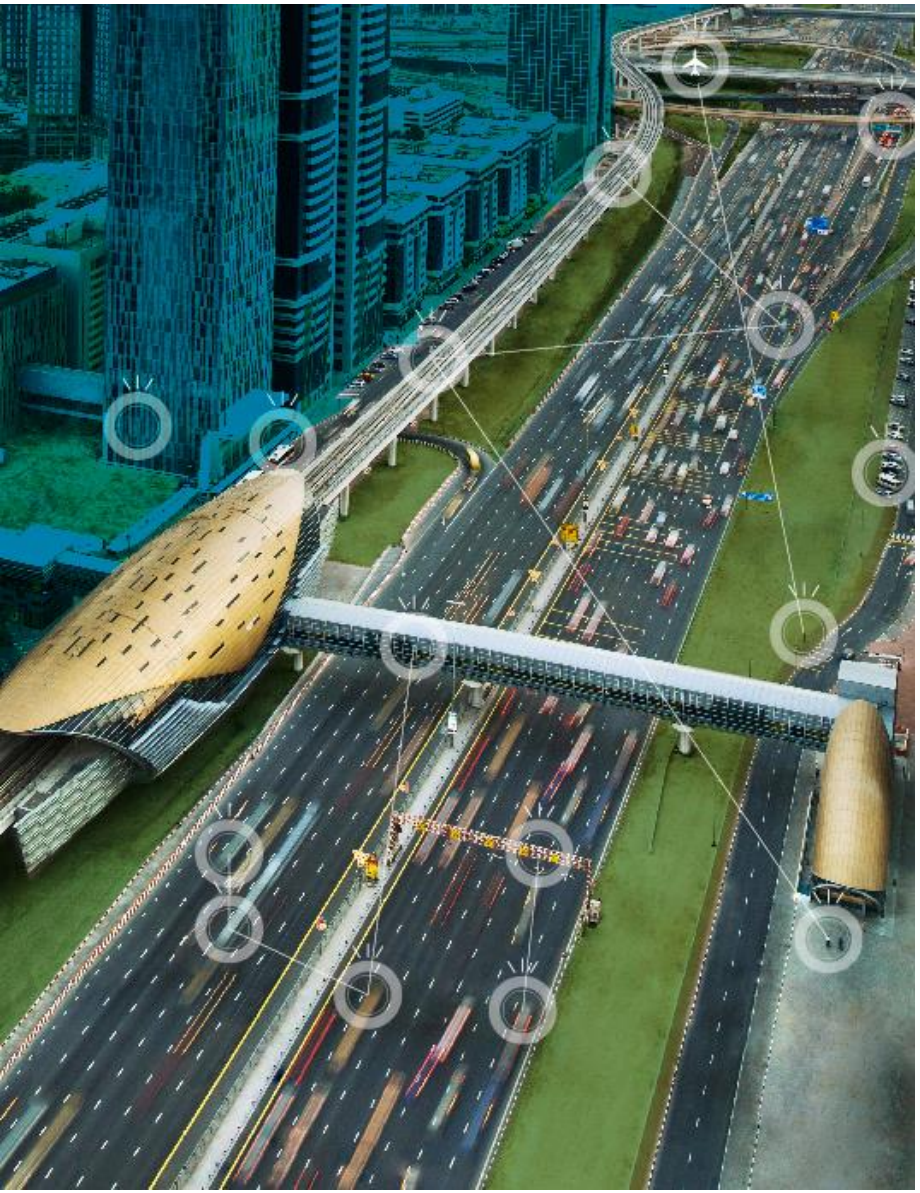

HNTB AUTOMATED VEHICLE PROGRAMS:

From Planning to Deployment

Jim Barbaresso

Fellow and Senior Vice President

HNTB Corporation

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SIP

U.S. AUTOMATED VEHICLE POLICY ENVIRONMENT

Source: General Motors

- Updated USDOT Policy (3.0) released October 4, 2018
  - Upcoming rulemaking on exemptions to vehicle safety standards
  - Reaffirms self-certification approach
  - Plans for MUTCD update
  - Eliminates USDOT proving ground designations
  - Focus on freight automation
  - Focus on safety – preservation of 5.9GHz
- SELF DRIVE Act passed by the House
- Senate version (AV START Act) stalled
- Industry leading the way
- Dynamic mobility ecosystem

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EARLY AUTOMATED VEHICLE BUSINESS CASES

- Urban applications – ride-hailing services and fleets of shared use vehicles
- First and last mile mobility opportunities
- Residential and campus circulation
- Highway maintenance operations
- Truck automation and platooning

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TRANSITIONING ON OUR HIGHWAYS

- Managed lanes in a new context
- Should we separate automated vehicles from others to generate the most benefits?
- At what penetration rate should we dedicate a lane?
- Incrementally increase the number of special lanes as the fleet turns over?

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AUTOMATION REQUIRES PLANNING, TESTING, & PILOT PROJECTS

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AV Policies & Planning

- Legislation and Regulation
- Long-Range Planning and Guidance Documents
- Short-Range Budgeting and Program Development

AV Proving Grounds

- Need for Controlled Environment for Testing and Validation of Use Cases
- Development of Infrastructure Design Criteria for Emerging Operational Design Domain

AV Pilots

- Deployment of Early Use Cases on Public Highways
- Partnerships with Industry to Support Deployment Scenarios

SCALED DEPLOYMENT

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HNTB AV EXPERIENCE IN ALL PHASES OF THE DEPLOYMENT LIFE-CYCLE

AUTOMATION REQUIRES PLANNING

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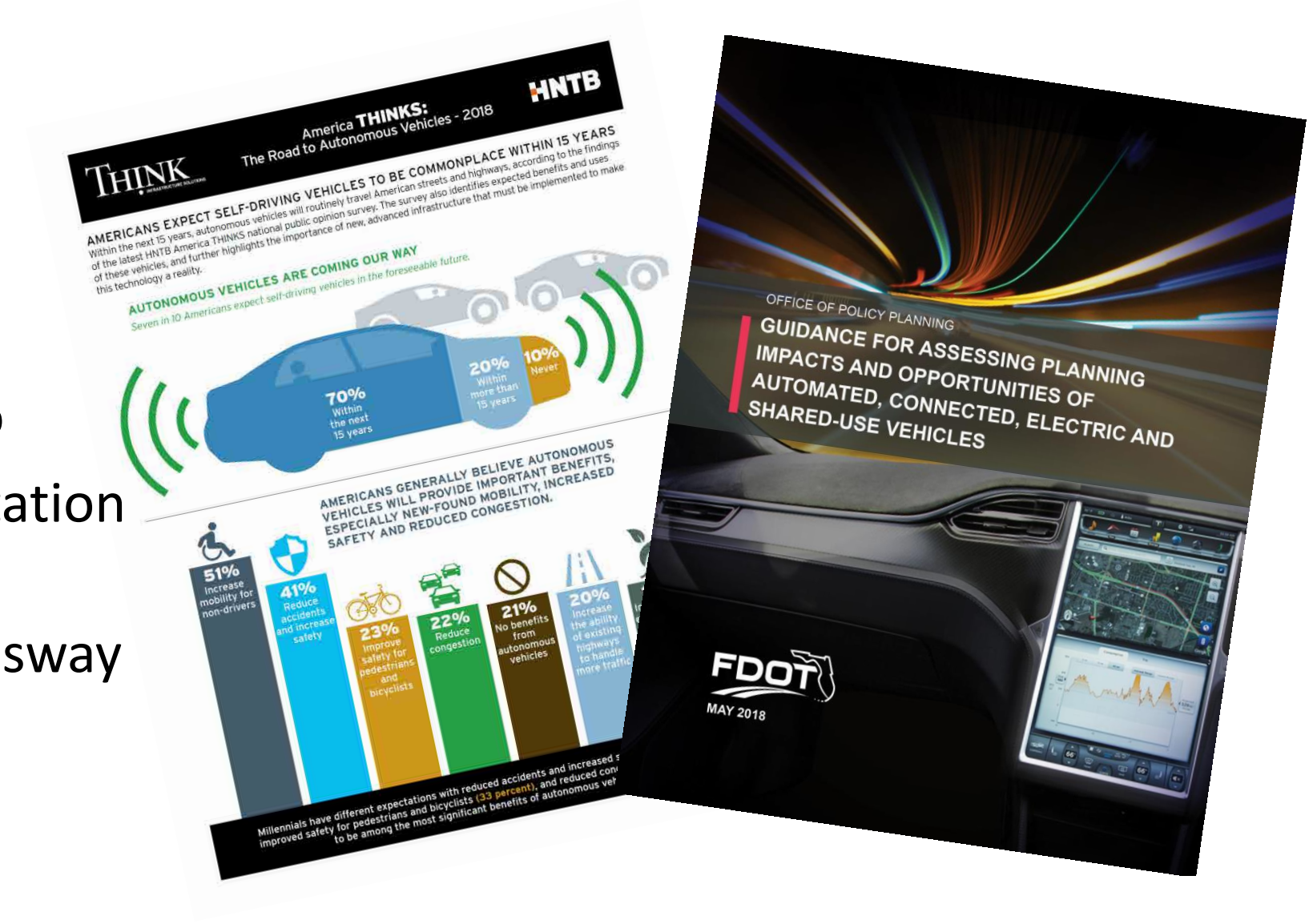
AV PLANNING AND POLICY DEVELOPMENT

- Florida DOT
- Virginia DOT
- Tennessee DOT
- Pennsylvania DOT
- Smart Columbus Ohio
- Jacksonville Transportation Authority
- Central Florida Expressway Authority



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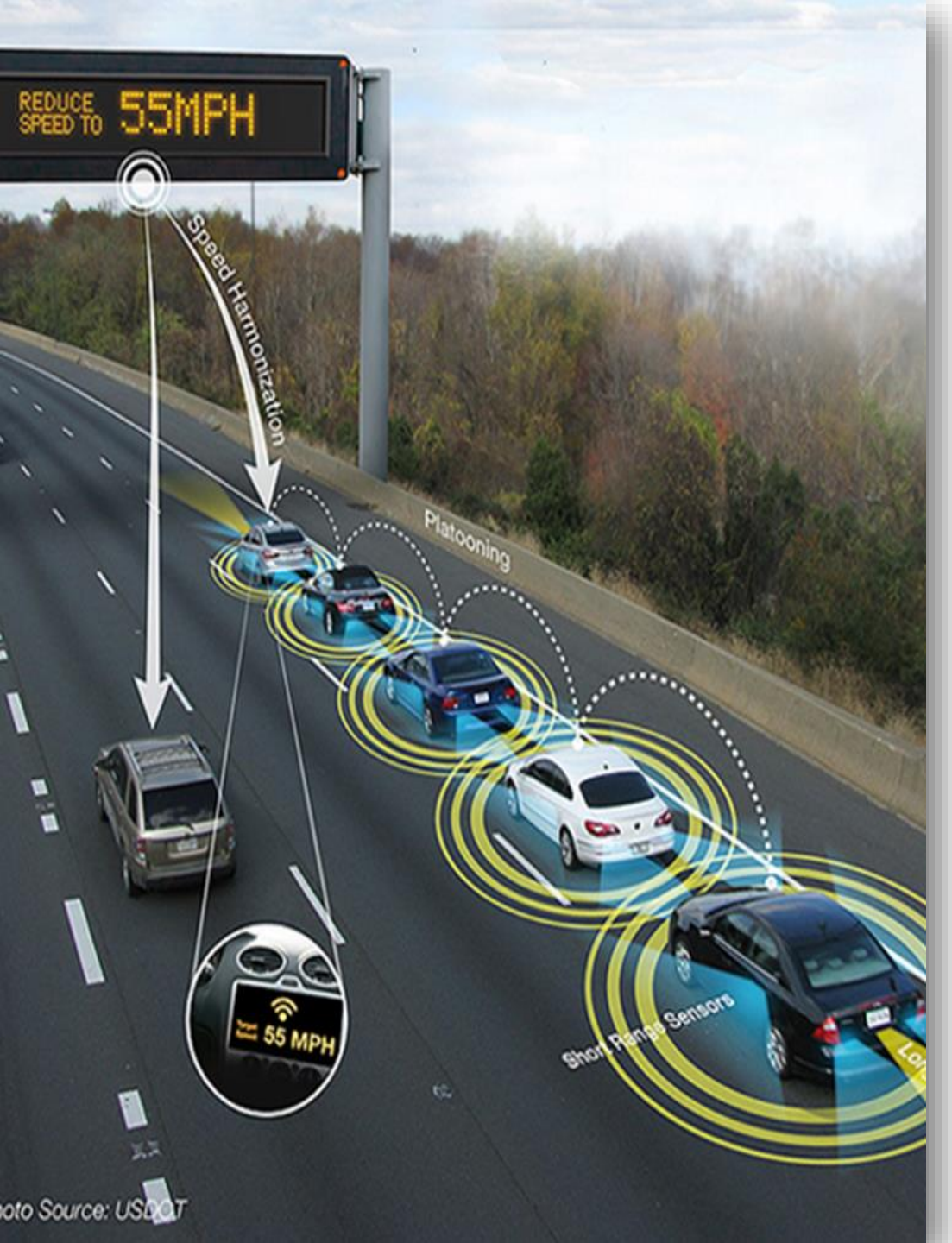

FLORIDA DOT CASE STUDY

- Florida DOT Automated Vehicle Support
  - Policy
  - Planning
  - Pilot project support
  - Intermodal applications
  - Education and outreach
  - Stakeholder engagement
  - Industry engagement
  - Annual Automated Vehicle Summit (November 26-28, 2018)

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AUTOMATION REQUIRES TESTING

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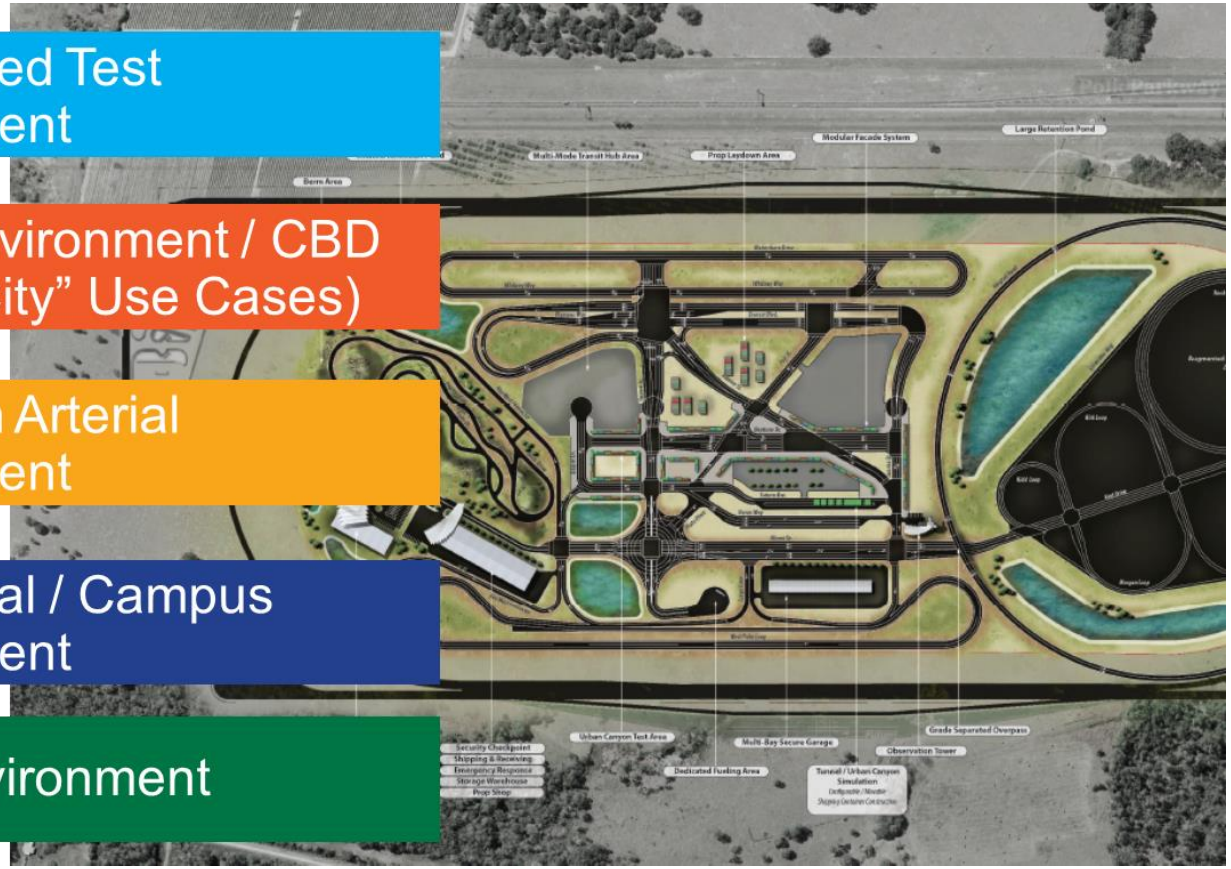
High-Speed Test Environment

Urban Environment / CBD ("Smart City" Use Cases)

Suburban Arterial Environment

Residential / Campus Environment

Rural Environment



AV PROVING GROUND DESIGN & DEVELOPMENT

- Florida Turnpike Enterprise SunTrax
- Pennsylvania DOT PennSTART Test Facility
- American Center for Mobility
- North Carolina Turnpike Authority AV Proving Ground

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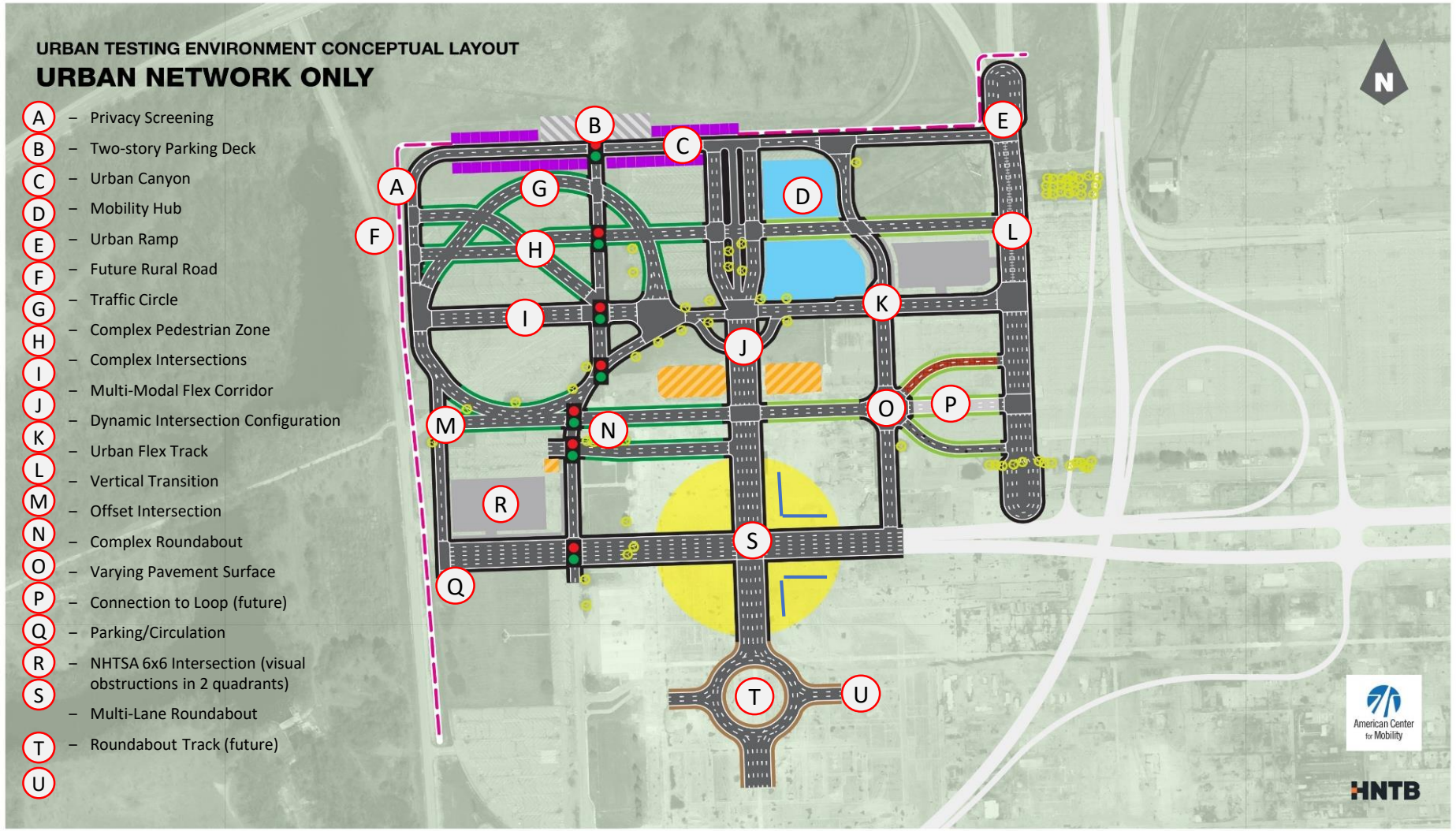
AMERICAN CENTER FOR MOBILITY CASE STUDY



- Design of Urban Environment
- Construction Engineering for High-Speed Loop

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AUTOMATION REQUIRES PILOT PROJECTS

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HNTB AUTOMATED VEHICLE PILOT PROJECTS

- Lincoln Tunnel Automated Exclusive Bus Lane Pilot
- Jacksonville Transportation Authority (JTA) Ultimate Urban Circulator Technology Support Services
- Hillsborough Area Transit Authority (HART) AV Shuttle Pilot
- SFCTA Treasure Island AV Shuttle Pilot
- Smart Columbus
- Florida Truck Platooning

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TREASURE ISLAND CASE STUDY

- San Francisco County Transportation Authority
- Working with transit agency to support AV solutions for new development
- Part of a larger mobility management initiative

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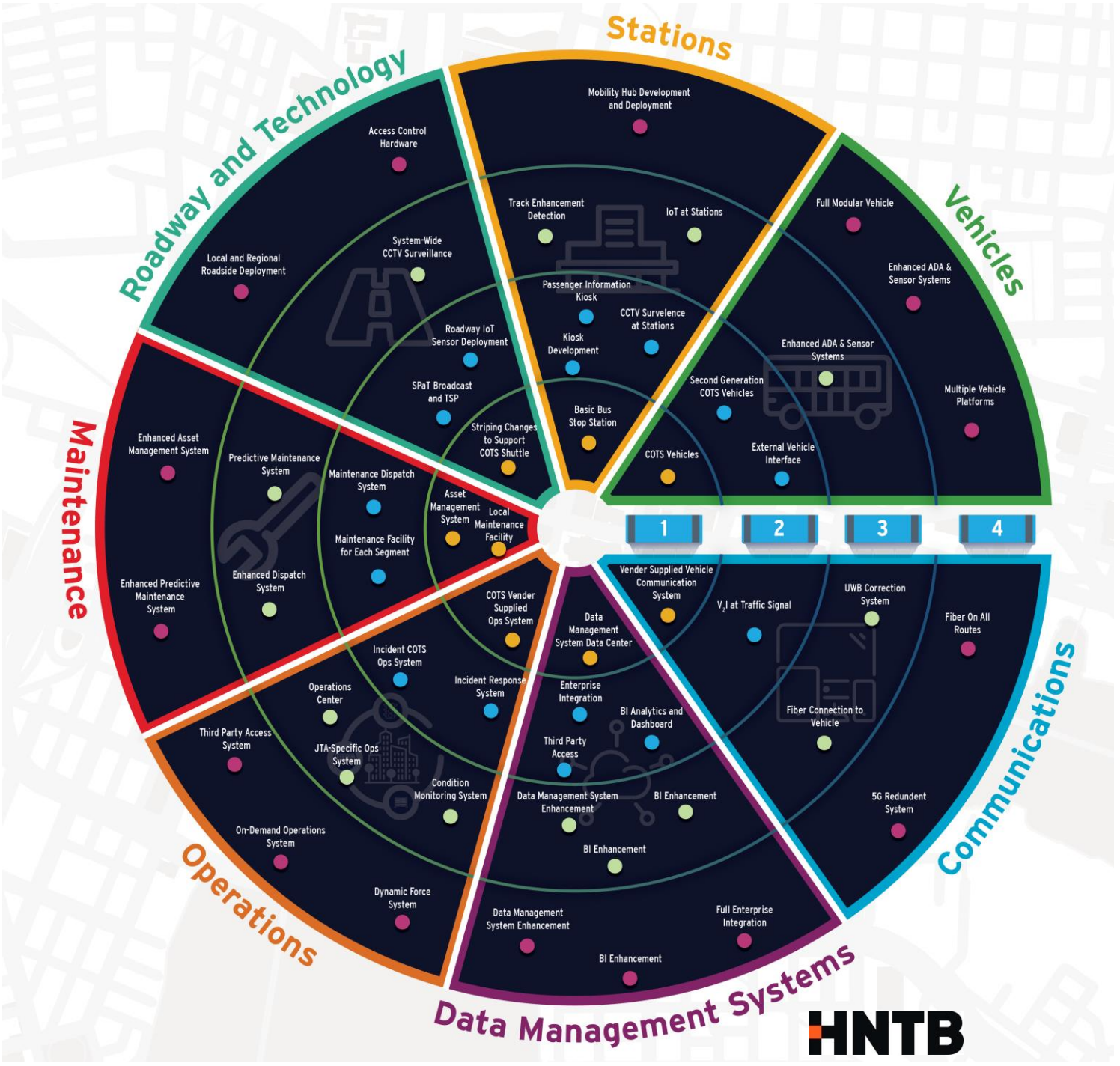
JTA ULTIMATE URBAN CIRULATOR CASE STUDY

- Phased, large scale pilot of automated transit solution
- Replacement of aging people mover in downtown Jacksonville
- Flexible AV environment
- Requires infrastructure changes, data management and operational control, communications network enhancements, and connectivity



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AUTOMATION WILL TRANSFORM OUR FUTURE

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INFRASTRUCTURE IMPACTS

- Traffic signalization impacts
- Signage and road markings
- Seamless travel between roads and modes
- If cars don’t crash

Source: University of Texas

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WHAT LIES AHEAD?

- More VMT or less?
- Less parking?
- Private versus fleet ownership models?
- Impacts on transit?
- Climate impacts?
- Quality of life

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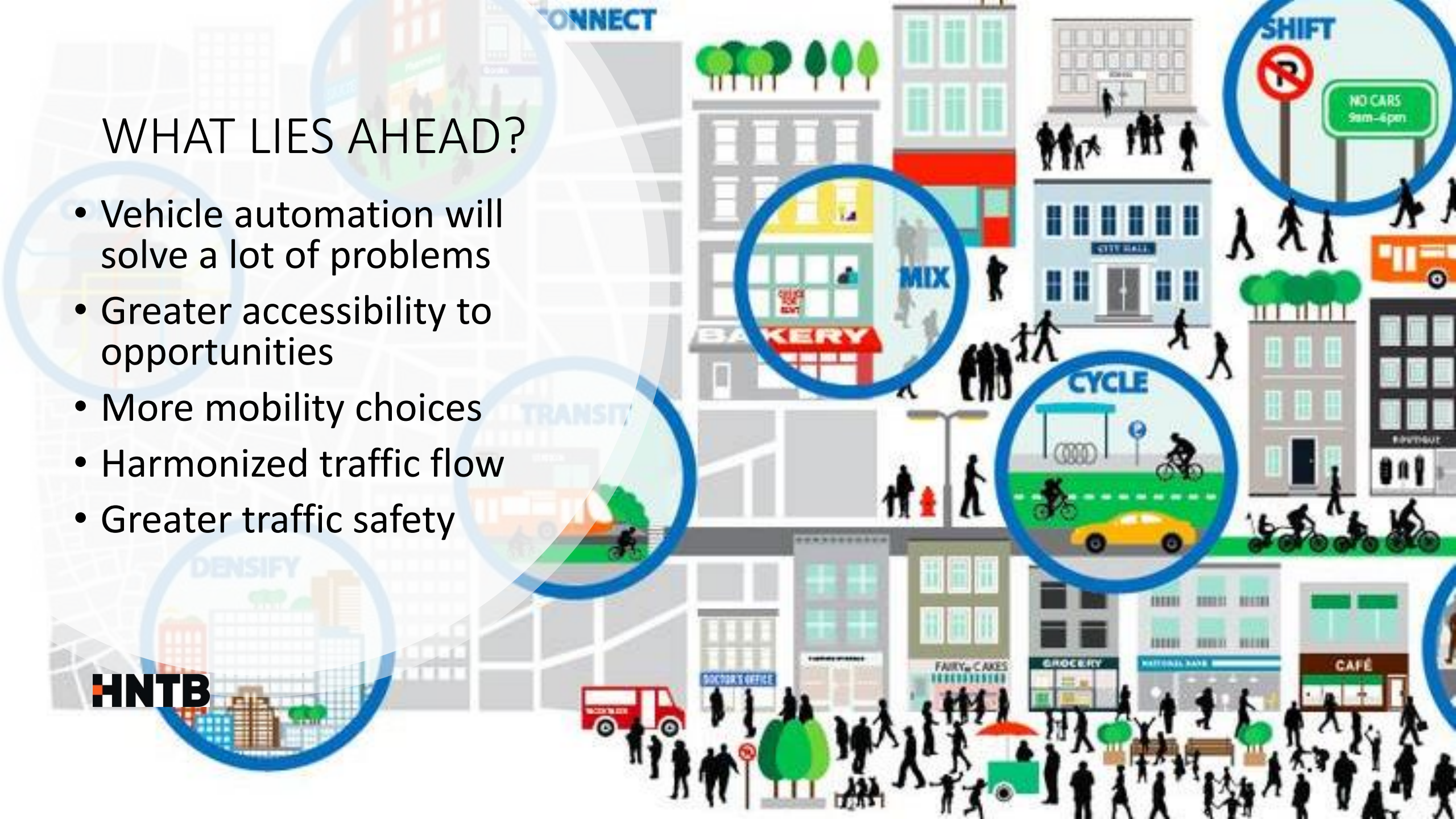
WHAT LIES AHEAD?

- Vehicle automation will solve a lot of problems
- Greater accessibility to opportunities
- More mobility choices
- Harmonized traffic flow
- Greater traffic safety



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WHAT LIES AHEAD?

- On the other hand…
- Vehicle automation may promote longer commutes
  - Work, sleep, eat on your ride
- Impacts:
  - Urban sprawl
  - Large lot developments and rural transformation
  - Property value decreases in urban core
  - Decentralization of housing and jobs to exurban areas
  - Additional strain on infrastructure

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WHAT LIES AHEAD?

- “Nomadization”
  - Untethered to place
  - Work, sleep, eat and live in your automated vehicle
  - Highways as homesteads
  - Strip cities / “sprawl on steroids”

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AV IMPACTS

- Automated Vehicles will Transform Transportation
  - Collaboration is required
  - Impacts on operations, urban form and land use, transportation system design, intermodal coordination, parking, green space
- Future Can’t be Left to Chance

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