Prioritization 3.0
Rail Division Scoring Criteria Summary Report

May 2014

In 2013, the North Carolina General Assembly created the Strategic Transportation Investments Act (STI) to strengthen the state's economy and provide a new formula to direct construction funds through strategic transportation investments. Governor Patrick McCrory signed the Act on June 26, 2013. Governor McCrory and the N.C. Department of Transportation (NCDOT) are committed to improving the quality of life for citizens in North Carolina. The desire is to find more efficient ways to better connect all North Carolinians - to jobs, health care, education and recreational experiences. The STI law will help make that possible by better leveraging existing funds to enhance the state's infrastructure, providing greater opportunity for economic growth.

The STI law outlines a new Strategic Mobility Formula (SMF) which is a new way to fund and prioritize transportation projects to ensure they provide the maximum benefit to our state. It allows NCDOT to use its existing revenues more efficiently to fund more investments that improve North Carolina's transportation infrastructure, create jobs and help boost the economy.

It was apparent even in the early stages of the STI draft bill that the identification of scoring criteria, methodologies, and transportation data to quantify the need of a future project would be critical to potential bill implementation. A Workgroup (established previously by NCDOT for its Prioritization 3.0 process) provided recommendations for both highway and non-highway scoring methodologies to support bill requirements. The Workgroup consisted of representatives from MPO's, RPO's, NCDOT planning staff, Division Engineers and other advocacy organizations. Rail Division staff attended meetings and brought forward criteria and data recommendations that would best represent and point to the needs of the state's rail system. Railroads and other rail planning experts were contacted by Rail Division Planning & Development Branch staff in order to identify available data and economic models. Rail staff also researched international rail prioritization processes. Rail scoring criteria were created using available data sources, including railroad track charts, crossing safety data, ridership studies, track capacity studies and design standards, and best engineering judgments and proven practices, based on rail construction experience.

During the criteria-development process, the Rail Division determined that there are different categories of rail projects that are best scored using separate scoring criteria and percent weightings. Categories include track and structures projects (freight and passenger), rail facilities projects (freight and passenger), and passenger service projects.

For track and structures projects, there are significant differences in projects depending on whether the project is for freight or passenger purposes. For example, passenger trains are more time-sensitive than freight trains, which typically operate at lower speeds, variable lengths, and without schedules, so performance measures differ between passenger projects and freight projects. Additionally, data from private companies (e.g. freight railroads, Amtrak, freight facility operators) is limited and proprietary, which significantly affects data availability for scoring purposes, and led to the need for criteria differences. One example is safety data, which is available for track projects, but not for freight intermodal facilities or passenger stations.

For consistency with highway mode scoring, Transportation Economic Development Impact System (TREDIS®) was selected to calculate Benefit-Cost (B-C) and Economic Competitiveness for rail projects. However, there are limitations in its ability to analyze local economic impacts due to rail projects, especially below the

statewide level. Freight rail traffic is not local in NC - 98% of North Carolina freight carloads cross the North Carolina state line. These TREDIS limitations result in the decision to lower B-C weighted percentages at the Regional & Division levels, and not use Economic Competitiveness scoring below the Statewide level.

A logarithmic formula is used at times to compress rail criteria scores that have wide ranges in order to bring extreme scores within the 0-100 scale, as required by the STI law. Logarithms do not alter ranking of projects, rather they compress project scores relative to each other below a set maximum value. A logarithm is needed to scale certain scores, because multiple project elements and their variables result in a wide scoring range.

The NCDOT Board of Transportation on November 7, 2013, approved the criteria, weights and measures used in the SMF. The following pages provide a brief description of each Rail project scoring criteria, how it will be measured, its data source and what percentage it is of a project's overall score. The hope is that this information provides a clear, concise and transparent view of the data used in the SMF. The summary tables below indicate what type of Rail improvement is eligible for each STI category.

Funding Category	Project Types			
	Freight Track & Structures	**Freight Intermodal**	**Intercity Passenger Track & Structures**	**Intercity Passenger Service & Stations**
Statewide (100% Criteria Score)	**Class I** sidings, double-track, grade separations, new improved access	Not Eligible	Not Eligible	Not Eligible
Regional (70% Criteria Score)	Same as Statewide	Not Eligible	**Rail lines crossing a county line** sidings, double-track, grade separation, curve realignment	**Rail lines crossing a county line** intercity passenger service
Division (50% Criteria Score)	Same as Statewide	**Class I -** Intermodal or transload facilities	Same as Regional	Same as Regional plus intercity passenger stations

Track & Structure Projects		Weighted Score				
		Statewide Freight	Regional		Division	
			Freight	Pax	Freight	Pax
Benefit-Cost	*Emissions*	**20%**	**10%**	**10%**	**10%**	**10%**
	Highway-to-rail diversion					
	Fuel savings					
	Travel time savings					
Economic Competitiveness	*Long-Term Economic Benefits*	**10%**	**-**	**-**	**-**	**-**
Capacity/ Congestion	*Volume-to-Capacity*	**15%**	**15%**	**25%**	**10%**	**15%**
Safety	*RR/Hwy crossing incidents*	**15%**	**15%**	**15%**	**10%**	**10%**
Accessibility	*New or enhanced accessibility*	**10%**	**10%**	**-**	**5%**	**-**
Connectivity	*Multimodal improvement*	**10%**	**5%**	**-**	**5%**	**-**
Mobility	*Service improvement*	**20%**	**15%**	**20%**	**10%**	**15%**
Total		**100%**	**70%**	**70%**	**50%**	**50%**

Freight Intermodal Facilities/Intercity Passenger Service and Stations		Weighted Score		
		Statewide Freight	Regional – Intercity Passenger Service only	Division – Facilities/ Intercity Service & Stations
Benefit-Cost	*Emissions*	-	15%	10%
	Highway-to-rail diversion			
	Fuel savings			
	Travel time savings			
Economic Competitiveness	*Long-term Economic Benefits*	-	-	-
Capacity/ Congestion	*Volume-to-Capacity*	-	25%	15%
Connectivity	*Multimodal improvement*	-	10%	10%
Mobility	*Service improvement*	-	20%	15%
Total		100%	70%	50%

Benefit Cost (Rail)

Definition

Monetized benefits are based on vehicle operating & maintenance costs, travel time savings, value of time related to cargo, environment, and safety. These benefits are compared to the project's cost. A rail project's benefit cost value is determined using TREDIS®.

Formula

Benefit Cost = Total Project Benefits/Total Project State Cost

Data Sources

TREDIS® data inputs include:

- Travel time savings (freight) – provided by freight railroads, if applicable
- Travel time savings (passenger) – calculated by NCDOT Rail Division, if applicable
- Travel time savings (vehicles) – based on calculated vehicular delay at grade crossings, if applicable
- Highway-to-rail diversions (freight) – provided by freight railroads, if applicable
- Highway-to-rail diversions (passenger) – based on documented studies or operational analysis
- Highway/rail crossing crash reductions – based on Federal Railroad Administration's GradeDec model

All other data are default values in TREDIS®.

Criterion Percent Weight by Project Type and STI Category:

	Statewide	Regional	Division
Freight Track & Structures	**20%**	**10%**	**10%**
Freight Intermodal & Transload Facilities	N/A	N/A	**10%**
Intercity Passenger Track & Structures	N/A	**10%**	**10%**
Intercity Passenger Service (Regional & Division) & Stations (Division only)	N/A	**15%**	**10%**

Economic Competitiveness (Rail)

Definition

Economic Competitiveness measures the impact of a project by estimating the number of full-time jobs in the future, based on the reallocation of project savings throughout the state economy. Jobs do not include project construction-related jobs.

Formula

Economic Competitiveness = Number of full-time jobs expected in Year 30 after project constructed

Data Sources

TREDIS® data inputs include:

- Travel time savings (freight) – provided by freight railroads, if applicable
- Travel time savings (passenger) – calculated by NCDOT Rail Division, if applicable
- Travel time savings (vehicles) – based on calculated vehicular delay for at-grade crossings, if applicable
- Highway-to-rail diversions (freight) – provided by freight railroads, if applicable
- Highway-to-rail diversions (passenger) – based on documented studies or operational analysis
- Highway/rail crossing crash reductions – based on Federal Railroad Administration's GradeDec model

All other data are default values in TREDIS®

Criterion Percent Weight by Project Type and STI Category:

	Statewide	Regional	Division
Freight Track & Structures	**10%**	N/A	N/A
Freight Intermodal & Transload Facilities	N/A	N/A	N/A
Intercity Passenger Track & Structures	N/A	N/A	N/A
Intercity Passenger Service (Regional & Division) & Stations (Division only)	N/A	N/A	N/A

Capacity/Congestion (Rail)

Definition

Capacity/Congestion measures the percentage a track segment, facility, or equipment set is over-capacity. The formula varies slightly depending on the project type, because there are different variables involved with each type. Variables include linear miles, carloads, station demand, equipment demand, parking demand. Track capacity is measured the same regardless of whether the project is a stand-alone track project or part of a larger service or station project.

Formula

Capacity/Congestion = ((Current daily volume/Maximum daily allowable volume) - 1)*100

- For a Track & Structures project with multiple rail segments, score is based on the most congested segment
- For an Intercity Passenger Station or Service project, capacity percentage for each project element is multiplied by the element's percentage of project cost, summing all elements
- A logarithm is used to scale scores within the range

Exception: Grade separation projects primarily benefit automobiles that are delayed at a grade crossing; therefore, the Highways Capacity/Congestion score calculation is a more appropriate measure for grade separation projects.

Data Sources

Capacity/Congestion data sources vary depending on project type.

- Freight and Passenger Track & Structures: Railroad track charts, Railroad self-reported volumes, rail capacity modeling
- Stations & Service: Facility design standards, railroad track charts, equipment capacity specifications
- Grade Separations: NCDOT AADT maps, municipal traffic counts, Rail Division's State Authoritative Rail and Highway (SARAH) database, *Highway Capacity Manual* averages

Criterion Percent Weight by Project Type and STI Category:

	Statewide	Regional	Division
Freight Track & Structures	**15%**	**15%**	**10%**
Freight Intermodal & Transload Facilities	N/A	N/A	**15%**
Intercity Passenger Track & Structures	N/A	**25%**	**15%**
Intercity Passenger Service (Regional & Division) Stations (Division only)	N/A	**25%**	**15%**

Safety (Rail)

Definition

The Safety criterion measures the crash potential for railroad/highway at-grade crossings.

Formula

Safety = Safety Review Index value

- For grade separations: multiply by 1 (eliminates risk)
- For at-grade improvements: multiply by 0.5 (reduces risk)
- No credit given if crossing improvements are not part of project

Data Sources

The Safety Review Index is based on the Rail Division's Investigative Index, which is based on extensive data maintained within the Rail Division's SARAH database. A logarithmic formula brings safety scores back to the 100-point scale as required by the STI law, and also ties scores back to the original, legally-defensible Investigative Index.

Criterion Percent Weight by Project Type and STI Category:

	Statewide	Regional	Division
Freight Track & Structures	**15%**	**15%**	**10%**
Freight Intermodal & Transload Facilities	N/A	N/A	N/A
Intercity Passenger Track & Structures	N/A	**15%**	**10%**
Intercity Passenger Service (Regional & Division) Stations (Division only)	N/A	N/A	N/A

Accessibility (Rail)

Definition

Accessibility measures the potential for new or enhanced industrial development opportunities through new or restored rail, or improved rail to allow access by heavier carloads.

Formula

Accessibility = (Rail Route Miles + National Highway System Miles)*(1+Weighted Unemployment Rate)

- Multiply by 1 if project provides new access
- Multiply by 0.5 if project provides improved access
- No credit given if neither new nor improved access provided

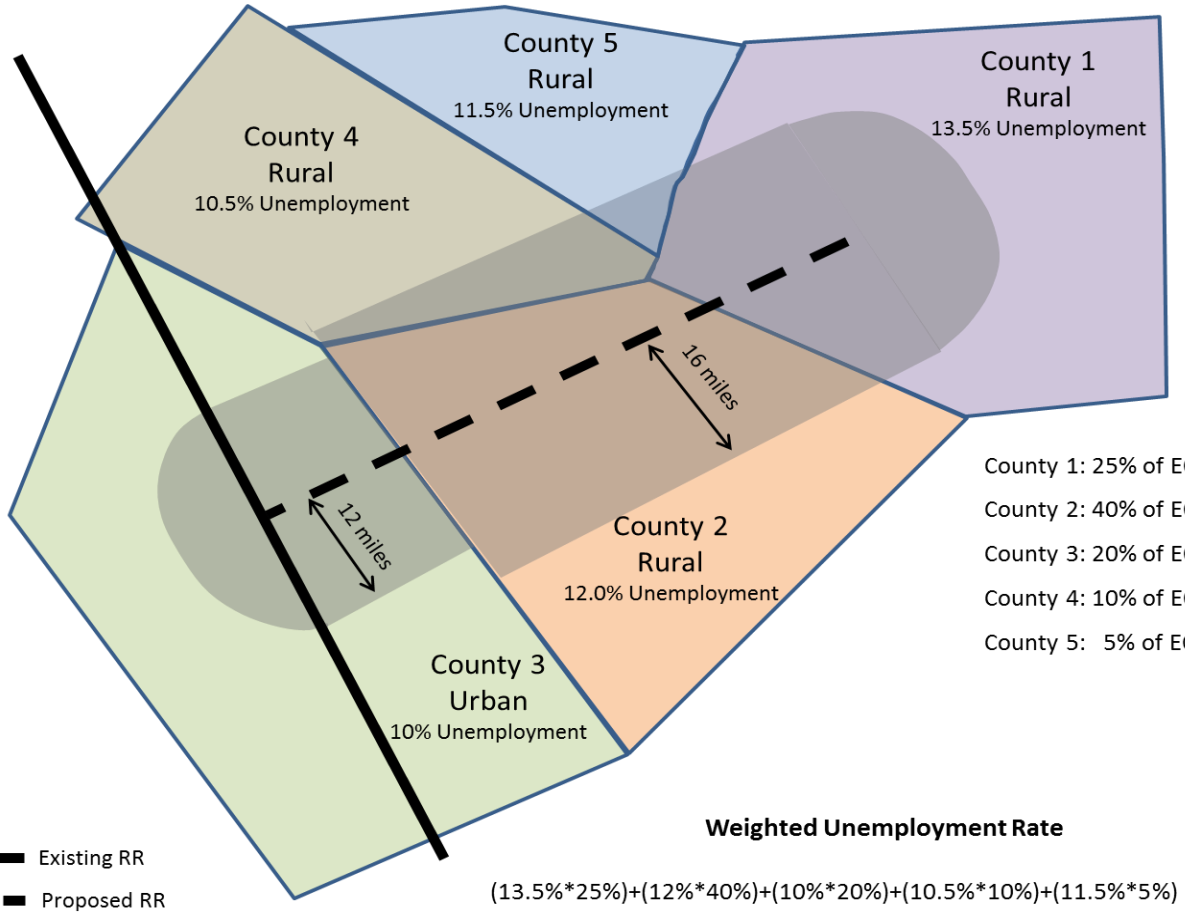
Data Sources

National Highway System (NHS) miles and the weighted unemployment rate are calculated using Geographic Information Systems (GIS).

- NHS miles: A five-mile buffer is drawn around the project centerline and the NHS GIS layer, and all NHS miles within the buffer are summed.
- Weighted Unemployment Rate: This rate is calculated using GIS following several steps. Also see the schematic on the following page.
  - Employment Opportunity Catchment Area represents the distance people would travel to a job and is established by identifying the project counties as rural or urban.
  - Urban counties are defined as Central Metropolitan Statistical Areas according to Office of Management and Budget data. All other counties are rural.
  - For the portion of a project within an urban county, the catchment area radius is 12 miles. For the portion of a project within a rural county, the catchment area radius is 16 miles. These distances were determined based on the 2009 National Household Travel Survey by FHWA, and represent the average commuting distance for urban areas and rural areas in North Carolina.
  - The appropriate catchment area is drawn around the project using GIS.
  - The percentage of the total catchment area (in square miles) within each county is calculated. The catchment area might encompass portions of counties that are not directly served by the project.
  - Each county's unemployment rate (from the NC Employment Security Commission's Local Area Unemployment Statistics) is multiplied by its catchment area percentage to determine a weighted unemployment rate for that county.
  - All of the weighted unemployment rates are summed, and this total weighted unemployment rate is now used as the Weighted Unemployment Rate in the Accessibility calculation.

Criterion Percent Weight by Project Type and STI Category:

	Statewide	Regional	Division
Freight Track & Structures	**10%**	**10%**	**5%**
Freight Intermodal & Transload Facilities	N/A	N/A	N/A
Intercity Passenger Track & Structures	N/A	N/A	N/A
Intercity Passenger Service (Regional & Division) Stations (Division only)	N/A	N/A	N/A



County 1: 25% of EOCA

County 2: 40% of EOCA

County 3: 20% of EOCA

County 4: 10% of EOCA

County 5: 5% of EOCA

Weighted Unemployment Rate

(13.5%*25%)+(12%*40%)+(10%*20%)+(10.5%*10%)+(11.5%*5%) = **11.8%**

Mobility (Rail)

Definition

Mobility measures how much the project is changing capacity or travel time for track projects. For freight and passenger facility projects, mobility measures daily volumes in relation to catchment area population. For freight intermodal facilities, the catchment area is a 100-mile radius. For freight transload facilities, the catchment area is a 70-mile radius. Passenger stations and services use a 17-mile radius as the catchment area.

Formula

Scoring calculations vary depending on project type and purpose.

- Freight & Passenger Track (capacity purpose)
  - Mobility = Percent change in available capacity for each rail segment, weighted by number of trains per segment
  - For grade separation projects, automobile travel time savings is also included to account for the amount of time a driver is saving at a crossing
- Freight & Passenger Track (travel time purpose)
  - Mobility = Travel time savings*Current daily volume
  - For intercity passenger projects, travel time savings is considered for freight & passenger train volumes, and added to automobile travel time savings
  - For grade separation projects, automobile travel time savings is also included to account for the amount of time a driver is saving at a crossing
- Freight Intermodal & Intercity Passenger Station/Service
  - Mobility = Projected new daily volume*(1+ % NC population in catchment area)
- A logarithm is used to scale scores within the range

Data Sources

Data sources include railroads, private operators, market studies, ridership and revenue modeling, US Census Bureau, and GIS. The catchment areas for freight intermodal and transload facilities were determined based on available studies, private facility operators, and railroad information. The catchment area for passenger services and facilities was determined based on research of available information.

Criterion Percent Weight by Project Type and STI Category:

	Statewide	Regional	Division
Freight Track & Structures	**20%**	**15%**	**10%**
Freight Intermodal & Transload Facilities	N/A	N/A	**15%**
Intercity Passenger Track & Structures	N/A	**20%**	**15%**
Intercity Passenger Service (Regional & Division) Stations (Division only)	N/A	**20%**	**15%**

Connectivity (Rail)

Definition

Connectivity measures the value the project has to strategic transportation users and how it is enhanced by its modal connections. For freight rail, connectivity is based on the strategic facilities a railroad or facility serves directly or indirectly, including military, port, intermodal, and transload. Freight intermodal facilities also account for connectivity to major highways and the market area served (catchment areas are the same as the Mobility criterion). For passenger rail, connectivity is based on the strategic passenger facilities to which the station or service directly connects, including parking, intercity passenger rail, commuter rail, and bus transportation.

Formula

Scoring calculations vary depending on project type and purpose.

- Freight Track and Structures
  - Connectivity = Mobility score*(25% port + 25% intermodal + 25% transload + 25% military)
- Freight Intermodal and Transload
  - Connectivity = [Projected new daily volume*(25% port + 25% intermodal + 25% transload + 25% military)]*0.5 + [(Number of NHS facilities in catchment area/(1+ % NC population in catchment area)]*0.5
- Intercity Passenger Stations and Service
  - Connectivity = Ridership increase*(25% intercity + 25% parking + 25% commuter + 25% bus)

Data Sources

Data sources include railroads, private operators, market studies, ridership and revenue modeling, US Census Bureau, and GIS. The catchment areas for freight intermodal and transload facilities were determined based on available studies, private facility operators, and railroad information.

Criterion Percent Weight by Project Type and STI Category:

	Statewide	Regional	Division
Freight Track & Structures	**10%**	**5%**	**5%**
Freight Intermodal & Transload Facilities	N/A	N/A	**10%**
Intercity Passenger Track & Structures	N/A	N/A	N/A
Intercity Passenger Service (Regional & Division) Stations (Division only)	N/A	**10%**	**10%**