DRAFT Meeting Minutes

Date: January 23, 2020

Location: Webinar

Subject: Scenario Planning Updates #8

Attendees:

- RCS Project Coordinator – Camelia Ravanbakht
- HRTPO/HRPDC – Theresa Brooks, Steve Lambert, Keith Nichols, Dale Stith
- City of Cheapeake – Troy Eisenberg
- City of Norfolk – Brian Fowler, Evandro Santos
- City of Portsmouth – Carl Jackson
- City of Virginia Beach – Tara Reel
- City of Williamsburg – Carolyn Murphy
- Gloucester County – Carol Rizzio
- James City County – Thomas Leininger, Tami Rosario, Thomas Wynsong
- Port of Virginia – Karen McPherson
- FHWA – Ivan Rucker
- Consultant Team – Craig Eddy, Lorna Parkins, Bill Thomas, Vlad Gavrilovic, Jason Espie, Scott Middleton, Phil White, Naomi Stein, Nick Britton

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Camelia Ravanbakht took attendance of those on the call. Lorna Parkins did brief intro of team members and introduction. She then turned it over to Bill Thomas to discuss the technology considerations for travel demand modeling. This included discussion about the differentiation between scenarios.

Questions

Brian Fowler, City of Norfolk: There are still concerns with regard to the burden placed on the project team in describing how each of these assumptions/inputs are affecting the outcome and that some adjustments may cancel out others. He disagrees with some of the assumptions made in our scenarios. Because of these two points, he believes there needs to be some way of showing the output comparisons at more detailed levels ("sub outputs"). Brian also indicated he was concerned about the effect of the technology on a new crossing evaluation.

Keith Nichols, Hampton Roads TPO: On slide 18, Passenger AV Adoption, the AV adoption levels for trucks seems low compared to autos. He believes that trucks are more likely to be automated in the short term. He noted that the Transportation Research Board had developed some default values that will end up being published Highway Capacity Manual, so perhaps the project team should consider those values. He offered to send the TRB numbers to us.

Brian: On slide 23, he is concerned about the two different ways of adjusting for capacity between the scenarios. He does not believe there is enough differentiation and that the results will reflect major changes.

Lorna: Note the step in the planning process for sensitivity analysis – we will do some iterations when we first run the travel model parameters if what we see happening is too extreme or not intuitive.

Bill: This is what we have available; part of the issue boils down to the levers that are available to us in the model. Bill asked Brian to provide any other alternatives if he had some.

Vlad Gavrilovic presented a brief update on the land use allocations. He addressed the missing Williams Tract and showed how its addition appeared on suitability maps. He also covered example suitability maps using the updated Transit Proximity dataset and the additional Employment Accessibility suitability factor.

Questions

No questions were asked at this time.

The webinar slides are attached and the webinar recording can be accessed here.

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TRAVEL DEMAND MODELING TECHNOLOGY CONSIDERATIONS & BRIEF LAND USE MODEL UPDATE

January 23, 2020

Michael Baker INTERNATIONAL

AGENDA

- Travel Demand Modeling Technology Considerations
  - Background on Exploratory Scenario Planning and Technologies Considered
  - Operational and Behavioral Impacts - Assumptions and Modeling Levers
  - Differentiation Between Scenarios
  - Other Parameters and Assumptions
- Brief Land Use Model Update
  - Responses to input from December Working Group Meeting

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TRAVEL DEMAND MODELING TECHNOLOGY CONSIDERATIONS

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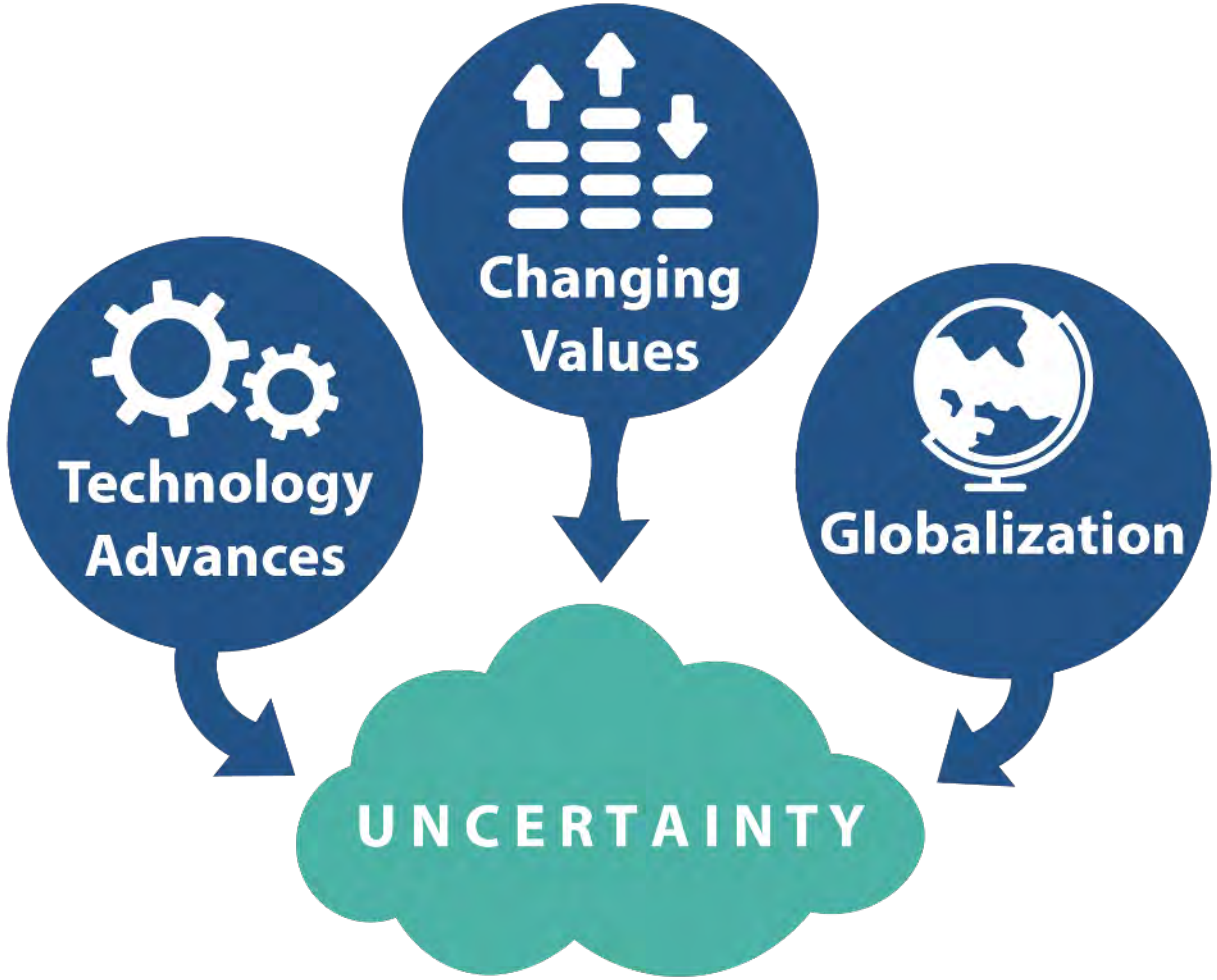
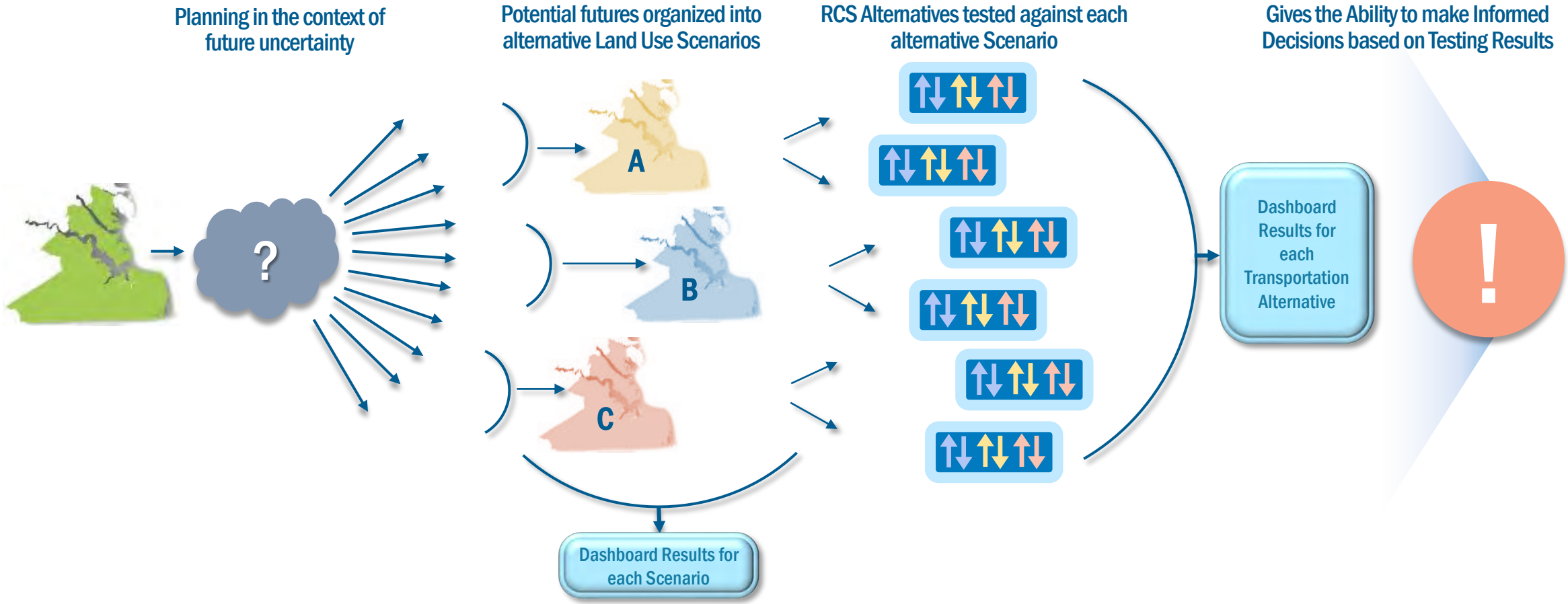
Exploratory Planning – Preparing for Uncertainty

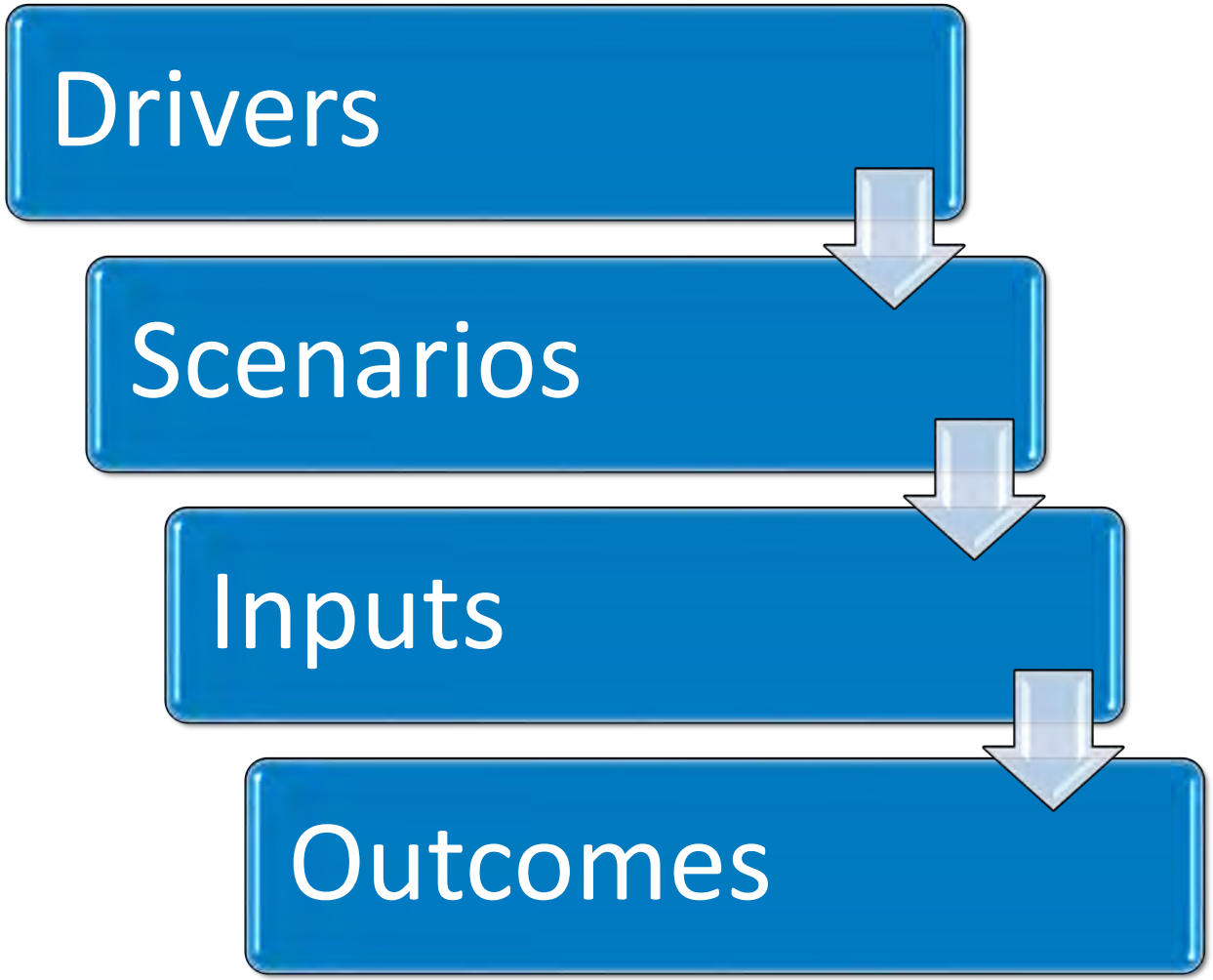


Exploratory Scenario Planning Process

- The purpose of Scenario Planning is to have plausible alternative futures against which to test Transportation Alternatives



Exploratory Scenario Planning Framework



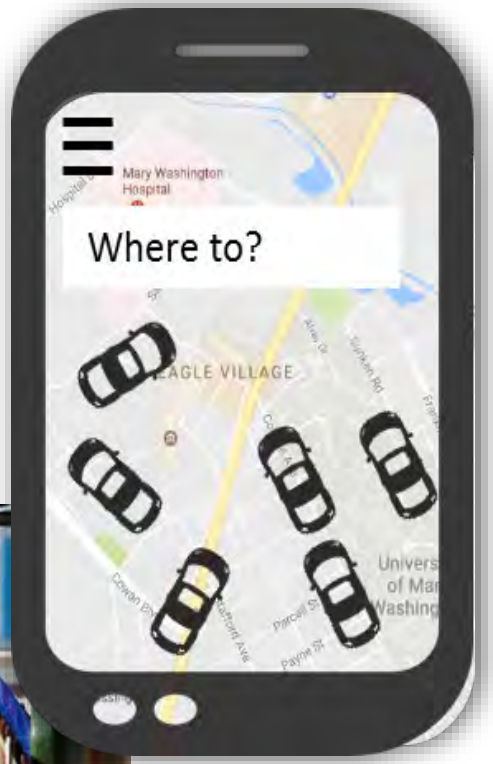
Economic, Lifestyle/Demographic, Technology, Environment

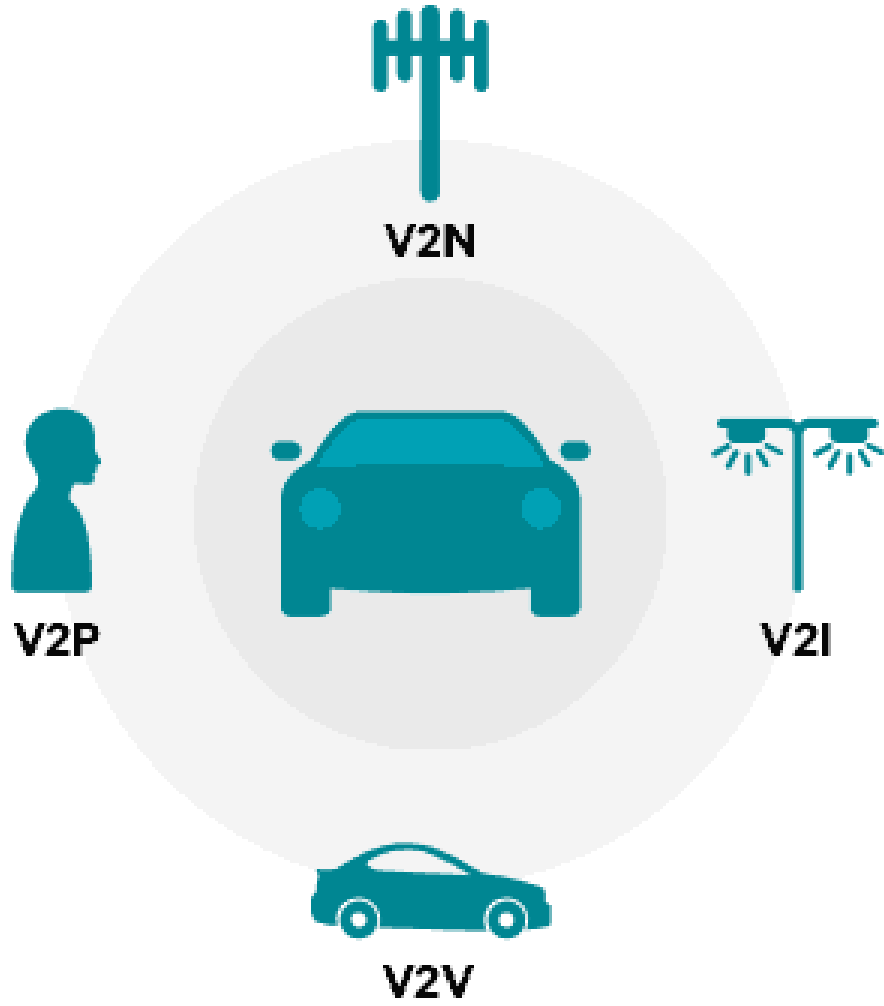
Drivers organized into three **Greater Growth Scenarios** with an equal amount of additional employment and population growth in each.

Control totals, and **assumptions** about the drivers, translated through **"Levers"** in the land use and travel demand models.

Performance Measures, based on the study Goals and Objectives and produced by the land use, travel demand, and economic models

Transportation Technology





Operational and Behavioral Impacts

Accessibility to elderly/special needs population. Latent Demand ⇧ ?

Reduction in vehicle accidents; increased travel time reliability. Congestion ⇩

Changes in roadway capacities. +/- ?

Increased travel due to latent demand. VMT ⇧

Change in travelers' trip lengths. Commuter VMT ⇧

Introduction of zero-occupant vehicles (ZOVs). VMT ⇧ Congestion ⇧

Challenges

Adoption

- Timing
- Magnitude
- Type
- Location(s)

Forecasting Tools

- CAV/SAV Modes
- Operational & Behavioral Impacts

CAV Adoption Timelines

Short Term

- Existing planning and modeling tools will suffice.
- Travel behavior changes will not be significant.
- Increasing use of new modes, such as MaaS.
- New types of access and egress options for public transportation systems.

Mid-Term

- CAVs will become more widespread, however non-AVs will still be present.
- Modeling and planning tools need to address problems related to having mixed fleets of CAVs and non-CAVs.

Long-Term

- CAVs will be pervasive and will require a complete set of new assumptions about urban form, land use, parking needs, and other indirect impacts in addition to the direct impacts on travel behavior.
- Planning tools and the models that support them will need to be based on scenario assumptions for this longer-range timeframe.

Source: NCHRP Research Report 896: Updating Regional Transportation Planning and Modeling Tools to Address Impacts of Connected and Automated Vehicles

Accounting for Technology in the Travel Model

Recent update to the HRTPO travel model includes a framework to account for the operational and behavioral impacts of technology.

- ✓Ability to adjust existing components and the addition of zero occupant vehicle (ZOV) trips.
- ✓Addresses both privately owned CAVs and shared CAVs.
- ✓Able to specify assumptions about how each behavioral parameter may change for various market segments.

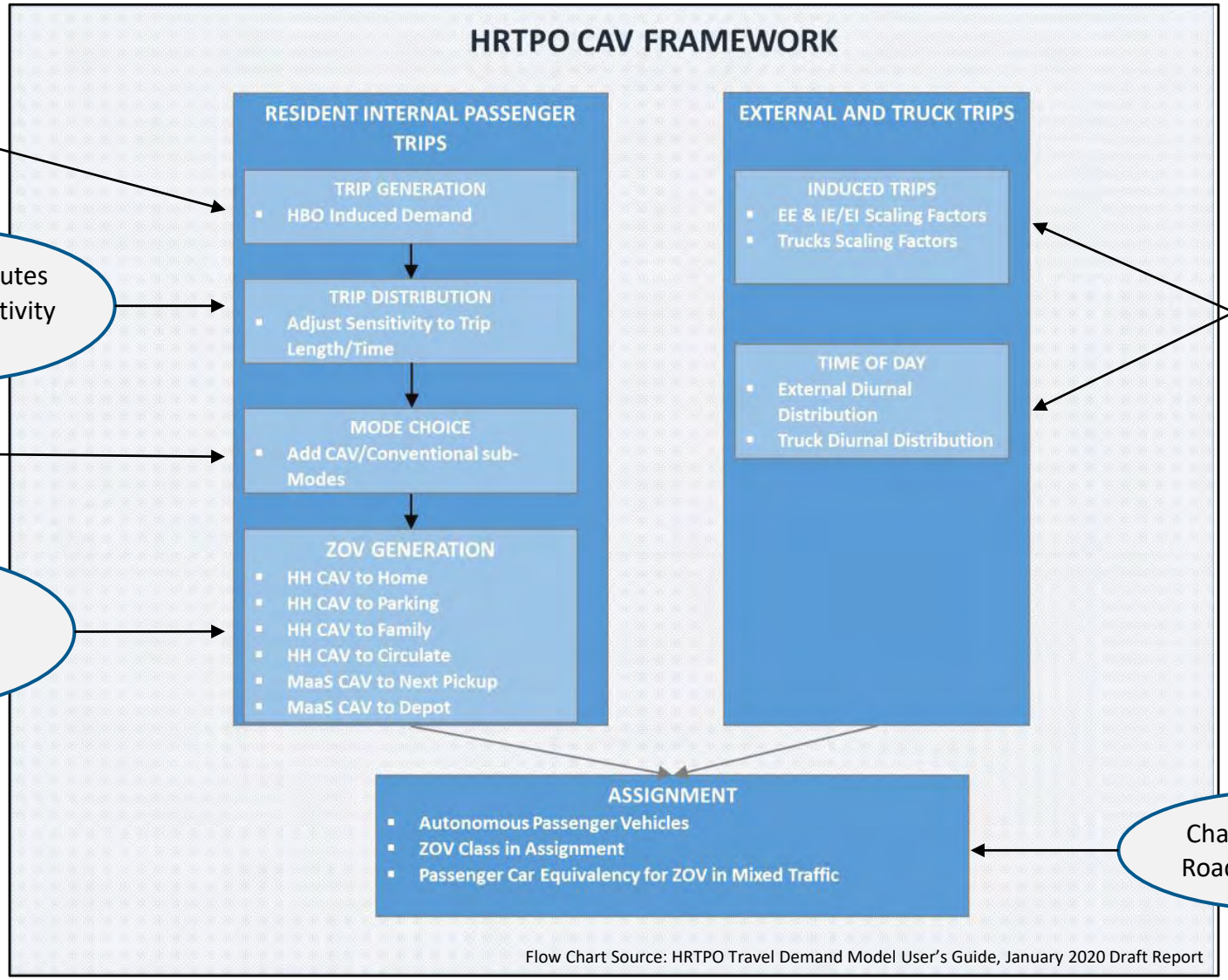
Impact on the 4-Step Planning Process

Step	Impact/Adjustment	Issues/Effects
Trip Generation	Auto Ownership • Overall ownership level. • CAV vs. Conventional. Induced Trips • Trips by seniors, children (non-work trips).	• Level of CAV adoption. • Private vs. shared vehicles. • Account for latent travel demand.
External/Truck Trip Generation	Induced Trips • Factor trip rates. Time-of-Day • Adjust diurnal distributions.	• Passengers sleep during long distance trips. • Latent demand for freight. • Shift in truck trips to overnight to avoid daytime congestion.
Trip Distribution	• Adjust trip lengths for home-base work travel.	• Longer commutes. • Added productivity.

Impact on the 4-Step Planning Process

Step	Impact/Adjustment	Issues/Effects
Mode Choice	• Add MaaS modes. • Add CAV & conventional submodes.	• Ride hailing. • Micro transit. • First/last mile -public transport.
ZOV Trip Generation	• Add vehicle trips to account for new trip legs with driverless vehicles.	• Private CAV to family, home, free parking, circulate. • Shared CAV to next pickup, depot.
Trip Assignment	• Adjust to reflect mixture of CAVs and conventional vehicles. • Designate CAV only lanes/facilities.	• Tech lanes. • Changes in speeds and capacities.

HRTPO Model Technology Framework



- Level of CAV Adoption
- Added Mobility

- Longer Commutes
- Added Productivity
- Sprawl

- Ride Hailing
- First/Last Mile

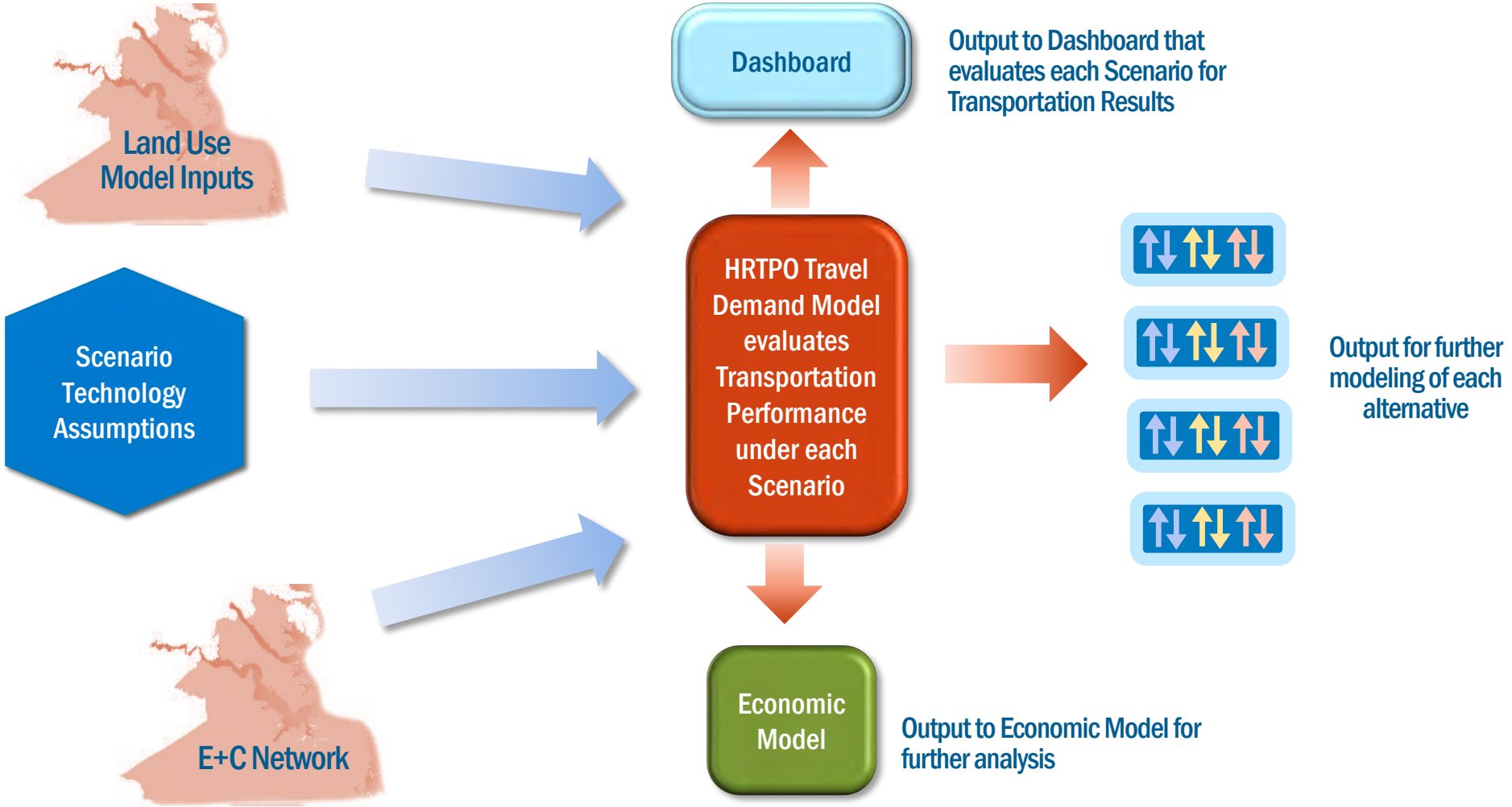
Magnitude and Pattern of "Zero-Occupant" Vehicles

Increased Mobility and Transportation Efficiency

Change in Effective Roadway Capacities

Flow Chart Source: HRTPO Travel Demand Model User's Guide, January 2020 Draft Report

Travel Forecasting Process



Differentiation Between Scenarios

Greater Growth on the Water

Growth in water-oriented activity. Port of Virginia becomes even more competitive with freight more multimodal. More dispersed housing locations. ***Moderate assumptions for CAV adoption and network adaptation.***

Greater Growth in Urban Centers

Significant economic diversification. Low space requirements per job. Large role for "digital port." New professionals prefer to live/work in urban settings. ***High level of CV adoption and low auto ownership/high TNC mode.***

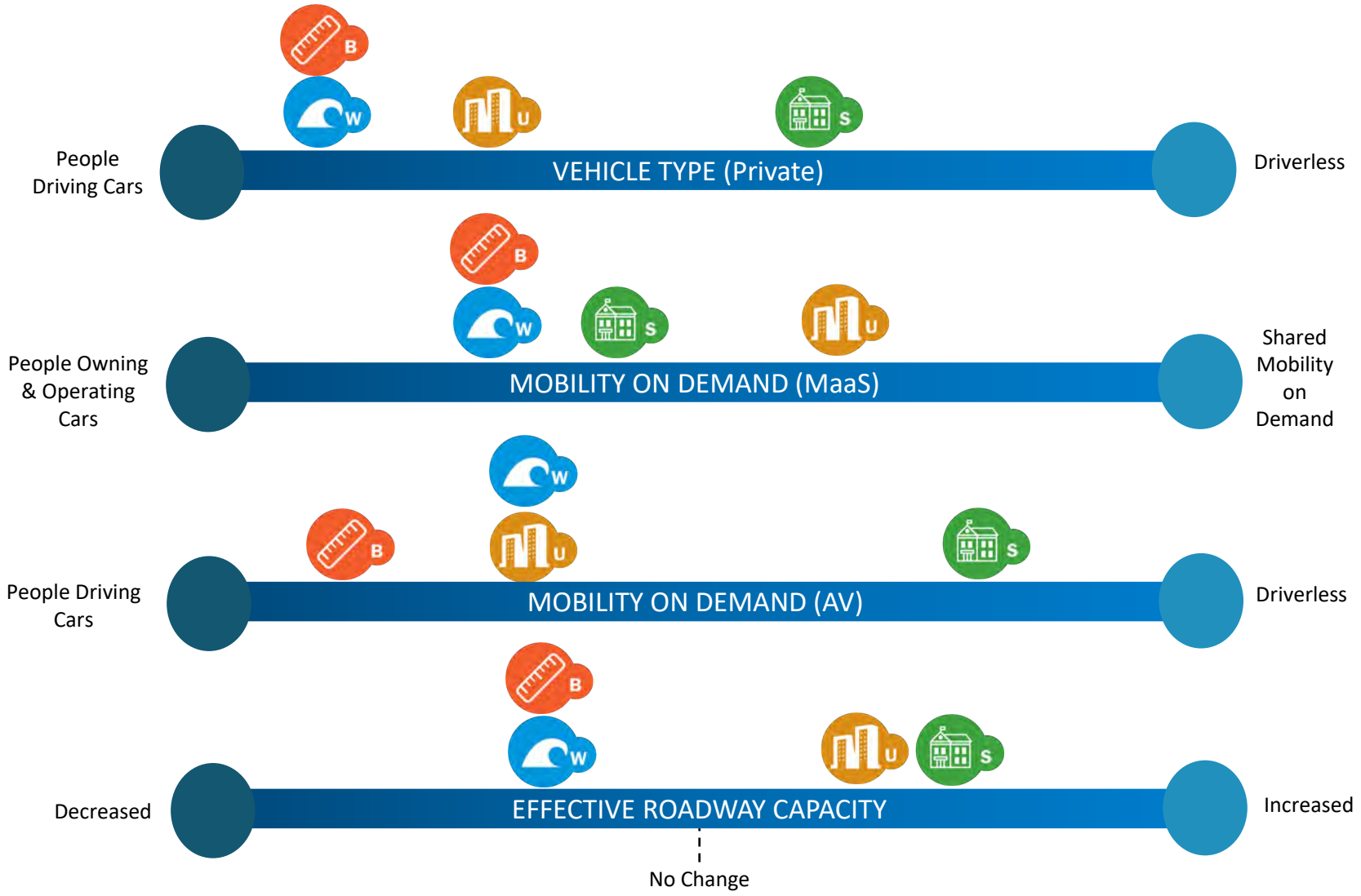
Greater Suburban/Greenfield Growth

Growth is suburban/ exurban, but growth includes walkable mixed use centers. Port of Virginia becomes even more competitive. "Digital port" brings additional jobs. Housing is more suburban. ***High level of AV adoption and network adaptation.***

Differentiation Between Scenarios

Regional Connectors Study Scenarios

- 2045 Baseline
- Growth on the Water
- Growth in Urban Centers
- Suburban/Greenfield Growth



Differentiation Between Scenarios

Passenger AV Adoption (Share of Household Vehicles)

	2045 Baseline	Growth on the Water	Growth in Urban Centers	Suburban/Greenfield Growth
Autos				
Internal	30%	30%	40%	75%
Internal-External	20%	20%	25%	45%
External-External	25%	25%	30%	60%
Trucks	20%	20%	25%	45%

Differentiation Between Scenarios

Mobility on Demand (MaaS) (Share of All Trips)

	2045 Baseline	Growth on the Water	Growth in Urban Centers	Suburban/Greenfield Growth
Peak				
Work	10%	10%	25%	15%
Non-Work	20%	20%	50%	30%
Off-Peak				
Work	10%	10%	15%	10%
Non-Work	30%	30%	60%	45%

Differentiation Between Scenarios

Mobility on Demand - Autonomous (Share of MaaS Trips)

	2045 Baseline	Growth on the Water	Growth in Urban Centers	Suburban/Greenfield Growth
Peak				
Work	10%	15%	15%	30%
Non-Work	20%	30%	30%	50%
Off-Peak				
Work	10%	10%	10%	20%
Non-Work	30%	45%	45%	75%

Differentiation Between Scenarios

Effective Roadway Capacity - Narratives

2045 Baseline	• Moderate assumptions for AV adoption and network adaptation. • AV acceleration profiles moderated compared with conventional vehicles, resulting in greater spacing between AVs and AV-Conventional. • Results in reduced effective capacity for mixed-vehicle flow.
Growth on the Water	• Moderate assumptions for AV adoption and network adaptation. • AV acceleration profiles moderated compared with conventional vehicles, resulting in greater spacing between AVs and AV-Conventional. • Results in reduced effective capacity for mixed-vehicle flow.
Growth in Urban Centers	• High level of CV adoption and network adaptation. • Emergence of CV traffic platooning and generally closer spacing of vehicles (primarily on major roadway facilities). • Results in enhanced effective capacity for some roadways.
Suburban/Greenfield Growth	• High level of AV adoption and network adaptation. • Traffic flow primary consists of AVs allowing optimal harmonization of demand and supply (on most roadway facilities). • Results in significantly higher effective capacity.

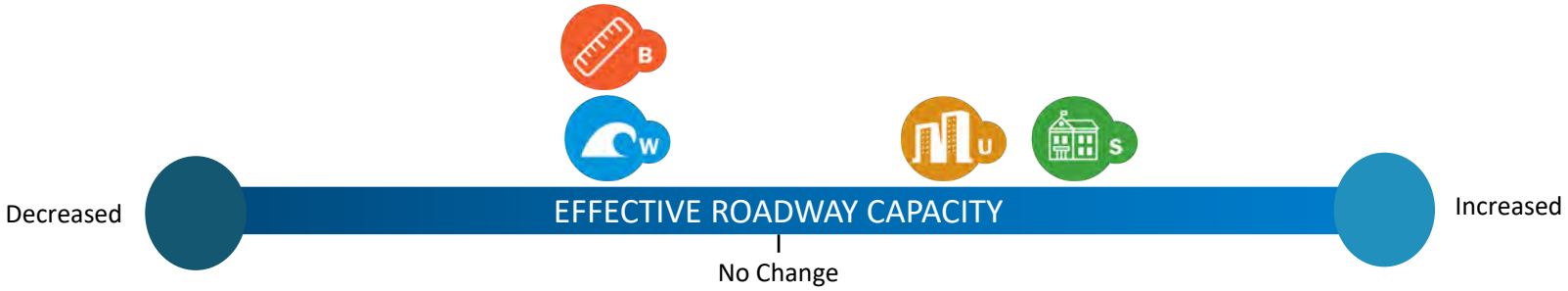
Differentiation Between Scenarios

Effective Roadway Capacity - Adjustments

Adjustment	Description	How Utilized
Roadway Capacity	Capacity of roadway to accommodate vehicle demand. Measured in passenger vehicles/lane/hour. Can vary by facility type, area type, and time-of-day.	Used as a proxy to model different vehicle spacing by facility type as a consequence of platooning.
Passenger Car Equivalent (PCE)	Amount of roadway capacity a specific type of vehicle uses. PCE for passenger cars = 1.0. Larger vehicles, such as trucks, will have higher PCE values.	Used as a proxy to model different acceleration profiles and spacing for AVs.

Differentiation Between Scenarios

Effective Roadway Capacity



Adjustment	2045 Baseline	Growth on the Water	Growth in Urban Centers	Suburban/Greenfield Growth
AV PCE	1.20	1.20	1.00	0.50
Roadway Capacity (Interstate/Freeway)	No Adjustment*	No Adjustment*	+35%	No Adjustment*

* Default travel model values

Zero-Occupant Vehicles

Behavior/Trip Type	Description
Type 1: Carsharing Among Household Members	• A private CAV drops one household member off at some destination and subsequently travels to some other location to pick up another member of the same household. • Households with at least one CAV but less vehicles than adults. • Only applied to home-based trips.
Type 2: Returning Home to Avoid Paid Parking	• Private CAVs. • Only applied to home-based trips.
Type 3: Travel to Non-Home Locations to Avoid Paid Parking	• Private CAVs. • New trips generated between locations with paid parking and nearby locations. with free parking.
Type 4: Circulating in Lieu of Parking or to Avoid Paid Parking	• Private CAVs. • Applied to trips with short activity duration (home based non-work).
Type 5: Travel to Pick-up Passengers	• MaaS or Shared CAVs.
Type 6: Travel to/from Centralized Depots	• MaaS or Shared CAVs. • Return to centralized depots intermittently, either to re-charge or when demand is low. • Asserting that some locations contain depots with set capacities.

Zero-Occupant Vehicles

Share of Households Contributing to ZOV Trips[1]

Behavior/Trip Type		Area Type[2]				
		CBD	OBD	Urban	Suburban	Rural
Type 1: Carsharing Among Household Members	Work	10%	10%	10%	15%	10%
	Other	20%	20%	20%	30%	25%
Type 2: Returning Home to Avoid Paid Parking	Work	10%	10%	10%	20%	15%
	Other	20%	20%	20%	25%	20%
Type 3: Travel to Location to Avoid Paid Parking	Work	10%	10%	10%	20%	15%
	Other	25%	25%	25%	35%	25%
Type 4: Circulating in Lieu of Parking	Other	20%	20%	20%	30%	25%

1 – Private CAVs; parameter values constant between scenarios.
2 – Area type of trip origin.

Other Behavioral Parameters*

Parameter		Value	Travel Behavior
Truck AV Adoption	All Trips	30%	
Induced Demand			• Trips by seniors, children (non-work trips). • Passengers sleep during long distance trips. • Latent demand for freight movement.
Autos	Home-Based Other	+20%	
	Home-Based Shopping	+30%	
	External - External	+25%	
	Internal-External	+50%	
Trucks	Internal, External	+50%	
Value-of-Time	Home-Based Work	-20%	• Account for added productivity for AV travel.
	Home-Based Other	0%	
Truck AV Diurnal Distribution	Peak	25%	• Shift in truck trips to overnight to avoid daytime congestion.
	Off-Peak	75%	

* HRTPO model default parameter values. Parameter values constant between scenarios.

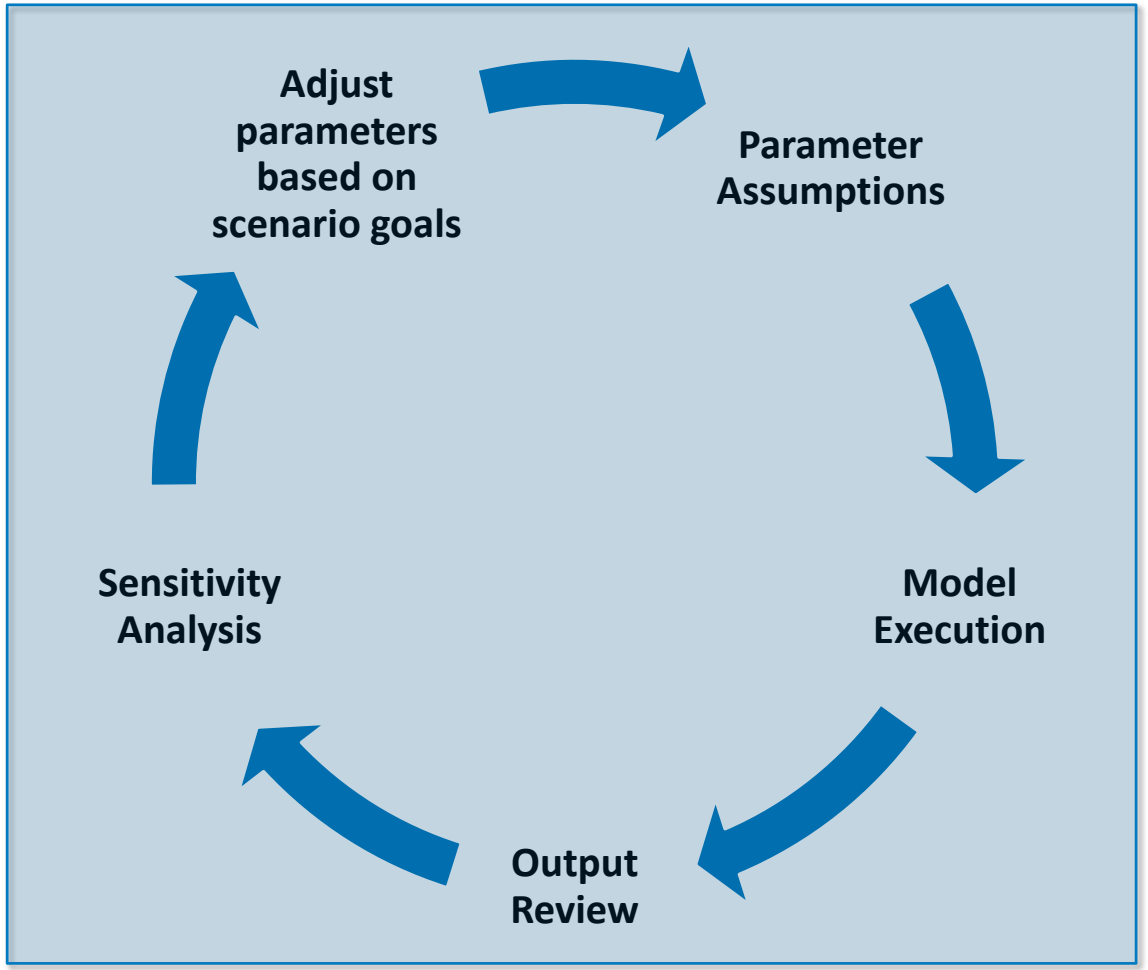
Quantifying Behavioral Parameters

PCE factors for CAVs in mixed flow?

Vehicle occupancies (CAV and MaaS)?

MaaS mode shares?

ZOV trip type mix and depot capacities?



Induced demand by trip purpose?

CAV/conventional split for trucks and external trips?

Change in values-of-time (peak, off-peak)?

Share of CAVs in household vehicles?

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SCENARIO PLANNING UPDATE

January 23, 2020

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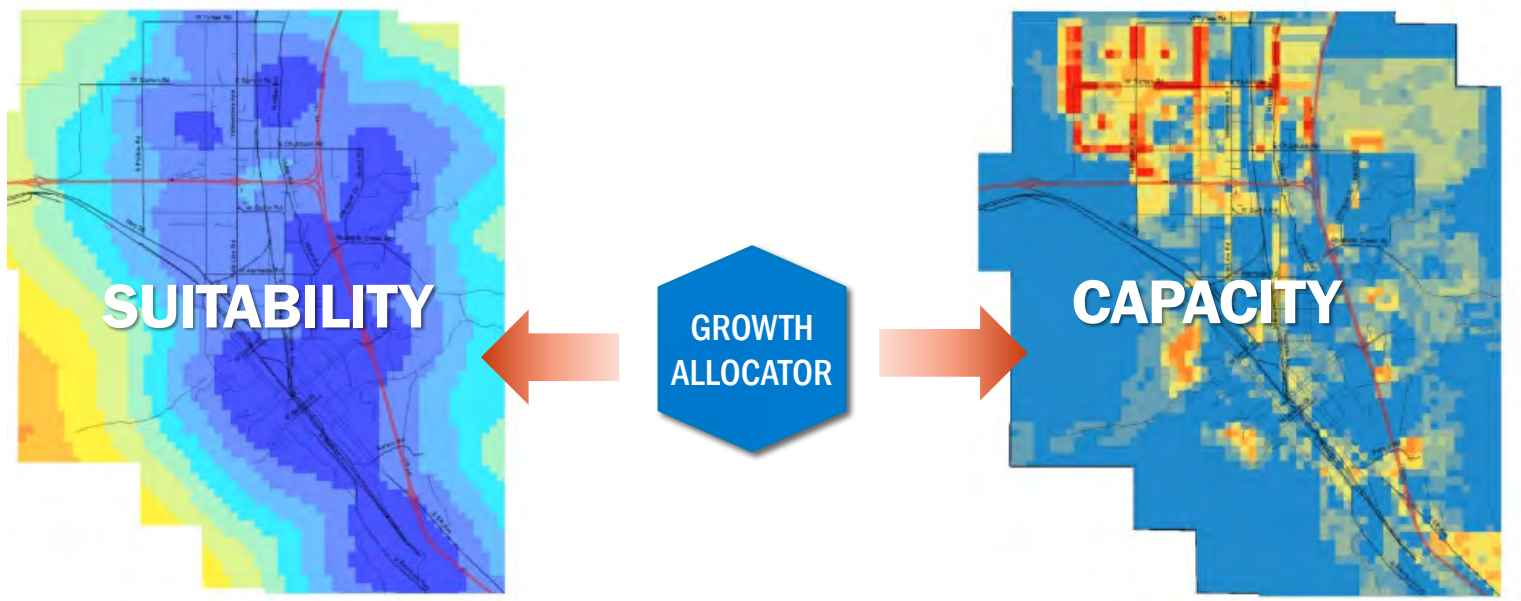
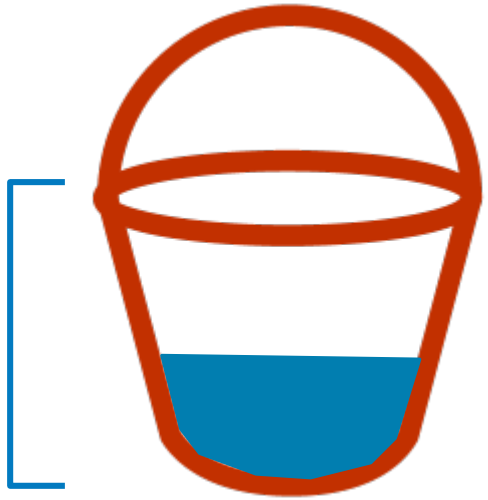
Land Use Allocations for Greater Growth Scenarios

- Place Type locations were not modified for the Greater Growth Scenarios (Place type locations from the 2045 Virtual Future were used)
- This was done to be faithful to the future growth policies of the region's localities
- However - differentiation in growth allocations for each scenario was achieved through:
  - Using Suitability Factors to guide growth spatially (varied by scenario)
  - Using modifications in Place Type capacity to guide growth by Place Type (constant across scenarios)



Capacity in Place Types

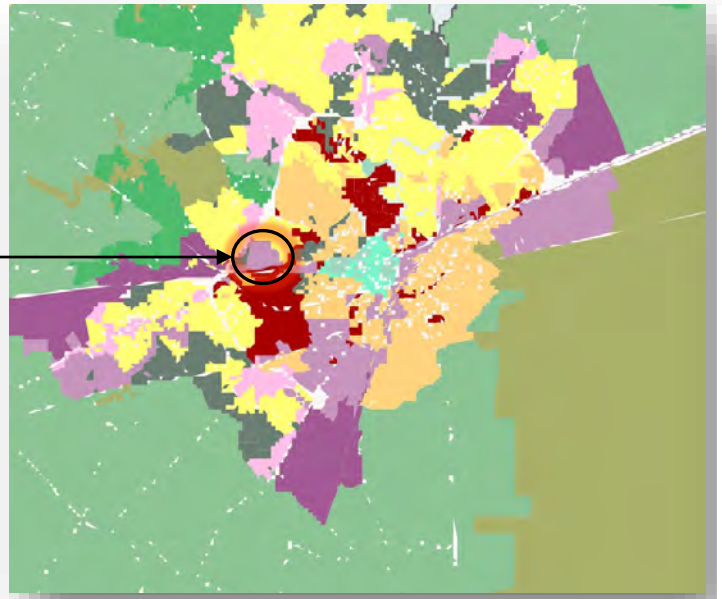
Growth Allocator



Total Capacity in the Place Type

Additional capacity for growth

Amount of growth in the 2045 Baseline

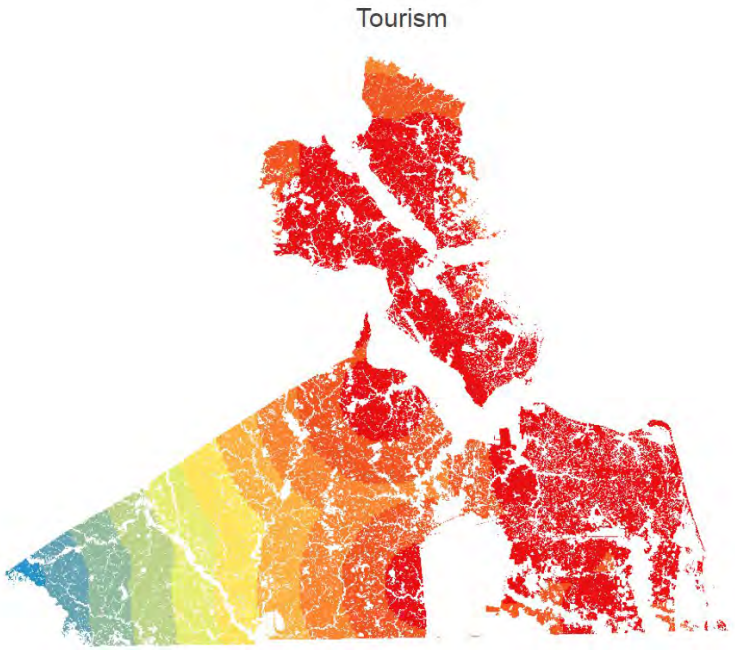


Map of 2045 Place Types

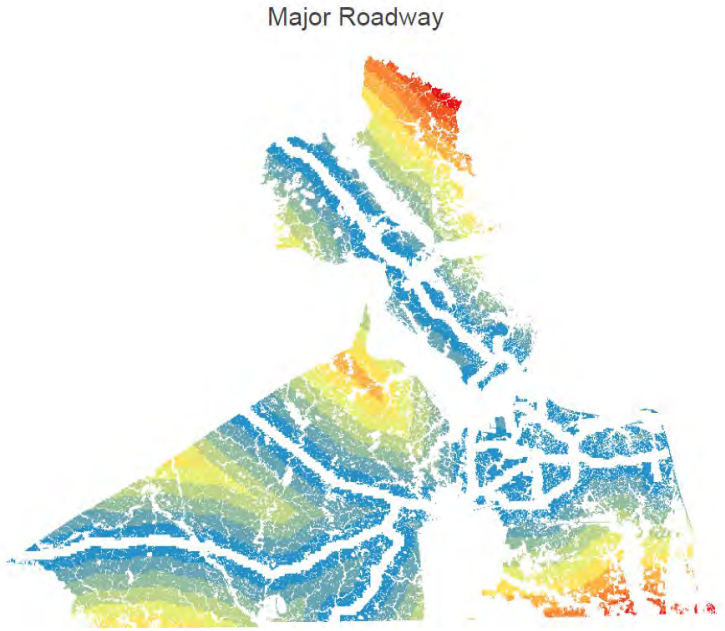
Land Use

- Agriculture
- Resource Conservation
- Historic, Cultural
- Vacant
- Parks and Recreation
- Rural Residential
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Neighborhood Commercial
- Local Commercial
- Regional Commercial
- Light Industrial
- Heavy Industrial
- Port or Aviation Industrial
- Mixed Use Comm-Res
- Mixed Use Comm-Ind
- Military
- Utilities
- Public or Semi-Public
- Transportation Network

Suitability for Greater Growth - Examples



Suitability by Distance as an Attractor



Suitability by Distance as a Detractor

Suitability by Overlap as an Attractor

Suitability acts as a magnet for growth

(Red = highest suitability & blue = lowest suitability)

Refinements to the Land Use Model (since December 3, 2019)

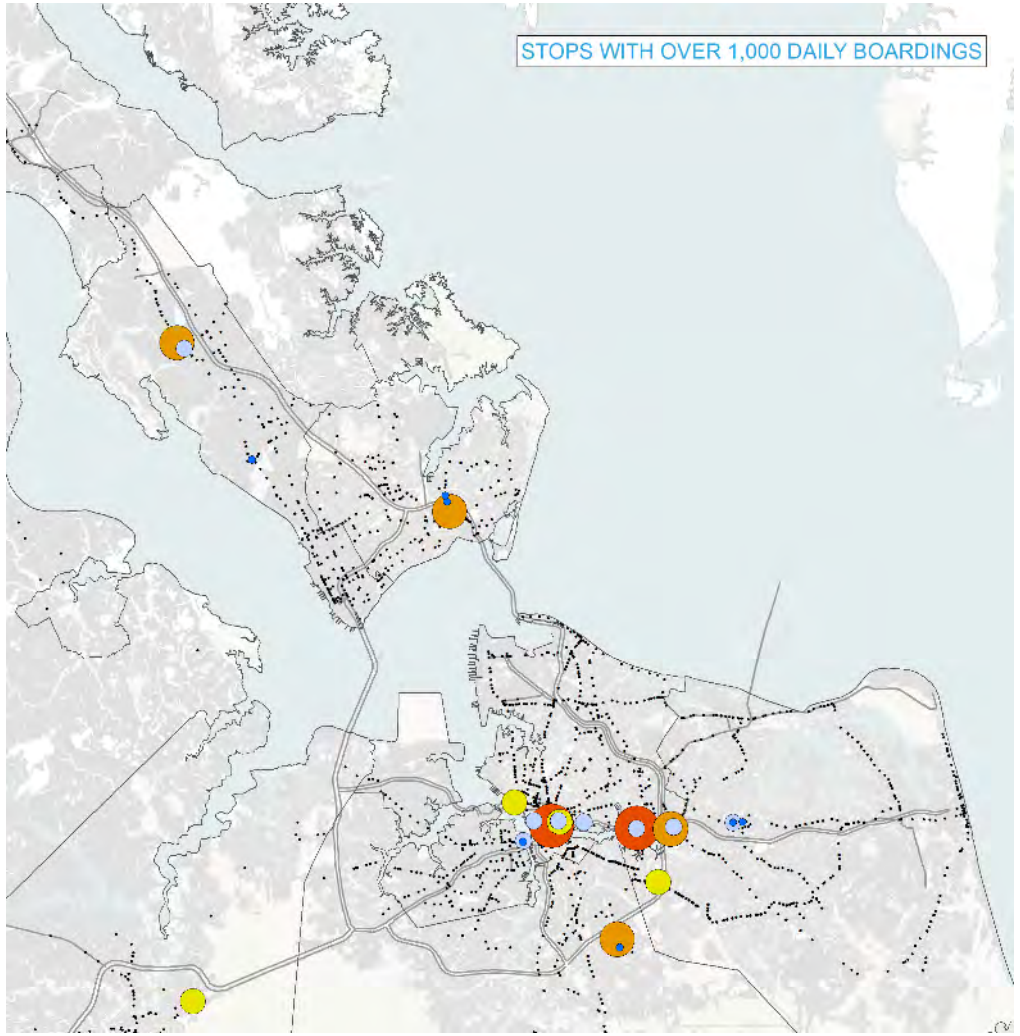
1. Williams Tract added:
   - Defined as a buildable parcel
   - Assigned Mixed Use / Commercial Industrial Place Type
   - Added to “Large Developable Sites” Dataset

2. Transit Proximity dataset changed based on 2045 Transit Demand data from the Travel Demand Model

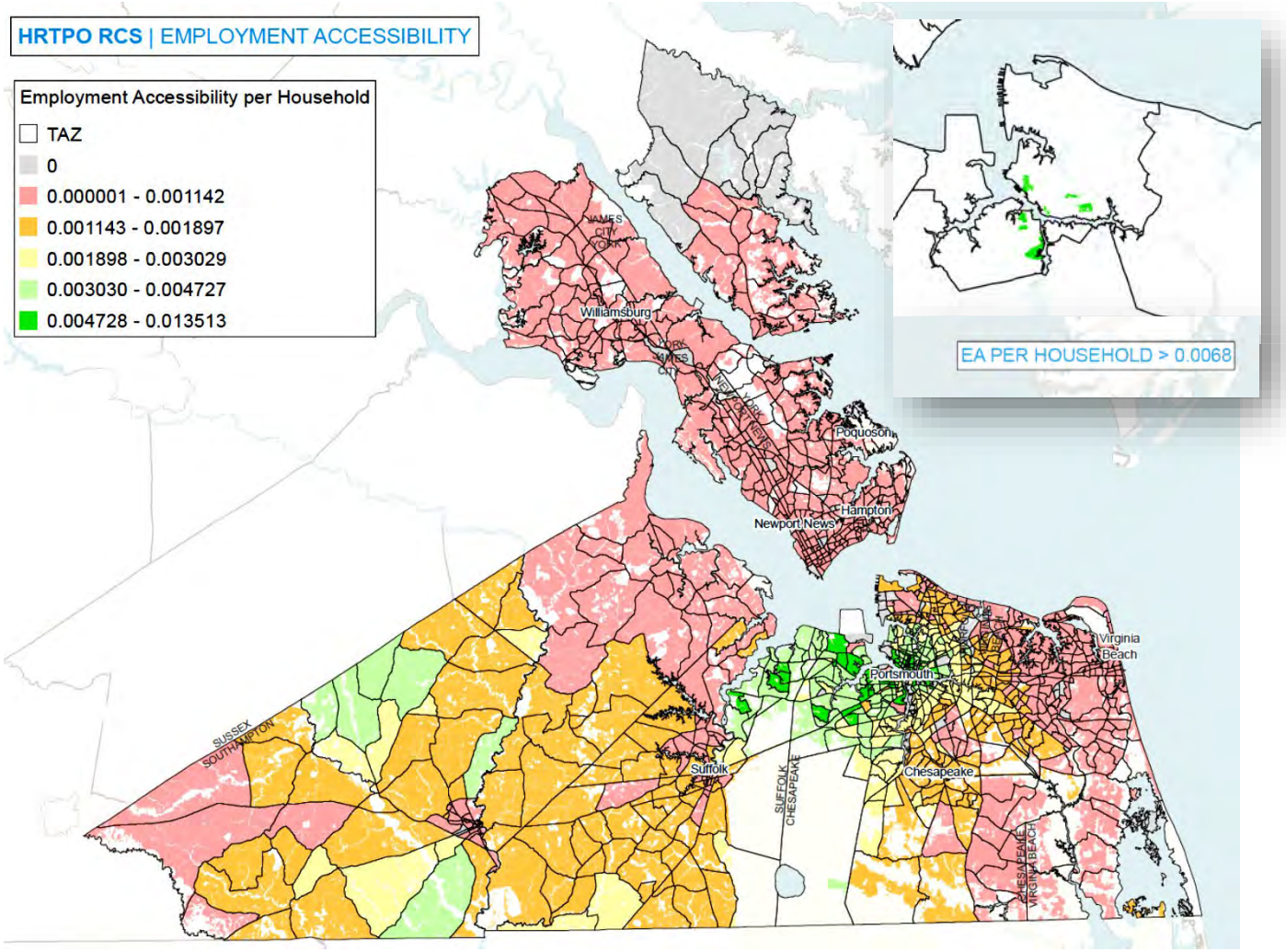
3. Employment Accessibility Suitability Factor added (based on accessibility to high density employment from the Travel Demand Model analysis)

Suitability Refinements: Transit & Accessibility

Transit Demand (2045)

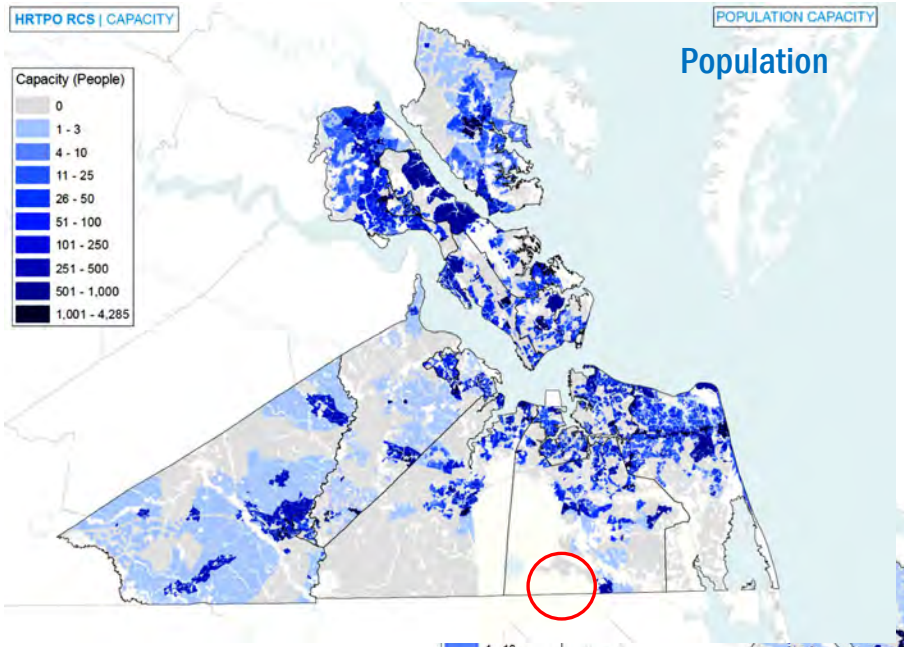


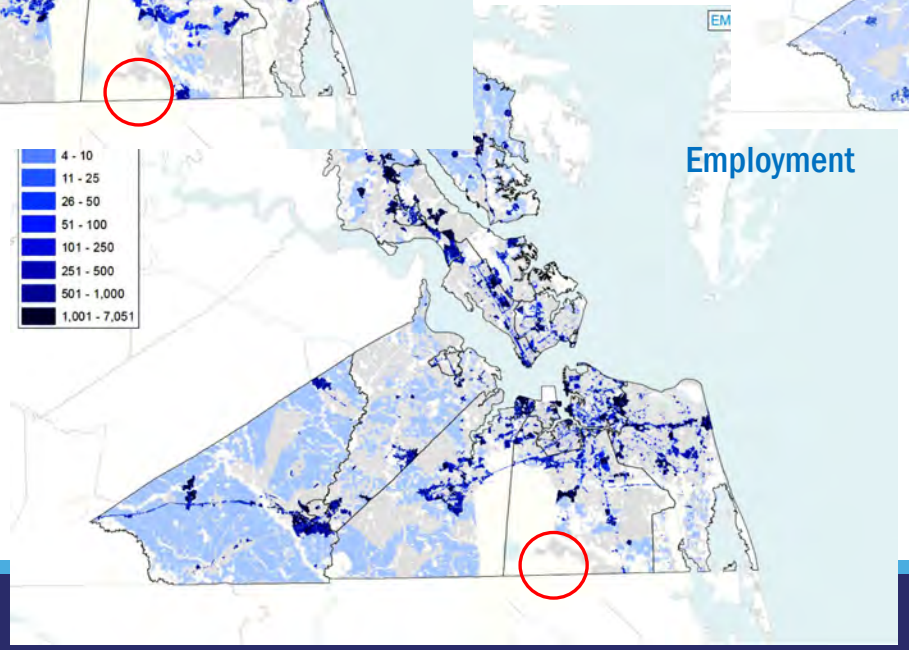
Employment Accessibility



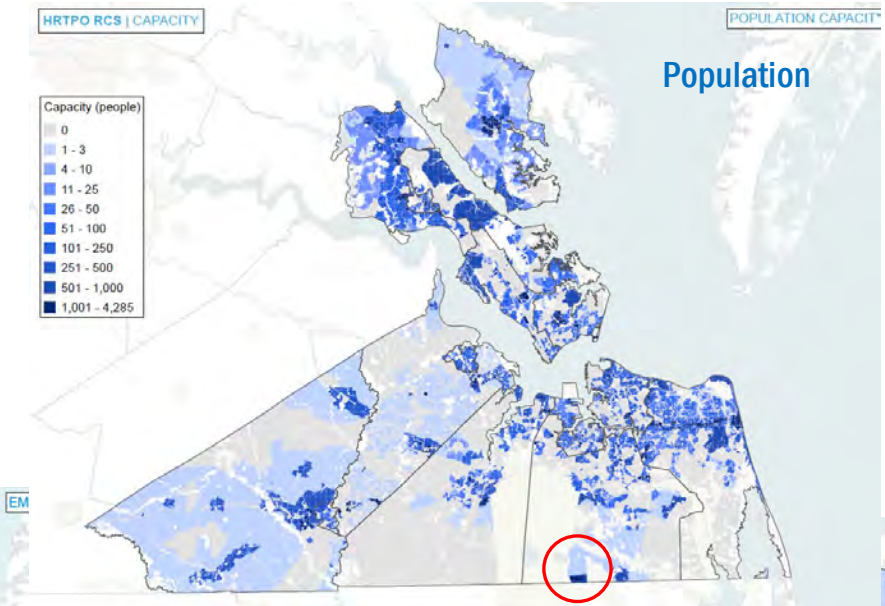
Capacity Refinements: Williams Tract

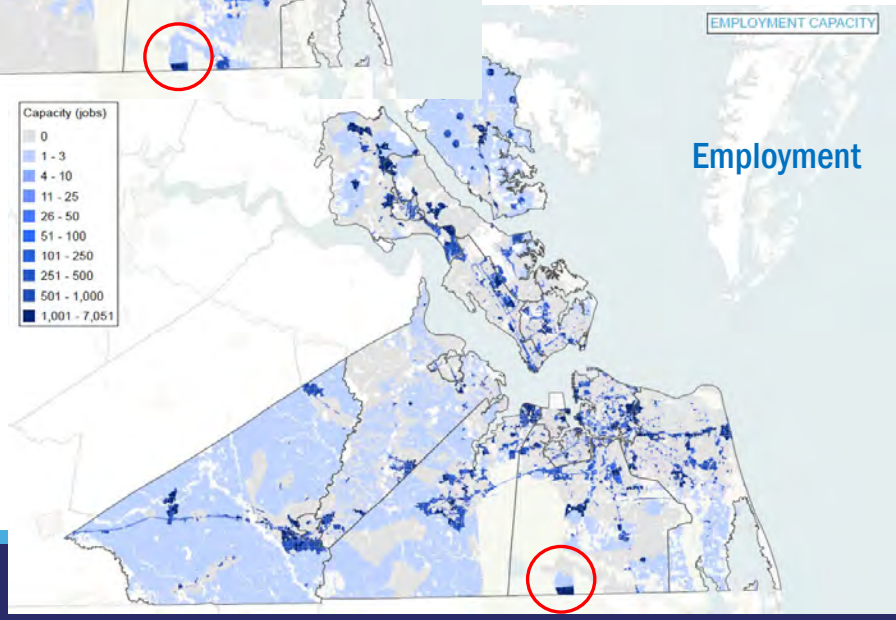
Old





New





Draft Suitability Factors & Weighting by Scenario

A. Water Scenario

Jobs			Population		
Sutability Factor	**Method**	**Weight**	**Sutability Factor**	**Method**	**Weight**
Tourism	Distance		Tourism	Distance	
Military Presence	Overlap		Military Presence	Distance	
Major Roadways	Distance		Major Roadways (-)	Distance	
Urbanized Waterfront	Overlap		Active Transportation	Distance	
Shipbuilding	Distance		Shoreline	OVerlap	
IPA Placetype	Distance		Utilities	Overlap	
IPA Placetype	Overlap				
Utilities	Overlap				

B. Urban Scenario

Jobs			Population		
Sutability Factor	**Method**	**Weight**	**Sutability Factor**	**Method**	**Weight**
Shipbuilding	Distance		Utility Service	Overlap	
Urbanized Waterfront	Distance		Active Transportation	Distance	
Utility Service	Overlap		Employment Accessibility	Distance	-
Active Transportation	Distance		Transit Proximity	Distance	
Employment Accessibility	Distance	-	City Center Proximity	Distance	
Transit Proximity	Distance		Redevelopment Potential	Distance	
City Center Proximity	Distance		Higher Education Facilities	Distance	
Redevelopment Potential	Distance		MCR Placetype	Distance	
Higher Education Facilities	Distance		2045 Employment Density	Distance	
MCR Placetype	Distance		2045 Population Density	Distance	
MCI Placetype	Distance		RLD PT	Distance	
VFEMP Density	Distance		RHD PT	Distance	
			RMD PT	Distance	

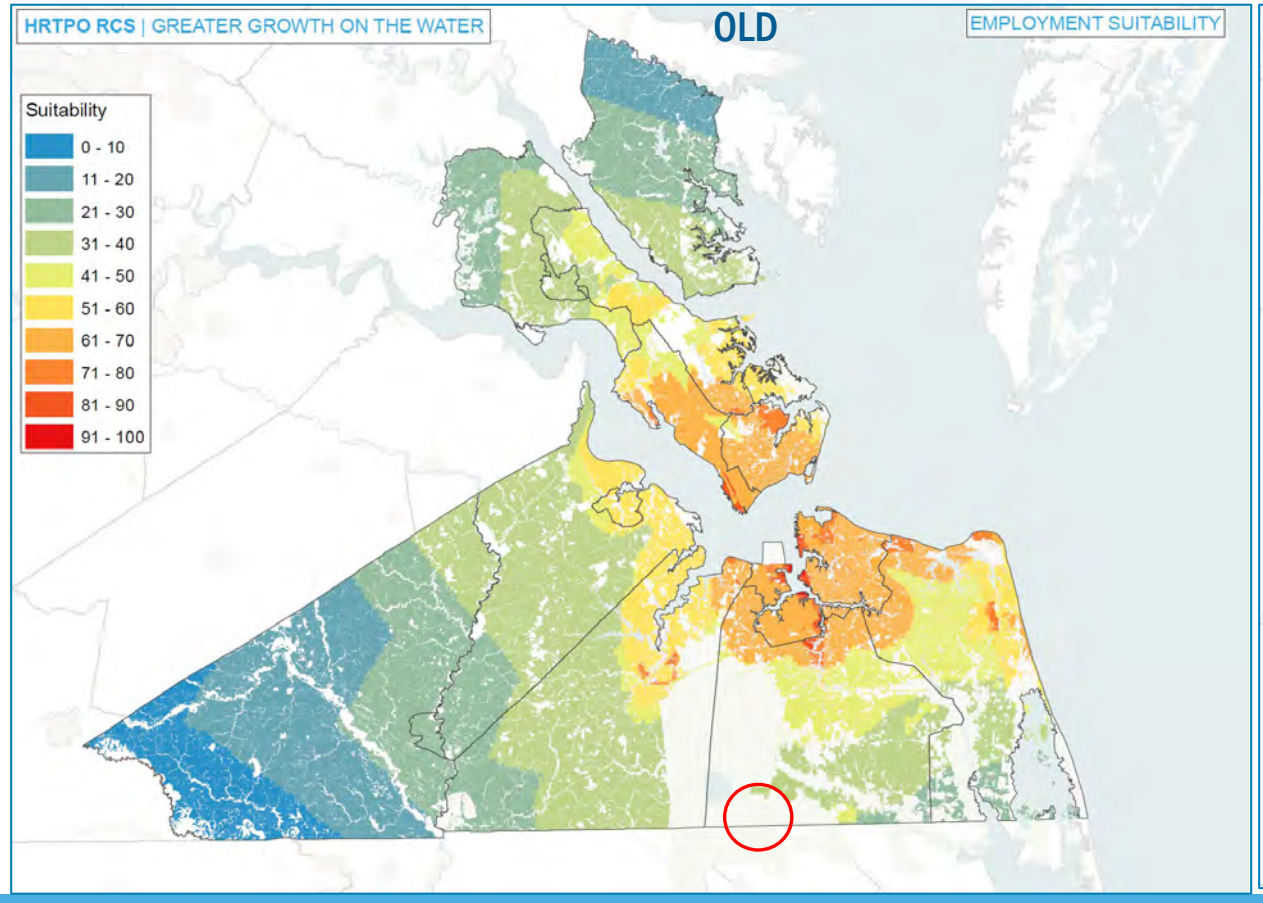
C. Suburban Scenario

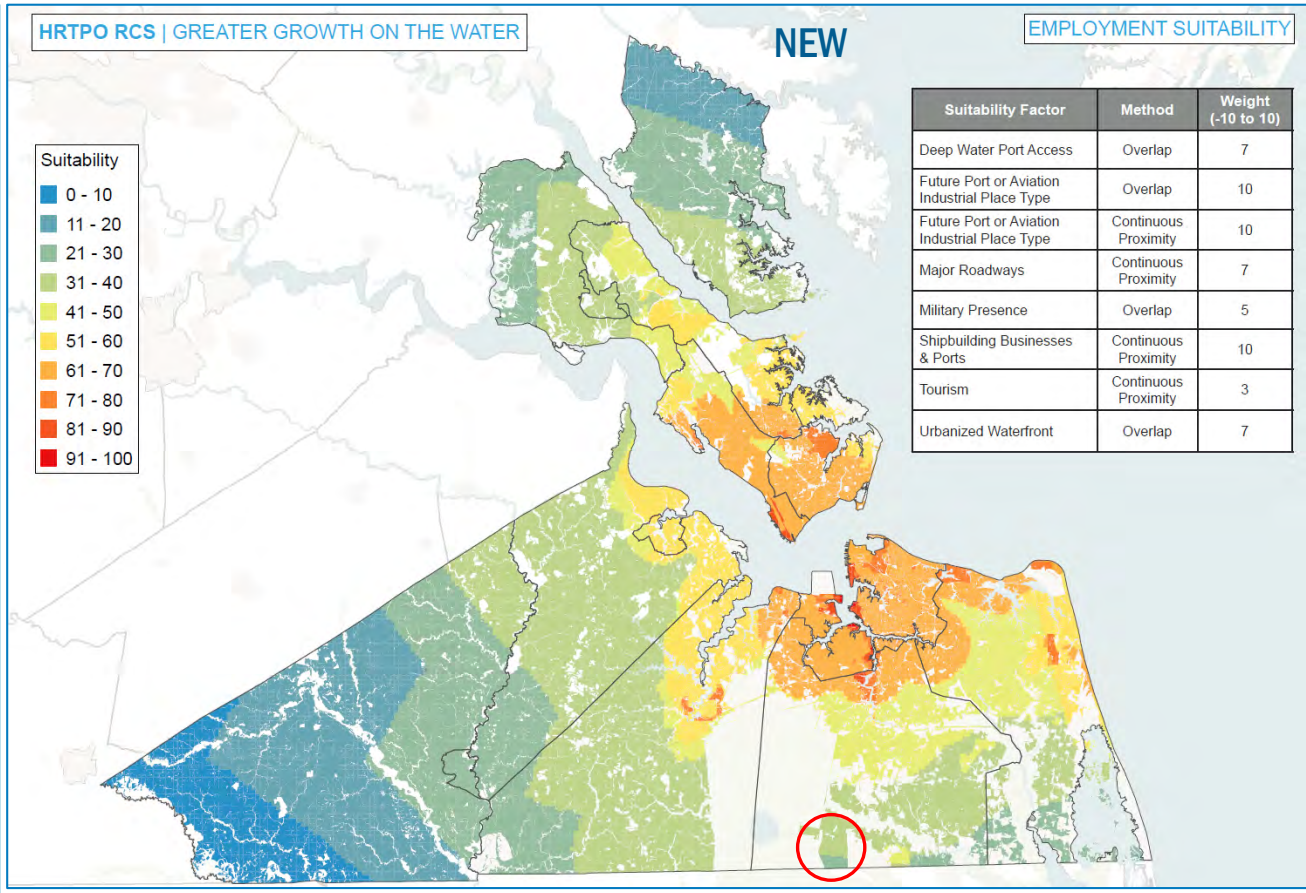
Jobs			Population		
Sutability Factor	**Method**	**Weight**	**Sutability Factor**	**Method**	**Weight**
Active Transportation	OVerlap		Active Transportation	Distance	
Vacant Land Availability	Distance		Major Roadways (-)	Distance	
Large Developable Sites	Distance		Vacant Land Availability	Distance	
Existing Warehouse Facilities	Distance		MCR Placetype	Distance	
MCR Placetype	Distance		Utility Service	Overlap	
MCI Placetype	Distance				
CR Placetype	Distance				
Utilities	Overlap				
ELU IH	Distance				
IP	Distance				
City Centers	Overlap				

Red highlighted factors have been refined

- The length of the blue bar indicates the relative "weight" of the suitability factor as an attractor
- Red bars indicate factors that are detractors

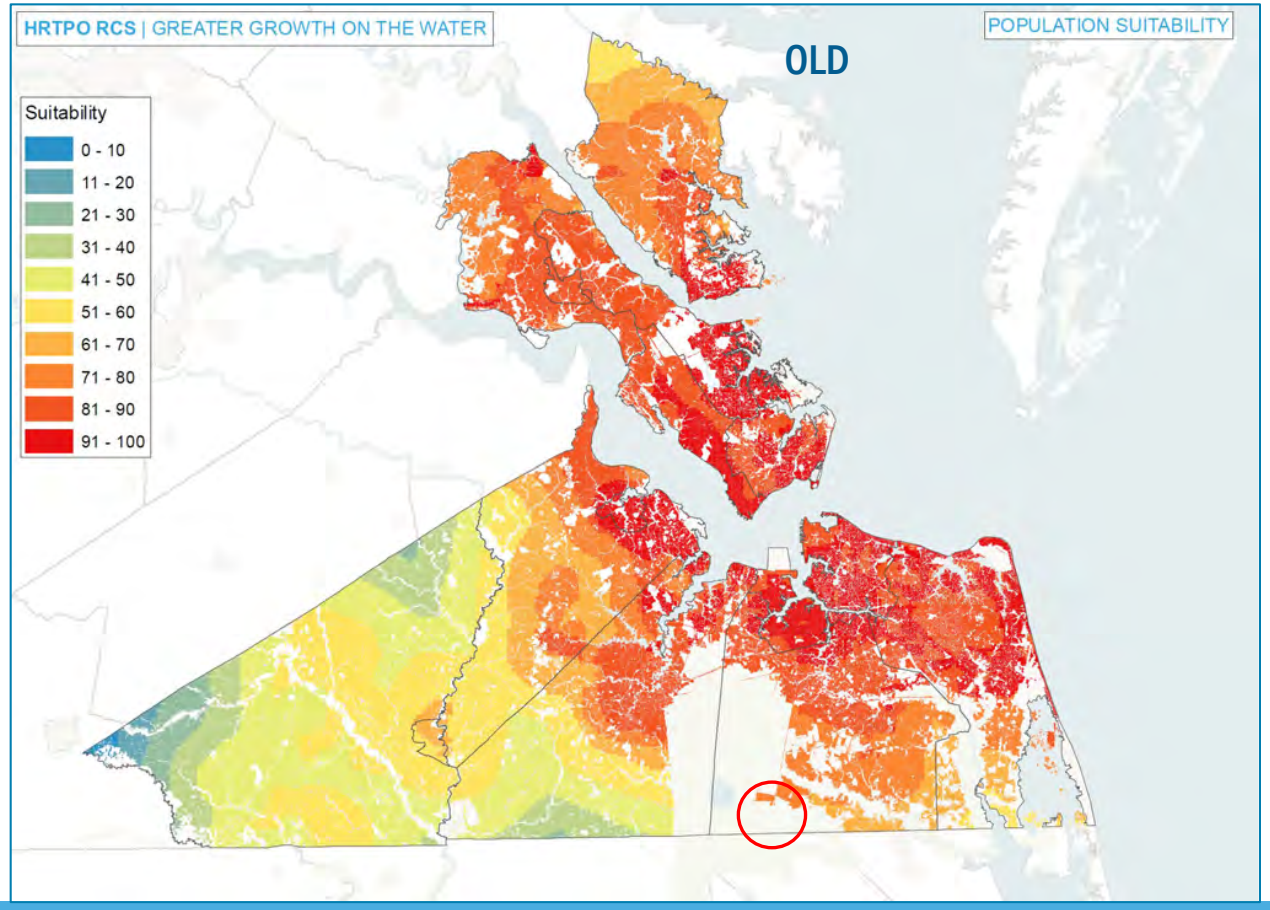
Comparing Suitability for Water Scenario: Employment

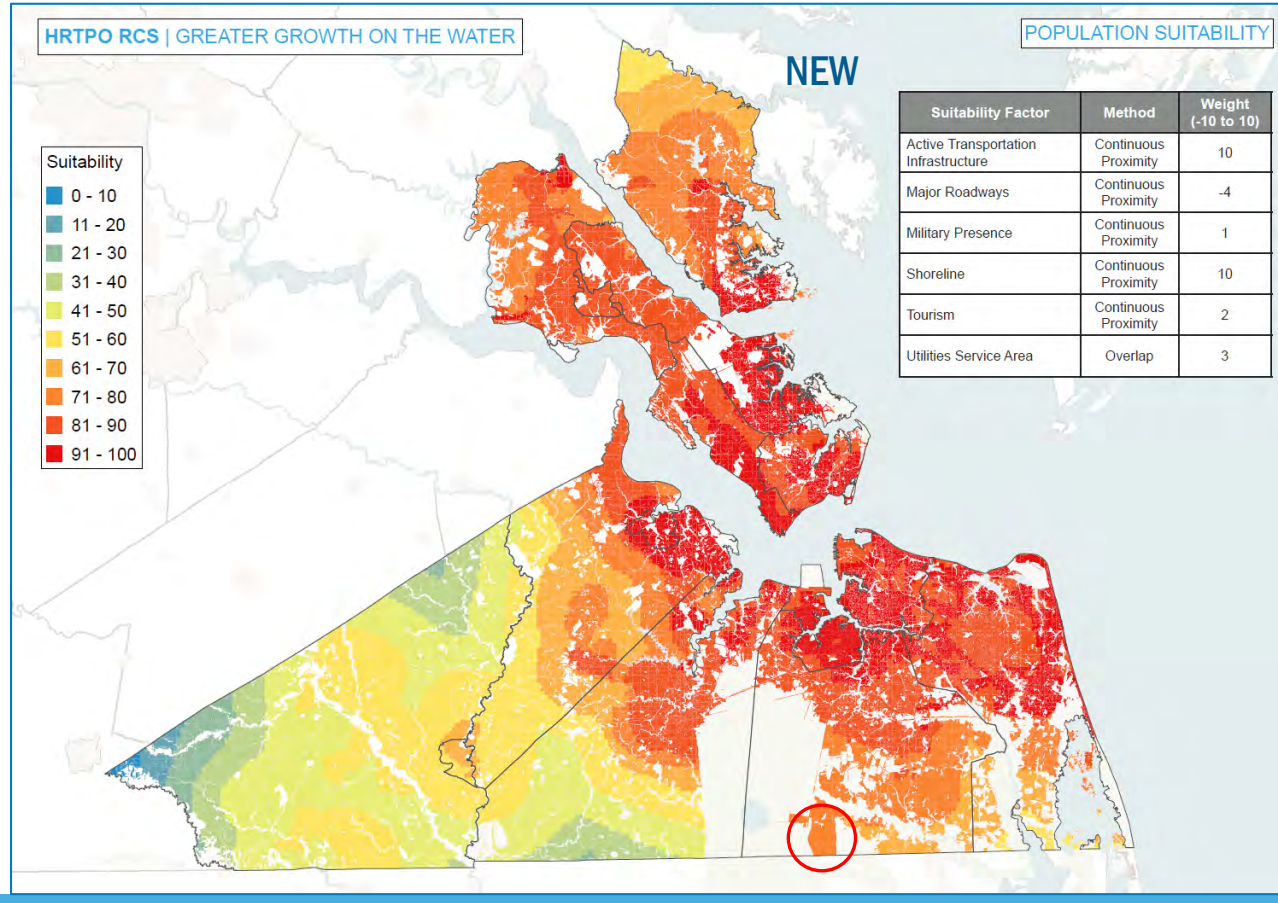




Suitability Factor	Method	Weight (-10 to 10)
Deep Water Port Access	Overlap	7
Future Port or Aviation Industrial Place Type	Overlap	10
Future Port or Aviation Industrial Place Type	Continuous Proximity	10
Major Roadways	Continuous Proximity	7
Military Presence	Overlap	5
Shipbuilding Businesses & Ports	Continuous Proximity	10
Tourism	Continuous Proximity	3
Urbanized Waterfront	Overlap	7

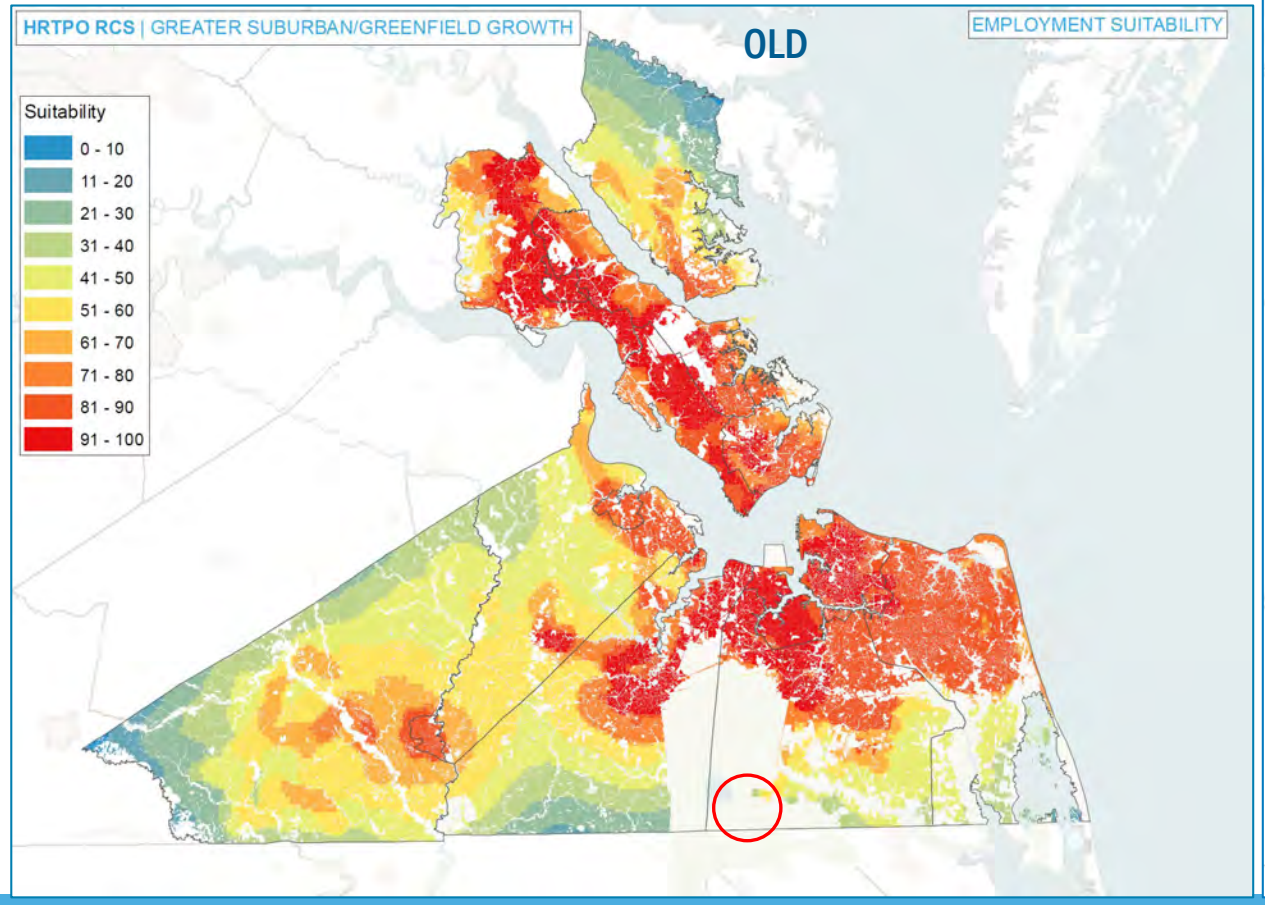
Comparing Suitability for Water Scenario: Population

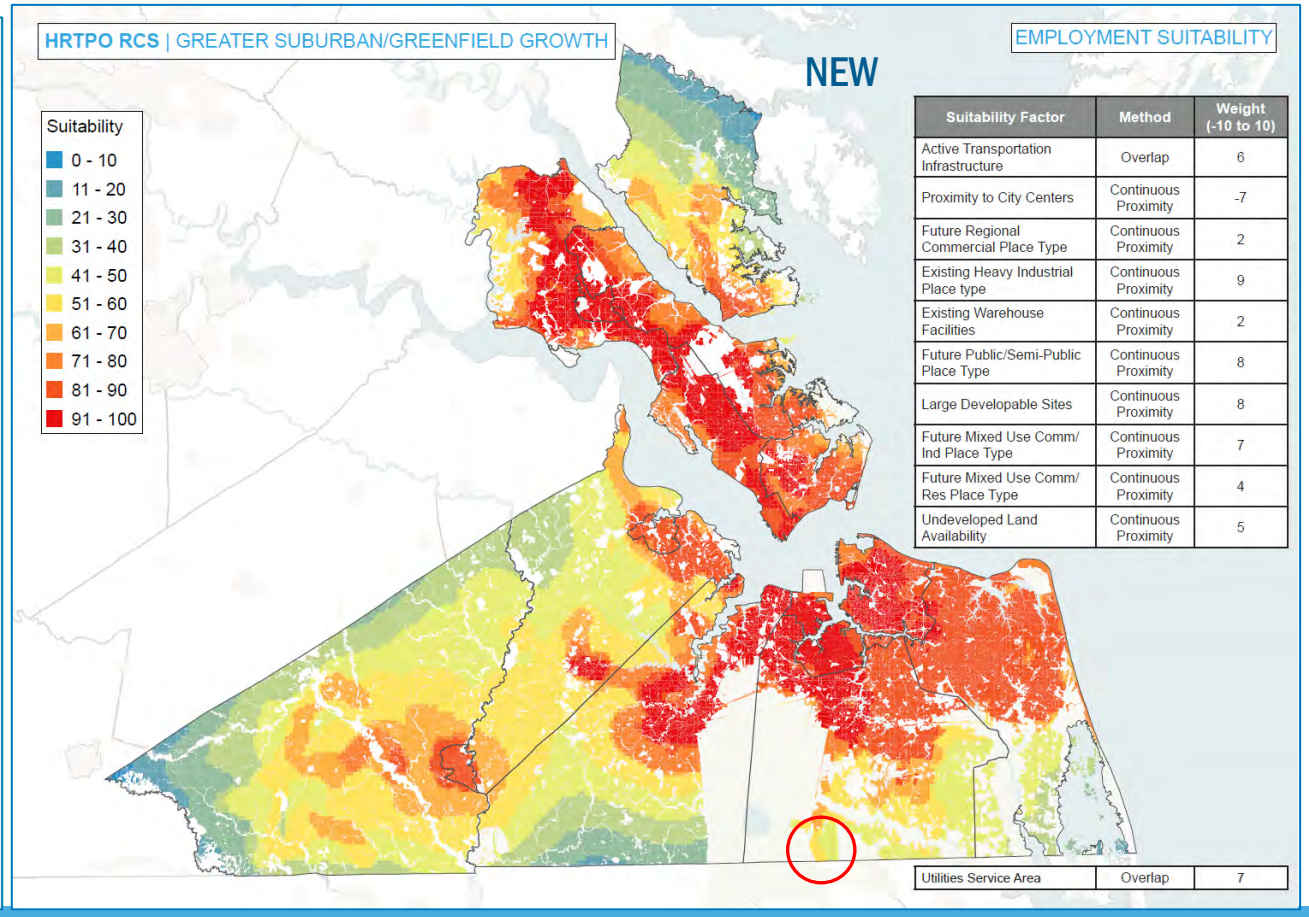




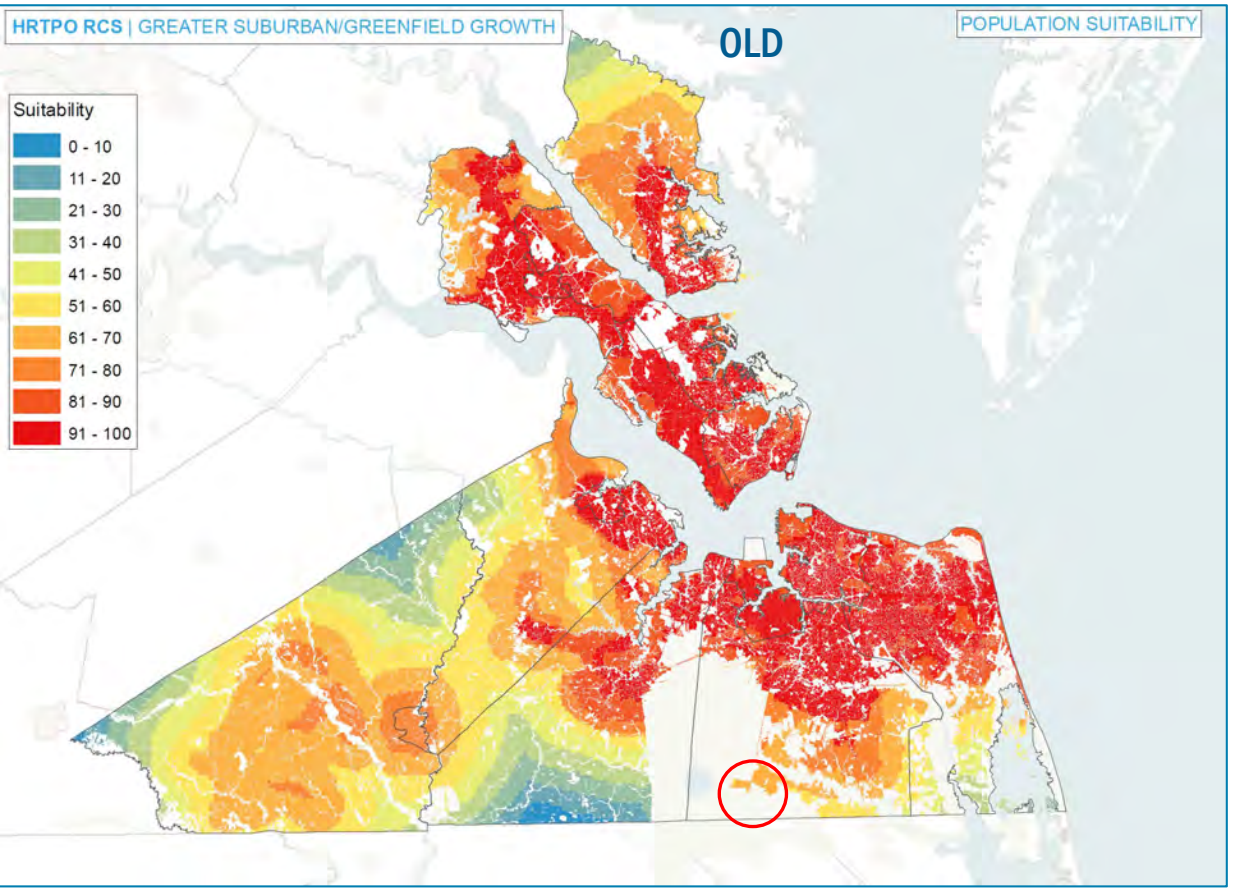
Suitability Factor	Method	Weight (-10 to 10)
Active Transportation Infrastructure	Continuous Proximity	10
Major Roadways	Continuous Proximity	-4
Military Presence	Continuous Proximity	1
Shoreline	Continuous Proximity	10
Tourism	Continuous Proximity	2
Utilities Service Area	Overlap	3

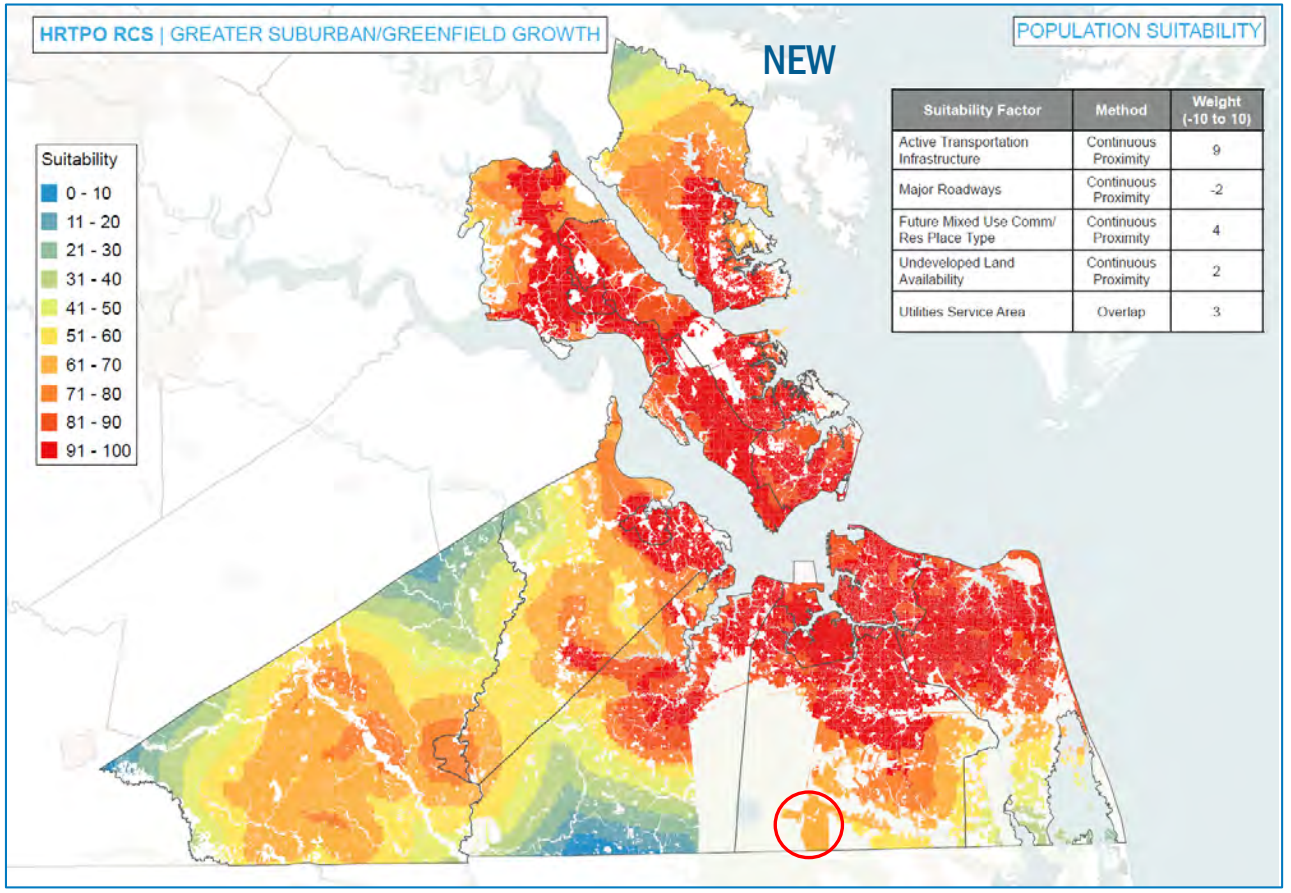
Comparing Suitability for Suburban Scenario: Employment



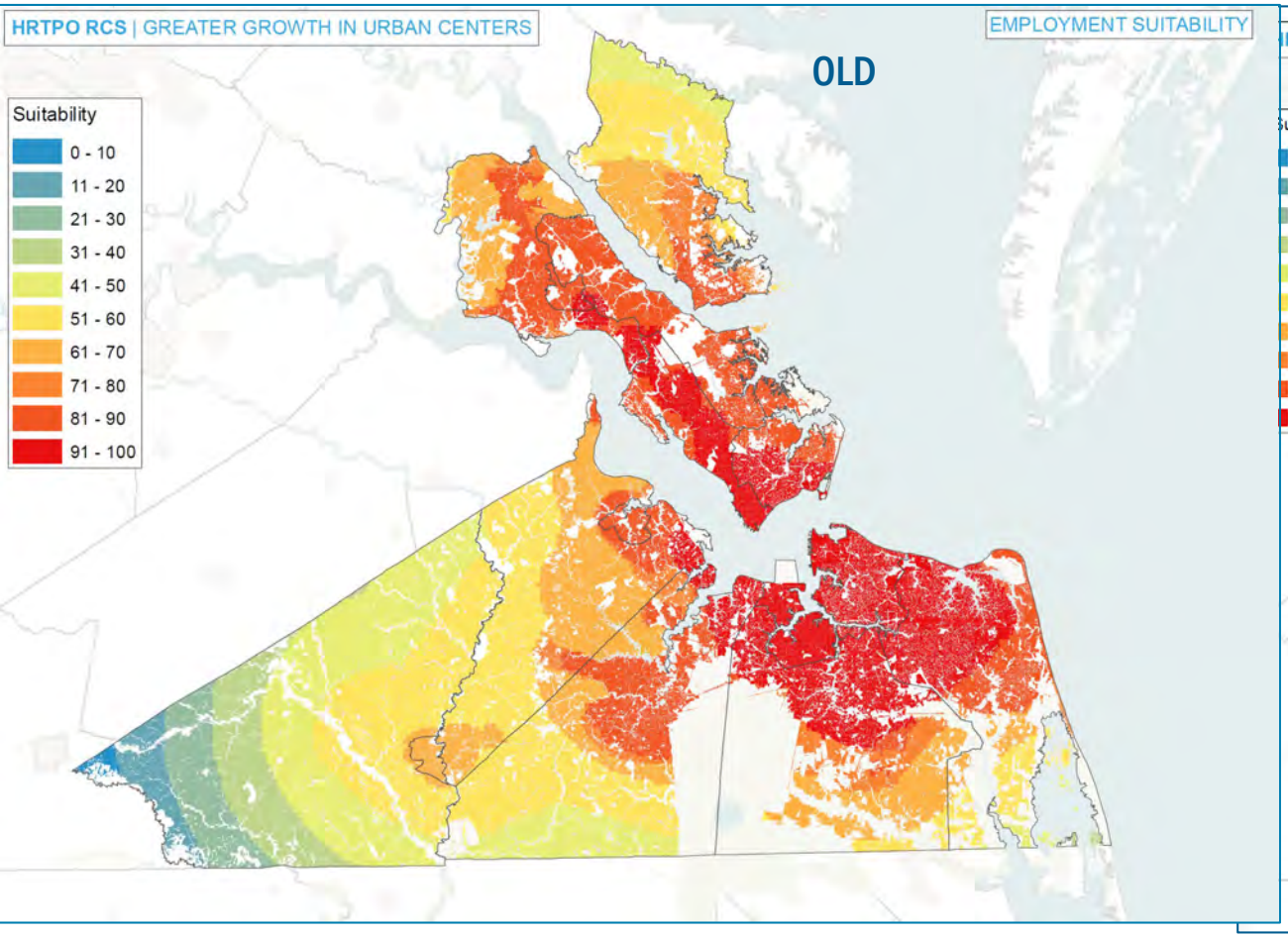


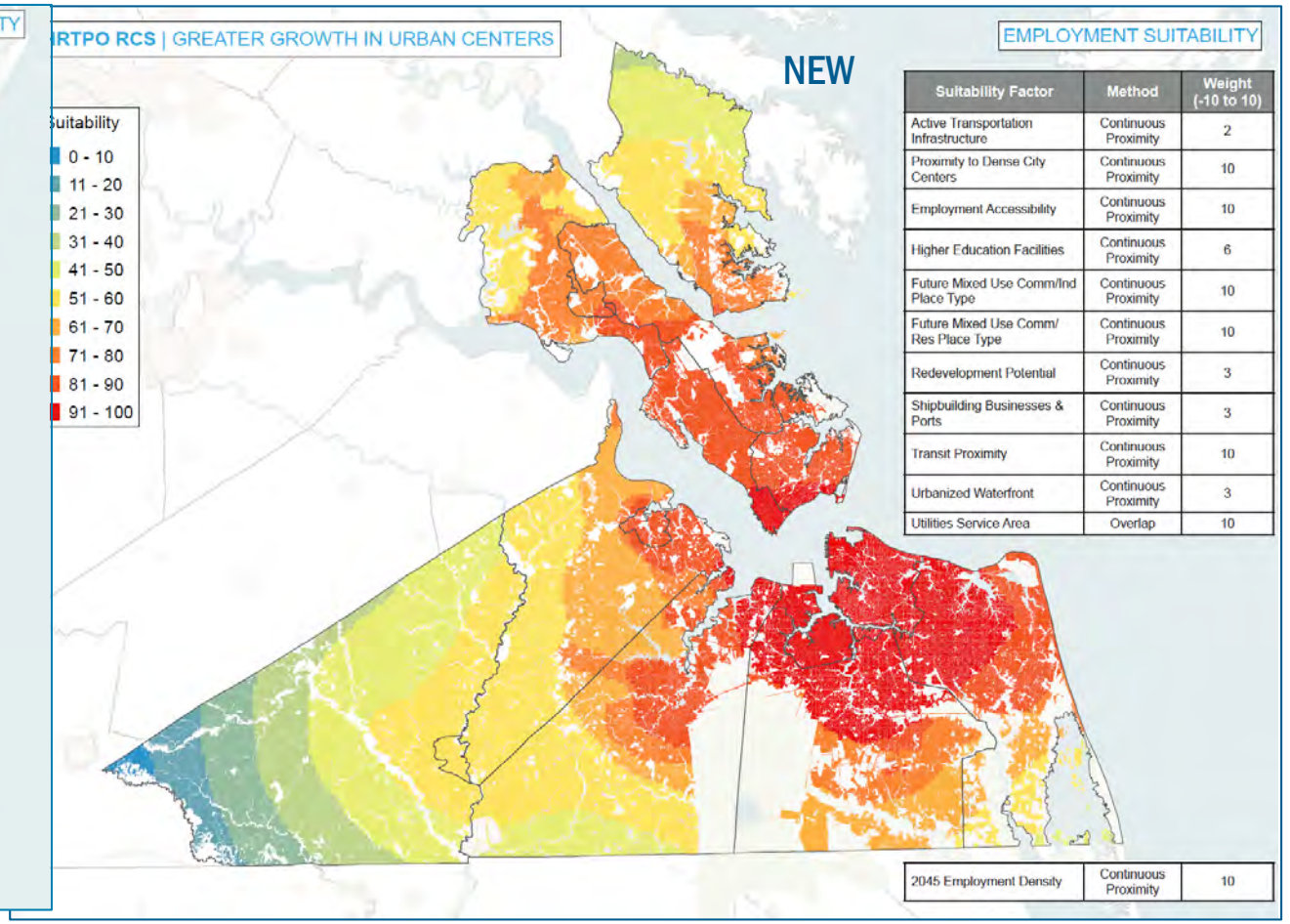
Comparing Suitability for Suburban Scenario: Population



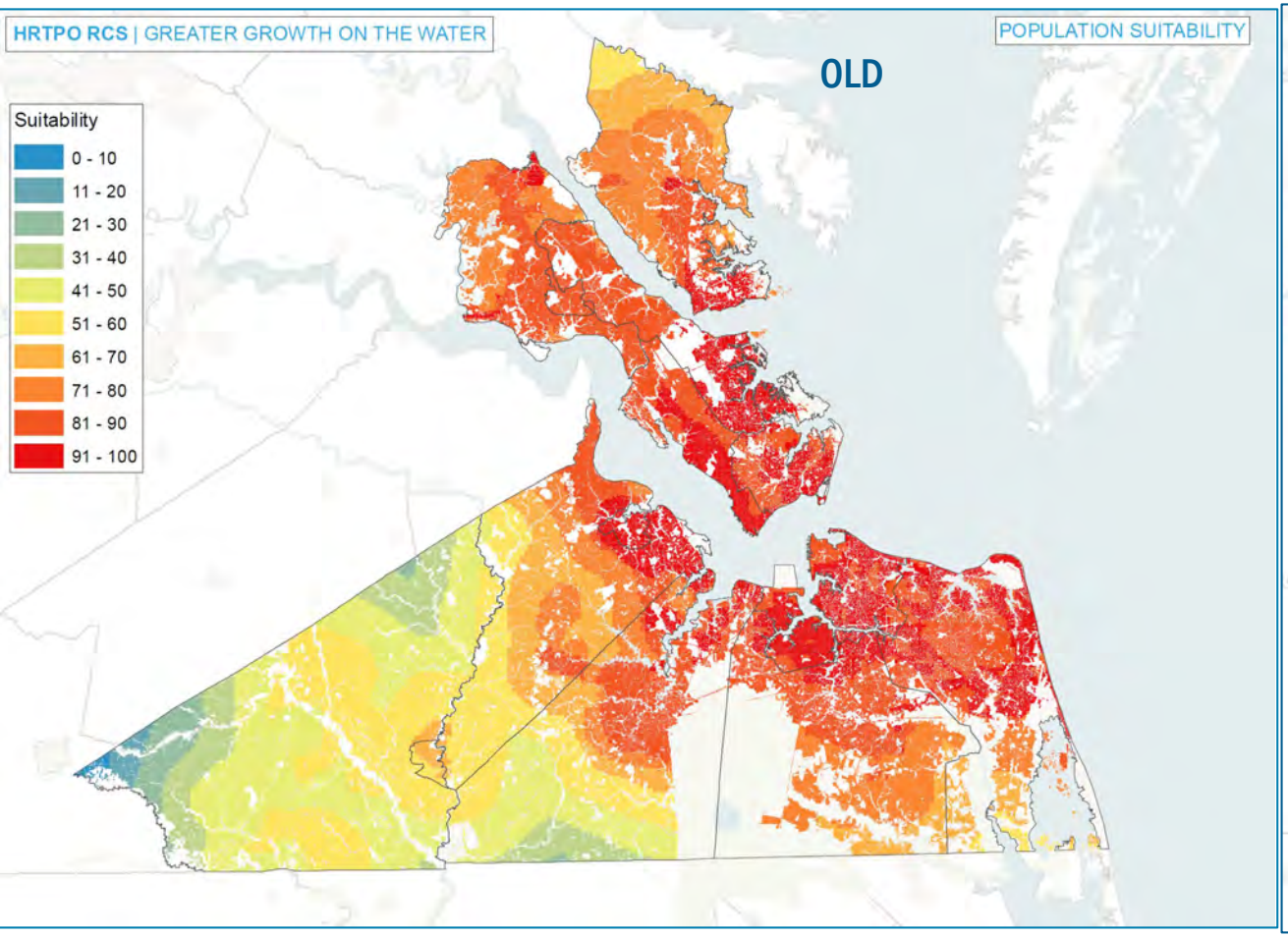


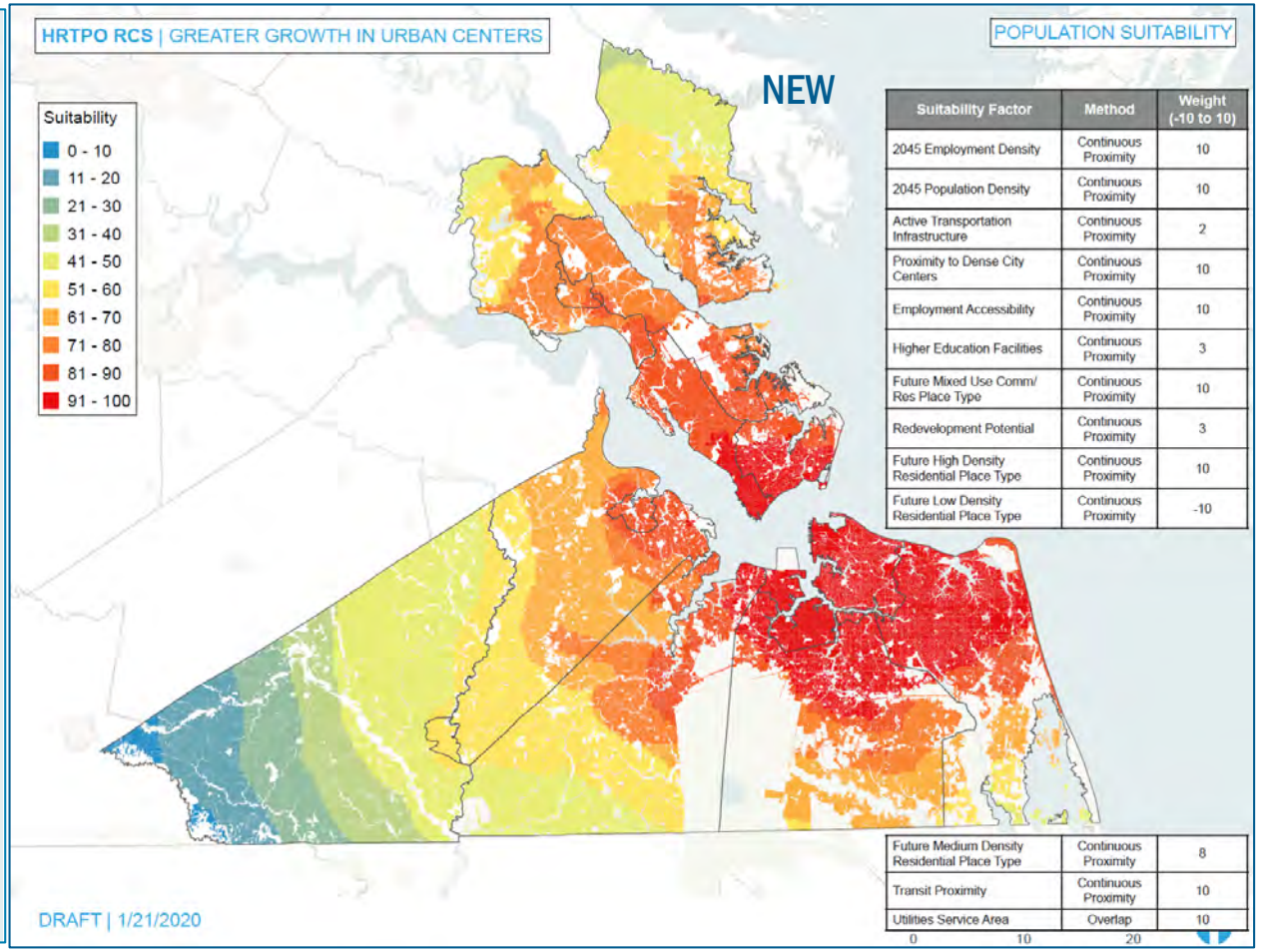
Comparing Suitability for Urban Scenario: Employment





Comparing Suitability for Urban Scenario: Population



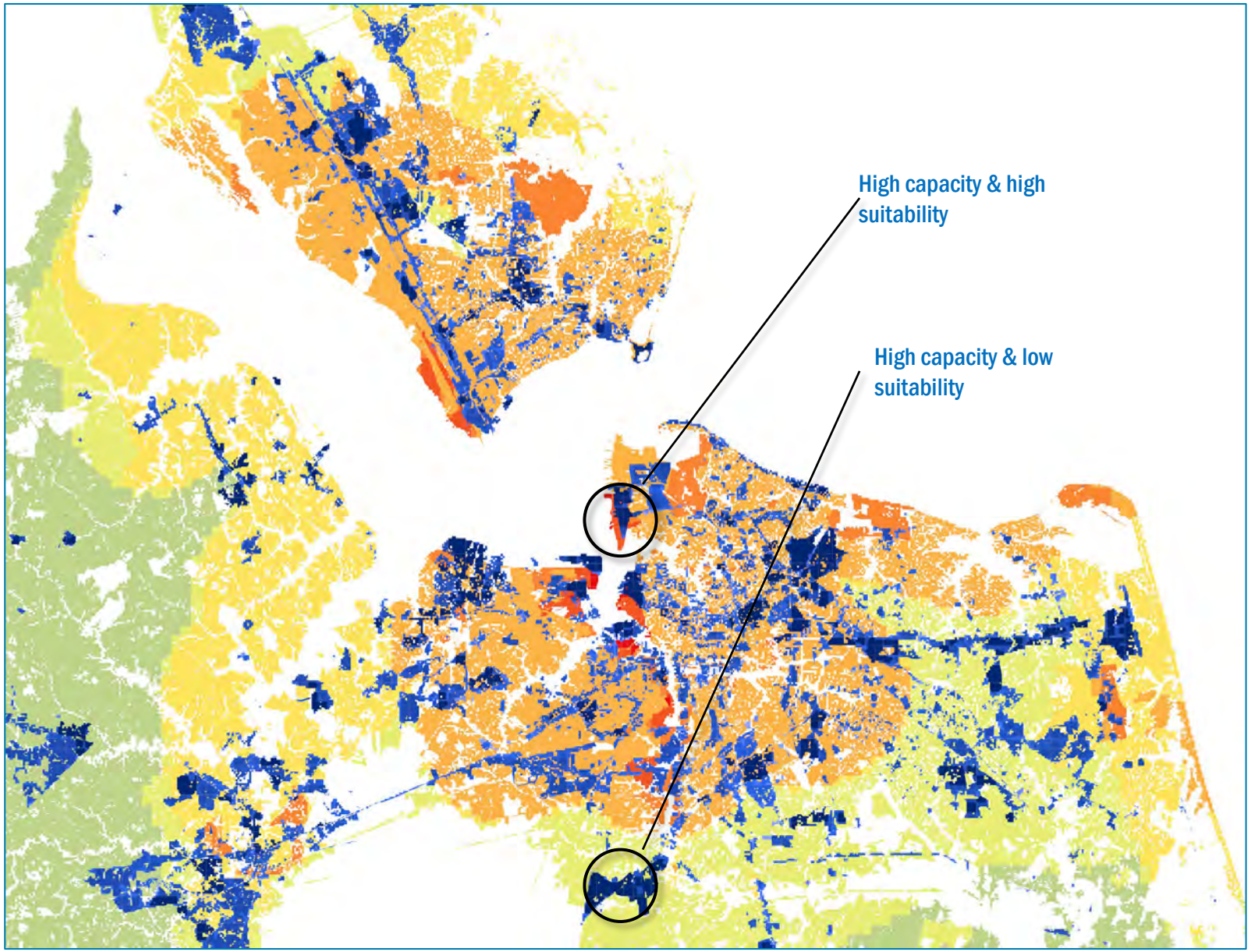


Suitability & Capacity Together

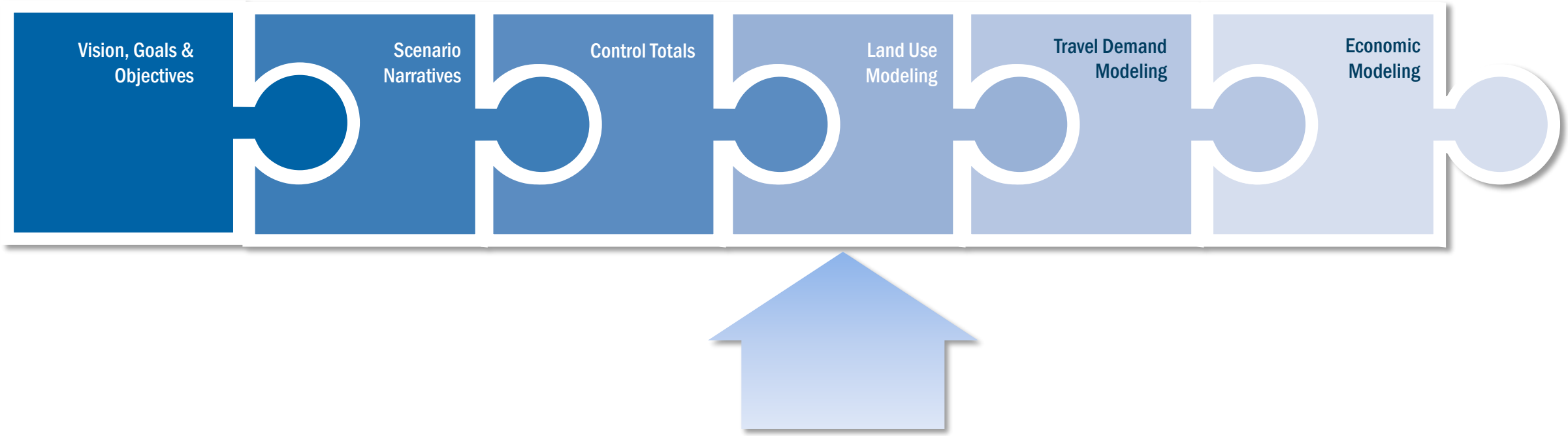
This is a map of the Employment Capacity map overlaid onto the Employment Suitability Map (for the Water Scenario)

The Allocator will allocate growth to Place Types that have capacity according to their Suitability weights

- Blue areas indicate Capacity – darker blue indicates greater capacity
- Green to red areas represent Suitability with red indicating the highest suitability



Next Steps – Land Use Modeling



- Run new Allocations using the new Suitability and Capacity Refinements
- Present Revised Allocations in February 13 Working Group meeting
- Output results of Land Use Modeling to Travel Demand Model