Construction Management at Risk **(CMAR)**

MD 4 at Suitland Parkway Interchange Improvements

Technical Proposal

Contract No. **PG6185470**

Kiewit

CAPABILITY OF THE PROPOSER

Section **B**

TIM CLEARY - PROJECT MANAGER

Years with Kiewit	Total Experience	Education & Awards:
33 Years	33 Years	BS – Building Construction (CM), University of West Florida 2009 FTBA; 2019 ACI Excellence in Concrete Cnst Awards; 2018 ENR

Licenses, Certifications, Trainings: Environmental Compliance Awareness Training

Tim has extensive CMAR and Design Build experience, including working as Project Manager on one of SHA's largest Design-Build Projects. Tim has spent decades working on similar projects with complex MOT, roadway, bridge, environmentally sensitive, utilities work and highly phased construction. Tim is an expert at performing preconstruction, design coordination, estimate development, project planning, project schedules, budget management, material and subcontractor procurement, risk management, evaluating innovation, stakeholder coordination, with high safety and quality. **Tim** has worked with **Luke Silvus** (Construction Manager) for over 20 years and worked closely with **David Gates** (Cost Estimator) as part of the JV Team at ICC-B and Telegraph Road.

Relevant Project Experience

I-95 Wilmington Rehabilitation **CMAR** | $178 Million | Delaware Department of Transportation (DelDOT) | Wilmington, DE

Position: Senior Project Manager of Preconstruction | November 2019 – Current

As Sr. Project Manager, Tim Cleary led the CMAR preconstruction process including proposal development, kickoff meetings, partnering workshops, public outreach meetings, weekly task force meetings, supported permitting and utility coordination, reviewed all project designs, provided input on accelerated techniques, constructability, value engineering and alternative technical concepts. Working with DelDOT and the ICE, Tim and his team incorporated over 20 innovations to reduce the project cost by $40 Million and cut 6 months off of the original 24-month schedule. Tim led the cost estimate development (OPCC and GMP), project schedule, coordination with the ICE, finalized contract negotiations with DelDOT and managed sub/supplier procurement while meeting robust DBE goals for the project. During construction, Tim managed the project team, equipment and material procurement, planning, subcontract negotiation/coordination, monitored schedules and budgets, continued design coordination, progress meetings, managed field changes, and oversaw safety and quality. I-95 in downtown Wilmington is a heavily traveled roadway that was put into two major phases of contraflow and major MOT efforts were required to construct the project. Scope includes 4 miles of asphalt and concrete roadway reconstruction, barrier wall, drainage, underdrain, guardrail and striping. Over 2 miles of bridges were rehabilitated including new backwalls, hydrodemo with new concrete overlays, 11,000 lf of new expansion joints, jacking and new bridge bearings, substructure repairs, and new parapet.

Interstate-95 at Telegraph Rd. Interchange | $236 Million | Virginia Department of Transportation (VDOT), Alexandria, VA

Position: Senior Project Manager | November 2011 – June 2013

As Sr. Project Manager, Tim supported all aspects of planning and construction. He was responsible for providing management oversight and partnering, supervising project staffing, joint venture monthly and quarterly reviews, resources, risk management, planning oversight and supporting schedule and budget adherence. The project was a fast-track 2.5 mile widening/reconstruction of I-95/I-495 and Telegraph Road interchange connecting the Woodrow Wilson Bridge project with new HOT lane projects. Substantial completion was achieved 112 days earlier than required completion date. The contract included building 11 new bridges, two of which were curve steel flyover bridges, box culvert extensions, drainage improvements, retaining walls, and noise walls.

Intercounty Connector (ICC) Contract B Design Build | $560 Million | Maryland DOT (SHA) | Baltimore, MD

Position: Project Manager | October 2008 – November 2011

Tim Cleary led the entire design-build process including proposal development, kickoff meetings, partnering workshops, public outreach meetings, weekly task force meetings, risk mitigation, fully integrated design and construction schedule, supported permitting and utility coordination, reviewed all project designs, provided input on accelerated techniques, constructability, involved with the initial project estimate, value engineering and alternative technical concepts. Located in an environmentally sensitive area, Tim led complex permitting and coordination with MDE to gain approvals to start construction. During construction, Tim managed the project team, equipment and material procurement, planning, subcontract negotiation/coordination, monitored schedules and budgets, continued design coordination, progress meetings, managed field changes, and oversaw safety and quality. The project consisted of the construction of steel girder erection at interchange bridges, 7 miles of new 6-lane toll road, 2.4 million cy of Excavation, 1.7 million cy of embankment, 500,000 sy of new pavement section, 20 retaining walls or 3000 lf ranging from 5 to 28' tall, over 80,000 lf of drainage, and 15 Bridges totaling over 600,000 sf of deck over environmentally sensitive land.

LUKE SILVUS - CONSTRUCTION MANAGER

Years with Kiewit	Total Experience	Education & Awards:
26 Years	33 Years	High School Diploma; 2014 DBIA- SE; 2009 FTBA

Licenses, Certifications, Trainings: NCCO Certified Crane Operator #100455369; Captains License; Superintendent Training

An east coast premier roadway and bridge builder, Luke has spent 26 years working as a Construction Manager on Kiewit's most complex projects. He has worked on four high-profile Design-Build projects, four complex CMAR projects, with 20 bridges that were accelerated and highly complex. Luke's expertise includes critical steel girder erection, retaining wall construction, concrete work, project scheduling, constructability improvements, craft hiring and training, managing complex MOT, and developing strong relationships with all project team members. **Tim, Dave** and **Luke** have worked together in identical positions for many years, including the ICC-B project.

Relevant Project Experience

I-95 Wilmington Rehabilitation **CMAR** | $178 Million | Delaware Department of Transportation (DelDOT) | Wilmington, DE

Position: Construction Manager | July 2020 – Current

Luke was heavily involved in the preconstruction process including kickoff meetings, partnering workshops, public outreach meetings, weekly task force meetings, provided constructability input, presented innovations and alternative technical concepts, identified utility conflicts and worked with utility companies to relocate, and ensured interdisciplinary coordination. He began extensive construction planning to perform 3 early work packages, including the high-risk AMTRAK demo shield, shoulder strengthening and long lead procurement. Luke supported the development and execution of the 18-month project schedule which reduced the overall project duration by 6 months. He supported the negotiation and coordination of every subcontract and hired the 100 craft required for the project. Luke performs daily field walks with the Client and Designer to review progress and solve challenges in an expedited manner. With the southern half of the project located in wetlands, Luke ensures full compliance with environmental permits, receiving perfect scores on nearly every weekly inspection. Scope includes 4 miles of asphalt and concrete roadway reconstruction, barrier wall, drainage, underdrain, guardrail and striping. Over 2 miles of bridges were rehabilitated including new backwalls, hydrodemo with new concrete overlays, 11,000 lf of new expansion joints, jacking and new bridge bearings, substructure repairs, and new parapet.

Intercounty Connector (ICC) Contract B Design Build | $560 Million | Maryland DOT (SHA) | Baltimore, MD

Position: Construction Manager | December 2009 – May 2010

As Construction Manager, Luke managed all bridge construction on the entire project and had extensive involvement in the design phase performing constructability reviews and planning. Luke set the first ever 96-inch dapped bulb tee girders in the state of MD using two crane picks, which was considered a critical lift. The construction consisted of steel girder erection at interchange bridges, approx. 7 miles of new 6-lane toll road, 2.4 million cy of excavation, 1.7 million cy of embankment, 500,000 sy of new pavement section, 20 retaining walls or 3000 lf ranging from 5 to 28' tall, over 80,000 lf of drainage, and 15 Bridges totaling over 600,000 sf of deck over environmentally sensitive land.

Arlington Memorial Bridge Rehabilitation Design Build | $190 Million | Federal Highway Administration | Washington, D.C.

Position: Construction Manager | July 2017 – July 2020

Luke participated in the entire design phase. He performed design reviews, constructability reviews, providing innovations and alternative technical concepts, supported interdisciplinary coordination, managed utility design and relocation, managed all project permitting and attended public outreach events. Upon award, the Client asked to reduce the schedule from 1,550 days to 1,000 days. Luke was instrumental in developing a new schedule to meet this request, and Kiewit delivered in 1,000 days. Luke led all highly technical planning, including high-risk bridge jackings and the erection of the 216' long 170,000 lb steel girders, 450 ea – 50,000 lb precast deck panels and other critical bridge elements. During construction, heavy traffic flows were maintained with three lanes, one being a reversible lane. Luke managed the daily coordination of MOT and switching the reversible lane. Luke hired over 100 craft and managed over 30 subcontractors. Luke's management of quality was exceptional on this historical monument. Luke ensured full compliance with the numerous permits on the project, completing with no NOV's. The scope of work included full deck replacement, new abutments, columns and caps, new roadways on the approaches including the full reconstruction and reconfiguration of the Arlington Roundabout, entirely new steel fixed span replacing the existing bascule bridge, extensive MOT and the restoration of over 4,500 pieces of historic granite.

US 1 Interchange and Reconstruction | $23 Million | Florida Department of Transportation (FDOT), Miami, FL

Position: Construction Manager | August 1999 – April 2001

Extensive MOT was required for this grade separated interchange project, including six-intersection traffic switches, numerous lane closures. There were 67 steel beams, with the largest being 9-feet-deep, 126-feet-long and weighing 66 tons. Kiewit constructed temporary detours and placed 2,500 ft of temporary asphalt curb, constructed 55,000 sq yd of roadway, placed 129,000 sq ft of MSE wall panels complete with coping, furnished and installed 185 drainage structures along with 8,500 ft of concrete drainage pipe, installed 40 each 36-inch to 72-inch drilled shafts, and placed 1,850 cu yd of bridge concrete including columns, caps and slabs.

DAVID GATES - COST ESTIMATOR

Total Experience	Years with Kiewit	Education:
32 Years	< 1 Year	BS – Civil Engineering, University of Hartford

Licenses, Certifications, Trainings: MDE Green Card, Environmental Compliance Awareness Training, Lead Estimator Training

With 32 years' experience estimating transportation projects, David estimates on highways, bridges, design-build, CMAR and utility proposals and bids, including schedules and final pricing and brings extensive SHA CMAR experience. With an emphasis on heavy civil/roadway and environmental, he analyzes drawings/specifications, itemizes construction components and formulates strategies. His expertise also leads to innovative value engineering, means and methods, and accelerated schedule concepts that result in cost savings for clients. David has recently joined our Kiewit Team. He has extensive experience working with Kiewit since 2007 having collaborated on 6 JV projects & estimates. David worked with **Tim Cleary** and **Luke Silvus** for over 2 years on the ICC Contract B project and they will work seamlessly again on this CMAR project. Previously, **David has successfully worked on 3 SHA CMAR projects**. On the MD 24 project, **David created the Risk Pool** idea which was integrated into the budget and paid for any risk that actually occurred. If the risk did not take place, SHA received the cost savings at the end of the project.

Relevant Project Experience

Interstate-95 at Telegraph Rd. Interchange | $236 Million | Virginia Department of Transportation (VDOT), Alexandria, VA

Position: Lead Cost Estimator | November 2011 – June 2013 (Substantial completion was 112 days early.)

David led the estimating team in quantifying components for all major disciplines on the project. He was an active participant in all design/constructability review meetings and assisted with all environmental and utility coordination. This JV Kiewit project had extensive ground improvement challenges using wick drains, densified aggregate piers, High Strength Geosyntec, and ground stabilization methods. David led the team through the constructability review and estimating of these measures. This Corman/Kiewit JV interchange project was a fast-track 2.5 mile widening/reconstruction of I-95/I-495 and Telegraph Road connecting the Woodrow Wilson Bridge project with new HOT lane projects.

Intercounty Connector (ICC) Contract A & B Design Build | $1,038 Million | Maryland DOT (SHA) | Baltimore, MD

Position: Cost Estimator | October 2008 – November 2011

David estimated all major components of both projects including quantity takeoffs and production based cost estimating and led the transition from the estimates to the design coordination. He met with the design team to coordinate designs and obtain MDE approval for roadway design segments, ensured interdisciplinary coordination, managed the risk register and supported overall permitting during design. He also managed the preconstruction schedule and met with stakeholders to address concerns and updated them on progress. ICC-A was 7.2 miles and ICC-B was 7 miles of controlled-access tri-lane divided highway with steel/precast concrete girder interchange bridge, roadway & extensive drainage and environmental improvements.

MD 24, Sections A & G **CMAR** | $5.3 Million | Maryland DOT (SHA) | Harford County, MD

Position: Lead Cost Estimator | December 2013 – April 2015

David prepared all estimate coordination and regularly met with SHA, the designer, and ICE to develop a constructible, innovative, cost effective, and timely design. David managed the innovation log, subcontracting plan to include DBEs for the construction phase (exceeded the 16% goal), led quantity takeoffs and led the risk assessment and mitigation workshops. David met with stakeholders to address environmental concerns in the Deer Creek River and supported all permitting. Through an open-book cost model with SHA, an Opinions of Probable Construction Cost (OPCC) and a Guaranteed Maximum Price was prepared/approved. Deer Creek in Rocks State Park gradually eroded its embankment which supports the MD 24 roadbed. This project improved road safety by re-mediating the slope supporting MD 24, repairing pavement, and improving roadway drainage.

Piscataway Emergency Repairs **CMAR** | $7.7 Million | Prince George's County | Fort Washington, MD

Position: Lead Cost Estimator | June 2015 – December 2016

David developed all estimate coordination and worked with the designer and ICE to provide a competitive cost proposal, performed quantity takeoffs, managed a risk register, incorporated innovations, ensured a constructible design, and saved the County $5 Million. He developed an innovative pile shoring solution to support the slope protection which alleviated a major soft soil risk on an unstable steep slope. David utilized the CMAR process to work with the County and designer to rebuild the roadway, storm drains, and water/sewer lines on this emergency stabilization contract.

Project Name: I-95/495 AT TELEGRAPH ROAD INTERCHANGE

Location: Alexandria, VA
Point of Contact: Nick Nicholson | 202.775.3300

Owner / Client: Virginia Department of Transportation
Project Delivery Method: Bid Build

Initial Overall Construction Cost: $237,393,187

Final Overall Construction Cost: $269,100,744

Reasons for Cost Difference: Earned contract incentives and owner approved changes

Initial Overall Schedule Performance: June 2013

Final Overall Schedule Performance: June 2013

Reasons for Schedule Difference: Substantial completion date was achieved 8/25/12, which was 112 days earlier than required completion date.

Brief Project Description

Kiewit served as a JV partner on this project which included a complete interchange reconstruction, widening and reconstruction of approximately 2.5 miles on I-95/I-495, west of Route 1 to the Eisenhower Connector exit. Improvements along Telegraph Road included roadway/bridge reconstruction, intersection improvements and utility relocations from Duke Street on the north to Lenore Lane to the south. This was the final major undertaking of the Woodrow Wilson Bridge project and the largest design-bid-build in Virginia at the time.

The new grade-separated interchange provided access to eastbound Huntington Avenue and North Kings Highway from the Beltway Outer Loop and southbound Telegraph Road, through elevated ramps over Telegraph Road and signalized intersections, and refined traffic flow and provided easier/safer pedestrian access. The project also included drainage improvements, five box-culvert extensions, new traffic systems, lighting, signage, utility relocations, landscaping along Telegraph Road and I-95/I-495 and an environmental mitigation project at nearby Cameron Run Wetlands.

Management of MOT was the most critical aspect of the project's success. The team revised MOT plans, greatly reducing the original design of six phases and 16 sub-phases to three phases with 10 sub-phases. This change helped the team meet all major interim milestones and their corresponding incentives, while improving traveling conditions for the public. Team partnering helped identify and resolve any priority issues early in the planning stages.

There were poor soils located throughout the project, which required ground improvements including wick drain installation. Through proactive planning and collaboration with the Client, we were able to mitigate the soft soils without impacting the project schedule.

Work Relevant to MD 4

Key Personnel Involved: Tim and **David** worked in identical roles.

Bridges: The project included 11 new bridges: 2 flyover curve steel girder bridges, 1 bridge widening, and 1 bridge repair. We also completely demolished 5 bridges, partially demolished 2 bridges, and reconstructed 7 adjacent to or over traffic.

Environmental: Wet land mitigation, stream restoration, and channel improvements to Cameron Run and its tributaries.

Roadway/Walls: The project included flyover ramps constructed with MSE walls. In order to construct the roadway there was 500,000 cy of excavation, 22 retaining/MSE walls, 4 sound barrier walls and 11 box culverts (new and extensions).

Similarities to MD 4

- Interchange Construction
- Roadway Construction
- Poor Soils and Wick Drains
- New Bridges with Similar Elements
- Retaining Walls
- MOT
- On / Off Ramps
- Landscaping
- SWM and ESC
- Signing
- Striping
- Major Utility Relocation Possible
- Estimating

The team managed the third-party stakeholders, and also assisted in the overall Woodrow Wilson bridge community outreach program with VDOT's GEC. They also coordinated work with the City of Alexandria, adjacent properties, local residents, utility companies, hotels, retail stores, police, fire and other emergency responders.

Successful Methods/Approaches/Innovations

Stakeholder/Third parties: We coordinated with WMATA, CSX, Norfolk Southern, and VDOT through regular meetings and detailed schedules to establish access and schedule track shutdowns for bridge construction over the railroad. Also, we collaborated with contractors working on the Route 1 roadway project, which is in proximity to Telegraph Road to coordinate traffic closures to avoid MOT conflicts and to ensure both projects were not impacted by each other. We managed third-party stakeholders and coordinated with adjacent properties, the City of Alexandria, local residents, utility companies, hotels, retail stores, police, fire, and other emergency responders. **Why relevant to MD 4?** The MD 4 Project is surrounded by many stakeholders including Prince George's County, Developers (Wood Property, Westphalia Developer, and Smith Farm Home), National Park Service (NPS), Joint Base Andrews, Utility companies (Washington Suburban Sanitary Commission).Kiewit will coordinate with all project stakeholders in conjunction with SHA and the Designer. We will hold regular meetings and share detailed schedules for access and shutdowns. This will include meetings with environmental agencies, local stakeholder groups, adjacent property owners, utility companies, and the public.

Utilities: Contract drawings showed no utility conflicts; however, as work began, it was clear many existed. Rather than wait to discover them, the project team identified and recorded existing utility locations for the entire project and recorded the conflicts. One of the critical utilities was a 36-inch water main that had to be protected and relocated in various locations. The team was able to mitigate these conflicts before they created construction impacts through detailed utility coordination, design and scheduling. As a result, the original schedule was maintained with extensive relocations coordinated with the schedule. **Why relevant to MD 4?** Utilities are identified in the MD 4 RFP as a Project Key Issue. We will use similar methods described above to eliminate and minimize impacts to the relocated utilities to the maximum extent possible. We will coordinate with Washington Suburban Sanitary Commission (WSSC) to address completion of the relocated waterline.

Geotechnical: Due to poor soils, after award, our team and in-house geotechnical engineers worked with the Client and design engineer to evaluate alternate ground improvement types, foundation types, retaining wall types and pavement sections. Our team pulverized the existing pavement and incorporated the existing materials into the new pavement section to mitigate subgrade concerns and save project cost. We were able to mitigate many of the poor soils due to our proactive approach early in the project. **Why relevant to MD 4?** We will bring in our in-house geotechnical engineers to work with SHA and the designer to evaluate the soil conditions and make innovative suggestions to mitigate subgrade concerns and save project cost. The contract documents also indicate the use of wick-drains at the MD 4 excavation. The same type of ground improvements were successfully used on the I-95 / Telegraph Road Interchanged project.

Maintenance of Traffic (MOT): Maintaining 160,000 ADT traffic was the most critical aspect of the project's success. Traffic flow issues were mitigated before they became problematic. Six lanes; three lanes in each direction of I-95 was maintained at all times during construction. Due to excessive traffic congestion, the project team revised MOT plans, greatly reducing the original design of six phases to three phases and from 12 traffic shifts to six. This positioned the team to improve public traveling conditions and meet all major interim milestones. Team partnering identified and resolved issues early in the planning stages. **Why relevant to MD 4?** MOT is identified in the MD 4 RFP as a Project Key Issue. Kiewit and our seasoned MOT design team will ensure safe and efficient MOT plans which will minimize impacts to the traveling public, maintain access to developments, and maintain the temporary closure at Joint Base Andrews (JBA) North Gate. Our Construction Team will be sure the MOT plan is flexible in case of heightening restrictions at JBA. We will collaborate to ensure signage in the plans is updated and accounts for all access points and developments.

Awards

2013 VTCA Transportation Engineering Overall Winner

Project Name: INTER-COUNTY CONNECTOR CONTRACT B

Location: Montgomery County, MD
Point of Contact: Melinda Peters | 410.728.2900

Owner / Client: Maryland State Highway Administration
Project Delivery Method: Design Build

Initial Overall Construction Cost: $545,092,000

Final Overall Construction Cost: $560,740,488

Reasons for Cost Difference: Owner directed scope increase

Initial Overall Schedule Performance: January 2012

Final Overall Schedule Performance: November 2011

Reasons for Schedule Difference: Finished project ahead of schedule due to good planning and management of project.

Brief Project Description

Kiewit was the lead for the joint venture that constructed the design-build project known as the Inter-County Connector, Contract B (ICC-B), which consisted of the middle segment of the ICC automated toll way. The work included more than seven miles of new six-lane highway constructed through some of the most environmentally sensitive and heavily populated areas in the Baltimore/Washington corridor.

Construction began in January 2009 and was open to traffic in November of 2011. Key elements included a diamond interchange at MD 182, a single point urban interchange (SPUI) at MD 650, and 10 new bridges including precast concrete and steel girders. Additional project features included intelligent transportation systems (ITS), electronic toll collection (ETC), traffic signals, signing and pavement marking, more than 80 acres of reforestation, 12,938 lf of hiker and biker trails, and the relocation of six side roads. In addition to the bridge structures, the project had more than seven miles of sound barriers and more than 65,000 square feet of mechanically stabilized earth (MSE) walls.

At the time, the Inter-County Connector, Contract B project was the largest design-build project ever undertaken by the State of Maryland. The team cleared more than 325 acres, constructed eight large stormwater management ponds and two large underground stormwater containment structures, moved more than 2.4 million cy of earth, constructed more than 54,000 lf of drainage systems, placed more than 500,000 tons of new asphalt pavement, and built more than 65,000 sf of MSE retaining walls. Our team self-performed 60% of the work.

Environmental Elements

Protecting the diverse and sensitive natural environment that was to be traversed by the Inter-County Connector (ICC) required extraordinary focus and effort. To fully address potential impacts during the proposal phase, our environmental and design teams worked closely to design ICC-B with a comprehensive set of avoidance, minimization, and mitigation to protect the environment to the utmost extent. The team worked closely with MDE to gain approvals to begin construction.

Work Relevant to MD 4

Key Personnel Involved: Tim, Luke and **David** worked in identical roles

Bridges: 15 new bridges including curved steel and concrete girders. Bridge elements were very similar to the structures on MD 4 and were designed per SHA standards.

SWM: The project included 54,000 lf of storm drain systems with new storm water management ponds.

Roadway/Walls: The project included over 65,000 SF of MSE retaining wall.

Similarities to MD 4

- SHA Project
- Alternative Delivery
- Interchange Construction
- Roadway Construction
- Retaining Wall Construction
- Soft Soils
- SWM and E&S
- Bridge Construction with Similar Elements
- Environmental Sensitivity and Permitting
- MDE Coordination
- Coordination with Third Parties
- Design Coordination
- **Mike Baker** was Environmental Consultant
- Landscaping
- Major Earthwork
- Utility Relocation Possible
- Maintenance of Traffic
- Public Outreach

Environmental design functions included: environmental studies and documentation required for design modifications; preconstruction baseline environmental monitoring; environmental reviews during design for additional avoidance and minimization; validation, verification of existing environmental features; environmental design for wetland, streams, fish passage, vernal pools and reforestation; and training construction field staff on environmental issues. *Environmental mitigation included:* wildlife monitoring, management of mammal passage, turtle and trout relocation programs, reforestation efforts, and pre and post-construction water quality monitoring. The team utilized an extensive sediment and erosion control system and minimized equipment idle time to reduce emissions.

Kiewit successfully coordinated with numerous stakeholders including the Maryland State Highway Authority, adjacent contractors at ICC contracts A and C, a multitude of project stakeholders including Montgomery County, MDE, USFWS, M-NCPPC, MDNR, USACE, EPA, utility companies, environmental agencies, county agencies, adjacent landowners, and community organizations.

Successful Methods/Approaches/Innovations

Environmental: Throughout construction, our team had to meet stringent environmental requirements and was monitored by an incentive/disincentive program. Overall, our team was rated an "A" rating from the Maryland Department of the Environment and earned over 90% of the project incentive. Bridges over parks and streams were built longer than normal to lessen the amount of environmental impact in these sensitive areas and allowed greater clearance for wildlife and vegetation. The path of the ICC roadway was lowered into the ground near existing communities to reduce noise and visual impacts. **Why relevant to MD 4?** Kiewit will support National Environmental Policy Act (NEPA) approvals. We will complete a comprehensive review and provide revisions to the E&S plans to address sequencing and constructability issues. We will Coordination with Maryland Department of Environment (MDE) for a new MDE Authorization Letter. We are aware that The National Park Service owns Suitland Parkway, which is on the National Register of Historic Places.

MOT: There was no live traffic on the ICC, however the corridor intersected five major roadways which could not be closed during construction. MOT at four of these locations included a temporary detour around the ICC site, during which time our team elevated the intersecting roadway over the ICC and switched traffic back on to the roadway and new bridge before continuing construction of the ICC underneath. The ICC spans over one intersecting roadway. During beam setting and overhead work at this location, traffic was detoured to avoid lane closures. **Why relevant to MD 4?** MD 4 and Suitland Parkway must remain open during construction and will include temporary detours during which time our team will excavate MD 4 below existing grade. We will provide detailed phasing and MOT plans to maintain safe and efficient maintenance of traffic and minimize impacts to the traveling public.

Public Outreach: Kiewit provided a full-time public outreach team that proactively addressed the upcoming concerns and issues that arose to ensure the community was informed and satisfied with the project. **Why relevant to MD 4?** Kiewit has assigned a Public Outreach Support person, Tina Chism, on MD 4. Kiewit will participate with SHA and the Designer in the Stakeholder outreach program. This will include meetings with environmental agencies, local stakeholder groups, adjacent property owners, utility companies, and the public.

Schedule: The ICC project experienced a 6-month delay to start-up due to proposal protest procedures and experienced numerous delays after start-up, in the approval and issuance of grading permits by the Maryland Department of the Environment (MDE). The Team, lead by **Tim** & **David,** was able to shorten the MDE permit approval process by 7 months Delays in start-up were overcome by a couple of key steps. Kiewit began design, mobilization, and procurement activities "at risk" to ensure a rapid start-up when available. The other was overcoming the start-up delay by working with the owner to develop a Limited Notice to Proceed, which allowed a limited number of critical activities to begin that were beneficial to the project regardless of the protest outcome. The tightly scheduled project was completed on time and SHA was able to open to traffic as planned. Grading permit issues were overcome by breaking the project into select areas that allowed work to begin in some as issues in other areas were addressed as the design advanced. **Why relevant to MD 4?** While we do not anticipate a similar proposal protest, Kiewit is prepared to present early work packages to allow for a limited number of critical activities to begin during the preconstruction phase.

Awards/Commendation

- The project received an "A" (Excellent) rating from the Maryland Department of the Environment on more than 150 inspections
- Design, construction, and program management were assessed by SHA and contract conformance was scored using a quality oversight database. The project ended with the project team earning a 95% conformance rating and meeting all key project goals
- ENR Northeast Region Best Project of 2011
- ARTBA 2012 GLOBE Award for Major Highway Project Greater than $100M
- Maryland Quality Initiative Silver Partnering Award
- 2012 National Design-Build Award, Transportation.

Project Name: ARLINGTON MEMORIAL BRIDGE REHAB

Location: Washington, D.C.
Point of Contact: Joe Fabis | 703.404.6271

Owner / Client: Federal Highway Administration
Project Delivery Method: Design Build

Initial Overall Construction Cost: $189,000,000

Final Overall Construction Cost: $205,000,000

Reasons for Cost Difference: Owner scope addition of Memorial Circle Design, Overruns in concrete repairs

Initial Overall Schedule Performance: November 2020

Final Overall Schedule Performance: November 2020

Reasons for Schedule Difference: Met the schedule.

Brief Project Description

Owned and operated by the National Park Service, the 84-year-old Arlington Memorial Bridge needed to be completely rehabilitated or face closure by 2021. Kiewit worked to restore the deteriorated components of the bridge while preserving the memorial's historic fabric for the next 75 years and beyond while minimizing the impact on the thousands of drivers, bicyclists, and pedestrians who use the bridge as a major gateway between Washington, D.C., and Arlington, VA.

The Arlington Memorial Bridge is 2,162-feet-long and 94-feet-wide. The bridge consists of ten reinforced concrete arch approach spans and a double-leaf bascule span at the bridge's center. Eight of the ten approach spans convey the Potomac River under the bridge. Two smaller concrete arches span the George Washington Memorial Parkway (GWMP) and Ohio Drive, SW, at each end of the bridge. The bridge has sidewalks on each side nearly 14 feet, and the roadway measures 60 feet from curb to curb, providing six 10-foot-wide vehicle travel lanes.

This project consisted of full deck replacement using stainless steel reinforced high-performance concrete precast panels with ultra-high-performance concrete closure pours. Kiewit installed deck panels by operating Liebherr 1200 cranes on movable trestles that spanned the existing bridge crosswalls. The 50,000 lb precast panels were delivered to the bridge each night, and four panels were installed along with a daily movement of the trestle. A total of 450 precast panels were installed. As part of the deck rehabilitation, Kiewit performed hydrodemolition and added a 2-inch LMC overlay as part of the final deck surface.

Kiewit replaced all expansion joints with new strip seals and a redundant trough system to reduce long-term maintenance and extend the life of the structure. The substructures were also badly deteriorated, so Kiewit replaced all existing concrete frames in the piers with new high-performance concrete columns, caps, and precast beams. At the approach span abutments, Kiewit Foundations installed 20 ea drilled shafts to accommodate the new substructure frames. Additional deterioration was repaired through the use of cathodic protection and spall repairs. Kiewit restored thousands of pieces of historic granite and cleaned the entire granite facade.

Work Relevant to MD 4

Key Personnel Involved: Luke worked in an identical role, **Tim** was an off-site executive

Bridges: Large steel girder erection, piers and foundations, abutments, expansion joints

MOT: This heavily traveled corridor included extension maintenance of traffic

Utilities and Permits: Kiewit had to procure all permits and relocate utilities during Preconstruction

Local Craft and Staff: Kiewit hired over 100 craft for the project, located minutes from MD 4, which will help with craft availability for the project

Environmental Significance to Similar Stakeholders: The National Park Service owns Suitland Parkway, which is on the National Register of Historic Places

Similarities to MD 4

- Close Proximity to MD 4 Project
- Alternative Delivery
- Highly Phased Construction
- Interchange Construction (Roundabout)
- Roadway Construction
- Steel Girders
- Similar Bridge Elements
- Permitting
- Utility Relocation
- National Park Service - Major Stakeholder
- Major MOT
- Major Metropolitan Area

For the bascule span, Kiewit designed and installed a "jack-up barge" to support the bridge during the two-phased removal while still maintaining traffic. After the "jack-up barge" and shoring towers were jacked out of the water, we supported the transverse floor beams that needed to be cut in half to accommodate the phased construction. Live traffic was supported by the "jack-up barge" for nearly one year, with Kiewit Infrastructure Engineering (KIE) performing the design engineering for this critical operation.

Once half of the bascule bridge was removed, Kiewit installed 12 each 216-feet-long, 170,000 lb main span steel girders along with back span steel girders. These girders were assembled on a barge and lifted with a Liebherr 1300 crane located from the barge. The team utilized rolling closures at night to set the main span girders. Within the bascule, Kiewit installed new 35-foot-tall abutment walls to support the new fixed span girders and worked around historical machinery rooms that had to be protected throughout construction. After girder installation, architectural subtruss steel was installed underneath the new main span girders to mimic the look of the original bascule bridge.

The Project was constructed in two phases to maintain traffic. Kiewit installed temporary lane use control signals, which enabled Kiewit to reverse lanes daily, optimizing traffic flows. A detailed TMP was developed and approved by all local stakeholders to maintain traffic in and out of D.C. with a high level of safety.

As a value-added scope, FHWA added a $3 million change order to the Virginia side roundabout to provide traffic movement improvements through ramp widening, roundabout reconfiguration, improved drainage, and updated traffic patterns. These improvements enhanced the level of service and reduced congestion during peak travel times.

Being only blocks from the White House, this high-profile project required extensive public outreach for all the stakeholders involved. The team coordinated numerous special events, including marathons, motorcycle rides, and the Fourth of July "A Salute to America". We also provided several high-profile tours, including the Secretary of the Interior, Director of the National Park Service, members of Congress, and other public officials.

Successful Methods/Approaches/Innovations

MOT: Kiewit implemented a Lane Use Control System (LUCS) to provide three lanes of traffic, one being a reversible lane. This allowed Kiewit to construct the bridge in halves. Kiewit also developed a Traffic Management Plan (TMP) that was approved by DDOT, VDOT and Arlington County. Due to Kiewit's efforts, traffic was maintained throughout construction with minimal delays. **Why relevant to MD 4?** Kiewit will provide innovations for MOT relevant to MD 4 just as we provided a custom and innovative MOT plans to the Arlington Memorial Bridge project.

Permit and Utility Matrix: Kiewit developed and maintained a detailed permit and utility matrix throughout design and construction. These matrices included all pertinent information required to ensure the permits and utility relocations were kept on track, including owner, lead times, status and key requirements. Kiewit was responsible for obtaining all permits and relocating all utilities. Our efforts resulted in an on-time design and construction phase. **Why relevant to MD 4?** Kiewit will provide similar matrices on MD 4 to ensure permitting and utility coordination contribute to an on-time design and construction phase.

Public Outreach: Kiewit provided a full-time public outreach team to proactively address the upcoming concerns and issues that arose to ensure the community was informed and satisfied with the project. **Why relevant to MD 4?** Kiewit has assigned a Public Outreach Support person on MD 4. Kiewit will participate with SHA and the Designer in the Stakeholder outreach program. This will include meetings with environmental agencies, local stakeholder groups, adjacent property owners, utility companies, and the public.

Schedule: Upon award, Kiewit was requested to reduce the 1,550-day schedule down to 1,000 days, including design while maintaining three lanes of traffic in each direction. To accommodate the request, Kiewit was required to perform the approach spans and bascule span concurrently, which posed a significant access challenge; however, Kiewit resequenced the schedule and developed an entirely new scheme to achieve the Client's request. The design and permitting lasted about nine months, and our team met every design milestone to ensure construction started by our planned date. **Why relevant to MD 4?** Kiewit is prepared to accommodate SHA's scheduling needs during preconstruction and construction. SHA has not provided a project completion date, however we have developed a preliminary schedule which will be adjusted as the baseline schedule is developed during preconstruction in collaboration with SHA and the Design team.

Temporary Engineering: Through the use of Kiewit Infrastructure Engineering (KIE), we self-performed all temporary engineering including steel girder erection, temporary trestles, bridge jacking and high risk shoring. Through innovative design, we were able to reduce cost and maintain the aggressive project schedule. FHWA reviewed and approved all of Kiewit's temporary designs in a highly collaborative manner. **Why relevant to MD 4?** Kiewit will use KIE to provide design innovations on MD 4.

Key Personnel

Tim Cleary will be the CMAR Project Manager serving as SHA's main point of contact for the Project Team. He will lead the team all through Preconstruction services and Construction until final completion. Tim's role in Preconstruction service will include: estimating, quantity take offs, ICE consultations, utility coordination, permit procurement, constructability reviews, value added analysis and innovations, value engineering, phasing plans, stakeholder and community outreach, risk analysis, design coordination and schedule planning. **Tim will be supported by our in-house subject matter expert (SME) team from Kiewit Infrastructure Engineering (KIE),** a team of technical experts with vast experience on alternative delivery projects. Tim and this KIE team have a proven record of collaborating to optimize the design to exceed project schedule, cost, and quality requirements. **Tim will lead David Gates, Wally Jordan, Joe Chang, Steve Saye, Mike Baker, and other discipline experts to generate innovative concepts, providing specific impact and feasibility studies that can be incorporated throughout Preconstruction.** The result is a real-time understanding of any proposed scope, phasing, or other implementation scenarios as they relate to schedule, cost, and risk giving SHA a high degree of CMAR selection confidence. These KIE experts will also work in tandem with our **Construction Manager, Luke Silvus** to perform constructability reviews during Preconstruction, maximizing scope within the project budget. Following his Preconstruction efforts, **Luke will oversee the on-site Construction Team.** He will manage project controls, safety, quality, schedule, material procurement and coordination, permitting, buyout and subcontracts. **Tim will lead Luke and the Construction Team through all construction processes. David Gates, Cost Estimator, will lead the OPCC estimates and Baseline estimates.** He will use his wealth of knowledge to prepare for MDE requirements and permitting actives. David is prepared to gain full understanding of the items that have been previously purchased by SHA and take inventory of materials already on site to ensure an accurate cost estimate and constructability of the design. He will participate in task force meetings with SHA and the Design Team. He will provide valuable design input for phasing, MOT and innovation strategies.

ANTICIPATED HOURS PER WEEK

		Preconstruction	Construction
Tim Cleary	PM	20 hrs	40+ hrs
Luke Silvus	CM	20 hrs	40+ hrs
David Gates	CE	40 hrs	0-5hrs

FIGURE 1 ORGANIZATION CHART

LEGEND
- Key Personnel
- Direct Relationship
- Supporting Relationship
- Collaborative Relationship
- DBE Opportunities

STAKEHOLDERS
Prince George's County
Joint Base Andrews
National Park Service
Developers:
- Wood Property
- Westphalia Developer
- Smith Farm Home

Utilities:
- WSSC

MDR
RAA
USACE
MDNR
Residents
Businesses
First Responders

SHA State Highway Administration

Independent Cost Estimator

OFF-SITE PRINCIPAL
BEN CARNAZZO

TIM CLEARY
Project Manager

JOSH WILSON
Safety Manager

STEVE CARL, P.E.
Quality Manager

MDOT DISTRICT 3
- MDOT Project Manager Lead Designer
- Structures
- Highway
- Traffic Engineering
- Geotechnical Engineering
- H&H / SWM / E&S
- Environmental and Permitting
- Utilities

PRECONSTRUCTION
- **DAVID GATES** — Cost Estimator / Construction Manager
- **WALLY JORDAN, P.E.** — Bridge Design Support
- **JOE CHANG, P.E.** — MOT / Roadway Design Support
- **STEVE SAYE, P.E.** — Geotechnical Design Support
- **MIKE BAKER, AECOM** — Environmental / Permitting
- **LUKE SILVUS** — Constructability / Planning / Utility Relocation
- **ALEXA FOSMER, PSP** — Preconstruction Scheduler
- **KELLI KELLY** — DBE Outreach
- **TINA CHISM** — Public Outreach Support

CONSTRUCTION MANAGEMENT
- **LUKE SILVUS** — Construction Manager
- **JORGE ESCOBAR** — Structures Superintendent
- **RYAN HAYES** — MOT / Traffic Manager
- **ALEXA FOSMER, PSP** — Construction Scheduler
- **TRAVIS ATKINS** — Drainage / Utility Superintendent
- **MIKE BAKER, AECOM** — Environmental / Permitting
- **KEITH DURHAM** — Grading / Roadway Superintendent

POTENTIAL SUBCONTRACTORS / SUPPLIERS

Structural Steel Fabricators	Trucking*
Concrete Girders	MSE Panel Supply
Asphalt Paving & Milling	Aggregates
E & S*	Ground Improvements
Guardrail*	Foundations
Landscaping*	Flatwork*
MOT*	Lighting
Painting*	Signage
Pavement Markings*	Slipform Barrier Wall
Rebar*	

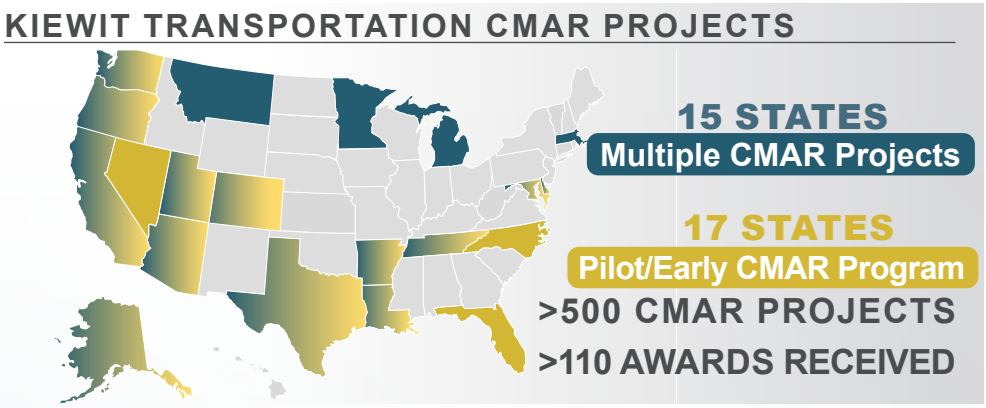
Section C

C. Project Approach

C.1 Preconstruction Approach

Through our extensive CMAR experience, we have developed several innovative approaches to the Preconstruction process that help exceed our clients' goals and ensure the successful delivery of these projects. Our Team utilizes a fully open-book approach regarding cost estimating, innovation tracking, and risk management. From the onset, we will develop a production based baseline estimate and focus on areas that our Team can make the most significant impact on cost. We will concentrate on innovation and risk mitigation by utilizing detailed tracking logs and tools that aid in decision making. As a true differentiator, our builders will be involved in every step of Preconstruction beginning with As-built and Conceptual design reviews, along with verifying existing site conditions. Our critical right-time constructability input will reduce cost, improve quality, reduce maintenance, and ensure on-time delivery. These are just a handful of the dozens of best practices Kiewit will bring to the MD 4 Project.

These best practices will be carried out by our experienced Preconstruction Team. Our Key Personnel have worked closely with SHA on projects such as: Design-Build ICC Contract B and **3 SHA CMAR Projects**: MD 24 (SHA's 1st CMAR), IS-95 – Greenbelt and MD 5 in St. Mary's County. Key members of our team have also worked on successful CMAR Projects for other agencies including DELDOT, NCDOT, TennDOT, as well local Maryland counties Montgomery County, MD, Anne Arundel County, and Prince George's County. **With over 500 successful CMAR Projects in Kiewit's resume, SHA can have confidence that our Team will deliver successful Preconstruction results for this critical and complex Project.** We will bring innovative ideas, lesson-learned, extensive Preconstruction, and Construction expertise to this CMAR Project. We will build a team with SHA, the designers, and stakeholders that will seamlessly collaborate and cooperate. A team that starts with trust and delivers results.



C.1.a. Collaboration

Kiewit will implement our best practices for the CMAR Preconstruction Processes to accomplish SHA's objectives of building a CMAR Team based on the principals of collaboration, cooperation, and trust. Our CMAR Preconstruction best practices include:

- **Implement a Project Communication Plan**
- **Meet the Project Goals**
- **Analyze and Resolve Decisions**
- **Attend Monthly Partnering Meetings**
- **Coordinate with Project Stakeholders**

Project Communication Plan

Kiewit will work with SHA, the Designer, and ICE to develop and implement a Project Communications Plan that effectively delivers information, keeps the entire team apprised, builds trust and resolves issues quickly. The Project Communications Plan will maintain a consistent meeting schedule that incorporates the use of project management tools for real-time and detailed information sharing. With these practices and tools, SHA will always have access to the most current information.

We will employ the following approach as part of the Project Communication Plan to collaborate and foster open communication and trust:

- At the Initial Project Workshop, the entire team will participate to align expectations, reinforce project goals and introduce the significance of collaboration. Building strong relationships with all the parties involved, including SHA, the Designer, the ICE, and stakeholders will be our focus to ensure that the project begins on solid footing.
- We will implement a Project Zipper Plan that will detail the chain of communications by aligning the Team to build strong, positive relationships with all parties and establish an effective communication flow between SHA, the Designer, the ICE, and Kiewit staff. The Plan identifies counterparts for all personnel throughout the organizations for clear lines of communication laterally and vertically.

- Kiewit will attend monthly partnering meetings and provide progress reports to communicate the Project's progression, including safety, quality, cost and schedule. These monthly meetings include executive management and allow for direct communication and the opportunity for issue discussion and resolution to keep the project moving forward.
- Our Team will utilize Cloud-based Technology (Kiewit or SHA supplied) to house project documents, communication logs and reports, and the Project Dashboard. All entities working on the project will have access, allowing for a completely transparent process where information is easily and clearly disseminated.
- Co-locating or in-person meetings will take place to provide a face-to-face collaborative environment and promotes a trusting partnership atmosphere.

Kiewit achieves true collaboration with SHA and the Design team by actively participating, listening, and basing all project decisions on SHA's project goals. **SHA's goals and our approach to meeting these goals are as follows:**

SHA's Project Goals and Kiewit's Plan to Meet Them
GOAL #1 Minimize project construction costs within the current budget.
• Implement robust CMAR Preconstruction Process with input from Kiewit Infrastructure Engineering (KIE) • Implement innovations to reduce cost • Develop improved phasing scheme to reduces temporary work and reduces duration-based cost • Utilize current procured material (steel, drainage, etc.) in new design
GOAL #2 Minimize project delivery time.
• Develop improved phasing scheme to improve overall schedule • Utilize permit and utility matrix to prevent delays in construction • Incorporate innovations to reduce quantities which results in faster schedule • Utilize Kiewit's scheduling best practices leading to consistent on-time/early performance
GOAL #3 Utilize temporary pipes and drainage structures already ordered and stockpiled.
• Perform inspection/inventory of all materials immediately upon Preconstruction award • Ensure all designs incorporate materials already purchased
GOAL #4 Utilize structural steel bridge, sign structures, lighting and signalization already ordered and stockpiled.
• Perform inspection/inventory of all materials immediately upon Preconstruction award • Ensure all designs incorporate materials already purchased • Perform survey of girders to confirm sizes and provide information to the Design team
GOAL #5 Improve safety and relieve congestion
• Utilize KIE's input to develop optimized MOT scheme with focus on safety • We have the proven ability to finish projects early through robust Preconstruction and improved phasing which will relieve congestion sooner • Enlist our construction experts to perform constructability reviews during Preconstruction with this goal in mind
GOAL #6 Minimize inconvenience and impacts to the traveling public.
• Perform relocation of access roads early in the project while maintaining access at all times • Complete tie into Armstrong Village early in project for better developer access • Implement MOT scheme with temporary detours to maintain free flow of traffic during construction • Utilize "Super weekends" to accomplish large amounts of work and major traffic shifts
GOAL #7 Facilitate a collaborative partnership with all members of the Project Team and stakeholders.
• Utilize our key staff with CMAR experience and strong performance in alternative delivery methods • Implement Project Management Plan at onset of Preconstruction to facilitate collaboration and teamwork • Hold effective initial workshop and regular partnering meetings to monitor health of project • Hold in-person meetings to build personal relationships

Analyzing Decisions

While each goal is unique, several are highly interrelated. For example, an innovation may appear to reduce project cost by optimizing bridge layout **(Goal #1)** but could result in the inability to utilize steel already purchased **(Goal #4)**. To address issues such as these, Kiewit will utilize our Decision Analysis and Resolution Team (DART) best practice to evaluate solutions to each suggestion, innovation, or major design change proposed. The DART matrix organizes and quantifies innovations developed during design to help the Team evaluate the overall change. Each innovation is evaluated based on impacts to design, construction, schedule, SHA, and overall project goals. Another example would be an innovation that saves construction cost but results in costly redesign. In this case, the DART analysis includes both design and construction costs, and gives SHA an overall look at the project budget. There may be several options available for each innovation, and in this case, the various options will be analyzed based on cost, schedule, and risk to allow the team to make the best decision for the Project. Several of our innovative ideas listed in the proposed technical concepts section of this proposal are ideal candidates for a DART analysis. We look forward to sharing and vetting these ideas with the Team. Overall, the DART process improves collaboration, cooperation and trust. **Figure 2** is an example of a DART Tracking Matrix utilized by Kiewit, SHA and the designer during Preconstruction on SHA's MD 97 CMAR project.

FIGURE 2 DART Tracking Matrix

MD97 BROOKEVILLE BYPASS — Decision Analysis and Resolution Team (DART) Tracking Matrix

DART #	0001
Proposer	Kiewit
Date	9/30/2015

Discipline	☐ Civil	☒ Structures	☐ Track	☐ Facilities
	☐ Drainage	☐ Signals	☐ Existing Util	☐
	☐ Roadway	☐ Geotech	☐ Proposed Util	☐
Area of Improvement	☐ Constructability/Phasing	☐ Material Substitution	☐ Standard Spec Change	
	☒ Design Alternative	☐ General Conditions	☐ Other _____	

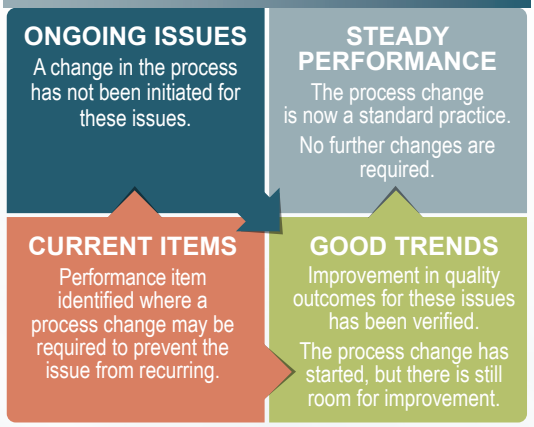
Item Description	Girders at Meadow Branch
Proposed Concept	Reduce the number of girders at Meadow Branch from 5 down to 4. Increases girder size and deck thickness.

Impacts to Design Scope on a Dollar Basis	Impacts to Construction Scope on a Dollar Basis	Impacts to Owner on a Dollar Basis	Impacts to Schedule on CPM Basis
Additional design required for 65% submittal.	<$1,435>	None	No major impact on schedule.

Factor (Check appropriate box)	Factor (Check appropriate box)	Factor (Check appropriate box)	Factor (Check appropriate box)
4 ☐ > $250K in Cost	4 ☐ > $250K in Cost	4 ☐ > $250K in Cost	4 ☐ > 5 Weeks added
3 ☐ $101K - $249K in Cost	3 ☐ $101K - $249K in Cost	3 ☐ $101K - $249K in Cost	3 ☐ 2 – 4 Weeks added
2 ☐ $50K - $100K in Cost	2 ☐ $50K - $100K in Cost	2 ☐ $50K - $100K in Cost	2 ☐ 1 – 2 Weeks added
1 ☒ $1 - $50K in Cost	1 ☐ $1 - $50K in Cost	1 ☐ $1 - $50K in Cost	1 ☐ < 1 Week add
0 ☐ No Impact	0 ☐ No Impact	0 ☒ No Impact	0 ☒ No Affect
-1 ☐ $1 - $50K in Savings	-1 ☒ $1 - $50K in Savings	-1 ☐ $1 - $50K in Savings	-1 ☐ < 1 Week reduction
-2 ☐ $50K - $100K in Savings	-2 ☐ $50K - $100K in Savings	-2 ☐ $50K - $100K in Savings	-2 ☐ 1 – 2 Week reduction
-3 ☐ $101K - $249K in Savings	-3 ☐ $101K - $249K in Savings	-3 ☐ $101K - $249K in Savings	-3 ☐ 2 – 4 Week reduction
-4 ☐ > $250K in Savings	-4 ☐ > $250K in Savings	-4 ☐ > $250K in Savings	-4 ☐ > 5 Week reduction
10 Weighted Score (Factor x 10)	-30 Weighted Score (Factor x 30)	0 Weighted Score (Factor x 30)	0 Weighted Score (Factor x 30)
ROM Cost: $6,000	ROM Cost: <$1,435>	ROM Cost: $0	ROM Time Impact: $0
	Total Cost: $4,565		**Total Score: -20**

Champion (s):	Donnie Arant
Attachments:	Cost Analysis
DART Recommendations:	Do not pursue due to low project savings.
Schedule to Follow-up:	
Final Resolution:	
Date Closed	NO ☐ Implemented YES ☐

FIGURE 3 Four Square Matrix



Partnering Meetings

As part of our monthly partnering meetings in Preconstruction and Construction, we suggest the use of the Four-Square Matrix **(see Figure 3)** which enables the team to identify positive and negative trends in an open, trusting and collaborative environment. At the monthly partnering meetings each team member has a voice, and will provide their perspective on all items going well and items needing improvement, which will all be added to the Four Square Matrix. In the first month, any good trend or current issue is added to the Current Items *(orange)* or Good Trends *(green)* box. If an item remains on the list more than one month, it moves to the Ongoing Issues box *(blue)* , which becomes an urgent issue needing resolution or the Steady Performance box *(grey)* to keep up the good work. By identifying ongoing issues or steady performers, the Team's attention can be focused on immediately resolving major issues, while ensuring things that are going well are maintained, which is a powerful collaboration and partnering tool.

Stakeholder Involvement

Strategic planning and delegation between SHA and Kiewit will form a solid foundation for effective public communication during Preconstruction. We will collaborate with SHA, the City and County Governments, Utility Companies, FHWA, NPS, Resource Agencies, EMS, Schools, Businesses, Residents, Developers, and JBA to create a plan based on your existing procedures. Kiewit will utilize best practices from other recent CMAR and DB projects to fully support SHA in stakeholder outreach during preconstruction, including:

- Establish public involvement goals for the project
- Institute PR procedures to ensure consistency
- Identify key stakeholders roles/responsibilities
- Determine potential issues/obstacles and devising solutions
- EMS: Prepare an Emergency Response Plan
- Utilize social media outreach and host regular update meetings with stakeholders, incorporate their comments and concerns into the Design
- NPS: Coordinate design submissions and comment resolutions
- Resource Agencies: Suggest alternative Designs and means and methods that minimize environmental impacts
- WSSC: Develop independent/early work package to complete this relocation if necessary

C.1.b. Design and Constructability Review

Kiewit will implement our best practices during Design and Constructability Reviews in the Preconstruction Phase in order to help streamline the design process, reduce errors and omissions, improve constructability and quality, reduce the cost of construction to ensure it is within budget, and optimize the project delivery schedule. Our best practices include:

- **Draw from Expertise of Key Personnel, Subject Matter Experts and our Environmental Partner**
- **Perform Interdisciplinary Technical Reviews**
- **Hold Task Force Meetings**
- **Prepare a Detailed Preconstruction Schedule**
- **Perform Constructability Reviews**
- **Implement Cost Reduction Techniques**

We will collaborate daily, whether face-to-face or remotely, with SHA and the Design Team. Our Key Team will fully participate in every project meeting in person, with supporting staff attending in-person or virtually. Key Personnel roles and responsibilities and Value Added expertise during Preconstruction is detailed below:

Key Personnel Roles During Preconstruction

Tim Cleary, Project Manager. Overall leader of entire process • Leads initial workshop in coordination with SHA • Attends all project meetings, including task force meetings, estimate reviews, schedule reviews, risk workshops, public meetings, executive meetings • Reviews all estimates and schedules with ICE/SHA • Ensures constructability reviews are thorough

Luke Silvus, Construction Manager. Attends task force meetings and risk workshops • Leads constructability reviews • Participates in phasing/schedule creation • Begins construction planning • Coordinates with stakeholders to incorporate their needs into construction planning • Leads construction of early work packages

David Gates, Lead Cost Estimator. Attends all task force meetings, estimate reviews, schedule reviews, risk workshops • Leads estimate coordination with the ICE • Leads cost estimating efforts, including early work packages • Prices innovation options using DART form and maintains innovation log • Participates in constructability reviews • Maintains risk register with the ICE

Value-Added During Preconstruction

KIE Subject Matter Experts (SMEs). Attends all tasks force meetings related to area of expertise • Develops discipline specific innovations to reduce cost• Partners with counterparts from the Designer • Brings national best-practices to preconstruction • Performs interdisciplinary reviews to avoid construction conflicts and reduce errors and omissions

Alexa Fosmer, Lead Scheduler. Develops and maintains fully integrated Design and Construction Schedule • Coordinates and compares Kiewit and the ICE schedules, reconciles differences • Evaluates innovations in the project schedule

Environmental Approvals

In order to streamline the design process and improve constructability and quality, it will be critical to perform a comprehensive review to the E&SC design and to coordinate with MDE for a new MDE authorization letter and obtain COE permits. We have partnered with environmental expert, **Mike Baker from AECOM** to support our Environmental Compliance Team. Mike has extensive experience in environmental and storm water management, wetland and waterway delineation and design, environmental resource analysis, water resource design, construction permitting, construction inspection and permit compliance. Mike Baker will guide our Preconstruction and Construction Teams to develop an optimal Construction Phasing Plan. He will then work with the Design Team to develop an E&SC design that is perfectly coordinated with the Construction Phasing Plan. This detailed coordination between Preconstruction, Construction and Design will improve collaboration, streamline permit approvals, improve constructability and reduce errors or omissions.

Mike and his Team will then work with SHA to obtain MDE authorization, COE permits, and any other project related permits. We will track the permits in real time on a detailed Permit Matrix which will list all permits, lead times, status, and other critical details that will be reviewed at the environmental task force meetings. The Environmental Team, with the knowledge from the Design team, will provide continuity during construction by working directly with the construction crews to ensure that the project is built to preserve the natural environment, thus optimizing the project delivery schedule.

Tim Cleary, David Gates and Mike Baker worked hand-in-hand on the ICC-B project to develop E&SC design, obtain MDE authorization, and all COE permits in a highly sensitive environmental area. They will bring this expertise to the MD 4 project to implement best practices and streamline environmental approvals and design.

Interdisciplinary Technical Review

Coordination between disciplines is a key facet of the review process to streamline the design process and reduce errors and omissions. The interdisciplinary review is a confirmation of consistency and compatibility among the various disciplines. The appropriate designers, builders, SHA Project Manager, and the Design Manager will perform plan reviews of design packages in an effort to maintain uniformity in plan preparation and ensure full coordination of design interfaces. **Roadway, Drainage and MOT Design are an example of critical disciplines to coordinate on the MD 4 Project to ensure all designs complement each other, thus streamlining design milestone reviews and reducing the number of design changes once construction begins.**

Task Force Meetings

Our approach to providing impactful constructability concepts and quality into the design is centered around organized collaboration by major discipline through Task Force Meetings. A Task Force Meeting is a design optimization meeting with each discipline and their key personnel where SHA can provide insight to design feature preferences. The Design Team will offer design criteria and options, and Kiewit will provide constructability, innovations, risk mitigation, schedule, and cost feedback.

Task Force Meetings will be attended weekly (or as determined by SHA) by key team members and value-added staff from KIE, based on their area of expertise, to provide effective communication and coordination between the major project components, including critical design work activities and action items. Task Force disciplines will be organized and led by a member of SHA, the Designer, and Kiewit **(see Figure 4)**.

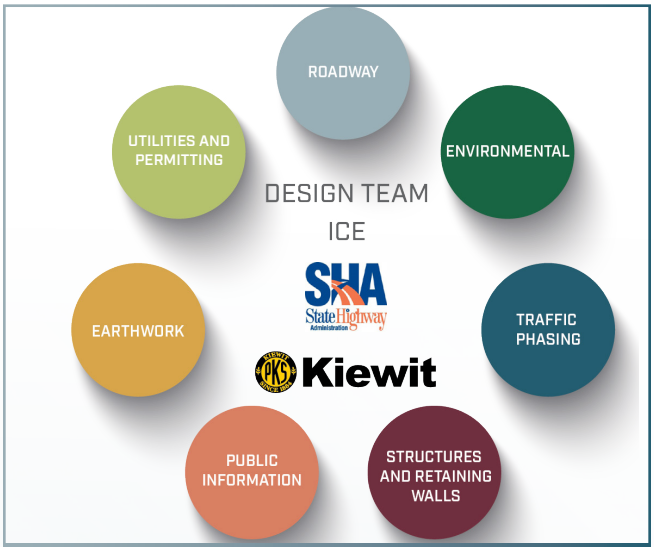


FIGURE 4 Task Force Meetings

This forum also allows subject matter experts to discuss alternative design and construction concepts, identify challenges, evaluate options, and implement solutions that provide the best value and lowest possible cost to the project (considering both the short and long term). In addition, SHA, key project stakeholders, and key subcontractors and suppliers are invited to topic-specific meetings to provide valuable input in the decision-making process. The goal of Task Force Meetings is to reach the most economical design and construction solutions for major project features while supporting SHA's interests and project goals.

Our team also provides input as needed by looking at sections of the design via informal reviews. We have found that regular collaboration between the Design Team and Kiewit through phone calls, Microsoft Teams meetings, and other informal meetings keep progress moving in between formal task forces, which improves the design schedule. The zipper plan will ensure the right people are collaborating with each other in a real time basis, which streamlines the design process.

Key Focus Areas During Initial Task Force Meetings:

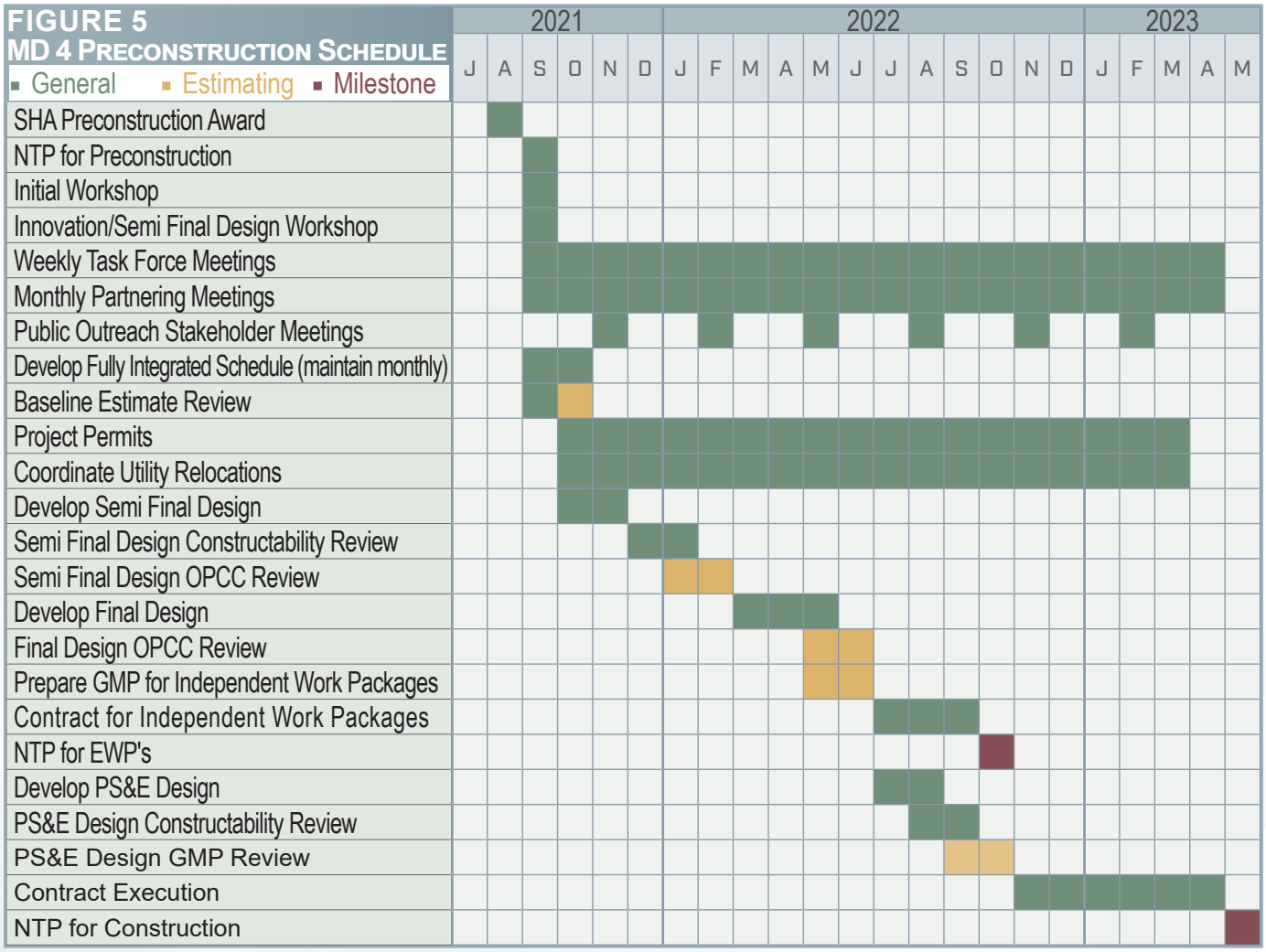
- **Traffic Maintenance Coordination:** We will work with MOT task managers to discuss construction access points and working room requirements to develop the Design. Our planned construction sequence will be a key factor in developing the MOT design. Maintaining the temporary closure at Joint Base Andrews (JBA) North Gates will be a top priority. The plan will be flexible in case of heightening restrictions at JBA. We will ensure our Team's plan provides a safe and efficient MOT and minimizes impact to the traveling public. We will also focus on bridge girder erection, and the use of rolling closures or detours. During Preconstruction, we will host a phasing workshop and develop the phasing plans with the Design Team.
- **Utilities Coordination:** The Utility Task Force will collaborate with the Design Team and WSSC on critical water main relocation work. Addressing long lead items will be key to ensure relocation work is designed and constructed with the critical phasing of the interchange work. Our goal is utility relocation avoidance and to minimize utility impacts and relocations. All utilities will be tracked on a detailed utility matrix, identifying the owner, current status, lead time and other critical information.
- **Drainage/SWM/E&S Coordination:** The design of pavement drainage is contingent upon the roadway grades, cross slopes, and barrier location. We will coordinate with MDE reviewers to ensure compliance and E&S Controls are constructible. Through design coordination, we provide the designers with input regarding temporary drainage to match our construction and MOT sequencing. For example, we communicate our phasing plan to the design team to ensure SWM areas are designed and constructed in the proper sequence to handle construction storm water and keep the project in compliance. **David Gates has extensive experience with MDE, as he directed the permit process for ICC Contracts A & B. He used the lessons learned on ICC Contract A to cut to permit approvals from 16 to 9** Months on ICC Contract B. As the structures or roadway design advances, there must be key coordination performed with the drainage Design Team to ensure all the designs are integrated together and there are no conflicts between the pipes, bridge foundations, abutment walls, and other roadway elements. We will also focus on drainage elements already purchased, to maximize their use on this project to meet the goals of reducing cost and reusing purchased materials.
- **Structures Coordination:** The primary focus of structure design will be improving constructability and reducing cost while ensuring that steel that has already been purchased is fully integrated into the final design, which is a primary goal of SHA. We will also evaluate the opportunity to reduce bridge clearances with the roadway team to minimize excavation quantities, while carefully evaluating impacts to drainage, SWM and geotechnical concerns. The DART tool **(Figure 2)** will be helpful to evaluate these items.

Fully Integrated Schedule

Kiewit's scheduling efforts began on day one during the project's procurement phase, with our scheduler being an integral part of the Team. Lead Scheduler, Alexa Fosmer, has worked on several CMAR projects and works closely with the cost estimators and discipline leads to produce a preliminary fully integrated design and construction schedule. Upon award and at the onset of Preconstruction, Kiewit will develop a full Primavera P6 project schedule, including all design tasks and milestones, required submittals, long-lead procurement items, third-party approvals, permitting, utility relocations, public approvals, and all construction tasks. We develop this schedule in full collaboration with the Designer and SHA to ensure the design milestones are achievable, while meeting SHA's schedule goals. The design milestones help the entire Team focus on meeting critical dates to streamline the design process and ensure the project starts on time.

*The Preconstruction Schedule **(Figure 5)** is based on the RFP's scope of work along with the anticipated tasks and activities that are common in CMAR Preconstruction. Upon award, we will work with SHA and the designer to agree on the critical activities/durations to ensure an on-time construction start.*

FIGURE 5
MD 4 Preconstruction Schedule
▪ General ▪ Estimating ▪ Milestone



Next, we work with the Construction Team to develop a preliminary construction schedule that meets all of SHA's project delivery goals. The schedule fully encompasses scope, reflects quantity take-offs, realistic production rates, and is detailed enough to reflect the planned construction sequence. During Preconstruction, a key objective will be to ensure that our proposed project duration is achievable and meets all interim and seasonal milestones. This detailed schedule also allows us to analyze multiple scenarios to ensure the schedule fully realizes all opportunities through different sequencing, means and methods, and planned working times, to determine the most optimized schedule for the MD 4 Project. Man-hours are included in the pursuit schedule so that resource needs can be analyzed. Identified risks are modeled into the schedule to determine potential impacts and model mitigation efforts.

Our Team will run several "what if" scenarios during preconstruction to identify potential issues such as delayed long-lead materials or differing site conditions during bridge or roadway construction to ensure schedule compliance. The significant phasing requirements of this project require a rigorous analysis of different scenarios. By providing several "Plan B" options, we can develop the optimal phasing plan that maintains the completion date if an issue were to arise. **Since the risks can change as the Team decides which concepts and approaches will be adopted, we will utilize the Risk Matrix as a living document to prioritize and track progress during design and construction to mitigate risk (See Figure 6 for our initial Risk Matrix).**

Constructability Reviews

Constructability Reviews will be conducted regularly during the design process, primarily at design milestones. Constructability reviews are led by our Construction Manager, Luke Silvus, with input from David Gates, Mike Baker, Steve Carl, KIE, and other project superintendents. Each reviewer will work independently to review each design drawing, and then hold a team plan flip, reviewing every page in detail to ensure our team members do not provide conflicting or erroneous comments. The comments are captured on a constructability review form and will be sent to SHA and the Designer in a timely fashion. In addition, we will support SHA in the coordination of design submissions and comments to stakeholders as required. Once comments are completed, we will hold a comment resolution meeting which allows reviewers to provide the full context of their comments and the Design Team to provide potential solutions to resolve these comments. **These constructability reviews reduce errors and omissions, reduce the number of field changes, improve quality, and ensures that the design is consistent with the intended workflow and methods that will be used in Construction.**

Reducing Cost

Our proposal was prepared to provide SHA with confidence that we can reduce project cost and construct this project at a fair market value while meeting SHA's budget goals. Our approach to reducing cost during Preconstruction includes the following items:

1. Due to the nature of the work, several stakeholders have requirements our Team will need to incorporate into our design and construction. Kiewit will partner with SHA to perform detailed research of these requirements to ensure the design and construction plan meets the specifications of the numerous agencies involved to avoid unexpected changes during construction or costly redesign.
2. Our Team will work with SHA and the Design Team to incorporate various innovations and proposed technical concepts that will reduce overall project cost and improve long term maintenance. Our experts at KIE will be a valuable resource in this effort.
3. Through a robust risk mitigation process, we will work collaboratively with SHA during the design and construction phases to identify major project risks and develop mitigation strategies to reduce the potential for cost overruns due to these risks.
4. The Kiewit Team can provide immediate cost information if we identify areas of concern during design such as major quantity overruns, escalations or costly construction techniques. We will develop a baseline estimate immediately upon preconstruction award. This essential cost information allows the Team to understand current project costs early to guide the Engineering and Construction efforts.
5. Kiewit will maintain a value analysis innovation log to track cost savings throughout Preconstruction to ensure we are meeting SHA's budget goals.

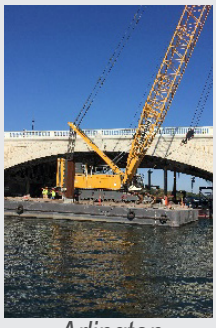
STEVE CARL, P.E.
Quality Manager

Quality Manager, Steve Carl, P.E., has 42 years of construction experience, working primarily as a quality control and quality assurance (QC/QA) manager developing and managing quality programs, including several CMAR and Design-Build projects throughout the region. Steve also has a strong background of bridge design experience which will further enhance his efforts during Preconstruction, including providing his input during design development as he develops our quality programs.

Steve will be essential in providing input during constructability reviews. He has worked seamlessly with **Luke** on numerous projects. Their combined expertise is sure to realize cost savings and discover innovations during constructability collaboration efforts.

Steve Carl's Relevant Project Experience:

I-95 Wilmington



Arlington Memorial Bridge

Dulles Guideway Track

C.1.c. – Risk Management

Risk Management

A strength of the CMAR delivery method is the ability to fully assess the entire risk profile of the project and work as a team to minimize and mitigate the risk through Design and project development prior to the start of Construction. We will work in partnership with SHA, the ICE, and the Designer to identify, analyze, innovate, and manage any potential risks that may occur on the project.

Working closely together, we will develop a plan and strategy that:

- Documents all potential risks identified
- Separates any risks out of the cost models
- Provides cost and schedule estimates if risk is encountered
- Develops approaches that either eliminate or minimize those risks, regardless of ownership
- Determines the correct contingency amounts for those risks that cannot be eliminated
- Determines which party "owns" each risk item
- Organizes risks using the Risk Matrix

First, we will identify potential risks and opportunities by analyzing each aspect of the Project, including, but not limited to, specific elements of Design and Construction, impacts to the public and other stakeholders, market conditions, permitting, and environmental restrictions, and third-party coordination. At the onset of Preconstruction, we will brainstorm potential risks by performing an initial plan flip with all team members involved in the project. The key is to identify risks in a timely manner to prevent any impacts to the project schedule. Every potential risk will be added to the initial Risk Matrix.

Next, each team member will spend individual time getting deeper into the details of the project plans. Our engineers, estimators, and superintendents are often able to find additional risks by performing takeoffs, running calculations, and developing the project schedule. To capture each team member's thoughts, we will ask individuals to maintain individual risk matrices and then hold a formal meeting to discuss every idea and put it on the master list. **Risks are identified, analyzed, and grouped into low, medium, and high categories using the Risk Matrix.** Probabilities will be assigned by comparing similar past projects, gathering historical data, and studying past and forecasted trends. Each risk is discussed with the Team during the Risk Workshops, then assigned to the appropriate party to mitigate or carry contingency.

Lead Cost Estimator, **David Gates**, and the Estimating Team will provide detailed cost estimates to capture the magnitude of the associated risk. Risk pricing will be open book and transparent, providing a detailed explanation of each cost component. A schedule analysis will also be performed to determine the overall impact on the project schedule. After identifying the risk on the matrix, our Team will enter a risk analysis process that leads to appropriate innovations and developing mitigation and innovative strategies, and efficient allocation of risks.

The Team will work in collaboration to apply appropriate risk-mitigating measures that can include the following:

- Conducting additional field and geotechnical exploration to refine assumptions in construction and design
- Modifying design, scope, or construction approach to reduce or eliminate risk
- Identifying specific methods and/or procedures to manage the risk during construction
- Executing early work packages to alleviate schedule risk
- Carrying an allowance for risks that are difficult to quantify, to eliminate the potential for conservative contractor contingencies

We will develop contingencies or allowances that will be separated from the base cost model for risks that cannot be eliminated. The amount of risk contingency will be directly related to the risks identified by the Team. Contingencies will be reviewed collaboratively at each formal design review to ensure appropriate sizing and allocation.

When the CMAR process is properly leveraged, projects have very few unidentified changes. Smart use of project contingency built into the GMP results in minimal change orders associated with the original scope, meaning there are no surprises. **Tim Cleary** and **David Gates** will be responsible for developing, updating, and maintaining the Project Risk Matrix in full collaboration with SHA and the ICE.

Our Team has taken an in-depth look at the potential risks we have identified for the MD 4 project. A detailed Risk Matrix has been provided in **Figure 6** on Page 19 identifying items such as:

Utilities	Long Lead Time Items
Contaminated Material	Stakeholder Coordination
Noise Restrictions	Traffic-Incident Management
Environmental-Permits	Purchased Materials
Agency Coordination	Maintenance of Traffic
Geotech - Soft Soils	Resources

FIGURE 6 RISK MATRIX

RISK MATRIX

MD-4 at Suitland Parkway

Risk #	Risk Name	Risk Description	Champion(s)	Probability	Cost Impact ($)	Time Impact (Days)	Mitigation Strategy
1	Utilities	Unknown Utilities or delays to relocations of known utilities - Cause delays in critical path construction activities, impacting cost and time.	David Gates	High	$ 500,000	90	Immediate coordination of utility agencies, design around existing utilities were possible, execute early work packages for utility relocations that are required. Incorporate into preconstruction schedule. Sequence construction activities to allow maximum time where utility relocations are required.
2	Contaminated Material	What if contaminated materials are encountered during excavation	David Gates	Medium	$ 250,000	30	Preconstruction testing of suspected contaminated areas to quantify impact. Develop design solutions to mitigate quantity where possible.
3	Noise Restrictions	Noise restrictions impacting critical operations, namely pile driving	Luke Silvus	High	$ 100,000	5	Obtain noise waivers where required during preconstruction. Open communication with community throughout construction.
4	Environmental - Permits	Potential adverse impacts due to unanticipated increased environmental permits	David Gates	Medium	$ 200,000	30	Partner with Mike Baker from AECOM to assist in environmental permits. Assign full time permitting support incorporate into preconstruction schedule. Develop permitting matrix identifying lead times and permit requirements. Perform detailed reviews of all permit applications.
5	Agency Coordination	Impacts from MDE, USACE, MDNR	David Gates	Medium	TBD	20	Engage in early agency communication during preconstruction. Open communication with various agencies during construction.
6	Geotech - Soft Soils	Potential subsurface poor soils affecting subgrade and requiring additional ground improvements.	David Gates	High	$ 500,000	90	Evaluate various ground improvement options, perform additional Geotech during preconstruction, reduce amount of excavation by reducing bridge clearance. Execute early work package for ground improvements.
7	Long Lead Time Items	Girders, Deck Joints, Bearings, Sign Structure procurement affecting schedule, escalation costs	David Gates	Medium	$ 100,000	90	Early work packages for girders, MSE wall panels, deck joints, bearings and sign structures will mitigate escalation risk. Incorporate into preconstruction schedule and procure early to mitigate schedule risk..
8	Stakeholder Coordination	Impacts from Emergency responders, Joint Base Andrews, NPS, Developers, Businesses	Tim Cleary	High	$ 250,000	30	Build upon existing relationship with NPS from Arlington, maintain stakeholder matrix with requirements, mitigation and requests. Early coordination with Joint Base Andrews in preconstruction for FAA/MOT restrictions. Hold regular public outreach meetings.
9	Traffic - Incident Management	Traffic Incidents during construction	Luke Silvus	High	$ 200,000	5	Focus on safety during MOT design development, supplement with KIE MOT experts, optimize phasing to reduce construction schedule, identify local tow truck service to remove accidents quickly.
10	Purchased Materials	Previously purchased material is fabricated incorrectly, stored incorrectly, or does not fit into the final design plans.	David Gates	Medium	$ 4,000,000	180	Perform detailed inventory and inspection early in preconstruction. Provide survey to provide dimensions of steel to design team. Perform detailed double checks on design plans to ensure purchased materials will work.
11	Maintenance of Traffic	Reduced access to Joint Base Andrews, local commuters	David Gates	Medium	TBD	TBD	Maintain temporary closure at Joint Base Andrews North Gate, develop flexible/multiple option MOT plans, coordinate early with JBA in preconstruction.
12	Resources	Lack of local labor, material, supplier and subcontractors	Luke Silvus	Low	TBD	TBD	Leverage local relationships from recent Maryland work for subs/suppliers, execute early work packages for high risk items, utilize local Kiewit workforce of over 300 craft employees, hold regular outreach meetings to DBE firms.

Innovation Management

One of the greatest benefits of the CMAR model is to allow the Contractor to partner with SHA and the Design Team to identify potential innovations that can have a positive impact on the project schedule, overall budget, long term maintenance, and public satisfaction. For each innovation developed, each suggestion will be provided to the Team and evaluated to decide whether to further advance the idea. Advancing a suggestion may result in the need for cost estimating, value analysis or exploring a design for feasibility. To accomplish this, we utilize Decision Analysis and Resolution Team (DART) tracking **(see Figure 2)**. In this case, the various options will be analyzed based on cost, schedule, and risk to allow the Team to make the best decision for the project.

Starting at the initial workshop and at subsequent innovation workshops and task force meetings, our key and supporting staff will review the Proposed Technical Concepts with the Team to further develop these concepts to determine their viability. We will also work with the Design Team to gather more information on additional design challenges and risks to determine where additional brainstorming and innovation is required. We will track all innovations on an innovations log to maintain a running list of cost, schedule and risk reduction, and regularly check back into the baseline estimate and OPCC estimates to monitor the overall cost of the project.

C.1.d Proposed Technical Concepts

The Kiewit team is confident in offering the following proposed technical concepts and accelerated construction techniques to achieve project success and exceed SHA's goals. These ideas are based on the practicality and feasibility of implementation to provide substantial returns in saved time, cost, quality, and safety, all while increasing the traveling public's ability to access and travel throughout the project area during Construction. Our overarching approach is to leverage the CMAR delivery opportunities, partnering with SHA and the Design Team to ensure we complete the MD 4 project within the schedule and budget constraints.

PTC #1 Bridge Foundations (H Pile vs. Pipe Pile)

DESCRIPTION	ADVANTAGES
Currently the design plans show driven HP 12x53 for the abutments and piers. They are approximately 80-100' long and have a 50-ton design capacity. Review of geotechnical information indicates the site is underlain by thick layers of loose/ soft sands and clays, which is common for Coastal Plain geology; pipe piles typically perform better than H-piles in these subsurface conditions. H-piles are non-displacement piles and are most efficient in end-bearing or partial end-bearing, while pipe piles are more conventional friction piles. Pipe piles are expected to have higher design bearing values resulting in reduced number of piles per substructure. Based on the available geotechnical information there are no hard layers in the subsurface that will prevent driving piles to necessary depth.	• Minimizes the number of piles, therefore reducing construction costs and schedule for the foundation work. • Pipe and CIP concrete pile lengths estimated during design are more predictable than friction H-piles therefore, pile quantity overrun during construction is less likely.

PTC #2 Wick Drains Early Work Package

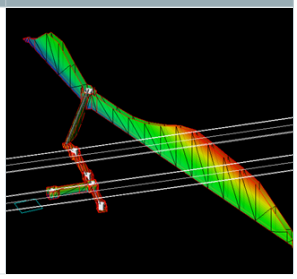
DESCRIPTION	ADVANTAGES
Based on review of boring logs, settlement in fill areas will occur in fill areas, and there are considerable amounts of clay/silt so wick drains are reasonable, however, the amount and time rate of settlement could not be determined with the information provided. It will be very important to understand settlement with respect to construction phasing, protection of existing facilities, final paving, etc. We propose an early work package to install wick drains and preload the fill areas. Surcharges (i.e., preload fill higher than proposed final grades) may be beneficial to reduce post construction settlement, but we will evaluate in Preconstruction working with the Designer and SHA.	• Completes long lead work as part of the design phase, mitigates schedule risk during major construction. • Support from KIE Geotech will ensure scope is minimized as much as possible, which will reduce project cost.

PTC #3 Reroute North Gate to Old Marlboro Pike Under Flyover

DESCRIPTION	ADVANTAGES
Reroute the North Gate Entrance Access Road connection to Old Marlboro Pike to pass under the proposed flyover bridge. We will evaluate the feasibility of rerouting the referenced access road to pass below the flyover bridge adjacent to Abutment 8. The proposed flyover bridge appears to provide sufficient horizontal and vertical clearance for the proposed rerouting plan.	• Eliminates short span bridge over the flyover ramp north of Suitland Parkway – flyover ramp can be constructed at grade west of MD 4. • Reduces construction material quantity and schedule

PTC #4 Utilize Modeling Program Trimble 3D

DESCRIPTION	ADVANTAGES
Trimble is a collaborative tool used to collect, analyze, and interact with multi-dimensional drawings and models. Kiewit has successfully implemented the use of the Trimble 3D modeling program to show impacts to elements of roadway construction. For example, the graphic to the right shows the model of a utility trench below a roadway. The estimating team and design team were able to collaborate on the exact size of the excavation cut and length and quantities of utilities and materials to be installed.	• Exact dimensions and quantities shared between the Estimating Team and Design Team. • Real time evaluation of cost and schedule impacts due to potential design changes



PTC #5 MOT Optimization

DESCRIPTION	ADVANTAGES
As described in our approach in **Figure 7, Phase 1**, we propose the construction of a temporary detour just north of Suitland Parkway to maintain access for the traveling public while providing uninterrupted access to the Suitland Parkway bridge construction. MD 4 traffic would be rerouted to the new ramps with temporary signals at the Temporary Suitland Parkway detour. This scheme would allow for the construction of the new bridge and MD 4 roadway. We will phase service road construction to ensure access for residents and businesses during construction.	• Reduces the overall construction schedule, minimizing delivery time. • Provides large work zones, improving productivity and cost. • Improves safety during construction. • Minimizes duration of impacts to the traveling public. • Ensures access for businesses and residents at all times.

PTC #6 Storm Water Pond Construction

DESCRIPTION	ADVANTAGES
Reconfigure ponds and add new ponds at Ramps D, J and O to increase onsite materials and reduce the need for borrow material.	• Reduces the construction cost by utilizing onsite materials, reducing the amount of purchased material and trucking. • Reduces amount of trucks on the road, relieving congestion and improving safety.

PTC #7 Ramp K Construction

DESCRIPTION	ADVANTAGES
Optimize existing lane widths to allow room for partial demolition of the existing headwall and retaining walls to allow for construction of the new bridge substructure and Ramp K.	• Maintains access from JBA during bridge and ramp construction. • Minimizes MOT costs

PTC #8 Super Weekends

DESCRIPTION	ADVANTAGES
Our Team has successfully utilized Super Weekends on nearby projects to accomplish major features of work and traffic switches in short windows of time. A super weekend could allow reduced traffic lane widths or a full closure for 54 hours. For this project, we would evaluate opportunities to utilize super weekends for major traffic switches between phases, bridge construction, and any other activity that could provide major schedule benefits..	• Reduces schedule time • Improves safety by performing high risk operations with no traffic present. • Reduces construction cost by minimizing MOT and highly phased work under traditional nighttime closures.

PTC #9 Reduce Bridge Clearance Under Suitland Parkway Bridge

DESCRIPTION	ADVANTAGES
The MDOT Office of Structures Guidelines and Procedures Memorandum specifies that the minimum design vertical clearance is to be 16'-9", which provides for 16'-0" absolute minimum and 9" of future surfacing. The bridge plans currently indicate a minimum vertical clearance of 20'-2" over MD 4. We will evaluate the feasibility of reducing the bridge clearance on MD 4 under Suitland Parkway Bridge to reduce the amount of excavation on the project.	• Reduces required excavation thus reducing hauling activities – fewer trucks on the road, relieves congestion and improves safety. • Reduces pier heights resulting in material quantity savings. • May reduce additional utility impacts

C.2 Construction Approach

C.2.a. Construction Sequencing

The Kiewit Team's Construction Sequence focuses on safety for the traveling public and our crews, minimizing impact to the traveling public and is flexible, allowing for any heightened restrictions at Joint Base Andrews. During the Preconstruction phase we will work with the design team to identify all the access points and develop a plan to maintain access during Construction while further refining our proposed approach. **We have developed a 5-phase Construction Sequence using the information provided by SHA (see Figure 7).**

Maintenance of Traffic (MOT)

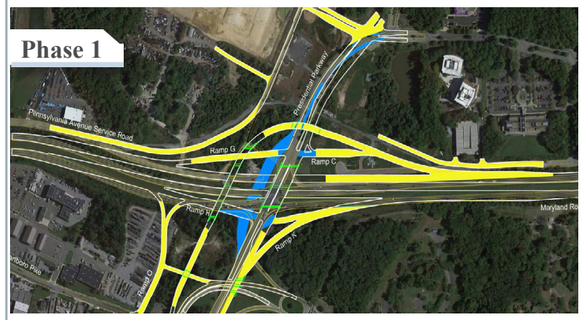
Maintaining traffic through the interchange will be our MOT manager Ryan Hayes's top priority. Ryan Hayes and Joe Chang, P.E. will work with SHA and the Design Team during Preconstruction to ensure our Construction Sequence minimizes impacts to the traveling public and includes the signage for all access points and developments. During Construction, Ryan will monitor traffic and relay any congestion concerns to SHA and the Design Team. Together they will work on a solution that improves traffic operations without sacrificing safety.

Early/Independent Work Packages

It will be critical to perform early/independent work packages that have long lead times to ensure major construction starts and finishes on time. Below are our proposed early/independent work packages.

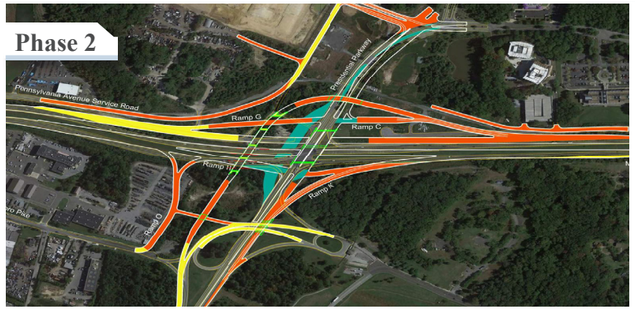
- Roughly 800,000 lf of wick drains are proposed for this project. After careful geotechnical review by Steve Saye, P.E. from KIE, we concur that this is the appropriate method to address poor soils and settlement under the new roadways constructed on fill. Installing the wick drains and achieving the desired settlement is a lengthy process and would be an ideal candidate for an early work package. We would propose to install the wick drains and fills in areas that do not have impacts to traffic prior to major construction, while design is still underway. This will allow streamlined project phasing and reduce major construction durations.
- We propose to perform any utility relocations in an early/independent work package anywhere possible. We understand per Q/A10 that the utility companies have relocated their facilities within the project limits and SHA is in the process of determining if all facilities constructed locations are as planned. We will work with SHA and the utility companies to understand their requirements, perform the design and get the utilities relocated prior to major construction if necessary. This would be a major focus on day one of Preconstruction.

FIGURE 7 Construction Sequencing



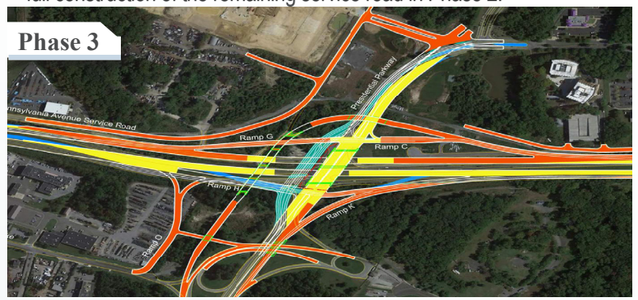
Phase 1

- We will build available components of the project that will have little to no/impact on the existing traffic, while setting up the project for future phases.
- Construct a new temporary detour/bypass for Suitland parkway just North of the existing alignment (shown in blue above). This will allow for uninterrupted access to the future construction of the new Suitland Parkway Bridge. We can construct most of the work with minimal impact to daytime traffic.
- Construct Ramp K and the widening of the bridge over the Joint Base Andrews(JBA) access roads while maintaining full access into the base at all times. Any tie-ins to existing JBA roads would be coordinated and performed at night or during weekend hours. We will analyze and optimize the lane widths under the Suitland Parkway Bridge over the JBA access to allow room for partial demo of the existing headwall/retaining walls and the construction of the new substructure.
- Concurrently with the bypass construction, begin the construction of Ramp G, C H and O. Construction of these ramps will enable future detours of Traffic on MD 4 for the Suitland Parkway Bridge construction.
- Construct the new flyover fill and roadway work on the Northbound off ramp including the flyover bridge over Presidential Parkway. This construction is in an ideal location which would have minimal impacts to the existing traffic.
- Construct the north side of the Pennsylvania Avenue service road reconstruction. We would coordinate and subphase this work to maintain access to properties along the service road during construction. We would also construct the south side of the Pennsylvania Avenue service road. The closure of this existing road should work well due to the duplicate access to the adjacent properties off the Presidential Parkway.
- Construct the Presidential Parkway connection to the residences at Armstrong Village which will provide access to the properties and allow final construction of the Service Road in Phase 2.



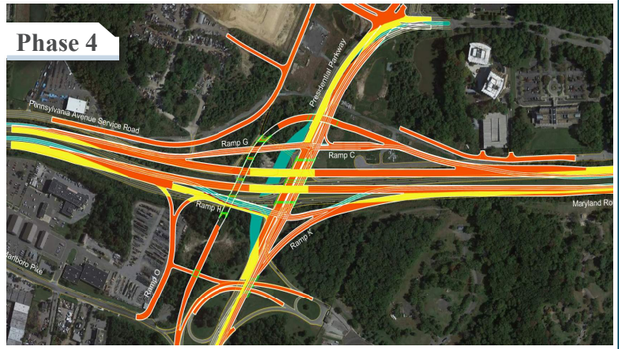
Phase 2

- MD 4 traffic remains in the existing configuration in this phase. We will focus on completing the ramp work so a temporary detour can be used to begin major bridge construction.
- Temporary walls will be constructed to allow for the construction of the Ramp D flyover bridge substructure without impacting future traffic on Ramp G.
- With the North Service Road relocated, we will complete the tie in of Ramp G onto northbound MD 4.
- Complete the widening on southbound MD 4, south of Ramp K, which will be necessary for the temporary detour in Phase 3.
- Coordinate and complete the JBA roadway reconstruction and Ramp D tie into Suitland Parkway.
- The northern Presidential Parkway connection built in Phase 1 allows for full construction of the remaining service road in Phase 2.



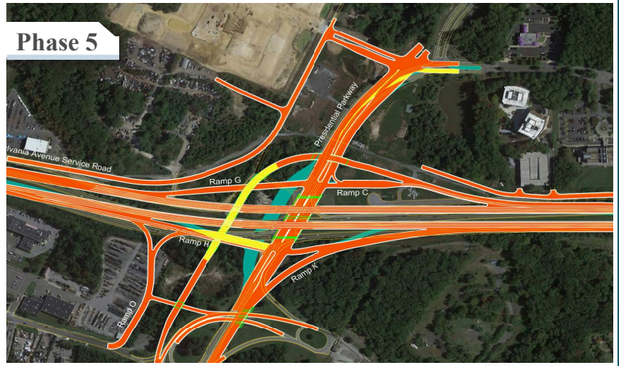
Phase 3

- We will shift traffic in Phase 3 to the temporary detours and begin major bridge construction over MD 4.
- Shift MD 4 traffic to newly constructed ramps G, C, H and K. This will allow full access to the bridge construction of Suitland Parkway Bridge over MD 4. Install signalization where Suitland Parkway intersects Ramps G and H.
- Construct Suitland Parkway bridge over MD4 along with the major excavation required for future MD 4 traffic.
- Complete all major MD 4 roadway work in between the temporary ramp detours, minimizing additional traffic impacts.



Phase 4

- Shift Suitland Parkway on to the newly constructed bridge. Remove temporary detour of Suitland Parkway and construction the new NB and SB lanes under the Suitland Parkway Bridge.
- Keep MD 4 traffic on ramps, while completing remaining roadway work on MD 4, Suitland Parkway and Presidential Parkway.



Phase 5

- Construct Ramp D Flyover and remaining portion of Ramp H. (Our goal will be to develop concepts to construct the flyover in earlier phases and provide early completion)

Legend

- Active Construction
- Previously Constructed
- Temporary Pavement
- Previously Constructed Temp Pavement
- New Bridge Structure
- Temporary Wall/Shoring

Factors that could affect the schedule:

Labor. Kiewit has multiple adjacent projects in Maryland and Virginia and currently employs more than 500 craft employees in the region that are well-suited for the structures, retaining wall, and roadway work, many of whom have been with Kiewit several years and share our culture of high performance. With several projects ending in early 2023, this Project aligns perfectly with our craft and staff succession plan.

Equipment. Kiewit owns an extensive equipment fleet located in the Mid-Atlantic region and has access to additional specialized equipment nationwide. With one of North America's largest equipment fleet's with a replacement value of over $2.4 billion and 23,000 pieces, along with being a top purchaser of Caterpillar and Liebherr equipment, Kiewit can mobilize all necessary equipment needed for this Project. Most notably, Kiewit owns all the lattice boom cranes required for the critical bridge construction. Due to the close proximity to our other projects, there is also the potential for mobilization savings when Construction starts on MD 4. Based on our strong supplier relationships, we are also able to quickly rent any pieces of equipment that are not owned or readily available by Kiewit.

Seasonal Work. In our preliminary approach, we paid special attention to weather conditions and how it would affect our work. Weather dependent operations on this Project include asphalt paving and concrete construction. As we developed our schedule, we sequenced the project to ensure asphalt placement only occurs in favorable temperature and worked to minimize cold weather concrete. During Preconstruction, we will focus on a robust E&S plan and run "what if" scenarios for a historical rainfalls or snow events to develop proactive mitigation plans.

Materials. We will work to identify any long lead materials during Preconstruction, analyze materials SHA already has on hand (girders, drainage) and utilize an early work package to purchase these materials to mitigate schedule risk. On I-95 Wilmington, we utilized early work packages to purchase bearings, portable message signs, and sound wall to mitigate procurement/schedule risk, and we would propose similar strategies on the MD 4 Project.

C.2.b. Construction Schedule

The MD 4 Construction Schedule may be impacted by the factors described above in Section C.2.a. as well as the following factors.

Adverse Weather. While the Project Schedule accounts for historical weather impacts in the area, the amount of weather days encountered during the project time frame may be much higher. In addition to average weather conditions resulting in more days than anticipated, a significantly large weather event could also impact the Project Schedule. For example, an unusually severe winter could impact plans to pour concrete during the winter. Another weather impact could be a flood event that would prevent certain construction activities from safely occurring. Kiewit will track weather days and analyze potential impacts during the course of the Project in order to discuss re-sequencing or mitigation efforts in real time.

Materials Inflation. Due to the current climate of the economy, price inflation has affected some construction material pricing. Kiewit will closely monitor any materials that may be impacted by inflation and coordinate with SHA and the Design Team to release early procurement packages for items of concern.

Submittal Approvals. Kiewit will follow an internal quality control process to ensure that all submissions meet the necessary requirements in order to minimize approval time and prevent resubmissions. Whenever possible Kiewit will also facilitate informal early reviews in order to speed up the required review time.

Utility Relocations. The proposed Construction Schedule depends on third party relocations being complete prior to the start of Phase 1. Kiewit is prioritizing the design work necessary to allow utility relocations to proceed as an early work package. Whenever possible Kiewit will help with coordination of activities and operations to facilitate the relocation.

Right of Way. Kiewit will minimize acquisitions to the extent practical, however, any land not acquired may cause a disruption to the schedule. Our current phasing does not require any additional right of way.

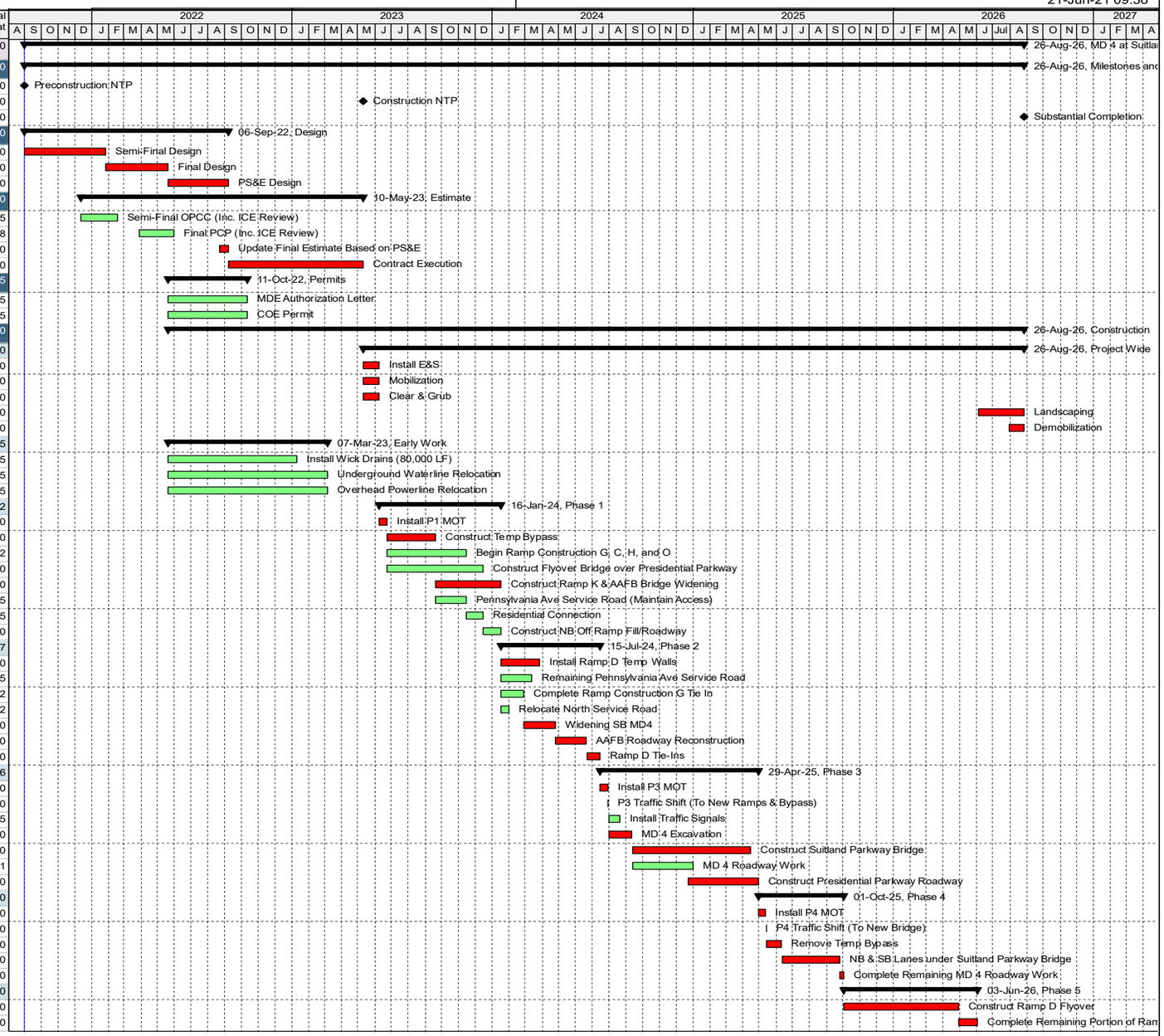
Our proposed schedule graphic outlining the major activities and their associated time frames can be found on **Figure 8 on Page 24**. We have anticipated Preconstruction Notice to Proceed of September 1, 2021; Construction Notice to Proceed of May 11, 2023. Substantial Completion is anticipated to be August 26, 2026. While there are several approaches available to construct the MD 4 Project, Kiewit's initial plan optimizes value by providing the following benefits:

- We evaluated the previos contract's project schedule which was approximately 5 years long. With our preliminary optimized phasing plan, **Kiewit is confident that we can complete this project in approximately 3 years**. This will meet the goal of minimizing project delivery time, reduce cost, and minimize the duration of inconvenience to the public.
- Through the use of early work packages for ground improvements and long lead procurement, we will greatly reduce schedule risk.
- We maintain traffic throughout construction, with careful consideration to the access roads and the North Gate at JBA.

FIGURE 8 CONSTRUCTION SCHEDULE

MD 4 at Suitland Parkway Interchange Improvements — 21-Jun-21 09:36

Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
MD 4 at Suitland Parkway Interchange Improvements		1267	01-Sep-21	26-Aug-26	0
Milestones and Admin		1821	01-Sep-21	26-Aug-26	0
MIL1010	Preconstruction NTP	0	01-Sep-21		0
MIL1001	Construction NTP	0	11-May-23		0
MIL1040	Substantial Completion	0		26-Aug-26	0
Design		255	01-Sep-21	06-Sep-22	0
PRE1010	Semi-Final Design	100	01-Sep-21	26-Jan-22	0
PRE1030	Final Design	80	27-Jan-22	19-May-22	0
PRE1050	PS&E Design	75	20-May-22	06-Sep-22	0
Estimate		355	13-Dec-21	10-May-23	0
PRE1020	Semi-Final OPCC (Inc. ICE Review)	45	13-Dec-21	16-Feb-22	85
PRE1040	Final PCP (Inc. ICE Review)	45	28-Mar-22	31-May-22	58
PRE1080	Update Final Estimate Based on PS&E	10	23-Aug-22	06-Sep-22	0
PRE1090	Contract Execution	170	07-Sep-22	10-May-23	0
Permits		100	20-May-22	11-Oct-22	145
PRE1060	MDE Authorization Letter	100	20-May-22	11-Oct-22	145
PRE1070	COE Permit	100	20-May-22	11-Oct-22	145
Construction		1087	20-May-22	26-Aug-26	0
Project Wide		842	11-May-23	26-Aug-26	0
CON1030	Install E&S	20	11-May-23	08-Jun-23	0
CON1040	Mobilization	20	11-May-23	08-Jun-23	0
CON1050	Clear & Grub	20	11-May-23	08-Jun-23	0
CON1350	Landscaping	60	04-Jun-26	26-Aug-26	0
CON1360	Demobilization	20	30-Jul-26	26-Aug-26	0
Early Work		200	20-May-22	07-Mar-23	65
CON1020	Install Wick Drains (80,000 LF)	160	20-May-22	10-Jan-23	105
CON1000	Underground Waterline Relocation	200	20-May-22	07-Mar-23	65
CON1010	Overhead Powerline Relocation	200	20-May-22	07-Mar-23	65
Phase 1		150	09-Jun-23	16-Jan-24	642
CON1060	Install P1 MOT	10	09-Jun-23	22-Jun-23	0
CON1070	Construct Temp Bypass	60	23-Jun-23	19-Sep-23	0
CON1080	Begin Ramp Construction G, C, H, and O	100	23-Jun-23	14-Nov-23	682
CON1090	Construct Flyover Bridge over Presidential Parkway	120	23-Jun-23	14-Dec-23	20
CON1100	Construct Ramp K & AAFB Bridge Widening	80	20-Sep-23	16-Jan-24	0
CON1110	Pennsylvania Ave Service Road (Maintain Access)	40	20-Sep-23	14-Nov-23	105
CON1120	Residential Connection	20	15-Nov-23	14-Dec-23	105
CON1140	Construct NB Off Ramp Fill/Roadway	20	15-Dec-23	16-Jan-24	30
Phase 2		125	17-Jan-24	15-Jul-24	547
CON1170	Install Ramp D Temp Walls	50	17-Jan-24	26-Mar-24	0
CON1150	Remaining Pennsylvania Ave Service Road	40	17-Jan-24	12-Mar-24	85
CON1130	Complete Ramp Construction G Tie In	30	17-Jan-24	27-Feb-24	642
CON1160	Relocate North Service Road	10	17-Jan-24	30-Jan-24	662
CON1180	Widening SB MD4	40	28-Feb-24	24-Apr-24	0
CON1200	AAFB Roadway Reconstruction	40	25-Apr-24	20-Jun-24	0
CON1210	Ramp D Tie-Ins	15	21-Jun-24	15-Jul-24	0
Phase 3		201	16-Jul-24	29-Apr-25	106
CON1220	Install P3 MOT	10	16-Jul-24	29-Jul-24	0
CON1230	P3 Traffic Shift (To New Ramps & Bypass)	1	30-Jul-24	30-Jul-24	0
CON1250	Install Traffic Signals	15	31-Jul-24	20-Aug-24	175
CON1260	MD 4 Excavation	30	31-Jul-24	11-Sep-24	0
CON1240	Construct Suitland Parkway Bridge	150	12-Sep-24	15-Apr-25	0
CON1270	MD 4 Roadway Work	75	12-Sep-24	31-Dec-24	191
CON1275	Construct Presidential Parkway Roadway	90	23-Dec-24	29-Apr-25	0
Phase 4		111	30-Apr-25	01-Oct-25	0
CON1280	Install P4 MOT	10	30-Apr-25	13-May-25	0
CON1290	P4 Traffic Shift (To New Bridge)	1	14-May-25	14-May-25	0
CON1300	Remove Temp Bypass	20	15-May-25	11-Jun-25	0
CON1310	NB & SB Lanes under Suitland Parkway Bridge	75	12-Jun-25	24-Sep-25	0
CON1320	Complete Remaining MD 4 Roadway Work	5	25-Sep-25	01-Oct-25	0
Phase 5		175	02-Oct-25	03-Jun-26	0
CON1330	Construct Ramp D Flyover	150	02-Oct-25	29-Apr-26	0
CON1340	Complete Remaining Portion of Ramp H	25	30-Apr-26	03-Jun-26	0



Remaining Level of Effort · Actual Work · Critical Remaining Work
Actual Level of Effort · Remaining Work · Milestone

Page 1 of 1

TASK filter: All Activities

C.2.c – Stakeholder Coordination

As a prominent infrastructure contractor, Kiewit has established relationships with communities across the nation. Diligent planning, active communication, and recognizing those most impeded by our presence ensures an effective approach to public relations. Kiewit will assist SHA in developing and executing an outreach program that will positively influence the community as well as the project. Outreach generally begins in the form of public meetings to stress our community-minded goals in safety, schedule, and impact reduction and address all concerns. Kiewit attended several community meetings on the I-95 Greenbelt and MD 97 projects to gain valuable input and incorporate concerns into the design and Construction. On I-95 Wilmington, Kiewit held regular meetings with community advisory groups, first responders, the Secretary of Transportation, and the Governor to communicate the project status and field any concerns.

Next, we will support SHA in targeted outreach, to reach out to stakeholders that may not typically attend public meetings. For example, we anticipate that Joint Base Andrews will require targeted outreach due to the sensitive nature of their operations. We performed similar outreach at the Arlington Memorial Bridge to ensure our 6 cranes did not impact the large amount of air traffic from Reagan National Airport, Marine One, the Coast Guard, and the aerial military operations, as well as MOT planning in the event of an emergency evacuation of D.C..

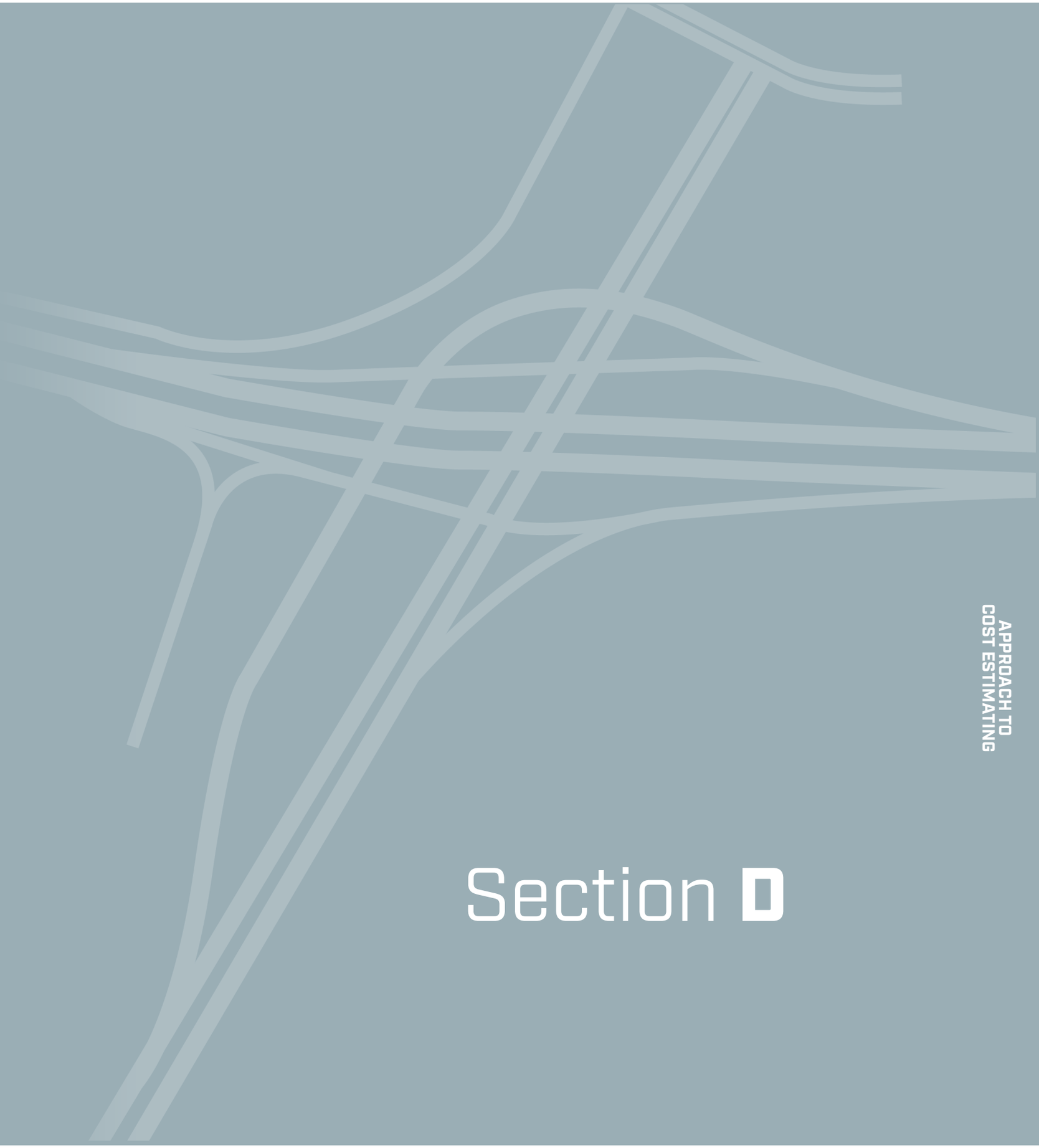
The following explores the specific strategies we will implement to gain the support of the local community and reduce disruption to everyday life. Kiewit has collaborated with some of these organizations in the past, including National Park Service, while working on the Arlington Memorial Bridge Project.

Project Stakeholders and Our Disruption Mitigation Strategies
City and County Governments (PG County)
• Minimize impacts to emergency services, local transit, street and school routes • Maintain clear consistent messaging and information on potential impacts
Washington Sanitary and Sewer Commission (WSSC)
• Review utility CADD file and available As-Built drawings to confirm current status of waterline relocation, including Design and Construction, resume where previous contractor left off • Develop early work package to complete this relocation if necessary • Confirm any potential seasonal restrictions on shutdowns/tie ins
Federal Highway Administration (FHWA)
• Conform to applicable FHWA standards and requirements • Keep FHWA informed throughout the project through SHA • Provide transparent costs for FHWA review
National Park Service (NPS)
• Regularly communicate to minimize impact to NPS' right-of-way • Coordinate MOT and Work phases with NPS Operations • Coordinate design submissions and comment resolutions with NPS staff
Resource Agencies (Maryland Department of the Environment, Maryland Department of Natural Resources, US Fish and Wildlife Service, US Environmental Protection Agency & USACE)
• Assist SHA in obtaining required permits • Meet all Permit requirements and procedures • Suggest alternative Designs and means and methods that minimize environmental impacts • Utilize the expertise of Environmental Permitting Manager- Mike Baker from AECOM
Schools (Prince George's County School Board Transportation and Operations Division)
• Coordinate changes in MOT and traffic patterns prior to implementation • Assist school transporters with potential detour routes, hold workshop to discuss construction plan

Project Stakeholders and Our Disruption Mitigation Strategies
EMS (Police, Fire, and Hospitals)
• Coordinate changes in MOT and traffic patterns prior to implementation • Assist EMS responders, as appropriate, to incidents along the roadway • PG County Police Department is on Presidential Pkwy, coordinate with this office • Bring EMS personnel to site to brainstorm access points, run "what if" scenarios
Local Commercial Establishments and Residents
• Minimize traffic impacts to other roadways in the area • Minimize impacts to emergency services, local transit routes and school routes • Maintain clear consistent messaging and information on potential impacts
Developers (Wood Property, Westphalia Developers, Smith Farm Home)
• Hold public meetings to communicate progress and potential MOT impacts • Discuss potential to provide borrow material from excavations • Coordinate any utility shutdowns/tie ins that may affect development
Joint Base Andrews
• Secure any needed FAA permits early in Preconstruction • Identify key contacts to communicate Construction Planning, MOT changes and Construction Progress
All Stakeholders
• Maintain clear, consistent messaging and information on potential impacts • Hold "Pardon our Dust" and other public informational meetings • Minimize traffic impacts to local streets, local transit and school routes • Minimize impacts to local community events • Maintain an active website to share information that is updated frequently • Maintain a manned phone system to receive text messages and calls from the community • Prepare informational fliers for distribution at public buildings (libraries, etc.), and large local commercial establishments • Maintain communication channels with local public officials • Utilize portable message signs for project updates • Utilize social media to publicize upcoming changes in traffic patterns or planned short-term closures for beam erection • Utilize radio broadcasts for traffic updates • Partner with Google and Waze to incorporate construction into the applications for this project.

During Construction, our Team will hold weekly operations meetings to generate a Four-Week Look-Ahead Work Schedule, which includes any MOT changes or potential road/lane closures affecting residents and commuters. This schedule will be distributed to interested third parties. We would anticipate a lane closure request be submitted to SHA weeks in advance of any needed lane closures or lane shifts to ensure good communication with the public and stakeholders. In the event of a traffic emergency, local emergency responders are notified immediately in accordance with our Emergency Response Plan that will be prepared during Preconstruction.

We will partner with SHA and project stakeholders to implement **Super Weekends** on MD 4 to accomplish major traffic shifts or construction operations in one weekend. Kiewit successfully implemented this best practice on the Arlington Memorial Bridge and I-95 Wilmington projects. We partnered with our Clients to plan these "super weekends", allowing the team to accomplish multiple critical major operations and major traffic shifts in a 56 hour window, which provided substantial schedule benefits to the project and less impact to the traveling public. Traditional closures would have taken weeks to accomplish the same amount of work.



APPROACH TO COST ESTIMATING

Section D

D. Approach to Cost Estimating

D.1 Estimating Environment

When partnering with Kiewit, SHA will realize an overall lower project cost through collaboration and extensive CMAR experience incorporated during the design phase. The main components that will deliver this Project to SHA at a fair, competitive price include:

- Experienced CMAR staff with SHA Experience
- Development of a Baseline Estimate
- Cost Efficient Design with support from Kiewit Infrastructure Engineering (KIE)
- Production Based Cost Estimating based on Historical Past Costs
- Efficient Schedule
- Proactive Risk Identification and Management

Experienced CMAR Staff

With more than 32 years of experience and extensive SHA CMAR experience, **David Gates** will lead all cost estimating for this project. He has spent his entire career in Maryland and has estimated countless SHA projects. **David has successfully lead 3 SHA CMAR Projects.** He is very familiar with SHA's standard specifications, local soil and weather conditions, key subcontractors and suppliers, and will be an invaluable asset on this project. **David** has a staff of capable estimators that will support all estimating on this project, with full support from our Project Manager, **Tim Cleary**.

David and his team will participate in all Preconstruction activities including **kickoff meetings, task force meetings, design milestone reviews and brainstorms**. David will bring in the key builders, including **Luke Silvus** and Steve Carl, P.E., to perform constructability reviews and risk mitigation workshops to reduce cost and optimize the project schedule. Throughout design, David will bring in key engineers from Kiewit Infrastructure Engineering (KIE) including Joe Chang, P.E., Wally Jordan, P.E. and Steve Saye, P.E. to support the Designer in various reviews including:

- Temporary MOT solutions that provide efficient construction and reduces temporary work
- Bridge layout and foundation design that reduces cost and long-term maintenance while ensuring items already procured are not affected
- Optimize roadway profiles to minimize excavation and borrow

We will also utilize Cost Estimator David Gates' and Environmental Permitting Manager Mike Baker's extensive experience from ICC-B and other local projects to review all E&S and SWM design to expedite MDE approvals.

Baseline Estimate

The primary challenge in the CMAR process is refining the design and developing a construction plan that fits within SHA's cost and schedule constraints. Our approach to accomplishing cost goals is to provide cost and schedule information to SHA by performing a baseline estimate and schedule based on the current design plans. This estimate and schedule will be developed immediately after Preconstruction award. This essential baseline cost information provides the following benefits to SHA:

- Allows for early estimate alignment with the ICE team, which will improve efficiency on future estimates
- Provides SHA with immediate cost information to compare to the overall budget of the project
- Allows the team to understand major cost drivers to focus attention on cost reduction
- Identifies risks early by diving deep into the drawings and estimate details providing maximum time for mitigation
- Ensures purchased materials by SHA (steel, sign structures, lighting signalization, pipes, drainage structures) are not included in estimate
- Obtains early pricing from subcontractors and suppliers, encouraging input from subs/suppliers during design
- Provides early DBE goal information
- Provides early schedule information to allow for brainstorming and overall schedule improvement
- Allows us to track value added innovation savings throughout Preconstruction

Throughout Preconstruction, we will always be checking back into the baseline estimate to track our overall progress on meeting your goals. For example, if the project team thinks it would be feasible to look at alternative pavement or bridge designs, we can easily compare the baseline pavement design to alternative pavement sections, and the team will be able to look at the cost savings to make better informed decisions on potential innovations. These innovations will also include any schedule savings and risk evaluation. The baseline estimate will allow for ease of tracking cost savings throughout the life of the Preconstruction phase.

The Baseline Schedule and Estimate help meet SHA's goals of minimizing construction cost within the current budget and minimizing project delivery time by providing critical information to SHA while ensuring an open and transparent process from the onset of Preconstruction.

Cost Efficient Design and Cost Drivers

Our CMAR experience has proven that the best way to reduce project costs and maximize scope within the budget is to focus on major cost drivers early in Preconstruction, incorporate design innovations based on best practices from Kiewit's other projects, reduce the amount of temporary work and develop a construction plan that provides the most labor and equipment production efficiency to SHA. While the component costs of labor and equipment rates and anticipated productions vary little from contractor to contractor, we minimize the project cost through a robust Preconstruction phase with our CMAR experts.

Kiewit will utilize Kiewit Infrastructure Engineering (KIE) to provide elite design support experience to the Preconstruction process. **This value added benefit sets us apart from our competition.** KIE is a group of professional design engineers that are experts in providing design support on CMAR projects. It is important to note that our KIE team does not replace the Designer in any sense, but they clearly understand their role of providing design support including:

- Provide innovative solutions from throughout the country that can reduce project cost, schedule and risk, including solutions that reduce maintenance and improve long term durability while understanding the unique environmental and geotechnical conditions in Maryland
- Provide technical experts for every discipline including structures, roadway, drainage, MOT and geotechnical to aid in design milestone reviews, improving constructability and reducing the potential for errors or omissions
- Develope detailed temporary engineering plans for critical girder erection and support of excavation which will aid in Construction Planning and Preconstruction Estimating.

Our value-added team from KIE, which is included in our Preconstruction fee, will support SHA's goal of minimizing construction costs within the current budget.

With the baseline estimate complete, the collaborative partnership of Kiewit (including KIE), the Designer, the ICE and SHA can now focus our attention on the major cost drivers where we can make the biggest impact to the project. While we need to focus on all potential design innovations, it is critical to spend the bulk of our efforts on the high-dollar items that can receive the biggest benefit from optimization while ensuring all project goals are being met. We will work collaboratively to develop innovative design and construction solutions that will reduce project quantities, temporary work, project schedule, and mitigate risk, ensuring that SHA completes this project in the most economical way possible.

When clearly understanding each innovation's cost, schedule, and risk, we can make the most informed and best decisions for the Project. All innovations will be tracked in a shared file, providing SHA with a continually updated summary to see how value engineering improvements can reduce the project cost.

We have identified the following main cost drivers to focus on in the Preconstruction Phase:

Cost Driver	How Kiewit will deliver the best and fair price
Structural Steel. Optimize span layouts and steel girder sections on bridges where steel has not already been purchased to achieve the lowest cost bridge structure possible	• Solicit multiple quotes, investigate early procurement to mitigate escalation costs • Utilize input from fabricator to produce the lowest cost in procurement • Consider erection in design to ensure most efficient construction plan
Optimize Profile in Roadway. Refine both horizontal and vertical profiles to reduce cuts under bridge #16297. Reduce clearance from 20' to 15'. Evaluate height of bridge #16298 to see if pier and retaining wall quantities can be reduced	• Work with Design Team to optimize profiles in Preconstruction • Utilize recent past productions from relevant projects for earthwork/retaining wall operations • Solicit sub quotes for grading operations to confirm competitive costs
Foundations – H Pile vs. Pipe Pile. Evaluate foundation design in Preconstruction to determine lowest cost solution	• Develop detailed cost/schedule analysis to evaluate cost and schedule • Solicit quotes from Kiewit Foundations/other subs to select best value sub.
Traffic Phasing. Optimize traffic phasing to 5 Phases by using improved temporary MOT scheme; reduced phasing can lead to an improved schedule, providing beneficial cost impacts	• Work with Designers and SHA to further optimize schedule, which lowers indirect cost and roadway user costs. • Evaluate phasing globally to determine how to best phase project to reduce temporary work and improve productivity on high quantity operations.
Temporary Work Elimination. Optimize temporary MOT scheme to reduce temporary grading and paving	• Focus on elimination of temporary work everywhere possible to reduce cost including temporary asphalt and support of excavation
Independent Work Packages – Procurement. Develop early work packages for long lead procurement items such as girders, pile, bearings; critical to optimize the schedule – proven successful with DelDOT on the recent project in Wilmington, DE.	• Solicit multiple quotes from vendors to ensure cost competitiveness • Early work procurement reduces escalation cost and schedule delays.
Independent Work Packages – Construction. Evaluate early work package for utility relocates, wick drains and temporary paving to accelerate the construction schedule.	• Evaluate potential early work packages during Preconstruction that can have the biggest improvement to project schedule.
Labor and Equipment. Utilize our over 500 locally employed craft and staff or 40 that will be immediately available upon NTP. Kiewit owns most of the equipment required for this project, with many of these pieces located on our I-95 Wilmington and WMATA projects; our competitive equipment rates offers reduced mobilization costs for the local pieces	• Reduces mobilization costs, improved utilization and less down time, ability to quickly mobilize additional equipment as needed, competitive equipment rates. • Utilize local labor that would not require per diems and move costs
Schedule and Weather. Carefully plan activities to avoid potential weather-related impacts or are weather independent	• Schedule the project to reduce cold-weather concrete and asphalt placement • Where necessary, provide adequate temperature controls for weather sensitive operations.

Production Based Cost Estimating Based on Historical Past Costs

Our Cost Model is built utilizing Kiewit's proprietary and industry marketed estimating system (InEight Estimate), offering SHA transparency, accuracy, and flexibility with a level of detail that enables a thorough project estimate with no surprises. We will lead upfront estimate coordination with the ICE to ensure the InEight Estimate will be perfectly aligned with the ICE's estimating software. Our software has the ability to integrate with other leading softwares to streamline the cost comparison process. Our coordination ensures accurate summary levels of detail, such as operational labor, equipment, material, subcontractor cost, and production information, which will aid in estimate comparisons during the Opinion of Probable Cost estimates (OPCC). This information can be filtered by work discipline and project location, with different scenarios loaded into our Preconstruction Schedule in real-time for forecasting purposes.

At the onset of Preconstruction, Kiewit's Cost Estimator, **David Gates**, will perform detailed estimate coordination with the ICE and the Designer to establish a list of bid items that follow SHA guidelines and formats. **With David's extensive SHA and CMAR experience, this process will be seamless.** As the design progresses, our Team will perform detailed quantity takeoffs and perform quantity comparisons with the ICE and the Design Team, to agree on the same quantities in the estimate.

David will provide staff rates, equipment rates, labor rates along with plugs for subcontractor and material pricing in a fully transparent manner. It is critical that the Teams utilize the same rates if possible, which eliminates unnecessary differences during OPCC reviews. Our focus should be spent on productions, equipment selection and overall schemes during OPCC review and not in differences in supplier plugs, which will be updated as quotes are received.

Once quotes are solicited, they will all be shared with SHA and the ICE in an open book manner. Our Team will work together to select the best value subcontractors and suppliers, and we will then convert our plug numbers to actual quoted numbers. We will pay special attention to DBE goals throughout this process with help from our DBE Outreach Expert, Kelly Kelli.

Once quantities and rates are agreed to, Kiewit and the ICE will develop two completely independent estimates. These estimates will be due based on the milestones set in our Preconstruction Schedule. Both estimates will be submitted to SHA independently, so SHA can compare the two. SHA will then prepare comparison sheets showing the differences between the two estimates. At a follow up OPCC comparison meeting, both Kiewit and ICE will review cost differences in a fully transparent manner. We will discuss differences in productions, equipment selection and our overall approach to the work. Our goal is to get the estimates within acceptable tolerances and provide a fair market value to SHA for the work. This is typically completed in 1-3 comparison sessions. We have found that with strong collaboration and teamwork, SHA can be confident that the final Construction price is fair and reasonable, with major future cost benefits including schedule and cost assurance and reduced risk.

Our method to ensure up-to-date OPCCs is to keep the estimate as real-time as possible. Our Preconstruction Team will continually update the cost model as the design evolves. Immediately upon Preconstruction award, our Team will provide an early baseline estimate. As the design progresses, we will update the baseline estimate and provide modified Interim OPCC Estimates. We anticipate that there will likely be two to three additional OPCC estimates after the baseline estimate is complete. **After the design is approximately 90% complete and the NEPA reevaluation agreement has been signed, we will submit a final Guaranteed Maximum Price (GMP).**

Kiewit's Cost Model and Assumptions includes the following factors to aid in transparency with SHA:

Labor. Labor rates include base rates, burdens, and fringes. Our estimate will show full breakdowns of the trades used for each operation for full transparency. Kiewit will utilize prevailing wages provided by SHA for this project.

Equipment. Ownership and Operating Expense. Kiewit owns the majority of the equipment needed for this project and will provide SHA and ICE with our competitive company rental rates for review.

Permanent Materials. We will lock in material prices early in Preconstruction where possible to mitigate potential escalation and reach out to multiple vendors to get the best possible prices. We will evaluate costs of materials affected by current inflation and determine the best time to lock in material prices.

Construction Consumable Materials. We will utilize historic expendable materials averages to estimate a competitive cost for this cost item.

Subcontractors. Our recent experience in Maryland and D.C. extends to the subcontracting market. We have well-established relationships with numerous reliable partners, including many highly regarded DBE contractors, which will ensure we get competitive pricing for the project. We would like to secure quotes as soon as possible to ensure SHA has an accurate estimate for the total project cost early in the Preconstruction process.

We recognize the potential for independent/early work packages which support the goal of minimizing project delivery time and we have successfully used them on previous CMAR projects. The potential for independent/early work packages could be used for early procurement of long lead items or for early construction packages such as temporary paving. In either case, Kiewit will work collaboratively with SHA and the Design Team to determine if the independent/early work packages will benefit to the project, and if so, we would break the early works out of the total project estimate and submit a price to SHA, along with an independent estimate from the ICE. After open book comparisons are performed and prices are deemed to be within acceptable range, SHA can issue a Construction contract for the early works. It is important to note that executing an independent/early work package does not increase cost of the project but is simply broken out of the total project cost performed at previous OPCCs.

Efficient Schedule

Kiewit's scheduling efforts begin on day one of the Preconstruction phase, with the scheduler being an integral part of the Team. Lead Scheduler, Alexa Fosmer, will work closely with the estimators and discipline leads to produce a baseline schedule that fully encompasses scope, reflects accurate quantity take-offs, realistic production rates, and is detailed enough to reflect planned Construction Sequence. By prioritizing the schedule during the Preconstruction phase, Kiewit ensures that our proposed duration is achievable. The detailed schedule also allows us to analyze multiple scenarios to ensure the submitted pursuit schedule fully realizes all opportunities through different sequencing, means and methods, and planned working time. Man-hours are included in the schedule so resource needs can be analyzed. Identified risks are modeled into the schedule to determine potential impacts and model mitigation efforts. Kiewit will then work collaboratively with the Team to include all design tasks and milestones, required submittals, long-lead procurement items, third-party approvals, permitting, utility relocations, public approvals, and all construction tasks. This approach was used effectively on the I-95 Wilmington CMAR project, creating a very streamlined process.

To create the most efficient schedule possible, our Team will implement the following Key Processes during Preconstruction:

- Identify and run "what if" schedule scenarios during Preconstruction to determine the impacts of issues in the field and the best mitigation method. For example, we will input a major weather activity into one of the winter seasons and see how it affects the project schedule. We will then work with the Team to identify solutions to this schedule impact to recover the loss. We will engage this scheduling method for the top risks of the project to be proactive in issue mitigation.
- Mitigate schedule risk by procuring long-lead items during Preconstruction which mitigates escalation risk.
- Evaluate independent/early work packages such as wick drains and surcharge to improve the overall project schedule.
- Manage detailed permit and utility matrices to ensure all key items are procured and mitigated before major project Construction.
- Level manpower and avoid major peaks in our craft count to provide the best possible production to SHA.
- Optimize MOT phasing to reduce temporary work, traffic switches and the overall project schedule.

As the design progresses and optimized phasing is developed, we will continually update the Preconstruction Schedule to develop the most efficient plan for the project. By optimizing the Construction Schedule, we reduce risk, reduce schedule, and drive down Construction costs, directly meeting SHA's goals.

Proactive Risk Management

By implementing a robust risk identification and mitigation process, the entire Project Team will drive cost, quality, and schedule impacts out of the project, further improving project goals and success. For risks that cannot be completely mitigated, it is critical to make sure that these risks are not included in the direct cost or anywhere else in the estimate. We will develop contingencies or allowances separated from the base cost model for risks that cannot be eliminated. The amount of risk contingency will be directly related to the risks identified by the team. Contingencies will be reviewed collaboratively at each formal design review to ensure appropriate sizing and allocation.

While reviewing the estimate in an open book manner, there may be additional cost items that the team may decide to move out of the estimate and onto the project risk register. An example would be any duration-based item that is hard to quantify during bid time. In this case, the team may decide that it would be better to pay this item as T&M out of the risk register in place of carrying conceptual cost in the estimate that may be conservative. This provides SHA with the flexibility of only being responsible for the actual cost of work.

For risks that SHA is not prepared or willing to manage, Kiewit will include these costs on a separate contractor risk register or contingency that will be reviewed openly with all parties. Upon final CAP execution, Kiewit will add the contractor contingency to the overall price. When the CMAR process is properly leveraged, projects have very few unidentified changes. Smart use of project contingency results in minimal change orders associated with the original scope, meaning there are no surprises.

D.2 Sample Estimate

Our goal is to provide an estimate for OPCC reviews that is open and transparent, easy to review, and improves final GMP negotiations. Working with SHA and the Designer, multiple construction cost estimates will be produced during the development of the design drawings and specifications. Our approach to estimating on CMAR projects is to provide a complete estimate of the direct costs separate from the indirect costs. This gives SHA and the ICE the opportunity to review and compare every item in our directs and indirects separately, instead of reviewing indirect costs that are spread throughout the estimate.

During estimate setup, we structure the estimate into four major categories:

1. **Direct Cost.** This includes all craft labor, equipment, permanent materials, subcontractors, and small tools and supplies needed to build the work. We utilize historical productions to develop a production-based estimate for all self-performed work. In addition, we have the unique ability to provide reliable check estimates on many of our subcontractors. Based on our extensive work history, we will utilize similar projects to evaluate each operation's appropriate productions and share these with SHA and the ICE in an open-book format. As we develop the direct cost, Kiewit will ensure that any potential risk or contingency is maintained on the risk register and not included in any direct costs.
2. **Indirect Cost** We will estimate all supervision, office expense, mobilizations, QC, and other indirect costs below the line, meaning that the indirect estimate will be broken out entirely and not included in any direct costs. At estimate kickoff, we will coordinate with the ICE on an indirect template containing an agreed-upon scopes and rates in the estimate structure to ensure both estimates are aligned appropriately before review. We can also provide check estimates to subcontractor work to verify the best value.
3. **Contingencies.** During the Preconstruction phase, we will develop a detailed risk register, including the schedule and cost risk for each risk item. On past CMAR projects, we have also found that it may be beneficial to move the direct cost items that are difficult to quantify into the risk register. During the OPCC and GMP reviews, we will determine which risk items are best for Kiewit or SHA to manage to select the appropriate contingency to carry in the estimate.
4. **Overhead and Profit.** Kiewit will include overhead or general and administrative costs as a fixed percentage on all project pricing. Profit will consist of a fixed percentage on all project costs, including indirects and subconsultants.

Once SHA, the ICE, and Kiewit agree on the appropriate direct, indirect, and contingency costs, we will spread the indirects, contingencies and markup across the direct bid items similar to any traditional bid build project. **Sample estimates for Excavation (Figure 9), Maintenance of Traffic (Figure 10), Approach to Indirect Costs (Figure 11) and our Approach to Applying Profit (Figure 12) can be found on Pages 33 and 34.**

FIGURE 9 SAMPLE OF CLASS 1 EXCAVATION ESTIMATE

Cost Breakdown Structure (CBS) Register

KIEWIT CORPORATION
Suitland Parkway - MD 4 Example

SHA Bid Item and Quantity

Bid Item Total - Direct Cost

Bid Item ManHour Total

CBS Position Code	Description	C E-(TO) Qty	C E-UOM	C E-$/UOM	C E-Total Cost	C E-MH/UOM	C E-UOM/MH	C E-MH (Dur. Driven)	C E-Shifts (Duration driven)
1	CLASS 1 EXCAVATION	22,000.00	CY	$31.68	$696,953.60	0.10	10.00	2,200.00	49.50
1.1	Excavator Excavation - Mainline	22,000.00	CY	$5.58	$122,658.44	0.05	20.00	1,100.00	27.50

Row #	Code	Resource Type	Description	Qty	UOM	Work Hrs	Unit Cost w/o Maint. Labor	Total Cost(Forecast) w/o Maint. Labor
1	1.C.01.1.02	Labor Rate	Laborer Foreman	1.00	Each	275.00	$57.06	$15,692.80
2	1.C.01.1.03	Labor Rate	Laborer Skilled	1.00	Each	275.00	$52.62	$14,469.82
3	1.C.01.4.03	Labor Rate	Operator Crane/ Excavator/Grader (Grp 1A)	1.00	Each	275.00	$78.03	$21,459.51
4	1.C.01.4.04	Labor Rate	Operator Dozer (Grp 1)	1.00	Each	275.00	$77.46	$21,301.75
5	2.02.012.00	Construction Equipment Rate	Pickup 3/4 T4X4	1.00	Each	275.00	$13.45	$3,698.75
6	2.05.002.00	Construction Equipment Rate	Cat D4	1.00	Each	275.00	$46.30	$12,732.50
7	2.10.009.00	Construction Equipment Rate	Exc. Cat 330-336	1.00	Each	275.00	$96.75	$26,606.25

Production Factors

Cost Item ManHour Total

Cost Item Duration

Bid Item Duration

1.2	Subgrade Finish - Mainline	44,000.00	SY	$2.94	$129,345.16	0.03	40.00	1,100.00	22.00

Row #	Code	Resource Type	Description	Qty	UOM	Work Hrs	Unit Cost w/o Maint. Labor	Total Cost(Forecast) w/o Maint. Labor
1	1.C.01.1.02	Labor Rate	Laborer Foreman	1.00	Each	220.00	$57.06	$12,554.24
2	1.C.01.1.03	Labor Rate	Laborer Skilled	1.00	Each	220.00	$52.62	$11,575.86
3	1.C.01.4.03	Labor Rate	Operator Crane/ Excavator/Grader (Grp 1A)	1.00	Each	220.00	$78.03	$17,167.61
4	2.01.011.00	Construction Equipment Rate	Operator Loader / Roller / Water Truck (Grp	2.00	Each	440.00	$77.16	$33,950.42
5	2.02.012.00	Construction Equipment Rate	Pickup 3/4 T4X4	1.00	Each	220.00	$13.45	$2,959.00
6	2.03.014.00	Construction Equipment Rate	Large Water Truck (4MG)	1.00	Each	220.00	$57.20	$12,584.00
7	2.08.006.00	Construction Equipment Rate	Cat 140 Grader	1.00	Each	220.00	$80.95	$17,809.00
8	2.11.004.00	Construction Equipment Rate	84" Sgl Drum Vib Roller	1.00	Each	220.00	$53.20	$11,704.00

1.1, 1.2, 1.3, 1.4. 1.5 are Individual Cost Items, when added together, they amount to Bid Item Total

Detailed breakdown of Labor and Equipment Costs

1.3	Direct Estimated Other Costs - Dump Fee	2,200.00	Ld	$80.00	$176,000.00	0.00	0.00	0.00	0.00

Row #	Code	Resource Type	Description	Qty	UOM	Work Hrs	Unit Cost w/o Maint. Labor	Total Cost(Forecast) w/o Maint. Labor
1	6.51180	Supply Rate	Dump Fee - Dirt Suitable @ 10cy/ld Tri-Axle	2,200.00	Ld		$80.00	$176,000.00

Detailed breakdown of Dump Fee Costs

1.4	Subcontractor Cost - Trucking - 1 Hour Round Trip	22,000.00	CY	$12.00	$264,000.00	0.00	0.00	0.00	0.00

Row #	Code	Resource Type	Description	Qty	UOM	Work Hrs	Unit Cost w/o Maint. Labor	Total Cost(Forecast) w/o Maint. Labor
1	7.51855	Unique Rate	Trucking - Triaxle Hourly	2,200.00	Hr		$120.00	$264,000.00

Detailed breakdown of Trucking Costs

1.5	Excavation and Grading Work Man-hour Small Tools & Supplies	2,200.00	DMH	$2.25	$4,950.00	0.00	0.00	0.00	0.00

Row #	Code	Resource Type	Description	Qty	UOM	Work Hrs	Unit Cost w/o Maint. Labor	Total Cost(Forecast) w/o Maint. Labor
1	6.91015	Supply Rate	MH Small Tools & Supplies- Excavation	2,200.00	MH		$2.25	$4,950.00

Detailed breakdown of Small Tools and Supplies

6							$696,953.60		2,200.00	49.50

FIGURE 10 SAMPLE OF MAINTENANCE OF TRAFFIC ESTIMATE

Cost Breakdown Structure (CBS) Register

KIEWIT CORPORATION
Suitland Parkway - MD 4 Example

SHA Bid Item and Quantity

Bid Item Total - Direct Cost

Bid Item ManHour Total

CBS Position Code	Description	C E-(TO) Qty	C E-UOM	C E-$/UOM	C E-Total Cost	C E-MH/UOM	C E-UOM/MH	C E-MH (Dur. Driven)	C E-Shifts (Duration driven)
2	MAINTENANCE OF TRAFFIC	1.00	LS	$1,459,344.61	$1,459,344.61	16,232.00	0.00	16,232.00	537.05
2.1	Maintain MOT - 7 Days/WK	52.00	Wk	$19,775.90	$1,028,346.95	280.00	0.00	14,560.00	364.00

Row #	Code	Resource Type	Description	Qty	UOM	Work Hrs	Unit Cost w/o Maint. Labor	Total Cost(Forecast) w/o Maint. Labor
1	1.C.01.1.02	Labor Rate	Laborer Foreman	1.00	Each	3,640.00	$57.06	$207,715.63
2	1.C.01.1.03	Labor Rate	Laborer Skilled	2.00	Each	7,280.00	$52.62	$383,055.64
3	1.C.01.4.04	Labor Rate	Operator Crash Truck	1.00	Each	3,640.00	$77.46	$281,957.66
4	2.02.012.00	Construction Equipment Rate	Pickup 3/4 T4X4	1.00	Each	3,640.00	$13.45	$48,958.00
5	2.03.070.00	Construction Equipment Rate	Crash Truck	0.50	Each	1,820.00	$31.95	$58,149.00
6	2.03.070.00	Construction Equipment Rate	Crash Truck (Idle)	0.50	Each	1,820.00	$16.00	$29,120.00

2.1 - 2.12 are Individual Cost Items, when added together, they amount to Bid Item Total

Production Factors

Cost Item ManHour Total

Cost Item Duration

Bid Item Duration

Detailed Breakdown of Labor and Equipment Costs

2.2	Subcontractor Support MOT	15.00	Cal Day	$2,825.13	$42,376.93	40.00	0.03	600.00	15.00
2.3	Protection Vehicle	150.00	Cal Day	$672.72	$100,907.43	5.00	0.20	750.00	150.00
2.4	Minor Lane Closure/Detours	12.00	Ea	$423.77	$5,085.23	6.00	0.17	72.00	1.80
2.5	Major Lane Closure/Detours	6.00	Ea	$1,765.71	$10,594.23	25.00	0.04	150.00	3.75
2.6	Setup Traffic Control	1.00	LS	$7,062.82	$7,062.82	100.00	0.01	100.00	2.50
2.7	Traffic Control Man-hour Small Tools and Supplies	15,632.00	DMH	$3.00	$46,896.00	0.00	0.00	0.00	0.00
2.8	Traffic Control - Buy Arrow Board	8.00	Ea	$3,500.00	$28,000.00	0.00	0.00	0.00	0.00
2.9	Traffic Control - Drums	175.00	Ea	$85.00	$14,875.00	0.00	0.00	0.00	0.00

Summary of Labor and Equipment Costs

Breakdown of Small Tools and Supplies

Row #	Code	Resource Type	Description	Qty	UOM	Work Hrs	Unit Cost w/o Maint. Labor	Total Cost(Forecast) w/o Maint. Labor
1	6.53010	Supply Rate	Barrels for MOT	175.00	Ea		$85.00	$14,875.00

2.10	Traffic Control - Type 3 Barricade	30.00	Ea	$140.00	$4,200.00	0.00	0.00	0.00	0.00
2.11	Traffic Control - Temp Signs	1,800.00	SF	$15.00	$27,000.00	0.00	0.00	0.00	0.00
2.12	Traffic Control - Police	1,920.00	Hour	$75.00	$144,000.00	0.00	0.00	0.00	0.00

Row #	Code	Resource Type	Description	Qty	UOM	Work Hrs	Unit Cost w/o Maint. Labor	Total Cost(Forecast) w/o Maint. Labor
1	7.53417	Subcontract Rate	Police Officer	1,920.00	Hr		$75.00	$144,000.00

Detailed breakdown of Subcontract Costs

13							$1,459,344.61		16,232.00	537.05

FIGURE 11 Approach to Applying Indirect Costs

KIEWIT CORPORATION
Suitland Parkway - MD 4 Example

Cost Breakdown Structure (CBS) Register

CBS Position Code	Description	C E-(TO) Qty	C E-UOM	C E-$/UOM	C E-Total Cost	C E-MH/UOM	C E-UOM/MH	C E-MH (Dur. Driven)
	Builders' Risk Insurance	1.00	Lu					
	Kiewit Project Bond	1.00	Lu					
	Kiewit G&A	1.00	Lu					
3	**Commercial Cost**	1.00	LS	$83,300.00	$83,300.00	0.00	0.00	0.00
3.1	Bonds	1.00	K$			0.00	0.00	0.00
3.2	Insurance	0.00	K$			0.00	0.00	0.00
3.3	Licenses, Permits, Taxes & Fees	1.00	K$			0.00	0.00	0.00
3.4	Dues, Donations & Community Support	1.00	K$			0.00	0.00	0.00
3.5	Shared Services (not part of 30.03)	1.00	K$			0.00	0.00	0.00
3.6	Legal Expense	1.00	K$			0.00	0.00	0.00
4	**Job Related Overhead**	156.00	MWk	$4,246.23	$662,411.19	40.00	0.02	6,240.00
4.1	Project Management	156.00	MWk				0.02	6,240.00
4.1.1	Management (Managers and Superintendents)	104.00	MWk				0.02	4,160.00
4.1.2	Engineering (Project, Office and Field Engineers)	52.00	MWk	$2,865.25	$148,992.07	40.00	0.03	2,080.00
4.1.3	Equipment Management (Managers, Superintendents a	0.00	MWk					0.00
4.1.4	Design Oversight Staff	0.00	MWk					0.00
4.1.5	Subsistence, Temporary Living Expense, Moves	156.00	MWk					0.00
4.2	Staff Expenses	208.00	MWk	$213.23	$44,351.84	0.00	0.00	0.00
5	**Operational Support**	1.00	LS	$384,377.85	$384,377.85	2,204.04	0.00	2,204.04
5.1	Operational Support & Compliance	52.00	MWk					2,080.00
5.2	Temporary Work	1.00	LS					124.04
5.3	Craft Labor Support	1.00	LS					0.00
5.4	Provisional Cost Assignments	1.00	LS					0.00
6	**Contingency**	85.00	K$	$1,000.00	$85,000.00	0.00	0.00	0.00
6.1	Project Risk	85.00	K$			0.00	0.00	0.00
25								8,444.0

Overhead, Builders Risk, and P&P Bonds Automatic Calculations as a % of Total Cost

Project Specific Commercial Items

Level 1 Summary

Level 2 Summary

Level 3 Cost Items

Project Management Costs are outlined, with the ability to drill down further to a more granular level

Project Management and Support Staff durations are linked to an Excel schedule embedded in the software program

Operational Support costs, including Temporary Works, additional Craft Labor Support and any provisional cost are carried here in the indirects. E.g.: Labor Wage Escalations, Temporary Laydown Yards, Snow Removal,ETC.

Project Risks requiring contingency are outlined individually

After the amount of profit is decided, the estimating software spreads the profit amount proportionately across all the total costs to develop a Balanced Price. This is referred to as the Target Price.

N
ay - MD 4 Example

	Cost Categories								
	Total	**Labor**	**Construction Equipment**	**Materials**	**Supplies**	**Subcontract**	**Fixed Fees and Services**	**G & A**	**Contingency (Allowances)**
Target Price	**$4,392,263**	***$2,076,301***	***$382,743***	***$6,338***	***$731,334***	***$525,129***	***$82,536***	***$490,132***	***$97,750***
Target Profit	**$569,638**	***$270,822***	***$49,923***	***$827***	***$95,391***	***$68,495***	***$7,500***	***$63,930***	***$12,750***
Total Cost	**$3,822,625**	***$1,805,479***	***$332,820***	***$5,512***	***$635,942***	***$456,634***	***$75,036***	***$426,202***	***$85,000***
Indirect Cost	$1,657,493	*$665,266*	*$17,821*	*$5,512*	*$361,021*	*$21,634*	*$75,036*	*$426,202*	*$85,000*
Direct Cost	$2,165,132	*$1,140,213*	*$314,999*	*$-*	*$274,921*	*$435,000*	*$-*	*$-*	*$-*

Direct Cost Subtotal

Indirect Cost Subtotal

Profit Subtotal

Unit/Total Prices on Bid Form

KIEWIT CORPORATION
Suitland Parkway - MD 4 Example

Row Number	Description	Pay Qty	UOM	Unit Direct Cost (bid qty)	$/UOM (Bid Qty)	Total Direct Cost (bid qty)	Total Indirect Cost (bid qty)	Total Profit (balanced)	Unit Price (balanced)	Total Price (balanced)	Unit Price (current)	Total Price (current)
1	CLASS 1 EXCAVATION	22,000.00	CY	$31.76	$56.67	$698,690.08	$534,848.18	$183,816.93	$64.43	$1,417,460.00	$64.43	$1,417,460.00
2	MAINTENANCE OF TRAFFIC	1.00	PLS	$1,466,442.34	$2,589,086.73	$1,466,442.34	$1,122,644.39	$385,821.43	$2,974,908.16	$2,974,908.16	$2,974,908.16	$2,974,908.16
2						$2,165,132.42	$1,657,492.57	$569,638.36		$4,392,368.16		$4,392,368.16

Estimators use the balanced price as a guide to determine the value of each of the individual bid items.

FIGURE 12 Approach to Applying Profit

D.3 . Contracting Plan

Self-Perform Commitment

Kiewit has the ability, equipment, and experience to self-perform all major operations. At a minimum, we will self-perform 50% of the contract value. Kiewit is committed to ensure the best value to SHA, so we will evaluate our cost competitiveness with subcontractors to give SHA the best value as well as performing check estimates for subcontractors.

Most recently on the I-95 Wilmington CMAR project, Kiewit was going to initially self-perform the drainage work; however, as we continued to solicit quotes for this work, we determined that a qualified subcontractor could perform the work at a lower cost, and awarded that contractor the work.

We anticipate self-performing the following operations:

- Roadway Demolition
- Grading and Base operations
- Drainage and Utilities
- Bridge Foundations
- Support of Excavation
- Ground Improvements
- Structures Work (Substructure and Superstructure)
- Steel and Precast Girder Erection

Subcontractor Selection Plan

Kiewit will first define all the project work scope packages and implement our subcontractor procurement process at an early stage in the Preconstruction. Once these packages are defined, we will utilize our bid solicitation software, Building Connected, to post all project information and then advertise the solicitation to select subcontractors. We will also use the MDOT Directory of Certified MBE, DBE, SBE, and ACDBE Firms, internet sourcing sites perform outreach as described in the DBE following section. Using Building Connected, we are able to maintain detailed records regarding who was contacted, interested bidders, questions received, and other pertinent information. With our long history in Maryland and our current contracts in the state, we understand which companies can perform, are cost-competitive, and are responsive to the project's needs. Scopes of work we intend to subcontract include:

- Asphalt Paving & Milling
- Guardrail
- Painting and Coatings
- Signage
- MOT
- Lighting
- Slipform Barrier Wall
- Pavement Markings
- Rebar Installation
- Erosion Control
- Landscaping
- Aggregates
- Ground Improvements
- Foundations
- Flatwork

Our subcontractor selection criteria is based on both qualifications and competitive bid criteria. If several alternatives for qualified subcontractors or suppliers are available, we will implement our selection plan to prequalify and evaluate bids that will provide the best value to the MD 4 Suitland Parkway project. **SHA staff will be involved throughout the subcontractor selection process, including the prequalification stage, to ensure that all subcontractors meet SHA's qualification requirements.** Subcontractor selection will be based on a combination of qualifications and price along with agreeing to prime and subcontract terms.

Kiewit will forward quotes from our subcontractors to both SHA and the ICE to ensure these costs are evaluated transparently. Our goal is to receive multiple quotes (at least 3) for each work scope package to ensure each company's costs are reasonable. We will collaborate with SHA on the final selection of subcontractors, keeping both cost and performance in mind.

Subcontractor engagement during Preconstruction is typically done in a design-assist role. The benefits of the Team include identifying and mitigating risk and incorporating valuable constructability, schedule, and production input, providing cost certainty to SHA. We will collaboratively work with SHA to determine the right subcontractor teaming arrangement and level of engagement during preconstruction to provide best value. For example, on the I-95 Wilmington CMAR project, we identified highly qualified, specialized subcontractors for the hydro demolition and Class D overlay work early in

Preconstruction to participate in constructability reviews, which helped create special provisions, set quality expectations and ensured all scope was included in the pricing.

For key subcontractors that are engaged during preconstruction, we will ensure their costs are competitive and transparent through the following methods:

- Both Kiewit and the ICE will perform estimates for major subcontract packages to ensure pricing is competitive.
- Even if a specific subcontractor participates in preconstruction, multiple quotes will still be solicited for the particular scope to ensure cost competitiveness.
- We will compare subcontractor pricing to past SHA projects and recent quotes Kiewit received on other projects.

DBE Commitments

With the support of our DBE Outreach coordinator, Kelli Kelly, our Team is committed to identifying and providing the DBE community with maximum opportunities to participate in this project. In addition to ensuring compliance with project requirements, Kiewit has established best practices to maximize participation and commit to all Disadvantaged Business Enterprise (DBE) participation that include the following:

- **Strategic Packaging.** Leveraging our understanding of the local contracting community gained while working on recent projects such as the Arlington Memorial Bridge, the Kiewit Team will break down the scopes of work into economically feasible packages to match the capacity and capabilities of such firms.
- **Outreach.** Through frequent outreach, we will share key information, allowing firms time to plan for opportunities. We use several tactics to engage and inform diverse businesses, including hosting networking, informational, and educational events, leveraging and growing our extensive database of vendors from previous projects to communicate events and opportunities through direct emails and calls, promoting opportunities through community/ industry organizations, and advertising events and opportunities in local newspapers and the Building Connected program.
- **Transparent Procurement Process.** We will provide a level playing field for such firms by ensuring that our procurement processes are clearly defined and understood by interested bidders.
- **Technical Assistance.** We understand that our success depends on the success of our diverse business partners. We have a vested interest in the success of such firms at every phase of the project – from procurement through closeout,
- **Issue Management.** Occasionally, small and diverse firms encounter operational challenges that threaten their ability to achieve optimal success and profitability on major projects. Through our extensive track record of successfully partnering with such companies, Kiewit leverages lessons learned to anticipate and provide support and intervention of common issues encountered, such as financial and cash flow challenges, scope and change order management, and safety and quality performance issues.

On the I-95 Wilmington CMAR Project, DelDOT requested that Kiewit increase the DBE goal early in the construction phase. Partnering with the Civil Rights Office, our team was able to solicit additional DBE contractors, including mentoring a company into the program. Through weekly calls and coordination, we exceeded DelDOT's expectations and increased the local DBE participation with no additional cost to the project.

COMAR 21.05.10.05

Tim Cleary and **David Gates** will implement our subcontract plan listed above which complies with COMAR 21.05.10.05. To summarize, Kiewit assumes all risk for the cost, schedule, and performance of the trade contracts for the MD 4 Project, which is why it is critical to implement a robust selection process. We intend to procure most contracts at the onset of construction, however, there may be additional contracts executed later in construction based on project needs and priority. We will ensure that solicitation notices and prequalification requirements are sent at least at least 14 days before proposals are due using approved outreach methods. We will work with SHA to support with publishing notice of the project, contact information of Kiewit, and general information on trade proposal solicitation on the eMaryland Marketplace. We will then work collaboratively with SHA to select trade contractors on factors other than low bid. Lastly, we will comply with the State's Nondiscrimination Clause as provided in State Finance and Procurement Article, §13-219, Annotated Code of Maryland, and the Commercial Nondiscrimination Policy as provided in State Finance and Procurement Article, Title 19, Annotated Code of Maryland.