MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

Statement of Qualifications

IS-695 FROM IS-70 TO MD 43 TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS

Contract No. BA0065172

July 8, 2019

CONCRETE GENERAL, INC. *in association with* RK&K

CONTENTS

MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

Section A

Design-Builder Capability

CONCRETE GENERAL, INC.

in association with

RK&K

MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

Key Staff

CONCRETE GENERAL, INC.

in association with

RK&K

MICHAEL HIGGINS, PE

Design-Build Project Manager | CGI

BS (Civil Engineering)

Professional Engineer
PA Registered (#044299E)

Mike Higgins has **more than 30 years of experience** as a project executive and design-build project manager (DBPM) for heavy civil construction projects, including roadways, highways, bridges, and utilities in Maryland and throughout the mid- Atlantic. He has led all current MDOT SHA projects for CGI, including the I-270 Innovative Congestion Management (ICM) progressive DB, MD 210 Livingston Road/Kerby Hill Road Interchange DB, and MD 32 DB from MD 108 to north of Linden Church Road. His responsibilities include overall design, construction, management and project coordination, allocation of labor and equipment resources and outside contractor forces, as well as oversight of project management, scheduling, and financial and regulatory requirements to meet both contractual and corporate expectations. He has a proven track record delivering complex, traffic-intensive projects to clients on-time and on-budget.

MDOT SHA I-270 ICM Progressive Design-Build, Montgomery/Frederick Counties, MD: DBPM and authorized representative for the design-builder for Maryland's first progressive DB project, a $100 million project to reduce recurring and non-recurring congestion and improve travel time reliability along the I-270 corridor. Responsibilities included achieving the project goals of mobility, safety, operability/maintainability/ adaptability and a well-managed project as well as oversight of CAP procurements, design, construction, management, project coordination services, and all administrative requirements for the project.

MDOT SHA I-695 at Benson Avenue/US 1, Baltimore County, MD: General Manager and CGI's authorized representative for this $30 million project to widen shoulders and replace two Inner Loop bridges on I-695. The project provided mobility improvements including increased vehicle throughput, decreased travel times, and a safer I-695 corridor. This project was constructed under traffic with additional stakeholder coordination required with various railroads including CSXT and Amtrak. Responsibilities included overall project management and delivering a quality project to MDOT SHA.

MDTA I-95 Moravia Road to Fort McHenry Tunnel, Baltimore, MD: General Manager and authorized representative for CGI for this $50 million project to reconstruct I-95 shoulders to provide four continuous lanes approximately 4 miles in each direction. The project provided mobility improvements, increased vehicle throughput, decreased travel times, and a safer I-95 corridor. This project was constructed under traffic and required stakeholder coordination with other ongoing projects such as MDTA and various railroads (e.g., Amtrak, CSXT). Responsibilities included overall project management and delivering a quality project.

VDOT Route 58 PPTA Design-Build, Hillsville to Stuart, VA: DBPM and authorized design-builder representative for the $223 million project. Responsibilities included oversight of design, ROW acquisition, utility relocation, permitting, construction, management and QA/QC. The comprehensive agreement provided development, design, and construction of 36 miles of Route 58 between Hillsville and Stuart, addressing safety and congestion concerns on both I-64 and I-81 by providing an alternate route for all vehicles. Three DB segments were completed, each developed as a construction package with a defined scope of work and a reconciled design/ construction agreed-upon price.

VDOT I-95 HOT Lanes Segment 1 Design-Build, Stafford County, VA: DBPM representing the contractor responsible for building the 9-mile extension of existing HOV lanes from Dumfries to Garrisonville Road, which enhanced mobility by alleviating the worst bottleneck in the region. Overall project cost was $925 million for 29 miles of high-occupancy toll lanes with new capacity, including installation of new electronic, dynamic tolling facilities, new sound walls, and new entry and exit points. He helped develop construction packages, including quantities and cost estimates, submit proposals, and reconcile final value of the segment. Responsibilities included overall project management and delivering a quality project.

Key Relevant Experience: Design-build; local agency coordination; preconstruction services; value engineering; cost and price reconciliation; design coordination; roadway alignment and widening; ROW acquisition coordination; utility coordination and relocation; public involvement and communication; stakeholder coordination; partnering; risk management and mitigation; development of contracting plans, including DBE goals; design/ construction scheduling; permit development and acquisition; environmental permitting and monitoring; stream and wetland compensatory mitigation; geotechnical; TMP development and execution; QA/ QC coordination

ERIC MELLOR, PE, DBIA

Design Manager | RK&K

BS (Civil Engineering)

Professional Engineer
Maryland Registered (#27047)

Eric Mellor brings **23 years of progressive engineering experience** managing major mobility and safety improvements through all phases of concept development, procurement, design, integration, and construction for projects of similar scope and complexity as I-695 TSMO. He has unique experience providing leadership for both DB teams and project owners for major transportation projects, and a long history of performing design for projects on I-695. He lives 2 miles from the project corridor and has firsthand knowledge of the daily congestion.

MDOT SHA I-270 ICM Progressive Design-Build, Montgomery/Frederick Counties, MD: Design Manager for Maryland's first progressive DB project, a $100 million project to use TSMO, practical design solutions, and technology to reduce congestion on I-270 with minimal footprint modification. Eric oversaw all design efforts and ensured that all requirements were met with respect to schedule, permitting, NEPA, stakeholder outreach/ education, software acquisition/integration, MDE/ PRD compliance, QA/QC, phased MOT, TMP, ITS, signing, lighting, markings, ATM, ramp metering, structures, design exceptions, IAPA, environmental delineations and permitting, geotechnical, surveys, noise analysis, pavement, and utility coordination.

MDOT SHA Rehabilitation of 11 Bridges on US 13—Salisbury Bypass Design-Build, Wicomico County, MD: Design Manager for rehabilitation of 11 bridges on US 13 Salisbury Bypass, which included long-term road closures with construction of temporary crossovers, including MDOT SHA's first use of portable traffic signals for detour routes. He oversaw all aspects of RK&K's design effort, including: schedule, permitting, geotechnical/pavement, utility coordination, traffic signing/ marking, ITS, highways, structures, TMP/MOT, and SWM/ESC/drainage.

NCDOT Monroe Connector Bypass Design-Build, Mecklenburg and Union Counties, NC: Design Manager responsible for one of four geographic sections of this $367 million, 19.7-mile new alignment electronic toll collection roadway built to interstate standards for purposes of increasing mobility and safety. Managed the development of highway concepts and final design and plans, including: incorporation of ITS and ETC, ATM, utilities, ROW, permitting, SWM, structures, geotechnical, and ESC.

MDOT SHA MD 404 Design-Build, Caroline, Queen Anne's and Talbot Counties, MD: Highway Design Lead for this $105 million dualization of MD 404 to increase mobility and safety. Managed all aspects of RK&K's design effort, including schedule, permitting, highway design, ITS, traffic, MOT, SWM, drainage, ESC, and DBE compliance. Eric coordinated with stakeholders, MDE, SHA PRD; provided QA/QC; and implemented of practical design.

VDOT I-64 Southside Widening/High Rise Bridge (Phase I) Design-Build, Chesapeake, VA: Provided high-level oversight and QA/QC for RK&K's design ensuring all requirements were met, including roadway design, lighting, signing, marking, MOT, CCTV, incident notification, and dynamic part-time shoulder use with lane control signals to improve mobility and safety in the corridor.

MDOT SHA Intercounty Connector (ICC) Contract A Design-Build, Montgomery and Prince George's Counties, MD: Design Manager, coordinated the concept development, IAPA, JPA, and procurement documents for the $476 million, 7.2-mile ICC Contract A. Eric managed design quality assurance oversight, resolved issues, design-related change orders, cost estimates, permitting processes, and stakeholder coordination. He led the development of design parameters, integration planning, and issue resolution for ETC, signing, and ITS, including lane use control signals for the deck-over.

MDOT SHA I-695 Charles Street to Dulaney Valley Road, Baltimore County, MD: Project Engineer/ Design Manager (under BCS 2004-18A) for preliminary/final design and PS&E documents for phased construction of I-695 at MD 46, MD 45, and MD 139 safety and capacity improvements/ interchange reconstruction, including several miles of I-695, all located within the I-695 TSMO DB corridor. Each project included considerations for future capacity expansions.

MDOT SHA I-695 over Liberty Road Bridge Replacement, Baltimore County, MD: Provided QA/ QC throughout project development, with focus on practical design solutions, constructability, TMP, safety, and reduction to traffic impacts for this widening and bridge replacement project (within the limits of the I-695 TSMO DB).

Key Relevant Experience: Design-build; good engineering judgment; practical design; design management; interdisciplinary coordination; public outreach; issue resolution; utility coordination; noise; safety; mobility; part-time shoulder use; lane use controls; MOT/TMP; stakeholder coordination; SWM/ESC permitting; geotechnical/pavement; ITS; DBE compliance; IAPA; design exceptions; operability; maintainability; innovative solutions; QA/ QC; scheduling

JOSEPH KIRSCH

Construction Manager | CGI

High School Diploma

MDOT Traffic Manager | Erosion and Sediment Control Certification (**Yellow Card**)

Joe Kirsch has **more than 35 years of experience** as a construction manager and project superintendent on heavy civil construction roadway/highway projects, including several design-build projects in Maryland. His relevant experience includes ensuring projects are completed per the project requirements, managing complex, multiple-phase MOT projects, managing construction activities and schedules, and coordination with other ongoing projects during construction. Many of these projects provided mobility and safety improvements while meeting the goals of minimizing operations and maintenance and being adaptable to future transportation improvements.

MDOT SHA I-695 at Benson Avenue/US 1, Baltimore County, MD: Construction Manager for CGI for this $30 million project to widen shoulders on I-695 and replacement of two Inner Loop bridges on I-695. This project provided mobility improvements including increasing vehicle throughput, decreasing travel times and providing a safer I-695 corridor. This project was constructed under traffic in multiple phases and required shoulder widening to allow for 2 major traffic switches during construction. Coordination with various stakeholders such as Amtrak was required throughout the duration of the project. Joe's responsibilities included scheduling of all CGI and subcontractor resources, overseeing all work-in-place to ensure delivery of a quality end-product.

MDTA I-95 Moravia Road to Fort McHenry Tunnel, Baltimore, MD: Construction Manager for CGI for this $50 million project to reconstruct I-95 shoulders to provide 4 continuous lanes in each direction for approximately 4 miles. This project provided mobility improvements including increasing vehicle throughput, decreasing travel times and providing a safer I-95 corridor. This project was constructed under traffic with additional stakeholder coordination required with other ongoing projects with MDTA and various railroads including Amtrak and CSXT. Joe's responsibilities included supervision and oversight of over 150 trade workers, working days, nights and weekends to meet the aggressive 20-month completion schedule.

MDOT MDTA I-95/I-895 Interchange (I-95 Express Toll Lanes), Baltimore, MD: Construction Manager for this $90 million project to relieve congestion and increase mobility along the I-95 corridor through Baltimore. The project consisted of two 1,900-LF curved bridges, retaining walls, multiple phases of MOT along a heavily traveled corridor, full-depth pavement construction, storm drainage construction, SWM facilities, landscaping, signing, marking, sign structures, lighting, ITS infrastructure, utility coordination and relocation. Joe was responsible for managing and coordinating trades with multiple crews, 22 suppliers, and 30 subcontractors (of which 15 were MBEs), and ensuring contract compliance. He also managed day-to-day construction activities and crew assignments, monitored the schedule, identified construction problems, and attended partnering meetings from which he prepared and maintained an Issues Resolution List. To avoid delays, he worked with the designers, owner, and MDE on plan changes and errors. Major realignment of the I-95/I-895 interchange was performed without significant traffic impacts by safely maintaining traffic and providing better mobility using DMS.

MDOT SHA MD 355 at Montrose/Randolph Road from Old Georgetown Road to Maple/Chapman Avenue Design-Build, Montgomery County, MD: Construction Manager for this $30 million design-build project along I-270 to improve safety and mobility in this highly congested area. This project was the construction of a new interchange at MD 355 and Montrose/Randolph Road, construction of relocated Montrose Parkway on new alignment, new bridge and retaining walls, three interchange ramps on new alignment and required significant MOT phasing with multiple temporary detours. Joe's responsibilities included managing and coordinating all construction activities, constructability reviews of early designs, monitoring the schedule, identifying and resolving construction problems.

Key Relevant Experience: Design-build; highway construction; construction management; design coordination; value engineering; environmental sensitivity and permit monitoring/compliance; stakeholder coordination; minimization of traffic impacts during construction; minimization of scope/cost for owner; constructability reviews; scheduling; design/preconstruction and construction/partnering coordination; implementation of DBE contracting plan; preconstruction services; QA/QC oversight and coordination; OED toolkit modifications

JEFFREY ROBERTA, PE

Highway Engineer | RK&K

BS (Civil Engineering)

Professional Engineer
Maryland Registered (#27499)

Jeff Roberta has been responsible for planning and final design of major freeway improvement projects throughout Maryland, including extensive experience with practical design solutions for existing corridors. His **17 years of engineering experience** includes project planning, geometric design, final design, contract development and procurement, QA/QC, design management, MOT, plan preparation, environmental requirements, utility coordination, issue resolution, cost estimating, and construction coordination for a wide range of projects. Jeff lives less than 5 miles from the project corridor and has firsthand knowledge of the congestion.

MDOT SHA I-270 ICM Progressive Design-Build, Montgomery/Frederick Counties, MD: Highway Engineer leading the design team implementing a series of roadway and technology-based solutions along I-270, including roadway modifications to address bottlenecks and congestion areas, and technology solutions of ramp metering and active traffic management (ATM) to better manage recurring and non-recurring congestion. Responsibilities include identification and development of proposed technical solutions, design of the roadway improvements, coordinating efforts of the design team, coordinating design activities with the contractor and MDOT SHA.

MDTA I-95 from Moravia Road to the Fort McHenry Tunnel, Baltimore, MD: Highway Engineer and Project Manager for the reconfiguration and capacity improvement of I-95 in Baltimore City, including the initial feasibility/planning through final design, and construction support. The project focused on improving mobility and safety by reconfiguring I-95 between the Fort McHenry Tunnel and the I-95 Express Toll Lanes to add a lane in each direction within the existing typical sections, including adding new lanes on existing shoulder. The project included on-structure and at-grade modifications. Responsible for developing the concept, preliminary, and overall project management for the final design effort, including leading a large multidisciplinary design team, full oversight of roadway design and MOT, coordinating environmental studies and permitting, MDTA, FHWA, and other stakeholder coordination, and researching/preparing design exceptions.

MDTA US 40/Hatem Bridge AET Conversion Final Design, Cecil and Harford Counties, MD: Highway Engineer and Project Manager responsible for the final design to implement all electronic tolling (AET) at the US 40/Hatem Bridge toll plaza. The project is improving mobility by providing an AET configuration through the existing toll plaza, construction sequencing to demolish existing plaza elements, accommodating electronic toll collection, signing changes, and relocation of plaza utilities. Responsibilities include developing cost estimates and design specifications, managing the design team, and coordinating with MDTA staff.

MDOT SHA I-495/I-270 Managed Lanes Study, Montgomery and Prince George's Counties, MD: Concept development and preliminary engineering lead for the first portion of MDOT's P3 Traffic Relief Plan (TRP) to improve traffic operations and safety. This includes developing alternatives to add managed lanes along I-495 and I-270 between the VDOT I-495 HOT Lanes, I-370/ICC, and west of MD 5. Six Build Alternatives were developed including main line widening, interchange reconstruction, identification of managed lanes direct access concepts, SWM needs, constructability, limits-of-disturbance, preliminary cost estimates, and impacts evaluation. Coordinated extensively with MDOT SHA staff, third-party stakeholders, and efforts for the P3 solicitation.

MDOT SHA I-95 Southbound Congestion & Safety Improvement Study, Baltimore and Harford Counties, MD: Highway Engineer responsible for concept development along southbound I-95 north of Baltimore, including dynamic part-time shoulder use with lane use signals to improve mobility and safety.

MDOT SHA West Side Mobility Study, Montgomery County, MD: Highway Engineer responsible for developing highway improvement concepts along I-495 and I-270 between the VDOT I-495 HOT lanes and I-370/ICC. Concepts ranged from short-term bottleneck/congestion point improvements to system-wide improvements within the existing highway footprint and large-scale highway widening and interchange modifications. The study included evaluation of innovative solutions, including peak period shoulder use, reversible lanes, and other ATM strategies. Work included preliminary engineering, cost estimates, and assessment of environmental impacts.

Key Relevant Experience: Design-build; practical design; highway design; retrofitting of improvements to existing interstates; cost estimating; alternatives comparison and cost benefit analysis; NEPA analysis and coordination; coordination with MDOT SHA and FHWA; dynamic part-time shoulder use; Transportation Systems Management and Operations.

BARRY BRANDT, PE, PTOE

Traffic Engineer | RK&K

BS, MS (Civil Engineering)

Professional Engineer
Maryland Registered (#21454)
PTOE (#115)

Barry Brandt has **28 years of relevant traffic analysis and project management experience**, including development of computer traffic simulation and optimization models, (e.g., VISSIM, CORSIM) with similar scope and complexity to the I-695 TSMO project. He has managed 15 traffic/ITS contracts worth more than $43 million and has managed MDOT SHA traffic engineering contracts for more than 20 years. He has experience verifying that traffic design is completed using good engineering judgment and that all requirements are met.

MDOT SHA I-270 ICM Progressive Design-Build, Montgomery/Frederick Counties, MD: Traffic Engineer for roadway and technology improvements along I-270 from I-70 to the Capital Beltway. Directed computer traffic simulations to identify improvements in mobility, safety, and operability. The effort required unique coding into VISSIM, such as accounting for ramp metering. Developed traffic analysis reports for each improvement, indicating the logical termini and independent utility of each project. Directed signing, pavement marking, and lighting design. Reviewed proposed improvements to verify the project intent was executed in the eventual design.

MDTA I-95 Moravia Road to Fort McHenry Tunnel, Baltimore MD: Traffic Engineer during planning and final design phases to improve mobility and reduce travel times along I-95. Planning included analysis of improvement concepts using traffic simulation models. Design included development of a transportation management plan (TMP) and traffic control device and ITS design.

MDOT SHA I-695 at Benson Avenue/US 1, Baltimore County, MD: Traffic Engineer for project to improve mobility and safety including ramp reconfiguration concept development, simulation with SimTraffic, preliminary IAPA and MOTAA.

MDOT SHA I-695 over Liberty Road Bridge Replacement, Baltimore County, MD: Traffic Engineer for project to improve mobility and safety while reconfiguring key ramp merge/diverge movements within the I-695/MD 26 interchange. Barry directed traffic analyses performed in support of alternatives development and the TMP.

VDOT I-66 Active Traffic Management Design-Build, Northern Virginia: Traffic Engineer performing QC for the development of 30% contract documents for the DB RFP. The project deployed ITS devices and software, including automatic incident detection (AID), to allow dynamic part-time shoulder use, full ATM implementation, and ramp metering. The project maximized mobility, safety, operability, and maintainability. Reviewed plans for device locations, potential impacts, and compliance with goals.

VDOT I-64 Southside Widening/High Rise Bridge Design-Build (Phase 1), Chesapeake, VA: Traffic Engineer for dynamic part-time shoulder use on I-64 to improve mobility, safety, and operability in the Hampton Roads region. Directed development of highway signing, pavement marking, lighting, and MOT design. Sign placement was important for informing motorists of all mobility options.

TSMO Planning Process, MDOT SHA CHART: Developing changes to MDOT SHA's project development process to focus on Transportation Systems Management and Operations (TSMO). Efforts include identifying key process changes, developing a TSMO Toolbox, and developing TSMO checklists for project delivery.

VDOT Greater Richmond Mobility Study, Richmond, VA: Lead Traffic Engineer for the study which evaluated options with high benefit-cost to improve mobility, safety, and operability along I-64/I-95 including dynamic part-time shoulder use. All options were computer simulated using VISSIM.

PennDOT I-76 ITS Enhancements, Montgomery County, PA: Traffic Engineer. Developed concept of operations and evaluated next generation operational strategies for the I-76 corridor from the Pennsylvania Turnpike to US 1, including evaluation of dynamic part-time shoulder use, queue warning, and dynamic late merge to improve safety and operability. The effort included modeling of alternatives using traffic simulation modeling in VISSIM, with evaluation of appropriate measures of effectiveness.

Key Relevant Experience: Design-build; traffic simulation and optimization modeling; dynamic part-time shoulder use; IAPA; AID software; performance measure evaluation; highway safety analysis; coordination with CHART and OOTS; CHART ATMS integration; traffic design (signing, pavement marking, lighting, signals); Transportation Systems Management and Operations; lane use control signals; fiber optic cable and network design; ITS concept development; ITS integration; maintenance; concept of operations development (systems engineering); ATM and ATM software procurement

BRIAN GRANDIZIO, PE, PTOE

ITS Specialist | RK&K

BS (Civil Engineering)

Professional Engineer
Maryland Registered (#40794)
PTOE (#3423)

Brian Grandizio is an ITS Specialist and traffic engineering manager with **13 years of experience** in selection, coordination, design, concept of operations, maintenance, integration, and implementation of ITS solutions for projects of similar scope and complexity as the I-695 TSMO project. He will be responsible for creation and coordination of ITS, ITS integration within existing MDOT SHA functions, and completion of ITS design, construction, and implementation using good engineering judgment and meeting all requirements. He lives less than 1 mile from I-695 and is familiar with I-695 congestion.

MDOT SHA ITS Design Manual and ITS Training: ITS Specialist for development of a 135-page ITS Design Manual. Brian developed and taught an 8-hour ITS Training for OOTS and CHART staff and consultants including a 254-slide PowerPoint.

MDOT SHA I-270 ICM Progressive Design-Build, Montgomery/Frederick Counties, MD: ITS Specialist for the selection, coordination, design, systems engineering (concept of operations), maintenance, integration and implementation of Maryland's first ramp metering and ATM (dynamic speed advisory and queue warning) ITS systems to improve mobility and safety along I-270 while providing adaptability with future systems. Design includes full-color LED DMS, CCTV, radar detectors, video detection, Ethernet switches, cellular and fiber optic cable networks similar to needs for I-695 TSMO. Brian is completing extensive coordination with MDOT SHA OOTS and CHART to obtain approval for ITS, establish policy and Standard Operating Procedures for operability and maintainability of the new technology.

VDOT I-66 Active Traffic Management Design-Build, Northern Virginia: ITS Specialist responsible for development of concept plans, specifications and cost estimates for installation of ATM with advisory speeds, lane use control signals, DMS, CCTV cameras and shoulder lane monitoring system using Automated Incident Detection (AID) software with video analytics to monitor blockages on the shoulder to improve safety and support dynamic part-time shoulder use on 34 miles of the most congested interstate near Washington, DC.

MDOT SHA MD 139 over I-695: ITS Specialist for design of fiber optic cable relocation plans.

MDOT SHA I-695 at Benson Avenue/US 1, Baltimore County, MD: ITS Specialist for widening the I-695 Inner Loop (ITS devices, lighting, signing and marking upgrades) to improve maintainability and safety including coordination with nearby projects.

MDOT SHA I-695 over Liberty Road Bridge Replacement, Baltimore County, MD: ITS Specialist responsible for development of ITS design plans for CCTV cameras including maintaining during MOT.

MDTA I-95 Moravia Road to Fort McHenry Tunnel, Baltimore, MD: ITS Specialist responsible for design of 4 miles of new backbone fiber on I-95, five CCTV cameras, and six DMS; coordination with MDTA for communication network layout, equipment selection, lane use control replacement at toll plaza, and new electrical power design for devices to increase vehicle throughput. Assisted with ITS device implementation including ODTR reviews and compliance.

MDOT SHA Traffic Engineering Design Services (BCS 2008-05E), Maryland: ITS Specialist for coordination, design, and implementation of ITS including 15 CCTV cameras, 12 DMS signs, ATR and RWIS. Managed 320 traffic and ITS tasks to improve mobility, safety, maintainability, and operability.

MDOT SHA CHART TSMO Program Support & Implementation, MD: ITS Specialist responsible for assisting CHART with implementation of TSMO program including evaluation of existing project development process (PDP); adding TSMO to current PDP; creation of TSMO PDP; Benefit-Cost evaluations for HSR; and development of TSMO Toolbox and checklist.

MDTA I-95 Southbound Congestion & Safety Improvement Study Baltimore, MD: ITS Specialist responsible for traffic analysis and development of ITS improvement concepts along I-95 including dynamic part-time shoulder use with lane use signals to maximize throughput and minimize delay.

District 6 US 30 ITS Design-Build, PA: ITS specialist responsible for ITS concept development, integration and construction to improve safety and operability.

Key Relevant Experience: Design-build; AID software video analytics; coordination with CHART and OOTS; dynamic part-time shoulder use; CHART ATMS integration; TSMO; I-695 ITS devices; lane use control signals; fiber optic cable and network design; ITS concept development; ITS integration; ITS maintenance; concept of operations development (systems engineering); ATM software procurement; ATM; large ITS projects; design of ITS DMS mounted in I-695 median.

BRIAN BENDA, PE

IDQM Manager | Alvi Associates

BS (Civil Engineering)

Professional Engineer
Maryland Registered (#200491)

Mr. Benda has **25 years of multidisciplinary experience** performing and overseeing QA/QC covering all facets of transportation projects. He is regularly charged with ensuring that plans, specifications, reports, and other documents produced by his staff and that of subconsultants are in compliance with the contract documents, standards, and the Quality Control Plan. His relevant expertise includes development and enforcement of QA/QC procedures, IDQA, performing quality and peer reviews for location studies, interchange and intersection layout, geometric design, and design exceptions; MOT design and development of TMPs; drainage, SWM, and ESC design; signing and pavement marking design; and ROW coordination. He is also experienced in inspection, design and review of bridges, culverts, bridge hydrology and hydraulics, scour analysis, retaining walls, and noise abatement. Brian drives through the I-695 TSMO project corridor every day and has firsthand knowledge of the congestion.

MDOT SHA MD 404 from US 50 to East of Holly Road Design-Build, Caroline, Queen Anne's and Talbot Counties, MD: Project Manager for dualization of several miles of MD 404 on the Eastern Shore, managing ESC design, PRD approvals, structural design, and H&H design for this large scale DB project. Oversaw the performance of services, QA/QC, and ensured that plans, specifications, and reports met the contract requirements. He also coordinated with the IDQM to track comments, participated in issue resolution, and certified that plans met all quality and process requirements.

MDOT SHA US 113 Design-Build, Worcester County, MD: Independent Design Quality Assurance Manager representing MDOT SHA HHD in performing independent quality reviews of the DB team submittals. He was responsible for managing and ensuring that the review process happened, plans were in compliance with the contract documents and the Design Quality Plan, comments and responses were documented, issues were resolved, and made recommendations to MDOT SHA regarding plan acceptance and/or approval.

MDOT SHA Intercounty Connector (ICC) Contract B Design-Build, Montgomery County, MD: Project Manager for several miles of new, tolled highway. Oversaw Alvi's services for this large-scale DB project and was responsible for conformance of all products with the design criteria, design standards, and QA/QC plan. Of particular significance was the design and coordination of 10 mechanically stabilized earth (MSE) retaining walls. This task required assurance of cross-discipline coordination to verify proposed heights and lengths, and coordination with all disciplines including ITS, signing, signals, pavement markings, utilities, barriers, end treatments, structures, drainage, ESC, and SWM in accordance with project-specific QA/QC procedures.

MDTA I-95 Section 100 (I-695/I-95 Interchange), Baltimore County, MD: Mr. Benda was in charge of ensuring that Alvi's work for the replacement of the existing interchange with a new multi-level interchange was performed in accordance with the contract requirements, relevant standards, and the design quality plan. His duties included QA/QC verification for 36 retaining walls up to 1500 feet in length and 38 feet high, for both cut-and-fill walls using MSE and cantilever concrete walls. The QA/QC plan required extensive coordination and documentation of comments and issue resolution between the structural, highway, bridge, drainage, and geotechnical engineers.

MDOT SHA I-695/Charles Street Interchange in Baltimore County, MD: Project Engineer in charge of Alvi's work for the replacement of the Charles Street Bridge over I-695, the replacement of the I-695 Bridges over the Light Rail, and extensive Charles Street widening and interchange reconstruction. His duties included design and QA/QC reviews for preliminary and final drainage, SWM, ESC, and MOT design. Included design of storm drain systems with 60 outlets, establishing requirements and design of two surface sand filters and extended detention facility, and maintaining traffic, drainage, and sediment controls during five major phases of construction. 2013 MDQI Award Winner.

Key Relevant Experience: IDQA for MDOT SHA HHD, QA/QC review of MDOT SHA design-build and traditional design contract documents; MDOT SHA I-695 interchanges; expertise in verifying compliance with design criteria, standards, and performance criteria; design quality plans; issue resolution; comment documentation and tracking

MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

Firm Past Performance

CONCRETE GENERAL, INC.

in association with

RK&K

MDOT SHA I-270 ICM Progressive Design-Build | Montgomery and Frederick Counties, MD

Delivery Method:	Design-Build	Performance:	May 2017 – Ongoing
Construction Cost:	$100 million	Initial Completion:	2020 (all projects)
Initial/Final Contract:	Ongoing	Actual Completion:	2020 (all projects)
Difference:	Overall project is on-budget	Difference:	Overall project is on-schedule

Owner/Client Reference:
Sean Campion | Chief, Innovative Contracting
(410) 545-8863 | scampion@sha.state.md.us

Firm(s): CGI (prime), RK&K (designer)
Key Staff Participation: Mike Higgins, Eric Mellor, Barry Brandt, Jeff Roberta, Brian Grandizio

The I-270 Innovative Congestion Management (ICM) project will reduce recurring and non-recurring congestion, improve **safety**, and be adaptable to future improvements along the full length of I-270 between I-495 and I-70. **CGI** and **RK&K** worked with MDOT SHA through the progressive DB approach to achieve the project goals by maximizing benefits within the fixed project budget. **RK&K** led by **Eric Mellor** and **Jeff Roberta** designed a set of roadway and technology improvements across 12 discrete projects to address the project goals, maximize benefits within budget, and implement solutions as quickly as possible. **CGI** led by **Mike Higgins** is constructing the improvements as individual projects under construction-agreed prices (CAPs). **Design has been completed on 10 of 12 projects, and construction is completed and accepted by MDOT SHA on four projects.**

RK&K's services include roadway design and analysis for each proposed capacity improvement project; pavement analysis and design for widening and where traffic will be placed on existing shoulders; traffic analysis and VISSIM modeling led by **Barry Brandt**; MOT design and TMP development; analysis of existing sign structures capacity to support proposed signs; signing and marking; noise analysis; NEPA/MEPA analysis and support for MDOT SHA; IAPA development and FHWA coordination; lighting design and analysis for newly configured ramps and impacted poles; supplemental surveys; utility designation and test pits to identify conflicts; SWM/ESC/drainage analysis and design; ITS design; development of complete contract bid documents; obtaining permits for design and construction of each individual roadway and technology project; and permitting assistance (e.g., PRD and NEPA/MEPA.)

The I-270 ICM project includes the first deployment of adaptive ramp metering and active traffic management (ATM) in Maryland. The adaptive ramp metering manages congestion by managing the flow of vehicles that enter I-270 at each ramp throughout the system. ATM includes queue warning and dynamic speed advisory messages to warn motorists of congestion on I-270. **Brian Grandizio** led the ITS/electrical development, including architecture drawings and CONOPS system engineering documents for ramp metering and ATM systems. The technology improvements are anticipated to support MDOT SHA's **mobility**, **safety**, and **operations** goals through decreased congestion, increased reliability, and reduced crashes. We have worked hand-in-hand with MDOT SHA in selection of the software vendor for ramp metering and ATM, including deployment of local and central software modules. The CGI Team is working closely with CHART to determine how deployment of these new ramp metering and ATM systems will change their business rules.

Completed projects SB 1 and SB 2 increased the length of the deceleration and acceleration lanes onto I-270, creating a safer merge onto SB I-270 and improving traffic operations and **mobility**. **Completed projects SB 5A and SB 10** increased commuter **mobility** and throughput by reconfiguring existing lane configurations, greatly improving traffic operations with a high benefit/cost ratio. **Four other projects are under construction with the remainder anticipated to begin construction in 2019**.

Successful Methods, Approaches, and Innovations

Many project elements are relevant for I-695 TSMO: evaluation of solutions to achieve project goals and maximize benefits; reconfiguration of roadway without widening or new ROW; new ITS infrastructure and devices; system engineering; identification of critical incident/crash areas within the corridor and design to minimize and mitigate incidents/crashes; review of existing plans and site conditions for compatibility and adaptability with proposed designs, collaboration with CHART for major systems and operation changes; coordination with MDOT SHA for SWM and ESC; analysis and preparation of design exceptions, environmental documentation, and permits; construction within constrained work zones on one of the most highly traveled and congested roads in Maryland; collaboration with MDOT SHA during design and construction enabled SB10 to be completed within 6 months of Notice of Award.

MDOT SHA I-695 at Benson Avenue/US 1 | Baltimore County, MD

Delivery Method:	Design-Bid-Build	Performance:	May 2013–Dec 2017
Construction Cost:	$36.2 million	Initial Completion:	(design Jun 2014) Aug 2017
Initial/Final Contract:	$37.1 million/$36.2 million	Actual Completion:	Dec 2017
Difference:	quantity underrun	Difference:	owner-requested change

Owner/Client Reference:
Bruce Cain | Construction Area Engineer
(410) 321-2800 | bcain1@sha.state.md.us

Firm(s): CGI (prime), RK&K (designer)
Key Staff Participation: Mike Higgins, Joe Kirsch, Brian Grandizio, Barry Brandt

RK&K designed and **CGI** constructed this project, which included replacement of bridge 0311305 on I-695 Inner Loop over Benson Avenue; replacement of bridge 0311405 on I-695 Inner Loop over Leeds Avenue, US 1, Amtrak, and Herbert Run; and realignment of I-695 Inner Loop Ramp 8 bridge 03116 from US 1 over Leeds Avenue. The project also included improvements along US 1 from Knecht Avenue to Linden Avenue. **Mike Higgins** was Project Manager and **Joe Kirsch** was Construction Manager.

The project widened I-695 for approximately 1 mile along the Inner Loop including shoulder widening, retaining walls, slope stabilization, SWM, ESC, and railroad coordination to provide width for future I-695 corridor capacity expansions. **RK&K** completed preliminary design of the new ramp from Leeds Avenue to I-695. **CGI** removed the ramp to I-695 Inner Loop from Leeds Avenue and replaced it with a ramp from US 1 to I-695. This new ramp connection allows traffic from US 1 to access I-695 without cutting through neighborhoods. **CGI** constructed the ramp and bridge structure in a narrow ROW (**similar to many ramps within the I-695 TSMO project**).

Construction began in early 2015 with an aggressive schedule. **CGI** led a large team of 25 subcontractors (including 9 MBEs) to meet MDOT SHA's MBE contract goals. **CGI** collaborated with MDOT SHA to complete construction using MDOT SHA's MOT requirements within a confined corridor. Construction of the bridges was completed in two major phases along I-695 to maintain all lanes of traffic in proximity to the I-95 interchange. The MOT for this project was similar to what is anticipated for I-695 TSMO.

Brian Grandizio and **Barry Brandt** led the design of signing and pavement marking to improve **safety** along US 1 and coordinated with an adjacent project which extended the road diet north and south of the project limit.

Along with the bridge widening, **RK&K** and **CGI** modified the lane configuration on I-695 Inner Loop prior to the I-95 on-ramp and the lane configuration from I-95 to I-695 Inner Loop to improve lane balancing to tie into the four lanes northwest of the project limit. **RK&K** coordinated extensively with MDOT SHA Travel Forecasting Division on the selected I-695 lane configuration. **RK&K** was also responsible for traffic control device, lighting and ITS design.

Successful Methods, Approaches, and Innovations

To minimize further impacts to the traveling public, **CGI** partnered with MDOT SHA District 4 to allow for surface pavement installation during potential weather restrictive periods. Setting the bridge structural steel over active railroads, US 1, and Benson Avenue required constant communication and extension coordination between all stakeholders including District 4 Traffic, Amtrak, and CSXT. Signing included replacement of major guide signs and lane reduction of transition signing along I-695 Inner Loop. The major replacement guide signs were designed and constructed into concrete median barrier, **similar to what is expected on I-695 TSMO**. **RK&K** coordinated extensively with District 4 Lighting Maintenance to identify and replace impacted lighting circuits, also **similar to the anticipated I-695 TSMO requirements**. Coordination by **RK&K** with neighboring projects was necessary to replace lighting at the I-95/I-695 interchange and signing upgrades along I-95. During preliminary design, **RK&K** developed an innovative approach to SWM by incorporating a road design (reducing roadway from two thru lanes to one lane along US 1) and using the median for SWM.

MDOT SHA I-695 over Liberty Road Bridge Replacement | Baltimore County, MD

Delivery Method:	Design-Bid-Build	Performance:	Apr 2010 – Sep 2012
Construction Cost:	$18.3 million	Initial Completion:	Sep 2012
Initial/Final Contract:	$18.3 million/$18.8 million	Actual Completion:	Sep 2012
Difference:	owner-directed change	Difference:	none

Owner/Client Reference:
Bruce Cain | Construction Area Engineer
(410) 321-2800 | bcain1@sha.state.md.us

Firm(s): CGI (prime), RK&K (designer)
Key Staff Participation: Eric Mellor, Brian Grandizio, Barry Brandt

RK&K designed and **CGI** constructed this project located **within the I-695 TSMO project limits**. The project included reconfiguration of key ramp merge/diverge movements within the MD 26 at I-695 interchange and replacement of the bridge carrying I-695 over MD 26. The work involved construction of a new 200-foot bridge carrying I-695 to improve **safety** and **maintainability** and **be adaptable with future improvements**, I-695 and MD 26 resurfacing and re-striping, minor widening, three new retaining walls, and three SWM facilities. The I-695 bridge was constructed in three stages with a complex MOT plan to maintain lanes on portions of existing and proposed bridge while adjusting the I-695 grade by more than 2 feet. **Similar to what is expected on I-695 TSMO**, reconstruction of median inlets were included in the design to allow traffic to drive on them during MOT, and temporary ramp construction/ detours were implemented to address ramp closures and safe movement of traffic during construction.

To improve **mobility** and **safety**, **RK&K** designed the interchange reconfiguration including a compressed, striped, buffer-separated collector-distributor lane along northbound I-695 on the Inner Loop to serve three ramps, addressing a failing cloverleaf weave area with a large speed differential between adjacent auxiliary and main line lanes. Additionally, **RK&K** designed the extension of the acceleration lane from MD 26 westbound to southbound I-695 along the Outer Loop to improve **safety** and operations at the merge. To properly document the improvements, **Barry Brandt** developed an Interstate Access Point Approval (IAPA), including forecasting and HCS/ Synchro/CORSIM. A crash analysis was completed for the IAPA report including comparison with statewide average crash rates.

The project required construction of bifurcated median barrier along with shoulder reconstruction and widening. This work was performed in phases to maintain existing traffic patterns and minimize impacts to the traveling public.

To improve **safety**, **RK&K** developed a Transportation Management Plan including temporary signals, automated speed enforcement and guide signing for the complicated MOT.

To minimize impacts to natural resources, avoid impacts to adjacent properties (e.g., residential, religious institution, parkland) and to achieve the goal of replacing the deteriorated I-695 over MD 26 bridge, **RK&K** designed all improvements to be constructed within existing ROW by securing FHWA approval for design exceptions related to loop ramp speeds. The exceptions were mitigated by the ramp weave and merge improvements noted above.

RK&K also secured all SWM/ESC approvals, prepared the Joint Permit Application (JPA) and secured approval for minor impacts to waters of the US within the interchange area, and secured reforestation approval from DNR.

This project involved design and construction of major guide signing, **similar to what is expected on I-695 TSMO**.

Successful Methods, Approaches, and Innovations
Project elements relevant to I-695 TSMO include: reconstruction of inlets in median to allow MOT driving in shoulder (dynamic part- time shoulder use); close coordination with District 4 lighting maintenance to identify system elements requiring replacement; CHART coordination by **Brian Grandizio** for proposed CCTV camera to verify the view would be useful for **operations and minimize maintenance needs**; close coordination with BGE for utility relocations; mitigating/decreasing **safety** risks to project personnel and the traveling public by implementation of automated speed enforcement; unforeseen site conditions (rock elevations) were encountered and coordination with OOS allowed the bridge piles to be installed using innovative rock sockets while minimizing cost and time impacts; project needs were met using design exceptions with mitigation provided

MDTA I-95 Moravia Road to Fort McHenry Tunnel | Baltimore, MD

Delivery Method:	Design-Bid-Build	Performance (design):	Aug 2015–Dec 2016
Construction Cost:	$49.4 million	Performance (build):	Mar 2017–Sep 2018
Initial/Final Contract:	$49.4 million/$49.4 million	Initial Completion:	Aug 2018
Difference:	completed on budget	Actual Completion:	Sep 2018
		Difference:	weather/owner-requested changes

Owner/Client Reference:
William Pines, PE | Acting Chief Engineer
(410) 456-8045 | wpines@mdta.state.md.us

Firm(s): CGI (prime), RK&K (designer)
Key Staff Participation: Mike Higgins, Joe Kirsch, Jeff Roberta, Barry Brandt, Brian Grandizio

RK&K provided comprehensive, multidisciplinary design services for the MDTA's I-95 Moravia Road to the Fort McHenry Tunnel (FMT) project, which was then fully constructed by **CGI**. The project enhanced **mobility** and **safety** by reconfiguring I-95 between the FMT toll plaza and the I-95 Express Toll Lanes to provide four continuous lanes in each direction, approximately 4 miles (half on structure), by adding a lane within the existing highway typical section. The reconfiguration of the corridor required modifications to existing at-grade shoulders and nine existing bridge decks and median barrier/parapet to accommodate the required shift in the grade break point in the shoulders and deck cross section.

RK&K led by **Jeff Roberta** developed the concept and preliminary design, and provided overall project management, including leading a large, multidisciplinary design team, project budgeting, schedule development and management, and QA/QC oversight; oversight of roadway and bridge design and MOT; drainage, SWM, and ESC; ITS and electrical; coordinating environmental studies and permitting; providing coordination with MDTA, FHWA, and other stakeholders; and researching/preparing design exceptions required for the narrowed lanes and shoulders. Traffic/ITS design included installation of 6 miles of fiber optic cable and four new CCTV cameras. Traffic design included signing, sign structures, marking, and lighting. MOT plans included automated speed enforcement developed for this multi-phased project to help enhance overall **safety** for drivers and construction personnel.

Construction began in early 2017 with an accelerated schedule that required the new lane in each direction to be opened by fall 2018. **CGI** led by **Mike Higgins** and **Joe Kirsch** coordinated closely and collaboratively with MDTA and the General Engineering Consultant (GEC) to complete construction under MDTA's stringent MOT requirements, including frequent lane closure restrictions due to events in Baltimore City, holidays, poor weather conditions, and other traffic-affecting occurrences. Work was completed within a confined corridor, including maintaining traffic flow and staging and constructing within the median without long-term lane closures. Construction was completed on-time and within budget.

Successful Methods, Approaches, and Innovations

Many elements of this project are relevant to I-695 TSMO: construction within constrained median work zone; shoulder cross slope adjustments and reconstruction/repaving; replacement of existing median barrier and parapet; reconstruction of median inlets to support traffic and meet modern drainage requirements; reconfiguration of a roadway without widening or new ROW; upgraded signing; new ITS infrastructure and devices; close coordination with MDTA for MOT and ESC; and close collaboration between designer (**RK&K**) and contractor (**CGI**) with the owner (MDTA). **CGI** worked with **RK&K** and MDTA to analyze non-peak travel times and extended work shifts when possible to decrease overall project duration and minimize impacts to the traveling public.

VDOT I-66 Active Traffic Management Design-Build | Northern Virginia

Delivery Method:	Design-Build	Performance:	Apr 2011 – Jul 2012
Construction Cost:	$38.6 million	Initial Completion:	July 2012
Initial/Final Contract:	$38.6 million/$38.6 million	Actual Completion:	July 2012
Difference:	completed on budget	Difference:	completed on schedule

Owner/Client Reference:	(NRO-VDOT)
Kamal Suliman | Regional Operations Director	
(571) 722-4048 | kamal.suliman@vdot.virginia.gov	
Firm(s):	RK&K (designer)
Key Staff Participation:	Barry Brandt, Brian Grandizio

RK&K was responsible for development of DB RFP plans, specifications, and cost estimates for the installation of the first active traffic management (ATM) installation on the East Coast. The project spans 34 miles of I-66 in Northern Virginia—one of the most heavily congested roadways in the region. Construction of the ATM system was completed in 2015, led by **RK&K**'s **Joseph Powers** (at the time with another firm). Joe's experience with successful implementation of ATM in the region brings lessons learned from design and construction of large-scale ATM and **dynamic part-time shoulder use** on congested freeways to the I-695 TSMO project.

The following elements were part of the DB documents: Advisory variable speed limits (AVSLs) which dynamically change the posted speed based on current traffic or roadway conditions; queue warning systems to provide advanced notice of congestion and causes via variable message signs in conjunction with AVSLs; and **dynamic part-time shoulder use** (shoulder lanes open or closed depending on roadway conditions) to increase capacity on I-66 dynamically. Operators in the traffic operations center decide whether to open or close the shoulder. A video shoulder lane monitoring system with Automated Incident Detection (AID) software, was installed to provide video analytics to monitor blockages and facilitate quick opening or closing of the part-time shoulder. Lane use control signals installed on overhead gantries were deployed to alert drivers to lane blockages.

RK&K led by **Barry Brandt** and **Brian Grandizio** developed the 227-page concept plans and functional requirements for the RFP documents, and evaluated the project area to determine the most effective ITS treatments, CCTV, microwave detection, lane control, and incident detection, to achieve the goals (i.e., **dynamic part-time shoulder use**, **mobility**, **safety**, operability, adaptability and maintainability).

RK&K developed performance specifications and requirements for all proposed ITS field devices, video analytics for **dynamic part-time shoulder use** lane monitoring and system communications equipment for compatibility and integration into the existing Traffic Control Center; coordinated with various VDOT departments, obtaining critical input for system requirements; and provided input and guidance for the development of the cost estimate.

The concept ITS plans for this project are **similar to I-695 TSMO** and included 31 lane use control gantries, 113 CCTV cameras, 10.7 miles of lane monitoring zones, 8 DMS, 42 microwave vehicle detectors, and 14 ramp metering main line detectors. Our team evaluated the need for each ITS device and determined placement requirements, developed ITS cabinet layouts (ramp metering, detectors, CCTV, DMS, and lane use control), Ethernet network diagrams, high-level communications and device block diagrams (for lane use control signals, CCTV cameras, radar detectors, DMS and ramp meters).

RK&K was responsible for concept design of static regulatory and guide signing, which required modification as part of the project. Sign details, sign structure elevation, lane use control gantry elevations, and electrical detail were included in the concept plan set. **RK&K** applied MUTCD sign placement concepts to provide adequate distance between lane use control gantries and static guide signs. ITS plans included the location of cabinets, fiber optic cable, all field devices, static signing modifications, existing signing, **dynamic part-time shoulder use** emergency pull off areas, shoulder lane monitoring system coverage, existing utilities, pavement markings and existing topographic features.

Successful Methods, Approaches, and Innovations

The I-66 ATM installation is similar in scope and scale to the I-695 TSMO anticipated **dynamic part-time shoulder use** with lane use control signals, CCTV camera coverage, fiber communications and video incident detection system (AID software).

The proposed ATM equipment was coordinated with existing and proposed ramp metering on the corridor. **RK&K** coordinated ITS installation with adjacent widening projects to avoid overlapping construction. Project included first in region CCTV incident detection for **dynamic part-time shoulder use**.

VDOT I-64 Southside Widening/High Rise Bridge Design-Build (Phase 1) | Chesapeake, VA

Delivery Method:	Design-Build	Performance:	Oct 2017 – Dec 2020
Construction Cost:	$410 million	Initial Completion:	(design May 2019) Dec 2020
Initial/Final Contract:	$410 million / $410 million	Actual Completion:	Ongoing
Difference:	project is on-budget	Difference:	project is on-schedule

Owner/Client Reference:
Ricardo Correa, PE | Project Manager
(757) 956-3106 | ricardo.correa@vdot.virginia.gov

Firm(s): RK&K (designer)
Key Staff Participation: Eric Mellor, Barry Brandt, Brian Grandizio

Hampton Roads regional **safety** and **mobility** enhancements include the widening of existing I-64 across the Elizabeth River (High Rise Bridge) with 9 miles of capacity, reliability, and **safety** improvements. The existing 4-lane section of I-64 will be widened to accommodate a HOT lane in each direction and **dynamic part-time shoulder use** during peak periods. During peak hours, the capacity of the newly completed facility will be double the current lanes. The project more broadly includes the widening of I-64 from I-264 to Battlefield Boulevard in Chesapeake, VA. **RK&K** provided all design disciplines, including roadway, structures, H&H, and MOT for the High Rise Bridge abutment to approximately 1.9 miles west on I-64. **Barry Brandt** and **Brian Grandizio** performed traffic engineering including signing, marking, and MOT for the entire project. Design was completed in May 2019.

Structure design included the Great Bridge Boulevard bridge and associated MSE walls, a cast-in-place retaining wall along a SWM basis access road, and a special design median barrier along I-64 and Libertyville Road. The bridge over I-64 was designed to provide a minimum of two traffic lanes, two bicycle lanes, and a sidewalk and did not preclude the ultimate section for I-64. The design maximizes maintainability by providing prestressed concrete girders with integral abutments and pile footings. The MSE walls were detailed to allow for movement of the integral abutment without disturbing the MSE wall panels. The design included architectural treatment and structural supports for lighting on and under the bridge.

MOT design for this project includes all lanes of existing traffic, including auxiliary lanes, to be maintained during construction. The MOT plan includes the use of temporary cameras, PCMS boards, and notification system for incidents and other recurrent, and non-recurrent problems along the corridor to assist with incident clearing.

The roadway design included a cross slope correction of I-64 and the incorporation of **dynamic part-time shoulder use** on Segment East 1 **similar to work expected for I-695 TSMO**. **Dynamic part-time shoulder use** had to account for the minimum of one emergency refuge area in each direction of I-64 with a minimum 12 foot width and 300 feet of storage. Although VDOT allowed the use of trench drains, the selected design included the use of "rocking" shoulders to create rolling gutter grades to achieve proper drainage which was provided along the **dynamic part-time shoulder use** sections where the profile was 0.3% or less and concrete barrier was proposed. **Dynamic part-time shoulder use** required the off ramp from I-64 westbound to Great Bridge Boulevard to be modified to provide a shoulder lane separate from the exit deceleration lane, which was designed right of the shoulder lane and tied into the existing ramp alignment while minimizing geometric impacts to the ramp.

Successful Methods, Approaches, and Innovations

To provide **dynamic part-time shoulder use**, **RK&K** incorporated appropriate signing and lane control devices, (**similar to what is expected for I-695 TSMO**). With **dynamic part-time shoulder use** already in the region, it was crucial to evaluate the existing system to maintain consistency and meet driver expectations. A detailed review of the existing system along I-264 in Virginia Beach was performed to determine appropriate spacing, signing, and pavement markings. This scheme was carried forward into the plans for this project and included gantries every ¼ mile (**similar to what is expected for I-695 TSMO**) with appropriate pavement markings to allow for exiting and entering traffic. Given the combination of strategies being employed along the corridor (HOT lanes, GP lanes, and a shoulder-use lane), appropriate sign placement and messaging help inform drivers of all **mobility** options without overloading them with information. Sign placement and provision of signs that contained all information necessary for drivers to make appropriate choices was critical. Drivers can see all of their options in a single instance, without having to see, recognize, and make adjustments based on sequenced signs.

MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

Organizational Chart

CONCRETE GENERAL, INC.

in association with

RK&K

Critical Line of Communication
Line of Report

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Executive Committee
Michael Miller (CGI)
Melinda Peters, PE, CCM, DBIA (RKK)

STAKEHOLDERS
FHWA ● Baltimore County ● MDE
USACE ● DNR ● USFWS ● EMS
State & Local Police ● Fire Depts ● NPS
Utilities ● Elected Officials ● Hospitals
Schools, Businesses, Residents, Commuters

Independent Design Quality Manager
Brian Benda, PE (AAI) 30/10

Design-Build Project Manager
Michael Higgins, PE (CGI) 40/40

Roadway/Civil/Structural
Jerry Scheff, PE (AAI)

Utilities
Thomas McKelvey, PE (CST)

Traffic/Lighting/ITS/ATM
Aneesha Griffin, PE, PTOE (CST)

Geotechnical & Paving
Edward Dalton, PE (TLB)

SWM/ESC/H&H
Rahul Kesarkar, PE, PMP, LEED AP (SCL)

Public Outreach/Education
Patty Egan (SCG)

Design Manager
Eric Mellor, PE, DBIA (RKK) 40/24

Construction Manager
Joseph Kirsch (CGI) 24/40

Design QA/QC
Patrick Martino, PE, Assoc. DBIA (RKK)

Construction QA/QC
Shannon Brown (CGI)

Highway Engineer
Jeffrey Roberta, PE (RKK) 40/10

Roadway
Mitchell Scott, PE (RKK)
Andrew Lynch, PE (RKK)

Survey & ROW
Thomas Yoakum (MCI)

Landscape Architecture
Joan Floura, PLA, LEED AP (FTLA)

Structures
Donald Tusing, PE, DBIA (RKK)

Geotechnical
Scott Berkheimer, PE, DBIA (RKK)
Staff (E2CR)

Noise/Air
Kevin Hughes (RKK)

SWM/ESC/H&H
Matthew Slagel, PE, DBIA (RKK)

Constructability
Mitch Rubin (RKK)

Utilities
John Ney (RKK)
Staff (ABC)

Environmental Lead
Erron Ramsey, AICP (RKK)

NEPA/MEPA
Eric Almquist, AICP, PWS (RKK)

Mitigation
Justin Reel, PWS (RKK)

Permitting
Gregory O'Hare, LPF, CA, LTE, PWS (RKK)

Traffic Engineer
Barry Brandt, PE, PTOE (RKK) 40/24

Analysis & Monitoring
Matt Snare, PE, PTOE (RKK)

Traffic Design
Heather Henck, PE, PTOE (RKK)

Highway Safety
Tony Chan, PE, PTOE (RKK)

Maintenance of Traffic/TMP
Scott Crumley, PE, PTOE (RKK)

ITS Specialist
Brian Grandizio, PE, PTOE (RKK) 40/30

ATM/ITS
Mahmood Shehata, PE, PTOE (RKK)

ITS Systems Design
Keith Riniker, PE, PTOE (SAI)

ATM Design
William Wu, PE, PTOE (RKK)

ITS Infrastructure
Joe Powers, PE, ENV PV (RKK)

Superintendents

Safety Manager
Phil Perry (CGI)

MOT/Traffic Manager
Armando Cruz (CGI)

Electrical/ITS Integrator
Alejandra Chavez (CGI)

Environmental Manager
Alfredo Fuentes (CGI)

Utility Coordinator
Steve Beckley (CGI)

RK&K resources number nearly 1,400 staff including 500 in our Baltimore headquarters

CGI resources include more than 350 personnel in Maryland

CGI	Concrete General, Inc.	
RKK	Rummel, Klepper & Kahl, LLP	
SAI	Sabra & Associates, Inc.	
ABC	AB Consultants, Inc.	DBE/MBE
AAI	Alvi Associates, Inc.	DBE/MBE
CST	CST Engineers	DBE/MBE
E2CR	E2CR, Inc.	DBE/MBE
FTLA	Floura Teeter & Associates, Inc.	DBE/MBE
MCI	Mercado Consultants, Inc.	DBE/MBE
TLB	Soil and Land Use Technology, Inc.	DBE/MBE
SCG	Stokes Creative Group, Inc.	DBE/MBE
SCL	Suyash Consulting, LLC	DBE/MBE

Key Personnel | Other Supporting Personnel
Hours/week committed (design ##/## construction)

MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

Section B

Project Understanding and Design-Build Approach

CONCRETE GENERAL, INC.

in association with

RK&K

PROJECT UNDERSTANDING & DESIGN-BUILD APPROACH

i. STRATEGIC APPROACH TO MEETING THE PROJECT GOALS

The CGI Team will use a proven process, focused around cost-benefit analysis to maximize the **dynamic part-time shoulder use**, **mobility**, **safety**, and **operations / maintainability / adaptability** provided by this fixed-fee, best-value, design-build procurement. Our process includes three major components, which are described throughout this section:

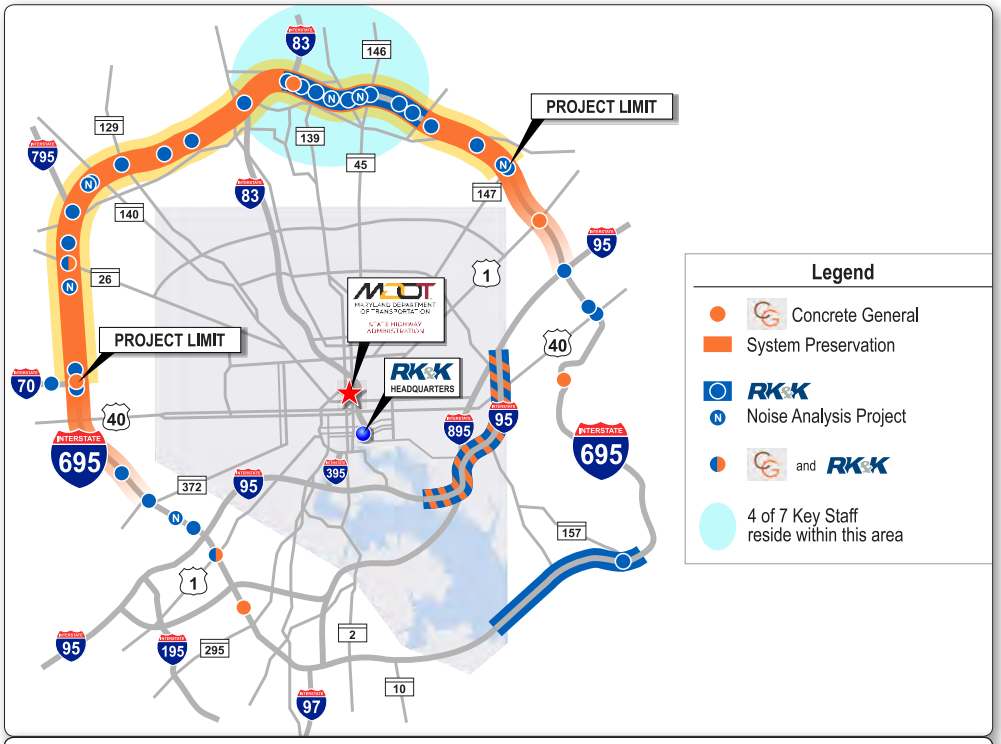
- Evaluation of Existing Conditions
- Development and Initial Analysis of Solutions
- Final Analysis and Selection of Solutions

EVALUATION OF EXISTING CONDITIONS

Development of Existing Information. The CGI Team will validate the existing information provided by MDOT SHA and obtain/develop additional information including traffic models, incident reports, existing utilities, geotechnical and pavement information, noise modeling, planned/concurrent projects, as-built plans, previous studies, and MDOT SHA's **TSMO** master plan. We understand that I-695 has been constructed and reconfigured in stages over several decades—in fact the CGI Team has performed the design or construction for many of these stages. We will perform additional geotechnical and pavement testing to establish the suitability of existing shoulder pavement. We will identify existing pinch points, existing design exceptions, existing excess pavement, and portions of I-695 that were constructed to accommodate future widening.

Enhancement of Existing Traffic Models. **Barry Brandt** (Traffic Engineer) will ensure that the traffic data and models differentiate the effects of recurring congestion (e.g., bottlenecks, alignment constraints) and nonrecurring congestion (e.g., special events, work zones, weather, and incidents) and calibrate them as required to properly identify existing issues. Highway Capacity Manual evaluations, historic Regional Integrated Transportation Information System (RITIS) data, and field observations/measurements will be used to validate the VISSIM model.

Barry Brandt and **Mahmood Shehata** have developed and calibrated over 500 miles of freeway VISSIM networks, including evaluations and recommendations for **dynamic part-time shoulder use** on I-76, I-64, I-276, I-95, and MD 210. Our key staff developed innovative solutions for the I-270 ICM project that saves over 30 minutes of commute time. RK&K also led TFAD's 2015 Freeway Congestion Management Study, including improvements on I-695 within the study limit. Our key staff will put this experience to use evaluating and recommending the right **TSMO** solutions for this project.



The CGI Team: Proven Experience. No team is better equipped to exceed MDOT SHA's expectations for this project. The CGI Team:

- Has been designing and constructing projects **on I-695, within the project corridor**, for more than 40 years.
- Demonstrated our **successful strategic approach** on the I-270 ICM project, which will save more than 30 minutes for commuters on I-270.
- Has regional experience with **dynamic part-time shoulder use**.
- Put improvements on the ground within 6 months on I-270 with demonstrated benefits for **mobility**.

Capacity Restrictions. We will work with the MDOT SHA-provided VISSIM model to identify areas where demand exceeds available capacity with and without **dynamic part-time shoulder use**. We will perform a deeper dive into the restricted capacity areas to identify where origin-destination, interchange configuration, or typical section issues are creating localized vs. wide-scale capacity restrictions.

Entrance/Exit Conditions and Geometry. Our experience on I-270 demonstrated that many bottlenecks were caused by restrictive auxiliary lane lengths, entrance/exit speed differentials, or weaving issues. **Jeff Roberta** (Highway Engineer) and **Barry Brandt** will use the enhanced VISSIM model, together with real world traffic observations (including daily observations by our four Key Staff who live and commute in this corridor) to differentiate these issues from strict capacity issues.

Geometric Conditions. Sight distance, grades, curvature and other geometric constraints also create congestion on I-695. While this project is unlikely to correct these geometric conditions, it is important that our proposed solutions seek to overcome the effects of these geometric limitations.

Jeff Roberta performed this same detailed geometric conditions analysis and solution development on I-270 ICM and I-95 Moravia Road to FMT. On I-270 ICM, the team was able to utilize existing shoulders to add a full-time lane between Montrose Road and I-495, providing a significant increase in **mobility**. On I-95 Moravia Road, the team modified existing shoulders to provide over 4 miles of new lane capacity. On both projects, this work was completed with minimal widening, through careful application of AASHTO requirements and only minor and localized design exceptions.

Safety. We will utilize nationally recognized tools to analyze incident reports and create graphical representations of **safety** hot spots/incident type. Together with the traffic model, **Barry Brandt** and **Tony Chan** (Safety Expert) will analyze this information together with the VISSIM model and determine incident causation as related to traffic, geometric, or other factors.

DEVELOPMENT AND INITIAL ANALYSIS OF SOLUTIONS

Led by **Mike Higgins** (Design-Build Project Manager) and **Eric Mellor** (Design Manager), our team will identify logical **dynamic part-time shoulder use** segments and other **TSMO** solutions, eliminating the root causes of recurring congestion, mitigating the causes of non-recurring congestion, and using a practical design approach to maximize vehicle throughout, minimize vehicle travel time, enhance **safety**, and create a more predictable commuter trip along I-695 without degrading operations on intersecting roadways.

Mike Higgins and **Eric Mellor** have more than 50 years of combined experience facilitating multidisciplinary teams to develop innovative, cost-competitive solutions to meet project goals. Mike and Eric will gather all team members for an intense, multi-day, solution-driven collaboration session to identify any potential project solution that can help achieve the project goals.

GOAL: ***Part-Time Shoulder Use.*** The CGI Team will seek to maximize the amount of **dynamic part-time shoulder use** on I-695 between I-70 and MD 43 consistent with the traffic throughput, **mobility**, and travel time reliability goals. The team will utilize FHWA's *Use of Freeway Shoulders for Travel—Guide for Planning, Evaluating, and Designing Part-Time Shoulder Use as a Traffic Management Strategy* to develop logical segment concepts for **dynamic part-time shoulder use**. Considerations will include how to initiate and end these lanes, suitability of existing shoulder pavement and/or existing excess roadway width, resolution of pinch points, AASHTO-compliant geometric and typical section elements, lane and shoulder widths, bridge clearances, barrier condition/standard, hours of operation, development/integration of software with CHART, noise impacts per updated policy, operational impacts due to lack of shoulder, and many other factors.

Keith Riniker (ITS Systems Design) assisted MDOT SHA with the CONOPS and concept plans for **dynamic part-time shoulder use** on I-95. We will use this knowledge to ensure our plans align well with MDOT SHA's model for **operations**, **maintainability**, and **adaptability**.

Our team will also solicit the guidance of RK&K's **Joseph Powers** (ITS Infrastructure), who served as the design manager for 34 miles of ATM on I-66 in Virginia, including the first deployment of **dynamic part-time shoulder use** on the East Coast.

Recognizing the challenges associated with implementation of **dynamic part-time shoulder use** in the median while meeting all appropriate AASHTO criteria, we will consider use of emergency pull-off areas, active management techniques, and deploying technology that decreases incidence response time such as CCTV with Automatic Incident Detection through video analytics (AID software). Our design will use AID software to eliminate the need for emergency response technicians (ERT) to drive the **dynamic part-time shoulder use** lane before opening.

GOAL: ***Mobility.*** With implementation of **dynamic part-time shoulder use** as the starting point, **Jeff Roberta** together with **Barry Brandt** will develop potential geometric modifications to maximize benefits to I-695 throughput, **mobility**, and reliability such as extensions to auxiliary lane lengths, adjustments to gore or ramp geometry, typical section modification, sight distance improvements, and interchange configuration changes. These solutions will target both recurring and non-recurring congestion. We understand proposed improvements cannot cause degradation to conditions on arterial roadways and that no right of way will be acquired. All solutions will be reviewed against FHWA's Policy on Access to the Interstate System for guidance on necessity of preparing Interstate Access Point Approval (IAPA) as well as considering the need for development of design exceptions.

RK&K, led by **Jeff Roberta**, applied a practical design approach for MDTA on I-95 from Moravia Road to Fort McHenry Tunnel. We prepared a feasibility study, NEPA documentation, and final design to provide one additional travel lane by modifying the existing typical section without widening the roadway. A detailed study of the existing roadway was performed to understand the trade-offs between lane and shoulder width, roadway geometry, roadside elements, and design exceptions to increase **mobility** while satisfying design criteria and **safety** requirements. CGI constructed the improvements led by **Mike Higgins** and **Joe Kirsch** (Construction Manager).

The CGI Team will also consider the full suite of traditional and **Transportation Systems Management and Operations (TSMO)** solutions to benefit I-695 including: CCTV, incident detection and management (AID software), lighting upgrades, pavement marking upgrades, signing upgrades, speed detection, ramp metering, and ATM.

Brian Grandizio (ITS Specialist) will develop an ITS concept plan to support deployment of the project improvements including **dynamic part-time shoulder use**, lane use control signals, CCTV cameras, video analytics for automatic incident detection (AID software), and detectors as required to meet the needs of the project. A software algorithm can determine when to open the **dynamic part-time shoulder use** lane since CHART operators are not traffic engineers. Our experience on projects like I-270 ICM and I-95 will enable us to develop solutions that meet the expectations of CHART and OOTS, use approved products, and are easily integrated into existing CHART software.

Barry Brandt and **Brian Grandizio** designed the ramp metering and ATM systems currently being installed by the CGI/RK&K team as part of the I-270 ICM project. Our solutions for I-695 will build on this established partnership and collaboration between MDOT SHA, CGI, and RK&K.

GOAL: ***Safety.*** **Barry Brandt** and **Tony Chan** will apply the principles and methods of the Highway Safety Manual (HSM), including **safety** management process, Interactive Highway Safety Design Model (IHSDM), predictive methods, and crash modification factors to develop and evaluate solutions for I-695. Recognizing the dynamic nature of its use, the team will evaluate I-695 with and without the part-time shoulder in-use such that all potential **safety** improvement areas are recognized. **Barry Brandt** and **Jeff Roberta** will lead the identification of solutions that will provide a safer I-695 corridor, enhance **mobility** and increase reliability. After analyzing the crash history and RITIS data to better understanding incident locations, our team will consider physical improvements, technologies and operational procedures that will reduce the number, duration and severity of incidents. We will consider management of incidents, both during and after construction, and how to provide quicker response times. Finally, we will evaluate how conditions such as reduced shoulders may impact **safety** and determine what mitigation measures are necessary.

Tony Chan and **Barry Brandt** will utilize their expertise from I-270 ICM and MDOT SHA District 3 traffic contracts to perform safety analysis based on the Highway Safety Manual using IHSDM or Enhanced Interchange Safety Analysis Tool (iSATe) methodology, including existing conditions and expected improvements for each potential solution.

GOAL: ***Operability/Maintainability/Adaptability.*** The CGI Team understands that project solutions must achieve the proper balance between maximizing performance and limiting future operational, maintenance, and technological expenditures. We will use FHWA's Systems Engineering (SE) Process to emphasize the operability of our solutions. Using the systems engineering process, we will identify functional requirements for any technological solutions, operational scenarios, and roles and responsibilities of MDOT SHA (including CHART).

Our team recognizes that **dynamic part-time shoulder use** will impact some standard operating procedures (SOP) and require revision to incident management plans, including identification of emergency pull-off areas. **Barry Brandt** and **Brian Grandizio** will participate in this consensus building effort between MDOT SHA and the Maryland State Police using their experiences doing this for MDOT SHA for development of the **TSMO** program, and with CHART for the I-270 ICM.

We will also develop a CONOPS which focuses on the high-level user-oriented view of the proposed system being considered that focuses on needs and functions that must be met.

Brian Grandizio (developed the CONOPS for Ramp Metering and Active Traffic Management on I-270) and **Keith Riniker** (assisted MDOT SHA with the preliminary CONOPS for **dynamic part-time shoulder use** on I-95 in Maryland) will bring their recent experience and lessons learned to the development of the I-695 CONOPS.

The CGI Team will incorporate measures to help reduce future maintenance of our solutions, whether they be physical or technological improvements. For physical improvements, we will minimize inlets and select SWM that requires minimal maintenance; place signs, ramp meter signals, and other traffic control equipment beyond the clear zone to minimize strikes; use non-intrusive technologies in lieu of more traditional technologies (in-pavement radar) that require more intrusive maintenance; and perform comprehensive existing pavement evaluations to ensure that all new and existing pavement meets required lifespan based on proposed use. When selecting technology devices, software and vendors, we will consider the future costs of software and hardware maintenance, licensing, upgrade and replacement cycles as well as **adaptability** to future needs.

Our solutions will be designed to provide maximum **adaptability** regarding future improvements and changing technology. For example, the **dynamic part-time shoulder use** lane could provide Connected Vehicles (CV) and Automated Vehicles (AV) opportunities such as an automated Traffic Information Dissemination system to warn of incidents. Our solutions will consider infrastructure which supports easy migration to accommodate future CV and AV usage.

Brian Grandizio and **Mahmood Shehata** (ATM/ITS) are taking the same approach to **adaptability** for ATM deployments in southeastern PA, where existing power and communications infrastructure (including conduits, cabinet space, power service) are being designed with capacity to accommodate future CV vehicle to infrastructure equipment.

Concept Development

Following the development and analysis of potential solutions, the CGI Team will rank potential solutions based on their ability to meet the project goals by maximizing benefits within the project budget. Those identified as likely candidates for inclusion will be moved forward to Concept Design.

Concept Design. All design disciplines will participate to develop 15% design documents sufficient for permit-ability, risk analysis, constructability, cost estimating, noise analysis, and (as required) discussion/submission to MDOT SHA as an ATC.

Jeff Roberta, assisted by **Andy Lynch** (Roadway), and **Barry Brandt**, developed and ranked dozens of concept designs for the I-270 ICM project before 14 were selected for inclusion in the project.

Permit-ability. **Erron Ramsey** (Environmental Lead) will use her experience completing NEPA studies for projects such as US 301, I-495/I-270 P3, and I-270 ICM to review the NEPA documentation provided by MDOT SHA and consider potential re-evaluations, JPA approvals, JD, AMMR reports, mitigation requirements, Section 401, and hazardous materials. Of particular concern will be the potential for noise from **dynamic part-time shoulder use**. This can be addressed within the context of the MDOT SHA noise policy.

Risk. **Eric Mellor** will lead a risk analysis for each Concept Design, including signing, lighting, ITS, utility impacts, noise impacts, right of way, typical section constraints/pinch points, proposed design exceptions, existing design exceptions, SWM needs, delays to adjacent local roadways, impacts to historical and archaeological sites, and degradation of **safety** among many potential risks.

Constructability. For a solution to be viable, our team must be able to construct it, considering heavy traffic on I-695, in a manner that minimizes delay and ensures safe passage of all roadway users. **Joe Kirsch** and **Mitch Rubin** will provide constructability input during concept development, and concepts will be revised as required to ensure constructability.

Operations/Maintenance/Adaptability. Our team will evaluate the **operations and maintenance** needs of all potential solutions. CONOPS and SOP needs will be considered for both construction and post-deployment periods. **Brian Grandizio** will develop the needs for additional MDOT SHA staff and maintenance inventory (spare parts) as he recently completed for the I-270 ICM ramp metering and ATM.

Cost Estimates. **Mike Higgins** will lead the effort, utilizing resources from both RK&K and CGI, to develop reasonable cost estimates for all solutions based on the Concept Designs. These cost estimates will include final design, construction, integration, software, start up, and hand-off costs, including appropriate contingencies based on level of completion and the concept level risk analysis.

One-on-One Meetings. During the concept development phase, the **Mike Higgins** and **Eric Mellor** will lead the team's participation in one-on-one meetings with MDOT SHA to gain a better understanding of the project, share concerns or questions, provide feedback based on MDOT SHA's standardized questions, and discuss potential alternative technical concepts (ATCs).

Alternate Technical Concepts. When our solutions are better than or equal to the requirements of the RFP, we will submit a written ATC to MDOT SHA for review and approval at its sole discretion. We understand that once an ATC is submitted, it will not be further discussed at one-on-one meetings.

FINAL ANALYSIS AND SELECTION OF SOLUTIONS

Initial Ranking. Using the completed Concept Plan for each solution (starting with **dynamic part-time shoulder use**) and including any approved ATCs, **Barry Brandt** will finalize traffic analysis using VISSIM and other appropriate tools to quantify the benefit of each potential solution with respect to vehicle throughput, travel time/delay, and reliability. Safety analysis, in accordance with the Highway Safety Manual, will be completed using IHSDM or iSATe methodology. The **operability**, **maintainability**, and **adaptability** of each potential solution will be rated. The combined results of these analyses will be used to rate each potential solution against the project goals, develop a cost/benefit ratio, and determine the most cost-effective solutions to achieve the project goals.

Iterative Analysis. To this point, each potential solution has been ranked on its own merits; however, the performance of individual solutions can be greatly impacted by decisions made regarding upstream, downstream, or coincident improvements. Our team will engage in an iterative analysis process, identifying how various combinations of solutions will perform, ultimately identifying the most advantageous program of solutions in accordance with project goals. The team acknowledges that a premium will be placed on **dynamic part-time shoulder use** based on the project goals and will maintain this solution as our number one priority. Concept designs, risks, and costs must also be revisited when necessary to align individual solutions for optimum performance as a program.

> The CGI Team, led by **Mike Higgins** and including many of the same key staff working on this project, successfully managed the iterative analysis process on the I-270 ICM DB project to develop 14 solutions providing 30 minutes of travel relief for I-270 Southbound.

Final Analysis and Ranking. Based on the results of the iterative solutions, our team will identify the final program of solutions and proceed with bid level cost estimating. The final program of solutions will be ranked in such a manner as to allow easy inclusion or removal of individual solutions as needed to adjust for maximum benefit from the contract fixed fee.

Technical Proposal. The CGI/RK&K's team final technical proposal will demonstrate to MDOT SHA the quantitative and qualitative measures of how the proposed improvements will meet the project goals.

ii. BALANCING/MANAGING CRITICAL RISKS

The CGI Team will meet the project goals using a cost/benefit approach that, by its nature, seeks to balance risks. Our comprehensive risk analysis process manages risk through the following steps:

Identification. Throughout the life of the project we will maintain a risk register including risks identified by the CGI Team, MDOT SHA, and others.

Mitigation. We will develop approaches to eliminate or minimize risks including contingency plans for unanticipated or especially severe occurrences.

Assignment. Ideally, each risk should be assigned to the party that can most effectively manage the risk. The CGI Team will work with MDOT SHA using one-on-one meetings, confidential and public questions, and ATCs to assign risks in a manner that best supports the project goals.

Balancing. The risks for each potential solution will be included in our cost/benefit analysis, allowing us to make informed qualitative and quantitative risk decisions for every combination of potential solutions.

We have identified six critical risks that are further discussed below: shoulder typical section, shoulder pavement section, drainage and SWM, operating procedures, integration with CHART, and noise.

Critical Risk—Shoulder Typical Section

Part-Time Shoulder Use ✓	Mobility ✓
Operability/Maint./Adapt.	Safety ✓

The existing shoulder on I-695 is not always suitable for use as a lane. Common risks include: pinch points at sign structures and bridges, substandard stopping sight distance, substandard vertical clearance at structures, adverse superelevation, cross slope breaks in the wheel path, and inlets or drainage spread infringing on the traveled way.

We understand that MDOT SHA does not anticipate obtaining design exceptions or waivers. If the CGI Team and MDOT SHA agree that a design expectation best balances the risks, **Mike Higgins**, **Jeff Roberta**, **Barry Brandt**, and **Eric Mellor**, have recently obtained design exceptions for I-270 ICM and understand the rigorous analysis, documentation, review, and approval process that FHWA and MDOT SHA require.

The CGI Team will develop concept plans and ATCs accounting for these risks while always seeking AASHTO compliant solutions. We will balance these typical section risks with the knowledge that roadway widening or lane shifts will likely increase noise impacts and SWM requirements.

Critical Risk—Shoulder Pavement Section

Part-Time Shoulder Use ✓	Mobility ✓
Operability/Maint./Adapt. ✓	Safety

The existing shoulders on I-695 were constructed and improved using many contracts over several decades. Not all locations will have sufficient lifespan under traffic bearing conditions; however, reconstruction of pavement negatively impacts cost, duration of construction, SWM, and MOT.

Our team will evaluate the existing shoulders using both MDOT SHA-provided and CGI Team data for a balanced approach to shoulder use. There may be portions of I-695 where outside widening makes more sense than using the existing inside shoulder; however, this must be balanced with cost and risk of additional SWM and noise impacts.

Scott Berkheimer (Pavement Lead) was successful in minimizing shoulder replacements on I-270 ICM by gathering additional in-situ data, performing rigorous analysis, and coordinating with MDOT SHA in the development of predicted life cycles.

We recognize that some areas of I-695 are currently paved with excess width. Our team will seek to utilize this pavement while balancing this use with the fact that the location of the excess pavement (inside vs outside) may influence noise impacts.

Critical Risk—Drainage and SWM

Part-Time Shoulder Use ✓	Mobility ✓
Operability/Maint./Adapt. ✓	Safety

Revisions to existing drainage patterns generated by changes to superelevation, break lines, and/or modifications to median drainage systems could increase discharges, require reconstruction of drainage systems, and impact outfall stability. Full depth shoulder reconstruction and any widening will increase SWM requirements. This risk can have an outsize impact on our ability to meet the project goals due to the associated cost and ROW challenges.

Matt Slagel (SWM/ESC/H&H) understands, from his work on MD 404 DB and I-270 ICM, how to evaluate and mitigate drainage issues. He has a proven ability to work with MDOT SHA HDD, PRD and MDE to achieve balanced solutions, minimizing SWM quantity and quality requirements using roadside bioswales or other ESD approaches within existing ROW.

Critical Risk—Operating Procedures

Part-Time Shoulder Use ✓	Mobility ✓
Operability/Maint./Adapt. ✓	Safety ✓

Dynamic part-time shoulder use will require significant changes to MDOT SHA standard operating procedures (SOP). Coordination with emergency services, CHART maintenance/operations staff, and third-party roadway service providers will be required to revise SOP to accommodate **dynamic part-time shoulder use**. Potential concerns include incident response, monitoring of median shoulders for obstructions, time of use enforcement, reduced shoulder availability, and snow plowing operations.

The CGI Team recognizes that **dynamic part-time shoulder use** will significantly change freeway incident management on I-695 for MDOT SHA. Our team (**Mike Higgins**, **Barry Brandt**, **Brian Grandizio**, and others) has experience meeting with first responders, including Maryland State Police, developing incident management SOPs, and identifying operational and maintenance needs for CHART SOC/TOC Operations and Field Operations staff. We will use technology such as Automatic Incident Detection (AID) software to limit the operational reliance on ERT to confirm the shoulder is clear before opening, and software algorithms with detection to determine when the shoulder lane will be opened to limit SOC/TOC Operator responsibilities.

The CGI Team will also work closely with MDOT SHA to balance the physical improvements with operational solutions. One example is considering limiting part-time shoulder use during snow events to provide for median shoulder snow storage.

Critical Risk—Integration with CHART

Part-Time Shoulder Use	Mobility
Operability/Maint./Adapt. ✓	Safety

Since **dynamic part-time shoulder use** requires command and control software, new software deployment or upgrades to existing software will be required for optimum implementation of this project.

Our team recognizes that the CHART ATMS does not currently support full-color-full-matrix DMS signs, which may be needed for part-time shoulder use, or CCTV Automatic Incident Detection (AID) using video analytics which are likely candidates for use on this project. One potential solution is the ATM software under deployment by the CGI Team for I-270 ICM, which can be upgraded with this functionality.

The CGI Team, led by **Brian Grandizio** and **Barry Brandt** will work closely with MDOT SHA, specifically CHART, to identify an appropriate level of integration, select software, develop schedule, operations changes, training for field staff, and test/deploy the new system.

Critical Risk—Noise

Part-Time Shoulder Use ✓	Mobility ✓
Operability/Maint./Adapt.	Safety

Current FHWA and MDOT SHA noise policy may require new or modified noise walls associated with **dynamic part-time shoulder use**. These noise walls would be costly and difficult to construct within the ROW, effectively limiting where **dynamic part-time shoulder use** can be implemented. **Kevin Hughes** (Noise/Air) will leverage his VDOT experience with **dynamic part-time shoulder use** to balance noise impacts, including peak-hour noise analysis, inside vs. outside shoulder use, performance of existing walls, and consideration of FHWA-approved policies from other jurisdictions such as WashDOT.

In addition to the six critical risks listed above, the CGI Team is also considering other risks: NEPA re-evaluations; permitting; condition of existing infrastructure (e.g., median barrier, end treatments, signing, lighting, pavement); survey accuracy; MDOT SHA and FHWA (as applicable) reviews and approvals; third parties; utilities; ITS communications; power service availability; construction access; lane closure restrictions; MOT phasing; legal issues (e.g., existing shoulder laws); and coordination with adjacent projects (I-695/I-70).

iii. DESIGN THROUGH CONSTRUCTION: THE DESIGN-BUILD PROCESS

The members of the CGI Team have worked in the I-695 corridor for over 40 years. We have a proven history of providing coordinated, economical, timely and fully functional quality design and construction products meeting the project goals.

QUALITY MANAGEMENT PLAN

It is our responsibility to provide design and construction of this project in conformance with the contract requirements. **Mike Higgins** (assisted by Design QA/QC Manager **Patrick Martino** and Construction QA/QC Manager **Shannon Brown**) will be responsible for ensuring the Quality Management Plan (QMP) is developed, approved, distributed, and implemented by all team members. All QA/QC will be performed independently from production.

Design Quality

Eric Mellor will have prime responsibility for implementation of the Design Quality Control Plan (DQCP), which contains our organization plan, responsibilities, and detailed QA/QC procedures.

Designer Reviews. All staff is responsible for checking their work; completing revisions and checks using a color-coded system; and ensuring that work is peer reviewed by independent qualified, responsible party for conformance with the contract, standards, and good professional judgment.

Constructability and Environmental Reviews. **Joe Kirsch** will take an active role during the design phase, ensuring that construction inputs are incorporated into the design. Environmental managers **Erron Ramsey** (Design) and **Alfredo Fuentes** (Construction) will work together to ensure that every work package has the appropriate NEPA clearances and permits, and that all environmental commitments are met.

Systems Engineering Conformance. **Brian Grandizio** will ensure that the needs and goals of the project are satisfied through software and hardware.

Over-the-Shoulder Reviews. All parties, including MDOT SHA, permitting agencies, and the IDQM team, will be encouraged to participate in over the shoulder reviews throughout design.

Design Quality Assurance. Separate from the QC requirements, QA will be a process-oriented review ensuring that QC procedures have been followed.

Independent Design Quality Management

After the design work is certified complete in accordance with the DQCP, plan packages will be forwarded to Alvi Consultants, our dedicated IDQM firm. **Brian Benda** (IDQM Manager) will be responsible for managing and ensuring that the independent review processes have occurred and certification that all design submittals are in conformance with the Contract requirements.

IDQM Review. The IDQM has independent authority to review the DQCP before submission to MDOT SHA; verify plan conformance with the contract requirements; coordinate with MDOT SHA regarding any conflicts; track IDQM comments and resolutions; and certify that submittals meet contract requirements. The IDQM will also perform reviews specific to PRD, MDE, and permitting agencies.

MDOT SHA Audit. MDOT SHA will audit work packages upon certification by the IDQM. We acknowledge that any construction work performed before the audit is complete is done at risk.

Construction Quality

The Construction Quality Management Plan (CQMP) will foster an environment where the quality is expected, planned for, and implemented. Our management philosophy promotes active coordination and partnering between design, construction and QC/QA; assignment of qualified personnel; document control; production standards; change management; and independent QA.

Release for Construction. All work packages will be QMP certified by the designer, professional seals applied; certified by the IDQM, and environmental approvals/permits in place before RFC.

Materials/Working Drawings. RK&K will review, accept, and stamp shop/working drawings/test plans and IDQM will be required to review them, before review, if required, is undertaken by MDOT SHA.

PROJECT CONTROLS

Document Control. The CGI Team will use collaboration software such as ProjectWise to allow all team members access to the current design, RFIs, shop drawings, RFC plans, and quality records.

Schedule Management. After award, a collaborative design and construction charrette, including MDOT SHA, will be used to develop a high-level schedule and master CPM schedule showing major design, permitting, software development, QA/QC, and construction activities. We will also maintain a 4-week look-ahead schedule covering both design and construction activities.

Issue Resolution / Change Management. Issues will be resolved at the lowest level possible with timely escalation via the partnering charter to ensure timely resolution. Changes to the scope of work will only be undertaken at the written direction of MDOT SHA.

Safety Management. **Phil Perry** (Safety Manager) will ensure that every individual has the proper training to work safely. Our Safety Program provides immediate guidance and direction for all employees, is provided in both English and Spanish, and allows all employees to stop work due to safety concerns.

REGULAR COORDINATION

Task Force Meetings. The CGI Team will use regularly scheduled Task Force Meetings to ensure timely coordination, decision making, and reviews. In addition to the traditional disciplines, our Task Forces will include critical activities such as environmental permitting, stakeholder outreach, and utility coordination.

With **TSMO** solutions including the first-time deployment of **dynamic part-time shoulder use** for MDOT SHA, we will establish a CHART/OOTS Task Force to ensure close coordination from NTP through final deployment/handoff and development of Standard Operating Procedures.

Project Development Meetings. Regularly scheduled project development meetings will be led by **Mike Higgins**, **Eric Mellor** and **Joe Kirsch**. Meetings will include all discipline leads to discuss design, construction, coordination, schedule, challenges, design/construction efficiencies, permits, QA/QC, crew scheduling, software development, weather, traffic management, safety, and materials availability.

Monthly Progress Meetings. **Mike Higgins** will lead monthly progress meetings, including all key staff, MDOT SHA, and stakeholders. Meetings will include agendas, minutes, issue tracking and resolution, risk tracking and mitigation, stakeholder concerns and resolutions, permit log, and schedule.

Partnering Meetings. The CGI Team is a strong proponent of and will participate in partnering, which allows open and honest communication and creates a structured issue resolution to benefit all parties.

DESIGN CONSIDERATIONS

NEPA Re-evaluations. If our project solutions require a NEPA re-evaluation, **Erron Ramsey** will provide technical data (e.g., noise, air quality, cultural, environmental, traffic analysis) in support of the re-evaluation.

MDE/SHA-PRD/USACE/DNR Permitting. The CGI Team, including **Matt Slagel** for PRD approvals, will optimize final design solutions, utilize practical design to reduce impacts, provide time in the schedule for permitting, and leverage our DB experience and relationships to engage the agencies in a pro-active, positive manner.

Software Development. We will consider that regulatory and/or increased safety sensitive functions may require fault tolerant programming of the existing software, battery backups for devices, and redundant operating locations to ensure safe operation of the dynamic part time shoulder lanes.

CHART Operations. We will develop a *day-in-the-life* document describing what CHART staff will need to perform regularly in support of the proposed solutions. Communication networks will be tested and commissioned. **Brian Grandizio** and **Barry Brandt** will work closely with CHART to determine the necessary level of integration into the CHART ATMS based on policy decisions by MDOT SHA for **dynamic part-time shoulder use**, which could include passing messages between systems or full integration.

Brian Grandizio and **Barry Brandt** recognize that **dynamic part-time shoulder use** requires CHART to provide proactive regulatory functions. Like our work on I-270 ICM, we will assist CHART with the transition to this new role.

CONSTRUCTION CONSIDERATIONS

Public Outreach and Education. The CGI Team will provide pro-active communication of construction impacts as well as educational outreach regarding this first deployment of **dynamic part-time shoulder use** in MD.

MOT. **Armando Cruz** (MOT/Traffic Manager) will be responsible for ensuring that the construction sequence safely and efficiently maintains the heavy volume of traffic while optimizing the protection of the construction workers.

Deployment. Like the I-270 ICM ramp metering and ATM, the CGI Team will provide testing, commissioning, and support after turn-on of any ITS systems before final acceptance.

Owner Education. **Brian Grandizio** will provide formal and informal education to MDOT SHA staff regarding new and upgraded systems to ensure a seamless handoff at final acceptance.

CONCRETE GENERAL, INC. *in association with* RK&K