MDOT SCOPING MANUAL

Michigan Department of Transportation

April 2025

Engineering Manual Preamble

This manual provides guidance to administrative, engineering, and technical staff. Engineering practice requires that professionals use a combination of technical skills and judgment in decision making. Engineering judgment is necessary to allow decisions to account for unique site-specific conditions and considerations to provide high-quality products, within budget, and to protect the public health, safety, and welfare.

This manual provides the general operational guidelines; however, it is understood that adaptation, adjustments, and deviations are sometimes necessary. Innovation is a key foundational element to advance the state of engineering practice and develop more effective and efficient engineering solutions and materials. As such, it is essential that our engineering manuals provide a vehicle to promote, pilot, or implement technologies or practices that provide efficiencies and quality products, while maintaining the safety, health, and welfare of the public.

It is expected when making significant or impactful deviations from the technical information in these guidance materials, that reasonable consultations with experts, technical committees, and/or policy-setting bodies occur prior to actions within the timeframes allowed. It is also expected that these consultations will eliminate any potential conflicts of interest, perceived or otherwise. Michigan Department of Transportation (MDOT) Leadership is committed to a culture of innovation to optimize engineering solutions.

The National Society of Professional Engineers Code of Ethics for Engineering is founded on six fundamental canons. Those canons are provided below.

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health, and welfare of the public.
2. Perform Services only in areas of their competence.
3. Issue public statement only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, reasonably, ethically and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

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1 INTRODUCTION TO SCOPING

DEFINITION: Identifying the need, determining the goals, and developing the items of work, costs, and risks associated for a future project or corridor.

Developing a thorough project scope and estimate is critical to helping the Michigan Department of Transportation (MDOT) achieve its objective of a successful and fiscally sound transportation program. A quality project scope provides a budget estimate for use in the Call for Projects (CFP) process, helps anticipate resource needs, creates a timeline of key milestones, and identifies objectives and geometric criteria for the future design of the project. To successfully complete this process, scoping must be a data-driven collaborative effort appropriately scaled to the complexity of a project and include input from key support areas and external partners.

In scoping a project, understanding the big picture is particularly important. Consider the following questions:

- How does this project impact future projects?
- Are there crash types or patterns to consider?
- Are there opportunities to provide appropriate access to all legal users and has connectivity for multiple modes of transportation and use been considered? Are there opportunities for access management?
- Does the community or communities affected by the project have a Complete Streets policy or a non-motorized plan?
- What is the Federal Highway Administration (FHWA) functional class of the project? Is it an arterial route, collector route, or local route?
- What is the FHWA contextual class of the project? Is it Rural, Suburban, or Urban?
- What external engagement has already occurred that needs to be accounted for during scoping?
- Is a external engagement plan needed? Are there opportunities to partner with local agencies to address mutual transportation needs?
- Besides construction, what other activities will impact external parties? What are the opportunities to improve the project or what mitigation can be implemented to reduce impacts?
- What can be done to maximize worker and user safety during construction?
- Will there be environmental surveys or impacts?
- What are the major risks associated with the project during the development and construction phase?
- Are any advance studies needed?

Aside from these questions, there are items that may not be analyzed based on the scope, work type, or strategy being used. Different fixes will have their own design standards, policies, and guidelines, depending on the type of work and the project's goals. Based on the questions above, during the scoping process it is important to focus on a project’s particular objective, and to document decisions that relate to defining the project’s scope.

This manual and the corresponding checklists provide guidance on planning, decision-making, and estimating for the MDOT scoping process. The manual is intended to provide direction on which questions to ask, and in many cases, it provides the answers or suggestions on where to find the answer. References to other manuals (often MDOT manuals) that contain more detailed information on a particular topic are provided throughout this document. Many, if not all, of these references are available on the MDOT SharePoint and/or the MDOT website. References are hyperlinked throughout this document and in Appendix A.

The manual is organized into six chapters, and each chapter focuses on a different area of the scoping process:

Chapter 1, Introduction. Describes the importance of the scoping process and its role in the 5-Year Transportation Program.

Chapter 2, Scoping Process. Describes external engagement, multi-modal development and delivery, and corridor planning/coordination.

Chapter 3, Checklist and Documentation. Provides additional instructions on filling out the statewide scoping master checklist.

Chapter 4, Bridge Scoping. Provides detailed information on conducting bridge condition surveys and coordinating the bridge scoping process.

Chapter 5, Estimating. Provides guidance on cost estimating, budget phases, and contingencies.

Chapter 6, Best Practices. Provides a framework of key steps and concepts to ensure successful project scoping.

1.1 Document Storage

It is imperative that all scoping documents be stored in an easy to find location so that information can be accessed by a variety of users. As folder structure and file-naming conventions may vary from Region to Region, it is imperative that the Scoping Engineer coordinate with their System Manager on the appropriate filing naming structure for their respective Region. A list of best practices for file naming and storage is provided in Chapter 6 of this manual.

1.2 Template Criteria

MDOT funding is divided into several categories or "Templates," each having its own criteria for qualifying projects. The type of project and the funding template criteria must be considered when scoping a project because the proposed work may be limited by the template guidelines and policies. Current templates and the required documents for project selection are described in the MDOT Highway Call for Projects General Information & Program Instructions Manual (CFP Manual).

1.3 Federal Highway Administration Oversight

Although FHWA oversight on a project may not affect the determined fix or the estimated cost for a project, it is information that should be included in the scoping package for the project designer. Inclusion of and coordination with the FHWA on federal oversight projects is required. Oversight of projects is determined on an individual project basis by agreement between the FHWA and the System Manager and is reviewed on an annual basis. For many projects, oversight will be defined in the FHWA Michigan Division Risk-Based Project Involvement

Guidance. Omission of FHWA coordination on pre-determined federal oversight projects can have impacts on project costs and the project schedule.

During the scoping process, any previous discussions or agreements with the FHWA should be reviewed and included in the project scoping package and be part of the documentation in the scoping record.

1.4 Long-Range Transportation Plan

Michigan's State Long-Range Transportation Plan lists the transportation investments that drive Michigan's social and economic prosperity, including MDOT's transportation program. This document establishes the goals and direction for MDOT's program, which should be considered when determining candidate projects for scoping. The information provided in this document as well as the CFP Manual form the framework for scoping projects.

1.5 External Engagement

External engagement is an opportunity to discuss schedules and potential partnerships with public and private entities to improve the overall transportation system. It involves coordination with the Region Planner and Transportation Service Center (TSC) Manager to determine the level of external engagement necessary for the scoping process. Meeting minutes document the interactions with external partners and should be included in the supporting documents for Scoping Packages. Additional guidance in the external engagement process can be found in the MDOT Guidelines for External Engagement.

2 SCOPING PROCESS

The scoping process consists of three steps: Coordinate System Planning, Identify Project Candidates and Scoping Phase, and Conduct Candidate/Project Scoping.

2.1 Step 1: Coordinate System Planning

This step of the scoping process is a high-level examination of the overall system to identify condition, mobility, and safety needs based upon an integrated asset management perspective regardless of template(s) or funding source(s). This review uses a Region-defined corridor approach using the department's Highway Call for Projects Strategic Direction as a guide.

System Planning is a formal coordination step that provides an overall review of the system using a corridor approach. It will require more effort up front but will assist in identifying issues earlier in the process to identify program development priorities and to develop better scoped projects that lead to more accurate budgets and schedules.

Goal

Document the potential action or work type for each bridge, trunkline segment, and other assets. Consider improvement options from all region and statewide templates and funding sources.

Responsible Party

A System Planning work group should be created to actively manage a Region-defined corridor scoping approach that leads to coordinated and unified scoping and/or planning studies. The suggested System Planning work group may include but is not limited to:

- Region System Manager, Region Bridge Engineer, and Region Planner(s)
- TSC Manager/Delegates
- Region or TSC Scoping Engineer
- Pavement Management Engineer
- Region Operations
- Region Traffic & Safety
- Resource Analyst
- Adjacent Region Personnel, as needed
- Statewide Attendees – Operations, Traffic & Safety, Planning, Bridges, and Environmental

Expected Outcomes

At the end of System Planning coordination, Regions should have identified and documented priority corridor needs, wants, and potential risks.

Tasks

- Review high-level asset condition information (e.g., condition of roads, bridges, and ancillary structures)
- Review annual safety, operations, and mobility information.

- Identify locations for further analysis using a corridor planning approach, Planning and Environmental Linkages (PEL) process, or other planning study.
- Coordinate system planning activities with adjacent regions and Statewide Planning on corridors that span Regions.

Best Practices

- Develop a Region long-range strategy documenting possible fix types for future projects for each bridge and road corridor/segment. Ensure all assets are considered.
- Consider road and bridge right-sizing for future operational, mobility, and safety needs
- Identify items that may take more time or investigation to determine the best solution.
- Determine how to stage/phase corridor investments to manage projects to funding levels that are achievable.
- Begin corridor-level external engagement.
  - Municipalities/Local Agencies
  - Metropolitan Planning Organizations (MPOs)
  - Right-of-Way Asset Owners (e.g., utility owners)
  - Planning Groups
- Develop a master spreadsheet for corridor-level scoping needs and history or include this information in a Geographic Information System (GIS) interface.

2.2 Step 2: Identify Priority Candidates and Scoping Phase

This step of the scoping process selects priority candidates and the scoping phase that will be utilized. Scoping (SCOP) and Early Preliminary Engineering (EPE) phases are the phase options available.

Goal

Gather and analyze data for compiling a preliminary candidate list. Develop a consensus of the prioritized candidate list of potential projects and fix type options (with supporting discussion notes).

Responsible Party

Region Development (road and bridge), Region Planning, and TSC Development

Supporting Areas

Consider including interdisciplinary positions that bring a comprehensive view of scoping. These could include:

- **TSC**: Operations, Traffic & Safety, Construction, Utilities, Maintenance
- **Region**: Operations, Traffic & Safety, Environmental, Soils, Survey, Real Estate, Planning, Construction
- **Statewide**: Operations, Traffic & Safety, Bridges, Planning, Environmental, Construction

Expected Outcomes

Prioritized candidate lists and determination of the timing and phase of scoping (SCOP or EPE).

Tasks

- Compile lists for each template based on the strategies and goals of the template as defined through the Highway Call for Projects manual and/or other guidance.

Region and TSC staff discuss candidate list and request changes to be made or additional information.

- Edit the candidate list to incorporate review notes and discussion. Develop a consensus on the prioritized scoping candidate list and fix options.
- Determine phase (SCOP or EPE) based on the following:
    - The SCOP phase is a stand-alone phase to investigate future scopes of work and cannot have subsequent phases added to it.
        - Use a SCOP phase when:
            - programming a Regionwide scoping job number.
            - multiple project candidates are grouped together.
    - EPE phases can be programmed either before or with subsequent (e.g. PE, CON, etc.) phases for a future project.
        - Use an EPE phase when:
            - programming the scoping of a specific location or group of locations, that will move forward as a standalone project.
            - conducting planning studies.
            - a project is submitted for funding and requires further investigation to refine project specifics.

Best Practices

- Conduct field reviews through virtual meetings and/or in-person van tours to discuss project details and what will be included in the project scope of work. These reviews should include TSC, Region, and Statewide multidisciplinary staff as noted above.
    - Identify issues that could affect cost and schedule during design and would need to be included in the scope of work.
- EPE Phase can be used to conduct preliminary design to determine environmental clearance, right-of-way (ROW) needs, and other items (up to 30% base plans is allowable when using federal funds).
    - Examples of items that may need more time and investigation include, but are not limited to:
        - Determining fix type or multiple alternatives
        - Understanding interchange reconstruction needs
        - Evaluating multiple operational alternatives
        - Understanding drainage and geotechnical issues

  - Conducting surveys
  - Investigating maintaining traffic schemes.
  - Accommodating an accelerated project development and delivery timeline.
- Consider risks by using available risk-based assessment tools.
- Consider external needs and opportunities prior to determining scoping method.
- Ensure coordination with other programs, templates, and/or grant opportunities.

2.3 Step 3: Candidate/Project Scoping

This step of the process moves forward candidate projects to be scoped. Using the Scoping Checklist, the Region and TSC develop cost estimates for the agreed upon fix options. The Scoping Checklist and all documentation from this step and the previous steps are incorporated into a detailed comprehensive Scoping Package. Documents should be saved in a Region identified location in ProjectWise.

The items to include in a Scoping Package will vary for the type and size of the job. For a straightforward project, at a minimum the package will simply be the scoping checklist and the cost estimate. Additional documents can be included to provide further details.

Goal

Use the Scoping Checklist and Scoping Manual to investigate and document items to be addressed by the candidate project and develop a detailed scope estimate.

Responsible Party

Region Development and TSC Development Staff

Supporting Areas

- **TSC**: Operations, Traffic & Safety, Construction, Utilities
- **Region**: Operations, Traffic & Safety, Environmental, Soils, Survey, Real Estate, Planning, Construction
- **Statewide**: Operations, Traffic & Safety, Bridges, Planning, Environmental, Construction

Expected Outcomes

A completed Scoping Package with a detailed cost estimate and completed Scoping Checklist.

Tasks

- Develop Scoping Package.
- Review scoping packages for completeness.
- Store scoping packages in ProjectWise.

Best Practices

- Consider the program development process and the intent and timing of scope development to be fiscally responsible which could include:

  - High level scoping to determine Region aligned detailed scoping priorities which will likely be included in a future Call for Projects.
  - Analysis for future grant opportunities and other opportunities for funding.
- Use consultant assistance to scope when Region/TSC staff do not have capacity.

2.4 Step 4: Additional System Planning Processes and Studies

System Planning may include additional planning processes and studies. Region planners lead planning activities in each region and are available to provide guidance to staff regarding the next steps in the planning process.

System Planning is the consideration of asset condition along with other safety, operational, and mobility needs to help balance corridor improvements with available funding. Featured below are two system planning processes (a Planning and Environmental Linkages process and a Corridor Plan) that could be used to further evaluate corridor needs beyond the typical scoping method found in the remainder of the Scoping Manual.

Planning and Environmental Linkages (PEL) Approach– What It Is and When to Do One

The Planning and Environmental Linkages (PEL) approach combines elements of the planning process with National Environmental Policy Act (NEPA) requirements to make planning decisions flow more readily into the NEPA phase of project development. The PEL approach is pre-NEPA and focuses on analyzing the appropriate level of social, economic, and environmental data alongside land use and transportation planning data so that environmental clearance proceeds smoothly once funding is obtained. Public, local government, and regulatory agency input, and information and analysis conducted in planning are used to complete the NEPA process. PEL studies can involve large-scale planning or small-scale decision-making.

The PEL approach can be used for smaller-scale planning and project development. PELs are optional, which means they offer flexibility in scope and outcomes.

A PEL process should be considered within the context of Region and Statewide priorities and will require Program and Project Review Board (PPRB) approval. Refer to the PPRB Charter.

What are the Benefits?

A PEL approach offers many benefits to project planners, including the following:

- The PEL process and document can be paid for with Federal Aid and is exempt from any payback requirements.
- There is no need to list construction dollars in a financially constrained Transportation Improvement Plan (TIP).
- Has the potential to identify cost-effective solutions.
- Clarifies environmental requirements.
- Encourages environmental stewardship by incorporating environmental analysis and mitigation earlier in the planning process.
- Helps a community and regulatory agencies engage in decision-making.
- Can help build trust with a community and identify community priorities.

- Offers opportunity to develop public/private financing implementation plan.
- Can be useful in developing short-, mid-, and long-term strategies to fix a problem.
- Documents decision-making for future Project Managers and other staff.
- May save time compared to completing a major action NEPA document, depending on the circumstances.

When Should I use a PEL Approach?

Planners and project managers should review the following list to determine if it would be appropriate to conduct a project-level PEL document:

- The proposed action is operational, not capacity building.
- There is a need to further define the problem and explore solutions.
- There may be controversy over a decision.
- The community commits to actively participate.
- FHWA agrees to participate.
- Public, regulatory, and local jurisdiction input is needed to solve the problem.
- Funding is uncertain and/or there may possibly be a public/private partnership or grant opportunities.
- There is a need to investigate alternatives.
- The Region has a reasonable expectation that the outcome of the PEL will lead to a constructed project within 10 years.

Corridor Planning Approach – What It Is and When to Do One

A Corridor Plan is a process-driven approach that begins with a review of the existing corridor to identify transportation-related problems. Interested parties are engaged to assist in the development of a comprehensive vision for the corridor. A Corridor Planning process is not pre-NEPA and does not achieve the level of analysis and review for future environmental clearance classification. A Corridor Planning approach does not focus on analyzing the level of social, economic, and environmental data and land use and transportation planning data that is required through the PEL approach. A Corridor Plan aims to take a holistic look at the system to avoid programming piecemeal projects, and it can be useful in the following situations:

- Need for a specific corridor planning study has been identified as part of a regional or agency Transportation Systems Management and Operations (TSMO) planning effort based on operational deficiencies within the corridor.
- Needs have been identified in the long-range transportation plan and/or congestion management process (CMP), and the corridor is found to be deficient in several areas.
- Need has been identified for large scale reconstruction or modernization of an interchange or freeway.
- High number of incidents are causing lane closures on a State urban arterial.
- High-crash locations involving the need for geometric and/or capacity improvements have been identified.

- Complex nonmotorized issues and Complete Streets expectations exist.
- Corridor Plan is critical to mobility and economic activity.
- Corridor Plan is deemed necessary by an individual Region or is to be developed in coordination with adjacent Regions and Statewide Planning.

Following the completion of a Corridor Plan, additional analysis may be necessary to further evaluate plan recommendations.

3 SCOPING CHECKLIST AND SCOPING PACKAGE GUIDANCE

3.1 Scoping Checklist and Scoping Package Overview

The Scoping Package is the document that includes the Scoping Checklist and supporting documentation. The Scoping Checklist includes a list of items that should be reviewed and considered in the scoping process. The list of items in the checklist is expandable or can also be reduced or flattened depending on the complexity of the project being scoped. The intent of the spreadsheet is to serve as a reminder of the various items of consideration and is a working document that can evolve as the project scoping progresses. This chapter of the Scoping Manual guides the user through the Scoping Checklist items.

The Scoping Checklist to be used is selected based on the complexity and fix type for the project. The Basic Scoping Checklist should be used for these types of projects:

- Cold-milling and single course Hot Mix Asphalt (HMA) resurfacing
- Capital Preventive Maintenance (CPM) projects

The MDOT CPM Manual describes various road CPM treatment options that are designed to extend the pavement life by maintaining existing geometric elements and having minimal impacts to surrounding road features. All other projects should use the Detail Scoping Checklist.

No matter which checklist is selected as the Scoping Checklist, it should be used to concisely and clearly document the scope of work and decisions that were made. Each section of a Scoping Checklist contains an input box labeled “Comment/Notes.” The Scoping Engineer should provide additional information in this space. If additional space is necessary, the row height should be adjusted to ensure the comments/notes are comprehensive. The Scoping Checklist and Scoping Package should be detailed enough for others to follow later in the design phase.

The final Scoping Package should contain a table of contents and be bookmarked according to the table of contents. The Scoping Package should be formatted according to the Scoping Checklist order. The Scoping Checklist should be saved as a pdf and inserted as the first document after the table of contents.

3.1.1 Performance-Based Practical Design

Performance Based Practical Design (PBPD) is a design philosophy that makes the necessary improvements to a roadway or structure to address specific performance issues. The goal of PBPD is to fix what is broken and to avoid spending scarce resources on features solely for the purpose of meeting published standards when those features that are defined by standards and guidance as deficient are not causing safety, mobility, or reliability issues, or similar problems. By analyzing each element of a project’s scope based on its value, need, and urgency, a PBPD approach seeks a greater return on infrastructure investments. Scoping Engineers should consider the PBPD philosophy in all elements of a project scope to ensure the project is providing the best value. Chapter 3 of the Michigan Department of Transportation’s (MDOT’s) Road Design Manual (RDM) contains additional information on PBPD.

3.1.2 Identifying Risk

Risk should be identified during the scoping process and projects evaluated for significant factors that warrant additional investigation prior to design. While all items in a project scope have some amount of risk, items identified as higher risk should be listed, and the list should be

updated as additional information and potential mitigation is identified during the scoping process. Several risk management tools as well as additional guidance on tracking and mitigating risk are currently being developed by MDOT Design Division. Scoping Engineers should contact their System Manager for guidance on the location and details of these resources and should review the Scoping Package upon completion to re-evaluate the most significant risk items and discuss them with their System Manager. The addition of an Early Preliminary Engineering (EPE) phase should be considered if it could help avoid, reduce, and/or mitigate a significant risk to the project.

3.1.3 General Information and Background

The MDOT Highway Call For Projects General Information & Program Instructions Manual (CFP Manual) should be reviewed to determine additional scoping requirements for each template. If the project being scoped is to be packaged with other projects for design and/or construction, these other projects should be noted in the Scoping Checklist.

3.1.4 Supporting Documentation

All supporting documentation should be included in the Scoping Package except for previous plans, which can be linked via ProjectWise. Supporting documents should document items that were discussed and decisions reached during the scoping process. These can also be documented in the comment/notes input box of the Scoping Checklist. Each supporting document should be bookmarked in the Scoping Package. Decisions and assumptions made during the scoping process that would not otherwise be included in the Scoping Package should be documented.

It is important to document these items so that the designers and others reviewing the Scoping Package will understand the decision-making process and avoid engaging in discussions that have already occurred. For the recommended minimum supporting documents, see Appendix B. Refer to Chapter 6 of this manual for other documentation that should be included in the Scoping Package.

3.1.5 Coordination with other funding templates

Coordination with the Region Bridge Engineer, Region Operations Engineer, and Traffic & Safety Engineer prior to fully developing the scope of work is crucial. These staff should be consulted before the Scoping Package is developed so that collaboration can take place if projects overlap.

The anticipated construction year should be considered because aligning the construction year of one project with that of another may result in economies of scale as well as minimize mobilization and re-work costs.

3.2 Project Information Section

The Project Information section provides a brief general overview of the project, including the location, anticipated funding templates, roadway characteristics, project objective, fix type, cost estimates, and additional project background information.

Previous plan information should be comprehensive for the entire project length and should be linked in the Scoping Checklist.

3.2.1 Identification Conventions

A Physical Road (PR) number is a part of a common linear referencing system used statewide to uniquely identify any point or section of roadway within Michigan's transportation network. The PR number is a unique value given to a section of roadway; this can be followed by an exact mile point to pinpoint a location or a beginning mile point (BMP) and ending mile point (EMP) can be listed to identify a section of roadway. All roadways have a PR number assigned to them. Projects often contain multiple PR numbers and are identified by a "major" PR number containing the most work for the project.

Another form of route identification is a Control Section (CS). A CS is assigned to every section of a roadway over which MDOT has jurisdiction. The first two digits of the CS indicate which county the roadway is located in. Every project has at least one CS.

MDOT bridges are identified by specific coding. Bridges are Y## of XXXXX where:

- Y designates the type of crossing
  - S = Grade Separation
  - B = Structure over Water
  - R = Road over Railroad
  - C = Culvert (10–20 feet)
  - X = Railroad over Road
- ## designates the bridge number
- XXXXX designates the CS where the bridge is located.

MDOT Ancillary Structures are identified by a unique structure ID number. Refer to the Michigan Ancillary Structures Inspection Manual (MiASIM) for a complete list of structures and their naming/numbering convention.

3.2.2 Traffic Forecast and Traffic Count Request

Complete the Traffic Analysis Request (TAR) form (Form 1730) (TAR Form) when traffic forecasts are required. A TAR may be needed for the following reasons: mobility analysis, pavement design, intersection signal warrants, and turn lanes. Coordinate with the Region Soils Engineer and/or Region Pavement Management Engineer to determine what to include for the pavement design. The MDOT Transportation Data Management System (TDMS) contains traffic counts for both the trunkline and the local system that can typically be used for scoping purposes.

The Statewide and Urban Travel Analysis Section (SUTA) endeavors to provide requested information within 45 days of receipt of the TAR Form, depending on data availability. Items such as interchange/intersection turning movements and travel demand model estimated traffic diversion will often need a field survey and/or model runs, which require additional time and analysis. If turning movements or additional traffic counts are required, the requestor should submit a Traffic Survey Request Form (Form 1776) to the Data Collection and Reporting Section. When the traffic survey data has been received, it should be forwarded on to SUTA for analysis. The assigned SUTA staff will contact the requestor if the analysis requires additional time beyond the usual 45 days.

3.3 Pavement, Geotechnical, and Earthwork Section

The pavement, geotechnical, and earthwork section provides details of the existing conditions and recommendations for the proposed pavement. It is important Scoping Engineers properly identify the underlying causes for the existing pavement deterioration and work closely with their Region Soils Engineer to select fixes that address the underlying causes as well as the surface distresses present as a result of these causes. Important considerations such as Life Cycle Cost Analysis (LCCA) and Alternate Pavement Bidding (APB) should be considered as part of this analysis.

3.3.1 Existing and Proposed Pavement Section

Obtain the depth of the existing HMA and/or concrete and the underlying material from previous plans, pavement cores, and soil borings. Consult the Region Soils Engineer for proposed pavement design options to be estimated. This estimated pavement structure is based on the proposed fix type, existing pavement information obtained from previous plans, pavement cores, Commercial Average Daily Traffic (CADT), and pavement design guidelines published by MDOT. The Region Soils Engineer should also be aware of any potential peat excavation or contaminated soil within the project limits and may provide an estimate for the work necessary to deal with these situations.

Existing pavement condition data should be provided for each section listed in the Scoping Checklist. Contact the Region Pavement Management Engineer to determine the pavement condition metrics that should be used.

Often, poor pavement condition is the result of poor drainage. It is critical to consider this as it may require re-grading of ditches and/or installing underdrains. See Section 3.8 of this manual for best practices on drainage.

3.3.2 Shoulder Work

When estimating the cost for shoulder work, include both the left and right shoulders or for divided roadways, two median shoulders and two outside shoulders. Note that shoulder thickness may be less than the thickness of the mainline. The HMA thickness on shoulders may be as low as 3.5 or 5.5 inches on non-freeways or freeways, respectively.

Consider whether existing shoulder widths are adequate for the roadway or whether widening is necessary. Wider shoulder widths typically require shoulder corrugation placement; however, some exceptions to this requirement exist based on adjacent land use and shoulder users. Consult the Transportation Service Center (TSC) Operations Engineer to determine whether shoulder corrugations should be omitted from the project.

Review existing shoulder gravel on the project for low areas and include shoulder gravel as needed. Consult the local Maintenance Coordinator to determine areas that are prone to washout and may require a more substantial fix. When estimating shoulder gravel, it is important to consider what the condition of the gravel may look like in the year of construction as opposed to the year of scoping.

Consult the TSC Manager and/or the System Manager regarding cold-milling and/or paving shoulders. Shoulders in fair or good condition could be excluded from the proposed work to provide potential cost savings.

Maintenance of Traffic (MOT) needs should be considered when determining shoulder pavement thickness and width for both the proposed project and future projects. If projects will require shoulder upgrades to maintain traffic, full depth shoulders should be considered.

See Section 6.05 and Appendix 6-A of the RDM for further details on shoulder considerations.

3.3.3 Life Cycle Cost Analysis

An LCCA should be completed, typically within 30 months of the project's letting date, for all reconstruction and rehabilitation projects where the estimated cost for pavement, either concrete or HMA, exceeds $1.5 million.

The Scoping Package should identify and document projects where the estimated pavement costs exceed $1.5 million. An informational LCCA can be requested by the Scoping Engineer during scoping if an LCCA is anticipated. To estimate the project completely, it may be prudent to prepare an estimate for both an HMA pavement section and a concrete pavement section.

Chapter 2 of the MDOT Pavement Selection Manual describes the current Reconstruction and Rehabilitation (R&R) fix type comparisons, the process, and the prices to be used to determine whether a project requires an LCCA. The manual provides a ProjectWise file path that contains the unit prices to be used for the cost threshold estimate.

3.3.4 Alternate Pavement Bidding

APB provides contractors an option to bid either HMA or concrete. The goal of this type of bidding is to increase competition and lower bid costs. The APB document contains information on the selection and process of APB projects.

Consult with the System Manager and Region Soils Engineer to determine whether APB is anticipated. Projects eligible for APB should be marked on the Scoping Checklist. If eligible, estimated Preliminary Engineering (PE) costs should include the work to develop a single set of plans showing the two paving alternatives. The construction cost estimate should reflect the higher cost design alternative.

3.3.5 Soils Issues

If there are suspected soils issues on a project, or if Post Construction Stormwater Control Measures (PC-SCMs) for infiltration will be required on the project, review previous plans, perform a field investigation, and consult the Region Soils Engineer during scoping. Soil borings and/or pavement cores can be ordered early to assist in the analysis and may help determine quantities for specific soil needs, such as subbase undercutting, subgrade undercutting and stabilization, peat excavation, and contaminated soil. The Region Soils Engineer needs to understand the proposed scope and strategy for this project to make recommendations for appropriate treatments.

3.3.6 Earthwork

Earthwork, both embankment and earth excavation, may be difficult to estimate at the scoping phase. Previous plans and cross sections, if available, may be used to determine the existing sections at various locations and conditions (cut or fill) along the length of the project. Approximate cross sections should be developed for use in estimating the earthwork and determining a conceptual slope stake line. Cut and fill sections, within the project limits, should be examined separately.

3.4 Geometrics Section

During the scoping process minimum design standards should be followed based on the type of work that is being considered. Standards, guides, and policies for the different types of work can be found in the Chapter 3 of the RDM, Chapter 12 of the Bridge Design Manual (BDM), the CPM Manual, and the Bridge Capital Scheduled Maintenance Manual (Bridge CSM Manual). Additional information can be obtained from American Association of State Highway and Transportation Officials (AASHTO) documents such as "A Policy on Geometric Design of Highways and Streets" and/or "A Policy on Design Standard--Interstate System."

All projects should be reviewed to determine the need for safety improvements, such as alignment modifications, superelevation modifications, sight distance improvements, ramp lengthening, lane widening, shoulder widening, slope flattening, underclearance increases, guardrail upgrading and bridge railings, obstacle shielding, and the removal or relocation of obstacles to provide a traversable roadside. The preliminary crash analysis for the project can provide information to determine where substandard geometric elements exist within the project limits. It is important that the Scoping Engineer consider all available information when determining if improvements are warranted as geometric elements may not require upgrading if the current segment is performing satisfactorily.

When scoping projects with added features, such as lane drops, lane shifts, tapers, or realignments, it is important to have an estimate that includes the proper impacts, lengths, and widths for these items. Prior to estimating, do the following:

- Use the Geometric Design Guides.
- Consider the existing conditions (for side impacts).
- Ensure the proposed feature can be added to the roadway segment.
- Consult the Lansing Geometrics Unit with questions or assistance on applying these guidelines.

Be sure to consider the improvements to the roadway geometry and its impacts to the bridges. Consider the impact on all modes of traffic.

3.4.1 Crown and Superelevation Modification

If an existing HMA roadway has a cross slope less than the current standard (2 percent) or has a parabolic cross section, the project may require upgrading the roadway to the current standard. This can be accomplished by profile cold-milling or the addition of an HMA wedging course. The additional HMA quantity for the wedging course should be included in the estimate, as this can have a large impact on the estimate. Modifying cross slopes in urban sections typically has impacts to curbs and gutters, driveways, and sidewalks. These modifications should be included in the estimate if they are part of the project work.

Superelevation modifications may be necessary on some project fix types to bring existing roadways up to current design standards. Standard superelevation rates and methods are described in Chapter 3 of the RDM. It is important when analyzing curves for superelevation modification that the entire curve length be considered for modification, as this may require changes to the proposed project limits to encompass the entire curve length. Existing curve information is typically available on MDOT Right-of-Way (ROW) maps or plans from previous projects. Scoping Engineers should use caution when estimating superelevation changes to ensure that actual field conditions match the previous plans and that all impacts from superelevation modifications are analyzed and factored into the project estimate. Additional

impacts from superelevation modifications can include changes to curb and gutter designs, roadside ditches, guardrail, intersections, driveways, and drainage features, to name a few.

3.4.2 Vertical Clearance

When scoping freeway resurfacing or reconstruction projects, existing freeway overpass structures should be analyzed for underclearance values to determine compliance with Chapter 3 of the RDM. Scoping Engineers should determine from a field investigation whether any overpass structures within the project limits are posted for a substandard height to determine whether existing issues are already present. Regardless of existing underclearance values, all structures in the project limits will require a more detailed analysis to determine whether the project will reduce existing clearances and whether a separate project fix will be needed in these areas. It is often necessary to reconstruct underpass areas on freeway resurfacing projects to maintain or improve the underclearance at structure crossings. Consult with the Region Bridge Engineer to identify any high load hit history. Consult with the System Manager if it is determined that a Design Exception (DE) for vertical clearance is necessary.

3.4.3 Design Exceptions and Variances

It is important to identify anticipated DEs and Design Variances (DVs) during the scoping process. It is understood that information may not be available to determine the need for all DEs and DVs, but the identification of some potential DEs and DVs should be apparent. Chapter 3 of the RDM contains additional information regarding DEs and DVs.

The DE and DV table in the Scoping Checklist should list the possible DEs and DVs for the designer. It is understood that not all DEs and DVs will be discovered due to the limited amount of information that may be available regarding an existing roadway or structure at the time of scoping.

3.4.4 Guardrail or Median Barrier

The existing guardrails and/or concrete or cable median barriers, including rail type (in cases where updates are needed to make the barriers Manual for Assessing Safety Hardware (MASH) compliant) should be identified and the condition noted on the Scoping Checklist. Consult the most current version asset management software available to obtain information on these features. Proposed guardrails and/or concrete or cable median barriers should be noted for inclusion in the Scoping Checklist and estimate of the project.

3.4.5 Maintenance Crossovers

If maintenance crossovers exist within the project limits of a freeway project (depending on the proposed project work type), their location should be compared to the guidelines in section 12.09 of the RDM Existing crossovers may need relocation or removal according to the current guidelines. When new crossovers are constructed or existing crossovers are eliminated, give additional consideration to requests from local emergency response providers. Maintenance providers should also be asked for input regarding the operational impacts of constructing new or eliminating existing crossovers.

If the maintenance crossovers are located near ramps that will be extended to meet current guidelines, the location of the crossovers should be compared to the proposed limits of the ramps.

Scoping Engineers should also note whether the maintenance crossover is paved and has the proper wide shoulder/taper for its intended use. While conducting the field visit, be sure to note any shoulder rutting or issues with the crossover. Discuss any pavement improvements or geometric improvements with the Region Operations Engineer.

3.4.6 Corrugations

The MDOT Standard Plan R-112-Series and section 6.05.11 of the RDM contain information on the design and applicability of corrugations. If the roadway has had previous sealing projects, the existing corrugations should be reviewed to determine whether they have the proper depth. The MOT concept should be checked to verify filling and/or removal and replacement of the corrugations is unnecessary. Section 6.01.20 of the Work Zone Safety and Mobility Manual (WZSMM) contains additional information regarding existing longitudinal corrugations.

3.5 Safety Section

Determination of any potential safety issues and concerns is a critical part of scoping. Several tools and processes are utilized to help determine the need for safety improvements as part of a project. Scoping Engineers should consult with their traffic and safety engineer to determine what type of safety analysis is required for a project.

3.5.1 Safety Review, Crash Analysis, and Road Safety Audit

A preliminary Crash Analysis is done as part of the scoping process for most projects. The scoping level crash analysis is completed by the local TSC or the Region Traffic and Safety Engineer and reviewed for crash concentrations or other items that indicate a focus area for improvement. Further reviews and detailed analyses are completed during the design phase of the project.

The Safety Program is a means by which MDOT can support the goals of the State of Michigan Strategic Highway Safety Plan (SHSP) and eliminate fatalities and serious injuries (Towards Zero Deaths) on Michigan roadways. The CFP Manual contains submittal requirements that vary depending on whether the fix is systemic. Improvements not listed on the approved systemic safety fixes list require a Time of Return (TOR) calculation to be included with the Scoping Package. Most projects are justified through this cost benefit analysis and typically involve improving safety at high crash locations.

Road Safety Audits (RSAs) are warranted based on the conditions defined in the RSA Guidance. An RSA is a formal safety performance examination of an existing or future road or bridge project by an independent, multidisciplinary RSA team. The EPE or PE budget should include funds to perform an RSA if needed.

3.5.2 Highway Safety Considerations

The Highway Safety Manual (HSM) provides methods and tools to quantitatively estimate crash frequency and severity for safety-related decisions made in the planning, project alternative analysis, and program development and evaluation phases. The HSM helps identify areas and possible countermeasures for reducing crashes and their potential severity and frequency levels.

Predictive safety analysis is used to document the safety impacts of a DE or DV. A predictive crash analysis can be completed to demonstrate the future safety impacts of the DE or DV itself (what will not be provided), as well as the impacts of the proposed countermeasures.

For additional information or training on HSM methods and predictive safety analysis, contact the MDOT Safety Programs Unit.

3.5.3 Access Management Opportunities

Access management is an effort to maintain efficient traffic flow, preserve the roadway's capacity and maintain safety (while maintaining reasonable access to land uses), by the planning and placement of access points (i.e., driveways, development approaches).

For additional information, visit the MDOT Access Management website and see the MDOT Access Management Guidebook.

The scoping process is the time to identify potential opportunities for improved access management with a review of the existing driveway spacing and configuration, and the number of driveways per property. There may be opportunities for the proposed project to close un-needed driveways or combine and/or reconfigure existing driveways while maintaining adequate access to the business or residence and improving safety for the roadway. Funding for access management improvements may include financial partnerships with local agencies and property owners.

3.6 Permanent Traffic Items Section

Existing and proposed permanent traffic items should be evaluated as part of the scoping process. Items such as freeway signing, traffic signals, and lighting can have a significant impact on project costs.

3.6.1 Signing

Include permanent signing in the following instances: where the proposed construction limits may impact existing signs, where new features requiring new signs (e.g., turn lanes, passing flares) are designed into the project on reconstruction projects, and where signs are mounted to bridges that may require modification. CPM, cold-mill/resurface projects, and other work types that do not impact the existing signs do not require permanent signing work or quantities.

The age and reflectivity of the existing signs should be considered when determining whether new signs are required or the existing signs may be salvaged and then re-erected on new posts. It is important to find out if a corridor signing project is planned, and where the new signs would be included in the signing project, thereby decreasing the work and money needed for permanent signing in the project being scoped. The Region Operations Engineer or TSC Traffic & Safety Engineer can provide information regarding the need for permanent signing on a project. Include sign and post quantities in the scoping estimate, as well as all cantilever, trusses, and bridge-mounted signs. Trusses and cantilever signs can add significant costs to a project, so it is important to verify whether the existing support structures meet the current criteria. Review the ancillary structure layer in the current asset management software that contains the signing assets to confirm if cantilever or truss signs are within the project limits. Contact the Lansing Signing Unit for additional information on cantilever and truss signs.

3.6.2 Pavement Markings

The pavement marking quantities should be included in the estimate. Aerial images can be used to compute pavement markings. Scoping Engineers should consult with the Region Operations Engineer to determine the materials and improvements necessary for pavement marking quantities.

3.6.3 Traffic Signals

Consult with the signal operations and design units if there are any signals within the project limits. Upgrades to Americans with Disabilities Act (ADA) sidewalk ramp facilities can cause modifications to be necessary for pedestrian pushbuttons or other signal infrastructure. If signals work is included in the project, the Lansing Signals Unit should provide a cost estimate. Consult with the Lansing Signals Unit to determine their availability to assist with the signal design in future phases and what options for funding the traffic signal work exist.

3.6.4 Lighting

Freeway projects in urban settings may include freeway lighting work for new lighting, repairs, or upgrades to the existing lighting system. Non-freeway projects such as roundabouts, rest areas, carpool lots or other roadway work may require new lighting installations, repairs, or upgrades. Contact the Municipal Utilities and Lansing Road Design Unit to coordinate the impacts to the existing lighting system or development of a new lighting system. The Municipal Utilities and Lansing Road Design Unit will examine the limits and scope of work to develop a detailed estimate. Refer to the ancillary structure layer in the current asset management software for additional information on MDOT lighting assets.

3.7 Intelligent Transportation Systems

To minimize disruption to the operation of Intelligent Transportation System (ITS) infrastructure, it is important to identify existing ITS elements during project scoping. This allows Region ITS Coordinators to establish alternative communications and/or power for affected devices where necessary.

ITS is defined as, “electronics, communications, or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system.” ITS sites contain several underground power and communications conduit runs that extend beyond the primary device location, potentially running along, under, or adjacent to the road surface. Individual sites may also act as communications relays, passing information via fiber optic cable or wireless radio link from adjacent sites that may fall outside of the project limits. Refer to the ancillary structure layer in the current asset management software for additional information on ITS infrastructure.

Underground ITS infrastructure is not coordinated as a utility; it is the MDOT Project Manager’s responsibility to identify ITS infrastructure that may be affected by the project. If identified, Region ITS Coordinators can provide additional detail to assist the project in budgeting for replacement or relocation.

- ITS fiber optic cable uses industry-standard aboveground markers with orange domed tops and an “MDOT FIBER OPTIC CABLE ROUTE” legend. Do not assume fiber optic markers in the MDOT right-of-way belong to private utilities.
- Underground ITS infrastructure may also be identified by the presence of handhole covers, which are placed at approximately 1,000-foot intervals along a conduit run, at a road crossing, or as needed near cabinets and support infrastructure.
- Environmental Sensor Stations (ESS) or Road Weather Information Stations (RWIS) may also have underground cabling connecting to sensors in or below the pavement several hundred feet away from other ITS infrastructure. It is the project’s responsibility to replace any affected sensors. ESS can typically be identified by the presence of a 30-foot-tall

lattice tower, but other configurations exist. Region ITS Coordinators can assist in identifying any ESS within the project limits.

- Traffic signals may have ITS components mounted to strain poles or in “combo cabinets” that house traffic signal hardware and ITS hardware in separate compartments of the same cabinet.

Devices installed or affected by projects require complex system integration and testing, including daily monitoring by the ITS System Manager during a 60-day post-installation burn-in period, to ensure individual devices and communication pathways work with the larger system. To provide adequate oversight for testing, projects should budget sufficient Construction Engineering (CE) for an ITS design and a prequalified consultant ITS System Manager to provide Design Assistance During Construction (DADC) until the close of all ITS-related tasks. Region ITS Coordinators can assist with providing an estimate for these costs.

In accordance with 23 CFR subsection 940.11, all ITS projects using federal funding must be based on a systems engineering analysis. Coordinate with the Region ITS Coordinator to determine an appropriate allocation for systems engineering in the project’s EPE phase.

Contact the Region ITS Coordinator to assist with determining whether any additional ITS work is needed or planned within the limits of the proposed project. The work may include upgrades to the existing system, complete installation of a new system, or preliminary work done in preparation for a future ITS project.

The Region ITS Coordinator will need to know the limits and type of work included in the proposed project before a determination can be made as to what type, if any, additional ITS work may be packaged with a road or bridge project. When a decision is made to include additional ITS work with a road or bridge project, the Region ITS Coordinator will provide a complete estimate of the proposed ITS costs and also funding from the ITS funding sources, if available. This estimate will not include the cost to maintain traffic, as that cost will be included in the road or bridge maintaining traffic costs. Stand-alone ITS projects will be coordinated with the System Manager by the Region ITS Coordinator. When scoping ITS projects, use the latest version of the Device Location Form spreadsheet, contact the Region ITS Coordinator for the most up-to-date form spreadsheet.

3.7.1 Continuous Count Station

As projects are scoped, the locations of any existing Continuous Count Stations (CCS) (formerly known as Permanent Traffic Recorders (PTRs)) should be identified. If it is determined that existing CCSs should be replaced or new CCS locations added within the proposed project limits, cost estimates for these should be included in the project estimates. The decision to install new CCSs should be made after consultation with the Region Planning staff and Bureau of Transportation Planning (BTP) staff and review of the Commercial Vehicle Enforcement (CVE) Plan for each Region. Available funding for the proposed work should be discussed and identified during the project scoping before moving forward to design.

A map detailing the CCS locations, including the control section, PR, and mile point information, is available on MDOT’s website.

For bridge projects, a CCS may be found between bridge piers or near the slope. At these locations, MDOT has loops and/or sensors usually within 20 to 100 feet of the structure.

3.7.2 Weigh In Motion/Portable Intermittent Truck Weigh Stations

Identify all Weigh in Motion (WIM) stations and Portable Intermittent Truck Weigh Stations (PITWSs) within the project limits. Determine whether these assets will be impacted by construction, and coordinate with the Commercial Vehicle Strategy Team (CVST) to verify the scope of work for the WIM stations and PITWSs. Include all work related to WIM stations and PITWSs in the cost estimate. Contact the System Manager to determine the funding mechanism for the WIM and PITWS work. See section 12.10 of the RDM for additional information.

3.8 Drainage Section

Drainage facilities such as channels, ditches, culverts, bridges, road storm drainage systems, stormwater storage facilities, and pump stations may be impacted by the proposed work. It is important that this work be identified during the scoping process. The scope of work of drainage items can have a significant impact on other items of work, including MOT and utilities. It is critical to consider the full impact of drainage work in a project. The Scoping Engineer should consider the following questions:

- Are there any road drainage issues?
- Will the project result in an increase in impervious area?
- Is the existing stormwater conveyance system adequate? Are new outfalls needed?
- Will the road be widened or the side slopes changed? This may require a longer culvert, which will require a hydraulic analysis and may result in upsizing the culvert.
- Are existing end treatments inside the clear zone crashworthy?
- Have pavement cracks formed parallel to the existing culvert or storm sewer?
- Are there sinkholes (or patched sinkholes) in the roadway, shoulder, or side slope?
- Are there scour holes at culvert or storm sewer outlets?

On projects proposing to raise the elevation of a roadway in a floodplain, a hydraulic analysis may be required during the design phase. Scoping Engineers should contact the Lansing Hydraulics Unit for assistance in determining if additional analysis is required. In addition, it is important to consider items outside the roadway that may be impacted by the proposed grade change. Impacts to drainage patterns, depth of fill over culverts or sewers, and ROW; potential impacts to utilities; and natural and cultural environmental impacts should all be discussed and addressed as necessary. See the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit Guidelines for Public Transportation Agencies and consult with the Region Environmental Permit Coordinator to determine whether a hydraulic analysis will be required during the design phase.

If widening is to be included in the project, including ramp extension, the impacts to existing ditches should be considered (including additional ROW that may be required). An increase in impervious surface area may require additional ROW to adhere to channel protection, water quality, and flood control standards.

The Lansing Hydraulics Unit in the Environmental Services Section may be consulted for input into the design and estimate for the hydrologic and hydraulic portion of the Scoping Package. The Lansing Hydraulics Unit should be consulted on any project that has a stream crossing with a drainage area greater than 2 square miles if the proposed work being considered impacts the stream. If a regulatory stream needs to be realigned, coordinate with the Region Environmental

Permit Coordinator to verify what may need to be included in the estimate and the potential impact to the project schedule.

Consider the method and staging of construction. Large and/or deep culverts may require temporary sheeting or jack-and-bored methods for construction. The method of construction will impact the pay items proposed in the scoping estimate. Methods of diverting the flow of water may also be required during construction. These costs should be accounted for in the estimate developed during the scoping process.

3.8.1 Field and Desktop Review of Drainage Items

Coordinate with the TSC Maintenance Coordinator to determine if there are any known flooding or maintenance concerns within the segment. Ask questions about frequency of maintenance operations on existing infrastructure and if there are any known drainage contributions from outside of the project limits. Use this information to help guide desktop and field investigations of existing drainage systems.

Determine the age of existing drainage systems from previous plans. Perform field investigations as necessary to determine the condition of existing drainage systems. Examine existing ditches for erosion issues, signs the ditch is too flat, and ditch cleanout needs. Consider videotaping existing culverts and trunk sewers to verify condition of the system if these features are expected to be retained. Additional condition information on culverts can be obtained from culvert reports.

3.8.2 Culvert Reports

Culvert reports from the Ancillary Structures Layer in the current asset management software should be included as a supporting document for road rehabilitation and reconstruction projects. Reports including condition assessments, work recommendations, and Requests for Action (RFAs) should all be reviewed. Culvert reports should be available for all cross culverts from 12 inches to 10 feet in size. For culverts greater than 10 feet in size, additional information can be retrieved from MiBRIDGE. Culvert reports will likely not be available for driveway culverts. Contact the Region Bridge Engineer for access to the reports.

Depending on the scope of the proposed project, the Scoping Engineer will need to review the culvert reports to determine whether culvert work should be included in the project. Consult with the Region Environmental Permit Coordinator if there is a perched culvert on a regulated stream, as this requires early coordination with EGLE and Department of Natural Resources (DNR). Culvert work may involve a structural engineer, hydraulic engineer, geotechnical engineer, ROW specialist, permit specialist, and others as needed. Scope development will include itemizing pay item quantities, construction method recommendations, and costs.

3.8.3 County Drains

A county drain may require coordination with the County Drain Commissioner. If any of the following issues exist, it may be beneficial to coordinate with the County Drain Commissioner (these issues may be the result of modifications made to the stream by natural or human-caused factors):

- The downstream drain does not have enough capacity to handle the design storm.
- Debris sources upstream can be eliminated.
- Issues or problems exist outside of the MDOT ROW that affect the drain.

- Any future plans for modifications or expansion could be coordinated.

Scoping Engineers should contact the MDOT Drainage Coordinator in the Lansing Hydraulics Unit for assistance in confirming County drain locations or contact information for County Drain Commissioners.

3.8.4 Pump Stations

If pump stations exist within the project limits (depending on the proposed project work type), an inquiry to the Region Maintenance and Lansing Transportation Systems Management Operations (TSMO) staff is recommended to determine the need for any upgrades or improvements. The Region Maintenance and/or Lansing TSMO staff will provide an estimate for the proposed work.

The TSMO Division in conjunction with Region Maintenance staff have the primary responsibility for prioritizing which pump stations will be selected for rehabilitation. Their decisions are based on several factors, including the results from the latest condition assessments (especially the condition of the electrical and mechanical systems), the existing capacity of the pumps, any known significant maintenance and operational concerns, the need to relocate the existing facility, and finally the age of the pump station. The corridor approach should be used when selecting the pump stations to be rehabilitated to take advantage of lower mobilization costs and economies of scale. Alert the System Manager, Lansing TSMO staff, and Region Maintenance personnel about the proposed candidates so they may provide input or suggestions as to whether alternate pump stations should be included in the Call for Projects.

3.8.5 Post-Construction Stormwater Control Measures

MDOT is required to have a current National Pollutant Discharge Elimination System (NPDES) permit as a regulated operator of a Municipal Separate Storm Sewer System (MS4) to discharge stormwater to a water of the State. MDOT developed a Stormwater Management Program (SMP) that documents the processes MDOT will use to achieve compliance with the permit.

The post-construction stormwater management portion of the SMP requires that all MDOT projects be reviewed for stormwater runoff impacts to water quality and channel protection. If the project disturbs more than 1 acre of land and discharges to a water of the State or to another regulated MS4, Post-Construction Stormwater Control Measures (PC-SCMs) are to be incorporated to the maximum extent practicable (MEP). Projects discharging to a water body with an established Total Maximum Daily Load (TMDL) must provide PC-SCMs, regardless of the amount of land disturbance.

Depending on the project type, the required water quality treatment (sediment removal and/or treatment of a specific TMDL) and channel protection treatment (infiltration of additional runoff caused by increased imperviousness) may vary. The SMP lists the various MDOT project types and the applicability of water quality/channel protection treatment. Consult the Region Resource Analyst to determine what criteria exist for the project.

The cost of PC-SCMs should be accounted for in estimating a project during the scoping process. A PC-SCM Screening Tool has been developed to aide in developing cost estimates for stormwater controls. For the latest version of the tool, see the Drainage and Utilities SharePoint site. Include the results from the PC-SCM Screening Tool as part of the Scoping Package.

Projects in urban areas typically have an enclosed storm sewer system, and designing PC-SCMs in these areas can be a challenge in terms of both water quality and channel protection. PC-SCM costs are typically higher in urban areas due to the higher relative risks (utility conflicts, lack of ROW, built-out ROW) of placing PC-SCMs. Rural projects typically have open drainage systems (ditches) to handle stormwater. Although there can be specific project challenges, PC-SCMs are typically easier to include in rural projects because the existing drainage system can be used for stormwater treatment, sometimes without any design modifications. Adjust PC-SCM scoping estimates to account for the risks associated with the project location.

Projects that require infiltration PC-SCMs need to account for a geotechnical investigation of possible infiltration sites as part of scoping. If a project requires infiltration and the PC-SCM Screening Tool shows poor draining soils within the project limits, consider the feasibility of adding detention basins to provide the required channel protection treatment instead of infiltration.

Some PC-SCMs require specialized tools or knowledge to properly maintain them, so it is essential to reach out to Region Maintenance staff for their input to ensure that they are aware of the proposed PC-SCMs and that they have the capability, including equipment and staff, to maintain the PC-SCMs after installation.

Consult the Water Quality Specialist and/or Stormwater Program Manager on this issue.

3.8.6 Additional Stormwater Considerations

Special consideration needs to be given to stormwater outfalls that discharge into shared systems in the scoping process. Many of these shared systems require cost-sharing agreements with a local municipality or government entity that can require additional reviews and approval considerations that should be accounted for in the scoping of a project. Important items to consider when scoping projects with storm sewer outfalls that leave MDOT ROW include:

- Is the existing or proposed outfall part of a combined sewer?
- Is the project increasing impervious area and potentially creating an issue for the receiving body of water or storm sewer?
- Is there an existing cost-sharing agreement for the storm sewer outfall or is a new one needed?
- Are there any ordinances or stormwater design criteria in addition to MDOT standards that must be followed?
- Is there a Government entity such as Great Lakes Water Authority (GLWA) or U.S. Army Corps of Engineers (USACE) that must provide approval for the outfall?

3.9 Utilities (Public and Private) Section

Utility information is important to gather during the scoping process. This is true for both public and private utilities, and it is especially true for underground utilities. Review previous plans to investigate the presence of utilities on the project and identify municipal water and sanitary sewer lines that may need improvement within a similar time frame as the proposed project. This will provide early opportunities to coordinate the municipal utility work with the MDOT project, and early identification of potential utility relocations may be critical to the successful completion of the proposed project. Utility companies need adequate time to plan and finance utility relocations, particularly major relocations. Obtain a list of potential utility companies and

their contact information from the TSC Utility Coordinator to facilitate the information-gathering activities.

An evaluation on the merits of applying Subsurface Utility Engineering (SUE)-contracted services should be done so that appropriate funding may be allocated. If the need for SUE-contracted services is determined prior to the development of the design scope of work, SUE services should be included as part of that scope. Contact the MDOT Statewide Survey Support Section for assistance in developing an estimate for SUE services. See Chapter 9 of the RDM for more information.

A Preliminary Planning/Scoping Letter (Form 2483) should be sent to all the utilities requesting locations of the existing utilities. A Preliminary Planning/Scoping Letter also serves as notice to the utilities of a potential project. Depending on the project type, these existing utilities may be impacted by the proposed work. The potentially impacted utilities are identified in the Scoping Checklist and noted in the scoping documents. The utility section and information are not included on the Basic Scoping Worksheet because CPM-type work does not typically impact utilities.

Additionally, a field review of the site may identify the existence of utilities within the project limits. Using the above methods in conjunction with Preliminary Planning/Scoping Letter will aid in identifying potential conflicts and developing a more informed cost estimate for utility relocation. Private utility companies will be contacted during the design phase to request additional utility location maps and information.

MDOT will relocate municipal utilities (e.g., sanitary sewers, storm sewers, water main, power lines, power poles, streetlights, communications lines) at project costs (excluding betterments) only when they are in direct conflict with the proposed construction. Betterments are the responsibility of the municipality having jurisdiction over the utility. It is of particular importance to identify any water mains that contain lead (Pb) service lines or galvanized steel lines that were once connected to lead service lines, as these present additional complications for road construction methods, project phasing, and the involvement of the owning municipality. See Chapter 9 of the RDM.

For assistance in estimating municipal utility relocation work, specifically water main relocation work, contact the TSC Utility Coordinator and/or the Municipal Utilities and Road Design Unit.

Determine during scoping and the external engagement process whether municipal utility work will be included using non-project funds. If that is the case, the Project Manager will request from the municipality the sources being used and consult with the Contract Services Division (CSD) to make sure that any related requirements are appropriately addressed. See Chapter 9 of the RDM for more information on funding sources.

3.10 Sidewalk Section

Accessibility (i.e., curb ramps) is mandated by Act 8, P.A. of 1973. Federal mandates followed this State Law in conjunction with the ADA. The United States Access Board published the Americans with Disabilities Act Accessibility Guidelines (ADAAG) in 1991 and subsequently extended its application to public ROW in 1994. The Access Board later published the Public Right-of-Way Accessibility Guidelines (PROWAG) to address issues specific to public ROWs. See subsection 6.08.01 of the RDM and the MDOT ADA Transition Plan to see what aspects should be considered. On projects that are within local agency jurisdiction, also coordinate with the local agency's ADA Transition Plan.

3.10.1 Curb Ramp Requirements

The design of curb ramps and landings must follow Standard Plan R-28-Series. There are limited acceptable exemptions for not constructing a curb ramp per the standards on a road construction project if a sidewalk meets a curb in an obvious crosswalk situation. An "obvious crosswalk situation" would be at a street intersection, regardless of whether or not there are painted crosswalk lines or traffic signals. Section 6.08.05 of the RDM contains additional information regarding curb ramp requirements, including warrants for new curb ramp construction and curb ramp upgrades with a road project. In addition, ADA compliance should be reviewed for bus stops and on-street parking**.** These should be discussed with local officials.

3.10.2 Sidewalk

Sidewalks will seldom be constructed as a stand-alone project but will predominately be coordinated and constructed in conjunction with ongoing road or bridge work. Identification of existing sidewalk and curb ramp conditions should be noted in the Scoping Checklist. See section 6.08.01 of the RDM for additional information.

The local agency or MDOT can pursue grants or other federal funding to pay for sidewalks or non-motorized facilities. These grants can be coordinated with proposed projects or be developed as stand-alone projects, such as streetscaping or aesthetic projects.

In developing the proposed work, it is important to consider whether the existing sidewalk meets the current standards. Proposed sidewalks, ramp upgrades, or sidewalk additions should be noted in the sidewalk section of the Scoping Checklist.

See section 3.15.1 of this manual for information on non-motorized paths.

3.11 Railroad Section

Early notification of work that impacts railroad crossings is required so that the work can be evaluated and the best way to proceed with preparation for working with the railroad can be determined. Each railroad has different regulations, guidelines, and specifications that require knowledge of the railroad's operating procedures. Contact the Railroad Coordination Section during scoping so that its staff can assist with the anticipated needs for coordination at the crossing. The practice of gapping out crossings is not recommended, as it can be perceived negatively by the public and Federal Highway Administration (FHWA).

3.11.1 At-Grade Railroad Crossings

Determine whether any work is needed to any of the at-grade railroad crossings within the project limits. Evaluate the following:

- Is there a proposed change in roadway alignment at the railroad crossing?
- Is there a proposed elevation change of greater than 1 inch at the railroad crossing? This should consider the entire cross section of the roadway and not just the profile at the centerline.
- Are there any proposed widening or lane configuration changes?
- Is there a non-motorized facility crossing the railroad?

The crossing may need improvements to ensure safety at the crossing during the proposed work. Examine the crossing itself and see whether the gates, warning signs or pavement markings require upgrading or replacement. Discuss your findings with the Trunkline Crossing

Engineer to determine how the project will impact the crossing. Then develop an implementation plan on how to move forward. An entirely new installation may even be needed.

Coordinate with the Trunkline Crossing Engineer to determine the funding mechanism for the work. The cost estimate should consider the cost associated with maintaining train traffic during construction. The contractor must provide railroad flaggers for notification of train traffic during project construction. The Trunkline Crossing Engineer will review the existing location geometry to determine the additional traffic control required during construction. Apply the costs to maintain the train movements anytime the railroad crossing is within the construction influence area. This would include a project where the railroad runs parallel to the roadway and traffic on the side street is impacted by the construction. All railroad protection needs required for the project should be included in the cost estimate.

3.11.2 Grade Separated Railroad Crossings

Whenever there is planned work on or under a structure involving a railroad (for both a railroad over a highway as well as a highway over railroad structures) special considerations must be undertaken. This work is not limited to structure rehabilitation, but includes work above and below a structure, such as mill and resurface projects, underground utility installations, and delineator or guardrail replacement on structures over railroads. Reductions in vertical and horizontal clearances during or after construction will increase the costs associated with railroad review for both PE and CE. Permanent reductions in clearances should be avoided as much as is practical. Scoping Engineers should also evaluate the following items:

- Is the project going to need a temporary crossing over the railroad tracks or temporary supports on the structure?
- Does the project include a complete structure replacement?
- Is this an accelerated construction project (work hours greater than 8-hour days or after hours), and therefore require higher flagging costs?
- Are improvements required for a bridge to meet American Railway Engineering and Maintenance-of-Way Association (AREMA) standards or individual railroad requirements (i.e., splashboards)?

The results should be discussed with the Railroad Grade Separations Engineer to determine how best to reduce the impacts to the project at the grade separation.

3.12 Maintaining Traffic Section

3.12.1 Work Zone Safety and Mobility

The primary goals of the Work Zone Safety and Mobility (WZSM) Rule and WZSM Policy are to reduce crashes and manage congestion due to work zones. MOT costs should be estimated and mobility issues identified during the scoping process. Early identification of MOT methods and costs is a crucial step in making sure that the project is funded in a way that ensures the safety of all road users

At the time a road segment is being considered for possible improvements, the safety and mobility impacts on all users, including bicyclist and pedestrians of all abilities and those involved in work activities within the work zone, of the proposed project and corridor should be analyzed. Coordinate with the TSC Traffic and Safety Engineer to determine whether the project will be identified as a Significant Project as defined in subsection 2.01 of the WZSMM.

As part of the scoping process, the proposed project work type(s) should be analyzed and the various construction alternatives and MOT schemes available for each work type should be assessed. Each work type and construction alternative should include a MOT concept, taking into consideration existing operational factors within the project limits. The MOT concept should include typical cross sections, written descriptions of MOT concepts, detour routes and whether the project will adhere to the MDOT Mobility Restrictions Map. The MOT concept does not need to include other items listed in subsection 2.02 of the WZSMM. The MOT concept is also important for the environmental clearance process. Potential upgrades to detour routes must be examined as part of the overall project.

If a detour route is proposed, include any improvements to the detour route in the estimate, either before or after use by MDOT. Discuss the proposed detours with the TSC Manager and the construction staff. Not all detours require upgrades or modifications. The appropriate staff may have prior knowledge of the condition or agreements for a particular detour plan. It can also be beneficial to have a discussion with the local agency that will be involved with the detour.

Mitigation techniques are identified in the WZSMM. The MDOT Safety and Mobility Decision Tree, provided in the WZSMM, must be used for all MDOT projects on roadways with a posted speed limit of 70 mph or greater; its use is optional on all other projects. Subsection 1.02.08 of the WZSMM contains additional information on the Decision Tree Justification Process. The use of police presence and enforcement should be considered during scoping and costs estimated if included in the project scope. Alternatives for maintaining traffic and non-motorized user movements (where allowed) during construction should consider part width construction, detour routes, flag control, use of crossovers to shift traffic, and temporary pavement widening.

Scoping Engineers are responsible for ensuring that the proposed project scope addresses work zone safety and mobility. The Scoping Package should include the MOT concept and the cost estimates for the proposed Temporary Traffic Control Plan (TTCP) components.

If the project Transportation Management Plan (TMP) cost still exceeds the threshold limit of 25 percent after all mitigation measures have been evaluated, the Region Engineer and System Manager should be notified. The Region is then responsible for following the process detailed in 2.01.03 of the WZSMM.

3.12.2 Maintaining Non-Motorized Traffic

Chapter 6D of the Michigan Manual on Uniform Traffic Control Devices (MMUTCD) provides the requirements and guidance for non-motorized traffic accommodations in construction and maintenance work zones. Consult with the Environmental Clearance Coordinator to determine whether there are additional 4(f) impacts from this work.

Chapter 5 of the WZSMM provides additional information specific to the planning, scoping, design, and implementation of non-motorized traffic control.

3.13 Environmental Section

As projects are scoped, impacts to environmental items must be avoided if possible. If impacts cannot be avoided, minimization efforts must be incorporated into the design process. Mitigation efforts follow the avoidance and minimization steps of any environmental impact.

3.13.1 Early Environmental Coordination

Every project must be analyzed for environmental impacts through the National Environmental Policy Act (NEPA) process. The depth of analysis of a project is determined by the severity of its impact upon the environment, not by the size of the project.

During the scoping process, contact the Environmental Clearance Coordinator and provide details of the project, including the proposed footprint, for the risk review to begin. Early coordination is especially important to streamline the environmental classification and certification processes when a project may have known impacts to the following:

- Historic property
- Archaeological resources
- Threatened and endangered species
- Section 4(f)
- Section 6(f)
- Sensitive noise receptors
- Environmental justice
- National Wild and Scenic River
- Commercially Navigable Section 10 River or Stream
- Coastal Zone
- Agricultural properties (PA 116s)
- Potentially Contaminated Sites
- Public Controversy

This preliminary review will help determine the level of environmental analysis required by the NEPA clearance process. The coordination will help determine whether there are environmental items that will require additional EPE/PE budget. It is important to consider the schedule impacts of environmental work. The optimal obligation date of the EPE, PE, and ROW phases may be impacted by the environmental work.

Information from previously completed and approved Planning and Environmental Linkage (PEL) Studies, Environmental Impact Statement (EIS) or Environmental Assessment (EA) documents, and the review of any previous engineering reports will also be helpful in the scoping process. General scope information provided in the completed EA or EIS should be used as a baseline to perform the detailed scoping of the project work. The completed EA/EIS will also provide information about the projects constraints that need to be accounted for.

Contact the Environmental Clearance Coordinator if the scoping footprint exceeds the footprint that was previously cleared in the EA/EIS, as a reevaluation may be required.

See Chapter 10 of the RDM for additional information.

3.13.2 Environmental Permits

The Region Environmental Permit Coordinator should be contacted during scoping to determine whether any environmental permits will be needed on a project. Items that typically may require a permit if impacted are:

- Streams/rivers (culverts, bridges, ditches)
- Floodplains (grade changes, culvert/bridge work)
- Wetlands (widening at toe of slope, ditching, culvert work)
- Shoreline (lakeshore impacts)
- New outfalls to waters of the state

3.13.3 Streams and Rivers, State and Federally Regulated Waterways

If a culvert within the proposed project limits is part of a county drain, cold water trout stream, state-designated waterway, state-designated natural river, state-designated water trails, or federally regulated waterway, it should be identified during the scoping process. A federally regulated waterway could include the Great Lakes, rivers, streams, tributaries, and/or wetlands that are connected to a navigable waterway. Any proposed work for the culvert and/or ditch, drain, stream, or channel may require permitting. For additional information or assistance to determine whether a ditch or channel is defined as any of the above, contact the Region Permit Specialist and/or the Environmental Clearance Coordinator, or use the applicable quadrangle map.

If a project will involve a physical impact to a regulated watercourse, an Inland Lakes and Streams (Part 301) permit will be required. The cost for the permit requirements will need to be included in the project scoping budget. Stream mitigation includes either a new stream enclosure (culvert) greater than 100 feet in length or a stream relocation. For either of these items, include 3 percent if the construction cost is less than $1,000,000 or $100,000 if the project cost is greater than $1,000,000 for the permit requirements. Consult with the Region Environmental Permit Coordinator and/or Environmental Clearance Coordinator on this issue.

3.13.4 Floodplains

Per Part 31 of Public Act 451, the Michigan Floodplain Authority requires a permit when work is to be done in a regulated floodplain. Stream crossings that drain 2 square miles or greater are regulated by Part 31. The Lansing Hydraulics Unit will review projects that impact the regulated floodplain.

Floodplains may appear as the flat area above the stream channel where water is stored during large storm events. Federal Emergency Management Agency (FEMA) floodplain maps may identify some of the larger areas. If there are obstructions, buildings, or walls near the channel or within the floodplain area, they may obstruct the flow of water.

To consider the existing condition, the local municipality's ordinances should be reviewed. With floodplain areas within or adjacent to the proposed project limits, the impact of removal and replacement of fill material quantities may need to be considered to ensure that there is a net zero difference to the high-water elevation level as a result of the project.

3.13.5 Wetlands

If a project will involve significant widening in wetland locations, a review and analysis of the impacts needs to be done during the scoping process to determine whether mitigation will be required. If wetland impacts are anticipated to exceed ⅓ acre, consult with the Region Environmental Permit Coordinator to determine whether an EPE phase should be considered to work through the wetland mitigation plan.

Before mitigation is considered, every effort should be made to design the project such that impacts to existing wetlands are avoided or minimized.

3.13.6 Contamination

A Project Area Contamination Survey (PACS) is a report generated by the Region Resource Analyst/Specialist to help identify contamination within the project limits. A PACS does not need to be included in the Scoping Package for most projects. Consult with the Region Resource Analyst/Specialist to determine whether a PACS is warranted during scoping.

If a PACS is completed, the Region Resource Analyst/Specialist may recommend a Preliminary Site Investigation (PSI) to sample for additional information. The PSI would be performed during the EPE/PE phase of the project. If a PSI is recommended, the EPE/PE budget should include funds for this work. Consider an EPE phase if it is anticipated that the contamination may have a significant impact on the design.

3.13.7 Tree Removal and Replacement

Tree removal, clearing, and tree replacement quantities may be difficult to estimate at the scoping phase. The estimate should assume trees within the conceptual slope stake line will need to be removed.

If trees will be impacted, contact the Region Resource Analyst/Specialist to determine the replacement ratio.

3.13.8 Traffic Noise/Noise Barriers

The project scope of work will determine if a traffic noise study is required. MDOT is required to do a traffic noise study for all Type I federal-aid projects, defined in 23 CFR Section 772.5.

FHWA defines Type I projects as federal highway projects in a new location or a physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment or increases the number of through lanes or auxiliary lanes, except for when the auxiliary lane is a turn lane.

If a proposed project impacts an existing noise barrier, regardless of its classification as a type I project, an acoustical analysis of the existing noise barrier may be required.

Consult with the Environmental Clearance Coordinator to determine whether the project will require a traffic noise study. Include the cost to perform the traffic noise study in the PE or EPE budget. Consider an EPE phase if it is anticipated that a traffic noise study will be required.

The potential for a noise barrier depends on the traffic noise levels at the noise-sensitive land uses calculated from the traffic noise study, which will be unknown when the project is scoped. Noise abatement is recommended for impacted land uses when the abatement meets both feasibility and reasonableness criteria. Consult with the MDOT Air Quality and Noise Specialist and the Environmental Clearance Coordinator to determine whether the cost estimate should include a noise barrier. This should be listed as a project risk in the checklist, as it will likely not be known at the time of scoping.

3.13.9 Recreation Areas (4(f), 6(f))

Consult with the Environmental Clearance Coordinator if the project may impact a publicly owned park, trail, or recreation area.

Section 4(f) of the Department of Transportation Act of 1966 (23 [U.S.C. § 138 and 49 U.S.C. § 303) requirements apply to all transportation projects that receive funding or require other approvals by the U.S. Department of Transportation (USDOT).

Section 6(f) of the Land and Water Conservation Fund (LWCF) Act (36 U.S.C. § 59) prohibits property acquired under the LWCF from being converted to uses other than public outdoor recreation without the approval of the Department of Interior. Once an area has been funded with LWCF assistance, it is maintained for public recreation use unless the U.S. National Park Service approves a substitution property of reasonably equivalent usefulness and location, and of at least equal fair market value.

3.14 Right-of-Way Section

The need for additional ROW is an important consideration when scoping a project due to state and federal requirements, property costs, and schedule impacts of ROW acquisition. Consult with the Region Real Estate Agent to discuss the potential ROW impacts and obtain a cost estimate for the proposed ROW acquisition, including temporary and permanent ROW. ROW impacts can also change the Environmental Classification of a project and should be identified early to maintain the project schedule and budget.

MDOT ROW maps should be reviewed to determine the existing ROW and whether additional ROW may be required to construct the project. Additional ROW required for a project may include the acquisition of permanent (fee or easement) and/or temporary (consents) property rights. Both should be included in the scoping estimate. When requesting a cost estimate, MDOT ROW maps or GIS maps should be provided to Region real estate staff and should include the anticipated ROW needs (fee/easement/consent) and the estimated size or area of taking.

3.15 External Engagement

Consult with the Region Planner and TSC Manager to determine the external engagement level of effort necessary for the Scoping Package. External engagement may have significant scope and cost impacts. See Chapter 6 of this manual and the MDOT Guidelines for External Engagement.

Some external partners, such as the local agency within the project limits, have been requesting road diets of the roadway lane configuration, which may reduce capacity. The accommodation of all legal users of the roadway should be considered. A capacity analysis and the future use of the facility should be considered. If the project proposes a reduction in lane and pavement width, federal funds could be jeopardized. Consider using the MDOT Road Diet Checklist and including it in the Scoping Package as a supporting document.

3.15.1 Non-Motorized Paths

Items for non-motorized paths are similar to those for a roadway. The cross-sectional elements (i.e., width of the path, maximum horizontal curvature, and maximum vertical grades) will differ from roads. Check the elements against the information in Chapter 12 of the RDM and the AASHTO Guide for the Development of New Bicycle Facilities. Conveyance of drainage must be maintained. Consult with the Multi Modal Development and Delivery/Context Sensitive Solutions (M2D2/CSS) Subject Matter Expert, TSC Operations Engineer, Bicycle and Pedestrian Coordinator, and Non-Motorized Safety Engineer for additional information. Check with the local agency to determine whether they have a Non-Motorized Plan or a Local Road Safety Plan that includes non-motorized elements.

3.16 Bridges and Ancillary Structures Section

The National Bridge Inventory (NBI) condition rating of bridges within the project limits should be listed in the Scoping Checklist. The condition ratings for ancillary structures should be listed in the Scoping Checklist. Ancillary structures include retaining walls, noise barrier walls, cantilever and truss signs, culverts, poles (lighting, strain, etc.), and other items that can be found on the Ancillary Structures website. Chapter 4 of this manual includes additional details for scoping bridge and ancillary structure projects.

The Scoping Engineer should consult with the Region Bridge Engineer and the Ancillary Structures Unit if there is a bridge(s) and/or ancillary structure(s) within the project limits.

3.17 Miscellaneous Items Section

3.17.1 ROW Fence

The existing ROW fence may need to be removed and replaced on freeway projects or at clear vision corners on non-freeway projects. In addition to providing for the cost to remove and replace the fence, it would be advisable to include a Clearing for Fence cost if the project location has areas of woods or overgrowth.

3.17.2 Rest Areas

For project limits that are within 1 mile of a rest area, evaluate the condition of the ramps, entrances, and parking areas. If the condition warrants work to be done, estimate the surfacing, sealing, or pavement patches needed and include this in the scope and cost. Contact the Roadside Development Unit to determine whether any work on the facilities (buildings, water and sewer, or landscaping) should be included in the project. If work on the existing facilities is to be included in the project, the Roadside Development Unit will provide a cost estimate and possible funding for the proposed work.

For projects that include a roadside park, scenic turnout, weigh station or other feature within the project limits, evaluate the condition of the ramps, entrances, and parking areas. If the condition warrants work to be done, estimate the surfacing, sealing, or pavement patches needed and include these estimates in the scope and cost.

3.17.3 Carpool Lots

When an existing carpool lot falls within the project limits of a road project, determine whether the carpool lot requires any work such as preventive maintenance, upgrades, or lighting. Consult with the System Manager to assist in making this determination. See the CFP Manual for additional information.

If an existing carpool lot requires work as part of a road project or as a stand-alone project, estimate the cost for this work. The work on the existing carpool lot will depend on the existing surface (HMA or gravel) and the proposed surface. If paved, the existing carpool lot may require cold-milling prior to resurfacing. The existing pavement surface should be inspected to make this determination. If it is necessary to enlarge an existing carpool lot, consider additional pay items, including earthwork and possible ROW needs.

When a new carpool lot is considered, whether as a stand-alone project or as a project to be combined with a road project, estimate and program the work to construct the carpool lot.

Before estimating the cost to construct the new carpool lot, determine the need, location, and size of the lot. Consult with the System Manager to discuss the options for a carpool lot in a given area. Verify the location with the statewide Carpool Lot map. Also consider other factors when analyzing the location of a proposed carpool lot, such as the proximity to local transit systems, availability of property in the area, and any local ordinances that may play a role in the decision to build a carpool lot.

Once a location has been determined, the property is known to be available, and local ordinances will not prevent the project from being constructed, determine the size, shape, and pavement structure for the lot. Base the size of the carpool lot on the anticipated use and consult with the Carpool Lot Coordinator in the BTP. The shape of the lot will be based on the property available, the terrain, the size of vehicles that will likely use the carpool lot, and the overall size of the carpool lot. Also, consider traffic flow patterns when evaluating the shape and size of a carpool lot. Section 12.13 of the RDM discusses various aspects of carpool lot design, including the number and size of parking spaces, width for aisles, and other geometric issues. Consult with the Region Soils Engineer to determine the most suitable pavement structure for the proposed carpool lot.

When estimating an upgrade to an existing carpool lot or the construction of a new carpool lot, include items similar to those considered for a non-freeway roadway. Also include drainage items, permanent pavement markings, signing, underdrains, lighting, and any improvements to the approach work on the crossroad. Maintaining traffic is typically not an issue for a carpool lot, as the lot is generally closed during the construction phase of the project; however, trunkline lane closures and shoulder closures may be necessary for access during construction. Carpool lots should be evaluated to see whether they are suitable for bicycle racks to enhance their usability by other modes.

3.17.4 Unique Items of Work

During the scoping process, unique items of work should be identified. Depending on the type of work, construction staff and/or a specialist in the area may need to be consulted during the scoping phase to determine whether the proposed work is feasible and to identify any potential impacts of the proposed work.

4 BRIDGE SCOPING

A detailed bridge scope consists of a detailed scoping inspection (site review), determination of repair options, and cost estimates for each repair option.

As part of scoping a bridge project, the National Bridge Inventory (NBI) condition ratings and the American Association of State Highway and Transportation Officials (AASHTO) element condition ratings are typically collected during the routine bridge inspection and should be reviewed. The NBI and AASHTO element ratings are valuable to network bridge management and are useful in the general determination of what bridges should be scoped, but a detailed bridge inspection is needed to determine the appropriate fix type for a bridge. Each bridge and its surroundings must be visited by the scoping team to locate and quantify all areas of deterioration, document unique site conditions, and determine feasible repair options. Where necessary, high-reach equipment or an under-bridge inspection vehicle must be used to get close enough to inspect the structural components at arm's length.

If a road and a bridge job are being packaged together, the Scoping Engineer will need to discuss the project with the Region Bridge Engineer to plan, coordinate, and/or combine the two projects. Road corridor and interchange needs should be reviewed including a review of vertical clearance deficiencies and requirements, and any history of high load hits.

Bridge preventive maintenance projects are typically scoped 2 to 3 years prior to letting and rehabilitation and replacement jobs are typically scoped 5 to 6 years prior to letting. Jobs scoped more than 3 years before the start of design may require field verification of quantities and estimates just prior to or as part of the scope verification milestone to account for any changes in field conditions and possible scope changes.

For assistance in completing the Scoping Estimate or with any other items related to the scoping of a bridge project, consult the Region Bridge Engineer or the Bureau of Bridges and Structures (BOBS) Bridge Scoping Engineer.

4.1 Bridge Scoping Report

The Bridge Scoping Report is a stand-alone document that is prepared during the scoping phase (for review by Bridge Management and the Call for Projects Bridge Subcommittee) and included in ProjectWise with all the documents and items necessary to scope the structure.

During the detailed scoping, any findings that would impact NBI inspection data or element inspection data should be updated in a new inspection report created by a Qualified Team Leader (QTL). The inspection frequency should be set to ensure that the entire bridge is inspected within a 24-month cycle.

The Bridge Scoping Report consists of the following five sections and an appendix:

- Executive Summary
- Field Site Review
- Rehabilitation Options
- Summary of Repair Recommendations
- Maintaining Traffic/Mobility Summary
- Appendix containing photos, notes, and other items

The Executive Summary includes a statement of the recommended treatment for the bridge and the cost of the repair. The Executive Summary will be a stand-alone section; it will not reference other sections of the report but will summarize the content of the other sections.

The information to be included in the Executive Summary is as follows:

- Recommended repair option and cost.
- General condition and NBI ratings for item 58A (deck surface), item 58B (deck underside), item 58 (deck), item 59 (superstructure), and item 60 (substructure), with (in parentheses) any of the recommended NBI ratings that may apply based on the detailed scope evaluation that may differ from the latest rating provided.
- Percent of each type of deficiency (spall, delamination, and map cracking) of the deck surface, deck underside and substructure units. State whether the recommended repair option is consistent with the Bridge Deck Preservation Matrix - Decks with Epoxy Coated Rebar (ECR) or Decks with Uncoated “Black” Rebar and provide a justification as to why or why not.
- Statement of whether the structure is on or off the National Highway System (NHS).
- Statement of whether the structure is scour critical.
- Field-measured existing vertical clearance and any utilities that are on the structure.
- Reduced load posting.
- Non-redundant steel tension members.
- Operation issues to be combined with other work.
- NBI or non-NBI.

The Field Site Review section will include, at minimum, discussion of the following areas:

- Date inspection was performed.
- Site observations such as posted speed limit, adjacent features such as wetlands, businesses, airports, historic structures, or other things that may affect the design or cost.
- Overall assessment of the condition of the bridge, including an evaluation of the beam end thicknesses (webs and bottom flanges) taken during the site review. State the percentage of deck surface and underside deficiencies.
- Summary of substructure and superstructure repair areas and typical deck sections for widening options. Are any temporary supports needed for repairs? If so, the locations should be detailed in the field site report.
- Site issues, such as geometrics, vertical clearance, maintenance of traffic (MOT), utilities, and scour. In cases where no site issues that impact the rehabilitation of the structure were identified, a statement should be included that all areas were investigated and no issues were found.
- Any testing results and implications to the repair options. If no testing was performed, this will be stated in the report.
- Photo log showing each element and component of the bridge, including deterioration.
- Historical status of the structure.

- Special structural design features that may affect the repair options, such as lack of load path redundancy, nonredundant steel tension members, and category “E” allowable fatigue stress details (see AASHTO Standard Specifications for Highway Bridges, 17th edition, Section 10.3, tables 10.3.1A, 10.3.1B, and 10.3.1C for descriptions and illustrative examples)
- Vertical clearance and high-load hit history.
- Uncoated weathering steel.
- Areas of deterioration in concrete due to suspected alkali silica reactions and follow up testing or documentation.
- Bank erosion, scour, scour countermeasures, and/or unusual channel features.
- Presence of threatened and endangered species such as the Eastern Massasauga Rattlesnake, mussels, etc.
- Attachments to the bridge (signs, instrumentation, utilities, etc.).

In situations where the appropriate repair option is clearly indicated, the detailed scoping inspection can be scaled back; however, those performing the scoping are always encouraged to look for unexpected deterioration.

If during the Field Site Review, structural conditions are found that may cause the bridge to be load-restricted (such as holes in beams, broken prestressing strands) or that may require other immediate action (such as lane closures or emergency repairs to holes in the deck, temporary supports, false decking due to spalled concrete), the Scoping Engineer should follow the Request for Action (RFA) process and the Region Bridge Engineer and the System Manager should be consulted immediately. Documentation of the condition (such as beam measurements, photos taken) should be provided to the Region Bridge Engineer as soon as possible.

If the Scoping Engineer determines there is a need for material evaluation or more advanced non-destructive testing, the Construction and Technology Division or Region Materials Unit should be consulted. Examples of material testing include taking 2-inch or 4-inch concrete cores to evaluate the strength and material properties of the concrete. Examples of non-destructive testing include ultrasonic testing or dye-penetrant testing of steel to confirm whether cracks exist.

For additional information on field inspection of bridge elements, see the Michigan Structure Inspection Manual (MiSIM).

The Rehabilitation Options section of the report should include an evaluation of the site review findings, the preparation of and evaluation of a minimum of three repair strategies, including the preparation of cost estimates, and finally the selection of the best repair option. For each option, a discussion of the necessary improvements and the associated costs should be included. The report must discuss and state the reasoning and judgment for selection of the recommended option. This discussion should also include the reasoning behind the elimination of all other options, as appropriate. Additional information on repair strategies and how to estimate quantities is presented in Chapter 12 of the BDM.

Use the current Bridge Cost Estimate Worksheet for estimating bridge work.

The condition of the deck is usually a key indicator that work is needed, and often leads to a structure being considered for rehabilitation or replacement. However, there are other issues

affecting a bridge that may necessitate a rehabilitation project, and these include, but are not limited to, superstructure deterioration, substructure deterioration, scour risk, corridor coordination, capacity issues, and functional issues such as vertical clearance, horizontal clearance, and/or bridge width. Sometimes it is desirable for an entire corridor to be brought up to a specific condition level as part of an overall strategy.

For deck patching, calculate the area of deficiencies on the deck and then multiply by two, for the quantity that will be included in the estimate. Use this factor to account for continued deterioration. For any areas where full depth patching is suspected, the Scoping Engineer should provide the specific locations on the field site report.

It is important for the Scoping Engineer to consider the effects of alterations to the location of lanes, crown points, and overlays on deck thicknesses and loading for the structure. For deck replacements and overlays other than epoxy overlays, the crown will need to be brought to current standards, which may require a grade raise. (Note that correcting the crown with an overlay can result in the bridge having deficient load capacity.) Scoping Engineers should consult the Bridge Load Rating Unit for additional guidance when this is encountered. They should also consider the effects of estimated grade raises on the length of approach work needed to match the existing roadway and the potential issues that could impact permitting (if the bridge is a water crossing).

For the deck replacement, superstructure replacement, and bridge replacement options, it is necessary to address eliminating or correcting undesirable or deficient design characteristics (i.e., structural capacity, minimum vertical clearance, stopping sight distance (SSD), horizontal clearances, traffic volume capacity, functional operation, multimodal accommodations). In addition, the roadway geometrics should be reviewed with any new construction/reconstruction (4R) bridge work so that the bridge work does not preclude bringing the road system to standard with the current project or future road projects**.**

Reference the Bridge Deck Preservation Matrix - Decks with Epoxy Coated Rebar (ECR) or Decks with Uncoated “Black” Rebar and justify the agreement or disagreement with the rehabilitation option outlined by the Bridge Deck Preservation Matrix - Decks with Epoxy Coated Rebar (ECR) or Decks with Uncoated “Black” Rebar.

If plans of the existing structure are not available, rehabilitation alternatives will be severely limited, according to Chapter 12 of the BDM. To determine the adequacy of the superstructure, consult the Bridge Design Unit Leader assigned to the Region. Furthermore, additional Preliminary Engineering (PE-S) funds will be required for a structure survey.

Depending on the type of railing, it may be necessary to replace or retrofit the railing (see Chapter 12 of the BDM). For NHS routes, it may be necessary to replace a portion of the deck when replacing the barrier to achieve the required reinforcement lap lengths. Consult the BDM to estimate the amount of removal necessary. Consult the Bridge Design Unit Leader assigned to your Region for additional assistance.

For superstructure repairs, consider the type of temporary supports needed and whether new bearings are warranted, and protection of utilities (under the bridge) is required. If temporary supports are anticipated to bear on the substructure cap, obtain section loss measurements of the end diaphragms and geometric measurements to allow for the design of the short temporary supports. When evaluating rocker tilt, consult the Rocker Bearing Realignment Summary in the BDM for guidance on realignment. Closely evaluate the amount of deterioration and pack rust within the bearing areas and ensure it is properly addressed when doing rehabilitation.

For substructure repairs, consider the amount of spalling and delamination on substructure elements (i.e., piers, pier caps, or abutments). If 30 percent or greater delamination is identified, consider replacing the element.

Estimate and plan for temporary supports for spalling areas located under beams or when replacement of a substructure element is being proposed. The placement of temporary supports could affect and/or require slope paving removal, excavation, storm sewers, and guardrails. The proposed location may also require a temporary concrete barrier for maintaining traffic and protection of the temporary supports.

When scoping bridge projects for painting, identify lead-based paint systems and include appropriate items in estimates to deal with disposal. When the overall paint condition is poor, the bridge should be programmed for a full paint replacement. If a bridge has a zinc-based paint system, zone paint and spot painting should be considered over full paint replacement. Uncoated weathering steel (UWS) structures require further considerations, consult the Weathering Steel Section below. From a purely preservation standpoint, zinc-based paint systems should never need to be removed. Consult the Michigan Department of Transportation (MDOT) Bridge Paint Matrix for guidelines on how to decide what type of painting is necessary. For further assistance in the identification of a paint system, consult BOBS Construction Section.

When existing structure foundations are to be replaced, widened, or subjected to increased load, use previous plans and existing geotechnical data to conduct a structure foundation review to analyze the increased load. Include recommendations from the review in the ProjectWise documents and incorporate them into the project scope. The Region Bridge Engineer should consult on this review with the BOBS Geotechnical Services Section.

A Hydraulic and Scour Analysis may be requested and conducted for bridges and culverts crossing regulated watercourses during the scoping phase. Consult with the Lansing Hydraulic Unit to get a rough bridge opening size during scoping of a bridge replacement over a regulated waterway. An analysis will be required during the design phase for bridge work over waterways, widening in a floodplain, a raise in road grade, lowering a vertical clearance (resulting in a reduction of the hydraulic opening), and culvert extensions. Include this information in a hydraulic report, identifying recommended structure sizes and scour countermeasures. In addition, construction methods such as haul roads or causeways may require a hydraulic survey or further environmental investigation (e.g., a mussel survey). If this information is not obtained during scoping, it will be part of the design phase. Prior to any hydraulic analysis, coordinate a hydraulic survey with the Hydraulic and Region Surveys units to determine the cost and the time needed to complete this work.

If a bridge is scour critical, investigate mitigation measures or the replacement of the structure. Mitigation measures could range from installing a designed riprap section, installing articulating concrete block, or adding micro-piles to the structure foundation, and may require a hydraulic analysis for design. Early coordination with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) and Michigan Department of Natural Resources (DNR) may be needed if articulating concrete block is selected as a countermeasure. Work with the Region Resource Specialist to coordinate early discussions with EGLE/DNR. If mitigation measures are not feasible, the Region will either have to continue to manage the structure for scour per the Plan of Action over the long term or replace the structure. Discuss the feasibility of mitigation measures with the Lansing Hydraulics Unit.

4.1.1 Weathering Steel

Weathering steel is a corrosion resistant alloy that was commonly used on bridges in Michigan between the mid-1960s through the early 1980s. The most common alloy used was ASTM International (ASTM) A588, the specification for high-strength (50 ksi), corrosion-resistant material. In 1980, MDOT issued a moratorium prohibiting the use of unpainted ASTM A588 steel in bridges, guardrail, sign structures, and lighting towers. As a result, unpainted weathering steel should no longer be used in MDOT structures, including pedestrian bridges.

Special consideration should be given to existing bridges that have UWS structural members, as many factors can affect the performance of the material, including material debris building on the surface, the quality of the patina, leaking joints and environmental factors such as humidity and salt spray. When scoping these structures, evaluate the presence of debris on the surface, the color of the surface, the amount of section loss and the presence of flaking rust or pack rust. Pay particular attention to areas below joints and fascia beams over traveled lanes. Consider the following fix based on the condition:

- Little to no corrosion of the unpainted weathering steel, patina is uniform in color and texture and is light to medium brown. Consider rinsing/flushing the structure if exposed to salt spray from the roadway below, remove any debris buildup on the surface, and maintain or replace joints if necessary to prevent leaking.
- Evidence of minor corrosion such as surface pitting in the steel, patina is not uniform in color and texture. Consider zone paint if corrosion is isolated to joint locations or full paint if corrosion is more widespread, remove any debris buildup on the surface, and maintain or replace joints if necessary to prevent leaking.
- Consider replacing any pin and hanger assemblies that are made from UWS .

4.1.2 Alkali Silica Reaction

Alkali silica reaction (ASR) is a chemical reaction in either concrete or mortar. In ASR, aggregates contain certain forms of silica that will react with alkali hydroxide in concrete to form a gel that swells as it absorbs water from the surrounding cement paste or the environment. These gels can induce enough expansive pressure to damage the surrounding concrete.

Typical indicators of ASR are random map cracking and spalled concrete. Cracking usually appears in areas with a frequent supply of moisture such as close to the waterlines in piers, near the ground of substructure units, near joints, or in pier columns subject to wicking action. ASR mostly occurs in bridges built between the 1990s and early 2000s. Scoping Engineers should pay particular attention to bridge elements prone to ASR when scoping structures built in this era. If ASR is suspected in any bridge elements, the Scoping Engineer should consult the Region Bridge Engineer to determine if further testing of the concrete is needed to supplement the scope of the bridge.

In some cases, the deterioration or presence of ASR may warrant replacement of the element, in other cases the element can be coated to slow the deterioration. For decks, an epoxy overlay can be applied. For barriers, a silane treatment can be applied to the traffic face and top surfaces.

4.1.3 Lateral Bracing Guidance

When scoping a structure that is not being completely removed and where lateral bracing is present, incorporate the removal of the lateral bracing over traffic or non-motorized facilities into

the scope, regardless of whether or not it is loose. Verify with your assigned bridge design unit leader that the lateral bracing is non-structural and can be removed.

When scoping a structure that is not being completely removed and where lateral bracing is present and is structural and required, incorporate the replacement of the lateral bracing with bolted connections into the scope.

When scoping a deck replacement where lateral bracing has been previously removed, incorporate the addition of lateral bracing into the project. Verify with your assigned bridge design unit leader that that lateral bracing is needed as part of the deck replacement scope.

4.1.4 Additional Elements to Evaluate

The following bridge elements for steel beam and concrete beam bridges should also be reviewed during the field site review.

4.1.4.1 Steel Beam Bridges

- For pin and hangers, look for signs of corrosion, distortion, “frozen” pins, missing cotter pins and broken washer tack welds (consult the Region Bridge Engineer if any of these signs are found)
- Identification of previous beam heat straightening
- Signs of constraint induced fatigue (CIF)
    - Review MiBRIDGE to see if CIF details are noted within the fracture critical (NTSM) and fatigue sensitive inspection reports.
    - If CIF details are present, review the latest report to see if any recommendations or action items or RFAs were identified (review open RFAs). Consult the Statewide Large Deck and Fatigue Sensitive Bridge Inspection Engineer to determine if any retrofit work is needed.
    - Standard practice is only retrofit locations within non-redundant steel tension member (NSTM) structures or structures that have experienced a previous fracture at a CIF location.
    - Retrofitting CIF details is typically not required for redundant structures, except in instances of wide beam spaces (15 feet or more) or long spans (275 feet or more). The Transportation Service Center (TSC) should be engaged in the discussion as to whether or not it is preferred to proactively retrofit the bridge as part of a project or react in the event of a fracture to address the issue at that time. An unplanned project may have significant mobility impacts as retrofit will most likely require full closure of the structure to limit vibrations.
    - Consult the Statewide Bridge Scoping Engineer for an estimate of retrofit costs.
- Section loss greater than 20 percent, usually under deck expansion joints (section loss greater than 20 percent would generally warrant repair)
- Whether the existing plans specify stud or spiral shear developers
- Excessive rocker bearing tilt. Refer to BDM 12.08.09 for more information.
- The presence of lead-based paint

- When scoping a bridge with a vertical clearance of 14 feet 6 inches or less or with a history of over-height vehicle damage, consider a full cleaning and coating of the structural steel elements in the spans over traffic. Heat straightening of beam with lead-based paint is not desirable and proactively removing the lead at the time of a project will improve the ability of statewide crews to repair future damage. Consult with the Emergency Response Specialist in BOBS for clarification on this matter.

- The presence of thin webs
  - There are many bridges within the MDOT inventory that have “thin webs.” Thin webs are considered to be 3/8-inch thick. Even though the design of these structures is likely adequate at full section, a small amount of section loss may have significant impacts on the load carrying capacity of the structure. The Scoping Engineer should consider including work to properly maintain the coating system and address leaking joints or debris buildup that may lead to section loss. Special consideration should be made for UWS . If there is pack rust or section loss discovered in the web, a detailed inspection and updated load rating is recommended. The list of bridges with thin webs can be requested from the Bridge Management Section of BOBS.

4.1.4.2 Concrete Beam Bridges

- Delamination of beam ends, usually under-deck expansion joints
- Sole plate corrosion
- Beam types that may be susceptible to damage from deck removal operations
- Any temporary support details are clearly identified in the scoping report
- If bearing replacements are considered for the scope of work for a bridge, be sure to take into consideration current bearing design standards and if the work is feasible without impacting the substructure units.

4.1.5 Deck Soffit Deficiencies

As part of contract work involving deck rehabilitation, deck bottom deficiencies are recommended to be addressed via full depth patching. Scaling of loose concrete in the underside without patching may be acceptable under certain conditions where the work being performed is short-term and bridge replacement or a more robust rehabilitation project is expected within the next 10 years or is not feasible due to MOT requirements. For work involving a rigid overlay or full-depth deck patching, include metal mesh panels installed over traffic. The cost of these fixes should be compared to the cost of full deck replacement to determine the most economical fix.

5.1.6 Existing Piers

Chapter 12 in the BDM discusses the protection of existing piers within the clear zone. Piers with columns less than 36 inches in thickness/diameter, piers with one or two columns, piers with columns under each beam but no cap, and piers within 12 feet of from the edge of a lane (traveled way) may require retrofitting with a crash wall (strut). The scoping report should note if any of these conditions exist and include offset measurements.

The scoping report should also note if an existing filler wall exists (with columns at least 36 inches in thickness/diameter) and the height of the filler wall above the adjacent

ground/shoulder. Filler walls shorter than 42 inches should be noted as they may need to be extended up to a minimum height of 42 inches about the adjacent ground/shoulder.

The scoping engineer should consult with Region Bridge Engineer and the assigned Bridge Design Unit Leader if any modifications to the substructure elements should be proposed based on the scope of work or if a waiver for any modifications should be pursued thru the design phase of the project.

4.1.7 Roadway

As part of bridge scoping, include evaluation of pavement relief joints if the road is a concrete or composite section. Approach pavement relief joints should be included in all projects that contain a significant amount of concrete roadway (in excess of 1,000 feet) adjacent to a structure.

It is important to recognize that situations where Design Exceptions (DEs) will not be acceptable may exist. In those cases, include sufficient funds to cover the cost of the approach work in the estimate. Some factors that will affect the approach work on bridge jobs include:

- Length of work required for any crown correction wash out
- Length of work required to correct any geometric insufficiencies (i.e., horizontal and vertical alignments, superelevations, and transitions)
- Length of approach work required to correct any vertical clearance deficiencies or to increase the hydraulic opening
- Guardrail needed to tie into updated bridge barrier

If the approach pavement requires replacement, it must be included in the bridge scoping report and added to the estimate. For additional information and requirements, see the Road Standard Plan R-43-Series. The Scoping Engineer should also consult with the Region Pavement Engineer for general pavement cost assumptions so adequate funding is assigned to the scope for the bridge.

If a bridge is over a railroad, a railroad flagger will be required during construction over and/or near the railroad. The MDOT Office of Rail Railroad Coordination Unit should be consulted to collaborate on an estimate for the railroad coordination and flagging cost to be included in the scoping estimate.

Aesthetic treatments (concrete form liners) and concrete surface coating may be desirable in some locations and should be accounted for in the scoping estimate.

Other enhancements such as decorative fencing, lighting or gateway signing may be requested by external partners. These additional features may require cost sharing with the local agency and a maintenance agreement with the local agency will be required to identify responsibilities. Consult with the TSC Manager or TSC Operations Engineer for guidance on the inclusion of any additional decorative features.

The Summary of Repair Recommendations should state the recommended rehabilitation for the structure and the factors used in determining this recommendation. This section should also briefly discuss the effects of postponing the recommended improvements.

The MOT/Mobility Summary should include a discussion of the various options reviewed to maintain traffic during construction and a summary of the results of the mobility analysis and review that was done for the preferred maintaining traffic scheme.

MOT may dictate how the structure work is to be performed or may need to be revised to reflect how the structure work is being planned. During the scoping of a project, the Scoping Engineer should consult the TSC Traffic and Safety Engineer for assistance in determining the traffic control and associated costs required for the project. Final detailed maintaining traffic costs for construction should be documented in the Bridge Scoping Report and the Bridge Cost Estimate Worksheet.

4.1.8 Non-Motorized Facilities

Identify any bicycle or pedestrian infrastructure, demonstrated use, or future needs included in a regional non-motorized transportation plan near the structure. If bicycle or pedestrian needs are identified, an analysis needs to be completed to determine whether bicycle or pedestrian facilities are required or should be enhanced for the structure per 23 United States Code (USC) 217. Typically, where there is a demonstrated need, safe accommodations should be provided if the cost is less than 20 percent of the larger project. If there is an identified need, or future need, and safe accommodations are not provided, the reasons should be documented in the scoping report. Consult MDOT Bridge Design Guide 6.05.02 for deck geometry to accommodate non-motorized users. See the MDOT Complete Streets Policy for more information. If enhancement beyond the minimum requirements to provide safe accommodations for non-motorized users is required by the either the Region or TSC staff, or external partners, other funding sources may be needed to incorporate them in the project. The Transportation Alternatives Program (TAP) funding may be available to provide road and bridge improvements to accommodate non-motorized users. The Scoping Engineer should consult with the Region Planners for guidance and further information on pursuing additional funding.

4.1.9 Constructability

Though it may be difficult to fully recognize, any suggestions regarding temporary steel sheet piling, bypass pumping, turbidity curtains, and other constructability items should be noted in the scoping report.

The use of accelerated bridge construction (ABC) techniques should also be reviewed to determine whether ABC is appropriate. There can be significant costs associated with the use of ABC. As part of the Accelerated Bridge Preservation Technologies (SPR-1687) research, two spreadsheets were created to help bridge engineers directly compare construction costs and user costs to make decisions regarding remediation strategies for new and existing bridges. Contact the Region Bridge Engineer for more information on available spreadsheets.

4.1.10 Retaining Walls

A retaining wall is occasionally required on a project to hold back earth when a roadway is widened or right-of-way (ROW) is limited. For information and assistance with the cost estimate for retaining walls, consult the BOBS Ancillary Structures Section, Region Bridge Engineer, and/or the Lansing Bridge Unit. To complete the estimate for the retaining wall(s), they will need to know the project location, limits, and type of work; the anticipated location of the wall(s) and the reason for the wall(s); the soil conditions where the wall is required; and the location of existing utilities, which may impact the depth and location of the retaining wall. Another item that should be discussed is the need for any specific or special aesthetic treatment of the retaining wall for the area.

4.1.11 Emerging Technology

A statewide fund is available for emerging technology projects. This funding is primarily for bridge emerging technology projects, but at the discretion of the Bridge Committee, it may also apply to ABC projects. Regions are encouraged to submit projects that will utilize emerging technology in bridge construction. Information for the available emerging technologies is available from the BOBS Bridge Program Engineer.

5 ESTIMATING

This chapter describes the development of a complete scoping package. An accurate estimate is critical to successful project scoping development. The estimate developed as part of the project scoping process is used to program all phases of a project, including design, right-of-way (ROW), and construction for the project. The consequences of a poorly developed estimate could include insufficient funding, project cancellation or delay, the need to request funds from other sources, modifications to the project scope, a reduction in the project limits, and potential conflicts with the Region or statewide strategies and goals.

5.1 The Estimating Process

Resources are available within the Michigan Department of Transportation (MDOT) (Transportation Service Center [TSC], Region, Bureau of Development [BOD], Bureau of Bridges and Structures [BOBS] and Bureau of Field Services [BFS]) with expertise in specific areas that may be used when developing an estimate at the scoping level. When requesting information, be specific in your request. Provide all the information that may be beneficial in estimating the portion for which assistance was requested. Include a deadline for when the information is needed, allowing enough time for the specialist's work to be performed and for incorporation of the requested information into the final estimate.

An estimate should include all major aspects of the proposed project and be developed using individual pay items (consult the MDOT Standard Specifications for Construction). Some items can be developed using lump sum categories; see Section 5.2.15 for these lump sum percentages. As with other elements of the scoping process, the Scoping Engineer must clearly document any assumptions made during the estimating process. This will ensure that calculations can be properly checked and verified in the Quality Assurance/Quality Control (QA/QC) process.

5.2 Items to be included in the Estimate

This section provides descriptions of the various items included in estimates.

5.2.1 Project Identification

Always identify the project at the top of the calculation sheet or in the header of the Excel spreadsheet, and note whether there are different versions or different scopes. Often the System Manager may ask for two different scopes to compare costs. Identify these as different work types and different versions. The information should include the job information (e.g., route, control section [CS], physical road, mile points), name of the estimator, date the estimate was done, name of the reviewer, and the date the calculations were reviewed.

5.2.2 Grouping of Specific Pay Items

For the estimate at the scoping stage, it is not always necessary to compute individual pay items and quantities for every item. Some items may be grouped together and estimated as a lump sum amount or as a percentage of the project. For example, a cost for soil erosion and sedimentation control items should be included in the estimate for all projects; however, it is not necessary to break out each type of soil erosion control item. A single line item in the estimate for soil erosion and sedimentation and control items will indicate this work has been accounted for in the estimate.

5.2.3 Earthwork

Estimating earthwork volumes during the scoping of a project requires the Scoping Engineer to consider the fix type, the most likely profile for a project (cut or fill) and to determine a “typical” existing and proposed cross section for the proposed roadway. It is important that the Scoping Engineer consider any proposed ditching or vertical alignment improvements that would potentially be part of the project as they will have a substantial effect on the proposed cross section and resulting earthwork volume. Once a typical existing cross section is established, a depth of excavation can be drawn on this section (including any proposed ditching) by considering the likely profile and the overall depth of the proposed pavement section. This section can then be used to calculate a representative area of excavation that can then be multiplied by the project length to determine a volume of earthwork for excavation. A similar process can be followed using the proposed cross section to determine an area and resulting volume of earthwork for embankment.

5.2.4 Subbase

If a project requires a proposed subbase, this should be estimated by drawing approximate existing and proposed cross sections and determining the area of the subbase for a typical cross section, then multiplying the area by the length of the project.

5.2.5 Aggregate

If aggregate is required, use a method similar to that used for a subbase, with the appropriate depth.

5.2.6 Shoulder Gravel

If a project requires shoulder gravel, it is important to forecast the need based on the condition in the year of construction as opposed to the condition at the time of scoping. Evaluate the existing level and slope of the gravel shoulder and the proposed fix for the roadway. Consider any additional thickness that would be required for cross slope correction or any proposed grade raise of the pavement surface to determine an average depth of gravel. This depth can then be used with the appropriate project length and width of placement to determine an estimated quantity.

5.2.7 Contaminated Soils

Estimation of proposed contaminated soils should be included at the scoping phase of a project. This item is best estimated by coordinating with the Region Resource Analyst and by using information in the Project Area Contamination Survey (PACS). The Region Resource Analyst can also advise as to whether additional budget should be included in the design phase of the project for a Preliminary Site Investigation (PSI).

5.2.8 Hot Mix Asphalt Wedging

Many roadway rehabilitation projects and some resurfacing projects require the addition of Hot Mix Asphalt (HMA) wedging to fix anomalies in cross slope or superelevation of the roadway section. Estimating accurate quantities for HMA wedging at the scoping phase can be difficult, and often requires a more advanced analysis of the existing and proposed conditions than is typically performed. It is best practice for designers to calculate the difference in thickness to be made up by wedging and to determine an equivalent average thickness for each area. This

thickness can then be converted into an application rate of HMA to be multiplied by the pavement area to be wedged.

5.2.9 Joint Repairs

It may be hard to determine whether a repair should be partial-depth (Detail 7) or full-depth (Detail 8), and this may need to be determined during construction while the deteriorated material is being removed. If project history is not available or there is not enough information to determine whether a Detail 7 or 8 joint repair will be needed, a best practice for estimating purposes can be used, such as 30 percent Detail 7s and 70 percent Detail 8s.

See Chapter 6 of the RDM for additional guidance on individual pay items and estimating techniques for both asphalt and full-depth concrete joint repairs.

5.2.10 Guardrails

Projects that include a pavement overlay require the height of the existing guardrail be reviewed to make sure they are within existing height tolerances after construction. Guardrail runs not meeting the appropriate height requirements after construction should be reviewed to determine if adjustment or replacement is the appropriate solution.

If a guardrail is to be removed, replaced, and/or installed, the length of the existing guardrail to be removed can be determined from field measurement or aerial imagery. Current guidelines may require longer guardrails, so the guardrail length should be estimated using the existing guardrail length, the additional length to be added based on a field review, and the appropriate guardrail endings.

Guardrail runs should be reviewed for any washouts or erosion that is occurring so the cause can be addressed. Berm grading may need to be included in the estimate to allow for proper drainage and to prevent future washouts.

5.2.11 Culverts

Individual culverts estimated for replacement should be estimated based on existing length and a proposed increase in size. Changes in design criteria have resulted in the increase of pipe size for culvert replacements, which needs to be accounted for by the Scoping Engineer. A best practice for estimating basic culvert replacements is to assume an approximate increase in size of 2 pipe sizes from the original pipe. For example, an existing 24-inch culvert would be scoped as a 36-inch culvert and a 30-inch culvert would be scoped as a proposed 42-inch culvert. Depending on roadway configuration, additional costs may apply for maintaining traffic and flow in the pipe during construction. When estimating culverts larger than 48 inches or culverts conveying streams or other regulated water bodies, Scoping Engineers should consult the Lansing Hydraulics Unit to determine if additional hydrologic or hydraulic analyses need to be performed to properly determine the proposed culvert size.

5.2.12 Storm Sewer

Accurately estimating proposed storm sewer drainage systems can be complex and estimates may vary based on several factors. Some of the factors to consider are roadway width, roadway slope, number of drainage outfalls, and local requirements for stormwater. Because estimating enclosed drainage is site-specific, the Scoping Engineer should consult the Lansing Hydraulics Unit to discuss the proposed project and a methodology for estimating the new system. The following basic estimating method assumes an independent trunk sewer; calculations with a

combined curb line trunk would vary from this method. Consider videotaping existing storm sewers prior to estimating.

To produce a basic estimate of storm sewer system, the Scoping Engineer should take the length of the project that will have enclosed drainage and divide it by 200 feet. This value can then be tripled to provide an assumed number of inlet catch basins and trunk catch basins for the project. Next, take the original value of the roadway length divided by 200 feet and multiply the proposed width of the roadway by this value. This value can then be divided into thirds. Each third represents a size of proposed storm sewer drainage lead pipe. It is recommended to assume that one-third of the pipe will be 12 inches, one-third will be 18 inches, and one-third will be 24 inches is recommended. Finally, take the length of the project and divide it into thirds. Each of these thirds represents a different size of trunk storm sewer. It is recommended that one-third of the pipe for the project be assumed to be 24 inches, one-third be assumed to be 36 inches, and one-third be assumed to be 48 inches.

5.2.13 Slope Restoration

An overall slope restoration quantity should be computed with less concern over which type (type A, B, C or D). The estimate should assume 10 feet beyond the estimated grading limits.

5.2.14 Night Work

If night work is anticipated for the project, a pay item to compensate the contractor for providing the necessary lights for the project site should be included in the project estimate. Scoping Engineers should coordinate with construction staff to determine whether a project will need lighting and include the item where applicable.

5.2.15 Lump Sum Pay Items

Some of the pay items that MDOT uses have a lump sum pay unit and are based on a percentage of the project costs. Although not all projects require all these items, many projects do require the inclusion of these items. It is important to determine at the scoping phase which pay items should be included and which are not necessary to produce a thorough and accurate estimate of project costs. Lump sum pay items are provided in the MDOT Proposal Lump Sum Calculator. A brief descriptions of common lump sum items and their use are provided below.

5.2.15.1 Mobilization

Mobilization is to reimburse the contractor for preparatory work and operations on the project. This includes all costs involved with moving personnel, equipment, supplies, and incidentals to the project site, as well as the cost of establishing the contractor's offices, buildings, and other facilities necessary to undertake the work. It also includes other work and operations needed or expenses incurred prior to work on the project site. Mobilization applies to all projects and is a maximum of 10 percent of the total project cost.

5.2.15.2 Minor Traffic Devices and Traffic Regulator Control

For a description of Minor Traffic Devices and Traffic Regulator Control, see Section 812 of the 2020 Standard Specifications for Construction.

5.2.15.3 Landscaping or Tree Planting

For projects with landscaping and/or tree planting, pay items for site preparation and watering, and cultivating, first and second season should be included.

5.2.15.4 Pavement Cleaning

Pavement cleaning may be required on HMA resurfacing projects and surface seals. See the RDM, 6.03.04B.2 for more detail.

5.2.15.5 HMA Longitudinal Joint Density

Scoping Engineers should ensure that projects with HMA surfacing include longitudinal joint density in their project estimates. Longitudinal joint density is an incentive payment for achieving density of the HMA above a defined threshold at paving joints in the layers of HMA. It is important that Scoping Engineers adequately consider the potential incentive payment from this item as well as the additional tonnage of HMA that can potentially be placed during paving operations as a result of construction techniques outlined in the special provision for Acceptance of Longitudinal Joint Density in Hot Mix Asphalt Pavements.

5.2.15.6 Safety Edge

Installation of Safety Edge is outlined in Chapter 6 of the RDM. Scoping Engineers should account for the impacts to surface paving quantities in areas where safety edge is required.

5.2.15.7 Project Cleanup

Project cleanup involves cleaning up the project area, including roadsides, prior to final acceptance. Project cleanup includes removing all debris (such as old fences, fallen timber, logs, and rubbish) within the ROW, up to 50 feet beyond the grading limits. This work also includes cleaning out all culverts, sewers, and drainage structures that contain sediments from the contractors' operations.

5.2.15.8 Contractor Staking and Staking Plan Errors and Extras

Contractor staking on a construction project is the surveying and staking work to lay out the alignment and other control points for the contractor. The inclusion of contractor staking should be discussed with the TSC Construction staff.

5.2.15.9 Stormwater Management Post-Construction Best Management Practices

Projects that disturb an acre or more are required by MDOT's National Pollutant Discharge Elimination System (NPDES) permit to treat stormwater runoff for water quality and channel protection using Post-Construction Stormwater Control Measures (PC-SCMs). The PC-SCM Screening Tool is to be used during scoping to develop potential PC-SCMs and their associated risks and relative costs. For the scoping estimate, the cost for these PC-SCMs is included as a lump sum pay item.

5.2.15.10 Quantities and Rounding

Round quantities for all items to the nearest 10 after computing the total. Weights for conversion from cubic yards to tons are as follows:

- Aggregate = 4,000 lbs/cyd or 110 lbs/syd*in

- Shoulder Class II = 4,000 lbs/cyd or 110 lbs/ syd*in
- Cold-milling = 4,000 lbs/cyd or 110 lbs/syd*in

Note: Weights for Aggregate and Shoulder Class II are for compacted in place (CIP).

5.2.15.11 Contingency

In general, all project estimates should include some amount of contingency to account for the unknowns that may arise during the detailed design of the project. Contingency values account for changes in conditions, standards, specifications, and policy implementations that occur between the time the project is scoped and the time of construction, as well as other minor work items not easily estimated at the time of scoping.

Table 5-1 provides recommended contingency percentages based on the size and complexity of projects. Apply the contingency percentages to the scoping estimate after a project construction subtotal has been calculated.

The following definitions apply to Table 5-1:

- High-complexity projects are generally characterized as major reconstruction, major rehabilitation, major widening, realignment, and/or new construction projects. Such projects may have variable and complex cross sections and/or site conditions and may have an increased potential impact on environmental and/or ROW factors.
- Medium-complexity projects are characterized as minor rehabilitation, resurfacing, and minor widening projects. Such projects may have consistent cross sections and/or site conditions, and typically have minimal impacts on environmental and/or ROW factors.
- Low complexity projects are usually characterized as preventive maintenance and/or minor repair type projects with little or no widening. Such projects have consistent cross sections and/or site conditions and have little to no impacts on environmental and/or ROW factors.

Table 5-1: Suggested Contingency Factors for Projects

Approximate Project Construction Cost *	Approximate Project Construction Cost *	Project Complexity	Project Complexity
	High	Medium	Low
≤$5 Million	10%	5%	5%
$5 Million to $10 Million	7%	5%	5%
≥ $10 Million	5%	3%	3%

* Note: Contingency percentages are applied to the construction subtotal. The construction subtotal is the sum of construction items prior to the EPE (Early Preliminary Engineering), PE (Preliminary Engineering), CE (Construction Engineering), Inflation, and Incentive costs. These costs are added to the total project cost.

5.2.15.12 Early Preliminary Engineering

Early Preliminary Engineering (EPE) includes work related to environmental clearance and classification of the project, traffic analyses and studies, design surveys of the project, alternatives analysis, the scoping of the project, the operation of a transportation system component, or other work that does not fit other project phase definitions. Depending on the

project type, complexity, and the type of environmental clearance, EPE work can be a significant cost for project development. Coordinate with the System Manager and Environmental Clearance Coordinator for help in estimating EPE costs.

5.2.15.13 Preliminary Engineering

Preliminary Engineering (PE) includes all design activities (e.g., surveys, soil investigations, identification of ROW needs, drainage, hydraulic analysis, environmental review, surveys) and plan preparation performed for the development of the construction plans and specifications for a transportation project.

Guidance for estimating PE costs is provided in the MDOT Highway Call For Projects General Information & Program Instructions Manual (CFP Manual). The percentages provided are updated annually.

5.2.15.14 Construction Engineering

Construction Engineering (CE) is the management of a project during the construction phase. This includes, but is not limited to, specification and plan interpretation, cost control, contract payment, project documentation, material testing, and quality assurance.

Guidance for estimating CE costs is provided in the CFP Manual. The percentages provided are updated annually. The TSC Construction Engineer can provide additional input on the CE cost estimate.

5.2.15.15 Right-of-Way (ROW)

If a project requires any proposed temporary or permanent ROW, consult the Region Real Estate staff to aid in the development of the ROW estimate. Region Real Estate staff will need project maps (ROW maps from the MDOT Plan Development website) to estimate ROW costs. During the scope development, identify on the map areas where proposed fee ROW, air rights, drainage easements, driveway, or grading impacts are anticipated. Indicate the type of ROW anticipated and the approximate dimensions of the impact to aid Region Real Estate staff in developing an accurate estimate.

5.2.15.16 Utilities

A separate utility phase should be estimated and programmed for projects that will need to include relocation of municipal utilities in direct conflict (excluding watermain and sanitary facilities) or private utilities with right of occupancy prior to construction. Examples such as municipally owned power and lighting or petroleum transmission pipelines should be identified when scoping projects and appropriate funding allocated for relocation. Municipally owned watermain and sanitary sewer relocations required for direct conflicts or indirect conflicts should be estimated at the scoping phase and included in the construction estimate for the project. Consult the TSC Utility Engineer or Chapter 9 of the RDM for more guidance on utility relocations and estimating.

5.2.15.17 Inflation

The CFP Manual provides direction for inflation, which is updated each year. The inflation calculations may change from year to year based on the economy, material availability, and other factors. The Bureau of Transportation Planning (BTP) attempts to provide the Regions with a value that will be appropriate for the transportation program.

6 BEST PRACTICES

This chapter describes the best practices that have been proven to be helpful in the scoping process.

6.1 Always Start Fresh

When beginning a scope or an estimate, always start fresh. The use of old documents, estimates, spreadsheets, or computations can result in errors, duplications, or omissions. Unit prices often change, quantities are unique to a project, and the pay items to include in a project may be unique to that project.

6.2 List Your Assumptions

Document all assumptions made during the scoping process, whether it be an assumption about the deterioration rate of the road or structural element or the number of driveways that might require a Consent to Grade. Assumptions that are not documented in the scoping process will need to be re-addressed later during the design process.

Quality Assurance/Quality Control (QA/QC) reviewers and designers cannot account for or follow assumptions that were made and not documented. Listing the general assumptions should occur at the beginning of the calculation sheets. Other assumptions that come up as the estimate progresses may continue throughout the calculations sheet but should be stated in words and stand out so they are easily seen. If using spreadsheets for calculations, assumptions should be typed and placed in the file such that they will be displayed and/or printed whenever the file is viewed.

6.3 Be Organized

Keeping organized notes and files allows for a straightforward, understandable review. When scoping multiple projects at the same time, it becomes more critical to organize the work so that notes for one project do not get mixed with another project. Placing the project description on each sheet of paper or each computer document will help keep things organized. Include page numbers (1 of 4, 2 of 4, 3 of 4, and 4 of 4) on each document. This also helps the reviewer know that all documentation has been provided.

6.4 Documentation

Documenting all items discussed during the scoping process is beneficial because items discussed and decided upon do not get revisited later in the scoping or design process. Good documentation enables the designers to see why decisions were made and reinforces the original scope, which is connected to the programmed budget. For recommended minimum documentation levels based on project type, see Appendix B of this manual.

6.5 Van Tours/Field Reviews

A field visit of the proposed project should be performed to ensure the accuracy of existing information compared to actual field conditions. Successful van tours and field reviews typically consist of a multidisciplinary team of subject matter experts familiar with the scoping process. Document unique items with photographs and verify the accuracy of previous plans if they are used in the scoping process. Be sure to document and measure any areas of pavement distress

that require additional corrective action beyond the typical project fix. The Scoping Engineer should prepare a list of questions and items prior to the field review.

6.6 Asset Management Mapping

A variety of information for developing an accurate scope is available to the Scoping Engineer through Michigan Department of Transportation's (MDOT's)current asset management software. Available layers include culverts, signing, guardrail, and ancillary structures, to name a few. For more information on what is available on the current asset management software, contact MDOT's asset management specialists.

6.7 Scoping Team and Review Meetings

Hold Scope Review meetings with the scoping team to discuss the progress of the scoping, areas that may need additional information, areas that need assistance from a technical expert, and the schedule for completing the scoping package. It is important to get and keep support areas engaged in the scoping process. Multidisciplinary teams bring diverse views and perspectives to the group and together can produce a stronger, more coherent scope. Document meetings, recommendations from specialty areas, and other information where direction is decided or recommended.

6.8 Input from Other Disciplines

Gathering input from specialty areas or disciplines will make a scoping package more complete. Some of the specialty areas to consult for input, advice, or guidance include Traffic and Safety, Construction/Delivery, Utilities, Surveys, Environmental, Real Estate, Rail, Hydraulics, Geotechnical, and Maintenance.

6.9 Storage Locations for Scoping Documents

Save all scoping documents on ProjectWise in the Region scoping folder. Folders should be organized by County or Transportation Service Center (TSC), depending on the Region preference. This system provides more flexibility than arranging folders by year, as often scoping packages that are not selected to become projects in one Call for Projects (CFP) cycle can be updated and used for a future CFP. Folders within a particular geographic boundary can be further divided by route and location to ensure all materials and supporting documents are stored with the appropriate project. At a minimum, the cost estimate and Scoping Checklist should be saved in the scoping folder. Include a link in the Scoping Checklist for previous plans.

6.10 Ask Questions and Share Ideas

Ask questions of your supervisor, your co-workers, and colleagues in the office, Region, or other MDOT support units. Take notes as you find answers to your questions. Note who provided the answer to the question or where the answer was found. The notes will help if you encounter a similar situation in the future.

Share ideas with other people. Unique ideas that work on one project may prove useful to subsequent projects. Best practices are developed and refined through the sharing of ideas.

6.11 Early Identification of Maintenance of Traffic Needs

The ability and method to maintain traffic during the construction of a project may impact the proposed fix for the project and the cost of the project. Early discussions on the options for

maintaining traffic compared to the proposed fix options should take place during the scoping phase.

The cost to maintain traffic by shifting traffic may be quite different from the cost to provide flagging sequences during construction. Likewise, the cost to maintain traffic on a detour route may be very different from the cost to widen the existing road and acquire right-of-way (ROW) for the temporary pavement. For work on a structure or bridge, consideration will need to be given as to whether work on a structure can be done while traffic uses the other half of the structure (part width construction and assuming the structure is wide enough) and whether the structure will need to be closed during construction or whether a temporary traffic signal can be installed to maintain one lane of traffic across the structure. Each of these options has a different cost associated with the work.

6.12 Anticipating the Need for ROW

When a proposed project includes widening, review the ROW maps to see the width and type of existing ROW. From the ROW maps, determine any areas where the existing ROW is in close proximity to existing travel lanes and pedestrian features on either side of the roadway. During the field review of the project, pay special attention to these areas to determine the need for proposed ROW and/or Consents for the proposed project.

Projects with proposed intersection improvements, either the addition of right turn lanes or radii improvements, will require careful examination of the existing ROW. Widening may require an existing ditch to be pushed out to beyond the existing ROW. As it is MDOT's practice to include the ditch bottom within the ROW, additional ROW may be required. Additionally, the work of increasing a radius may create the need for additional ROW and possibly Consents to Grade.

Mark the locations for proposed ROW or Consents to Grade on the ROW maps and include this information in the scoping package. These marked ROW maps will be useful when requesting the Region Real Estate staff to provide an estimate for the ROW needs of the project.

6.13 External Engagement Opportunities

On projects likely to require external engagement, review the MDOT Guidelines for External Engagement and coordinate with the Region Planner and TSC Manager to determine the level of external engagement necessary for the scoping process. External engagement is an opportunity to discuss schedules and potential joint ventures to improve the overall transportation system. Special consideration should be given to items requested by local governments that require cost participation, agreements, grant applications, and construction coordination.

Identifying existing combined sanitary/storm systems within reconstruction areas early and having early external engagement can help prevent delays in design. Guidance on cost participation for items such as water mains, sanitary sewer systems, and parking lanes can be found in the RDM. Notes from meetings with external partners should become part of the scoping documentation.

6.14 Corridor Approach to Project Coordination

When considering work to be done on a roadway segment, review opportunities and needs within that corridor. Consider packaging projects to reduce impacts to traffic. This may also reduce the cost for maintaining of traffic, mobilization, and eliminate re-work.

6.15 Corridor Data Map

During the planning and development of a project, it is helpful to have a map of the corridor or area that shows the different work that will or has taken place in that segment according to the transportation program. These items could include past, current, and future work, condition data, and work that will be done by local agencies. This information will help with planning the proposed work, maintaining traffic, addressing mobility issues, and managing the overall coordination of work in the corridor.

6.16 Constructability

Understanding the constructability considerations of a project can help ensure the quality of the project and reduce cost overruns. There are opportunities during the scoping phase and the design phase to perform a constructability review of the proposed projects. The constructability review should consider the entire scope of work and schedule.

6.17 Photos

The inclusion of photos or video in the scoping document is very useful. Images from Road Asset Viewer or Google Maps can be valuable tools and may be printed and included in the Scoping Package. Some items that may be helpful to include are the following:

- Areas showing unusual deterioration or distress relative to the remainder of the road, bridge, or culvert
- Areas with erosion issues or slope stability concerns
- Roadway and/or shoulder conditions
- Areas of proposed work for roadways that may be needed to describe or show the relative location of the feature (e.g., intersections, railroad crossings, driveways, guardrails, drainage structures, culverts, tree lines, sidewalks [or worn paths indicating pedestrian activity], bridges, bridge railings, bridge approaches, utilities, ditches, waterways, building locations relative to ROW/roadways, signs, and ROW fences)
- Areas of proposed work for structures, including elevation views (both sides of a bridge), deck surfaces, joints, railings, approaches, undersides of decks, superstructure elements (e.g., beams, bearings, pin and hanger elements), substructure abutments (including slope protection) and piers, waterways and railroad tracks, signs (e.g., vertical clearance signs, load posting signs), and quadrant photos
- Deck surface photos (if required): an aerial view taken from a height of at least 12 feet above the surface of the deck

6.18 Cross Sections

Get representative cross sections, early in the scoping phase, to accurately visualize the impacts to curb elevations when trying to do a mill and resurface. Replacing curb lines, superelevations, and old parabolic crowns can add increases to curb elevations beyond the anticipated mill and overlay. This will impact drainage when the ground needs to drain toward the roadway. A sidewalk close to the curb can cause further drainage and sidewalk issues. Existing pavement and curb widths need to be carefully considered, as even a slight widening to construct a new curb and gutter can adversely impact green spaces and sidewalks. The impacts to the curb lines may indicate a need for more sidewalk replacements or potential curb islands in paved areas and may also increase impacts to driveways.

6.19 Previous Plans

Research previous plans to get stationing and cross sections. Measurements can be obtained using a digital measuring instrument (DMI) in the field and from aerial images. Use a spreadsheet and break down the job into segments, using station ranges where width changes and station equations occur. With these lengths, it is useful to calculate the square yardage of the paved shoulders and the lanes separately. Shoulders may have a different fix than the lanes, so separating these measurements is useful. Calculating everything based on square yardage works well because it can be translated easily into any fix for both square yardage and tonnage pay items.

6.20 Quality Estimates

For Capital Preventive Maintenance (CPM) or resurfacing jobs, putting in a little bit of extra time on the cost estimate can save time during the design phase. If the spreadsheet and quantities are accurate and easy to follow, the estimate spreadsheet can be used as a starting point for design.

Consider using Computer-Aided Drafting and Design (CADD) based off of aerial imagery to determine quantities. Use imagery to quickly and accurately trace areas for approach work. Sketch out the guardrail lengths using the aerial imagery to get quantities for berm grading and guardrail height adjustments. Depending on the job, this can go a long way toward providing an accurate estimate. Using CADD to get some of these supplementary quantities eliminates guesswork or time spent measuring in the field.

Assume a 1.5-inch edge drop exists in the field when calculating shoulder gravel quantities. This is usually the case and provides a conservative quantity for the shoulder gravel in design. In addition, this edge drop may change from the time of scoping to construction.

Using a spreadsheet, rather than hand calculations, for the cost estimate is a good way to eliminate simple calculation errors. Unit price adjustments (or other adjustments) can easily be made when using a spreadsheet. Changes can be made fast if needed and what was estimated is obvious.

Usually, surface areas are first generated from the office, either using previous plans, the MDOT Pavement Historical Database (PHD), and/or aerial images. It is important to make sure proper widths are used. Field staff may be able to confirm widths by obtaining actual measurements.

Unit prices can have a significant impact on scoping estimates. Use the most recent Weighted Average Item Price Report.

6.21 Capital Preventive Maintenance Tips

Make sure items are included for pretreatment (e.g., patches, milling, joint repairs, edge trimming, scratch paving) and for spot treatment areas that are already showing signs they need additional work. Additional items may be necessary for guardrail repairs, height adjustments, or replacements. It is important to consider any overlay thicknesses and height tolerances for existing guardrails when estimating this work.

Include a contingency to account for pavement deteriorating prior to the planned construction year (usually projects are scoped 3 years away from construction).

Evaluate sidewalk ramps for Americans with Disability Act (ADA) compliance and requirements for fix types. Do not assume they are in good condition if they are less than 10 years old. If upgrades are necessary, generate estimated quantities for each ramp location. Be sure to

consider survey and potential ROW needs when estimating the Preliminary Engineering (PE) and ROW phases for these projects. Coordinate the budgets for PE and ROW phases with the System Manager and any potential needs for early obligation of phases to accomplish this work.

Make sure to include adequate shoulder gravel in both overlays and surface seals. Account for existing and future edge drops in the construction year. Evaluate existing slopes for wide aggregate shoulders and their compliance with design standards.

Talk to maintenance staff to determine whether anything else is of concern.

6.22 Replacement and Rehabilitation Tips

Researching previous plans is important for getting a feel for the drainage and age of the current system and for gathering other facts as well as the history of the segment.

Make sure the proposed fix type will work in all areas. Crush and shape projects will need a grade raise of at least 5 inches, and this requirement may eliminate this fix from consideration for urban sections.

Check to make sure there is room for grade increases and make sure to include other adjustments, such as adjustments to culvert ends, guardrails, intersections, driveways, shoulder gravel, and embankment and restoration quantities.

6.23 QA/QC Review of Estimate

Each scoping package should have a TSC-level Quality Control (QC) review and a Region-level Quality Assurance (QA) review completed by an independent person who was not directly involved in the development of the Scoping Package. Bridge Scoping Packages should also have an additional final QA performed by the Bureau of Bridges and Structures (BOBS). The Scoping Checklist can be used to communicate the project's intent to the engineer(s) during the QA/QC reviews of the Scoping Package. The QA/QC reviews should include a review that the Scoping Package is complete, that Scoping Checklists are complete, and that assumptions are documented, and a check of the estimate for omissions and errors and conformity with the previously agreed-upon scoping direction.

6.24 Innovative Contracting

Innovative contracting concepts should be considered and a cursory evaluation should determine if the project is a candidate for innovative contracting. A scoping meeting should be held with the Innovative Contracting Unit if the Region or TSC is considering an innovative contracting method. Chapter 2 of the MDOT Innovative Construction Contracting Guide contains project selection information.

6.25 Repairing Pavement Joints and Cracks

Full-depth (Detail 8) or partial-depth (Detail 7) Hot Mix Asphalt (HMA) patching is used for the preparation of the HMA overlay of existing deteriorated concrete that is past the point of CPM, for concrete pavement rehabilitation/restoration, or for composite pavements that are receiving new overlays.

For composite pavements, look for severely deteriorated cracks with secondary cracking or heaved cracks where the pavement has pushed up at the crack. Cracks that have heaved, especially the ones that do not go down after the frost is out, are indicators the underlying concrete has continued to deteriorate full depth and will require either a concrete repair or a

Detail 8 repair. Detail 8 repairs will allow more thermal movement in the underlying concrete than concrete repairs but may be a better choice based on the condition of the old concrete (nothing to tie into without more damage) and economics (the cost of repair and the HMA contractor not subcontracting the concrete work). If there is no heaving and there are multiple adjacent cracks, a Detail 7 repair would suffice. Single straight or random cracks that are not heaved do not require a repair. The current pavement management resource can also be used to obtain performance and cracking data.

For concrete pavements, the selection of Detail 7 repairs and Detail 8 repairs should be less complicated because there is some clear evidence of distress. An exception would be bottom-up deterioration that has occurred on many old Jointed Reinforced Concrete Pavement (JRCP) joints. If base plates were incorporated in the joint design, the probability is high for bottom-up deterioration leading to premature failure of the HMA overlay. A concrete repair is preferred on concrete pavements because of the improved thermal movement restraint, and single reflective cracks are much easier to deal with over the life of the composite pavement. The same could be said of the Detail 7 repairs; however, the number of distressed locations will impact the decision process.

For additional details about Detail 7 and Detail 8 repairs, see subsection 6.03.04B10 of the RDM and Standard Plan R-44 Series.

Appendix A Links to Document Reference

AASHTO

A Policy on Design Standards Interstate System – A Policy on Design Standards--Interstate System

A Policy on Geometric Design of Highways and Streets – A Policy on Geometric Design of Highways and Streets

Guide for the Development of Bicycle Facilities – Guide for the Development of Bicycle Facilities

Highway Safety Manual (HSM) – Highway Safety Manual

EGLE

Permit Guidelines for Public Transportation Agencies – Permit Guidelines for Public Transportation Agencies

FEMA

Floodplain Maps – Flood Maps | FEMA.gov

FHWA

Distress Identification Manual for the Long-Term Performance Pavement Program (2014) – Distress Identification Manual

Michigan Division Risk Based Project Involvement Guidance (2021) – Michigan Division Risk Based Project Involvement Guidance

MDOT

Accelerated Bridge Preservation Technologies (SP-1687 guide only) – Accelerated Bridge Preservation Technologies (guide only)

Access Management Guidebook – Access Management Guidebook

Access Management website – MDOT Access Management

Administrative Rules regulating Driveway, Banners and Parades (2007) – Administrative Rules regulating Driveways, Banners and Parades

Alternate Pavement Bidding Process – Alternate Pavement Bidding Process

Americans with Disabilities Act Transition Plan – ADA Transition Plan

Bridge Capital Scheduled Maintenance Manual – Bridge CSM Manual

Bridge Deck Preservation Matrix – Decks with Epoxy Coated Rebar (ECR) – Bridge Deck Preservation Matrix – Decks with Epoxy Coated Rebar (ECR)

Bridge Deck Preservation Matrix – Decks with Uncoated “Black” Rebar – Bridge Deck Preservation Matrix – Decks with Uncoated “Black” Rebar

Bridge Design Guides – Bridge Design Guides

Bridge Design Manual – BDM

Bridge Scoping Cost Estimate Worksheet – Bridge Cost Estimate Worksheet

Bridge_Paint_Matrix_– Steel – Steel Bridge Girder Coatings Repair Matrix

Capital Preventive Maintenance Manual (2020) – CPM Manual

Complete Streets Policy – Complete Streets

Construction Manual – Construction Manual

Control Section/PR Finder – MDOT Next Generation PR Finder

Data Driven Safety Analysis (DDSA) Guidance (2022) – DDSA Guidance

Design-Build Guidelines (2022) – Design-Build Guidelines, 3rd Edition

Drainage Manual (2006) – Drainage Manual

Forms Repository – MDOT Forms

Geometric Design Guides – Geometric Design Guides

Geotechnical Manual (2019) – Geotechnical Manual

GIS – ArcGIS Online

Guidelines for External Engagement (2009) – Guidelines for External Engagement

Highway Call For Projects General Information & Program Instructions Manual – CFP Manual

Innovative Construction Contracting Guide (2015) – Innovative Construction Contracting Guide

Lump Sum Calculator – Lump Sum Calculator

M2D2 Guidebook (2019) – M2D2 Guidebook

MiBRIDGE – MiBRIDGE (michigan.gov)

Michigan Ancillary Structures Inspection Manual – MiASIM

Michigan Manual of Uniform Traffic Control Devices – MMUTCD

Michigan Mobility 2045 Plan – Michigan Mobility 2045 Plan

Michigan Office of Highway Safety Planning – Office of Highway Safety Planning

Michigan Structure Inspection Manual – MiSIM

Mobility Restrictions Map – MDOT Mobility Restrictions Map

Pavement Historical Database – PHD

Pavement Selection Manual (2021) – Pavement Selection Manual

PC-SCM – PC-SCM Screening Tool (arcgis.com)

Plan Development website – MDOT Plan Development

Preliminary Planning/Scoping Letter (Form 2483) – Preliminary Planning/Scoping Letter

Project Management Development/Design Task Manual (Preconstruction Process Documentation Manual) – Project Management Development/Design Task Manual

Real Estate Procedure Manual (2023) – Real Estate Procedure Manual

Right-of-Way Map Files – MDOT Right-of-Way Maps

Road Design Manual – RDM

Road Diet Checklist – Road Diet Checklist

Road Safety Audit Guidance – RSA Guidance

Sight Distance (2015) – Sight Distance Guidelines

Standard Plans – Standard Plans

Standard Specifications for Construction (2020) – 2020 Standard Specifications for Construction

State of Michigan Strategic Highway Safety Plan – State of Michigan Strategic Highway Safety Plan

Stormwater Management Program (2021) – SMP

Stormwater Program SharePoint – Drainage And Utilities SharePoint

Traffic Analysis Request (TAR) form (Form 1730) – TAR Form

Traffic and Safety/Standards and Special Details – Traffic and Safety/Standards and Special Details

Traffic Survey Request form (Form 1776) – Traffic Survey Request Form

Transportation Alternatives Program Applicant Guide – TAP Applicant Guide

Transportation Data Management System – TDMS

Weighted Average Item Price Report – Weighted Average Item Price Report

Work Zone Safety and Mobility Manual (2022) – WZSMM

U.S. Access Board

Public Right-of-Way Accessibility Guidelines (PROWAG) – Public Right-of-Way Accessibility Guidelines (PROWAG)

United States Code

23 USC 217: Bicycle transportation and pedestrian walkways – 23 USC 217

Appendix B Minimum Recommended Documentation

MAJOR WORK TYPES

Minimum Recommended Documentation	Single Course Mill & Fill	Single Course HMA Overlay	Concrete Patching (includes Detail 7's and 8's)	Pavement Seals	Diamond Grinding	Dowel Bar Retrofit	Two Course Mill and Overlay	HMA Crush and Shape	Unbonded Concrete Overlay	Rubbilize	Pavement Reconstruction
Detailed Scoping Checklist		X					X	X	X	X	X
Basic Scoping Checklist	X		X	X	X	X					
Cost Estimate	X	X	X	X	X	X	X	X	X	X	X
Traffic forecast											X
Previous Soil Borings								X			X
Field Review of Joints			X		X	X					
Informal LCCA							X	X	X	X	X
Existing and Proposed Typical	X	X	X	X	X	X	X	X	X	X	X
Draft DEs & DVs							X	X	X	X	X
Old Plans	X	X	X	X	X	X	X	X	X	X	X
Crash Analysis							X	X	X	X	X
Road Safety Audit							X	X	X	X	X
Time of return (TOR) Calculation											
Access Management Concept (if applicable)							X	X	X	X	X
Culvert Condition Report							X	X	X	X	X
Watermain/Sanitary Sewer Study (if applicable)							X	X	X	X	X
Concept MOT							X	X	X	X	X
MOT Typical	X	X	X	X	X	X	X	X	X	X	X
Previous EIS or EA							X	X	X	X	X
PACS							X	X	X	X	X
ROW Maps							X	X	X	X	X
Email Correspondence / Meeting Minutes	X	X	X	X	X	X	X	X	X	X	X
Photos							X	X	X	X	X
Ancillary Structures Condition Report							X	X	X	X	X
Justification if the project doesn't meet criteria							X	X	X	X	X

BRIDGE WORK

Additional Recommended Documentation	Capital Schedule Maintenance (CSM)	Capital Preventive Maintenance (CPM)	Rehabilitation	Replacement
General Plan of Site & Structure	X	X	X	X
Aerial Image of the Site	X	X	X	X
Site review Checklist(s)	X	X	X	X
Sketches or calculations	X	X	X	X
Bridge Safety Inspection Report	X	X	X	X
Request For Actions	X	X	X	
ROW Maps	X	X	X	X
Scour Plan of Action and High Flow Event Reports	X	X	X	
Streambed cross-sections		X	X	X
Contract work and maintenance history	X	X	X	
Load Analysis summary		X	X	
Scoping photos	X	X	X	X
Underclearance Measurements (form 1190)	X	X	X	X
Detailed beam form		X	X	X
Life Cycle Cost Analysis (LCCA) Estimate	X	X	X	X
Corridor studies or other relevant studies		X	X	X
Form 0350, Checklist for Bridge scoping			X	X
Form 1961 Constructability Checklist		X	X	X
FAA Notice Criteria Tool report	X	X	X	X