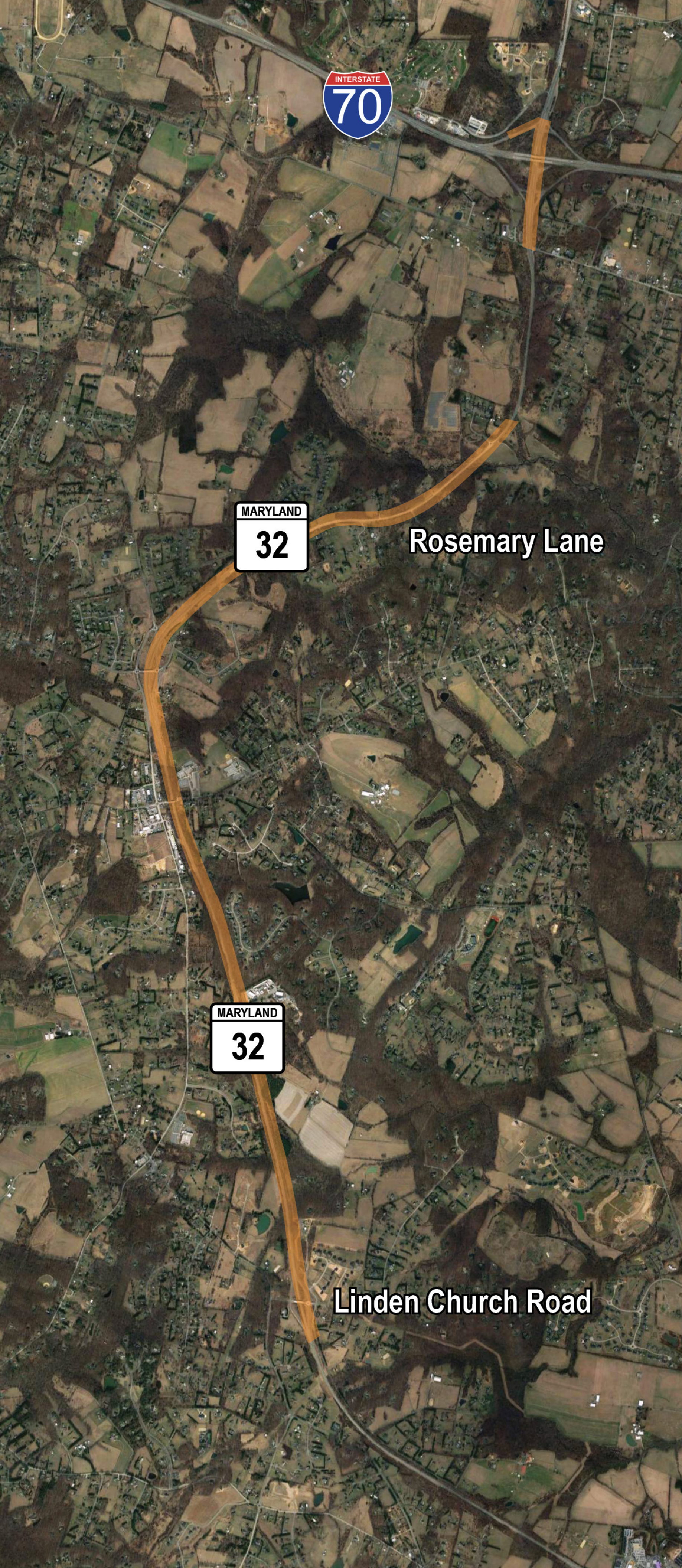

TECHNICAL PROPOSAL

MARYLAND
32

DESIGN-BUILD

MD 32 FROM LINDEN CHURCH ROAD TO I-70
HOWARD COUNTY

CONTRACT NO. HO7565370

F.A.P. No. AC-NHPP-118-1(69)N

ORIGINAL

September 20, 2018

Maryland Department of Transportation

State Highway Administration

CORMAN KOKOSING | JMT

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4.2

Safety & Mobility

4.2 SAFETY AND MOBILITY

Goal 1: Provide a project that maximizes the project elements to improve corridor traffic operations and safety while being compatible with the future planned corridor improvements.

A. PROJECT DESCRIPTION

The Corman | JMT Team's project scope is to upgrade MD 32 to a continuous four-lane dualized minimal access roadway. As provided for in Addendum #3, the total length of dualization has been reduced from the original proposed RFP concept. We propose to dualize MD 32 from the north end of the MD 32 Phase 1 dualization (currently under construction) to STA. 486+07 for a total distance of 29,130 LF (5.52 Miles).

This section of roadway has the highest traffic volumes throughout the corridor. Replacing the Triadelphia Road Bridge over MD 32 and MD 32 Bridge over the Middle Patuxent River are also included in our scope. MD 32 will continue to operate as an urban principal arterial since at-grade access will be provided at various consolidated driveways/ side roads, and a signalized intersection will remain at the MD 32/MD 144 intersection. Improvements **(ATC#23)** at the I-70 Interchange are also included. The dualized roadway will have a design speed of 60 MPH.

VALUE: In addition to the dualization from Linden Church Road to STA. 486+07, the Corman / JMT Team proposes to design and construct improvements at the northern terminus of the project corridor to provide efficient and safe traffic flow (LOS E) along MD 32 at all the entrances to I-70.

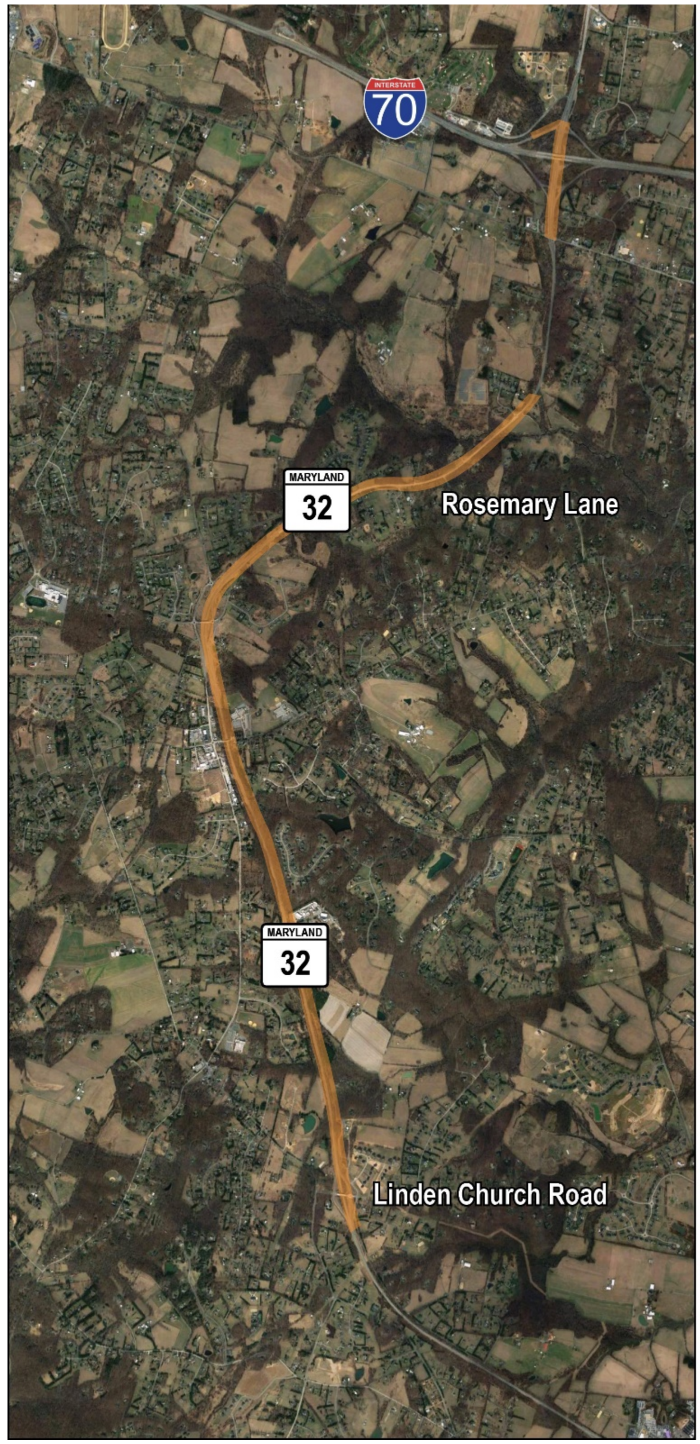


Figure 1: MD 32 Proposed Project Limits

ALTERNATIVE TECHNICAL CONCEPTS (ATC) TO BE UTILIZED

To provide this level of roadway improvements without exceeding the stipulated sum, we will incorporate the following ATCs, including all conditions imposed:

ATC NO.	NAME
01	Reduction of Outside Shoulder Width to 8-ft.
02	6-ft. Outside Shoulder Width Along Auxiliary Lanes
03REV.	Utilize Soil Cement Base vs. Graded Aggregate Base
05	Maintain Crown Section Northbound MD 32
06	Utilizing High Binder Replacement Asphalt Mixtures
07	Slope Median Shoulders to Outside of Roadway
09REV.	Utilize Bulb Tee's with Standard Deck
10	MD 32 Realignment to Eliminate Retaining Wall STA 482+00
11REV.	Reduction in Landscape Densities
13REV.	Utilize Foamed Asphalt Stabilized Base vs. 25.0 mm SAM for Base, and Soil Cement and Open Graded Asphalt Base Drainage Layer vs. Graded Aggregate Base
16	CLOMR Modification Requirements
23	Choice Lane on MD 32 Northbound at Intersection with I-70 Westbound Ramps
24REV.	Revised Seeding of Reforestation Areas on Steep Slopes
31	Utilize Pipe Culverts Instead of Boxes at S-1, S-3, and S-8
33	Utilize Soil Cement Base and Asphalt-Stabilized Open-Graded Drainage Layer vs. Graded Aggregate Base
34	MD 32 Alignment Relocation STA. 407+/- to STA. 459+/-
35	Roadway Dualization Limits to STA. 459+00
36	Shoulder Pavement Design

Figure 2: ATCs to be Incorporated

The above ATCs, accompanied by MDOT SHA approval letters, are in the **Appendix**. The Corman | JMT Team will comply with conditions incorporated in the approval letters. Some, such as **ATCs #03 REV, 13 REV and 33,** are mutually exclusive and address proposed pavement sections – the actual pavement section to be selected and, therefore, ATC implemented will be determined during final design based upon more detailed geotechnical explorations and material costs at the time of construction. ***ATC #35 ending our dualization to STA. 459 has been improved upon - During final pricing we were able to extend the full dualization an additional 2,707-ft. (1/2 mile) to STA. 486+07 and replace the entire Middle Patuxent River Bridge.***

PROJECT ELEMENTS WE WILL PROVIDE WITHIN THE LIMITS OF DUALIZATION

Number of Lanes, Lane Widths, Shoulder Widths. The proposed four-lane dualized MD 32 roadway will have a typical section consisting of four 12-ft. wide travel lanes with 8-ft. wide outside shoulders **(ATC #01)** and 4-ft. inside shoulders. The shoulder width along the outside of auxiliary lanes will be 6-ft. **(ATC #02).**

The median dividing northbound/southbound directions will vary in width, with a typical width of 26-ft., outside of turn lanes, emergency crossover areas, Dayton Shop access and the crossover tie-in at

Terrapin Branch. Traffic barrier w-beam will be installed in the median for positive separation of travel directions. The posted speed will be 55 MPH south of the Burntwoods Road interchange and 50 MPH from this point to the proposed northern terminus of the four-lane dualization **(See Figures 3 and 4).**

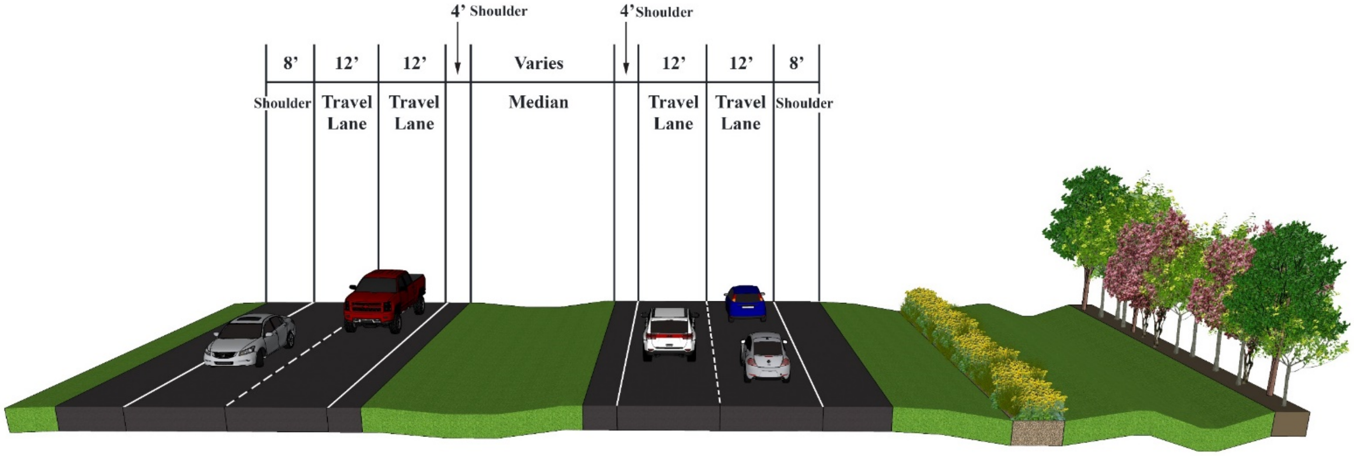


Figure 3: Normal Mainline MD 32 Typical Section Proposed by ATC #01 (traffic barrier not shown for clarity)

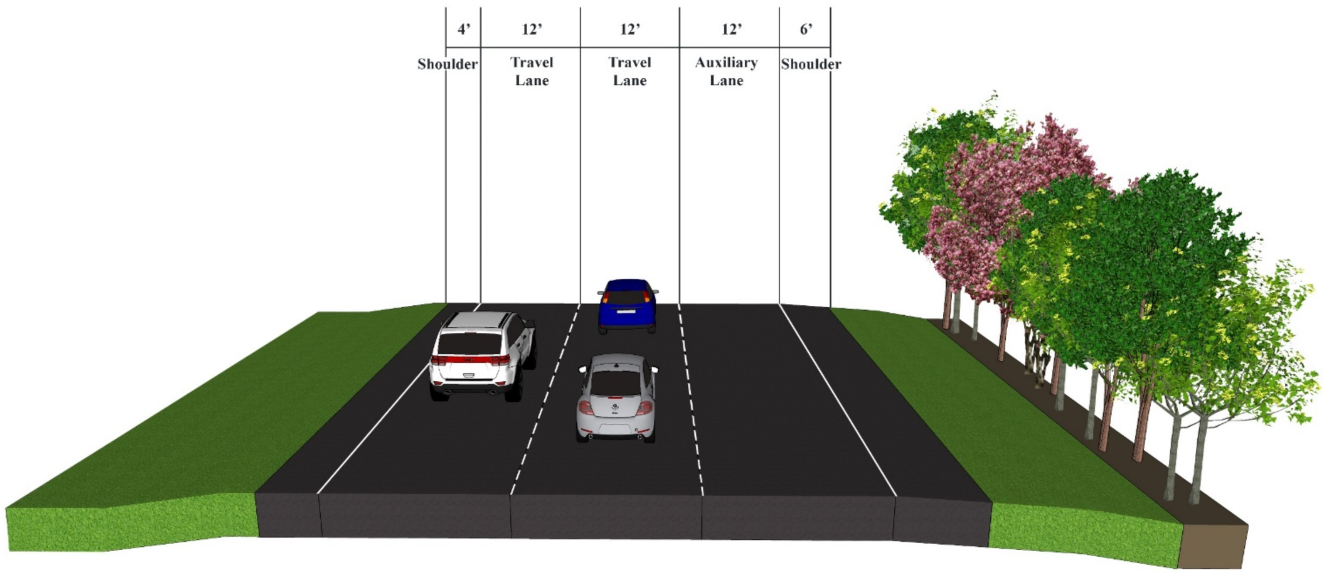


Figure 4: MD 32 Typical Half Section at Auxiliary Lanes Proposed by ATC #02 - Northbound Shown (traffic barrier not shown for clarity)

Triadelphia Road Bridge will have a typical section consisting of two 12-ft. travel lanes and a 6-ft. shoulder on the north side (westbound) and 8-ft. shoulder on the south side **(See Figure 6 on page 11).** The lanes and shoulders will be transitioned on either side of the bridge to tie to existing paved section. A 5-ft. wide sidewalk will be incorporated across the north side of the bridge structure and be continued to provide connectivity to the nearest driveway/access points on either side of the bridge. These typical section elements match the RFP performance requirements. ***During construction, pedestrian safety will be enhanced with the installation of temporary concrete barrier between the pedestrian walkway and one-way travel lane. This safety measure is in addition to the specified RFP requirements.***

INTERSECTION CONFIGURATIONS | CROSSOVERS

Value Statement Objective: Ensure the signalized intersections along with the basic, merge, diverge, and weaving sections operate at a Level of Service (LOS) E or better in the 2040 design year.

One of the project's Value Statement Objectives is to provide for LOS E or better operations and improved safety and operations. This is achieved within our revised project limits at the I-70 eastbound and westbound ramps intersections and throughout the dualized section, by providing continuous four-lane dualization and maximizing the throughput of the northern area of the project using **ATC #23 (Choice Lane).**

Dualization Crossover. The northern terminus of the proposed four-lane dualization construction for MD 32 is at STA. 486+07. A *crossover* will be implemented to shift the roadway section back to meet existing lane configurations on the Terrapin Branch Bridge. The following elements will be incorporated:

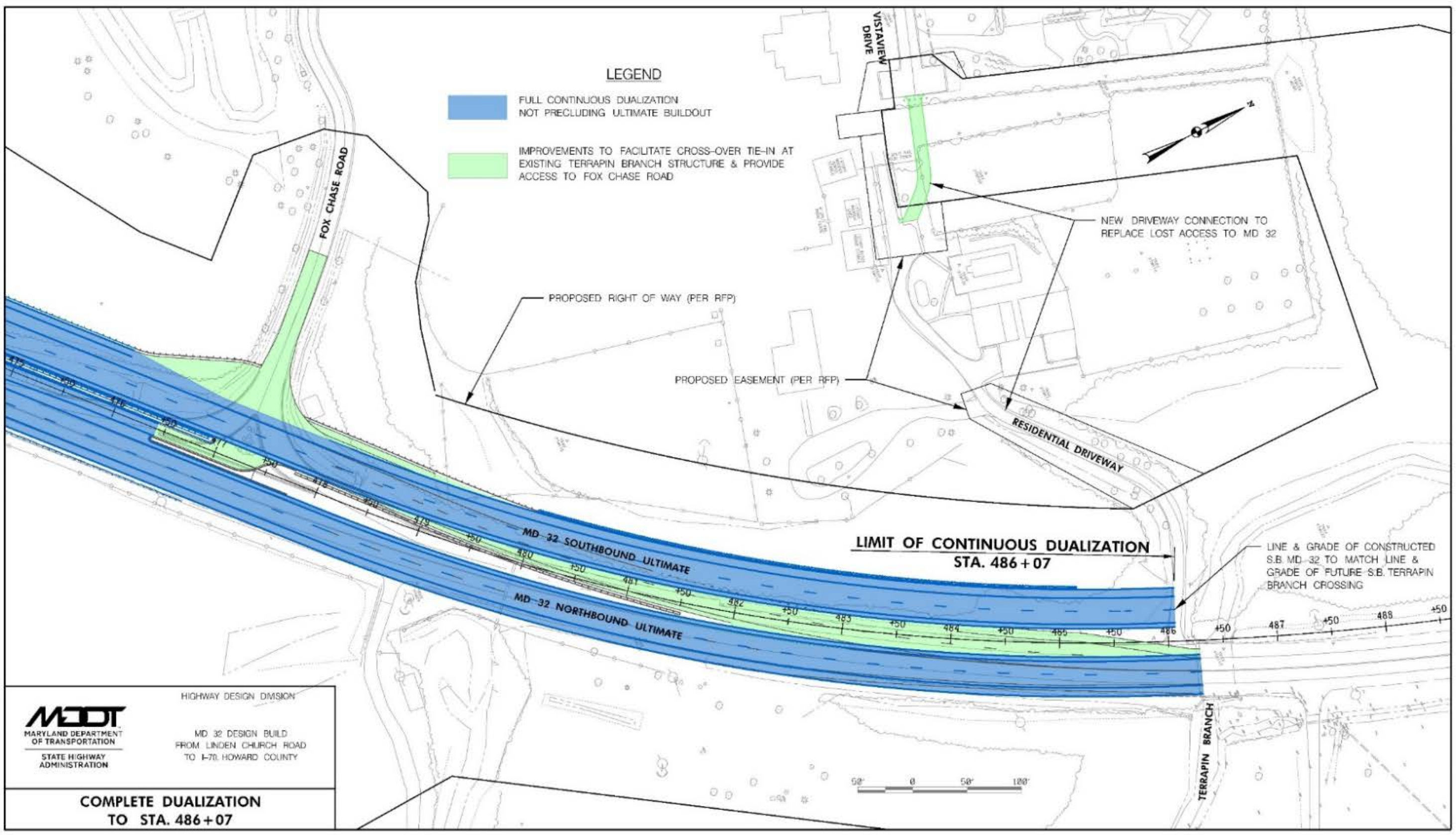


Figure 5: Complete MD 32 Dualization to STA. 486 + 07

Incorporate a J-turn in the Fox Chase Road area to address access management and safety conditions.

BENEFIT: *Accommodates lefts-out from Parliament Place, Stiles Way and Rosemary Lane as well as lefts-in for River Valley Chase and Fox Chase Road.*

The Section of MD 32 roadway between the Terrapin Branch Bridge to the MD 144 intersection remains in its current configuration, with the exception of the following:

- Upgrade/replace any w-beam traffic barrier not meeting current standards, including end treatments, as needed.
- Replace existing ground-mounted signage as needed based on altered lane or traffic configurations elsewhere within the project limits.

MD 144/I-70 Operational and Safety Improvements. The following enhance the northern area of the project from at the I-70 ramp intersections as per **ATC #23** to improve traffic operations and safety conditions (reduce queuing and resulting rear end collisions):

- ✓ Increase throughput of the double left turn from MD 32 northbound to I-70 westbound through use of a center choice lane.
- ✓ Widen ramp to I-70 westbound to accept the second turn lane with an alternating merge downstream.
- ✓ Construct double left turn, including new left turn lane from MD 32 southbound to I-70 eastbound.
- ✓ Widen ramp to I-70 eastbound to accept the second turn lane with an alternating merge downstream.
- ✓ Place signal heads and signing as per MDOT SHA standards for the new lane configurations.

ACCESS ROADS | ACCESS POINTS

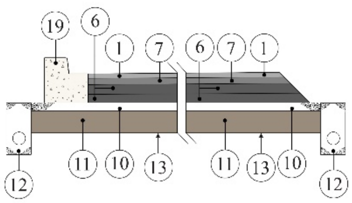
Access roads | roadside access points will match configurations shown/noted on the RFP Concept Plans, with the exception of the following:

- ✓ Not constructing Access Road 4 since it is not within the limits of proposed dualization and the majority of existing utilities between the end of dualization and MD 144 can remain.
- ✓ Individual driveway and community access points between Terrapin Branch and MD 144 remain in their current configuration, including any bridges over streams.
- ✓ Access for Fox Chase Road will be a right-in/right-out to MD 32 AND a direct left-in movement. Left-out movement is via J-turn to the south at Parliament Place.
- ✓ Design access to River Valley Chase as right-in/right-out as per Addendum #1, with emergency access only for lefts-in from northbound MD 32.
- ✓ Revise access to the property serviced by an existing driveway at STA. 486 +/- left through connection to the west to Vistaview Drive, similar to the access connection in the RFP.
- ✓ Restrict access to Parliament Place, Stiles Way and Rosemary Lane to right-in/right-out only per the RFP, with a left-in to Parliament Place at the southbound J-turn.

> ***BENEFIT:*** *There will be an additional J-turn/U-turn near the limit of four-lane dualization at Fox Chase as noted above to provide these communities access to southbound MD 32 without having to divert north to the MD 144 intersection.*

PAVEMENT SECTIONS

ROADWAY ELEMENT 1 | FULL-DEPTH BASE WIDENING FLEXIBLE PAVEMENT SECTION

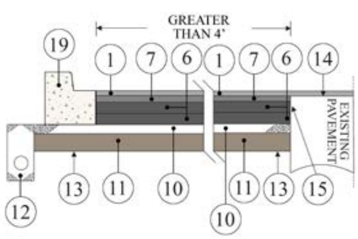


Full-depth construction of two new southbound travel lanes and shoulders on **MD 32 southbound** to accommodate a divided highway with a wide median. Consists of **Approved ATC #03 REV.** flexible pavement section:

- (1) 2-in. Gap-Graded Asphalt Mix 12.5 mm for Surface, PG 64E-22/Level 5.
- (7) 3-in. Superpave Asphalt Mix 19.0 mm for Base, PG 64S-22/Level 2.
- (6) 8-in. Superpave Asphalt Mix 25.0 mm for Base, PG 64S-22/Level 2 (Two 4-in. Lifts).
- (10) 4-in. Graded Aggregate Drainage Layer.
- (11) 8-in. Soil Cement (One Lift).
- (12) Longitudinal Underdrain.
- (13) Limit of Class 1 Excavation and Top of Subgrade.
- (19) New Curb as Required by Final Design.

Will utilize **Approved ATC #36** for shoulder construction and **Approved ATC #07** which will slope the inside 4-ft. median shoulders toward the outside of the roadway section of southbound MD 32.

ROADWAY ELEMENT 2 | FULL-DEPTH BASE WIDENING FLEXIBLE PAVEMENT SECTION



Full-depth base widening of the **Existing MD 32** mainline, shoulders, acceleration/deceleration, and turn lanes. Construction consists of **Approved ATC #03 REV.** flexible pavement section:

- (1) 2-in. Gap-Graded Asphalt Mix 12.5 mm for Surface, PG 64E-22/Level 5.
- (7) 3-in. Superpave Asphalt Mix 19.0 mm for Base, PG 64S-22/Level 2.
- (6) 8-in. Superpave Asphalt Mix 25.0 mm for Base, PG 64S-22/Level 2 (Two 4-in. Lifts).
- (10) 4-in. Graded Aggregate Drainage Layer.
- (11) 8-in. Soil Cement (One Lift).
- (12) Longitudinal Underdrain.
- (13) Limit of Class 1 Excavation and Top of Subgrade.
- (14) Top of Existing Pavement.
- (15) Full-depth Saw Cut for Excavation.
- (19) New Curb as Required by Final Design.

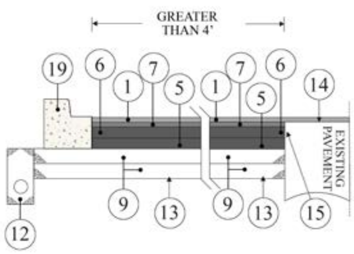
Rehabilitation of MD 32 Mainline between STA. 206+50± to 560+00±. Consists of pavement repair as required by Pavement Engineering Report and resurfacing existing MD 32 pavement with:

- (1) 2-in. Gap-Graded Asphalt Mix 12.5 mm for Surface, PG 64E-22/Level 5.
- (14) Top of Existing Pavement.

Will utilize **Approved ATC #36** for shoulder construction and **ATC #05** which will maintain the existing pavement crown line along the proposed northbound MD 32 travel lanes and **ATC #07** which will slope the inside 4-ft. median shoulders toward outside of the roadway section of northbound MD 32.

The Corman | JMT Team reserves the right to use **ATCs #13REV** or **#33** for Roadway Elements 1 and 2 in lieu of **ATC #03REV.** after completing more detailed geotechnical investigations and design and as dictated by market conditions at time of construction.

ROADWAY ELEMENT 3 | FULL-DEPTH BASE WIDENING FLEXIBLE PAVEMENT SECTION



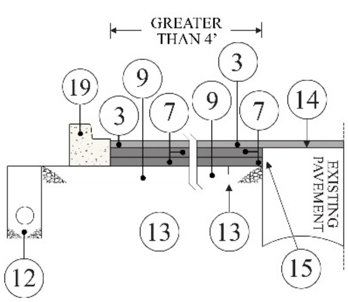
Full-depth base widening of **Existing MD 32 Ramp H to I-70 westbound and Existing MD 32 Ramp F to I-70 eastbound.** Construction consists of the following flexible pavement section from the RFP minimum pavement section:

- (1) 2-in. Gap-Graded Asphalt Mix 12.5 mm for Surface, PG 64E-22/Level 5.
- (7) 3-in. Superpave Asphalt Mix 19.0 mm for Base, PG 64S-22/Level 2.
- (6) 4-in. Superpave Asphalt Mix 25.0 mm for Base, PG 64S-22/Level 2.
- (5) 4.5-in. Superpave Asphalt Mix 25.0 mm for Base, PG 64S-22/Level 2.
- (9) 12-in. Graded Aggregate Base Course (Two 6-in. Lifts).
- (12) Longitudinal Underdrain.
- (13) Limit of Class 1 Excavation and Top of Subgrade.
- (14) Top of Existing Pavement.
- (15) Full-depth Saw Cut for Excavation.
- (19) New Curb as Required by Final Design.

Rehabilitation of existing MD 32 Ramp H to I-70 westbound consists of resurfacing the westbound pavement with the following materials:

- (1) 2-in. Gap-Graded Asphalt Mix 12.5 mm for Surface, PG 64E-22/Level 5.
- (14) Top of Existing Pavement.

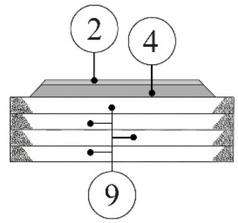
ROADWAY ELEMENT 4 | FULL-DEPTH FLEXIBLE PAVEMENT BASE WIDENING



River Valley Chase Road base widening consists of the following flexible pavement section from the RFP minimum pavement section:

- (3) 1.5-in. Superpave Asphalt Mix 9.5 mm for Surface, PG 64S-22/Level 2.
- (7) 6-in. Superpave Asphalt Mix 19.0 mm for Base, PG 64S-22/Level 2 (Two 3-in. Lifts).
- (9) 6-in. Graded Aggregate Base Course.
- (12) Longitudinal Underdrain.
- (13) Limit of Class 1 Excavation and Top of Subgrade.
- (14) Top of Existing Pavement.
- (15) Full-depth Saw Cut for Excavation.
- (19) New Curb as Required by Final Design.

ROADWAY ELEMENT 5 | FULL-DEPTH BRIDGE APPROACHES ON TRIADELPHIA ROAD OVER MD 32 (TRIADELPHIA ROAD BRIDGE)

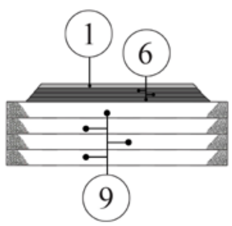


Note: 24-in. Graded Aggregate Base (four 6-in. lifts) for 30-ft. closest to bridge or 12-in. Graded Aggregate Base beyond 30-ft. (two 6-in. lifts)

Full-depth bridge approaches reconstruction for Triadelphia Bridge over MD 32 will use an asphalt pavement section from Standard No. MD 580.09, medium traffic detail as follows:

- (2) 2-in. Superpave Asphalt Mix 12.5 mm for Surface, PG 64S-22/Level 2.
- (4) 10-in. Superpave Asphalt Mix 25.0 mm for Base, PG 64S-22/ Level 2 (Two 5-in. Lifts).
- (9) 24-in. Graded Aggregate Base (Four 6-in. Lifts) for 30-ft. closest to Bridge or 12-in. Graded Aggregate Base Beyond 30-ft. (Two 6-in. Lifts).

FULL-DEPTH BOX CULVERT APPROACHES ON MD 32 (NO. 1302300) AND MIDDLE PATUXENT BRIDGE APPROACHES

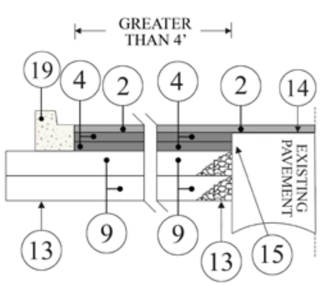


Note: 24-in. Graded Aggregate Base (four 6-in. lifts) for 30-ft. closest to bridge or 12-in. Graded Aggregate Base beyond 30-ft. (two 6-in. lifts)

Full-depth box culvert approaches on MD 32 Box Culvert (No. 1302300) over Middle Patuxent tributary and approaches on MD 32 Middle Patuxent Bridge will use a modified pavement section from Standard No. MD 580.09, heavy traffic detail as follows:

- (1) 2-in. Gap-Graded Asphalt Mix 12.5 mm for Surface, PG 64E-22/Level 5.
- (6) 12-in. Superpave Asphalt Mix 25.0 mm for Base, PG 64S-22/Level 2 (Three 4-in. Lifts).
- (9) 24-in. Graded Aggregate Base (Four 6-in. Lifts) for 30-ft. closest to Bridge or 12-in. Graded Aggregate Base Beyond 30-ft. (Two 6-in. Lifts).

ROADWAY ELEMENT 6 | TRIADELPHIA ROAD WIDENING AND RESURFACING



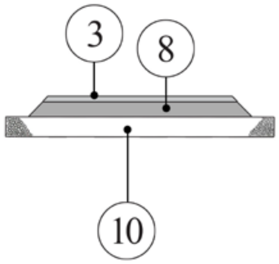
Triadelphia Road **full-depth base widening** consist of the following flexible pavement section from the RFP minimum pavement section:

- (2) 2-in. Superpave Asphalt Mix 12.5 mm for Surface, PG 64S-22/Level 2.
- (4) 10-in. Superpave Asphalt Mix 25.0 mm for Base, PG 64S-22/Level 2 (Two 5-in. Lifts).
- (9) 12-in. Graded Aggregate Base Course (Two 6-in. Lifts).
- (13) Limit of Class 1 Excavation and Top of Subgrade.
- (15) Full-depth Saw Cut for Excavation.
- (19) New Curb as Required by Final Design.

Triadelphia Road rehabilitation consists of **resurfacing** the Triadelphia Road pavement with the following materials:

- (2) 2-in. Superpave Asphalt Mix 12.5 mm for Surface, PG 64S-22/Level 2.
- (14) Top of Existing Pavement.

ROADWAY ELEMENT 7 | FULL-DEPTH BASE WIDENING AND RECONSTRUCTION OF RESIDENTIAL DRIVEWAYS



Full-depth base widening and reconstruction of residential driveways will consist of an asphalt pavement section from Standard No. MD 580.08 Driveways and Bike Paths as follows:

3 1.5-in. Superpave Asphalt Mix 9.5 mm for Surface, PG 64S-22/Level 2.
8 2.5-in. Superpave Asphalt Mix 19.0 mm for Base, PG 64S-22/Level 2.
10 4-in. Graded Aggregate Base.

MAJOR DRAINAGE STRUCTURES | STREAM RESTORATION

We will replace culverts (Structures S1, S3 & S8) carrying Clyde's Branch and its tributaries across MD 32 and replace the box culvert (Structure S5) carrying a tributary to the Middle Patuxent River (Rosemary Lane Tributary) across MD 32.. A geomorphic assessment will investigate fish and other aquatic organism passage improvement/blockage removal opportunities at the crossing. A natural channel design approach will ensure long-term stability through the drainage structure and provide stable connections to the restored upstream and downstream reaches of waterways.

Our proposal includes restoring Rosemary Lane tributary from just upstream of MD 32 to crossing to confluence with Middle Patuxent River and Clyde's Branch upstream and downstream of the culvert crossing of MD 32. Geomorphic, habitat and functions and values assessments will be used to characterize the existing degraded stream system to evaluate ecological uplift potential for the site. Natural channel design techniques will provide a sustainable and long-term stable system which meets the compensatory stream mitigation standards set forth by the USACE and MDE to offset unavoidable stream impacts.

Our design approach for the Rosemary Lane tributary and Clyde's Branch is to create a stream system to accommodate the drainage basin's available water and sediment and which is highly connected to its floodplain to reduce stream power, provide surface and groundwater exchange and promote establishment of floodplain riparian wetlands adjacent to the stream channel. These conditions will promote channel stability, floodplain deposition, denitrification and habitat improvements for flower and fauna, including aquatic organisms resulting in significant ecological uplift of the existing degraded system. Native vegetation, including herbaceous and woody species plantings and seed mixes, will permanently stabilize the proposed stream banks and floodplain areas.

We will replace MD 32 bridge crossing over the Middle Patuxent River with new dual bridges (Structure S6) and associated relocated upstream and downstream sections of the Middle Patuxent River. A geomorphic assessment will investigate fish and other aquatic organism passage improvement/ blockage removal opportunities at the crossing, and to inform a natural channel design approach which will ensure long-term stability through the bridge structure and relocated reaches and provide stable connections to the unrestored upstream and downstream channel reaches outside of the project limits. The relocated/restored downstream reach will be carefully designed to function in concert with the Corman | JMT Team design of the adjacent Gossage Wetland Mitigation Site. The hydraulic analysis and approvals for the bridge crossing will be modified to eliminate the need for a center pier for the bridge structure.

All other existing piping, except for the 36-in. diameter crossing at STA. 309+10 which is to be replaced per RFI #138, will be reused consistent with the RFP Concept Plans unless integrity/capacity is shown to be inadequate during scope validation. ***Even though our improvements do not directly impact the existing 66-in. CMP culvert at STA. 526+50 the pipe will be replaced as desired by RFI #92.***

Stormwater Management Best Management Practices (BMPs) will be followed to provide Environmental Site Design (ESD) to the Maximum Extent Practicable (MEP) and to manage 10-year peak discharge for the proposed roadway improvements. SWM BMPs will be designed to treat existing and proposed impervious areas so that there is no debit to the water quality bank for any 6-digit watershed. Once ESD to the MEP is met, additional BMPs will be provided as required to meet Channel Protection Volume (CPv) and 10-year peak Discharge Management requirements. Stormwater ponds and culvert crossings will be designed to meet Pond Code 378 embankment standards.

BRIDGES | STRUCTURES

> ***Value Statement Objective: Design all structures to limit future maintenance and be compatible with the future planned corridor improvements.***

Our proposed improvements are compatible with the future planned corridor improvements.

Structure S1 (MD 32 over a Tributary to Clyde's Branch) is approximately 200-ft. long and crosses beneath MD 32 at approximate STA. 255+00. Will be twin 78-in. diameter RCPP pipes **(ATC #31)** in accordance with ASTM C-361. One pipe will be depressed 1-ft. relative to the other. These pipes will be supported by a Mix No. 3 concrete base/collar full length of the pipes. Concrete base will be 9 inches minimum thickness beneath the lowest pipe and extend to a height of ½ the pipe diameter along the sides. Structure will have cast-in-place reinforced concrete headwalls on either end.

Structure S3 (MD 32 over Clyde's Branch) is approximately 250-ft. long and crosses beneath MD 32 at approximate STA. 227+45. Will be twin 78-in. diameter RCPP pipes **(ATC #31)** in accordance with ASTM C-361. One pipe will be depressed 1-ft. relative to the other. These pipes will be supported by a Mix No. 3 concrete base/collar the full length of the pipes. Concrete will be 9 inches minimum thickness beneath the lowest pipe and extend to a height of ½ the pipe diameter along the sides. Structure will have cast-in-place reinforced concrete headwalls on either end.

Structure S4 (Bridge No. 13045 on Triadelphia Road over MD 32) replaced as follows:

- ✓ Will be a two-span, steel haunched plate girder structure with maximum span lengths 100-ft. – 100-ft. as proposed in the RFP. Girders will have a 60-in. deep web at the pier and parabolically taper to 34 inches deep over a distance of 30-ft. The remainder of girder length will have a constant web depth of 34 inches.
- ✓ MD 32 typical section will be as proposed in the RFP Concept Plans and provide for the full MD 32 typical section beneath the bridge. MD 32 will be symmetrical about the centerline of pier and consist of ½ pier thickness which will be approximately 2.5-ft., 10.5-ft. graded median, traffic barrier w-beam, 4-ft. inside shoulder, two 12-ft. travel lanes, 8-ft. outside shoulder, traffic barrier w-beam with

10:1 foreslope grading and 2:1 backslope grading to the face of a stub abutment with a 3.0-ft. maximum exposed face.

- ✓ Triadelphia Road typical section **(See Figure 6)** will be as proposed in the RFP and consist of a 1.58-ft. parapet (north side), 5.67-ft. sidewalk, 6-ft. shoulder (westbound), two 12-ft. travel lanes, 8-ft. shoulder (eastbound) and 2 ft. 42-in. high F-shape barrier (south side). Bridge will be supported by six girders; five spaces at 8.25-ft. with 3-ft. overhangs each side.

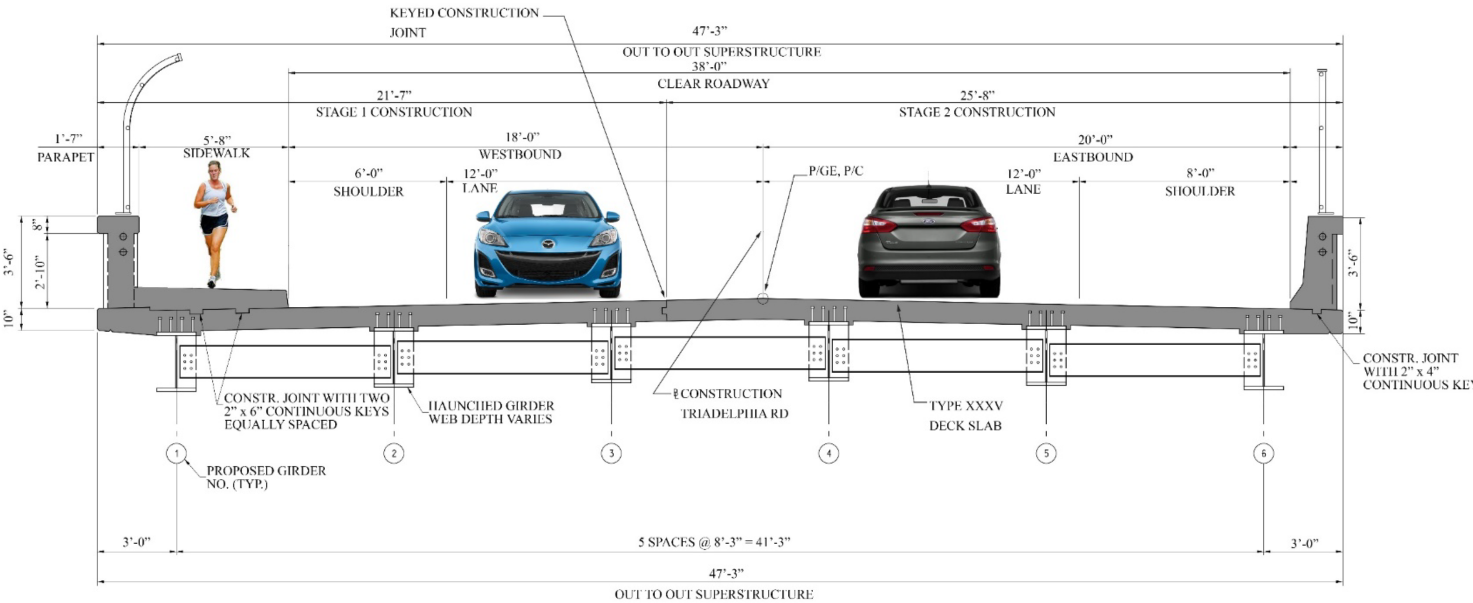


Figure 6: Triadelphia Road Bridge – Proposed Typical Section

- ✓ Design/construct bridge utilizing phased construction under a single westbound lane of traffic.

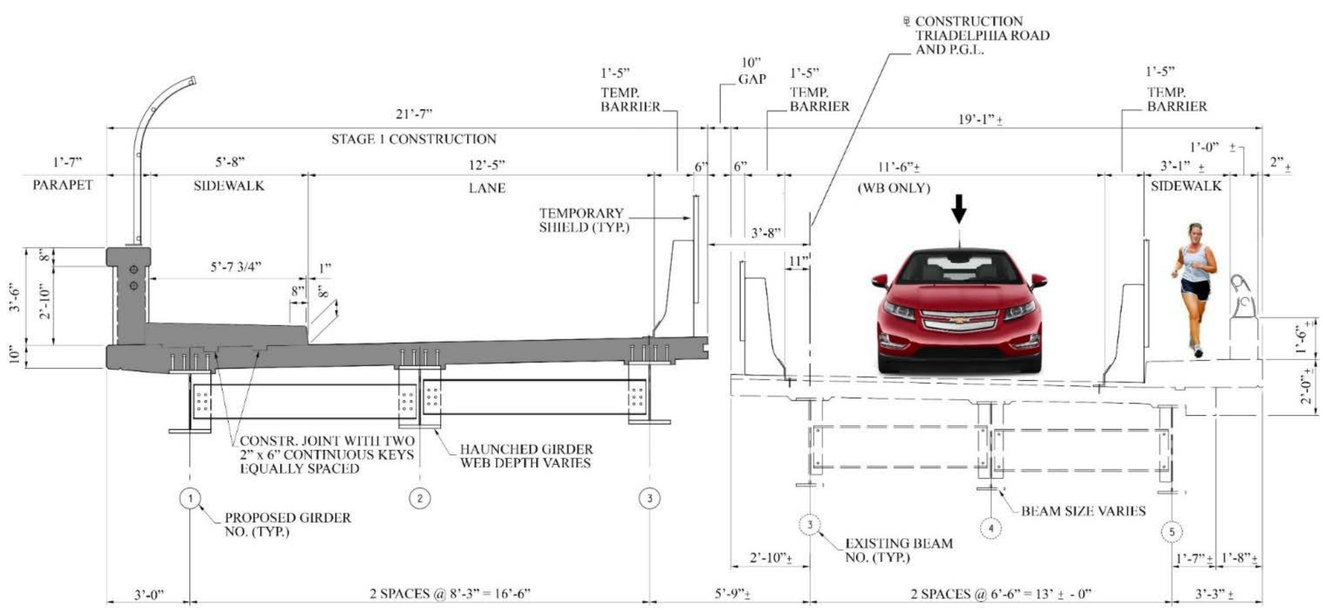


Figure 7: Triadelphia Road Bridge – Transverse Bridge Section (Stage 1 Construction)

***BENEFIT:** As a value-added safety feature, a temporary precast concrete barrier will be placed and bolted down along the existing curb-line during one-way operation. This physically separates pedestrians using the sidewalk from vehicles.*

- ✓ Abutments and pier will be founded on driven HP bearing piles.
- ✓ All other specified performance requirements will be adhered to.

Structure S5 (MD 32 over Tributary to Middle Patuxent Branch) is approximately 240-ft. long, will be at approximate STA. 450+00, and is a double cell 10-ft. x 9-ft. box culvert cast-in-place for its full length. Founded on a spread footing foundation with a prepared subgrade consisting of 2-ft. undercut, placement of Type SE geotextile fabric and placement with 2-ft. AASHTO No. 57 stone. Headwalls will be cast-in-place reinforced concrete on a similar spread footing prepared foundation.

Structure S6 (Bridge No. 1302201 & 1302202 on MD 32 over Middle Patuxent River) is approximately 110-ft. long single-span pre-stressed concrete Bulb-T girder bridge (53-in. PCBT girders) as proposed and accepted in **ATC #09Rev**. Bridge is dualized, with the roadway lane, shoulder widths and girder spacings shown in **Figure 8.** It will be supported on a scour-resistant foundation consisting of drilled reinforced concrete shafts, cored below or into non-scourable rock.

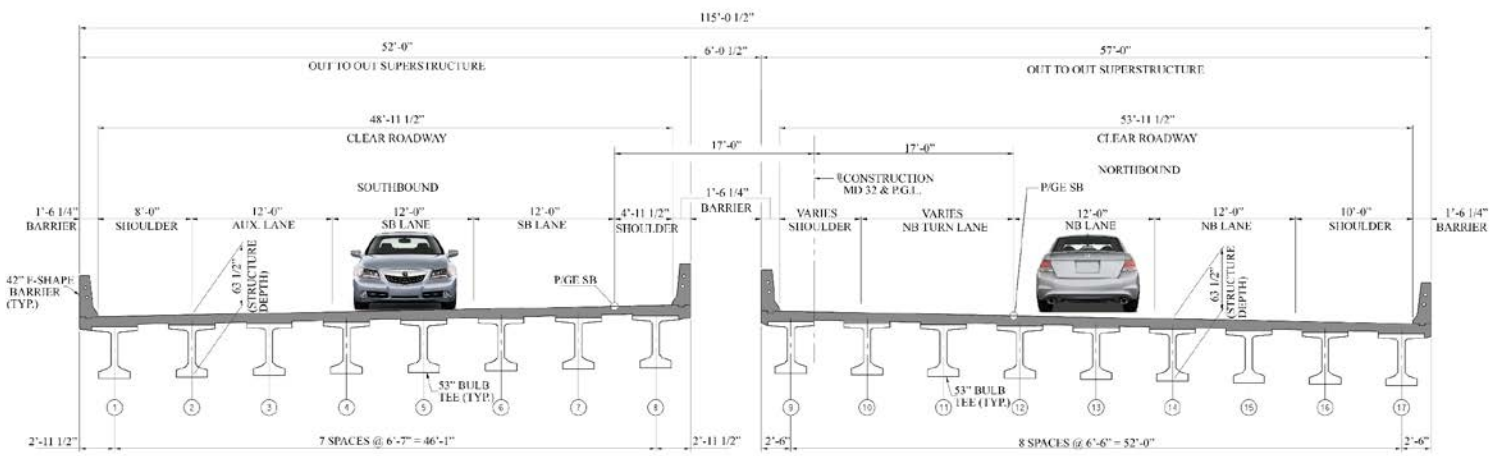


Figure 8: Bridge No. 13022 on MD 32 over Middle Patuxent River – Proposed Typical Section

Structure S8 (MD 32 over a Tributary to Clyde's Branch) is approximately 200-ft. long and crosses beneath MD 32 at approximate STA. 250+00. Will be twin 54-in. diameter RCPP pipes **(ATC #31)** in accordance with ASTM C-361. One pipe will be depressed 1-ft. relative to the other. Pipes will be supported by a Mix No. 3 concrete base/collar full length of the pipes. Concrete will be 9 inches minimum thickness beneath the lowest pipe and extend to a height of ½ the pipe diameter along the sides. Structure will have cast-in-place reinforced concrete headwalls on either end.

NOISE BARRIERS

A noise analysis is needed to confirm impacts for the realignment option as part of **ATC #34.** We performed a preliminary re-evaluation based on the shifted northbound roadway alignment and profile and completed a barrier analysis. Outcomes indicated a slight increase of noise levels but resulted in the same conclusion as the RFP Noise Report. As part of the final design, the Corman | JMT Team will complete analysis of the potential noise impacts and document the design changes as an Addendum to the project's existing Noise Report.

RETAINING WALLS

The Corman | JMT Team received a conditional approval under **ATC #10** on a realignment of MD 32 that resulted in eliminating the need for the S2 Retaining Wall on MD 32 while meeting all MDOT SHA conditions.

LANDSCAPE ARCHITECTURE

Avoiding/minimizing forest resource impacts is essential. Identifying specimen and significant trees within their forest communities ensure tree preservation methodologies are implemented. Clear communication of design and preservation intent to our team is vital to project success. Maintaining healthy forest includes careful control of invasive/noxious species and replacing impacted areas with a healthy, diverse mix of plant species native to the region. Constant coordination with our Erosion and Sediment Control (ESC) engineers will ensure tree protection details and sequences of construction are included on the ESC plans.

ATC #11REV. modified plant densities for reforestation plantings to match those required to meet State Law which has generated healthy forest ecosystems on many projects across Maryland over the last 25-30 years. A second **ATC #24REV.** will be included and will enhance developing forest areas on the steep slopes proposed along the project limits. Instead of underseeding with Lowland Meadow seed mix, we will use Woody Plant seed mix, with appropriate amendments, which will introduce seeds from preferred woody species to the project area while stabilizing the soil.

Landscaping in high-visibility areas, such as bridge abutments, will be designed for high visual quality, while meeting planting setbacks defined in applicable codes, specifications, and requirements. Easy maintenance is a top priority throughout the project corridor and plant types and species will be selected and located for long-term effectiveness. SWM landscape planting will be designed to maximize the ecological benefit of including plant materials in SWM features, while meeting SDC guidelines established by MDOT SHA.

TRAFFIC ENGINEERING

ATC #23 provides safety and operational improvements at the northern terminus of the project with I-70. We propose to use the existing traffic signal infrastructure and equipment at MD 144 intersection and install a cellular modem in the cabinet to connect the signal to the ATMS. At the I-70 eastbound and westbound ramps, we propose to install new signals including poles, signal heads, luminaires, signs, cameras and ethernet switch. Interconnect is proposed to be completely replaced between these signals where impacted and per the RFP. This accommodates the lane configuration changes implemented as part of the safety and operation improvements. Signs within the project limits that do not meet current standards will be upgraded. Signing will be designed to MDOT SHA and Maryland MUTCD standards. It appears the overhead sign structure north of the MD 144 intersection was recently installed and meets current standards and will not need to be replaced.

This overhead structure will be used for any required new sign panels. Roadway lighting is proposed at all intersections and ramps per the RFP. Sign lighting is per MDOT SHA Lighting Design Guidelines.

UTILITIES

ATC #35 eliminates dualization of MD 32 from approximate STA. 459+00 **(now extended to STA. 486+07)** to the northern terminus in the RFP. Eliminating this segment of dualization greatly diminishes required utility relocations. For example, the Utility Conflict Matrix in the RFP provided impact identifications (IID) 1 - 82. Our initial analysis indicates that IIDs 39 - 61 have been eliminated, noting that not all identified conflicts required relocation.

Utility Construction Phase (UCP) 3 – Access Road 4: Pole and UG Conduit Relocations. This UCP is associated with Access Road 4 which is within the limits of the eliminated section of dualization. Since Access Road 4 is north of STA. 486+07, we propose to eliminate Access Road 4 construction. This eliminates the need for BGE to construct the proposed BGE duct and pole line that leaves MD 32 at approximate STA. 486+, traverses through the woods and up the hill to Access Road 4 on a new pole line, containing approximately 30 new poles and running parallel with Access Road 4. It also eliminates moves for Verizon and Comcast to the new pole line. Within the Utility Conflict Matrix this eliminates IID's 18, 46 - 50B and 61 - 68, greatly reducing risks associated with relocating these utilities. Any relocations associated with **ATC #35** under UCP 2 will be closely scrutinized to confirm need. UCP 1 is not impacted by **ATC #35**.

ATC #23 proposes MD 32 improvements approaching I-70 to increase safety and enhance operations. A review of utility impacts indicates there are no additional impacts to the existing utilities in this area, however Verizon and Howard County Utility Fiber are known to have facilities there. Howard County Fiber concept design plans show a new crossing of MD 32 being installed at approximate STA. 535+50 which does not appear to be impacted by this ATC. We will coordinate with these entities and perform designations and test pitting to confirm locations and evaluate conflicts.

ATC #35. Effects on ***UCP 1 Triadelphia Road - Pole and UG conduit relocations-remain unchanged by our design***. In addition to the pole and UG relocations associated with IID 13 and 14, to accommodate the Triadelphia Road Bridge Replacement, relocating 4-in. PL HP Gas at approximate STA. 334+50 IID 12 is required.

The Corman | JMT Team will coordinate with utility companies as part of UCP 2. The Utility Matrix IID's 23 and 25 - 28, Verizon, Comcast and BGE Electric, all near STA. 427+/- will be the focus of review with utility companies as the concept design has been modified at River Valley Chase.

IID 24 BGE Gas Cut, Cap and Abandon 6-in. PL Gas at River Valley Chase prior to crossing proposed MD 32, approximate STA. 427+25 is still required.

IID's 28A and 29, telecom and electric, approximate STA. 442+80, relocation is still required as originally contemplated. Howard County Fiber and Telecom relocations will be further evaluated for opportunities to reduce relocation requirements due to our ATCs.

The OH crossing clearance of BGE Electric at approximate STA. 272+60, IID 5, and 380+25, IID17 will be confirmed and marked in the field with signs during construction.

The pole line along MD 32 northbound, STA. 383+00 to 385+70, IID 18a that include Verizon, Comcast and BGE primary and secondary electric will be evaluated during final design in an attempt to eliminate relocation.

At MD 32, STA. 398+50 right, a Comcast line diverts from overhead on a BGE pole to underground. It continues underground to a hand box at approximate STA. 401+00 and returns to overhead at approximate STA. 412+00. The Conflict Matrix shows it as IID 20 and annotates relocation as the required mitigation. Based on the roadway cross sections and work anticipated, it appears most of this line is outside the limits of work and can remain in place with only limited relocations needed. During final design, we will further coordinate with Comcast and evaluate requirements of this relocation to minimize relocations to the facility.

> ***BENEFIT:*** *The Corman / JMT Team has not identified any increase in impacts to the known utility facilities companies as a result of our approved/implemented ATCs. In fact, we have substantially reduced impacts.*

B. IMPROVING NETWORK TRAFFIC OPERATIONS AND REDUCE CRASHES WITHIN LIMITS OF DUALIZATION

REDUCING NETWORK DELAY

> ***Value Statement Objective: To reduce network delay for both the AM and PM peak periods for the 2040 design year when compared to the no build condition.***

The project eliminates the No-Build bottlenecks at Linden Church Road interchange during AM and PM peak periods, while the dualized section reduces congestion between Linden Church Road and Rosemary Lane in the AM and PM peak periods and decreases travel times.

In the AM peak period, MD 32 southbound travel times are reduced by 25% from 6 to 4.5 minutes between Rosemary Lane and Linden Church Road. Network delay is reduced by 58% when compared to the No Build condition.

In the PM peak period, MD 32 northbound travel times are reduced by 31% from 16 to 11 minutes between MD 108 and Rosemary Lane. Northbound traffic destined to the Burntwoods Road interchange experiences a 60% decrease in travel time from 12 to 5 minutes. Network delay is reduced by 10% when compared to the No Build condition. The dualized section between Rosemary Lane and Linden Church Road has greatly improved traffic operations with the alternate merge north of Fox Chase Road maximizing throughput at northern end of the proposed dualization.

> ***BENEFIT:*** *These improvements increase roadway reliability through shorter travel times, improved shoulder hour performance and reduced crashes.*

REDUCING CRASH RATES

The project provides a divided section from north of Linden Church Road to the end of dualization just south of Terrapin Branch, eliminating high-severity opposite direction crashes. It eliminates left turn movements onto MD 32 within the area of dualization and consolidates left turning movements into two J-turns. The J-turns provide a median protected turning location, reducing rear end collisions and significantly shortens the required crossing distance, greatly reducing left turn angle crashes.

Value Statement Objective: Reduce the crash rate for rear-end collisions, reduce the crash rate at the I-70 interchange, and reduce the overall corridor-wide crash rate.

The first J-turn is at Parliament Place and serves left-in movements for Parliament Place, Stiles Way and Rosemary Lane, as well as left-out movements for nearby driveways along MD 32 southbound.

The second J-turn is at Fox Chase Road, just south of Terrapin Branch and serves left-out movements for Parliament Place, Stiles Way and Rosemary Lane, as well as left-in movements for Fox Chase Road, River Valley Chase and nearby driveways along MD 32 southbound.

BENEFIT: *By eliminating bottlenecks at Linden Church Road and congestion between the Burntwoods Road interchange and MD 108, the dualized section of MD 32 increases peak hour speeds to near the posted speed limit, reduces the number of stopped or slow-moving motorists, resulting in significantly reduced rear-end, sideswipe and other congestion-related crashes.*

I-70 | MD 144 OPERATIONAL AND SAFETY IMPROVEMENTS

By constructing double left turns from MD 32 northbound to the I-70 westbound ramps and from MD 32 southbound to the I-70 eastbound ramps, the project provides LOS E or better operations at the I-70 interchange. As part of **ATC #23**, the project significantly reduces queuing and increases throughput along MD 32 northbound and allows left turns to use both the left and right lanes of MD 32 northbound without changing lanes.

BENEFIT: *Eliminates upstream impacts to I-70 eastbound ramps and MD 144 intersection due to spillback queuing during the PM peak and balances lane usage at the I-70 interchange ramps. This prevents left turning motorists from getting trapped in the center thru lane due to long left turn queues. Rear-end and sideswipe crash rates are expected to significantly decrease at the I-70 ramps.*

The 95th percentile queues on MD 32 northbound at the I-70 westbound ramps intersection are substantially improved from the RFP concept as shown in **Figure 9:**

MD 32 at I-70 Westbound Ramp PM Peak Hour 95th percentile queues			
Northbound Lane	**RFP Concept**	**ATC #23**	**% reduction**
Left	670-ft.	480-ft.	29%
Left	1,830-ft.*	510-ft.	72%
Thru	1,270-ft.	110-ft.	92%
Thru	425-ft.	125-ft.	70%

***Impacts upstream I-70 eastbound ramps intersection**

Figure 9: MD 32 at I-70 WB Ramp PM Peak Hour 95th Percentile Queues

As per **Figure 9,** the left turn queues impact the upstream I-70 eastbound ramps intersection, with the high thru queues resulting from trapped left turning motorists. As part of **ATC #23**, there are significant operational and safety benefits:

- ✓ Provides increased throughput of the double left turn to I-70 westbound by allowing left turns to use both the left and center lanes of MD 32 northbound without changing lanes.
- ✓ Eliminates upstream impacts to I-70 eastbound ramps and MD 144 intersections due to spillback queuing during PM peak. Rear-end crashes due to congestion are expected to significantly decrease.
- ✓ Balances lane utilization between MD 144 and the I-70 eastbound ramps distributing queues across all lanes.
- ✓ Prevents left turning motorists from becoming trapped in the center thru lane due to long left turn queues. Rear-end and sideswipe crashes are expected to significantly decrease.

Under **ATC #23,** 95th percentile queues for the left and thru movements are 510-ft. and 125-ft., respectively, and will not block the Choice Lane taper 700-ft. upstream of the intersection.

One of the RFP's primary goals is a *"…project that maximizes the project elements to improve corridor traffic operations and safety…"* with a key objective *"to reduce the crash rate for rear-end collisions, [and] reduce the crash rate between MD 144 and the I-70 interchange…"* **OUR PROPOSAL MEETS THAT GOAL!**

> ***BENEFIT:*** *Our proposed RFP Concept Plan changes eliminates the spillback queuing along MD 32 northbound and improves safety by reducing congestion and rear-end collisions between MD 144 and I-70.*

C. MEETING THE 10 AASHTO CONTROLLING CRITERIA

The FHWA currently identifies 10 AASHTO Controlling Criteria that are to be met for high-speed roadways (design speed equal to | greater than 50 mph) on the National Highway System (NHS):

1. Design Speed
2. Lane Width
3. Shoulder Width
4. Horizontal Curve Radius
5. Super-elevation Rate
6. Stopping Sight Distance (SSD)
7. Maximum Grade
8. Cross Slope
9. Vertical Clearance
10. Design Loading Structural Capacity

Per the RFP, MDOT SHA is in the process of acquiring Design Exceptions for two of the criteria in specific areas of the project corridor. They are related to Super-elevation Rate and Maximum Grade.

> ***Meeting the 10 AASHTO Controlling Criteria:*** *Aside from the noted RFP Design Exceptions, ALL Design Elements within the limits of proposed MD 32 dualization will conform to the 10 AASHTO Controlling Criteria.*

It is noted that the Design Criteria referenced herein applies only to the fully-dualized section of MD 32 roadway and any connecting ramps to I-70 impacted by the project. The Design Criteria does not apply to lower-speed non-NHS roadways or local roadways/streets not maintained by MDOT SHA.

Mitigation for non-conforming project elements are not needed since ***all of the AASHTO Controlling Criteria will be met by this project within the dualized section.*** Any mitigation measures identified in the RFP Design Exceptions noted above will be implemented by the Corman | JMT Team.

4.3

Project Schedule & Management

4.3 PROJECT SCHEDULE & PROJECT MANAGEMENT

Goal 2: Provide a project that minimizes inconvenience to the community and the traveling public.

A. PROJECT SCHEDULE

The Corman | JMT Team understands the project's requirements, complexities, and required milestones to successfully complete the project and has formulated a strategy for timely completion of both design and construction. Our project schedule and narrative outlines the steps to complete this project on time and on budget with minimal impact to the community and traveling public. The schedule details our plan to accomplish the work per the RFP. The narrative below outlines the sequencing, description and explanation of the critical path, proposed means and methods, and other key assumptions.

KEY MILESTONES

A project that is completed in a timely and efficient manner while minimizing the disruptions to the community and traveling public.

The Corman | JMT Team is committed to an August 10, 2023 completion date. We phased the work to establish a schedule for timely completion, identify potential risks, and plan/implement mitigation strategies. Coordinating work between everyone involved is vital for project success. Our plan utilizes a temporary structure at Middle Patuxent River crossing and the minimum number of traffic switch overs to minimize traveling public disruptions. In addition, we have elected to perform traffic congestion and safety improvements **(ATC #23)** at the I-70 interchanges as an independent early design package. Completing this work early will accelerate safety and congestion improvements for the traveling public. We will work with MDOT SHA and stakeholders to complete the work and meet the Project Milestones outlined below:

KEY MILESTONE	MILESTONE DATE
Notice of Intent to Award	November 16, 2018 (Anticipated)
Notice to Proceed	December 17, 2018 (Anticipated)
Start Date for Triadelphia Road Detour	October 2, 2019
Completion date for Triadelphia Road Detour	August 31, 2020
Completion date for Safety and Operational Improvements at I-70	May 7, 2021
Final Completion Date	August 10, 2023

Figure 10: Key Milestone Table

CALENDARS

Two project calendars are used in our CPM schedule and include:

1. **Seven-Day:** This calendar is used for all activities within the WBS Elements associated with design and project milestones. The abbreviation CD (Calendar Day) is used in the WBS

description to identify the sections of the schedule using durations in calendar days instead of working days.

2. **Five-Day:** This calendar is used for all activities directly associated with the actual construction work. The abbreviation WD (Working Day) is used in the WBS description to identify the sections of the schedule using durations in working days instead of calendar days. This calendar is based on a five-day work week. The contract required holidays (non-work days) have been incorporated in this five-day calendar. The contract required holidays (non-work days) have been incorporated in the five-day calendar.

SCHEDULE COMPONENTS AND ACTIVITY IDENTIFICATION

The schedule consists of 18 Elements in the WBS. The first three Elements are directly associated with administrative and engineering design-related work/milestones. The remaining 15 Elements are directly associated with construction work/milestones. Each Element of the WBS has been sequentially labeled, including a description of the Element. For example, the first Element of the WBS is labeled as follows: Element #1 – Contract Administrative Milestones (CD). As previously mentioned in the CALENDARS section above, the abbreviation (CD) or (WD) are used in the description of the WBS Elements to identify which calendar is used in each WBS Element.

Each Element is broken down into a series of activities to describe the work within the Element or Construction Work area. The first six elements of the WBS have activities with 4-digit activity numbers with increments of 10 between each activity. This provides a unique number for each activity. There is room for nine additional activities if additional detail is needed later.

The actual construction-related activities have a unique smart activity identification system of their own. Elements 7 - 17 of the WBS are specifically related to the actual construction work on project improvements. The activity identification is a 5-digit number with a letter at the end. The first digit represents the work area itself. Within the area to be dualization there are five Construction Work areas shown in Part B on ***Figure 11 – MD 32 Work Area Staging Diagram*** which correspond to each of the Elements on the WBS that are associated with the actual construction work (WBS Elements 7 - 17). The letter at the end of the five digits show if the work activity is on the Southbound (S) side or on the Northbound (N) side. For example, Activity 10000S in Element 7 is Set up Traffic Control. This work is planned to occur on the Southbound side. These activities are in increments of 100 so that a lot more detail can be added later if needed. The current level of detail of activities in each Element is more than adequate to determine the project's critical path. Once selected, the summary will be expanded with more detail and tracked weekly.

PLAN AND STRATEGY

Design: The design schedule has been integrated into the project schedule to assist with determining the critical path of Elements 1 - 18. Each Element has unique features that require a separate approach to meet the project goals. It includes our internal quality control (QC) and quality assurance (QA) formal reviews for each deliverable to MDOT SHA.

QC reviews include a design review by an Independent Design Quality Manager (IDQM) Firm, KCI Technologies, Inc., and interdisciplinary reviews by all disciplines, Design/Construction Integrator, and Construction Manager. Once comments are addressed, there is an independent QA review via the same process with the independent QA Team, Design Manager, Design/Construction Integrator and constructability reviews by the Construction Manager to ensure compliance before submitting to MDOT SHA for review/comments/approval. These processes will be thoroughly documented within the Design Quality Control Plan shown in the schedule and beginning shortly after Notice of Selection.

MDOT SHA's 21 and 40-day (design) and 28-day Plan Review Division (PRD) plan reviews have been scheduled for each design submittal. Our strategy is to have the IDQM Firm review staff involved with *Over-the-Shoulder* reviews during design and monthly review meetings where we will discuss upcoming submittals. This gives the IDQM firm the opportunity to plan for the right review staff for each submittal. Their comments will be addressed, and the actions taken documented in the Comment Resolution sheets for each plan re-submittal. Before re-submittal, the design teams will complete the QA/QC process to ensure it can be reviewed/approved timely allowing plans to be released for construction in the shortest possible time.

As shown on the schedule, once each of the design/permitting milestones above have been completed, the actual construction work, Elements 7 to 17, can begin.

Environmental/Permitting: The Corman | JMT Team evaluated the environmental/permitting requirements for each Project Element and the critical elements are included in the project schedules. Below is a brief discussion on each critical environmental concern as it relates to each construction-related Project Element:

As an advance activity, we will obtain from MDOT SHA PRD an independent SWM concept approval and site development and final SWM/ESC approvals to construct the Triadelphia Road Bridge. This will facilitate compliance with the limited window during which a single lane is allowed on the bridge. The stormwater management design will demonstrate compliance with water quality and quantity for the impervious area related to the proposed bridge replacement.

A separate SWM concept will be developed and MDOT SHA PRD concept approval obtained for the remainder of the project. After approval, the project is broken up into smaller submittal packages to facilitate design and review to expedite site development and final SWM/ESC approvals for construction to proceed efficiently through the corridor. Packages will include both Clearing and Mass Grading Packages, as well as Final Roadway Plan Packages. Submittal Packages will also be provided to MDE, USACE, and MDOT SHA's Environmental Planning Division for review/acceptance. Reports summarizing efforts for avoidance/minimization to environmental features will accompany each submission. We will prepare individual site development and final submittal packages for the hydraulic crossings at S-1 (Twin 78-in. RCP Culverts at Clyde's Branch Tributary), S-3 (Twin 78-in. RCP Culverts at Clyde's Branch), S-8 (Twin 54-in. RCP Culverts at Clyde's Branch), S-5 (Double 1-ft. x 9-ft. Box Culvert at the Middle Patuxent Tributary), 66" Dia Culvert Replacement at Station 526+50 and the Middle Patuxent River Bridges (MPR).

The MPR Bridge is a permanent dual concrete bridge supported on caissons located near STA. 471+00. It will span over the proposed relocated Middle Patuxent River. The southbound section of the bridge will be built with the new southbound roadway construction and the remaining new northbound section constructed once traffic is detoured onto the newly-constructed southbound roadway. A temporary bridge, located around STA. 468+00, will be installed allowing the Middle Patuxent River to continue flow as the northbound roadway is reconstructed and two-way traffic uses the new southbound roadway. Once the girders are placed on the northbound portion of Structure S6, the Middle Patuxent River will be diverted to its permanent location. Once diverted, demolition of the existing bridge over the existing Middle Patuxent River alignment begins.

The Corman | JMT Team will attend the MDOT SHA-scheduled pre-permitting meeting to discuss the permitting process and anticipated approach to wetlands and waterways permitting, including avoidance/minimization during design. In addition, the team anticipates attending monthly meetings to discuss design elements related to wetlands and waterways permits.

Compliance with wetlands and waterways permits will be demonstrated through quarterly compliance reports, including quarterly tracking of impacts to regulated resources. Pre-construction wetland and stream condition reports will provide a baseline for comparison with post-construction conditions. Following completion of construction, a JPA will be submitted to modify wetlands and waterways permits to reflect final impacts; pre- and post-construction wetland and stream condition reports will be included with this application.

Noise Wall Analysis: A noise analysis will confirm impacts for the realignment option included as part of **ATC #34**. The Corman | JMT Team performed a preliminary re-evaluation based on the shifted northbound roadway alignment and profile which indicated a slight increase of the noise levels, but resulted in the same conclusion as the RFP Noise Report. As part of the final design, the Corman | JMT Team will complete analysis of the potential noise impacts and document the design changes as an Addendum to the project's Noise Report.

Right-of-Way (ROW) Acquisition & Utilities: ROW acquisition and utility relocations are critical schedule factors in delivering the project on time. Our understanding of the ROW dates and utility relocations are that ROW clearance will be accomplished by June 30, 2019. Utility relocations associated with Triadelphia Road (UCP 1) were scheduled to start July 15, 2018 with an anticipated relocation duration of approximately 120 days. The remaining utility relocations will be closely coordinated/accomplished during design and construction to ensure timely relocations.

CRITICAL PATH

The critical path has been calculated based on the longest path. All critical path activities are on the dualization element of the project, and include:

- ✓ Notice of Selection
- ✓ Design Quality Control Plan
- ✓ NTP Design Phase
- ✓ Area 3 PRD & MDE Approval Triadelphia Bridge Final Clearing, RG, E&S, Drainage & MOT
- ✓ Areas 4 & 5 PRD & MDE Approval Final Clearing, RG, E&S, Drainage & MOT
- ✓ Area 3 Triadelphia Bridge Reconstruction
- ✓ Construction Work Southbound Area 5
- ✓ Construction Work Northbound Area 5
- ✓ Construction Work Northbound Area 3
- ✓ Construction Work Northbound Area 2

✓ Project Closeout

KEY ASSUMPTIONS

The Corman | JMT Team made these key assumptions on which our Proposal Schedule is based:

- ✓ ROW availability is as specified in the RFP/Addendums.
- ✓ Utility relocations are as specified in the RFP/Addendums.
- ✓ PRD reviews durations are 28 days and include no more than three reviews per submittal.
- ✓ All in stream work in compliance with Use IV-P March 1 to May 31.
- ✓ PRD will accept a separate package, including Concept, Site-Development, Final for Triadelphia Road.
- ✓ Limiting Triadelphia Road Bridge to one westbound lane with implemented detour for the 2019-2020 school year only.

B. PHASING AND MAINTENANCE OF TRAFFIC APPROACH FOR THE DUALIZATION PORTION OF THE PROJECT

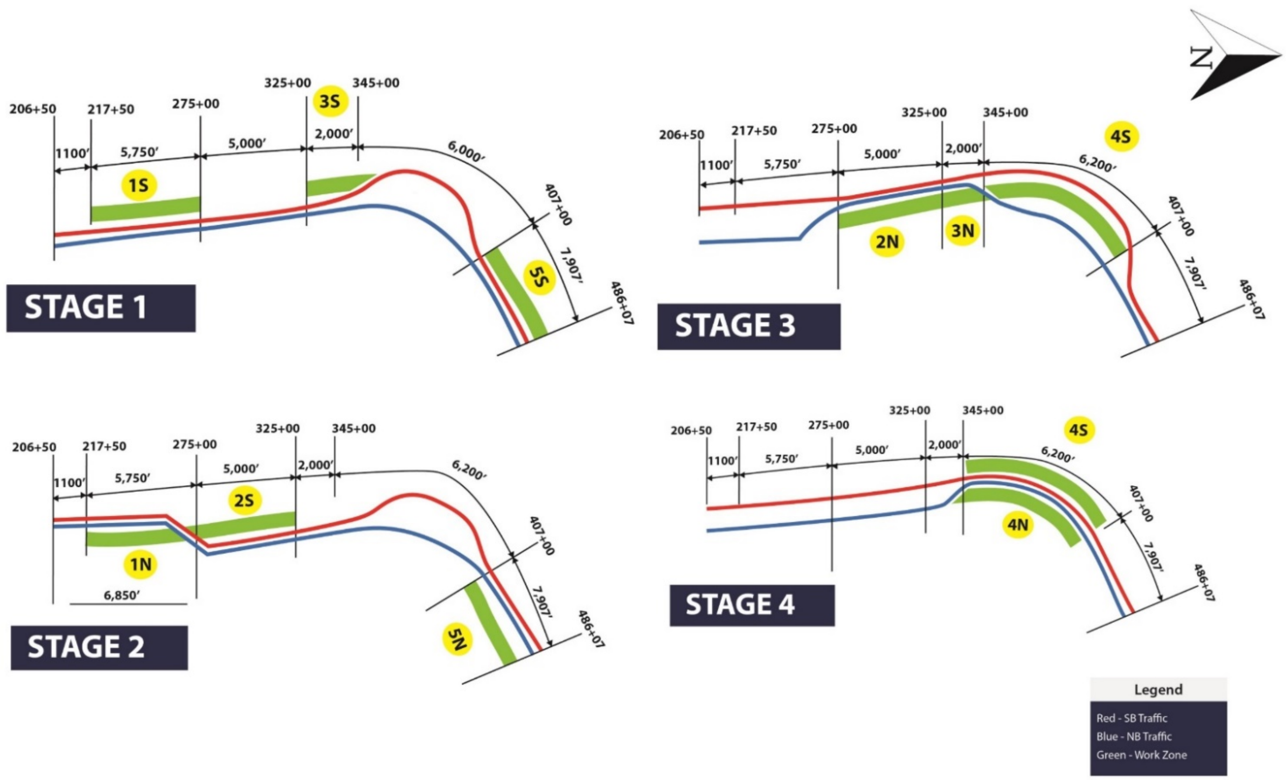


Figure 11: MD 32 Work Area Staging Diagram

Our ***MD 32 Work Area Staging Diagram (See Figure 11)*** shows the MOT pattern ***requires only four changes to current/existing traffic pattern to complete all the work. This will minimize disruptions to the travelling public. Key highlights are:***

- ✓ Mass Grading packages will be developed based on the 20-acre grading unit requirement Stabilize work areas before transitioning to the next work location
- ✓ Start utility coordination early and continue until impacted utilities are fully cleared. Some construction items may need to be phased to accommodate relocation schedules. Perform stake out, clearing, grubbing and grading to accommodate utility relocations..
- ✓ Provide an early package for safety and operational improvements north of the dualization at the I-70 interchange.
- ✓ Provide pedestrian walkway on Triadelphia Road protected from traffic by barrier.
- ✓ Maintain two travel lanes (one each direction) on MD 32 at all times.
- ✓ Maintain bicycle traffic for project areas south and north of the Burntwoods Road interchange.
- ✓ Provide at least two emergency vehicle turnaround locations: One between Linden Church Road and Triadelphia Road Bridge; one at River Valley Chase/Parliament Place intersection.
- ✓ This schedule is predicated on 3 PRD submittal cycles taking the full time available for reviews. If there are less resubmittals required or reviews are completed faster, the project can start and finish earlier.

Work at the I-70 interchange will be predominately at night in accordance with standard MOT details without full road closures. This will minimize disruptions to the traveling public.

C. PHASING CONSTRUCTION TIMELINE FOR TRIADELPHIA ROAD BRIDGE

We anticipate setting up the eastbound traffic detour starting on October 2, 2019. Once the eastbound traffic on the existing Triadelphia Road Bridge is detoured, only westbound traffic can cross the existing bridge. Westbound traffic on the existing bridge is guided toward the northern side of the bridge in the existing eastbound lane. ***Temporary concrete bolt-down barrier will provide a safe protected walkway for pedestrians and school children using the bridge while maintaining a traffic lane width of approximately 11-ft.-6-in.*** **Figure 12** illustrates a transverse bridge section to reflect this first stage of the bridge reconstruction work:

Demolition of the bridge's northern side (existing westbound lane) is planned to take approximately 4.5 weeks. The new portion of the bridge (westbound lane) require approximately four months to construct. Once the first half of the bridge is constructed, we will reinstall the protected pedestrian walkway. Existing westbound traffic will be pushed over to the new side of the bridge and continue to go west while eastbound traffic remains off the bridge and on the eastbound detour.

> ***BENEFIT:*** *Total duration of the bridge work from beginning to end is about 11 months and will be completed before school starts up in Early September 2020. Our CPM schedule reflects a Mandatory August 31, 2020 finish milestone.*

To help expedite the Triadelphia Road Bridge, our schedule includes a separate SWM Concept-Site Development-Final Approval process for the bridge which moves it forward without influence of other portions of the project. The bridge's structural design has been broken down to include a superstructure process that allows the long lead superstructure steel to be ordered and fabricated while other portions of the design are advanced.

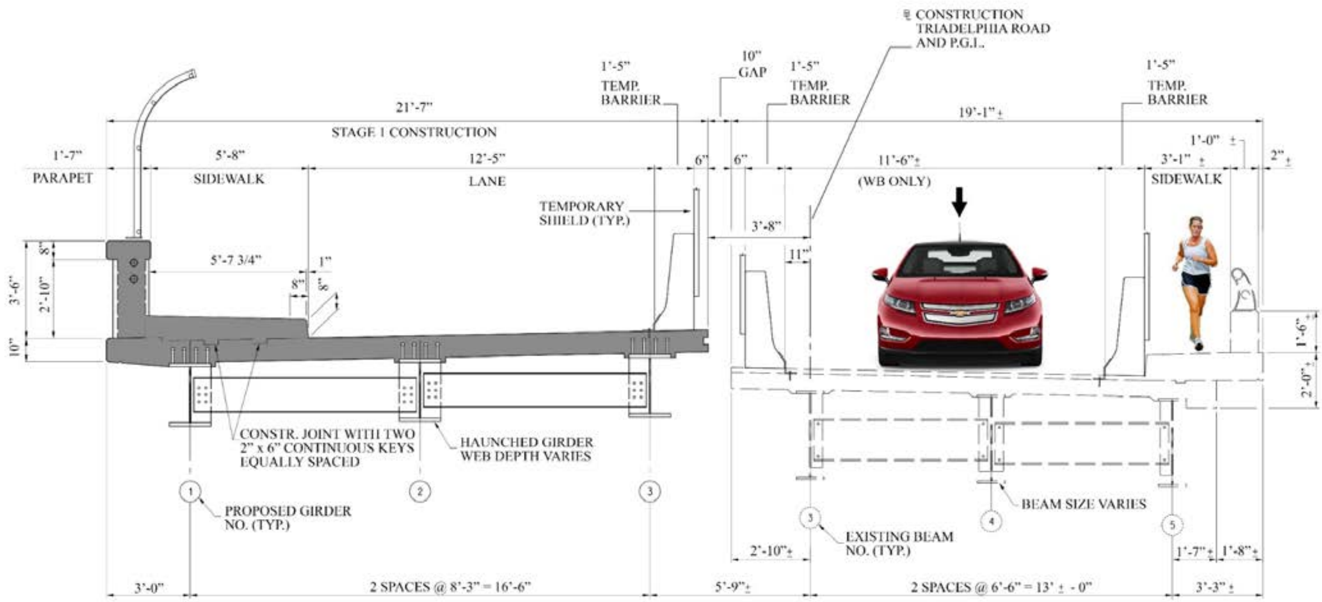


Figure 12: Triadelphia Road Bridge – Transverse Bridge Section (Stage 1 Construction)

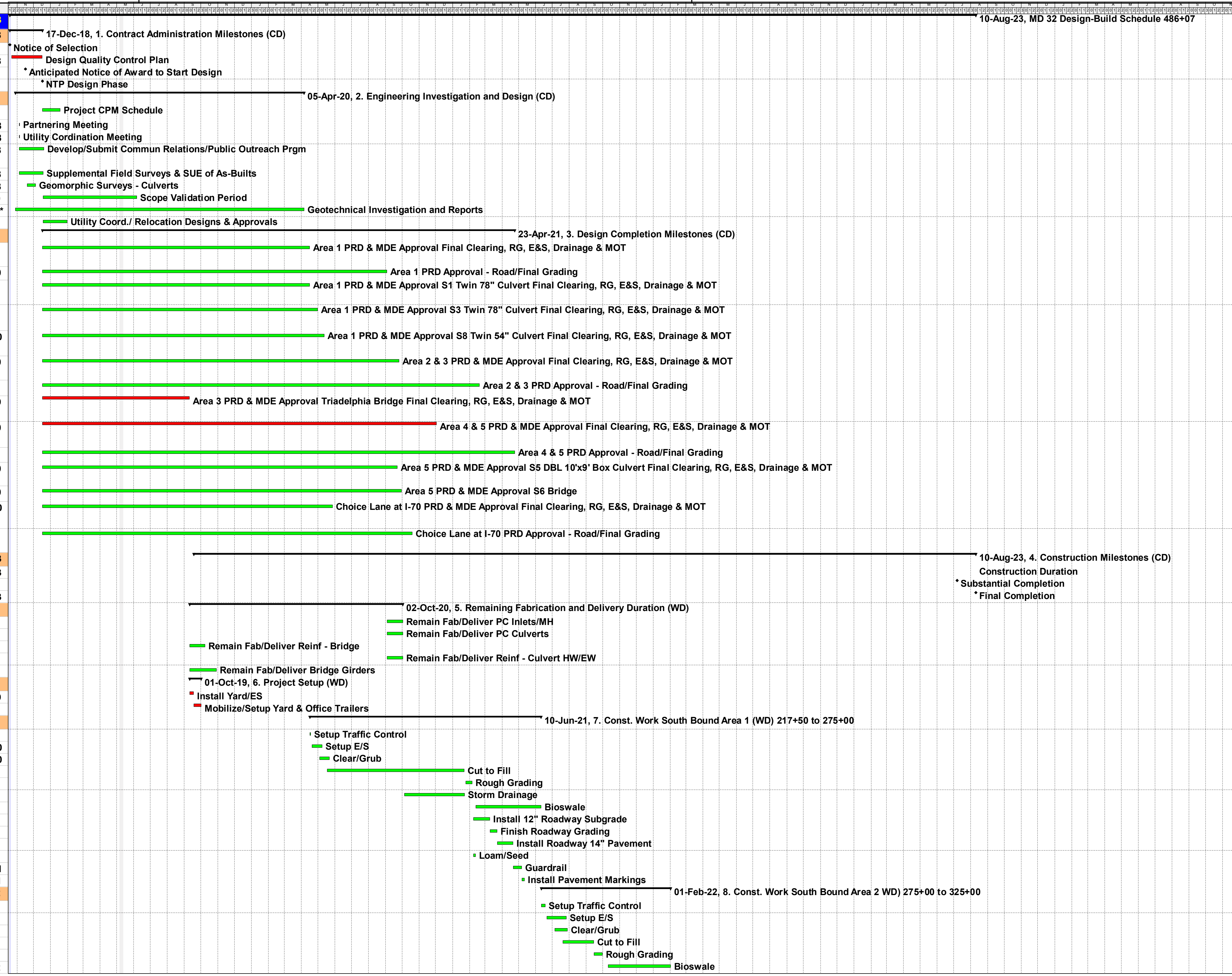
ENHANCEMENTS TO ADMINISTRATION PROVIDED MOT / DETOUR PLAN

The following are some key steps we will take to enhance the MOT and Detour Plan provided in the RFP Concept plan.

- ✓ **Provide a Protected Walkway across the Triadelphia Road Bridge at all times during Reconstruction:** We have enhanced safety and pedestrian access within the schools and local commercial establishments.
- ✓ **Provide a Full-Time MOT Manager and Flagmen** during construction.
- ✓ **Provide Extensive MOT Plans and Well-Marked Detours:** Detours will be monitored and driven daily, or more frequently as needed by weather or project conditions, to ensure signing and road conditions are as required.
- ✓ **Enhanced Public Relations with Public/Schools Regarding Pedestrian Safety in Association with Traffic Shifts and Schedule:** Our construction staff will visit the school to brief walking students on pedestrian options and parents on the detour itself.
- ✓ **Perform Modeling to Predict Traffic Queues:** Educate the public on what to anticipate to avoid *surprises* and include results in the Transportation Management Plan.
- ✓ **Erect Temporary Fencing around the Bridge Construction Area** to limit pedestrian access.

> ***BENEFIT:*** *This separation of both the PRD process, as well as early work packages for the bridge components allows bridge construction to begin September 10, 2019, thereby allowing maximum use of the window provided for the one westbound lane with implemented detour for the 2019-2020 school year only when the necessary approvals are considered.*

Activity ID	Activity Name	Original Duration	Start	Finish
MD 32 Design-Build Schedule 486+07		1753	19-Oct-18 A	10-Aug-23
1. Contract Administration Milestones (CD)		56	19-Oct-18 A	17-Dec-18
1000	Notice of Selection	0	19-Oct-18 A	
1010	Design Quality Control Plan	56	22-Oct-18	16-Dec-18
1020	Anticipated Notice of Award to Start Design	0	16-Nov-18	
1050	NTP Design Phase	0	17-Dec-18	
2. Engineering Investigation and Design (CD)		524	29-Oct-18	05-Apr-20
1500	Project CPM Schedule	32	17-Dec-18	18-Jan-19
1510	Partnering Meeting	1	05-Nov-18	05-Nov-18
1520	Utility Cordination Meeting	1	05-Nov-18	05-Nov-18
1530	Develop/Submit Commun Relations/Public Outreach Prgm	45	05-Nov-18	19-Dec-18
1540	Supplemental Field Surveys & SUE of As-Builts	44	05-Nov-18	18-Dec-18
1550	Geomorphic Surveys - Culverts	16	19-Nov-18	04-Dec-18
1560	Scope Validation Period	170	18-Dec-18	06-Jun-19
1570	Geotechnical Investigation and Reports	524	29-Oct-18	05-Apr-20*
1580	Utility Coord./ Relocation Designs & Approvals	43	18-Dec-18	30-Jan-19
3. Design Completion Milestones (CD)		858	17-Dec-18	23-Apr-21
2000	Area 1 PRD & MDE Approval Final Clearing, RG, E&S, Drainage & MOT	485	17-Dec-18	15-Apr-20
2010	Area 1 PRD Approval - Road/Final Grading	626	17-Dec-18	03-Sep-20
2020	Area 1 PRD & MDE Approval S1 Twin 78" Culvert Final Clearing, RG, E&S, Drainage & MOT	485	17-Dec-18	15-Apr-20
2030	Area 1 PRD & MDE Approval S3 Twin 78" Culvert Final Clearing, RG, E&S, Drainage & MOT	500	17-Dec-18	30-Apr-20
2040	Area 1 PRD & MDE Approval S8 Twin 54" Culvert Final Clearing, RG, E&S, Drainage & MOT	512	17-Dec-18	12-May-20
2050	Area 2 & 3 PRD & MDE Approval Final Clearing, RG, E&S, Drainage & MOT	648	17-Dec-18	25-Sep-20
2060	Area 2 & 3 PRD Approval - Road/Final Grading	794	17-Dec-18	18-Feb-21
2070	Area 3 PRD & MDE Approval Triadelphia Bridge Final Clearing, RG, E&S, Drainage & MOT	267	17-Dec-18	10-Sep-19
2080	Area 4 & 5 PRD & MDE Approval Final Clearing, RG, E&S, Drainage & MOT	716	17-Dec-18	02-Dec-20
2090	Area 4 & 5 PRD Approval - Road/Final Grading	858	17-Dec-18	23-Apr-21
2100	Area 5 PRD & MDE Approval S5 DBL 10'x9' Box Culvert Final Clearing, RG, E&S, Drainage & MOT	645	17-Dec-18	22-Sep-20
2110	Area 5 PRD & MDE Approval S6 Bridge	652	17-Dec-18	29-Sep-20
2130	Choice Lane at I-70 PRD & MDE Approval Final Clearing, RG, E&S, Drainage & MOT	527	17-Dec-18	27-May-20
2140	Choice Lane at I-70 PRD Approval - Road/Final Grading	672	17-Dec-18	19-Oct-20
4. Construction Milestones (CD)		1423	18-Sep-19	10-Aug-23
3000	Construction Duration	1423	18-Sep-19	10-Aug-23
3020	Substantial Completion	0	07-Jul-23	
3030	Final Completion	0		10-Aug-23
5. Remaining Fabrication and Delivery Duration (WD)		272	11-Sep-19	02-Oct-20
6000	Remain Fab/Deliver PC Inlets/MH	20	04-Sep-20	02-Oct-20
6010	Remain Fab/Deliver PC Culverts	20	04-Sep-20	02-Oct-20
6020	Remain Fab/Deliver Reinf - Bridge	20	11-Sep-19	08-Oct-19
6030	Remain Fab/Deliver Reinf - Culvert HW/EW	20	04-Sep-20	02-Oct-20
6040	Remain Fab/Deliver Bridge Girders	35	11-Sep-19	29-Oct-19
6. Project Setup (WD)		15	11-Sep-19	01-Oct-19
7000	Install Yard/ES	5	11-Sep-19	17-Sep-19
7010	Mobilize/Setup Yard & Office Trailers	10	18-Sep-19	01-Oct-19
7. Const. Work South Bound Area 1 (WD) 217+50 to 275+00		294	16-Apr-20	10-Jun-21
10000S	Setup Traffic Control	2	16-Apr-20	17-Apr-20
10100S	Setup E/S	15	20-Apr-20	08-May-20
10200S	Clear/Grub	14	04-May-20	21-May-20
10300S	Cut to Fill	173	18-May-20	21-Jan-21
10500S	Rough Grading	10	25-Jan-21	05-Feb-21
10600S	Storm Drainage	77	05-Oct-20	22-Jan-21
10700S	Bioswale	84	12-Feb-21	10-Jun-21
10800S	Install 12" Roadway Subgrade	22	08-Feb-21	09-Mar-21
10900S	Finish Roadway Grading	9	10-Mar-21	22-Mar-21
11000S	Install Roadway 14" Pavement	21	23-Mar-21	20-Apr-21
11200S	Loam/Seed	4	08-Feb-21	11-Feb-21
11300S	Guardrail	12	21-Apr-21	06-May-21
11400S	Install Pavement Markings	3	07-May-21	11-May-21
8. Const. Work South Bound Area 2 WD) 275+00 to 325+00		163	11-Jun-21	01-Feb-22
20000S	Setup Traffic Control	6	11-Jun-21	18-Jun-21
20100S	Setup E/S	25	21-Jun-21	26-Jul-21
20200S	Clear/Grub	17	06-Jul-21	28-Jul-21
20300S	Cut to Fill	40	20-Jul-21	14-Sep-21
20500S	Rough Grading	12	15-Sep-21	30-Sep-21
20700S	Bioswale	79	11-Oct-21	01-Feb-22



Actual Work | Critical Remaining Work | Summary | Remaining Work | Milestone

TASK filter: All Activities

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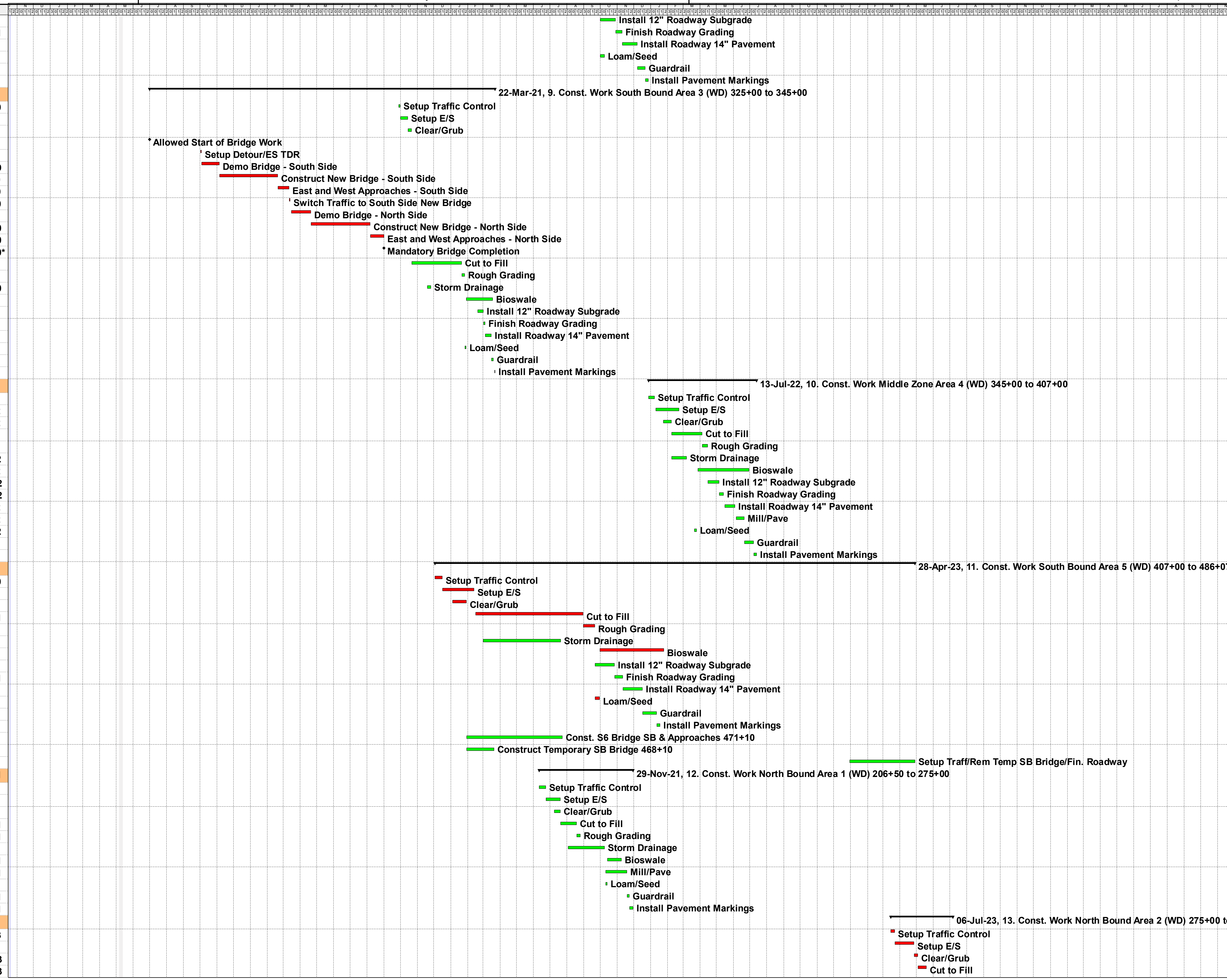
Activity ID	Activity Name	Original Duration	Start	Finish
20800S	Install 12" Roadway Subgrade	20	01-Oct-21	28-Oct-21
20900S	Finish Roadway Grading	8	29-Oct-21	09-Nov-21
21000S	Install Roadway 14" Pavement	19	10-Nov-21	07-Dec-21
21200S	Loam/Seed	6	01-Oct-21	08-Oct-21
21300S	Guardrail	10	08-Dec-21	21-Dec-21
21400S	Install Pavement Markings	3	22-Dec-21	27-Dec-21
9. Const. Work South Bound Area 3 (WD) 325+00 to 345+00		631	01-Jul-19	22-Mar-21
30000S	Setup Traffic Control	3	28-Sep-20	30-Sep-20
30100S	Setup E/S	10	01-Oct-20	14-Oct-20
30200S	Clear/Grub	5	15-Oct-20	21-Oct-20
30208S	Allowed Start of Bridge Work	0	01-Jul-19*	
30210S	Setup Detour/ES TDR	2	02-Oct-19	03-Oct-19
30220S	Demo Bridge - South Side	23	04-Oct-19	05-Nov-19
30230S	Construct New Bridge - South Side	73	06-Nov-19	19-Feb-20
30240S	East and West Approaches - South Side	15	20-Feb-20	11-Mar-20
30250S	Switch Traffic to South Side New Bridge	2	12-Mar-20	13-Mar-20
30260S	Demo Bridge - North Side	26	16-Mar-20	20-Apr-20
30270S	Construct New Bridge - North Side	76	21-Apr-20	06-Aug-20
30280S	East and West Approaches - North Side	17	07-Aug-20	31-Aug-20
30282S	Mandatory Bridge Completion	0		31-Aug-20*
30300S	Cut to Fill	62	22-Oct-20	20-Jan-21
30500S	Rough Grading	4	21-Jan-21	26-Jan-21
30600S	Storm Drainage	5	19-Nov-20	25-Nov-20
30700S	Bioswale	35	29-Jan-21	18-Mar-21
30800S	Install 12" Roadway Subgrade	7	19-Feb-21	01-Mar-21
30900S	Finish Roadway Grading	3	02-Mar-21	04-Mar-21
31000S	Install Roadway 14" Pavement	7	05-Mar-21	15-Mar-21
31200S	Loam/Seed	2	27-Jan-21	28-Jan-21
31300S	Guardrail	4	16-Mar-21	19-Mar-21
31400S	Install Pavement Markings	1	22-Mar-21	22-Mar-21
10. Const. Work Middle Zone Area 4 (WD) 345+00 to 407+00		139	28-Dec-21	13-Jul-22
40000S	Setup Traffic Control	8	28-Dec-21	07-Jan-22
40100S	Setup E/S	31	10-Jan-22	21-Feb-22
40200S	Clear/Grub	11	24-Jan-22	07-Feb-22
40300S	Cut to Fill	40	08-Feb-22	04-Apr-22
40500S	Rough Grading	8	05-Apr-22	14-Apr-22
40600S	Storm Drainage	20	08-Feb-22	07-Mar-22
40700S	Bioswale	67	28-Mar-22	29-Jun-22
40800S	Install 12" Roadway Subgrade	15	15-Apr-22	05-May-22
40900S	Finish Roadway Grading	6	06-May-22	13-May-22
41000S	Install Roadway 14" Pavement	14	16-May-22	03-Jun-22
41100S	Mill/Pave	11	06-Jun-22	20-Jun-22
41200S	Loam/Seed	4	22-Mar-22	25-Mar-22
41300S	Guardrail	12	21-Jun-22	07-Jul-22
41400S	Install Pavement Markings	4	08-Jul-22	13-Jul-22
11. Const. Work South Bound Area 5 (WD) 407+00 to 486+07		877	03-Dec-20	28-Apr-23
50000S	Setup Traffic Control	10	03-Dec-20	16-Dec-20
50100S	Setup E/S	40	17-Dec-20	12-Feb-21
50200S	Clear/Grub	20	04-Jan-21	29-Jan-21
50300S	Cut to Fill	139	15-Feb-21	30-Aug-21
50500S	Rough Grading	14	31-Aug-21	20-Sep-21
50600S	Storm Drainage	100	01-Mar-21	20-Jul-21
50700S	Bioswale	80	30-Sep-21	24-Jan-22
50800S	Install 12" Roadway Subgrade	26	21-Sep-21	26-Oct-21
50900S	Finish Roadway Grading	11	27-Oct-21	10-Nov-21
51000S	Install Roadway 14" Pavement	25	11-Nov-21	16-Dec-21
51200S	Loam/Seed	7	21-Sep-21	29-Sep-21
51300S	Guardrail	16	17-Dec-21	11-Jan-22
51400S	Install Pavement Markings	4	12-Jan-22	17-Jan-22
52000S	Const. S6 Bridge SB & Approaches 471+10	175	30-Jan-21	23-Jul-21
53000S	Construct Temporary SB Bridge 468+10	50	30-Jan-21	20-Mar-21
54000S	Setup Traff/Rem Temp SB Bridge/Fin. Roadway	120	30-Dec-22	28-Apr-23
12. Const. Work North Bound Area 1 (WD) 206+50 to 275+00		172	11-Jun-21	29-Nov-21
10000N	Setup Traffic Control	9	11-Jun-21	23-Jun-21
10100N	Setup E/S	17	24-Jun-21	19-Jul-21
10200N	Clear/Grub	7	09-Jul-21	19-Jul-21
10300N	Cut to Fill	22	20-Jul-21	18-Aug-21
10500N	Rough Grading	5	19-Aug-21	25-Aug-21
10600N	Storm Drainage	48	03-Aug-21	08-Oct-21
10700N	Bioswale	26	14-Oct-21	08-Nov-21
11100N	Mill/Pave	29	11-Oct-21	18-Nov-21
11200N	Loam/Seed	3	11-Oct-21	13-Oct-21
11300N	Guardrail	2	19-Nov-21	22-Nov-21
11400N	Install Pavement Markings	4	23-Nov-21	29-Nov-21
13. Const. Work North Bound Area 2 (WD) 275+00 to 325+00		80	15-Mar-23	06-Jul-23
20000N	Setup Traffic Control	6	15-Mar-23	22-Mar-23
20100N	Setup E/S	25	23-Mar-23	26-Apr-23
20200N	Clear/Grub	5	27-Apr-23	03-May-23
20300N	Cut to Fill	12	04-May-23	19-May-23



Actual Work | Critical Remaining Work | Summary | Remaining Work | Milestone

TASK filter: All Activities

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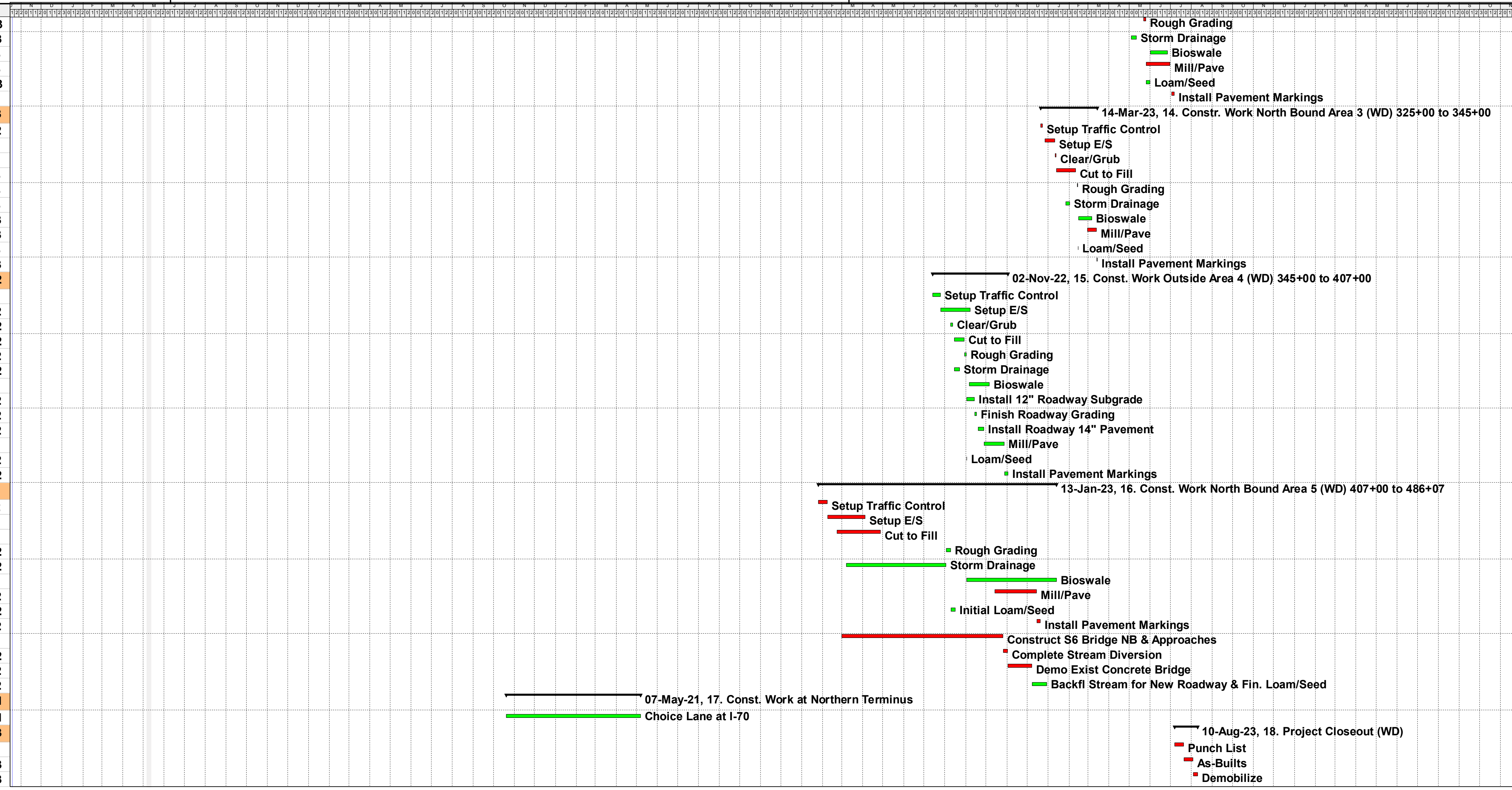
Activity ID	Activity Name	Original Duration	Start	Finish
20500N	Rough Grading	4	22-May-23	25-May-23
20600N	Storm Drainage	6	04-May-23	11-May-23
20700N	Bioswale	18	01-Jun-23	26-Jun-23
21100N	Mill/Pave	25	26-May-23	30-Jun-23
21200N	Loam/Seed	3	26-May-23	31-May-23
21400N	Install Pavement Markings	3	03-Jul-23	06-Jul-23
14. Constr. Work North Bound Area 3 (WD) 325+00 to 345+00		**58**	**21-Dec-22**	**14-Mar-23**
30000N	Setup Traffic Control	3	21-Dec-22	23-Dec-22
30100N	Setup E/S	10	27-Dec-22	10-Jan-23
30200N	Clear/Grub	2	11-Jan-23	12-Jan-23
30300N	Cut to Fill	21	13-Jan-23	10-Feb-23
30500N	Rough Grading	1	13-Feb-23	13-Feb-23
30600N	Storm Drainage	4	27-Jan-23	01-Feb-23
30700N	Bioswale	14	15-Feb-23	06-Mar-23
31100N	Mill/Pave	10	28-Feb-23	13-Mar-23
31200N	Loam/Seed	1	14-Feb-23	14-Feb-23
31400N	Install Pavement Markings	1	14-Mar-23	14-Mar-23
15. Const. Work Outside Area 4 (WD) 345+00 to 407+00		**79**	**14-Jul-22**	**02-Nov-22**
40000N	Setup Traffic Control	8	14-Jul-22	25-Jul-22
40100N	Setup E/S	31	26-Jul-22	07-Sep-22
40200N	Clear/Grub	4	09-Aug-22	12-Aug-22
40300N	Cut to Fill	11	15-Aug-22	29-Aug-22
40500N	Rough Grading	3	30-Aug-22	01-Sep-22
40600N	Storm Drainage	6	15-Aug-22	22-Aug-22
40700N	Bioswale	22	06-Sep-22	05-Oct-22
40800N	Install 12" Roadway Subgrade	7	02-Sep-22	13-Sep-22
40900N	Finish Roadway Grading	3	14-Sep-22	16-Sep-22
41000N	Install Roadway 14" Pavement	7	19-Sep-22	27-Sep-22
41100N	Mill/Pave	22	28-Sep-22	27-Oct-22
41200N	Loam/Seed	1	02-Sep-22	02-Sep-22
41400N	Install Pavement Markings	4	28-Oct-22	02-Nov-22
16. Const. Work North Bound Area 5 (WD) 407+00 to 486+07		**248**	**25-Jan-22**	**13-Jan-23**
50000N	Setup Traffic Control	10	25-Jan-22	07-Feb-22
50100N	Setup E/S	40	08-Feb-22	04-Apr-22
50300N	Cut to Fill	47	22-Feb-22	27-Apr-22
50500N	Rough Grading	5	03-Aug-22	09-Aug-22
50600N	Storm Drainage	104	08-Mar-22	02-Aug-22
50700N	Bioswale	92	02-Sep-22	13-Jan-23
51100N	Mill/Pave	43	14-Oct-22	14-Dec-22
51200N	Initial Loam/Seed	5	10-Aug-22	16-Aug-22
51400N	Install Pavement Markings	4	15-Dec-22	20-Dec-22
52000N	Construct S6 Bridge NB & Approaches	168	01-Mar-22	25-Oct-22
52100N	Complete Stream Diversion	5	26-Oct-22	01-Nov-22
52200N	Demo Exist Concrete Bridge	25	02-Nov-22	07-Dec-22
52300N	Backfl Stream for New Roadway & Fin. Loam/Seed	15	08-Dec-22	29-Dec-22
17. Const. Work at Northern Terminus		**140**	**20-Oct-20**	**07-May-21**
60000	Choice Lane at I-70	140	20-Oct-20	07-May-21
18. Project Closeout (WD)		**25**	**07-Jul-23**	**10-Aug-23**
70000	Punch List	10	07-Jul-23	20-Jul-23
70010	As-Builts	10	21-Jul-23	03-Aug-23
70020	Demobilize	5	04-Aug-23	10-Aug-23



Actual Work | Critical Remaining Work | Summary | Remaining Work | Milestone

TASK filter: All Activities

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4.4

Well Managed Project

4.4 WELL MANAGED PROJECT

Goal 3: Provide a project that minimizes overall impacts and provides proactive coordination.

A. APPROACH TO COORDINATING DESIGN/CONSTRUCTION WITH POTENTIAL UTILITY RELOCATIONS

Corman | JMT Team understands it is our responsibility to obtain all information required to complete the roadway design and construction. The MDOT SHA has conferred with the utility companies with facilities in the project area to document the potential impact of construction and to initiate designs and relocations. We will continue this proactive coordination effort and work with utility-hired contractors performing the relocations. Since the key to successful coordination is through *early, consistent, and effective* communication, we will *identify, confirm, resolve* utility conflicts timely and ensure that any relocations being performed do not present conditions or limitations that impact the constructability.

Starting Early: Coordination/communication with utility owners begins upon Notice of Selection (NOS) and an initial status/schedule update meeting with utility company representatives commences prior to Notice-to-Proceed (NTP). This is where we review their construction plans to ensure any conflicts or eliminated conflicts with our proposed construction improvements are identified early and discussions on conflict status, proposed relocation alignments, scheduling and work sequence take place.

Our 7-Step Proactive Approach

1. Early/Continuous Coordination and Communication.
2. Evaluate Existing Utilities to Identify Potential Conflicts.
3. Evaluate Proposed Utility Relocations Against Design and Construction.
4. Conduct Weekly Utility Conflict Matrix Updates and Coordination.
5. Frequent Meetings with Utilities Owners.
6. Adjust Design Features to Avoid Impacts.
7. Document/Evaluate/Communicate.

Figure 13: 7-Step Proactive Approach

The Corman | JMT Team will work with each utility company during design/construction. Corman's Utility Coordination Manager, Omid (Alex) Gharavi, and JMT's Utilities Coordinator, James Smith, PE, will form a Utility Task Force (UTF) Group to engage utility owners to proactively prevent small issues or delays from becoming major. Communication is essential to maintaining an agreed upon design and construction delivery schedule. Alex will serve as the onsite utility coordinator for daily construction activities who will monitor/coordinate utility activities and immediately address/resolve issues to keep the project moving. He will perform an intense review to identify potential conflicts, including constructability/construction access needs. Alex's prior experience with the utility owners provides a thorough understanding of their needs, standards and protocols which flows into coordinating concurrent work schedules to maximize efficiency and expedite relocations. Weekly progress meetings with utility companies will quickly resolve any conflicts and avoid preventable delays. Utilities that will share relocated facilities (poles or conduit) will meet jointly with the UTF Group to confirm agreement with the selected design and installation schedules.

Color-Coded Utility Maps: During design and as part of our relocation coordination, we will provide up-to-date color-coded utility maps at each submittal stage, with each utility clearly labeled. It will be the same scale as the roadway plans depicting known existing utilities within the proposed right of way and overlaid on the current design files. Existing/proposed utilities will be shown in plans and on the profiles and cross sections. It will display service connections and connections between valve boxes, manholes, poles, etc. and labeled with existing service type (i.e., 2-in. electric, fiber optic, etc.). To keep everyone on the same page, this map will be kept current, show proposed utility relocations, and will be distributed to MDOT SHA and involved utility companies.

Project Schedule: The Corman | JMT Team included utility submittals and milestone reviews in our project schedule that identify key utility relocation milestone and submittal dates. By monitoring the schedule, we can quickly identify reviews and additional data needs, such as utility test holes, and approvals that may become problematic or risk impacting the schedule. If a utility relocation results in a potential adverse situation, we can immediately assign resources to expedite/manage mitigation.

The Corman | JMT Team will further identify and mark known utilities/underground obstructions that may impact construction. We determined that most anticipated utilities appear to be represented on the RFP plans. Evidence of additional utilities, such as pavement patches and clearing lines in the adjacent terrain, will be investigated. However, underground/overhead utilities, as well as the as-built condition of relocations that have been completed or started will be verified by field investigations during design and verified before construction.

MEASURES TO AVOID/MINIMIZE UTILITY IMPACTS DURING DESIGN/CONSTRUCTION

Avoiding/Preventing/Minimizing Utility Impacts: The Corman | JMT Team will evaluate existing utilities within the project area through provided plans/test holes; researching County (public)/private utility company plans/records; and our in-house utility designating/surface locating vacuum trucks to confirm locations onsite. Upon NOS, meetings with known review agencies and private utility owners will confirm facilities are identified/evaluated and identify any utilities that must be avoided to stay on track.

Existing/new utility conflicts will be plotted on cross sections and will use 3D modeling where beneficial. The relationships and clearances of the facilities will be analyzed with the proposed features, including drainage pipes, ditches, BMPs, traffic control devices and tree plantings. For areas with anticipated impacts, test pitting will pinpoint exact locations, and design changes to mitigate utility conflicts will be explored/implemented. We will minimize relocations and avoid utilities where possible, i.e., shift tree locations or guardrail placement, drainage swales, light poles, etc. Proposed roadway features will be spaced to account for utilities which are to be abandoned/replaced. As many utilities within the project will be relocated/replaced or maintained in place, our UTF will concentrate on the significant ones which are to remain, such as BGE Gas Transmission and Columbia Gas Transmission Mains, as well as the existing utility service connections, such as electric and gas.

We will accelerate field inspections, clearly define impacts and clearance issues, review constructability and sequencing to minimize risks, and monitor project milestones and the schedule. Maintaining communication with the utility companies will keep the project on track and alert us to any risks early giving us time to react to schedule impacts and adjust operation sequencing. Progress with each utility owner will be tracked by our Utility Coordination Manager through a Utility Conflict Tracking Matrix, which will be updated and provided to MDOT SHA every week. It will include utility milestones to facilitate design and relocation construction on a regimented schedule.

As utility companies prepare and advance utility modification plans, we will review them to verify there are no conflicts between the utility's relocation plans and proposed construction. This verification and subsequent submittal will be accompanied by written certification that the relocation plans being submitted to MDOT SHA and other stakeholders do not conflict with proposed road improvements or another utility's relocation plan.

It is anticipated that various utility companies will relocate their underground/overhead facilities prior to and during construction. The Corman | JMT Team has experienced in-house utility designating/locating services operating out of JMT's Hunt Valley office. These crews will confirm as-built conditions and provide additional utility data needed for design and construction.

Anticipated utility relocations based on MDOT SHA conceptual plans have been broken down into two Utility Construction Phases (UCP): **UCP 1 | Triadelphia Road:** Pole/UG conduit relocation and **UCP 2 | MD 32:** Pole/UG conduit relocation. Our design does not impact **UCP 3**.

If the Corman | JMT Team identifies private septic system impacts that are unavoidable and were unforeseen during contract development, we will notify MDOT SHA. It is our responsibility to coordinate relocation with the property owner. Septic system impacts will NOT proceed without the required seven-day notice. Furthermore, we will coordinate design, permitting, schedule, installation and sequence of construction to avoid delays to the property owner and project schedule. Any septic system work will adhere to Howard County Health Dept. requirements for onsite sewage disposal systems.

ANALYSIS OF SELECTED ATC'S IMPACT ON UTILITIES

ATC #35 eliminates dualization of MD 32 from approximate STA. 459+00 **(now extended to STA. 486+07)** to the northern terminus shown in the RFP. Eliminating this segment of dualization greatly diminishes the required utility relocations. For example, the RFP-provided Utility Conflict Matrix provided impact identifications (IID) 1 - 82. Our initial analysis indicates IIDs 39 - 61 have been eliminated.

UCP 3 – Access Road 4: Pole and UG Conduit Relocations is associated with Access Road 4 which is within the limits of the eliminated section of dualization. Since Access Road 4 is north of STA. 486+07, under **ATC #35**, we propose to eliminate Access Road 4 construction. This eliminates the need for BGE to construct the proposed BGE duct and pole line that leaves MD 32 at approximate STA. 487+, traverses through the woods and up the hill to Access Road 4 on a new pole line, containing approximately 30 new poles and running parallel with Access Road 4. It also eliminates moves for Verizon and Comcast to the new pole line. Within the Conflict Matrix this eliminates IID's 18, 46 - 50B and 61 - 68, greatly reducing risks associated with relocating these utilities. Any relocations associated with **ATC #35** under UCP 2 will be closely scrutinized to confirm need. UCP 1 is not impacted by **ATC #35**.

ATC #23 proposes I-70 intersection improvements to increase safety and enhance operations. A review of utility impacts indicates there are no additional known impacts to the existing utilities in this area, however Verizon and Howard County Fiber are known to have facilities in the area. Howard County Fiber concept design plans show a new crossing of MD 32 being installed at approximate STA. 535+50 which does not appear to be impacted by **ATC 23.** We will coordinate with both of these entities and perform designations and test pitting to confirm locations and evaluate conflicts.

ATC #35. Effects on ***UCP 1 Triadelphia Road - Pole and UG conduit relocations-remain unchanged by our design***. In addition to the pole and UG relocations associated with IID 13 and 14, to accommodate the Triadelphia Road Bridge Replacement, relocating 4-in. PL HP Gas at approximate STA. 334+50 IID 12 is required.

The Corman | JMT Team will coordinate with utility companies as part of UCP 2. The Utility Matrix IID's 23 and 25 - 28, Verizon, Comcast and BGE Electric, all near STA. 427+/-, will be the focus of review with utility companies as the concept design has been modified at River Valley Chase.

IID 24 BGE Gas Cut, Cap and Abandon 6-in. PL Gas at River Valley Chase prior to crossing proposed MD 32, approximate STA. 427+25 is still required.

IID's 28A and 29, telecom and electric, approximate STA. 442+80 relocation is still required as originally contemplated. Howard County Fiber and Telecom relocations will be further evaluated for opportunities to reduce relocation requirements due to our ATCs.

The OH crossing clearance of BGE Electric at approximate STA. 272+60, IID 5, and 380+25, IID17 will be confirmed and marked in the field with signs during construction.

The pole line along MD 32 northbound, STA. 383+00 to 385+70, IID 18a that include Verizon, Comcast and BGE primary and secondary electric will be evaluated during final design to eliminate relocation.

At MD 32, STA. 398+50 right, a Comcast line diverts from overhead on a BGE pole to underground. It continues underground to a hand box at approximate STA. 401+00 and returns to overhead at approximate STA. 412+00. The Conflict Matrix shows it as IID 20 and annotates relocation as the required mitigation. Based on the roadway cross sections and work anticipated, it appears most of this line is outside the limits of work and can remain in place. During final design, we will further coordinate with Comcast and evaluate requirements to confirm this impact elimination in total. ***The Corman / JMT Team has not identified any increase in impacts to the known utility companies as a result of our approved/implemented ATCs. In fact, we have substantially reduced impacts.***

B. APPROACH TO AVOID/MINIMIZE ENVIRONMENTAL RESOURCE IMPACTS

The Corman | JMT Team takes a proactive approach to avoid/minimize impacts to environmental resources, such as wetlands, wetland buffers, streams, forests, wildlife species, and historical/cultural resources. **ATCs #01** and **#02**, which narrow the proposed shoulders, reduce environmental resource impacts. Eliminating the dualization of MD 32 from approximately STA. 486+07 to the northern terminus substantially further reduces environmental impacts within the current phase.

Because protecting the environment is important, we selected Chesapeake Environmental Management, Inc. (CEM) to provide an Environmental Compliance Manager (ECM) during construction to develop the Environmental Compliance Plan (RFP, Section 13.1.5) and the Environmental Tracking Database Checklist (RFP, Section 13.1.4); conduct quarterly field inspections to verify Tracking Database Checklist status; develop/submit quarterly Environmental Compliance Reports (RFP, Section 13.1.4.); and perform additional environmental inspections/attend field meetings as required by construction. Our proactive approach to avoid/minimize environmental resource impacts includes:

STEP 1: DETAILED INVENTORY OF RESOURCES	
Wetlands/ Wetland Buffers/ Streams	Prior to design, verify wetland/stream boundaries to document condition of existing resources within the LOD, plus 25 ft. beyond. Use information to generate a Pre-Construction Conditions Report and develop Conceptual Avoidance and Minimization (A&M) Plan.
Forests	Prior to design and under ISA-certified Arborist direction, inspect forest resources to verify presence/location of specimen trees within the LOD, plus 30-ft. beyond. Specimen trees are defined as trees with a Diameter at Breast Height (DBH) of > or equal to 30-in. or at least 75% of the DBH of the MD State Champion of the species, whichever DBH

	is smaller. Critical root zones will be determined (1.5-ft. of radius per 1-in. DBH for trees > 30-in. DBH).
Wildlife	Prior to design and during verification of wetlands/streams and inspection of forests, note wildlife presence.
Historical/ Cultural	Prior to design, identify known historical/cultural resource areas and note protection commitments.

STEP 2: WORK WITH DESIGNERS AS PLANS ARE DEVELOPED FOR PROPOSED CONDITIONS	
Wetlands/ Wetland Buffers/ Streams	A Conceptual A&M Plan will document maximum impact to wetlands and buffers/ streams. As design progresses, further avoidance/minimization can be realized through modifications, such as minor alignment shifts, steepening of side slopes, and use of retaining walls. Memos accompany each ESC/SWM Package submission to demonstrate plan compliance and track further avoidance/minimization of impacts. Monthly meetings will discuss design elements related to wetland and waterway permits. By having design plan reviews, collaborating with engineers, and participating in design review meetings, environmental scientists will maximize A&M of impacts.
Forests	In coordination with ESC/design plans, a Tree Impact A&M Report will define forest resources to be preserved and which are expected to be impacted; location of tree protection devices/activities, including limits of root pruning, proposed Temporary Orange Construction Fence placement, additional protection measures to accommodate impacts from ESC, and reduction of hazardous limbs/other forest components to create safe working/operating conditions; and sequence of construction notes to protect forest resources.
Wildlife	Consider protection fencing as needed and incorporate crossings into the design as per the RFP to minimize potential for future wildlife strikes. Fencing will redirect wildlife through the wildlife bench associated with the culvert conveying the Middle Patuxent River beneath MD 32. If proposed, breaks in these controls will be avoided at ditch, culvert, and bridge crossings.
Historical/ Cultural	Develop design plans so there is no further impingement on historical/cultural resources within the study area. If additional resources are encountered, impacts will be minimized as much as practicable.

STEP 3: IMPLEMENT PLANS FOR THE LEAST NEGATIVE EFFECT	
Wetlands/ Wetland Buffers/ Streams	Prior to construction, flag wetland boundaries within the LOD to promote further A&M opportunities during construction. Determine boundaries adjacent to the LOD with high-visibility fencing before construction to alert field personnel and minimize potential impacts. Maintain fencing during construction. During construction, seek opportunities for further A&M of impacts to wetlands, buffers/streams.
Forests	Prior to construction, hold an on-site meeting to include the ISA Arborist, Licensed Tree Expert (LTE), and project team members to review/discuss field conditions within project limits, plus 30-ft. beyond LOD, specifically relating to existing forest resources; proposed construction activities and sequence; and specific tree preservation methods to be employed and how to maximize effectiveness of preservation devices/activities. The

	LTE will continue to monitor construction and condition of forest resources throughout the project and will recommend further action if unanticipated conditions arise.
Wildlife	Minimizing wildlife impacts will occur through further avoidance/minimization of impacts to wetlands, wetland buffers, streams, and forest resources. Fencing will be used to preclude wildlife from entering active construction areas. In addition, fish will be relocated prior to work within perennial streams.
Historical/ Cultural	Make provisions to stop work near a potential historical/cultural resource if there is an unanticipated discovery. Notifications will be made prior to resuming construction.

STEP 4: MONITOR ENVIRONMENTAL RESOURCES	
Wetlands/ Wetland Buffers/ Streams	During construction, ECM monitors and documents impacts to wetlands, buffers, and streams; records/tracks temporary/permanent impacts throughout the project; submits quarterly reports documenting corridor-wide impacts to MDOT SHA and regulatory agencies per permit requirements; and generates a Post-Construction Conditions Report that documents final condition of wetlands, buffers, and streams. This will be an addendum to the Pre-Construction Conditions Report and will demonstrate the final disposition of each resource, including restoration of temporarily-impacted areas.
Forests	Monitor forest resources to incorporate responses to site conditions into the project to provide effective A&M of impacts. Because forest resources are a living component of the job, it is vital to monitor for signs of stress from unexpected natural and other occurrences, such as weather events, pests and diseases, and non-project related activities.
Wildlife	Maintain protective fencing around sensitive resources, such as wetlands/streams/ forests to prevent wildlife entering active construction areas.
Historical/ Cultural	ECM ensures impacts are in accordance with the RFP, commitments made throughout the NEPA process, and appropriate permit conditions.

Figure 14: Proactive Approach to Avoid/Minimize Environmental Resource Impacts

C. CUSTOMER OUTREACH PLAN DURING DESIGN AND CONSTRUCTION

Corman | JMT Team's Public Relations Coordinator is Elisabeth McCollum, CPSM, of JMT who encompasses nearly 20 years of experience in community and stakeholder identification, engagement, facilitation and mediation; developing engagement strategies and methodologies using traditional/non-traditional techniques; consensus building; developing communication plans; event/meeting planning and facilitation; website and social media content development/management; technical and creative writing; comment tracking and reporting; and managing graphics/videography tasks, sub-consultants, and vendors. Her efforts will be supported by our MBE sub-consultant, Remline Corp. Customer Outreach tasks will be conducted per the RFP and include the following:

1. Create draft project materials, including content/design.
2. Print, mail and manage materials distribution, including zip code mailings, door hanger postings, etc.
3. Collect/provide clips of project media coverage.
4. Gather information on construction updates and project timelines and input/distribute data through communication channels.

5. Draft responses to correspondence, emails, etc., including Customer Care Management System assignments.
6. Assist with website content management/development, including text, photographs, and videos of project progress.
7. Facilitate/coordinate acquiring photos, maps, art or other needed materials.
8. Coordinate/participate in community/stakeholder events and meetings and create materials.
9. Prepare logistics/materials for special events and/or VIP and media events.
10. Research public, elected officials and/or media inquiries and draft responses. Any materials created by the Corman | JMT Team will be sent to the MDOT SHA Project Manager and the Office of Customer Relations and Information (OCRI) for review/approval before releasing to the public.
11. The Corman | JMT Team will notify MDOT SHA TOC of planned road/shoulder closures, detours or changes to MOT before they take place.

POTENTIAL PROJECT PUBLIC STAKEHOLDERS

The Corman | JMT Team has identified the following potential stakeholders in/near the project:

CATEGORY	STAKEHOLDER	
Community/HOAs	✓ Greenberry, Buckskin Ridge, Fox Valley, Carroll Mill	
First Responders/ Hospitals	✓ West Friendship Volunteer Fire Dept. ✓ Glenwood Fire Station	✓ Howard County General Hospital ✓ Howard County Police Dept./Sheriff ✓ State Police
Businesses/ Facilities	✓ Tin Lizzie Wine Works ✓ Merry Acres Farm ✓ Nixon's Farm ✓ Town & Country Auto Repair ✓ Wilber Auto Repair ✓ MD 32/Triadelphia Rd. Shops (Highs, Royal Farms, PNC Bank Etc.) ✓ Dayton US Post Office	✓ Dayton Oaks Elementary School ✓ Glenelg High School ✓ Glenelg Country School ✓ Folly Quarter Middle School ✓ Triadelphia Ridge Elementary School ✓ West Friendship Elementary School ✓ Howard County Fairgrounds ✓ MDOT SHA Dayton Shop
Religious	✓ Brown Chapel United Methodist Church ✓ Four Square Gospel Church	✓ Clarksville Kingdom Hall of Jehovah's Witnesses
Environ./Rec. Advocates	✓ The James & Anne Robinson Foundation ✓ The Patuxent Water Trail	✓ Middle Patuxent Environmental Area and Foundation ✓ Dayton Rural Preservation Society

Figure 15: Potential Stakeholders

OTHER CUSTOMER OUTREACH SERVICES

The Corman | JMT Team will also be responsible for these customer outreach activities:

✓ **Toll Free Hotline** will be established and a call log maintained and accessible to MDOT SHA 24/7 with formal submittals every two months. We will respond to calls in person or by telephone within one hour and resolve immediately. This hotline will be displayed within the project, at the field office, and on every flyer.

- ✓ **Responses to Inquiries/Comments/Complaints** from residents, businesses, or general public will be referred to MDOT SHA within four hours and will work with MDOT SHA to resolve. If requested, the Corman | JMT Team Project Manager will serve as a project spokesperson.
- ✓ **Written Public Notifications** will be sent to the public, residents, and affected businesses along the project regarding construction progress/upcoming events. Notifications regarding lane closures, critical utility shutoffs or diversions, residential and business/commercial utility shutdowns, road and driveway closures, and weekly construction updates will be provided per RFP timeframes/methods. Utility shut-off/diversion announcements will be coordinated with MDOT SHA and utility company in advance.
- ✓ **Public Contact Records,** a database of business owners, residents, media and property owner contacts will be maintained/provided to MDOT SHA prior to the 25th of the previous month.
- ✓ **Construction Schedule/MOT and Access** information will be readily available in a format that can be quickly disseminated to the public. Any information provided to the public will be consistent with information contained in the Baseline Progress Schedule, Schedule Updates, and MOT Plan.
- ✓ **Signs** will be installed at the start and end of the project at intersections with County and State highways, and at all field offices with the MDOT SHA logo, project name, hotline number, and website, if applicable. Signs and lettering will be sized using MUTCD guidelines.
- ✓ **Telephone Trees** for emergencies divided into areas of expertise will be established/managed and include emergency response agencies.
- ✓ **Public Forums** where we will attend to advise the public of upcoming construction activities accompanied by graphics/printed materials which we will provide.
- ✓ **Construction Progress Photographs** will be provided electronically to MDOT SHA monthly or when a new significant activity commences (10 minimum). Project photos will also be used to share information with the public. We will facilitate requests and make arrangements for MDOT SHA to take additional photos as needed.

ADMINISTRATION CUSTOMER OUTREACH ROLE

MDOT SHA's Customer Outreach role include the following:

- ✓ Maintain Questions & Answers/Frequently Asked Questions of approved communication efforts by the Corman | JMT Team.
- ✓ Customer Outreach liaison.
- ✓ Monitor our performance for compliance with the Contract's customer outreach requirements.
- ✓ The Corman | JMT Team, our subcontractors, or employees will not have any direct interaction with the media without MDOT SHA approval.

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