

Pathways to the Future

TRANSPORTATION



Advisory Workgroup Meeting

December 3, 2025

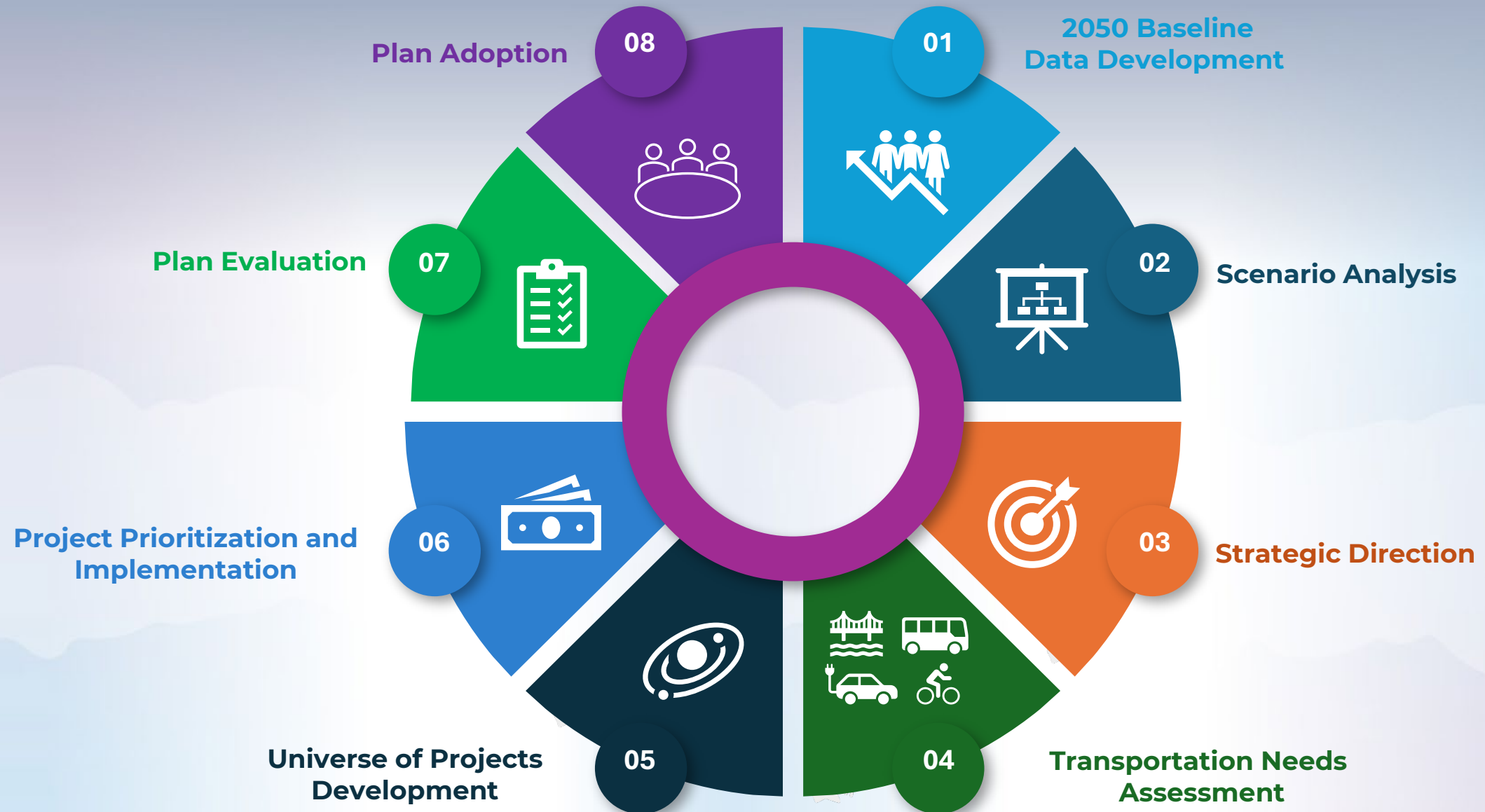


AGENDA

1. Attendance
2. October 22 Meeting Summary
3. Public Comment Period
4. LRTP Progress Update
5. LRTP Phase 5: Universe of Projects – Update (Recommendation Requested)
6. LRTP Phase 6: Project Prioritization – Methodology and Scorecard Update
7. LRTP Phase 6: Constrained Plan Development
8. Next Meeting




L RTP Progress Update

2050 LRTP – PROCESS FLOW



2050 LRTP PROCESS FLOW – LRTP-AWG ACTION ITEMS

Task 3 Strategic Direction

 Vision, Goals, Objectives  

 Performance Measures (PM)  

 Transportation Issues Identification (Overarching Problems)

Geographic Clusters and groupings of Issues

Transportation Needs Assessment (Specific Solutions) 

Regional Project Inclusion Guidelines  

Universe of Multimodal Transportation Projects (Tangible Actions)  

Project Prioritization Process  

Constrained Plan  

Task 4 Transportation Needs Assessment

LRTP –AWG ACTION ITEMS

 Input  Recommendation

 Discussion  Agreement

Task 5 Universe of Projects Development

Task 6 Project Prioritization and Implementation



L RTP Phase 5: Universe of Projects – Update (Recommendation Requested)

TASK 5 – UNIVERSE OF PROJECTS

What are the options?

(Universe of Transportation Projects Development)

- Regional Project Selection Guidelines
- Universe of Candidate Projects Development
- Total Funding Requirement

Deliverables:

- Regional Project Inclusion Guidelines
- Universe of Regionally Significant Multimodal Transportation Projects

UNIVERSE OF PROJECTS

CHAMPIONS DEVELOPING

Comprehensive Plans,
Conceptual Plans



L RTP Needs
Assessment



Recent Plans and
Studies



Unfunded Projects
(SMART SCALE,
CVTA, RRTPO)



Universe of
Projects



Previous
L RTP
Rollovers



UNIVERSE OF PROJECTS UPDATE

- Staff received list of projects from LRTP-AWG Project Champions
- Staff screened projects against 2050 LRTP Project Inclusion Guidelines
- Staff shared update draft list to the AWG on Nov. 20th for review

- **Revisions**

- Powhite Parkway Extension, Phase 2 (4-lane concept) - Woolridge Rd to Duval Rd – Cost Estimate revision \$400M to \$505M

- **Addition**

- 288/360: Route 288 NB (Route 360 - Powhite Parkway) CD Road - \$300,000,000
- Rt 288 (Rt 10 - Courthouse) Widening - \$50M
- Route 10 (Jessup Rd - Cogbill Rd) Safety and Operation Improvements – \$20M

UNIVERSE OF PROJECTS UPDATE

Project Type	Total # of Projects	% of Total Projects	Total Project Costs (\$)
Highway	144	71%	\$6,689,732,123
Active Transportation	21	11%	\$426,134,500
Transit	13	7%	\$1,405,000,000
Travel Demand Management	8	4%	\$53,097,134
Freight/Passenger Rail	9	4%	\$335,500,000
Bridges	6	3%	\$435,500,000
Total	201	100%	\$9,344,963,757

TASK 5 – TENTATIVE SCHEDULE

- **LRTP Advisory Committee Approval:** December 2025
- **Project Scoring:** December/January 2025
- **Formal Public Review Period:** January 2026
- **Policy Board Approval:** February 2026

L RTP Phase 6: Project Prioritization – Methodology and Scorecard Update

Performance Measures



How much will a potential solution help?

How will we get there?

How do we measure success?

Where do we want to be?

Performance Measures



Number of Fatal & Injury
Crashes Avoided

Implement complete streets policies
including adding sidewalks, crosswalks,
and other proven countermeasures

By 2050, the number of people killed or
seriously injured on all roadways will be
reduced by 100%

A system where no one is killed or
seriously injured, and people feel secure
and comfortable regardless of how they
travel

What's new this time?

New performance measures needed for:

- Resiliency
- Reliability
- Freight Access
- Economic Development

Updated measures for:

- Natural & Cultural Resources
- On-Road Emissions

L RTP Performance Measure Goal Weights

L RTP Goal	Goal Weight
Safety	20%
Sustainability	35%
Reliability	30%
Resiliency	15%
Total	100%

12 Regional Performance Measures: Derived to mirror Smart Scale Performance Measures while reflecting updated regional goals

Table 4.2 Factor Weights by Category

Factor	Safety	Congestion Mitigation	Accessibility	Land Use	Economic Development	Environmental Quality
Category A	15%	45%*	25%	**	5%	10%
Category B	20%	25%	25%	**	20%	10%
Category C	30%	20%	15%	**	25%	10%
Category D	40%	10%	10%	**	30%	10%

Goal A Safety PMs

- **A1:** Reduction in the fatal and injury crashes weighted by severity (EPDO) – **70%**
 - average number of fatal and injury crashes over a five-year period before and after the proposed improvement

1. Compile five years of fatal and injury crashes within project limits. Project limits are defined as the 250 feet buffer area around the project.
2. Review the SYIP to determine if any improvements have been made within the project limits. If so, shorten analysis period to the post-improvement period only.
3. Weight the severity of each crash by EPDO using the statewide Smart Scale weighting and calculate the average annual EPDO.
4. For roadway and bike/ped projects, find the appropriate crash modification factor (CMF) for the project improvements. The percent expected crash reduction (PECR) is calculated as follows: $PECR = 1 - CMF$. Most improvements have been standardized for statewide usage. For transit, passenger rail, and park and ride lots, the expected reduction in VMT will be used to calculate crash reduction. For freight rail, the expected reduction in truck traffic (and corresponding truck crashes) will be used.
5. Multiply the PECR by the annual average EPDO of fatal and injury crashes to determine the expected reduction

Crash Severity	Rounded Value	Weighting
Fatality Injury	\$2,404,686	983
Severe Injury	\$181,961	58
Moderate Injury	\$80,469	19
Minor Injury	\$57,257	11
Property Damage Only	\$17,130	1

Goal A Safety PMs

- **A2:** Reduction in the rate of fatal and injury crashes weighted by severity (EPDO) – **30%**
 - rate of fatal and injury crashes per million vehicle miles (segments) or million entering vehicles (intersections).
1. Determine the project limits as defined in A.1. For segments calculate the annual traffic volume for the base year in million vehicle miles (MVM = Length * ADT * 365 / 1,000,000). For projects that cross multiple segments, the annual traffic volume is calculated as the average volume for all segments. For intersections the measure is million entering vehicle (MEV = 1/2 * sum of ADT on all approaches * 365 / 1,000,000).
 2. Calculate annual EPDO of fatal + injury crashes avoided (S.1.). Convert into crash rate using the following formula: Crash Rate Reduction = EPDO of fatal + injury crashes avoided / MVM or MEV as appropriate.

Crash Severity	Rounded Value	Weighting
Fatality Injury	\$2,404,686	983
Severe Injury	\$181,961	58
Moderate Injury	\$80,469	19
Minor Injury	\$57,257	11
Property Damage Only	\$17,130	1

Goal B Sustainability PMs

- **BPM1: Change in average access to Jobs – 30%**

- Improvements in travel speed, pedestrian quality of service, or transit frequency, among other types of improvements
- This analysis requires the use of the RTC model and the RRTPO Accessibility Analysis Tool to estimate of future no-build (without project) and build (with project) job accessibility. The project is added to the RRTPO Accessibility Tool and outputs are then used to summarize average job accessibility.

1. For all Highway, Transit and Active Transportation Projects

- Code the project into the RTC Travel Demand Model. Flag the links for any connectivity changes due to any active transportation projects.
- Extract the Auto and Transit Skims for the build and the no-build model runs and input it into the RRTPO Accessibility Analysis Tool.
- The RRTPO Accessibility Analysis Tool calculates the improvement in number of jobs reachable within that travel time resulting. The average number of jobs reachable represents the total jobs accessible from each TAZ to every other TAZ.
- Dividing the total reachable job divided by the TAZ population gives the total jobs per person. This calculation is done for all TAZ sets to get the average job accessibility per person.

2. For all other projects

- The change in average job accessibility per person is not measured for freight and rail projects.

Goal B Sustainability PMs

- **BPM2: Change in average access to Goods & Services – 30%**

- Increase in average access to weighted destinations per 1000 persons (Travel Time of 30 minutes for all modes) for all population.
- Each destination within each destination type is given a weighted score in the range of 1 to 5. Each destination type is also weighted as essential (multiplier of 1.5) or non-essential (multiplier of 1) to establish a destination score by TAZ.

1. For all Highway, Transit and Active Transportation Projects

- Requires RTC model and the RRTPO Accessibility Analysis Tool to estimate of future no-build (without project) and build (with project) destinations accessibility.
- Code the project into the RTC Travel Demand Model. Flag the links for any connectivity changes due to any active transportation projects.
- Extract the Auto and Transit Skims for the build and the no-build model runs and input it to the RRTPO Accessibility Analysis Tool. The RRTPO Accessibility Analysis Tool calculates the improvement in number of weighted destinations reachable within that travel time resulting from a proposed transportation improvement and generates destination accessibility scores for each project.
- The total reachable weighted destinations divided by the TAZ population gives the total weighted destination per person. Since this number is likely to be small, multiplying this by 1000 gives the total weighted destinations per 1000 people.

2. For all other projects

- The change in average access to weighted destinations per 1000 persons is not measured for freight and rail projects.

Goal B Sustainability PMs

- **BPM3: Systemwide reduction in VMT per capita – 20%**
 - Sum of the number of miles traveled by all vehicles on all roadways divided by total regional population
 - The VMT per capita is the calculated at the system level.

1. Highway Projects

- Code the project into the RTC Travel Demand Model with assumed posted speed limit, facility type, and number of lanes.
- Calculate total difference in VMT per capita between the no-build model and the build model.

2. Transit/Active Transportation/Freight Projects

- For other modes, estimate reduction in total VMT per capita. The VMT reduction is associated with a shift of demand from auto to the other modes.

Goal B Sustainability PMs



- **BPM4:** Systemwide reduction in annual VOC, NOx, **PM2.5**, and **CO2e** emissions in metric tons – **20%**

1. Highway Projects

- Code the project into the RTC Travel Demand Model with assumed posted speed limit, facility type, and number of lanes.
- Calculate daily emissions for each pollutant based on the emission factors.
 - Figure on left presents the emissions factors of grams per vehicle mile, for different speed bins.
 - The speed bins are the range of vehicle's congested speeds. For example, if the modeled congested speed is 34 mph, the emissions are estimated from the factors corresponding to the speed bin of 32.5-37.5.
 - The emissions in grams is computed by the following formula: Model volume*link distance*emissions factor. This statistic is converted to tons by appropriate conversion factor.
- Calculate the total annual emissions for all pollutants. Total Annual Emissions = Daily emissions (NOx + VOC) * 365 tons.
- Calculate total difference in annual emissions between the no-build model and the build model.

Emissions Factor for Richmond Area

Speed1	Speed2	NOX Factor	VOC Factor
0	2.5	0.6108	0.6967
2.5	7.5	0.2552	0.1659
7.5	12.5	0.1699	0.0908
12.5	17.5	0.1424	0.0652
17.5	22.5	0.1271	0.0521
22.5	27.5	0.1166	0.0434
27.5	32.5	0.1118	0.0382
32.5	37.5	0.1051	0.0341
37.5	42.5	0.1038	0.031
42.5	47.5	0.1033	0.0287
47.5	52.5	0.1038	0.0272
52.5	57.5	0.1055	0.0263
57.5	62.5	0.1091	0.0259
62.5	67.5	0.119	0.0266
67.5	72.5	0.1373	0.0296

2. Transit/Active Transportation/Freight Projects

- Calculate VMT reduction estimate due to the project implementation
- Calculate daily emissions reductions for each pollutant as shown in figure below.
- Calculate the total annual emissions reduction for all pollutants. Total Annual Emissions = Daily emissions (NOx + VOC) * 365 tons.

National Average Criteria Pollutant Emission Rate

Pollutant	Average Emission Rate	Emission Calculation
NOx	0.9018 grams/mile	VMT (Miles) * NOx Emissions Rate (grams/miles)
VOC	0.686 grams/mile	VMT (Miles) * VOC Emissions Rate (grams/miles)

Goal B Sustainability PMs



- **BPM5:** Impact to natural and cultural resources*
 - Weigh the potential for negative impacts on the region's natural and heritage resources
 - Total value of environmental and heritage features within ¼ mile of project limits
1. Create a ¼ mile buffer around each project.
 2. Run the union tool to determine the areas of overlap between the buffer and the environmental and conservation areas hexagon features.
 3. Calculate the average Regional Environmental Index and Regional Heritage Index scores in the buffer.
 4. For each project, apply an adjustment to the index score based on the project tier shown in Exhibit 14 and formulas. This adjustment is intended to reflect the potential impact of certain project types:
 - Average Regional Environmental Index * Adjustment Factor = Adjusted Average Regional Environmental Index
 - Average Regional Heritage Index * Adjustment Factor = Adjusted Average Regional Heritage Index

Tier	Adjustment
1	0.1
2	0.5
3	1.0

Calculate the overall impact score using the following formula:

$(3 * \text{Adjusted Regional Environmental Index}) + \text{Adjusted Regional Heritage Index} = \text{Impact Score}$

*** Up to 5 Points subtracted from final score based on the total potential sensitive acreage impacted**

Goal C Reliability PMs

- **CPMI:** Increase in corridor total person throughput (all modes) – **40%**
 - Number of vehicles successfully entering project limit during peak period
 - Average occupancy rate of 1.2 persons per vehicles will be used based on SMART SCALE

1. Highway Projects

- Code the new facility into the RTC Travel Demand Model with assumed posted speed limit, facility type, and number of lanes.
- Calculate total difference in Vehicles Hours Travelled (VHT) between the no-build model and the build model. Multiplying the difference between the no-build VHT from the build VHT by 30% to convert to peak period delay reduction (expressed in vehicle hours).
- Compute the average system project vehicle throughput by multiplying the difference between the no-build VHT from the build VHT by 60 to convert to vehicles minutes traveled and dividing this difference by the average trip length (expressed in minutes).
- Multiply by average vehicle occupancy rate (1.2) to get the person throughput.

2. Transit/Active Transportation/Freight Projects

- For trips on other modes, estimate total person throughput for existing and new users in the peak period. For transit projects, compute the number of equivalent vehicles on roadway(s) within the impacted area using a forecasted ridership per hour and an assumed transit occupancy. Once the number of vehicles on impacted roadway(s) is computed, determine the peak period person throughput for no-build and build conditions by multiplying an average vehicle occupancy rate by the vehicle throughput.

Goal C Reliability PMs

- **CPM2:** Decrease in person-hours of delay – **40%**
 - Peak period analysis
 - $((\text{Travel time} - \text{travel time free flow speed}) / \text{number of vehicle trips})$

1. Highway Projects

- Code the project into the RTC Travel Demand Model with assumed posted speed limit, facility type, and number of lanes. Calculate total difference in Vehicles Hours Travelled (VHT) between the no-build model and the build model.
- Multiply the difference between the no-build VHT from the build VHT by 30% to convert to peak period delay reduction (expressed in vehicle hours)
- Compute the person peak period delay by multiplying the average vehicle delay by an average vehicle occupancy rate (1.2).

2. Transit/Active Transportation/Freight Projects

- For trips from other modes, estimate total person travel time savings for existing and new users in the peak hour. The person travel time savings for existing users is associated with any improvement in frequency or travel time associated with the project. For active transportation projects the mode shift from vehicles to active transportation projects will be used to calculate the overall reduction in person hours of delay.



- **CPM3:** Truck throughput on critical freight corridors – **20%**
- The number of trucks present at the start plus those attempting to enter and successfully entering the system (project limit) during the analysis period (24-hour period)

1. Highway Projects

- Code the new facility into the RTC Travel Demand Model with assumed posted speed limit, facility type, and number of lanes.
- Calculate total difference in Truck Hours Travelled (THT) between the no-build model and the build model.
- Compute the average system project truck throughput by multiplying the difference between the no-build THT from the build THT by 60 to convert to truck minutes traveled and dividing this difference by the average trip length (expressed in minutes).

2. Transit/Active Transportation/Freight Projects

- For trips on other modes, estimate total truck throughput for existing and new trucks in the 24-hour period.

Goal D Resiliency PMs

- **DPM1: Multimodal Network Redundancy – 50%**
 - Estimates the ability of the network to absorb a 10% increase in volume

1. Highway/Transit Projects

- Code the project into the RTC Travel Demand Model with assumed posted speed limit, facility type, and number of lanes.
- Calculate total difference in Vehicles Hours Travelled (VHT) between the base no-build model and the 10% increased assignment no-build model. Repeat for the build scenario.
- Calculate the difference between the change in vehicle hours traveled in the no-build and build scenario.
- $[(VHTNB+10\% - VHTNB) - (VHTB+10\% - VHTB)] = \text{Change in VHT}$
- Calculate the change in vehicles by dividing the change in vehicle hours traveled by the average trip length in hours.
 - $\text{Change in VHT} / \text{Average Trip Time}_{NB} = \text{Change in number of trips/vehicles experiencing excessive delay}$

2. Active Transportation/Freight Projects

- For trips from other modes, estimate the mode shift associated with the project. The shift in mode will be used to calculate a simplified redundancy index measure:
- $\text{Redundancy Index} = (VHTNB+10\% - VHTB(\text{Shift})+10\%) / \text{Average Trip Time}$

Goal D Resiliency PMs

- **DPM2: Network Connectivity - 50%**
 - Assesses the directness of the shortest route between two TAZs in real travel conditions compared to an idealized straight distance as measured in minutes.

1. Highway/Transit Projects

- Code the project into the RTC Travel Demand Model with assumed posted speed limit, facility type, and number of lanes.
- Calculate ratio of in Vehicles Hours Travelled (VHT) and between AM peak congested period and the direct line between TAZs at no-build free-flow speed in the no-build model. Repeat with build scenario.
- Compute the change in the ratio between build and no-build to determine the delta

2. Active Transportation/Freight Projects

- For trips from other modes, estimate total person travel time savings for existing and new users in the peak hour. The person travel time savings for existing users is associated with any improvement in frequency or travel time associated with the project. For active transportation projects the mode shift from vehicles to active transportation projects will be used to calculate the overall reduction in person hours of delay

PERFORMANCE MEASURE SCORECARD



Goal	Safety		Sustainability					Reliability			Resiliency	
Weight	20%		35%					30%			15%	
PM	F+I crash reduced	F+I crash rate	Access to Jobs	Access to Services	VMT per capita	Air Quality	Impact to Resources	Person thruput	Person hours of delay	Freight Corridor thruput	Redundant Capacity	Connectivity
Weight	70%	30%	30%	30%	20%	20%	*	40%	40%	20%	50%	50%
Points	14	6	10.5	10.5	7	7		12	12	6	7.5	7.5
Benefit Score	0 – 100 value											
	* Up to 5 points subtracted from final score based on the total potential sensitive acreage impacted											
Cost	\$##,###,###											
Cost Benefit Score	Benefit Score / (Cost / \$10,000,000)											

Questions?

L RTP Phase 6: Constrained Plan Development

Fiscal Constraint: what can we afford to do?

- sufficient financial information for demonstrating that projects can be implemented using **committed, available, or reasonably available revenue sources**
- reasonable assurance that the federally supported transportation system is being **adequately operated and maintained.**

Requires coordination with state, system operators to develop forecasts

Fund Source	2050 Plan (Preliminary)
Highway Funds (VDOT)	\$26.7 Billion
Transit Funds (DRPT/GRTC)	\$4.9 Billion
Total	\$31.6 Billion

Many funds in the highway funds forecast (RSTP, CMAQ, Smart Scale, etc.) can be used for transit projects

NOTE: Roughly 1/4 of the total forecast revenue was available for regional projects in 2045 plan

Forecast covers 2026 to 2050; VDOT and DRPT provided estimates of state and federal revenues; additional local numbers are preliminary and require final coordination with agencies

Funded
Projects funded in the SYIP
or locally (2026 – 2031)

Year of Expenditure (from SYIP and/or TIP)

No Regrets
Low-Cost or Immediate
Interventions currently
unfunded but possible
within budget (2026 – 2031)

Year of Expenditure
(3% per year)

Building Blocks
Mid-term, prerequisites for
priority project (2032 - 2037)

Time Period Midpoint

Priority Projects
Long-term, require
additional planning,
sequenced projects or larger
investment (2038 - 2050)

Building Blocks: 2034/1.2668
Priority Projects: 2044/1.7024

Vision Projects
Desirable projects, not
financially feasible or outside
funds (rail)

Same Midpoint as Priority Projects

Historically, CLRP has been developed using a single recommended plan, refined by localities & advisory work group

Plan	Approach
2045	Cost-Benefit , manual adjustment for local priority, linked projects
2040	Goal, subjective benefit , adjusted for local priority, linked projects

New Approach: Develop multiple investment options for AWG & public to review before final refinements

1. Cost-Benefit Scenario
2. Benefit Scenario
3. Mode Shift Scenario
4. Business-as-Usual Scenario

Goal	Safety		Sustainability					Reliability			Resiliency	
Weight	20%		35%					30%			15%	
PM	F+I crash reduced	F+I crash rate	Access to Jobs	Access to Services	VMT per capita	Air Quality	Impact to Resources	Person thruput	Person hours of delay	Freight Corridor thruput	Redundant Capacity	Connectivity
Weight	70%	30%	30%	30%	20%	20%	*	40%	40%	20%	50%	50%
Points	14	6	10.5	10.5	7	7		12	12	6	7.5	7.5
Benefit Score	0 – 100 value											
Cost	\$##,###,###											
Cost Benefit Score	Benefit Score / (Cost / \$10,000,000)											

Goal: Maximize total cost-benefit score of selected projects

Rationale: Aims to maximize the number of projects selected to increase expected benefit

Goal	Safety		Sustainability					Reliability			Resiliency	
Weight	20%		35%					30%			15%	
PM	F+I crash reduced	F+I crash rate	Access to Jobs	Access to Services	VMT per capita	Air Quality	Impact to Resources	Person thruput	Person hours of delay	Freight Corridor thruput	Redundant Capacity	Connectivity
Weight	70%	30%	30%	30%	20%	20%	*	40%	40%	20%	50%	50%
Points	14	6	10.5	10.5	7	7		12	12	6	7.5	7.5
Benefit Score	0 – 100 value											
Cost	###,###,###											
Cost Benefit Score	Benefit Score / (Cost / \$10,000,000)											

Goal: Maximize total benefit score of selected projects

Rationale: Aims to maximize the benefit, allowing us to select bigger projects which do not score well in cost/benefit scenarios

Goal: Maximize mode shift by funding transit, active transportation, P&R and rail projects *first*

Rationale: Mode shift needed to achieve adopted objectives around mode share, access, VMT, and emissions reduction which can be prioritized through project selection

Goal: Replicate existing six-year improvement program (SYIP) funding mix using cost-benefit scores for prioritization

Rationale: Provides a baseline investment scenario under existing trends and reflective of cost-benefit funding process

Questions?

Next Meeting

THANK YOU!

**Pathways
to the Future**
TRANSPORTATION



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Where the region comes
together to look ahead.



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