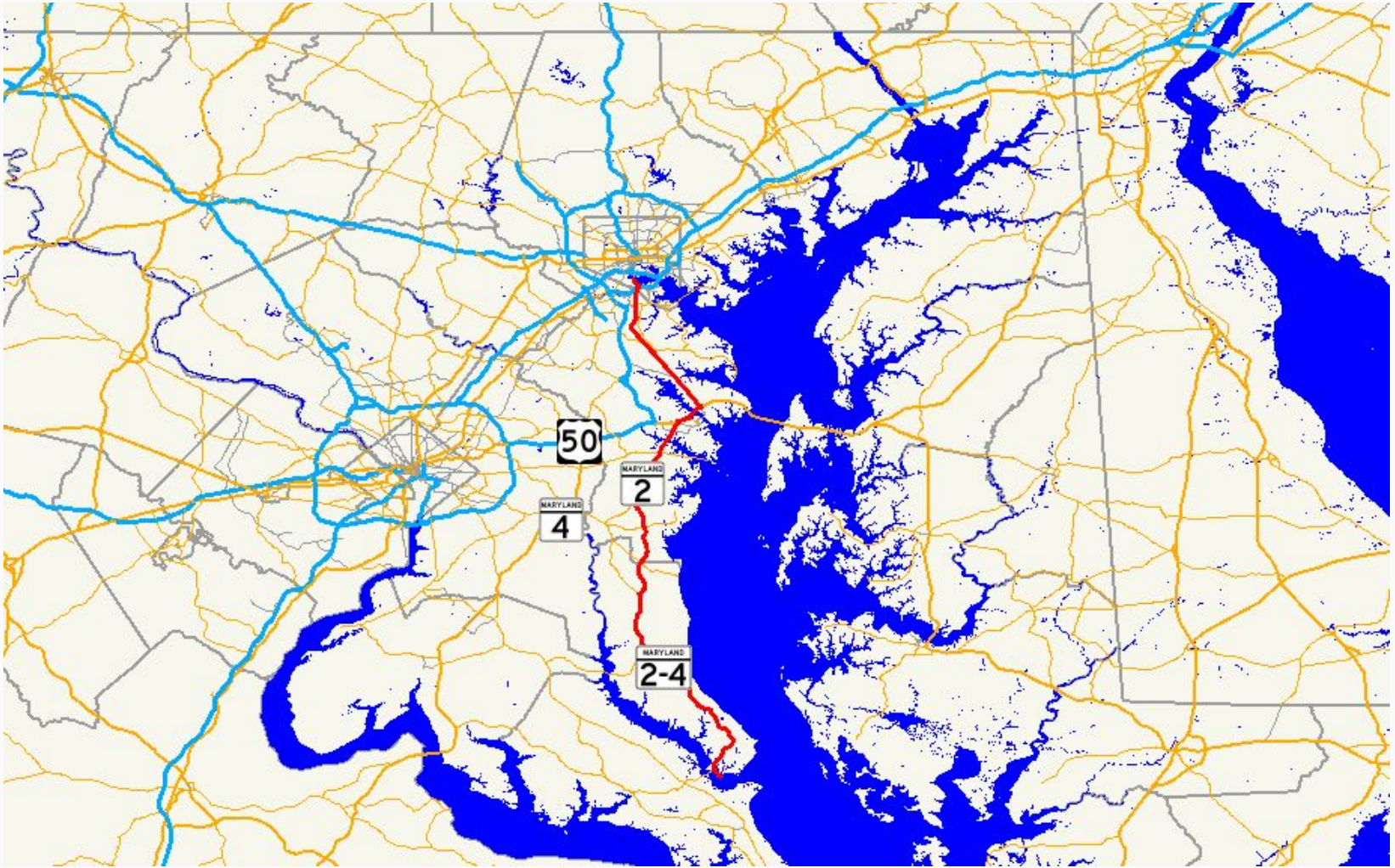
# MD Route 2: Express Bus Proposal

By: Group 2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# Problem Statement

- Analyze bus routes and transportation operations along the Route 2 Corridor
- Identify alternatives for improving transit options and service quality
- Prioritize linking residents with points of interest and important transfer stations

# Corridor Growth Management Plan

- Observes projected growth in employment and households over next 20 years which create additional travel demand
- Evaluates 9 most traveled regional highway corridors plus four important connector roads
- Total cost is $3.6 Billion

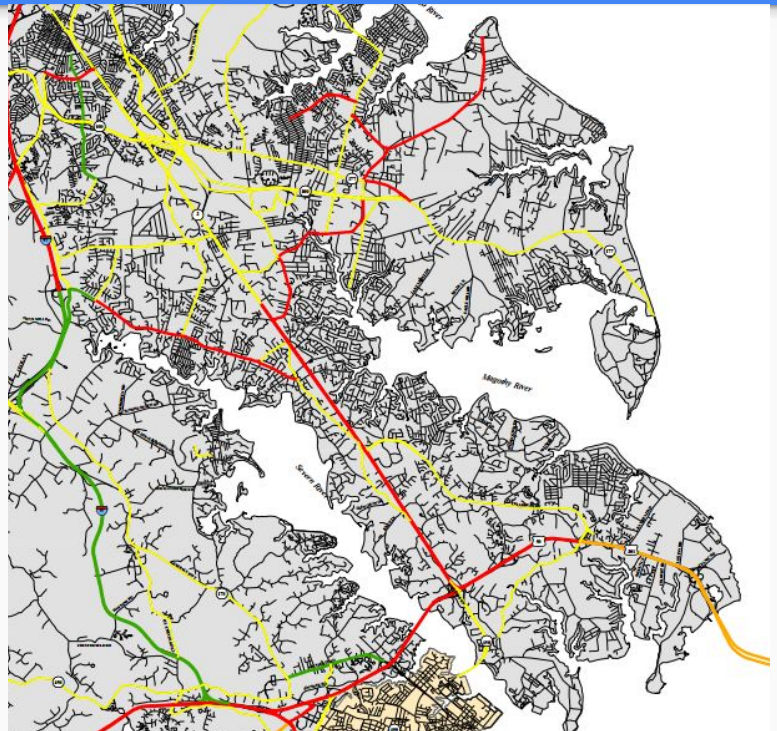
# Route 2 Growth

- Northbound
  - Projected to carry 76,000 vehicles/day by 2035
  - **26%** increase in traffic volume
- Southbound
  - Projected to carry 63,000 vehicles/day by 2035
  - **46%** increase in traffic volume
- Serves Annapolis, Glen Burnie, Severna Park, Pasadena, and Baltimore

# Route 2 Growth Plan Recommendations

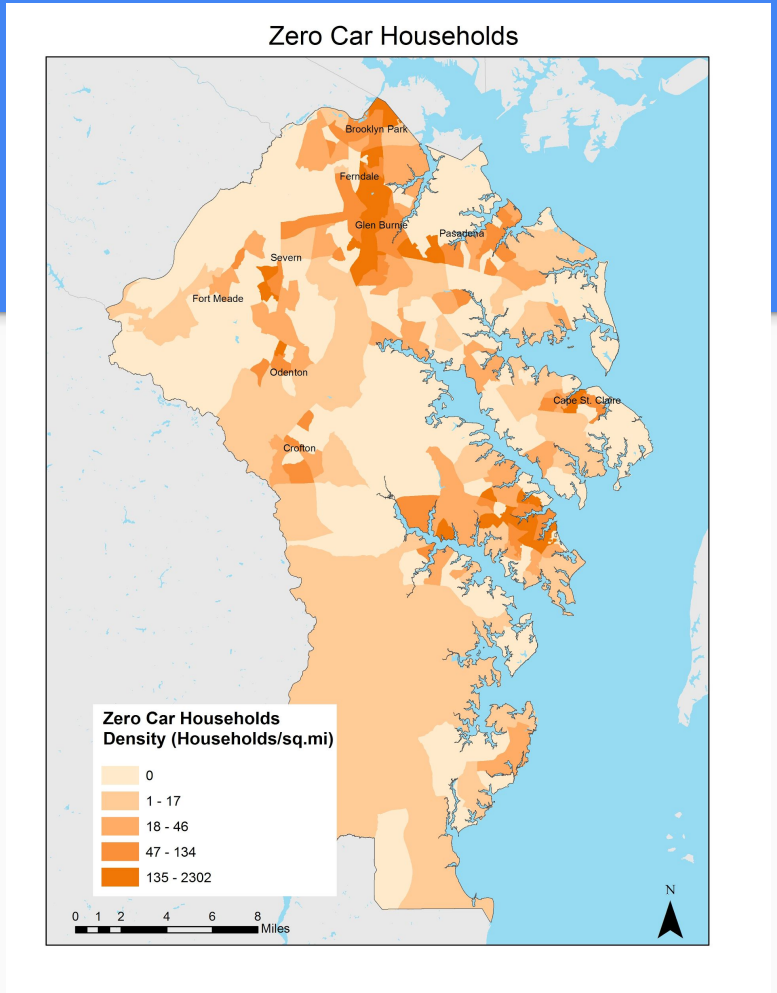
- Northbound
  - Widen roadway from 4 to 6 lanes
  - New sidewalks
  - Permit land use densities to support transit in locations where redevelopment may occur
- Southbound
  - Pedestrian and Bicycle Improvement
  - Improve site design to orient new buildings and better manage congestion

# Transportation Level of Service Forecasts for 2035 Proposed by AAC General Development Plan



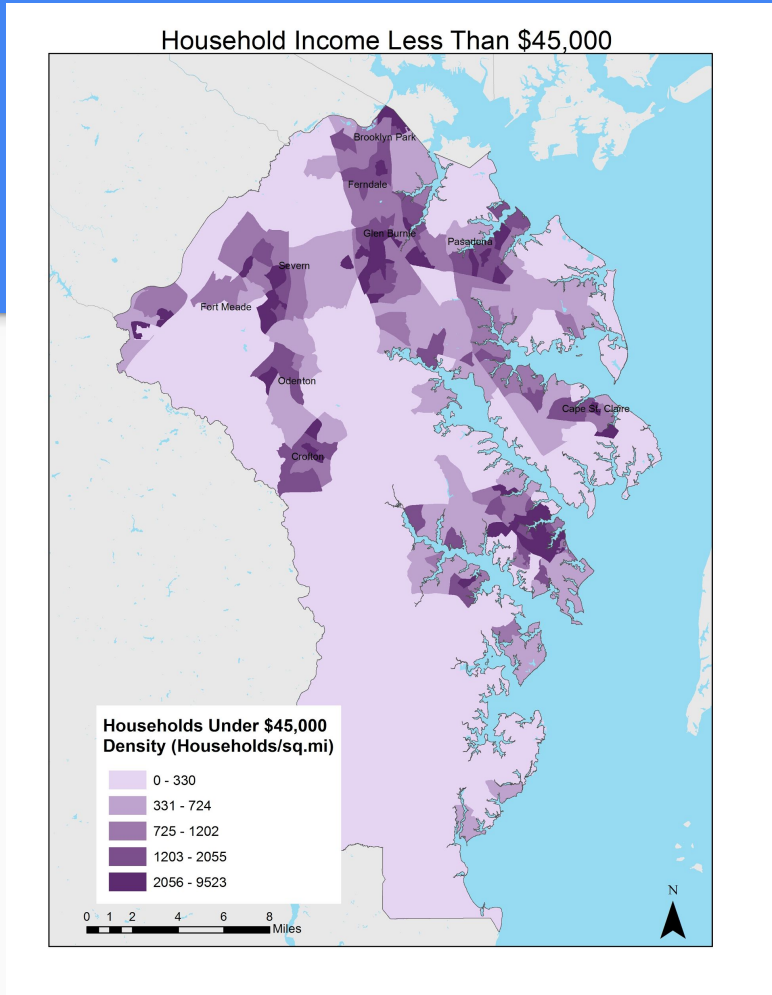
# Existing Demographics

- Zero Car Households
- Areas in Brooklyn Park, Glen Burnie
  - 135 - 2302 Households/square mile



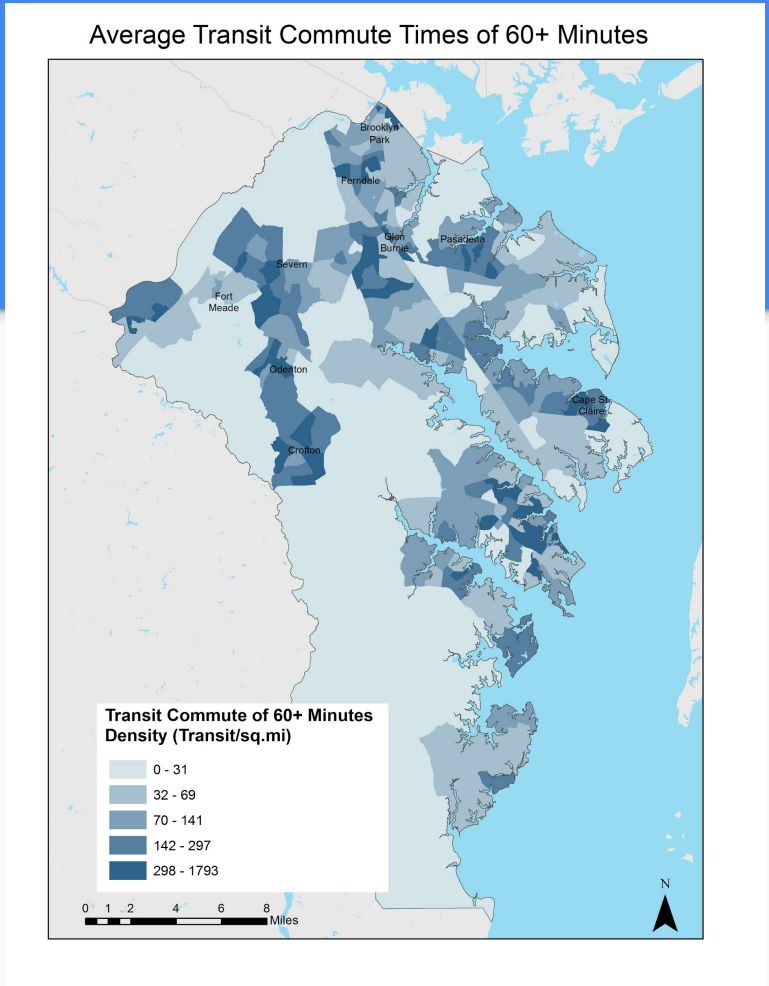
# Household Income

- Brooklyn Park and Glen Burnie
- At worst - 2056 - 9523 homes/square mi



# Transit Commute Time

- Average Commute Time over 60 min
- More consistent along all of  Route 2



# Commuting Patterns

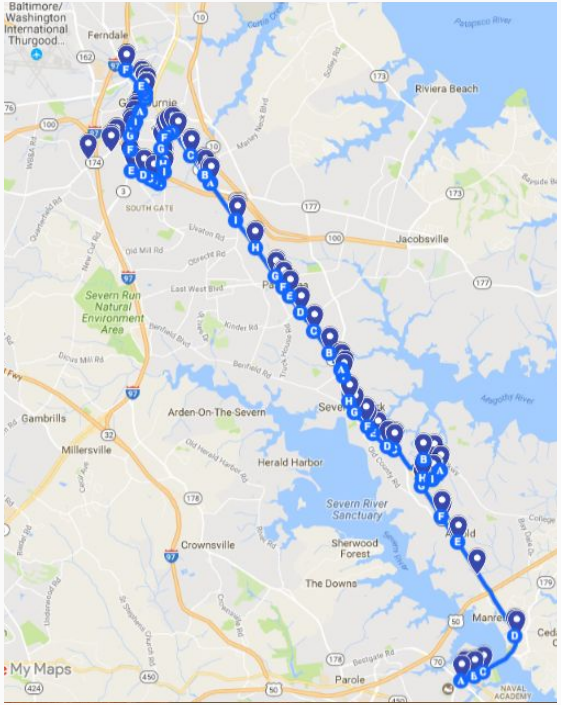
- 42% of AAC residents work within the county
- Majority of them work in Annapolis or Glen Burnie

# Existing Public Transportation Routes

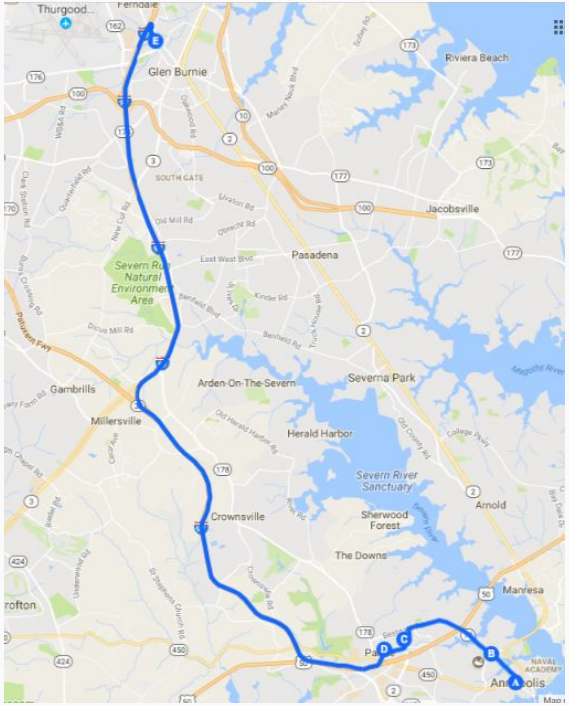
- Fastest Route (non-peak hours) takes 1hr and 30 min
- Local 14 ----> Cromwell Station ----> Hunt Valley Light Rail ---> BWI Light Rail
- Fastest Route (peak hours) takes 37 minutes from Cromwell Station to Annapolis
- BusLink Route 215

# Existing Public Transportation Routes

Local 14




215 Commuter BusLink



# Existing Demand

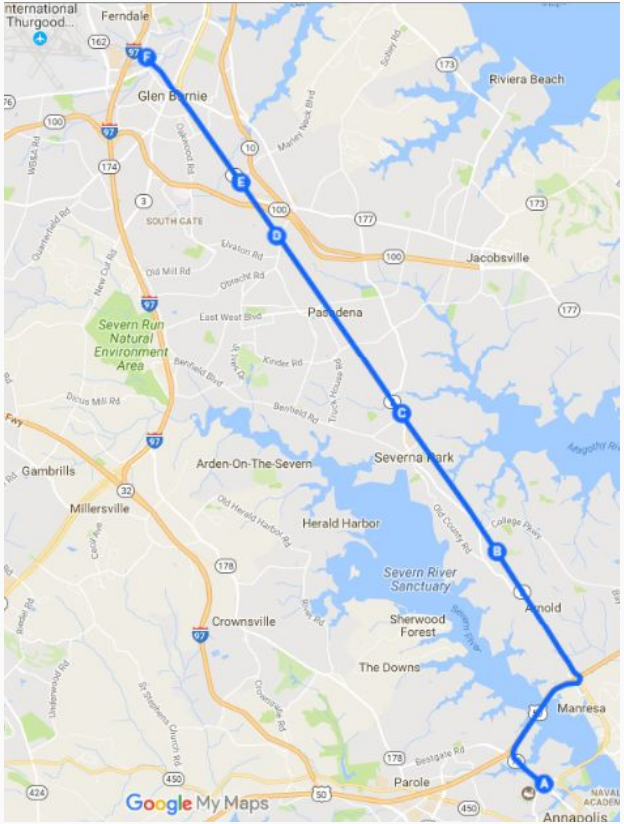
- High Demand for Local 14 bus
- Typically buses are completely full
- Demand calculation depends on bus type
  - 40ft bus has demand of 192 ppl/hr
  - 35ft bus has demand of 172 ppl/hr

# Methodology

# Proposed Public Transportation Routes

- Should take 54 minutes from Annapolis to Cromwell station during peak hours
- 5 buses every 22 min for peak
- 4 buses every 15 min for off-peak

| Stop Addresses for Proposed Express Bus | |
|---|---|
| A | Row Boulevard & Taylor Ave (WB) |
| B | 1257 Ritchie Highway |
| C | Ritchie Hwy & Robinson Rd |
| D | Ritchie Highway & Jumpers Hole (NB) |
| E | Ritchie Highway & Marley Station (NB) |
| F | Cromwell Station Loop |



# Proposed Demand

- Expect high demand since Local 14 buses are usually full
- Traffic volume along Rt. 2 is expected to increase significantly
- Shorter commute ----> More ridership

# Infrastructure Requirements

- Local 14 has bus stops along Route 2
  - Bus Stop Concrete Pads
  - Bus Shelters
  - Lane Markings
- Busses
- Hybrid/Diesel Fleet
  - 40 ft and 35 ft

- No new bus stops need to be Constructed
- Proposed stops are located at current Local 14 stops
- Additional Busses to accommodate new Route
  - Recommend 35 ft bus

# Environmental Impacts

## Existing Conditions

- Heavy Suburban Area leads to congestion on roads
  - No HOV lane currently
- Increase in Carbon Dioxide being released

## Proposed Conditions

- Positive
  - Decrease in Carbon Dioxide emissions
  - Increased fuel efficiency
- Negative
  - Using of non-hybrid busses could deter an positive environmental impacts

# Cost of Operation

## Current:

- Main components are are designed to last 12 years service
  - servicing
    - Estimate of maintenance: $1.00/mile.
- Capital costs: $300,000-$350,000.
- average employment wage of $29.76.
- Battery pack replacement every 6 years costing  $27,500.
- Estimates the current costs for the county to be $53.29/hour/bus.

## Proposed:

- 1 bus will be $395,000 with a lifespan of 12 years or 500,000 miles.
- Marketing costs

# Performance and Service Measures

- **Current situation:**
  - Current round trip: approximately 3 hours in rush hour
    - Result: unreliable for commuting to work.
      - Demand: more centralized location of bus stops in order to optimize time, money and energy
- **Proposed Bus Line will allow**:
  - Reduction of  travel time, fewer stops, reducing the travel time during operational hours, esp. during peak hrs.
    - Result: increase in commuter flexibility and reliability
  - Increase comfort.
    - Newer buses entice people to ride the bus.
    - Incorporation of an express route will allow for better seating due to demand being shared between the Local 14 and the proposed express route.

# Optimization

$TC = 2Dc/(vh) + (2qDv_t)/v + qhv_t$

**Peak:**

$$\frac{dTC}{dh} = 0 = \frac{-2Dc}{vh^2} + 0 + qv_t$$

$$0 = \frac{-2(19 miles)(\$64/veh\ hr)}{(23 mph)h^2} + q(9\ \$/pass\ hr)$$

$$\frac{105.74(\$ \cdot hr/veh\ hr)}{h^2} = q(9\ \$/pass\ hr)$$

$$\frac{105.74\ (\$\ miles/veh\ hr)}{(82\ pass\ trip/hr)(9\ \$/pass\ hr)} = h^2$$

$$\frac{11.75\ (pass\ hr)}{83\ (pass\ trip/hr)} = h^2$$

$h^*_{peak} = 0.376$ hrs = 23 minutes

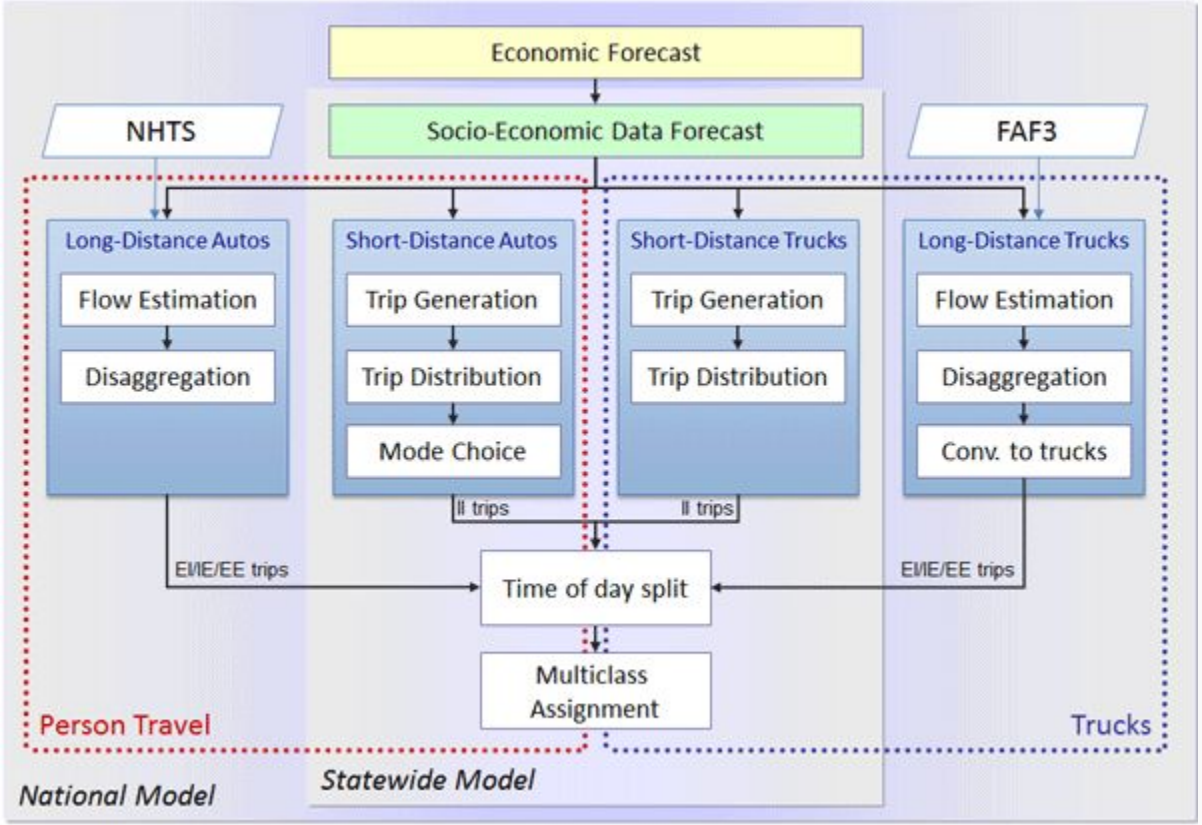
Peak:

- Initial headway = 23 minutes
- 5 buses
- Re-optimized = 22 minutes
- Total Cost = $1,779/veh hr

Off-peak:

- Initial headway = 16 minutes
- 4 buses
- Re-optimized = 15 minutes

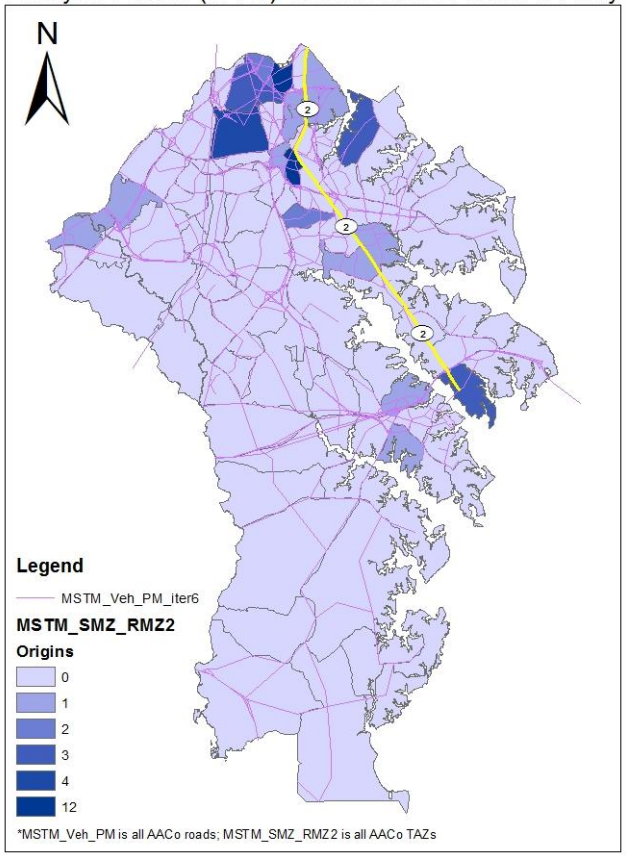
# Maryland Statewide Transportation Model (MSTM)



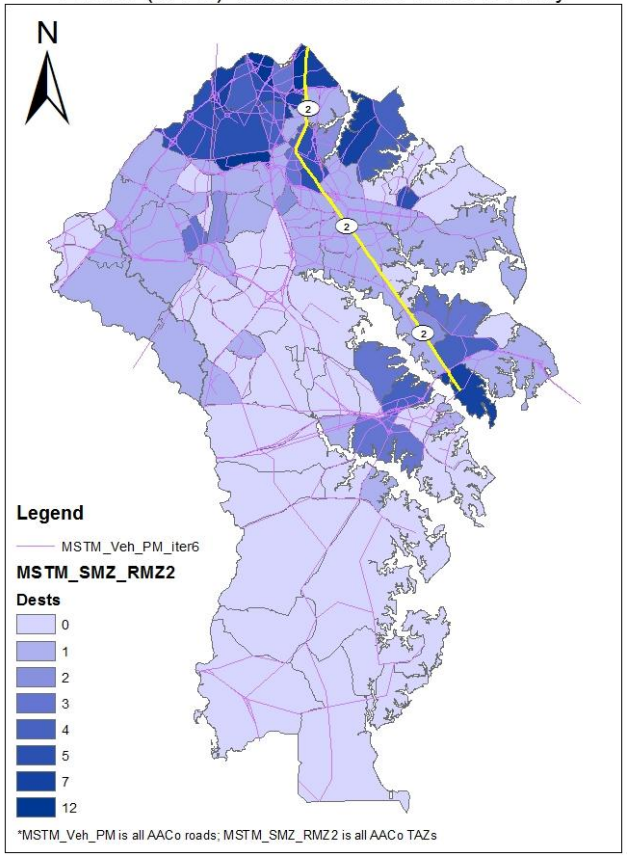
# MSTM

- Used for statewide transportation planning
  - Demand forecasting
- Baseline - based on 2007
- Proposed - including our proposed route in year 2035
- Inputs
  - Type of service, speed, headway, stop delay, stop locations
- Outputs
- Challenges

Increase in Transit Trips Originating in Traffic Analysis Zones (TAZs) Within Anne Arundel County




Increase in Transit Trips Ending in Traffic Analysis Zones (TAZs) Within Anne Arundel County



# Strengths/Weaknesses

Strengths

- Shorter commute times
- Hybrid buses reduce emissions
- Alleviates congestion
- Reduced cost since using existing infrastructure

Weaknesses

- High start-up costs
- Bus still stuck in traffic

# Conclusion

Express bus along Route 2

- 6 stops
- 1hr 48min round trip
- 5 buses in peak hours, 4 in off-peak

# Future Considerations

- Alternative ideas not developed:
  - Specialized or more advanced optimization calculation
  - New suburban routes
  - New technology
  - Save capital costs and invest in improving only local 14 route
  - New infrastructure such as Park and Rides
  - Additional lanes
- Accurate modelling and specific corridor study
  - Local data and surveys
- Utilize newer MSTM

# Questions?