SMART SCALE

Funding the Right Transportation Projects in Virginia

SMART SCALE Technical Guide

prepared for

Commonwealth Transportation Board

date

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1.0 Introduction

Transportation needs will almost always be greater than the funds available to address them. The signing of House Bill 2313 in 2013 created a more sustainable revenue source supporting transportation funding. While passage of this bill enabled the Commonwealth Transportation Board (CTB) to add significant revenues to Virginia's transportation program, there are still many transportation needs that cannot be addressed with available revenues. To find a way to better balance transportation needs and prioritize investments for both urban and rural communities throughout the Commonwealth, new legislation – House Bill 2 – was signed into law in 2014. In 2016, the process was renamed "SMART SCALE, Funding the Right Transportation Projects in Virginia." SMART SCALE stands for System Management and Allocation of Resources for Transportation: Safety, Congestion, Accessibility, Land Use, Economic Development and Environment.

The purpose of SMART SCALE is to fund the right transportation projects through a prioritization process that evaluates each project's merits using key factors, including: improvements to safety, congestion reduction, accessibility, land use, economic development and the environment. The evaluation focuses on the degree to which a project addresses a problem or need relative to the requested funding for the project.

Prior to the implementation of SMART SCALE, the Commonwealth utilized a politically driven and opaque transportation funding process that included uncertainty for local communities and businesses. SMART SCALE requires the CTB to develop and implement a quantifiable and transparent prioritization process for making funding decisions for capacity enhancing projects within the six-year improvement program.

The ultimate goal in the implementation of SMART SCALE is investing limited tax dollars in the right projects that meet the most critical transportation needs in Virginia. Transparency and accountability are crucial aspects of delivering a process that project sponsors will support. SMART SCALE projects will be evaluated based on a uniform set of measures that are applicable statewide, while recognizing that factors should be valued differently based on regional priorities.

Beginning in 2017, the SMART SCALE process transitioned to a biennial schedule with applications accepted in March of even numbered years and final project selections made in June of the following odd numbered year. The SMART SCALE process does not cover all types of projects within the SYIP. There are other sources of funding including the State of Good Repair program, the Highway Safety Improvement Program, the Revenue Sharing Program, the Congestion Mitigation Air Quality Program, the Transportation Alternatives Set-Aside Program, and Regional Surface Transportation Program funds. These are detailed later in this guidance document.

Two rounds of SMART SCALE prioritization have been successfully completed. Since implementing the SMART SCALE process in 2015, information has been collected on lessons learned in order to identify potential improvements to the application in-take, screening, validation, evaluation process, documentation and training. This updated Technical Guide reflects these recent improvements.

This Technical Guide document provides detailed information on the CTB's SMART SCALE policy including information on process, roles and responsibilities, project eligibility, project readiness requirements, the project application process, evaluation measure definitions, project cost and scoring, and prioritization and programming considerations and rules.

1.1 SMART SCALE LEGISLATION REQUIREMENTS

Virginia House Bill 2, signed by Governor Terry McAuliffe on April 6, 2014 and effective as of July 1, 2014, (as defined in § 33.2-214.1) required the development of a prioritization process that the CTB was to use for project selection by July 2016. The prioritization process evaluates projects using following factor areas: congestion mitigation, economic development, accessibility, safety, environmental quality and land use coordination (in areas with over 200,000 population). Factor areas are weighted differently across the commonwealth based on certain characteristics and may be weighted differently within each district. Candidate projects are screened to determine if they meet an identified need in VTrans, the Commonwealth's long range transportation plan and to determine if they meet eligibility requirements.

Projects are scored based on an objective and fair analysis applied statewide. SMART SCALE also requires project benefits be analyzed relative to project cost. CTB policy requires the project benefits be analyzed relative to the amount of SMART SCALE funds requested, so the final SMART SCALE score is based on the project cost to the state.

In 2017, the General Assembly adopted HB2241/SB1331 (as defined in § 33.2-214.2) updating several items related to SMART SCALE. These bills provide the responsibility for the implementation of the SMART SCALE process to the Office of Intermodal Planning and Investment, which reports to the Secretary of Transportation in their role as the Chairman of the CTB. It also requires that the scores be released at least 150 days prior to the CTB action to include SMART SCALE projects in the Six-Year Improvement Program, or January of odd-numbered years. This will ensure there is always 5 months for public discussion of the results of the project evaluations.

Funding Programs

In February 2015, the General Assembly adopted HB1887, which established a new transportation funding formula with funding, after specialized programs, distributed as follows: 45% for the State of Good Repair Program (SGR); 27.5% for

the District Grant Program (DGP); and 27.5% for the High-Priority Projects Program (HPPP). Both the HPPP and the DGP are subject to SMART SCALE (see table 1.1).

The DGP (as defined in § 33.2-371) refers to projects and strategies solicited from local governments that address a need for a corridor of statewide significance, regional network, improvements to promote urban development areas, or safety improvements identified in VTrans2040, the Statewide Transportation Plan. In this program, candidate projects and strategies from localities within a highway construction district compete for funding against projects and strategies within the same construction district.

The HPPP (as defined in § 33.2-370) refers to projects of regional or statewide significance that address a transportation need identified for a corridor of statewide significance or a regional network in VTrans2040, the Statewide Transportation Plan. In this program, projects and strategies compete for funding against projects and strategies submitted statewide.

For both programs, projects and strategies are to be screened, evaluated, and selected according to the process established pursuant to SMART SCALE.

Table 1.1 Funding Programs

	High Priority Projects Program	District Grant Program[a]
Capacity Need on Corridors of Statewide Significance	Yes	Yes
Capacity Need on Regional Networks	Yes	Yes
Improvement to Support Urban Development Areas	No	Yes
Improvements for identified Safety Need	No	Yes

[a] Only projects submitted by localities are eligible.

1.2 ROLES AND RESPONSIBILITIES

Commonwealth Transportation Board

The CTB establishes the policy and oversees the SMART SCALE project evaluation process. The CTB reviews the scored project list once the evaluation has been released, and uses the scoring, along with other information submitted to the CTB about each project to inform their funding decisions regarding the allocation of funds for the HPPP and the DGP in the SYIP. The CTB is not required to fund the highest-scoring projects and may use other considerations, in addition to the SMART SCALE process, to make final funding decisions. However, if the CTB makes modifications to the staff recommended funding scenario, then the member seeking such change must provide a rationale for such modification and seek approval, by majority vote, of the Board.

Office of the Secretary of Transportation

Under the Secretary of Transportation's Office, the Office of Intermodal Planning and Investment (OIPI) manages the implementation of the SMART SCALE process. Both VDOT and DRPT assist the office in the screening and evaluation of applications under the guidance of the Office. The Office provides the final evaluation to the CTB, makes the final evaluation public, and develops the staff-recommended funding scenario for the Board's consideration.

Technical Evaluation Team

A technical evaluation team is responsible for conducting the measure calculations and making qualitative rating assessments for each factor area, for each of the submitted, screened projects in the SMART SCALE process. This evaluation team is comprised of technical staff from OIPI, DRPT, and VDOT. The staff appointed to the technical evaluation team includes subject matter experts from both the District and Central Office that are experienced with the data, analytical tools, and qualitative content reported for each measure. Duties of the internal technical evaluation team include:

- Validating project information;
- Evaluating project preparation; and
- Calculating evaluation measures and scores for submitted projects according to the methodologies set out in Appendices A-F.

To ensure consistency and quality control ten percent of projects are selected at random for a second evaluation. A member of the technical evaluation team not involved in the initial analysis conducts the blind independent evaluation to ensure consistency in the development of assumptions and application of analytical methods.

External Peer Review

To ensure the transparency of the SMART SCALE evaluation process, an external review group, consisting of staff representatives from the Virginia Association of Counties (VACO), Virginia Municipal League (VML), Virginia Transit Association (VTA), as well as other non-governmental groups are assembled to provide oversight of the process and methodology and to review the calculated measure values for projects.

Applicant Responsibilities

Applicants are responsible for ensuring that all SMART SCALE application requirements are understood. Projects submitted for SMART SCALE funding will be held to a basic standard of development to guarantee they can be evaluated reliably throughout the application process. Beginning in 2018, the SMART SCALE application process is comprised of two parts: (1) A pre-application containing sufficient information for project screening and eligibility review; and

(2) the remaining sections needed to complete the validation and evaluation steps. More information on the schedule for application intake can be found in Section 1.4.

To ensure the submittal of complete applications, it is strongly recommended that applicants complete the following tasks:

- Reach out to VDOT, DRPT and OIPI staff early in the process
- Complete a Pre-Application between March and May (no new applications may be created after June 1)
- Ensure project meets a VTrans need
- Ensure project and applicant eligibility requirements have been met
- Ensure project readiness requirements have been met
- Ensure project is properly defined in terms of scope, schedule, and cost estimate
- Submit a completed application by August 1, preferably earlier

Applicants are expected to prioritize the applications they submit. Beginning in 2018, there will be a limit on the number of applications allowed per applicant. A two-tiered population-based approach sets the maximum number of applications at 4 for smaller localities, transit providers, and regional agencies and 8 applications for larger localities, transit providers, and regional agencies.

For information on the required inputs to the SMART SCALE application, please refer to the SMART SCALE Application Guide (available at http://smartscale.org/resources/).

1.3 STAKEHOLDER INPUT

To develop a fair and informed SMART SCALE project prioritization process that would work across all modes and throughout the Commonwealth, extensive stakeholder input was considered in its initial development. Numerous meetings were held to obtain the input of jurisdictions, agency stakeholders and the public body across the Commonwealth.

Stakeholder engagement continues to be essential for each biennial implementation of the SMART SCALE submission process and evaluation. Collaboration and involvement continues throughout the entire process. At a minimum, the opportunities for stakeholder input include the following:

- Application phase: Stakeholders have the opportunity to provide input as to what projects the jurisdictions/MPOs/PDCs/transit agencies should consider moving forward in the process through the development of an application for SMART SCALE funds as well as by providing feedback to the CTB during the annual Fall Transportation Meetings. Stakeholders may work with the state to

ensure that projects are defined in sufficient detail for SMART SCALE evaluation.

- Analysis and Scoring phase: By January of each SMART SCALE cycle, the evaluation of projects selected for SMART SCALE prioritization evaluation will be complete, and results will be made public. Stakeholders have the opportunity to review assumptions and calculations and see each project's score.
- Results and Programming phase: Every year, during the development of the Six-Year Improvement Program, stakeholder input is received during public meetings held following the release of the draft Six-Year Improvement Program in April. Stakeholders have the opportunity to provide input upon the projects that were selected for funding for both grant programs.
- Lessons Learned and Process Improvement Evaluation: Each cycle, applicants are invited to provide feedback on opportunities for improvement to the process. Additionally, as enhancements are considered for process improvements, stakeholder input is requested prior to adoption by the CTB.

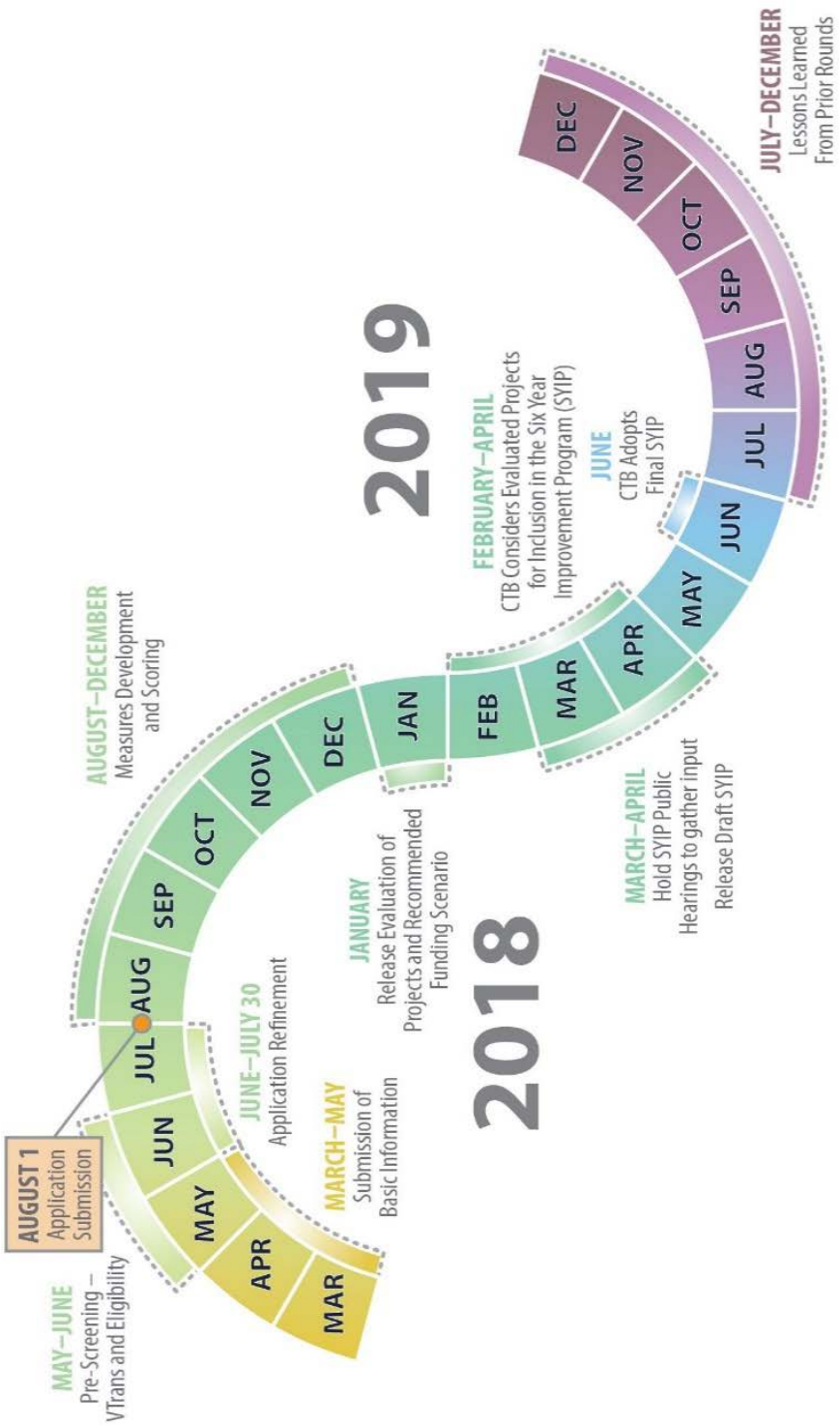
1.4 BIENNIAL SMART SCALE CYCLE

Each year that funding is available, SMART SCALE is planned to operate according to the biennial cycle illustrated in Figure 1.1. Applicants now have more than six months to complete their SMART SCALE applications, a significant increase from two months available in previous rounds. Eligible entities can begin creating candidate project applications starting March 1st in even numbered years from eligible entities, with complete project applications due August 1st of the same year. All candidate project applications must be created by June 1st with a required minimum level of information to be provided by that date (the pre-application). No new applications will be created after June 1st. Project sponsors are encouraged to coordinate well before August working with VDOT and DRPT staff. From there, OIPI, VDOT and DRPT screen, review/validate, and evaluate the projects per the SMART SCALE process over a five month period from August through December.

At the January CTB meeting the results of the evaluation are released along with the staff recommended funding scenario. In the Spring, the draft Six-Year Improvement Program is released by the CTB, followed by public hearings to gather input. In June, the revised final Six-Year Improvement Program is released and considered for adoption by the CTB.

Any changes to the staff recommended scenario require affirmative action by the CTB prior to the June meeting.

Figure 1.1 Anticipated SMART SCALE Biennial Cycle



As currently identified, the application and evaluation process timeline will generally proceed as follows:

- **Winter/Spring: –** Early coordination with DRPT and VDOT prior to application submissions.
- **March 1st** - Call for applications and notification of estimated amount of funding available.
- **March-May** - Applicants create pre-application containing sufficient basic project information for project screening and eligibility review.
- **June 1st** – Deadline to complete pre-application. No new applications will be allowed after June 1st.
- **May-June -** Pre-screening to see if project meet VTrans need and are eligible for SMART SCALE funding
- **June through July 30th** - Application refinement
- **August 1st –** Final applications due. All applications will be made public after the deadline to submit has passed.
- **August through December –** Submitted projects are screened, evaluated and scored.
- **January CTB Meeting –** Results of SMART SCALE screening and evaluations are made public along with the staff recommended funding scenario.
- **February through June –** SMART SCALE-funded projects will follow existing public comment period and Six-Year Improvement Program approval process. The CTB may modify the staff recommended funding scenario through formal action.

2.0 Project Eligibility and Application Process

This section summarizes project eligibility, readiness, screening, and application process considerations for SMART SCALE implementation. Prospective projects must meet or exceed certain qualifications to be considered for evaluation in the SMART SCALE process, and sponsors must provide specific information for eligible projects.

2.1 Eligibility Requirements

The types of projects and entities eligible for consideration are described in this section, along with a listing of funding sources not affected by SMART SCALE, and characterizations of entities eligible to submit projects. SMART SCALE projects may be submitted by regional entities including Metropolitan Planning Organizations (MPOs) and Planning District Commissions (PDCs), along with public transit agencies; counties; and cities and towns that maintain their own infrastructure.

Figure 2.1 illustrates the process of determining whether a project has been developed enough to assess its benefits according to the SMART SCALE factors and measures.

Eligible Types of Projects

There are several types of projects that are considered for SMART SCALE funding. Highway, transit, rail, road, operational improvements and transportation demand management projects and strategies will be considered. The following project types are (i) not eligible or (ii) will not be considered in the evaluating and rating for SMART SCALE:

- Stand-alone studies;
- Projects where a significant portion of the project costs are related to "in-kind" repair or replacement of existing traffic control devices, asset management (bridge rehabilitation, "bridge-only" bridge replacement projects, pavement repair/replacement, guardrail repair/replacement) or other activities eligible for the State of Good Repair;
- Projects that are fully funded through other committed funding sources such as local funding or proffers. In general projects that are fully funded in a capital improvement program, a metropolitan planning organization's transportation improvement program or committed by a developer through local zoning approval process will be excluded from consideration in

evaluating and rating for SMART SCALE. However, the Board recognizes that there are unique circumstances for large projects that require flexibility. Accordingly, if a project with a cost reasonably expected to exceed $1 billion will start procurement prior to the award of the next round of SMART SCALE but which was ineligible for the most recent previous round of SMART SCALE due to project readiness then a fully funded project may be considered under SMART SCALE;

- Projects where a project components or feature is not contiguous or proximate, or of the same improvement type (e.g., signal improvements, transit stations, etc.)

Other Considerations

- If an applicant submits an existing fully funded or committed project with independent utility for SMART SCALE funding with intention of requesting additional funds to add additional project component such as landscaping, streetscaping, and/or bicycle and pedestrian infrastructure, then the benefits associated with the fully funded or committed project element(s) will be excluded from consideration in evaluating and rating the project for SMART SCALE;
- For a project phase or element that is expected to be funded through proffers, the costs and benefits associated with that project element will be excluded from consideration in evaluating and rating the project for SMART SCALE;

Table 2.1 shows the general project types that are eligible to receive SMART SCALE funds.

Table 2.1 Project Types Eligible for SMART SCALE Funding

Project Types Included within SMART SCALE (Capacity and Operational Improvements only)	Project Types Excluded from SMART SCALE
Highway Improvements (Widening, Operational Improvements, Access Management, Intelligent Transportation Systems, Technology Operational Improvements)	Asset Management (bridge rehabilitation, "bridge-only" bridge replacement projects, pavement repair/replacement, guardrail repair/replacement)*
Transit and Rail Capacity Expansion	
Bicycle and Pedestrian Improvements	
Transportation Demand Management (Park & Ride facilities)	

* Asset Management projects excluded from SMART SCALE may be eligible for funding under the State of Good Repair program as pursuant to 33.2-369 of the Code of Virginia.

In addition, projects must meet a need identified in VTrans as defined in SMART SCALE legislation;

> *"Candidate projects and strategies shall be screened by the Commonwealth Transportation Board to determine whether they are consistent with the assessment of capacity needs for all corridors of statewide significance, regional networks, and improvements to promote urban development areas established pursuant to § 15.2-2223.1, undertaken in the Statewide Transportation Plan in accordance with § 33.2-353."*

VTrans the Commonwealth's long range transportation plan, consists of two components; the (i) VTrans Vision Plan and the (ii) Virginia Multimodal Transportation Plan (VMTP). The Needs Assessment developed within the VMTP serves as a screen for projects applying for consideration under the SMART SCALE prioritization process. The CTB adopted the VTrans Needs Assessment in December 2015 and are not anticipated to consider an update for several years. The process for screening projects based on VTrans needs is described in more detail in Section 2.2.

Funding Programs

A variety of funding sources are subject to allocation according to the SMART SCALE process. Projects seeking funding from most state and Federal discretionary fund categories are required to go through the SMART SCALE process. However, the following funding categories are exempt from the SMART SCALE process: Congestion Mitigation and Air Quality Improvement (CMAQ) Program funds, Highway Safety Improvement Program (HSIP), Regional Surface Transportation Block Grant Program (RSTBG), Transportation Alternatives (TA) Set-Aside funds (previously known as Transportation Alternatives Program (TAP) under MAP-21), and the Revenue Sharing program. Regional funds for Northern Virginia and Hampton Roads are also exempt from the SMART SCALE process. Funds not subject to SMART SCALE may be allocated to projects and used to leverage/reduce the SMART SCALE fund request.

As described in Section 1, HB1887 established two new funding programs; the HPPP and the DGP. These programs, and the State of Good Repair Program also established by HB1887, replace the previous 40-30-30 system formula and the CTB alternate formula. The HPPP addresses projects of regional or statewide significance and projects will compete statewide for funding. The DGP sets aside funds for each district and projects will compete for funding only with projects submitted by other localities within the same district.

Although both state and Federal funds are expected to be available through the SMART SCALE process, all projects selected for funding that can qualify for Federal funds shall be developed as federally eligible projects.

Entities Eligible to Submit Projects

While many stakeholders across the Commonwealth have an interest in projects that are considered for funding, only a select group of entities are eligible to submit projects for consideration. Public transit agencies, and regional entities, including Metropolitan Planning Organizations (MPO), the Northern Virginia Transportation Authority, and Planning District Commissions (PDCs) are eligible to submit projects, along with counties, cities, and those towns that maintain their own infrastructure. To support local and regional planning efforts and consistency with the Constrained Long Range Plans, localities and transit organizations are required to obtain a resolution of support from the relevant regional planning body prior to submitting an application. A summary of the entities eligible to submit projects for SMART SCALE is presented below in Table 2.1.

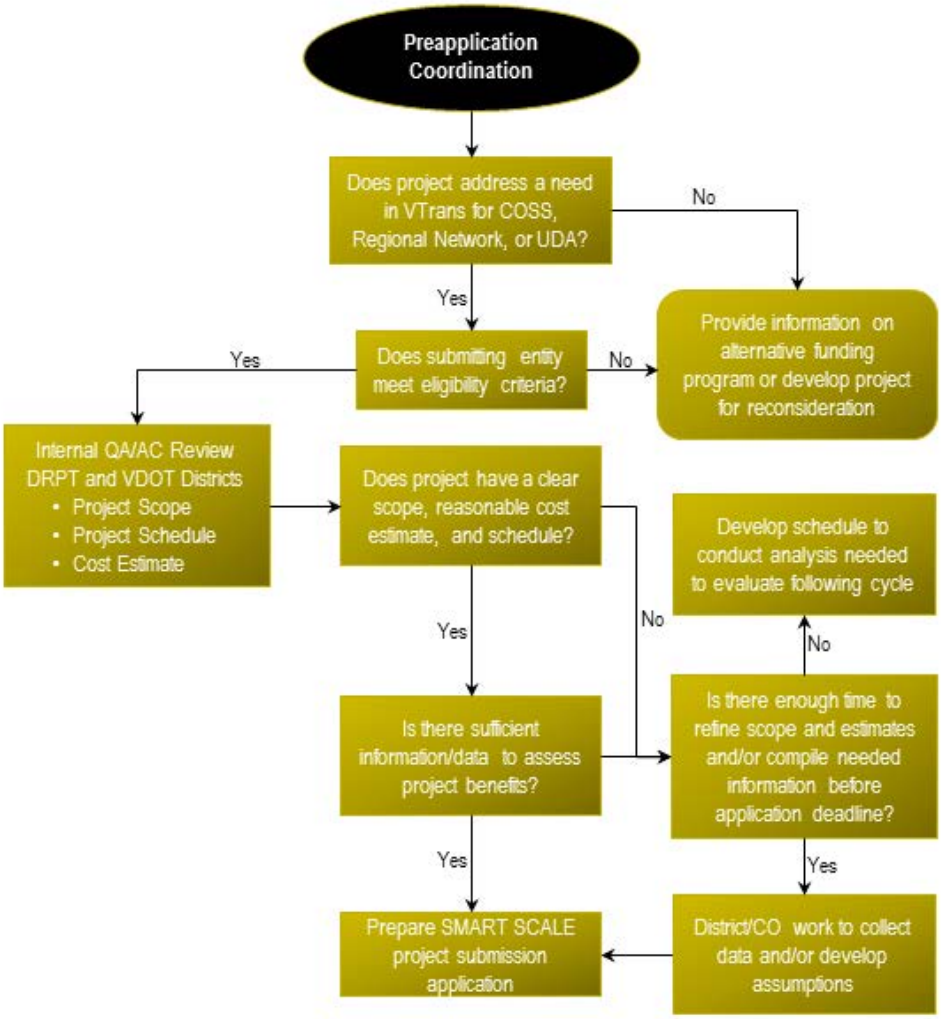
Table 2.2 Eligibility to Submit Projects

Project Type	Regional Entity (MPOs, PDCs)	Locality* (Counties, Cities, and Towns)	Public Transit Agencies
Corridor of Statewide Significance	Yes	Yes, with a resolution of support from relevant regional entity	Yes, with resolution of support from relevant regional entity
Regional Network	Yes	Yes, with a resolution of support from relevant regional entity	Yes, with resolution of support from relevant entity
Urban Development Area	No	Yes, with a resolution of support from relevant regional entity	No
Safety	No	Yes, with a resolution of support from relevant regional entity	No

Applications for funding through either the HPPP or the DGP must relate to projects located within the boundary of the qualifying entity. Localities and regional planning bodies may submit joint applications for projects that cross boundaries.

By majority vote, the CTB may choose to submit up to two projects for evaluation each application cycle.

Figure 2.2 SMART SCALE Project Eligibility and Pre-Application Process



2.2 PROJECT READINESS – PLANNING REQUIREMENTS

This section provides guidance on the required level of planning and supporting documentation needed for projects to be considered and evaluated for SMART SCALE funding. All projects must include a detailed description for each project feature that focuses on the scope of the project and not the benefits of the project. The following guidelines should be used to assist the applicant in providing a complete and accurate application regarding specific project types. If the required

level of planning and supporting documentation has not been completed, then the project application will be excluded from consideration in the evaluating and rating of SMART SCALE. Supporting documentation will be required for application submission.

Grade Separation Projects

Grade Separation on Limited Access Facilities

Proposed new grade separated interchanges on existing limited access facilities **require** a draft or final Interchange Justification Request (IJR) study or interchange feasibility study with a warranted and feasible preferred alternative identified that is consistent with the scope described in the application.

Grade Separation of at-grade Intersection

Proposed grade separations of existing at-grade intersections **requires** a planning level study or analysis that includes the evaluation of at-grade alternatives and identifies a warranted and feasible preferred alternative that is consistent with the scope described in the application.

New Traffic Signals

Proposed new traffic signals must meet VDOT spacing standards and **require** an approved traffic signal justification report to justify their use as the appropriate traffic control method at the proposed location. The signal justification (including warrants analysis and evaluation of alternatives to signalization) must be uploaded to the SMART Portal as part of the project documentation. For a new traffic signal(s) on the VDOT Arterial Preservation Network, State Traffic Engineer approval is required and the applicant must provide evidence that innovative intersection improvements have been considered and evaluated. Additionally, signalization requiring new median crossovers on the Arterial Preservation Network require approval from the State Location & Design Engineer. If a justification report has not been conducted to show that a signal is the appropriate traffic control method, then the project will be excluded from consideration in scoring and rating for SMART SCALE.

New Location Facilities

An applicant that proposes construction of a new roadway must demonstrate that alternatives to improve the existing transportation network have been evaluated as part of the planning process, and that the alternatives analysis results were used in making the decision on the preferred alternative. The preferred alternative must be consistent with the scope described in the application.

Major Widening Projects

An applicant that proposes a major widening of an existing roadway must demonstrate that alternatives to optimize the existing capacity have been thoroughly evaluated as part of the planning process, and that the alternatives analysis results were used in making the decision on the preferred alternative. The preferred alternative must be consistent with the scope described in the application.

Public Support

Applicants must demonstrate that a project has the support of key stakeholders and the public at the time of application submittal to SMART SCALE. A resolution of support from the relevant governing body or policy board is required at the time of application. The resolution of support must be uploaded in the SMART Portal as part of the project documentation.

NEPA and Alternatives Analysis

- If NEPA is not complete, applicants must coordinate with VDOT/DRPT to assess the anticipated level of NEPA document required and the current status.
    - In the situation where it is determined that the project requires analysis of alternatives then there must be an identified locally preferred alternative. The applicant must provide the draft NEPA document if available along with the anticipated level of NEPA class of action required. The NEPA Concurrence form approval by FHWA must be uploaded to the SMART SCALE Portal.
    - In the situation where it is determined that an alternatives analysis is not required VDOT/DRPT will provide the applicant with documentation of such determination.
- If NEPA is complete, the FHWA approval letter (CE, FONSI, ROD), and (if available) a link to the document on-line, shall be uploaded in the SMART Portal as part of the project documentation.

2.3 SCREENING PROCESS

VTrans Needs Screening

All projects submitted for the SMART SCALE process must pass through an initial screening process conducted by the OIPI team and demonstrate that the project addresses a need identified in the Commonwealth's long-range transportation plan – VTrans. VTrans needs are updated once every four years. VTrans assesses the State's transportation needs within four categories

- **Corridor of Statewide Significance (CoSS**) – key multimodal travel corridors that move people and goods within and through Virginia, serving primarily long-distance / interregional travel;
- **Regional Networks (RN)** – multimodal networks that facilitate intraregional travel within urbanized areas;
- **Urban Development Areas (UDA)** – areas where jurisdictions intend to concentrate future population and employment growth and development consistent with the Code of Virginia (§15.2-2223.1)[1]; and
- **Transportation Safety Needs** – statewide safety needs identified in VTrans2040 will be eligible for funding under the District Grant Program.

The needs categories selected by the applicant will determine which screening criteria VDOT, DRPT, and OIPI will apply to the project application.

Each of these categories has transportation needs that are identified on an interactive map (See Figure 2.2) on the VTrans website. The website provides links to individual documents for each CoSS segment, Regional Network, and UDA that documents the individual needs. Applicants are required to identify which of the four categories primarily fit their candidate project and how their proposed project meets a VTrans need on each of the categories selected. A project may address one or more needs.

Project applicants are required to include the following components in their VTrans Needs description:

- Identify the CoSS segment, Regional Network, UDA, and/or specific Safety Need (preferable referencing the specific need ID or name) from the VTrans Needs Assessment that is addressed by the project,
- Identify the project location, and
- Identify how the project will address the need.

The project screening is a critical component of SMART SCALE as it links the planning process to the and programming process to ensure that the overarching transportation goals of the Board are advanced. If a project does not address an identified need in VTrans, it will be screened out of the SMART SCALE process.

The HPPP (as defined in § 33.2-370) can fund projects that address a transportation need identified for a CoSS) or a Regional Network in VTrans. The DGP can fund

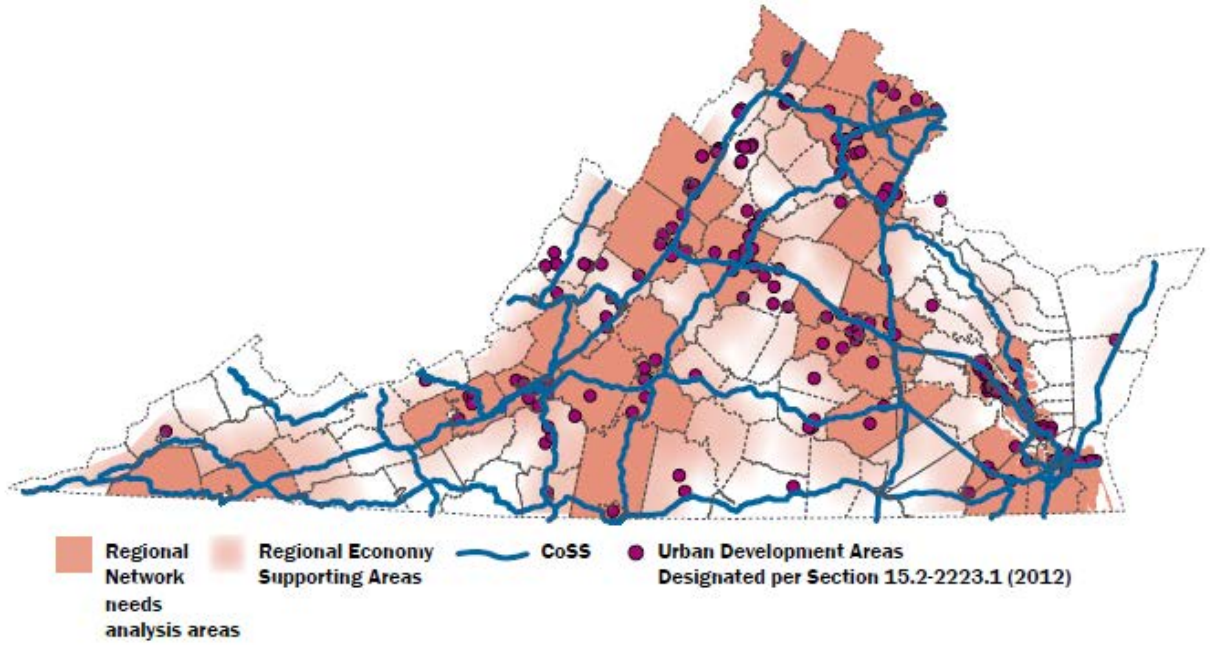
[1] Including any locally designated growth areas that have a comprehensive plan reference to the UDA section as qualified for SMART SCALE screening, even if they are not named as UDAs. Designated growth areas with the proper code reference submitted after October 1, 2016 will still be included in the VTrans2040 Multimodal Needs Assessment (VMTP) in an ongoing fashion.

projects that address CoSS and RN needs, as well as needs identified for UDAs and safety issues.

The VTrans website provides all information on the Needs Assessment (http://www.vtrans2040.com). The Needs Assessment as well as the VTrans Vision Plan were formally adopted by the CTB in December 2015.

Applicants must justify how their proposed project meets a VTrans need. Within the SMART Portal and the application, an applicant will an applicant will utilize the mapping tool to identify specific VTrans needs. For each VTrans need selected, the applicant will need to provide a justification for each need selected. See smartscale.org/resources for assistance in using the mapping tool.

Figure 2.3 VMTP Needs Assessment – COSS, RN, and UDA Scales Map



Source: VTrans Multimodal Transportation Plan 2025 Needs Assessment

Note: Regional Networks are focused on the MPO areas plus the full county boundaries surrounding them. In some cases needs were identified beyond the county boundaries, in order to reflect needs addressing the connection between exurban and rural areas into the Regional Network. Those needs will also be considered in the screening process.

2.4 APPLICATION AND VALIDATION PROCESS

To support the success of the evaluation process, project sponsors are encouraged to coordinate with VDOT and DRPT early in the process to share information on prospective applications. This coordination phase will allow project descriptions and scopes of work, cost estimates, and potential benefits to be developed and refined and will facilitate the application and evaluation process.

Beginning in 2018, project sponsors are required to create a pre-application within the on-line application tool by June 1. Project applications created by June 1 will be reviewed for eligibility, project readiness and screened to determine if the project meets a VTrans need. This will provide the project sponsor with an early screening and eligibility determination. No new applications may be created after June 1. VDOT and DRPT will be available to assist in application preparation.

Project Preparation

Projects submitted as candidates for SMART SCALE funding will be held to a basic standard of development to assure that they can be evaluated reliably. VDOT and DRPT intend to provide support to project sponsors prior to application submission to help project sponsors understand and meet expectations. Project sponsors are encouraged to initiate coordination with VDOT and DRPT staff prior to the application period to ensure that candidate projects are adequately developed.

SMART SCALE project applications must include the following information:

- **Scope –** At a minimum, the scope should define the limits of the project, its physical and operational characteristics, and physical and/or operational footprint.
- **Schedule –** At a minimum, the schedule should clearly define the expected process for further project development including key milestones, work activities, related activities, and approvals/approval timelines. The schedule should be realistic and reflect the complexity of the project and identify durations for project phases (PE, RW, CN). For a future planned phase start, the applicant should assume a start date of no earlier than August 1, 2023 (Fiscal Year 2024) to align with funding availability for round 3 of SMART SCALE. Actual dates may be earlier or later and will depend on number of factors, including actions required to obtain federal and/or state authorization to begin the phase (e.g., TIP/STIP action, locally administered project agreement, etc.), and availability of funding.
- **Cost –** At a minimum, the cost estimate should be as realistic as possible and should account for applicable risk and contingencies based on the size and complexity of the project. Projects should not be divided/segmented to the extent that they no longer have logical termini or independent utility. Cost estimates must be escalated to the anticipated start date for future phases.

If federally eligible, projects must meet the relevant federal requirements for inclusion into the Constrained Long Range Plan (CLRP) in order to make use of funding received through SMART SCALE and advance.

Projects with an estimated total cost greater than $100 million are required by both state and federal code to have a financial plan. If selected for funding, the initial project financial plan will be required prior to federal authorization of construction phase funding. The financial plan document provides reasonable assurance that there will be sufficient funding available to implement and complete the entire project as planned. Additional information on financial plan requirements can be found at http://www.virginiadot.org/projects/financial_plans.asp.

The estimated cost to be used on the project application will be significant in determining each project's SMART SCALE score and ranking. Prior to submitting

project applications, applicants should work in conjunction with VDOT and DRPT staff to develop reliable cost estimates as part of the application process. Increases in project cost and SMART SCALE funding requests, could result in reevaluation of the project and potentially a loss of funding as described in Section 5.3.

Phase estimates should account for the total cost of the phase to include future planned costs and costs of any previous work or accomplishments to date on existing phases. To the extent possible, right of way phase costs should attempt to exclude the value of donated land or easements or other right of way phase related in-kind contributions. If such aspects are included as a part of the phase's cost estimate, the applicant should denote that the value of such items are reflected as "Local Funds" in the Project Funding Sources described below. For future phases, the cost estimate must be escalated pursuant to the scheduled phase start date included in the application.

For projects in which the applicant requests VDOT to administer the project, VDOT will be responsible for providing the applicant with a cost estimate for each project application. If the applicant has provided an estimate, VDOT will be required to validate the estimate for use on each project application.

For projects in which the applicant requests to locally administer the project (and for all DRPT oversight projects), the applicant must provide a cost estimate for each project application, however VDOT and/or DRPT staff will validate the estimate for use on each project application

Pre-Application Coordination and Submission

VDOT and DRPT strongly encourage early coordination with VDOT and DRPT as they consider projects for application submission. Submission of a Pre-Application Coordination form (available on line at http://vasmartscale.org/resources/default.asp) to VDOT and DRPT prior to June 1st will aid both the applicant and VDOT/DRPT in developing the necessary information for application submission. A Pre-Application Coordination form was developed to provide preliminary guidance to assist SMART SCALE applicants with the development and refinement of potential projects to be considered for the SMART SCALE process. The form provides an opportunity to compile and develop necessary data ahead of the screening and application process.

The on-line application tool (SMART Portal) will open on March 1, allowing project sponsors to begin application development. All candidate project applications must be created by June 1st and no new applications will be allowed after June 1st. There is no cap on the number of candidate project applications that can be created. To further facilitate VDOT and DRPT assistance in developing project applications, an applicant must submit basic information by June 1st to guarantee technical assistance from the two agencies. The pre-application will identify if projects meet a VTrans need, are eligible and ready before submission and provide advance knowledge of the number and type of applications. Project

Sponsors will be notified prior to submission if their application meets a VTrans need and is eligible.

The pre-application requires minimum inputs be provided by the applicant to include the following:

- Project Title
- Principal Improvement
- Organization Name
- POC Name
- POC Phone Number
- POC Email
- Project Description - Long Description (the what not the why)
- Project Administration
- Existing UPCs (if available)
- VTrans Need Selection and Justification
- Project Sketch
- Project Location
- Project Readiness
  - NEPA Status
  - Planning Study/Alternatives Analysis
  - Interchange Justification Report
  - Intersection Alternatives Analysis
  - Signal Justification
- Project Eligibility -
  - Project Type and other basic information needed to understand the general project scope

Validation (Pre- and Post-Application Submittal)

Upon receiving the notice that the applicant desires assistance, VDOT and DRPT will begin to work with project sponsors to ensure that scope, schedule, and cost estimate for the project are adequate for the evaluation process. Depending on the completeness of available data, the VDOT and DRPT staff may request additional information or identify issues that need to be resolved. Final submitted applications are reviewed by internal technical staff and must be fully validated to move forward into the evaluation and evaluating process.

If there is disagreement concerning the cost estimate or other application data that impacts the evaluation that cannot be resolved between the applicant and VDOT/DRPT local contact, the applicant may request resolution from the VDOT District Engineer / Administrator or the DRPT Director.

Based on the review and validation by internal technical staff, a project application may be recommended to not advance to evaluation since the project type of applicant is not eligible for SMART SCALE or the project has been determined to be insufficiently developed and the benefits cannot be calculated.

Certain projects that are based on conceptual planning-level recommendations and have not been formally scoped or defined may require additional planning/pre-scoping level work before their benefits can be adequately assessed according to the SMART SCALE factors and measures. Planning and pre-scoping resources exist within VDOT, DRPT, localities, regional planning bodies, and some other entities (e.g., SPR, PL, Pre-scoping, FTA 5303, FTA 5304, etc.). However, resources are unlikely to be sufficient to fund every potential request for assistance for project development related to the SMART SCALE process. Additional information on project eligibility and project readiness are included in Sections 2.2 and 2.3.

Application Submittal

The CTB's goal is to formulate an application process that remains simple and straightforward for applicants. Once the applicant is ready, the online application can be completed and submitted through the SMART Portal link at: https://smartportal.virginiahb2.org/ Additionally, staff from VDOT and DRPT are available for support throughout the process. It is important for applicants to reach a consensus with VDOT and DRPT staff on the scope, schedule and estimate for project submission. A key guiding theme is to develop a process that does not require applicants to invest significant time and resources for submission of project information, or require the use of consultants to develop an eligible application. Early application submission is encouraged to mitigate discrepancies throughout the process.

To further this effort, the on-line application tool has been enhanced to provide the ability to submit applications for other VDOT programs to include Revenue Sharing, Transportation Alternatives (TA) Set-Aside funds (previously known as Transportation Alternatives Program (TAP) under MAP-21), and Highway Safety Improvement Program (HSIP) funds. State of Good Repair forms for bridges and paving are also available through the one-line application tool. Additional programs may be added in the future. Applications submitted through other applications programs or from a prior round may be cloned for use in SMART SCALE.

The on-line application tool continues to be enhanced based on feedback and lessons learned. VDOT and DRPT staff will provide training and will be available to provide support and tools for applicants in compiling data and information needed for application.

Table 2.3 lists the types of information needed to calculate the prioritization measures and highlights which items will need to be provided by the applicant and which items will be calculated by the Commonwealth. The on-line application tool is electronic and map-based to facilitate automated population of key data elements. This has the potential to reduce the likelihood of data entry errors and improve consistency with VDOT's current scoping form.

Note that if an applicant submits more than one project for consideration, as part of the application process, each applicant will be asked to rank their submitted projects in order of priority. Applicants are encouraged to focus on their highest priority projects as each applicant is limited in the number of applications it can submit,

Table 2.2 SMART SCALE Measure Data Responsibility

	Responsibility	
	State	Applicant
All Measures		
Detailed description of improvement		X
Project location		X
Safety		
S.1 - Reduction in number of Fatal and Injury crashes	X	
S.2 - Reduction in Fatal and Injury crash Rate	X	*
Congestion Mitigation		
C.1 - Increase in Person Throughput	X	*
C.2 - Decrease in Person Hours Delay	X	*
Accessibility		
A.1 - Increase Access to Jobs	X	
A.2 - Access to jobs for disadvantaged population	X	
A.3 - Checklist of multimodal elements included in the project (transit, bike/ped, park&ride, etc.)		X
A.3 - Number of non-SOV users	X	*
Environment		
E.1 - Checklist of project elements that contribute to reduced pollutant emissions and/or energy use (transit, bike/ped, park&ride, energy-efficient facilities, etc.)		X
E.1 - Location of improvement on roadways with truck use > 8%	X	
E.1 - Improvements that benefit freight rail or intermodal facilities		X
E.2 - Acres of natural and cultural resources potentially impacted	X	
Economic Development		
ED.1 - Transportation project consistency with Local Comprehensive Plan or Local Economic Development Strategy		X
ED.1 - Transportation project consistency with Regional Economic Development Strategy		X
ED.1 - List of Development projects supported by the transportation improvement (up to 5 miles away depending on project type) including description, square footage, distance from the transportation project, and directness of access that the transportation improvement provides		X
ED.1 - Development project consistency with locality Comprehensive Plan/Zoning		X
ED.1 - Development project site plan status		X
ED.1 - Development project site utilities status		X
ED.2 - Improve access to distribution, intermodal and manufacturing facilities	X	
ED.2 - Improve STAA truck route	X	
ED.2 -. Improve access reduce congestion ports/airports	X	
ED.2 - Tonnage (1000s) per day	X	
ED.3 - Travel time reliability	X	
Land Use and Transportation Coordination		
L.1 - Transportation efficient land use	X	
L.2 – Increase in transportation efficient land use	X	

* On non-VDOT roadway facilities, the applicant will need to provide study traffic data (existing turning movement counts and VDOT approved future traffic volumes). For non-roadway (transit, park&ride, bike/ped) projects, applicant will need to provide expected future year peak period usage.

* Applicants are encouraged to provide supplemental data and analysis, but will not be required.

3.0 Evaluation Measures

This section summarizes the evaluation measures that are used in the SMART SCALE evaluation process, and the methods by which those evaluation measures are calculated. SMART SCALE legislation requires that the measures be quantifiable and objective, that the analysis of a project's benefits is relative to its cost (essentially a benefit-cost analysis using the SMART SCALE factors), and that the CTB consider all modes of transportation. The law requires that the measures fall into six factor areas, listed below:

- Safety;
- Congestion Mitigation;
- Accessibility;
- Environmental Quality;
- Economic Development; and
- Land Use Coordination (for areas over 200,000 populations).

Using the framework of the six factor areas, VDOT and DRPT used an extensive process to develop the measures for SMART SCALE. The team researched best practices from other state DOTs and MPOs, established a work group focused on measures, held a peer exchange workshop, and conducted lessons learned tasks from the initial rounds of SMART SCALE. From these working groups and activities, the team gained a key understanding of some guiding principles that should be included in SMART SCALE, formalized into six guiding principles:

- Analyze what matters to people and has a meaningful impact;
- Ensure fair and accurate benefit-cost analysis;
- Be both transparent and understandable;
- Work for both urban and rural areas;
- Work for all modes of transportation; and
- Minimize overlap between measures.

3.1 Safety Measures

The SMART SCALE safety measures evaluate how each project addresses multimodal transportation safety concerns through implementation of best practice crash reduction strategies. Listed below in Table 3.1 are brief summaries of the two measures. Additional information about the measures, methodologies, and other details are available in Appendix A.

Table 3.3 Safety Measures

ID	Measure Name	Measure Description	Measure Objective	Measure Weight
S.1	EPDO of Fatal and Injury crashes	Equivalent property damage only (EPDO) of fatal and injury crashes expected to be avoided due to project implementation	Estimate number of fatalities and injury crashes (weighted by "equivalent property damage only" crash value scale (ratio) used by FHWA) at the project location and the expected effectiveness of project specific counter-measures in reducing crash occurrence	50%[a]
S.2	EPDO Rate of Fatal and Injury crashes	Equivalent property damage only (EPDO) of fatal and injury crashes per 100 million vehicle miles traveled (VMT) expected to be avoided due to project implementation	Similar to S.1, but by focusing on the change in fatality and injury crashes (weighted by "equivalent property damage only" value scale (ratio) used by FHWA) per VMT. The measure considers projects that address areas with a high rate of crashes that may be outside of high-volume roadways	50%

[a] 100% for Transit Projects.

3.2 CONGESTION MITIGATION MEASURES

The SMART SCALE congestion mitigation measures evaluate how each project addresses the ability of the transportation system to move people and reduce travel delay across the State. Listed below in Table 3.2 are brief summaries of the measures. Additional information about the measures, methodologies, and other details are available in Appendix B.

Table 3.4 Congestion Mitigation Measures

ID	Measure Name	Measure Description	Measure Objective	Measure Weight
C.1	Person Throughput	Increase in corridor total (multimodal) person throughput attributed to the project	Assess the potential benefit of the project in increasing the number of users served within the peak period.	50%
C.2	Person Hours of Delay	Decrease in the number of person hours of delay in the corridor	Assess the potential benefit of the project in reducing peak period person hours of delay.	50%

3.3 ACCESSIBILITY MEASURES

The SMART SCALE accessibility measures evaluate how each project addresses worker and overall household access to jobs and other opportunities, as well as multiple and connected modal choices. Listed below in Table 3.3 are brief summaries of the measures, and additional information is available in Appendix C.

Table 3.5 Accessibility Measures

ID	Measure Name	Measure Description	Measure Objective	Measure Weight
A.1	Access to Jobs	Change in average jobs accessibility	Measure assesses the average change in access to employment opportunities as a result of project implementation based on the GIS accessibility tool.	60%
A.2	Access to Jobs for Disadvantaged Populations	Change in average jobs accessibility for disadvantaged populations	Measure assesses the average change in access to employment opportunities as a result of project implementation based on the GIS accessibility tool.	20%
A.3	Access to Multimodal Choices	Assessment of the project support for connections between modes, and promotion of multiple transportation choices	Measure assigns more points for projects that enhance interconnections among modes, provide accessible and reliable transportation for all users, encourage travel demand management, and potential to support emergency mobility.	20%

3.4 ENVIRONMENTAL QUALITY MEASURES

The two SMART SCALE environmental quality measures evaluate how projects address the reduction of pollutant emissions and energy consumption, and minimize the impact on natural and cultural resources. Measure E.2, which looks at potential impact to natural and cultural resources, is unique among evaluation measures because it is adjusted, or scaled, by the benefit values for all other measures. Listed below in Table 3.4 are brief summaries of the measures, and additional information is available in Appendix D.

Table 3.6 Environmental Quality Measures

ID	Measure Name	Measure Description	Measure Objective	Measure Weight
E.1	Air Quality and Energy Environmental Effect	Potential of project to improve air quality and reduce greenhouse gas emissions	Measure rates a project's potential benefit to air quality and ability to increase energy efficiency or alternative energy use weighted by the total number of users served.	50%
E.2	Impact to Natural and Cultural Resources	Potential of project to minimize impact on natural and cultural resources located within project buffer	Measure evaluates how much sensitive land would be affected within project buffer around the project, and rates projects highest that have minimal or no impacts and are providing benefits in other factor areas.	50%

3.5 ECONOMIC DEVELOPMENT MEASURES

The SMART SCALE economic development measures evaluate how each project addresses regional and local economic development plans and new development activity, as well as improvements to intermodal freight movement access and efficiency, and travel time reliability to support the movement of goods and

people. Listed below in Table 3.5 are brief summaries of the measures. Additional information about the measures, methodologies, and other details are available in Appendix E.

Table 3.7 Economic Development Measures

ID	Measure Name	Measure Description	Measure Objective	Measure Weight
ED.1	Project Support for Economic Development	Project consistency with regional and local economic development plans and policies and support for local development activity	This measure assesses if the project is supporting new economic development and the progress made toward development in the project corridor at the local level. The scoring value is scaled by square footage of sites being developed in the area of influence of the project.	60%
ED.2	Intermodal Access and Efficiency	Rate projects based on the extent to which the project is deemed to enhance access to critical intermodal locations, interregional freight movement, and/or freight intensive industries	This measure assesses the: Level to which the project enhances access to distribution centers, intermodal facilities, manufacturing industries or other freight intensive industries; Level to which the project supports enhanced efficiency on a primary truck freight route (or high volume/ high value truck or rail freight corridor); Level to which the project enhances access or reduces congestion at or adjacent to VA ports/ airports	20%
ED.3	Travel Time Reliability	Improvement in travel time reliability attributed to the project	This measure determines the projects expected impact on improving reliability which supports efforts to retain businesses and increase and economic activity.	20%

3.6 LAND USE COORDINATION MEASURES

The coordination between transportation and land use is an important issue within jurisdictions throughout Virginia. SMART SCALE legislation mandates the use of this factor area for metropolitan areas in the Commonwealth with a total population of 200,000 or more. Localities with a population beneath that threshold were given the opportunity to voluntarily choose to use this factor area as well. The goals of the SMART SCALE land use coordination measures are to improve the consistency of the connection between local comprehensive plan goals for transportation-efficient land use and transportation infrastructure design, multimodal accommodation, and system operations. Listed in Table 3.6 is a brief summary of the land use measures, and additional information is available in Appendix F.

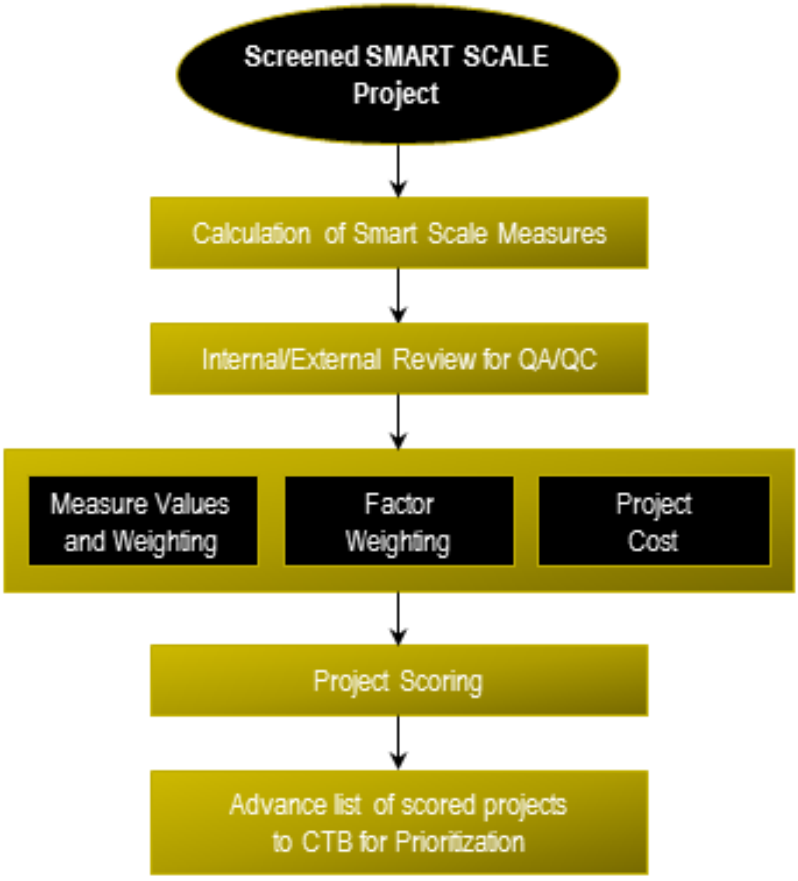
Table 3.8 Transportation Efficient Land Use Measure

ID	Measure Name	Measure Description	Measure Objective	Measure Weight
L.1	Transportation Efficient Land Use	Amount of population and employment located in areas with high non-work accessibility	This measure determines the degree to which the project supports population and employment that on averages has a reduced impact on the transportation network	70%
L2	Increase in Transportation Efficient Land Use	Increase in amount of population and employment located in areas with high non-work accessibility between present day and the horizon year of 2025	This measure determines the degree to which the project supports population and employment that on averages has a reduced impact on the transportation network	30%

4.0 Project Evaluation and Rating

This section summarizes how projects are evaluated once submitted for consideration in the SMART SCALE process. The CTB's goal is to ensure a transparent process that allows the public and stakeholders to understand how the project benefit for each project is determined and hold decision makers accountable. The flowchart in Figure 4.1 below illustrates the general process of SMART SCALE project evaluation and rating, and will be explored in more details within this section.

Figure 4.4 SMART SCALE Project Evaluation Process



4.1 CALCULATION OF SMART SCALE MEASURES

The technical evaluation team collects and calculates measures listed in Section 3, spanning the six factor areas. This is an open process that involves state agency collaboration and review from an external team of stakeholders to ensure transparency. Methodologies and specific evaluating methods are listed in Appendix A-F for each of the factor areas.

4.2 INTERNAL/EXTERNAL REVIEW

A key step in the rating process is to perform quality assurance / quality control (QA/QC) review of the calculated measures for each project. This review will be conducted by internal and external technical groups. Measures generated through a GIS-based analysis (i.e., environmental factor) or based on responses from the applicant are not subject to the QA/QC review.

The internal technical evaluation team led by the Office of Intermodal Planning and Investment, with assistance from VDOT and DRPT staff, is responsible for calculating and evaluating submitted projects in the SMART SCALE process. Duties of this group include:

- Validating and screening projects;
- Calculating measure values for submitted projects according to the methodologies set out in the Appendices; and
- Identifying any inconsistencies.

Once initial analysis is done a blind secondary analysis is performed on a minimum of 10 percent of the applications. Projects are randomly chosen for a blind secondary evaluation. A member of the technical evaluation team not involved in the initial analysis conducts the blind independent evaluation to ensure consistency in the development of assumptions and application of analytical methods.

An external review group, consisting of staff representatives from VACO, VML, VTA, and others will provide oversight of the process and methodology and to review the calculated measure values for projects.

4.3 FACTOR WEIGHTING

The SMART SCALE legislation recognized the diversity of transportation needs in different areas of the Commonwealth. It states:

"The Commonwealth Transportation Board shall weight the factors used in subdivision 1 for each of the state's highway construction districts (9). The Commonwealth Transportation Board may assign different weights to the factors, within each highway construction district, based on the unique needs and qualities of each highway construction district"

"The Commonwealth Transportation Board shall solicit input from localities, metropolitan planning organizations, transit authorities, transportation authorities, and other stakeholders in its development of the prioritization process pursuant to this section. Further, the Board shall explicitly consider input provided by an applicable metropolitan planning organization or the Northern Virginia Transportation Authority when developing the weighting of factors pursuant to subdivision 3 for a metropolitan planning area with a population over 200,000 individuals."

"The Commonwealth Transportation Board, pursuant to subdivision B.3 of § 33.2-214.1 as created by this act, shall ensure that congestion mitigation, consistent with § 33.2-257 of the Code of Virginia, is weighted highest among the factors in the prioritization process."

Based on a robust public involvement process, it was determined that needs within each construction district are often diverse as well. The CTB decided to create four weighting frameworks and assign frameworks by planning district commission (PDC) and metropolitan planning organization (MPO) boundaries. Table 4.1 and Figure 4.2 present the final factor weighting categories assigned to each MPO and PDC area.

Figure 4.5 PDC – MPO Factor Weighting Typology Map

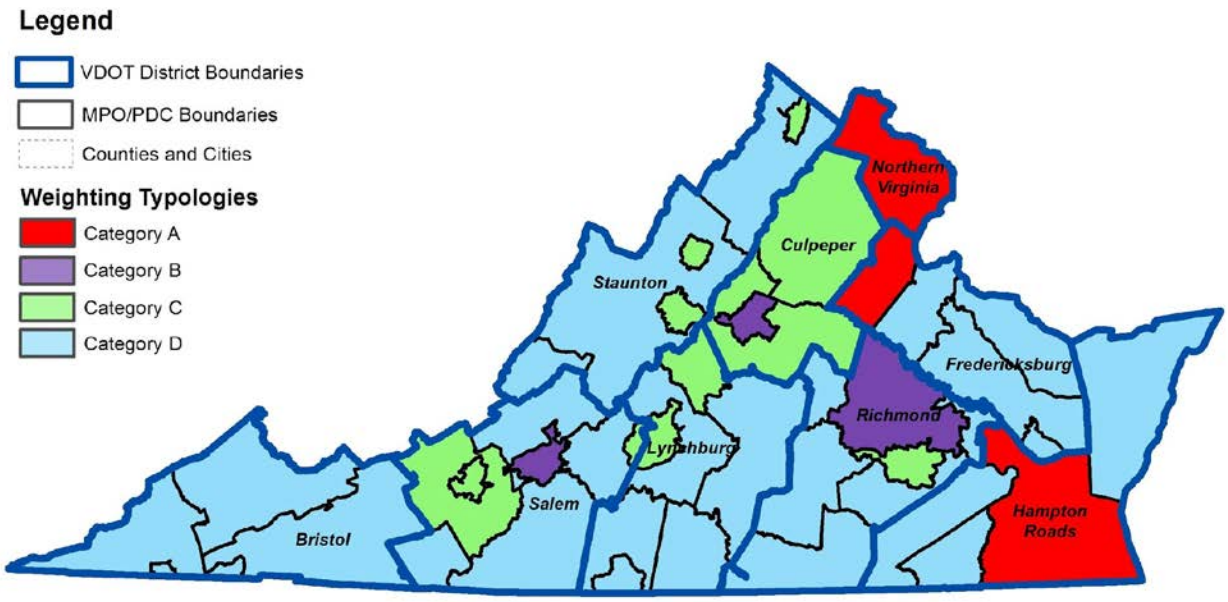


Table 4.9 PDC-MPO Factor Weighting Typology

Name	Typology
Accomack-Northampton PDC	Category D
Bristol MPO	Category D
Central Shenandoah PDC*	Category D
Central Virginia MPO	Category C
Charlottesville-Albemarle MPO	Category B
Commonwealth RC	Category D
Crater PDC*	Category D
Cumberland Plateau PDC	Category D
Danville MPO	Category D
Fredericksburg Area MPO (FAMPO)	Category A
George Washington RC*	Category D
Hampton Roads PDC*	Category D
Hampton Roads TPO (HRTPO)1	Category A
Harrisonburg-Rockingham MPO	Category C
Kingsport MPO	Category D
Lenowisco PDC	Category D
Middle Peninsula PDC	Category D
Mount Rogers PDC*	Category D
New River Valley MPO	Category C
New River Valley PDC*	Category C
Northern Neck PDC	Category D
Northern Shenandoah Valley RC*	Category D
Northern Virginia Regional Commission (NVTA)/ Transportation Planning Board (TPB)2	Category A
Rappahannock-Rapidan RC	Category C
Region 2000 LGC*	Category D
Richmond Regional PDC*	Category D
Richmond Regional TPO (RRTPO)	Category B
Roanoke Valley TPO (RVTPO)	Category B
Roanoke Valley-Alleghany PDC*	Category D
Southside PDC	Category D
Staunton-Augusta-Waynesboro MPO	Category C
Thomas Jefferson PDC*	Category C
Tri-Cities MPO	Category C
West Piedmont PDC*	Category D
WinFred MPO	Category C

* PDC defined as the remainder of the region outside the MPO boundary. In many cases, these regions include partial counties (e.g., Goochland County is partially within RRTPO and the Richmond Regional PDC). If a project is within the MPO boundary in a partial county, the project shall use the weighting associated with the MPO with the following exceptions:

i. Glouchester County portion of HRTPO included within Middle Peninsula PDC typology.

ii. Fauquier County portion of TPB included within Rappahannock-Rapidan RC typology.

iii. For projects that cross multiple typology boundaries, the project shall use the weighting associated with the typology for which the majority of the project is located.

The final weighting scheme by category is presented in Table 4.2. Where MPO boundaries cover a partial county, the assumption is that any project partially or wholly within the MPO boundary will use the assigned MPO weighting approach unless noted otherwise in Table 4.1. For projects that cross multiple typologies, the weighting framework from the typology for which the majority of the footprint of the project is located will be utilized.

Table 4.10 Factor Weights by Category

Factor	Congestion Mitigation	Economic Development	Accessibility	Safety	Environmental Quality	Land Use
Category A	45%[b]	5%	15%	5%	10%	20%[a]
Category B	15%	20%	25%	20%	10%	10%[a]
Category C	15%	25%	25%	25%	10%	
Category D	10%	35%	15%	30%	10%	

[a] For metropolitan planning areas with a population over 200,000, the prioritization process shall also include a factor based on the quantifiable and achievable goals in VTrans. TPB, HRTPO, RRTPO, FAMPO and RVTPO all meet this definition.

[b] For Northern Virginia and Hampton Roads construction districts, congestion mitigation is weighted highest among the factors in the prioritization process.

4.4 PROJECT COST

SMART SCALE mandates that the prioritization process be based on benefit of a project relative to the cost of the project.

For purposes of determining the SMART SCALE score, only the funds requested from SMART SCALE programs – the High Priority Projects Program and the District Grant Program – are considered. However information on a project's benefits relative to total cost will be provided to the Board for comparison purposes.

Using only the funds requested from SMART SCALE programs directly accounts for the financial benefit of private, local, or other funding, and reflects the increased leveraging power of state resources.

The intent of this policy is to encourage applicants to bring resources to the table. Localities of all sizes participate in the Revenue Sharing Program, which requires a 50% match of non-state funds. Under this policy, a locality may use those funds in SMART SCALE to increase the SMART SCALE value of their projects – avoiding the limitation on award amount per jurisdiction and the caps on total award per project that are in place for the Revenue Sharing Program.

4.5 PROJECT SCORING

SMART SCALE requires an analysis of the project benefits, considering each applicable factor, relative to the cost of the project. Each project's benefit is determined by calculating values for each of the evaluation measures, converting those values into a normalized value for each factor (0 to 100 scale), and then by weighting the factor values according to one of several potential weighting frameworks approved by the CTB. Ultimately, a Project Benefit is divided by the amount of funds requested from the SMART SCALE programs to obtain the final SMART SCALE score used to rank projects and develop the staff-recommended funding scenario. In addition, the Project Benefit is also divided by the total cost of the project and this figure is provided to the CTB for information purposes.

Key Terms

Measure Value – Data calculated for the project that describes the characteristics of the project. Wherever possible, the SMART SCALE measure values should be calculated so they are proportional to the size or impact of the project, even for qualitative measures.

Normalized Measure Value – Numerical value given to each measure based on the Measure Value as a percentage of the maximum Measure Value (in other words, normalized relative to the highest Measure Value).

Weighted Normalized Measure Value – Normalized Measure Values within a factor area multiplied by their measure weights.

Factor Value – Sum of the Weighted Relative Measure Values within a factor area.

Weighted Factor Value – Factor Value multiplied by the factor weight of the appropriate weighting framework based on the project location.

Project Benefit – Sum of the Weighted Factor Values for each factor area. This represents the total benefits of the project relative to other project's benefits.

SMART SCALE Value (Project Benefit / SMART SCALE Cost) – Project Benefit divided by the SMART SCALE-funded cost of the project. This index allows projects to be compared to each other in terms of their benefit per SMART SCALE dollar invested. Project costs are applied in units of tens of millions of dollars ($10 millions).

Methodology

Step 1 – Within each factor, for each measure, the highest Measure Value is determined after calculating the measures for each project. The highest Measure Value is given a value of 100 percent. Other Measure Values are compared to the highest Measure Value, and the Normalized Measure Value is then established by taking the project Measure Value as a percentage of the highest value. An example of normalization is shown in Table 4.3 below.

Table 4.11 Step 1: Normalization of Measure Weights

	Project 1	Project 2	Project 3	Project 4
Measure Value	11.62 hours	166.45 hours	1332.85 hours	21131.65 hours
Measure Value	0.05	0.79	6.31	100.00

Step 2 - Once each Normalized Measure Value has been assigned for a factor, the measure weighting is applied. Each measure within the five or six factors has a measure weight which determines the proportion of the Factor Value carried by each measure. Once the measure weighting has been applied, the sum of the Weighted Normalized Measure Values produces the Factor Value. Table 4.4 presents an example for the Congestion Mitigation factor area.

Table 4.12 Step 2: Apply Measure Weights

	C.1: Person Throughput		C.2: Reduction in Person Hours of Delay		Raw Factor Value: Congestion
Measure Weight	50%		50%		
	Value	Value	Value	Value	
Project 1	5	0.01	11	0.05	(50% * .01) + (50% * .05) = .03
Project 2	747	1.40	166	0.80	(50% * 1.4) + (50% * .80) = 1.1
Project 3	182	0.34	1,332	6.30	(50% * .34) + (50% * 6.31) = 3.32
Project 4	53,200	100.00	21,131	100	(50% * 100) + (50%*1000)= 100

Step 3 - The Factor Value is then multiplied by the weighting percentage assigned to that factor by the predetermined weighting typology. Table 4.5 demonstrates this factor weighting using example project 2 and the Category A weights. This process is repeated for all applicable factors – their sum producing the Project Benefit.

Table 4.13 Step 3: Apply Factor Weights

Project 2 (Category A Weights)	Congestion Mitigation	Economic Development	Accessibility	Safety	Environmental Quality	Land Use	Final Project Value
Weight	45%	5%	15%	5%	10%	20%	
Factor Value	1.1	2.6	0.2	4.1	0.3	4.5	
Weighted Value	0.50	0.13	0.03	0.2	0.03	0.89	1.8

Step 4 - The Project Benefit is then divided by the SMART SCALE-funded cost of the project (in $ 10 millions) to determine the value of benefit for every dollar

invested. For example, assume that Project 2 is requesting $12.4 million in SMART SCALE funds out of a total cost of $20 million. The Project Benefit is 1.78, the SMART SCALE Value (or Final Value) would be 1.43 (i.e. 1.78/1.24 = 1.43).

The Project Benefit is also divided by the total project cost to provide supplemental information on the cost-effectiveness of each project. If the total project costs were used, instead of SMART SCALE funds only, the cost-effectiveness of Project 2 would be 0.89 (i.e. 1.78/2 = 0.89).

Everything is Relative

Under this process, the maximum measure values may change on a year-to-year basis depending on the characteristics of the projects that are submitted. The aim of this method is to score each project on a scale proportional to its benefits and relative to its cohort of projects rather than an arbitrary scale that defines whether a project does well or not.

In the first round of SMART SCALE, the Transform66: Outside the Beltway project received the highest measure value in the congestion factor with a 100. In that same round the I-64 High Rise Bridge and Widening project received a 24.3. In the second round of SMART SCALE without the Transform66: Outside the Beltway project, the I-64 High Rise Bridge and Widening project received a 94.5 measure value for the congestion factor – the highest value. The benefits of the I-64 High Rise Bridge and Widening project did not quadruple, rather as the evaluation is done on a relative basis the benefit increased because it did the most to reduce congestion of the projects submitted in second round of SMART SCALE.

Table 4.6 summarizes the calculation of the SMART SCALE Score for the Project 2 example described above. This shows how the measure values and weights, combined with the factor weights, can be used to calculate the Project Benefit. The SMART SCALE Score is the Project Benefit divided by the SMART SCALE cost. Once all projects have been evaluated, they are sorted (ranked) based on the highest scored to lowest scored projects.

Project Segmentation – Fixed Guideway Projects (Transit and Rail Only)

Some projects are submitted for SMART SCALE that are a segment of a larger project plan. The individual project may not deliver certain benefits but the larger project will have significant benefits if each of the individual components are built. For example, if a project is submitted to extend a platform at a rail station to allow longer trains to be utilized, the benefits for just the extended platform will be very limited. To account for future benefits of projects that are segmented, a percentage of the benefits derived from all segments of a larger plan will be used in the evaluating of a specific segment. In our example, assuming the rail platform cost $10 million, and the future purchase of railcars cost $90 million for a total cost of $100 million, benefits would be measured for the total project and the segmented component would receive a pro-rata percentage of the benefits relative to the component's cost to the total project's cost. In this instance, 10% ($10 million/$100

million) of the benefits would be used for evaluating the platform project as this component represents 10% of the overall cost of the total project. [2]

Table 4.14 Calculate SMART SCALE Score

Factor	Congestion Mitigation		Safety		Accessibility			Economic Development			Environment		Land Use	
Measure	Increase in Peak Period Person Throughput	Reduction in Peak Period Delay	Reduction in Fatal and Injury Crashes	Reduction in Fatal and Injury Crash Rate	Increase in Access to Jobs	Increase in Access to Jobs for Disadvantaged Populations	Increase in Access to Multimodal Travel Choices	Square Feet of Commercial/Industrial Development Supported	Tons of Goods Impacted	Improvement in Travel Time Reliability	Potential to Improve Air Quality	Other Factor Values Scaled by Potential Acres Impacted	Future Transportation and Efficent Land Use	Increase in Transportation Efficient Land Use
Measure Value	12.5 Persons	17.3 Person Hrs	0.4 EPDO	124.1 EPDO/ 100M VMT	1815.6 jobs per person	1,392.5 jobs per person	2,237.9 adjusted users	28,995 adj. sq. ft. (000's)	1,257.2 adj. daily tons (000's)	11.8 adj. buffer time index	1,826.7 adj. points	0.5 scaled points	16,004.3 access * pop/emp density	6815.1 access * pop/emp density change
Normalized Measure Value (0-100)	1.4	0.8	6.9	1.2	0.2	0.2	0.2	2.1	2.8	3.8	0.1	0.4	5.4	2.3
Measure Weight (% of Factor)	50%	50%	50%	50%	60%	20%	20%	60%	20%	20%	50%	50%	70%	30%
Factor Value	1.1		4.1		0.2			2.6			0.3		4.5	
Factor Weight (% of Project Score)	45%		5%		15%			5%			10%		20%	
Weighted Factor Value	0.50		0.20		0.03			0.13			0.03		0.89	
Project Benefit	1.78													
SMART SCALE Cost	$12,400,000													
SMART SCALE Score (Project Benefit per $10M SMART SCALE Cost)	**1.43**													

[2] This has very limited applicability and does not apply to roadway widenings

5.0 CTB Prioritization and Programming

This final section summarizes CTB prioritization and programming methods that are used in the SMART SCALE process, specifically how SMART SCALE scored projects are reviewed, and ultimately, incorporated into the Six-Year Improvement Program. The flowchart in Figure 5.1 below illustrates the basic process of the final stages of the SMART SCALE Biennial Process, in which the CTB begins with the results from the SMART SCALE evaluation and rating process, and the staff recommended funding scenario, to inform funding decisions for the draft Six-Year Improvement Program.

Figure 5.6 Prioritization and Programming Process

First, the SMART SCALE technical review team presents the screening and scoring results to both the CTB and the public. Pursuant to Section 33.2-214.2 of the Code of Virginia, project values will be made publicly available no later than 150 days prior to the CTB's vote to adopt the Six-Year Improvement Plan. Under current practices this requires that the results be released at the January CTB meeting. The CTB gives guidance on program development, and begins to narrow down their funding decisions for projects that will be funded in the draft Six-Year Improvement Program. Their decisions are represented in the draft SYIP. After the draft Six-Year Improvement Program is presented, the CTB holds a public comment period that allows eligible entities to comment on the process, on screening decisions, and on the evaluating of individual projects. The CTB takes into account public comments based on the draft Six-Year Improvement Program, ultimately approving the final Six-Year Improvement Program in June.

Funding Decisions for Draft SYIP

Pursuant to Section 33.2-214 of the Code of Virginia, each year the CTB must approve a capital improvement program that outlines planned spending for transportation projects for proposed construction development or study for the next six years. The Six-Year Improvement Program covers all surface transportation projects, including highway, transit, rail, roadway, technology operational improvements and transportation demand management strategies. Project funding is programmed in accordance with project schedules and cash flow requirements. The CTB updates the Six-Year Improvement Program each year as revenue estimates are updated, priorities are revised, project schedules and costs change, and study results are known.

Information from the fall transportation meetings and results of the evaluation process are utilized by the CTB to direct the development of a draft SYIP. The draft SYIP is presented to the CTB each spring. At that time the draft SYIP is made available for public comment. A final SYIP is presented to the CTB in June each year for approval. To meet its statutory obligation, the CTB will adopt a Six-Year Improvement Program in June of each year effective July 1st, though SMART SCALE will only happen every other year (see Section 1.4, Biennial SMART SCALE Cycle).

Once the scoring is complete, the Office of Intermodal Planning and Investment develops a staff-recommended funding scenario based on guidance from the CTB.

The CTB may modify the staff-recommended funding scenario. Additional considerations that may be used by the CTB include:

- Public feedback from Fall Transportation Meetings and Spring public meetings;
- SMART SCALE scores;
- Project segmentation – starting the next phase of a multi-segment roadway improvement, e.g., to complete a major multi-segment project; and

- Other information on project status.

The prioritization process does not require that the CTB fund projects in order of their scores. Further, the CTB is not required to select the highest scoring project. The process is a means to assist the CTB in evaluating and comparing proposed improvements. The CTB continues to retain final decision-making authority on improvements to be included in the SYIP.

5.1 PUBLIC COMMENT PERIOD

The CTB provides numerous opportunities for the public to provide input on transportation projects and priorities as part of the continuing transportation planning process. The CTB holds annual Fall Transportation Meetings in the construction districts, providing public and elected officials with an opportunity to identify transportation priorities and to review and comment on the current SYIP. VDOT and DRPT also hold an annual planning and programming meeting inviting representatives from all MPOs and PDCs to attend and provide their transportation priorities prior to the annual development of the Six-Year Improvement Program. Each spring, the draft Six-Year Improvement Program is made available for public comment and CTB hosts a public hearing in each construction district. Attendance at the Fall Transportation Meetings and spring public meetings generally includes elected state officials, city and town officials, members of County Boards of Supervisors, representatives of advocacy groups, representatives from MPOs and PDCs, and the general public. Comments are accepted both verbally and in writing at the meeting or via regular mail or email after the meeting.

5.2 PROCESS ISSUES

The CTB adopted an updated Six-Year Improvement Program policy on December 7, 2016 with changes to the programming process intended to: i) improve transparency in the programming process, (ii) increase certainty for local project sponsors, citizens and businesses, and (iii) accelerate delivery of selected projects. This policy document outlines key provisions in the following areas:

- Frequency of updates to the SYIP and to HPPP and DGP;
- Changes relating to modification of the amounts of funds previously committed and programmed to projects under certain programs;
- All SMART SCALE projects selected for funding under the HPPP and the DGP must be fully funded and demonstrate the Board's commitment to advance the project through construction;
- The Board will select a preferred prioritization scenario to guide allocation of funds and consider modifications to the preferred prioritization scenario;

Some of the specific process issues pertaining to SMART SCALE are outlined below.

Changes in Project Scope/Schedule/Cost

In general, once a project has been screened, evaluated, and selected for funding by the (CTB), it will remain in the SYIP as a funding priority. Certain circumstances may warrant a reevaluation of the SMART SCALE score and funding decision. Examples of this type of circumstance are outlined below:

Important Considerations:

- It is important to ensure the integrity of the SMART SCALE scoring process, the original intent/benefits of evaluated projects, and the CTB's allocation decisions. Changes to these basic elements (scope or cost) could result in funding projects that are not as cost effective when decisions to fund those projects are made by the CTB.
- If there are increases in project scope and budget, the change in project scope must be assessed to determine the impact on the benefits. If the scope is increased, the applicant is responsible for the additional cost.
- There is flexibility to allow for modifications within the established thresholds ensures that minor changes to a project scope and/or estimate can be addressed through business rules without requiring CTB action, and avoiding potential project delays.

A project that has been selected for funding must be re-scored and the funding decision re-visited if there are significant changes to either the scope or cost of the project, such that the anticipated benefits relative to funding requested would have substantially changed in any of the following situations:

1. If an estimate increases prior to project advertisement or contract award that exceeds the following thresholds, and the applicant is not covering the increased cost with other funds, CTB action is required to approve the budget increase:
    - Total Cost Estimate <$5 million: 20% increase in funding requested
    - Total Cost Estimate $5 million to $10 million: $1 million or greater increase in funding requested
    - Total Cost Estimate > $10 million: 10% increase in funding requested; $5 million maximum increase in funding requested
2. If the project scope changes and is significant enough to impact the project benefits an initial qualitative assessment will be conducted to determine if the changes will impact the SMART SCALE benefits. If there is no impact, no further action is needed. If the SMART SCALE benefits may be impacted, then a quantitative assessment will be conducted to determine the level of impact. If warranted the project will be reevaluated utilizing the same methodology and maximum measure values for the round of SMART SCALE in which the

project was selected for funding. In this case, if the revised score is less than the lowest ranked funded project in the district for that round of SMART SCALE, CTB action is required to approve the change in scope. In the event the CTB does not approve such changes, they may choose to cancel the project. In such cases, the remaining SMART SCALE funds will be reserved to address budget adjustments on existing SMART SCALE projects or reserved for allocation in the next solicitation cycle for SMART SCALE. The CTB may also choose to advance the original scope of the project. If the scope change is also associated with a budget increase, the applicant is responsible for funding the increase. Results of reevaluation will be made publicly available.

3. If there is a significant reduction in the locally/regionally leveraged funds available for the project, in cases where a project has been selected for funding which identified other sources of funding, the qualifying entity is committed to pay the difference if other sources of funding are not provided.

Funding Sources

Other sources of funding may include previous applications for VDOT or DRPT funding programs (State of Good Repair, Revenue Sharing, Transportation Alternatives (TA) Set-Aside funds, FTA Programs), regional funding (CMAQ/RSTP), or local funds requested from the BOS or City/Town Council. An explanation of the source of the requested funding must be provided. The applicant must provide documentation of other requested funds; such as resolutions of support, letter, applications, etc. In the cases where a project has been selected for funding which identified other sources of funding, the applicant is committed to pay the difference if other sources of funding are not provided.

A project that has been selected for funding must be initiated and at least a portion of the programmed funds expended within one year of the budgeted year of allocation or funding may be subject to reprogramming to other projects selected through the prioritization process. In the event the Project is not advanced to the next phase of construction when requested by the Commonwealth Transportation Board, the locality or metropolitan planning organization may be required, pursuant to § 33.2-214 of the Code of Virginia, to reimburse the Department for all state and federal funds expended on the project.

Fully Funded Project Applications

SMART SCALE funding is not intended to replace other committed funding sources such as local/regional funding, proffers, and/or other committed state or federal funding sources.

1. The CTB may waive this requirement for projects that:
   a. have an anticipated total cost in excess of $1 billion; and
   b. were not eligible for submission in the the previous round of SMART SCALE due to readiness considerations, but initiated procurement prior to award of the current round of SMART SCALE.

2. If a fully funded project is submitted with additional features that are not yet funded, the benefits associated with the fully funded or committed project element(s) will be excluded from consideration in evaluating and rating the project benefits for SMART SCALE.
3. Other committed funds must have at least been applied for at the time of the SMART SCALE application submission.
    a. Future applications for State of Good Repair, Transportation Alternatives, Safety, Revenue Sharing, CMAQ, RSTP, NVTC, HRTAC, FTA New Starts, etc. cannot be considered other committed funds.

Re-Submittal of Projects

If a submitted project is not selected for funding during a cycle, the CTB will allow eligible entities to re-submit the project the next cycle.

Other considerations regarding resubmittal of projects include the following:

- A project that has been selected for funding cannot be resubmitted to address cost increases or loss of other sources of funding.
- Once a project is selected for funding, an entity must wait for two rounds of SMART SCALE following the end date of construction before submitting a new project application for the same location that meets the same need as the project that was selected for funding.
- Once a project is selected for funding, an entity may not resubmit the project with a revised scope in a subsequent round unless the previously selected project has been cancelled.

Program Funding Changes

In order to cover estimate increases, funds will be reprogrammed from projects with surplus allocations due to estimate decreases, contract award savings, schedule changes, etc. or from future SMART SCALE funds from the District's District Grant Program funds. Regular reviews will be conducted to ensure that the scope and benefit of selected projects has not changed significantly. Project estimates will also be monitored to determine if the thresholds need to be adjusted.

The Board may adjust the timing of funds programmed to projects selected in previous SMART SCALE cycles to meet the cash flow needs of the individual projects, but will not (1) reduce the total amount of state and federal funding committed to an individual project unless it is no longer needed for the delivery of the project or the project sponsor is unable to secure permits and environmental clearances for the project or (2) increase the total amount of state and federal funding committed to an individual project beyond the thresholds requiring CTB action identified in the SMART SCALE policy.

- Surplus DGP funds no longer needed for delivery of a project will remain with the district and may not be used in other districts.

- Surplus HPPP funds will be transferred to a statewide balance entry account and may be used on a statewide basis on other High Priority projects.
- Such funds will be reserved to address budget adjustments on existing SMART SCALE projects or reserved for allocation in the next solicitation cycle for SMART SCALE.

In the event that revenue reductions decrease the amount of actual funding available for a particular SMART SCALE cohort, two approaches are envisioned:

- Delaying timing of projects to out years where future funding may be available; or
    - Utilizing SMART SCALE funds from future years to fund the project.

5.3 IMPROVEMENTS TO PROCESS AND MEASURES

SMART SCALE is a new step forward for the Commonwealth of Virginia, and the CTB is breaking new ground in moving towards a prioritized transportation funding structure. As the process moves into future cycles, SMART SCALE will continue to evolve and improve. Advances in technology, data collection, and reporting tools will upgrade and modernize SMART SCALE for a growing Virginia, and the CTB looks forward to using these tools to provide a more balanced and equitable distribution of the Commonwealth's transportation funds.

6.0 Appendix A: Safety Measures

Table 6.1 Safety Factor – Measures Summary

ID	Measure Name	Weight	Measure Description	Measure Objective
S.1	EPDO of Fatal and Injury crashes	50%[a]	Equivalent property damage only (EPDO) of fatal and injury crashes expected to be avoided due to project implementation	Estimate number of fatalities and injury crashes (weighted by "equivalent property damage only" crash value scale (ratio) reported by FHWA) at the project location and the expected effectiveness of project specific counter-measures in reducing crash occurrence
S.2	EPDO Rate of Fatal and Injury crashes	50%	Equivalent property damage only (EPDO) of fatal and injury crashes per 100 million vehicle miles traveled (VMT) expected to be avoided due to project implementation	Similar to S.1, but by focusing on the change in fatality and injury crashes (weighted by "equivalent property damage only" crash value scale (ratio) reported by FHWA) per 100 million vehicle miles traveled (VMT, the measure considers projects that address areas with a high rate of crashes that may be outside of high-volume roadways

[a] 100% for Transit Projects

Measures Approach

S.1 Equivalent property damage only (EPDO) of Fatal and Injury crashes

Definition: EPDO-weighted fatal and injury crashes expected to be reduced due to project implementation.

Data Source(s)

- Most recent five years of crashes from VDOT Roadway Network System (RNS) geospatial (GIS) data prepared by Traffic Engineering Division.
- FHWA report on crash cost estimates by severity of the injuries sustained adjusted to the mid-year of the analysis period as modified by VDOT[3].

[3] Council, F., Zaloshnja, E., Miller, T., and Persaud, B., Crash Cost Estimates by Maximum Police-Reported Injury within Selected Crash Geometries, U.S. Department of Transportation, Federal Highway Administration (FHWA), October 2005, Washington, DC.

- Six-year Improvement Program to determine if and when improvements have been implemented in proximity to the project in the last five years.
- SMART SCALE project expected crash reduction percentage developed using FHWA's Crash Modification Factors (CMF) Clearinghouse website and Virginia crash summaries and models published in the Resource page.[4]
- For park and ride projects, identify the location of the project using information from Census data to determine the average commuting distance.[5]

Methodology

The methodology varies by project type, as described below.

Roadway

Step 1: VDOT will compile the latest 5 years of fatal (F) and injury (I by severity) crashes for the roadway segments within the project limits. The project limits are defined by the begin and end milepost for roadway, pedestrian, bicycle, in-roadway transit service (e.g., bus rapid transit), in-roadway freight service corridor improvements; the ends of the turn bays on all approaches for intersection improvements; the nearest intersection(s) on the cross street for a new interchange as well as adjacent ramps on the freeway within 1,600 feet of any proposed interchange ramp; and the begin and end milepost on key parallel roadway(s) (facilities where vehicles may shift from) for transit and freight improvement projects. The Six-Year Improvement Program will be reviewed and local VDOT staff will be queried to determine if and when improvements have been implemented within the project limits during the 5 year analysis period. The analysis period will be shortened to the post improvement years as necessary.

Step 2: Weight the number of crashes by severity using the "equivalent property damage only" (EPDO) crash value scale reported by FHWA and adjusted to the mid-year of the analysis period. Research has shown that many factors unrelated to the design or condition of a roadway play a role in whether a crash results in fatality or severe injury, such as age of the individual and age of the vehicle, VDOT has developed an average weighted EPDO value for crashes that involve either a fatality or a severe injury. The EPDO values used in the SMART SCALE process are shown in Table 6.2 below.

[4] *http://www.cmfclearinghouse.org/ and http://vasmartscale.org/resources/default.asp.*

[5] *http:onthemap.ces.census.gov/.*

Table 6.2 EPDO Crash Value Conversion Table

Accident Type	Rounded Value	Weight
Fatal + Injury	$850,000	85
Moderate Injury	$100,000	10
Minor Injury	$50,000	5

Step 3: Select the most appropriate expected crash reduction (PECR) percentage (PECR=1-CMF) for each of the project segments based CMFs applicable to SMART SCALE project types.

Step 4: Multiply the average annual EPDO weighted fatal and injury crash frequency by the PECR to estimate the number of EPDO crashes expected to be reduced.

- For roadway widening (capacity) projects, the previously described steps are applied using crashes on the highway segment from the beginning and end mile points of the project plus influence areas of intersections at the terminals.
- For intersection related improvement projects, crashes in the influence area of the minor roadway approaches to the major roadway, which is defined as the highest volume facility, will be included for those minor roadways recorded in VDOT's RNS roadway inventory. The minor roadway approach improvement influence area is considered to be 250 feet or the length of existing turn lanes, whichever is greater.
- For projects on roadways on new location, crashes on the most reasonable alternative route(s) would be compiled. The statewide 5-year average fatal and injury crash rate for the new roadway, using the facility type and number of lanes of the new roadway, would represent the build condition. Based on travel demand model estimates of VMT for the build versus no-build scenarios, percent changes in VMT on each alternate route segment equates to the CMF applied. The net total of the expected EPDO crashes on the alternative route(s) and the expected EPDO crashes on the build corridor equals the overall project crash reduction. The alternate routes with expected changes in traffic volumes may be identified by the applicant.
- New interchanges and interchange ramp modifications on the freeway will consider freeway and crossing route crashes depending on the specific ramp improvements in proposed projects.

Transit/Freight Rail/TDM

The methodology described for roadway projects is not used for transit infrastructure projects. Rather the safety benefits for transit projects will be estimated based on reduced vehicle miles traveled from expected shift from auto to transit with the assumption that dedicated transit vehicles have minimal crash frequencies. The same approach as described for transit projects would be applied

to freight rail projects, except the focus will be on the 5-year average of truck-related fatal and injury crashes in the parallel corridor. For TDM projects like park and ride lots, the same approach as described for transit projects would be applied taking into account the traffic reductions on adjacent highways.

Transit/Freight Rail/TDM service safety analysis includes the following steps:

Step 1: Project sponsor identifies segments of highway with new on-road transit service and key parallel roadway(s) to new on-road and fixed guideway transit projects that will experience the primary travel shifts. For Park and Ride lot ride-sharing TDM projects, the applicant shall provide the increase in parking spaces. For each highway and fixed guideway transit segment with new service, the applicant sponsor shall provide the daily and hourly ridership. Ride-sharing increase estimate impacts on daily traffic volumes (thus VMT) are provided by the Congestion Measure analysis outputs. The highway segments impacted by a mode shift will be assessed to determine the percent VMT change on the network; that is, the expected percent modal shift from highway (VMT) to transit/ride-sharing due to the project. The after project VMT will be one minus the percent model shift (VMT After = 1 – %VMT Reduced).

Step 2: For corridor transit service projects or freight rail projects, compile all fatal and injury crashes by severity from roadway segments within the project limits (in the case of an on-street bus or rail transit project) and/or on key impacted parallel roadways from where the vehicle traffic may be reduced (in the case of a facility that is separated from the roadway or the travel lanes). For Park and Ride improvements, crash frequencies are retrieved for the selected roadway segments provided by the Congestion assessment.

Step 3: Weight the number of crashes by severity using the "equivalent property damage only" (EPDO) crash value scale reported by FHWA and adjusted to the mid-year of the analysis period.

Step 4: Compute the 5-year annual average F+Injury EPDO crash frequencies for the on-road segments and impacted parallel roadways.

Step 5: Calculate the expected reduction of annual F+Injury EPDO crash frequencies for on-road and parallel roadway segments by multiplying the existing crash frequency by the after-project percent VMT reduction.

Bicycle/Pedestrian

The methodology described for roadway projects will be used for bicycle and/or pedestrian projects based on the proposed segment and/or intersection improvement CMFs. CMFs from FHWA and other sources were developed based on the associated roadway element improvement CMF for all motor vehicle crashes (not just those involving the non-motorized users). Other alternative sources of information may be developed to assess the safety benefit of these project types based on bicycle facility classification or facility separation from travel lanes.

Scoring Value

Total change in EPDO of fatal and injury (F+I) crash frequency.

S.2 Equivalent property damage only (EPDO) Rate of Fatal and Injury crashes reduced

Definition: Number of Equivalent Property Damage Only (EPDO) weighted fatal and injury crashes per 100 million vehicle miles traveled (VMT) expected to be reduced due to project.

Data Source(s)

- Five years of crashes (anticipated 2010–2014) from VDOT RNS geospatial GIS data prepared by Traffic Engineering Division.
- FHWA report on crash cost estimates by severity of the injuries sustained adjusted to the mid-year of the analysis period[6].
- Six-year Improvement Program to determine if and when improvements have been implemented in the last five years.
- Existing AADT by roadway segment from VDOT RNS, available studies, Congestion Measure analysis or the applicant/jurisdiction, and segment(s) length to calculate annual VMT.
- SMARTSCALE project expected crash reduction percentage developed using FHWA's CMF Clearinghouse website and Virginia crash summaries and models published in the Resource page.[7]

Methodology

The methodology varies by project type, as described below.

Roadway and Bicycle/Pedestrian

Step 1: Collect and use the most recent years AADT to calculate the annual VMT for the same segment(s) used for the S.1 measure crash data collection.

Step 2: Match the project location segment VMT with the expected F+I EPDO crashes reduced by the project from the S.1 measure.

Step 3: Compute the existing F+I EPCO crash rate based on EPDO per 100 million VMT.

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[6] Council, F., Zaloshnja, E., Miller, T., and Persaud, B., Crash Cost Estimates by Maximum Police-Reported Injury within Selected Crash Geometries, U.S. Department of Transportation, Federal Highway Administration (FHWA), October 2005, Washington, DC.

[7] http://www.cmfclearinghouse.org/ and http://vasmartscale.org/resources/default.asp

Step 4: Compute the expected F+I EPDO crash rate reduction as a result of the project improvements - the S.1 reduced annual average F+I EPDO crashes divided by the segment 100 million VMT. For longer projects covering several segments with different AADT values, the average annual crash rate reduction is the sum of the segment reduced crashes over the sum of the segment VMTs.

The methodology varies by project type, as described above for S.1 crash frequency reduction assessments.

Transit/Freight Rail/TDM

The methodology described for roadway projects cannot be used for transit projects. For on-road and off-road (dedicated guideway) transit projects, only the S.1 measure of the total F+I EPDO crash frequency reduction will be used so the transit safety score will be based on the S.1 result. The same approach as described for transit would be applied for Freight Rail types of project except the focus will be on the 5-year average of truck-related fatal and injury crashes in the parallel corridor.

Scoring Value

Expected reduction in fatal and injury (F+I) EPDO crash rate.

7.0 Appendix B: Congestion Mitigation Measures

Table 7.1 Congestion Mitigation Factor – Measures Summary

ID	Measure Name	Weight	Measure Description	Measure Objective
C.1	Person Throughput	50%	Increase in corridor total (multimodal) person throughput attributed to the project	Assess the potential benefit of the project in increasing the number of users served within the peak period.
C.2	Person Hours of Delay	50%	Decrease in the number of person hours of delay in the corridor	Assess the potential benefit of the project in reducing peak period person hours of delay.

NOTE: The SMART SCALE team is currently evaluating options to revise the congestion mitigation scoring measure C.1 - Person Throughput to better reflect the size of project improvements. Proposed changes to the analysis methodology will be published at the conclusion of the evaluation.

Measures Approach

C.1 Person Throughput

Definition: Change in corridor total (multimodal) person throughput attributed to the project.

Data Source(s)/Analytical Tools

- Latest available 24-hour traffic count data summarized by hour, direction, and roadway segment, including vehicle classification, where applicable, from VDOT TMS, or jurisdiction.
- Latest available regional travel demand model encompassing the influence area only for projects consisting of new transportation facilities.
- Existing AADT by roadway segment from VDOT TMS or jurisdiction.
- Lane capacity is set by the current functional classification of the roadway. In the case of a new location roadway, the planned functional classification is used. Lane capacities were established based on an average of the capacities outlined in the *ENTRADA User's Guide*, February 2014 and the *Virginia Travel Demand Modeling Policies and Procedures Manual Version 2.0.*
- Obtain lane capacities for different facility types (i.e., freeway, collector, etc.) and area types from the *ENTRADA User's Guide*, February 2014. The urban threshold for capacity will be used statewide and is generally based on LOS D/E.
- For park and ride projects, identify the location of the project using data from

the U.S. Census Bureau's OnTheMap tool to query the population within 3 miles of the proposed park and ride improvement. The OnTheMap tool provides data that can be used to determine the average commuting distance and direction for this population.

- For transit projects, Department of Rail and Public Transportation (DRPT) will provide estimated daily ridership and hourly ridership for the proposed service.
- For new managed lane projects, assumed occupancy rates will be provided by VDOT.
- For roadway projects, SPS will be used to determine number of lanes, lane widths, speed limit, terrain (e.g., level, rolling, mountainous), lateral clearance, number of driveways on arterials, interchange density on freeways, and median type on arterials.
- Latest available aerial imagery used to determine merge, diverge, and weaving lengths on freeways and verify other data from SPS.
- FHWA Cap-X: evaluation tool that uses critical lane volumes (CLV) to evaluate the efficiency of intersections and interchanges.
- Potential traffic growth rate sources include VTrans2040, SPS, and travel demand model.
- Highway Capacity Software (HCS) 2010 – Freeway Facilities Module.
- Modified Bureau of Public Roads (BPR) spreadsheet.

Methodology

The methodology is a quantitative, corridor-based analysis that requires an estimate of future no-build (without the project) and build (with the project) person throughput. It is anticipated that project corridor will consist of an intersection or segment within the corridor depending on the project type. The segment within the corridor with calculated person throughput increase above zero is used for analysis purposes.

The methodologies to determine person throughput for roadway, bicycle/pedestrian, transit, TDM (including park and ride lots), and freight projects are described below, starting with roadway projects.

For all project types described in this section, person throughput is only credited/ scored if the facility is over capacity in the no-build project condition (has a volume to capacity ratio greater than 1.0)

Roadway: There are four types of analyses used to quantify the change in person throughput as a result of a proposed roadway project:

- Basic roadway segment (freeway, rural multilane, rural two-lane), urban arterial (segments between signals are combined with delay calculations from Cap-X to establish no-build versus build average travel speeds)

- Freeway facility (diverge, merge, weave)
- Intersection or interchange, and
- New/Complex facilities - Interstate capacity expansion projects greater than 2 miles in length are defined as complex.

The methodology to compute the change in person throughput will be described for each of the four facility types listed above. The methodology for the analysis of first two facility types is the same.

Basic Roadway Segment / Freeway Facility

Basic segments represent uninterrupted-flow conditions and have no fixed causes of delay or interruption external to the traffic stream. This category includes two-lane highways, multilane highways, and basic freeway segments as defined in the *2010 Highway Capacity Manual*. Freeway facilities also represent uninterrupted-flow facilities consisting of continuously connected segments that include: basic freeway, weaving, merge, and diverge segments. In order to calculate average travel speeds along signalized arterial routes, basic roadway segment sheets are coded along the project length and are combined with the Cap-X analysis to compute the no-build and build average travel speeds.

A modified Bureau of Public Roads (BPR) equation is used for the analysis of these types of facilities. Nationally, the BPR equation is the mostly widely used volume-delay function for road segments. The equation addresses the relationship between volume and capacity on the segment, with the result being the delay associated with traffic volumes. Capacity in the BPR equation is based on the area type and facility type.

Step 1: Compute future 2025 peak period traffic volumes within the project corridor using some of the aforementioned data sources, including traffic growth rates and the existing peak period traffic count data from VDOT TMS.

Step 2: Determine the peak period flow rate on the roadway segment without the project and with the project. Using the capacity values by functional classification, compute the vehicle throughput without the project and with the project.

Step 3: Compute the change in peak period vehicle throughput by subtracting the no-build vehicle throughput from the build vehicle throughput.

Step 4: Compute the peak period person throughput for no-build and build conditions by multiplying an average vehicle occupancy rate by the vehicle throughput.

Intersection / Interchange

Intersections and interchanges represent interrupted flow conditions with features that create delay such as traffic signals.

Step 1: Compute future 2025 peak period traffic volumes within the project corridor using the aforementioned data sources, including traffic growth rates and the existing peak period traffic count data from VDOT TMS.

Step 2: Use FHWA CAP-X analysis tool to determine the intersection / interchange critical lane volumes and to estimate the vehicle throughput for the no-build and build conditions.

Step 3: Compute the change in peak period vehicle throughput by subtracting the no-build vehicle throughput from the build project vehicle throughput.

Step 4: Compute the peak period person throughput for without and with conditions by multiplying an average vehicle occupancy rate by the vehicle throughput.

New Roadway Facilities

Estimating vehicle throughput for new roadway facilities requires the use of a regional travel demand model. The project is added to the regional travel demand model and model outputs are then used to summarize with project vehicle throughput.

Step 1: Code the new facility into the regional travel demand model with assumed posted speed limit, facility type, and number of lanes.

Step 2: Identify links in the regional network operating below the speed limit in future no-build scenario with greater than 10% reduction of traffic for the different alternative improvements compared to the no build scenario. Calculate total difference in VHT for these links between the no-build model and the build model.

Step 3: 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).

Step 4: Compute the average system project 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).

Transit / Bicycle/Pedestrian / Freight Rail / TDM

New service for alternative modes supports change in throughput both on the other mode and on highway network. For trips on other modes, estimate total person throughput for existing and new users in the peak period. The person throughput reduction for new users is associated with any throughput savings associated with a shift from auto to the other mode. For the highway network, total demand is reduced, which may lead to a reduction in vehicle demand on parallel facilities. For transit projects, compute the number of equivalent vehicles on roadway(s) within the impacted area using a forecasted 2025 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.

Scoring Value

Total change in person throughput due to the project.

C.2 Person Hours of Delay

Definition: Decrease in the number of peak period person hours of delay in the project corridor.

Data Sources/Analytical Tools

- Latest available 24-hour traffic count data summarized by hour, direction, and roadway segment, including vehicle classification, where applicable, from VDOT TMS, or jurisdiction.
- Latest available regional travel demand model encompassing the influence area only for projects consisting of new location transportation facilities.
- Existing AADT by roadway segment from VDOT TMS or jurisdiction.
- Lane capacity is set by the current functional classification of the roadway. In the case of a new location roadway, the planned functional classification is used. Lane capacities were established based on an average of the capacities outlined in the *ENTRADA User's Guide*, February 2014 and the Virginia Travel Demand Modeling Policies and Procedures Manual Version 2.0.
- For park and ride projects, identify the location of the project using data from the U.S. Census Bureau's OnTheMap tool to query the population within 3 miles of the proposed park and ride improvement. The OnTheMap tool provide data that can be used to determine the average commuting distance and direction for this population.
- For transit projects, Department of Rail and Public Transportation (DRPT) will provide estimated daily ridership and hourly ridership for the proposed service.
- For new managed lane projects, assumed occupancy rates will be provided by VDOT.
- For roadway projects, SPS will be used to determine number of lanes, lane widths, speed limit, terrain (e.g., level, rolling, mountainous), lateral clearance, number of driveways on arterials, interchange density on freeways, and median type on arterials.
- Latest available aerial imagery used to determine merge, diverge, and weaving lengths on freeways and verify other data from SPS.
- FHWA Cap-X: evaluation tool that uses critical lane volumes (CLV) to evaluate the efficiency of intersections and interchanges.
- Potential traffic growth rate sources include VTrans2040, SPS, and travel demand model.
- Highway Capacity Software (HCS) 2010 – Freeway Facilities Module.
- Modified Bureau of Public Roads (BPR) spreadsheet.

Methodology

The methodology is a quantitative, corridor-based analysis that requires an estimate of future no-build (without project) and build (with project) person throughput and congested travel speeds.

The methodologies to determine person hours of delay for roadway, bicycle/pedestrian, transit, and freight projects are described below, starting with roadway projects. It is anticipated that project corridor length definition will vary by mode and project type. For example, the project length for a park and ride lot project is equal to the average commuting distance determined from the census data website identified in the data sources. On the other hand, the project length for a roadway corridor improvement project is established by extending the corridor to the next adjacent signalized intersection or interchange on both ends of the corridor. If there are no adjacent signalized intersections or interchanges within one mile of the either end of the corridor, then one mile is added to both ends of the corridor.

Roadway: There are four types of analyses used to quantify the change in person hours of delay as a result of a proposed roadway project:

- Basic roadway segment (freeway, rural multilane, rural two-lane, urban arterial)
- Freeway facility (diverge, merge, weave),
- Intersection or interchange, and
- New facility.

Basic Roadway Segment

Basic segments represent uninterrupted-flow conditions and have no fixed causes of delay or interruption external to the traffic stream. This category includes two-lane highways, multilane highways, and basic freeway segments as defined in the *2010 Highway Capacity Manual*. In order to calculate average travel speeds along signalized arterial routes, basic roadway segment sheets are coded along the project length and are combined with the Cap-X analysis to compute the no-build and build average travel speeds.

A modified Bureau of Public Roads (BPR) equation is used for the analysis of these types of facilities. Nationally, the BPR equation is the mostly widely used volume-delay function for road segments. The equation addresses the relationship between volume and capacity on the segment, with the result being the delay associated with traffic volumes. Capacity in the BPR equation is based on functional classification.

Step 1: Compute future 2025 peak period traffic volumes within the project corridor using some of the aforementioned data sources, including traffic growth rates and the existing peak period traffic count data from VDOT TMS.

Step 2: Collect and document all roadway geometric features using data from SPS and supplemented by field visits and/or aerial imagery.

Step 3: Convert the peak period traffic volumes to flow rates using methods from the *2010 Highway Capacity Manual*.

Step 4: Compute no-build and build travel speeds and delays using a modified BPR equation. Delay is calculated by calculating the difference between the predicted travel speed and the posted speed limit.

Step 5: Compute the change in vehicle hours of delay by subtracting the build (with project) delay from the non-build (without project) delay.

Step 6: Compute the peak period person hours of delay for no-build and build conditions by multiplying an average vehicle occupancy rate by the vehicle delay.

Step 7: Compute the change in person hours of delay by subtracting the build (with project) delay from the non-build (without project) delay.

Freeway Facility

Freeway facilities also represent uninterrupted-flow facilities consisting of continuously connected segments that include: basic freeway, weaving, merge, and diverge segments. The HCS Freeway Facility module is based on *2010 Highway Capacity Manual* procedures.

Step 1: Compute future 2025 peak period no-build and build traffic volumes within the project corridor using the aforementioned data sources, including traffic growth rates and the existing peak period traffic count data from VDOT TMS.

Step 2: Compute volume-to-capacity ratio and travel speed using HCS methodologies for no-build and build conditions.

Step 3: Compute no-build and build delay using the travel speed and segment length.

Step 4: Compute the peak period person delay for no-build and build conditions by multiplying the average vehicle delay by an average vehicle occupancy rate by the vehicle delay.

Step 5: Compute the change in person hours of delay by subtracting the build (with project) delay from the non-build (without project) delay.

Intersection / Interchange

Intersections and interchanges represent interrupted flow conditions with features that create delay such as traffic signals. Corridor travel speed and delay will be calculated based on intersection/interchange delay and segment speed and delay. Apply a capacity check for intersection/interchange and roadway segment. Use the least improved bottleneck to calculate throughput change between the no-build (without project) and the build (with project) conditions.

Step 1: Compute future 2025 peak period traffic volumes within the project corridor using the aforementioned data sources, including traffic growth rates and the existing peak period traffic count data from VDOT TMS.

Step 2: Determine the critical lane volume for each approach to the intersection, which is defined as the movements with the maximum traffic volume per lane.

Step 3: Use FHWA CAP-X analysis tool to estimate the vehicle delay for the no-build and build conditions.

Step 4: Compute the peak period person delay for no-build and build conditions by multiplying the average vehicle delay by an average vehicle occupancy rate by the vehicle delay.

Step 5: Compute the change in peak period delay by subtracting the build (with project) delay from the non-build (without project) delay.

New Roadway Facilities

Estimating vehicle delay for new facilities requires the use of a regional travel demand model. The project is added to the regional travel demand model and model outputs are then used to summarize project build vehicle delay. The total vehicle delay reduction is the cumulative effect at a system level (total trips).

Step 1: Code the new facility into the regional travel demand model with assumed posted speed limit, facility type, and number of lanes.

Step 2: Identify links in the regional network operating below the speed limit in future no-build scenario with greater than 10% reduction of traffic for the different alternative improvements compared to the no build scenario. Calculate total difference in VHT for these links between the no-build model and the build model.

Step 3: 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)

Step 4: Compute the person peak period delay by multiplying the average vehicle delay by an average vehicle occupancy rate.

Transit / Freight Rail / TDM

New service from alternative modes supports change in delay both on the other mode and on the highway network. 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. The person travel time savings for new users is associated with any travel time savings associated with a shift from auto to the other mode. For the highway network, total demand is reduced, which may lead to a reduction in delay on parallel facilities.

Bicycle/Pedestrian

No reduction in person hours of delay is assumed for a stand-alone bicycle and/or pedestrian project.

Scoring Value

Total peak-period person delay reduction.

8.0 Appendix C: Accessibility Measures

Table 8.1 Accessibility Factor – Measures Summary

ID	Measure Name	Weight	Measure Description	Measure Objective
A.1	Access to Jobs	60%	Change in average job accessibility per person	Measure assesses the average change in access to employment opportunities in the region as a result of project implementation based on the GIS accessibility tool.
A.2	Access to Jobs for Disadvantaged Populations	20%	Change in average jobs accessibility per person for disadvantaged populations	Measure assesses the average change in access to employment opportunities in the region as a result of project implementation based on the GIS accessibility tool.
A.3	Access to Multimodal Choices	20%	Assessment of the project support for connections between modes, and promotion of multiple transportation choices	Measure assigns more points for projects that enhance interconnections among modes, provide accessible and reliable transportation for all users, encourage travel demand management, and potential to support incident management.

Measures Approach

A.1 Access to Jobs

Definition: The GIS accessibility tool analyzes the existing average accessibility to jobs per person at the individual U.S. Census block group level statewide. The tool calculates the average accessibility to jobs by mode (auto and transit). The jobs are weighted based on a travel time decay function, where jobs within a shorter travel time are weighted more than jobs farther away. The decay function was developed based on travel survey data. The average accessibility represents the total number of jobs reachable from each block group to every other block group. In previous rounds, a limit of 45 minutes for auto trips and 60 minutes for transit trips was used and jobs beyond that limit were not considered. The methodology has been updated to consider jobs beyond these limits, though jobs will be 'discounted' based on the decay curve mentioned above.

The tool calculates the improvement in number of jobs reachable within that travel shed resulting from a proposed transportation improvement. Therefore, the average number of jobs reachable represents the total jobs accessible from each block group to every other block group, weighted by the population in each block group. The actual metric relevant for SMART SCALE prioritization purposes is the

increase in average job accessibility resulting from a proposed project. Travel times are based on congested roadway travel times, real transit operating schedules, and an assessment of pedestrian network connectivity.

As part of the estimation of change in project corridor person hours of delay (Measure C.2), an estimate of the project build congested speed is developed. The project build congested speed is entered into the underlying congested network within the accessibility tool, and the difference between the build and no build congested speeds is used to calculate the change in cumulative accessibility by block group for auto.

Data Source(s)

- Accessibility tool.
- Change in project corridor congested speed, transit operations, and pedestrian system connectivity (as it relates to last mile connections to transit service).

Methodology

The accessibility tool reports an average accessibility to jobs by mode for each Census block group (for auto, or Census block for transit) in region. The analysis of project benefits considers how an improvement in travel time expands accessibility to jobs at the block group or block level (without consideration of regional or State boundaries). By default, 2025 land use forecasts will be used. Applicants may also provide modified land use density assumptions from a locally or regionally approved market study to be used for Build versus No-Build analysis.

Step 1: Update congested roadway speeds, transit network, or pedestrian system connectivity. Based on analysis conducted in the congestion factor for measure C.2, post-project implementation congested speeds are generated and applied to the roadway network underlying the accessibility tool. For transit projects, the project corridor and basic operational information (peak period frequency and travel times) are coded into the transit network (based on General Transit Feed Specification (GTFS) data, which is a common format for public transportation schedules and associated geographic information) underlying the accessibility tool. For the non-motorized mode, the tool reflects improvements in connectivity provided by new sidewalk or path connections or meaningful pedestrian elements that substantially improve quality of service on routes providing access to transit service.

Step 2: Use the accessibility tool to calculate the current (no build) accessibility by mode for a project. The accessibility is the average access to jobs from each block group to every other block group within the project's area of influence.

Step 3: Use the accessibility tool to calculate the build accessibility (using post-project implementation congested speeds and/or changes in transit operations) by mode for a project.

Step 4: Calculate the change in accessibility scores between the build and no build conditions. For each project, an average accessibility improvement is reported (depending on mode, e.g., for roadway projects the auto mode improvement is reported, for transit projects the transit mode improvement is reported).

Scoring Value

Total change in average jobs accessibility.

A.2 Access to Jobs for Disadvantaged Populations

Definition: The accessibility tool analyzes the existing average accessibility to jobs at the individual U.S. Census block group level statewide. The tool calculates the average accessibility to jobs by mode (auto and transit). The jobs are weighted based on a travel time decay function, where jobs within a shorter travel time are weighted more than jobs farther away. The decay function was developed based on travel survey data. The average accessibility represents the total number of jobs reachable from each block group to every other block group[8]. For this measure, the change in average job accessibility is calculated and averaged based on the disadvantaged population in each Census block or block group. In previous rounds, a limit of 45 minutes for auto trips and 60 minutes for transit trips was used and jobs beyond that limit were not considered. The methodology has been updated to consider jobs beyond these limits, though jobs will be 'discounted' based on the decay curve mentioned above.

Data Source(s)

- Accessibility tool.
- 2014 U.S. Census American Community Survey 5-year estimates.

Methodology

For the purposes of this analysis, "disadvantaged population" is calculated as low-income, minority, or limited-English proficiency (LEP) population.

All Census blocks and block groups in Virginia were analyzed to determine the populations of low-income minority, or limited English speaking persons (LEP)in each.

The accessibility tool calculates job accessibility averaged by population in each Census block or block group. The calculation of accessibility for disadvantaged population was calculated in exactly the same way as described in A.1 above for

[8] The area of influence of a project is defined as a 45 mile radius circle around the project (reflecting 45 minutes of travel at 60 miles per hour). Beyond this area of influence, the tool does not calculate job accessibility as it is a distance that is not relevant to the vast majority of trips.

general accessibility, except that instead of averaging for population as a whole, the accessibility was averaged for the disadvantaged population in each Census block or block group.

Scoring Value

Total change in average jobs accessibility for disadvantaged populations.

A.3 Access to Multimodal Choices

Definition: This measure considers the degree to which the project can increase access to non-single occupant vehicle travel options. The objective is to recognize projects that enhance connections between modes or create new connections.

Data Source(s)

- GIS data of transit routes or transit service areas, all rail transit stations (from GTFS data as described for accessibility tool).
- DRPT/VDOT GIS data of park-and-ride lots.
- VDOT GIS data of on and off-road bicycle facilities (incomplete dataset at this time).
- Anticipated peak period non-SOV users of travel options with increased access or service.

Methodology

Step 1: The project sponsor provides project level detail on the extent of connections and accommodation of multiple modes as part of the project definition and self assign points in consistent with descriptions in Table 8.2.

Step 2: The project corridor is entered into a GIS database and overlaid with a layer including all multimodal transportation options. The GIS analysis is recommended to inform the validation of sponsor scoring in Table 8.2.

For roadway or multimodal projects this includes: type of bicycle facility, type of pedestrian facilities, connection to park-and-ride locations or inclusion of managed lanes, inclusion of technology supporting traveler information, or wayfinding signage to other modes, and accommodation of on-road transit vehicles.

For transit projects, depending on transit mode, this includes: associated bike and pedestrian facilities, bicycle parking, accommodation of bike on transit vehicles, park-and-ride facilities, traveler information, affiliation or presence of local TDM programs, and transfers with other transit modes.

For bike and pedestrian projects, this includes: class of bicycle facility, type of pedestrian improvements, connections to other on- or off-road bicycle facilities, connections to transit facilities, and affiliation or presence of local TDM programs. A bicycle facility project can include elements in one or more of the following categories:

- On-Street Facilities: Shared use paths, separated bicycle lanes (cycle tracks), buffered bicycle lanes, conventional bicycle lanes, bicycle boulevards (signed routes) and shared roadways.
- Off-Street Facilities: Off-street bicycle facilities are separate from motor-vehicle roadways and include shared use paths or trails. Trails may be adjacent to the roadway or located on an abandoned railroad right of way (ROW).
- Equipment: Bicycle facility equipment includes signs, traffic signals, barriers, and bicycle parking.

Freight related accessibility is considered in the economic development factor.

Step 3: SMART SCALE review staff evaluate project scoring and work with project sponsor to adjust scoring as necessary.

Step 4: Total project points are then multiplied (scaled) by the number of peak period non-SOV users.

Scoring Value

Total points reflecting multimodal choicesscaled by the number of peak period non-SOV users of the project.

Table 8.2 Access to Multimodal Choices – Scoring Approach

Project Type (Mode) and Characteristics	Points (If Yes)
Project includes transit system improvements or reduces delay on a roadway with scheduled peak service of 1 transit vehicle per hour.	5
Project includes improvements to an existing or proposed park-and-ride lot. Ex. New lot, more spaces, entrance/exit, technology (payment, traveler information).	4
Project includes improvements to existing or new HOV/HOT lanes or ramps to HOV/HOT	2
Project includes construction or replacement of bike facilities. For bicycle projects, off-road or on-road buffered or clearly delineated facilities are required.	1.5
Project includes construction or replacement of pedestrian facilities. For pedestrian projects, sidewalks, pedestrian signals, marked crosswalks, refuge islands, and other treatments are required (as appropriate).	1.5
Project provides real-time traveler information or wayfinding specifically for intermodal connections (access to transit station or park&ride lot).	1
Provides traveler information or is directly linked to an existing TMC network/ITS architecture.	1
Total Points Possible	5 points maximum
Measure Scaling: Points are multiplied by the number of new peak period non-SOV users	

9.0 Appendix D: Environmental Quality Measures

Table 9.1 Environmental Quality Factor – Measures Summary

ID	Measure Name	Weight	Measure Description	Measure Objective
E.1	Air Quality and Energy Environmental Effect	50%	Potential of project to improve air quality and reduce greenhouse gas emissions	Measure rates a project's potential benefit to air quality and ability to increase energy efficiency or alternative energy use weighted by the total number of users served.
E.2	Impact to Natural and Cultural Resources	50%	Potential of project to minimize impact on natural and cultural resources located within project buffer	Measure evaluates how much sensitive land would be affected within project buffer around the project, and rates projects highest that have minimal or no impacts and are providing benefits in other factor areas.

Measures Approach

E.1 Air Quality and Energy Environmental Effect

Definition

The Air Quality and Energy Environmental Effect measure describes the level of benefit that a project is projected to have on air quality and greenhouse gas emissions (or alternative energy use). The objective of this measure is to recognize projects that are expected to contribute to improvements in air quality and reductions in greenhouse gas emissions.

Data Source(s)

- Project sponsor answers defined qualifiers as described below based on project definition.
- Total project corridor passenger throughput (as determined in the congestion factor).

Methodology

Air quality and energy effect is determined by reviewing a project sponsor responses (collected through the project nomination) to the qualifications identified in Table 9.2. The methodology applies to all project types.

Step 1: The project sponsor self assesses the project based on Table 9.2 (10 point potential maximum). The nomination form includes space for the sponsor to provide clarifications/justifications for the points awarded.

Step 2: SMART SCALE review staff receive each project nomination and reviews the information provided. As appropriate, staff contact project sponsors to address any questions or unexplained scoring.

Table 9.2 E.1 Air Quality and Energy Environmental Effect – Scoring Approach

Project Type (Mode) and Characteristics	Points (If Yes)
Non-SOV Project Characteristics	
Project includes improvements to rail transit or passenger rail facilities.*	3
Project includes construction or replacement of bike facilities. For bicycle projects, off-road or on-road buffered or clearly delineated facilities are required.*	2
Project includes construction or replacement of pedestrian facilities. For pedestrian projects, sidewalks, pedestrian signals, marked crosswalks, refuge islands, and other treatments are required (as appropriate).*	2
Project includes improvements to an existing or proposed park-and-ride lot. Ex. New lot, more spaces, entrance/exit, technology (payment, traveler information).*	2
Project includes bus facility improvements or reduces delay on a roadway with scheduled peak service of 1 transit vehicle per hour.*	1
Project include special accommodations for hybrid or electric vehicles, or space or infrastructure for electric vehicle parking/charging).*	0.5
Project includes energy efficient infrastructure or fleets, including: hybrid or electric buses, electronic/open road tolling, alternative energy infrastructure (e.g., roadside solar panels).*	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 (If Yes)**
Project reduces traffic delay at a congested intersection, interchange, or other bottleneck with a high percentage of truck traffic (greater than 8 percent of AADT). ***	1
Project includes improvements to freight rail network or intermodal (truck to rail) facilities/ports/terminals.**	0.5
Total Points Possible	1.5 points maximum**
Measure Scaling: **Points are multiplied by daily truck volumes ** Points awarded for projects with a decrease in person hour delay greater than zero and with truck traffic greater than 8% AADT	

Scoring Value

After SMART SCALE staff review and confirm points assigned in Table 9.2. The maximum total points for each category (non-SOV and trucks) are multiplied by the respective scaling value (non-SOV users and peak period truck volume).

E.2 Impact to Natural and Cultural Resources

Definition: This measure considers the potential of a project to minimize the impact on natural and cultural resources located within the project buffer.

Data Source(s)

GIS layers for each of four categories. For cultural resources, associated non-spatial data ("Property Evaluation Status" or "Site Evaluation Status") will be used to determine eligibility for listing in the National Register of Historic Places. For threatened and endangered species, species status will be referenced to appropriately filter the spatial data and is limited to state endangered, state threatened, federal endangered, federal threatened.

Methodology

The potential of the project to minimize impact on natural and cultural resources is conducted by considering the existing acres of sensitive areas and resources located within a ¼ mile buffer around the project, as well as the type of environmental document (EIS, EA, CE) expected to be required for the project. The final E.2 (Natural and Cultural Resource Impact) score for the project will be based on the portion of acres affected relative to the total project buffer (initial score) and the weighted points derived from other factor areas. The resulting value is then renormalized to calculate the final score and weighting is applied. Measure E.2 is unique among evaluation measures because the score is adjusted, or scaled, by the benefit scores for all other measures.

Step 1: Using a ¼ mile buffer around each project, total the acreage of land in four categories – 1) Conservation Land, 2) Species/Habitat, 3) Cultural Resources, and 4) Wetlands. The specific GIS layers used in each category are as follows:

<u>Conservation Lands</u>

- Virginia Outdoor Foundation Protected Easements
- Virginia Department of Conservation and Recreation 6F properties
- Virginia Department of Conservation and Recreation Conservation Lands
- Virginia Department of Forestry Agricultural/Forest Districts
- Virginia Department of Historic Resources Protected Easements

<u>Species/Habitat</u>

- Virginia Department of Game and Inland Fisheries Threatened and Endangered Species
- Virginia Center for Conservation Biology (Eagles)

<u>Cultural Resources</u>

- National Park Service, American Battlefield Protection Program Potential National Register (POTNR) Areas
- Virginia Department of Historic Resources Architecture layer: properties listed

in, or determined eligible for listing in the National Register of Historic Places ("Evaluation Status")

- Virginia Department of Historic Resources Archeology layer: sites listed in, or determined eligible for listing in the National Register of Historic Places

Wetlands

- U.S. Fish and Wildlife Service National Wetlands Inventory

Step 2: Determine the level of environmental documentation required for the federal action. This information will be used to assess and scale the potential natural resource impacts. If not already determined by the appropriate federal agency with the action, VDOT/DRPT environmental staff will determine the anticipated level of environmental documentation required for the project using the best available information. Concurrence by the federal agency is required prior to initiation of environmental documentation. The amount of potentially impacted acreage that will be counted towards the score is different based on the type of environmental document required:

- *Environmental Impact Statement* – 50% of acreage will be used for scoring –
- *Environmental Assessment* –30% of acreage will be used for scoring
- *Categorical Exclusion* – 10% of acreage will be used for scoring

This process of scaling acres based on the type of environmental document is illustrated in Table 9.4 below.

Table 9.3 Example of Potentially Impacted Acres by Type of Environmental Document

Project	Conservation	Species/ Habitat	Cultural Resources	Wetlands	Total Acres	Environmental Document	Acres Counted	Buffer Acres	Buffer Ratio	Final Buffer Ratio
A	100	25	25	150	300	EA	100	500	0.2	0.2
B	100	25	25	150	300	EIS	150	500	0.3	0.3
C	20	0	0	5	25	CE	2.5	500	0.005	0.005
D	200	400	200	400	1200	EIS	600	500	1.2	1.0

Step 3: Divide the amount of potentially impacted acres by the total buffer area in acres. If the result is > 1.0 then set buffer ratio equal to 1.0. This is the ratio of potentially impacted area.

Step 4: The impacted areas buffer ratio is normalized on a 0 to 100 scale, with the projects having zero acreage potentially impacted receiving 100 points, the project with the lowest non-zero acreage potentially impacted receiving 95 points, and the project having the greatest impacted acres assigned 0 points. All other values are scored on a straight line between 0 and 95. The second highest score was set at 95, and not relative to 100, to reflect the greater benefit of having no impacts compared with a small amount of acres impacted. **Scoring Value**

The final score is assigned by scaling the Natural and Cultural Resource Impact (E.2) score based on benefits in other categories. The steps in this re-scaling process are the following:

1. Initial E.2 measure score is calculated from acres impacted and placed on a 0 to 100 scale as described in Step 4 above.
2. Scores are scaled by the weighted scores of all the other measures.

   $$S_{E2} = \sum S_{Weighted} * \frac{S_{E2,Initial}}{100}$$

   where

   S_{E2} Final Natural and Cultural Resource Impact score

   $\sum S_{Weighted}$ Sum of the weighted scores for all other measures

   $S_{E2,Initial}$ Initial score, Natural and Cultural Resource Impact E.2
3. Normalized Natural and Cultural Resource Impact (E.2) scores are calculated by dividing each Scaled Graduated score by the highest Scaled Graduated score.
4. Finally, each Weighted Natural and Cultural Resource Impact (E.2) Score is calculated by multiplying each Normalized Environmental Impact score by 5%. (Environmental Factor is weighted 10% statewide and Natural and Cultural Resource Impact Measure is 50% of Environmental score).

An example of how this adjustment works is shown below in the table. In the example, project A has a lower initial score (80) on E.2 than project C (90). However, project A has more benefit (higher score) in all of the other measures with 48 points, compared with project C with 32 points. When the E.2 score is adjusted and normalized to account for benefits in other factor areas, project A results in a final E.2 score with a 5, while project C has a final E.2 score of 3.75.

Table 9.4: Example of Scaling the E.2 Based on Scores in Other Factor Areas

		Factor Area Scores									
Project	Initial E.2 Score Based on Acres Impacted	Safety	Congestion	Access.	Econ. Develop.	Land Use	E.1 Score	Sum Weighted Scores (without E.2)	E.2 Scaled by Factor Area Scores	Normalized Final E.2 Score	Weighted E.2 Score
A	80	10	18	10	5	3	2	48	38.4	100.0	5.00
B	30	10	18	10	5	3	2	48	14.4	37.5	1.88
C	90	15	4	5	5	1	2	32	28.8	75.0	3.75
D	5	15	4	5	5	1	2	32	1.6	4.17	0.21

10.0 Appendix E: Economic Development Measures

Table 10.1: Economic Development Factor – Measures Summary

ID	Measure Name	Weight	Measure Description	Measure Objective
ED.1	Project Support for Economic Development	60%	Project consistency with regional and local economic development plans and policies and support for local development activity	The intent of this measure is to assess if the project is supporting future economic development and the progress made toward development in the project corridor at the local level. Progress will be assessed through use of a checklist of desired actions.
ED.2	Intermodal Access and Efficiency	20%	Rate projects based on the extent to which the project is deemed to enhance access to critical intermodal locations, interregional freight movement, and/or freight intensive industries.	The intent of this measure is to assess the: Level to which the project enhances access to distribution centers, intermodal facilities, manufacturing industries or other freight intensive industries; Level to which the project supports enhanced efficiency on a primary truck freight route (or high volume/ high value truck or rail freight corridor); Level to which the project enhances access or reduces congestion at or adjacent to VA ports/ airports
ED.3	Travel Time Reliability	20%	Improvement in travel time reliability attributed to the project	The intent of this measure is to determine the project's expected impact on improving reliability which supports efforts to retain businesses and increase and economic activity.

Measures Approach

ED.1 Project Support for Economic Development

Definition: Assessment of project based on input provided by the applicant regarding the project's potential to directly support economic development and the readiness of the economic development sites affected. Progress will be assessed through use of a checklist of desired actions that examine the impact of the project on economic development sites and the progress that has been made to advance the economic development sites.

Data Sources: Project description and supporting information provided by the project sponsor.

Methodology: The focus of this measure is on support of real, planned non-residential development (residential only developments are not eligible) within the project corridor (what is included in the project corridor is clarified in steps below). Residential development as part of a mixed-use development that includes a non-residential component is eligible. Project assessment is based on the use of a checklist, which is shown in Table 10.2 below. Validation (a brief narrative) of the existence of the actions in the checklist is included as part of the project nomination. The project would be awarded points for each question below, points are summed. Detail to support development of a response to each question follows Table 10.2.

The total points from Table 10.2 above are multiplied (scaled) by the proposed or projected square footage of each development to reflect the magnitude of the development supported by the transportation project. Table 10.3 shows the buffer distances used to identify eligible sites based on the project type.

Table 10.2: ED.1 - Project Support for Economic Development – Scoring Approach

Rating Description	Points Value
Transportation project referenced in local Comprehensive Plan, local Economic Development Strategy or Regional Economic Development Strategy	Referenced in: 0.5
Transportation project located in an area of economic distress	Up to: 0.5
Development project site plan status	Conceptual site plan submitted: 0.5 Conceptual site plan approved: 1 Detailed site plan submitted: 2 Detailed site plan approved: 4
Total (maximum points in rows above)	5
Measure Scaling: Points are multiplied by development building square footage (does not include residential-only property) near the project. Zoned only sites must have primary access to the project to be included. The project improvement type dictates the buffer allowed (refer to Table 10.3). Square footage is discounted by the following:	
Project provides primary access to the site or is adjacent to the site	100% of sq. footage
Project enhances access in the vicinity of the site but is not physically adjacent	50% of sq. footage

Table 10.3 Buffer Distance by Project Type and Adjustment for Provision of Access

Buffer Distance to Determine Total Square Footage	Applicable Project Types
Tier 1 Project Type – 0.5 mile buffer	Turn Lane, Intelligent Transportation Systems, Bike Lane or Path, Sidewalk, Bus Stop, Park & Ride Lot
Tier 2 Project Type – 1 mile buffer	Access Management, Signal optimization, Increase Bus service, Improvement to Rail Transit Station
Tier 3 Project Type – 3 mile buffer	New through lane, new/improved interchange, new bridge, new Rail Transit Station, additional Rail Track
Access Provision Adjustment per Site within Buffer	
Project provides new direct access to the site or improves existing access to the site (site must be physically adjacent to the project). In case of capacity enhancement to limited access facility, new or improved interchange, transit rail capacity improvement, or new transit rail station zoned properties within 0.5 miles of the adjacent interchange(s) or rail station(s) qualify as receiving improved direct access.	Project enhances economic development by improving congestion, mobility, access, or operations in the vicinity of the site but the site is not physically adjacent to the project
Multiply by 1	Multiply by 0.5

* buffer distance is measured via the travel distance on the transportation network

Guidance for Questions 1-3:

Question 1 guidance: To determine whether a project is consistent with local Comprehensive Plan, local Economic Development Strategy or Regional Economic Development Strategy the project sponsor should conduct the following steps:

Step 1: Identify the local Comprehensive Plan, local Economic Development Strategy or Regional Economic Development Strategy for the geographic area in which the transportation project is proposed (the strategy or goals may be found in a stand-alone document or as part of another document, such as a comprehensive plan).

Step 2: Review the goals, objectives and strategies noted in the document(s).

Step 3: Review the document to determine if the proposed transportation project is specifically cited in the document(s) as a key project desired to support local/regional economic development.

Step 4: Award points to the proposed project as follows:

- If the proposed transportation project is specifically mentioned as a key project in at least one of the local Comprehensive Plan, local Economic Development Strategy or Regional Economic Development Strategy documents, the project is considered "referenced in," and is awarded 0.5 pts.

Question 2 Guidance: To determine whether a project is located in an area of economic distress, consult the Economic Innovation Group's latest Distressed Communities Index by ZIP Code (ZIP Codes refer to US Census Bureau ZIP Code Tabulation Areas). Find the ZIP Code or Codes in which the transportation project is located. Use the highest distress score and divide by 200. If the transportation project is located in a ZIP Code that does not have a distress score (Zip Codes with populations under 500 do not have a value calculated), then use the highest value adjacent ZIP Code and divide by 200.

Question 3 Guidance: To assess each development project's site plan status, review the jurisdiction information regarding development review and approval of development projects adjacent to the project corridor. Please use the following definitions to determine the type and status of the site plan.

Detailed Site Plan: Construction documents, engineering/architectural drawings and specifications that includes construction requirements for a project. These plans are detailed enough for construction and include details regarding building pad locations, grading, drainage, utilities, parking and entrances.

Conceptual Site Plan: A conceptual sketch as part of a rezoning application that must include the following detail: 1. The location, area and density or floor area ratio (FAR) of each type of proposed land use within the development. 2. A delineation of developable land to exclude wetlands and terrain that will not be developed. 3. The location of any proposed roadway facility on site within the development's boundaries and the connectivity of the network addition as proposed. 4. The location of stub outs on adjoining property and the existing land use of such adjacent property, if applicable, and the location of any proposed stub outs within the network addition, if applicable.

Approved: Site plans that have been reviewed and given documentation of support from a local jurisdiction and/or VDOT, if applicable. Official approval documentation from the approving authority must be uploaded with the application.

Submitted: Site plans that are currently under review by a locality and/or VDOT, if applicable, for construction, rezoning or special use permits. Documentation of submitted site plans to the approving authority must be uploaded with the application.

Zoned Only: Development project lacks an approved or submitted conceptual or detailed site plan but is consistent with local comprehensive plan's future land use or zoning map, and/or zoning code/ordinance. Zoned only sites must have primary access to the project to be included.

Points are awarded as follows:

- Detailed site plan approved: 4 points
- Detailed site plan submitted: 2 points
- Conceptual site plan approved: 1 point

- Conceptual site plan submitted: 0.5 points

Scoring Value

Measure Scaling: Points are multiplied by the proposed or potential development building square footage (does not include residential-only property) near the project.

Step 1: Award Points to each development using the checklist in Table 10.2. (ED.1 Economic Development Support – Scoring Approach)

Step 2: Determine total square footage: acquire the proposed or potential development building square footage (does not include residential-only property) within a buffer distance from the project, depending on project type, as defined in Table 10.3.

Step 3: Next adjust for provision of access as shown in Table 10.3 for each site within the buffer distance to calculate the adjusted square footage value.

See the example in Table 10.4 for illustration of this calculation in Step 2 and Step 3 for a Tier 1 project example.

Table 10.4 Sample Calculation for Adjusting Square Footage of Development

Project Type	Development Square Footage (within 1 mile buffer)	Project provides direct access (Yes = 1, No =0.5)	Adjusted Square footage value	Distance (divide if greater than 1 mile)	Final Adjusted Square footage value
Bike Path (Tier 1)	40,000	1	40,000	1	40,000
	150,000	0.5	75,000	2	37,500
	500,000	0.5	250,000	1.5	166,667
	25,000	1	25,000	2	12,500
	10,000	1	10,000	1	10,000
TOTAL	725,000		400,000		266,667

Step 4: Next, results of Step 3 are adjusted for distance from the project:

For any development sites that are greater than 1 mile away, the adjusted square footage value must be divided by the distance in miles.

Step 5: Finally, the points awarded in Step 1 are factored by the adjusted square footage value to obtain the project score.

ED.2 Intermodal Access and Efficiency

Definition: Measure rates each project based on the extent to which the project is deemed to enhance access to critical intermodal locations and/or freight intensive industries and supports increased efficiency for freight movement in congested corridors.

Data Sources:

- Project description and supporting information provided by project sponsor
- Project description, if applicable, in the Virginia Multimodal Freight Study (2014)
- STAA Truck Routes and Restrictions[9]
- SMART SCALE Congestion Scoring outputs

Methodology

Project descriptions will be reviewed and assessed based on the extent to which the project is deemed to enhance access to critical intermodal locations and/or freight intensive industries and supports increased efficiency for freight movement in congested corridors.

Points are assigned through a qualitative assessment of the project description and supplementary information submitted by the project sponsor. Flexibility is provided in the project nomination for sponsors to describe the manner in which the project is expected to enhance access to critical intermodal locations, interregional freight movement, and/or freight intensive industries and supports increased efficiency for freight movement in congested corridors. The project rating is based on the extent to which the project is deemed to enhance access to critical intermodal locations, freight networks, and/or freight intensive industries and supports increased efficiency for freight movement in congested corridors. The Congestion Scoring process will identify roadway improvements that are likely to provide an operational benefit to freight movement.

This comparison supports a determination of the level of economic enhancement on a 0 to 6 scale as summarized in Table 10.5.

[9] http://gis.vdot.virginia.gov/vatruckweb/VaTruckRestrictions.aspx.

Table 10.5 Intermodal Access and Efficiency – Scoring Approach

Rating Description	Value
1. Level to which the project enhances access to existing or planned distribution centers, intermodal transfer facilities (excluding ports and airports), manufacturing industries or other freight intensive industries	
Project provides direct access (within 1 mile) to existing or planned locations	2
Project provides indirect access (greater than 1 mile, less than 3 miles) to existing or planned locations	1
No direct or indirect access	0
2. Level which the project supports enhanced efficiency on a primary truck freight route	
Project is on the designated STAA National and Virginia Network or a STAA Virginia Access Route[10]	2
Project directly connects to designated STAA National and Virginia Network or a STAA Virginia Access Routes	1
Project is not on and does not connect to the designated STAA National and Virginia Network	0
3. Level to which the project enhances access or reduces congestion at or adjacent to Virginia ports or airports	
Project provides direct access to (within 1 mile) existing or planned ports or airports (measured from designated entry gates to port or air cargo facilities)	2
Project provides indirect access to (greater than 1 mile, less than 3 miles) existing or planned ports or airports (measured from designated entry gates to port or air cargo facilities)	1
No direct or indirect access	0
Total (sum of score)	0 – 6

Scoring Value

Total points received based on the assessment in Table 10.7 are multiplied (scaled) by total freight tonnage within the project corridor and by the total length of the proposed roadway project contributing to the operational benefit to freight movement. Depending on the project type, the definition of total freight tonnage within the project corridor will vary. For example, for an interchange project or extension of acceleration/deceleration lanes at an interchange, estimates of freight tonnage on the ramps (instead of the mainline) will be used to scale the points received as described in Table 10.7.

[10] http://gis.vdot.virginia.gov/vatruckweb/VaTruckRestrictions.aspx.

ED.3 Travel Time Reliability

Definition: Change in travel time reliability attributed to the project.

Data Source(s)

- Latest five complete years of crashes from VDOT Roadway Network System (RNS) GIS data maintained by Traffic Engineering Division.
- Buffer index (BI) from University of Maryland Regional Integrated Transportation Information System (RITIS).
- Weather information from VDOT VA Traffic database.
- AASHTO *Highway Safety Manual* (HSM), 2010.

Methodology

The methodology to compute travel time reliability for a project is a quantitative, corridor-based analysis with two components: impact and frequency. Impact is defined as the ability of a project to reduce the impact of the four contributors for unreliable travel time:

- Highway incidents
- Weather events
- Work zones
- Capacity bottlenecks

Since other SMART SCALE measures account for the impacts of work zones and capacity bottlenecks, only the impacts of highway incidents and weather events will be accounted for in the computation of travel time reliability.

Frequency is defined as the likelihood of unanticipated delays due to highway incidents and weather events. Estimates of frequency are based on segment data for incidents and weather.

For each project, VDOT will compile information to compute five factors to be used in evaluating the reliability of the proposed project:

- Buffer index (BI)
- Incident impact
- Incident frequency
- Weather impact
- Weather frequency

The buffer index is defined as the extra time travelers should add to average travel times to ensure on-time arrival. This index is expressed as a percentage of the average time. A buffer index of 0.20 means that a travelers needs to increase their time cushion by an extra 20% from the average travel time. This index value is computed by dividing the difference between the 95th percentile travel time and

mean travel time by the mean travel time for a segment. For long corridors, the index is averaged using a weighted factor based on VMT.

The buffer index which comes from the RITIS data does not provide statewide coverage. In the first round of SMART SCALE scoring, in cases where data does not exist, the method utilized buffer indices from other nearby facilities. This approach leads to questionable results on low volume roadways. Moving forward, if buffer index data does not exist within the project corridor, the approach is to assume there is no reliability issue and BI = 0 - therefore the score will be 0.

The methodology to compute travel time reliability for roadway projects is defined in the following steps:

Step 1: Determine the impact of incidents on the network. The effectiveness of the project to reduce the impact of incidents within the project study area will be based on the type of project. Table 1 present the impact values of both roadway and transit projects. Project types that are most effective at reducing the impacts of incidents will receive the highest scores as identified in the following scoring criteria:

2: Projects directly improving incident frequency and duration (e.g., interchange improvements, truck run-away ramps, queue warning)

1: Projects improving incident management response (e.g., traveler information systems, location signs, reversible lanes)

0: No impact

While most projects provide one benefit in incident reduction per the project type listed in Table 1, there are complex projects that provide more than one benefit. For those projects, the total score of the impact of incidents is found by adding the maximum value of one benefit (i.e., 1 or 2) to 10% of the value of the remaining benefits. For example, if a project adds a travel lane and a truck runaway ramp, its score is 2 (travel lane) + 10%x 2 (truck runaway ramp) = 2.2

Step 2: Determine the frequency of crashes using historical crash data. VDOT will compile the latest 5 years of crashes within the project limits. An annual average Equivalent Property Damage Only (EPDO) value is obtained through data from the VDOT Roadway Network System and the ratio of cost for crashes by severity published by FHWA and AASHTO since the EPDO value is used as a measure to quantify the incident duration and the impact to travel time reliability, the weight for Fatal crashes is adjusted from 540 to 120 to better reflect the incident duration as opposed to the societal cost as applied in the EPDO calculation for the safety measures. EPDO will be used as a surrogate measure to determine the frequency and duration of incidents, since more severe crashes will typically cause a longer traffic disruption. The EPDO equates injury and fatal crashes to property damage only crashes, thus reflecting the severity. Project types that are most effective at reducing the frequency and severity of incidents will receive the highest scores as identified in the following scoring criteria:

5: EPDO greater than 300

4: EPDO between 200 and 300

3: EPDO between 125 and 200

2: EPDO between 75 and 125

1: EPDO between 25 and 75

0: EPDO less than 25

Step 3: Determine the impact of weather events. The effectiveness of the project to reduce the impact of weather within the project study area will be based on the type of project. Project types that are most effective at reducing the impacts of weather will receive the highest scores as identified in the following scoring criteria:

2: Projects directly mitigate weather impacts by geometric improvements or end-to-end detection or warning systems

1: Projects that contain a component of an end-to-end detection or warning system or mitigate the event (e.g., improved detour routes, expanded transit operations)

0: No impact

While most projects provide one benefit in mitigating weather events per the project type listed in Table 1, there are complex projects that provide more than one benefit. For those projects, the total score of the impact of weather events is found by adding the maximum value of one benefit (i.e., 1 or 2) to 10% of the value of the remaining benefits. For example, if a project adds a bridge heating system and a reversible lane, its score is 2 (bridge heating system) + 10%x 1 (reversible lane) = 2.1

Step 4: Determine the frequency of weather events using historical weather data. VDOT will compile 3 years historical weather data within the project limits. The magnitude of weather events will be determined from historical data and scores will be assigned according to the following criteria:

2: More than 40 hours of combined moderate/severe snow events and flood events per year

1: Between 20 and 40 hours of combined moderate/severe snow events and flood events per year

0: Less than 20 hours of combined moderate/severe snow events and flood events per year

Step 5: Compute the buffer index of the roadway. The Regional Integrated Travel Information System (RITIS), offered through VDOT's participation with the I-95 Corridor Coalition provides a tool to calculate the buffer index. The RITIS system can provide the buffer index for all interstates and most primary routes.

Where buffer index data is not available it can be assumed that the buffer index is zero if no congestion or reliability issues are observed.

Step 6: Compute the travel time reliability measure. To compute travel time reliability, add the product of the incident impact (from Step 1) and the incident frequency (from Step 2) to the product of the weather impact (from Step 3) and the weather frequency (from Step 4), then multiply this result by the buffer index (from Step 5).

The methodology to determine travel time reliability for transit, and TDM (including park and ride lots) use this defined process as they are include as project impacts in Table 10.8. Bicycle/pedestrian projects are not applicable.

Scoring Value

The travel time reliability measure estimated in Step 6 above is multiplied by corridor VMT to scale the scoring results.

Table 10.6 Incident, Weather and Work Zone Impact Scoring

Major Project Type	Sub Project Type	Incidents Impact	Weather Impact
Median Design	Emergency crossovers, Controlled/Gated turnaround	2	1
	Moveable traffic barriers	0	1
	Movable cable median barrier	1	1
	High median barriers	1	0
	Traversable medians	1	0
	Accessible/widen shoulder to 10 ft	2	1
Shoulder Design	Drivable shoulder to 11-12 ft	2	1
	Hard shoulder running/Dynamic shoulders	2	1
	Emergency pull-offs/Turnouts, Crash investigation sites	2	0
	Bus turnouts	0	0
Ramps Design and Use	Ramp widening (All lanes)	2	1
	Ramp closure (time of day)	1	1
	Off-ramp terminal traffic control	2	0
	Ramp turn restrictions (time of day)	0	0
Truck Incident Design	Runaway truck ramps	2	0
Travel Lanes Design	Add travel lanes	2	1
	Interchange modifications – ramps	2	1
	Intersection modifications – turning lanes	2	1
Animal-Vehicle Collision	Wildlife fencing over/underpass	1	0
Lane Types and Use	Contra-flow lanes – (no-notice evacuation will be scored w/ weather)	0	2
	Adding HOV lanes / HOT lanes	2	1

Major Project Type	Sub Project Type	Incidents Impact	Weather Impact
	Dual facilities (bypass lanes)	2	1
	Reversible lanes	1	1
	Lane reconfigurations to improve capacity or improve safety (static change, i.e., lane stripes)	1	0
Traffic Signals	Emergency vehicle traffic signal improvements	2	0
	Signal timing systems	1	0
Active Traffic Mgmt	Dynamic ramp metering / flow signals	1	1
	Variable speed limit / reduction	2	2
	Connected Vehicle System integration	2	2
	Over-height vehicle detection system	2	0
	Truck roll over warning	2	0
	Queue warning	2	0
	Integrated Corridor Management (alt routes/modes)	1	1
	Dynamic lane merging	1	0
Tolling	Converting to all electronic tolling	1	0
Weather	Fog detection warning system	0	2
	RWIS	0	2
	Flood warning systems / Wind warning systems	0	2
	Bridge heating systems / Anti-icing	0	2
	Drainage improvements	0	2
Incident Management	Incident clearance – pre staged incident response, incentive based towing, emergency relocation programs	2	0
	Safety Service Patrol	2	1
	Improvements to detour routes	2	1
	Reference location signs	1	0
	Incident detection / CAD integration	2	0
Traffic Demand Management	Park and Ride Lots	0	0
	Traveler Information/ Travel Time Information: DDMS	1	1
Transit	Additional trains on existing rail lines	0	1
	New rail lines	0	1
	New rail station / intermodal connection	0	1
	Transit AVL – Traveler Information	0	0
	Shorter headway	0	0
	New bus route	0	1
	Larger bus capacity	0	0
	Additional bus stops	0	0

11.0 Appendix F: Land Use Coordination Measure

Table 11.1 Land Use Factor – Measure Summary

ID	Measure Name	Weight	Measure Description	Measure Objective
L.1	Future transportation efficient land use	70%	Evaluates the amount of population and employment located in areas with high non-work accessibility	To determine the degree to which the project supports population and employment that on averages has a reduced impact on the transportation network
L.2	Increase in Transportation Efficient Land Use	30%	Evaluates the increase in amount of population and employment located in areas with high non-work accessibility between present day and the horizon year of 2025	To determine the degree to which the project supports population and employment that on averages has a reduced impact on the transportation network

Measures Approach

L.1 Future Transportation Efficient Land Use

Definition: The measure reports a project's support for transportation efficiency based on the amount and pattern of future development. The measure is based on (i) the amount of population and employment in 2025 and (ii) the non-work accessibility, or the number of key non-work destinations that are accessible within a reasonable walking distance. Research and analysis has demonstrated that areas with a high level of non-work accessibility result in less vehicle miles traveled per household than in areas with less non-work accessibility with reductions of as much as 66% per household.

Data Sources

- Accessibility tool
- Change in local pedestrian network and network conditions
- Horizon year, 2025, population and employment

Methodology

The accessibility tool reports access to non-work destinations by walking as a composite value at the individual U.S. Census block level. The analysis considers how well local land uses around the project support access to a variety of destinations within a reasonable walking distance. Current non-work destinations considering the impact of the project will be used. Proposed changes to transportation networks are included in the analysis; those that improve walking access to destinations will improve scores while any that impede walking access will reduce scores.

A composite value of local access to non-work destinations was established by analyzing existing patterns throughout Virginia. This value, described in Table 11.2, assigns points for different types of non-work destinations accessible by walking, based on the maximum expected number of occurrences for each destination type statewide. Similar to the access to jobs analysis, destinations are evaluated using a decay curve where destinations within a shorter travel time are weighted more than destinations farther away. The decay function was developed based on travel survey data. Every location in Virginia earns a value between 0 and 100.

Table 11.2 Local Non-Work Access Value

Destination Type	Definition (specific destinations included)	Points per destination
Bank	Bank, ATM	0.74 (up to 15 occurrences)
Education	School	5.6 (up to 2 occurrences)
Entertainment	Cinema, Performing Arts, Museum, Nightlife, Sports Complex, Convention/Exhibition Center, Sports Center, Animal Park	5.6 (up to 2 occurrences)
Food & Drink	Restaurants, Coffee Shop, Winery, Bar or Pub	0.25 (up to 45 occurrences)
Grocery	Grocery	3.7 (up to 3 occurrences)
Healthcare	Hospital, Medical Service, Pharmacy	3.7 (up to 3 occurrences)
Public Services	Library, Post Office, Community Center, City Hall, Court House, Police Station	3.7 (up to 3 occurrences)
Recreation	Golf Course, Ice Skating Rink, Campground, Park/Recreation Area	3.7 (up to 3 occurrences)
Shopping	Shopping, Convenience Store, Clothing Store, Department Store, Specialty Store, Home Improvement & Hardware Store, Office Supply & Service Store, Bookstore, Home Specialty Store, Sporting Goods Store, Consumer Electronic Store	0.34 (up to 33 occurrences)
Total points		100

Step 1: Update transportation networks in the accessibility tool to reflect new or changed links that the proposed project will provide. The tool imposes impedances on certain walking conditions automatically. Measure development involves scanning the project area carefully using aerial imagery for links that are legally walkable but that average people would avoid, such as crossings of

unsignalized freeway ramps, or narrow bridges with narrow shoulders and no pedestrian accommodations; any of these links within a 1-mile buffer of the project are removed.

Step 2: Use the accessibility tool, with a destination-decay rate for walking mode, to calculate post-project non-work accessibility to the weighted destinations in table 11.2 for each Census block in a 3-mile buffer of the project.

Step 3: Obtain horizon-year population and employment for all Census blocks in the 3-mile study area. For each block, calculate the sum to obtain the future job-population.

Scoring Value

L.1 – Non-Work Accessibility x Future Density

The post-project non-work accessibility value for each block is multiplied by the future job-population density of each block, and these values are averaged

L.1 Measure = Average for all blocks of [Future Job-Population Density x Post-Project Non-Work Accessibility Value]

L.2 Increase in Transportation Efficient Land Use

Definition: This measure uses the same inputs as the L.1 measure but it evaluates the increase in the amount of population and employment located in areas with high non-work accessibility. The measure is based on (i) the change in the amount of population and employment between today and the horizon year of 2025 and (ii) the non-work accessibility, or the number of key non-work destinations that are accessible within a reasonable walking distance.

Data Sources

- Accessibility tool
- Change in local pedestrian network and network conditions
- Current year and horizon year, 2025, population and employment

Methodology

The accessibility tool reports access to non-work destinations by walking as a composite value at the individual U.S. Census block level. The analysis considers how well local land uses around the project support access to a variety of destinations within a reasonable walking distance. Current non-work destinations considering the impact of the project will be used. Proposed changes to transportation networks are included in the analysis; those that improve walking access to destinations will improve scores while any that impede walking access will reduce scores.

A composite value of local access to non-work destinations was established by analyzing existing patterns throughout Virginia. This value, described in the previous section in Table 11.2, assigns points for different types of non-work destinations accessible by walking, based on the maximum expected number of occurrences for each destination type statewide.

Step 1: Update transportation networks in the accessibility tool to reflect new or changed links that the proposed project will provide. The tool imposes impedances on certain walking conditions automatically. Measure development involves scanning the project area carefully using aerial imagery for links that are legally walkable but that average people would avoid, such as crossings of unsignalized freeway ramps, or narrow bridges with narrow shoulders and no pedestrian accommodations; any of these links within a 1-mile buffer of the project are removed.

Step 2: Use the accessibility tool, with a destination-decay rate for walking mode, to calculate post-project non-work accessibility to the weighted destinations in table 11.2 for each Census block in a 3-mile buffer of the project.

Step 3: Calculate the difference between the existing and horizon-year job-population (the sum of population and employment for all Census blocks in the 3-mile study area. For each block, calculate the sum to obtain the future job-population.

Scoring Value

L.2 - Non-Work Accessibility – Change in Density

The post-project non-work accessibility value is multiplied by the expected change in job-population density of each block, and these values are averaged

L.2 Measure = Average of all blocks of [(Future Job-Population Density – Existing Job-Population Density) x Post-Project Accessibility Value]