PennDOT’s 2020
Construction Program & Initiatives

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Deputy Secretary for Highway Administration
PA Department of Transportation
UPCOMING CHALLENGE: Generations

- **By 2021 – 46-50%** of workforce Millennials
- X-Gen “gap”
  - 72M Baby Boomers (1945-1964)
  - 74M iGens (1997-2012)
- Millennials in Leadership
  10 yrs. sooner than others
- **Are You Ready?**
PennDOT by the Numbers

- 40,000 Miles of Roadway
- 25,400 Bridges
- $9.9 Billion Budget
- $2.2 Billion Annual Construction Contracts Bid
- 11,463 Employees
- 7,096 Maintenance Employees
- 53 Transit Systems
- 65 Operating Railroads
- 3 Ports
- 127 Public Use Airports
- 10.1 Million Licensed Drivers & ID Holders
- 12 Million Registered Vehicles
- 77 Billion Annual Vehicle Miles Traveled
- 2,440 Miles of Bicycle PA Routes
PennDOT Strategic Themes

- **Sustainable Policy-Based Investments**: Invest taxpayer money into smart, environmentally sustainable transportation infrastructure in which community benefits and impacts are sought before dollars are allocated.

- **Open, Proactive Communications**: Maintain proactive, consistent, transparent, and open (two-way) communications with the public, employees, and transportation stakeholders.

- **Sustainable Infrastructure Investment**: Proactively and innovatively manage resources.

- **Effective Partnerships**: Be, at all levels, a consistent resource partner to intra-agency offices, outside partners, stakeholders, and our customers.

- **Innovative, Smart, and Diverse Organization**: Nurture a diverse organization and workforce by encouraging innovative thinking, process improvement, job-specific training, minority opportunities, and sound technology investments.

- **Safety at All Levels**: Sustain the resources to build a safety culture for employees, contractors, and our customers.
SAFETY

• Safety Culture Established – 2011

• Accomplishments

• Reinvigorate Safety Emphasis

• Executive Safety Council
Work Zone Safety

Automated Work Zone Speed Enforcement (AWZSE) in Pennsylvania

- 23 work zone crash fatalities in 2018
- 1,804 total crashes in PA work zones in 2018
- 47 percent of work zone crashes citing excessive speeding
- 2% increase annually since 2012
OPEN, PROACTIVE COMMUNICATIONS

- Employees at All Levels
- Planning
- Design
- Construction
- Maintenance
- Operations & Performance
Enhanced Communications

511PAConnect is a new, trapped-traveler emergency communications tool that allows incident response teams to communicate via automated phone or text message directly with motorists who are trapped in a roadway backup. The tool also gives emergency crews a clearer picture of what is occurring in a trapped vehicle and where they are, so agencies can better plan for the use of resources.

511PAConnect is a mobile app and requires no initial download or action from motorists.

511PAConnect will only be activated during prolonged, emergency roadway stoppages that are expected to last four or more hours. Upon activation, 511PAConnect will send a push message to all phones in the incident area. This message will provide motorists who are impacted instructions for how to participate and receive further information throughout the incident.

It also offers distinct benefits to travelers, including:

- Automated updates and the latest relevant information delivered in the method most convenient for the traveler (automated phone call, text message, web page)
- No need to comb through social media posts for the status of the event
- Communications the measure travelers throughout the event for the safety and awareness of their presence
“The significant problems we face cannot be solved at the same level of thinking we were at when we created them.” – Dr. Albert Einstein
• For 2020 we anticipate up to 25 projects will be greater than $20 Million
• But Many Future Challenges
PennDOT Project Letting Trends

2015: $2.56B, 607 projects
2016: $2.52B, 750 projects
2017: $2.43B, 702 projects
2018: $2.56B, 726 projects
2019 Projected: $2.20B, 600 projects

Dollars: Billions
# of Projects

Pennsylvania Department of Transportation
### 2020 Program Distribution

<table>
<thead>
<tr>
<th></th>
<th>Cost Based Percentage</th>
<th></th>
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<th></th>
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<tbody>
<tr>
<td></td>
<td>2015</td>
<td>2016</td>
<td>2017</td>
<td>2018</td>
<td>2019</td>
<td>2020*</td>
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<tr>
<td>Highway</td>
<td>69%</td>
<td>53%</td>
<td>64%</td>
<td>60%</td>
<td>70%</td>
<td>63%</td>
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<tr>
<td>Bridge</td>
<td>24%</td>
<td>35%</td>
<td>21%</td>
<td>28%</td>
<td>19%</td>
<td>25%</td>
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<tr>
<td>Other</td>
<td>7%</td>
<td>12%</td>
<td>15%</td>
<td>12%</td>
<td>11%</td>
<td>12%</td>
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## PennDOT Construction Material Quantity & Cost

<table>
<thead>
<tr>
<th>Material</th>
<th>2015 (000's)</th>
<th>2016 (000's)</th>
<th>2017 (000's)</th>
<th>2018 (000's)</th>
<th>2019 (000's)</th>
<th>2020* (000's)</th>
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</thead>
<tbody>
<tr>
<td>Asphalt (Tons)</td>
<td>6,751</td>
<td>6,106</td>
<td>7,591</td>
<td>7,182</td>
<td>6,668</td>
<td>6,004</td>
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<tr>
<td>$/Ton</td>
<td>$77.07</td>
<td>$65.54</td>
<td>$65.77</td>
<td>$71.95</td>
<td>$71.88**</td>
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<tr>
<td>Total</td>
<td>$520,289</td>
<td>$400,159</td>
<td>$499,287</td>
<td>$516,749</td>
<td>$479,279</td>
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<tr>
<td>Structural Concrete (CY)</td>
<td>386</td>
<td>371</td>
<td>359</td>
<td>405</td>
<td>267</td>
<td>248</td>
</tr>
<tr>
<td>$/CY</td>
<td>$972.04</td>
<td>$1,079.49</td>
<td>$950.10</td>
<td>$877.44</td>
<td>$1,136.79**</td>
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<tr>
<td>Total $</td>
<td>$374,932</td>
<td>$400,729</td>
<td>$341,459</td>
<td>$355,226</td>
<td>$303,456</td>
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<tr>
<td>Concrete Paving (SY)</td>
<td>1,007</td>
<td>1,043</td>
<td>802</td>
<td>674</td>
<td>440</td>
<td>671</td>
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<td>$/SY</td>
<td>$117.06</td>
<td>$121.28</td>
<td>$122.59</td>
<td>$124.08</td>
<td>$145.08**</td>
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<td>Total $</td>
<td>$117,902</td>
<td>$126,493</td>
<td>$98,271</td>
<td>$83,679</td>
<td>$63,810</td>
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<td>Aggregate (Tons)</td>
<td>11,587</td>
<td>9,882</td>
<td>10,808</td>
<td>8,997</td>
<td>8,272</td>
<td>8,162</td>
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<tr>
<td>$/Ton</td>
<td>$30.77</td>
<td>$31.20</td>
<td>$27.96</td>
<td>$32.64</td>
<td>$32.51**</td>
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<td>Total $</td>
<td>$356,530</td>
<td>$308,307</td>
<td>$302,181</td>
<td>$293,652</td>
<td>$268,909</td>
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* Estimated Projections  
** Construction Unit Cost
Challenges – Additional Cost Pressures

- Local Roads and Bridges
- Safety and Guiderail Upgrades ($820M)
- Intelligent Transportation Systems ($35M)
- Real ID ($150M through FY 2023-24)
- Driver & Vehicle Services ($9M/yr through FY 2023-24 to reduce customer wait times)

- MS4 Stormwater Compliance ($25.5M/yr)
- Emergency Repairs ($110M over budget to date for FY 2018-19)
- Flooding
- Landslides
- ADA Station Upgrades
- Fleet Replacement ($35M/yr)
- Facility Repairs (PennDOT Buildings) $5M/yr
- Connected & Automated Vehicles

- County Maintenance
- Flat/Declining Budgets
- Aging Fleet/Equipment
- Aging & Deteriorating Buildings
- Difficulty Attracting Candidates; Winter Staffing ($10M/yr)
- Reduced Purchasing Power (Inflation)

Source: Risks to Pennsylvania Transportation Funding Study – Transportation Advisory Committee
Currently, Interstate is funded at <50% of basic cyclic need
  • Directing additional funding to Interstate negatively impacts remainder of system

Even more funding will be needed for:
  • The current backlog of asset needs
  • Modernization (fiber network, ITS expansion, operational improvements, safety and guiderail upgrades)
  • Strategic Investments – selected capacity improvements, interchanges, truck climbing lanes
Pennsylvania’s Interstate System

Statewide Concerns

- Poor/Fair condition of bridges
- Critical Highway and Bridge Preservation
- Highway Preservation is not lasting as long
  - Reconstruction is what’s needed
  - Modernization, Capacity
- Freight/Trucks
- Rest Areas / Truck Parking
Pennsylvania’s Interstate System

Annual Funding Need*

$460 million
- Current Interstate Funding
- Safety Projects

$1.2 billion
- Safety & Cyclic Asset Based Need
- Maintain Existing Highways & Bridges

$1.5 - 3 billion
- Address Safety & Reconstruction Needs
- Modernization
- Strategic Investments

*Needs are based on current dollars, unadjusted for inflation
Pennsylvania’s NHS (non-Interstate)

**Annual Funding Need***

<table>
<thead>
<tr>
<th>$742M</th>
<th>$2.2B</th>
<th>$2.5B</th>
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</thead>
</table>
| • Current NHS Funding  
  • Safety Projects | • Safety & Cyclic Asset Based Need  
  • Maintain existing highway and bridges | • Strategic Investments |

*Needs are based on current dollars, unadjusted for inflation
Pennsylvania Local Network and Bridges

- Local Governments own over 78,000 miles
- Locally owned bridges just over 6,400
  - 28% poor condition (Jan 2015 was 34%)
  - Or $2.3 billion to improve poor condition

Greenfield Ave Bridge
City of Pittsburgh
Flood Impacts

- In 2019, $59 Million total in Emergency Funding
  - 43 projects let (14 projects approximately $10 million related to 2018 flooding)
- In 2018, $125 Million total in Emergency Funding
- Secondary Road Improvement Program impacts
SUSTAINABLE POLICY BASED INVESTMENT

- Asset Management
- Quality Investment
- Core and Cyclical Maintenance
- Green Initiatives
- Recycled Asphalt Pavements
- MS-4
Transportation Asset Management Plan (TAMP) certified by FHWA

- PAMS, BAMS
- Adding Guiderail, Drainage, others?
- Program Roads and Bridges Differently?
- Improved rehabilitation techniques?
- Better Preservation Tools and Processes?
Lowest Life Cycle Cost (LLCC)

- Federally Mandated
- NHS Routes
- Risk-Based Prioritization
- Emphasis on Preservation
- Eliminates “Worst First” Approach

A series of well-timed preservation activities extends life, maintains the asset at a higher performance level for longer, and lowers the total cost per year.
Quality

- TQI
  - Design
  - Construction
  - Procurement

- RAC
  - Reformatted Approach

- STIC
  - Restructured

- QICs
Activities and Accomplishments

- Stone Matrix Asphalt (SMA)
- Longitudinal Joint Density
- High Friction Surface Treatments (HFST)
- Minimum Effective Asphalt
  - 9.5 mm Project Data Collection
- Full Depth Reclamation (FDR)
- Percent Within Limits (PWL)
Activities and Accomplishments (continued)

- Long Life Asphalt Pavement (LLAP)
- High RAP Mixes
  - 19 mm High RAP WMA Binder/Leveling Course
  - 9.5 mm High RAP WMA Wearing Course
  - 25 mm High RAP WMA Base Course
- SMA with RAP
- NECEPT Subcommittee
  - Course Materials Update
  - Technician Performance Evaluation
- Mixture Performance Testing Subcommittee
Quality – Trends & Targets

CY 2019 - All 9.5 mm Wearing Courses – Std. Dev. for Asphalt Content

Blue = AC Std. Dev.
Red = % Sublot Results within ±0.2 of JMF Target
Cyclical Maintenance

- Cyclical Maintenance – defined work that requires to be carried out on an agreed cycle and can be performed annually or on a defined cycle.
- Cycles may vary based on;
  - Geography
  - Climate
  - Budget
  - Treatment Life Expectancies
- Long Term Cost Savings
Secondary Road Improvement Program

- Low cost treatments
- Minimum of 2” structure
- Roadway Criteria
  - Up to 1,500 ADT and up to 75 trucks
    1. Recycled Asphalt Paving (RAP)
    2. Flexible Base Paving (FB)
    3. High RAP WMA Binder Overlay
  - 1,500 to 3,000 ADT and up to 300 trucks
    1. Recycled Asphalt Paving (RAP)
    2. High RAP WMA Binder Overlay
  - 3,000 to 5,000 ADT and up to 750 trucks
    1. High RAP WMA Binder Overlay
    2. Traditional Warm Mix Asphalt Binder Overlay
  - 107 Miles RAP Paving, 294 miles High RAP
Green Initiatives - RAP

Reclaimed Asphalt Pavement (RAP) Usage Trend in HMA & WMA

Virgin HMA/WMA  HMA/WMA w/ RAP


With RAP
Without RAP
Green Initiatives - RAP

Amount of RAP Milled from Pavements

District

D1 D2 D3 D4 D5 D6 D8 D9 D10 D11 D12

Tons

0 100,000 200,000 300,000 400,000 500,000 600,000 700,000 800,000 900,000 1,000,000

2017 2018 2019

Green Initiatives - RAP

Pennsylvania Department of Transportation
19.0mm High RAP WMA Binder/Leveling
9.5mm High RAP WMA Wearing
25mm High RAP WMA Base Course
SMA with RAP
Instructions for Usage

- 100% state funded projects only, no federal funds
- No use on the National Highway System
- Traffic: Maximum 5000 ADT, maximum 300 daily trucks
- Binder/leveling course 2.5-inch minimum average depth
- No use as final surface, mix has no SRL designation
- No use in conjunction with PWL-LTS of PWL-HOLA SSPs
- Not Mandatory for Districts to include in ECMS contracts for projects meeting the use guidelines

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>75,170</td>
</tr>
<tr>
<td>2019</td>
<td>288,417</td>
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<tr>
<td>2020</td>
<td>??</td>
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</table>
Standard Special Provision

- Industry / PennDOT Team (SSP released 9/23/19)
- Supports RoadMaP
- SSP is currently provisional

Use Guidelines for Low Volume Roads

- Only use in 100% state funded projects (No federal funds).
- Only use for low volume roads that meet the following criteria:
  - Maximum Average Daily Traffic (ADT) ≤ 2000 vehicles and,
  - Maximum Average Daily Truck Traffic (ADTT) ≤ 300.
- Minimum design pavement thickness shall be ≥ 1.5”.
- The asphalt mixture’s coarse aggregate Skid Resistance Level (SRL) shall comply with Bulletin 14.
25 mm High RAP WMA Base Course

Standard Special Provision

- Currently in Draft form
- Industry / PennDOT Team working on SSP
- SSP being developed in support of RoadMaP initiative
- eCAMMS Specification thresholds

Use Guidelines for Low Volume Roads

- Only use in 100% state funded projects (No federal funds).
- Only use for low volume roads that meet the following criteria:
  - Maximum Average Daily Traffic (ADT) ≤ 5000 vehicles and,
  - Maximum Average Daily Truck Traffic (ADTT) ≤ 300.
- Minimum design pavement thickness shall be according to PUB 242
**SMA With RAP**

“Second Tier” Premium Mix

- Roads that can Accept Additional Risk

Environmental and Economical Benefits of RAP

- Pavement Performance more Cost Effectively

Current Status

- Pilot Project Districts 11 & 4
- Testing (Rutting & Cracking)
What We’ve Done

- PWL
- Publication 408 Rewrite
- Broader applications of RAP
- Late Season Paving
- Mix enhancements for super pave
- Longitudinal joint density
- Thinlay
- Long life
- Binder overlays
- High RAP Binder
• Closer Adherence to JMF / Increase in Average Density / Decrease in SD
• Incentives/Disincentives
• Publication 408/2020 –NEW Section 413
• Moving to Evaluation Phase Pavement Performance
• Partnership with AASHTO re:source for assessing Labs
• Partnership with Penn State and NECEPT to provide PWT/PWL Training
What’s Next

• Thinlay – broader deployment?
• Fibers in mixes
• RAS
• RAP in SMA
• Shoulder applications
• Quality Consistency
• Rejuvenators
• National Pooled Fund Study on Pavement Preservation
Many Best practices
• MTV required
• Tack Every Layer
• PWL spec
• Incentives
• Longitudinal Joint Spec.

Balanced Asphalt Mix Design Program
• Predict and balance rutting and cracking through performance testing
• Traffic loads
• Weather conditions
• Aging

Future Direction
• Robust research effort
  • Select best performance related perforation test(s)
  • Identify performance related spec. limits
  • To start early 2020
District 2 Potters Mills Gap, SR 0322 B06
- GOH project
- Full depth pavement on new alignment
- Includes asphalt rich base layer
- Paving scheduled 2019 / 2020

District 11 SR 28 A55
- Lindy Paving Project
- Break and seat project
- Paving scheduled 2018

District 4 SR 0084 450
- James Morrissey project
- Full depth asphalt reconstruction
- Includes asphalt rich base layer
- Paving scheduled 2019 to 2022
2019 – Third Year of Outreach Sessions
Small/Diverse Businesses
Training
Industry efforts?
• Deployment is where we struggle

• Office of Operations and Performance
  - Research
  - STIC
  - New Products
  - QIC’s
  - TQI
AASHTO Research and Innovation (R&I)

• Research to Deployment
  – 3 to 5 years
  – How to keep pace with Technology?
  – Tools to enhance Research Implementation

• Developing Innovative Culture
  – AASHTO Innovations Initiative
  – Innovation Community of Practice (iCoP)
Transportation Secretary Leslie Richards kicks off the AV Policy Task Force, Pittsburgh, June, 2016.

PennSTART Test Track
Unmanned Aircraft System (UAS or Drone)
“Planless 2025”

- Time to embrace a new way of doing things
- Get away from “but that’s how we’ve always done it”
- We have the tools we need
- Rethink how we approach – the outcomes are limitless
PennDOT Mobile Applications (Apps)

Currently Deployed

- MC DOCs
- PSA
- Punchlist
- Force Account

- CMH Mobile
- Visual Site Inspection Report
- MPT

Pennsylvania Department of Transportation
RELATIONSHIPS

- PennDOT Connects
- Partnering, Future Leaders, Regional Sessions, Winter Schools
- QIC’s, TQI
- Workforce Development forward?

Effective Partnerships

Be, at all levels, a consistent resource partner to intra-agency offices, outside partners, stakeholders and our customers

- PennDOT consistently builds and strengthens internal relationships
- PennDOT also consistently builds and strengthens relationships with:
  - Local governments and elected state and federal officials
  - Metropolitan Planning Organizations and Rural Planning Organizations
  - Other Commonwealth agencies
  - Transportation-related Associations
  - State and Federal lawmakers
  - Federal agencies
  - Public/Customers
  - Other DOTs and similar agencies
What We’ve Done

Existing QIC’s
- Asphalt Paving Quality Improvement Committee (APQIC)
- Concrete Paving Quality Improvement Committee (CPQIC)
- Aggregate Quality Improvement Committee (AQIC)
- Concrete Quality Improvement Committee (CQIC)

New QIC’s
- Pennsylvania Association of Asphalt Material Applicators Quality Improvement Committee (PAAMA-QIC)
- Cement Quality Improvement Committee (CEMQIC)
- Slag Quality Improvement Committee (SlagQIC)
• National Census Day is April 1, 2020.
• Pennsylvania’s census count will affect the next decade of federal spending, policy, and decision-making.
  – Federal spending on programs like highway planning and construction.
• Everyone counts. Be a good neighbor and spread awareness in your community.
We look forward to working with PAPA and its members in 2020!

Any Questions?
Challenges – Federal Funding Impact

Federal Funding Impact

$6 billion at risk through FY 2029-30

Source: Risks to Pennsylvania Transportation Funding Study – Transportation Advisory Committee
Traffic Speed Deflection Devices (TSDDs)

- Measurement: Deflection Velocity of Pavement
- Speeds up to 60 mph
- 100-200 miles per day
- Determine Existing Structural Condition
- Data Integrated w/PAMS
- Pooled Fund Study TPF-5(385)
- 3 Years @ 300 Miles/Year
- 2019 – 80 Miles of Asphalt Projects- Project Level Assessment
- Other Objectives:
  - Define Data Collection Protocols
  - Use on Composite or Concrete Pavement?
  - Compare to FWD
  - How to Incorporate Data into Pavement Management
  - Define Value Added
Lack of Trained Personnel
  - Seasonal need

HOLA comes with extra costs
  - Overtime
  - Travel
  - Sample security
• Quantities typically not to F&T requirements
• Continue acceptance testing
• QC data consistency – Incentive/Disincentive
• What performance improvement can we achieve?
Performance Based Specifications

Performance related testing
$500,000 balanced asphalt mix design research project.
  • Evaluate cracking tests.
  • Rutting test – Hamburg wheel tracking test.

Cracking Test(s)
(SCB and IDEAL CT)

Hamburg Wheel Tracking Test (HWT)