Planning & Engineering 360°
Module 3: Project Delivery
Introduction
Module 3 Overview

P&E 360 Course Overview

Module 1: The Value of Planning
Module 2: Program Development (Pre-TIP)
Module 3: Project Delivery (Post-TIP)

Collaboration Opportunities
- Comprehensive Planning
- Corridor Studies/Plans
- Long-Range Transportation Plan
- PennDOT Connects

Critical Activities for Planners
- Engineers Learn about Planner Role

Critical Activities for Engineers
- Planners Learn about Engineer Role

Stakeholder Engagement
- Planners and Engineers Learn How to Engage Stakeholders

Better Communities
Better Transportation Systems

Program Development for Module 3

Workbook p.8
Review of Module 2

Planning & Engineering Collaboration

Community Conditions

Better Communities

Community Development
Vision, Values and Aspirations
Quality of Life & Livability
Sense of Place & History
Community Vitality
Land Use

Better Transportation Systems

Collaboration Opportunities
Comprehensive Planning
Corridor Studies/Plans
Long Range Transportation Plan
PennDOT Connects

Project Development & Delivery
Transportation Choices
Safety & Operations
Asset Management
Mobility & Access

Transportation System Performance
Revisit Your Community

- College Town
- Rural Community
- (Former) Industrial Community
- City or Metropolis
- Small Town or Borough
- Retail or Logistics Hub
- Waterfront Town
- Bedroom Suburb
Open your workbook to Appendix 2C and find your community’s transportation problem and review it with your table team.

Based on your community’s transportation problem, fill in one of the two sections of the Project Initiation Form (PIF) that you have been given.

Be sure to complete it to the level of thoroughness and quality that Engineers would need for the transition to Project Delivery.
Post-TIP Collaboration Opportunities

Transportation Program Development and Project Delivery Process

<table>
<thead>
<tr>
<th>Problem Assessment</th>
<th>Proposal Identification</th>
<th>Proposal Evaluation</th>
<th>Project Addition to TIP/STP</th>
<th>PE/NEPA Decision</th>
<th>Final Design and Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Input Form</td>
<td>Proposal Screening Form</td>
<td>TIP/STP Document</td>
<td>Scoping Form</td>
<td>Environmental Decision Document</td>
<td>ECMTS</td>
</tr>
</tbody>
</table>

Evaluate contextual issues, as well as potential solutions and alternatives considering:
- Safety issues/concerns
- Bicycle/pedestrian accommodations
- Transit-multi-modal considerations
- Stormwater management
- Presence of impacts from current/future freight-generating land uses
- Utility issues
- Transportation operation considerations
- Emergency services accommodations
- Planned development
- Long range transportation plans
- Consistency with current and/or proposed zoning
- Consistency with community comprehensive or other plans
- Regional planning studies
- 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
- Presence of EJ community or LEP individuals
- Maintenance agreement requirements
- Other specific regional/local topics

Recommend formal study, place on LRTP or TIP as a study

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Footnotes:
1. Not required for all proposals.
2. PennDOT and the MPO/RPO may jointly decide to dismiss a proposal at any time if the proposal is determined to be a routine maintenance project or not feasible due to constructability issues.
3. Projects may also be deferred to the LRTP Candidate List or illustrative list.
4. Studies can also be funded through the Unified Planning Work Program (UPWP).
5. Multimodal includes highway, public transit, aviation, rail, freight, and bicycle and pedestrian facilities.

Workbook p.11
Appendix 2B

March 22, 2017
Conduct collaborative scoping field view including local governments with full consideration of community vision, needs, goals and objectives.

Use information collected in the collaborative planning process to inform the NEPA decision document, preliminary engineering, final design and construction. Monitor commitments made.
PE/NEPA Collaboration Considerations

Planners

- Maintain a seat at the table
- Continue to advocate for communities
- Help identify funding options, scheduling considerations, & priorities
- Share ownership to enhance accountability

Community Development
Vision, Values & Aspirations
Quality of Life & Livability
Sense of Place & History
Community Vitality
Land Use

Engineers

Operations & Maintenance

PE/NEPA Collaboration Considerations

Project Leadership Transitions
Community/Stakeholder Interests
Information Sharing
Data Collection
Project Cost Containment/Schedule
Commitments/Follow-through

Peace Corps
Better Communities
Better Transportation Systems

Better Communities
Better Transportation Systems
Transistioning into Preliminary Engineering

PennDOT Connects Bridge

Plans

Program/TIP

Project Delivery
Overview
Scoping provides an early interdisciplinary opportunity to:

• Provide a clear description of project objectives, purpose and need.
• Identify potential alternatives (e.g., alignments).
• Identify potential engineering and environmental impacts.
• Identify deliverables.
• Establish basis for scope of work.
Design Criteria and Flexibility

- Design speed
- Lane width
- Shoulder width
- Bridge width
- Horizontal/vertical geometry
Example: Design Speed

Conventional Design

Using Desired Operating Speed
Scoping

Collaboration Possibilities

The Scoping Field View is a proactive, on-site review of the project among team members and key stakeholders.

• Assemble scoping team.
• Obtain stakeholders’ perspectives.
• Engage Planner to represent community priorities.
• Maximize local in-depth knowledge of environmental issues (e.g., property owners, etc.).
Overview

• Follow NEPA/PA Act 120 Process.
• Comply with state and federal environmental laws.
• Determine the extent of environmental impacts that a project may have. (Typically, the more complex a project, the greater the range of potential environmental impacts.)
• Identify mitigation alternatives.
Environmental Analysis & Documentation

Collaboration Possibilities

- Gain a clear understanding of project environmental issues.
- Determine value-added support role for Planners, where beneficial.
- Bring forward relevant data from planning.
- Maintain awareness of potential impacts on regional issues.
- Provide additional detail on issues.
- Ensure critical community environmental issues are addressed.
- Share data and mapping resources.
- Work with coordinating agencies.
- Identify streamlining opportunities.
Overview

• Prepare engineering studies, designs, analyses, and associated documentation.

• Support and align with the project’s environmental studies.
Collaboration Possibilities

- Ensure project coordination between MPOs/RPOs, municipalities, and districts, as beneficial.
- Advocate for alternatives that benefit communities.
- Involve Planners as project alternatives are refined.
- Leverage Planner’s knowledge of community environmental issues, population, demographics, traffic, etc.
- Consider the following:
  - Context Sensitive Solutions
  - Design Value Engineering
  - Intersection Control Evaluations (ICE)
Overview

• Planning requires public participation; project delivery requires meaningful public involvement.
• One size doesn’t fit all - approach should be customized for a specific project (e.g., complexity, context and intensity of impacts, location, etc.).
• Typically, amount of public involvement increases with the level of environmental documentation required.
Public Involvement

Collaboration Possibilities

• Identify creative, value-adding ways to engage key stakeholders, considering:
  o Local perceptions and concerns.
  o All transportation needs and modes.
  o Opportunities to improve quality of life.

• Obtain public feedback on alternatives.

• Leverage the best data, maps, and other media available.

• Consider issues beyond the borders.

• Reconcile conflicts.
Design Field View

Overview
The Design Field View is the culmination of PE/NEPA efforts and involves both engineering and environmental elements.

The purpose of the Design Field View is to:

• Support the project’s Purpose and Need.
• Confirm project impacts from the NEPA document.
• Receive and review comments on Preliminary Design.
• Refine the project detail resulting from the PE/NEPA activities.
Collaboration Possibilities

• Review Preliminary Engineering commitments (PIF/NEPA).
• Participate in the Design Field View, if beneficial.
• Address municipal agreements (sidewalks, maintenance, etc.).
• Address agencies’ involvement.
• Address utilities’ involvement.
Based on your community’s problem and alternatives generated in Module 2, select a project for your community and name it. Then…

1. Identify three (3) stakeholders that have a high stake in the project (e.g., utility companies, private companies, public officials, freight shippers & carriers, etc.).

2. Identify key issues or concerns that each stakeholder might have.

3. When and how would you engage them?

PennDOT Connects Pointer: Consider stakeholders identified early on.
Final Design

Use information collected in the collaborative planning process to inform the NEPA decision document, preliminary engineering, final design and construction. Monitor commitments made.
Final Design Collaboration Considerations

**Planners**
- Maintain a seat at the table
- Continue to advocate for community
- Bring knowledge of local context & return information to locals
- Update TIP to reflect changes in project cost and schedule
- Share ownership to enhance accountability

**Engineers**
- Design Plans Preparation
- Permits & Agreements
- Right-of-Way
- Utilities
- PS&E Package

- **Final Design Collaboration Considerations**
  - Project Leadership Transitions
  - Community/Stakeholder Interests
  - Information Sharing
  - Data Collection
  - Project Cost Containment/Schedule
  - Commitments/Follow-through

Workbook p.24
Final Design: Avoiding Re-work
Overview
Identify project-related improvements/details, materials, and quantities.
Design Plan Preparation

Collaboration Possibilities

- Review/confirm Final Design commitments (NEPA).
- Engage public officials, resource agencies, and the public to resolve PE and/or new issues.
- Address design details as they relate to prior PIF commitments.
Cost Containment Revisited

Contingency Range

Major, Complex Projects

Minor, Non-Complex Projects

Planning
Scoping
Design Field View
FDOM
PS&E
Permits & Agreements

Overview
Submit required documentation to federal, state, and local regulatory agencies/officials to gain approval to advance the project.
Permits & Agreements

Collaboration Possibilities

• Include analyses and completed reports/forms that are necessary to fulfill the permitting requirements.

• Remain aware of any required permits based on the complexity of the project.

• Remain aware of specific agreements with local municipalities (e.g., maintenance agreements, sidewalks, trails, recreation areas, etc.).

• Ensure that stormwater requirements are known and coordinated with community interests.

PennDOT Connects Pointer: Risk Management Strategies
Right-of-Way

Overview
Right-of-way is a formal and legally intensive process entailing the following:

• Analyzing and minimizing impacts
• Developing plans
• Preparing legal agreement
• Negotiating
• Acquiring property
Collaboration Possibilities

Remain aware of potentially significant right-of-way requirements that may affect:

• Community traffic flow
• Land use
• Zoning requirements
• Residential
• Agricultural
• Business development
• Commercial development
Utilities

Overview

• Include details of utilities above or below project area that may be affected by design components.
• Coordinate relocation of the utilities with utility companies.
• Promote ongoing communication and coordination among all impacted parties.
• Adjust project details, as necessary.
Collaboration Possibilities

• Remain aware of utility requirements associated with the project.
• Consider project design adjustments resulting from utility data discovered through the design process (particularly when changes must be worked out with local government authorities).
Overview

• The Plans, Specifications and Estimate Package is the final document for review.
• Include engineering data and information necessary to place a transportation project under contract for construction.
Collaboration Possibilities

• Remain aware of the project advertisement schedule.

• Adjust cost and schedule information in TIP to reflect approved price and schedule.

• Confirm that any remaining commitments are reflected in the PS&E Package.

• Confirm that any commitments **not** reflected in the PS&E Package are communicated back to the community.
Collaboration during Final Design

In your Table Teams, fill out the form below. For each of the elements we’ve covered under Final Design, think of an event or issue that could trigger an opportunity for beneficial collaboration. Make a note of the type of collaboration that would be needed for each trigger (e.g., inform, discuss, decide). Finally, note the type of collaboration that would be needed for each trigger.

<table>
<thead>
<tr>
<th>Final Design Element</th>
<th>Trigger</th>
<th>Type of Collaboration Needed</th>
<th>Benefits of Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Plan Preparation</td>
<td></td>
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<tr>
<td>Permits &amp; Agreements</td>
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<td>Right-of-Way</td>
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<tr>
<td>Utilities</td>
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</tr>
<tr>
<td>PS&amp;E Package</td>
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</tbody>
</table>
Construction

Use information collected in the collaborative planning process to inform the NEPA decision document, preliminary engineering, final design and construction. Monitor commitments made.
Construction Collaboration Considerations

**Planners**
- Maintain a seat at the table
- Continue to advocate for communities
- Bring knowledge of local context & return information to locals
- Share ownership to enhance accountability

**Engineers**
- Construction Schedule
- Traffic Control
- Construction Design Changes
- Construction Inspection
- Mitigation Commitments

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Workbook p.33
Construction Schedule

Overview

Completing the project on time depends on a well-prepared and monitored construction schedule. Construction schedule requires:

- Effective communication to resolve project issues
- Assessment of the impacts of changes to the schedule
- Accurate decisions concerning corrective actions
Collaboration Possibilities

• Communicate the initial project schedule for community awareness.

• Update key community interests if project schedule changes occur.

• Update the community in the spring of each construction year.
Overview

• Provide a safe construction zone while maintaining traffic flow for all users throughout the project limits.

• Attempt to minimize detours or traffic control patterns that cause severe choke points or undue congestion during construction.
Collaboration Possibilities

• Planners may be a resource in helping to establish modal alternatives during construction.
• Liaison with the community or regional officials.
• Communicate new travel patterns to the public.
Construction Design Changes

Overview

During the Construction phase, previously unforeseen circumstances may require changes to the design.
Collaboration Possibilities

• Remain available to provide input when necessary due to unforeseen/unanticipated construction complications.

• Monitor project construction process to coordinate concerns or impacts on residents, business owners, etc., during construction.
Construction Inspection

Overview
Validate that appropriate construction methods, techniques, and materials are used during project construction and monitoring of construction activities.
Collaboration Possibilities

Should construction inspection result in any need-to-know items for the community, follow up appropriately with community interests.
Overview

• Many construction projects involve mitigation requirements for the disturbance or disruption to environmental features or other elements that may be impacted due to the project scope.

• If avoiding an environmental feature is not possible, then some type of mitigation to the impact of the environmental feature is required.
Mitigation Commitments

Collaboration Possibilities
Keep community and other key stakeholders informed of mitigation measures.
Operations & Maintenance (System Performance Monitoring)
Feedback Loops

Planning & Engineering Collaboration

Community Conditions

Better Communities

Community Development
Vision, Values and Aspirations
Quality of Life & Livability
Sense of Place & History
Community Vitality
Land Use

Collaboration Opportunities
Comprehensive Planning
Corridor Studies/Plans
Long Range Transportation Plan
PennDOT Connects

Better Transportation Systems

Project Development & Delivery
Transportation Choices
Safety & Operations
Asset Management
Mobility & Access

Transportation System Performance
Operations & Maintenance Collaboration Considerations

**Planners**
- Maintain a seat at the table
- Continue to advocate for communities
- Bring knowledge of local context & return information to locals
- Help identify funding options, scheduling considerations, & priorities
- Share ownership to enhance accountability

**Engineers**
- Multi-modal
- Infrastructure Maintenance
- Crash Data & Analysis
- ITS and TSM&O
- Asset Management & (System) Performance Measures

**Construction**
- Project Leadership Transitions
- Community/Stakeholder Interests
- Information Sharing
- Data Collection
- Commitments/Follow-through

**Final Design**
Overview
It is important to monitor the transportation system performance for future consideration of transit, bike, pedestrian, and freight enhancement.

<table>
<thead>
<tr>
<th>Area</th>
<th>LRTP – PennDOT Connects Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bike-Ped</td>
<td>- Identification of projects where the incorporation of bike and pedestrian accommodations can enhance safety and provide community benefits.</td>
</tr>
<tr>
<td></td>
<td>- Alternative funding strategies.</td>
</tr>
<tr>
<td>Public Transit</td>
<td>- Consideration of supporting improvements such as road and bike-ped access, community-related opportunities and priorities, traffic flow, etc.</td>
</tr>
<tr>
<td>Freight/Goods Movement</td>
<td>- Identification of priorities for improved freight movement efficiency, reduced congestion, and where possible the community related issues and opportunities (e.g., economic development)</td>
</tr>
<tr>
<td>TSMO</td>
<td>- System management goals, priorities, and projects and their community impacts</td>
</tr>
<tr>
<td>ITS</td>
<td>- ITS goals, priorities, and projects and their community impacts</td>
</tr>
<tr>
<td>Aviation</td>
<td>- Airport-heliport development priorities and community compatibility, land use, etc.</td>
</tr>
<tr>
<td>Water Ports</td>
<td>- Improvement goals and priorities for ports and port access and community related issues and opportunities</td>
</tr>
</tbody>
</table>
Overview

Infrastructure maintenance follows prescribed cycles and includes the following:

- Drainage facilities
- Winter maintenance
- Pavement maintenance
- Damage repairs (e.g., potholes, guide rails, etc.)
- Roadside maintenance
Overview

Identify problem areas that could indicate safety improvement needs.
ITS and TSM&O

Overview
Integrate information technology/systems with transportation to improve throughput, operational efficiency, safety, incident management, and to provide a higher level of customer service. Include traffic management.

ITS = Intelligent Transportation System
TSM&O = Transportation Systems Management & Operations
Transportation & Information Marriage

Travelers
- Remote Traveler Support
- Personal Information Access

Centers
- Traffic Management
- Emergency Management
- Toll Administration
- Commercial Vehicle Administration
- Maintenance and Construction Management

Wide Area Wireless Communications
- Information Service Provider
- Emissions Management
- Transit Management
- Fleet and Freight Management
- Archived Data Management

Vehicle
- Emergency Vehicle
- Commercial Vehicle
- Transit Vehicle

Dedicated Short Range Communications
- Roadway
- Security Monitoring
- Toll Collection
- Parking Management
- Commercial Vehicle Check

Vehicles
- Maintenance and Construction Vehicle

Field
**Overview**

This is a structured approach to the maintenance and replacement of bridge, highway, and other assets. Often follows specific backlog and improvement cycles, and/or asset management plans.

Data and inputs to asset management include:

- Monitoring system condition and changing needs
- System age
- Cost trends

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<td>≤ 70</td>
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<td>Excellent</td>
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<td>71-75</td>
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<td>76-100</td>
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<td>Fair</td>
<td>Fair</td>
<td>Fair</td>
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<td>101-120</td>
<td>Poor</td>
<td>Poor</td>
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<td>Poor</td>
</tr>
<tr>
<td>121-150</td>
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<tr>
<td>151-170</td>
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<tr>
<td>171-195</td>
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<tr>
<td>196-220</td>
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<tr>
<td>&gt; 220</td>
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</tbody>
</table>

**IRI Ranking Categories**
Traffic Signal Performance Measures

Automated Traffic Signal Performance Measures (ATSPM) are a series of visual aids depicting real-time and historical functionality of signalized intersections using logs of controller and detector events. This allows traffic engineers to measure what they previously could only model. A traffic decision maker making about signal performance and timing helps in the management and planning identify vehicles and pedestrian malfunctions. This cost-effective solution also measures vehicle delay and the volume, speed and travel time of vehicles. These meters can be used to identify operational deficiencies, optimizing mobility and helping manage signal timing and maintenance. Evaluating signals helps reduce congestion, save fuel costs and improve safety.


ATSPM are a valuable asset management tool—aiding technicians and managers in the control of both hardware and overall system within the system. This allows analysis of data 24 hours a day, 7 days a week, improving the accuracy, flexibility and performance of signal equipment and the system as a whole.

This technology provides a clear framework for performance and design, informing good dialogue and helping calibrate expectations of the public, agency leadership, legislators, first responders and other mobility partners.

In addition, signal timing is a resource that can be used to model or track how the asset degrades over time and therefore the system. ATSPM will help Pennsylvania achieve better scores on the National Traffic Signal Report Card. When last compiled, the overall score on the National Traffic Signal Report Card in 2012 was a D+.

ATSPM work because they were developed, tested and successfully adopted by your peers. The M2IT Innovation Initiative assembled those innovative people on a team that is standing by now to help deliver ATSPM for Pennsylvania stakeholders.

What are Pennsylvania’s Traffic Signal Performance Objectives?

- Safe and consistent operation of signals
- Efficient, optimized signals with effective use of green time
- Consistency in the quality of the design and operation of signals
- Consistent and comprehensive maintenance

ATSPM helps achieve these objectives as follows:

- Monitor signals frequently enough to identify when maintenance or operational intervention is warranted
- Good signalization on selected corridors at selected times of day

Who uses Traffic Signal Performance Measures data?

- Signal engineers to optimize and fine-tune signal timing
- Maintenance signal technicians to identify broken detector problems and investigate trouble calls
- Traffic engineers to conduct various traffic studies, such as speed studies, turning movement studies, modeling studies, and optimizing intersection operations

What is Required to Implement Automated Traffic Signal Performance Measures? Where does the information come from?

ATSPM uses a combination of modern signal controllers and vehicle detection systems to collect and analyze operational data with timestamped data. This information is then stored and analyzed for further analysis and reporting. ATSPM does not require a central traffic management or traffic adaptive system, and the data storage and reporting are achieved with open-source software developed by the Utah Department of Transportation (UDOT).

Example use cases from Pennsylvania Intersections (using existing controllers and detectors):

- Identify malfunctioning pedestrian push buttons based on movements operating for maximum time in the middle of the night (left below—bars represent green time in each cycle; colors represent reason for phase termination; pink is maximum time)
- Identify malfunctioning vehicle detection based on movements operating for the maximum time at off-peak times (such as shadows at a certain time of day affecting video detection)

- Modifying offsets to reduce corridor travel time and increase reliability (before offset adjustment on left below, after on right)
- Green shading represents the probability of the signal being green at any point during the cycle based on actual green times. Black bars represent the proportion of vehicles arriving at that time in the cycle.
Corridor Performance Measures

Outcome Assessment using Connected Vehicle Data to Justify Signal Investments to Decision Makers

Drake Krohn¹, Lou Rymarczuk¹, Jijo Mathew¹, Christopher Day¹, Howell Li², Ashwin Patel³, Daniel Farley², Darcy M. Bullock³

¹: Purdue University; 2: Pennsylvania Department of Transportation

Abstract

This paper describes the use of connected vehicle data to perform corridor level travel time outcome assessment along five corridors in the greater Philadelphia, Pennsylvania area. These corridors are comprised of a total of 114 signals and are considered five of the most critical corridors in this region, experiencing a high volume of traffic, with ADT greater than 30,000 vehicles. These corridors were evaluated on six-week periods and after the installation of adaptive controls and signal timing using private-sector segment speed data. Measurements and interview data of these six were used to assess the impact of adaptive operation. Various graphs, charts, and figures produced through web tools and traditional metrics provide a user-friendly component to the dashboard. In addition, user cost reductions and CO₂ emission impacts were also determined. Four out of the five corridors had substantial reductions of average travel times that amounted to approximately $3.3 million in annualized user benefits.

Study Corridors

<table>
<thead>
<tr>
<th>Corridor ID</th>
<th>Corridor Name</th>
<th>Length (mi)</th>
<th>Average Speed Limit (mph)</th>
<th>Signal Count (Adaptive)</th>
<th>Before Time Range</th>
<th>After Time Range</th>
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<tbody>
<tr>
<td>A3</td>
<td>Broad St/Broad St</td>
<td>5.5</td>
<td>50</td>
<td>15</td>
<td>10/20/2014 - 10/21/2014</td>
<td>10/20/2015 - 10/21/2015</td>
</tr>
<tr>
<td>A4</td>
<td>Center City</td>
<td>7.2</td>
<td>30</td>
<td>10</td>
<td>10/20/2014 - 10/21/2014</td>
<td>10/20/2015 - 10/21/2015</td>
</tr>
<tr>
<td>A5</td>
<td>Roosevelt Blvd/Fairmount Ave</td>
<td>6.3</td>
<td>40</td>
<td>30</td>
<td>10/20/2014 - 10/21/2014</td>
<td>10/20/2015 - 10/21/2015</td>
</tr>
</tbody>
</table>

Evaluation Methodology

Weekday Median and IQR Evaluation

Weekend Median and IQR Evaluation
Corridor Performance Measures

Outcome Assessment using Connected Vehicle Data to Justify Signal Investments to Decision Makers

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$32M Net User Cost Benefit

<table>
<thead>
<tr>
<th>Weekly</th>
<th>a Weekday</th>
<th>a Weekend</th>
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</thead>
<tbody>
<tr>
<td>A1</td>
<td>$12,000</td>
<td>$13,000</td>
</tr>
<tr>
<td>A2</td>
<td>$24,000</td>
<td>$26,000</td>
</tr>
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<td>A3</td>
<td>$36,000</td>
<td>$38,000</td>
</tr>
<tr>
<td>A4</td>
<td>$48,000</td>
<td>$50,000</td>
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<tr>
<td>A5</td>
<td>$60,000</td>
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<tr>
<td>Total</td>
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<td>$182,000</td>
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PennDOT Web Application Suite

Corridor Analysis Procedure

1. Corridor Selection
2. Analysis Data Selection
3. Time Selection
4. Arterial Ranking

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Travel Time Comparison Tool

Travel Time outlet cumulative frequency diagrams. The vertical blue line represents the ideal travel time, no stoppage and following the speed limit.

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Travel Delay Monitor

The travel delay monitor displays cumulative congested miles over time. Rush hour times can often be identified, as shown in the figure below for 400-500 miles range.

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Arterial Ranking Tool

Arterial Ranking allows selection of specific hour ranges (a) while travel time is displayed for the integration of on/off points (b). Travel Delay Monitor displays the hours within the time selection in the output figures.

Equation and Calculation Analysis

User-Cost Benefits

Arterial Ranking displays arterial performance as reliability versus central tendency in the graph in the lower left-hand corner of the figure above.

Arterial Ranking also sorts this one-dimensional graph, displaying the reliability of the corridor using the difference of the 75th and 25th percentiles and the total travel time.

Equation and Calculation Analysis

$32 Million total benefit
$275,000 per day, savings 10,000 was 60, reduced

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Workbook p.44
Collaboration Possibilities (System Performance Monitoring)

• Review system performance evaluations/data.
• Share asset management and performance measures to identify potential infrastructure improvement projects to inform the LRTP and TIP processes.
• Collaborate on crash data to identify areas where safety may be enhanced by transportation improvements.
• Consider community level performance data (e.g., bike/ped) that may impact future maintenance decisions and system performance, including future project modeling or forecasting, to the Engineers.
• Obtain input regarding community/county work programs (e.g., bike/ped).
• Collaborate on operational/safety audits.
Operations & Maintenance Collaboration

Collaboration Possibilities (System Performance Monitoring)

**Planners**
- Maintain a seat at the table
- Continue to advocate for communities
- Bring knowledge of local context & return information to locals
- Help identify funding options, scheduling considerations, & priorities
- Share ownership to enhance accountability

**Engineers**
- Multi-modal
- Infrastructure Maintenance
- Crash Data & Analysis
- ITS and TSM&O
- Asset Management & (System) Performance Measures

**Ops & Maintenance Collaboration Considerations**
- Project Leadership Transitions
- Community/Stakeholder Interests
- Information Sharing
- Data Collection
- Commitments/Follow-through
Wrap-up & Evaluation
Challenges/Opportunities Form

Community Name: ________________________________
Date: ____________________

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<th>Challenges/Opportunities</th>
<th>Strategies</th>
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Tools to Support Mutual Success
As a large group, discuss your answers to the questions in your workbook in response to your facilitator’s prompts.
In what ways can collaboration during project delivery be improved to enhance both community outcomes and transportation project delivery ...and beyond?
All participants of P&E 360 will be sent a link to a more detailed course evaluation.

When you receive this link, please fill out the evaluation as soon as possible.

Your feedback will help us identify the best opportunities for making improvements to the course.

Thank you!
Planning & Engineering 360°

Module 3: Project Delivery