC Corridor Partners joint venture, AECOM continued work on the ICC by providing general engineering consultant (GEC) services to the Maryland Transportation Authority and SHA. Continuing past ROD, through the preliminary design and procurement of the four major design-build construction segments, these services included planning and preliminary design of highways, bridges, environmental features, traffic control devices, intelligent transportation systems (ITS), and electronic toll collection (ETC) systems.

As a multimodal highway, the ICC provides a travel way for high quality east-west express bus service to serve the study area. The AECOM team analyzed the projected transit ridership for the express bus service included with each alternative. The ICC transit service was modeled for all alternatives and incorporated six representative ICC express routes and five local feeder routes, as well as all of the transit features in the FY 03 Metropolitan Washington Council of Governments (MWCOG) Constrained Long Range Plan (CLRP). Express bus ridership for 2030 was estimated by analyzing the results of the mode split and transit assignment components of the MWCOG travel forecasting model and other factors such as bus headways, stop locations, and travel times that were assumed for each route.

PROJECT RELEVANCE

- Design-build
- Program management
- ITS Tolling Sites
- ETC and ITS Design
- Construction of ITS, traffic signals and corridor lighting
- Traffic maintenance and management
- Environmental permitting
- QA/QC
- Interstate geometrics (horizontal/vertical)
- Bridges; steel & concrete
- Noise walls (up to 22')
- Retaining wall systems
- Signs, sign structures, and foundations
- Milling and overlaying existing pavement
- Deep & shallow foundations
- Erosion and sediment control
- 500,000 tons of asphalt paving
- 54,000 LF of storm drainage
- 325 acres of clearing
- 80 acres of reforestation
- Constructed 8 SWM ponds and 2 underground storage containment structures
- Coordinated with SHA and stakeholders including Montgomery County, MDE, USFWS, M-NCPPC, MDNR, USACE, EPA, utility companies, environmental agencies, county agencies, adjacent landowners, and community organizations.
- Public involvement coordination

Construction: Kiewit was the lead constructor for the joint venture for the design-build Inter-County Connector, Contract B (ICC-B), which consisted of the middle segment of the ICC automated toll way. The work included more than seven miles of new six-lane highway design and construction through some of the most environmentally sensitive and heavily populated areas in the Baltimore/Washington corridor. Construction began in January 2009 and the roadway was open to traffic in November of 2011, resulting in approximately 1.2 lane miles designed and constructed every month. Key elements included a diamond interchange at MD 182, intelligent transportation systems, electronic tolling collection ,a single point urban interchange (SPUI) at MD 650, and 10 new bridges. Contract B was one of the most technical sections and was completed under budget and ahead of schedule.

SUCCESSFUL METHODS/APPROACHES

Design Management – As part of multiple on-going Design-build projects, the GEC provided oversight of all aspects of design, including highway, structures, water resources, geotechnical, utility, and traffic.

Construction Management – the GEC staff was co-located with each design-build team to administer construction and conduct quality oversight. This included resident engineer services, quality oversight inspectors, and extensive environmental oversight.

Environmental Stewardship/Mitigation – responsible for acquisition of NEPA approvals, permitting, environmental construction monitoring, and management of approximately 63 separate construction contracts involving environmental mitigation/enhancement and community based improvements.

While there was no live traffic on the ICC, the corridor intersected five major roadways which could not be closed during construction. MOT at four of these locations included a temporary detour around the ICC site, during which time our team elevated the intersecting roadway over the ICC and switched traffic back on to the roadway and new bridge before continuing construction of the ICC underneath. The ICC spans over one intersecting roadway. During beam setting and overhead work at this location, traffic was detoured to avoid lane closures. The project required a full-time public outreach team that proactively addressed the upcoming concerns and issues that arose to ensure the community was informed and satisfied with the project.

The ICC project experienced a 6-month delay to start-up due to proposal protest procedures and experienced numerous delays after start-up, in the approval and issuance of grading permits by the Maryland Department of the Environment (MDE). Delays in start-up were overcome by a couple of key steps. Kiewit began design, mobilization and procurement activities "at risk" to ensure a rapid start-up when available. The other was overcoming the

start-up delay by working with the owner to develop a Limited Notice to Proceed, which allowed a limited number of critical activities to begin that were beneficial to the project regardless of the protest outcome. The tightly scheduled project was completed on time and SHA was able to open to traffic as planned. Grading permit issues were overcome by breaking the project into select areas that allowed work to begin in some areas as issues in other areas were addressed as the design advanced.

INNOVATIONS

With specific regard to planning of Intelligent Transportation Systems (ITS) for the project, AECOM has performed the following:

- "Over-the shoulder" review of ITS field device and communications plans/specifications
- Development of an ITS Concept Plan
- Development of conceptual designs for the ITS devices necessary for a deck-over structure
- Development of the Request for Proposal for each of the four Design-Build contracts
- Review and evaluation of Alternative Technical Concepts
- Evaluation of the submitted technical and price proposals.
- Coordination with the MDTA's Toll Systems Integrator.

With specific regard to design/construction of ITS, AECOM performed the following:

- "Over-the shoulder" review of ITS field device and communications plans/specifications
- Formal assessment of design submissions by the Design-Builds
- Trouble-shooting unanticipated problems in the field
- Acceptance testing and activation support of all ITS field devices and communication system
- Assisting MDTA with system performance monitoring during the post-construction period.

Environmental mitigation included wildlife monitoring, management of mammal passage, turtle and trout relocation programs, reforestation efforts, and pre and post-construction water quality monitoring. The team utilized an extensive sediment and erosion control system and minimized equipment idle time to reduce emissions.

The project requirements called for numerous environmental protections, mitigations, and construction methods. One example involved early clearing and grubbing packages prior to commencing construction, allowing the relocation of wildlife. A turtle exclusion fence was installed along the limit of disturbance to prevent the Eastern Box Turtle from migrating back into the work area. After the fence installation, multiple field sweeps were performed to capture and relocate more than 520 turtles. Specially trained dogs were used to locate and retrieve the turtles. All rescued turtles were relocated to a suitable habitat outside of the project's right-of-way. Fish were also removed and blocked from returning to areas of instream work.

To fully address potential impacts during the proposal phase, our environmental and design teams worked closely to design ICC-B with a comprehensive set of avoidance, minimization and mitigation to protect the environment to the utmost extent. Environmental design functions included environmental studies and documentation required for design modifications; preconstruction baseline environmental monitoring; environmental reviews during design for additional avoidance and minimization; validation, verification of existing environmental features; environmental design for wetland, streams, fish passage, vernal pools and reforestation similar to Norwich Creek and the associated floodplains; and training construction field staff on environmental issues.

For Contract B, bridges over parks and streams were built longer than normal to lessen the amount of environmental impact in these sensitive areas and allowed greater clearance for wildlife and vegetation. The path of the ICC roadway was also lowered into the ground near existing communities to reduce noise and visual impacts.

AWARDS

- The project received an "A" (Excellent) cumulative rating from the Maryland Department of the Environment on more than 150 inspections
- Design, construction, and program management were assessed by SHA and contract conformance was scored using a quality oversight database. The project ended with the project team earning a 95% conformance rating and meeting all key project goals
- 2013, ENR Northeast Region Best Project
- 2012, ARTBA 2012 GLOBE Award for Major Highway, Project Greater than $100M
- 2012 Maryland Quality Initiative Silver Partnering Award
- 2012 National Design-Build Award, Transportation

I-595 REVERSIBLE MANAGED LANES, FDOT Fort Lauderdale, FL

The I-595 Corridor Roadway Improvement project consisted of the reconstruction of the I-595 mainline and all associated improvements to frontage roads and ramps from the I-75/Sawgrass Expressway interchange to the I-595/I-95 interchange, for a total length of approximately 10.5 miles. A major project component of this $1.2B project included the construction of 3 ground-level reversible express toll lanes, serving express traffic to/from the I-75/ Sawgrass Expressway from/to east of SR 7, with a direct connection to the Florida's Turnpike. These lanes operate as managed lanes with dynamic tolls to optimize traffic flow, and reverse direction during peak travel times (eastbound in AM and westbound in PM). The project included the managed lane access control subsystem consisting of status changeable message signs, lane control signals, warning gates, barrier gates and CCTV cameras dedicated to monitor the managed lanes and to provide the operators with the ability to safely manage the reversible flow system.

AECOM managed all aspects related to the design and coordination with the Concessionaire. AECOM also provided architectural services associated with a toll equipment building and three ITS communication hubs, and ITS infrastructure design services for the deployment of various ITS elements for the managed and general purpose lanes. The ITS devices include 35 changeable message signs, 7 lane control signs, 52 CCTV cameras, 8 freeway dynamic message signs, 7 arterial dynamic message signs, 93 microwave vehicle detectors, 6 highway advisory radio signs, 3 warning gates and a barrier gate at every access point to the express lanes.

PROJECT RELEVANCE

- P3 (DBFOM)
- Three reversible express lanes in median
- Reversible express Lanes access control gates
- ITS Tolling sites
- Environmental permitting
- Utility coordination and relocation
- Traffic maintenance and management
- Public involvement and stakeholder coordination
- Interstate geometrics (horizontal/vertical)
- Bridges; steel & concrete
- Stormdrain and SWM
- Noise walls (up to 22' tall)
- Retaining wall systems
- Traffic control devices
- Signs, sign structures, and foundations
- Milling and overlaying existing pavement
- Deep foundation & shallow foundations
- QA/QC

WELL-MANAGED PROJECT

The project was managed using a transparent project execution plan, which included performance expectations including, quality reviews, design criteria and standards, and communication protocols for the team. During the design phase, the QA/QC team completed quality audits of each team office, including subconsultants to confirm compliance with the quality program. Project cost and schedule goals were achieved through collaboration with the Owner, Concessionaire, Contractor and design team. Design innovations were worked through joint design workshop sessions that included the Owner, Concessionaire and Contractor. This partnering approach contributed to achieving the on time project completion.

OPERABILITY/MAINTAINABILITY/ADAPTABILITY

Managing the MOT on this high-volume corridor was completed through the same partnering approach that was used during the initial design phase of the project. The planning and development of the MOT was approved, however, continuous monitoring of the progress of work and improvement to traffic patterns facilitated a successful construction phase. Key factors to successfully managing the MOT during construction included maintaining the equivalent number of traffic lanes that existed preconstruction; having early coordination of lane closure requests with the CEI and Owner; maintaining the MOT designer co-located with construction during the construction phase.

MOBILITY AND SAFETY

The project included the widening of the existing highway to accommodate three, new 10.5-mile reversible toll lanes in the median of a six-lane interstate highway and improved traffic in the Fort Lauderdale area. The project included 63 bridges that were built or reconstructed, including widening (partial or complete demolitions of existing structures at nine interchanges), new steel girder and concrete girder bridges with spans up to 158.1 feet, seven braided ramps with integral post-tensioned pier caps, four-span steel girder bridges with spans up to 211.9 feet and 3 miles of widening along Florida's Turnpike, including a direct express lane connection. Key project features included:

- Reducing/eliminating congestion and thereby reducing hours of travel for local commuters, tourists and freight by providing congestion pricing of the three reversible express lanes.
- Enhancing driver safety, mobility and connectivity with state-of-the-art gate access and emergency access gates to the three express lanes.
- Providing economic contributions during construction with more than 275 local companies employed on this project, with more than 2,000 employees per month working directly on the project.
- Creating conditions for future business and economic growth.
- Providing positive environmental benefit by improving air quality and construction of sound barrier walls that provide noise abatement for 20 communities.
- Providing an option for improved quality of life by construction of the New River Greenway (pedestrian and bike path) and Express Bus service within the corridor.
- Delivering the project on time and budget and thereby reducing inconvenience to commuters and saving taxpayers money.

M4 J3-J12 & M6 J10A 10 13 SMART MOTORWAY, HIGHWAYS ENGLAND
London, Midland, UK

AECOM has been working with Managed Motorways for more than 10 years, covering whole project lifecycles including feasibility-preliminary design-options engineering, development of consent orders, detailed design engineering, supervision and construction support-commissioning and handovers.

This project has two distinct sections:

- **Junctions 10a to 11a.** This section between the M54 at junction 10a and the M6 toll at junction 11a will have the benefit of controlled motorway technology, which uses gantry signing to control lane discipline and speeds. Hard shoulder running will not be provided over this section. The new works will provide dedicated slip road lanes at the interchanges with M54 and M6 toll. This will help accommodate the high flows expected to enter and leave the M6 at these motorway interchanges.
- **Junctions 11a to 13.** This section from the M6 toll to Stafford will have permanent (by default) hard shoulder running as well as the technology to vary mandatory speed limits. A number of information signs and signals on gantries will be installed as part of the improvement scheme.

The project will provide improved traffic flow, increased capacity, improved air quality, smarter operations and improved compliance through new signalised gantries, message signs, vehicle detection systems, 100% CCTV low light coverage , emergency telephones, emergency refuse areas, speed detection systems, for speed compliance of variable speed limits control and traffic management signage for future ease of setting out maintenance closures.

PROJECT RELEVANCE

- Technical project management
- Project controls
- Site data design
- Liaison with third party stakeholders
- Cost estimates
- Heavily congested roadway
- Construction inspections
- Vehicle detection systems
- CCTV cameras
- Speed detection systems

WELL-MANAGED PROJECT

For the M4, AECOM delivered a Target Cost package to detail the design stage including technical project management, producing Departures from Standards, Highways England Project Control Framework (PCF) Products, site data design and liaison with third party stakeholders. The scheme also included motorway signalling (cantilever and portal gantries), emergency telephones, CCTV subsystem, Motorway Incident Detection and Automatic Signalling (MIDAS) with an upgrade of the hard shoulder to achieve a permanent running lane.

OPERABILITY/MAINTAINABILITY/ADAPTABILITY

AECOM provided innovative designs that were presented at Highways England Technology meetings, which challenged the **Highways England Design Guides**. This resulted in departures from standards being approved by Highways England with a view to issuing these as best practice solutions to the wider consultancy community for the Smart Motorways Programme. Innovations included developing standards for the installation of Side-Fire RADAR and temporary traffic maintenance signage for use on the Highways England Network. Further, AECOM was instrumental in the ongoing Smart Motorways and Expressways standards development for future scheme adoption.

AECOM is working to improve the M6 by making it a smart motorway between junctions 10a and 13 close to Birmingham, which is a heavily congested strategic route on England's motorway network. AECOM produced the detailed design, construction supervision, commissioning and handover duties for this project.

MOBILITY

The M6 Smart Motorway will provide improved traffic flow, increased capacity, improved air quality, smarter operations and improved compliance through new lane control signs mounted on gantries, DMS, vehicle detection systems, 100% CCTV camera low light coverage, emergency telephones, emergency refuse areas, speed detection systems for speed compliance of variable speed limits control, and traffic management signage for establishing maintenance closures.

ATDM-MANAGED LANES PROGRAM, ODOT
State of Ohio

AECOM is assisting the Ohio Department of Transportation (ODOT) in evaluating the application of Active Traffic and Demand Management strategies, including Managed Lanes, to address growing congestion within their major regional networks (i.e., Cincinnati, Columbus, Cleveland, Akron, Dayton, Toledo). The overall effort includes developing and applying a multi-tiered screening methodology to assess and recommend strategies; preparing an implementation plan for the selected strategies; and developing a pilot program to be implemented in the near-term.

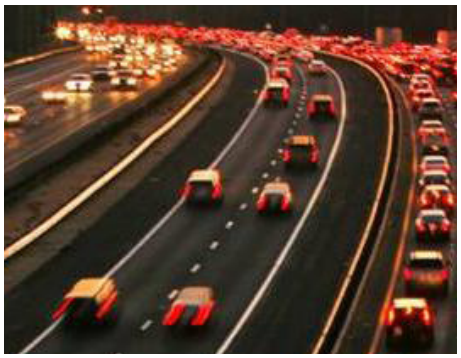
AECOM worked with ODOT to identify and define its goals and objectives, as well as the opportunities and constraints with respect to ATDM and managed lanes strategies. This was followed by applying the screening methodology to identify priority statewide corridors considering volume/capacity ratios, average daily traffic (ADT), truck volumes, roadway classification, population, system connectivity and employment.

PROJECT RELEVANCE

- Design-build
- Overhead managed lames
- Vehicle detection systems
- ITS tolling sites
- CCTV monitoring
- Utility coordination and relocation
- Traffic maintenance and management
- Public involvement and stakeholder coordination
- Retaining wall systems
- Traffic control devices - ATDM
- Signs, sign structures, and foundations
- Milling and overlaying existing pavement
- Deep foundation & shallow foundations
- QA/QC

WELL-MANAGED PROJECT

AECOM is evaluating a broad range of ATDM strategies including managed lanes, ramp metering, hard shoulder running, speed harmonization, dynamic merge control, queue warning and dynamic lane assignment. These strategies are being assessed with respect to the following project goals using quantitative and qualitative metrics: travel time reliability; preserving reliable capacity for the future; improving freight travel; improving transit reliability; reducing vehicle delay; financial feasibility; reducing overall vehicle hours of travel; improving person throughput; reducing overall vehicle-miles of travel; reducing personal travel time; potential for public support; and improving safety.



OPERABILITY/MAINTAINABILITY/ADAPTABILITY

The ATM system will be built around data processing, roadside dynamic message, lane control equipment, a significant expansion of roadway surveillance devices, and a phased deployment of decision support modules. Overhead Lane Management Stations would be provided at approximate half-mile spacing and connect into the existing fiber optics network with other ITS devices along the corridor that are maintained by ODOT. Shoulder-specific lane control displays or "mini-gantries" would be provided at approximate ¼ mile intervals consistent with current spacing of shoulder lane displays along the corridor.

The system will perform data collection and condition monitoring activities using a series of sensors (e.g., vehicle detectors, CCTV cameras, weather sensors, incident detection), each serving as automated input to a central data processing and ultimate decision support module that will serve as the core of the ATM central system elements. The devices will collectively generate specific data and images that will capture current traffic data as the basis for formulating proactive strategies.

MOBILITY

The upgraded traffic management system software installed at the Statewide TMC would permit greater flexibility in operating and controlling shoulder operations. This software will require enhancement as part of the ATM efforts addressed above to accommodate deployment of VSLSs and dynamic lane management in an integrated fashion along with hard shoulder running.

As ATM relies to a great extent on automated operations, appropriate decision support functions will ultimately need to be implemented so that these strategies such as speed harmonization are tied to actual downstream traffic flows, weather conditions, and lane closures. Specific response plans would be selected based on operational rules and specific traffic flow parameters.

Specific vehicle detection systems and CCTV cameras installed in support of ATM would be connected into existing traffic management modules, such that all available information (from both new and existing systems) would be available to the baseline traffic management system as well as the specific ATM system. Enhanced operator workstations would provide accessibility to ATM decision support plans as well as device display information, permitting direct control or override of specific response plans or portions thereof, as needed to reflect the desired operational strategy.

Within the decision support module, specific combinations of operational and geographic response strategies would be stored. Particular strategies would be selected based on specific detector parameters along with incident detection alarms (shoulder lane incident detection cameras) and real-time information (either manually input by the TMC operator or provided via 511 and State Police).

SAFETY

ATDM strategies have been proven to provide significant traffic safety benefits. AECOM has conducted international research on ATDM strategies for FDOT which indicate the following: hard-shoulder running - 13% reduction in crash rates; speed harmonization and lane control - 16-35% reduction in crash rates, 27% reduction in property damage only, and 31% reduction in injury accidents; queue warning systems - 40-50% reduction in secondary accidents; and ramp metering - 15-50% reduction in crashes.

UPGRADE PROJECT, QUEENSLAND LIMITED, TRANSPORT MAIN ROADS
Brisbane, Australia

Queensland Motorways Limited embarked on a AU$1.88B project to upgrade a 24km section of its Gateway Motorway (QML), including the duplication of the Gateway Bridge over the Brisbane River. AECOM was chosen as the civil and ITS designers for the Leighton-Abby Group Joint Venture

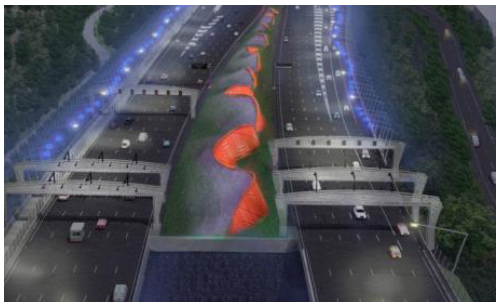
PROJECT RELEVANCE

- Overhead managed lanes
- Vehicle detection systems
- CCTV monitoring
- Design-Build
- Utility coordination and relocation
- Signs, sign structures and foundations

WELL-MANAGED PROJECT

For this project, which was valued at AU$2.12b and included upgrading a 24km section of the Gateway Motorway and duplication of the Gateway Bridge, AECOM delivered an integrated Motorway Management System including:

- 12 variable message signs
- 4 multi-lane weigh-in-motion sites
- Vehicle loop detectors
- 304 variable speed limit/lane use signs on 35 overhead steel girders
- 136 help telephones
- 87 CCTV cameras
- Changeable message signs
- Road weather monitors
- Travel time signs
- 4 multi-lane automatic number plate recognition systems
- Vehicle classifiers
- Ramp metering signals



AECOM was also responsible for designing the ITS communication infrastructure, including permanent and during construction networks, to link all ITS equipment to QML's Traffic Management Centre. The roadside ITS equipment is controlled and monitored by Transmax STREAMS Motorway Management Software. AECOM also designed the power reticulation design for all ITS, road lighting and tolling equipment.

The road lighting design encompassed the entire 24km of the motorway and included changed local roads and interchanges, except for the duplicated Gateway Bridge and its approaches. The design also included a section of HV power reticulation, the design of substations, and LV distribution to lighting switchboards. Environmental factors such as minimizing spill lighting onto adjacent properties and using high efficiency luminaires were also considered.

During the course of the project, the ITS and road lighting team was responsible for ensuring a close tie in with the civil, structural and urban design teams to deliver a coordinated design.

MOBILITY

The motorway was fitted with vehicle detectors every 500m and at interchanges allowing STEAMS to automatically detect and report flow breakdown to the operators. The operators use the full CCTV coverage to observe traffic conditions and employ incident management measures such as VMS messages and reducing speed limits via the VSL/LUMS.

OPERABILITY/MAINTAINABILITY/ADAPTABILITY

The design included access tracks, pull-off bays and local parking to maintain all ITS and civil infrastructure. Maintenance personnel were always protected behind guard rail, concrete barriers and equipment located on local roads where possible.

All overhead gantries were designed for walk-on maintenance access and therefore not requiring the closure of the motorway lanes for maintenance of overhead signs.

All active equipment was connected to the STREAMS motorway management software to that the equipment could be remotely monitored and controlled. Faults were automatically reported into the inbuilt maintenance planning module of the software for faster response times.

SAFETY

Sequencing safely and successfully implemented without major failures or traffic disruption because engineering issues and planning constraints were carefully studied and programmed. ITS and Electrical work coordinated with staging for civil works to ensure minimum disruption to the traveling public.

CDOT C-470 Managed Lanes (ITS/ETC/DSRC) State of Ohio

AECOM is improving Colorado's safety and mobility, by teaming with Flatiron Construction on this Design-Build project to increase capacity along 13 miles of Colorado Route 470 (C-470) between Wadsworth Avenue and I-25. Within the corridor, AECOM is responsible for designing, installation, integration, testing and final acceptance of the following operational equipment along the corridor.

GOALS OF THE PROJECT

- Optimize traffic operations on C-470 within the project budget by adding two expressed lanes.
- Optimize operating and life-cycle maintenance costs.
- Minimize impacts to the traveling public during project construction and future construction
- Utilize dedicated short range communications (DSRC) to test and validate V2X expansion for CDOT.
- Increase situational awareness and traveler information dissemination through the inclusion of various ITS devices.

SAFETY

The roadway is being instrumented with DSRC antenna and field processors to collect and disseminate data to both commercial and public motorists directly through to their vehicle. Shared information includes stopped or slow moving vehicles, geometry, and pavement conditions.

OPERABILITY/MAINTAINABILITY/ADAPTABILITY

Full CCTV camera coverage will be implemented to allow TMC operations to have situation awareness over the entire corridor to better manage traffic incidents and conditions. ITS site design include safe pull-off areas for workers to perform routine and emergency equipment maintenance.

MOBILITY

Microwave detectors and travel time readers are being installed to collect travel speeds to provide accurate travel time to major destinations. Ramp metering is being upgrades to provide minimal disturbance to mainline traffic from vehicles entering the roadway. The ramp meters have shown the capability to decrease queues by 50%.

PROJECT RELEVANCE

- 7 Cashless Tolling Points
- 33 DSRC Sites
- 30 CCTV Cameras
- 3 VMS
- 16 Tolling VMS
- 28 Microwave Detectors
- 17 Travel Time Indicators
- 28 AVI Antenna
- 7 AVI Readers
- 12 Ramp meters VMS

SR 202L WIDENING DESIGN-BUILD
Phoenix, Arizona

This $190M Design-Build project was ADOT's largest design-build project to date, and their third-largest project overall. The project, lead by the Kiewit/Sundt Joint Venture (KSJV), consisted of widening 10 miles of the heavily-congested SR 202L freeway through Phoenix and Tempe, adding general purpose and auxiliary lanes. The project portions, which spanned over protected wetlands, Tempe Town Lake, and the Salt River, included the widening of 22 bridges and the reconstruction of 18 on- and off-ramps.

WELL-MANAGED PROJECT

Many of the project challenges were related to the aggressive 600-calendar-day schedule that required the design of this complex, highly-phased project to be completed within eight months, and construction within 13 months. The team completed the project on August 1, 2010 (within 592 calendar days), eight days ahead of the RFP bid schedule, and eight months earlier than ADOT's original anticipated schedule.

This design and construction was completed ahead of schedule despite very adversarial weather in early 2010. During this time, the Phoenix area received record amounts of rain. In addition, the flows in the Salt River, resulting from this rain, were at their highest levels since 1993. The heavy rains and the Salt River flows occurred during a critical time of the project when KSJV was attempting to complete the entire project prior to the specified Spring 2010 asphalt paving window. The project was also completed several million dollars below ADOT's budget, which allows the repurposing of funds for future projects.

The team's issue/resolution procedure–the most important element in managing the project–was founded on the commitment to provide the other party immediate notification of any issue to allow the team to discuss and implement actions that either minimized or eliminated impacts. ADOT and KSJV also used bi-weekly How Are We Doing meetings to allow senior project management to provide guidance and support to the project team, and to empower the staff to find equitable resolutions. The project team built a strong partnership, and jointly received the Marvin M. Black partnering award in Las Vegas, NV in late 2010. Many of the relationships remain to this day.

PROJECT RELEVANCE

- 12 miles of freeway construction
- constructed under live traffic conditions
- provide congestion relief
- Major ITS infrastructure and upgrade

AWARDS

- 2011 AGC Marvin M. Black Award for Excellence in Partnering, Public – Renovation Highway Construction
- 2011 AGC Build Arizona Award
- 2011 APWA Project of the Year
- 2011 Arizona Transportation Award for Partnering Excellence

OPERABILITY/MAINTAINABILITY/ADAPTABILITY

Throughout the course of construction, the project team identified future maintenance and operability challenges, and incorporated them into the project design. For example, while this project was a widening and only required the lengthening of bridge joints, it was discovered that the existing joints were in poor condition and needing replacement. Instead of creating future impacts to the traveling public, the team incorporated these repairs into the project, and performed the work under other adjacent traffic closures. This resulted in minimal impacts to the public, saved ADOT money, and decreased the need for future maintenance.

Due to the location of the project, there was a large landscaping package that was part of the design-build scope. During initial investigation, the team discovered a large amount of plant loss and watering system issues due to an inadequate and poorly maintained system. Our team incorporated the issues into our new landscaping design and upgraded the entire system to reduce future maintenance costs, reduce water consumption, and prevent plant loss.

Additional innovations associated with the project included the use of hybrid bridges, cast high and lower construction method, ProjectOne program, 3D laser scanners and BIM. These innovative ideas saved ADOT time and money.

MOBILITY

The entire purpose of the SR 202L project was to improve mobility by increasing capacity. This ultimately resulted in improved vehicle throughput, minimized travel times, and created a more predictable commuter trip. For the 10 miles of construction, the Design-build team worked with ADOT during the design phase to develop innovative solutions to further improve mobility after construction. For example, our team worked with ADOT to install the first pole mounted vehicle count detection systems in the state. At the 44th street ramp, our team utilized a a hybrid precast girder and cast in place box girder combo bridge to improve span length and eliminate columns that would have reduced capacity. We also constructed a strattle bent on the bridge widening along with improving the ramp location to improve driver visibility, deceleration room, and capacity. Every ramp utilized ramp metering to aid in traffic flows. Lastly, we installed several ITS tools including DMS message boards to notify drivers of travel times for better predictability, and to alert drivers of any delays. All of these tools were highly successful, and resulted in the project winning several local and national awards, and helped secure future contracts with ADOT.

SAFETY

The SR 202L project greatly improved corridor safety through several design and construction methods. First, the entire project was constructed with minimal accidents and zero work zone fatalities by implementing a rigorous MOT plan for the project. Much of the impactful construction was completed on nights and weekends, and detailed coordination was required with the hundreds of stakeholders along the corridor. By adding capacity, the amount of congestion and traffic accidents were reduced. All of the safety features including shoulder width, ramp geometry, and drainage functionality were designed to the standards and did not require any design exceptions. Several modifications were made to ramp geometry to improve visibility, and in one case, a bridge was modified to accommodate the new ramp. Lastly the pavement was rehabilitated and new striping was installed to improve motorist safety.