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Replace chapters 1-3, 5-8, and 10 in the November 2015 Edition of the Design Manual, Part 10. No changes were made to chapters 4 and 9.

DM1 has been updated to include the changes to the Pre-TIP planning process as well as to include the PennDOT Connects policy.

Any comments or questions regarding the above revisions should be directed to the Highway Design and Technology Section, Highway Delivery Division, Bureau of Project Delivery.

CANCEL AND DESTROY THE FOLLOWING:

- Chapter 1
- Chapter 2
- Chapter 3
- Chapter 5
- Chapter 6
- Chapter 7
- Chapter 8
- Chapter 10

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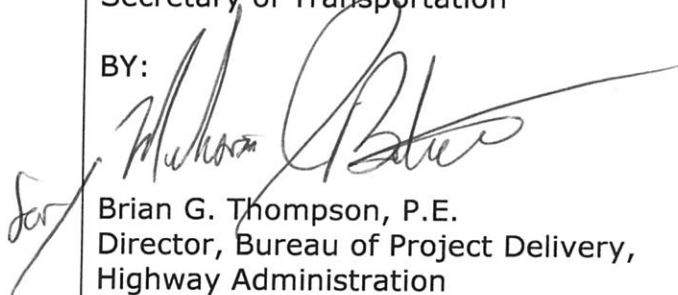
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APPROVED FOR ISSUANCE BY:

LESLIE S. RICHARDS
Secretary of Transportation

BY:



Brian G. Thompson, P.E.
Director, Bureau of Project Delivery,
Highway Administration

Publication 10

Design Manual Part 1

Transportation Program Development and Project Delivery Process

November 2015 Edition

March 2018 Change No. 1

DESIGN MANUAL 1 TRANSPORTATION PROGRAM DEVELOPMENT AND PROJECT DELIVERY PROCESS

TABLE OF CONTENTS

<u>CHAPTER</u>	<u>SUBJECT</u>	<u>PAGE</u>
CHAPTER 1 INTRODUCTION		
1.0	INTRODUCTION	1 - 1
1.1	PURPOSE AND OBJECTIVES	1 - 6
1.2	ORGANIZATION	1 - 7
	A. Design Manual Series of Documents	1 - 7
	B. Contents of Design Manual Part 1	1 - 7
1.3	PROCEDURES FOR MODIFICATIONS OR ADDITIONS TO THIS DOCUMENT	1 - 9
CHAPTER 2 DEFINING A TRANSPORTATION PROJECT		
2.0	INTRODUCTION	2 - 1
2.1	PROJECT COMPLEXITY LEVELS	2 - 1
2.2	HIGHWAY AND BRIDGE PROJECT TYPES	2 - 8
	A. Highway Restoration Program	2 - 8
	B. Bridge Program	2 - 9
	C. Safety and Operations	2 - 10
	D. Interstate Management Program	2 - 11
	E. Economic Development Transportation Program	2 - 11
2.3	SPECIAL PURPOSE PROJECTS	2 - 11
	A. Transportation Alternatives Set-aside Program	2 - 11
	B. Bikeways and Pedestrian Facilities	2 - 12
	C. Park-and-Ride Facilities	2 - 14
	D. Safety Rest Areas and Welcome Centers	2 - 14
	E. Aviation, Rail Freight, Ports, and Waterways	2 - 15
2.4	GROUPINGS OF PROJECTS	2 - 15
	A. Purpose	2 - 15
	B. Design Groupings	2 - 15
	C. Construction Groupings	2 - 16
	D. Design-Build Groupings	2 - 18
	E. General Considerations when Grouping	2 - 18
CHAPTER 3 A MULTI-DISCIPLINARY TEAM		
3.0	TRANSPORTATION PROJECT ORGANIZATION	3 - 1
	A. Introduction	3 - 1
	B. The Design Team	3 - 1
3.1	THE PROJECT MANAGER	3 - 2
	A. Introduction	3 - 2
	1. What is Project Management?	3 - 2
	2. Organization-wide Commitment	3 - 3
	3. Three Project Management Levels	3 - 9

- 4. Early and Continuous Project Manager Involvement 3 - 9
- 5. The Project Manager/Portfolio Manager Relationship 3 - 10
- B. The Role of the Project Manager..... 3 - 10
- C. Responsibility and Authority..... 3 - 11
 - 1. Cost Management 3 - 11
 - 2. Effective Communications..... 3 - 12
 - 3. Project Schedules..... 3 - 13
 - 4. Managing Consulting Engineering Agreements 3 - 13
- 3.2 COORDINATION WITH OTHER AGENCIES 3 - 14
 - A. Coordination with Regulatory Agencies 3 - 14
 - 1. Agency Coordination Meetings..... 3 - 14
 - 2. Act 120 Agency Coordination Process 3 - 15
 - 3. Federal Highway Administration..... 3 - 16
 - 4. U.S. Environmental Protection Agency..... 3 - 17
 - 5. U.S. Army Corps of Engineers..... 3 - 18
 - 6. U.S. Fish & Wildlife Service 3 - 18
 - 7. U.S. Coast Guard 3 - 19
 - 8. Natural Resource Conservation Service..... 3 - 20
 - 9. National Park Service..... 3 - 20
 - 10. Native American Tribal Nations..... 3 - 20
 - 11. Pennsylvania Fish and Boat Commission 3 - 20
 - 12. Pennsylvania Department of Environmental Protection and County Conservation Districts..... 3 - 21
 - 13. Pennsylvania Historical and Museum Commission..... 3 - 22
 - 14. Pennsylvania Department of Conservation and Natural Resources..... 3 - 22
 - 15. Pennsylvania Natural Diversity Inventory 3 - 23
 - 16. Pennsylvania Game Commission..... 3 - 23
 - 17. Pennsylvania Public Utility Commission..... 3 - 24
 - 18. Agricultural Lands Condemnation Approval Board 3 - 24
 - 19. Utility Providers..... 3 - 25
 - 20. Pennsylvania Turnpike Commission 3 - 25
 - B. Modal and Planning Relationships 3 - 26
 - 1. General Relationships with Railroads..... 3 - 26
 - 2. General Relationships with Aviation 3 - 26
 - 3. PennDOT Coordination on Non-PennDOT Projects 3 - 27
 - 4. Metropolitan Planning Organizations (MPO) and Rural Planning Organizations (RPO)..... 3 - 27
 - 5. PennDOT Coordination with Municipal and County Government..... 3 - 27

CHAPTER 4 QUALITY CONTROL AND QUALITY ASSURANCE PRACTICES AND PROCEDURES

- 4.0 INTRODUCTION 4 - 1
- 4.1 QUALITY MANAGEMENT PLAN..... 4 - 2
 - A. Management Responsibility 4 - 2
 - B. Quality System 4 - 2
 - C. Internal Quality Audits and the Independent Oversight Program 4 - 5
 - D. Corrective and Preventive Actions 4 - 5
 - E. Design Management..... 4 - 5
 - F. Consultant Management..... 4 - 5

CHAPTER 5 PRE-TIP AND TIP PROGRAM DEVELOPMENT PROCEDURES OVERVIEW (STEPS 1 THROUGH 4)

- 5.0 INTRODUCTION 5 - 1
- 5.1 FEDERAL REQUIREMENTS..... 5 - 2
 - A. Long-Range Plans and Short-Range Programs..... 5 - 2
 - B. Public Involvement..... 5 - 3

- 5.2 STATE REQUIREMENTS 5 - 3
 - A. Pennsylvania State Transportation Commission 5 - 3
 - B. Twelve Year Transportation Program 5 - 3
- 5.3 PRE-TIP/TIP STEPS 1 THROUGH 4 OVERVIEW 5 - 4
 - A. Problem Assessment (Step 1)..... 5 - 5
 - B. Proposal Identification (Step 2)..... 5 - 7
 - C. Proposal Evaluation (Step 3)..... 5 - 8
 - D. Project Addition to TIP/STIP (Step 4)..... 5 - 9
- 5.4 LOCAL BRIDGE PROGRAM..... 5 - 9
- 5.5 FEDERAL-AID PROGRAMMING AND AUTHORIZATION PROCEDURES 5 - 10

CHAPTER 6 POST-TIP NEPA PROCEDURES OVERVIEW (STEP 5)

- 6.0 INTRODUCTION 6 - 1
- 6.1 PRE-TIP DATA VERIFICATION 6 - 1
- 6.2 ENVIRONMENTAL DOCUMENTATION PREPARATION 6 - 1
- 6.3 NEPA DECISION..... 6 - 1

CHAPTER 7 PRELIMINARY ENGINEERING AND FINAL DESIGN PHASE PROCEDURES OVERVIEW (STEPS 5 AND 6)

- 7.0 INTRODUCTION 7 - 1
 - A. Design Flexibility and Tort Liability..... 7 - 1
- 7.1 PRELIMINARY ENGINEERING 7 - 2
 - A. Introduction 7 - 2
 - B. Key Activities 7 - 3
 - C. Preliminary Engineering and Environmental Analysis 7 - 4
 - D. Public Involvement..... 7 - 5
 - E. Agency Involvement 7 - 5
- 7.2 FINAL DESIGN 7 - 5
 - A. Introduction 7 - 5
 - B. Main Path Activities 7 - 6
 - 1. Design Development..... 7 - 6
 - 2. Plans Preparation 7 - 8
 - 3. Contract Management..... 7 - 9
 - C. Parallel Path Activities 7 - 10
 - 1. Right-of-Way 7 - 10
 - 2. Utility Coordination 7 - 11
 - 3. Public and Agency Coordination 7 - 12
 - 4. Permitting 7 - 12
 - D. Other Final Design Activities/Considerations 7 - 13
 - 1. Mitigation Measures 7 - 13
 - 2. Design Partnering 7 - 13
 - 3. Plan Reviews/Constructability Review..... 7 - 13
 - 4. Final Design Office Meeting..... 7 - 14
 - 5. Plans, Specifications and Estimates (PS&E) Submission 7 - 15
 - 6. Pre-Bid Construction Schedule Process..... 7 - 15
 - 7. Contract Letting 7 - 15

CHAPTER 8 CONSTRUCTION (STEP 6)

- 8.0 INTRODUCTION 8 - 1
- 8.1 SPECIFIC DETAILS 8 - 1
 - A. PennDOT's Role 8 - 1
 - B. Contractor's Role 8 - 2
 - C. Design Review During Construction..... 8 - 2

D. Scheduling 8 - 2
E. Surveying 8 - 4
F. Measurement and Payment..... 8 - 4
G. Related Publications 8 - 4
H. Selective Post-Construction Project Design Reviews 8 - 5
8.2 SHOP DRAWINGS/CONSULTATION 8 - 5
8.3 COMMITMENTS AND MITIGATION MEASURES 8 - 5
8.4 CONSTRUCTION VALUE ENGINEERING 8 - 6
8.5 AS-BUILT PLANS 8 - 6

CHAPTER 9 MAINTENANCE AND OPERATIONS

9.0 INTRODUCTION 9 - 1
9.1 PROCEDURE FOR MAINTENANCE 9 - 1
9.2 BUDGET 9 - 1
9.3 MAJOR MAINTENANCE AND OPERATIONS ITEMS 9 - 2
 A. Snow and Ice Control 9 - 2
 B. Paved Surface Maintenance..... 9 - 2
 C. Drainage and Drainage Systems..... 9 - 2
 D. Roadside Management 9 - 2
 E. Bridge Maintenance..... 9 - 3
 F. Emergency Operations 9 - 3
9.4 INTERACTION BETWEEN DESIGN AND MAINTENANCE..... 9 - 3

CHAPTER 10 SPECIAL COORDINATION PROCEDURES

10.0 INTRODUCTION 10 - 1
10.1 INTEGRATED NEPA/404 PROCESS..... 10 - 1
10.2 DESIGN PARTNERING..... 10 - 2
 A. Needs and Benefits 10 - 3
 B. Core Partnering Characteristics 10 - 4
10.3 SECTION 106 PROGRAMMATIC AGREEMENT 10 - 5
10.4 BRIDGE AND ROADWAY PROGRAMMATIC AGREEMENT 10 - 5
10.5 REAL PROPERTY PROGRAMMATIC AGREEMENT 10 - 6
10.6 RELATIONSHIPS WITH THE DESIGN AND CONSTRUCTION INDUSTRIES 10 - 6
 A. PennDOT/Consultant Relations - American Council of Engineering Companies (ACEC) 10 - 6
 B. PennDOT/Contractor Relations - Associated Pennsylvania Constructors..... 10 - 7

LIST OF FIGURES

<u>FIGURE</u>	<u>SUBJECT</u>	<u>PAGE</u>
1.1	Transportation Program Development and Project Delivery Process	1 - 3
3.1	Transportation Program Development and Project Delivery Process Responsibilities	3 - 4
3.2	Pennsylvania Department of Transportation Organization Chart.....	3 - 6
3.3	PennDOT Regional Map	3 - 7
3.4	Representative District Office Organization Chart.....	3 - 8
3.5	Pennsylvania's Transportation Planning Organizations Rural and Metropolitan Areas	3 - 29
4.1	Quality Pyramid	4 - 3
5.1	Procedural Flow for Form D-4232	5 - 11

LIST OF TABLES

<u>TABLE</u>	<u>SUBJECT</u>	<u>PAGE</u>
2.1	Typical Non-Complex (Minor) Projects.....	2 - 3
2.1A	Typical Qualifications Of Non-Complex (Minor) Projects	2 - 4
2.2	Typical Moderately Complex Projects	2 - 4
2.2A	Typical Qualifications Of Moderately Complex Projects	2 - 5
2.3	Typical Most Complex (Major) Projects.....	2 - 6
2.3A	Typical Qualifications Of Most Complex (Major) Projects	2 - 7

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CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

Transportation is an integral part of nearly every aspect of our communities and our Commonwealth. Pennsylvania's economy is highly competitive, increasingly global, and largely service-oriented. Contemporary cultural values emphasize mobility, independence, and immediate access to an ever-expanding range of products, services, and activities. The Commonwealth's economic growth and overall quality of life are directly dependent on a transportation system that can move people and products safely and efficiently. Such a network must be flexible and responsive, interconnecting various modes of transportation and land uses. It is evident that the transportation network and surrounding land uses need to be integrated to manage capacity, driver expectations and behaviors, community needs / livability, and environmental considerations.

The Pennsylvania Department of Transportation (PennDOT) is the lead agency responsible for developing, maintaining and enhancing the Commonwealth's transportation system; a system that includes highways, bridges, airports, railroads, ports/waterways, and bicycle/pedestrian facilities. Rapidly changing trends in development patterns, transportation funding, mobility needs, and economic conditions place high demands on Pennsylvania's transportation network. To adapt to a changing environment where land use and community needs are becoming even more dependent on transportation and vice versa, PennDOT has implemented a Transportation Program Development and Project Delivery Process (Process; See [Figure 1.1](#)) that will ensure limited transportation funding is:

- Used to maintain existing infrastructure first;
- Applied in a manner that requires smart land use decisions;
- Coordinated in collaboration with Metropolitan and Rural Planning Organizations (MPO/RPOs) and local government staff;
- Focused on better use of existing capacity; realizing that adding capacity is not always the answer; and,
- Programmed based on realistic project (design and construction) cost estimates; projects are designed to these estimated costs.

During the initial transportation planning phases, PennDOT and its *Planning Partners*, typically the MPO/RPOs, take responsibility for identifying potential transportation problems. The Planning Partners are asked to help develop Project Needs, identify potential alternatives, ensure environmental responsibility, and create a fundable transportation plan, which contains proposals and potential projects that will sustain and enhance the transportation network and our Commonwealth's communities. PennDOT has placed a renewed emphasis on planning and collaboration under the *PennDOT Connects* policy which was issued by Secretary Richards on December 19, 2016. This policy commits PennDOT to collaborate with MPO/RPO staff and local government planners/staff during the planning process. The objective of this collaboration policy is to identify needs of communities and related contextual issues early in project planning through the collaborative planning process. The role of local government planners/staff in the process is to make PennDOT and the MPO/RPO aware of visions and aspirations for the community as well as identified local needs. PennDOT and the MPO/RPO need to work with local government planners/staff to determine if community-related project features are justified to be incorporated as part of the transportation proposal.



As shown in [Figure 1.1](#), once the Planning Partners' and PennDOT's proposals become projects to be developed and delivered, information from the Pre-Transportation Improvement Program (TIP) and TIP Project Delivery Procedures will be carried through to the Post-TIP Project Delivery Procedures. During the Post-TIP activities, PennDOT's process and other supporting principles, including but not limited to Context Sensitive Solutions, Flexibility in Highway Design and Smart Growth will be further used to develop an efficient, affordable, and sustainable transportation network. See Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix B, Glossary for definitions of these terms. It is imperative that PennDOT works collaboratively with the Planning Partners prior to and during TIP development. It is also vital that the Planning Partners are aware of PennDOT's Process and guiding principles (discussed in subsequent sections of this chapter) and are considering these concepts in their evaluation of potential proposals to move forward for TIP development.

Before developing a transportation program, PennDOT must clearly layout the Commonwealth's goals and objectives for the transportation system, which set Pennsylvania's transportation direction for a 20 year period and define "where we are going." These goals are supported by the Transportation Program Development and Project Delivery Process (see [Figure 1.1](#)), which defines "how we get there." Transportation problems being considered (or proposed) for inclusion on the TIP/State Transportation Improvement Program (STIP) must support the Commonwealth's transportation system goals as these proposals evolve into projects and eventually are constructed. The Process defines the various steps required to systematically identify problems, shape conceptual solutions into proposals, and eventually advance projects through the planning, design, and construction phases. The Process is an effective mechanism through which PennDOT responds to Pennsylvania's diverse transportation needs. The first four steps of the process are iterative, in that proposals that do not make it onto the TIP are not necessarily dismissed from consideration. Proposals that are not included on the TIP, but that are still on the Long Range Transportation Plan (LRTP), may go through the first four steps of the Process many times before being put on the TIP as a project to advance to construction. The Plan and Process were developed to provide a sustainable transportation system and adhere to the following Core Principles (more details on each of the following principles will be found throughout Design Manual Part 1, and in Design Manuals Parts 1A, 1B, and 1C).

Transportation Program Development and Project Delivery Process



Figure 1.1

CORE PRINCIPLES

1. Money Counts

- A baseline project cost estimate should be prepared as early as possible in the Process; the project will eventually be designed to this baseline cost. Updated estimates should be compared to this baseline throughout project delivery. Projects must be fundable to be constructible.

2. Choose Projects with High Value to Price Ratios

- The goal is to find the best solution that:
 - addresses the identified project needs;
 - fits within the transportation, community, land use, environmental, and fiscal context;
 - is community supported;
 - is affordable, based on fiscal constraints;
 - can be implemented in a reasonable time frame; and,
 - achieves the greatest benefits for the money spent on a project.
- The degree of improvement must be justifiable based on the total required investment; actual metrics for making this determination will need to be developed on a project-by-project basis.

3. Enhance the Local Network

- Encourage solutions that are on the current alignment.
- Reduce the number of environmentally complex projects.
- Utilize the existing right-of-way.
- Emphasize network connectivity.
- Better manage capacity by integrating land use and transportation planning.
- Strive for access and corridor management.

4. Look Beyond Level of Service (LOS)

- Project approach should fit the project need, type, and complexity (see [Chapter 2](#)); and provide a full range of affordable, cost-effective solutions.
- Concepts should be filtered through the best judgment of a Multi-Disciplinary Team.
- Design exceptions and waivers may be appropriate based on the project.
- Try to achieve balance between Design Speed, Desired Operating (Running) Speed, and Posted Speed.
- Use Measures of Success (Performance Measures).

5. Safety First and maybe Safety only

- Virtually all projects require a Safety Review; and although not required, all projects can benefit from a Roadway Safety Assessment.
- Safety projects must provide documentation on the expected performance of the proposed improvements (Measures of Success or Performance Measures).
- Crash fatality reduction is always a goal.

- Procedures from the AASHTO's *Highway Safety Manual* (HSM) should be incorporated as appropriate. See Publication 638, *District Highway Safety Guidance Manual*, for information on the HSM and on performing crash analysis and safety impact evaluations.

6. Accommodate all modes

- Consider Pedestrian needs (Walkable Communities Program; well-connected sidewalks; Americans with Disabilities Act (ADA) requirements).
- Consider needs of Bicyclist.
- Incorporate public Transit (bus, passenger rail), where applicable (Transit Revitalization Investment Districts (TRID)).
- Consider needs of nearby Airports (Statewide Airport System Plan (SASP)).
- Consider access to ports/waterways (navigable) and freight rail lines/facilities.
- Use of a Multi-Disciplinary Team (see [Chapter 3](#)) that includes team members with expertise in each transportation mode, as appropriate for the project.

7. Leverage and Preserve existing investments

- Focus should be on the overall transportation network and how the project fits into that network not only on the individual roadway.
- Redevelopment (maintenance/preservation) first of existing infrastructure (Asset Management, see Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix B).

8. Build towns, not sprawl

- Consistency with local planning; concentrate development in existing developed areas.
- Use access controls (Highway Occupancy Permits and access covenants [Publication 170, *Highway Occupancy Permit Manual*, Chapter 7]).
- Develop transportation networks that serve all modes of travel: pedestrian, bicycle, transit, and motor vehicle.
- Consider:
 - Home Town Streets and Safe Routes to Schools programs
 - *Keystone Principles and Criteria for Growth, Investment, and Resource Conservation* (2005)
 - *Land Use, Transportation, and Economic Development* (LUTED)

9. Understand the context; plan and design within the context

- Respect the community character.
- Understand the full context (transportation, environmental, community, land use, and fiscal) – refer to Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix B for more information on defining "context."

- Understand place (rural, suburban network, suburban corridor, suburban center, town/village/urban neighborhood, town center, urban core) and how that affects design – refer to Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix B for more information on defining "place."
- Respect existing and future land use.
- Match vehicular speeds (desired operating speed/design speed) to the local context and place.

10. Develop local governments as strong land use partners

- PennDOT's Transportation Program Development and Project Delivery Process (Figure 1.1) encourages more meaningful participation in project development by local and regional transportation planning agencies.
- Integrate land use planning with transportation planning (existing and future).

As stated, more details on each of PennDOT's ten Core Principles are contained throughout this manual; Publication 10A, Design Manual Part 1A, *Pre-TIP and TIP Program Development Procedures*; Publication 10B, Design Manual Part 1B, *Post-TIP NEPA Procedures*; and Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*. It is imperative that PennDOT Project Managers, Planners, and Designers, along with the Planning Partners, follow these principles and PennDOT's Process.

1.1 PURPOSE AND OBJECTIVES

This manual was developed by PennDOT to serve as a guide for PennDOT and its Planning Partners / Consultants / Contractors who are responsible for advancing transportation projects through the Process. Familiarity with the Process will contribute greatly to improved efficiency in the coordination and advancement of Pennsylvania's transportation projects.

This manual is not intended to be a substitute for experience or sound judgment. Because every project offers different challenges, creative application or modification of the procedures described in this manual may be necessary to advance a project and achieve project-specific objectives.

The flexibility provided by current law and policy, and this Process, coupled with PennDOT's goal to improve the overall quality of projects delivered in terms of scope, cost, and schedule has led to the establishment of seven primary objectives for this Process:

1. Focus available funds and resources on the most necessary transportation needs

Establish project purpose and need in Planning, and eliminate unnecessary projects and unrealistic alternatives in Planning (Pre-TIP phases, see Figure 1.1) – may require identification of appropriate funding for Planning Phase.

2. Improve cost estimating for potential projects

Undertake more engineering and environmental analysis prior to TIP/Statewide Transportation Improvement Program (STIP) activities; enable a review of preliminary project cost estimates before placing projects on the TIP; develop metrics for each TIP to compare actual project costs to TIP/STIP estimates; and, when developing preliminary costs, remember to carefully consider inflation factors so that Year of Expenditure (YOE) dollars are used for the estimates.

3. Increase accuracy in project scheduling and improve predictability for project delivery

Develop a better understanding of engineering, environmental, and public constraints early in project planning to facilitate development of realistic schedules that will lead to more timely delivery of projects.

4. Develop better and more accurate project scopes

Evaluate project alternatives, project design criteria and conduct preliminary studies during planning; and collect more project specific data during planning leading to a better understanding of potential project issues.

5. Better reflect PennDOT's goals in project selection

Provide for the integration of the Commonwealth's transportation system goals and other initiatives (as discussed in PennDOT's Design Manuals, see following section) into project planning, and develop consistent criteria for identifying and prioritizing potential projects.

6. Improve communication, coordination, and cooperation within and among PennDOT, the MPO/RPOs, local governments, the Federal Highway Administration (FHWA), Federal Transit Administration (FTA), other transportation planning entities, tribal nations, and the resource agencies

Integrate PennDOT staff and local government staff into MPO/RPO Long Range Transportation Plan (LRTP) and TIP development; form (emphasizing integrated membership) Programming Advisory Committee to review project proposals; and work with tribal nations and the agencies (including FHWA and FTA, as appropriate) earlier in the Process.

7. Promote early public participation and public involvement

Provide opportunities for more participation by the agencies and public at earlier stages beginning with the development of the LRTP, and continuing through prioritization and project delivery.

1.2 ORGANIZATION

A. Design Manual Series of Documents. This manual is Part 1 of a nine-volume series of documents that encompasses PennDOT's Design Manual. The Design Manual (DM) series includes:

Publication 10	Part 1	<i>Transportation Program Development and Project Delivery Process</i>	Design Manual Part 1	(DM-1)
Publication 10A	Part 1A	<i>Pre-TIP and TIP Program Development Procedures</i>	Design Manual Part 1A	(DM-1A)
Publication 10B	Part 1B	<i>Post-TIP NEPA Procedures</i>	Design Manual Part 1B	(DM-1B)
Publication 10C	Part 1C	<i>Transportation Engineering Procedures</i>	Design Manual Part 1C	(DM-1C)
Publication 10X	Part 1X	<i>Appendices to Design Manuals 1, 1A, 1B, and 1C</i>	Design Manual Part 1X	(DM-1X)
Publication 13M	Part 2	<i>Highway Design</i>	Design Manual Part 2	(DM-2)
Publication 14M	Part 3	<i>Plans Presentation</i>	Design Manual Part 3	(DM-3)
Publication 15M	Part 4	<i>Structures</i>	Design Manual Part 4	(DM-4)
Publication 16	Part 1	<i>Utility Relocation</i>	Design Manual Part 5	(DM-5)

B. Contents of Design Manual Part 1. Design Manual Part 1, *Transportation Program Development and Project Delivery Process*, contains ten chapters.

Chapter 1, Introduction, introduces the Process and how it brings order and direction to a dynamic, potentially complicated, and often conflicting set of circumstances. The Process defines a systematic approach that provides for the cost effective delivery, maintenance, and operation of Pennsylvania's Transportation System.

Chapter 2, Defining a Transportation Project, defines transportation projects in terms of project complexity levels (non-complex or minor; moderately complex; and most complex or major) and project types (highway restoration, bridge program, safety and mobility, interstate restoration, economic development, bicycle and pedestrian, and transportation alternatives).

Chapter 3, A Multi-Disciplinary Team, describes the organization and use of a group of professionals with varying expertise and discipline areas to help develop projects that are financially responsible, but also fit with the full context (transportation, community, environmental, land use, and fiscal) of an area. Chapter 3 also defines the roles of the primary members of the Multi-Disciplinary Team and outlines tips and techniques for successful project management. The roles, responsibilities of, and interaction with outside agencies is also discussed.

Chapter 4, Quality Control & Quality Assurance Practices and Procedures, describes PennDOT's policies and procedures for insuring quality in plans and other deliverables. Chapter 4 includes an overview of the Stewardship & Oversight Agreement with the FHWA.

Chapter 5, Pre-TIP and TIP Program Development Procedures Overview, establishes standard procedures for the development of the TIP and STIP. All MPO/RPO and PennDOT proposals being advanced for TIP/STIP inclusion shall follow these procedures. More details are provided in Publication 10A, Design Manual Part 1A, *Pre-TIP and TIP Program Development Procedures*.

Chapter 6, Post-TIP National Environmental Policy Act (NEPA) Procedures Overview, describes the Process that involves moving a project from planning to and through the environmental analyses (concurrent with preliminary engineering, as discussed in Chapter 7) and to the NEPA Decision where a final decision is made on environmental clearance and whether to advance the project on to Final Design. More details are provided in Publication 10B, Design Manual Part 1B, *Post-TIP NEPA Procedures*.

Chapter 7, Preliminary Engineering and Final Design Phase Procedures Overview, describes the procedures utilized during Preliminary Engineering and Final Design of a Transportation Project. It also provides an overview of the design flexibility provided by current guidance, which allows better decisions to be made regarding design features and helps to design transportation projects that better integrate into the surrounding community. More details are provided in Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*.

Chapter 8, Construction, discusses PennDOT's and the Contractor's roles during construction, overviews various tasks required during construction (i.e. shop drawing review), discusses incorporation of mitigation commitments into construction projects, and addresses construction value engineering and as-built plans. More details are provided in Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*.

Chapter 9, Maintenance and Operations, provides an overview of the purpose of Maintenance and Operations, which is to improve safety and extend the useful service life of a facility by preventing its rapid deterioration and premature failure. Maintenance and Operations has a direct bearing on safety, design considerations, PennDOT's fiscal resources, and the public's overall perception of Pennsylvania's transportation system. Other issues include the organization of PennDOT's maintenance forces and funding sources. Chapter 9 also examines PennDOT's various highway maintenance commitments including snow removal, vegetation management, litter control, etc. More details on Maintenance and Operations are provided in Publication 23, *Maintenance Manual*.

Chapter 10, Special Coordination Procedures, outlines procedures for integrating the NEPA and Section 404 processes and for design partnering. Chapter 10 describes the Programmatic Agreement for Minor Transportation Projects with FHWA, the Advisory Council on Historic Preservation, and Pennsylvania Historical and Museum Commission. The Chapter also overviews the relationships with the design (American Council of Engineering Companies) and construction (Associated Pennsylvania Constructors) industries.

1.3 PROCEDURES FOR MODIFICATIONS OR ADDITIONS TO THIS DOCUMENT

This document is published in digital form to facilitate future changes and additions. PennDOT recognizes that the regulations and policies affecting its engineering procedures are continuously changing and that this manual must be a dynamic document to remain current. Whenever modifications or additions are required to improve the present procedures, the following procedure shall be followed:

- Bureau Directors and District Executives should submit suggestions in the form of revised pages in digital form to the Central Office Bureau of Project Delivery for evaluation and processing. The Bureau of Project Delivery will coordinate with the appropriate Deputates and Bureaus as necessary concerning additions and modifications to this manual. The suggestions should include:
 - The title and page number of the existing Procedures, if applicable.
 - The recommended revised page(s) and the Chapter into which it (they) should be incorporated.
 - The reasons for recommending modifications or additional procedures.
- The Director, Bureau of Project Delivery, will review the recommended changes or additional procedures and transmit copies to the various affected Bureau Directors for their comments.
- The affected Bureau Directors shall provide their comments to the Director, Bureau of Project Delivery, who will take appropriate action.
- The Director, Bureau of Project Delivery, will submit the final version of all changes to FHWA for approval prior to issuing the revised manual.
- When modifications or additions are made to pages in this manual, a revision date will be indicated below the page number in the upper right- or upper left-hand corner, and the revision will be distributed by the Bureau of Project Delivery by Transmittal Letter.

CHAPTER 2

DEFINING A TRANSPORTATION PROJECT

2.0 INTRODUCTION

This chapter discusses how a transportation project is defined; the differing levels of project complexity; and provides specific information on highway and bridge projects. Federal transportation legislation mandates that all appropriate modes of transportation be considered in the development of transportation solutions. PennDOT recognizes the need to coordinate engineering procedures among alternate modes of transportation, including aviation, railroads, public transit/transportation, waterways, pedestrians, bicycles, and highways, even though highways continue to be the leading mode of transportation in Pennsylvania; therefore, this chapter focuses on highways/bridges and how other modes of transportation should be considered / factored into PennDOT projects.

2.1 PROJECT COMPLEXITY LEVELS

By definition, a project is any series of activities or tasks that:

- Have specific objectives to be completed within certain parameters.
- Have clearly defined starting and ending points (logical termini) and duration.
- Have budget and time limitations.
- Utilize resources (i.e., money, people, equipment, etc.).

The primary objective of a typical highway project is to produce a solution that fulfills the project need, fits its role within the transportation network and in the project area setting (context), is cost effective, minimizes impacts, maintainable, constructible, biddable, and consistent with PennDOT's QC/QA plan. The main constraints on a typical highway project are time, cost, quality, and public perceptions. Project success depends on meeting goals and objectives within these constraints while avoiding excessive changes to the original scope of the project.

PennDOT Transportation Projects are divided into three complexity levels, as shown in [Table 2.1](#), Typical Non-Complex (Minor) Projects; [Table 2.2](#), Typical Moderately Complex Projects; and [Table 2.3](#), Typical Most Complex (Major) Projects. In addition to requiring larger design teams and more detailed planning, Most Complex (Major) projects also require more elaborate management arrangements and communication techniques. On some very large projects, the District Project Manager may need to be involved nearly full-time and have assistants.

For major or very large projects, District Project Managers sometimes choose to expand the project organization. By assigning responsibility for day-to-day project decisions to a Multi-Disciplinary Team, as discussed in [Section 3.0](#), where each member is responsible for a specific design discipline, the Project Manager can ensure a timely response to critical design issues.

In this type of project organization, project success depends on the ability of the Project Manager to share authority and the commitment of the team members to meeting their discipline-specific project assignments. While the Project Manager maintains the project scope, schedule, and budget, the team members provide the necessary technical expertise and services. Each team member may direct a staff of design engineers, planners, and/or technicians that carry out various tasks.

While [Tables 2.1A](#), [2.2A](#), and [2.3A](#) provide some guidance on the appropriate level of environmental document, it is important to note that project complexity levels are not always good indicators of the environmental document level. Some projects that are complex from a design standpoint may not be environmentally complicated (i.e., few environmental issues and/or impacts) and therefore might require a Categorical Exclusion (CE) instead of an Environmental Assessment (EA) or Environmental Impact Statement (EIS). Similarly, a non-complex (minor) project might be very challenging from an environmental standpoint (i.e., numerous environmental issues, potential for significant effects, or substantial public controversy) and could require a higher environmental document level

than a CE. Decisions on the appropriate level of environmental document for a project should be made by the District Environmental Manager at the Scoping Field View in coordination with the Project Team, including PennDOT Central Office and FHWA as necessary.

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**TABLE 2.1
TYPICAL NON-COMPLEX (MINOR) PROJECTS***

Roadway	<ul style="list-style-type: none"> • Maintenance Betterment projects. • 3R (Resurface, Restore, Rehabilitate) projects. • Intersection improvement projects with minor or no signal layout changes or un-signalized. • Construction of turn lanes at intersections. • Overlay projects, simple widening.
Structures**	<ul style="list-style-type: none"> • Bridge resurfacing or repairs which do not require re-analysis of bridge capacity. • Replacement with minimal approach work. • Pipes, box culverts, or minor culvert replacements. • Sign structures, including Dynamic Message Sign structures. • Noise walls or retaining walls for which the design can be picked directly from the standards or using design computer software.
Highway Safety Improvements	<ul style="list-style-type: none"> • Guide rail elimination, replacement, or updating. • Slope flattening. • Traffic operations with minor or no roadway work (e.g., signalization including retiming, signing, pavement markings and roadway lighting). • 23 U.S.C. Sections 130 and 148 Highway 130 Safety Projects. • Truck escape ramps.
Miscellaneous	<ul style="list-style-type: none"> • Transportation Alternatives (TA) Set Aside projects (e.g., pedestrian and bicycle paths). • Transportation corridor fringe parking facilities. • Rehabilitation of truck weigh stations, rest areas, or tourist information facilities. • Rehabilitation of bus storage and maintenance facilities. • Rehabilitation or reconstruction of existing rail and bus facilities. • Rehabilitation of rail storage and maintenance facilities. • Construction of replacement wetlands.

* Projects must not be Federal Oversight (See Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*, Chapter 3 and Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*). Projects cannot be on the Interstate System, National Highway System (NHS) freeways or other limited access facilities.

** Bridge projects should not be classified as Minor if they will require Bridge Design and Technology Division (BDTD) and possible FHWA involvement as per Publication 15M, Design Manual Part 4, *Structures*.

TABLE 2.1A
TYPICAL QUALIFICATIONS OF NON-COMPLEX (MINOR) PROJECTS

Traffic Control	<ul style="list-style-type: none"> • Single traffic control/management projects (i.e., projects with no traffic control phasing or with a single detour). • Non-ITS but minor safety improvements.
Right-of-Way	<ul style="list-style-type: none"> • Involve minor right-of-way acquisitions with no controversial or only minor displacements and maintain or reduce existing access control.
Utilities	<ul style="list-style-type: none"> • Minor adjustments/relocations.
Environmental	<ul style="list-style-type: none"> • Categorical Exclusion (Level 1A or 1B), Environmental Documentation, or NEPA Programmatic Agreement. • Minimal interaction with environmental and permitting agencies. • Minor environmental impacts. • Minimal or no involvement with cultural resources or hazardous waste. • No substantial flood plain encroachments.
Stakeholders	<ul style="list-style-type: none"> • No public controversy on environmental grounds.

TABLE 2.2
TYPICAL MODERATELY COMPLEX PROJECTS

Roadway	<ul style="list-style-type: none"> • 4R (Resurface, Restore, Rehabilitate, Reconstruct) projects that do not add capacity. • Minor relocations and/or reconstructions. • Minor sections of new alignment. • Intersection improvement projects with additional through lanes. • Intersection improvement projects with significant signal layout changes. • Roundabouts and Innovative Intersections
Structures	<ul style="list-style-type: none"> • Non-complex (straight geometry with minimal skew; designs using AASHTO distribution factors; minimal seismic analysis; footings on rock or conventional piles and abutments) bridge replacements. • Bridge rehabilitation that requires re-analysis of bridge capacity. • Bridge mounted signs. • Tie back walls. • Sound barriers. • Proprietary/non-proprietary walls.

**TABLE 2.2A
TYPICAL QUALIFICATIONS OF MODERATELY COMPLEX PROJECTS**

Traffic Control	<ul style="list-style-type: none"> • Minor-ITS projects, such as non-corridor spot improvements. • Major safety improvements. • Interconnected traffic control/management projects.
Right-of-Way	<ul style="list-style-type: none"> • Less than 20 moderate to significant claims, and minimal relocations or displacements.
Utilities	<ul style="list-style-type: none"> • Some utility relocations, most of it prior to construction, but no major utility relocations.
Environmental	<ul style="list-style-type: none"> • Categorical Exclusion (Level 1B or 2). • Cultural resources (historical, archeological, etc.). Coordination with PHMC, FHWA, and/or Advisory Council. • Water and air pollution mitigation. • Major coordination with PA Game or Fish and Boat Commissions. • Endangered Species Act, Section 7 Consultation.
Stakeholders	<ul style="list-style-type: none"> • Involvement of public and public officials is moderate due to non-controversial project type. • General communication about project progress is required.

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**TABLE 2.3
TYPICAL MOST COMPLEX (MAJOR) PROJECTS***

Roadway	<ul style="list-style-type: none"> • New highways. • New interchanges. • Major Relocations, including signal relocations that influence/change a coordinated system. • Capacity adding/major widening. • Major reconstruction.
Structures	<ul style="list-style-type: none"> • Replacement, new or rehabilitation of: <ul style="list-style-type: none"> • Unusual (non-conventional such as, segmental, cable stayed, major arches or trusses, steel box girders, movable bridges, etc.). • Complex (sharp skewed (less than 70 degree) superstructure, non-conventional piers or abutments, horizontally curved girders, three dimensional structural analysis, non-conventional piles or caisson foundations, complex seismic analysis, etc.). • Major (bridge cost of \$15 Million or more - Federal definition). • Unusual geology (i.e., mines, karst, etc.).

*For major projects, if project costs are estimated to be between \$100 and \$500 million, the Project Manager must follow the requirements outlined in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix C, FHWA/PennDOT Stewardship & Oversight Agreement.

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**TABLE 2.3A
TYPICAL QUALIFICATIONS OF MOST COMPLEX (MAJOR) PROJECTS**

Traffic Control	<ul style="list-style-type: none"> • Multi-phased traffic control for highway or bridge construction that would mandate CPM during construction. • Major ITS (Electronic surveillance, linkages) corridor project.
Right-of-Way	<ul style="list-style-type: none"> • Numerous relocations of residences or displacements of commercial and/or industrial properties are required. Major involvement of environmental clean-up.
Utilities	<ul style="list-style-type: none"> • Major utility (transmission lines, substations) relocations or heavy multi-utility coordination is involved.
Environmental	<ul style="list-style-type: none"> • Level 2 Categorical Exclusion Evaluations, Environmental Impact Statements, or Environmental Assessments are required. • Continued public and elected officials' involvement in analyzing and selecting alternates. • Other agencies (such as FHWA, COE, PHMC, Game Commission, Fish & Boat Commission, DEP, DCNR, EPA, Agricultural Board, etc.) are heavily involved to protect air; water resources; gamelands; game fish, threatened and endangered species; cultural resources (historical and archaeological); parks; wetlands; etc.
Stakeholders	<ul style="list-style-type: none"> • High profile projects (Fast track design/construction, high public impact, high interaction of elected officials, etc.). • Controversial projects (Lack of consensus). • Major coordination among numerous stakeholders is required.

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2.2 HIGHWAY AND BRIDGE PROJECT TYPES

A. Highway Restoration Program. A highway restoration project is defined as a roadway project that restores an existing highway to an acceptable condition or improves the roadway through the following types of work:

- Pavement - replace portions, overlay or mill and resurface the roadway's surface.
- Widening - increase the width of the existing travel lanes or adds lanes.
- Shoulders - resurface, stabilize, or widen the existing shoulders.
- Intersections - nominal channelization of intersections and addition of turning lanes.
- Alignment adjustments - change the roadway by either reducing or eliminating horizontal and vertical curves, or changing the roadway's superelevation.
- Structures - replace or rehabilitate structures of any length.
- Other roadway work items - replace and/or repair existing guide rail, signs, traffic signals, pipes, culverts, drainage systems, etc.
- Various minor safety improvements.

The maintenance and restoration of Pennsylvania's existing highway and bridge system is a priority. During LRTP and TIP development, it is vital that asset management needs be considered and funded first (Asset Management - see Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix B, Glossary) to ensure the viability of the Commonwealth's highway network. The PennDOT Districts and their Planning Partners develop prioritized lists of highway restoration needs. The Program Center considers available funding and aggregates the regional TIPs into PennDOT's recommended State Transportation Improvement Program (STIP). The recommended program is submitted to the State Transportation Committee (STC) for review and adoption.

The highway restoration program focuses on the restoration of Interstate highways, expressways, other state highways, and local roads. Not only is the existing network systematically improved and restored, but improved mobility and safety is considered for all travelers, including pedestrians and bicyclists.

Specific highway restoration programs and definitions of each include:

- Preventive Maintenance (PM). These projects involve tasks such as pothole repair, crack and joint sealing, pipe cleaning, milling and resurfacing, etc. The purpose of preventive maintenance is to maintain the integrity of the transportation network. For information regarding pavement preservation, see Publication 242, *Pavement Policy Manual* and Publication 15M, Design Manual Part 4, *Structures*, Chapter 5, Bridge Preservation.
- Roadway and Bridge Rehabilitation (3R) - Resurfacing, Restoration and Rehabilitation. These projects selectively upgrade existing highway safety, highway features, and roadway features without the cost of full reconstruction. Publication 13M, Design Manual Part 2, *Highway Design*, provides specific design criteria for 3R projects.

Highway restoration projects differ from capital projects since the project is primarily within the existing right-of-way (not on new location). These projects involve minimal reconstruction of the roadway and often use state funds from the county's annual Appropriation 582 maintenance budget. Most Interstate and expressway restoration projects are considered capital projects (see [Section 2.2.D](#) on the Interstate Restoration Program), with federal funds being matched with Appropriation 581 funding, which are state funds for capital projects.

The identification of highway restoration projects for programming is based upon a variety of factors, including:

- Deficiencies identified in Systematic Techniques to Analyze and Manage Pennsylvania Pavements (STAMPP).
- Continuation of the priority corridor approach to restoring state routes.
- Project coordination with other highway or bridge projects.
- Inclusion of minor safety improvements in the restoration project.
- Replacement or rehabilitation of bridges.
- Coordination of projects with the District's Business Plan, pavement cycles, and the surface treatment program.
- Public Input.

Roadway restoration projects can require an extended design phase to complete all environmental clearance, utility relocation, design review and right-of-way acquisition requirements. To insure that projects are let in the year they are programmed for construction, costs associated with these activities are usually programmed at least one year before construction.

B. Bridge Program. PennDOT typically considers a bridge as any elevated structure, carrying a roadway or railroad, that is 2.4 m (8 ft) or greater in length. By this definition, there are approximately 55,000 bridges in Pennsylvania, including all highway and railroad bridges that overpass highways. Federal regulations limit the use of Federal funds to the replacement or rehabilitation of structures 6 m (20 ft) or greater in length. The PennDOT Bridge Program uses a combination of federal, state (Act 26, see Section 5.4), and local funds and, generally, gives priority to projects that address closed and weight restricted bridges. State funding is provided from the bridge-restricted account for state bridges (Appropriation 185) and local bridges (Appropriation 183). State law limits the level of state participation for local projects to 80% of the non-Federal share.

The Districts, in coordination with MPOs, RPOs and local officials, develop prioritized lists of bridge project candidates. As with the highway restoration program, the Program Center considers available funding and aggregates the regional TIPs into PennDOT's recommended STIP. The recommended program is submitted to the State Transportation Commission for its review and adoption.

For more information on PennDOT's local bridge program, including program management, eligible projects, right-of-way, utility and construction approvals, and funding issues, see Publication 740, *Local Project Delivery Manual*.

For information regarding bridge preservation, see Publication 15M, Design Manual Part 4, *Structures*, Chapter 5.

For information regarding the Study Process to Evaluate Bridge Closure and Removal, see Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix AD.

C. Safety and Operations. Safety and mobility programs provide an expanded and comprehensive approach to highway safety improvements. The success of a safety and mobility program depends on the cooperation of the Planning Partners, PennDOT and other agencies. The range of typical safety and mobility project improvements include:

- Intersections
- Roundabouts
- Interchanges
- Highway-Rail Crossing Projects
- Corridor safety improvements
- Traffic signal coordination/synchronization
- Shoulders
- Spot locations

Transportation Demand Management Safety and mobility programs should emphasize the components of safety, congestion management, and air quality improvements along corridors and grids within the framework of the following areas:

- **Safety Corridors.** Safety Corridors are identified through a combination of crash statistics focusing on fatalities and severe injury crashes as identified in the Strategic Highway Safety Plan, by Regional Planning Organizations, PennDOT Districts, and local input.
- **Congested Corridors and Grids.** These areas are identified in the Congested Management Process for Transportation Management Areas through a multi-disciplinary task force comprised of Regional Planning Organizations, transit authorities, PennDOT Districts and Central Office, and local input.
- **Air Quality.** Air quality improvement should emphasize PennDOT cooperation with all planning partners. Programs are developed that use innovative management strategies to improve the efficiency of person flow rather than vehicle flow (i.e., reducing dependence on single occupancy vehicles (SOVs) and providing or enhancing alternative transportation modes). These programs may be customized to achieve the specific air quality attainment goals of a region. The product is a prioritized list of candidate physical and nonphysical improvement projects, programs and strategies that will best contribute to air quality attainment.

Each District should develop a Strategic Highway Safety Plan (SHSP) and safety performance measures in coordination with the MPO/RPO that encompasses those concerns that were not addressed by the corridor and grid approaches. The plan should consider the following eight components:

- Isolated locations with a high frequency of severe crashes.
- Isolated locations with a high frequency of driver errors or "near misses."
- Roadside safety improvements in rural areas through adequate clear zones.
- Reduced congestion through improved signalization and intersection geometrics.
- Elimination of critical, capacity controlling bottlenecks.
- Risk management of physical deficiencies.
- Pedestrian safety measures, including lighting, for urbanized areas.
- Low cost improvements including rumble strips, "day lighting," and guiderail.

Proposed safety and mobility improvement projects are incorporated into the regional LRTP and regional TIP and eventually PennDOT's recommended STIP as discussed earlier under the Highway and Bridge Programs. Procedurally, if it is appropriate, the Program Management Committee (PMC) approves safety and mobility projects pre-TIP, the Program Center should also collaborate with the affected MPO or RPO in obtaining TIP approval/STIP approval for the proposed improvements. Whenever possible, safety and mobility improvements should be combined with other programmed projects, such as betterments and the bridge program, to improve design and construction efficiency, reduce traffic disruptions, and minimize project delivery costs.

Safety impacts assessment/crash analysis using applicable *Highway Safety Manual* (HSM) methodology, as described in Publication 638, *District Highway Safety Guidance Manual*, should be conducted.

D. Interstate Management Program. PennDOT's Interstate Steering Committee conducts an annual evaluation of the condition of Pennsylvania's portion of the Interstate System. An annual analysis provides detailed information regarding the condition of interstate pavement and identifies potential reconstruction, restoration, and preservation projects statewide. Individual Interstate segment needs are identified and the overall system is compared to previous years. This analysis is based on an array of technical data including Present Serviceability Rating (PSR), Overall Pavement Index (OPI), International Roughness Index (IRI), and on-site field inspections (STAMPP). Although all of the indices above include ride quality, PSR also includes the roadway profile; OPI emphasizes structural distress; and IRI reflects roughness.

In conjunction with the analysis of pavement condition, each segment of Interstate is assigned to a treatment group. The treatment group represents the general category of work required to rehabilitate the pavement. Segments in need of rehabilitation become proposals for reconstruction, restoration, or pavement preservation. The scope and nature of work for proposals in these classifications are quite different, with different criteria used to rank and select projects.

Besides mainline highway restoration work, other categories of work must also be undertaken as part of the Interstate Program. These include:

- Sign Upgrades
- Pavement Markings
- Safety Hardware Upgrades

Interstate and related needs should be identified by PennDOT and its Planning Partners. These needs are then prioritized as potential projects on the statewide Interstate Management Program developed by PennDOT. The Interstate Management Program eventually become part of the STC reviewed and adopted STIP.

E. Economic Development Transportation Program. An excellent transportation system is a key ingredient in the economic development of Pennsylvania. Particular attention is given to the identification of major projects that can preserve and enhance the National Highway System (NHS) and increase economic activity in the state. As stated in the previous sections, PennDOT and its Planning Partners identify and prioritize potential economic development transportation projects for inclusion on the TIP and STIP which is reviewed and adopted by STC.

PennDOT's program to support and promote economic development consists of two major components:

- Construction of major highway projects, including the completion of key missing links.
- Improvements in making intermodal connections to facilitate the transfer of goods and people from one transportation mode to another.

The types of projects that may be considered are:

- Resurfacing, Restoration, Rehabilitation and Reconstruction Projects (4R).
- Major Widening Projects.
- New Location Highway Projects.

On major projects, intermodal issues must be considered, and where appropriate, incorporated into the project scope.

2.3 SPECIAL PURPOSE PROJECTS

A. Transportation Alternatives Set-aside Program. Federal legislation, beginning with the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, the Transportation Equity Act for the 21st Century (TEA-21) of 1998, and the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users

(SAFETEA-LU) of 2005) provided the opportunity for transportation enhancements that go beyond the normal elements of a transportation improvement project. These acts are described briefly in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix B. Transportation enhancements are generally described as "...opportunities for adding community and environmental value to Pennsylvania's transportation system." Transportation enhancement activities must have a direct relationship to the intermodal transportation system. An intermodal transportation system is one in which various forms of transportation (or modes, such as motor vehicles, transit, rail freight or bicycles) are integrated and interconnected. The intent of the Transportation Enhancements Program was to more creatively integrate various transportation facilities into their surrounding communities and the natural environment.

In 2012, the Moving Ahead for Progress in the 21st Century Act (MAP-21) combined the Transportation Enhancements Program with Safe Routes to School and Scenic Byways to create the Transportation Alternatives Program (TAP). The Fixing America's Surface Transportation (FAST) Act keeps many of the MAP-21 changes intact, but changed the program name to the Transportation Alternatives Set-aside of the Surface Transportation Block Grant (TA Set-aside).

Eligible TA Set-aside activities must fall into one or more of the ten Transportation Alternative Set-aside categories found on the Transportation Alternatives Data Exchange page: http://trade.railstotrails.org/10_definitions. Refer to the PennDOT Competitive Transportation Funding website (<https://spportal.dot.pa.gov/Planning/AppReg/Pages/default.aspx>) for more information.

The design and construction of TA Set-aside projects is the primary responsibility of the project sponsor (typically municipalities, municipal authorities, or schools). The project sponsor is responsible for establishing the implementation schedule for their project. PennDOT staff will assist the sponsor with securing the appropriate approvals. Additional information about TA Set-aside projects is available on the web at the PennDOT Competitive Transportation Funding website (<https://spportal.dot.pa.gov/Planning/AppReg/Pages/default.aspx>) or from the District Transportation TA Set-aside Coordinator, the Program Center, or the PennDOT document, *2016 PA TAP Statewide Program Guidance* (<https://spportal.dot.pa.gov/Planning/AppReg/Program%20Documents/2016%20PA%20TAP%20Statewide%20Program%20Guidance.pdf>).

B. Bikeways and Pedestrian Facilities. Bicycling and walking represent important modes of transportation throughout the Commonwealth of Pennsylvania with more than one quarter of a million commuters annually traveling to work primarily by walking or biking. Additional trips are generated by citizens who engage in activities of everyday life such as visiting relatives, obtaining medical care, and shopping and by visitors who participate in tourism and recreational activities.

At the federal level, the United States Department of Transportation (USDOT) set a nationwide policy for bicycle and pedestrian accommodation in 2010 with the issuance of its "Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations." That policy states in part:

"The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide—including health, safety, environmental, transportation, and quality of life—transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes."

As a result of the Transportation Advisory Committee's 2016 Bicycle and Pedestrian Policy Study, PennDOT developed a formal Core Policy Statement, "PennDOT shall make accommodations for bicycling and walking a routine and integral element of planning, project development, design, construction, operations, and maintenance."

Evaluation of the need and planning for bicycle and pedestrian facilities shall be integrated with the planning for other transportation modes. Often an improvement that enhances bicycle travel may also benefit other travel modes. Conversely, highway improvements through appropriate planning and design can enhance bicycle and pedestrian

travel. Plans for implementing bicycle and pedestrian projects can be in harmony with the goal for transportation improvements, which in turn, should be consistent with overall community goals.

Pedestrian and bikeway accommodations should provide for the safe, efficient movement of pedestrian and bicycle traffic through a project area by deploying physical improvements in the completed project, and in temporary traffic control throughout the duration of the project. These improvements must either be on-site, or within reasonable distance, must be in accordance with generally accepted guidance for pedestrian and bicycle accommodations and must provide sufficient capacity to meet existing and projected demand.

Consider these existing, latent, and projected planning elements when formulating design projects:

- Pedestrian and bicycle generators and attractors.
- Pedestrian access, connectivity, and continuity through project limits (during and after construction).
- Origin and destination of pedestrian and bicycle users.
- The recreational and quality of life contribution of the facility.
- The transportation value of the facility.
- Removal of barriers to non-motorized transportation (Americans with Disabilities Act requirements).
- The local bicycle master plan, which should identify known issues, network gaps, crash histories, desired facilities, and other relevant information –percentage of no-motor vehicle owners, origin/destination, etc.
- Physical barriers to bicycle travel (widths, overhead obstructions, bridge restrictions, access-controlled roadways).
- The reduction, prevention or alleviation of bicycle crash problems.
- Proper integration of bicycle facilities into a multi-modal transportation environment.
- Provision of frequent and convenient bicycle access and adequate access for emergency, maintenance and service vehicles.
- The context sensitive orientation of a bikeway facility.
- Security along remote bicycle paths and the possibility of theft or vandalism at parking locations.
- Delays or frequent stops required by bicyclists along the bikeway facility since this may cause them to avoid the route or disregard traffic controls.
- Evaluation and elimination, if possible, any conflicts between bicyclists, motorists and pedestrians involving highway design.
- Bikeway pavement surface quality that shall accommodate bicyclists, commensurate with the type of facility.
- Truck and bus traffic, motorhomes and trailers that may cause special problems for bicyclists due to their aerodynamic effect and width that causes lane width issues
- On-street motor vehicle parking that affects bicycle safety through car door openings and angle parking spaces.
- For bikeway facilities on roadways, traffic volumes, speeds of motor vehicles and the roadway width should be considered.
- The decision to implement a bikeway plan should be made with a conscious, long-term commitment to a proper level of maintenance and any required improvements.
- Bicycle facilities and programs that reflect local laws and ordinances to encourage bicyclists to operate in a manner consistent with Pennsylvania Title 75, PA Vehicle Code and the adopted "Pennsylvania Bicycle Driver's Manual".
- Bridges that afford bicyclists safe access and movement across barriers.
- Since a high proportion of bicycle crashes occur at intersections, select intersection facilities to minimize bicycle/motor vehicle conflict points.
- Input of community officials for groups limited to non-motorized vehicles
- Incorporation of outreach methods appropriate to reach populations reliant on non-motorized vehicles

For more information on bikeway and pedestrian funding, design procedures and maintenance agreements, refer to the current version of the following publications:

- PennDOT, Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*

- PennDOT "Bicycle and Pedestrian Checklist"
- PennDOT Publication 13M, Design Manual Part 2, *Highway Design*
- PennDOT Publication 632, Horse and Buggy Driver's Manual
- PennDOT, *Statewide Bicycle and Pedestrian Master Plan*
- AASHTO, *Guide for the Development of Bicycle Facilities*
- AASHTO, *Guide for Planning, Design, and Operation of Pedestrian Facilities*
- FHWA, *Separated Bike Lane Planning & Design Guide*
- FHWA, *Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts*
- FHWA, *Small Town and Rural Multimodal Networks*
- FHWA's *Manual of Uniform Traffic Control Devices (MUTCD)* – accommodation of bicyclists and pedestrians in work zones

The following resources, which include national association's guidelines, provide the designer additional guidance associated with design and development of bicycle facilities. The use of these resources or other innovative design guides may require special approvals through FHWA.

- National Association of City Traffic Officials (NACTO) *Urban Bikeway Design Guide*
- NACTO *Urban Street Design Guide*
- NACTO *Transit Street Design Guide*
- Institute of Transportation Engineers (ITE) Guide *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*

C. Park-and-Ride Facilities. Park-and-ride lots are fringe-area parking facilities that can provide a relatively inexpensive contribution to air quality and mobility improvements.

One of the main considerations in planning a park-and-ride facility is reducing overall emissions. Park-and-ride facilities that have a transit interface are generally more effective in reducing emissions. A park-and-ride facility must demonstrate air quality benefits to qualify for Federal funding under some programs, but not all programs.

For more information on park-and-ride facilities, including design, maintenance and operations procedures, refer to the current version of the following publications:

- AASHTO, *Guide for the Design of Park-and-Ride Facilities*.
- Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*.
- Publication 13M, Design Manual Part 2, *Highway Design*.

D. Safety Rest Areas and Welcome Centers. Safety rest areas and welcome centers are a necessary component of highway development. These areas may include the provision for a truck weigh-in-motion scale system in order to provide a dual use opportunity at the rest area.

For more information on the design of safety rest areas, refer to the current version of the following publications:

- Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*.

- Publication 13M, Design Manual Part 2, *Highway Design*.
- AASHTO, *Guide on Safety Rest Areas for the National System of Interstate and Defense Highways*.

E. Aviation, Rail Freight, Ports, and Waterways. The PennDOT Bureaus of Aviation and Rail Freight administer aviation, rail freight, and waterways programs. The Bureau of Aviation administers the statewide airport programs and the state-owned aircraft flight services. The Bureau of Rail Freight administers monies allocated from the Commonwealth's General Fund to the Rail Freight Assistance Program (RFAP). Pennsylvania's ports (Philadelphia, Pittsburgh, and Erie) and waterways are under the jurisdiction of PennPORTS, a division of the Pennsylvania Department of Community and Economic Development. PennPORTS promotes Pennsylvania's economic development through waterport commerce.

PennDOT Bureaus of Project Delivery and Rail Freight coordinate with PennPORTS by planning and programming the development of intermodal (rail and highway) access to these waterport facilities. This coordination may involve planning improved access to the National Highway System or providing grants for additional rail sidings, better grade crossings, and Double Stack container service.

2.4 GROUPINGS OF PROJECTS

A. Purpose. Project Grouping is the process of combining multiple bridges or multiple roadway sections into a single design or construction project. Effective grouping provides an efficient means of delivering a larger number of bridges or roadway improvements while achieving economy of scale and minimizing motorist inconvenience. The method of grouping will vary depending on the unique needs and scheduling restrictions of the work to be delivered and the phase of the grouping (design, construction, or design-build).

B. Design Groupings. Effective grouping in the design phase streamlines the design process and should ideally be considered during scoping. In order to provide for the selection of qualified consultants, the following items should be considered:

- **Type of Work.** Grouping designs provides for the selection of a qualified consultant specialized in the type of work, such as:
 - Bridge replacements on new alignment
 - Roadway or Bridge Reconstruction, Rehabilitation or Preservation
 - Complexity of structure type
 - Material restrictions (Steel/Concrete)
 - Highway construction on new alignment
 - Intelligent Transportation System (ITS)
- **Size of Bridges.** Consider grouping designs by size of bridge to allow for the selection of a qualified consultant who specializes in the delivery of the particular size of bridges or improvement projects.
 - Small bridges/Large bridges
 - Consultant Resources/Delivery
- **Location.** Grouping designs by location can reduce the need for redundant reviews by regulating authorities and establishes similar criteria for permitting and/or traffic control and improves efficiency by allowing meetings and field views to be combined.
 - Watershed - limits the number of hydraulic models, PNDI search areas, etc.
 - Review Agency Regions (i.e., PA DEP Regional Offices, Conservation Districts, etc.) - reduces number of required submissions/reviews.
 - Traffic Management - minimize designs for traffic control and minimize disruption of traffic and detour routes.

- Local Coordination/Public Involvement - reduces the need for multiple meetings.
- Contextual Setting - allows for efficient design by developing single solution to similar contextual issues relating to entire group.
- **Scheduling/Duration.** Successful design grouping balances scheduling concerns with issues such as consultant project delivery capabilities. For example, the consultant's capacity may be critical when grouping 10 small bridges to be let within one month, versus spread out over a period of 10 months. If bridges in the same grouping are to be delivered simultaneously, it may be necessary to work with multiple design teams.
 - Simultaneous/consecutive delivery
 - Anticipated team make-up/design squads available to meet schedule
 - Scheduling concerns of critical path items to meet let schedules
- **Level of Impact.** Grouping designs with similar levels of impacts can reduce the potential for delays to the entire group in order to obtain Environmental Clearance or Right-of-Way for individual projects.
 - Environmental Impacts - including historic, wetlands, stream degradation, etc.
 - Watershed Quality - impacts type of permits required and level of mitigation required (i.e., an Individual NPDES permit in an Exceptional Value watershed)
 - Impact to surrounding properties - impacts requiring right-of-way acquisition
- **Anticipated Project Grouping for Letting.** Determine if entire design group will be let together in single construction contract or if group components will be let in various construction groupings. For example, bridges with different levels of impacts may be included as one design group if the bridges will be let in separate construction contracts.

C. Construction Groupings. Effective construction grouping can provide an economical means of delivering a large number of bridges or roadway improvements on time. Costs are minimized by making projects more desirable to the contracting community by reducing administration efforts, such as preparing bid packages, and increasing the value of the contract (several bridges grouped into larger contract). Other advantages include the potential for quantity discounts for products and scheduling economies. As in design, grouping for construction should be considered during scoping and should consider the following factors:

- **Location.** Provides accessibility to all work sites in contract and minimizes traffic disruption.
 - Physical Location - Reasonable proximity for travel between bridge sites. Whenever possible, groupings should occur within a single District. Groupings should involve bridges on contiguous routes.
 - Traffic Management - minimize disruption of traffic and detour routes.
- **Scheduling/Duration.** Successful grouping of bridges balances scheduling concerns with project delivery. For example, staggering the construction of several bridges in a contract may allow a contractor to make the best use of specialized labor by having the teams complete work at one site and then immediately move to the next bridge site.
 - Designs completed to meet let date (including right-of-way, permits, utility clearance)
 - Simultaneous/consecutive delivery
 - Ability to adjust the construction period for individual bridges or highways
 - Acceptable duration of construction (including highway and/or individual bridge work)
 - Ability to deliver within time period to avoid excessive exposure to material escalation
 - Anticipated specialized labor and/or equipment

- **Construction Materials.** Allows for volume discounts and best utilization of labor force.
 - Quantity
 - Size and type (such as spread box beams versus adjacent box beams)
- **Similar Work.** Offers construction economies in the type of work to be performed, such as:
 - Steel/Concrete construction
 - Preservation/rehabilitation/ reconstruction/ bridge replacement
 - Specialized work (such as bridge painting or traffic signals)
- **Thresholds to Ensure Competitive Bids.** Construction groupings must consider the availability of bidders capable of performing the specific types and volume of work. Groupings should be limited to ensure competitive bids. For bridges, use the following:
 - Number of bridges in contract - Generally groupings should be limited to 15 bridges in a single construction contract for Bridge Rehabilitation/Replacement projects or 25 bridges in a single construction contract for Bridge Preservation projects.
 - Districts should evaluate the number of bridge projects. Consideration should be given to discussions regarding the number of bridge projects at the regional APC meetings.
 - Large Groupings - With larger groupings, more conflicts may arise with other issues not related to project efficiencies. The District is to seek Central Office approval for groupings larger than 15 projects (highway or bridge rehabilitation/replacement) or 25 bridge preservations. Requests must be submitted to the Highway Design and Technology Section, Highway Delivery Division of the Bureau of Project Delivery. The submission must include justification for the large grouping and should include discussion of the following issues:
 - Type and scope of work for individual projects
 - Risk Assessment for bridges
 - Fiscal issues including funding sources and cash flow constraints
 - District management (design and construction) and construction coordination issues
 - Method of Delivery and special contract provisions (such as type of design-build method and potential scheduling, delivery, or payment provisions which will be included in the contract)
 - Assurance of competitive bids and impacts to contracting community (such as advertisement period, etc.)
 - Discussion of potential impacts to DBE participation and resolution
 - Design and construction scheduling and impacts on mobility during construction
 - Duration and related impacts, such as maintenance during contract
 - Right-of-Way acquisition issues with a statement that concurrence has been obtained by the District Right-of-Way Administrator
 - Previous District success in grouped projects

The Highway Design and Technology Section will coordinate with the Bridge Design and Technology Division; the Project Scheduling, Specifications, and Constructability Section; and the FHWA to evaluate the submitted documentation prior to issuing approval.

D. Design-Build Groupings. Grouping projects for Design-Build should consider all concerns shown above for both Design and Construction Groupings, with the primary emphasis on project scheduling. Variations in levels of impacts, permitting, and type of work should be considered in regard to the construction project schedule. For example, it may be possible to include a single project with significant right-of-way impacts in a project grouping if the construction schedule is staggered and full clearance is not needed until the next construction season. The successful grouping of projects for Design-Build requires the development of a detailed, realistic schedule addressing both design (including right-of-way, utility coordination, and permitting) and construction activities. Design-Build Groupings should be based on the following:

- **Design Grouping Considerations.** See [Section 2.4.B](#), Design Groupings.
- **Construction Grouping Considerations.** See [Section 2.4.C](#), Construction Groupings.
- **Design-Build Contracting Method.** See Publication 448, *Innovative Bidding Toolkit*.

E. General Considerations when Grouping. When grouping projects for design and/or construction, be cognizant of other issues, beyond those listed above, that might be impacted by larger scale projects, including:

- **Risk Assessment and Priorities.** Grouping bridges for design and/or construction may involve advancing some bridges ahead of higher-risk/or high-priority structures. Evaluate the ability to address critical bridge needs when such grouped bridge contracts are being considered.
- **Fiscal constraints, including funding sources and cash flow through the duration of construction.** Grouped projects may involve significantly larger payments and involve more than one fiscal/TIP period.
- **Availability of Bidders.** Consider availability of bidders to ensure competitive bids
- **Mobility during construction.** Consider critical needs for mobility (local and statewide) when scheduling construction on grouped projects. Provisions for emergency vehicles may be needed.
- **Maintenance during construction.** Consider the impact of grouping on maintenance operations (i.e., winter operations) and activities when scheduling construction.
- **Right-of-Way Activities.** Coordination with District Right-of-Way Administrator early in the process of developing grouped projects is often required. This coordination is needed to ensure timely delivery of all Right-of-Way activities.
- **Value Engineering.** Consider full project grouping when determining the need for a Value Engineering review. Perform Value Engineering Review when the total estimated costs of all projects in each grouping reach the thresholds established in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix R.
- **Multiple Work Zones.** Consider the proximity of projects when developing work zones for the group. The close proximity of projects could influence work zone timing, phasing, and traffic management plans.
- **Disadvantaged Business Enterprise (DBE) Participation.** Overall program must ensure that DBEs have the opportunity to participate in the performance of contracts and subcontracts.

CHAPTER 3

A MULTI-DISCIPLINARY TEAM

3.0 TRANSPORTATION PROJECT ORGANIZATION

A. Introduction. Successful project management depends on effective use of the Multi-Disciplinary (Design) Team concept. A Multi-Disciplinary or Design Team is a group of individuals that together cover the project's transportation, environmental, community, land use, and fiscal context. More information on developing/understanding context is contained in in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix B, Glossary. One of the Project Manager's initial tasks is to confirm and further define the project scope and assemble the Design Team with staff from across the organization and from supplemental-consultant resources as necessary.

B. The Design Team. The Design Team consists of individuals selected for their expertise in various disciplines required by the project. [Figure 3.1](#) presents a flow chart that briefly outlines the main positions and roles of the Multi-Disciplinary Team. [Figure 3.1](#) also outlines the major activities that each team member is typically responsible for leading.

The strength of the team depends on the technical and interpersonal skills of the team members. In many cases, the Project Manager and members of the Design Team may have previous experience working together. The effectiveness of the team concept depends on the relationships between team members, their level of technical expertise, and their ability to communicate and commit to project objectives. The key members of the Design Team are typically:

- The PennDOT District Project Manager.
- The District Planning and Programming Manager.
- The District Planner.
- The Environmental Manager or Planners.
- The lead Engineer or Designer.
- The District Traffic Engineer.
- PennDOT Central Office Staff (Program Center, Environmental, Highway, and Bridge, etc.).
- Other agency staff, such as the FHWA, Federal Transit Administration, Federal Aviation Administration, the Agency Coordination Meeting (ACM) resource agencies, MPO/RPOs and local government planners/staff (see [Section 3.2](#) for more information on the agencies with which PennDOT collaborates).

Additional staff from PennDOT and/or Consultants, including the following design disciplines, should also be included on the Design Team as appropriate for the project: Environmental, Community Relations/Communications, Roadway, Right-of-way, Construction, Geotechnical, Traffic, Safety, Contract Management, Structures, Utilities, and Maintenance. The Project Manager is pivotal in building, directing, and maintaining the Design Team.

The Design Team is a temporary, task-oriented group assembled specifically for the purpose of meeting the project's specific goals and objectives. When the project is completed, the Design Team members return to their functional units within PennDOT or their respective agency, or continue work on other Design Teams.

PennDOT's functional organization is a much larger, more permanent structure defined by the type of work performed by staff with various levels of authority and expertise. PennDOT's functional organization is depicted in [Figure 3.2](#), Department of Transportation Organization Chart. PennDOT Central Office consists of five Deputies, as shown on [Figure 3.2](#), which are further divided into a varying number of Bureaus. The two main Deputies in

regards to the Design Manual series are Highway Administration and Planning. Planning is predominantly responsible for the Pre-TIP and TIP Project Delivery Procedures, while Highway Administration has primary responsibility over the Post-TIP Project Delivery Procedures (See [Figure 3.1](#)). The eleven Engineering Districts, organized under the Highway Administration Deputate, predominantly play a participatory role Pre-TIP and a project management role Post-TIP.

Pennsylvania's eleven engineering districts (Highway Administration Deputate) design, maintain and oversee the construction of improvements to PennDOT's highway system at the local level. As shown in [Figure 3.3](#), PennDOT District Map, each Engineering District is responsible for three to nine counties. [Figure 3.4](#), Representative District Office Organization Chart, shows a representation of the overall organization of each District, which is similar throughout the eleven District Offices. Each is headed by a District Executive who is responsible for overseeing the design, maintenance, and construction of transportation projects within the District. Answering directly to the District Executive are several Assistant District Executives (ADE) and District specialists. The exact number of ADEs and specialists varies from District to District. Each ADE is typically responsible for one of the following three major divisions: Design, Construction, or Maintenance. Within each division are a number of supporting units as shown in [Figure 3.4](#). Although, organizational structures vary from District to District, most Districts have several design Project Managers that report to the Portfolio Manager. The Portfolio Manager and the Functional Unit Managers report to the ADE-Design, who reports to the District Executive. To be effective, a Project Manager must understand and be able to function within both the project (Design Team) and functional organizations.

3.1 THE PROJECT MANAGER

A. Introduction. The Project Manager gains the Design Team's commitment to the project plan by soliciting and incorporating the team's contributions to the task plan and budget. It is important that the Project Manager be effective at communicating project objectives and motivating the Design Team. The Project Manager promotes the team concept by defining the team members' roles and responsibilities and delegating decision-making authority to the various technical experts. The Project Manager has a responsibility to be familiar with the basic Federal and State laws and regulations relevant to design and construction, including environmental laws, in order to effectively guide the team and clearly communicate with team members.

The Project Manager makes arrangements with the respective functional unit managers, see [Figure 3.4](#), for the necessary staff to be assigned to his/her project. The functional unit managers are responsible for providing staff that has the necessary qualifications and is available to work on the project as needed to meet the project schedule. Individual team members answer directly to both their respective functional unit managers and their current Project Manager. The Design Team members must provide real time feedback to the Project Manager and early identification of potential problems.

Effective project management is at the core of every project that is completed on time, within budget, and in agreement with PennDOT's Quality Management Manual (see Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix D). This section describes the pivotal role of the Project Manager in advancing a transportation project from, for the most part, the Preliminary Engineering/NEPA Decision through Final Design and the Construction Notice to Proceed. However, depending on a project's size and complexity, the Project Manager may also be involved in Pre-TIP activities, as shown in [Figure 3.1](#). The basic principles and skills described in this chapter apply to all types of projects regardless of size, cost, or complexity. Key factors contributing to the need for project-oriented management techniques are: tight time constraints; need for cost effectiveness; need to meet higher quality expectations; uncertainty and risk; rapid changes in technology; legislation and customer expectations; complexity of work; need for formal communications; need to integrate activities across multiple functional lines; and rigorous performance standards.

1. What is Project Management? Project management is both a management technique and a type of organizational structure. Project management is a results-oriented approach that integrates resources and activities across an organization's functional lines of authority to achieve specific objectives. It involves the planning, scheduling, organizing and controlling of resources to achieve specific objectives within established time limits, budget constraints, and quality standards. Project management differs from more traditional management techniques in the nature of the work performed and how organizational resources are allocated.

Highway design is ideally suited to project management techniques. The design of highway improvements involves a broad range of specialized technical activities that must be performed in an environment of frequently changing policies, funding and regulations. Highway design for a particular project is a site-specific, non-repetitive, and often very complex process that requires a wide range of expertise to develop unique solutions within limited time, budgeting, and scheduling constraints. To increase its effectiveness in advancing highway design projects, PennDOT has adopted project management techniques and an organizational structure that are flexible, results-oriented, and readily adaptable to changing circumstances.

2. Organization-wide Commitment. Effective project management requires the complete commitment of all levels of the organization. PennDOT recognizes that project management offers the most appropriate techniques for expediting the delivery of transportation projects and is committed to maintaining uniform, high standards of project management at all levels of PennDOT. This commitment is demonstrated by the project management tools, training, resources and procedures provided throughout the PennDOT organization.

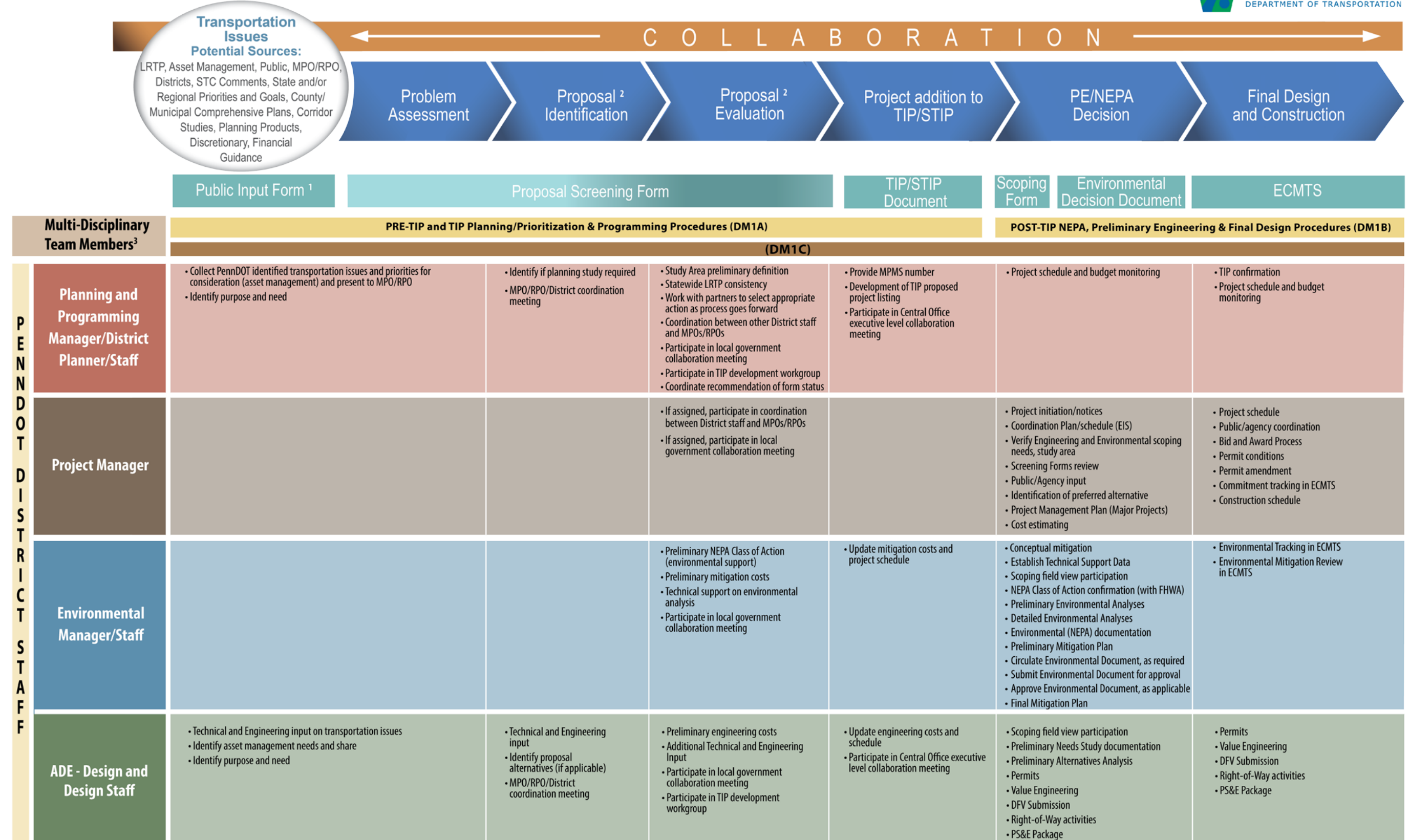
In addition to organization-wide commitment, the success of project management depends on a thorough understanding and widespread acceptance of how project management techniques extend authority across an organization's functional lines. This requires an understanding of the following:

- PennDOT's functional organization as discussed in [Section 3.0.B](#).
- Project objectives
- Design criteria
- Available tools and techniques for planning, scheduling, and controlling progress
- PennDOT's Transportation Program Development and Project Delivery Process (Process)

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Transportation Program Development and Project Delivery Process Responsibilities

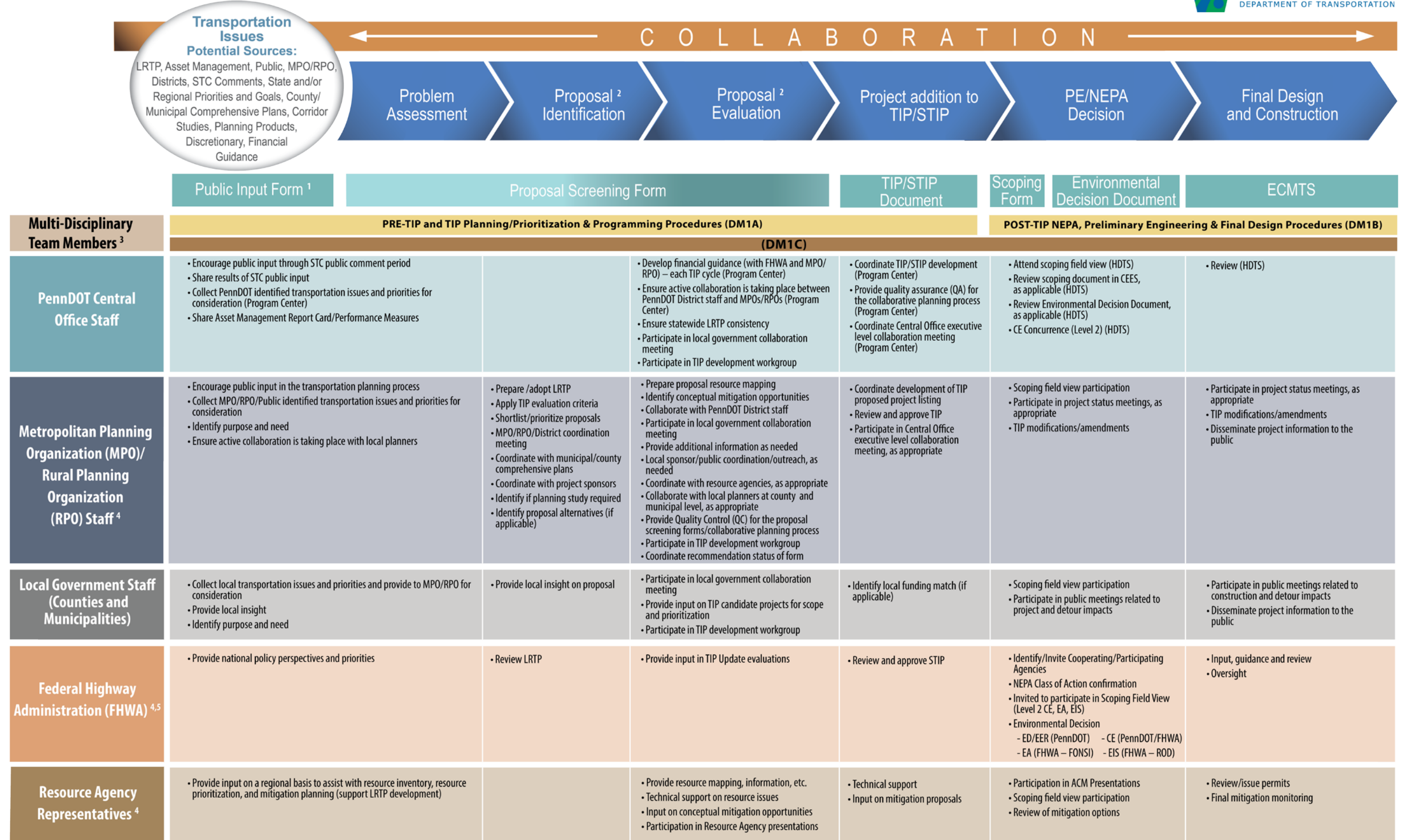


Notes: 1 Not required for all proposals.
2 PennDOT and the MPO/RPO may jointly decide to dismiss a proposal at any time if they proposal is determined to be a routine maintenance project.
3 Note the Team Member responsibilities designate the traditional lead role for each activity; other team members/disciplines may be involved as necessary with each activity.

Figure 3.1



Transportation Program Development and Project Delivery Process Responsibilities



Notes: 1 Not required for all proposals.
2 PennDOT and the MPO/RPO may jointly decide to dismiss a proposal at any time if they proposal is determined to be a routine maintenance project.
3 Note the Team Member responsibilities designate the traditional lead role for each activity; other team members/disciplines may be involved as necessary with each activity.

4 Activities listed for outside agencies are only those that are directly a part of PennDOT's Transportation Program Development and Project Delivery Process; internal agency activities (i.e. permit approvals, tracking, etc.) are not included.
5 May also be Federal Transit Administration (FTA), Federal Aviation Administration (FAA), or Federal Railroad Administration (FRA)

November 21, 2017

Figure 3.1
(continued)

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION ORGANIZATION CHART

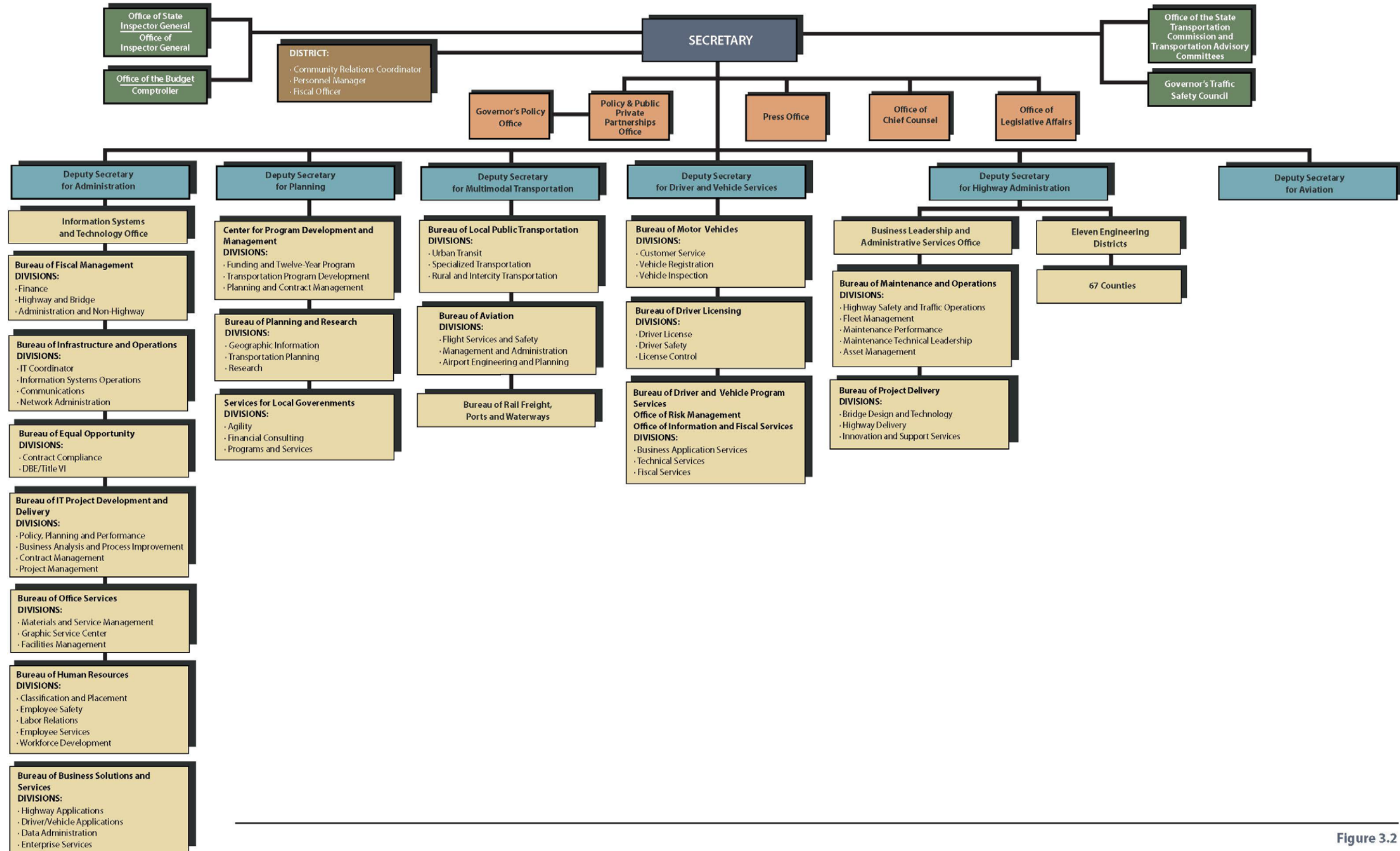


Figure 3.2

PENNDOT REGIONAL MAP

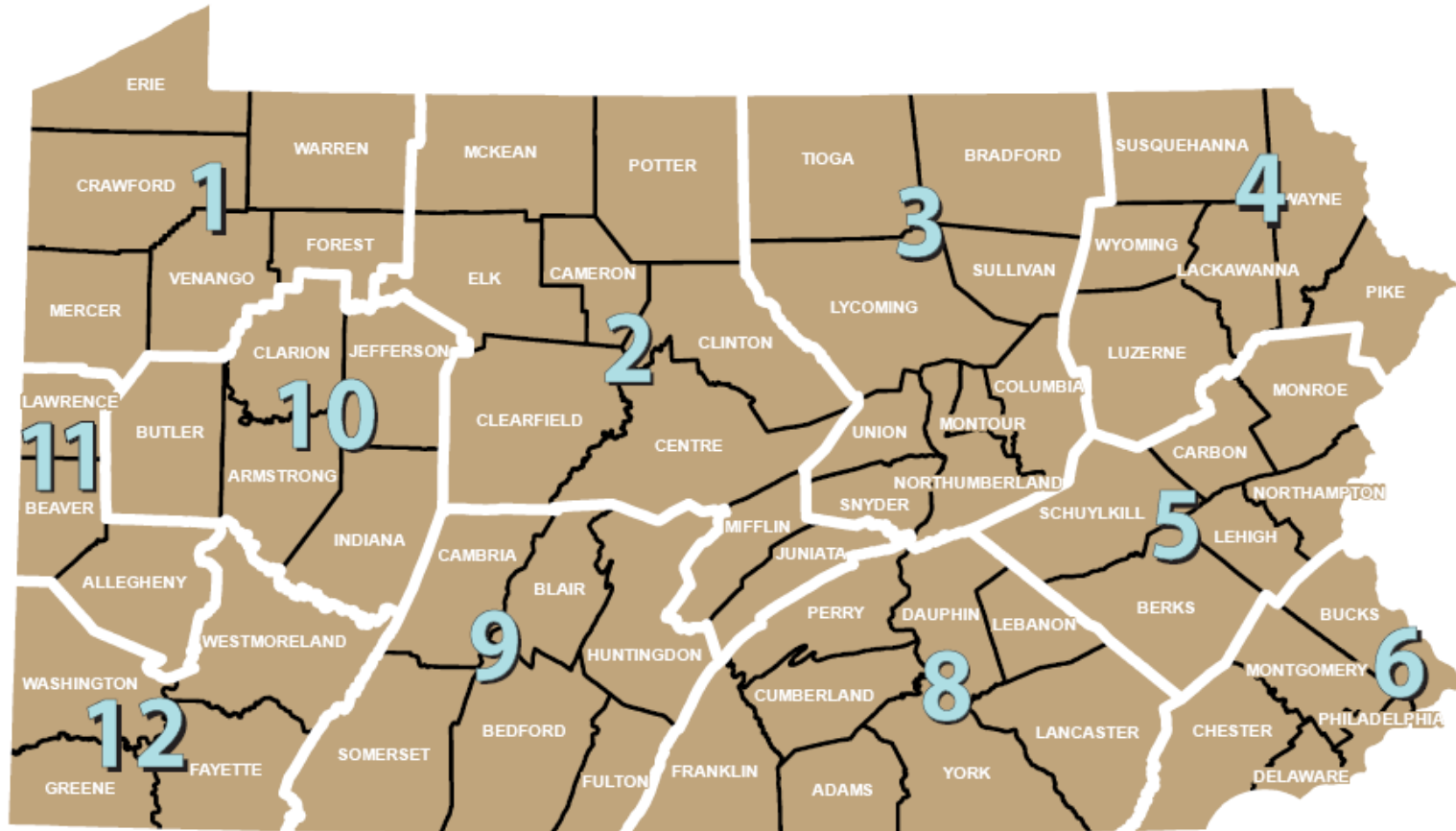
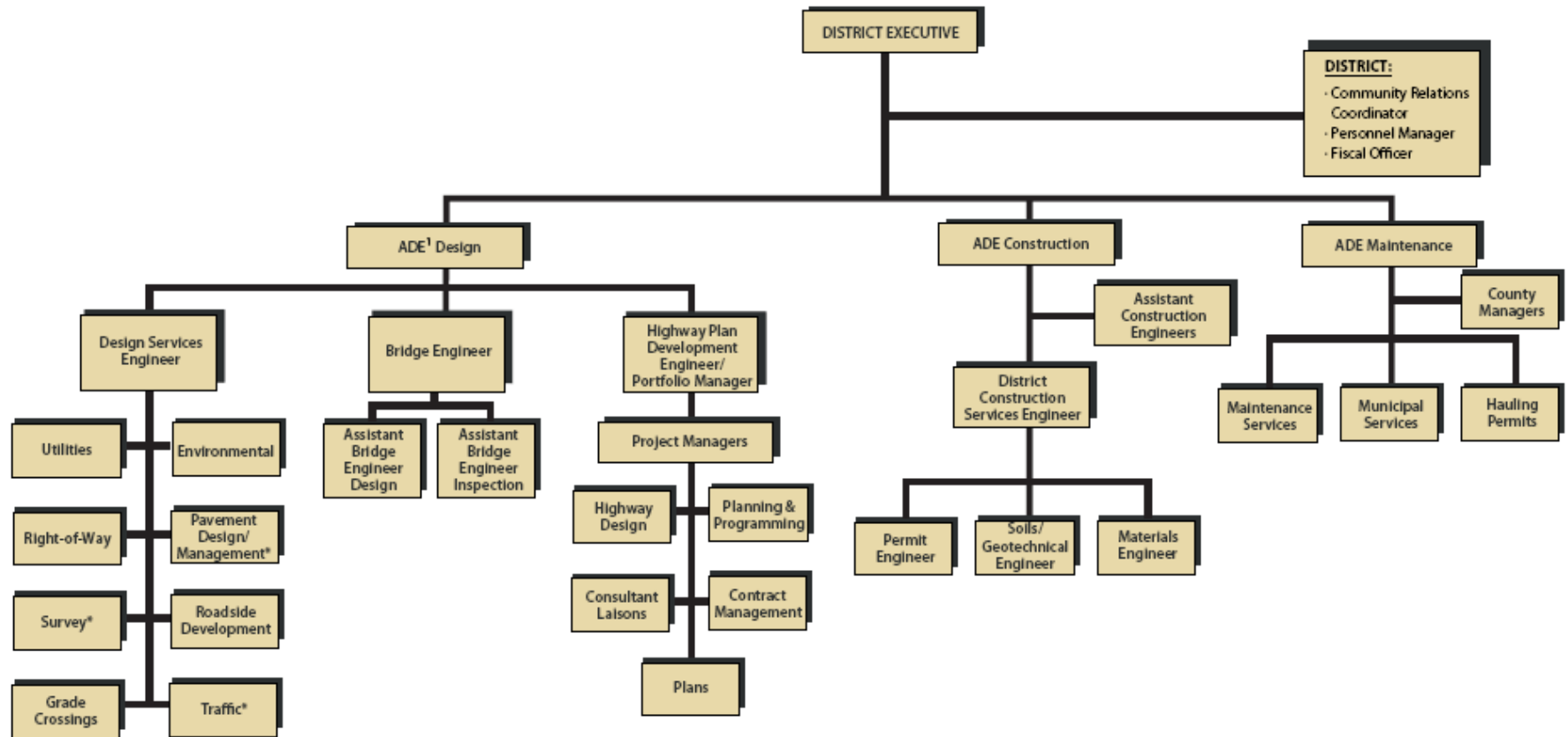


Figure 3.3

REPRESENTATIVE DISTRICT OFFICE ORGANIZATION CHART²



¹ ADE = Assistant District Executive
² Note that while District Organization is similar, responsibilities do vary by ADE's
 * Responsibility of the ADE for Maintenance in some Districts

Figure 3.4

3. Three Project Management Levels. The Portfolio Manager generally has at his or her disposal several levels of Project Managers. Each level represents a "pipeline" to project completion. The number and complexity of projects each pipeline can carry depends on several variables, including the Project Manager's time commitments, cross-functional authority, resource commitment, and level of planning. The following levels are suggested for use as a Portfolio Manager's tool, but it is the Portfolio Manager's decision to properly assign projects.

Level 1. Project Managers on this level are responsible for various types of projects, but the largest share of their workload consists of projects that typically require a relatively narrow range of technical expertise and a limited amount of coordination with other functional units. These projects generally involve the execution of a series of standard, well-defined tasks, and require little detailed planning, with resource commitment primarily by skill, rather than person. Level 1 Project Managers have limited cross-functional authority. By the nature of their projects, they typically spend less than half of their time on project management. The rest of their time is spent on other responsibilities within their functional unit or within other design teams. [Table 2.1](#), Non-Complex (Minor) Projects, describes the types of projects generally assigned to a Level 1 Project Manager.

Level 2. Project Managers on this level are typically responsible for a moderate number of projects. Although they handle a combination of project types, most of their projects are generally more complicated and require a moderate range of technical expertise and a moderate amount of coordination with other functional units. Level 2 Project Managers direct the execution of a combination of standard and non-standard design tasks. Non-standard tasks are less clearly defined and require more detailed coordination. Their projects typically require a higher level of planning than those assigned to Level 1 Project Managers. Resource commitment is by person or skill.

Level 2 Project Managers have moderate cross-functional authority. By the nature of their projects, they typically spend more than 75 percent of their time on project management. The rest of their time is spent on other responsibilities within their functional unit or within other design teams. [Table 2.2](#), Moderately Complex Projects, describes the types of projects generally assigned to a Level 2 Project Manager.

Level 3. Like their Level 1 and Level 2 counterparts, Level 3 Project Managers typically handle a combination of project types, but the bulk of their workload generally consists of projects that require the widest range of technical expertise and extensive coordination with other functional units. They are frequently involved in major projects that require the execution of a large number of interrelated activities, including both standard and non-standard design tasks. These projects require a very high level of planning, with resource commitment primarily by person.

Level 3 Project Managers have very high functional authority. By the nature of their projects, they typically spend most of their time on project management. The rest of their time is spent on other responsibilities within their functional unit or within other design teams. [Table 2.3](#), Most Complex (Major) Projects, describes the types of projects generally assigned to a Level 3 Project Manager.

The project complexity levels and project management levels should also be considered in developing the approach to the project, which should fit and be tailored to the project need, project area and transportation context, project type and complexity, and to the project cost estimate baseline developed for the project. The approach should result in a full range of multi-modal solutions, traditional and non-traditional, that are affordable and cost-effective (for more guidance refer to Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix B, Glossary). The use of a Multi-Disciplinary Team, as discussed previously in this Chapter, will assist with tailoring the approach and developing appropriate, cost-conscious solutions.

4. Early and Continuous Project Manager Involvement. It is important that Project Manager selection occur as early as possible. Typically, the Portfolio Manager selects the Project Manager during development of the TIP/STIP or as late as the Preliminary Engineering / NEPA Decision Phase (see [Figure 3.1](#)), depending on project complexity and the environmental document level, and keeps that individual on that project at least through Notice to Proceed for Construction. This promotes a sense of project ownership and expedites projects,

since there is a learning/familiarization period required when projects are transferred from one Project Manager to another.

In addition to prioritizing projects and making Project Manager assignments, the Portfolio Manager also reviews and approves Project Managers' proposed Design Team resource allocations. This is particularly important on projects designed entirely with District staff, and is done using a formal workload analysis that considers resource availability, time constraints, and commitments to other work that is not project related.

5. The Project Manager/Portfolio Manager Relationship. The Portfolio Manager assigns the Project Manager to a project typically during Proposal Evaluation (See [Figure 1.1](#)) for more complex or higher level NEPA class of action projects or during the Preliminary Engineering / NEPA Decision Phase for other projects. The Portfolio Manager must also coordinate between PennDOT's programming and design organizations, and is sometimes called upon to assist with resolving conflicting priorities across the District's functional areas. The Portfolio Manager has direct oversight of the Project Managers, their project schedules, estimated cost updates, and project quality.

The Portfolio Manager's objectives are to:

- Ensure quality products.
- Monitor the District's schedule commitments.
- Expedite project development.
- Avoid cost escalation due to project delays and keeping to the original scope.
- Promote positive customer (public) relations.

B. The Role of the Project Manager. At PennDOT, the Project Manager is the single individual most directly responsible for the success of the project. With this responsibility comes the authority to make decisions concerning the project schedule, cost and Design Team performance. The Project Manager is empowered to:

- Ensure quality products.
- Assemble and direct the Design Team, including consultants.
- Conduct project kick-off meetings.
- Serve as the lead point of contact for project communication.
- Represent PennDOT at public meetings.
- Coordinate project issues with other agencies.
- Schedule project development activities.
- Review product quality and assure compliance with PennDOT's QC/QA plan and current design standards.
- Monitor Design Team performance (person-hours per task) and project delivery.
- Control project costs; projects should be designed to the established TIP baseline project cost estimate.
- Promote an atmosphere of good public relations and customer satisfaction.
- Process requests for project authorization and funding (Forms ID-21 and D-4232).
- Coordinate the flow of information concerning the project.

C. Responsibility and Authority. Successful project development depends on the Project Manager's ability to address a broad range of responsibilities, including:

- Scope
- Communications
- Schedule/Time Constraints
- Performance/Quality
- Budget/Costs Constraints
- Functional Units
- Design Team Utilization

The overall success of a transportation project is typically measured by the Project Manager's ability to deliver a quality Plans, Specifications, and Estimate (PS&E) package on schedule and within budget. The Project Manager's effectiveness in controlling costs and monitoring quality depends on his knowledge of basic Federal and State laws that relate to design and environmental clearance; design, the flexibility in design guidelines (see [Section 7.0.A](#)); actual production rates; and PennDOT's QC/QA plan (Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix D). Much of that knowledge is gained through experience preparing preliminary and final design deliverables.

To be effective, a Project Manager must know his/her responsibilities, and have the ability to delegate these responsibilities and empower others. It is important that a Project Manager balances the assignment of work within his/her team. Project Managers need to set project-specific policies and procedures, share responsibility, support the Design Team's technical experts, and as necessary provide their expertise and skills to the project development and design.

By empowering members of the Design Team to make necessary design development decisions, the Project Manager can make optimum use of available resources. By achieving an appropriate balance of responsibilities and proper assignment of design tasks, the Project Manager can improve his/her own effectiveness not only from a standpoint of improving their own time management but providing opportunities for their staff to develop their skills.

The Project Manager depends heavily on the cooperation of the District's Functional Unit Managers, who contribute their technical staff to the project. The ability to communicate, coordinate, and integrate project activities, policies and procedures with the District's Functional Unit Managers is essential.

1. Cost Management. One of the most important responsibilities of a Project Manager is the careful management of project costs. The Project Manager must control both design development costs and estimated construction costs. Poor cost management (not keeping costs within the Program Management Committee (PMC) approved amounts) can result in project deferrals and program adjustments. The Project Manager should perform regular reviews of design and estimated construction costs throughout project delivery. The goal is to develop estimates that are accurate to within 10 percent (above or below) of the actual design and construction costs. Remember that cost containment is about accurate estimation; it is important to avoid committing too many resources or too few resources to a project.

Preliminary design and construction (project) cost estimates for all proposals will be developed in Step 3. The formal Scoping Field View will most likely occur at the beginning of the Preliminary Engineering / NEPA Decision Phase. This preliminary project cost estimate, developed in Step 3 of the process, should become the baseline for comparison of updated estimates throughout the project's design. Remember that "Money Counts"; the baseline cost estimate should be a quality estimate based on sound decisions and good engineering judgment. The project's scope must match the estimate, which should also consider appropriate inflation factors so that designs/solutions are being developed with real-year construction costs in mind. Projects must be fundable to be constructible and development of a fiscally responsible, yet realistic baseline cost estimate is the basis for developing constructible projects. It should be emphasized that the right size, fiscally constrained solution must also consider public comments and environmental impacts in the determination of the best possible solution. Publication 352, *Estimating Manual* contains information on the level of accuracy required

for the cost estimate developed at the four main estimating stages: Planning (Steps 1 through 4 of the Process), Screening (Step 3), Design (Step 5) and PS&E (Step 6). During the Post-TIP Project Delivery Phases (Steps 5 and 6), at a minimum, construction costs should be updated at the following milestones:

- At the beginning of the Preliminary Engineering / NEPA Decision Phase, during verification of the Pre-TIP screening field view and after the Scoping Field View (see [Section 7.1.A](#)).
- At the Design Field View Stage/NEPA Decision (design is approximately 30% complete).
- After the Final Design Office Meeting (design is approximately 75% complete).
- At the preparation of the District Contract Management Engineer's construction cost estimate (just prior to PS&E submission).
- At the bid opening.

The Project Manager shall prepare and retain construction cost estimates at the above milestones for all projects meeting the following criteria:

- All bridge projects with a total cost of \$2 million or more.
- All highway projects with a total cost of \$5 million or more.

These reports shall be maintained in the project files as part of the project cost history. Design costs should be listed separately for preliminary engineering and final design. Project costs should be determined based on bid histories of similar types of projects and estimated inflation. Remember that the goal is to be within 10 percent, above or below, of the actual costs.

PMC action will be required if at any time estimated costs exceed the programmed costs as shown on the TIP by \$2.5 million or more. The Project Manager is to submit this information, including historical cost information, to the District Planning & Programming Manager for presentation to the MPO or RPO, PennDOT, and FHWA/FTA. Justification for cost increases will focus on project cost and scope, and any cost containment measures that have already been taken. Estimated costs exceeding programmed costs by less than \$2.5 million, but more than \$1 million, should seek action by the Center for Program Development and Management. Estimated costs exceeding programmed costs by less than \$1 million should seek approval from the District Executive. Justifications for cost increases should focus on the project cost and scope, and should clearly identify all steps already taken to contain costs. This cost increase justification is required to be added as a note in the Project's Open Plan schedule (see [Section 3.1.C.3](#)).

Note that if project costs are estimated to be between \$100 and \$500 million, the Project Manager must follow the requirements outlined in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix C, FHWA/PennDOT Stewardship & Oversight Agreement, Appendix A. A financial plan is required for all projects with costs greater than \$100 million. Projects with costs greater than \$500 million are designated as Major Projects. In addition to the financial plans, Major Projects require Project Management Plans and cost validations. The FHWA Division Office should be consulted when a Major Project is being considered.

2. Effective Communications. Perhaps the single most important quality a Project Manager must have is the ability to communicate effectively. A Project Manager must be able to work with people, coordinating and integrating complex design issues and assignments across multiple, functional lines of authority. The ability to motivate and focus the Design Team on achieving project objectives is essential. The quality of the design deliverables is a reflection of the Project Manager's ability to obtain the cooperation and support of the Design Team.

The Project Manager's primary focus should be on achieving project objectives. One of the ways a Project Manager can help expedite the design process is by promoting the effective use of all staff involved in the

review and approval of design submissions. Through effective communication (formal and informal), the Project Manager can eliminate unnecessary reviews. When appropriate, the Project Manager should facilitate concurrent reviews that produce dialogue between functional units and result in earlier consensus.

In the course of a typical project, a Project Manager must coordinate numerous project issues with various agencies, including the Planning Partners. It is important that the Project Manager establish good lines of communication with these agencies early in the project. This is particularly true of communications with Utilities, Railroads, and other entities that can require long lead times. All contacts made to the Railroad(s) should be through or include the District's Grade Crossing Engineer/ Administrator (DGCE/A).

3. Project Schedules. Project Managers schedule project activities and milestones by identifying the tasks to be completed, determining the availability of staff and equipment, and estimating production rates. The Project Manager's ability to estimate performance depends on his knowledge of actual performance on previous tasks. Therefore, a task database of actual production rates from previous projects can be a very useful guide for project scheduling and resource allocation.

Project Managers, or their consultants, must develop a schedule for every project in accordance with Publication 615, *Procedures for PennDOT Schedules*. Activities may be deleted from the templates only if they are not applicable to their given project. The PennDOT Master Template contains task pools with the commonly used activities that can be dragged and dropped into the schedule. The nomenclature and coding have been standardized for historical data purposes so these items should not be changed. The Project Manager should work with the District Portfolio Manager to ensure that there are not logic issues with the schedule. It is recommended that the project schedule be first developed without any type of project or activity constraint or adjustments made to achieve any specific date. Upon completion of this step, a "Finish On" constraint should be set on the "Open Bids" activity so that the constraint matches the committed let date.

When developing the Asta Powerproject schedule, be sure to consider the timing of the approved TIP. Consideration of TIP funding timing is important to ensure that funding for the design and construction phases can be encumbered/obligated at the appropriate time. For example, having NEPA clearance schedule to occur after the time that the approved TIP shows funding needing to be encumbered/obligated for Final Design, Utility and Right-of-way Phases, which cannot start until NEPA clearance is obtained, could jeopardize funding for these phases.

Once the constraint is established, the initial baseline should be created. The schedule will be progressed through the Asta Powerproject software or the Asta Web Portal. The Asta Web Portal is a web based application that links to the Asta Powerproject schedule. The process of progressing the schedule via the Web Portal eliminates issues related to security permissions and the need for consultants to continually email electronic copies of the Asta Powerproject schedule. The Project Manager should perform regular reviews of the scheduled progress to ensure that the project is on track to meet the project's letting date. Project Managers not only monitor the performance of their design team to assure quality and on time project completion, but also collect performance data for scheduling future activities. Project delivery performance is measured against the projects baselines and feedback is provided to the Project Manager, ADE-Design, Portfolio Manager, and the Functional Unit Managers.

The general requirements for Department schedules are contained in Publication 615, *Procedures for PennDOT Schedules*.

4. Managing Consulting Engineering Agreements. Publication 93, *Policy and Procedures for the Administration of Consultant Agreements*, presents PennDOT's policies and procedures for the selection of consultants and negotiation, execution and administration of consultant agreements. Refer to Publication 93, *Policy and Procedures for the Administration of Consultant Agreements*, for more detailed information (available to PennDOT staff). Projects that do not use federal or state transportation funding (e.g., enhancements, congestion mitigation) for planning phases should follow the requirements of the appropriate funding source.

The types of engineering contracts used are determined by the type of services required. The seven types of engineering contracts used by PennDOT are as follows:

- Project Specific Agreements
- Project Specific Open-end Agreements
- Open-end Agreements for preliminary and/or final design work and services
- Task Specific Agreements
- Open-end Agreements for cultural resources, environmental studies, and geo-technical work and services
- Open-end Agreements for bridge inspection
- Open-end Agreements and Project Specific Agreements for construction inspection

The method of payment selected is generally determined by how well the Scope of Work can be defined and the amount of engineering effort required. The five methods of payment PennDOT uses for engineering services are as follows:

- Cost Plus Fixed Fee
- Lump Sum Method
- Cost Per Unit of Work
- Specific Rate of Compensation
- Specific Rate of Compensation for Construction Inspection

Information on contract types and methods of payment for Design-Build jobs is contained in Publication 448, *Innovative Bidding Toolkit*.

PennDOT's final design engineering agreements also typically provide for shop drawing review, signal permit review, and consultation during construction. If design or design related issues are encountered during construction, the District should contact the design consultant to satisfy these concerns or misunderstandings. Pending the availability of sufficient funds and the District's determination that a site visit is necessary, the District should request that the design consultant visit the project site to resolve these issues.

3.2 COORDINATION WITH OTHER AGENCIES

This section briefly describes PennDOT's interaction with other agencies; the general roles the agencies fulfill; and information on including these agencies, as appropriate, in the Process.

A. Coordination with Regulatory Agencies. PennDOT provides support to assist several resource agencies by funding staff positions whose primary responsibility is to review PennDOT related submissions.

1. Agency Coordination Meetings. The purpose of Agency Coordination Meetings (ACM) is to provide a means for open and effective communication between the transportation providers and Federal and state environmental, regulatory, and resource agencies. ACM provides a format for input on long range planning and projects that require an EIS and projects that integrate the NEPA and Section 404 processes (see Chapter 10). Implementation of the following procedures will ensure proper documentation of agency input. See Figure 3.1 under ACM Agency Representatives.

All projects with significant impacts (i.e., projects that require an EIS) should be brought before the ACM. Environmental Assessment (EA) and Categorical Exclusion Evaluation (CEE) projects should be brought to

the ACM at the discretion of the District Offices, Central Office, the Pennsylvania Turnpike Commission, and FHWA.

The goal of the ACM forum is to develop long range transportation plans and projects that are environmentally responsible through open and effective communication between the FHWA, the state and Federal environmental resource agencies, PennDOT, the Pennsylvania Turnpike Commission, and other transportation providers. The ACMs are meant specifically for transportation planning and project development. Transportation agencies other than PennDOT, the Pennsylvania Turnpike Commission, and FHWA may use the ACM upon request.

The ACM forum should be used by the MPOs/RPOs to involve the resource agencies in the transportation planning process, as shown in [Figure 3.1](#) and as discussed in more detail in Publication 10A, Design Manual Part 1A, *Pre-TIP and TIP Program Development Procedures*.

A list of the specific objectives of the ACM process is contained in the ACM Operating Procedures (see Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix E). The ACM Operating Procedures were written to help facilitate timely completion of the Process. They eliminate the need to revisit previously completed steps in the Process.

These procedures were developed as a cooperative effort between the Bureau of Project Delivery, including the Highway Delivery Division, Environmental Policy and Development Section; District Offices; and the following Federal and state agencies:

- Federal Highway Administration
- U.S. Environmental Protection Agency
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- Pennsylvania Fish and Boat Commission
- Pennsylvania Department of Environmental Protection
- Pennsylvania Historical and Museum Commission
- Pennsylvania Department of Community and Economic Development
- Pennsylvania Game Commission
- Pennsylvania Department of Agriculture
- Pennsylvania Department of Conservation and Natural Resources

2. Act 120 Agency Coordination Process. This section describes the agency coordination process required by Pennsylvania Act 120 of 1970 for highway project development projects. These procedures are applicable to 100% state funded projects and Federal-state funded projects.

As prescribed in this section, sending copies of specific environmental documents to the Act 120 Review agencies only satisfies the Act 120 coordination requirements. Copies of environmental documents must also be sent to state and Federal agencies as required by other laws, regulations, and/or directives (such as NEPA).

Projects that meet the requirements for a Level 1A or 1B Categorical Exclusion (CE) [or Environmental Documentation (ED)] do not require Act 120 Agency Review. Projects requiring Level 2 CE [or Environmental Evaluation Report (EER)], however, may require Act 120 Agency Review when one or more of the following conditions apply:

- The project requires a Section 2002 Evaluation (see Publication 349, *Section 4(f) Handbook*).
- The project requires a Public Hearing (see Publication 295, *Project Level Public Involvement Handbook*).

For Level 2 CE, or EER and Section 2002 Evaluations, the following apply:

- When Act 120 Agency review is required because the project requires a Level 2 CE, or EER and/or a Section 2002 Evaluation, the Originating Office shall send one copy of this document to the Act 120 Agencies after the Director, Bureau of Project Delivery approves the document for circulation. The letter transmitting this document shall specify a thirty-day review period.
- When Act 120 Agency review is required because the project involves a Public Hearing, the Originating Office shall send one copy of the Level 2 CE, EER and/or Section 2002 Evaluation to the Act 120 Agencies. This document shall be submitted to these agencies at the time the first Public Hearing ad is placed in the newspaper. The hearing ad shall be placed after the environmental document is approved for circulation. The cover letter transmitting this document to the agencies shall invite them to make a presentation at the hearing and to submit their comments within ten days after the hearing.

The Act 120 Review Agencies and their contact information are contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H. Act 120 agency reviews for EAs and EISs occur as part of the document circulation processes outlined in Publication 10B, Design Manual Part 1B, *Post-TIP NEPA Procedures*, Chapters 4 and 5.

3. Federal Highway Administration. The United States Department of Transportation (USDOT) Federal Highway Administration (FHWA) was established in 1967. It is FHWA's Vision to meet the Nation's need for the safe, efficient, and environmentally sound movement of people and goods. The FHWA's mission is to ensure the highest quality surface transportation system that promotes the Nation's economic vitality and quality of life of its people.

The Federal Aid Road Act of 1916 and the Federal Highway Act of 1921 established the basic tenets of the Federal-Aid Highway Program (FAHP) as it exists today: a federally assisted, state administered program, requiring a state matching share, and focusing on a limited length of eligible roads. The FAHP provides Federal financial assistance to state transportation departments for the improvement of surface transportation facilities. Federal funds distributed through the FAHP come from taxes (e.g., motor fuel tax) paid by highway users and dedicated to the Highway Trust Fund (HTF). The FHWA is the Federal agency responsible for administering the FAHP.

The FHWA makes Federal-Aid highway funding available to the state transportation departments each year. In addition to making Federal-Aid funds available, the FHWA has the responsibilities of promulgating standards for Federal-Aid projects, ensuring compliance with Federal laws, providing technical assistance, and reimbursing the states for approved project expenditures. This is carried out through FHWA's Division Offices.

The FAHP is a state administered program, as such states are responsible for selecting, planning, designing, and contracting for the construction of Federal-Aid highway projects. This responsibility includes working with the state's MPOs, RPOs, and local governments to determine how the funds will be distributed among projects within state boundaries. The states also have been responsible for maintaining and operating the Federal-Aid highway projects.

PennDOT complies with FHWA directives and standards for Federal-Aid highway projects. PennDOT policy concerning design review procedures is defined in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix C, FHWA/PennDOT Stewardship & Oversight Agreement.

On PennDOT Oversight projects, PennDOT assumes the responsibilities assigned to the FHWA under Title 23 for Federal-Aid projects after environmental clearance has been granted. PennDOT Oversight does not preclude FHWA access to and review of Federal-Aid projects at any time. See Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*, for more details on Oversight Status.

FHWA is also responsible for coordination with Native American Tribes and Nations. See Publication 591, *Pennsylvania Tribal Consultation Handbook*; Publication 592, *Pennsylvania Tribal Consultation Handbook Appendix*; and Publication 295, *Project Level Public Involvement Handbook* for more information.

FHWA's organizational structure consists of the Washington, D.C. Headquarters, the Federal Lands Highway Offices, and the Office of Motor Carriers. Furthermore, to ensure efficient and effective delivery of the program to the states, FHWA maintains 52 Division Offices, one in each state (generally located in the capital), the District of Columbia, and the Commonwealth of Puerto Rico. The Commonwealth of Pennsylvania is served by the Division Office in Harrisburg, Pennsylvania.

Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals I, 1A, 1B, and 1C*, Appendix H.

4. U.S. Environmental Protection Agency. The U.S. Environmental Protection Agency (EPA) is a Federal regulatory and review agency charged with overseeing the implementation of Federal laws designed to promote public health through protection of the Nation's air, water, and soil from harmful pollution. In this capacity, EPA performs a combination of research, monitoring, standard setting, and enforcement activities.

The primary purpose of EPA's interaction with PennDOT is to ensure that:

- PennDOT complies with applicable Federal laws designed to protect human health and the environment.
- Environmental protection is an integral consideration in PennDOT's transportation project delivery policies, particularly in regard to:
 - Air quality
 - Waters of the U.S. (may include rivers, streams and wetlands)
 - Hazardous wastes
 - Disposal of dredged materials
 - Endangered species
 - Environmental Justice Populations

EPA interfaces with PennDOT in numerous areas of environmental review and regulation. EPA is involved in the transportation planning process through participation in PennDOT's Air Quality Interagency Consultation Group, as well as, their coordination and concurrence in the US DOT air quality conformity determination process. One of the most visible areas of interface is during Preliminary Engineering in the NEPA process. EPA participates in the environmental review and Section 404 permitting of all major PennDOT transportation projects requiring an EIS or EA through the ACM process. EPA can veto a permit issued by the USCOE. This participation involves EPA in the following activities:

- Project Notification - EPA reviews, comments, and provides input into the development of the project Purpose and Need.
- Scoping - EPA reviews initial data (Scope of Work), and provides information, technical assistance, and resources to identify environmental concerns and establish methodology for evaluation.
- Alternatives Development - EPA reviews and comments on the full range of alternatives; may request evaluation of additional alternatives and information on each; participates in developing alternatives.
- Alternative Analysis and Screening - EPA reviews alternatives presented; comments on adequacy of information and range of alternatives; and provides input on alternatives.

- Environmental Document Review - EPA reviews and comments on both the draft and final EIS, and EAs when requested.
- 404 Process (reviews adequacy of 404 avoidance and minimization efforts).
- Clean Air Act, Section 309 review - under this section of the Clean Air Act, EPA is responsible for reviewing all EIS's. EPA reviews and rates Draft EIS's in two parts: (1) Rating the Environmental Impact of the Action and (2) Rating the Adequacy of the Draft EIS. See EPA's Environmental Impact Statement Rating System Criteria for more information.

EPA also reviews Categorical Exclusion and EA projects involving wetlands on a case-by-case basis.

EPA's national organization structure includes ten geographical regions. Pennsylvania is in EPA Region 3, which also includes Delaware, Maryland, Virginia, West Virginia, and the District of Columbia

Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H.

5. U.S. Army Corps of Engineers. This section describes the relationship between PennDOT and the U.S. Army Corps of Engineers (USCOE) and serves as a general guide to various USCOE regulations affecting highway improvement projects. These regulations include the Section 10 Permit, Section 404 Permit and the Pennsylvania State Programmatic General Permit (PASPGP-5)). Refer to Publication 13M, Design Manual Part 2, *Highway Design*, Chapter 10 for procedures and current directives for obtaining permits from the USCOE.

Under the authority of Section 404(b)(1) of the Clean Water Act (33 U.S.C. §1344), the USCOE exercises jurisdiction over the waters (both navigable and otherwise) of the United States. Accordingly, PennDOT must obtain approval from the USCOE in the form of a Section 404 Permit for all proposed encroachments (including most bridges) involving the placement of dredged or fill materials in the waters of the United States in Pennsylvania. Bridges are not included as the U.S. Coast Guard (USCG) is responsible for permitting these bridges over the navigable in-law waterways (USCG Bridge Permit, see Section 7 USCG that follows). A Section 10 Permit is issued by the USCOE for work in, over, or under navigable waterways, which is to prohibit the destruction or alteration of navigable U.S. waters. All Section 404 permit applications must comply with Section 404(b)(1), which requires an alternative analysis in order for the Permit to be issued. The USCOE is authorized to determine whether a project complies with the Clean Water Act Section 404(b)(1).

The USCOE also participates in project activities related to Project Notification, Scoping, Alternatives Development, Alternatives Analysis and Screening, and Environmental Document Review, similar to that discussed under the EPA.

There are three USCOE Districts that exercise jurisdiction in Pennsylvania. Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H. The USCOE website (<http://www.usace.army.mil>) includes a map showing the boundaries of each USCOE District.

6. U.S. Fish & Wildlife Service. U.S. Fish & Wildlife Service (USFWS) is an agency of the Department of the Interior dedicated to conservation, protection and enhancement of fish and wildlife and their habitats for the continuing benefit of the American people. USFWS serves all fifty states and Puerto Rico through nine regional offices. Pennsylvania is within the USFWS's Northeast Region (Region 5), which encompasses all of New England and the Mid-Atlantic states.

Under the authority of the Endangered Species Act, 16 U.S.C. §§1531-1543, the USFWS reviews transportation projects (Categorical Exclusions, Environmental Assessments, and Environmental Impact Statements) for the presence of Federally listed Threatened and Endangered fish and wildlife, including, reptiles, amphibians, birds and mammals. In addition to the Threatened and Endangered species review, the USFWS also searches for critical and unique habitat. Under Section 7 of the Endangered Species Act (ESA),

the USFWS is responsible for consultation regarding endangered species and issuing Biological Opinions when necessary. The USFWS may also issue an incidental take permit for threatened and endangered species.

Under the Fish and Wildlife Coordination Act, 16 U.S.C. §§661-667e, the USFWS has a consultation role in some federal permits. While the USFWS, itself, does not issue any environmental permits, it does review permit applications and offer its comments to permitting agencies. Applications for an USCOE 404 Permit, for example, are reviewed by USFWS. The USCOE considers the USFWS's concerns in its review of the permit application.

The USFWS also participates in project activities related to Project Notification, Scoping, Alternatives Development, Alternatives Analysis and Screening, and Environmental Document Review, similar to that discussed under the EPA.

Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H.

7. U.S. Coast Guard. Under the Rivers and Harbors Act of 1899 (33 U.S.C. §§401 et. seq.) the U.S. Coast Guard (USCG) has jurisdiction over the Waters of the United States determined to be navigable in law and has responsibility to:

- Determine whether a USCG bridge permit is required for improvements to an existing bridge or construction of a new bridge over navigable waters.
- Approve the bridge location, alignment and appropriate navigational clearances in bridge permit applications.
- Approve the reconstruction, rehabilitation, demolition, painting or other work which may reduce permitted clearance or pose a threat to navigation.
- Prescribe appropriate lighting and markings for bridges, both during construction and for the life of the bridge.

Under the U.S. Code of Federal Regulations, Title 23, Part 650.805, the FHWA has the responsibility to determine whether a USCG permit is not required. A USCG permit shall not be required if the FHWA determines that the proposed construction, reconstruction, rehabilitation, or replacement of the federally aided or assisted bridge is over waters that are:

- Not used or are not susceptible to use in their natural condition or by reasonable improvement as a means to transport interstate or foreign commerce and
- Not tidal or, if tidal, used only by recreational boating, fishing, and other small vessels less than 6.4 m (21 ft) in length.

The determination that no USCG permit is required does not eliminate the USCG's lighting or marking authority. Therefore, the USCG should be notified of bridges constructed under this authorization so the USCG can determine how the bridge shall be lighted and marked.

Three USCG Districts exercise jurisdiction for construction of bridges over Navigable Waters in Pennsylvania. Generally, streams that flow into the Mississippi River watershed are in the Eighth Coast Guard District. Streams that flow into the Great Lakes are in the Ninth Coast Guard District. Streams that flow into the Atlantic Ocean are in the Fifth Coast Guard District.

Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H.

8. Natural Resource Conservation Service. The Natural Resource Conservation Service (NRCS) of the U.S. Department of Agriculture (USDA) has jurisdiction over the Federal Farmland Protection Policy Act (FPPA) of 1981 (7 U.S.C. §§ 4201-4209). The FPPA was enacted "to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses." Because of this legislation, all federally funded transportation projects must comply with the FPPA.

Each PennDOT District shall identify the adverse impacts to farmland of all proposed Federal-Aid projects and shall consider measures to avoid and minimize these impacts during the Engineering and Environmental Study Phase of highway project development.

Details on complying with the FPPA and other agricultural rules and regulations are described in PennDOT Publication 324, *Agricultural Resources Evaluation Handbook*.

The NRCS also has a role in jurisdictional determinations of wetlands in farmland. This issue is addressed in Publication 325, *Wetland Resources Handbook*.

Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H.

9. National Park Service. The National Park Service (NPS) is the Federal agency entrusted with the care of national parks. The NPS is also the Keeper of the National Register of Historic Places. NPS's involvement with PennDOT projects generally includes:

- Coordination under Land and Water Conservation Fund (LWCF) Act (Title 16, U.S.C. §4601), which requires coordination under Section 6(f) for take of any property purchased with or improved using LWCF monies.
- Coordination for right-of-way takes involving federal parkland or Wilderness Area property.
- Coordination for any projects that involve a federal Wild and Scenic River (Title 16, U.S.C. Chapter 28).

Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H.

10. Native American Tribal Nations. Section 106 of the National Historic Preservation Act, obligates federal agencies to work closely with federally recognized Native American Tribes in reaching decisions. As a federal agency, the FHWA, and by extension PennDOT, need to make a reasonable and good faith effort to identify and consult with Native American Tribes that may attach religious and cultural significance to historic properties affected by Federal-Aid projects. These historic properties may or may not be located on tribal lands. Pennsylvania has no current tribal lands, but historic properties may also be located on ancestral, aboriginal or ceded lands affected by Department projects.

Consultation between the Department and each Tribe is to be done in a manner that is sensitive and respectful of tribal sovereignty. In principle, consultation should begin early in a project's planning process so that all parties have ample time to identify and discuss relevant historic preservation issues and resolve concerns about the confidentiality of information concerning historic properties of religious and cultural significance to tribes. For additional information regarding Tribal Consultation, see Publication 591, *Pennsylvania Tribal Consultation Handbook*, and Publication 592, *Pennsylvania Tribal Consultation Handbook Appendix*. A list of the currently recognized Native American Tribal Nations is available on this site and/or from the District's CRP.

11. Pennsylvania Fish and Boat Commission. The Pennsylvania Fish and Boat Commission (PFBC) regulates fishing and boating in and on all inland and boundary waters of the Commonwealth. The PFBC also manages and protects the state's aquatic resources, including fish, reptiles, and amphibians. Of particular concern to the PFBC are potential impacts to federal and state threatened and endangered species of aquatic resources. The PFBC also provides an ecological review of watercourses and information on water trails and

water recreation access. For any navigable waterways, the PFBC will require that PennDOT develop an Aid to Navigation (ATON) plan, see PFBC's website, listed below for more information and Publication 13M, Design Manual Part 2, *Highway Design*, Chapter 10.

The PFBC reviews transportation projects for the presence of state listed threatened and endangered aquatic species. All requests for information on such species should start with the PNDI Project Planning Environmental Review Tool. Follow-up coordination, if required, should be directed to:

PA Fish and Boat Commission
Division of Environmental Services
595 E. Rolling Ridge Drive
Bellefonte, PA 16823

The PFBC has indirect authority over permits. While the PFBC, itself, does not issue any environmental permits, it does review permit applications and offers its opinion to permitting agencies. Applications for a PA DEP Chapter 105 Permit, for example, are reviewed by PFBC.

The PFBC under certain conditions can restrict where and when construction and other activities can be performed in streams and waterways. Construction restrictions are typically enforced in trout waters (seasonal, in-stream work restrictions) and other restrictions in waters containing threatened and endangered species (typically no in-stream work is permitted). The PFBC also issues blasting permits for underwater blasting done in Pennsylvania's waterways. In addition, the PFBC establishes Water Trails (<http://www.fishandboat.com/Boat/WaterTrails/Pages/default.aspx>), which are boat routes suitable for canoes, kayaks, and small motorized watercraft. Maps of each trail are located on PFBC's website. Note that Water Trails may be considered Section 4(f) Resources (see Publication 349, *Section 4(f) Handbook*) and, as such, when located in a project area, coordination with FHWA concerning the trail's viability as a Section 4(f) Resource should be conducted.

Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H.

12. Pennsylvania Department of Environmental Protection and County Conservation Districts. The PennDOT Districts are encouraged to establish a working relationship with the appropriate Pennsylvania Department of Environmental Protection (PA DEP) Regional Office and County Conservation Districts. The six regions and the locations of the PA DEP regional offices are listed below.

The PA DEP administers three programs that could impact PennDOT projects: the National Pollutant Discharge Elimination System (NPDES) permit program; the Chapter 105 Water Obstruction and Encroachment permit program; and the Section 401 Water Quality Certification. An NPDES permit is required for an earth disturbance activity greater than or equal to one acre. The NPDES permit program requires the use of Best Management Practices (BMPs) to control stormwater runoff during construction in the form of an Erosion and Sedimentation Control Plan (E&S plans) and post construction in the form of a Post Construction Stormwater Management (PCSM) plan.

Under the Dam, Safety and Encroachment Act, 32 P.S. §§693.1, et seq., the construction, operation, maintenance, modification, enlargement, or abandonment of any water obstruction or encroachment is prohibited without a permit from the PA DEP. Types of activities requiring a permit include placing fill in wetlands or streams, stream relocations, or the construction of bridges, culverts, or pipes in wetlands or streams. Similar to the Section 404 permit process, this permit requires an alternatives analysis to avoid, minimize, and mitigate impacts to wetlands and streams. Chapter 105 (25 Pa. Code Chapter 105) details the requirements for obtaining a permit.

Section 401 of the Clean Water Act requires that an individual applying for a Federal license or approval (e.g., a Section 404 permit from the USCOE or a permit from the USCG) obtain a certification from the state that any associated discharge to waters of the United States will comply with the provisions of the Clean Water Act

addressing effluent limitations, water quality standards, and performance standards for specific types of activities. In Pennsylvania, PA DEP issues this Water Quality Certification.

PA DEP has delegated certain responsibilities under the NPDES permit program to the County Conservation Districts. For example, the County Conservation Districts approve the E&S plans and some County Conservation Districts may undertake certain enforcement actions.

Detailed information on preparing and submitting permit applications is contained in Publication 13M, Design Manual Part 2, *Highway Design*.

Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H.

Contact information for the Commonwealth's County Conservation Districts can be found at: <http://pacd.org> (PA Association of Conservation Districts, Inc.).

13. Pennsylvania Historical and Museum Commission. Under the State History Code (37 P.S. §§ 101, et. seq.), PennDOT consults with the Pennsylvania Historical and Museum Commission (PHMC) regarding the significance of historic, and archaeological resources on projects with 100% state funding. Established procedures are in place for the PHMC to review and concur with PennDOT findings regarding effects to historic and archaeological resources. The key to the successful implementation of these procedures is a clear understanding of the process and the technical adequacy of all supporting documentation.

For Federal-Aid projects, Section 106 of the National Historic Preservation Act of 1966, 16 U.S.C. §470F and its regulations, established a process to identify, evaluate, and consider the effects of projects on historical and archaeological resources. Resources afforded consideration are those eligible for the National Register of Historic Places. Historic properties of exceptional value are National Historic Landmarks. Section 106 requires consultation with the State Historic Preservation Officer (SHPO) and others. The Pennsylvania State Historic Preservation Office is a bureau within PHMC. The PHMC's Executive Director is designated as the SHPO.

Under the Section 106 Programmatic Agreement, PennDOT acts as the agent of the FHWA and consults with the SHPO. FHWA coordinates with the Advisory Council on Historic Preservation (ACHP) where projects will adversely affect historic resources. FHWA also coordinates with the Keeper of the National Register, who has delegated authority from the National Park Service, when there is disagreement over eligibility with the SHPO.

The Section 106 Federal review process was designed to ensure that historical and archaeological sites are considered during Federal project planning and execution. The review process is administered by the Advisory Council on Historic Preservation. The regulations are entitled "Protection of Historic Properties" and appear in the Code of Federal Regulations (36 CFR Part 800).

Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H.

For additional information see the Section 106 Programmatic Agreement (Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix Y) and Publication 689, *Cultural Resources Handbook*.

14. Pennsylvania Department of Conservation and Natural Resources. The Pennsylvania Department of Conservation and Natural Resources (DCNR) was established by P.L. Act 18 of 1995. DCNR's basic functions are maintaining and preserving state parks, managing state forestland, providing environmental education and promoting conservation of Pennsylvania's parks, open spaces and natural areas.

DCNR's organization includes seven Bureaus. The three Bureaus most likely to be affected by PennDOT projects are:

- State Parks. The Bureau of State Parks manages Pennsylvania's 117 state parks. Its responsibilities include preserving the natural, scenic, aesthetic and historical qualities of each park and ensuring visitor safety, maintaining facilities, and monitoring concessionaires.
- Topographic and Geologic Survey. This Bureau provides technical reports, maps, guides and educational reports that explain Pennsylvania's complex geology and topography, including information on rocks, minerals, coal, glaciers, landslides and earthquakes. The Bureau also prepares topographic maps of the 900 quadrangles that cover Pennsylvania.
- Forestry. The Bureau of Forestry and its 20 forest districts throughout the state protect state forestland from fire, destructive insects and diseases, while balancing economic interests and visitor's recreational needs. The Bureau of Forestry is a partner in the Pennsylvania Natural Diversity Inventory (following section), an important database of Pennsylvania's natural resources. DCNR also reviews projects for impacts to state listed threatened and endangered plant species.

PennDOT projects located near state forests or parks must be coordinated with the respective Bureau. Additionally, any take of property from a state forest or park will require coordination under Section 4(f) of the US DOT Act of 1966 or Section 2002 of PA Act 120. Any property take that impacts land purchased with 6(f) funds under the Land and Water Conservation Fund (LWCF) Act will require coordination with DCNR. Although the Bureaus do not issue their own permits, they do participate in the review of permit applications, providing opinions to permitting agencies. In addition, DCNR maintains the list of state Scenic Rivers. Information on the Scenic Rivers System can be found on DCNR's website at <http://www.dcnr.pa.gov/Conservation/Water/RiversConservation/ScenicRivers/Pages/default.aspx>.

Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H.

15. Pennsylvania Natural Diversity Inventory. The Pennsylvania Natural Diversity Inventory (PNDI) [Pennsylvania Natural Heritage Program] is a partnership between the Western Pennsylvania Conservancy and the Pennsylvania DCNR Bureau of Forestry. PNDI conducts inventories and collects data to identify and describe the Commonwealth's rarest and most significant ecological features. Species tracked within the PNDI information system are those classified as Endangered, Threatened, or Rare as listed by DCNR, PA Game Commission, PFBC, USFWS and species recommended by the PA Biological Survey. Natural community types and geologic features are identified and mapped based on the recommendations of PNDI ecologists and the DCNR, Bureau of Topographic and Geologic Survey, respectively.

For transportation projects, the PNDI Project Planning Environmental Review tool (<http://www.naturalheritage.state.pa.us/>) is used as the first step in obtaining protected species information.

Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H.

16. Pennsylvania Game Commission. The Pennsylvania Game Commission (PGC) protects, conserves, and manages the Commonwealth's diversity of wildlife and wildlife habitats; provides wildlife-related education services and recreational opportunities for both consumptive and non-consumptive uses of wildlife; and maintains and promotes Pennsylvania's hunting and trapping heritage.

The PGC reviews transportation projects for the presence of state listed Threatened and Endangered birds and mammals. All requests should start with the PNDI Project Planning Environmental Review Tool (see previous section) and follow-up coordination, if required, should include a brief description of the project, a U.S. Geological Survey quadrangle map indicating the project study area and quadrangle name, and contact person for the project. In addition to the Threatened and Endangered review, the PGC also searches for critical and unique habitat, and potential impacts to State Game Lands (Note that in Pennsylvania, State Game Lands are protected under Section 4(f) and Section 2002. See Publication 10B, Design Manual Part 1B, *Post-TIP NEPA Procedures* and Publication 349, *Section 4(f) Handbook* for more details). The PGC is also concerned with

general wildlife impacts from transportation projects, and should be consulted on projects that might bisect wildlife habitat and/or travel corridors.

Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H.

17. Pennsylvania Public Utility Commission. The Pennsylvania Public Utility Commission (PUC) balances the needs of consumers and utilities to ensure safe and reliable utility service at reasonable rates; protect the public interest; educate consumers to make independent and informed utility choices; further economic development; and foster new technologies and competitive markets in an environmentally sound manner.

The PUC has exclusive jurisdiction over the construction, relocation, suspension, and abolition of public highway-railroad crossings. No alterations shall be made to any public highway-railroad crossing facilities whether the crossing is a highway at grade, above grade or below grade, without first obtaining approval from the PUC.

Grade Crossing activities encompass a wide range of issues critical to the design and construction of highways, bridges, and other types of transportation structures. The following references provide a comprehensive guide to these issues.

- Title 23, Code of Federal Regulations, Part 646
- Publication 371, *Grade Crossing Manual*
- Publication 16, Design Manual Part 5, *Utility Relocation*, Chapter 9, Public Utility Commission Involvement
- Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*, Chapter 3, Section 3.3.B.14, Railroad/PUC Involvement and Chapter 4, Section 4.5, Railroad/PUC Coordination
- Act 1978, Public Law 1051 (Public Utility Code), Title 66 §2702, Construction, Relocation, Suspension and Abolition of Crossings and §2704, Compensation for Damages Occasioned by Construction, Relocation or Abolition of Crossings.

18. Agricultural Lands Condemnation Approval Board. As discussed in Publication 324, *Agricultural Resources Evaluation Handbook*, PennDOT may not condemn land in agricultural production for projects involving new highway facilities without approval from the Agricultural Lands Condemnation Approval Board (ALCAB). The ALCAB Test involves the presentation of data in the form of an alternatives analysis to establish that there is *no reasonable and prudent alternative to the utilization of productive agricultural land for the project*. Projects requiring ALCAB coordination should follow the process described in Publication 324, *Agricultural Resources Evaluation Handbook*, Section VI.

Once it is determined that ALCAB approval is required, it is PennDOT's policy to proceed with ALCAB following the receipt of environmental clearances or sooner at the discretion of the Engineering District in consultation with the Bureau of Project Delivery.

For an ALCAB hearing, PennDOT encourages early consultation with the **Pennsylvania Department of Agriculture** as well as the farmers and farm owners who might experience impacts resulting from any project subject to NEPA clearance, as this information is often a critical component of the federal decision-making process. Early coordination provides reasonable assurances that the proposed project can be constructed, has considered measures to minimize harm, and has considered public comment.

Conducting the ALCAB hearing after environmental clearance is beneficial in that the Preferred Alternative is known and detailed data is available for use in preparing for and conducting the hearing. However, there is inherent risk in that if ALCAB does not agree that the Preferred Alternative is the ALCAB Preferred Alternative, then a reevaluation of the environmental document and additional studies may be required before a

project can proceed through final design. The ALCAB hearing can be delayed as late as Final Design; however, waiting until Final Design may affect the anticipated letting by hindering the right-of-way clearance. The Project Manager must be aware of the effort that the ALCAB hearing process demands and the significant impacts it may cause in terms of schedule and budget.

On some projects, especially controversial projects or those involving a large amount of productive agricultural land it may be beneficial to conduct the ALCAB hearing prior to environmental clearance. This will ensure that the alternative that is environmentally cleared will be the Preferred Alternative from both a NEPA and an ALCAB standpoint. However, with this option the project environmental clearance can be delayed until the ALCAB process is complete and changes during final design may need to be re-presented to ALCAB depending on the extent of changes in impact to productive agricultural land. See Publication 324, *Agricultural Resources Evaluation Handbook*, for more details and guidance on ALCAB requirements.

19. Utility Providers. Utilities may not make an opening in, or place utilities above, a State highway without following the conditions, regulations and restrictions established by PennDOT. The Secretary of Transportation has the authority to issue licenses to a public utility to occupy any bridge under the jurisdiction of PennDOT. All fees collected from permit applications shall be paid into the Motor License Fund.

Details on coordination with and rights of utilities are in Publication 16, Design Manual Part 5, *Utility Relocation* and Publication 371, *Grade Crossing Manual*. In addition, utility relocation activities encompass a wide range of issues critical to the design and construction of highways, bridges, and other types of transportation structures. The following references provide a comprehensive guide to these issues.

- Title 23, Code of Federal Regulations, Part 645
- Title 67, PA Code, Chapter 459
- Publication 16, Design Manual Part 5, *Utility Relocation*
- Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*, Chapter 3, Section 3.3.B.15, Utility Identification & Verification
- ASCE Publication 38-02, *Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data*

20. Pennsylvania Turnpike Commission. The Pennsylvania Turnpike is one of the longest toll roadways in the United States. In total, it encompasses approximately 552 miles of limited access, high-speed roadway. When the Pennsylvania Turnpike Commission (PTC) was established by Act 211 of 1937, its purpose was to enhance accessibility throughout the state, thus supporting economic development. Currently, its mission is to operate and manage a safe, reliable, cost effective and valued toll road system.

The PTC is a component unit and an independent instrumentality of the Commonwealth. The Commission's governance structure is composed of members who are responsible to Turnpike customers, elected officials, and policy makers. The Commission is governed by five members, including the Pennsylvania Department of Transportation (PennDOT) Secretary. Commission members are appointed to four year terms by the Governor with the advice and consent of at least two-thirds of the Senate.

Under Act No. 61 of 1985, Section 19(b), PennDOT is required to approve the PTC's plans and specifications for construction. Additionally, 74 Pa.C.S. 8120 (b) requires that PennDOT review and comment on all PTC construction contracts prior to execution. Design items are approved by the Bureau of Project Delivery (BOPD) as well as affected Districts. Construction contracts are reviewed and commented on by BOPD.

Since PennDOT and PTC transportation facilities create the conveyance backbone for economic development and job creation throughout the Commonwealth, it is imperative that the two systems function effectively as a seamless system. PennDOT projects that traverse, intersect the turnpike, are in close proximity to PTC facilities, or may affect turnpike operations, or PTC projects which intersect or may affect State roadways must

be coordinated. Detailed procedures for coordination are contained in Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*, Section 4.3 Public, Public Official, and Agency Coordination, Part C - Pennsylvania Turnpike Commission Coordination.

Contact information is contained in Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*, Section 4.3 Public, Public Official, and Agency Coordination, Part C - Pennsylvania Turnpike Commission Coordination.

B. Modal and Planning Relationships. This section describes PennDOT's relationships with miscellaneous entities not included in the previous categories.

1. General Relationships with Railroads. Typical highway and bridge projects involving Railroads include grade crossings, grade separations, and general safety improvement projects.

Inspection and Protective Services by Railroads fall into two general categories:

- Force Account Projects. Inspection and protective services by Railroad forces are considered a legitimate part of and, consequently, are a proper charge to the Railroad force account project and need not be specified in Form D-4232.
- Construction Contract Project. If inspection and protection services by Railroad forces were rendered in connection with a construction contract project, and in the absence of a previously authorized Railroad force account project, they may be charged to the contract project itself but must be included as a separate item (CENG-R) at the time the Form D-4232 for the contract project is submitted, or as an amendment if such item was not included in the original Form D-4232 submission.

Additional guidance and procedures pertaining to types of Railroad reimbursement agreements, development of Railroad agreements and the execution process of such agreements can be found in the latest edition of Publication 371, *Grade Crossing Manual*.

2. General Relationships with Aviation. Construction or alteration of highway-related items may require review and approval by state and Federal aviation agencies, especially when an airport is within a two-mile radius of the project. Coordination is required during design, construction, and after construction. The results of the coordination effort should be documented in the NEPA document. The PennDOT Bureau of Aviation oversees state requirements (see Publication 405, *Aviation Development Sponsor's Guide*), while the Federal Aviation Administration (FAA) oversees Federal requirements.

At the state level, the Aviation Code requires notice of proposed construction or alteration. This notice must be provided to the Bureau of Aviation. The applicant must supply the Bureau of Aviation with the nature of the proposal, complete description of the structure, location of the structure, and its height and elevation. The applicant must also describe the site's location with respect to highways, streets, airports, prominent terrain features, existing structures, etc.

At the Federal level, the Federal Aviation Act of 1958 requires notice of proposed construction or alteration (see 14 CFR Part 77, Section 77.13 for more information on when this notification is required). This notice must be provided to the FAA along with information that is similar to the Bureau of Aviation's requirements above. Application forms may be obtained from the following regional office:

Federal Aviation Administration, Eastern Regional Office

Air Traffic Division, AEA-530
1 Aviation Plaza
Jamaica, NY 11434
Telephone: 718-553-4508

3. PennDOT Coordination on Non-PennDOT Projects. Generally, PennDOT's involvement on projects being completed by another agency (other than local transportation and/or bridge projects, see Publication 740, *Local Project Delivery Manual*) is typically limited to the issuance of permits under the Highway Occupancy Permit process (see Publication 282, *Highway Occupancy Permit Guidelines*). However, there are times when PennDOT is required to coordinate with an agency that is developing a project along a State Highway that might affect the transportation facility. For example an airport that wants to extend a runway closer to a highway (is a road relocation required?) or a transit provider proposing a new station (does PennDOT need to advise on traffic?). In these cases, PennDOT must work with the other agency to ascertain the potential impacts on PennDOT facilities and to deliver any needed transportation improvements through the Process. PennDOT may also need to support the other agencies work with information/studies such as traffic data, signal warrants, turning lane warrants, etc. Overall, PennDOT's role on these types of projects is typically support; however, in some instances, such as the airport example above, PennDOT may need to plan, program and deliver a project through the Process to support the other agency's action.

4. Metropolitan Planning Organizations (MPO) and Rural Planning Organizations (RPO) MPOs represent the interests of 19 metropolitan areas throughout the state. The four RPOs help to develop transportation improvement programs in the rural areas of the state. [Figure 3.5](#) shows the regional boundaries of the MPOs and RPOs in Pennsylvania.

During the Pre-TIP and TIP Project Delivery Procedures (see [Figure 3.1](#)), PennDOT will work in partnership with the MPOs/RPOs and other transportation agencies to identify transportation-related deficiencies and problems, and develop policies, strategies, and proposals for consideration and potential inclusion in the MPO/RPO's Long Range Transportation Plans (LRTP). The LRTP's are the basis for development of a list of prioritized proposals to be placed on the region's Transportation Improvement Program (TIP) and incorporated into the Statewide TIP (STIP).

During the Pre-TIP and TIP planning process, the MPO/RPOs are to thoroughly consider the purpose and need of potential proposals along with land use, environmental resources, and contextual issues. Proposals are then prioritized according to both need and financial constraints. Funding is allocated based on the priority assigned to the proposals and the available resources. PennDOT should collaborate with the MPO/RPOs to identify and prioritize projects that will benefit both the transportation facility and the communities in which they are located. The MPO/RPO should also be included in decisions that are made during Preliminary Engineering or Final Design that impact the outcome of the project.

Contact information is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix H.

5. PennDOT Coordination with Municipal and County Government. The Municipalities Planning Code (MPC) requires that county comprehensive plans have a long range transportation component. The MPC also requires these plans to have a level of consistency between them through multiple reviews and comment periods for each plan among associated planning partners. For single county planning partners, the county comprehensive plan and the long range transportation plan may even be the same document. Larger regions should be sure their individual county comprehensive plans are incorporated into the MPO's or RPO's long range transportation plan and that the long range plan informs the comprehensive plan. PennDOT should work with municipal and county government as appropriate to ensure a strong linkage between the land use typically identified in comprehensive plans and the development of the LRTP, TYP, and TIP/STIP.

PennDOT has placed a renewed emphasis on planning and collaboration with municipal and county government staff under the *PennDOT Connects* policy. This policy commits PennDOT to collaborate with MPO/RPO staff and local government planners/staff during the planning process. The objective of this collaboration policy is to identify the needs of communities and related contextual issues early in project planning through the collaborative planning process. The role of local government planners/staff in the process is to make PennDOT and the MPO/RPO aware of visions and aspirations for the community as well as identified local needs. PennDOT and the MPO/RPO will work with local government planners/staff to determine if community-related project features are justified to be incorporated as part of the transportation

proposal. A local government collaboration meeting is required to be conducted prior to a project being added to the TIP and is one example of an opportunity to discuss specific topics which include, but are not limited to:

- Safety issues/concerns
- Bicycle/pedestrian accommodations
- Transit/multimodal considerations
- Stormwater management
- Presence of/impacts from (current/future) freight generating land uses
- Utility issues
- Transportation operations considerations
- Emergency services accommodations
- Planned development
- Long range transportation plans
- Regional planning studies, e.g. corridor studies, resource management studies, watershed studies, etc.
- Consistency with current community comprehensive or other plans
- Consistency with current and/or proposed zoning
- Other proposed transportation improvements
- Impacts on the natural, cultural, or social environment
- Right-of-way considerations
- Anticipated public opinion
- Community or cultural events in the candidate project area
- Maintenance agreement requirements

PennDOT must reach out to the local governments to conduct this collaboration. If the local governments choose not to participate, there must be evidence that a good faith effort was made by PennDOT to conduct the required collaboration.

Collaboration provides the opportunity for details unique to communities to be identified and discussed for each project in planning, prior to developing project scopes and cost estimates. More transparency provides the opportunity for community input into project scopes earlier in the process, providing better understanding of local contextual issues, and avoiding delays later in project delivery. More transparency can also serve to provide better information to local governments allowing them to better plan other improvements in their communities. Providing more information for local governments can avoid conflicts with PennDOT transportation projects later in construction.

MPOs/RPOs and local governments must demonstrate the need to include community mobility and related objectives in project scopes. Ideally, decisions should be based, in-part, on comprehensive planning, corridor studies, resource management studies, multimodal studies or other related planning studies that demonstrate a need for community features. If no documented planning is available, community features must be well thought-out and consistent with the current and future land uses within the community.

Decisions reached on community features during planning must be communicated to the local government and collaboration with local government planners/staff must also occur during project delivery. MPO/RPO and local government planners/staff must be invited to participate in Environmental and Engineering Scoping Field Views.

Refer to Publication 10A, Design Manual Part 1A, *Pre-TIP and TIP Program Development Procedures* for more information.

Pennsylvania's Transportation Planning Organizations Rural and Metropolitan Areas

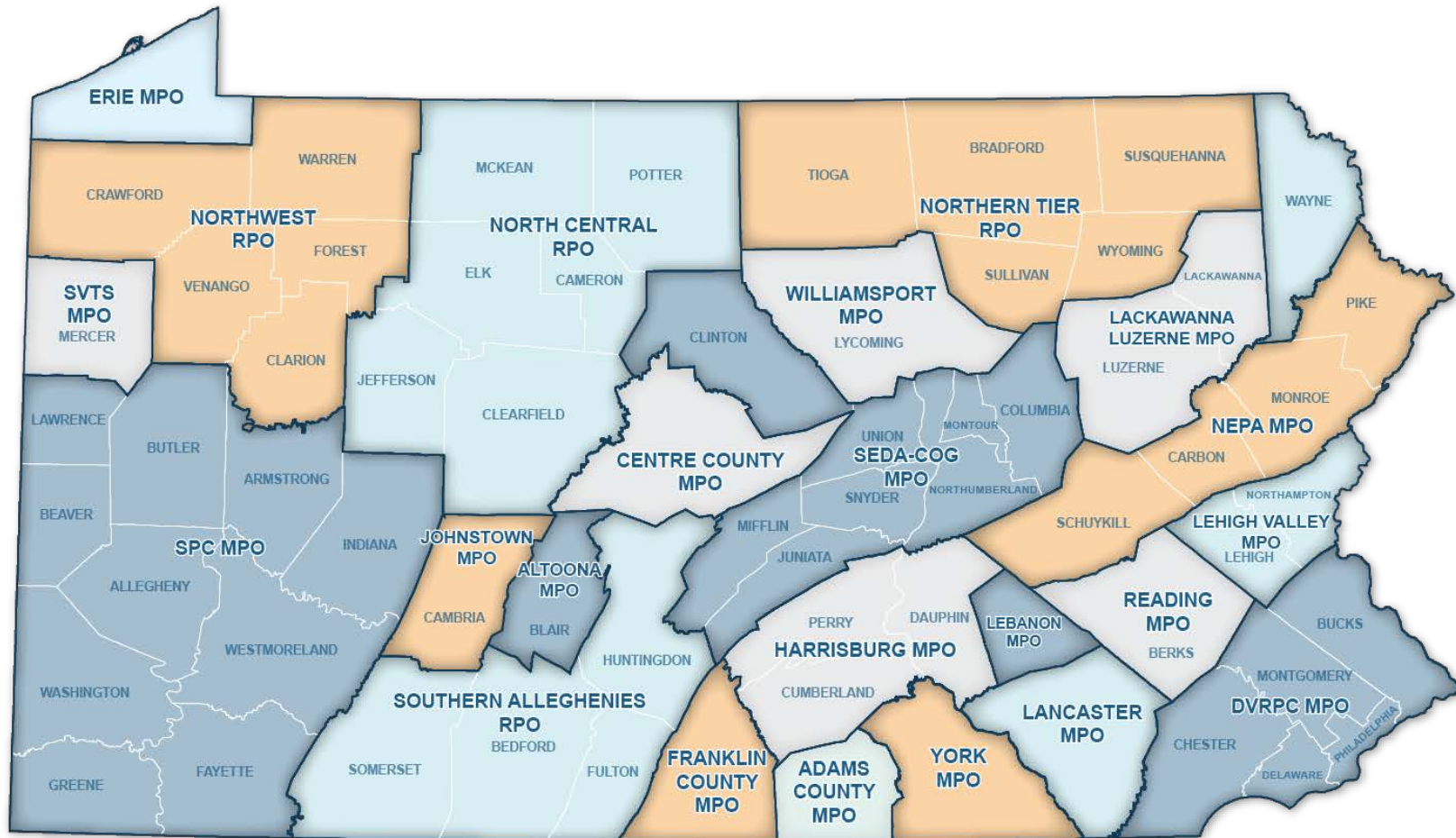


Figure 3.5

CHAPTER 4

QUALITY CONTROL AND QUALITY ASSURANCE PRACTICES AND PROCEDURES

4.0 INTRODUCTION

PennDOT is committed to improving quality in all facets of its operations. This chapter describes PennDOT's Quality Control and Quality Assurance (QC/QA) policies and procedures as administered by the Central Office Bureaus and Engineering Districts. For definitions of terms related to this chapter, see Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix B, Glossary.

PennDOT's QC/QA policies and procedures are intended to ensure that:

- All projects are developed and designed in accordance with Federal and state requirements;
- Corrective actions are taken when design processes and related approvals are found to be in noncompliance with applicable Federal and state requirements; and
- Continuous quality improvement is applied to all design processes and products.

The current FHWA/PennDOT Stewardship & Oversight Agreement (Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix C) delegates much of FHWA's approval authority to PennDOT for certain preliminary engineering, construction contract administration, and right-of-way activities on or related to Federal-Aid projects, based on the understanding that PennDOT's QC/QA plan will assure that all such approvals are in accord with applicable Federal requirements. FHWA and PennDOT, also have a Programmatic Agreement that delegates much of FHWA's review responsibilities on applying Categorical Exclusion procedures on routine projects.

The design phase QC/QA roles and responsibilities of the Engineering Districts, Central Office Bureaus and FHWA are as follows:

The following are the general roles and responsibilities of PennDOT's eleven Engineering Districts:

- Manage project development and perform delegated approvals.
- Manage consultant agreements.
- Maintain and distribute internally copies of appropriate policies and procedures.
- Comply with appropriate policies and procedures.
- Develop detailed operating procedures.
- Exercise appropriate QC measures.
- Prepare and implement Quality Development plans.

The following are the general roles and responsibilities of the two Central Office Bureaus in the Highway Administration Deputate:

- Develop policies and procedures.
- Perform oversight role for design functions performed by District and Consultant staff.
- Perform quality assurance on activities and project approvals not delegated to Districts.
- Develop and implement the project management system.
- Participate with FHWA in the Independent Oversight Program (IOP).
- Coordinate with FHWA.
- Perform quality control on products produced by Central Office.

The following are the general roles and responsibilities of the FHWA:

- Environmental document review and approval.
- Monitor and assess PennDOT's delegated authority through Independent Oversight Program (IOP) reviews.
- Coordinate/participate with Central Office and Districts.
- Approve and act on Federal Oversight projects.
- Review and approve standards, plans, specifications, and policies (i.e., publications and strike-off-letters) for all Federal-Aid activities.

The Central Office Bureau Directors and District Executives are responsible for the management of all design work performed under their authority. As part of PennDOT's continuous quality improvement initiative, every work process and its QC/QA procedures are to be continuously monitored by the respective Divisions within each Bureau. All incidents of non-conformance will systematically be reported by the Division Chiefs to the responsible District Executive via quarterly parallel activities reports or other means deemed appropriate. Corrective actions will be taken at the lowest, competent level possible.

4.1 QUALITY MANAGEMENT PLAN

A. Management Responsibility. All members of the PennDOT design community share the responsibility for quality management, including the Central Office Bureaus, District Offices, and consultants. The PennDOT design community is committed to consistently providing high-quality products in a timely manner and within the design and construction budgets. Quality consists of meeting the requirements or expectations of the client. A key element of quality is continuous quality improvement.

Managers within the Central Office Bureaus and Engineering Districts are responsible for implementing and managing design work performed in their respective areas. This would include quality control and quality assurance functions; however, quality begins with the individual. Each employee is responsible for the correctness and timely completion of his/her work, and each employee is responsible for continuously recognizing and recommending work process improvements.

B. Quality System. The Quality Management Manual (QMM) is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix D and references various current operating procedures and policies developed by the Central Office Bureaus and Engineering Districts. Additional operating procedures will be developed over time as part of the continuous quality improvement process.

PennDOT's quality system is applicable to all design products and processes. This system covers all design activities from PMC approval to construction contract award and execution. At contract award and execution, responsibility for project quality is transferred to the Bureau of Project Delivery, Innovation and Support Services Division and the District construction units. However, the design staff retains responsibility for activities performed under the construction services phase, which include shop drawing reviews, alternate structures review, and consultation during construction, including resolution of design-related construction issues.

PennDOT has adopted the Quality Pyramid documentation structure shown in Figure 4.1.

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QUALITY PYRAMID

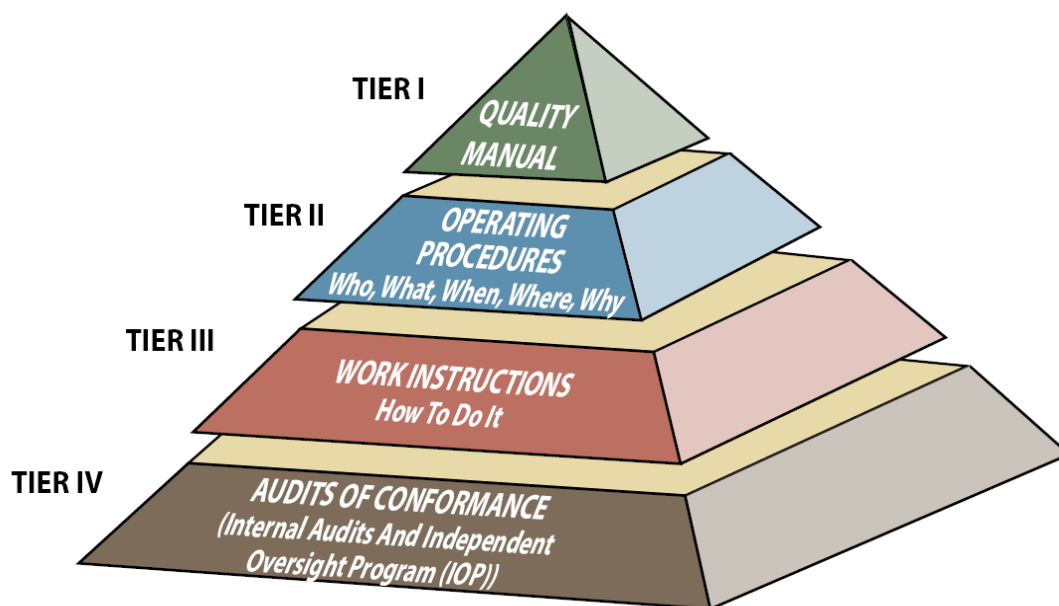


Figure 4.1

Tier I - PennDOT Quality Management Manual (QMM) (see Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix D). This document represents the top of the quality pyramid. It establishes PennDOT's commitment to quality and the general philosophy of the QMM.

Tier II - Operating Procedures. Tier II contains documentation that addresses the "who, what, when, where, and why" of design activities performed in both the Central Office Bureaus and the District Offices. PennDOT's current standard operating procedures include, but are not necessarily limited to, those published in PennDOT's various manuals, standard drawings, specifications, strike-off-letters, policy letters, and handbooks. Under PennDOT's ECMS initiative, PennDOT's current operating procedures are continuously evolving.

These procedures are proactively revised and improved to include more effective QC/QA processes, including steps to identify non-conforming products and services, and implement corrective actions when necessary.

Tier III - Work Instructions. Work instructions are detailed directions and checklists developed to assist individuals actively performing design work. These instructions are revised and improved as needed to stay abreast of current technology and include more effective QC/QA processes.

Tier IV - Audits of Conformance. This Tier includes any internal audits PennDOT staff or others perform to randomly monitor activities to ensure that the QC/QA practices have been addressed and documented. Tier IV includes an annual third party Independent Oversight Program (IOP) for Federal-Aid projects as identified in the current FHWA/PennDOT Stewardship & Oversight Agreement (See Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix C). Primary responsibility for the IOP rests with FHWA. However, the selection of process and review topics, the performance of reviews, and the preparation of reports will be performed jointly with PennDOT.

The following objectives guide the overall Quality Management effort in Design and the implementation of the QC/QA program required by the current FHWA-PennDOT Stewardship & Oversight Agreement.

- Provide overall quality for project design development.
- Ensure quality services during the design and construction phase.
- Perform duties FHWA delegated to PennDOT in the Stewardship & Oversight Agreement.
- Prepare Quality Development Plans.
- Obtain appropriate operating procedures from all design partners.
- Establish standardized procedures for QC/QA for the various design-processes.
- Develop standardized procedures for revising operating procedures and incorporating QC/QA requirements.
- Identify procedures to obtain approval for delegating duties in accordance with FHWA/PennDOT Stewardship & Oversight Agreement requirements.
- Make consultants responsible for the quality of their design products and comply with the Quality Development Plan.
- Identify generic procedures for preparing project-specific Quality Development Plans for both PennDOT staff and consultants.
- Ensure compliance with QC procedures in all work processes and in policy development procedures.

Operating procedures and work instructions for project design development are contained in PennDOT's Design Manuals, handbooks, manuals, guides, standards, and various other publications as listed in the QMM (Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix D). These publications contain PennDOT's approved procedures, standards, and policies for virtually all design activities, including QC/QA reviews.

Design products will be prepared, reviewed and approved in accordance with operating procedures to be developed by each Bureau or District. The development of operating procedures by each Bureau or District will interface with ECMS and utilize the automation being developed and acquired for ECMS implementation. The appropriate operating procedures will be incorporated in revisions to Tiers I, II, III, and IV documents to ensure that these practices are integral to the standard design procedures used throughout the PennDOT design community.

PennDOT's purpose in both the ECMS and the FHWA/PennDOT Stewardship & Oversight Agreement is to delegate approval authority to the lowest possible competent level. To accomplish this goal, each Bureau or District will develop operating procedures for its particular design work process. The respective operating procedures will address the following items:

- The objective of and approach to the design process
- The design criteria
- The education, experience, roles, and responsibilities of the named key personnel
- The quality control measures
- The quality assurance measures
- The corrective action procedures

After Central Office approval and FHWA concurrence in these respective operating procedures, the approval authorities will be officially delegated to the appropriate Bureau or District.

C. Internal Quality Audits and the Independent Oversight Program. FHWA, in consultation with the Directors of the Bureaus of Project Delivery and Maintenance and Operations (BOPD/BOMO) and District Executives, will establish procedures for conducting internal quality audits. Internal quality audits will be conducted on an annual or as-needed basis. The purposes of conducting internal quality audits are:

- To ensure compliance with standard processes, laws, regulations, policies, operating procedures, or other requirements.
- To investigate and eliminate the cause of problems identified.
- To modify a process to improve its efficiency and cost effectiveness.
- To study processes and products so all involved or affected improve their understanding.

An annual third party IOP will evaluate the reliability and effectiveness of PennDOT's quality management system as well as the products developed using the identified processes. FHWA and PennDOT will jointly determine areas for the IOPs. PennDOT representatives will assist the FHWA in conducting these IOPs. FHWA will also establish procedures to respond to FHWA's IOP findings and recommendations within 90 days.

D. Corrective and Preventive Actions. PennDOT is committed to Continuous Quality Improvement (CQI). The essence of CQI is identifying what we do and how we can do it better. Results of the ongoing quality control procedures (i.e., reviews, checking, etc.) during the design process, and the above-referenced Internal Quality Audits and IOPs will be evaluated to determine what is causing work process problems and what can be done to eliminate the causes or reengineer the process. Corrective action will then be determined and implemented by the "owners" of the work process. As part of the continuous quality improvement process, new QC/QA procedures will be developed and integrated into the design work processes. Subsequent internal quality audits and IOPs will assure that the corrective actions have been implemented and that they are effective.

E. Design Management. The Design Manuals listed in the QMM (Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix D) currently contain guidance on procedures for design management. The object of this quality management system is to comply with these current procedures. Currently groups with input to a specific design process interact via PennDOT's standard procedure for distributing proposed changes. This process includes soliciting comments from the affected parties.

At appropriate stages of design, the design results will undergo formal documented reviews in accordance with current operating procedures identified in the Design Manuals and documents listed in the QMM (Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix D), and as identified in the District's quality development plans. Participants in each design review shall represent all functions associated with the design stage being reviewed. Records of such reviews shall be maintained.

F. Consultant Management. PennDOT employs consultants to perform a wide variety of design activities. PennDOT's procedures for obtaining consultant design services are found in Publication 93, *Policy and Procedures for the Administration of Consultant Agreements*. This document addresses:

- The need for a consultant,
- The consultant selection process,
- The development of the consultant Scope of Work,
- Consultant negotiations, and
- Consultant management.

PennDOT has implemented procedures to place additional responsibilities on consultants for quality of work. The consultants will be required to submit a corporate quality plan and submit job specific Quality Development Plans (QDPs) for PennDOT approval. As part of quality reviews, process reviews, and IOPs, these plans and the consultants' conformance to them will be monitored, evaluated and documented.

PennDOT Project Managers should remind all consultant designers that they are responsible for ensuring that all calculations and drawings are correct, are completed by generally accepted engineering methods, and meet the requirements of all applicable Department Design Manuals and other applicable standards. This includes the review and checking of all calculations and drawings and sealing of the documents by a registered professional engineer who assumes full responsibility for their completeness and accuracy.

All calculations and drawings must be thoroughly checked for correctness and accuracy and shall be initialed by the designer and the checker prior to submission to the Department. This quality control process is expected to be an incidental part of all work performed for the Department and for Department funded projects at the local level. Drawings and calculations that do not meet this requirement will be returned without review. Consultants must be rated promptly and appropriately for the level of quality that they are providing to PennDOT. These ratings must be taken into account and weighed accordingly during the consultant selection process.

The District and its Project Managers must take seriously its responsibility to provide Quality Assurance checks on all consultant submitted designs. However, it is not the responsibility of PennDOT, nor do the resources exist within PennDOT to perform quality control functions for the consultant designer. PennDOT Project Managers must ensure consultants are fulfilling their QC role and take the time to review all work for completeness and accuracy prior to its submission for Central Office review.

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CHAPTER 5

PRE-TIP AND TIP PROGRAM DEVELOPMENT PROCEDURES OVERVIEW (STEPS 1 THROUGH 4)

5.0 INTRODUCTION

The Transportation Program Development and Project Delivery Process (Figure 1.1) applies to all projects regardless of funding (federal or 100% state) and the class of NEPA or Act 120 documentation. The first four Pre-TIP and TIP development phases of PennDOT's Process outline include the assessment, identification evaluation, and addition of projects for potential programming on the TIP/STIP (see Figure 3.1). These phases involve matching limited resources to customer-specific transportation needs. Pennsylvania has numerous transportation needs in all modes of travel - highways, aviation, rail freight, public transit, bicycle and pedestrian, and intermodal interfaces. To address these needs, Pennsylvania uses a priority programming process whereby needs are prioritized and assessed on a county, regional and statewide basis, with funding then assigned to the highest priority needs overall. Refer to Publication 10A, Design Manual Part 1A, *Pre-TIP and TIP Program Development Procedures* for more information.

Decisions regarding how available transportation funds are to be disbursed are made in the Pre-TIP and TIP/STIP phases (Steps 1 through 4) of PennDOT's Process. The Post-TIP phases (Steps 5 and 6) contain the bulk of the National Environmental Policy Act (NEPA) process (Step 5). In the past, the Pre-TIP planning phases and the Post-TIP NEPA phases were predominately separate processes. However, over the years, the PennDOT planning and NEPA processes were updated with additional requirements as the result of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and the Transportation Equity Act for the 21st Century (TEA-21) of 1998, the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) of 2005, Moving Ahead for Progress in the 21st Century (MAP-21) of 2012, and Fixing America's Surface Transportation (FAST) Act of 2015. SAFETEA-LU's provisions require more consideration of community and environmental issues and impacts during planning and encourage the use of products from the planning process in the NEPA process. Refer to the American Association of State Highway and Transportation Officials (AASHTO) Practitioner's Handbook #10, *Using the Transportation Planning Process to Support the NEPA Process* for more information on how thoughtful consideration of environmental issues during planning can shorten the environmental review process.

MAP-21 provided details on the adoption of planning products for use in NEPA proceedings. The Federal lead agency (usually FHWA) may choose to adopt portions of or the entire planning product. MAP-21 ended the TEA era and brought a new renewed focus and requirements for transportation performance management and a performance-based planning and programming process. Performance-based planning and programming refers to the application of performance management principals within the planning and programming processes of transportation agencies to achieve desired performance outcomes for the multimodal transportation system.

The FAST Act added purpose and need and preliminary screening of alternatives and elimination of unreasonable alternatives to the list of planning decisions that can be used in the environmental review process. Refer to Publication 10A, Design Manual Part 1A, *Pre-TIP and TIP Program Development Procedures* for more information.

PennDOT's Process also includes increased consideration of project purpose and need, environmental impacts, alternatives, mitigation, and costs in the Pre-TIP phases (shown in Figure 3.1, Phases 1 through 4).

During the first four phases, PennDOT and the MPO/RPOs must work together to identify, prioritize, and program future projects that are fiscally responsible, have a high value to price ratio (i.e., greatest balance of costs and benefits), enhance and build upon existing investments and the overall transportation network, integrate local land use planning, reflect the context of the surrounding community, and accommodate all transportation modes. It is important during the process that the needs of existing transportation infrastructure are considered first (Asset Management – see Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix B).

PennDOT's Process (Figure 3.1) requires an early evaluation of project needs, purpose, transportation and project area context, environmental constraints, and fiscal requirements. This early analysis, during the Pre-TIP phases, is vital to developing an overall STIP that meets fiscal constraints while delivering smart transportation improvements that focus on safety, maintain the existing transportation infrastructure, is scaled to fit the needs (problem), and utilize the existing network to full capacity to serve the mobility needs of the Commonwealth's residents and communities, and fit within the context of the surrounding community while reflecting state, regional, and local goals.

In order to achieve the outcomes noted above as part of the Pre-TIP phases, the *PennDOT Connects* collaborative planning process commits PennDOT to collaborate with MPO/RPO staff and local government planners/staff during the planning process. The objective of this collaboration policy is to identify needs of communities and related contextual issues early in project planning. The role of local government planners/staff in the process is to make PennDOT and the MPO/RPOs aware of visions and aspirations for the community as well as identified local needs. PennDOT and the MPO/RPOs will work with local government planners/staff to determine if community-related project features are justified to be incorporated as part of the transportation proposal.

5.1 FEDERAL REQUIREMENTS

Since the 1962 Federal-Aid Highway Act, federal authorizing legislation for expenditure of surface transportation funds has required metropolitan area Long Range Transportation Plans (LRTP) and short-range Transportation Improvement Programs (TIP) to be developed through a Continuing, Cooperative, and Comprehensive (3-C) planning process. Over successive authorization cycles, Congress has added and revised the substantive content expected from the 3-C planning processes.

Following the Federal-Aid Highway Act, in 1969, a national commitment to the environment was formalized through the passage of NEPA. NEPA established a national environmental policy and provided a framework for environmental planning and decision-making by federal agencies. NEPA directs federal agencies when authorizing, taking approval-action, or issuing permits to conduct environmental reviews to consider the potential impacts their proposed actions would have on the environment. NEPA also established the Council on Environmental Quality (CEQ), which is charged with the administration of NEPA.

Section 6001 of SAFETEA-LU, Transportation Planning (codified as 23 USC §§134 and 135), revised the transportation planning laws to require increased consideration of the environment in both statewide and metropolitan long range transportation planning for purposes of streamlining the NEPA process. FHWA updated its Statewide Transportation Planning and Metropolitan Transportation Planning regulations accordingly at 23 CFR Parts 450 and 500 on February 14, 2007, and FTA concurrently published its final rulemaking on the update of its planning regulations at 49 CFR Part 613. In early 2007, FHWA and FTA issued joint legal program guidance [*Integration of Planning and NEPA Processes* (Appendix A: Linking the Transportation Planning and NEPA Processes) February 2007] encouraging stronger linkages between the transportation planning and NEPA processes. MAP-21 and the FAST Act have both reinforced that linkage.

A. Long-Range Plans and Short-Range Programs. Federal law requires that each urbanized area with a population in excess of 50,000 have a long-range plan and short-range program that cover all surface transportation modes. PennDOT has formally recognized RPOs and have been extended the same rights and privileges as the MPOs. The MPO/RPOs, in concert with PennDOT, develop two separate but linked transportation planning products:

- The Long Range Transportation Plan (LRTP)
- The short-range Transportation Improvement Program (TIP).

The LRTP must demonstrate that the existing system is being adequately operated, maintained and expanded where appropriate over a twenty-year time horizon, given the funds reasonably expected to be available. The TIP covers a four-year period and is a subset of the LRTP. The TIP specifies which projects will be advanced over the current four-year time span. TIPs must be updated at least every two years by the MPOs and RPOs.

Federal law also requires that each state develop a Statewide Transportation Improvement Program (STIP). The STIP consists of the individual metropolitan and rural TIPs. The STIP is updated at least every two years and concurrently with the MPO/RPO TIPs. All of the above programs and plans must be fiscally constrained. That is,

they must be based on an estimate of funding that can reasonably be expected to be available during the appropriate time period.

Federal law also requires a long-range, multi-modal, statewide plan that does not necessarily need to be project-specific. These plans are, in essence, long-range policy plans that establish the broad principles, goals and objectives upon which the short-term statewide and regional programs are developed. All LRTPs must be developed in accordance with the statewide transportation system goals.

B. Public Involvement. The processes used by the regional agencies to develop plans and programs are similar to those used at the state level, including a strong emphasis on public participation and involvement. The purpose of the regional transportation planning and programming effort is to incorporate investment decision making.

PennDOT public involvement activities for projects should meet the requirements of NEPA, address the needs of affected groups and individuals and adhere to the principles set forth in Publication 295, *Project Level Public Involvement Handbook*, which outlines the procedures that are required by regulation. In addition, consultation should occur between MPO/RPOs/PennDOT to identify any previous public outreach that may have occurred.

5.2 STATE REQUIREMENTS

In addition to the above Federal requirements, the processes for Pennsylvania's MPOs and RPOs also must be consistent with the Commonwealth's Long Range Transportation Plan, Pennsylvania Act 120, and the budget authority provided by Pennsylvania's General Assembly.

A. Pennsylvania State Transportation Commission. The Pennsylvania State Transportation Commission (STC) is a fifteen-member body chaired by the Secretary of Transportation with representation by members of the General Assembly and public. The STC is responsible for reviewing and approving Pennsylvania's Twelve Year Program, which is the Commonwealth's official transportation program. The STC also determines and evaluates the condition and performance of Pennsylvania's transportation system in order to effectively assess the resources required to preserve, restore, extend and expand transportation facilities.

B. Twelve Year Transportation Program. Pennsylvania's Twelve Year Program (TYP) is the Commonwealth's official transportation program. The TYP is a multimodal, fiscally-constrained, list of transportation projects spanning a 12 year period. Act 120 of 1970, as amended, requires PennDOT to prepare, update and submit the TYP to the STC every two years. The Statewide Transportation Improvement Program (STIP) covers the entire state and includes the 24 individual TIPs representing each planning partner, plus one independent county (Wayne). Federal law requires TIPs to be updated at least every four years. Pennsylvania's MPOs and RPOs update their TIPs every two years during the TYP update process.

Program listings are organized primarily around MPO and RPO jurisdictions. The program's secondary organization is by county. Information provided includes brief project descriptions, funding sources, costs, and disposition relative to the first, second or third four-year periods of the program. Projects can be classified by the following transportation improvements:

- Highways and Bridges
- Aviation
- Intermodal
- Transit
- Rail
- Intelligent Transportation Systems (ITS)
- Non-Motorized
- Multimodal

Funding sources include a combination of the federal, state, and local funds expected to be available over the specified twelve-year period. Federal funding is estimated based on Federal authorizing legislation. State funds are based on current revenues.

Funding in the first year of the four-year period is in current dollars. The funding in the remaining three years, as well as, for the second and third four-year periods is Year of Expenditure dollars to reflect the impact of inflation as appropriate. Project costs are adjusted every two years. The first four-year period of the program is identical to the planning partners' federally mandated and approved TIPs. Combined, these project listings constitute the STIP. Before PennDOT can proceed with these projects, the STIP must be reviewed and approved by the FHWA and FTA for conformance with appropriate Federal legislation and other transportation, air quality and public involvement (Title VI) requirements.

5.3 PRE-TIP/TIP STEPS 1 THROUGH 4 OVERVIEW

Understanding the community context in terms of the current transportation system and land use, as well as environmental, historical, and cultural resources allows PennDOT and its Planning Partners to make better and more informed decisions when identifying transportation needs in term of both asset management and capacity issues. Thoughtful consideration of these issues during the Pre-TIP and TIP/STIP phases leads to a more predictable schedule, cost, and efficient movement through the post-TIP phases of the process. The ultimate goal is more consistent decision-making which benefits communities, the environment, and transportation by identifying alternatives that avoid or minimize impacts. Refer to the AASHTO Practitioner' Handbook #10, *Using the Transportation Planning Process to Support the NEPA Process*.

During the first two steps of the Process (Figure 3.1) financial guidance and transportation safety needs and maintenance needs (Asset Management) of the existing infrastructure and other deficiencies in the overall transportation system are identified and proposals are developed by the MPO/RPO and PennDOT for consideration and potential inclusion in the LRTPs. Urgent needs of existing infrastructure must be given priority over other deficiencies in the transportation system. The LRTPs become the basis for the development of a list of priority proposals to be placed on a region's TIP and eventually incorporated into the STIP in Step 4. Refer to Publication 10A, Design Manual Part 1A, *Pre-TIP and TIP Program Development Procedures* for more information.

This approach helps manage the scope of both a program and individual proposals at an early stage. Having this type of information prior to programming projects onto the TIP/STIP allows for better consideration of realistic program costs and development of accurate baseline project cost estimates, which will help to ensure projects programmed on the TIP/STIP provide a high value benefits to cost ratio.

Thoughtful consideration of environmental resources and issues and community context during the Pre-TIP and TIP/STIP phases leads to a predictable schedule and efficient movement through the Post-TIP phases of the Process. Refer to the AASHTO Practitioner's Handbook #10, *Using the Transportation Planning Process to Support the NEPA Process* for more information. Moreover, it leads to better program and project decisions for both transportation, the community, and the environment through the early identification of solutions/alternatives that avoid and minimize impacts and better fit into their surroundings. A coordinated effort, during the Pre-TIP / TIP phases (Planning - Steps 1 through 4) and Post-TIP phases (NEPA - Step 5), results in more cost-effective project delivery.

Cost containment is a critical consideration of this process. Early coordination and identification of issues results in improved planning, programming, and design of projects that will reduce the opportunity for unforeseen cost increases as the project advances toward construction. However, just as importantly, this process will provide, as stated, the baseline project cost estimate that will be adhered to throughout the Process (i.e., that the project will be designed to this cost estimate) and will become the comparison baseline for future updated cost estimates.

Since financial resources will never be sufficient to address every problem, needs must be prioritized. The regional LRTP is required to be fiscally constrained and still be responsive to local and regional needs and priorities, as well as, technically sound. Establishing a project prioritization and selection process can help stakeholders ensure the consistency between the goals and policies to be implemented through the plans and the problem/project identification process.

The Process was developed to thoroughly address regulatory requirements and PennDOT initiatives in order to ensure quality, high value to price transportation projects that fit within the local context and the overall transportation network. With additional attention given to the identification of potential environmental impacts, public controversies, resource agency coordination, or other issues before a proposal is programmed on the TIP

and/or STIP, a detailed proposal scope will be known, and realistic schedules and project cost estimates can be developed. Proposals will be consistent with the Core Principles (see [Chapter 1](#)) before they are programmed, include consideration of Context Sensitive Solutions, and be better defined as they enter the TIP/STIP, thus streamlining project delivery post-TIP/STIP.

A. Problem Assessment (Step 1). The first step in the Process is "Problem Assessment" ([Figure 1.1](#)). The term is applied to the initial advancement of any transportation or transportation-related problem intended for consideration as part of a regional LRTP or TIP. Those problems can be statements from PennDOT, from an MPO/RPO, from a local municipal government, or from the public.

For a problem to be assessed, it must first be identified. The majority of problems/issues are directly identified by PennDOT or the MPO/RPO through performance-based planning and programming, and asset management. PennDOT and the MPO/RPO use transportation data to assess or analyze the needs of the entire transportation system from a statewide, a District, and an MPO/RPO perspective.

Any person can advocate that a problem exists. The process of planning is a people-oriented process. The individual MPO/RPO can set its own procedures for how transportation problems are brought to their attention, either directly to the MPO/RPO or through municipal or county planning agencies, municipal or county government boards, councils, and/or commissions. The MPO/RPO should communicate the process clearly to those who might become advocates for proposals.

Problems or extremely unrealistic solutions submitted as problems can be dismissed immediately as not appropriate to the process, frivolous, or outside the purview of capital infrastructure. But most problems should be considered, to the depth proportional to the resources made available to the project selection team, for potential inclusion in an LRTP and TIP, either in the short-term or long-term. This applies to issues presented by PennDOT, the MPO/RPO, local government planners/staff or by others.

Sources of problem assessment phase problems include:

- Existing LRTP goals and project lists from previous or existing LRTPs
- A PennDOT plan for work that is based on asset management methodology such as maintaining maintenance cycles for pavements
- A PennDOT plan for work that is based on performance measurement-based actions such as risk assessments, or roughness indices, or other performance measures
- The MPO/RPO's regional priorities and goals and assessment of needs, including performance-based, data-driven targets
- Ideas provided by the public during the STC public comment periods
- Problems/proposals provided by the public during MPO TIP public comment periods
- A municipal comprehensive plan set of goals and/or objectives that include transportation components
- The advancement of raw ideas that came from citizens to municipal councils, boards, or commissions
- A county comprehensive plan that prioritizes certain areas of development and/or redevelopment and the accompanying infrastructure support needed
- Input from a bus, shared ride, intercity, rail, or air transit provider
- Corridor studies and/or traffic impact studies conducted at the local or regional level
- A transportation related advocacy group's (bicycle, pedestrian, multimodal, transit, truck, rail, aviation, port) input

- A private developer's anticipated plans
- Specialty funding program applications/other funding

The problems entering the Transportation Program Development and Project Delivery Process include specifically-defined proposals that are addressed as part of PennDOT's continuing asset management focus and philosophy, and an investment strategy that is a cooperative and collaborative effort of the MPO/RPO and PennDOT with input from local government planners/staff. Raw ideas and or newly identified issues may also be generated by citizens. The list can include information from prior planning efforts, and should be tied to stated community goals, municipal and joint municipal comprehensive plan goals, MPO/RPO and statewide performance measures, and regional, state, and national goals.

Examples of types of “raw” issues and their indicators of potential transportation problems include:

- “Too many crashes”: A large number of crashes or severe crashes in an area
- “Too much gridlock”: Recurring congestion and event-related congestion
- “We need good jobs”: Lack of economic development opportunities
- “No other way to go”: Lack of transit service to a particular neighborhood or employment center, or inadequate allowances for bicycle-pedestrian traffic
- “Bridge is falling apart”: Bridge is in poor condition
- “Fix this road”: Pavement conditions have deteriorated to an unacceptable state
- “Repetitive flooding”: stormwater component or structure hydraulic design inadequate to handle flow under current conditions

Data should be identified or collected to determine if it supports these raw issues. It is important to recognize that the assessment of problems and planning associated with those problems may occur first at the local level of government. Effective municipal and county planning efforts harness this citizen "identification" of issues. It is effectively paired with the PennDOT/MPO/RPO, and municipal asset management and performance-based planning approaches to develop a transportation program (TIP or LRTP).

Effective municipal and/or county comprehensive planning proactively seeks participation from all citizens. Local planning commissions meet regularly to discuss issues. Often, the public does not see this as an opportunity to make a difference, but citizens who speak up prove that while a single person may not be able to change the future of an area, a single idea can have great power. Individuals who speak up have been successful in many ways and in many areas in advancing transportation improvement projects simply by identifying a problem they have seen, or experienced. It is useful for PennDOT to be as involved as appropriate in local planning efforts, and to support municipalities by communicating its priorities and project information in a way that helps municipal planners do their planning.

Municipal comprehensive plans (where they exist) help in the development of county comprehensive plans (required by the PA Municipalities Planning Code). Integration of county comprehensive plans and concepts into the regional LRTP is a way to link land use to the transportation planning process, and eventually the program development and project delivery processes. Efficient and effective project delivery is the desired result. Each MPO/RPO has forged relationships with its municipal and county planning partners, and it is important that PennDOT staff be as involved as appropriate at all times so that effective collaborative planning is the result of consistent communication and cooperation from all parties to the planning itself.

PennDOT collects information in a variety of ways at a variety of levels, but it begins with daily interaction by the public with the county maintenance districts which repair and repave. Specific customer care center opportunities are offered to the public to collect maintenance concerns. Engineering Districts work closely with their county

maintenance district managers, assistants, and roadway program coordinators to identify continuing ways to maintain and sustain the highways and bridges.

Planning for development and redevelopment, for economic opportunities, for new housing, for recreational and cultural plans, happens at the local level. The Commonwealth of Pennsylvania has more than 2,500 municipalities, and perhaps as many as 2,500 different ideas of what local planning should be, within state regulation, law, and guidance. There are vast differences in approaches, but the same desired outcome - clearer local vision about future development and the transportation infrastructure and programs that will be consistent with and supportive of that vision. Pennsylvania's Municipalities Planning Code guides planning for counties and municipalities and its regulations apply to plans and zoning undertaken by municipal and county governments in Pennsylvania.

It is important that municipalities have a cooperative relationship with county planning offices, and that all efforts are built to align municipal and county visions with MPO/RPO, statewide, and national visions on transportation's role in the planning process. County planning offices should maintain good cooperative communications and relationships with MPO/RPO organizations, and with PennDOT Engineering District personnel. All parties should understand that any system that avoids duplication of effort and uses resources wisely at any level of the process benefits all partners. Earlier and more coordinated communication and cooperation will pay dividends in wise use of financial resources in the planning stages, and translates to more effective use of financial resources in project delivery.

For more information on Problem Assessment and the Level 1 Screening Form that is completed during this step, refer to Publication 10A, Design Manual Part 1A, *Pre-TIP and TIP Program Development Procedures*.

B. Proposal Identification (Step 2). The regional LRTP drives each region's TIP and STIP. Problems advanced from Step 1 to Step 2 are studied further if necessary, and more data is collected and documented on the Level 2 Screening Form so that all problems can be examined in the context of community, state and national goals, or in the case of PennDOT-initiated asset management category projects, so that an asset management line item can be created for the LRTP, with details of the line item proposals provided to all partners as soon as possible and feasible. The advancement of problems from Step 1 to Step 2 permits those problems to become more defined, and eventually for alternatives to address the problems to be more objectively compared as they are considered against other problems or proposals for possible inclusion within the LRTP. Emerging from the process as part of the LRTP, they can then be considered for further definition and programming as projects on the TIP/STIP. PennDOT and other planning partner sponsors of problems should balance the desires of long term plans with the realities of system performance, available funding, and environmental stewardship. The product of sound planning here can be the most accurate budget, scope, and schedule possible at the earliest possible time.

It is important that all PennDOT Engineering Districts work closely with the MPO/RPOs within their boundaries to specifically address the common goals of prioritizing asset management proposals, and meeting community needs. That is accomplished when PennDOT offers engineering information and the MPO/RPO offers community contextual information so that the proposals are more clearly identified on the Level 2 Screening Form.

The LRTP is a comprehensive strategy for transportation and development at a regional/county level, developed and adopted by an MPO/RPO. MPO and RPO planners create the regional LRTPs. An LRTP addresses no less than a 20-year planning horizon, but may extend beyond that time frame at the discretion of the MPO/RPO, and is updated at least every four or five years depending on its air quality (attainment or non-attainment) status under the Clean Air Act. It contains a financial plan whose total costs may not exceed projected revenue in order to demonstrate the consistency between reasonably available and projected sources of Federal, State, local, and private revenues and the costs of implementing the proposed transportation system improvements. For illustrative purposes, the LRTP can also include a supplementary list of proposals for funding if additional revenues become available, and a plan for economic development. It is from that supplementary list of proposals that programmable projects may be developed in the future.

The transportation planning process provides an opportunity for citizens, government officials, planners, associated stakeholders and other interested parties to come together to:

- Visualize the region's future,
- Identify trends within the region,
- Document current and projected conditions (asset management and system operational demand)

- Set goals, performance measures, performance targets, and
- Prioritize transportation proposals for what the region hopes to achieve within the next 20 or more years.

Furthermore, the planning process allows for update cycles to ensure that the vision and goals are consistently revisited and reassessed to address a region's changing needs and support a region's desired transportation direction. Given the scale and longevity of transportation investments and the impact they have on a region's economy and quality of life, improvements to the transportation system demand deliberate and thoughtful planning. A realistic long-range transportation plan is critical in helping a region realize its vision for the future.

Selection of proposals or projects in an LRTP is a challenging task that requires the balancing of needs, resources, and priorities across many political jurisdictions. To work in a multi-jurisdictional environment, the prioritization and selection process cannot be solely driven by rigid rules, however it is necessary to meet basic minimum criteria to remain aligned among regions, and with federal and state laws, regulations, policies, and guidance. Proposals or project rankings are compared to available financial revenues available by problem type (e.g., highway vs. bridge investment funds), and it is from that combination of the problem need and financial capacity that problems are programmed as projects for the TIP and STIP.

Baseline proposal or project selection criteria are outlined in the LRTP Guidance document. Additionally, the PennDOT Program Center will update the LRTP Guidance to be consistent with Federal and State policy direction as needed.

For more information on Problem Identification and the Level 2 Screening Form, refer to Publication 10A, Design Manual Part 1A, *Pre-TIP and TIP Program Development Procedures*.

C. Proposal Evaluation (Step 3). Once problems have been identified, development of a proposal's purpose and need has been initiated, and the proposal has been determined to be a candidate for the TIP or LRTP, it is time to take a hard look at the location in collaboration with the community to determine the local and regional context of the area and identify the range of possible solutions to consider that would be the most appropriate to meet the defined transportation needs.

To conduct a thorough evaluation of proposals, collaboration between PennDOT, MPO/RPOs and local government planners/staff is essential. This collaboration results in the understanding of potential fatal flaws/risks such as environmental issues, right-of-way, or land use conflicts as well as contextual issues associated with the location and community.

If additional information is required to make a decision on a proposal, it can be programmed on the TIP or LRTP as a formal planning study. Once recommendations of that study are identified, they can then reenter the collaborative planning process at the appropriate phase of the process (based on the amount of collaboration/data collection that has taken place).

Potential solutions/alternatives should be conceptually identified, if they have not been already, and further evaluated, taking into consideration what has been learned about the context and what is appropriate for the specific location/community. A full range of potential solutions should be considered to address the identified transportation needs. It is important to remember that not all alternatives must consist of traditional design and construction, nor should it necessarily be the goal to increase capacity. Depending on the needs to address and the specific location, there may be opportunities to consider other options that address the needs and also may minimize impacts to the surrounding environment and/or communities. Local government collaboration should include a discussion of alternatives and their contextual issues. Local insight should be used to better understand what alternatives would meet the project need and at the same time benefit the surrounding community.

Alternatives can be dismissed in planning and that information used in the NEPA process by following the guidance in DM-1A.

For more information on Proposal Evaluation, refer to Publication 10A, Design Manual Part 1A, *Pre-TIP and TIP Program Development Procedures*.

D. Project Addition to TIP/STIP (Step 4). The MPO are mandated by federal law and regulations to establish and carry out a cooperative, continuous, and comprehensive planning process to meet various planning and programming responsibilities established by legislation. In Pennsylvania, PennDOT has an official agreement with the RPOs that treats the RPOs as equals to the MPOs; therefore, all the Federal and State laws, regulations, and policies that apply to the MPOs, also apply to the Pennsylvania RPOs. The purpose of the TIP/STIP process is to select transportation improvements with the greatest benefit to the Commonwealth and individual counties/regions. The TIP also gives all partners the flexibility to more effectively choose and approve the best mix of projects that meet their own varied needs. Transportation system preservation and management continues to be the highest priority in Pennsylvania and the individual MPO/RPO programs should emphasize asset preservation and management. Additionally, the MPO/RPO programs should consider regional, state, and national performance measures as well as identified community needs.

The development of a regional TIP by an MPO or RPO is part of formal creation of a STIP, the official federal programming document. The STIP is approved by the US Department of Transportation. The official state programming document is the TYP. The development and update of this program is guided by Act 120 of 1970 which established the STC and its related duties and responsibilities. The STC adopts the TYP. The STIP is actually the first four years of three, four-year segments (e.g., The TYP that covers 2015-2026 includes the STIP for 2015-2018).

The addition of projects to the TIP/STIP is the programming step in the collaborative planning process. There are two key items that must be completed prior to the addition of a project to the TIP. These include:

- Local government collaboration meetings must occur before new projects are added to future TIPs. These collaboration meetings must become a routine element of the collaborative planning process. If local collaboration does not occur during the collaborative planning process, the meeting must be conducted prior to adding a new project during the TIP update process. The objective is to fully consider community features for future projects before projects are programmed on a TIP.
- Completed Level 2 proposal screening form in the proposal screening system and in a status of “On LRTP/TIP” or “Recommended to LRTP/TIP”.

The collaborative planning process results in an updated LRTP, TYP, and TIP that is predictable in budget, scope, and schedule, and that provides the Commonwealth with a program that is fiscally constrained, environmentally responsible, contextually appropriate, and sustainable by the community.

More details on Programming/Project Addition to TIP/STIP are contained in Publication 10A, Design Manual Part 1A, *Pre-TIP and TIP Program Development Procedures*.

5.4 LOCAL BRIDGE PROGRAM

In 1982, the State Legislature passed and the Governor signed Pennsylvania Act 235. This legislation, known as the Billion Dollar Bridge Bill, resulted in the programming of 979 state, local and orphan (a former bankrupt railroad bridge for which no railroad, municipality or the state is willing to assume ownership) bridge projects in the TYP.

Act 235 of 1982 authorized state funding for state and local bridges as well as bond financing for state projects. At the same time, additional legislation was passed that established a dedicated revenue source (the Axle Tax) to provide state funding for the bridges. In 1987, when the U.S. Supreme Court declared the Axle Tax unconstitutional, the Legislature quickly enacted a replacement for the Axle Tax. The replacement was in the form of increased registration fees and fuel taxes for heavy trucks, thus restoring state revenues earmarked for improvement of state and local bridges.

Implementation of the Bridge Program projects began immediately. It soon became clear that an even greater effort was required to update all of the Commonwealth's bridges. This led to several amendments to the Bridge Bill legislation to authorize funding for additional bridge projects. Funding for the program is a combination of Federal, state, local and, in some cases, railroad and private funds.

More details on the Local Bridge Program, including Donation Credits, are available in Publication 740, *Local Project Delivery Manual*. Publication 740 was developed to provide information on the Local Bridge project delivery process in one comprehensive document. The Publication includes the background, development, and implementation of a bridge program, as well as guidance specifically related to the development and delivery of local bridge projects.

5.5 FEDERAL-AID PROGRAMMING AND AUTHORIZATION PROCEDURES

Form D-4232 is used by PennDOT and the FHWA to authorize the use of Federal funds for highway and bridge projects. Procedurally, the District develops Form D-4232 and submits it to the Center for Program Development and Management (Program Center) for a review to ensure consistency with state and federal regulations and the Transportation Improvement Program. The Form D-4232 is then forwarded to the FHWA for review and authorization. The Districts are notified of authorized D-4232s by the Program Center, after which they may proceed with the approved work up to the funding amount and phase (PE, Final Design, Utilities, ROW, or Construction). The procedural flow of Form D-4232 is shown in Figure 5.1. Form D-4232 supplies the FHWA with a concise summary of project characteristics, including project funding amounts and funding program codes, environmental and right-of-way clearances, project oversight and roadway type classifications and TIP data.

If expected project costs change or limits of work change, an Amended Form D-4232 is initiated by the District or the Program Center. The Amended Form D-4232 is forwarded to the FHWA for review and authorization of the additional work and/or to obligate or release Federal funding for the project. Controls are put into the accounting system so as to not exceed the approved authorized amount.

It should be noted that Section 102(b) of title 23, United States Code, as amended by SAFETEA-LU, requires a State to repay all Federal-aid reimbursements for PE costs on any project that has not advanced to ROW acquisition or construction within 10 years after Federal-aid funds are first made available. Part 630.112(c)(2) of title 23, Code of Federal Regulations (CFR), provides States a slightly longer timeframe in that ROW or construction must be started by the close of the tenth fiscal year following the fiscal year in which the project is authorized. Since sufficient discretion is provided to the Secretary in 23 U.S.C. 102(b), Divisions may adhere to the CFR timeframe when determining project time limits. For more information on this requirement, please refer to Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix Z, Repayment of Preliminary Engineering Costs.

PROCEDURAL FLOW FOR FORM D-4232

(Request for FHWA Authorization)

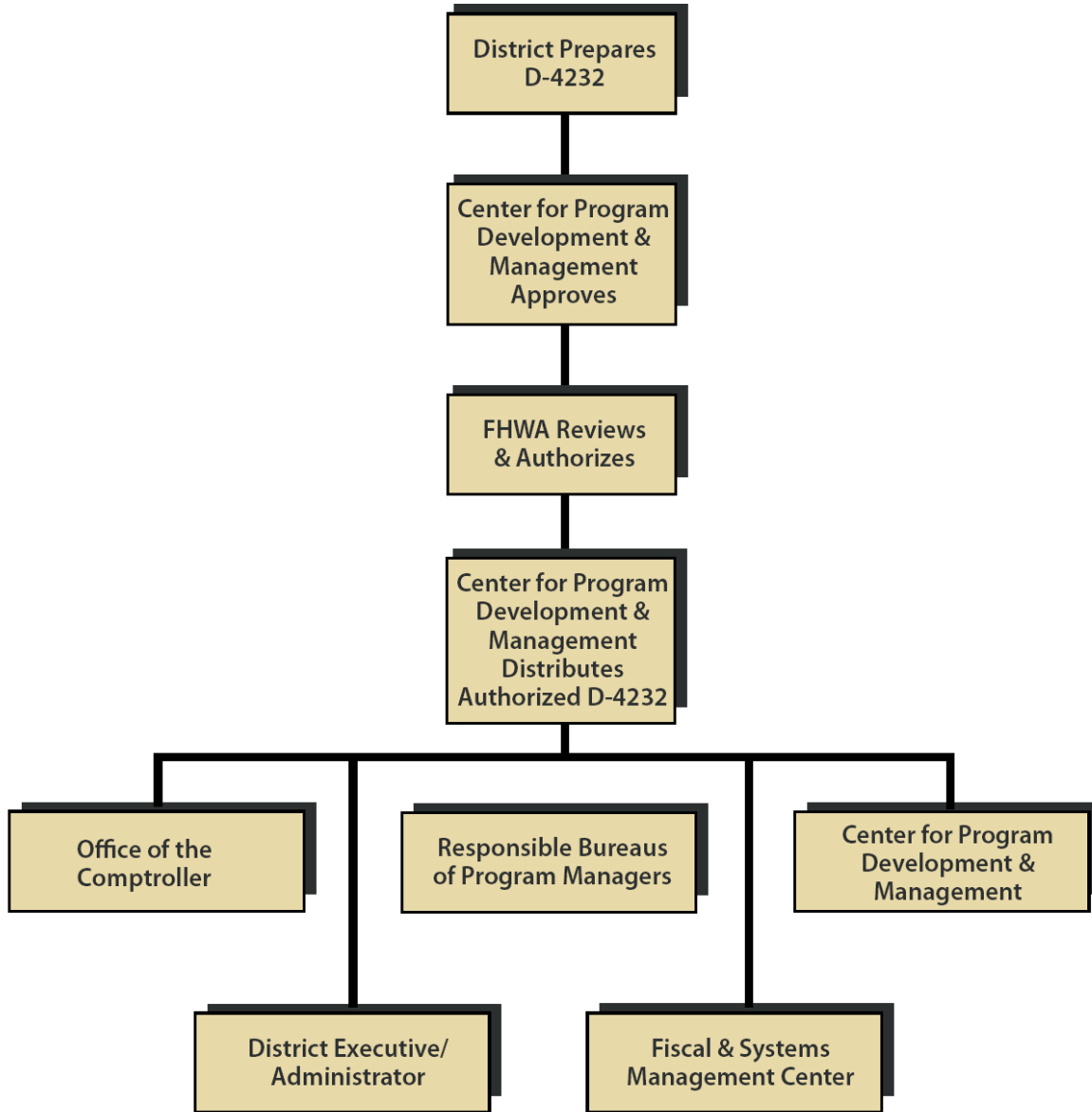


Figure 5.1

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CHAPTER 6

POST-TIP NEPA PROCEDURES OVERVIEW (STEP 5)

6.0 INTRODUCTION

After being programmed on the Transportation Improvement Plan (TIP) and Statewide Transportation Improvement Plan (STIP), projects that would be federal actions, including projects that receive Federal aid/funding and/or required Federal approval/permits in any project phase, must comply with NEPA and its associated implementing regulations (40 CFR 1500-1508). NEPA compliance and decision-making occur during Step 5 of the Process, along with Preliminary Engineering (see Chapter 7). Projects that are 100% state-funded (in both design and construction) and do not require any Federal action (permits, etc.), continue to follow the Process to comply with PA Act 120 and other applicable laws and regulations. Pre-TIP phase data and analyses are verified and built upon as the foundation for these post-TIP phases. Additional details on each of the Post-TIP NEPA phases of the process are contained in Publication 10B, Design Manual Part 1B, *Post-TIP NEPA Procedures*.

6.1 PRE-TIP DATA VERIFICATION

Once programmed on the TIP, a proposal becomes a project. The NEPA environmental review process is then initiated through the verification of the data collected and analysis performed in the Proposal Initiation and Proposal Definition Phases. This data is drawn from the Level 1 and 2 Screening Forms, as well as the field view documentation and Detailed Studies Report, if completed/prepared (see [Figure 3.1](#)). Note that sign-off on these documents at this stage is required by both the District Environmental Manager and the MPO/RPO.

The detailed data that was collected during prior Pre-TIP phases related to purpose and need, alternatives and project area features is reviewed and its continued accuracy and completeness verified. The project scoping information is reviewed, and the NEPA class of action is reconfirmed. Additional public involvement activities are undertaken according to current guidance as well as other early action activities that may be related to specific NEPA classes of action (i.e., project initiation letter, notice of intent, and coordination plan and schedule for EIS projects). All of these actions set the stage for the preparation of the environmental clearance documentation.

6.2 ENVIRONMENTAL DOCUMENTATION PREPARATION

The environmental documentation for the project could include a CEE, EA or EIS under NEPA, or an Environmental Documentation (ED) or an Environmental Evaluation Report (EER) under Act 120 for 100% state-funded projects.

To support the preparation of the environmental documentation, environmental impacts are further examined through the completion of additional studies commensurate with the NEPA class of action – these studies will build upon the data collected during prior phases. Mitigation measures are explored for unavoidable environmental impacts, and a Preferred Alternative is identified.

The appropriate level of environmental documentation to be prepared for the project may be elevated (i.e., EA to an EIS) or downscoped (i.e., EA to a CEE) dependant upon the significance of impacts and level of public controversy.

6.3 NEPA DECISION

The NEPA Decision involves a final decision on whether to grant environmental clearance on a project, confirm inclusion of the fully funded project on the TIP/STIP and if necessary the LRTP, and to advance the project to Final Design. A project may also be deferred from further consideration due to impacts, costs, or controversy.

The form of environmental clearance is dependant upon the class of NEPA action and level of documentation. The CE is approved by PennDOT or FHWA. FHWA issues a Finding of No Significant Impact (FONSI) for EAs or a Record of Decision (ROD) for EIS level projects. For 100% state-funded projects, the ED or EER approval is granted by PennDOT.

Documentation of mitigation commitments is also prepared at this time (see Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix T, Environmental Commitments and Mitigation Tracking System (ECMTS) Process). This documentation may take the form of text within an electronic CE, a mitigation memorandum, or a mitigation report. Specific commitments and/or conditions need to be detailed and shared with the MPOs/RPOs, final design engineers, construction contractors/managers, and maintenance staff, by utilizing an environmental tracking system as appropriate.

<p>NOTE: In cases where the no-build alternative becomes the selected alternative for a project, any subsequent improvements in the original project area will need to advance through this process as separate proposals/projects.</p>
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CHAPTER 7

PRELIMINARY ENGINEERING AND FINAL DESIGN PHASE PROCEDURES OVERVIEW (STEPS 5 AND 6)

7.0 INTRODUCTION

The purpose of Preliminary Engineering and Final Design (Design) is to determine the type, size, and location of the transportation facilities best suited to meet a specific need for improved safety, access, and mobility, to complete the required environmental analysis (see [Chapter 6](#)), and to develop the detailed Plans, Specifications, and Estimates (PS&Es) required for construction.

Design can be a highly complex and time-consuming process that engages a large number of diverse interests, technical disciplines, regulations and review authorities. Design requires gathering information, developing a range of possible alternatives and making decisions that often affect a variety of interests.

A transportation project's path through design is affected by a host of factors, including its technical complexity, construction cost, environmental impact, funding source and categorization relative to the Interstate, National Highway System and local road networks. Because of the typically high cost, large physical size and long life expectancies of transportation facilities, PennDOT's projects can have significant fiscal, environmental and social impacts that must be carefully evaluated and addressed throughout Design.

This chapter provides an overview of preliminary engineering and final design required to advance projects through the delivery process. It is vital that as projects are advanced through Preliminary Engineering and Final Design that PennDOT's ten Core Principles, outlined in [Chapter 1](#), be integrated into the project approach. The approach to a project is adaptable and should be tailored to fit every project based on size, complexity, and project type. The project cost estimate baseline developed earlier in the Process should be adhered to by designing the solution(s)/alternative(s) to meet this estimate, and used as a comparison basis for future cost estimate updates. The goal should be to develop affordable, context appropriate projects that provide a high value (benefit) to cost ratio, can be implemented in a reasonable timeframe, and result in improvements that are justified based on the total investment.

A. Design Flexibility and Tort Liability. Flexibility in design is the application of sound engineering judgment to engineering decisions in the use of design guidelines and criteria. Publication 13M, Design Manual Part 2, *Highway Design* and the AASHTO *Green Book* (utilize the latest version that is recognized by PennDOT) provide design guidelines and criteria for PennDOT's projects. It is important for PennDOT Engineers, Designers, and Consultants to recognize that these criteria allow flexibility in achieving innovative solutions while meeting project needs. PennDOT's philosophy challenges designers to consider and use flexibility while providing for safety within design criteria. At times, this involves looking beyond the given design criteria; and can include the use of design exceptions, when appropriate (see Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix P).

The application of the Core Principles (see Chapter 1) to achieve project designs that are best fit and context sensitive, challenges designers to find the flexibility within design guidelines and criteria and, as stated, may involve looking beyond the criteria. Designers must properly consider and apply the flexibility in design criteria to meet project needs, promote joint use of all transportation modes, and allow sufficient flexibility to encourage innovative or unique designs for particular situations.

Preliminary Engineering is initiated and occurs in conjunction with preparation of the environmental document. While completing the Preliminary Engineering for projects remember to:

- Make the approach fit the Project Need, Type, and Complexity

- Avoid or minimize environmental impacts
- Develop a full-range of affordable, cost-effective solutions (utilize the Preliminary Project Cost Estimate that was developed for TIP programming)
- Consider the relationship between Design, Desired Operating, and Posted Speeds
- Consider Community Context and Place (see Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix B, Glossary)
- Accommodate all transportation modes (vehicles, bicycles, pedestrians, transit)
- Filter concepts through the best judgment of the Multi-disciplinary Team
- Be consistent with local planning objectives and goals
- Consider design exceptions and waivers, which may be appropriate based on the project
- Utilize the flexibility provided by the current design criteria and guidance (see Section 7.0.A).

The flexibility available in design criteria must be appropriately evaluated and documented for all projects to achieve the most cost efficient use of resources while still meeting the project needs and without compromising safety. This is especially important when considering PennDOT's Tort Liability.

Tort is a civil wrong that results in personal injury or property damage. The Commonwealth has immunity in all but nine categories. These categories are:

1. *Vehicle Liability*
2. *Medical - Professional Liability*
3. *Care, Custody or Control of Personal Property*
4. *Commonwealth Real Estate, Highways and Sidewalks*
5. *Potholes and Other Dangerous Conditions*
6. *Care, Custody or Control of Animals*
7. *Liquor Store Sales*
8. *National Guard Activities*
9. *Toxoids and Vaccines*

Categories 1, 3, 4, and 5 pertain to PennDOT. Of these, categories 4 and 5 concern highway designers because tort claims involving roadway design issues represent a significant portion of the tort cases filed against the Commonwealth of Pennsylvania. Designers should solicit any comments from Maintenance in order to minimize any concerns the maintenance staff might have about maintaining the newly designed facility.

7.1 PRELIMINARY ENGINEERING

A. Introduction. The purpose of Preliminary Engineering is to set preliminary line, grade, and width. Preliminary Engineering is conducted primarily during Step 5 of PennDOT's Process (see [Figure 3.1](#)). Regardless of project scope and complexity, Preliminary Engineering requires specific progress points and completion of various activities. It occurs on a parallel track and in concert with the NEPA documentation and decision (See [Chapter 6](#)).

The amount of time and effort required for preliminary engineering and the NEPA Decision depends on the scope and complexity of the engineering, environmental, social, and regulatory issues that need to be addressed. Minor projects involving routine improvements to an existing highway and having little to no environmental impact

generally require relatively little Preliminary Engineering. Major projects involving construction of a highway on new location, or involving an existing and heavily traveled urban corridor, can have substantial environmental impacts and may require considerable Preliminary Engineering effort. This section provides an overview of Preliminary Engineering and describes its main progress points and component activities.

B. Key Activities. The key activities in Preliminary Engineering are the Scoping Field View, the Preliminary Engineering Studies, NEPA (or Act 120) documentation and decision, Design Field View Submission, Design Field View, and Design Field View Approval.

The *Scoping Field View* is the basis for a project's design phase. This is a pivotal meeting conducted at the project site by the District with assistance from the Central Office Bureaus, FHWA, and other agencies as appropriate, for moderately complex and complex projects. Every project, regardless of size or complexity, is subject to screening/Scoping. Screening is done either during the Proposal Evaluation Phase (screening field view) for complex (see tables in [Chapter 2](#)) or environmentally challenging projects and verified at the beginning of Step 5, or the Scoping Field View may be completed at the beginning of Step 5 for less complex or simple environmental projects, see [Figure 3.1](#).

The Planning Partner and local government staff shall be invited to all Scoping Field Views. The involvement of the Planning Partner and local government are particularly important to address local community issues related to mobility and land use within the project area. The Scoping Field View is also an opportunity to review local community issues that may have been identified during earlier collaborative planning prior to the programming of the project.

The purpose of the screening/Scoping Field View is three fold:

- To assess the level of effort required to advance the project to Plans, Specifications, and Estimates (PS&E) submittal. Particular emphasis is placed on the level of environmental studies required to obtain environmental clearance.
- To develop an accurate preliminary cost estimate of project design and construction costs to serve as or compare to programmed costs.
- To produce a comprehensive scoping document that clearly describes project objectives; identifies deliverables; serves as the basis for a Scope of Work; identifies potentially impacted resources and utilities; documents evaluation of key issues; and helps in developing the project schedule.

PennDOT has developed a standard scoping form that must be completed for all Scoping Field Views. This form is located on the CE Expert System.

Detailed Scoping Field View Procedures are provided in Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*.

Preliminary Engineering Studies include the preparation of plans, profiles, typical sections, representative cross sections, construction cost estimates, and other documentation supporting the engineering analysis of alternatives. These materials are the main engineering products of Preliminary Engineering and are filed as support for the project's environmental (NEPA or Act 120) document. Completion of this information marks an important progress point in the overall design phase.

On many projects involving the rehabilitation of an existing facility, the preferred alternative may be obvious, may have few impacts and require little to no engineering and environmental effort. In such cases, the Preliminary Engineering Studies may consist of little more than an updated set of the original design plans, a few typical sections and a preliminary construction cost estimate.

On more complex projects, a full range of alternative alignments may have to be developed, carefully studied and reduced to a single, preferred alternative for further analysis and refinement in Final Design. The Preliminary

Engineering Studies must document all alternatives that were studied and indicate the reasons for their selection or elimination. The documentation at this stage can rely upon decisions made in Steps 1 through 4 of the Process.

Detailed guidance for conducting Preliminary Engineering is contained in Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*.

NEPA (or Act 120) documentation and decision. State and federal laws require that every project listed on the Twelve Year Transportation Program (Twelve Year Program), regardless of how small or environmentally benign, must have environmental analysis and approval before it can be advanced to Final Design. The level of environmental analysis and documentation required to obtain clearance must be commensurate with the project's anticipated impact on the environment or public controversy. See Publication 10B, Design Manual Part 1B, *Post-TIP NEPA Procedures* for more information.

The purpose of the *Design Field View Submission* is to:

- Facilitate review comments on the proposed Preliminary Design of the preferred alternative
- Acquaint reviewers with the project site before the actual Design Field View
- Obtain Design Field View Approval for the project's preferred alternative

Before a Design Field View Submission is prepared for a project having multiple alternatives and requiring either an EIS or an EA (or EER for 100% state-funded projects), a preferred alternative must be clearly identified. As a rule, the CEE for a project (or ED for 100% state funded projects) has a clearly defined preferred alternative. See Publication 10, Design Manual Part 1B, *Post-TIP NEPA Procedures*. Depending on the complexity of the engineering issues affecting the project, the preferred alternative may warrant further investigation through the development of a Design Field View Submission.

The procedures for preparing, reviewing and approving a Design Field View Submission are in Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*, Chapter 3.

The purpose of the actual *Design Field View* is to evaluate the Design Field View Submission under field conditions. This is an important opportunity to:

- Meet with the District Units, Central Office, FHWA and affected review agencies (as necessary).
- Obtain pertinent review comments.
- Reach consensus on critical issues.
- Identify aspects of the project requiring special attention in Final Design.

The Design Field View complements the Design Field View Submission and is typically held within several weeks of its submission.

Design Field View Approval indicates that Preliminary Engineering requirements have been met and the Preferred Alternative is approved for Final Design development. Design Field View Approval cannot occur prior to Environmental Clearance.

C. Preliminary Engineering and Environmental Analysis. NEPA states that implementing procedures must ensure that environmental information is available to public officials and citizens before decisions are made and before actions are taken.

Title 23 CFR Section 771.113 states "necessary NEPA evaluations should include environmental studies, related engineering studies, agency coordination and public involvement. However final design activities, property acquisition (except hardship and protective buying), purchase of construction materials or rolling stock, or project construction shall not proceed until the completion of a CE classification, Finding of No Significant Impact, or a Record of Decision has been signed."

Prior to a final NEPA (or Act 120) decision, resources cannot be committed that may prejudice the process. This does not preclude preliminary planning or design work needed to support an alternatives analysis needed for an application for permits nor does it preclude necessary engineering studies to determine the viability and effects of alternatives as well as necessary mitigation measures. FHWA supports necessary efforts to develop reasonably accurate representations of the characteristics, impacts and mitigation associated with the alternatives being studied, and using such information gathered during the NEPA process to the extent possible for future development. This flexibility should not be construed to allow a "head start" on final design.

The scope of "allowable design activities" will differ for each project. Highly controversial or complicated projects may require more detailed engineering analyses to aid decision making. In general, all alternatives should be developed to the same level of detail, but only to the extent necessary to support the NEPA (or Act 120) decision.

Generally, appropriate activities that support the NEPA process would include preliminary field survey, preliminary field views, line, grade, traffic analysis, typical sections, intersection/interchange schematics, critical cross-sections, and preliminary drainage. Other activities may be appropriate depending on circumstances. All such activities would be developed only to the extent needed to support NEPA decision making. See Publication 10B, Design Manual Part 1B, *Post-TIP NEPA Procedures* for details on the NEPA process.

D. Public Involvement. The public is an important stakeholder and is a very active participant in the Process. Informing the public and obtaining consensus for the project is essential, particularly on projects that involve displacements and/or have a significant impact on traffic flow, the environment, and other public interests.

Public Involvement is an integral part of the Preliminary Engineering process and some form of public involvement is required for the NEPA process and Environmental Clearance. PennDOT recognizes that a well-organized public involvement program can effectively guide public discussion toward resolution of key project issues, and that failure to involve the public can result in major project delays.

Refer to Publication 295, *Project Level Public Involvement Handbook*, for a detailed discussion of public involvement activities.

E. Agency Involvement. This section describes some of PennDOT's established procedures for systematically involving affected agencies in Preliminary Engineering.

MPOs and RPOs represent the transportation planning interests of municipalities and other forms of local government. These agencies are valuable resources for confirming project need and identifying community concerns about possible design alternatives. It is PennDOT's policy to work in partnership with these agencies in project planning, scoping and design development (See [Figure 3.1](#)). Representatives of the MPOs and RPOs are asked to help identify strategies and design alternatives that are consistent with the community's immediate objectives and Long Range Transportation Plan.

During Preliminary Engineering, Public Officials' Meetings are important opportunities for the planning officials to review design alternatives and provide information relevant to the project.

All projects with substantial impacts (e.g., those requiring an EIS) should be brought before the Agency Coordination Meeting (ACM). EA and CE level projects should be brought to the ACM at the discretion of the Districts, Central Office, and FHWA. For EA and CE level projects not brought before ACM, general project coordination should be conducted. This coordination effort can be initiated via early coordination letters to the state and federal agencies. In addition to the ACMs, PennDOT facilitates agency involvement in many of its projects through the Act 120 Agency Review Process. All projects on the Twelve Year Program (except those classified as CEs) require Act 120 agency coordination.

Section 3.0 contains a detailed discussion of ACMs, Act 120, and PennDOT's procedures for coordinating with other public and private agencies, including the Pennsylvania Turnpike Commission, PUC, and utilities.

7.2 FINAL DESIGN

A. Introduction. During Final Design, the alternative that received environmental clearance in the NEPA Decision is further refined, detailed, and let for construction.

Final Design consists of the following seven interrelated components:

Final Design Components	
<u>Main Path</u> <i>(Generally Sequential Components)</i>	<u>Parallel Path</u> <i>(Generally Non-Sequential Components)</i>
<ul style="list-style-type: none">○ Design Development○ Plans Preparation○ Contract Management	<ul style="list-style-type: none">○ Right-of-Way Acquisition○ Utility Coordination○ Public and Agency Coordination○ Permitting

The main path of Final Design includes Design Development, Plans Preparation, and Contract Management, three generally sequential components. Paralleling the main path are Right-of-Way Acquisition, Utility Coordination, Public and Agency Coordination, and Permitting, four generally non-sequential components that represent other important activities that require additional engineering and plans preparation. All components are essential and have a strong bearing on the project.

Any environmental mitigation commitments and other special design considerations/ commitments agreed to during the Preliminary Engineering and NEPA Decision must be included in a project's final design. Mitigation documentation is shared and environmental and mitigation commitments tracked to ensure their completion and adherence to permit conditions. Changes in mitigation measures during final design are permissible only with written approval from the PennDOT District Environmental Manager and the FHWA, as applicable. The permitting agencies should also provide approvals if the changes are not minimal and are related to permit approval.

B. Main Path Activities. As stated, the main path through Final Design includes three generally sequential components: Design Development, Plans Preparation, and Contract Management. This section briefly describes each of these components.

1. Design Development. This is the lead component in the main path of Final Design. It starts at the completion of Preliminary Engineering after the NEPA (or Act 120) Decision for the preferred alternative has been obtained. From a legal standpoint, PennDOT needs only FHWA approval (CE Level 2, FONSI or ROD) or PennDOT internal approval (CE Level 1A, CE Level 1B, BRPA, ED or EER) to begin detailed plans preparation.

Design Development is an iterative process that encompasses all design disciplines required to meet the specific engineering, environmental and social requirements of a project. Design Development consists of a series of steps conducted over a range of parallel and interdependent design disciplines. The following series of steps is performed for each discipline:

- Collect information.
- Prepare design concept.
- Submit for review.
- Refine as required by review and for integration with other disciplines.
- Resubmit the refined design for approval.

This sequence of steps promotes an organized and value oriented approach to design development. Information is systematically collected, analyzed and integrated into the design, which is reviewed by all affected disciplines and further refined.

It is important to note that the interdependency of design disciplines requires the overall project design be developed through this cycle of design, review and refinement. Each discipline affects other disciplines. The optimum design is achieved only after each discipline's design concept is systematically prepared, reviewed, refined and integrated into the overall design. Design Development encompasses a broad range of interrelated disciplines that must be thoroughly coordinated to produce a cost effective and integrated design.

The amount of effort required for Design Development generally depends on the engineering requirements, oversight status, and permitting requirements, as discussed in the following paragraphs.

Engineering requirements encompass a wide range of project-specific issues that have great influence on the Design Development effort. Complex projects typically require unusual solutions, more detailed coordination and consequently, more engineering effort than simple ones. Engineering provides the project-specific solutions needed to assure a cost effective application of the construction budget.

Typical engineering requirements include:

- Design criteria
- Geometric design
- Right-of-way requirements
- Utility involvements
- Temporary traffic control considerations
- Construction staging requirements
- Subsurface conditions
- Structures
- Environmental mitigation commitments
- Drainage design
- Maintenance considerations
- Lighting and signing
- Traffic signalization and signing
- Erosion and sedimentation control measures
- Permits

Refer to the following publications for specific engineering requirements, procedures, and design criteria:

- Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*
- Publication 13M, Design Manual Part 2, *Highway Design*
- Publication 14M, Design Manual Part 3, *Plans Presentation*
- Publication 15M, Design Manual Part 4, *Structures*
- Publication 16, Design Manual Part 5, *Utility Relocation*

Design submissions are systematically reviewed by the appropriate agencies (District, Central Office Bureaus, FHWA, County Conservation Districts, etc.) at specified project milestones to assure that the design conforms to approved standards and meets project objectives. A project's oversight status (see Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*, Section 3.3) determines its design review process and who has final design approval authority.

Most PennDOT projects are classified as PennDOT Oversight and therefore, in accordance with the FHWA/PennDOT Stewardship & Oversight Agreement (Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix C), do not require direct participation by the FHWA in the design review process. On PennDOT Oversight projects, this responsibility is delegated by the FHWA to PennDOT and divided among the Central and District Offices.

Federal Oversight projects, because of their greater cost, complexity, and/or disposition relative to the Interstate and National Highway System (NHS), do require direct participation by the FHWA. A project's oversight status is determined by specific criteria contained in the FHWA/PennDOT Stewardship & Oversight Agreement and is reviewed during the Scoping Field View.

Regulatory Permits are required for certain types of project activity. This involves coordination and obtaining permits from regulatory agencies by completing applications, submitting aspects of the design for review and responding to comments. Much of the detailed information required to complete various permit applications is not available until Final Design is well underway. See Publication 13M, Design Manual Part 2, *Highway Design*, Chapter 10 for more details on permitting.

2. Plans Preparation. Plans Preparation overlaps and follows Design Development. One purpose of Plans Preparation is to support Design Development, Right-of-Way and Utility Coordination. Another purpose is to produce the complete PS&E package needed by a contractor to build the project and by PennDOT to manage its construction.

Plans preparation is an iterative process that begins early in Design Development as field data is collected, evaluated and assembled on the drawings. Design solutions are conceptualized, displayed, refined, reviewed and approved using plans as the communications medium. Plans Preparation continues beyond Design Development with attention focused on satisfying all PS&E requirements. These requirements include the plans, tabulations of construction items and quantities, final Pre-Bid Schedule, clearances, special provisions and construction cost estimates. Refer to Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures* for a detailed summary of PS&E requirements.

Final design plans, including right-of-way, construction and "Also" plans (see bulleted list below) are instruments of binding contracts between PennDOT and property owners and between PennDOT and construction contractors. It is based on these plans that PennDOT acquires right-of-way and enters into agreements with contractors for specific products and service. It is also based on these plans that contractors formulate bids, schedule work, purchase materials, and build projects.

The purpose of final design plans is to identify project-related improvements, materials, quantities, and activities in sufficient detail to depict required actions and materials. To fulfill their function, final design plans and specifications must be accurate, concise and complete.

A complete set of final design plans will typically contain:

- Highway Construction Plans (including "Also" plans)
- Right-of-Way Plans (many highway resurfacing and rehabilitation projects require no right-of-way acquisition)

Depending on the scope and specific requirements of the project, the "Also" Plans may include:

- Traffic Control Plans
- Soil Profiles
- Contour Grading and Drainage Plans
- Erosion and Sediment Pollution Control Plans
- Landscape Planting Design Plans
- Signing, Sign Lighting, and Pavement Marking Plans
- Structure Plans (including sound barrier plans)
- Highway Lighting Plans
- Traffic Signal Plans
- Utility Relocation Plans

- Mitigation Plans
- Intelligent Transportation System (ITS) Plans
- Cross Sections

The major Final Design Plan submissions are:

- Final Roadway Plans and Quantities
- Final Right-of-Way Plans
- Final Plans, Specifications and Estimates (PS&E)

Refer to Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures* for more details and Publication 14M, Design Manual Part 3, *Plans Presentation* for specific guidance on graphic standards and requirements for highway plans preparation.

3. Contract Management. Contract Management is the third and final component of the main path of Final Design. All projects involving construction forces other than PennDOT's own internal forces must be processed through Contract Management. The purpose of Contract Management is to prepare and execute the contracts needed to obtain the funding, services and materials required for project Construction. The other Final Design components must be completed before a project can be advanced to Contract Management.

Key Contract Management activities include:

- Bid Package Preparation
 - Proposal, plans, and construction cost estimate preparation
- PS&E Submission Review
 - Proposal review
 - Uploading and advertising the contract through the ECMS System
- Conducting the Pre-Bid Conference (if required)
- Conducting the Bid Letting
 - Respond to Contractor's questions on the bid documents
 - Issue any necessary proposal addenda
- Awarding the Contract
 - Collecting and evaluating contractors' bids
 - Verify DBE/MBE/WBE requirements
 - Providing Concurrence in Award
 - Executing the Contract
 - Issuing Construction Notice-to-Proceed

The responsibility for carrying out these activities is divided among several PennDOT offices, including the District Contract Management Unit; the Bureau of Project Delivery, Highway Delivery Division, Project Schedules, Specifications, and Constructability Section; and the Bureau of Office Services.

The District assembles the bid package (PS&E), including special provisions and documentation of required permits, approvals, agreements and special commitments. The District submits bid packages to Central Office

for review, advertising, letting, award and ultimately, contract execution (Note that some minor projects are let by the District Office).

PennDOT lets a large number of projects each year. Each project letting requires a bid package that typically contains:

- A bid proposal
- A bid schedule
- Special provisions
- Non-plan attachments
- Plans
- Cross sections

Refer to the following publications for more detailed discussion of terms and procedures involved in Contract Management and Construction:

- Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*
- Publication 408, *Specifications*, Section 100, General Provisions
- Publication 51, *Plans, Specifications and Estimate Package Delivery Process Policies and Preparation Manual*
- Publication 352, *Estimating Manual*.

C. Parallel Path Activities. The activities discussed in this section parallel the main activities. These parallel activities are Right-of-Way Acquisition, Utility Coordination, Public and Agency Coordination, and Permitting, four generally non-sequential components.

1. Right-of-Way. The purpose of the right-of-way component of Final Design is to determine a project's land requirements and prepare the plans needed by PennDOT to acquire that land from its current owners. Because of the many steps and considerable time typically required to complete the right-of-way clearance process, right-of-way activities should begin as early as possible in the design process; however, right-of-way acquisition should not occur prior to the NEPA (or Act 120) Decision.

Initial Right-of-Way activities are closely linked to and should be closely coordinated with the Design Field View Submission during Preliminary Engineering and the Design Development and Plans Preparation components of Final Design. These initial activities include field surveys, deed research, preparation of property mosaic and establishment of preliminary right-of-way requirements for purposes of identifying impacts and estimated right-of-way costs. Upon Design Field View Approval, the preparation of the final right-of-way plans and property plots can begin in coordination with other Final Design activities. These plans and plots are the basis for determining property damages resulting from a project's construction. The plans and plots are subsequently used to appraise, negotiate, settle and ultimately obtain clear title to the required right-of-way and required easements for the project. Plans and plots also provide the legal record of the location, extent and character of any right-of-way acquisitions. Before a highway project can be let for construction, PennDOT must acquire all required right-of-way from the current property owners.

PennDOT's right-of-way interests are advanced on both the District and Central Office levels. Each District Office includes a Right-of-Way Unit that is responsible for reviewing right-of-way plans, preparing property appraisals, and negotiating with property owners. The Bureau of Project Delivery, Highway Delivery Division, Utilities and Right-of-Way Section is responsible for setting policies and procedures, and assisting the Districts with special requirements.

Close coordination between right-of-way acquisition and plans preparation is essential. A project's right-of-way plans should be checked and coordinated for accuracy with the project's construction plans. The right-of-way limits shown on these two sets of plans should match exactly although right-of-way plans should contain only such construction information needed to establish limits for right-of-way acquisition and to accurately estimate the right-of-way costs.

PennDOT's acquisition program is structured to ensure that property owners are treated fairly and consistently, and that acquisitions are expedited with minimal litigation and hardship to displaced property owners. Pennsylvania law (the "Administrative Code") authorizes PennDOT to take private property by condemnation procedures when negotiations fail to produce a mutually agreeable settlement.

The Administrative Code requires that right-of-way plans define the type of interest to be acquired. PennDOT's policy is that required right-of-way shall be acquired in fee simple title unless otherwise directed by the District Right-of-Way Administrator. However, there are exceptions to this policy, as outlined in Publication 14M, Design Manual Part 3, *Plans Presentation*.

Refer to Publication 14M, Design Manual Part 3, *Plans Presentation*, Chapter 3 for specific guidance on graphic standards and requirements for right-of-way plans preparation. Also, refer to Publication 378, *Right-of-Way Manual* (available from the PennDOT District Office). Note that right-of-way clearance is required prior to project letting. Additional references include:

- Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646)
- Title 26, Pennsylvania Consolidated Statutes, Eminent Domain

2. Utility Coordination. Utility Coordination involves identification and possible relocation of existing facilities that may be in conflict with proposed highway improvements. Successful utility coordination requires early and frequent communication with utility owners, as well as cooperation and clear identification of the project scope and schedule.

Part of utility identification is knowing the precise location of existing utility facilities. This can be achieved through Designating and Locating services (see Publication 16, Design Manual Part 5, *Utility Relocation*). Use of these services will aid in compliance with Act 287 of 1974, as amended (Call Before You Dig). It is very important that utility owners be informed of the purpose of the project and the proposed contract letting date. Failure to adequately coordinate utilities can cause serious injuries, construction delays, additional expenses and disruption of service to utility customers. Utility companies are typically much more cooperative if they have been advised of the project well in advance and can schedule their participation in the utility coordination process.

The District Utility Relocation Unit is responsible for all utility coordination. Throughout design development, changes are made to construction and right-of-way plans. It is vitally important that these changes be provided to the Utility Relocation Unit for timely transmittal to the affected utility companies. Coordination is greatly improved when all parties are working with the same current, accurate and complete design data. The Bureau of Project Delivery, Highway Delivery Division, Utilities and Right-of-Way Section is responsible for setting policies and procedures, and assisting the Districts with special requirements.

Early and frequent coordination with utility companies, and familiarity with affected utilities, is extremely important in ensuring timely utility relocations.

The following is a summary of laws governing the occupancy of highways by utilities:

- Act 1945, Public Law 1242 (The State Highway Law):
 - Section 411. Allows public utilities to occupy highways and bridges under the regulation of PennDOT (Permits).
 - Section 412. Allows PennDOT or County to take over public utility rights-of-way and facilities, requires that substitute rights-of-way are provided, and that relocation expenses are reimbursed where applicable.
 - Section 412.1. Allows PennDOT to relocate or adjust facilities owned by municipalities or authorities and authorizes the Secretary of Transportation to share in these expenses.
 - Section 420. Relates to occupation of highways by utilities.
- Title 67, PA Code, Chapter 459. Regulates the occupancy of highways by utilities.
- Act 287 of 1974, as amended by Act 187 of 1996 and by Act 181 of 2006 (Call Before You Dig). Requires designers, utilities, and contractors to coordinate any excavation through the Pennsylvania One Call System.
- Act 1978, Public Law 598 (Public Utility Code). The law governing Public Utility Commission requirements.

Refer to Publication 16, Design Manual Part 5, *Utility Relocation*, for specific guidance on utility coordination. Note that utility clearance is required prior to submission and review of the PS&E package.

3. Public and Agency Coordination. Public and Agency Coordination is an essential component of the design and construction of every highway project. Successful public and agency coordination requires early and frequent communication with the affected parties, as well as their cooperation. Clear identification of the project scope and schedule informs the public and helps agencies plan for their participation in the permitting process.

Important public concerns that frequently require coordination during Final Design are:

- Noise mitigation: barriers, berms
- Driveways: adjustments, sight distance, permits
- Drainage: correction of existing problems on the roadway, easements
- Right-of-way: property acquisition, easements
- Traffic control: detours, road closures
- Aesthetics: landscaping
- Construction impacts: dust, noise, traffic, access to homes and businesses
- Public transportation: schedule and route changes
- Historic properties: implementing mitigation and minimization commitments
- Permitting: Section 404, Chapter 105, NPDES

Refer to Publication 295, *Project Level Public Involvement Handbook*, for specific guidance in coordinating these and other Final Design concerns with the public.

4. Permitting. Various permits are required, depending on the project, from several different agencies, including, but not limited to, the USCOE, USCG, PA DEP, and the County Conservation Districts. More details on coordinating with these agencies are contained in [Chapter 3](#). Details on the processes for different

permits can be found in Publication 13M, Design Manual Part 2, *Highway Design*. All permits should be incorporated into the project PS&E package.

D. Other Final Design Activities/Considerations. In addition to the main path and parallel path activities discussed in the previous two sections there are several other considerations and activities that are/may be completed during final design. This section briefly discusses each of these final design activities and considerations.

1. Mitigation Measures. Mitigation measures are specific design commitments made during a project's environmental analysis that lessen impacts caused by the proposed action. These measures may be temporary and/or permanent. They may include planning and development commitments, environmental measures, right-of-way improvements and agreements with various agencies that affect construction or post-construction action.

The type of mitigation measures applicable generally depend on the anticipated environmental effects of the proposed project and the environmental regulation. When mitigation is necessary, mitigation commitments must be documented in the project's environmental document. Mitigation for CE projects is summarized on the mitigation page in the CE Expert System. Mitigation Reports are typically prepared for EA and EIS projects.

A Final Mitigation Report is a summary document that informs parties involved in project development of mitigation commitments to be incorporated as project design features. Included in the Mitigation Report are operational and construction measures to minimize or avoid the environmental consequences of the project.

The report should cover at least the following topics:

- Introduction: purpose of the report
- Brief project description (including mapping and plans)
- Environmental consequences requiring mitigation
- Established measures to minimize or avoid environmental consequences
- Public and agency involvement
- Schedules and time frames for fulfilling the commitments.

The report should contain those specific commitments that are a part of PennDOT's designs, specifications and standards. Approvals will be needed for special measures or design exceptions. All mitigation measures should be incorporated into the project PS&E package. See Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures* and Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix T, Environmental Commitments and Mitigation Tracking System (ECMTS) Process for more details on tracking mitigation commitments during design and construction.

2. Design Partnering. PennDOT is committed to using Design Partnering in an effort to improve design quality, prevent unnecessary project delays and contain design costs. Design Partnering is a cooperative relationship between PennDOT, its engineering consultant and other project stakeholders in which a team attitude is established at project kick-off, and nurtured throughout the design process to enhance the final design product. [Section 10.2](#) discusses Design Partnering in more detail.

3. Plan Reviews/Constructability Review. The purpose of a Plan Review and Constructability Review is to verify that the PS&E package is complete and in conformance with PennDOT standards before its submission to the District Contract Management Unit or to the Bureau of Project Delivery, Highway Delivery Division, Project Schedules, Specifications and Constructability Section.

A Plan Review is held for every PennDOT project that requires plans to be developed according to Publication 14M, Design Manual Part 3, *Plans Presentation*. This is an important and one of the final steps in PennDOT's systematic approach to design quality control.

Depending on the type and oversight status and complexity of a project, the plans review may be conducted by the Plan Reviewer who is a Certified District Plan Reviewer (CDPR) or a Central Office, Bureau of Project Delivery Field Liaison Engineer (FLE) or designee. The Plan Reviewers will conduct plan reviews and complete the Plan Review Report for all sets of plans. (See Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*, Chapter 4 for information on Plan Review Procedures and Certification Process).

The CDPR will be responsible for plan reviews of PennDOT Oversight (PO) Minor and Moderately Complex projects and formal Plan Revisions. CO FLE will be responsible for plan reviews of PennDOT Oversight (PO) Major Complexity and Federal Oversight (FO) projects. CO FLE or designee will conduct plan reviews of PO Minor and Moderately Complex projects and formal Plan Revisions if requested by the District Executive (DE) or designee. FHWA representatives may elect to participate in Plan Reviews for FO projects (see [Tables 2.1, 2.2](#) and [2.3](#) for information on Project Complexity Levels).

Throughout Design, representatives from Construction are invited to join the Design Team and take an active part in the project's design development by providing pertinent review comments and recommendations. There are a series of formal constructability reviews, but involvement must be on-going rather than after the fact. The District should conduct formal constructability reviews throughout Final Design to determine:

- The most effective method of building the project
- A refined pre-bid schedule
- A list of specifications
- Project milestones
- Necessary changes to the design
- Action items to follow up on

The frequency of these reviews will depend on the complexity of the project. See Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures* for more details.

4. Final Design Office Meeting. The Final Design Office Meeting is a design review conducted prior to the Final Design Plans Check and submission of the (PS&E) package.

The purpose of this meeting is to provide an opportunity for the FHWA and the Bureau of Project Delivery to review and comment on the design. This meeting may be waived by the Bureau of Project Delivery for PennDOT Oversight Projects, but is required for Federal Oversight Projects. The Final Design Office Meeting is typically attended by the District, Bureau of Project Delivery, FHWA, and Consultant as deemed appropriate. A Final Design Office Meeting is not needed for minor projects and is typically not required for a majority of projects.

The Final Design Office Meeting is held to review project development after the following design issues (if applicable) are approved or have been significantly completed:

- Typical Sections
- Pavement Design
- Service Road Justification
- Interchange Geometrics
- Hydraulic Computations
- Addenda (if required) to the draft Soils and Geological Engineering Report
- Traffic Control Plan (TCP)
- Erosion and Sediment Pollution Control Plan
- Hydraulic Design of Structures and Roadway Drainage
- Lighting Plans

- Signing Plans
- Traffic Signal Plans
- Special Provisions
- Planning and coordination of major utility relocations
- Structure Plans

See Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures* for more details.

5. Plans, Specifications and Estimates (PS&E) Submission. This submission marks the culmination of the Design Development and Plans Preparation parts of Final Design, and the start of Contract Management. All projects must have a PS&E package to advance to Construction. A PS&E package is a set of binding contract documents that identify project-related improvements, materials, quantities and activities. Submission of the PS&E package is one of the last major progress points in Design.

This package must be accurate, concise and complete, and must provide sufficient detail to clearly identify all actions required to advance the project through construction. It must contain all data needed to obtain permits and right-of-way and utility clearances. The PS&E package must also provide reasonable information required by the contractor to submit a sound, equitable bid to build the project to PennDOT's standards.

See Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures* for detailed PS&E preparation procedures.

6. Pre-Bid Construction Schedule Process. A key aspect of project constructability is the time required to complete construction. During the design phase, it is essential that the District plan the project's construction by determining a realistic Pre-Bid Construction Schedule. This schedule must provide sufficient time for an average contractor with reasonable resources (in addition to project specific constraints) to complete the project within budget and quality specifications. This schedule serves as a baseline against which the Contractor's actual construction schedule is measured.

After final review of the Pre-bid schedule, project milestones, and schedule specifications by the Constructability Team at the time of the PS&E submission, the District Executive or his/her designee approves the Pre-bid Schedule and the schedule special provisions and they are included in the project bid package.

7. Contract Letting. After the District Contract Management Unit has reviewed the PS&E submission and finalized the bid package using the Department's ECMS in accordance with Publication 51, *Plans, Specifications and Estimate Package Delivery Process Policies and Preparation Manual*, the bid package is submitted to the Bureau of Project Delivery, Highway Delivery Division, Project Schedules, Specifications and Constructability Section for advertisement. Note that some minor projects are let by the District Office. On federal projects, a D-4232 for construction must be submitted and approved prior to advertisement/bid opening (see [Section 5.5](#)). Proposals and plans are then made available to prospective bidders and bids are accepted through the ECMS system in accordance with Publication 637, *ECMS Construction Contractor Manual*. At the scheduled bid opening, ECMS bid results are publicly read and an apparent low bidder announced. After verification of the bids, the contract is awarded to the lowest responsible bidder.

Within 30 days of contract award, the project must be executed, and a Notice to Proceed, with specific contract start-up date, issued by the District Construction Unit.

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CHAPTER 8

CONSTRUCTION (STEP 6)

8.0 INTRODUCTION

Construction is the final part of Step 6 of the Process. It is during Construction that the design concepts are transformed into physical shapes through the application of energy and technology to materials. During this phase, all permit conditions must be followed, a review of environmental mitigation will occur, and mitigation commitments will be implemented and tracked through use of an environmental tracking system. In some cases, environmental monitoring may be required during and even after construction.

Once construction is completed, PennDOT opens the facility to full traffic operations and includes it in a regular maintenance program.

For information on local projects please refer to Publication 740, *Local Project Delivery Manual*.

8.1 SPECIFIC DETAILS

A. PennDOT's Role. It is PennDOT's responsibility, along with their consultants and contractors, as appropriate for the project, to design construction projects, prepare the needed contract documents, and define clearly the work to be performed, along with explicit specifications for materials and workmanship. This is to ensure that contractors understand their responsibilities. Construction plans developed during the Design phase are one of the principal contract documents that set forth the Scope of Work for construction.

The contractor's work is always subject to the inspection of the Engineer or the Engineer's authorized assistants (i.e., Inspector-in-Charge and/or inspector). The Inspector-in-Charge has immediate responsibility for monitoring the performance of work on the project. The Engineer may assign inspectors to the project to examine the contractor's work. It is essential that the inspectors interpret the construction plans and specifications clearly and consistently and inspect, test and ensure the quality of the contractor's materials, procedures and workmanship.

During Construction, the Central Office - Bureau of Project Delivery, and the District Construction Unit are involved in various aspects of the project's construction management.

The Bureau of Project Delivery oversees many of PennDOT's transportation project delivery operations and procedures. The Bureau of Project Delivery, Highway Delivery Division, Project Schedules, Specifications and Constructability Section evaluates the contractors' qualifications, provides training and scheduling services and develops PennDOT's standard specifications (Publication 408, *Specifications*). The Bureau of Project Delivery, Construction and Materials Division, Laboratory Testing Section tests products used on a construction site for adherence to the proper specifications. Sampling is normally done by employees from the Bureau of Project Delivery, Construction and Materials Division, Construction QA Section or the District Inspectors stationed on the construction site. Some field-testing of materials is also done by the Bureau of Project Delivery, Construction and Materials Division, Construction QA Section or the District Inspectors.

A typical District Construction Unit is under the direction of the Assistant District Executive (ADE) for Construction, and consists of internal and external components.

The internal component is headed by the District Construction Services Engineer, who typically oversees the following:

- Soils, headed by the District Soils Engineer.
- Materials, headed by the District Materials Engineer.

- Construction services, headed by the District Construction Services Engineer.

The external component is headed by various Assistant Construction Engineers (ACEs). Each ACE is typically responsible for a designated geographical area and oversees a staff of construction management specialists, which includes managers, resident engineers, supervisors, and inspectors. One of the ACEs typically serves as the District Structures Control Engineer.

Under the direction of the ACEs, the specialists provide on-site, day-to-day construction management of the project. Typical responsibilities include monitoring construction progress and schedule compliance, coordinating contractors' Requests For Information (RFIs) with the Plans Unit or consultant, performing construction inspections, and monitoring contractor compliance with applicable labor laws. During the design phase, these specialists will participate in design constructability reviews.

B. Contractor's Role. Contractors and any assigned subcontractors complete construction projects. Contractors and subcontractors must be prequalified before the date fixed for the opening of bids for highway construction work. To be awarded a project, contractors must submit bids and must show they are qualified to do the work specified by PennDOT. Publication 408, *Specifications*, includes information on prequalification for State highway construction work.

After PennDOT awards and executes the contract and issues Notice to Proceed, the contractor must do the work and conform to the lines, grades, dimensions, and details as specified. The contractor must keep direct control of the contract and see that the work is properly supervised and is completed in accordance with the contract requirements.

The terms and conditions of the contract are in effect until the work is completed and accepted by PennDOT. However, the contractor is relieved of responsibility for further physical work, maintenance and third party liability on the date of physical work completion as established during the final inspection. The issuance of acceptance does not relieve the Contractor and surety holder from continuing liability for latent defects, as specified.

C. Design Review During Construction. Meetings between PennDOT, designer (e.g., in-house or consultant) and contractor are often required to coordinate construction procedures. As described in an upcoming section, shop drawings and consultation are ways to check that the constructed items meet the specifications in the contract.

Depending on the scope and complexity of the project, additional involvement by public agencies may be required to review and coordinate the design during the Construction Phase. These parties may include Federal and state review agencies, emergency services (e.g., State Police, fire, ambulance, etc.) and other stakeholders directly affected by the project.

On larger projects, PennDOT may specify "partnering." In partnering, a project management team includes the contractor, PennDOT, design consultant, FHWA (on federally funded projects), and other significant project stakeholders. A "partnering" meeting, at which time common goals for the project are developed, is usually held shortly after the contract award. These goals may include meeting the project schedule, safety, Value Engineering (VE), project quality and job satisfaction. In addition, a conflict review and resolution procedure is established to involve higher levels of management with the goal of resolving disputes as they emerge.

For Design-Build projects, Design's role will be more involved than during a traditional project. Design staff will be involved throughout the Design-Build process for activities ranging from, but not limited to, environmental clearance, reviews, mitigation tracking, and permitting. For more information refer to Publication 448, *Innovative Bidding Toolkit*.

D. Scheduling. The duration required to complete a construction job depends upon many factors. These factors may include size, location, type of construction and the season(s) that the job will span.

The construction schedule should be simple and consistently followed to avoid omissions and poor logic. A methodology should be established and followed uniformly. Coordination among the project Design Team, job estimator and specification writer is essential to avoid incorrect and inconsistent assumptions and procedures.

Schedules may be prepared by two methods. The manual method involves physical drawing or tabulation of activities with associated time relations and interactive links in the form of bar charts. The automated method uses computer software and may provide the same physical drawing.

Construction in Pennsylvania is affected by the seasons of the year. Many material specifications (e.g., paving, concrete bridge decks, etc.) define minimum temperatures that must be available to place or cure the materials. Inclement weather conditions such as rain, wind, snow and ice may delay a construction project for several days or weeks. The number of available working days for a project in a given construction season depends on when the project begins and ends, and geographic location. PennDOT's estimators and schedulers must account for these variables.

Critical Path Method (CPM) scheduling is an important project management tool during both design and construction. CPM decisions can expedite the completion of a construction project. CPM requires the analysis of activity sequencing and the time required to complete a certain logical sequence of activities from beginning to end. Refer to Publication 352, *Estimating Manual*, Chapter 7, for more details on schedules.

During the design phase, the Design Team starts planning the construction schedule by preparing the Pre-Bid Schedule. The Pre-Bid Schedule is updated and refined as the design advances from Design Field View Approval through Final Design to Contract Letting. Final adjustments to the schedule typically reflect changes in letting date, addenda, and /or changes to the Notice-to-Proceed date.

A thorough Pre-Bid Schedule helps PennDOT achieve several important goals, including:

- More effective communication between design and construction
- Closer cooperation between project stakeholders (PennDOT, contractors, utilities, etc.)
- Better quality (more constructible) designs
- Cost savings (fewer project delays and work orders due to schedule-related omissions).

Innovative contract procedures may reduce the time normally required to complete a construction project. In developing the Pre-Bid Schedule, the Design Team should consider the type of contracting procedure most appropriate to the project. In many cases schedule constraints will strongly influence, or determine the contracting procedure. For more information on types of innovative contract procedures, refer to Publication 448, *Innovative Bidding Toolkit*.

Following contract letting, the contractor submits a baseline schedule to PennDOT as required by the contract special provisions. The ACE evaluates the contractor's baseline schedule by comparing it to the Pre-Bid Schedule and verifies that all required milestone completion dates are met. If the baseline schedule fails to satisfy the milestone dates, the ACE may withhold schedule approval and request a revised baseline schedule from the contractor for approval.

During the construction phase, the ACE monitors the contractor's progress against the approved baseline schedule. If an unforeseen event occurs that affects the schedule, the cause of the event is reviewed and determined, and the Inspector-in-Charge may identify a necessary change in work. Depending on whether the change in work would delay a project milestone, the ACE may take one or more of the following actions:

- Require the contractor to prepare a recovery narrative and schedule
- Authorize the contractor to accelerate work
- Give the contractor a time extension

For more information on construction procedures, refer to Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*.

E. Surveying. For a construction project to be successful, proper surveying and stakeout are necessary and essential. Benchmarks are needed to relate the project design to the project site. Depending on the type and complexity of the project, surveying techniques may be as sophisticated as tying into a coordinate system or as simple as using a flat chain method.

Publication 408, *Specifications*, Section 686 presents the types of construction surveying required for roadways, roadway appurtenances and structures. Publication 122M, *Surveying and Mapping Manual*, also provides detailed information on surveying procedures.

At the preconstruction conference, pertinent survey information will be provided by PennDOT. On the construction site, the contractor is required to provide construction-surveying services, material and equipment needed to stake, mark, reference, and monitor the project. The contractor must also employ a Professional Land Surveyor or Professional Engineer, registered in the Commonwealth of Pennsylvania, qualified in the use of highway and bridge plans; cross sections and specifications; and procedures for establishing line and grade, and structure locations and dimensions, as may be required.

F. Measurement and Payment. The construction specifications specify measurement and payment methods. Payment for items of work performed under a construction contract is made at the contract price per unit of measure, at a lump sum amount, or at a predetermined amount. Unless otherwise specified, the contract unit price will cover all costs for materials, labor and equipment.

Additional work, extra work, and extra work on a force account basis will be paid by PennDOT if authorized in writing by the District Executive. If the work is to be paid as additional work, the written agreement will refer to the contract price for that work. If the work is to be paid as extra work, the written agreement will authorize commencement of such extra work at a reasonable negotiated price or by force account records. For more detailed information, refer to Publication 408, *Specifications*.

G. Related Publications. Several publications relate directly to current construction practices and procedures. They are:

- Publication 408, *Specifications*. Specifications pertain to the method and manner of doing the work or to the quantities or qualities of material to be furnished under the contract. Note that supplemental specifications, special provisions and bulletins may be included in proposals with the specifications from Publication 408.
- Construction Standards. The following publications identify the construction standards for PennDOT projects:
 - Publication 72M, *Roadway Construction Standards*
 - Publication 111, *Traffic Control - Pavement Markings and Signing Standards*
 - Publication 148, *Traffic Standards - Signals*
 - Publication 219M, *Bridge Construction Standards*
- Material Specifications. Many of PennDOT's publications contain material specifications for bituminous mixtures, Portland cement concrete and aggregates, including:
 - Publication 27, *Bituminous Concrete Mixtures, Design Procedures, and Specifications for Special Bituminous Mixtures*
 - Bulletin 5 (Publication 30, *Portland Cement Concrete*)
 - Bulletin 14 (Publication 34, *Aggregate Producers*)

PennDOT updates and modifies these publications continuously to reflect improvements in construction practices, procedures and requirements.

H. Selective Post-Construction Project Design Reviews. Before project construction closeout, the Design Project Manager and key members of the design team shall conduct a project design review or field view to evaluate how effective the constructed design is in achieving project objectives. The purpose of this review or field view is to provide design personnel with a valuable learning experience and foster continuous improvement of the overall design process. See Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*, Chapter 4, Section 4.14 for more details.

8.2 SHOP DRAWINGS/CONSULTATION

The Construction plans prepared by PennDOT are adequate for job pricing and general construction purposes. However, they are not necessarily suitable for the fabrication and production of many required construction products. Manufacture of the necessary job materials often requires shop drawings that supplement, enlarge and clarify the contract design. Shop drawing review is conducted to ensure that fabrication of items is according to the intent of the contract.

Technical guidelines for shop drawing review, required shop drawings, and permanent records are given in Publication 15M, Design Manual Part 4, *Structures*, Appendix B. For additional information on shop drawings, refer to Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*, Chapter 5.

Many of PennDOT's Engineering Agreements for final design services also include provisions for shop drawing review and consultation during Construction. If design, or design related, issues are encountered during Construction, the District should contact the designer to satisfy these concerns or misunderstandings. The District can request that the designer visit the project site to resolve these issues, if the District determines that a site visit is necessary.

If Final Design was performed by a consultant under an engineering agreement, the District personnel responsible for administering the engineering agreement should verify that there are sufficient funds available for consultation services prior to authorizing or requesting a site visit.

8.3 COMMITMENTS AND MITIGATION MEASURES

For projects that include mitigation measures or design features, the District Environmental Manager should meet with the Construction Unit to discuss commitments. During any pre-bid meetings, the Environmental Manager should call attention to any commitments included in the project with the meeting attendees.

The Contractor, in coordination with the District Construction Unit, must implement mitigation measures or carry out commitments as described in the project's contract documents. However, when necessary to successfully implement or maintain mitigation measures or carry out commitments, changes in contract documents should be proposed. Mitigation measures and commitments described in a project's contract documents must not be changed without the written approval of the District's Environmental Manager and the Approving Authority for the environmental document or permit.

During construction, the District Construction Unit must immediately notify the Environmental Manager of any known project involvement with environmental resources and environmental hazards not noted in the project's approved environmental document or permits. In addition, the District Construction Unit should notify the Environmental Manager of any substantial changes in a project's Scope of Work.

Once constructed, the District must monitor and maintain mitigation measures through final inspection and completion of the construction contract. Project inspection personnel should be made aware of PennDOT's responsibilities as described herein and the inspectors' role in fulfilling those obligations.

PennDOT's pledge to develop environmentally responsible transportation improvements does not end with environmental clearance. The District must formulate a plan for ensuring that the commitments made on paper are carried through to completion. This plan must ensure that required mitigation measures are incorporated in Final

Design and implemented properly during Construction and Maintenance. Follow-through in carrying out these commitments is very important since it is in PennDOT's (and the public's) interest to assure that the most effective and sensitive design is implemented. More details on mitigation commitments are provided in Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures* and in the AASHTO Practitioner's Handbook #04, *Tracking Compliance with Environmental Commitments/Use of Environmental Monitors*.

8.4 CONSTRUCTION VALUE ENGINEERING

Value engineering applies to cost reduction proposals that may be initiated, developed and submitted to PennDOT for modifying the plans, the specifications or other contract requirements. This does not apply to a proposal unless it is identified as a value engineering proposal at the time it is submitted.

Value engineering proposals are those that would require a change in the contract and would result in an immediate net savings to PennDOT. They provide a decrease in the cost of performance, without impairing essential functions and characteristics, such as service life, reliability, economy of operation, ease of maintenance, and safety features. Another factor considered is whether the VE proposal would require modifications to the project's existing permits (e.g. NPDES, Chapter 105 or Section 404 permits) and NEPA clearance (environmental mitigation commitments cannot be compromised by VE). Details on Construction Value Engineering Procedures are contained in Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures*.

8.5 AS-BUILT PLANS

"As-Built" plans are a set of construction drawings prepared to show the facility as actually built, including all field construction changes. The purpose of As-Built plans is to record the actual dimensions of the finished product of construction. As-Built plans reflect changes made through addendums, change orders, field adjustments, or corrections.

As-Built drawings are a valuable source of information for the District Maintenance Unit and designers involved with the reconstruction or rehabilitation of an existing facility. They may also be helpful in protecting PennDOT against possible tort liability related to changes to such items as drainage or guiderail.

In accordance with Publication 2, *Project Office Manual*, a set of "As-Built" drawings shall be maintained for every project that has construction plans. The Bureau of Project Delivery assigns responsibility for the preparation of the As-Built plans to the Districts. The Bureau's policy gives the Districts flexibility in the preparation of these plans.

Depending on available resources, the District may assign this responsibility to its construction inspectors, in-house design staff, or consultants. See Publication 10C, Design Manual Part 1C, *Transportation Engineering Procedures* Chapter 5 for more details on As-Built Plans.

In accordance with the Department's Records Retention Schedule (RRDS), Item 00000150B, the plans are classified as vital records and should be retained for 100 years.

CHAPTER 9

MAINTENANCE AND OPERATIONS

9.0 INTRODUCTION

The purpose of Maintenance and Operations is to extend the service life of the facility, improve safety and keep up a pleasant appearance of areas within the right-of-way. Maintenance and Operations has a direct bearing on safety and the public's perception of Pennsylvania highways. Maintenance and Operations problems are noticed and reported by a variety of individuals. PennDOT responds to these problems in several ways, depending on the size and priority of the problem.

Transportation Asset Management (See Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix B, Glossary) is a key part of the Process. Maintenance (lifecycle-cost analysis and preventative) needs must be identified as early in the process as possible to avoid design features that could be difficult to maintain or preserve. To that end it is important that proper inventory and analytical processes be conducted and documented to help provide a candidate list of transportation assets that should be included for maintenance in the regions LRTPs and TIPs, as discussed in Publication 10A, Design Manual Part 1A, *Pre-TIP and TIP Program Development Procedures* in more detail.

This chapter provides an overview of Maintenance and Operations, which are under the direction of the Bureau of Maintenance and Operations (BOMO). Issues addressed include organization of PennDOT's maintenance forces, funding and general duties. For additional information, refer to Publication 23, *Maintenance Manual*.

9.1 PROCEDURE FOR MAINTENANCE

In addition to activities conducted by PennDOT staff with regards to identifying maintenance problems, problems are also identified and reported by the state and local police forces, contractors, the public and local legislators. Perhaps the most regular and vocal submitter of problems is the public. The public is PennDOT's main customer and provides the most extensive report about road conditions.

Pennsylvania is divided into eleven Districts and each District consists of several counties (See [Figure 3.3](#)). In each District, all Maintenance forces, except a small administrative staff, are assigned to individual counties. The maintenance crews perform most of the everyday maintenance activities.

A majority of problems, such as roadway maintenance for potholes, vegetation control and drainage inspection can be addressed by the County Manager, Assistant County Manager, or Foreman. These individuals have the authority to delegate the repair of the problems to the various maintenance crews. If the problem is too extensive for these individuals and crews, such as snow removal, the District may choose to have the work supported by a contractor.

9.2 BUDGET

Maintenance and Operations receives funding from highway user fees, including:

- Liquid fuels taxes
- Federal funds
- License and registration fees
- Oil company franchise tax
- Other

Of these total funds, Highway Maintenance typically receives the largest share. Routine Highway Maintenance and Operations typically demands the largest portion of the maintenance budget. Routine Highway Maintenance and Operations includes personnel, equipment, and material costs associated with routine highway maintenance of shoulders, highways, and bridges; vehicle maintenance and purchasing; mowing, herbicides, and tree trimming; buildings and ground maintenance; line painting and sign repair; and snow removal. Snow removal can take a larger portion of the budget, depending on the severity of the winter.

9.3 MAJOR MAINTENANCE AND OPERATIONS ITEMS

A. Snow and Ice Control. During winter weather events, the removal of snow and ice accumulation from the road surface takes precedence over all other Maintenance and Operations activities. Removal of snow and ice accumulations can be termed an emergency operation and may even justify the closing of some roads. Publication 23, *Maintenance Manual*, details the activities that must occur in each season of the year.

B. Paved Surface Maintenance. The purpose of pavement maintenance is to extend the service life of the pavement. A regular maintenance program will preserve the initial investment and minimize the frequency of reconstruction. The major adversary for pavements is water seeping into cracks and holes and then expanding during freezing temperatures. All voids and cracks should be filled and sealed at regular intervals. For rigid pavements, the emphasis is placed on joint sealing, overlaying, pothole patching, "blowups" and slab jacking of settled slabs. For bituminous pavements, the emphasis is placed on pothole patching, crack sealing, mechanized patching and leveling.

In addition to regular maintenance of the paved surface, pavement markings are one of the most important safety aspects of pavement maintenance. Poorly visible pavement markings hinder a driver's ability to distinguish pavement edges and lane lines. Glare on wet pavements, especially at night, can cause worn markings to become nearly invisible and of very little value.

Publication 23, *Maintenance Manual*, contains more details on the required maintenance activities for paved surfaces.

C. Drainage and Drainage Systems. The maintenance of drainage systems is of great importance due to water's destructive effects on pavements. The expansion and contraction of water during the freeze-thaw cycles of the winter months can crack pavements and cause potholes. Water not collected by drainage systems can wash away material under the pavement or wash across the surface of the pavement creating hazardous driving conditions.

Pipes and culverts need to be inspected and cleaned at regular intervals to ensure proper flow throughout the drainage system. Inlets and endwalls need to be kept clear so that the flow of the water is not impeded.

Annual inspections should be made after the snow and ice season to locate any blockages or failures in the system. Routine inspections should be performed after heavy rains to see how efficiently the system is performing.

Publication 23, *Maintenance Manual*, contains more details on the required maintenance activities and responsibilities for drainage systems.

D. Roadside Management. Roadside Maintenance consists of vegetation control, planting and roadside litter cleanup. The most time consuming portion of vegetation control is mowing of grassy areas. During the spring, summer and fall seasons, mowing should be performed as needed on shoulders, medians and open grassy areas at rest stops and welcome centers. Mowing regularly maintains safe access and visibility and propagates a strong ground cover of sod, thereby inhibiting weed and tree growth.

Herbicide control of vegetation comes in three forms: growth inhibitors, selective herbicide and non-selective herbicide. The growth inhibitors are used where plant growth is to be slowed down but no plant forms need to be eliminated. Growth inhibitors yield plant control without the unsightly browns of dying vegetation. Selective herbicides are used to eliminate specific, detrimental forms of plant life while leaving the desirable plants and grasses to flourish. Non-selective herbicides are used to clear areas of all plant life. Non-selective herbicides

eliminate all forms of plant life and should only be used in places where plants would be detrimental to roadway safety or integrity.

Plant revitalization, planting and plant maintenance at rest areas, scenic overlooks and road edges need to be performed as needed. Tree and shrub trimming should be considered for a pleasant appearance and safety considerations.

Roadside litter, including animal carcasses on interstates, should be removed to preserve the functionality, safety and appearance of PennDOT's highways. The appearance of Pennsylvania's highways, rest areas and welcome centers is important to the state's tourism industry. Effort should be made to keep rest stops from becoming litter strewn so that they appear clean and welcome.

Publication 23, *Maintenance Manual*, contains more details on the required maintenance activities for roadside management.

E. Bridge Maintenance. Bridge maintenance can be broken down into two categories: preventive maintenance and demand maintenance. Preventive maintenance is a cyclical activity performed to extend the service life of a structure. Demand maintenance is based on a known bridge service life of a structure. Demand maintenance is a known bridge deficiency identified by the bridge inspection program and includes structural, safety and all other nonstructural activities. All bridges in Pennsylvania with a span of 2.4 m (8 ft) or greater must be inspected once every two years, with supplemental inspections as required.

Publication 23, *Maintenance Manual*, contains more details on the required maintenance activities for bridge maintenance.

F. Emergency Operations. Emergency Operations, as defined in Publication 23, *Maintenance Manual*, are a combination of circumstances creating a crisis that calls for immediate, decisive actions. Emergency operations are either manmade (accidents, debris on roadways, spills, etc.) or natural (weather related).

Various officials are authorized to declare an emergency operation, including: the Governor; Secretary of Transportation; Director of the Bureau of Maintenance and Operations; District Executive; Maintenance Manager; and State or Local Law Enforcement Officers. District Executives are responsible for developing emergency traffic routing plans. These plans dictate that in an emergency, traffic should be rerouted to other, predetermined routes.

Publication 23, *Maintenance Manual*, contains more details on the required maintenance activities for emergency operations.

9.4 INTERACTION BETWEEN DESIGN AND MAINTENANCE

During Design, Maintenance should be consulted concerning the proposed design and asked to make recommendations that will eliminate any future maintenance problems that may be inherent to the design of the project. These recommendations could improve safety and lower the long-term cost of maintaining the roadway and surrounding area. Designers need to consider these recommendations to achieve the most cost effective design over the expected life of the roadway.

Providing opportunities for representatives from District Maintenance to participate in final design plan reviews is a highly recommended practice. The Bureau of Maintenance and Operations, Asset Management Division, Pavement Testing and Asset Management Section is required to participate in the Final Design Office Meetings of all Federal Oversight projects.

Some maintenance considerations that can easily be incorporated into design include:

- Using antigraffiti coating on structures to reduce the time and danger of cleaning such things as barriers and bridge abutments.
- Paving under guiderail reduces the need to mow next to moving traffic.
- Attempting to place lighting in easily accessible locations for fixture replacement.
- Providing adequate protection for pavement base drain outlet pipes by specifying proper endwalls and delineators, particularly in areas subject to mowing or errant vehicles.
- Providing snowplowable reflective pavement markers on highways.

Design should attempt to accommodate maintenance operations and eliminate problems. For example a little additional right-of-way or pavement may simplify snow removal or provide for improved traffic control during incidents. The initial cost of additional right-of-way and pavement areas may be offset by the reduced cost of simplified maintenance operations. While the cost of future maintenance is typically not estimated, during design consideration should be given to material types, design features (i.e., elimination of bridge expansion joints, additional area for snow removal, or elimination of obstacles to snow removal), and other design measures that can benefit future maintenance operations. Simplified maintenance results in improved safety for maintenance forces and the traveling public.

Another benefit of improved maintainability is increased public safety. If maintenance problems can be addressed quickly and easily, then the public is less exposed to possible safety hazards. Public safety is an overriding concern when designing a roadway.

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CHAPTER 10

SPECIAL COORDINATION PROCEDURES

10.0 INTRODUCTION

On certain projects, PennDOT may elect to implement special coordination procedures to help streamline and compress the Process. These procedures are typically most beneficial on major projects requiring close coordination of complex engineering, environmental, and public involvement issues. The purpose of these procedures is to facilitate the collaboration of key project stakeholders, including FHWA, the District Office, the Bureau of Project Delivery, and the environmental resource, municipal, and other agencies. These special procedures include the Integrated NEPA/404 Process and Design Partnering.

Another coordination procedure that can greatly expedite the project delivery process is PennDOT's Programmatic Agreement with the Pennsylvania State Historic Preservation Office, FHWA, and the Advisory Council on Historic Preservation. The Agreement equips District Environmental Managers and PennDOT's Cultural Resource Professionals with a streamlined approach to the cultural resources review process defined under Section 106 of the National Historic Preservation Act (NHPA) of 1966.

PennDOT's long-term approach to project development is shaped by its relationships with the various organizations in the transportation design and construction industries. PennDOT maintains close lines of communications with the American Council of Engineering Companies of Pennsylvania and the Associated Pennsylvania Constructors through its participation in various committees and task forces sponsored by these organizations.

This chapter reviews these special procedures and PennDOT's participation in various industry organizations.

10.1 INTEGRATED NEPA/404 PROCESS

When FHWA and the states undertake actions that will have a significant impact on resources such as wetlands, air quality, historic sites, or Threatened and Endangered species, NEPA requires them to prepare an EIS.

Under NEPA, FHWA prepares environmental documents that address not only NEPA requirements, but also many other Federal, state, and local environmental laws. FHWA uses the NEPA process to bring environmental and other considerations into a single analysis, developing a document that not only addresses all reasonable alternatives and identifies environmental impacts, but also helps the agency make better transportation decisions that take into account requirements of other laws and regulations.

If a project will have an impact on wetlands or other waters of the United States, the Clean Water Act of 1977 requires the states to assess and mitigate these impacts. To meet Section 404 of this Act's requirements, the state studies the impacts on wetlands, develops measures to mitigate such impacts, and applies [to the USCOE] for a Section 404 permit. If the USCOE approves the application, the state can proceed with the design and construction of the project. Throughout the NEPA and Section 404 reviews, the FHWA, the states and agencies, such as the EPA, the USFWS and the USCOE coordinate to ensure that the EIS adequately assesses the environmental impacts and that the selected alternative meets Section 404 permit requirements.

The integrated NEPA/404 process, which coordinates agency activities and makes it possible to obtain NEPA environmental approval and a U.S. Army Corps of Engineers Section 404 permit, concurrently, was adopted by the Federal agencies with jurisdiction in Pennsylvania on July 23, 1992 with the execution of an interagency consensus document. The agencies involved include the FHWA; the EPA Region 3; the USCOE North Atlantic Division; the USFWS Region 5; and the National Marine Fisheries Service Northeast Region.

The decision to integrate the NEPA/404 processes should be made as early as possible during project development. A joint coordination effort/decision is required between FHWA, USCOE, and PennDOT to integrate the NEPA/404

processes. Coordination is also required with PADEP for the 401 Water Quality Certification. A benefit of an integrated process is that the environmental document serves as the NEPA decision-making document as well as the Section 404 permit application, and the Public Hearing requirements for both NEPA and Section 404 would be covered with one joint Public Hearing. See Publication 295, *Project Level Public Involvement Handbook* for more information on Joint Public Hearings.

Essentially, the methodology involves project management techniques that can, but is not required to, include:

- The use of a special assistant for PennDOT projects, appointed by PennDOT, and a special assistant for Turnpike projects, appointed by the Turnpike Commission, to provide leadership and guidance through the State's Process;
- The creation of an Executive Committee comprised of senior transportation agency managers, resource and regulatory agency representatives, and local officials;
- The use of an EIS Management Team comprised of key transportation professionals, consultants and subconsultants, who shared the common goal of providing project management;
- The use of a management consultant to provide oversight coordination and accelerated document review;
- The adoption of an intensive meeting schedule, in which EIS Management Team Status Meetings are held weekly, ACMs are held monthly, and Executive Committee Meetings are held quarterly;
- A commitment for the cooperating agencies to provide additional coordination and to hold frequent and additional ACMs; and
- The funding of resource agency positions to expedite the review process.

Note: SAFETEA-LU (Section 6001 and 6002) further facilitates this integrated concept by requiring consultation with agencies and consideration of mitigation activities during planning, and by placing time limits on permit issue upon NEPA approval.

For more details on the Integrated NEPA/404 Procedures contact the Bureau of Project Delivery, Highway Delivery Division, Environmental Policy and Development Section.

10.2 DESIGN PARTNERING

Design Partnering is a formal program to improve communications between the people and organizations (PennDOT, FHWA, Consultants, and other project stakeholders) working on a design project. Over the course of the project, key project members convene for a pre-design workshop and regularly scheduled follow-up workshops. They typically work with a facilitator to identify objectives and improve the overall quality and productivity of their discussions. PennDOT is committed to using Design Partnering in an effort to prevent unnecessary project delays and costs.

The purpose of Design Partnering is to facilitate the completion of a quality design, on time, within budget, with no disputes. Design Partnering enables PennDOT and its design partners to react quickly to unforeseen issues that arise and to maintain effective communications. When and if disputes do occur, they can be resolved more quickly within a pre-established environment of cooperation and mutual respect.

Design Partnering is ideally suited to complex, multi-discipline or high visibility projects with major stakeholders. It can also be very beneficial on projects with significant time constraints or critical environmental issues that require very close coordination with regulatory agencies. Design Partnering should not be used on simple projects without first inviting all stakeholders nor should it be used as a last resort at the end of troubled projects.

Design Partnering emphasizes the team concept; encouraging stakeholders to get involved early and commit to working together to achieve stated project objectives. Productivity and product quality are improved because clearer, more effective lines of communication are established at the very start of the project, and less time is spent on the project learning curve. In addition, with partnering, the roles of all parties and their working relationships are established early, thereby eliminating possible errors and confusion caused by overlapping authority issues or conflicting responsibilities.

Several sources discuss design partnering, including NCHRP Synthesis 214, *Resolution of Disputes to Avoid Construction Claims* and *Partnering Manual for Design and Construction* by William C. and Jean S. Ronco, 1996.

At the initial partnering meeting, participants write, agree on, and plan to implement three documents (**Partnering Tasks**):

- **Goals Statement.** The goals statement describes their hopes for the project. The result should be clear expectations with mutual goals and objectives.
- **Communications Procedures.** Communications procedures specify in detail how, when and what people will communicate with one another on the project. A commitment to regular follow-up must be established and all stakeholders must be responsive and provide timely feedback.
- **Conflict Resolution Process.** This process anticipates that people on the project will differ and lays out steps to help them resolve their conflicts to everyone's mutual satisfaction.

To ensure that project team members have the communications skills necessary to implement partnering, and to set a tone that supports the quality of the work, facilitators often provide project team members with communications skills training, focusing especially on:

- Conflict resolution skills
- Listening skills
- Valuing differences and diversity
- Creative problem solving.

A. Needs and Benefits. Partnering potentially addresses many serious, complex problems. Costly litigation plagues many design and construction projects. Partnering can provide the structure, the skills, and a forum to resolve conflicts easily, before they are serious enough to become lawsuits. Partnering does not eliminate litigation but it can significantly reduce its frequency, extent and impact for four reasons:

- Partnering workshops provide a forum, structure and skills to resolve conflicts quickly.
- Partnering workshops enable participants to connect at a deeper level. Face-to-face contact occurs between the owners and senior managers of the firms involved in a project.
- Partnering encourages individuals to take responsibility for resolving their own conflicts.
- Partnering workshops provide a vehicle to manage the tone of communications (i.e., it provides contacts and interaction but also creates both explicit and implicit expectations that people will make an effort to get along with one another).

Ineffective communications directly impact project costs and the profitability of the firms working on the project. Ineffective communications result in rework, mistakes, low quality, and lack of coordination. Partnering provides a mechanism for improved communications.

The chief means for reducing costs on many projects is to cut back on the schedule for completion. If the project can be completed more quickly, contractors and subcontractors can trim their labor costs and move their people onto other jobs.

Traditionally, the design and construction industry has been rigidly divided into different trades and professions. Partnering can provide a forum for coordination, bringing the different players together to address project-wide problems, improving quality. Partnering enhances project quality in three different ways:

- Establishes a forum in which people from different agencies can discuss problems that cut across lines of responsibility;
- Provides a forum in which project managers can set a tone for the project by expressing an interest in quality; and
- Sets a model that people on the job site can emulate.

Design partnering provides participants with in-depth exposure to new management ideas and methods. Partnering also can bring to light internal issues in the participating organizations, thus providing some insight into key internal issues to address.

B. Core Partnering Characteristics. Partnering varies widely from one project to another, yet there is also extensive consistency among most partnering efforts. These core characteristics of partnering are as follows:

- **Communications Focus.** Partnering focuses on communications between project team members, not on their technical skills or professional expertise.
- **Inclusive.** Partnering brings all the key players on a project together in an effort to bridge many gaps set up by the way the design and construction industry divides the work.
- **Public.** Partnering brings people into the same room simultaneously, rather than having communications follow a sequential chain among people in different locations.
- **Proactive.** Partnering attempts to take an active stance to managing many predictable or inevitable miscommunications and conflicts that arise in design and construction.
- **Cooperative.** In all partnering efforts, there is an attempt to cooperate, collaborate and get along well.

With this consistency, the ways in which partnering efforts may vary include:

- **Built in or Add-on Features.** Whether partnering is included as an aspect of project communications from the outset, planned and listed in bid letters, or if it is added after the project has started.
- **Emphasis.** Which of the Partnering Tasks are emphasized, neglected or even ignored?
- **Execution.** Specifically, how the Partnering Tasks are carried out. For example, it is possible to rush a project team through writing a goals statement. Alternatively, it is possible to write a goals statement slowly and thoughtfully and to devote in-depth effort to planning how to implement the statement so that it impacts everyday work on the project.
- **Time.** How much time is devoted to the partnering effort? For some projects, partnering involves workshops that last several days. For others, partnering may not involve a workshop at all but simply a structured meeting of several hours duration.
- **Structure.** How is the partnering effort structured and organized? Sometimes people conduct partnering activities in intense one- or two-day workshops separate from everyday design and construction work. At other times, people divide partnering activities into smaller tasks and link them with ongoing project work, conducting partnering tasks on the job site.

SAFETEA-LU (23 CFR Section 139) encourages early and frequent stakeholder interaction, including inviting Participating Agencies and developing a coordination plan and schedule. See Publication 295, *Project Level Public Involvement Handbook*, for more details on Participating Agencies and coordination plans and schedules.

10.3 SECTION 106 PROGRAMMATIC AGREEMENT

The *Programmatic Agreement Among the Federal Highway Administration, the Advisory Council on Historic Preservation, the Pennsylvania State Historic Preservation Officer, and the Pennsylvania Department of Transportation Regarding Implementation of the Federal Aid Highway Program in Pennsylvania*, commonly referred to as the Section 106 Programmatic Agreement (PA), was developed to streamline the cultural resources review process as applied to the development of federally funded transportation projects.

The Section 106 PA covers all federal-aid highway projects. Generally speaking, projects are classified into two categories under the Section 106 PA - those that may be exempted from further Section 106 review because they are considered to have a low potential for effects to historic properties and will not result in any changes to the properties' significant characteristics; and those that are not exempted.

Projects must meet specific criteria and conditions, as detailed in Appendix C of the Section 106 PA to be exempted; and the exemptions can only be made by PennDOT staff with particular training as either a District Designee or Cultural Resources Professional. Details of the qualifications for exempt projects and the exemption process are contained in Publication 689, *Cultural Resources Handbook*. For those projects that are not exempt, eligibility and effects findings must be made, and adverse effects must be resolved under the Section 106 process. The Section 106 PA and the Publication 689, *Cultural Resources Handbook* outline the coordination and public involvement requirements for various types of projects and effects, as well as methods for dispute resolution.

Details on the Section 106 Programmatic Agreement are contained in Publication 10B, Design Manual Part 1B, *Post-TIP NEPA Procedures*.

The Section 106 PA is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix Y.

10.4 BRIDGE AND ROADWAY PROGRAMMATIC AGREEMENT

The Bridge and Roadway Programmatic Agreement (BRPA) is intended to address environmental clearance (NEPA/PA Act 120) for a vast majority of the bridge, roadway and non-complex projects the Department undertakes. Stipulation 1 of Part A, Stipulations 1, 2, and 4 of Part B, and Stipulation 1 of Part C of the BRPA define the authorized activities. Part A addresses roadway rehabilitation and pavement preservation activities; Part B addresses bridge replacement, rehabilitation, preservation, and removal; and Part C addresses other non-complex projects such as intersection improvements, addition of turn lanes, construction or replacement of signage and guiderail/barrier, traffic operations, grade crossings, certain pedestrian and bicycle facilities, fringe parking, and ADA curb cuts. Specific activities authorized by the BRPA are described in detail within the BRPA.

The use of this BRPA continues to require the collection of traditional engineering and environmental data to support the design process. Once that data has been collected and analyzed, and the preliminary design completed, the "Bridge and Roadway Programmatic Agreement Categorical Exclusion Applicability Matrix" (Applicability Matrix) (Appendix A of the BRPA) should be completed. Following verification of the data contained in the form, the Environmental Manager shall concur with the findings documented on the Applicability Matrix. The Environmental Manager's concurrence shall constitute environmental approval for the proposed activity. The date of the approval of the BRPA shall be listed as the formal NEPA Approval date for the project. BRPA documentation is prepared and approved in the CE Expert System (CEES).

Any questions regarding the use or applicability of the BRPA should be directed to the Bureau of Project Delivery, Highway Delivery Division, Environmental Policy and Development Section.

Details on the BRPA are contained in Publication 10B, Design Manual Part 1B, *Post-TIP NEPA Procedures*.

The BRPA is contained in Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix V.

10.5 REAL PROPERTY PROGRAMMATIC AGREEMENT

PennDOT and FHWA developed the Disposal of Real Property and Lease Agreements/Renewals Programmatic Agreement to outline the policy and procedures for environmental (NEPA) clearance of disposal of excess right-of-way, leasing of right-of-way, or renewal of existing right-of-way lease agreements that have no significant social, environmental, or environmental effects. See Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix W.

The PA outlines the responsibilities of PennDOT's CRP's related to clearance of historic resources and the District's Environmental Unit in the clearance for threatened and endangered species and hazardous or residual wastes. Documentation of the environmental information will be in the Disposition of Real Property and Lease Agreement/Renewal Categorical Exclusion Form (see Publication 10X, Design Manual Part 1X, *Appendices to Design Manuals 1, 1A, 1B, and 1C*, Appendix W, the form is Appendix A of the PA). The PA documents five stipulations that must be met in order to satisfy FHWA's NEPA responsibilities, including preparation of and use of the referenced CE form. Once completed, the form is approved by the District Environmental Manager.

10.6 RELATIONSHIPS WITH THE DESIGN AND CONSTRUCTION INDUSTRIES

A. PennDOT/Consultant Relations - American Council of Engineering Companies (ACEC). Founded in 1968, the *American Council of Engineering Companies of Pennsylvania (ACEC/PA)* works to enhance public understanding of the critical work performed by consulting engineers and the importance of quality engineering to the success of design and construction. The organization's mission is to promote ACEC/PA member firms and the practice of consulting engineering, thus enabling them to provide quality services in the best interests of their clients and the public.

ACEC/PA is a Member Organization of the American Council of Engineering Companies, and currently the largest statewide organization of engineers engaged in the practice of consulting engineering. Membership in ACEC/PA is open to independent firms providing engineering and related services through licensed professionals on an as-needed basis within the Commonwealth. ACEC/PA is comprised of more than 125 independent engineering firms throughout Pennsylvania that provide engineering expertise in a wide range of disciplines, including civil, structural, mechanical, electrical, environmental, and industrial engineering. These firms employ over 7,500 engineers, land surveyors, scientists, technicians, or other personnel in Pennsylvania.

The organization maintains close ties to state agencies, including PennDOT and the Pennsylvania Turnpike Commission, and assists its members through programs to strengthen public awareness of the engineering profession, through legislative initiatives, and through its efforts to enhance professional development. The organization represents its member in state and local legislative and policy debates involving the development of rules, regulations and contracting principles affecting consulting engineering. ACEC/PA promotes dialog among its member firms and clients through direct communication, regional meetings, and annual conventions.

ACEC/PA works closely with PennDOT to improve the contract relationship between consulting engineering firms and PennDOT in all phases of project delivery, operations and maintenance. ACEC/PA also maintains strong relations with contractors and suppliers through joint leadership committees and liaison with PennDOT and the Associated Pennsylvania Constructors (APC).

American Council of Engineering Companies of Pennsylvania
2040 Linglestown Road, Suite 200
Harrisburg, PA 17110-9568
Telephone: 717-540-6811
Fax: 717-540-6815
Website: www.acecpa.org

B. PennDOT/Contractor Relations - Associated Pennsylvania Constructors. Founded in 1920, the Associated Pennsylvania Constructors (APC) represents highway construction contractors and others that have a business interest in the transportation construction industry in Pennsylvania. The mission of APC is to advocate adequate funding for Pennsylvania's transportation needs, foster a positive partnership based on trust between governmental agencies and officials and APC members, and promote quality in the design and construction of transportation systems.

PennDOT maintains close ties to the transportation construction industry through its participation in and support of several standing APC committees. These committees provide an important opportunity for liaison between PennDOT and the construction industry. The committees are forums for the exchange of useful information about the construction industry between PennDOT and contractors, as well as among APC members. The committees also enable members to provide input on the development of various PennDOT standards, policies and specifications.

The following is a list of the standing APC committees and a brief description of the functions of each:

- Bridge Committee. This committee meets periodically with PennDOT on industry developments and structure issues as they affect the membership.
- APC/PennDOT Joint EEO/DBE Committee. This committee works with the PennDOT Bureau of Equal Opportunity towards formulating and implementing policies to ensure a fair DBE/WBE program.
- Information Technology Committee. This committee works with PennDOT, the Turnpike and other state agencies in obtaining access to necessary construction information. The committee also works to identify and apply new technologies to more effectively communicate and disseminate vital bid information.
- Risk Allocation Committee. This committee meets with PennDOT to identify and address risk in the construction process to ensure that legal and financial responsibilities are assigned to the appropriate party.
- APC/PennDOT Joint Safety Committee. This committee participates with PennDOT in formulating regulations and addressing issues to promote and ensure worker safety.

In an effort to expand awareness of new transportation construction methods, policies and procedures, while encouraging strong working relationships, APC collaborates with PennDOT and ACEC/PA in sponsoring annual events, including the Fall Seminar and District Liaison Meetings.

The PennDOT/APC/ACEC Fall Seminar typically includes technical workshops and presentations by PennDOT officials, APC members, and other industry leaders, displays by vendors, and renowned speakers from throughout the transportation construction industry.

District Liaison Meetings are held in each of the eleven PennDOT Districts during February and March. These annual meetings provide a forum that helps establish an open line of communication between PennDOT officials and APC members. Both parties are given the opportunity to resolve problems and concerns at the District level.

These meetings are also valuable because they help contractors and PennDOT staff gain a uniform interpretation of district-to-district construction practices. Meeting topics are chosen from questionnaires completed by APC members.

For more information, contact:

Associated Pennsylvania Constructors
800 N. Third Street
Harrisburg, PA 17102
Telephone: 717-238-2513
Fax: 717-238-5060
Website: www.paconstructors.org