# SMART SCALE ROUND 5
**Proposed Changes**

October 19, 2021

# SMART SCALE Overview

- **Safety** – reduce the number and rate of fatalities and severe injuries
- **Congestion** – reduce person hours of delay and increase person throughput
- **Accessibility** – increase access to jobs and travel options
- **Economic Development** – support economic development and improve goods movement
- **Environmental Quality** – improve air quality and avoid impacts to the natural environment
- **Land Use** – support and improve non-work accessibility

Scoring based on outcomes, not the size of the problem

SMART SCALE | SCORE → $\dfrac{\text{Benefit Score}}{\text{Requested \$}}$

# Summary Round 5 Proposed Changes

- **Environmental Quality Measures**
  - **E.1 (Air Quality)**
  - **E.2 (Impact to Natural and Cultural Resources)**
    - Round 2 change - address issue of projects with no other benefits getting funded by this measure
    - Round 4 change – made measure subtractive
- **Land Use Measure**
- **Cost Estimates**

# Environmental Measures

- **CTB Member(s) Request**
  - Interest in enhancing E.1 Quantify Greenhouse Gas (GHG) Emissions
  - Increased Scrutiny on E.2 measure as a negative measure
- **Environmental Working Group Established in Early June**
  - District POCs, OIPI, VDOT CO Environmental
- **Additional Support/Stakeholders**
  - Cambridge Systematics
  - DEQ

# Environmental E.1 – Air Quality

1. **Current Process/Methods**
2. **Potential Qualitative Improvements**
3. **Potential Quantitative Improvements**

<u>**Round 4 Observations**</u>
- Intent of E.1 Measure is to reduce Greenhouse Gas Emissions
- Can it be improved or benefits better quantified?

# Strategies to Improve Air Quality and Reduce GHG

1. Reduce Vehicle Miles Traveled (VMT) / Increase Non-Single Occupancy Vehicle (Non-SOV) VMT

2. Reduce vehicle delay to reduce fuel use per mile

3. Technological change including improved vehicle efficiency, electrification, and using low carbon fuels

4. Reduce Impacts to Natural Resources

# Current E.1 (Air Quality) Overview

Potential of project to improve air quality and reduce greenhouse gas (GHG) emissions

| Non-SOV Project Characteristics | Points |
|---|---|
| Rail Factor - Project includes improvements to rail transit or passenger rail facilities.* | 3 |
| Bicycle Factor - Project includes construction or replacement of bike facilities* | 2 |
| Pedestrian Factor - Project includes construction or replacement of pedestrian facilities* | 2 |
| Park and Ride Factor - Project includes improvements to an existing or proposed park-and-ride lot* | 2 |
| Bus Factor - Project includes bus facility improvements or reduces delay with scheduled peak service of 1 transit vehicle per hour.* | 1 |
| Special Accomodations Factor - Project include special accommodations (space/infrastructure) for hybrid or electric vehicles* | 0.5 |
| Energy Efficient Factor - Project includes energy efficient infrastructure or fleets* | 0.5 |
| Total Points Possible | 8.5 points maximum* |
| **Measure Scaling: *Points are multiplied by the number of peak period non-SOV users.** | |

+

| Freight Transportation Project Characteristics | Points |
|---|---|
| Project reduces traffic delay with a high percentage of truck traffic (greater than 8 % of AADT). ** | 1 |
| Project includes improvements to freight rail network or intermodal facilities/ports/terminals.** | 0.5 |
| Total Points Possible | 8.5 points maximum* |
| **Measure Scaling: **Points are multiplied by daily truck volumes** | |

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# Proposed Qualitative Improvements

- **Increase Non- SOV Component**
  - **Currently all points are totaled and multiplied by increase *in all non-SOV users***
    - Results in points given credit based on users from other categories
    - Propose multiplying by **non-SOV increase for respective category – (eg Bike, Ped, transit…)**
- **Freight Component with Reduced Delay**
  - **Non-SOV Users and Freight Component are not in the same unit**
    - Freight requires reduced delay greater than zero, but captures *existing* truck volumes
    - Propose normalizing separately, and equal weight the two categories
    - Propose scaling by delay reduction
- **Special Accomodations Point Category**
  - Policy Guidelines are not clear on the Federal / State Level – Sale of Non-Food
  - Federal Grant money is proposed

# Example - Lafayette Boulevard Multimodal Improvements

| Factor | In App? | Supporting Information | Current E.1 - Increase in Non-SOV | | | Proposed - Increase in Non-SOV by Mode | | |
|---|---|---|---|---|---|---|---|---|
| | | | Points | Increased Users | Measure | Points | Increased Users | Measure |
| Rail | ✗ | | 3 | | | 3 | | |
| Bike | ✓ | Route 208 PNR lot - 10 bicycle lockers and 10 covered bicycle parking spaces | 2 | X 59 | = 118.0 | 2 | X 0 | = 0.0 |
| Pedestrian | ✓ | 2000 ft sidewalk on the eastside of Lafayette Blvd (Sheetz to Family Dollar) | 2 | X 59 | = 118.0 | 2 | X 22 | = 44.0 |
| Park and Ride | ✓ | Route 208 PnR Lot - Add Transit Stations, Lighting, Bicycle Lockers/Parking | 2 | X 59 | = 118.0 | 2 | X 5 | = 10.0 |
| Bus | ✓ | VRE Feeder Service and Bus Stop Improvements | 1 | X 59 | = 59.0 | 1 | X 31 | = 31.0 |
| Special Accomodations EV | ✗ | | 0.5 | | | *Proposed Removal* | | |
| Energy Efficient | ✓ | New transit Shelter at the Route 208 PNR lot will include LED solar lighting | 0.5 | X 59 | = 29.5 | 0.5 | X 31 | = 15.5 |
| **Increase in Non-SOV User Points** | | | | Sum = | 442.5 | | Sum = | 100.5 |
| **Non-SOV Normalized Measure** | | | | | | *(divide by maximum score in cohort and multiply by 100)* | | 8.7 |

| Factor | In App? | Supporting Information | Current E.1 - Freight | | | Proposed - Freight Scaled by Delay | | |
|---|---|---|---|---|---|---|---|---|
| | | | Points | Trucks | Measure | Points | Trucks | Measure |
| **Intermodal / Freight Rail** | ✗ | | 0.5 | | | | | |
| **Reduces Delay with High Truck** | ✓ | 13% Trucks (3515 Peak Period Volume) | 1 | x 3515 | = 3515 | | | |
| **Points based on Delay Reduction**<br>0 < Delay Reduction < 2 = 0.5 point<br>2 <= Delay Reduction < 100 = 1 point<br>Delay Reduction >= 100 = 2 points | ✓ | 5.88 Person-Hours of Delay Reduced *(From C.2 Score)* | | | | 1 | X 3515 | = 3515.0 |
| **Freight Delay Reduction Points** | | | 1 | | 3515 | 1 | | 3515 |
| **Freight Delay Reduction Normalized Measure** | | | | | | *(divide by maximum score in cohort and multiply by 100)* | | 100.0 |
| | | | **Total Measure** | = | 3957.5 | **Weight Each 50%** | = | 54.4 |

# Results Summary

## Impacts to E.1 Measure Top Scoring

| | Current E.1 - Increase in Non-SOV | | | Proposed - Increase in Non-SOV by Mode | | |
|---|---|---|---|---|---|---|
| **Points** | **Increased Users** | **Measure** | **Points** | **Increased Users** | **Measure** | |
| 3 | | | 3 | | | |
| 2 | X  59 | = 118.0 | 2 | X  0 | = 0.0 | |
| 2 | X  59 | = 118.0 | 2 | X  22 | = 44.0 | |
| 2 | X  59 | = 118.0 | 2 | X  5 | = 10.0 | |
| 1 | X  59 | = 59.0 | 1 | X  31 | = 31.0 | |
| 0.5 | | | *Proposed Removal* | | | |
| 0.5 | X  59 | = 29.5 | 0.5 | X  31 | = 15.5 | |
| | Sum = | 442.5 | | Sum = | 100.5 | |
| | | | *(divide by maximum score in cohort and multiply by 100)* | | 8.7 | |

| | Current E.1 - Freight | | | Proposed - Freight Scaled by Delay | | |
|---|---|---|---|---|---|---|
| **Points** | **Trucks** | **Measure** | **Points** | **Trucks** | **Measure** | |
| 0.5 | | | | | | |
| 1 | x  3515 | = 3515 | | | | |
| | | | 1 | X  3515 | = 3515.0 | |
| 1 | | 3515 | 1 | | 3515 | |
| | | | *(divide by maximum score in cohort and multiply by 100)* | | 100.0 | |
| **Total Measure** | **= 3957.5** | | **Weight Each 50% =** | | **54.4** | |

**Current and proposed measures should not be compared directly, as they are not on the same magnitude. Example project does not change rank.**

| Rank E.1 Current | Rank E.1 Proposed | Display ID | Project Title |
|---|---|---|---|
| 1 | 2 | 6867 | Route 208 Operational and Multimodal Improvements |
| 2 | 1 | 7198 | Intercity Rail Service Expansion along US-29 & I-81 Corridors |
| 3 | 3 | 6806 | Rt 2 & 17 Widening from City Line to Shannon Airport Area |
| 4 | 4 | 6719 | Lafayette Boulevard Multimodal Improvements |
| 5 | 5 | 7076 | Town of Bowling Green US 301/Chase Street |
| 6 | 7 | 6738 | Weyers Cave Road (Rt. 256) Turn Lane Project |
| 7 | 9 | 6842 | I-64 WB Widening (Exit 211 to Exit 205) |
| 8 | 8 | 6822 | Route 1 (Fraley Boulevard) Widening |
| 9 | 10 | 6815 | BRITE Pedestrian Improvements |
| 10 | 11 | 6799 | I-81/Route 8 (Exit 114) Park & Ride Lot |

| Rank E.1 Proposed | Display ID | Project Title |
|---|---|---|
| 6 | 6948 | Mount Vernon Trail North Enhancements |

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# Proposed Quantitative Calculate $CO_2$ Offset

**Use existing collected data for High Level Analysis**

- Increase in non-SOV users - *currently calculated for E.1*
- Hours of delay reduced - *currently calculated for C.2*
- Trip Length - national averages, and SS analysis segment length (C.1/C.2)
- Emissions factors - *average passenger car fuel efficiency*
- Fuel use factor - *from delay reduced (gallon/hour)*

**Two Parts**

**Non-SOV CO2 Offset + Reduced Truck Delay CO2 Offset**

# Proposed Quantitative Non-SOV $CO_2$ Offset

1. **Increased Non-SOV VMT**
   - **Transit and Park & Ride Users** -  multiply new users by the analysis trip length
   - **Pedestrians -** multiply total new users by 0.67 miles*
   - **Bicyclists -**  multiply total new users by 3.54 miles*

     *Average Person Trip Length

2. **Increased Non-SOV VMT - Sum Above**

3. **Non-SOV $CO_2$ Offset (Apply Fuel Efficiency and Emissions Factors)**

$$\text{Non-SOV VMT} \times \frac{1 \text{ gallon gas}}{24 \text{ miles}} \times \frac{8.9 \text{ kg } CO_2}{1 \text{ gallon gas}}$$

# Proposed Quantitative Freight CO$_2$ Offset

1. **Reduced Truck Delay - Get Back to Vehicle Hours of Delay (VHD)**

   - Divide total Person-Hours of Delay (PHD) by 1.2 Person/Vehicle

2. **Reduced Truck Delay - Heavy Vehicle Hours of Delay (HVHD)**

   - Multiply VHD by project weighted average truck percent

3. **Heavy Vehicle CO$_2$ Offset (Apply Gas & Emissions Factors)**

$$\text{HVHD (hours)} \times \frac{0.44 \text{ gallons}}{1 \text{ hour}} \times \frac{8.9 \text{ kg CO}_2}{1 \text{ gallon gas}}$$

**Final Measure is sum of two values**
1. **Non-SOV CO2 Offset**
2. **Freight CO2 Offset**

# Example - Lafayette Boulevard Multimodal Improvements

| Non-SOV $CO_2$ Offset | | | | | |
|---|---|---|---|---|---|
| **Factor** | **In App?** | **Supporting Information** | **Increased Users** | **Trip Length (miles)** | **VMT** |
| **Rail** | ✗ | | | | |
| **Bike** | ✓ | Route 208 PNR lot - 10 bicycle lockers and 10 covered bicycle parking spaces | **0.0** X | **3.54** | = **0.0** |
| **Pedestrian** | ✓ | 2000 ft sidewalk on the eastside of Lafayette Blvd (Sheetz to Family Dollar) | **22.0** X | **0.67** | = **14.7** |
| **Park and Ride** | ✓ | Route 208 PnR Lot - Add Transit Stations, Lighting, Bicycle Lockers/Parking | **VMT Summed by Segment** | | = **122.8** |
| **Bus** | ✓ | VRE Feeder Service and Bus Stop Improvements | **VMT Summed by Segment** | | = **200.9** |
| **Non-SOV VMT** | | | | | **338.4** |
| **Non-SOV $CO_2$ Offset (kg)** | | | $\times \dfrac{1 \text{ gallon gas}}{24 \text{ miles}} \times \dfrac{8.9 \text{ kg } CO_2}{1 \text{ gallon gas}}$ | | **125.5** |

| Freight $CO_2$ Offset | | | | |
|---|---|---|---|---|
| **Total Delay Reduction (Person-Hours)** | **÷** | **Persons/Vehicle** | **X** | **% Trucks** |
| **5.8** | **÷** | **1.2** | **X** | **0.13** |
| **Freight Delay Reduction (hours)** | | | | **0.63** |
| **Freight $CO_2$ Offset (kg)** | | $\dfrac{0.44 \text{ gallons}}{1 \text{ hour}} \times \dfrac{8.9 \text{ kg } CO_2}{1 \text{ gallon gas}}$ | | **2.46** |
| **Total $CO_2$ Offset** | | | | **128.0** |

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# Propose Combining Quantitative and Qualitative

## Final Proposed E.1 Score

- **Weight Qualitative Method - 50%**
- **Weight Quantitative Method - 50%**

## Impacts to E.1 Measure Top Scoring

| Rank E.1 Current | Rank E.1 Proposed | Display ID | Project Title |
|---|---|---|---|
| 1 | 5 | 6867 | Route 208 Operational and Multimodal Improvements |
| 2 | 1 | 7198 | Intercity Rail Service Expansion along US-29 & I-81 Corridors |
| 3 | 7 | 6806 | Rt 2 & 17 Widening from City Line to Shannon Airport Area |
| 4 | 8 | 6719 | Lafayette Boulevard Multimodal Improvements |
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| 6 | 11 | 6738 | Weyers Cave Road (Rt. 256) Turn Lane Project |
| 7 | 3 | 6842 | I-64 WB Widening (Exit 211 to Exit 205) |
| 8 | 4 | 6822 | Route 1 (Fraley Boulevard) Widening |
| 9 | 31 | 6815 | BRITE Pedestrian Improvements |
| 10 | 14 | 6799 | I-81/Route 8 (Exit 114) Park & Ride Lot |

## Additional New Top Scoring

| Rank E.1 Proposed | Display ID | Project Title |
|---|---|---|
| 2 | 6948 | Mount Vernon Trail North Enhancements |
| 6 | 6858 | Upper King Street Multimodal Reconstruction |
| 10 | 6809 | Rte 15 Leesburg Bypass Interchange with Edwards Ferry Road |

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# E.2 (Impact to Natural and Cultural Resources) - Overview

Potential of project to minimize impact on natural and cultural resources located within project buffer
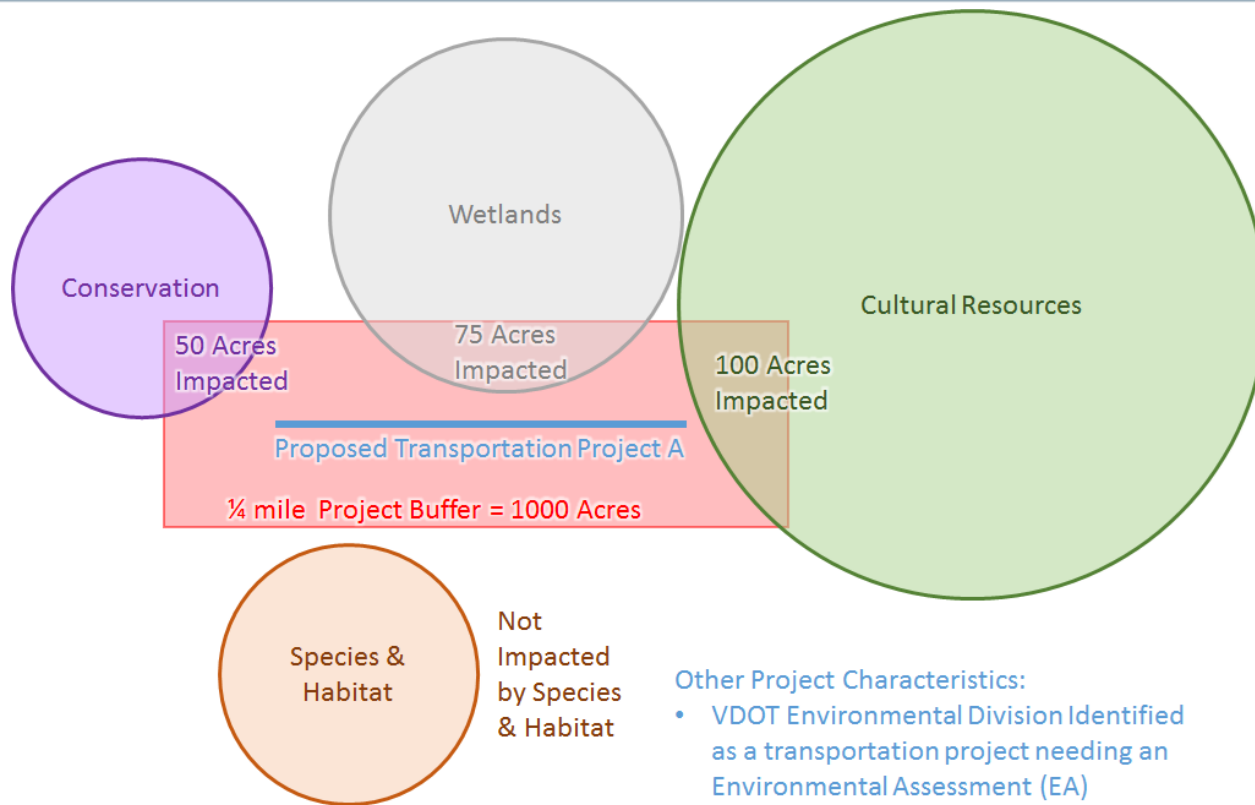


**Round 4 Observations**
- Is it appropriate to apply a ¼ mile buffer to all project types?
- Projects within R/W?

Conservation

Wetlands

Cultural Resources

50 Acres Impacted

75 Acres Impacted

100 Acres Impacted

Proposed Transportation Project A

¼ mile Project Buffer = 1000 Acres

Species & Habitat

Not Impacted by Species & Habitat

Other Project Characteristics:
- VDOT Environmental Division Identified as a transportation project needing an Environmental Assessment (EA)

| Project | Conservation | Species/ Habitat | Cultural Resources | Wetlands | Total Acres | Environmental Document Scale | Total Acres Scaled by Environmental Document | Impact Buffer Acres | Final Total Acres |
|---|---|---|---|---|---|---|---|---|---|
| A | 50 | 0 | 100 | 75 | 225 | EA (30%) | 68 | 1000 | 68 |

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# E.2 Process Improvements

- **Impact Buffer Acres**
  - *Proposed* tiering approach
  - Features selected
    - *Tier 1 = 30 ft*
    - *Tier 2 = 1/8 mile*
    - *Tier 3 = 1/4 mile*
- **Sensitive Areas**
  - Environmental Division will review for validity every round

*Examples*

| Project Feature | E.2 Tier |
|---|---|
| Road Diet | 1 |
| Roadway Reconstruction/Realignment | 1 |
| Shoulder Improvement(s) | 1 |
| TDM Other | 1 |
| Traffic Signal Modification | 1 |
| Turn Lane Improvement(s) | 1 |
| Widen Existing Lane(s) (No New Lanes) | 1 |
| Construct/Expand Bus Facility | 2 |
| Freight Rail improvements | 2 |
| Improve Park and Ride Lot | 2 |
| New Intercity Passenger Rail Station or Station Improvements | 2 |
| New Park and Ride Lot | 2 |
| New Station or Station Improvements | 2 |
| Right-of-Way/Easements acquisition required | 2 |
| Add New Through Lanes(s) | 3 |
| Highway Other | 3 |
| Improve/replace existing bridge(s) | 3 |
| Managed Lane(s) (HOV/HOT/Shoulder) | 3 |
| New Bridge | 3 |
| New Interchange, Limited Access Facility | 3 |
| New Interchange, Non-Limited Access Facility | 3 |
| Rail Transit Other | 3 |
| Roadway on New Alignment | 3 |

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# E.2 Outcomes

- **Improved Distribution**
    - Projects in Tier 1 (30' buffer) either improved in SMART SCALE rank or remained at the exact same rank
    - Projects in Tier 2 (1/8th mile) projects on average changed by less than one position in SMART SCALE rank
    - Projects in Tier 3 (1/4th mile) fell an average of 4 positions in SMART SCALE rank
    - ***Statewide - only 2 projects impacted in funding scenario***

# Land Use

- Land Use has two components: Future Transportation Efficient Land Use (L.1) and *Increase* in Transportation Efficient Land Use (L.2)

- What they have in common is - the non-work accessibility, or the number of key non-work destinations that are accessible within a ***reasonable walking distance,*** scaled by population density

**Round 4 Observations**
- Concerns that *3 mile buffer is excessive* to consider reasonable.
- Large component of score, should other Area Types be considered for Land Use?

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# Land Use

- **Three Scenarios Tested**

- **Apply Land Use to all Area Types**
  - **Weighting Changes for Type C & D Considered**
  - **Use a 1 Mile Buffer instead of 3 Mile Buffer**
    - 1 mile walk is closer to the average pedestrian trip length

# Potential Weighting Adjustments

## Existing

| Area Type | Congestion | Safety | Accessibility | Environment | Economic Development | Land Use |
|-----------|-----------|--------|---------------|-------------|---------------------|----------|
| A | 45% | 5% | 15% | 10% | 5% | 20% |
| B | 15% | 20% | 25% | 10% | 20% | 10% |
| C | 15% | 25% | 25% | 10% | 25% | |
| D | 10% | 30% | 15% | 10% | 35% | |

## Proposed

| Area Type | Congestion | Safety | Accessibility | Environment | Economic Development | Land Use |
|-----------|-----------|--------|---------------|-------------|---------------------|----------|
| A | 45% | 5% | 15% | 10% | 5% | 20% |
| B | 15% | 20% | 20% | 10% | 20% | 15% |
| C | 15% | 25% | 15% | 10% | 25% | 10% |
| D | 10% | 30% | 10% | 10% | 30% | 10% |



A
B
C
D
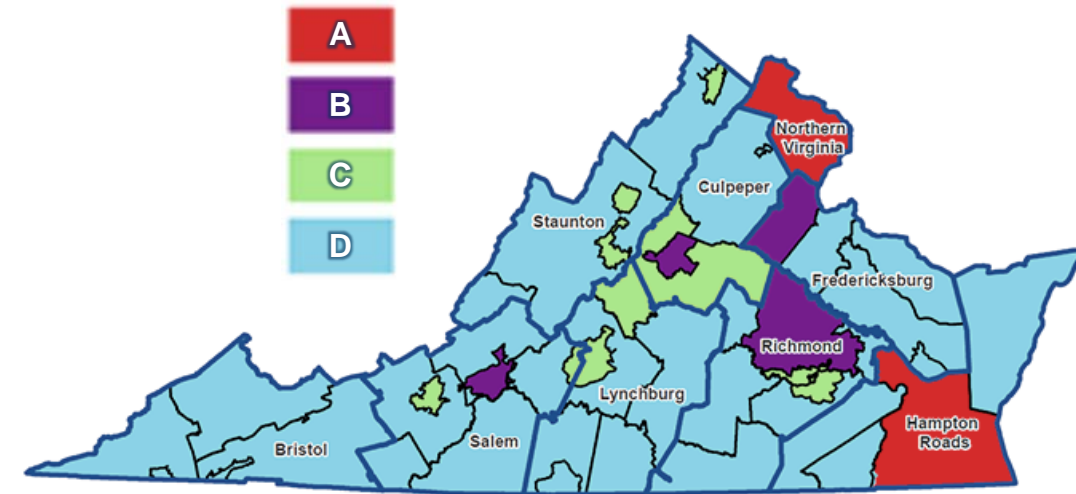
# Cost Estimates

- **August 2, 2021 VDOT Published Cost Estimating Manual and an associated Implementation Plan (IIM)**

- **Draft Cost Estimate Training Completed will be available in VDOT University**
  - VDOT L&D will need to rollout a SMART SCALE Training Plan

- **Working with Cost Estimation Office (Lead Mitch Ball)**
  - Consistent Message broadcasted through SMART SCALE platform
  - Updated Estimation Tools

- **Implementing Pre-Application and Full Application Consistency**

# Next Steps

- **November**
  - Deeper Dive into Land Use
  - Intake Public Comments
- **December**
  - Seeking Action Round 5 Policy Changes
  - Release Updated Technical Guide by end of year

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**Thank you.**