120 Planning and Programming

120.1 General

Long-range planning is the first step in project development and serves to establish long-range goals, objectives, and system needs at the statewide, regional, or metropolitan planning area level. The statewide long-range plan must cover a period of at least 20 years and be updated every four years. The plan is developed with Metropolitan Planning Organizations (MPOs) and Regional Transportation Planning Organizations (RTPOs) around the state, and includes a State Freight Plan that focuses on the needs of the freight users in New Mexico. The MPOs develop Metropolitan Transportation Plans (MTPs), while the RTPOs develop Regional Transportation Plans (RTPs) in coordination with the New Mexico Department of Transportation (NMDOT).

New Mexico's long-range plan informs near-term planning by identifying transportation needs for a four- to six-year period. These needs are identified, prioritized, and funded through a collaborative process involving the state, local jurisdictions, tribal entities, and implementing agencies. The NMDOT programs projects in the Statewide Transportation Improvement Program (STIP) for a six-year period, although funds are allocated only for the first four years. MPOs program projects in Transportation Improvement Programs (TIPs), which use the same "four years plus two" structure of the STIP, and feed directly into the STIP. RTPOs program projects in Regional Transportation Improvement Programs (RTIPs).

Projects included in the long-range plans, STIPs, and TIPs are based on transportation needs determined by other NMDOT plans and studies, such as the Transportation Asset Management Plan, Bicycle/Pedestrian/Equestrian Plan, Strategic Highway Safety Plan, State Rail Plan, and others. Projects are also identified through various monitoring programs designed to identify deficiencies in the transportation system (e.g., bridge, pavement, safety, and traffic monitoring systems).

120.2 References

The following references provide additional details concerning transportation planning.

- Fixing America's Surface Transportation Act (FAST), or current authorization bill.
- 23 Code of Federal Regulations (CFR) Part 450, Planning Assistance and Standards.
- 49 CFR Part 613, Planning Assistance and Standards.

In addition, this chapter provides information and resources related to project management identified in the guide below:

Guide to Project Management Strategies for Complex Projects (The Guide) - This guide assists transportation project managers and teams in delivering successful complex projects. The Guide presents a project management framework as well as proven methods and solutions tailored to the planning and management of complex transportation projects. NMDOT has incorporated components and tools of this project management framework into its project development process. Specific elements that NMDOT has incorporated are discussed in Chapters 110, 120, 130, 140, and 200 of this Design Manual. The guide is a Transportation Research Board (TRB) publication that is part of the Second Strategic Highway Research Program (SHRP 2) under the R10 Renewal Project.

120.2.1 Specific NMDOT Planning Resources

NMDOT has developed the following resources that explain the transportation planning process in New Mexico. This chapter

provides a general overview of the NMDOT planning process, but the documents identified below provide specific details.

- New Mexico 2040 Plan - This is the current version of NMDOT's long-range multi-modal transportation plan. NMDOT developed this plan (adopted in September 2015) in cooperation with the seven RTPOs and five MPOs in New Mexico. The plan, required by federal transportation law, extends out at least 20 years and is updated every four years. The plan sets the long-term goals and direction for the NMDOT, helping to shape policy decisions. The plan covers all areas of the state, is multi-modal in scope, and provides for the development, implementation, and integrated management and operation of transportation systems and facilities that function as an intermodal transportation system.
- NMDOT Planning Procedures Manual - This manual clarifies the roles and responsibilities of the NMDOT Statewide Planning Bureau, MPOs, and RTPOs in carrying out the federally mandated statewide transportation planning program.
- NMDOT Location Study Procedures, current edition - This guide has been prepared to assist transportation engineers, planners, and other practitioners in conducting alignment and corridor studies for NMDOT projects. It guides the process for establishing the project purpose and need, developing and evaluating alternatives, and conducting public outreach throughout the project development process. While the guide provides the information needed to cover the most complex transportation projects, it emphasizes the processes appropriate for the most common project scopes. The guide is also intended to establish consistency in how location studies are prepared, reviewed, and processed by the NMDOT.
- NMDOT Statewide Transportation Improvement Program (STIP) Procedures - This document outlines procedures, policies, and timelines for the STIP and MPO TIPs. The document provides information on project inclusion, amendment requirements, administration modification requirements, public comment periods, and fiscal constraint.
- IDD-2013-04 Project Program Modification Request to the Production and Letting Schedule and STIP Modifications - This

Infrastructure Design Directive (IDD) provides guidance to NMDOT Program Management Division and Transportation and Planning Division staff for carrying out metropolitan transportation planning responsibilities.

120.3 Definitions

The following select definitions are from federal planning regulations. A full listing of references is included in 23 United States Code (USC) 101(a), Federal-Aid Highways, the NMDOT Location Study Procedures, and 23 USC 135, Statewide and Nonmetropolitan Transportation Planning.

- **Alignment study** - A study performed by NMDOT to accomplish project scoping and conceptual design for less complex actions where the roadway location is already established; for example, a shift in the roadway centerline due to lane and/or shoulder widening, or the need to flatten horizontal or vertical curves.
- **Corridor study** - A study performed by NMDOT to accomplish project scoping and conceptual design for more complex actions where the route location is not established, or the magnitude of improvements may result in a substantial change to an existing alignment; for example, a new roadway or major changes to the typical section and/or alignment of an existing highway.
- **Environmental level of effort** - The type of document required for certification of a project under the National Environmental Policy Act (NEPA). The level of effort may be a Categorical Exclusion (CE), Environmental Assessment (EA), or an Environmental Impact Statement (EIS).
- **Maintenance area** - An area that was designated as an air quality nonattainment area, but was later re-designated by the Administrator of the Environmental Protection Agency as an air quality attainment area, under section 107(d) of the Clean Air Act (42 USC 7407 [d]).
- **Metropolitan Planning Organization (MPO)** - The organization designated by the Governor to carry out the continuing, cooperative, and comprehensive transportation planning process for an urbanized area (over 50,000 population).

- **Rural areas** - All areas of a state not included in urban areas.
- **Regional Transportation Planning Organization (RTPO)** - The organization established by New Mexico, in accordance with 23 USC 135(m), to enhance the planning, coordination, and implementation of statewide strategic long-range transportation plans and transportation improvement programs with an emphasis on the needs of nonmetropolitan areas.
- **Urbanized area** - An area with a population of 50,000 or more designated by the United States Census Bureau, within boundaries to be fixed by the responsible state and local officials in cooperation with each other, subject to approval by the United States Secretary of Transportation. Such boundaries shall encompass, at a minimum, the entire urbanized area within a state as designated by the Census Bureau.

120.4 Major Planning Efforts

Below is a discussion of the planning elements in New Mexico including long-range planning, near-term programming, and defining the project (project definition).

120.4.1 Long-Range Planning

The statewide long-range plan sets long-term goals, objectives, and transportation system needs for a period of at least 20 years into the future. NMDOT's long-range transportation plan outlines a vision for multimodal transportation in New Mexico and defines the goals, objectives, performance measures, and targets to achieve that vision. The plan integrates, harmonizes, builds upon, and refines existing studies, plans, and policies from the NMDOT, MPOs and RTPOs, and other agencies. The plan identifies:

- Strategies and actions needed to connect all elements of the state's transportation system
- Elements of the system needing improvement
- New elements (including programs) needed to ensure that New Mexico's multimodal transportation system is safe, efficient, and effective

In addition, a Statewide Freight Plan is a component of NMDOT's long-range transportation plan that provides a comprehensive plan for the immediate and long-range planning activities and investments with respect to freight. NMDOT also uses other subject-specific plans—based on funding programs, modes, or strategies—that establish additional goals, objectives, and performance measures that must be considered when selecting, defining, and designing projects. These plans include the Transportation Asset Management Plan, the Strategic Highway Safety Plan, and the Bicycle/Pedestrian/Equestrian Plan.

Federal law requires urban areas with a population of 50,000 or more to develop their own long-range transportation plans. Currently, there are five of these areas, known as MPOs, in New Mexico: Mid-Region (Albuquerque area), Santa Fe, Farmington, Mesilla Valley (Las Cruces area), and a portion of the El Paso, Texas, metropolitan planning area that extends into New Mexico. Projects within these MPOs must be included in the adopted long-range MTP before they can be authorized for design and construction using federal funds.

For rural locations outside of an MPO boundary, RTPOs are developed. The RTPOs serve to enhance the planning, coordination, and implementation of statewide strategic long-range transportation plans and programs, with an emphasis on addressing the needs of non-urban areas. The RTPOs define regional needs in RTPs. There are currently seven RTPOs in New Mexico: Mid-Region, Northeast, Northern Pueblos, Northwest, South Central, Southeast, and Southwest.

At the statewide level, the long-range transportation plan should reference, summarize, or incorporate other applicable short-range planning studies, strategic planning and/or policy studies, and other policies, goals, and objectives relevant to the development of the long-range transportation plan. Additionally, all MTPs and RTPs must be consistent with the statewide long-range plan.

120.4.2 Near-Term Programming

Project programming for NMDOT is accomplished through the STIP which lists funded and prioritized projects over a four-year

period (as well as two additional years of unfunded projects). By federal law, transportation programs must be updated a least every four years, although the NMDOT practice is to update the STIP every two years. Transportation projects in the STIP must be consistent with the long-range plans (23 CFR Part 450.216[k]) and, for NEPA clearance documents, the STIP must match the details of the proposed project including:

- Funding source—state, federal, and other
- General project scope
- Project phasing—construction, final design, right-of-way acquisition, environmental documentation, and/or Preliminary Design
- Project location and termini

Similarly, MPOs are required to develop a TIP that must be included in the STIP. The TIP must cover a period of no less than four years, although most New Mexico TIPs cover a six-year period. The TIPs must be updated at least every four years; however, to maintain consistency with the STIP, New Mexico MPOs update their TIPs every two years.

Additional information on the STIP/TIP development process is included in Section 120.2.1 of the Design Manual.

120.4.3 Project Definition

The definition phase of project development identifies the level of effort and general approach and steps needed to initiate projects. It is an iterative planning process that builds on the identification of the project in the long-range plan and assists with programming projects in the STIP. Typically, project definition is the responsibility of the Districts and involves interdisciplinary input from the various functional groups within the NMDOT. Major outcomes of the project definition phase include the level of effort, anticipated schedule, initial cost estimate, major issues to be considered, and SHRP 2, R10 project management documentation contained at the end of this chapter. Requests for specific information such as traffic, crash, and pavement condition data may be initiated in this step.

This step also includes requesting a project control number, identifying preliminary project termini, and developing the project's purpose and need statement. Obtaining a project control number is a critical step for initiating a project in the NMDOT's funding and tracking system. To aid in this process, the NMDOT uses a Project Definition, Initial Cost Estimate, and Project Control Number Request Form that needs to be completed at the beginning of the project definition phase. An example of the form is provided at the end of this chapter.

Identifying the appropriate level of effort is an essential part of project definition. The level of effort and detail required depends on the scope, complexity, potential impacts, and location of a particular project. Identifying this level of effort assists in developing an accurate budget and schedule, which in turn will assist with developing or adjusting the overall project budget and design/construction schedule programmed in the STIP.

Several issues can affect the cost, schedule, and staffing needs for a project. These issues are often first discovered during the project definition phase and may include:

- Engineering issues (drainage, structures, traffic, mapping, etc.)
- Environmental considerations (wetlands, air quality, cultural resources, etc.)
- Consistency with applicable plans (long-range plan, State Freight Plan, Transportation Asset Management Plan, Bicycle/Pedestrian/Equestrian Plan, Strategic Highway Safety Plan, State Rail Plan, and adopted local plans) and compatibility with adjacent land uses
- Public involvement issues (public interest, special needs populations, public controversy)
- Safety considerations (crash data, safety countermeasures, multimodal accommodation)
- Right-of-way (land ownership, encroachments)

Project Control Number Request Form

Obtaining a project control number is a critical step for initiating a project in the NMDOT's funding and tracking system. To aid in this process, the NMDOT has developed a Project Definition, Initial Cost Estimate, and Project Control Number Request Form that needs to be completed at the beginning of the project definition phase. An example of the form is provided at the end of this chapter.

Products of the project definition phase are the result of an iterative planning process including project identification in the NMDOT Long Range Plan and programming in the STIP. The products of the project definition phase include:

- A decision on the type of study and anticipated level of environmental processing to be conducted
- Refinement of the project termini and study area boundaries
- Identification of major issues that need to be addressed and supporting information required to complete the study
- Composition of the study team
- Budget and schedule needs

In addition to the products above, completing the SHRP 2, R10 project management documentation provided at the end of this chapter is required for NMDOT projects. The exception is that the SHRP 2, R10 documentation is not required for maintenance projects.

Working through the SHRP 2, R10 project management documentation (worksheets) will help project teams to set the stage for successful project delivery. The SHRP 2, R10 project management documentation was developed from years of research, and will help project teams manage the five project dimensions, including cost, schedule, technical issues, context, and financing. NMDOT tailored the SHRP 2, R10 project management documentation to reflect NMDOT's project development process. Completing the SHRP 2, R10 project management documentation at the end of this chapter will help project teams with the following:

- Identifying project issues
- Determining project complexity dimension rating and ranking
- Developing a project complexity map and follow-up questions
- Identification of critical success factors
- Identification of key staff members
- Developing a preliminary project action plan

SHRP 2, R10 Project Management Documentation

Project teams should work through the exercises and documentation at the end of this chapter to set the stage for successful project delivery.

The Project Development Engineer (PDE) should lead the effort to complete the SHRP 2, R10 project management documentation. The PDE will identify who should be involved from the NMDOT to develop the documentation. A listing of the staff/disciplines that should be considered is provided in the Project Definition, Initial Cost Estimate, and Project Control Number Request Form located at the end of this chapter. The PDE should schedule a meeting with the appropriate District and Region staff. As part of that meeting, the PDE should lead NMDOT staff through the SHRP 2, R10 project management documentation and exercises to develop a project complexity map and preliminary project action plan. Much of the work completed can be used to either identify the internal NMDOT project team and scope of work or develop a consultant Request for Proposals (RFP).

The PDE will lead the effort to update the SHRP 2, R10 project management documentation as part of project scoping and Preliminary Engineering. However, the team members that participate in the updates may be different than the original team depending on whether consultant staff is used or not.

The SHRP 2, R10 project management documentation elements discussed above are explained in greater detail at the end of this chapter. Additional guidance concerning the project definition phase can be found in NMDOT's Location Study Procedures and the Guide to Project Management Strategies for Complex Projects.

120.5 Documentation

The following documentation is required for this stage of project development:

- Project Definition, Initial Cost Estimate, and Project Control Number Request Form (attached)
- SHRP 2, R10 Project Management Documentation for Project Definition (attached)

Project Definition, Initial Cost Estimate, and Control Number Request Form

This form documents the activities of project definition. It is to be completed by Districts in collaboration with the design regions and various technical services lines within the NMDOT. Project definition identifies the level of effort, general approach, critical issues, and approximate cost to program and initiate a project. The required elements for project definition are the same for projects involving a Scoping Report or Phase A/B study. This form must be completed before a project is added to the STIP. Additional information can be found in Chapter 120 of the NMDOT Design Manual.

REQUESTING DISTRICT ☐ District 1 ☐ District 2 ☐ District 3 ☐ District 4 ☐ District 5 ☐ District 6

WHY IS THE PROJECT NEEDED? (Check all that apply)

- ☐ Improve unsafe conditions (unsafe physical and/or geometric deficiencies)
- ☐ Address congestion and capacity problems
- ☐ Condition of pavement and/or structures
- ☐ Drainage improvements
- ☐ Improve access and/or access management
- ☐ Project is part of an adopted economic development initiative or other legislative mandate
- ☐ Other (Describe) _____

PROJECT PHASE (check all that apply)

☐ Study Phase/Env. Document ☐ Design ☐ Right-of-Way ☐ Construction ☐ Utilities ☐ Other

PROJECT DESCRIPTION (check all that apply)

☐ Roadway ☐ Bridge ☐ Drainage ☐ Right-of-Way
☐ Fencing ☐ Rehabilitation ☐ Realignment
☐ Other project type (describe) _____

Route Number _____

Logical Termini _____
(Include transitions)

Beginning Milepost _____ Ending Milepost _____

Structure Number(s) _____

PROJECT SCOPE FOR TIP/STIP (provide brief description suitable for inclusion in the TIP or STIP)

_____

_____

_____

_____

POTENTIAL ISSUES THAT MAY SUBSTANTIALLY ADD TO PROJECT BUDGET AND/OR SCHEDULE (check all that apply)

- ☐ Extensive right-of-way acquisition/constraints
- ☐ Complex geotechnical issues
- ☐ Complex environmental issues (e.g., seasonal constraints for T&E survey)
- ☐ Extensive cultural resource issues (e.g., extensive data recovery)
- ☐ Public controversy
- ☐ Extensive agency and/or tribal coordination (US Army Corps, BLM, Forest Service, tribal, etc.)
- ☐ Utilities relocations
- ☐ Complex maintenance of traffic
- ☐ Other (describe) _____

PROJECT ESTIMATE

☐ Cost/lane mile: _____ ☐ Cost/sq.ft.: _____

☐ Other method (Describe) [attach supporting documentation]: _____

ESTIMATE DATA

Project 1:

CN: _____ Program Year: _____ Letting Date: _____

Reason for Selection: _____

Project 2:

CN: _____ Program Year: _____ Letting Date: _____

Reason for Selection: _____

Project 3:

CN: _____ Program Year: _____ Letting Date: _____

Reason for Selection: _____

Project 4:

CN: _____ Program Year: _____ Letting Date: _____

Reason for Selection: _____

TOTAL PROJECT STIP ESTIMATE: _____

FISCAL YEAR FUNDING

☐ Working STIP FY 2020 ☐ Year 1 ☐ Year 2 ☐ Year 3 ☐ Year 4

☐ Planning STIP FY 2020

COORDINATION	Contact	Date	Signature
☐ Regional Design Manager			
☐ District Engineer			
☐ Project Development Engr.			
☐ Assistant District Engr.			
☐ Bridge Design			
☐ Drainage Design			
☐ Traffic Design			
☐ Geotechnical Section			
☐ Environmental Development			
☐ Environmental Geology			
☐ Right-of-Way Bureau			
☐ Planning Bureau			
☐ Utilities			
☐ Others			

Concerning this request:

- Are all ADE's aware of this request?
- Has this request been reconciled with the SAAG?

DISTRICT REVIEW:				
ADE Engineering Support:	Date:	Recommended:	Yes ☐	No ☐
District Engineer:	Date:	Recommended:	Yes ☐	No ☐
Chief Engineer/Div. Director	Date:	Recommended:	Yes ☐	No ☐
Received STIP Coordinator		Programmed:	Yes ☐	No ☐

SHRP 2, R10 Project Management Documentation for Project Definition[1]

Introduction

Exercises in this section have been tailored to meet NMDOT's needs from materials provided by the Guide to Project Management Strategies for Complex Projects (The Guide), S2-R10-RW-2. The Guide is a Transportation Research Board (TRB) publication that is part of the Second Strategic Highway Research Program (SHRP 2) under the R10 Renewal Project. The objective of the Guide and the materials provided in this document are to help project managers and transportation teams to deliver successful projects, especially complex projects. The Guide and the materials provided in this document present a practical approach based on proven methods tailored to transportation planning and project management. These exercises and worksheets were developed from an in-depth study of 15 complex projects in the United States and three international projects that identified strategies, methods, and solutions that led to the successful delivery of those projects.

What are complex projects?

Complex projects involve uncertainty and unpredictability. The project manager must make decisions in a dynamic environment where many critical factors are outside the project team's control. This leads to iterative planning and design to seemingly random events that can create unforeseen changes in the project scope.

The project management approach discussed in the Guide is a five-dimensional approach (called 5DPM) that complements, rather than replaces NMDOT's current project management practices. The 5DPM approach is not a day-to-day project management process, rather it promotes early planning, estimating, and risk analysis. In addition, the 5DPM approach emphasizes parallel rather than linear project development. The intended benefits of implementing the 5DPM approach include:

- Early communication in the project development process
- Early identification of complexity based on the specific needs of the project.

[1] Exercises and text in this section have been adapted from materials provided by the Guide to Project Management Strategies for Complex Projects, S2-R10-RW-2.

- Early preparation of financials, schedules, and resources.
- Consideration of the issues of context and financing as project drivers.
- Early identification of critical success factors.
- Creating a realistic balance between available funding and the project scope.
- Reducing and managing uncertainties.
- Developing project action plans and/or a more defined project scope early in the project.

NMDOT has adapted the worksheets provided in the Guide to fit into NMDOT's project development process. The use of this approach is fully scalable and may be as simple or as in-depth as needed or desired depending on project needs and complexity.

The 5DPM approach places a strong emphasis on frontloading the project development process to identify and start addressing critical issues (including cost, schedule, technical, context, and financing) that create project complexity as soon as practical. The 5DPM approach focuses on five dimensions of project management, five 5DPM project development methods, and 13 solutions that have been identified as documented approaches that can help manage risks for transportation projects. The five dimensions of project management are:

- **Cost** – The cost dimension covers the factors that affect quantifying the scope of work in terms of dollars.
- **Schedule** – The schedule dimension relates to all the calendar-driven aspects of a project. This dimension provides the time factors, requirements, and constraints needed to achieve delivery of a project.
- **Technical** – This dimension fleshes out all technical aspects of a project including typical engineering requirements.
- **Context** – The context dimension focuses on all external factors that can impact a project. Context factors can be some of the most difficult issues to predict and manage.

- **Financing** – This dimension focuses on financing as a separate issue from cost, since knowing the project cost is often not enough. The project owner must know how the project will be paid for as well as constraints and timing of funding so that those factors can be integrated into the project.

The five 5DPM methods are:

1. Define critical success factors
2. Assemble the project team
3. Select project arrangements
4. Prepare an early project cost model and finance plan
5. Develop project action plans

The 13 solutions are listed below and are discussed in greater detail at the end of this attachment.

1. Incentivize project outcomes
2. Develop dispute resolution plans
3. Perform comprehensive risk analysis
4. Identify critical permit issues
5. Evaluate applications of off-site fabrication
6. Determine involvement of right-of-way and utilities
7. Determine work packages and sequencing
8. Design to budget
9. Co-locate the team
10. Establish flexible design criteria
11. Evaluate flexible financing
12. Develop finance expenditure model
13. Establish public involvement plans

Implementing 5DPM at NMDOT

The SHRP 2, R10 project management documentation should be completed by the Project Development Engineer (PDE) in collaboration with other Region/District staff as part of the project definition phase to determine the complexity of each project, identify key issues, and begin developing a project action plan to address issues that could negatively affect project delivery.

The PDE should schedule a meeting with the appropriate District/Region staff during the project definition phase. As part of that meeting, the PDE should lead NMDOT staff through the SHRP 2, R10 project management documentation.

The 5DPM approach builds on typical three-dimensional project management that focuses on cost, schedule, and technical issues. By including factors such as context (public opinion) and financing, a project team can better understand and manage the factors outside of their control. Due to project complexities, project planning and design are iterative and can often lead to unforeseen changes in a project's scope. To manage that, the 5DPM approach is integrated early in NMDOT's project development process (at the project planning/definition stage), and is updated to reflect changed conditions during project scoping and Preliminary Design.

This document only summarizes resources contained in the Guide. For additional resources or help understanding specific concepts and worksheets, please consult the Guide. Also, links to SHRP 2, R10 case studies are provided below. These case studies provide examples of how to develop the documentation contained in this section as part of the 5DPM process.

- https://www.fhwa.dot.gov/goshrp2/Content/Documents/Factsheets/R10_CaseStudy_RIDOT_V_singles_2.pdf
- https://www.fhwa.dot.gov/goshrp2/Content/Documents/r10_case_study_washington_state.pdf
- https://www.fhwa.dot.gov/goshrp2/Content/Documents/R10_WisDOT_Case_Study_SHRP2.pdf

Project Definition Management Documentation

The exercises below comprise the work that should be done by the Project Development Engineer (PDE) in collaboration with other Region/District staff as part of the project definition phase to determine the complexity of each project, identify key issues, and begin developing a project action plan to address issues that could negatively affect project delivery. The PDE will identify who should be involved from the NMDOT to develop the documentation. A listing of the staff/disciplines that should be considered is provided in the Project Definition, Initial Cost Estimate, and Project Control Number Request Form located at the end of Chapter 120 in the Design Manual. The PDE should schedule a meeting with the appropriate District and Region staff. As part of that meeting, the

What should I do with the completed worksheets and exercises?

Once the documentation has been completed, please include the worksheets in the project file. These materials will be used again during conceptual design and Preliminary Design.

PDE should lead NMDOT staff through the SHRP 2, R10 project management documentation and exercises provided below.

This first group of exercises are to be completed before the design and/or consultant team is selected for a project. Much of the work will be refined and updated as part of project scoping or Location Study Procedures and Preliminary Design. This initial work includes the following components:

1. Identify key project issues
2. Dimension complexity ranking and rating
3. Develop complexity map
4. Complexity map follow-up questions
5. Identify critical success factors
6. Identify key team members
7. Develop preliminary project action plan
8. Develop preliminary targeted action plan (if needed)

The exercises below help to develop a specific complexity map that shows the complexity of the project examined. The project complexity map is a qualitative, visual tool used to identify and understand the dimension(s) with the most complexity. Project complexity maps help organizational leaders to assign internal team members, develop effective procurement plans, advocate for project needs, and allocate financial resources. Other uses of complexity maps include:

- Identifying and discussing critical project issues at an early stage of project planning and project definition.
- Developing a shared understanding among the project team of complexity dimensions that drive the project.
- Determining when human and technical resources are needed to maximize the potential for project success.
- Tracking project performance over time.

Identify Key Project Issues

Circle the top three anticipated challenges in each dimension for your project in Exhibit A120-1.

Exhibit A120-1

Project Issue Identification[1]

Cost Factors	Schedule Factors	Technical Factors	Context Factors	Financing Factors
• Contingency usage • Risk analysis • Estimate formation • Owner resource cost allocation • Cost control • Optimization's impact on project cost • Incentive usage • Material cost issues • User costs/benefits • Payment restrictions • Other (specify)	• Timeline requirements • Risk analysis • Milestones • Schedule control • Optimization's impact on project schedule • Resource availability • Scheduling system/software • Work breakdown structure • Earned value analysis • Other (specify)	• Project scope • Owner's internal structure • Bidder prequalification • Warranties • Disputes • Delivery methods • Contract formation • Design method • Reviews/analysis • Existing conditions • Construction quality • Safety/Health • Optimization's impact on construction quality • Typical climate • Technology use • Other (specify)	• Public • Political • Owner • Jurisdictions • Designer(s) • Maintaining capacity • Work zone visualization • Intermodal • Social equity • Demographics • Public emergency services • Land use impact • Growth inducement • Land acquisitions • Local economics • Marketing • Cultural impacts • Local workforce • Utility coordination • Railroad coordination • Resource availability • Sustainability goals • Environmental limitations • Procedural law • Local acceptance • Global/national economics • Global/national incidents • Unexpected weather • Force majeure events • Other (specify)	• Legislative process • Uniformity restrictions • Transition to alternate funding sources • Project manager financial training • Federal funding • State funding • Bond funding • Borrowing against future funding • Advance construction • Revenue generation • Monetization of existing assets • Franchising • Public-private partnerships • Risk analysis • Financial management software • Other (specify)

1 Exhibit A120-1 was modified from the Guide to Project Management Strategies for Complex Projects.

Provide a statement explaining unique aspects of the project for each category.

Cost: _____

_____

_____

_____

Schedule: _____

_____

_____

_____

Technical: _____

_____

_____

_____

Context: _____

_____

_____

_____

Financing: _____

_____

_____

_____

_____

Complexity Dimension Ranking and Rating

Please rank (1 to 5) the complexity of the following dimensions (cost, schedule, technical, context, and financing) with 5 being the most complex and 1 being the least complex. These rankings should be based on the complexity of the factors listed in Exhibit A120-1 that comprise the five project management dimensions. Do NOT assign equal values to any dimension (no "ties" in the rankings):

	1 (least complex)	2	3	4	5 (most complex)
Cost	☐	☐	☐	☐	☐
Schedule	☐	☐	☐	☐	☐
Technical	☐	☐	☐	☐	☐
Context	☐	☐	☐	☐	☐
Financing	☐	☐	☐	☐	☐

Dimension Rating Worksheet

Indicate the overall complexity for each dimension by placing an "X" for each on the scale below. No "ties" can be assigned to any dimension. Note that the dimension rating becomes more complex the higher the rating. A score of 50 would represent a typical level of complexity for a dimension.

Exhibit A120-2

Dimension Rating Exercise[1]

Dimension	Scale				
Cost Complexity	Minimal		Average		High
	0	25	50	75	100
Schedule Complexity	Minimal		Average		High
	0	25	50	75	100
Technical Complexity	Minimal		Average		High
	0	25	50	75	100
Context Complexity	Minimal		Average		High
	0	25	50	75	100
Financing Complexity	Minimal		Average		High
	0	25	50	75	100

1 The complexity ranking worksheet on the previous page and Exhibit A120-2 are incorporated from the Guide to Project Management Strategies for Complex Projects

Do your ranks and relative scores correspond? List the ranks and scores in Exhibit A120-3 below:

Exhibit A120-3

Complexity Map Exercise – Comparing Ranks and Relative Score[2]

Dimension	Rank	Rate/Relative Score
Cost		
Schedule		
Technical		
Context		
Financing		

2 Exhibits A120-3 and A120-4 were modified from the Guide to Project Management Strategies for Complex Projects

Developing the Complexity Map

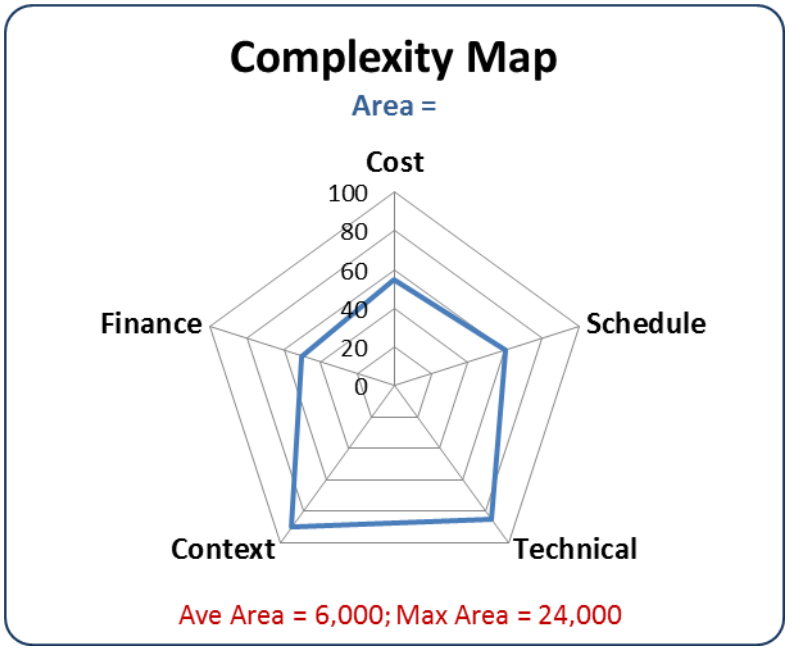
You will need to use the Excel tool that is provided here under the NMDOT Design Manual to create the complexity map for your project using the rank/relative score information identified above in Exhibit A120-3. A complexity map example is provided below.

Complexity Map Information

The average area of 6,000 would correspond to all five dimensions being scored as a 50. The maximum area would correspond to all dimensions being scored as 100.

Exhibit A120-4

Sample Complexity Map[4]



Dimension	Rate
Cost	55
Schedule	60
Technical	85
Context	90
Finance	50
Area:	**10,509**

Complexity Map Follow-Up Questions[1]

Once you have developed the complexity map for your project, please answer the follow-up questions provided below:

1. How are you going to address your most complex dimension?

2. What resource allocation issues need to be addressed as part of project planning for each dimension?

3. When are you going to address these complexity factors?

1 From SHRP 2 Project Selection and Complexity Map Exercise, Appendix A, July 26-27, 2016

Identify Critical Success Factors

The next step is to identify critical success factors in each dimension. To help develop critical success factors, go back to Exhibit A120-1 where your team identified the top three challenges in each dimension. The objective of this work is to identify critical success factors for each dimension.

The list below provides an example of the critical success factors identified for the Route 66 Bridge Project. Develop a list tailored to your project needs using the worksheet provided on the next page.

Example: Success Factors for the NMDOT Route 66 Bridge Project

Complexity 5 Most Complex (Finance)

A. Identify financial source by October 2017

B. Stop at Preliminary Design if no funding is identified

Complexity 4 (Context)

A. Develop a railroad cost share agreement by September 2017

B. Get the alternative through public involvement by January 2017.

C. Keep emergency access through the at-grade alternative.

Complexity 3 (Schedule)

A. Get approval of at-grade railroad crossing by October 2017.

B. Complete environmental assessment by October 2017.

Complexity 2 (Cost)

A. Meet budget of 8 million dollars.

B. Obtain a decision on the existing bridge by August 23, 2016.

Complexity 1 Least Complex (Technical)

A. Find out what bridge selection type is needed.

Success Factors Worksheet[1]

Complexity 5 ( )

A.

B.

C.

Complexity 4 ( )

A.

B.

C.

Complexity 3 ( )

A.

B.

C.

Complexity 2 ( )

A.

B.

C.

Complexity 1 ( )

A.

B.

C.

It is not necessary to identify three success factors for each complexity dimension. For example, if the cost dimension is the most complex issue and technical dimension is the least complex category, you may identify three success factors for the cost dimension and one for the technical dimension. As a reminder, the most complex dimension is complexity 5.

1 From SHRP 2 Project Selection and Complexity Map Exercise, Appendix A, July 26-27, 2016

Identify Team Members

Assembling the Project Team

As you look at the project's success factors, identify essential members of the project team and determine if there are in-house resources available or if a consultant will be required.

Exhibit A120-5

Project Team Member Analysis[1]

Team Member	Required? (yes or no)	In-House (i) or Consultant (c)
Public involvement officer		
Cost model expert		
Contract administration engineer		
Project Development Engineer		
Assistant District Engineer		
Design Project Manager		
Traffic engineer		
Geotechnical engineer		
Geologist		
Pavement engineer		
Utility coordinator		
Right-of-Way specialist		
Environmental specialist		
ADA coordinator		
Construction manager		
FHWA representatives		
Local jurisdiction representatives		
Consultant staff (specify)		
Other (specify)		

1 NMDOT developed this worksheet, which covers method 2, assemble the project team.

Develop Preliminary Action Plan

Use Exhibit A120-6 below to develop a preliminary action plan to address issues identified in the previous exercises.

Exhibit A120-6

NMDOT Preliminary Project Action Plan Worksheet[1]

More Complex to Less Complex	Complexity 5 (Most Complex)	Complexity 4	Complexity 3	Complexity 2	Complexity 1 (Least Complex)
Success factor					
Who is responsible?					
What technical and human resources are needed?					
How will needed resources be obtained?					
When are resources needed?					
What are the interim milestones?					
What actions will be taken?					
Can the success factor be achieved using existing systems and practices? (Yes or No, If the answer is no, a specific action plan is needed, see Exhibit A120-7 on the next page)					
Will any SHRP 2 project management solutions be used?[2]					

1 NMDOT adapted this form from several worksheets provided in the SHRP 2 Project Selection and Complexity Map Exercise, Appendix A, July 26-27, 2016

2 SHRP 2 project management solutions are identified at the end of this section.

Develop a Targeted Action Plan

Use Exhibit A120-7 below to develop a targeted action plan to address existing systems and practices that are road blocks to successful project delivery.

Exhibit A120-7

NMDOT Targeted Action Plan Worksheet[1]

Targeted Plan	Action Plan Description	Constraint[2]	Who is the champion?	What other plans depend on successful outcomes?	Deadline for action	Project management solutions[3] incorporated
1						
2						
3						
4						

1 This sheet only needs to be completed if the answer was "No" on the previous sheet to the question "Can the goal be achieved using existing systems and practices? This sheet was incorporated from SHRP 2 Project Selection and Complexity Map Exercise, Appendix A, July 26-27, 2016

2 Indicate who controls the constraint, the public, legislature, railroad, etc.?

3 This refers to the 13 project management solutions contained on the next page. Project solutions in addition to the 13 solutions may be considered and documented here.

Project Management Solutions to Consider[1]

As you are developing your preliminary project action plan, consider the project management solutions below as you identify methods to manage project risks. Selecting project management solutions begins early in project development and continues throughout the project development process. The following 13 project management solutions listed below were identified through Department of Transportation (DOT) case studies to identify best management practices for complex transportation projects. The list of 13 project management solutions is not exhaustive, and project team members may identify other solutions based on past experience and local requirements. As innovations in project delivery; new forms of project financing; advancements in materials and construction methods; and social, demographic, political, and legislative changes work their way into the transportation industry, new solutions will become available for use. The process of identifying and selecting useful solutions as part of the transportation project development process can be iterative, occurring periodically throughout project delivery.

1. Incentivize critical project outcomes

   This solution involves incentivizing critical project outcomes for various members of your project team. Incentives could be created for designers, builders, consultants, etc. The incentives may range from traditional schedule, cost, and safety incentives to various external factors such as social, environmental, public involvement, and traffic mobility. You can make the decision to use incentives early in the planning process. However, if contract awards are made strictly on the lowest cost, the effectiveness of incentives will be diminished. The more project owners can reward value-added activities, the more project partners are likely to align their interests with the owner's organization.

[1] Guide to Project Management Strategies for Complex Projects, Chapter 4 and Appendix E

2. Develop dispute resolution plans

   Another solution that can be used is developing dispute resolution plans. This can be useful in cases where the complexity evaluation conducted at the beginning of a project identifies possible areas of conflict that add to the project's complexity and may compromise the success of the project. Examples of possible project conflicts include issues arising from neighborhood groups; different design requirements, processes, and desired outcomes with local agencies; or conflicts with Section 4(f) signatories or other stakeholders. The goal of a dispute resolution plan should be to identify and manage conflicts proactively before they have a negative impact on project cost, schedule, or risk.

3. Perform comprehensive risk analysis

   The development and implementation of risk analysis and mitigation plans, whether formal or informal, can be critical to project success. Risk analysis must include clear and concise assignment of responsibilities and designated resources. Risk analysis must include traditional cost and schedule issues in addition to context and financing issues, such as those related to railroads, utilities, right-of-way needs, environmental considerations, and appropriations. Early involvement from contractor groups or construction specialty review boards can be effective for obtaining input on means, methods, and material supply issues.

4. Identify critical permit issues

   Identifying critical permit and regulatory approval issues is one solution that can be used to control risks related to project cost, schedule, and scope. Developing a plan and timelines for environmental reviews and permits very early in the project life cycle is critical for successful projects, particularly projects involving sensitive stakeholder issues, cultural resource impacts and/or recovery, and wetland and threatened and endangered species impacts.

5. Evaluate applications of off-site fabrication

   Off-site fabrication can help manage cost, schedule, and technical complexity, which in turn may be a solution for context and stakeholder constraints. Off-site fabrication can be a good solution for minimizing road closures, disruption to local business, traffic delays, detour lengths, and public inconvenience.

6. Determine involvement of right-of-way and utilities

   Determining the project needs related to right-of-way and utilities early in a project and developing an action plan can often help alleviate project challenges, if these items are identified as critical project success factors.

7. Determine work packages and sequencing

   Another solution that can increase project success can be to develop project work packages and sequencing. Upfront planning in this regard can help minimize risks associated with financing, traffic impacts, contractor capabilities, and stakeholder concerns.

8. Design to budget

   Designing to budget can help to manage complexities associated with project cost and technical issues. Under this scenario, the project team's focus is to design the project within an established budget while considering stakeholder expectations to the extent possible.

9. Co-locate the team

   Co-locating the project team is sometimes considered for large and complex projects. Co-location is most effective when each critical partner places a dedicated, empowered representative in a common location.

10. Establish flexible design criteria

    Flexible design criteria may be used to minimize potential right-of-way takes, utility conflicts, or conflicts with natural or cultural resources. Flexible designs can be achieved by using the criteria of design exceptions, need-based reviews, performance specifications, mechanistic designs, innovative procurement mechanisms, or other similar methods.

11. Evaluate flexible financing

    This solution involves evaluating alternative funding sources including grant anticipation revenue vehicle (GARVEE) bonds, hybrid forms of contracting such as public–private partnerships, and project phasing to leverage financing.

12. Develop finance expenditure model

    A finance expenditure model can help a project team to understand cash flow projections and integrate them into project phasing plans for planned expenditures, including the use of resource-loaded project plans and network schedules to track expenditures and project cash needs.

13. Establish public involvement plans

Developing and implementing public involvement plans can help manage complex projects to identify stakeholder needs, expectations, and concerns throughout the life of a project.