Review of TRAC Program Local Investment Factors

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16. Abstract

The Transportation Review Advisory Council (TRAC) program is the mechanism through which the Ohio Department of Transportation (ODOT) provides funding for Major New Capacity and other critical infrastructure projects within the state. As part of the evaluation process for TRAC funding consideration, the value of local infrastructure (roadways, utilities, and building construction) around project sites is calculated using local infrastructure cost factors. The objective of this research task was to review construction cost data and generate updated values for the TRAC program's local investment cost factors. Data from local infrastructure projects in Ohio and national average construction costs from R.S. Means data were utilized in the update. New cost factors reflecting construction costs for each of the five TRAC project regions as of January 2020 are presented for use in future project applications. A framework for classifying building construction costs using NAICS codes is also presented. Feedback from TRAC program stakeholders, as well as a review of the practices used by other State DOTs, yielded some suggested policy revisions for future consideration.

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PROBLEM STATEMENT

The Transportation Review Advisory Council (TRAC) program is the mechanism through which the Ohio Department of Transportation (ODOT) provides funding for Major New Capacity and other critical infrastructure projects within the state with an estimated project cost in excess of $12 million. The TRAC program is implemented by ODOT using an annual application cycle through which project sponsors, including ODOT, submit applications for funding. The ODOT Division of Planning, Office of Jobs & Commerce maintains primary responsibility for the day-to-day operations of the TRAC program and its application process. Applications are evaluated using 100-point scoring system to score applications according to transportation factors (55 points), economic performance factors (15 points), local investment factors (15 points) and the project's funding plan (15 points). The intent of the "local investment factors" evaluation component is to allow for local investments made by project sponsors to be represented in the process[1]. The current local investment factors were added to the TRAC scoring process in approximately 2015 based on consultant economic impact studies that were conducted in 2013 and 2014. Accordingly, it is critical for ODOT that both the TRAC's local investment factors policy and the dollar values used to "credit" project sponsors for local infrastructure are updated and reflect current state-of-practice for evaluating major new capacity investments.

RESEARCH BACKGROUND

Research Objectives and Tasks

This project was carried out as Task #1 under the ODOT Office of Statewide Planning and Research (SPR) program project "Division of Planning Research On-Call Services" (PID 111440; SJN 136125). Researchers from the Ohio Research Institute for Transportation and the Environment (ORITE) at Ohio University, with assistance from TransCon Ohio, Ltd., completed all Task #1 work. The goal of this task was to provide ODOT with updated data on local infrastructure construction costs and to provide recommendations on potential revisions to the TRAC's local investment criteria policy to ensure local investments are adequately captured in the process. The following objectives were pursued:

- Objective 1: Review available data on construction costs for local infrastructure and develop updates to the current "multipliers" used in the TRAC application process.
- Objective 2: Identify other strategies/approaches that could be used by the TRAC to include the extent of local infrastructure investments in the decision-making process.
- Objective 3: Recommend potential new strategies or improvements to current TRAC policy that could enhance how local infrastructure investments are captured in the process.

[1] Transportation Review Advisory Council (TRAC) Policies and Procedures; ODOT, May 2015

To accomplish the research objectives, the ORITE research team completed the following five tasks over a duration of six months:

- Task 1.1: Project Kickoff;
- Task 1.2: Construction Cost Review and Update;
- Task 1.3: Policy Review;
- Task 1.4: Draft and Revised Final Deliverables; and
- Task 1.5: Project Management.

Literature Review

The literature review for this task was limited to background research on the methods and processes used to establish the current local investment factors used by the TRAC program scoring process as well as the State DOT policy and practice review task. As noted previously, the local investment factors criteria were added to the TRAC policy in 2015. The policy allows for considerations of the local and private investments that have been committed for land use, infrastructure, and public utilities within one mile of the project area. Land use factors reflect the occupied and vacant square footage of certain non-residential land uses including heavy/light industrial, warehouse, commercial, and institutional. Local infrastructure that is examined includes local streets and transit service, while utilities that are considered include local water/sewer and electricity networks. These investments are monetized using "cost multipliers" reflecting the average construction costs for such infrastructure. The local investment factors criteria recognize that improvements to local infrastructure and the presence of various land uses within a project area contribute to the overall success of major investments and as such, these investments should be considered in the TRAC process. Two separate economic impact reports were supplied to the research team to aid in understanding the process that was used to arrive at the current factor values. These reports provided some clarity on the calculation procedures but also revealed some significant shortcomings in the inputs and procedures used to develop the current factors. Some of these shortcomings were addressed by the research team in the cost review and update task. Additional details of the State DOT policy and practice review are presented in the research findings section of this report.

RESEARCH APPROACH

The ORITE research team approached the research goals and objectives with three key activities, described as follows. Additional details of the research approach components are described in this section.

- Review and update of the TRAC Local Investment Factors values to reflect current construction costs for local infrastructure projects in Ohio;
- Outreach to various TRAC program stakeholders to obtain feedback and identify suggested modifications or updates to the local investment factors scoring; and
- Review of practices at other State DOTs related to the valuation of local infrastructure investments in statewide project prioritization.

The first component of the research approach was to review and update the TRAC Local Investment Factors to reflect current construction costs for local infrastructure projects in Ohio. As previously noted, the following types of local infrastructure are included in the valuation process: local roadways, local water main, local sanitary sewer, electric utility, and building construction. The procedures used by the ORITE research team to estimate the updated local investment factors are summarized as follows:

- Project/Unit Costs Data: For local roadway, water main, and sanitary sewer service, the ORITE team researched actual costs from local projects of these types in Ohio. Data sources included ODOT bid tabs, ODOT Jobs & Commerce projects, Ohio Public Works Commission (OPWC) projects, and additional research conducted by the team. Appropriate unit costs were derived based on the project-specific details available. Unit costs for electric utility service and building construction were sourced from data reported in R.S. Means.
- Infrastructure Extent: To reduce the burden on applicants, the TRAC scoring procedures permit the use of a cost value "per acre" if the exact extent of certain types of infrastructure is not known with certainty. To allow for this option to continue to be available, the ORITE research team examined the extent of local roadways, water main, sanitary sewer, and electric utility using various data sources and sketch-level calculations.
- Cost Multipliers: Because the ORITE research team utilized cost data from a variety of national, state, and local data sources, it was necessary to utilize regional cost multipliers to achieve a common geographic scope. Additionally, construction cost index data from ODOT and R.S. Means were used to factor all project costs to the January 2020 time period.
- Final Calculation: The recommended local investment factors consist of both the weighted average unit costs as well as the per-acre costs, which were calculated by multiplying the unit costs by the infrastructure extent. A second set of cost multipliers were then applied to all calculated values to account for cost variations among the five ODOT Jobs & Commerce project regions.

The research approach utilized by the ORITE team for this project improves upon the previous methods used to calculate the TRAC local investment factors in several ways. First, actual local infrastructure project cost data from Ohio were extensively researched and incorporated into the calculation procedures. Local project cost data sources included data internal to ODOT (e.g., Jobs & Commerce projects) as well as other state programs such as the OPWC. Second, data on actual private investment in building construction was utilized to develop building square footage investment factors for Basic/Manufacturing and Warehouse/Distribution building categories. These land uses are prevalent in Ohio, particularly adjacent to major highways where TRAC projects are generally located. Finally, the ORITE research team developed a land use classification framework relating the NAICS code of an establishment to one of the five building categories used in the TRAC scoring system. The names of the recommended building categories and the component land uses are slightly different than the current framework used by the TRAC, but the

relationship with the NAICS industry classification codes permits TRAC applicants to use readily-available establishment data to develop appropriate values for building square footage in proximity to project sites. Collectively, these improvements increase the credibility to the recommended local investment factors while also providing more clarity on the local investment valuation process. Full details of the research methods used to develop the updated construction cost values are presented in Appendix A of this report.

The second component of the ORITE team's research approach was outreach to TRAC program stakeholders. The objective of the stakeholder outreach task was for the research team to collect feedback from TRAC program stakeholders about the program and, in particular, the local infrastructure valuation and scoring aspects of the program. The ORITE research team engaged both ODOT personnel and local public agency (LPA) personnel as part of this process. The feedback mechanism consisted of primarily telephone conference meetings including the research team and stakeholder representatives. The discussion points in the meetings included TRAC program viewpoints, suggestions for policy improvements, and feedback on the local investments scoring aspect of the TRAC application process. In total, four ODOT personnel and three LPA representatives provided feedback. Additional LPAs were requested for interview, but no responses were provided. Additional details of the stakeholder outreach activities are presented in Appendix B of this report.

The third and final component of the ORITE team's research approach was a comprehensive review of policies and practices of other State DOTs with respect to the valuation of local assets in the project prioritization process. The objective of the State DOT policy review task was to research and summarize methods that are used by other State DOTs to prioritize major infrastructure investments with specific emphasis on the valuation of local roadway, utility, and building assets in the areas surrounding projects. The research team reviewed State DOT websites and research reports from various states as well as national research projects on relevant topics. The policies of the following 12 State DOTs were analyzed: Alabama, California, Delaware, Florida, Georgia, Indiana, Massachusetts, Minnesota, North Carolina, South Carolina, Vermont, and Virginia. Of these 12 states, the most useful information was gleaned from the experience of the Virginia DOT. Additional details of the State DOT policy review are presented in Appendix C of this report.

RESEARCH FINDINGS AND CONCLUSIONS

The key findings and conclusions from this research task are presented in this section. The recommended local infrastructure investment factors for use in TRAC application scoring are presented in Table 1 for each of the five ODOT Office of Jobs & Commerce project regions. The ODOT Districts that are assumed to correspond with each of the Jobs & Commerce project regions are also noted. In keeping with current TRAC practices, investment factors for two different units of infrastructure extent are provided for each group except for the building square footage component. The values presented in Table 1 are calculated for the start of year 2020 and are rounded to the nearest 10 cents for utility costs per length of installation and to the nearest whole dollar for all other figures (trailing zeroes are omitted in this case).

Table 1: Recommended Local Infrastructure Investment Factors

	Southeast	Southwest	Northeast	Northwest	Central
ODOT Districts	**9; 10**	**7; 8**	**3; 4; 11; 12**	**1; 2**	**5; 6**
Local Streets					
• Per Lane-Mile	$521,444	$584,683	$572,058	$479,941	$525,441
• Per Acre	$52,144	$58,468	$57,206	$47,994	$52,544
Local Water Main					
• Per Inch-Foot	$19.80	$19.90	$20.60	$19.50	$19.80
• Per Acre	$9,194	$9,226	$9,561	$9,036	$9,212
Local Sanitary Sewer					
• Per Inch-Foot	$17.70	$17.80	$18.40	$17.40	$17.80
• Per Acre	$8,910	$8,941	$9,265	$8,758	$8,928
Electric Utilities					
• Per Foot of Roadway	$93.70	$86.00	$91.80	$94.40	$91.50
• Per Acre	$24,737	$22,704	$24,235	$24,922	$24,165
Square Footage of Buildings					
• Basic Industry	$315	$289	$279	$292	$292
• Warehouse/Distribution	$95	$87	$84	$88	$88
• Service/Retail	$185	$170	$164	$172	$172
• Educational	$316	$290	$280	$293	$293
• Public Administration	$255	$234	$226	$237	$237
Source: Ohio Research Institute for Transportation and the Environment (ORITE) Analysis					

Comparing the recommended local investment factors presented in Table 1 with the current values used in the TRAC scoring process, several key differences are noted. The cost for local streets is approximately 30 percent higher on both a per-lane mile and per-acre basis. The unit costs for local water main and sanitary sewer services are also higher than current values but the per-acre costs are lower due to a more defensible estimate of the infrastructure extent per acre generated by the research team. The cost of local electric utilities is basically on the same magnitude as the current TRAC scoring values. Due to changes in the building type classification, the square footage construction costs cannot be directly compared but most recommended values are higher than current factors, as expected.

The stakeholder interviews yielded valuable feedback on key historic milestones and suggestions for policy revision concepts that could be considered by ODOT Jobs & Commerce and the TRAC advisory committee. Stakeholder feedback indicated a high level of satisfaction with the TRAC program in general and the local investment factors process in particular. No significant issues were identified by any stakeholders consulted and there was no knowledge of any agencies that did have serious concerns. Nevertheless, the outreach revealed two useful suggestions for policy revisions that could be considered by the TRAC for future updates. First, the scoring criteria could be modified or adjusted to provide an option for "shovel-ready" or "development-ready" sites that are vacant yet desirable for development. Second, the evolution of how local public transit services are provided, including the nearly ubiquitous coverage of ride-hailing services across the state, suggests that the public

transit coverage aspect of the TRAC evaluation may need to be updated or redefined to match the current state of transit service in Ohio.

The State DOT policy and practice review found that the ODOT TRAC program appears to be unique among State DOTs in the role and importance of local infrastructure in major project prioritization. Many State DOTs indicated that major project scoring does consider "compatibility with local land use plans" including the adopted plans of Metropolitan Planning Organizations (MPOs) as part of their prioritization. However, only one State DOT (Virginia) reported a comprehensive program that was similar to ODOT's in terms of the enumerated contribution of local development around major projects. VDOT's "SMART SCORE" prioritization system captures the extent of eligible non-residential developments within a certain distance of proposed projects with this factor representing 3 percent of the overall project-specific score. The "search radius" varies depending on the project type, with longer distances permitted for project types anticipated to have greater economic development impacts. Additional factors considered in the process include: the progress of the specific development (e.g., built out, approved site plan, approved zoned, etc.); vacant site that is "shovel-ready" per Virginia's economic development agency; access to sites relative to the proposed project; and other factors.

RECOMMENDATIONS FOR IMPLEMENTATION

Recommendations

Based on the findings and conclusions of this research task, the ORITE research team presents the following recommendations for consideration:

- Recommendation #1: The updated local investment factors summarized in Table 1 should be adopted by the TRAC to replace the current factors. The local investment factors reported in Table 1 reflect current costs for constructing various types of local infrastructure, expressed in January 2020 dollars, with appropriate multipliers applied to provide values for each of the five ODOT Jobs & Commerce project regions. The methods used by the research team to develop the recommended factors, as outlined in this report, reflect a more pragmatic approach incorporating actual construction costs and experiences from Ohio-based projects where possible.
- Recommendation #2: The proposed framework relating the building type categories with specific NAICS codes (see Table 7) should also be adopted. To accompany Recommendation #1, the proposed framework outlined in Table 7 should also be adopted. NAICS codes for business and institutional establishments located within close proximity to TRAC projects are readily accessible to applicants; the proposed framework eliminates ambiguity as to how a certain establishment type should be classified for the scoring process. Adopting this recommendation would also address feedback from some stakeholders that suggested the present classification did not adequately reflect actual development conditions in Ohio.
- Recommendation #3: ODOT should consider a revision to the TRAC local investment factors scoring process to account for "shovel-ready" vacant land.

The current TRAC scoring procedures do not include any options to prioritize projects near sites with vacant land that has been "certified" as "shovel-ready" by Jobs Ohio or other certification mechanisms. Although there is a scoring factor for vacant space within buildings, there is no provision for vacant land that may be desirable for development if appropriate infrastructure investments are put in place.

- Recommendation #4: TRAC staff should develop processes to collect local infrastructure cost data from readily-available sources. ODOT Jobs & Commerce staff already compile data about anticipated private investment for new building construction around the state. This information can be used to estimate per-square foot costs if project sizes are available. Additionally, TRAC staff should engage with OPWC staff to collect appropriate cost and quantity data for locally-funded infrastructure projects. Such data could be used to continue building a database of appropriate project costs for locally-funded infrastructure investments and private building construction.

The primarily limitation of this research is that the recommended local investment factors are estimated to a time period of January 2020 generally reflecting pre-COVID pandemic conditions. Even after one year of dealing with the COVID pandemic, it is unclear how the pandemic will influence construction costs in 2021 or the years to come. To update the local investment factors for future years, several cost index models are available for TRAC consideration. One model that is readily-available to the TRAC is the ODOT Chained-Fisher Construction Cost Index maintained by the ODOT Division of Construction Management, Office of Contract Sales & Estimating. Because this index is used by ODOT for long-range business planning, it is recommended that this cost index be used to update the TRAC local investment factors for future years as desired by the TRAC staff.

Implementation Plan

To implement the recommendations of this research task, the following plan is suggested. Recommendations #1 and #2 can easily be implemented with a formal change in the TRAC policies and procedures document. It should be noted that Recommendations #1 and #2 must be carried out together in order for the updated local investment factors to be properly utilized by project applicants. Implementing these two recommendations addresses the primary objective of the research task by introducing updated cost values in the TRAC scoring process. Carrying out Recommendation #3 could potentially be more complex as the vacant land provision would potentially replace one or more of the local investment factors or perhaps all development-related factors (utilities and square footage). The experience of the Virginia DOT SMART SCORE method may be instructive in this revision as some concepts are already in use by VDOT. Carrying out this recommendation would address stakeholder concerns about bias in the scoring process toward developed urban areas and potentially allow for more rural projects to have higher scoring. Implementation of Recommendation #4 requires some outreach and coordination between TRAC personnel and OPWC, but the data obtained will be valuable to building a "living" database of actual project costs for local projects.

APPENDIX A: CONSTRUCTION COST REVIEW AND UPDATE

Overview and Methods

The TRAC project scoring process monetizes the value of infrastructure that exists in the area surrounding the project site. The valuation of local infrastructure is intended to provide greater weight in the scoring process for areas that are developed or prepared for development. The following aspects of local infrastructure are considered in the current TRAC scoring process:

- Local Roadway Construction Costs (per Lane-Mile and per Acre);
- Local Water Main Construction Costs (per Inch-Foot and per Acre);
- Local Sanitary Sewer Construction Costs (per Inch-Foot and per Acre);
- Local Electric Service (per Foot-Road and per Acre); and
- Building Construction Costs (per Square Foot of various building types).

This Appendix describes the calculation procedures used by the ORITE research team to develop updated local infrastructure investment factors for the TRAC project scoring process. A description of the general procedures is as follows. To develop updated local infrastructure investment factors, the ORITE research team consulted national-level data (e.g., R.S. Means unit costs) and state-level data including historical bid tabulations and cost data from actual local projects. Procedures that were used to develop the current local investment multipliers were reviewed to determine applicability. These documents included the following:

- *Transportation Review Advisory Council (TRAC) Policies and Procedures*; Ohio Department of Transportation, May 2015
- *TRAC Economic Impact Study Outreach Results: New Economic Scoring Approach*; Economic Development Research Group, Inc., May 2014
- *Current Valuation of Existing Economic Assets Ohio TRAC Scoring Methodology White Paper*; Economic Development Research Group, Inc., April 2013

Some calculations described in this section follow closely with those procedures while others are modified, updated, and/or clarified as appropriate. Additionally, the extent of local infrastructure in several case study locations were examined to aid in per-acre cost estimates. Cost multipliers from the *R.S. Means Heavy Construction Costs* publication were used to adjust project-specific costs for both the year of the project and the location of the project within the State of Ohio[2]. Consequently, all project costs are reported as national average project costs for January 2020 time epoch. Next, an average construction cost value was calculated as the weighted average of all individual projects or components of a particular category. These weighted average costs were then translated to average costs corresponding to each of the five ODOT Jobs & Commerce regions for direct use in the TRAC local investment factors scoring process. The cost multipliers for different project years and project locations within Ohio are reported in Table 3. As noted later in this

[2] *Heavy Construction Costs with RS Means Data 2020*, 34th Annual Edition. Gordian Group, 2019.

section, a separate process was used to develop regional cost multipliers for local roadway construction costs using data available from ODOT.

Local Roadway Construction Costs

Local roadway construction costs are considered in terms of the costs per lane-mile and the costs per acre. It is the intention of the TRAC local investment multipliers to reflect "ground up" construction costs for these roadways, rather than costs for rehabilitation or reconstruction activities. The current local investment factor utilized by the TRAC for local roadway construction costs is sourced from the U.S. DOT Highway Economic Requirements for States (HERS-ST) model[3]. Replicating this method indicated a normal construction cost of $1,965,000 per lane mile for a rural major collector along new alignment in flat terrain (2012 dollars). Assuming the use of the National Highway Construction Cost Index (NHCCI) to convert to 2020 dollars, the per lane mile cost is equal to $2,456,250[4]. However, the current values for local roadway construction costs range from $394,400 to $412,888 per lane mile – substantially lower than what is implied by the methodology description reports.

As a result of this discrepancy, the ORITE research team decided to investigate a different approach for this local investment factor and use actual data from actual local roadway construction projects in Ohio. This approach was challenging because a vast majority of local road construction projects in Ohio are rehabilitation or reconstruction, rather than new construction. One area where new construction is taking place is roadways associated with new industrial and economic development projects in Ohio. For example, a local government may wish to construct a new roadway 1,500 feet in length to connect a new development site to a major State Highway or County Route. The ORITE research team reviewed construction costs for these types of roadways sourced from ODOT Office of Jobs & Commerce project information or third-party data sources. Construction costs per lane mile were summarized and factored to January 2020 dollar values using the ODOT Chained-Fisher Construction Cost Index, which is used by the Department to forecast construction costs for long-range business planning purposes[5]. It should be noted that the ODOT construction cost index method does not account for regional variations in roadway construction costs and therefore no adjustments were made to the project-specific unit cost to account for location within the State of Ohio.

The estimated local roadway construction costs per lane mile are summarized in Table 4. Considering all projects reported in Table 4, the weighted average construction cost is estimated to be $1,377,716 per lane mile. This value is much higher than the current value used for TRAC scoring but is lower than the January 2020 dollar value calculated from the HERS-ST/NHCCI method. It is likely that this value represents a higher end of local roadway construction costs, as it is based on roadways that are constructed for local industrial developments (assuming higher than average heavy truck traffic) while also including certain features such as curb and gutter, sidewalk, and lighting that may not be as extensive on a typical city street.

[3] https://www.fhwa.dot.gov/policy/2015cpr/appendixa.cfm
[4] https://www.fhwa.dot.gov/policy/otps/nhcci/
[5] https://www.dot.state.oh.us/Divisions/ConstructionMgt/Estimating/Pages/BART.aspx

To provide a sense of comparison for the recommended value, the research team assembled a sketch-level cost estimate for a one-mile section of two-lane highway that would be typically encountered in a rural county environment. Unit costs for the typical highway estimate were obtained from a review of bid tabulations available from ODOT for all projects bid during calendar year 2019, assuming statewide average unit costs for different work items with no factoring to account for the time of the bid during the year or the location of the project. Certain lump sum items utilized assumed values as award bid prices can vary substantially for mobilization, site clearing, maintenance of traffic, and construction layout. Details of the typical highway cost estimate are presented in Table 5; the unit cost applicable to the TRAC scoring process is calculated to be $541,600 per lane mile. As a conservative estimate of the contribution of local highways in the TRAC scoring process, it is recommended that the lower value of $541,600 per lane mile be adopted.

Having established a current and defensible estimate of the per lane mile costs associated with local highway construction applicable to Ohio projects, the remaining tasks for this specific local investment factor were to establish the per-acre costs and to determine corresponding local investment factors for the five ODOT Jobs & Commerce project regions. The per-acre construction costs were estimated by first calculating the extent of roadway lane-miles per acre and multiplying this value by the per lane mile cost. The current TRAC local investment factors have an implied value of approximately 0.082 lane-miles per acre. The ORITE research team examined all available data from the ODOT TIMS system as well as a simulation of the lane-miles per acre based on different configurations of intersecting lanes. For example, the intersection of two two-lane roads with the center of the intersection at the precise center of a square one acre in area yields an implied extent of 0.079 lane-miles per acre while a single four-lane roadway in one acre of area has an implied extent of 0.158 lane-miles per acre. To simplify the subsequent calculations and to err on the side of a more conservative estimate, the ORITE research team determined that an assumed extent of 0.1 lane-miles per acre could be sufficient for the updated TRAC local investment factors. The average construction costs per lane mile are then multiplied by the assumed per-acre extent of highway lane miles to calculate the per-acre cost of local highway construction.

To account for regional variations, the ORITE research team devised an Ohio-specific regional cost multiplier using the process described as follows. As previously noted, the ODOT construction cost index does not incorporate regional variations for the purposes of long-range business planning. However, it is noted that around 30 percent of the ODOT construction cost index is weighted toward bid items that are associated with asphalt. Thus, comparing average awarded unit prices for asphalt-related work items (Items 301, 441, and 442) across the five ODOT Jobs & Commerce project regions is a suitable method to use for devising regional cost multipliers. Bid tabulations for the years 2016 through 2019 for all ODOT-let projects were analyzed and factored to current year (Q1 2020) dollars using the asphalt component of the ODOT construction cost index. The average award unit prices and the corresponding regional cost multiplier (calculated by dividing the regional average unit price by the statewide average unit price) are reported in Table 6. These regional cost multipliers

are then multiplied by the statewide average construction costs per lane mile and per-acre to estimate the appropriate investment factors for local highway construction that are reported in Table 2.

Local Utilities Construction Costs

Local utilities considered in the TRAC local investment factors scoring framework include local water main and local sanitary sewer services. Cost factors for local utilities are reported in terms of cost per inch-foot of utility pipe and per acre of project area served by the utilities. An inch-foot of utility pipe is equal to one foot of pipe length with a diameter of one inch. As an example, a four-inch diameter pipe with a length of 1,000 feet would be calculated as 4,000 inch-feet. To determine the cost of utility installation on a per inch-foot basis, the ORITE research team identified local project construction costs from the following sources:

- Ohio Public Works Commission (OPWC) funded projects (Round 32 and 33);
- Projects funded by ODOT Jobs & Commerce funding programs; and
- Additional projects as identified by the ORITE team.

OPWC projects were included in this analysis only if sufficient information was contained in the publicly available project agreement documents to permit a calculation of the inch-feet of pipe being installed. The analyzed projects consisted of various common pipe materials (e.g., copper, DIP, PVC, HDPE) but there were no specific calculation steps taken to account for varying materials (some projects did not specify pipe material). Additionally, it should be noted that all projects analyzed included a variety of complementary work items (e.g., pump stations, fire hydrants, minor paving, residential connections) that would be expected for any water line or sanitary sewer project. A total of 44 local water main and 37 local sanitary sewer projects were included in the final data set. A chart displaying the average project cost compared with the pipe quantity for both water main and sanitary sewer projects is shown in Figure 1. Based on the data analyzed, the construction costs were estimated to be $21.18 per inch-foot for local water main projects and $19.09 per inch-foot for local sanitary sewer projects. Using these national averages, per-inch-foot cost averages were calculated using the "Utilities" cost multipliers for each of the five ODOT Jobs & Commerce regions; the results are presented in Table 2.

The second aspect of the local water main and local sanitary sewer local investment factors is the construction costs per acre for these projects. Some TRAC project applicants may wish to use an estimate of the service area coverage for these utilities in lieu of having precise data on the size and length of water and sanitary pipes in the project radius. The current TRAC local investment multipliers imply a per-acre extent of 1,877 inch-feet per acre of local water main and 1,624 inch-feet per acre of local sanitary sewer coverage. Details on how these figures were determined were not provided in the previous TRAC studies. To validate these figures, the ORITE research team examined GIS-based utility data sets from the Ohio communities of Heath and Marysville. Based on the average coverage of each type of utility, the extent of local water main was approximately 465 inch-feet per acre and the extent of local sanitary sewer was approximately 500 inch-feet per acre. These

values were then multiplied by the per-inch-foot cost values to determine the per-acre cost for providing these utility services. Based on these values, the per-acre construction cost averages were calculated using the "Utilities" cost multipliers for each of the five ODOT Jobs & Commerce regions; the results are presented in Table 2.

Electric Utility Construction Costs

The TRAC local infrastructure investments scoring process also considers the value of the extent of local electric utility services in the area surrounding TRAC projects. Local electric utility services are valued in terms of construction costs per mile and construction costs per acre served by electric utilities. As with the water main and sanitary sewer components, updating the local infrastructure investment factors for project area electric utility service required both a unit cost estimate and an estimate of the per-acre extent of coverage.

The cost of local electric utility service was estimated using two different scenarios. The first scenario assumed a typical residential-style development with an appropriately sized underground conduit and wire of commensurate voltage, generating an estimate of approximately $100 per linear foot. It is further assumed that residential electric utility service would be provided at approximately the same length as the local roadway. Following the same calculations as the extent of local roadway infrastructure (0.1 lane-miles per acre), it is assumed that this is equal to 0.05 centerline miles or 264 feet of roadway per acre (assumed average of two highway lanes). Combining the linear foot cost estimate with the assumed roadway footage per acre yields an estimated cost of $26,400 per acre.

The second scenario analyzed data on the extent of electric utility service at an industrial park located in Licking County which was assumed to be typical for conditions in Ohio. From this information, the ORITE research team estimated that there was approximately 13,000 feet of 34.5 kV transmission line and 12,725 feet of 69 kV distribution line servicing the 450-acre facility. A sketch-level cost estimate for this infrastructure was developed assuming a buried conduit of appropriate size for industrial development and corresponding wire to provide the service needed at the park. The total construction cost for this utility service was estimated to be $11,982,840 (2020 dollars) or approximately $26,630 per acre. This result was consistent with the first scenario analyzed and therefore confirmed the application of the per-acre costs across various TRAC project contexts. As a conservative estimate of the value of local electric utility service, the lower value of construction costs of $26,400 per acre and $100 per linear feet of roadway served by electric is recommended. Based on these two values, the per-foot and per-acre construction cost averages were calculated using the "Electric" cost multipliers for each of the five ODOT Jobs & Commerce regions; the results are presented in Table 2.

Building Construction Costs

The objective of the building construction costs local investment factor is to establish a valuation for the non-residential buildings and structures in proximity to TRAC project sites. Cost factors for project area buildings are reported in terms of dollars of construction cost per square foot of building. Five categories of building

types are established in the current scoring framework, as follows: Light Industrial, Heavy Industrial, Warehouses, Commercial, and Institutional Buildings. Reviewing the methods that were used to establish the current local infrastructure investment multipliers for building square footage, the ORITE research team identified several concerns to address as part of this update project. First, changes in the availability of square foot cost data for certain land uses between the time when the present building construction costs data were determined (using 2014 R.S. Means data) and the present (2020 data set) resulted in some significant changes in the investment factors for certain land use categories. For example, data for a component of the Heavy Industrial category, Power Plants, were no longer provided in the 2020 data set. In 2014, the Power Plants land use component was valued at $1,150 per square foot; as a result, the Heavy Industrial average construction cost would decrease from $483 to $104 per square foot if the previous framework were used directly. Second, data on large warehouse, distribution center, and fulfillment center type facilities were not provided in the 2020 R.S. Means data set. One data point, Warehouse, reported a median project size within the data set of 10,400 square feet; warehouse and distribution facilities within Ohio are typically at least 10 to 20 times that size. Such large facilities are common across Ohio, particularly in locations where TRAC projects are being considered. The final limitation identified by the ORITE research team was that there was no clear relationship between what specific on-site activities or businesses should be included in which building category.

The ORITE research team invested a significant amount of time in overcoming these issues and improving the building construction cost local investment factors. Addressing the final limitation noted above first, the ORITE research team established a five-category framework relating the North American Industrial Classification System (NAICS) code of the establishment to a specific building category. A similar framework was used by Sperry, et al.[6] to analyze trip attractions and travel demand modeling for business establishments in Texas. A list of the suggested NAICS codes and corresponding industry group that are assigned to each building category is reported in Table 7. The five building categories suggested are as follows:

- Basic Industry/Manufacturing
- Warehouse/Distribution/Fulfillment Centers
- Service/Retail
- Educational
- Public Administration

Building construction cost data for the latter three building categories were drawn exclusively from R.S. Means square foot costs data. R.S. Means data included median square foot construction costs for 28 distinct land uses, which were distributed as follows: Service/Retail, 15 component land uses; Educational and

[6] Sperry, B.R., B.T. Chigoy, L.K. Green, and E. Hard. Development of Improved Trip Attraction Rates for Small and Medium-Sized Travel Demand Models. *Transportation Research Record* 2568, 2016.

Public Administration, 5 component land uses each; and the remaining 3 land uses assigned to Basic Industry or Warehousing.

To compensate for the lack of building square foot cost data in the Basic Industry and Warehousing categories, the ORITE research team solicited information about costs for recent construction projects of these types in Ohio. Data from the ODOT Office of Jobs & Commerce were particularly helpful for this task. In addition to its work coordinating the TRAC program the ODOT Office of Jobs & Commerce is assigned responsibility for providing infrastructure funding support for new developments with significant economic impact. Data collected by ODOT for this work includes total private capital investment, building sizes, and the type of industry that is investing. Supplemental research by the ORITE team was also utilized in this task to provide additional data points for new developments where ODOT Jobs & Commerce was not involved. This effort yielded construction cost data for 14 basic industry/manufacturing projects and 16 warehouse/distribution center projects, a majority of which were provided by ODOT Jobs & Commerce. The resulting data set provided important insight and yielded a clear stratification of the NAICS codes between the two building categories. The national weighted average construction costs for each building category (year 2020 costs) are as follows:

- Basic Industry/Manufacturing, $315 per square foot (see Table 8);
- Warehouse/Distribution/Fulfillment Centers, $95 per square foot (Table 9);
- Service/Retail, $185, per square foot (Table 10);
- Educational, $316 per square foot (Table 11); and
- Public Administration, $255 per square foot (Table 12).

Details of the Ohio-based projects and the component land uses contributing to each building category are reported in the tables noted in the list above. Using these national averages, averages were calculated using the “Weighted Average” cost multipliers for each of the five ODOT Jobs & Commerce regions; the results are presented in Table 2.

Summary

Table 2 presents the recommended local infrastructure investment factors that were calculated using the procedures described in this Appendix. This table is replicated in Table 1 in the main body of this report. The values presented in Table 2 are calculated for the start of year 2020 and are rounded to the nearest 10 cents for utility costs per length of installation and to the nearest whole dollar for all other figures (trailing zeroes are omitted in this case). Additional data tables supporting these calculations are presented in the Appendix A Data Tables section that immediately follows this section. Some numbers may vary slightly due to the rounding previously mentioned.

Table 2: Recommended Local Infrastructure Investment Factors

	Southeast	Southwest	Northeast	Northwest	Central
ODOT Districts	**9; 10**	**7; 8**	**3; 4; 11; 12**	**1; 2**	**5; 6**
Local Streets					
• Per Lane-Mile	$521,444	$584,683	$572,058	$479,941	$525,441
• Per Acre	$52,144	$58,468	$57,206	$47,994	$52,544
Local Water Main					
• Per Inch-Foot	$19.80	$19.90	$20.60	$19.50	$19.80
• Per Acre	$9,194	$9,226	$9,561	$9,036	$9,212
Local Sanitary Sewer					
• Per Inch-Foot	$17.70	$17.80	$18.40	$17.40	$17.80
• Per Acre	$8,910	$8,941	$9,265	$8,758	$8,928
Electric Utilities					
• Per Foot of Roadway	$93.70	$86.00	$91.80	$94.40	$91.50
• Per Acre	$24,737	$22,704	$24,235	$24,922	$24,165
Square Footage of Buildings					
• Basic Industry	$315	$289	$279	$292	$292
• Warehouse/Distribution	$95	$87	$84	$88	$88
• Service/Retail	$185	$170	$164	$172	$172
• Educational	$316	$290	$280	$293	$293
• Public Administration	$255	$234	$226	$237	$237
Source: Ohio Research Institute for Transportation and the Environment (ORITE) Analysis					

Appendix A Data Tables

Cost Multipliers

Table 3: Construction Cost Multipliers Utilized in Investment Factor Calculations

County	ODOT District	ODOT Region	City	ZIP Prefix	Weighted Average	Multiplier Utilities	Multiplier Electric
Summit	4	Northeast	Akron	442-443	0.938	0.948	0.904
Athens	10	Southeast	Athens	457	0.919	0.921	0.939
Stark	4	Northeast	Canton	446-447	0.909	0.947	0.915
Ross	9	Southeast	Chillicothe	456	0.918	0.946	0.935
Hamilton	8	Southwest	Cincinnati	451-452	0.893	0.957	0.854
Cuyahoga	12	Northeast	Cleveland	441	0.959	0.958	0.955
Franklin	6	Central	Columbus	430-432	0.914	0.953	0.902
Montgomery	7	Southwest	Dayton	453-454	0.882	0.929	0.854
Butler	8	Southwest	Hamilton	450	0.883	0.931	0.855
Allen	1	Northwest	Lima	458	0.907	0.899	0.871
Lorain	3	Northeast	Lorain	440	0.926	0.947	0.882
Richland	3	Northeast	Mansfield	448-449	0.913	0.933	0.933
Marion	3	Central	Marion	433	0.911	0.922	0.924
Clark	7	Southwest	Springfield	455	0.884	0.930	0.877
Jefferson	11	Northeast	Steubenville	439	0.935	1.116	0.974
Lucas	2	Northwest	Toledo	434-436	0.949	0.936	1.017
Mahoning	4	Northeast	Youngstown	444-445	0.916	0.946	0.863
Muskingum	5	Central	Zanesville	437-438	0.910	0.931	0.920
				Southeast	**0.9185**	**0.9335**	**0.9370**
				Southwest	**0.8855**	**0.9368**	**0.8600**
				Northeast	**0.9280**	**0.9707**	**0.9180**
				Northwest	**0.9280**	**0.9175**	**0.9440**
				Central	**0.9117**	**0.9353**	**0.9153**

Source: R.S. Means *Heavy Construction Costs with RS Means Data 2020 Edition*

Construction Cost Data – Local Roadways

Table 4: Summary of Construction Cost Data – Industrial Development Roads

Roadway Location	Cost per Lane-Mile (2020)	Roadway Length (Lane-Miles)	Data Source
Licking County	$1,086,615	2.180	ORITE Research
Franklin/Licking County	$1,809,023	1.810	ORITE Research
Licking County	$1,262,311	1.382	ORITE Research
Ashland County	$1,166,730	1.023	ODOT J&C
Hancock County	$1,839,906	0.852	ODOT J&C
Mercer County	$974,295	0.568	ODOT J&C
Hancock County	$714,721	0.473	ODOT J&C
Wood County	$2,208,957	0.455	ODOT J&C
Weighted Average (Ohio)	**$1,377,716**		

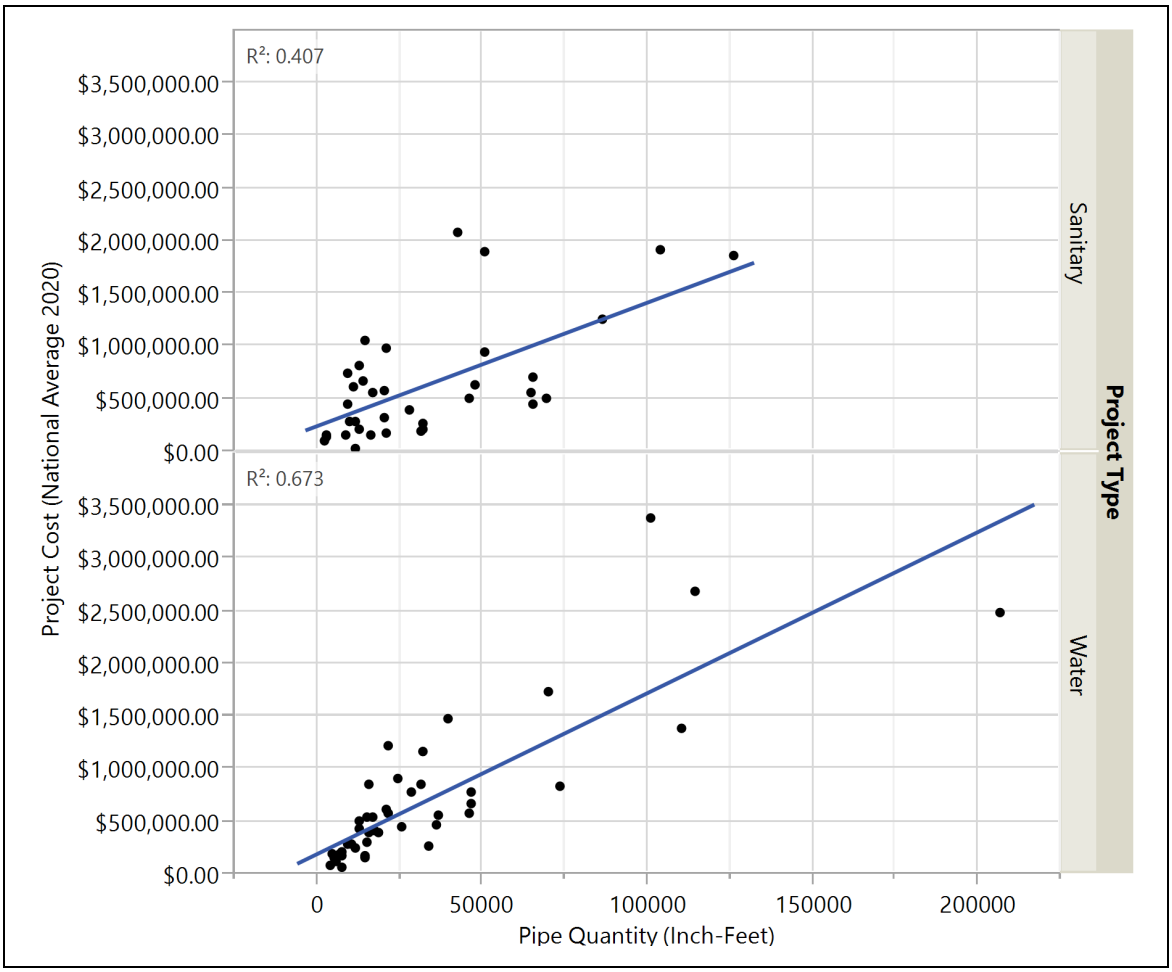
Table 5: Construction Cost Estimate for Typical Two-Lane County Highway

Cost Item Description	Assumed Quantity	Assumed Unit Cost	Cost Extension
Clearing and Grubbing	1 lump sum	$10,000.00	$ 10,000.00
Excavation	792 CY	$30.00	$ 23,760.00
Subgrade Compaction	14,080 SY	$3.40	$ 47,872.00
Seeding and Mulching	11,733.33 SY	$4.50	$ 52,800.00
AC Base (4 inches)	1,564.44 CY	$283.00	$ 442,797.78
Aggregate Base (6 inches)	2,346.67 CY	$86.00	$ 201,813.33
AC Surface (2 inches)	782.22 CY	$331.00	$ 258,915.56
Edge Line	2 miles	$4,150.00	$ 8,300.00
Center Line	1 mile	$7,000.00	$ 7,000.00
Maintenance of Traffic	1 lump sum	$5,000.00	$ 5,000.00
Construction Layout	1 lump sum	$15,000.00	$ 15,000.00
Mobilization	1 lump sum	$10,000.00	$ 10,000.00
Total Cost Estimate			**$1,083,258.67**
Assumes a roadway dimension 5,280 feet length and 24 feet wide.			
Source: Ohio Research Institute for Transportation and the Environment (ORITE) Analysis			

Table 6: Development of Regional Cost Multipliers for Local Roadway Costs

	Southeast	Southwest	Northeast	Northwest	Central
Regional Average Bid Price Statewide Average = $291.27 per CY (Items 301, 441, and 442 Only)	$280.43	$314.44	$307.65	$258.11	$282.58
Implied Cost Multiplier Statewide Average = 1.0000	0.9628	1.0795	1.0562	0.8862	0.9702
Source: Ohio Research Institute for Transportation and the Environment (ORITE) Analysis					

Construction Cost Data – Local Water Main and Sanitary Sewer



Source: ORITE research team analysis of OPWC, ODOT J&C, and Other data sources.

Figure 1: Comparison of Project Cost and Pipe Quantity

Building Category and NAICS Codes

Table 7: Suggested NAICS Codes by Building Category

Building Category	NAICS Code	Industry Group
Basic Industry/ Manufacturing	11	Agriculture, Forestry, Fishing and Hunting
	21	Mining, Quarrying, and Oil and Gas Extraction
	22	Utilities
	23	Construction
	31–33	Manufacturing
	5182	Data Processing, Hosting, and Related Services
Warehouse/ Distribution Center	42	Wholesale Trade
	48–49	Transportation and Warehousing (except 491)
Service/Retail	44–45	Retail
	491	Post Offices
	51	Information (except 5182)
	52	Finance and Insurance
	53	Real Estate and Rental and Leasing
	54	Professional, Scientific, and Technical Services
	55	Management of Companies and Enterprises
	56	Administrative, Support, Waste Management
	6114–6116	Business, Technical Trade, and Other Schools
	6117	Educational Support Services
	62	Health Care and Social Assistance
	71	Arts, Entertainment, and Recreation
	72	Accommodations and Food Services
	81	Other Services (except Public Administration)
Educational	6111	Elementary and Secondary Schools
	6112–6113	Jr. Colleges, Colleges, Universities, and Professional Schools
Public Administration	92	Public Administration

Construction Cost Data – Basic/Manufacturing; Warehouse/DC

Table 8: Summary of Construction Cost Data – Basic/Manufacturing

Land Use/Facility Description	Cost per S.F. (2020)	Building Size (Square Feet)	Data Source
Toilet Paper Manufacturing	$278.45	1,408,000	ODOT J&C
Pet Food Manufacturing	$513.25	1,200,000	ODOT J&C
Recreational Vehicle Assembly	$80.76	723,000	ODOT J&C
Corrugated Paper Manufacturing	$438.44	704,000	ODOT J&C
Auto Systems Manufacturing	$200.45	375,000	ODOT J&C
Corrugated Paper Manufacturing	$232.97	350,000	ORITE Research
Metal Products Manufacturing	$282.16	250,000	ODOT J&C
Food Service Manufacturing	$168.93	193,000	ODOT J&C
Textile Manufacturing	$440.06	168,000	ODOT J&C
Auto Seat Manufacturing	$450.71	150,000	ORITE Research
Office/R&D/Light Assembly	$190.43	150,000	ODOT J&C
QC Lab and Data Center	$369.56	140,000	ODOT J&C
Personal Care Manufacturing	$75.34	70,000	ODOT J&C
Light Manufacturing	$244.44	50,000	ODOT J&C
General Industrial Buildings	$104.00	22,100	R.S. Means
Data Centers	$281.00	14,400	R.S. Means
Weighted Average (National)	**$315.13**		

Table 9: Summary of Construction Cost Data – Warehouse/Distribution

Land Use/Facility Description	Cost per S.F. (2020)	Building Size (Square Feet)	Data Source
Logistics/DC/Fulfillment	$42.15	5,000,000	ODOT J&C
Consumer Products DC	$66.15	1,800,000	ORITE Research
General Warehouse Shell Only	$27.80	1,232,112	ORITE Research
Retail Distribution Center	$122.28	1,200,000	ODOT J&C
Fulfillment Center	$205.95	855,000	ODOT J&C
HQ/Distribution Center	$62.66	750,000	ODOT J&C
Food Distribution Center	$73.91	740,000	ODOT J&C
Fulfillment Center	$392.23	700,000	ODOT J&C
Fulfillment Center	$161.68	650,000	ODOT J&C
Manufacturing/DC Automotive	$75.71	570,000	ODOT J&C
Wholesale Distributor	$38.60	500,000	ORITE Research
Grocery Supply Chain/Distribution	$381.19	405,000	ODOT J&C
Distribution Center	$67.23	400,000	ODOT J&C
Sports Gear Manufacturing	$79.64	347,200	ODOT J&C
Wholesale Distributor	$117.70	150,000	ODOT J&C
Auto Supply Chain/Distribution	$106.20	100,000	ODOT J&C
General Warehouse	$125.00	10,400	R.S. Means
Weighted Average (National)	**$95.34**		

Construction Cost Data – Service/Retail; Educational; Institutional

Table 10: Summary of Construction Cost Data – Service/Retail

Land Use/Facility Description	Cost per S.F. (2020)	Building Size (Square Feet)	Data Source
Automotive Sales	$186.00	24,900	R.S. Means
Banks	$299.00	9,300	R.S. Means
Gymnasium	$204.00	52,400	R.S. Means
Hospital	$375.00	87,100	R.S. Means
Medical Clinic	$217.00	20,900	R.S. Means
Mixed Use	$216.00	28,500	R.S. Means
Apartments Low Rise	$208.00	49,900	R.S. Means
Nursing Home	$160.00	38,200	R.S. Means
Offices Low Rise	$200.00	20,500	R.S. Means
Parking Garage	$47.00	151,800	R.S. Means
Parking Garage w/ Mixed Use	$175.00	254,200	R.S. Means
Community Center	$253.00	21,000	R.S. Means
Recreational	$281.00	28,800	R.S. Means
Restaurants	$305.00	6,000	R.S. Means
Retail Stores	$114.00	28,700	R.S. Means
Weighted Average (National)	**$185.08**		

Table 11: Summary of Construction Cost Data – Educational

Land Use/Facility Description	Cost per S.F. (2020)	Building Size (Square Feet)	Data Source
Schools (Senior High)	$227.00	70,600	R.S. Means
University (Administration)	$284.00	48,300	R.S. Means
University (Dorm Low Rise)	$227.00	28,900	R.S. Means
University (Labs)	$315.00	39,800	R.S. Means
University (Unions)	$530.00	48,700	R.S. Means
Weighted Average (National)	**$315.92**		

Table 12: Summary of Construction Cost Data – Institutional

Land Use/Facility Description	Cost per S.F. (2020)	Building Size (Square Feet)	Data Source
Court House	$284.00	47,600	R.S. Means
Jail	$315.00	37,800	R.S. Means
Fire Station	$238.00	13,100	R.S. Means
Police Station	$267.00	28,500	R.S. Means
Police/Fire Combined	$171.00	44,300	R.S. Means
Weighted Average (National)	**$255.27**		

APPENDIX B: STAKEHOLDER OUTREACH

Purpose and Objectives

The objective of the stakeholder outreach task was for the ORITE research team to collect feedback from TRAC program stakeholders about the program and in particular the local infrastructure valuation and scoring aspects of the program. The ORITE research team engaged four ODOT personnel of various job types and three local public agency (LPA) personnel representative as part of this process. Additional LPA personnel were requested for interview, but no responses were provided.

Summary of Stakeholder Outreach

A summary of the stakeholder outreach is presented in this section. The stakeholder interviews yielded valuable feedback on key historic milestones and suggestions for policy revision concepts that could be considered by ODOT Jobs & Commerce and the TRAC advisory committee. The stakeholder feedback that could be considered for TRAC policy changes are summarized as follows:

- Some stakeholders expressed concerns about perceived bias in the current scoring system toward urban or built-out areas. One potential option to address this concern would be to incorporate a "shovel-ready site" criterion as an option in the scoring system to account for vacant, yet desirable sites.
- Stakeholders expressed some concerns about the applicability of the five existing land use categories to the current development patterns in Ohio. To some extent this concern has been addressed with the recommended building categories described in Appendix A (Table 7).
- One interesting note from the stakeholder outreach was related to the transit service aspect of TRAC local investment factors scoring. The emergence of flexible or on-demand transit services, as well as ride-hailing services of all types, allow for some type of transit access to virtually anywhere in the state. Future TRAC policy revisions should examine if this factor should still be retained or if a new transit policy should be defined.

Details of Stakeholder Outreach

Key Historic Milestones

Stakeholder feedback related to key historic milestones of the TRAC program are summarized below.

- In 2000, ODOT included up to 135 "bonus points" (keeping in mind that the max attainable score is 100 w/o bonus points.)
- TRAC process got a re-boot in 2010. Policy was created in 2010 with discussion of containing sprawl in lieu of encouraging "build it and they will come" issue.
- Mid 1990s TRAC developed transportation factors.
- Different source but repeat from above: 2007 TRAC encouraged policies to curb urban sprawl. The message to local governments for TRAC funding

applications was "pay as you grow," rather than TRAC contributions to local governments that would stimulate growth in rural outlying areas. (Presumably meaning that the TRAC would not reward speculative investment that encourage sprawl.)

- At one point there was a "Level the TRAC" or "Mini-TRAC" program about 10 years ago. This was geared for low-cost projects, under $10M. At the same time, the safety program was (and still is) unofficially limited to around $5M. The mini-TRAC was aimed at closing the gap between the two programs.

Potential Policy Suggestions/Revisions

Stakeholder ideas for TRAC policy revisions are summarized in this section.

- Emphasis on the project scoring system has gotten "out of control" and that it should rather be used as a tool for deliberation. The deliberative body should ultimately rely on other non-numeric tangibles to decide.
- TRAC scoring system is a black box to local governments and that a more simplistic scoring system is needed.
- The local investment factor (maybe unfairly) redundantly captures the transportation factors with a bias to densely populated areas (i.e., these projects serve an already built out area).
- The advantage of greenfields that are "site-ready" with electric, water and sewer need to be captured in the scoring system. There needs to be "some demonstration of readiness." The Jobs Ohio site certification process as one such tool that could be used for this purpose, but others are available.
- A job is not a job. A job at the Boeing plant at HNLCPA is not the same as an Amazon job pay wise.
- (Our Community) does have transit, although not in the traditional sense that is measured (buses, rail.) Through the County transit agency, Uber and Lyft have been made available that should qualify in the scoring system as a transit option. (maybe even through a subsidy so really should be considered).
- Economic distress criteria should be replaced with "scale of impact" criteria. It was pointed out that 9,000 jobs lost in one of the "3-Cs" is the same scale as 900 jobs lost in a small city. Furthermore, big cities are built out, rural areas have room to grow. The recent success of "spec" buildings demonstrates that the market is looking for space and work force in lower-taxed areas.
- Medical, logistics and manufacturers are the big drivers of economic development in Ohio, at least in eyes of politicians. Should be considered as primary economic development categories.
- The scoring system may be dated. It currently uses commercial, warehouse and industrial, but Ohio is currently seeing a lot of data centers being built. Mentioned that a data center recently constructed, and they are self-reliant, they have no secondary employment. Can scoring system capture this?

- Should local projects be placed in their own TRAC scoring system, separated from the state projects?
- The current scoring criteria includes: 1) Percent local funds in phase requested; 2) Total local contribution as percent of all phases; and 3) No. of non-ODOT funding sources. All this together only accounts for a total max of 3% additional points, yet it speaks much louder than a support letter. The amount of funds and number of local community contributors demonstrates local commitment more than anything and the scoring should reflect this.
- As it is, the local investment factor and funding commitments all favor big cities over small LPA's.
- Suggestion to study which agencies are applying and winning, and wondered if local public agencies are getting an adequate seat at the TRAC funding table
- The 2010 policy of containing sprawl is counter to one interviewee's perspective that these investments add value to developable sites, and that most new manufacturing sites are in rural, undeveloped areas.
- When asked about any known complaints, a local community asked to be coached on how they could maximize their score in the local government categories; however, no specific complaints or concerns were voiced.
- The current system is fair but acknowledged that it may not adequately capture a region's strengths and needs. Suggested that maybe a scoring component could be borrowed from Jobs Ohio or Jobs & Commerce "ready site" criteria. If the scoring system would be modified to use this as an alternate scoring method, then maybe 20 or 30 points from the local scoring categories could be left on the table for this purpose.
- Should local projects be placed in their own TRAC scoring system, separated from the state projects (Bracket B)? Later follow up: There may already be a Bracket B being accomplished through the MPOs (such as the MORPC attributable funds program.) However, it was acknowledged that this leaves out areas that do not have an MPO.
- Maybe there is a way to give local governments direct credit for matching funds such as with the credit bridge program (In this program, local governments are enabled to monetize their previous local investments by using their value as local match to federal funds).
- Local governments need to be more creative in valuing their contribution. Example given where recently a local community sponsored a local road improvement project that enhanced the candidate TRAC project and was able to use the entire costs as a contribution.

APPENDIX C: STATE DOT POLICY REVIEW

Summary and Key Findings

The objective of the State DOT policy review task was to research and summarize methods that are used by other State DOTs to prioritize major infrastructure investments with specific emphasis on the valuation of local roadway, utility, and building assets in the areas surrounding projects. This review examined policies of the following 12 State DOTs: Alabama, California, Delaware, Florida, Georgia, Indiana, Massachusetts, Minnesota, North Carolina, South Carolina, Vermont, and Virginia. The policy review indicated that each state has its own transportation maintenance/construction/improvement program, and each is run differently with its own method of project prioritization based on local needs and organizational or governmental structures. Methods share similarity with TRAC in that a scoring criteria system is used to establish a priority ranking of projects under consideration. The scoring criteria within each state's system share some common elements related to traffic, safety, and project cost but also reflect each state's unique needs and priorities. Scoring approaches have some common elements, such as metrics to capture traffic-related factors, project costs, and safety aspects. Many prioritization methods also incorporate factors related to environmental resources and economic development. The unique needs and circumstances of the different state DOTs and their priorities are also reflected in the scoring frameworks. The structure of the scoring approach may vary, sometimes based on ranking projects, sometimes based on some quantitative measure (e.g., AADT), sometimes based on an index derived from an adopted classification scheme. These can be combined in multiple ways in very elaborate approaches, such as in California; involve software, as in Florida; or be subjected to an iterative process to adjust for additional parameters such as ensuring a widespread distribution of projects across the state or having sufficient resources available to run all projects that year, as in Indiana. In addition, the scoring and ranking approach may vary with the type of project involved; Massachusetts uses four approaches on six different types of projects, for example.

Pertaining to the valuation of local infrastructure investments and capturing those values within the project prioritization methods, the ODOT TRAC program appears to be unique among State DOTs in its approach. Nearly every state examined considered land use activities surrounding project locations in some manner. In many cases, a decision factor of "coordination with local land use plans" or similar measure permitted this consideration to be included in the final prioritization. However, in terms of incorporating the extent or value of local infrastructure formally into the scoring process, the most comparable state to the ODOT TRAC program method is the method used in Virginia. Virginia's method considers the following criteria in identifying buildings to be used for the scoring process:

- Buffer zone is based on the project "Tier" with more impactful projects having a larger radius for inclusion of sites that are counted in the scoring;
- Development progress (e.g., approved site plan or zoning approved);

- Site status as a redevelopment site or "shovel-ready" site based on Virginia's economic development agency criteria; and
- Numerical adjustments to account for economic distress areas, site access, and distance from the site to the proposed transportation project.

Square footage of eligible non-residential (commercial or industrial) buildings are included in the scoring process subject to the criteria and adjustments noted above. Within the economic development factor criteria group, the extent of supported commercial or industrial buildings accounts for 60 percent of the project scoring; in turn, the economic development factor accounts for 5 percent of the total project scoring. Therefore, the building-related factors account for 3 percent of the overall project scoring. Due to the greatest applicability to the ODOT TRAC program situation, discussion of the Virginia experience is provided as the first entry in this Appendix. Following the report of Virginia's experiences, the experiences of the other State DOTs reviewed are presented in alphabetical order.

Virginia DOT Experience

Virginia Department of Transportation (DOT) set out to develop a construction project prioritization approach[7]. They began by looking at what other agencies were doing, specifically the states of Alaska, Delaware, and Ohio, and the metropolitan areas of North Jersey, Corpus Christi, Texas, and Hampton Roads, Virginia. Virginia had established five goals for their system:

- Goal 1: Provide a transportation system that facilitates the efficient movement of people and goods;
- Goal 2: Provide a safe and secure transportation system;
- Goal 3: Retain and increase business and employment opportunities;
- Goal 4: Improve quality of life and minimize potential impacts to the environment; and
- Goal 5: Preserve the existing transportation system and promote efficient system management.

The prioritization methods of the selected projects were evaluated in terms of how well they addressed the Virginia goals. Proposed projects are sorted into three tiers. Tier 1 has projects addressing capacity deficiencies in the next 8 years or an identified safety deficiency; Tier 2 has projects addressing capacity deficiencies in the 9 years following the period considered in Tier 1, and Tier 3 is for projects addressing capacity deficiencies beyond the 17 years covered by Tiers 1 and 2.

[7] Virginia DOT (VDOT), 2020, "Prioritizing the State Highway Plan: Developing an Effective Transportation Investment Strategy for Virginia's Investment Strategy for Virginia's Interstate and Primary Roadways", http://www.virginiadot.org/projects/resources/vtranspublicbrochure8x11.pdf, accessed January 20, 2021.

A list of goals and measures for prioritizing Tier 1 projects is given. These cover goals that can be scored, and in addition the process includes an effort to evaluate information that cannot be readily modeled or quantified. Additional evaluation considerations include: Public feedback, availability of funding, maximizing the use of federal funds, project development considerations such as the status of federally required location studies and whether the project is the next phase in a multi-phase improvement. This process pointedly avoids ranking projects or requiring funding be assigned based on any rank order. The process does provide information to be used by VDOT in evaluating and comparing proposed projects, with final decision-making authority residing with the Commonwealth Transportation Board. There is an expectation the process will be refined and enhanced, and the department will develop and incorporate new data sources and measures.

Virginia's SMART SCALE program includes an application process used by local agencies and organizations[8], with more detailed information in the program's Technical Guide[9]. Applications can be found at the program's web site, http://smartscale.org/. Projects fit into one of four scales: Corridor of Statewide Significance, Regional Networks, Urban Development Areas, or Statewide Safety. The applicant must also identify how the project meets a general or location-specific need congruent with the commonwealth's long-term transportation plan, VTrans2040. The Technical Guide has a table specifying who is responsible for gathering data on project measures. The project measures fall into six categories: Safety, Congestion Mitigation, Accessibility, Environment, Economic Development, and Land Use and Transportation Coordination.

The Economic Development project measures are of greatest interest to the current research study of the TRAC local investment factors. The measures and the corresponding weights are described in Figure 2. The Economic Development Factor measure is based on real, planned non-residential development or redevelopment. A flowchart showing the calculation steps for the Economic Development Factor is displayed in Figure 3. To identify developments that are to be included in the scoring process, the following additional criteria are considered; details of each step are presented in the figure that is noted in parenthesis:

- Buffer zone is based on the project "Tier" with projects expected to have a greater overall economic impact having a larger radius for inclusion of sites that are counted in the scoring (see Figure 4);
- Development progress (e.g., approved site plan or zoning approved), with projects that are further along in the process having higher scores (Figure 5);

[8] Virginia Department of Transportation (VDOT), 2016, "SMART SCALE Application Guide: Funding the Right Transportation Projects in Virginia", September 2016. Available at: http://smartscale.org/documents/2016smartscaleapplicationguide.pdf, accessed 2/16/2021.

[9] Virginia Department of Transportation (VDOT), 2020, "SMART SCALE Technical Guide", revised October 2020. Available at: http://smartscale.org/documents/2020documents/technical-guide-2022.pdf, accessed 2/17/2021.

- Site status as a redevelopment site or "shovel-ready" site based on Virginia's economic development agency criteria (Figure 5); and
- Numerical adjustments to account for economic distress areas (Figure 6), site access, and distance from the site to the proposed transportation project, with sites closer to the proposed project having higher scoring (Figure 7).

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 economic activity.

Source: Virginia DOT Smart Scale Technical Guide, October 2020

Figure 2: Summary of Virginia DOT Economic Development Factors

Source: Virginia DOT Smart Scale Technical Guide, October 2020

Figure 3: Virginia DOT Economic Development Factors Flowchart

Table 10.2 Site Eligibility by Transportation Project Tier

Transportation Project Tier by Feature Type Selected	Distance from Transportation Project to be an Eligible ED Site
Tier 1 Add/Construct Bike Lane, Bike/Pedestrian Other, Construct or Convert Existing General Purpose or Parking Lane to Bus-only Lane, Construct or Improve Bus Stop / Shelter, Construct Shared-Use Path, Construct Sidewalk, Highway Other, Improve Bike/Pedestrian Crossing (At Grade), Improve Bike/Pedestrian Crossing (Grade Separated), Improve Park and Ride Lot, Improve Rail Crossing, Improve/replace existing bridge(s), Increase Existing Route Service – Additional Vehicles or Increased Frequency, ITS Improvement(s) / Adaptive Signal Control, New Intersection, New Park and Ride Lot, New Route/Service, New Traffic Signal, New/Expanded Vanpool or On-Demand Transit Service, Other Transit Technology Improvements, Rail Transit Other, Ramp Improvement(s), Right-of-Way/Easements acquisition required, Road Diet, Roadway Reconstruction/Realignment, Shoulder Improvement(s), TDM Other, Traffic Signal Modification, Turn Lane Improvement(s), Widen Existing Lane(s) (No New Lanes)	Up to 0.5 mile buffer
Tier 2 Access Management, Constuct/Expand Bus Facility, Innovative Intersection(s) / Roundabout(s), Intercity Passenger Rail Service Improvements, Intersection Improvement(s), Managed Lane(s) (HOV/HOT/Shoulder), New Interchange-Non-Limited Access Facility, Rail Service Improvements	Up to 1.0 mile buffer
Tier 3 Add New Through Lanes(s), Freight Rail improvements, Improve Grade-Separated Interchange, New Bridge, New Interchange-Limited Access Facility, New Intercity Passenger Rail Station or Station Improvements, New Station or Station Improvements, Roadway on New Alignment	Up to 3.0 mile buffer

Source: Virginia DOT Smart Scale Technical Guide, October 2020

Figure 4: Virginia DOT Site Eligibility by Project Tier

Table 10.3 Site Scaling Points

Scaling Point Description	Points Value
Development Site Plan Status (Max of 3 scaling points)	Detailed site plan approved: 3
	Detailed site plan submitted: 1
	Conceptual site plan approved: 0.5
	Conceptual site plan submitted: 0.25
	Zoned Only: 0
Site Characteristics (Max of 1 scaling point)	Redevelopment of existing site: 1
	VEDP Tier 5 Site: 1
	VEDP Tier 4 Site: 0.5
	VEDP Tier 3 Site: 0.25
Subtotal of Economic Development Site Scaling Points (max 4 points that can be applied)	
Development building square footage up to a maximum of 10 million square feet (does not include residential-only property) within a specified buffer distance from the project and adjusted by factors will be multiplied by the above points to calculate the final project measure value. Zoned only sites must have primary access to the project or be directly adjacent to the proposed transportation project in order to be eligible.	

Source: Virginia DOT Smart Scale Technical Guide, October 2020

Figure 5: Virginia DOT Site Scaling Points

Table 10.4 Transportation Project Scaling Points

Scaling Point Description	Points Value
Transportation project referenced in local Comprehensive Plan, local Economic Development Strategy or Regional Economic Development Strategy	Referenced in: 0.5 points
Transportation project area economic distress score	Up to: 0.5 points
Subtotal of Transportation Project Points (max 1 point that can be applied – these points are applied to each eligible economic development site included in the project application)	
NOTE: Zoned only sites must have primary access to the project or be directly adjacent to the proposed transportation project in order to be eligible.	

Source: Virginia DOT Smart Scale Technical Guide, October 2020

Figure 6: Virginia DOT Transportation Project Scaling Points

Table 10.5 Adjustments for Access and Distance

Access Provision Adjustment	
Transportation 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.	100% of building sq. footage
Transportation 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	50% of building sq. footage
Distance Adjustment**	
Economic development site is within 1 mile of the proposed transportation project.	100% of building sq. footage
Economic development site is greater than 1 mile from proposed transportation project.	Divide building sq. footage by distance in miles

* Zoned only sites must have primary access to the project or be directly adjacent to the proposed transportation project in order to be eligible.

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

Source: Virginia DOT Smart Scale Technical Guide, October 2020

Figure 7: Virginia DOT Adjustments for Access and Distance

Other State DOT Experiences

Alabama

Alabama's Highway Safety Improvement Program (HSIP) has several programs/project types, each with own scoring/prioritizing approach, according to the 2019 Annual Report[10]. For some of these, weights for criteria are given in response to the question "Select the processes used to prioritize projects for implementation. For the methods selected, indicate the relative importance of each process in project prioritization. Enter either the weights or numerical rankings. If weights are entered, the sum must equal 100. If ranks are entered, indicate ties by giving both processes the same rank and skip the next highest rank (as an example: 1, 2, 2, 4)", which was asked of all programs.

- Program: Bicycle Safety:
    - Rank of Priority Consideration
    - Ranking based on B/C:2
    - Available funding:1
- Program: Horizontal Curve
    - Relative Weight in Scoring
    - Available funding:50
    - Ranking based on net benefit:50
    - Total Relative Weight:100
- Program: Intersection
    - Rank of Priority Consideration
    - Ranking based on B/C:1
    - Available funding:2
- Program: Median Barrier
    - Rank of Priority Consideration
    - Available funding:50
    - Other-Projects are ranked by priority:50
- Program: Pedestrian Safety
    - Rank of Priority Consideration
    - (no answer)
    - Program: Roadway Departure
    - Relative Weight in Scoring
    - Available funding:50
    - Cost Effectiveness:50
    - Total Relative Weight:100
- Program: Shoulder Improvement
    - Rank of Priority Consideration
    - Available funding:1
    - Cost Effectiveness:2
- Program: Sign Replacement and Improvement

[10] Federal Highway Administration (FHWA), 2019, Alabama Highway Safety Improvement Program 2019 Annual Report, available online at https://safety.fhwa.dot.gov/hsip/reports/pdf/2019/al.pdf, accessed January 27, 2021.

    - Rank of Priority Consideration
    - Available funding:1
    - Cost Effectiveness:2
- Program: Wrong Way Driving
    - Rank of Priority Consideration
    - Ranking based on B/C:1
    - Available funding:2

California

The California Department of Transportation (Caltrans), runs the State Highway Operation and Protection Program (SHOPP). A pilot project for asset management was set up in 2015, and a draft report lists the evaluation criteria used for a number of project types[11]. Projects were submitted by the 12 Caltrans districts, and scoring was based on how well the project met the five departmental strategic goals. Five subject matter expert teams developed criteria for the goals, and an executive leadership group then used the Analytic Hierarchy Process to estimate weights for the five goals. A linear additive model then combined the goal weights and the project scores to determine a single cumulative benefit estimate, which was then divided by the project total SHOPP costs to create a benefit/cost ratio. Projects were ranked by the ratio and selected until the budget was depleted. The scoring process is discussed in exhaustive detail, as described below. The five strategic goals in the Caltrans Strategic Management Plan 2015-2020 were as follows, with the specific focus areas of each strategic goal and relative weights summarized as well:

- Goal 1: Safety and Health: Road User Safety (40%), Worker Safety (20%), and Overall Health (40%);
- Goal 2: Stewardship and Efficiency: Condition of Infrastructure, Consequences of Failure or Inaction (50%), Traffic Levels (30%), and State Funding (20%);
- Goal 3: Sustainability, Livability, and Economy: People (30%), Planet (40%), and Prosperity (30%);
- Goal 4: System Performance: Delay Reduction (25%), System Reliability (25%), Corridor Management and Integration (25%), and Complete Streets (25%); and
- Goal 5: Organizational Excellence: Enabling employee engagement and innovation (10%), fostering collaboration (30%), encouraging skilled communication (30%), and supporting effective decision-making through the application of risk management (30%).

[11] California Department of Transportation (Caltrans), 2016, Project Prioritization Criteria for the SHOPP Asset Management Pilot Program, Draft report. Available online at: https://dot.ca.gov/-/media/dot-media/documents/projectprioritizationcriteria-raft-a11y.pdf, accessed January 26, 2021.

The "Sustainability, Livability, and Economy" strategic goal will be summarized in more detail below due to its similarity to the TRAC local investment factors. For each goal, the project prioritization criteria provide the following:

- A methodology to determine a project's score toward each strategic goal;
- A methodology to evaluate a project's cumulative benefit toward all strategic goals; and
- A top to bottom benefit-cost ratio ranking of competing projects in the SHOPP.

Goal 3 is Sustainability, Livability, and Economy, which is based on ability to realize the following objectives:

- People — Improve the quality of life for all Californians by providing mobility choice, increasing accessibility to all modes of transportation and creating transportation corridors not only for conveyance of people, goods, and services, but also as livable public spaces.
- Planet — Reduce environmental impacts from the transportation system with emphasis on supporting a statewide reduction of greenhouse gas emissions to achieve 80% below 1990 levels by 2050.
- Prosperity — Improve economic prosperity of the State and local communities through a resilient and integrated transportation system.

Goal 3 is assessed via a 20-question questionnaire developed by a contractor and which has some similarities to LEED assessment. Of the questions, 6 (30%) focus on "people", 8 (40%) focus on "planet", and the remaining 6 (30%) pertain to "Prosperity". The questions are multiple choice with at least 5 choices; more than one may be selected, although some may be prerequisites to other choices. The total number of choices selected determines a question score of 0 to 5, so the final score is 0-100. CalTrans wants to move to supplement or supplant the question scores with quantitative performance measures from the Strategic Management Plan:

- "People" performance measures
    - Bike, pedestrian, and transit increase
    - Accessibility score
    - Livability score
    - Sustainable corridors
- "Planet" performance measures
    - Per capita vehicle-miles traveled reduction
    - System pollution reduction (air and energy)
    - Operational pollution reduction (air, energy, and water)
    - Improve green infrastructure score
- "Prosperity" performance measures
    - Prosperity score
    - Freight efficiency score
    - Resiliency score (climate change, system, and financial)
    - Resources consumption reduction (materials and potable water)

Delaware

Delaware published a guide for local governments establishing Transportation Improvement Districts (TIDs)[12]. In Delaware, land use decisions are made at the local level, with infrastructure and services provided by the state (e.g. DelDOT). Delaware defines a TID as a geographic area defined for the purpose of securing required improvements to transportation facilities in the area. DelDOT maintains about 90% of the state's lane-miles of road, compared to about 20% elsewhere. There is no detailed description of how construction projects are prioritized in TIDs.

Florida

Florida DOT (FDOT) published a report entitled *Prioritizing Florida's Highway Investments 2012-2013: Identifying Needs, Setting Priorities, and Investing in Florida's Highway Transportation System*[13]. FDOT's priorities are listed in the report:

- Highway Capacity
  - Strategic Intermodal System (SIS) Capacity
  - Non-SIS Capacity and Other Enhancements
- Preservation
  - Bridge Repair and Replacement
  - Resurfacing
- Safety
  - Highway Safety Improvement Program
  - High Risk Rural Roads
  - Safe Routes to Schools

The report outlines how the projects in the specific categories are selected by listing the goals and criteria, and mentioning that they are weighted, but the weights themselves are not given (though they can be fudged some to prioritize one goal higher than others). For example, the SIS Capacity Improvement Program starts with the priorities of modal plans, local governments, and MPOs to identify projects, which are then scored by the FDOT Strategic Investment Tool (SIT), described as follows. FDOT's SIT tool prioritizes and scores SIS highway projects based on the 2010 SIS Strategic Plan goals using quantitative measures for each goal. By default, the SIT weights each goal equally (five goals each accounting for 20 percent of the overall SIT score with a highest possible score of 100.) Goals can be weighted to place additional

[12] Marcia S. Scott and Matthew Watkins, 2014, Transportation Improvement Districts: A Guide for Delaware Local Governments, Prepared for the Delaware Department of Transportation (DelDOT), Institute for Public Administration, School of Public Policy & Administration, College of Arts & Sciences, University of Delaware, December 2014, Available at: https://udspace.udel.edu/bitstream/handle/19716/16845/TID-Guide-2015-Final-Web.pdf?sequence=1&isAllowed=y, accessed October 23. 2020.

[13] Florida Department of Transportation (FDOT), 2013, Prioritizing Florida's Highway Investments 2012-2013: Identifying Needs, Setting Priorities, and Investing in Florida's Highway Transportation System. Available online at: https://www.fdot.gov/docs/default-source/planning/systems/programs/mspi/pdf/Prioritizing-Florida's-Highway-Investments-2013.pdf, accessed January 26, 2021.

emphasis on a specific goal while reducing the emphasis of another. The SIS goals used in the SIT are as follows, with examples of the associated measures:

- Safety and Security: Crash ratio, Fatal Crash Ration, Bridge Appraisal Rating, Link to Military Base
- System Preservation: Volume to Capacity (V/C) ratio, AADT, AADTT, Bridge Condition rating
- Mobility: Connector Location, V/C ratio, Change in V/C ratio, AADT, AADTT, System Gap, Interchange Operations, Bottleneck /Grade Separation, Delay
- Economics: Demographic Preparedness, Primary Sector Robustness, Tourism Intensity, Supporting Facilities
- Quality of Life: Land and Social Criteria, Geology Criteria, Habitat Criteria, Water
- From there, further evaluation considers funding commitments, funding availability, project phasing and timing, and geographic distribution.

Non-SIS capacity improvement program projects have another prioritization process. Funding is allocated to FDOT districts by an unspecified statutory formula based equally on population and gas tax collections. The prioritization factors are described generally, but there is not a quantitative formula given.

- Geographic Distribution: Districts manage geographic distribution of funds among the counties in the district.
- MPO/Local Entity priority: Entities provide a prioritized list of transportation projects within their jurisdiction for evaluation for eligible funding.
- Funding Availability: Districts must determine if a sufficient amount of eligible funding is available for the project.
- Project phasing/timing: Districts must consider if the project is ready for production, which may entail analysis of multiple phases to ensure projects can be completed if phases are initiated.
- Local Participation: Districts consider whether the MPO/local entity can provide match funding to complete a project.

The Preservation Program is focused mainly on bridge repair and replacement or on pavement resurfacing. Bridges are inspected every two years with 0-9 ratings applied to the deck, superstructure, and substructure. Anything below 4 is poor condition. Bridge sufficiency ratings include these ratings and “other data”. Inspectors recommend repairs or maintenance to correct deficiencies, which fall into the categories Structurally Deficient and Functionally Obsolete. The aforementioned bridge sufficiency ratings are defined by the FHWA on a scale of 0-100, which determine eligibility for federal funds. The rating considers these three factors as weighted: 55% Structural adequacy and safety, 30% Serviceability, and 15% Essentially for public use. All bridges in poor condition (as indicated above) must be addressed. Projects are assigned priority level 1, 2, or 3, which determines the deadline for action as 60, 180, or 365 days.

For pavement resurfacing, pavements are given a condition rating on a scale of 0-10 accounting for rutting, cracking, and smoothness, in order of weight. A

pavement rating less than 6.4 (5.4 if speed limit is 45 mph or less) in any attribute is deficient. Other considerations in prioritizing pavement resurfacing projects include pavement age, pavement thickness, surface type, location, AADT, AADTT, and materials (Overlays may have been placed over poor quality earlier layers which may need to be removed).

For safety program projects, FDOT has a web-based program called Crash Reduction Analysis System Hub (CRASH), which is used to evaluate all projects proposed for the Highway Safety Improvement Program (HSIP) and the High-Risk Rural Roads program (HRRR). The program estimates crash reduction factors from the proposed improvements and then evaluates them based on a benefit-cost analysis. Besides having a benefit-cost ratio greater than 1, other criteria for project selection include high crash location, transparency report, Strategic Highway Safety Program emphasis areas, skid hazard elimination, run off road mitigation, and roadside obstacle elimination. There is also a Safe Routes to Schools program that provides for infrastructure projects designed to improve the ability of children to walk to school. The scoring of applications is done by a district team assembled by the District Safety Engineer/Manager using a statewide scoring form.

Georgia

Based on a set of PowerPoint slides[14], priority is to be given to maintenance and expansion/improvement of highway infrastructure where there is the most impact from traffic congestion or need to attract economic development. There is a 10-year strategic plan, which encompasses statewide strategic transportation plan, transportation improvement plan (Statewide and MPOs), statewide freight and logistics action plan, managed lane implementation plan, county and multicounty transportation plans, asset management of bridges and pavements, and the strategic highway safety plan. There are five categories of projects, each requiring a different prioritization process: New highway construction, maintenance of existing infrastructure, bridge repair/replacement, safety enhancement, and administrative expenses. For example, new highway construction has these prioritization goals:

- Determine uniform statewide scoring criteria to make holistic data driven based decisions
- Quantitative process that utilizes resources, assets, and data
- Determine uniform value of projects to assist in making informed decisions

Projects fall into two tiers, with the first-tier criteria including: Freight network, GRIP Prioritization review, State route prioritization from the Office of Transportation Data, and Georgia DOT's freight and logistics plan. Tier 2 adds additional scoring criteria, including, identified in a state DOT study, Statewide Strategic Transportation Plan goals, level of service (vis-à-vis congestion), safety factors via crash data review, regional traffic operations program corridor, support

[14] Jay Roberts and Meg Pirkle, 2015, "Transportation Funding Act of 2015: 10 Year Strategic Transportation Plan & Project Prioritization", Georgia Department of Transportation (GDOT), presentation slides available online at: http://www.dot.ga.gov/AboutGeorgia/Board/Presentations/TransportationFundingAct-10YearStrategicTransPlan-ProjectPrioritization.pdf, accessed January 26, 2021.

from local governments including signed commitments for local funds, pavement condition, and an approved concept report.

Maintenance projects are first evaluated in which class the route falls in the state route prioritization scheme: Critical, High, Medium, or Low. Pavement maintenance projects include resurfacing, pavement preservation, and restriping. Projects are rated based on output from a Computerized Pavement Condition Evaluation System, AADT and AADTT, and the aforementioned state route prioritization. Bridge projects include maintenance and replacement on state routes, the off-system low impact bridge program, and off0system Design-Build Bridge Bundles. Prioritization factors include Age and Sufficiency rating (incorporating structural evaluation, functional obsolescence, condition, and importance for access to critical facilities and detour length). Safety projects are divided into location specific improvements (intersections, traffic signals, pedestrian upgrades, lighting) and systemic improvements (guardrails and cable barriers, centerline and edge rumble strips, sharp curve treatments, signs, and railroad crossings). Factors include number and types of crashes, crash reduction factors, crash modification factors, road safety audits, and programmed systemic improvements.

Indiana

The Indiana DOT (INDOT) announced their Major Moves program, the first ten years (2006-2015) of the 2030 INDOT Long-Range Plan[15]. It is fully funded with federal and state gas tax money and money from leasing the Indiana Toll Road to a private company. This allowed for up to 75% increase in construction funds. The Major Moves program emphasizes adding Major New Capacity, defined as projects over $5 million designed to increase mobility, provide connectivity, increase accessibility for economic development, increase capacity of a transportation facility, or reduce congestion. Projects in Major New Capacity were subjected to a systematic scoring process, with 50% related to transportation system preservation or enhancement, 25% for safety improvement, and the remaining 25% on economic impact (creating or retaining jobs, increasing investment, 15%) and consumer input (10%). In addition to these 100 points, bonus points can be awarded for urban revitalization (up to 10) and earmarks (public/private/local contributions, up to 100). Longer range planning for 2016-2030 uses similar scoring approach but simplified with fewer scoring criteria and condensed due to less information available for the longer-term planning[16]. A more detailed breakdown of the scoring for the Major Moves program is given in Figure 8.

These various elements are elaborated upon in the report. The Cost-Effectiveness Index is derived from the benefit-cost ratio and net present value, with benefits and agency costs calculated using the Highway Economics Requirements

[15] Indiana Department of Transportation (INDOT), 2007, "INDOT 2030 Long Range Transportation Plan: Chapter 10 Major Moves Program and Scoring Process, Adopted June 2007, Available online at: https://www.in.gov/indot/files/10_majormoves.pdf, accessed January 26, 2021.

[16] Indiana Department of Transportation (INDOT), 2007a, "INDOT 2030 Long Range Transportation Plan: Chapter 11 Planning and Fiscal Analysis, Adopted June 2007, Available online at: https://www.in.gov/indot/files/11_planning.pdf, accessed February 16, 2021.

System modeling software. Data in the model come from the nationally established Highway Performance Management System. The Corridor Completion factor is based on how much the project will assist with completion of one of 33 designated corridors – 2 points if the project will complete more than 50% of remaining work on one of the corridors, 1 point if less than 50% of a corridor, and 0 if the project is not on one of the corridors. Highway Classification is up to 5 points based on FHWA functional classes, except Statewide Mobility Corridors are the top end of the highway system and extend across the state. Regional corridors provide mobility within regions of the state. Local access control designates short-distance routes with lower speeds.

Goal	Factors	Maximum Score
Transportation Efficiency	Cost Effectiveness Index- A measure of the Benefit Cost Ratio and Net Present Value of the investment	20
	Corridor Completion- A measure of a project's ability to complete statewide connectivity targets	2
	Road classification - A measure of a highway's importance	5
	Congestion Relief (Mobility)- a measure of the Truck and Vehicle AADT, volume to Capacity Ratio and Change in LOS from the improvement.	15
	Adjacent State or Relinquishment Agreement- A measure of interstate connectivity.	3
	Percent Complete in Development	5
	Transportation Efficiency points account for up to 50 points	**50**
Safety	A measure of the Crash Frequency/Density, Crash Severity, and Fatality Rate Ratio.	25
	Safety Points account for up to 25 points	**25**
Economic Development	Jobs Created or Retained	10
	Economic Distress & Cost Effectiveness	5
	Maximum Economic Development Score:	**15**
Customer Input	Local Planning Agency Input- priorities established by planning organizations	4
	Legislative & Elected Officials - priorities of the local officials	3
	Other - A measure of the input of citizens either through their legislative representative or via direct documented comments to the agency.	3
	Economic Development & Customer Input account for up to 25 points	**25**
BONUS Point Categories:		
Earmarks	Public/Private/ or Local Participating Funds (up to)	100
Urban Revitalization		10
Total Possible Points including transportation, Economic Development, and Earmarks		***210***

Source: Indiana DOT Major Moves Program and Scoring Process, June 2007

Figure 8: Overall Scoring Process for Indiana DOT "Major Moves" Program

Mobility is scored based on vehicle and truck AADT (up to 2.5 points each), Volume to capacity ratio (up to 2.5 points), Level of Service Improvement (5 points) based on extent of congestion expected after the project is completed. Intergovernmental agreements are scored from 0 to 3 based on the type of agreement involved in the project: Interstate (3 points), Local Government (2 points), Relinquishment (1 point), or no agreements (0 points). Percent complete is based on the percent of the work already complete, 1 point for each 20% of the design and engineering work on the project already completed.

Safety criteria include Crash Density with 15 points if there are more than 90 crashes per mile, and fewer points for fewer crashes. Another 5 points is assigned based on the annual cost of crashes in that stretch of road (5 points for more than %5 million, 3.3 points for $2.5 million or more, 1.7 for $1 million of more, and 0 if less). 5 points are assigned to fatality rate ratio based on the fatality rate of that section divided by 1.12 fatalities per 100 million vehicle miles (the 2003 rate), with 5 points for a ration greater than 3, 3.3 points for greater than 2, 1.7 for ration greater than 1, and 0 for smaller ratio.

Economic Development is scored based on estimated levels of job creation (including immediate, long-term, and retained), the level of economic distress in the county of the project, and a cost-effectiveness criterion, measured by the cost to INDOT for every job created. Additional details of the scoring for the Economic Development factor are presented in Figure 9. It is noted that the economic development component scoring is a maximum of 15 points out of 210 overall available points (≈7.1%). The earmark bonus points are for each percentage of the project funding coming from non INDOT sources. Finally, a set of business rules describes how the selection process uses the scores to select using an iterative process. The selection process accounts for the following factors, presented in the order in which they are applied:

- Ensuring a geographic distribution of major projects (> $100 million) evenly across the state and over time;
- Prioritizing projects that are nearly “ready for construction” across different program years;
- Prioritization of project scoring from highest to lowest rating;
- Adjustments for corridor completion in phases;
- Adjustments to minimize shortages of resources in certain areas;
- Adjustments for traffic flow/access management in affected communities; and
- Adjustments to ensure INDOT resources are balanced.

Additional specific rules and requirements imposed by the Major Moves legislation for I-69 completion and certain set-asides for Indiana Toll Road counties, as well as program balancing, are also applied.

Economic Development Scoring

Maximum 15 pts

Job Creation & Retention Criteria:

Immediate Number of Jobs (0-3 Years)

Jobs Created	Points
100-199	2
200-399	4
400-599	6
600-799	8
800+	10

Future Number of Jobs (3-5 Years)

Jobs Created	Points
100-799	2
800-1199	4
>1200	6

Retained Number of Jobs

Jobs Retained	Points
25-49	1
50-99	2
100-149	3
150-199	4
200	5

Immediate,Future, Retained Total Possible Points = 10

Economic Distress Criteria:

County 5-year unemployment rate in relation to state rate

Range	Points
1-10% greater than statewide rate	1
10.1 - 20% greater than statewide rate	2
20.1 - 25% greater than statewide rate	3
25.1 - 30% greater than statewide rate	4
30.1% or greater than statewide rate	5

Economic Distress & Cost Effectiveness of Investment Total Possible Points = 5

Cost Effectiveness Of Investment :

INDOT Cost per Job Created

Cost per job	Points
> $400.00	0
$300.01-$399.99	1
$150.01-$300.00	2
$100.01-$150.00	3
$50.01-$100.00	4
$50.00 or less	5

Source: Indiana DOT Major Moves Program and Scoring Process, June 2007

Figure 9: Economic Development Scoring for Indiana DOT "Major Moves" Program

Massachusetts

A 2015 report describes the outcomes of the work of the Project Selection Advisory Council, who spent 18 months developing a method for project selection, holding public hearings, gathering testimony and input, and incorporating elements from the legislation establishing the committee[17]. Projects were divided into two categories, those designed to Modernize, i.e. rehabilitate or replace existing infrastructure and those designed to increase Capacity by adding connections or otherwise expanding the network. Scoring varies based on the type of project:

- Roads and Paths Modernization
- Roads and Paths Capacity
- MBTA Modernization
- MBTA Capacity
- Regional Transit Modernization
- Regional Transit Capacity

Roads and Paths projects are funded at least in part by MassDOT Highway Division, including roads, bridges, and multi-use paths; while Regional Transit projects are funded at least in part by the Rail and Transit Division (not MBTA). Project scoring is weighted differently by type of project, as described in Figure 10. These criteria were selected to differentiate between projects, limit redundancy, and maximize simplicity. The details of each of the four scoring systems are elaborated in separate tables on the following pages.

Goals/Criteria	Roads & Paths Modernization	MBTA/Regional Transit Modernization[3]	Roads & Paths Capacity	MBTA/Regional Transit Capacity
Cost Effectiveness	15	20	20	25
Economic Impact	10		15	20
Environmental & Health Effects	10	5	10	10
Mobility	10	30	25	25
Policy Support	10	10	10	10
Safety	10	10	10	
Social Equity			10	10
System Preservation	35	25		
Total	**100**	**100**	**100**	**100**

Source: Pollak, et al. (2015)

Figure 10: MassDOT Project Scoring Criteria by Project Type

[17] Stephanie Pollak, et al., 2015, Recommendations for MassDOT Project Selection Criteria: Project Selection Advisory Council Report to the Legislature, July 1, 2015. Available online at https://d3n8a8pro7vhmx.cloudfront.net/t4ma/pages/37/attachments/original/1437489463/Project_Selection_Criteria_Reco.pdf?1437489463, accessed January 27, 2021.

Criteria	Weight	Objectives	Data Needs
Cost Effectiveness	15	• Minimize public cost per persons served	• *Current number of road/path users* • *Anticipated number of road/path users as a result of the project* • Capital cost of the project • *Future maintenance costs of the project* • Availability and amount of private or municipal funding, or certain types of federal funding which are restricted to the specific project in question
Economic Impact	10	• Support local, regional, and state economic development plans and strategies	• *Investment priority areas defined by EOHED*[9] • Corridor development plans • Local or regional plans • Documentation on how project could support development
Environmental & Health Effects	10	• Reduce health and environmental impacts of criteria air pollutants and greenhouse gas emissions • Reduce impact to natural and cultural resources	• Transportation demand modeling outputs • Federally required air quality analysis modified to incorporate greenhouse gases • GPS data of environmental resource areas
Mobility	10	• Improve persons per hour throughput in a congested area • Strategically improve bicycle, pedestrian, and transit access and connectivity	• Average Daily Traffic (ADT) • Transit trips and ridership along the corridor • *Bicycle and pedestrian usage in the area* • Bicycle, pedestrian, and transit planning documents • Travel demand model output
Policy Support	10	• Support local, state, or regional policies or goals not accounted for in other criteria.	• Existing written documentation on policies or goals and how project will contribute.
Safety	10	• Reduce fatalities and severe injuries	• *Vehicle crash data (property, injury, fatality), bicycle and pedestrian crash data*
System Preservation	35	• The extent to which the project meets a need identified in an asset management plan, fulfills asset management goals, and is supported by asset management data. • The extent to which expensive ongoing maintenance is required unless the capital project is completed.	• *Asset condition* • Ideal treatments and timing • *Current and anticipated maintenance costs on corridor as a result of delaying the project*

Source: Pollak, et al. (2015)

Figure 11: MassDOT Project Scoring Details: Roads and Paths Modernization

Criteria	Weight	Objectives	Data Needs
Cost Effectiveness	20	• Minimize public cost per persons served • Minimize net impact on operating costs	• Current number of users on facility • Anticipated number of users as a result of the project and other growth • Capital cost of the project • *Future maintenance costs of the project* • Availability and amount of private or municipal funding, or certain types of federal funding which are restricted to the specific project in question.
Environmental & Health Effects	5	• Potential to reduce pollution and consumption of natural resources • Potential to promote mode shift	• Transportation demand modeling outputs • Federally required air quality analysis to incorporate greenhouse gases • GPS data of environmental resource areas
Mobility	30	• Potential to improve persons per hour throughput, reliability, efficiency, accessibility, or service quality	• Types of improvements • User demographics
Policy Support	10	• Supports local, state, or regional policies or goals not accounted for in other criteria.	• Existing written documentation on policies or goals and how project will contribute.
Safety	10	• Project is specifically intended to address significant identified safety threat.	• Project is specifically intended to address identified safety threat.
System Preservation	25	• The extent to which the project meets a need identified in an asset management plan, fulfills asset management goals, and is supported by asset management data. • The extent to which maintenance is required.	• *Asset condition* • Ideal treatments and timing • *Current and anticipated maintenance costs as a result of delaying the project*

Source: Pollak, et al. (2015)

Figure 12: MassDOT Project Scoring Details: MBTA/Transit Modernization

Criteria	Weight	Objectives	Data Needs
Cost Effectiveness	20	• Minimize public cost per persons served	• *Current number of road/path users* • *Anticipated number of road/path users as a result of the project* • Capital cost of the project • *Future maintenance costs of the project* • Availability and amount of private or municipal funding, or certain types of federal funding which are restricted to the specific project in question
Economic Impact	15	• Support local, regional, and state economic development plans and strategies	• *Investment priority areas defined by EOHED* • Corridor development plans • Local or regional plans • Documentation on how project could support development
Environmental & Health Effects	10	• Reduce health and environmental impacts of criteria air pollutants and greenhouse gas emissions • Potential impacts to natural and cultural resources	• Transportation demand modeling outputs • Federally required air quality analysis modified to incorporate greenhouse gases • GPS data of environmental resource areas
Mobility	25	• Improve persons per hour throughput in a congested area • Strategically improve bicycle, pedestrian, and transit access and connectivity	• Average Daily Traffic (ADT) • Transit trips and ridership along the corridor • *Bicycle and pedestrian usage in the area* • Bicycle, pedestrian, and transit planning documents • Travel demand model output
Policy Support	10	• Supports local, state, or regional policies or goals not accounted for in other criteria	• Existing written documentation on policies or goals and how project will contribute
Safety	10	• Expected reduction in fatalities and severe injuries	• *Vehicle crash data (property, injury, fatality), bicycle and pedestrian crash data*
Social Equity/Fairness	10	• Project provides mobility and/or environmental benefits to residents of Title VI or environmental justice communities • Title VI community has demonstrated support for the project	• GPS data on environmental justice and Title VI communities

Source: Pollak, et al. (2015)

Figure 13: MassDOT Project Scoring Details: Roads and Paths Capacity

Criteria	Weight	Objectives	Data Needs
Cost Effectiveness	25	• Minimize public cost per persons served • Minimize net impact on operating costs	• Current number of users on the facility • *Anticipated number of users as a result of the project and other growth* • Capital cost of the project • *Future maintenance costs of the project* • Availability and amount of private or municipal funding, or certain types of federal funding which are restricted to the specific project in question.
Economic Impact	20	• Support local, regional, and state economic development plans and strategies	• *Investment priority areas defined by EOHED* • Corridor development plans • Local or regional plans • Documentation on how project could support development
Environmental & Health Effects	10	• Potential to reduce pollution and consumption of natural resources • Potential to promote mode shift	• Transportation demand modeling outputs • Federally required air quality analysis modified to incorporate greenhouse gases • GPS data of environmental resource areas
Mobility	25	• Potential to improve persons per hour throughput, reliability, efficiency, accessibility, or service quality	• Types of improvements • User demographics
Policy Support	10	• Supports local, state, or regional policies or goals not accounted for in other criteria	• Existing written documentation on policies or goals and how project will contribute.

Source: Pollak, et al. (2015)

Figure 14: MassDOT Project Scoring Details: MBTA/Transit Capacity

Minnesota

Minnesota has a comprehensive Guide to MnDOT Project Selection[18], which accompanies the selection policy[19] [MNDOT, 2018] and is incorporated therein by reference. It also fulfills a statutory mandate. The selection process applies to projects selected for the 4-year State Transportation Improvement Program (STIP) or the 10-year Capital Highway Investment Plan (CHIP) and follows the policy in the Statewide Multimodal Transportation Plan and investment guidance in the 20-year State Highway Investment Plan. These are augmented by long-range plans from Metropolitan Planning Organizations in urbanized areas (>50,000 population). Projects fall into three broad categories: Asset management, Targeted safety improvements, and Mobility and capacity expansion. There are subcategories within each, which have their own scoring process. There are also various competitive programs, such as Corridors of Commerce Program, Highway Freight Program, Highway Safety Improvement Program, Local Partnership Program, Railway-Highway Crossing Program, Stand Alone Noise Barriers Program, and Transportation Economic Development Program. Projects are subject to rescoring and updating every 5 years if originally placed in year 5 or later of the CHIP and not moved into the STIP.

Asset Management projects are scored on a basis of 0-100 points, which can vary, e.g., by type of pavement. Examples of the scoring distribution for pavement projects for the National Highway System (NHS), non-NHS, and other urban area freeway/expressway projects are presented in Figure 15. For more details on measures and scoring rubrics for pavements, the reader is referred to Appendix D of the document, where the criteria are elaborated upon. For example, for NHS pavement projects, the detailed scoring process is presented in Figure 16. There are similar general and detailed tables for various types of bridge projects, for capacity expansion projects, for safety improvement projects, and so on.

Perhaps closest to ODOT's TRAC program is the Minnesota Local Partnership Program, which funds improvements on state highways identified by local agencies, which the cities and counties apply for. For this program, the scoring criteria vary by which of the 8 funding regions (Note: M is the region that includes the Minneapolis-St. Paul metropolitan area) are impacted, as noted in Figure 17. It is noted that some regions are blank due to the on-going development of this scoring system.

[18] Minnesota Department of Transportation (MNDOT), 2020, Guide to MNDOT Project Selection, June 2020, downloaded from: https://edocs-public.dot.state.mn.us/edocs_public/DMResultSet/download?docId=3565817, accessed January 20, 2021.

[19] Minnesota Department of Transportation (MNDOT), 2018, "Project Selection Policy", Policy No. OP016, effective date 11-30-2018, downloaded from https://edocs-public.dot.state.mn.us/edocs_public/DMResultSet/download?docId=2219978, accessed January 20, 2021.

Criteria	Points Available	Data Source / Basis
Timing of the Improvement	60	Forecasted Ride Quality Index[19]
Network Designation	5	Interstate, Non-Interstate Freeway and other NHS
Traffic Volume	10	Annual Average Daily Traffic (AADT)
Truck Volume	10	Heavy Commercial Average Annual Daily Traffic (HCADT)
Length/Miles Covered	5	Roadway miles
Other Infrastructure Needs	10	Condition of pipes under the road

[a] National Highway System (NHS) Pavement Projects

Criteria	Points Available	Data Source / Basis
Timing of the Improvement	60	Forecasted Ride Quality Index
Traffic Volume	10	AADT
Truck Volume	10	HCADT
Length/Miles Covered	5	Roadway miles
Other Infrastructure Needs	10	Condition of pipes under the road
Turnback Candidate[20]	5	Jurisdictional Realignment Study and assessment by district staff

[b] Non-NHS Pavement Projects

Criteria	Points Available	Data Source / Basis
Timing of the Improvement	25	Forecasted Ride Quality Index
Cracking, Patching and Rutting	25	Forecasted Surface Rating
Other MnDOT Infrastructure Condition	10	Age and condition of storm drains, catch basins, cables and other infrastructure owned by MnDOT
Local Utility Condition	5	Documented condition issues or community plans
Americans with Disabilities Act (ADA) Compliance	10	ADA Compliance of sidewalks, ramps and signals
Traffic Volume	10	AADT
Active Transportation & Transit	10	Safety risk factors for people walking, rolling and biking, corridor designation and planning, and share of community bisected by the highway
Benefits Environmental Justice Population	5	Census data

[c] Non-Freeway/Expressway Urban Pavement Projects

Source: Minnesota DOT (2018;2020)

Figure 15: Minnesota DOT Project Scoring Process Details

Criteria	Points Available	Scoring Rubric
Timing of the Improvement	60	See table below for detailed scoring information
Network Designation	5	Interstate – 5 points Non-Interstate Freeway – 2 points Other NHS – 0 points
Traffic Volume	10	Projects with AADTs equal to or greater than 25,000 in Greater MN and 120,000 in Metro receive full points. Below those values, points are assigned as a percent of those values rounded down to the nearest point. Example AADT of 14,000 in Greater MN: 14,000/25,000 X 10 points = 5.6 points rounded down to 5 points.
Truck Volume	10	Projects with HCADTs equal to or greater than 1,000 in Greater MN and 5,000 in Metro receive full points. Below those values, points are assigned as percent of those values rounded down to the nearest point.
Length/Miles Covered	5	≤ 10 roadway miles - miles/2 = points (i.e. 4 mile project gets 2 points) – round to the nearest half point > 10 roadway miles - 5 points
Other Infrastructure Needs	10	Number of condition 3 & 4 pipes: ≥5 – 10 points 1-4 – 5 points 0 – 0 points

Source: Minnesota DOT (2018;2020)

Figure 16: Minnesota DOT NHS Pavements Scoring Details

District	Status	Current	Available Points
1	Developing	Safety	35
		Local and regional Priorities	35
		Project readiness	15
		Mobility and Access Improvements	10
		System Stewardship and Asset Management	5
			100
2	Developing	Project benefits Locals and MnDOT	
3	Piloting	Infrastructure Condition	30
		Safety	20
		Project Readiness	20
		Mobility and Access	15
		Local/Regional Priorities	15
			100
4	Piloting	Healthy Communities	50
		Travel Safety	25
		Critical connections	15
		System Stewardship and Asset Management	10
			100
M	Piloting	Local and Regional Priorities	50
		Mobility and Access Improvements	20
		Safety	15
		Infrastructure Condition	10
		Project readiness	5
			100
6	Piloting	Preservation	10
		General Project considerations	8
		Safety	7
		Infrastructure Condition	5
		Project Readiness	5
			35
7	Developing	Local and regional Priorities	40
		Safety	25
		Mobility and Access Improvements	20
		Project Readiness	20
		Infrastructure Condition	5
			100
8	Piloting	Regional and Community Priorities	40
		Mobility and Critical connections	20
		Project Readiness	20
		System Stewardship and Asset Management	10
		Safety	10
			100

Source: Minnesota DOT (2018;2020)

Figure 17: Minnesota DOT Local Partnership Program Scoring Criteria

North Carolina

The FHWA published a report on Cross-Modal Project Prioritization in 2015[20]. The document reports on a "peer exchange" event held December 16-17, 2014 with representatives from NCDOT, FHWA, NC General Assembly, and various MPOs, RPOs, and transit agencies to discuss challenges implementing the NC Strategic Transportation Investments (STI) law. Project prioritization approaches are compared for a group of peer states: DE DOT, Genesee Transportation Council in New York, Metropolitan Transportation Council in the San Francisco Bay area in California, Oregon DOT, and Virginia DOT. Methods and approaches are described in general terms, without discussion of specific scoring and rating approaches.

South Carolina

South Carolina DOT has a web site entitled "How We Pick Projects", which discusses in a general way how projects are funded and prioritized[21]. Legislation passed in 2007 listed the objective, quantifiable criteria to consider in project prioritization:

- Financial viability
- Public safety
- Potential for economic development
- Traffic volume and congestion
- Truck traffic
- Pavement Quality Index (PQI)
- Environmental impact
- Alternative transportation solutions
- Consistency with local land use plans

Projects are scored and ranked within categories: Safety, Pavements, Bridges, Interstate Capacity, and Interstate Interchange. Sometimes the prioritizing, e.g., for non-NHS resurfacing, are prioritized on a county level, while others, such as NHS resurfacing, are prioritized on a statewide basis.

A separate memo, Planning Directive 15[22], spells out the scoring processes for metropolitan planning organizations (MPOs) and Council of Governments (COGs). Here are criteria to be considered in the process for all types of projects:

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[20] Scott Middleton, 2015, Cross-Modal Project Prioritization: A TPCB Peer Exchange, report for Federal Transit Administration/Federal Highway Administration Office of Planning & Environment/Office of Planning, by U.S. Department of Transportation Research and Innovative Technology Administration, Cambridge MA, Lead Agency North Carolina Department of Transportation (NCDOT), May 2015. Available online at https://rosap.ntl.bts.gov/view/dot/12202/dot_12202_DS1.pdf?, accessed January 26, 2021.

[21] South Carolina DOT (SCDOT), 2020, "How We Pick Projects" Available at https://www.scdot.org/inside/planning-project-prioritization.aspx, accessed November 5, 2020.

[22] South Carolina DOT (SCDOT), 2020a, "COG and MPO Project Ranking Process", Planning Directive PD-15, effective July 15, 2020. Available online at https://www.scdot.org/inside/pdf/Planning/MPO-COG_Score_Ranking_Directive.pdf, accessed November 5, 2020.

(a) financial viability including a life cycle analysis of estimated maintenance and repair costs over the expected life of the project;
(b) public safety;
(c) potential for economic development;
(d) traffic volume and congestion;
(e) truck traffic;
(f) the pavement quality index;
(g) environmental impact;
(h) alternative transportation solutions; and
(i) consistency with local land use plans.

This is followed by a series of scoring breakdowns for different classes of projects. For Corridor Improvements/Widening Projects:

- Traffic volume and congestion (35 percent) – The traffic volume and congestion score is based on current and future traffic volumes and the associated level-of-service condition.
- Located on a priority network (national highway system (NHS), freight, and strategic corridors) (25 percent) – The priority network score is based on a project's location in relationship to defined priority networks.
- Public safety (10 percent) – The public safety score is based on crash rates.
- Economic development (7 percent) – The economic development score is based off of on an assessment of livability, regional economic development, benefit-cost & cost effectiveness, and system performance. These assessments should be considered but are not limited to.
- Truck traffic (10 percent) – The truck traffic score is based on current and projected truck percentages.
- Financial viability (5 percent) – The financial viability score is based on estimated project cost in comparison to the ten-year Statewide Transportation Improvement Program (STIP) budget. Additional consideration will be given to projects supplemented with local project funding and/or other federal and state funding.
- Pavement quality index (PQI) (3 percent) – The PQI score is based on pavement condition assessments.
- Environmental impacts (5 percent) – The environmental impacts score is based on an assessment of potential impacts to natural, social, and cultural resources.
- Alternative transportation solutions (not scored) – The criteria is deemed relevant, however, consideration of alternative transportation solutions is confirmed during the NEPA process.
- Consistency with local land use plans (not scored) – The criteria is relevant, however, verification of consistency with local land use plans are confirmed during project evaluation. If the project is inconsistent with the local land use plans, justification is required.

When considering a new-location roadway as a solution to capacity needs, the criteria will be considered in the following manner:

- Traffic volume and congestion (40 percent) – The traffic volume and congestion score is based on a comparison of network hours of delay between build and no-build scenarios.
- Economic development (20 percent) – The economic development score is based off of on an assessment of livability, regional economic development, benefit-cost & cost effectiveness, and system performance. These assessments should be considered but are not limited to.
- Environmental impacts (15 percent) – The environmental impacts score is based on an assessment of potential impacts to natural, social, and cultural resources.
- Connectivity to a priority network (15 percent) – The priority network score is based on the proposed road's relationship to a priority network.
- Financial viability (10 percent) – The financial viability score is based on estimated project cost in comparison to the ten-year Statewide Transportation Improvement Program (STIP) budget. Additional consideration will be given to projects supplemented with local project funding and/or other federal and state funding.
- Alternative transportation solutions (not scored) – The criteria is deemed relevant, however, consideration of alternative transportation solutions is confirmed during the NEPA process.
- Consistency with local land use plans (not scored) – The criteria is relevant, however, verification of consistency with local land use plans are confirmed during project evaluation. If the project is inconsistent with the local land use plans, justification is required.

The new-location roadway criteria are to be applied to projects that have new location design considerations in the project purpose and need, or a new location alignment defined through the NEPA process. The MPO and COG functional intersection improvement projects will consider criteria in the following manner:

- Traffic volume and congestion (35 percent) – The traffic volume and congestion score is based on current and future traffic volumes and the associated level-of-service condition.
- Public safety (25 percent) – The public safety score is based on crash rates.
- Truck traffic (10 percent) – The truck traffic score is based on current and projected truck percentages.
- Located on a priority network (15 percent) – The priority network score is based on the project's relationship to a priority network.
- Financial viability (5 percent) – The financial viability score is based on estimated project cost in comparison to the ten-year Statewide Transportation Improvement Program (STIP) budget. Additional consideration will be given to projects supplemented with local project funding and/or other federal and state funding.
- Economic development (5 percent) – The economic development score is based off of on an assessment of livability, regional economic development, benefit-

cost & cost effectiveness, and system performance. These assessments should be considered but are not limited to.

- Environmental impacts (5 percent) – The environmental impacts score is based on an assessment of potential impacts to natural, social, and cultural resources.
- Alternative transportation solutions (not scored) – The criteria is deemed relevant, however, consideration of alternative transportation solutions is confirmed during the NEPA process.
- Consistency with local land use plans (not scored) – The criteria is relevant, however, verification of consistency with local land use plans are confirmed during project evaluation. If the project is inconsistent with the local land use plans, justification is required.

Using the above weighted criteria, projects will be scored and ranked within each project type classification and adopted into their respective MPO or COG Long Range Transportation Plan (LRTP).

Vermont

Vermont DOT (VTrans) spells out project prioritization methods in a 14-page memo[23]. State legislation requires VTrans to develop a numerical grading system for priority rating to pavement, roadway, bridge, and bridge maintenance projects using objective and quantifiable asset-management based factors, including: Safety, Traffic volume, Availability of alternate routes, future maintenance and reconstruction costs, and MPO/regional planning commission (RPC) priorities. There follows a discussion of important non-quantified elements in prioritizing, such as functional importance of the route and importance to social and cultural life in the area. There were some refinements to the method, primarily in how local agency input is gathered, emphasizing the importance of the close working relationship between VTrans and the local RPC/MPO organizations.

There follows a long series of prioritization factors given by project type, starting with Pavement:

- Pavement Condition Index (20 points): Weighted based on condition; more points are assigned for higher levels of deterioration.
- Benefit/Cost (60 points): The BIC is provided by the Pavement Management System, a.k.a. dTIMS. Factors include optimal treatment, traffic volume, and type of traffic (trucks).
- Regional Priority (20 points): Does the regional planning commission support the project from a local land-use and economic-development perspective?

[23] Vermont Agency of Transportation (VTrans), 2014, "Project Prioritization", Online document (14 page "abstract"), available at: http://54.172.27.91/transportation/VTrans/ProjectPrioritizationAbstract2014.pdf, accessed January 20, 2021.

The results from these analyses are summarized for the three program funding categories/functional classifications: Interstate (90% Federal/10% State), State Highways (80/20), and Class I Town Highways (80/20).

Bridges (> 20 ft, inspected every 2 years):

- Bridge Condition (30 points): Weighted based on condition of major inspected components (deck, superstructure, substructure, and culvert); more points assessed for higher levels of deterioration. The condition is determined at the most recent inspection.
- Remaining Life (10 points): Correlates the accelerated decline in remaining life to condition.
- Functionality (5 points): Compares roadway alignment and existing structure width, based on roadway classification, to accepted state standards. Too narrow or poorly aligned bridges are safety hazards and can impede traffic flow.
- Load Capacity and Use (15 points): Is the structure posted or restricted? What is the inconvenience to the traveling public if the bridge is out of service? What is the average traffic use on the structure?
- Waterway Adequacy and Scour Susceptibility (10 points): Are there known scour issues or concerns? Is the structure restricting the natural channel? Are channel banks well protected or vegetated?
- Project Momentum (5 points): Points are assigned if the project has a clear right of way, has all environmental permits, and the design is ready and waiting for funds to become available.
- Regional Input and Priority (15 points): Does the regional planning commission support the project from a local land-use and economic-development perceptive?
- Asset - Benefit Cost Factor (10 points): This compares the benefit of keeping a bridge in service to the cost of construction. The " benefit" considers the traveling public by examining the traffic volume and the length of a detour if the bridge were posted. For example, a bridge with a high traffic count that does not have a good detour around it would get a higher benefit score.

Assigned points are summed together to yield a maximum point value of 100. Roadway projects, including full-depth reconstruction, realignment, widening, adding lanes, etc.:

- Highway System (40 points): This factor looks at the Highway Sufficiency Rating and the network designation. Interstates are held to the highest standard, followed by non-Interstate primary and then off-primary roads. The Highway Sufficiency Rating considers traffic, safety, width, subsurface road structure, and more.
- Cost per vehicle mile (20 points): This is the project cost divided by the estimated number of miles vehicles will travel on the project. This is a relatively easy method to get a benefit/cost ratio for comparing similar projects.

- Regional Priority (20 points): The top RPC Roadway project is assigned 20 points. The score is reduced for lower RPC priorities. Projects listed as priority #10 and lower get two points.
- Project Momentum (20 points): This factor considers where the project is in the development process and anticipated problems such as right of way or environmental permitting. Some projects are so far along that they must be completed or the Agency would have to pay back federal funds.
- Designated Downtown project: Per 19 V.S.A. §10g(l)(3), VTrans awards ten bonus points to the base score for projects within a designated downtown development district established pursuant to 24 V.S.A. § 2793.

Traffic Operations (Intersection Design):

- Intersection Capacity (40 points maximum): This factor is based on Level of Service (LOS) for the intersection and the number of intersections that are in the coordinated system. Projects with a lower LOS and that are part of a larger coordinated system receive higher scores for this category.
- Accident Rate (20 points maximum): This factor is based on the critical-accident ratio for the intersection. Projects with higher critical-accident ratios receive higher scores for this category.
- Cost per Intersection Volume (20 points maximum): This factor uses the estimated construction cost and average-annual-daily traffic through the intersection. VTrans calculates the construction cost of the project for each anticipated user through the intersection. Projects with lower costs per intersection volume receive higher scores for this category.
- Regional Input and Priority (20 points maximum): This factor is based on the ranking of projects from the RPCs/MPO. The RPCs/MPO rank the projects based on criteria they develop. Projects with higher regional rankings receive higher scores for this factor.
- Project Momentum (10 points maximum): This factor considers where the project is in the development process, anticipated problems such as right of way or environmental permitting, and funding.

Park & Ride:

- Total Highway and Location (40 points): An accumulation of points from individual scorings of Highway Sufficiency Rating, Current Average Daily Traffic, Highway Function (Network), distance from Primary Network and Public Transit Service.
- Cost/Parking Space (20 points maximum): Correlates the facility project cost with the total number of parking spaces.
- Regional Input and Priority (20 points): Regional Planning Commission support for the project from a Regional perspective, and the project's priority within the region.
- Project Momentum (20 points): Projects that are already underway, projects that are already in VTrans' capital program and have identified funding, and projects that do not anticipate permitting or right-of-way problems are assigned more points.

Bicycle/Pedestrian:

- Land Use Density (20 points): Weighted based on surrounding land use condition including: Downtown or Village center, Connects outlying area to Downtown or Village Center, Connects Residential Area to School or Recreation area, Part of Regional Network
- Connectivity to a larger network of bicycle and pedestrian facilities (10 points): Correlates the proximity of the proposed bike or pedestrian improvement to a larger (local or regional) network of facilities. Includes the following factors: Completes critical missing link, First facility in a community, Links to both ends of facility, Links to one end of facility, Does not link to existing facility
- Multi-Modal Access (5 points): Correlates the proximity of the proposed bike or pedestrian improvement to other transportation modes. For example, points are given if the sidewalk, path or bike lane provides access to a bus station, train station or a Park & Ride lot.
- Designated Downtown or Village Center (5 points): Points are assigned if the proposed facility is completely or partially within a downtown area.
- Project Cost (20 points): Cost is analyzed per linear foot plus a consideration for bridges and retaining walls.
- Regional Priority (20 points)
- Project Momentum (20 points)
- Two points are assigned for each of 10 different factors:
  - Project Development Process: Project definition complete, Preliminary design complete, Environmental permits acquired, ROW clear
  - Funding: Project was funded in previous fiscal year, Project construction identified in the State Transportation Improvement Plan, Project construction expenditures are in the current Capital Program.
  - Anticipated Workflow Problems: No environmental resource problems anticipated, No design problems anticipated, No ROW problems anticipated

Transportation Enhancement Project Selection Process. Applications are reviewed by VTrans' Local Transportation Facilities (LTF) Section to ensure that the proposed projects meet all eligibility requirements for consideration. LTF staff reviews and comments on the applications for technical feasibility, budgetary feasibility, cost/benefit of the proposed project, and the capability/track record of the project sponsor. Applications and the LTF comments are scored by the Transportation Enhancement Grant Committee (TEGC). The score is based on the following ten criteria: (Note: Per legislative directive, preference is given to bicycle and pedestrian facilities as well as projects that are within Designated Downtowns and Villages.):

- The project promotes quality, linkage, and variety in Vermont's transportation system. (10 points) Points are given for project characteristics such as:
  - Has a clear, desirable, and defensible relationship to surface transportation.
  - Creates or completes a new transportation facility where it is needed.

    - Enhances the function and/or aesthetics of an existing transportation system.
    - Makes linkages to other modes of transportation, including public transportation, bicycling and walking facilities.
- Benefits a substantial number of Vermonters and visitors to the State. Does the project serve populations currently not served or underserved? (10 points)
- The project is compatible with its surroundings as well as relevant state, regional, and local planning. The project is supported by the RPC or MPO. (10 points)
- The project is feasible and likely to be finished. (10 points): There are no substantial environmental concerns, property ownership issues, or design challenges. The project has a completed study demonstrating its feasibility. The project has completed an analysis other than a feasibility study, has a detailed budget and firm commitment of local matching funds. The project sponsor has made provisions for long-term maintenance and its costs.
- The project enjoys strong community support. Indicators of support are: (10 points) Letters of support from organizations and individuals; A local financial match greater than 20 percent; The project accurately and effectively addresses one or more of the 12 eligible Transportation Enhancements activities. (10 points)
- The project is particularly innovative or creative. For example, points are given if the project has unique partnerships, innovative design, and use of local materials. (10 points)
- The project budget is 50 percent or more for pedestrian and bicycle travel surfaces. (10 points)
- The project benefits an economically-disadvantaged area, as evidenced by State designation or the town's most recent U.S. Department of Labor rate of unemployment. (5 points); The Project is located within Orleans and Essex Counties or within the geographic area of the Springfield Regional Development Corporation. The project is located in a town where the rate of unemployment exceeds 5.9 percent.
- The project benefits a designated downtown or village, as determined by the Vermont Downtown Board.
    - The project is within a Designated Downtown District. (5 points)
    - The project is directly adjacent to a Designated Downtown District. (3 points)
    - The project is within a Designated Village District. (2 points)

The TEGC members return their scores for each project to the LTF Section where the scores are averaged for each project. The TEGC awards funds in the priority ranked order until there is approximately $500,000 left. At that time, the committee considers the geographic distribution of projects. If necessary, projects might be elevated in priority to achieve better geographical distribution.