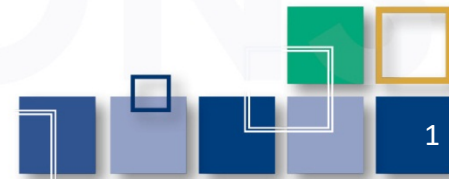


# Pennsylvania Safety Transportation and Research Track (PennSTART)



## Transportation Engineering and Safety Conference

December 13, 2019



## Introductions and Agenda

- Overview and Systems Engineering Process
- Feasibility Study
- Concept of Operations
- System Requirements and Business Plan
- Next Steps and Schedule



- **Overview and System Engineering Process**

INNOVATIONS

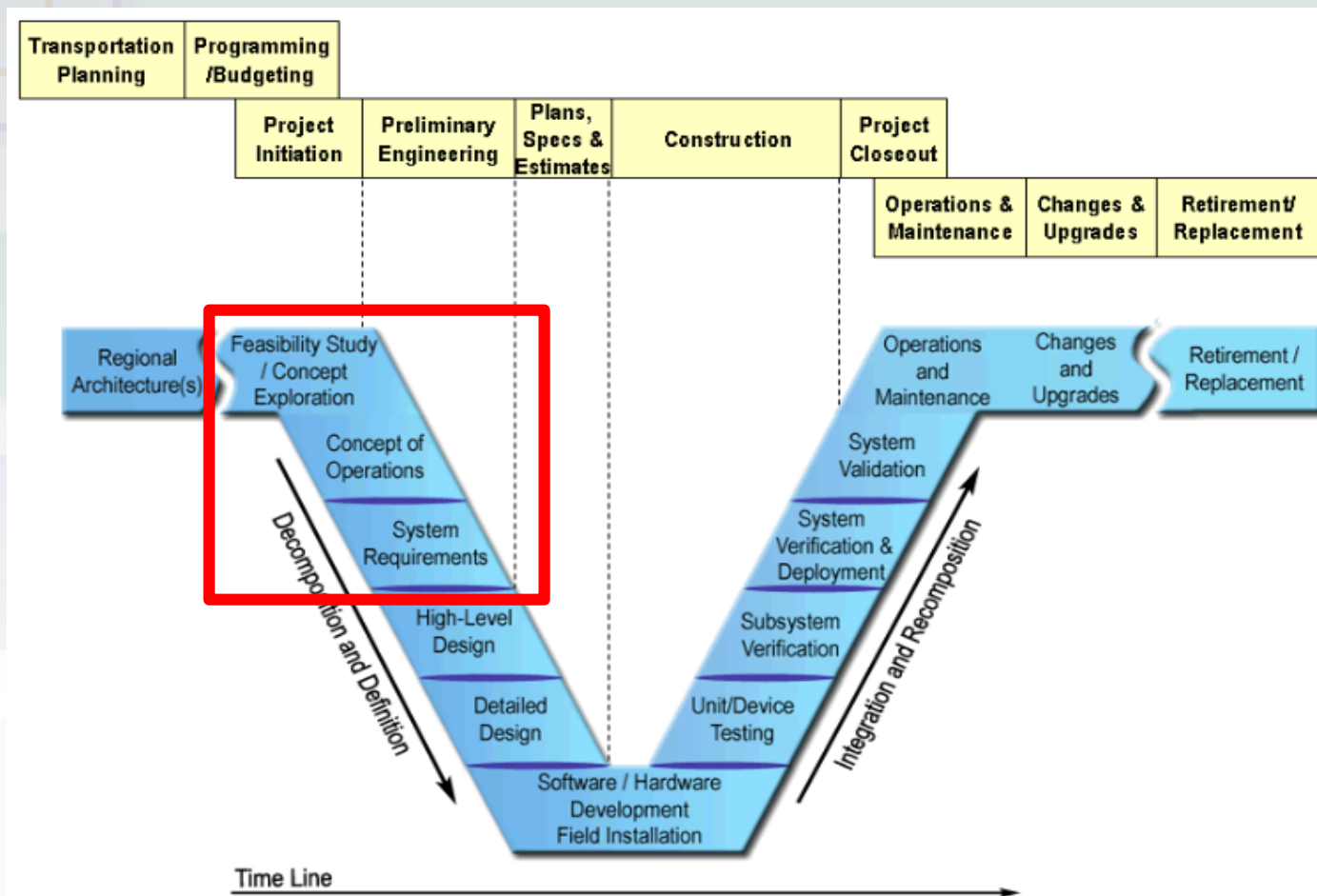
## Overview

- **High-speed test track and transportation facility for research, testing, and training**
- **Designed to accelerate innovation in the areas of:**
  - Safety testing and training for traffic incident management (TIM), work zones, railways and crossings, and aircraft;
  - Connected and autonomous vehicle (CAV) testing; and
  - Tolling and intelligent transportation systems (ITS) technology testing.

## Overview

- **Targets private and public-sector end-users to form a collaborative environment that drives emerging innovation from four sectors:**
  - Public Sector - Testing and Training
  - Private Sector - Testing and Research
  - Voluntary Sector - Training
  - Academic Sector - Testing and Research
- **Spearheaded and lead by a partnership between the PA Turnpike Commission, PennDOT, and Penn State University**

## Systems Engineering Process (SEP)



- **Feasibility Study**

INNOVATIONS

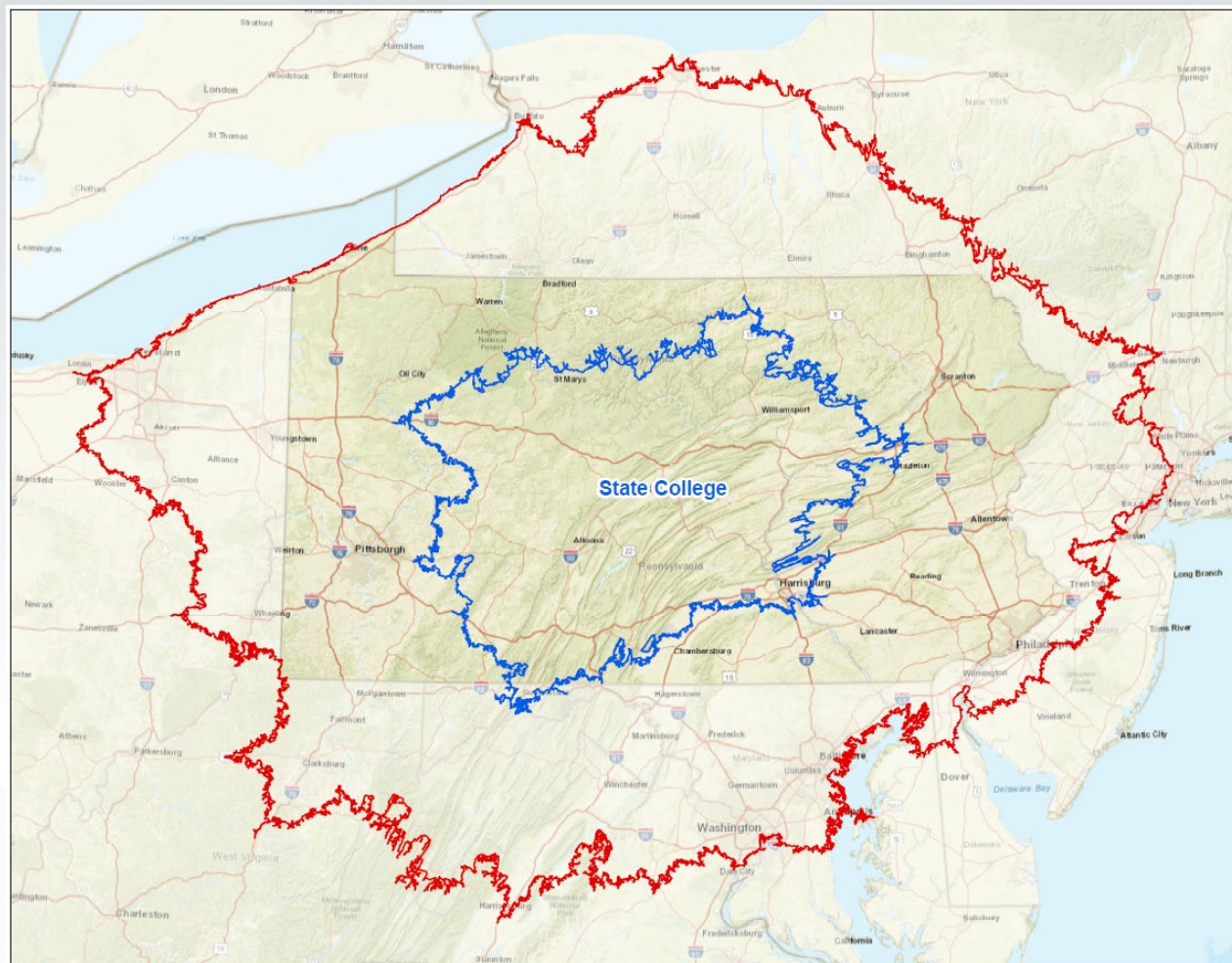
## Feasibility Study

- Partially Funded by the PA Turnpike Commission and PA State Transportation Innovation Commission (STIC)
- Conducted between January 2017 – August 2018
- Defined Purpose and Need, and preliminary operations model and concept plan
- Formalized partnership between PennDOT, PA Turnpike and Penn State







## Site Location Analysis



### Drive Time Analysis

-  Two Hour Drive
-  Four hour Drive

## Dynamic Operations Model



### CONNECTED AND AUTONOMOUS VEHICLE TECHNOLOGY TESTING



### TOLLING AND ITS TECHNOLOGY TESTING

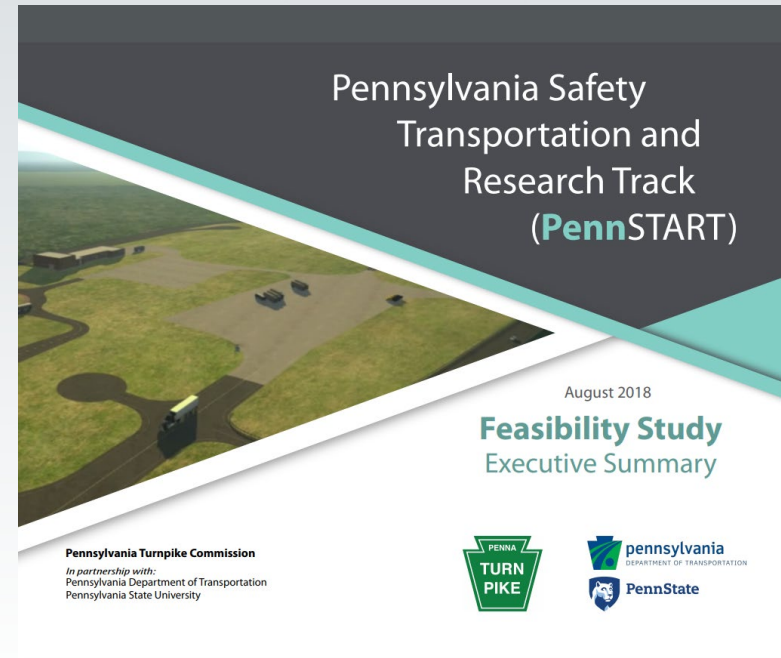


### SAFETY TESTING AND TRAINING



## Feasibility Study Findings

- ~110 acre site, 1.5 mile track
- Multimodal demand
- Research, education, training demand
- Defined grant opportunities
- Preliminary cost estimates
  - ~\$22.1 million for track
  - ~\$1.3 million land
  - ~\$10 million academic building
  - ~\$7.1 million funding gap



# Pennsylvania Safety Transportation And Research Track (PennSTART)

This is an initial schematic conceptual plan and will be updated as the project progresses

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
X-X	XXXX	XXXXXX	XXX	OF XX
REVISION NUMBER	REVISIONS	DATE	BY	

- 4 Point Roundabout with area for Green Space
- Rural Intersections
- Urban 4 Point Intersection (Leg 1 Simulates Multilane through with right turn only, Leg 2 Simulates Multilane through with left turn only, Leg 3 Simulates Left turn and Right turn only with concrete island and signal, Leg 4 Simulates a Typical Intersection layout with left turn into a rural intersection)
- Automation Test Loop (Will have sections to simulate Type 31-5 guide rail, Cable systems, and Concrete Jersey Barrier.)
- Typical Bridge Section with embankments
- Truck Turnaround area
- Academic Building with Classrooms and Labs and Garage
- Parking Lot Currently Showing 160 spaces
- High Speed Testing with Return Loop
- Truck Parking and Staging Area with Smart Truck Parking capabilities
- 6 Lane Highway Section with on ramp and off ramp simulations
- Overhead Tolling Gantry
- City Simulation with Small Radii
- Helpad
- Active Traffic Management System
- Signalized Urban Corridor
- Railroad at Grade Crossing
- Signalized Rural/High Speed Intersection
- Queue Preemption
- Ramp Meters
- Aircraft Rescue Fire Fighting and Training Simulator
- Potential Roadway Flooding Area

## PENNSYLVANIA SAFETY TRANSPORTATION AND RESEARCH TRACK (PennSTART)

- AVIATION SIMULATOR
- HIGH SPEED TRACK
- TIM FACILITY USE
- AUTONOMOUS VEHICLE USE
- PARKING AND STAGING AREAS
- ACADEMIC BUILDING AND GARAGE

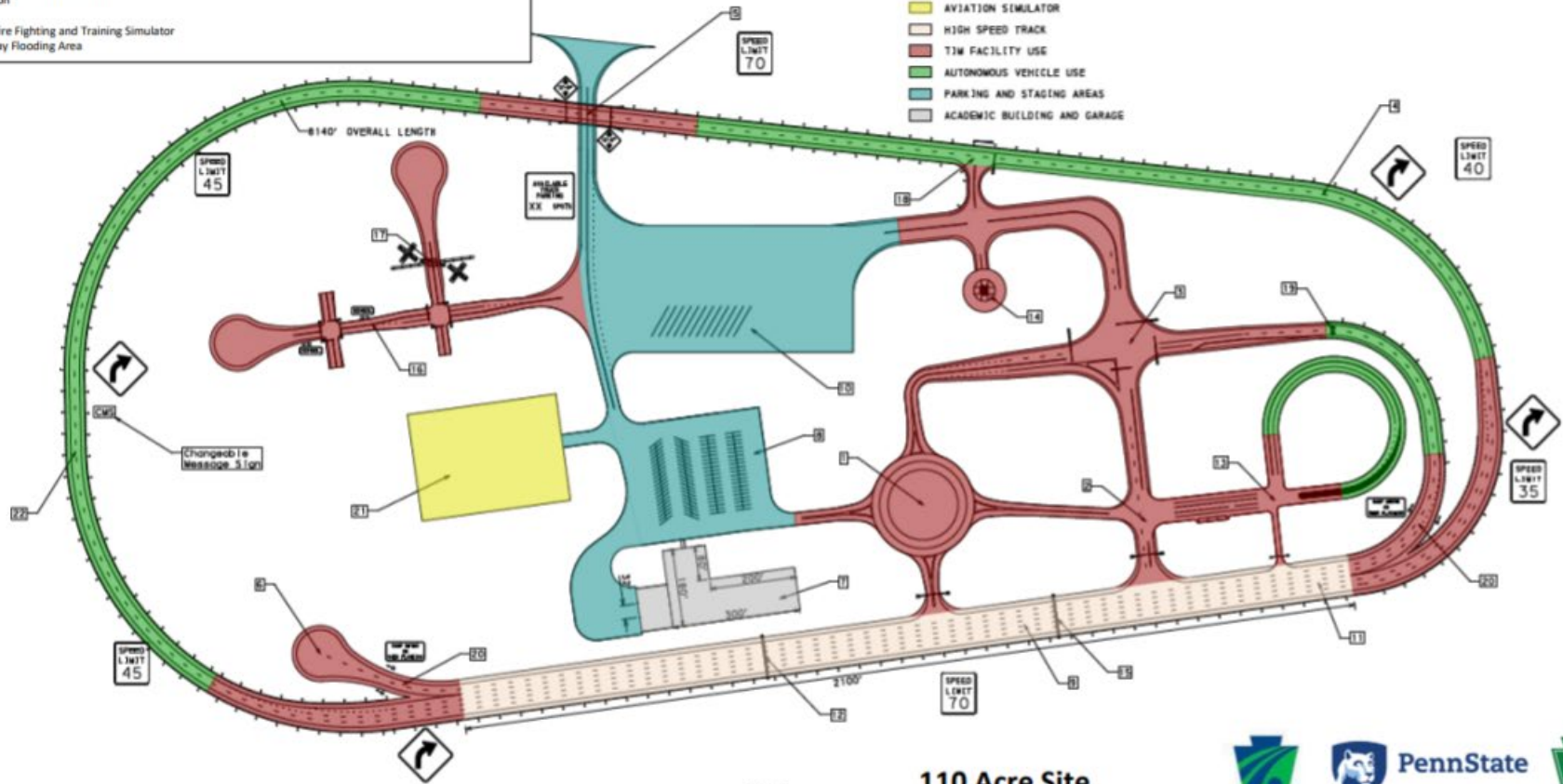


Figure 6-1. Schematic Design of the PennSTART Facility

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- **Concept of Operations**

INNOVATIONS

## What is a Concept of Operations?

*WHAT*

- What are the known elements and the high-level capabilities of the system?

*WHERE*

- What are the geographical and physical extents of the system?

*WHEN*

- What is the time sequence of activities that will be performed?

*HOW*

- What resources do we need to design, build, or retrofit the system?

*WHO*

- Who are the stakeholders involved with the system?

*WHY*

- What does your organization lack that the system will provide?

# Concept of Operations (ConOps)

- November 5, 2018 ConOps Workshop – Harrisburg, PA
- 80 stakeholder participants:
  - Traffic Incident Management & Work Zone Safety
  - ITS/Tolling
  - Connected and Autonomous vehicles (CAV)
  - Commercial and Transit vehicles
  - Crossing Safety (Rail, Bicycle, Pedestrian)
  - Aviation, UAV, Simulator



# Pennsylvania Safety Transportation And Research Track (PennSTART)

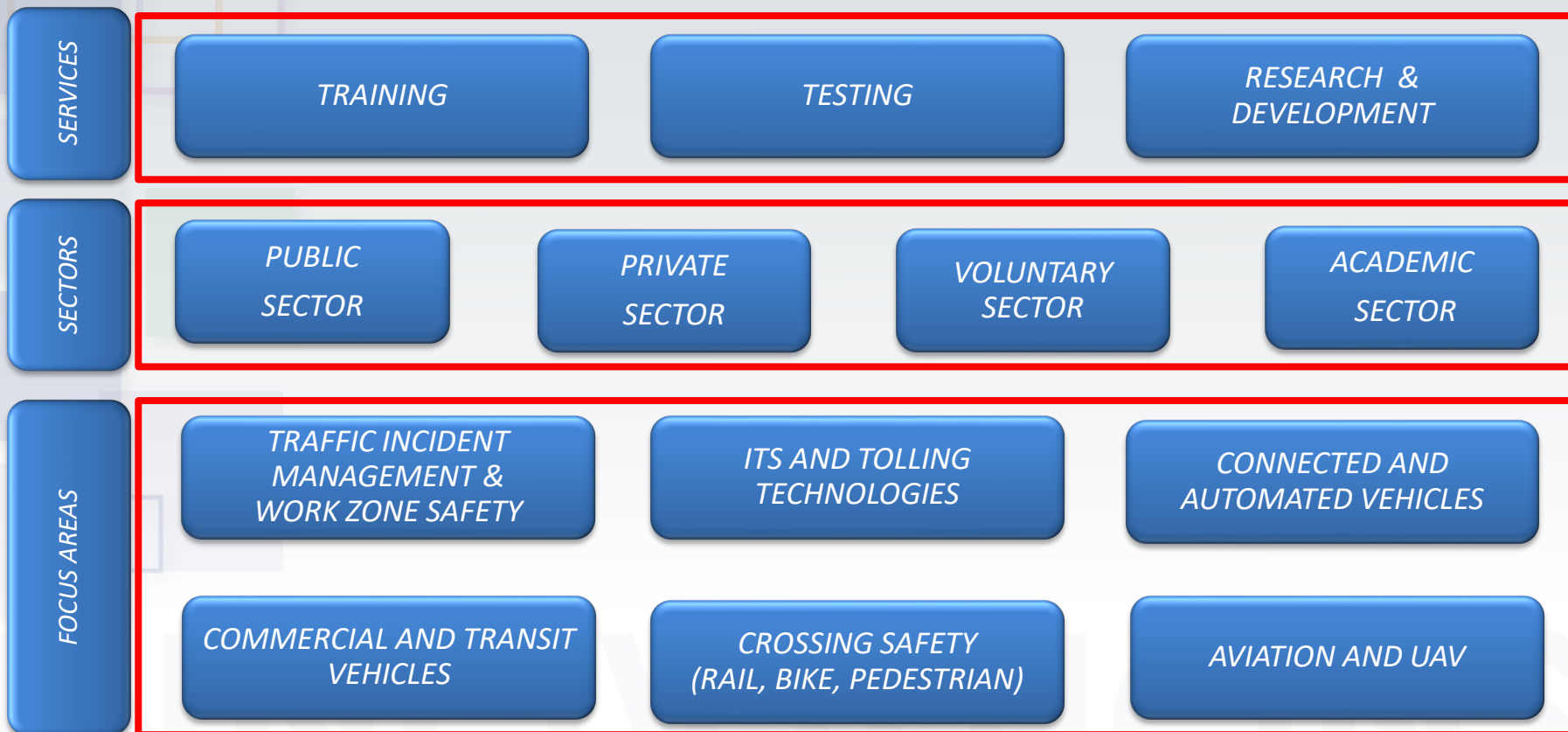
## Proposed ConOps Document Outline

1. Scope
2. User-Oriented Operational Description
3. Operational Needs
4. System Overview
5. Operational Environment
6. Support Environment
7. Operational Scenarios

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## User Needs



# Pennsylvania Safety Transportation And Research Track (PennSTART)

## TIM & Work Zone Safety

- Law Enforcement
- Fire and Rescue
- Towing
- Roadside Maintenance

## ITS and Tolling

- Tolling
- Traffic Signals and Arterial O&M
- Camera/DMS Technology
- Communications/IT
- TMC and Data Analytics

## Connected and Automated Vehicles

- Freeway and Highway System Components
- Signalized and Unsignalized Intersections
- Non-Motorized Transportation Modes
- Digital Infrastructure
- Product Testing and Development
- AV Shuttles

## Commercial and Transit Vehicles

- Transit Operations
- Truck Platooning
- Truck Parking
- Freight Movement
- Training

## Crossing Safety

- Railroad
- Bicycle
- Pedestrian

## Aviation and UAV

- Aviation Rescue and Simulator
- UAV
- Airport Facility Maintenance
- Helicopter Landing Zone

# Pennsylvania Safety Transportation And Research Track (PennSTART)

## www.PennSTART.org

PennSTART

[PennSTART Feasibility Study Executive Summary](#)

[PennSTART ConOps](#)

Welcome to  
Pennsylvania Safety Transportation and  
Research Track (PennSTART)

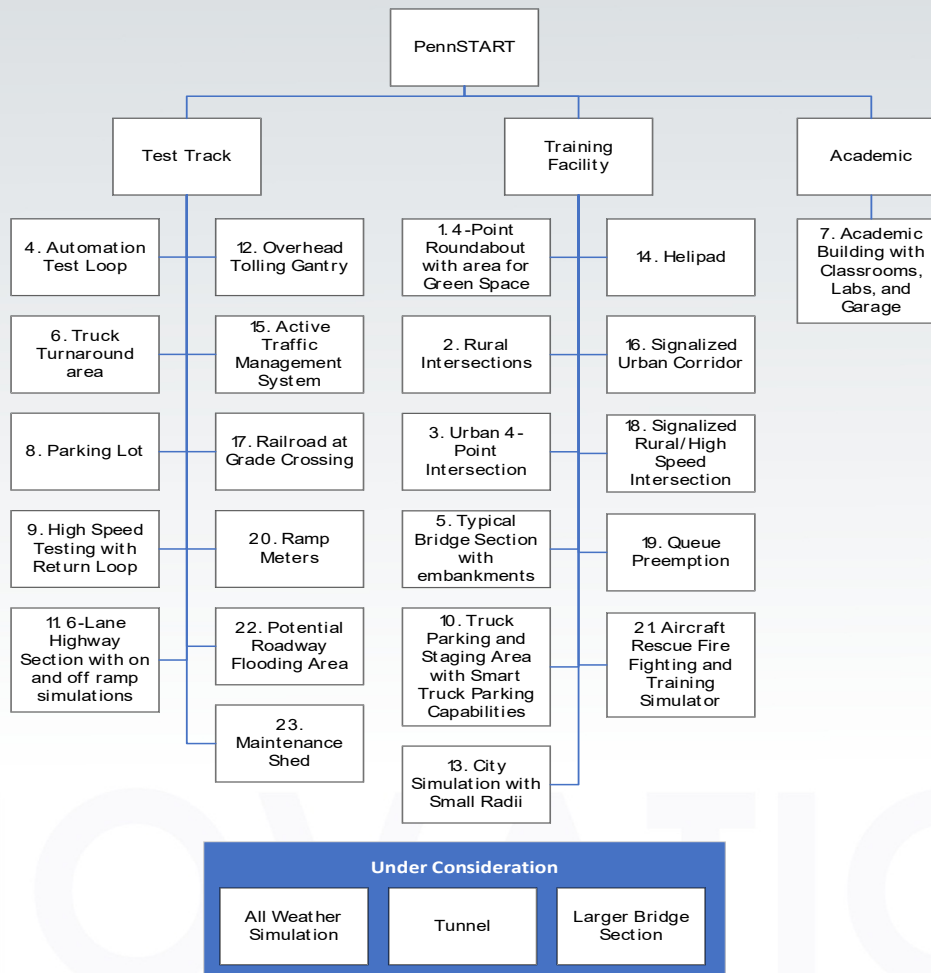
[LEARN MORE](#)

PennSTART is a state-of-the-art facility that will benefit emergency responders, transportation organizations, and research institutions.

- **System Requirements and Business Plan**

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## PennSTART Facility Elements



## Types of Requirements

Requirements govern what, how well, and under what conditions a product will achieve a given purpose.

- **Functional (FN) - What**
- **Performance (PR) – How Well**
- **Non-Functional (NF) – Under What Conditions**
  - Physical (PY)
  - Availability and Recovery (AR)
  - Maintainability (MT)
  - Storage and Transport (ST)
  - Disposal (DP)

## General Requirements - Track

- **Track lighting – individual controllable**
- **Designed to applicable local, state, and national standards**
- **Installed field devices**
  - RSE (DSRC coverage)
  - Intersections signals/controllers
- **Communication throughout the facility**
  - Fiber
  - Wireless Wide Area Network
- **Back-up Power**
- **Fenced and Gated Facility**
- **24/7 monitoring**

## General Requirements – Academic Building

- **Potential LEED Certified**
- **Designed to applicable local, state, and national standards**
- **Building Components**
  - Front desk
  - Classrooms
  - Restrooms
  - Coatroom
  - Server area
  - Storage area
  - Mini-TMC
- **Indoor and outdoor cameras**

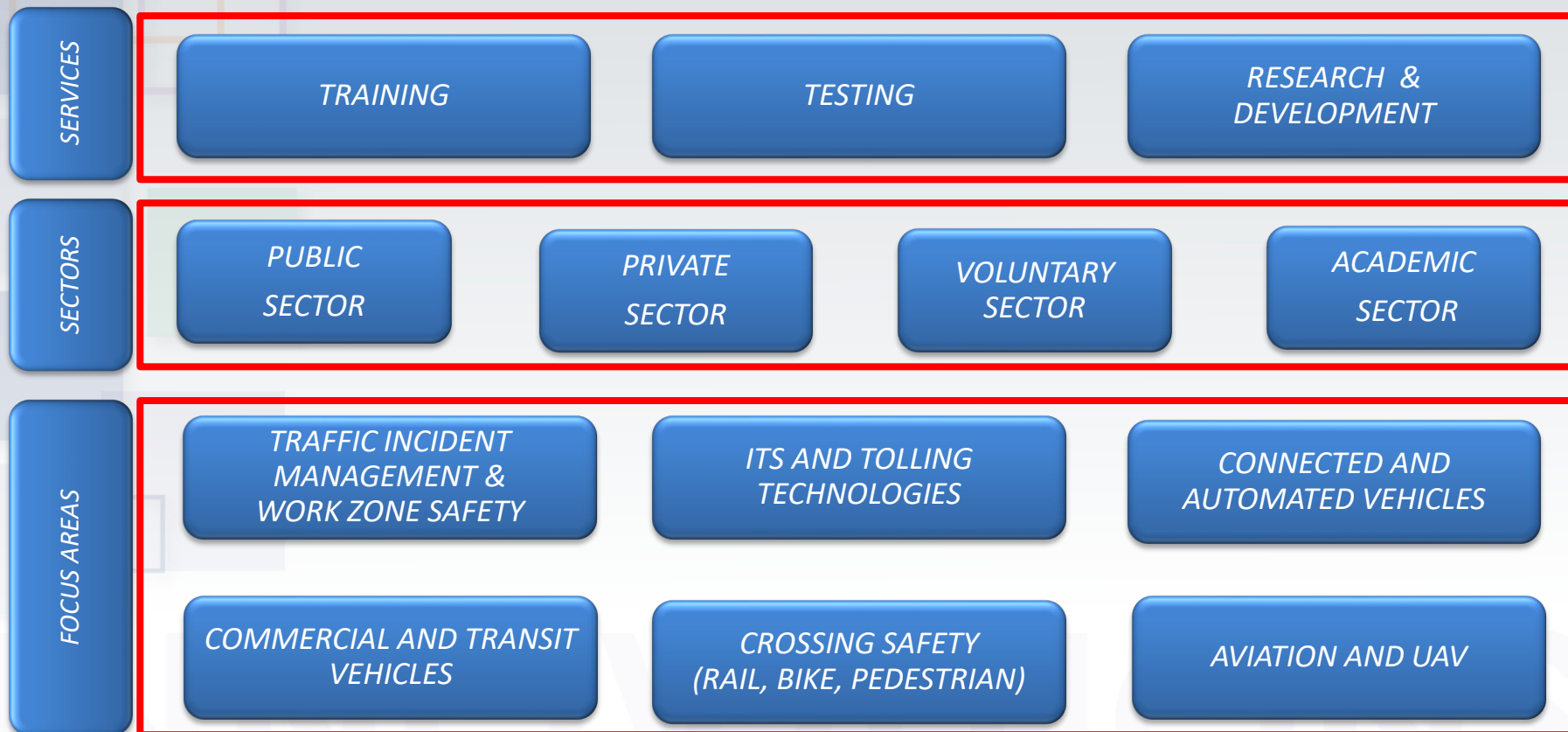


## Business Plan Outline

- Introduction
- Market Needs and Services Provided
- Business Model
- Implementation Strategy
- Project Funding
- Partnership Opportunities

INNOVATIONS

## Market Needs and Service Provided



## Business Model - Value Propositions

- Location/Accessibility
  - Convenience/Usability
  - Design/Features
  - Customization
  - Newness
  - Cost Reduction
  - Risk Reduction
  - Price Competitiveness
  - Multiple Focus Areas
- PSU/PennDOT/Turnpike
  - Type of Uses
    - R&D
    - Education
    - Training (Technology Transfer)

## Business Model – Key Activities

- **Plan for Operations and Maintenance**
  - Day-to-day Planning
  - Continuous Improvement
- **Operate the facility**
  - Organize leases
  - Schedule
  - Move stuff
- **Maintain the Facility**
  - Cleanup; lawn mowing; snow plowing
  - security
- **Marketing/Sales**

## Business Model – Key Staffing

- CEO/Test Track Manager
- CTO/Office Manager
- Finance Director
- Safety Officer
- On-Site Technical (2)
- Administrative Support
- Building Maintenance (0.5)
- On-Site Security (5)
- Physical Plant Support

## Business Model – Cost

- **Planning/Design – PennDOT/PA Turnpike**
- **Construction**
  - Phase 1
    - ✓ Track, in-field facilities
      - Total estimate - \$23.4 M
      - Total commitments to date – \$16.3 M
      - Gap - \$7.1 M (Grants, Sponsorships, others?)
    - ✓ Phase 2 (Future)
      - Academic building - \$10 M
      - Aircraft rescue and firefighting simulation - \$3.5 M
      - Grants, Sponsorships/Others
- **O&M**
  - Usage Fee
  - Advertising/Sponsorship
  - R&D (Over head)

# Partnership Opportunities

- Strategic Alliances (with non-competitors)
- Cooperative (with competitors)
- Joint Ventures (new businesses being formed)
- Buyer-Supplier (assuring reliable supplies)
- Industry partners
- R&D partners

INNOVATIONS

- **Next Steps and Schedule**



## Next Steps

- **Current Systems Engineering Phase:**
  - System Requirements Gathering
  - Business Plan Development
  - May 16, 2019 Workshop
  - Estimated Completion: Fall 2019
- **Future System Engineering Phases:**
  - Engineering and Design
  - Construction
  - Initiate Operations and Maintenance
  - Perform Changes and Upgrades

# Pennsylvania Safety Transportation And Research Track (PennSTART)

## Schedule



## “Struck by” Deaths

109 - Law Enforcement

70 - PennDOT

40 - PA Turnpike

21 - Fire and Rescue

15 - Towing & Recovery

3 - EMS



# Questions/Comments

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