



NORTH CAROLINA
Department of Transportation



Developing Traffic Forecasts that Include Connected and Autonomous Vehicles

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Connected and Automated Vehicles (CAVs) Will Bring As Big a Change As...

- Jet airplane?
- Interstate system?
- Model T?
- Railroads?
- Steamships?



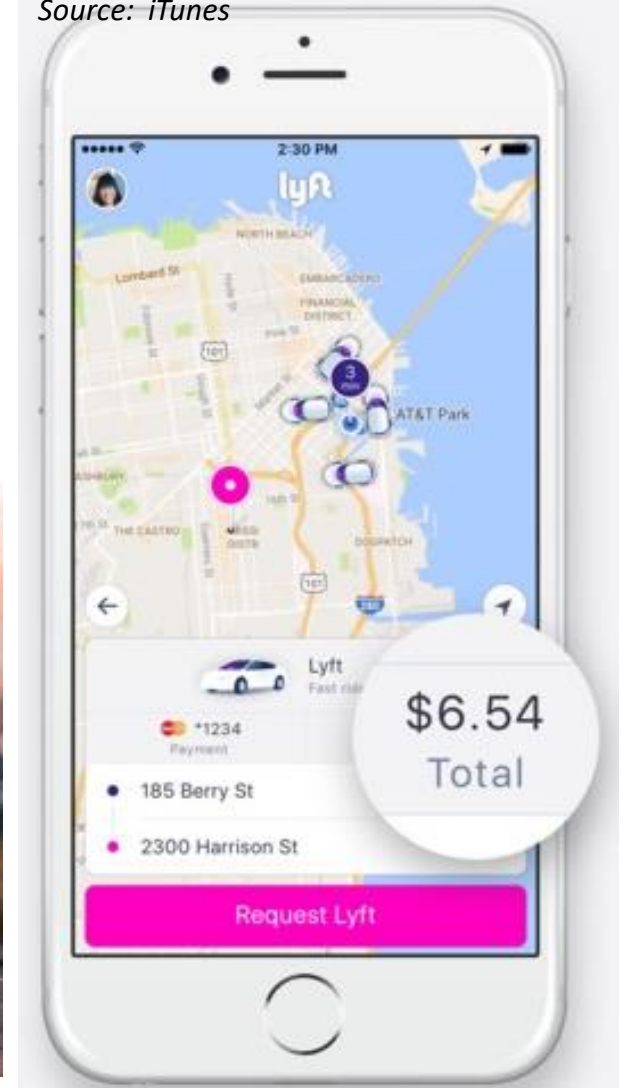
Changing How We Use Vehicles

- Connected,
- Automated,
- Subscription/Shared, and
- Electric



Google "Gumdrop" vehicle, from CNET

Source: iTunes



Quick Adoption Because...

- Safer
- Cheaper
- Benefits to groups of consumers
 - Older, younger, disabled, low-income, ...
- Technologies adopted quicker
- Manufacturer plans
- Little new infrastructure needed
- Legislature on board—laws in 2017, 2020, and 2021



Potential Challenges Could Be...

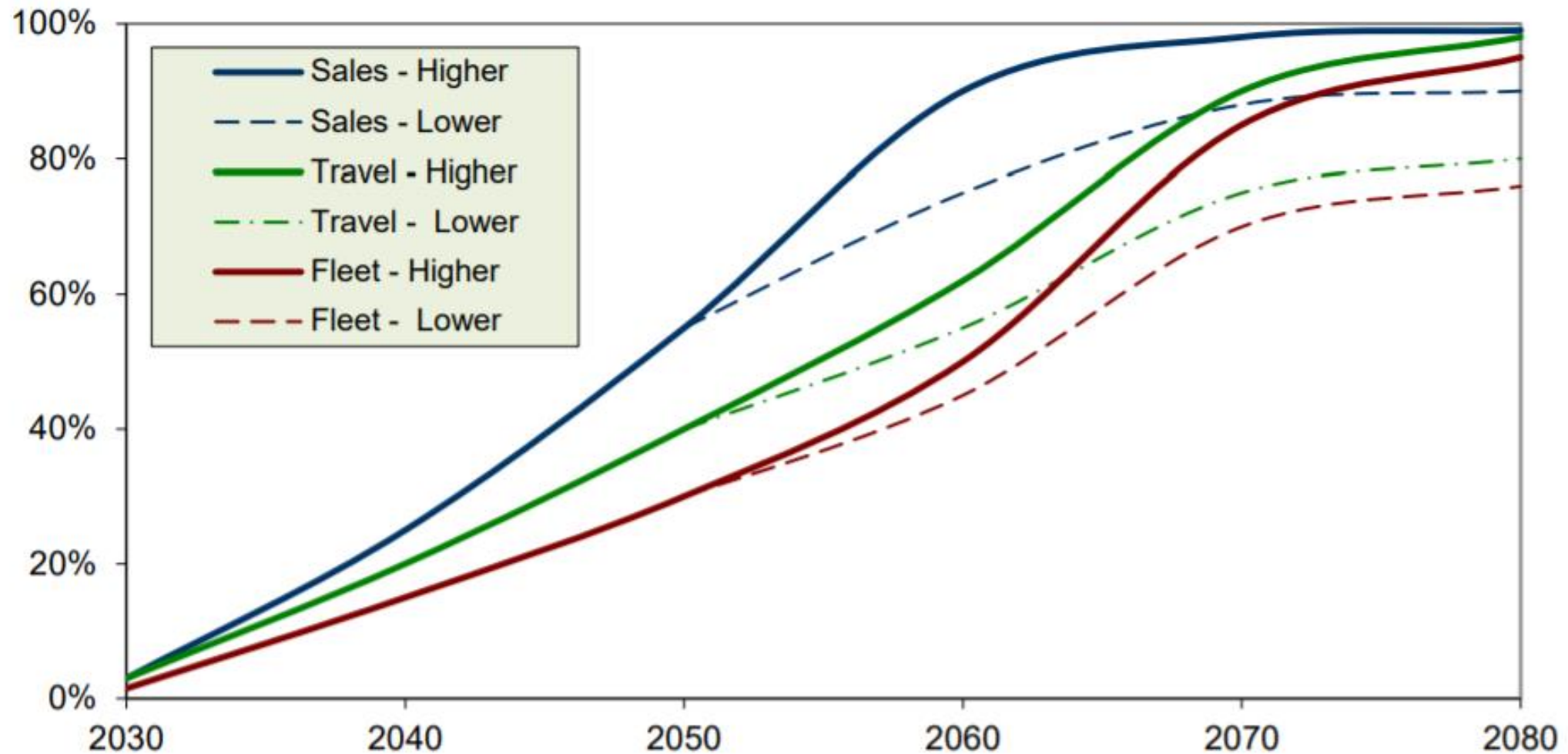
- Technology to achieve level 5 not quite around the corner
- Federal regulation
 - NHTSA exemption process
- Public skepticism
- Liability and insurance concerns
- Too long to turn over the fleet



Lots of Momentum Toward Widespread Adoption

- Driverless testing is expanding both in geography and with more companies
- California has 8 different companies approved to do driverless testing on their roadways
- California will continue to approve companies for driverless deployment
- People are paying for driverless rides in some cities
- Continued growth in automated delivery devices and personal delivery devices
- Continued operation of driverless shuttles such as the one at the Wright Brothers National Park
- Trucks are already self driving in industrial mining sites
- Self-driving trucks are becoming more prevalent

Recent CAV US Adoption Forecast



If You Are Buying This So Far...

- CAVs will be on NC roads in large numbers by 2045 and 2050
- 2045 and 2050 are the current NCDOT project design years
- CAVs will affect our designs
- We currently forecast and design for exactly 0.0 % CAVs
- We should begin forecasting CAVs so we can consider them in our designs
 - Let's not do projects that will be antiquated a few years after opening

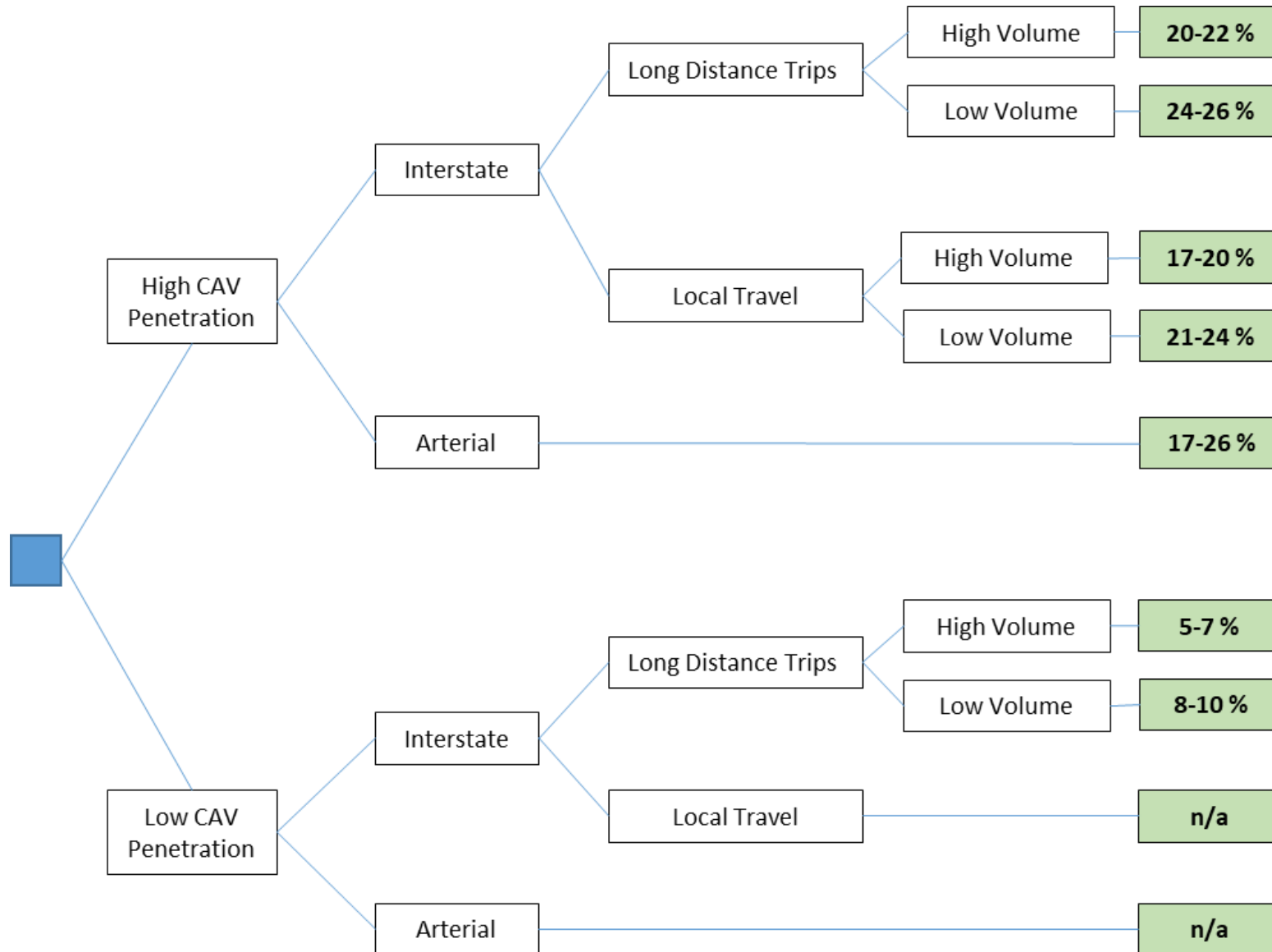
Forecasting CAVs is Difficult

- CAVs will likely change...
 - Land uses
 - Parking
 - Trip generation—who, when, why
 - Trip distribution--where
 - Mode split--how
 - Traffic assignment
- No one is doing these forecasts yet
- So we asked Leta to solve this difficult problem



Technical Assistance

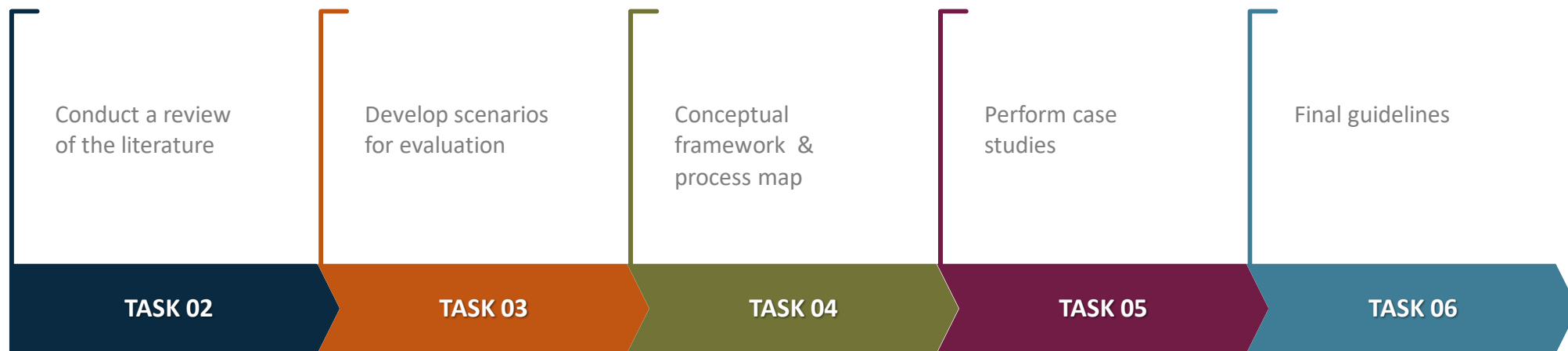
- Simplified sketch level approach
- Goal: inform the development of adjustment factors for traffic forecasts
- Edge cases
 - High and low CAV market penetration rates
 - Driven largely by findings from the literature related to VMT increases
 - Shows a variation of impacts by facility type and types of travel
 - Leveraged data from NCSTM



Guidance on Considering CAVs in Travel Demand Models

Key Objective

Provide guidance on possible updates to the RTDM Development Guidelines and to regional POs on how they should update and apply their travel demand models to include CAVs and their effects.

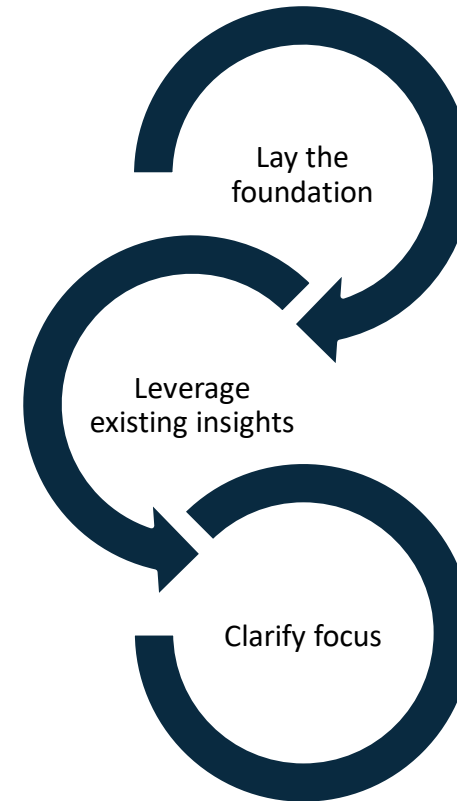


TASK 02

- State-of-practice review for CAVs in TDMs
- Predictions, factors and timeline for deployment
- Impacts of CAVs on demand and supply components

Literature Review

Goals



TASK 03

Scenario Development

Goals

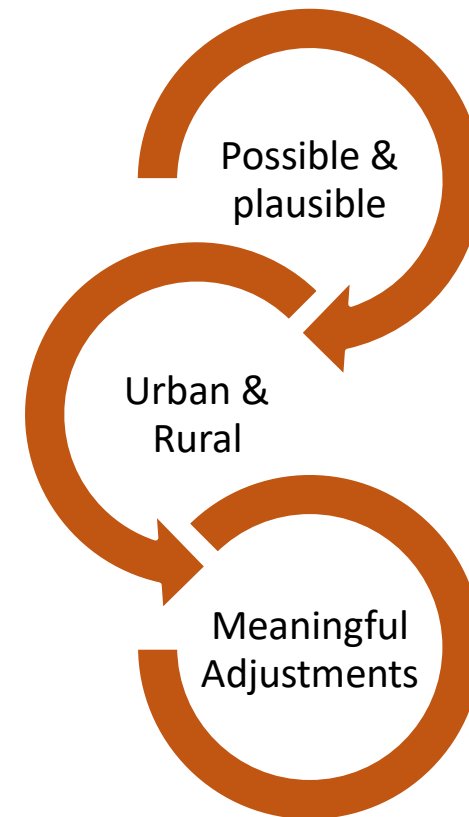
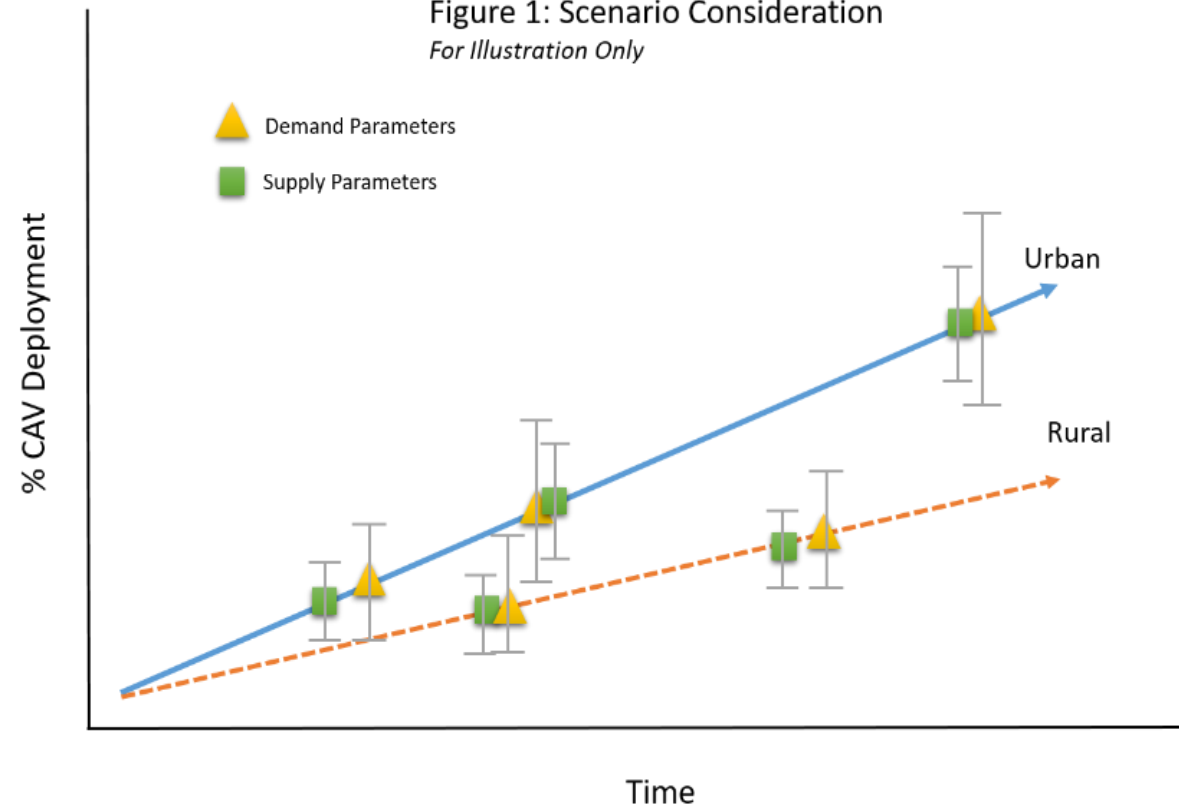


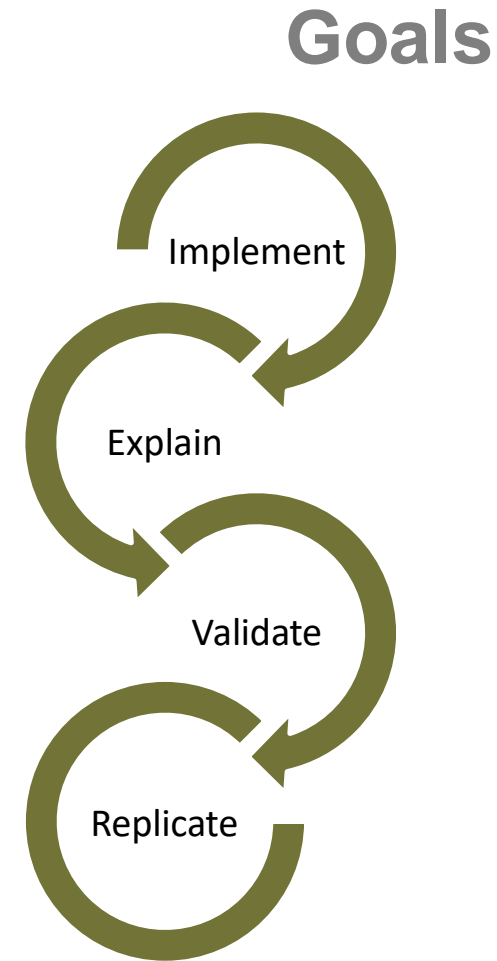
Figure 1: Scenario Consideration
For Illustration Only



TASK 04

- Understanding of modeling frameworks
- Conceptual framework (big picture)
- Process map (details)
- Structural model changes

Model Adjustments

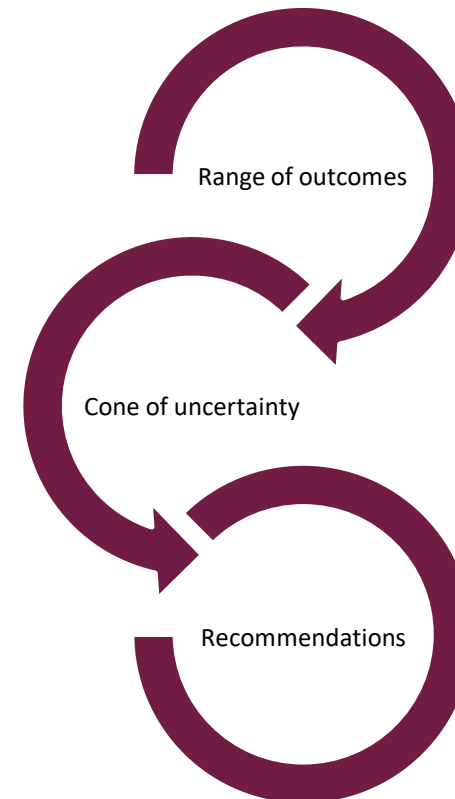


TASK 05

- TRMG2 & RTDM
- Model application and performance evaluation
- Project level case study analysis
- Summarize and report results

Case Studies

Goals

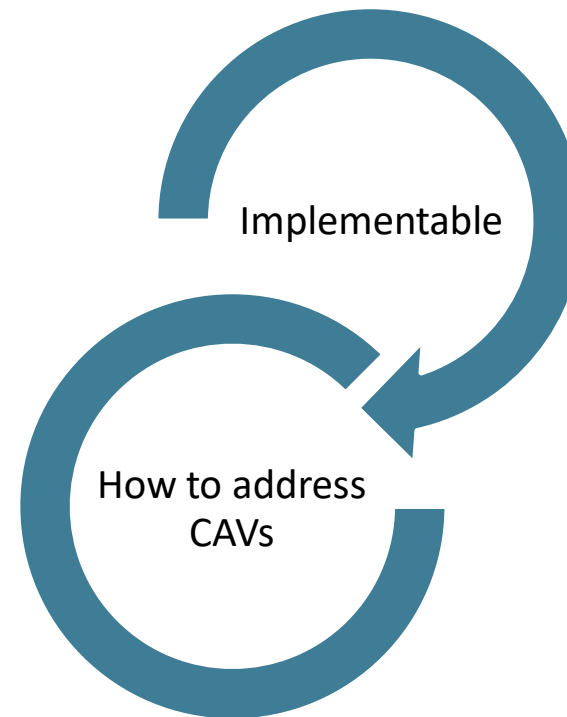


TASK 06

- Guidelines for regional models
- Recommended modifications to RTDM guidelines
- Expected ranges

Guidelines

Goals



Expected Products



Index of predictions and factors

Recommendations for modifying
RTDM

Guidelines for updating regional
TDMs

Documented ranges and
sensitivities

Detailed results of the effects of
CAVs on traffic distribution

Other Questions for NCDOT

- Do roadway designs change?
 - Intersections, driveways, curves, barriers,...
- CAV-priority facilities?
- Pavement and bridge designs?
- Freight facilities?
- Lighting?
- Noise walls?
- Traffic control devices?

Bigger Picture--Needed Actions

- Federal legislation and regulation on vehicles
- State legislation
 - NCDOT funding, CAV companies share data
- Local governments
 - Planning, land use changes, parking, curb management
- Courts (liability)
- Education of public
- Train people for new businesses
- More research and implementation

Thank You!

- Let's talk CAVs, or good transportation, anytime
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