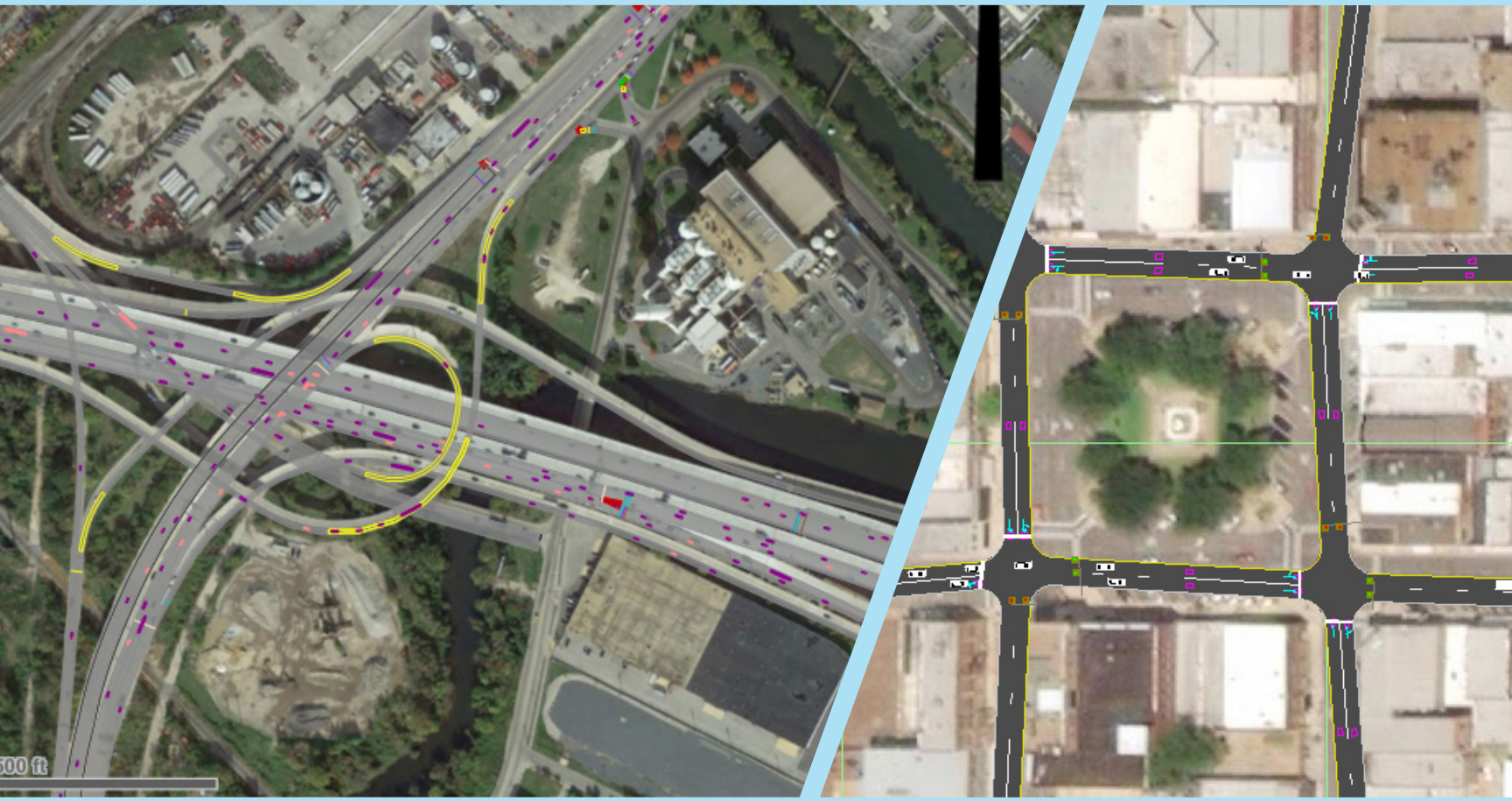
BALTIMORE METROPOLITAN COUNCIL

Project T30FB:
Regional Traffic Impact Study Guidelines

Final Suggested Best Practices Report



November 20, 2020

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I. Introduction

The Baltimore Metropolitan Council (BMC) performs activities that promote an integrated approach to transportation issues within the region. BMC initiated the subject project to "Develop Traffic Impact Study (TIS) Guidelines" for potential use by its member jurisdictions. These "guidelines" would support the analysis of the impacts that may be attributable to a proposed land use development on the surrounding transportation network. The Consultant Team's effort on the project was facilitated by a Project Steering Committee, which consisted of the BMC Project Manager, representatives of the jurisdictions who have direct responsibility and oversight for TIS reviews, and the Consultant Team.

The project scope stipulated the following principal objectives:

- Review and document the current TIS guidelines and related requirements currently used by the nine (9) BMC jurisdictions;
- Review new research and best practices for improving TISs, specifically to consider the current use of level of service criteria, and to potentially include assessment of multi-modal impacts; and
- Suggest recommendations for best practices to be used in conducting TISs.

In the previous tasks for this study, the Team reviewed and documented the current TIS guidelines currently used by the BMC jurisdictions and reviewed new research and best practices of jurisdictions around the country. Review meetings were held with the Steering Committee on March 18, 2020 and May 26, 2020 to discuss the findings. A Workshop was held on July 8, 2020 to discuss a framework for potential elements to be included as BMC TIS guidelines, leading to the creation of this report, which responds to the third objective listed above. More specifically, it presents the results of Task 5 of the Project Scope of Work, "Preparation of Suggested Best Practices." The Draft Suggested Best Practices Report was submitted on August 19. 2020 and this Final Suggested Best Practices Report addresses comments that were received.

II. Organization of this Document

This report is organized to first discuss "standard" TISs, along with potential changes based on current best practices. In this context, "standard" TISs are defined as those currently in-use by BMC jurisdictions. Expanded TISs are discussed next and include additional topics/parameters that are not generally present in BMC jurisdiction TISs, but could be considered for inclusion. A summary of recommended changes for agencies to consider follows the discussion of the two types of TISs. Additionally, the implications of COVID-19 on existing traffic in general and on TISs in particular are briefly discussed; however, these impacts are wide-ranging and developing in real-time.

III. Suggested Best Practices: "Standard" TISs

A. Development of the Suggested Best Practices

In practice, the acronym TIS typically stands for Traffic Impact Studies. However, it is readily apparent that the guidelines discussed in this report for BMC jurisdictions, as well as others in use around the county, are transitioning towards more of a multi-modal approach instead of focusing predominantly on vehicles. As such, it is recommended that agencies begin using the term *Transportation Impact Studies* rather than Traffic Impact Studies, although the acronym would remain the same.

As noted throughout the course of this study, the current TIS guidelines of BMC member agencies are generally working satisfactorily for those agencies. However, if an agency wished to modify its guidelines and procedures, the suggestions found in **Table 1** would be appropriate for consideration. In most cases, these changes could be made without a requiring a wholesale change to current procedures.

Table 1 is structured to show the development of the suggested best practices throughout the course of the project. Working from left to right, the table columns present:

- Each Parameter which has been discussed throughout the project
- Current Practices of BMC Agencies (a summary of the information presented in Technical Memorandum No. 1)
- Noteworthy Practices in Use by Other Agencies (a summary of the information presented in Technical Memorandum No. 2)
- Comments and Changes for Consideration by BMC Agencies (which were discussed during and following the Framework Workshop)
- Final Suggested Best Practices (which were developed on the basis of the information in the preceding columns), and
- Additional Information/Discussion of the Final Suggested Best Practices.

Table 1 and the remainder of this document contain several terms which could be interpreted differently by different readers. The definitions of these terms intended by the Study Team members are provided below, in alphabetical order.

- Build-out Year: The year of completion of a development, including all phases of a multi-phase development
- Design Year: The Build-out Year
- Horizon Year: The Build-out Year
- Post-Horizon Year: A year beyond the Build-out Year, identified for the purpose of longer-term planning analysis
- Regional Implications: Geographic implications larger than those typically found in a TIS; generally related to larger developments
- Scoping: The process conducted by a jurisdiction to clearly identify each of the specifics of a TIS with a developer; typically determined in an initial meeting or exchange of ideas with the developer
- Transportation System Features (TSFs): Relevant elements that make up the vehicular, pedestrian/bicycle, and other multi-modal travel space (i.e. lane/shoulder/sidewalk widths, pavement condition, transit routes and stops, bicycle facilities, etc.)

Table 1: TIS Parameters and Potential Changes – Traditional Transportation Impact Studies

Parameter	Current Practices of BMC Agencies	Noteworthy Practices in Use by Other Agencies	Discussed at/following Framework Workshop		Study Recommendations	
			Comments	Changes for Consideration by BMC Agencies	Final Suggested Best Practices	Additional Information/Discussion
Parameters Previously Discussed – Technical Memoranda 1 and 2						
1) Study Scoping Process	• All require scoping meeting with developer and agency; MDOT SHA included for some • Different requirements for urban/rural areas • TIS prepared by agency staff and/or developer's consultant	• Specific details not called out in the TIS guidelines are determined/discussed during scoping	• Encourage or allow community/citizen involvement in the study scoping process? • Potential downside of community involvement: Average person does not understand the technical details of a TIS and parameters may not exist for metrics they want to be evaluated • Instead, community comments should be raised at public meetings to be evaluated and addressed, if appropriate	• Encouraging including involvement by MDOT SHA will hopefully reduce conflicting comments between agencies	• Note: Many of the parameters identified in this study require discussion during scoping • Require formal scoping linked to the development application intake process • Require formal meeting to discuss all key/study parameters • Participation by the State and neighboring jurisdictions is strongly recommended, for developments which impact State roadways and broader local transportation system	• Initial pre-application scoping meeting may be helpful in establishing the requirements of a TIS, if one is needed • Scoping checklist may be helpful
2) Study Requirement Threshold	• Number of peak hour trips (5 of 9 jurisdictions) • Number of daily trips (3 of 9 jurisdictions) • Size of development (1 of 9 jurisdictions) • Proximity to problem intersections (4 of 9 jurisdictions)	• Small developments may not require "full" TIS • Net increase in VMT	• Include safety criterion? (Crash history, existing pedestrian/ bicycle network deficiencies, etc.) Note: This topic is discussed further in Table 2 • Include proximity to schools and other high pedestrian/bicycle generators?		• If not already in use, identify quantitative parameters, where practical • Allow flexibility to consider unusual conditions, such as proximity to high pedestrian/bicycle generators, proximity to existing dense development, etc.	• Most BMC jurisdictions currently have quantitative parameters, but not all have explicit flexibility • VMT is probably too detailed for most TISs, at this time • Inclusion of safety is discussed as part of Expanded TISs (see Table 2)

Parameter	Current Practices of BMC Agencies	Noteworthy Practices in Use by Other Agencies	Discussed at/following Framework Workshop		Study Recommendations	
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3) Study Area Definition	• Requirements vary by location (developed vs. rural) or development size • Defined distance from site • Impacted intersections	• All intersections and roadways where site generated traffic comprises a specific percentage of peak hour volume or number of peak hour trips	• Certain distance or number of intersections/roadway classifications from development site, if not already specified • Distance criteria may not always work when there is a large distance between intersections (call out if first major intersection is within ¼ mile of site, etc.)	• Allow flexibility based on study area – may need to add or subtract intersections depending on site specific issues – should be decided in scoping process	• Identify definitive parameters where practical • Allow flexibility to consider unusual conditions and site-specific issues • Identify a generalized radius from the main site entrance (or site center) as a starting point; modify on a case-by-case basis • Allow for reasonable review and response from the applicant – this should strongly be linked to the study scoping process	• This parameter is closely related to the "Study Requirement Threshold" parameter, and thus has similar recommendations for best practices • It is more difficult to quantify some items in this parameter; for example, "extend study area to first major arterial" would probably be more appropriate than "extend study area for 0.5 miles from site access points" • Factors to consider in modifying the study area would include the likely trip distribution pattern
4) Study Horizon/Design Year	• Proposed development completion/opening date • Dependent on build-out schedule for phased development	• Specific number of years after development opening or build-out • Vary based on size of development - opening year for smaller developments and a greater number of years after opening for larger developments	• Vary based on size/scope of development? • Vary based on when build-out will actually occur		• Use build-out year as design year • Use the results of the analyses for that year as the criteria for approval • Use interim build-out years for large and phased developments • Link approval of phased development to mitigation measures required for that proposed phasing	• For planning purposes, a jurisdiction may wish to require analyses for a post-horizon year (beyond the design year), particularly for large developments. If so, potential improvements identified by those analyses should not be the responsibility of the developer

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5) Existing Traffic Conditions and Related Data Requirements	• Peak hour TMCs and daily vehicular volumes • Counts must be from within a certain number of years • Pedestrian and bicycle counts included (4 of 9 jurisdictions) • Intersection geometry, particularly related to freight movement (1 of 9 jurisdictions)	• Pedestrian/bicycle/transit system inventory • Documentation of other transportation system features (lane widths, pavement condition, etc.)	• Require additional counts - pedestrian, bicycle, other modes? • What would be done with the additional count information if collected? (Justification for upgrading ped/bike facilities.) • Require vehicle classification data?	• Require multi-modal data collection • Could include ADA compatibility of area sidewalks, adequacy of ped signal timing, location of transit stops	• Set a maximum age for acceptable traffic counts from date of scoping – one year is suggested, with older counts being acceptable on an exception basis • If a signal warrant analysis may be needed, require 13-hour TMCs • For new intersection counts, require pedestrian and bicycle volumes • Require documentation of other relevant transportation system features	• In some areas with stable conditions, counts older than one year may be appropriate • "Transportation system features" (TSFs) should include lane widths, shoulder widths, sidewalk widths, pavement condition, identification of transit routes, location of transit stops, bicycle facilities and/or accommodations, ADA features, bike/car share locations, etc. • The required duration of intersection counts should vary with project location. Longer durations would be appropriate for urban settings where peak periods are extended. This should be a key part of the scoping process. • For industrial settings, consider requiring classification counts

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6) Background Traffic Projections / Considerations	• Projection of growth required to a horizon year (generally development build-out year) • Agencies provide growth rates for smaller developments; use forecasting models for larger developments • Most agencies require identifying approved/ background developments	• Extrapolation of historical traffic count data (10 or more years)	• If extrapolation of historical traffic counts are allowed, define the minimum number of years required • Historical data may be a good resource, but may not necessarily be relied upon for future conditions – use previous TISs and forecasting models instead		• Provide a list of background developments to be approved • Identify an annual growth rate to be applied to the build-out year; growth rates can be used in the absence of or with background development site traffic • If background developments are to be included, consider potential reduction of the annual growth rate	• Inclusion of site-specific background developments should be considered on a case-by-case basis • Different annual growth rates may be desirable for different areas in the jurisdiction • Annual growth rates may be based on historical trends or on modeled forecasts • The suggested reduction due to background developments should vary from TIS to TIS
7) Site Trip Generation	• ITE Trip Generation Manual • Locally-derived trip rates • Allow potential for adjusted rates based on studies	• Some agencies provide their own trip generation rates or adjustment factors • ITE Recommended Practice notes that local rates are more representative of local driving habits			• Use jurisdiction-approved local rates, if available • Otherwise, use ITE Trip Generation Manual • On a case-by-case basis, allow adjustments to trip generation rates, based on land use density, proximity to transit, etc.	• Developer-proposed trip generation may be acceptable, but should be approved with caution. If approved, the rates should be included in the jurisdiction's database of local rates. • Other factors that may be considered include pass-by trips and internal trip capture (for mixed-use developments) • Reduction in trip generation may be appropriate in the case of a replacement use on an already-developed site

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8) Site Trip Distribution and Traffic Assignment	• BMC regional trip distribution model (or County model) • Based on proximity of trip generators and attractions, and existing travel patterns • Calculated by land use • Specifics sometimes worked out during TIS scoping process	• Based on peak hour directional splits	• Define if BMC regional trip distribution model or another method should be used • Is an informal approach (as sometimes used today) adequate?	• Informal approach seems adequate for small to medium generators. Some generators not able to be captured by BMC model (too coarse), such as a gas station, a day care center, etc.	• Identify on a case-by-case basis, depending upon type, size and location of development. • For developments with significant truck traffic, identify separate distribution/assignment for trucks • Consider referring to navigation apps for confirmation of trip distribution assumptions	• For developments with regional implications, use of the BMC model should be considered, and could include zone to zone trip productions and attractions • For major retail developments, the applicant's market study (if available) could be considered

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9) Network Evaluation/ Analysis Methodology	• Critical Lane Volume (CLV) analysis – recognized as a sketch-level planning tool • Flexibility to use alternative tools (Synchro, HCS, SIDRA, etc.) • Vehicular LOS is standard – presented by individual movements, as well as overall intersection • Pedestrian and bicycle LOS included by one jurisdiction	• Pedestrian/bicycle/transit LOS in urban areas • VMT analysis (California only) • Total Transportation Level of Service – incorporate auto and non-auto LOS and mode share	• IS CLV still a good option? (No longer widely used, and not software-based) • Travel time reliability, v/c ratio, and queuing *(previously suggested by City of Annapolis)* • VMT analysis • Pedestrian/bicycle/transit LOS	• Consider using delay for ease of communication to the public • Queuing is also an important metric • Instead of ped/bike LOS, maybe use Level of Comfort (LOC)?	Overall: • Keep LOS as the standard pass-fail metric, but report delay (and queueing, where necessary) – delay is generally better-understood by the public than LOS • VMT analysis and travel time reliability are probably too detailed for most TISs, at this time For small/medium TISs (those without regional implications): • For vehicular analyses of intersections, require: ○ HCM analysis – this can be accomplished by either HCS or Synchro/SimTraffic ○ Synchro/SimTraffic for closely spaced intersections, for network analysis, and for study areas where queuing is of concern ○ Where queuing is a concern, report 95th% queues and excessive block times ○ Reporting of both LOS and delay in all instances • Require VISSIM for freeways and for TISs that require transit-specific analysis • Require Sidra analysis for roundabouts • For pedestrian/bicycle analyses, use Level of Comfort	• In unusual circumstances, a study may include a freeway – if so, VISSIM is recommended • For additional information regarding software, please see discussion below of *Parameter 16) Guidelines for Software Analysis*

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9) Network Evaluation/ Analysis Methodology (continued)					For TISs with regional implications: • For vehicular analyses: ○ Use Synchro/SimTraffic, unless VISSIM is required (based on freeway/transit criteria above) ○ Use delay and queuing as performance metrics	
10) Safety Evaluation	• Not standard • One jurisdiction requires evaluation for projects in proximity to high crash locations • Crash history, sight distance measurements, and speed studies (determined during scoping)	• Not standard; generally includes high-crash locations when included	• Crash history • Could be defined in terms of crash rate, number of locations, etc. • Member jurisdictions are developing Strategic Safety Plans and this may provide an opportunity to incorporate safety evaluations into TISs • Discussed in more detail in Table 2	• Consider what is looked at for safety in the Access Permit process versus the TIS process • Similar to capacity issues, does the applicant need to mitigate any existing safety problems, or just the delta from Background conditions to Build conditions?	• Since the inclusion of safety as a parameter is not standard, this is discussed as part of Expanded TISs (see Table 2)	
11) Site Access and Mitigation	• Shared responsibility of mitigating impacts to the roadway network – if the developer has a failing movement and/or intersection, they have to propose improvements to mitigate their traffic • Consider proportional cost-sharing by respective developments • Based on location of development	• Generally, no specific mitigation requirements are defined • Contribution to pooled funds is standard • Boost pedestrian/bicycle/transit connectivity (to reduce generated vehicle trips) • Parking reduction in urban environments to discourage vehicle trips	• Significant complexities involved in allocating the improvement/mitigation costs		• Determine physical and operational improvements needed to achieve the jurisdiction's LOS/delay/queuing criteria for intersections and roadways • Require either construction of those improvements or contribution to funding those improvements • Identify other desirable transportation system features (TSFs) • Require either construction of those desirable TSFs or contribution to funding those improvements • On a case-by-case basis, allow improvements to TSFs in lieu of other identified improvements	• TSFs should include lane widths, shoulder widths, sidewalk widths, pavement condition, identification of transit routes, location of transit stops, bicycle facilities and/or accommodations, ADA features, bike/car share locations, etc. • Indicate timing of implementation relative to the build-out or phasing of the development • Feasibility of improvement strategies should be considered/scaled relative to the context of the study

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12) Jurisdictional Coordination	• Open to jurisdictional coordination, but no specific guidelines	• No specific processes mentioned for coordination with adjacent jurisdictions	• Develop guidelines/process for coordination for developments close to boundaries		• Participation by neighboring jurisdictions is strongly recommended, for developments with multi-jurisdictional impacts	• This will require bi-lateral cooperative agreements between jurisdictions. An informal approach is probably best, at least initially.
Additional Parameters for Consideration						
13) MDOT SHA Involvement	• MDOT SHA is sometimes asked to participate; attends scoping meetings and has input for State roadways	• N/A	• How formally should MDOT SHA be involved?	• Encouraging including involvement by MDOT SHA in Scoping will hopefully reduce conflicting comments between agencies	• Participation by MDOT SHA is strongly recommended for developments with impacts on State facilities	• An important consideration is having MDOT SHA in agreement with the TIS analysis and evaluation process, including acceptance of the analysis methodology • MDOT SHA participation is particularly important if direct access to a State facility is needed and may reduce conflicting comments between agencies
14) Incorporation of Planned Developments	• Not generally discussed explicitly in the guidelines • Usually include developments under construction and background developments, which are approved but not yet built	• Generally, approved development projects in the vicinity are included • Potential analysis of pending developments determined during scoping	• Add process for incorporating approved and pending developments - within certain radius, varying based on development size, etc.? • Would like to include nearby developments that haven't received approval yet, especially large developments	• Include developments following planning approval/APFO approval	• Incorporation of planned developments is discussed above in *Parameter 6) Background Traffic Projections/Considerations*	
15) "Preliminary" TIS Submittal Before Capacity Analyses Conducted	• Not addressed	• Not addressed	• This would allow agreement on the existing data and the trip generation/distribution, before capacity analyses get done; however, may add significantly to the study time and process		• Not recommended at this time • Require submission of sufficient information during the scoping process to fulfill the intent of this parameter	• Some jurisdictions already require a substantial submission as part of the scoping process

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16) Guidelines for Software Analysis	• Most jurisdictions offer flexibility to use various software	• No calibration/ standardization of software applications is mentioned	• Develop criteria for software (Synchro has become a default – what parameters can be adjusted, and what kind of calibration is needed?) • Possible to evaluate how navigation apps may route trips? *(previously suggested by Queen Anne's County)*	• Differentiate if Synchro is enough or if SimTraffic part of package should also be used • VISSIM or HCS for instances with freeways/interchange impacts	• A specific version of each permitted software package (e.g, HCS, Synchro/SimTraffic, VISSIM, and Sidra) should be identified • Calibration requirements for each software package should be identified • Limits on modifications of some software parameters (such as length of yellow interval at signalized intersections) should be identified	• Guidelines could include a glossary of terms, and stipulations regarding how analysis tools may be used • Current MDOT SHA guidelines could be used as a starting point
17) Appeals Process	• One jurisdiction has a formal process • Public hearings (if held) allow for technical/witness testimony, which could challenge TIS findings	• No appeals process outlined by any other jurisdiction	• Identify an appeals process if a developer disagrees with the agency's TIS decision(s)		• No specific appeals process is recommended at this time	• Enabling ordinances or regulations may already provide a process for each jurisdiction
18) Post-Development Audit	• One jurisdiction requires a post-development audit in connection with approved mitigation measures	• Enforcement of mitigation is not clearly defined	• Identify process for post-development audit (by developer?) of effectiveness of mitigation requirements, as well as outlining the process if they are not met • Conduct by agency, solely for calibration of agency guidelines?	• Montgomery County has Traffic Management Plans (TMPs) which setup post-development audits	• The intention of this requirement would be to allow the jurisdiction to develop a database of the effectiveness of various mitigation measures, not to penalize the developer • Require post-build-out year data collection by developer • Require documentation by developer of effectiveness of implemented mitigation measures • Do not require additional mitigation by the developer, even if goals have not been achieved	• Generally, such audits would be applicable to situations where trip mitigation measures, such as transit usage, staggered work hours, etc. are proffered by the applicant as TDM measures • Documentation does not need to be extensive, and could be qualitative for some mitigation measures

B. Additional Background

To the extent practical, additional information/discussion of each of the parameters has been included in **Table 1**. However, this was not feasible for Parameter *9) Network Evaluation/Analysis Methodology*. Additional background information leading to the Final Suggested Best Practices for this parameter is provided below.

Network Evaluation Methodology #1 – CLV

Five of the nine BMC jurisdictions currently require CLV as the primary analysis methodology for evaluating intersections and also offer flexibility in the use of HCM on a case-by-case basis. However, none of these jurisdictions provide any definitive guidance on the use of this planning level tool, as is done by neighboring jurisdictions such as Prince George's and Montgomery Counties. Based on research and Study Team experience using this tool, the following are the pros and cons:

Pros:

a) Provides a quick assessment of the overall capacity sufficiency of an intersection
b) Useful for evaluating the feasibility of capacity improvement (i.e., addition of lanes, etc.)
c) Useful tool for analyzing future conditions, where traffic volumes are "projected" and detailed signal timing information is unknown
d) Could be used to determine the most effective signal phasing scheme required to achieve optimum capacity results
e) Relatively easy to use, and the computations are easy to verify by a reviewer.

Cons:

a) Does not consider the impact of roadway/intersection geometrics (such as lane widths, grades, storage lengths, etc.)
b) Does not consider signal timing or control delay by approach (or the intersection as a whole)
c) Subjective, and requires considerable user judgment
d) Does not consider traffic flow characteristics such as peak hour factor or heavy vehicle percentage
e) The impact of pedestrian activity (particularly on turning vehicles) is not considered
f) Generally regarded as conservative, and not recommended as a stand-alone tool for operational analysis.

Network Evaluation Methodology #2 – HCM

HCM is particularly useful when a current situation is being studied in the context of future conditions, as in the case of TISs. It is noteworthy that ITE recommends in *Transportation Impact Analyses for Site Development: An ITE Recommended Practice* that the analysis procedures detailed in the most recent HCM be used in evaluating study intersections. This methodology is currently utilized by four of the nine BMC jurisdictions and, as discussed during the Workshop, the sentiments of the Steering Committee members were leaning more towards the use of this methodology. The following are the pros and cons:

Pros:

a) Useful for performing planning, operational, and design analysis of intersections
b) Considers the impacts of signal timing, roadway geometrics, traffic flow characteristics, and pedestrian activity in determining control delay, which is considered a more relatable measure of level of service
c) Provides an aggregation of control delay, as well as volume-to-capacity ratio by lane group/movement, approach and overall intersection
d) Appropriate for evaluating/identifying traffic operational issues, which could be mitigated with short-term improvements such as signal timing optimization
e) Identifies queues
f) Consistent with results Synchro uses and reports
g) Flexibility to adjust default values to better reflect existing operational conditions
h) Based on nationally accepted guidelines.

Cons:

a) Procedure is time consuming since it requires considerable amount of data input
b) Considered an expensive option since it requires purchase of software
c) Reviewers generally find it difficult to verify the analysis, which is performed by a computer (and prone to errors)
d) Requires some level of training to use.

Based on the above information, the HCM methodology offers a more robust and customizable platform to evaluate the performance of both signalized and unsignalized intersections. The methodology is also based on nationally vetted guidelines, which are periodically updated, unlike the CLV methodology, which has not undergone any significant update in decades. For these reasons, HCM analysis is recommended – as stated in **Table 1**.

Delay as a Preferred Measure of Level of Service (LOS)

The HCM notes that the results of traffic analyses are highly technical and can be difficult for the public (and other local stakeholders) to interpret for decision making. Therefore, it is important that the results be presented in the simplest *and most relatable* way possible. Delay is generally considered the most relatable/perceptible measure of effectiveness of transportation systems because it is the metric that the average roadway user can most easily appreciate. In this context, use of "average delay" is the suggested best practice for supplementing LOS.

IV. Suggested Best Practices: Expanded TISs

A. Development of the Suggested Best Practices

Expanded TISs refer to the inclusion of additional topics/parameters that are not typically found in the TIS guidelines of BMC member agencies. **Table 2** presents the parameters that could be implemented in an Expanded TIS.

Table 2 is structured to show the development of the suggested best practices throughout the course of the project. Working from left to right, the table columns present:

- Each additional Parameter which has been discussed throughout the project
- The Rationale for Consideration of the parameter
- Possible Challenges which could be encountered in using the parameter
- Comments and Changes for Consideration by BMC Agencies (which were discussed during and following the Framework Workshop)
- Final Suggested Best Practices (which were developed on the basis of the information in the preceding columns), and
- Additional Information/Discussion of the Final Suggested Best Practices.

It may be noted that, for a few of the parameters in **Table 2**, reference is made back to **Table 1**. While the Study Team initially intended to keep the two tables completely separate, it became clear that there was substantial overlap, particularly for **Table 1's** Parameter *5) Existing Traffic Conditions and Related Data Requirements* and the parameters in **Table 1** which were dependent upon how Parameter 5 is implemented. This dependence carries over into **Table 2**. Rather than force an unwieldly separation of the two tables, the Study Team allowed the overlap to remain.

Table 2: Potential Topics to Address in Expanded Transportation Impact Studies

Parameter	Rationale for Consideration	Possible Challenges	Discussed at/following Framework Workshop		Study Recommendations	
			Comments	Changes for Consideration by BMC Agencies?	Final Suggested Best Practices	Additional Information/Discussion
1) Safety Analyses	• Important Issue, not well-addressed currently • Vision Zero tie-in	• Additional detailed analyses will increase the level of review required • Availability of data (crash history). May require agency involvement to obtain crash data. • May require lengthy lead times • Potential difficulty with obtaining high-quality crash reports due to privacy requirements/data censoring • How to develop threshold based on crash history and identify what needs to be improved	• The State and most jurisdictions are adopting Vision Zero as part of their mobility objectives • Evaluate based on severity, number of crashes, or crash rate based on ADT?	• Create public policy document to identify intersections with safety concerns (traffic-related, multimodal, etc.) for developer to analyze	• Given the challenges associated with obtaining crash data, it is probably not reasonable to require quantitative crash analyses in all TISs • Require assessment of sight distance at all intersections and along roadway segments; require identification of needed sight distance improvements • Identify specific locations of concern during scoping, based on crash history or other factors; require qualitative identification of potential improvements • Require assessment of how all roadways/intersections in the study area conform to the jurisdiction's design standards • On a case-by-case basis, allow improvements to TSFs in lieu of other identified improvements – see *Table 1, Parameter 11) Site Access and Mitigation*	• Other possible safety-influencing factors to include in TSF inventory: existing pedestrian/bicycle network deficiencies, presence/absence of shoulders, presence/absence of turning lanes/bypass lanes, condition of signing/pavement markings, presence/absence of lighting • BMC jurisdictions are developing Strategic Safety Plans and this may provide an opportunity to incorporate safety evaluations into TISs • In scoping, determine if applicant will need to mitigate existing safety issues or only the difference associated with the development
2) Multi-modal Analyses	• Analyses could identify areas of improvement as potential mitigation strategies (pedestrian/bicycle/transit network deficiencies, etc.) • Equity – places less priority on roadway users	• Additional detailed analyses will increase the level of review required • Additional data collection will be necessary (pedestrian, bicycle, transit, etc.)		• ADA compliance in study area, ped bike LOC, adequate ped crossing times at signals are possible measures	• See recommendations in *Table 1, Parameter 5) Existing Traffic Conditions and Related Data Requirements* and *Table 1, Parameter 11) Site Access and Mitigation* • The need for multi-modal analyses should be discussed as part of the scoping process	• Multi-modal analysis may not be necessary, depending on the location of the development • Developments located within urban/ suburban areas may require pedestrian, bicycle and/or transit analysis • Developments located in very rural areas may require only vehicular analysis

Parameter	Rationale for Consideration	Possible Challenges	Discussed at/following Framework Workshop		Study Recommendations	
			Comments	Changes for Consideration by BMC Agencies?	Final Suggested Best Practices	Additional Information/Discussion
3) Transportation Demand Management (TDM)	• Currently considered optional in many jurisdictions, but required in some urban locations • Generally lower-cost improvement strategies (such as ride-sharing, transit usage, flexible hours, etc.)	• Additional detailed analyses will increase the level of review required • How to account for TDM improvements in the roadway LOS analysis?	• Are TDM strategies logical in all areas, or should they be used on a case-by-case basis?		• On a case-by-case basis, allow consideration of TDM in lieu of other identified improvements • Require post-development audit – see *Table 1, Parameter 18) Post-Development Audit* for additional information	
4) Types of Trips Besides Vehicle-Trips	• Equity – places less priority on roadway users	• If you allow for other-than-vehicle-trips, do you require analyses for those modes? • Additional detailed analyses will increase the level of review required • Logical in all areas, or should it be used on a case-by-case basis?	• Pedestrian/bicycle, micro-mobility, transit, etc. • Define terminology for this parameter?	• Montgomery County methodology for determining volume of transit, ped and bike trips – if over 50/hour for any mode then trigger analyses for that mode	• This topic is discussed above in *Table 2, Parameter 2 – Multi-modal Analyses*	
5) Additional Types of Mitigation Strategies	• Some mitigation strategies may lead to modal conflicts (i.e., a positive effect on one mode of travel may adversely impact another) • Recognizes and places importance on TDM, transit enhancements, and pedestrian/bicycle/micro-mobility enhancements	• New mitigation strategies will require guidelines and may be untested in local jurisdictions	• Define terminology for this parameter?		• This topic is discussed in *Table 1, Parameter 11 – Site Access and Mitigation* and *Table 2, Parameter 3 – Transportation Demand Management*	
6) Penalties for Non-Achievement of Mitigation Requirements	• Currently not defined	• Potentially difficult to enforce	• Define terminology for this parameter?		• Penalties are not recommended at this time • Require post-development audit – see *Table 1, Parameter 18) Post-Development Audit* for additional information	• Alternatively, a jurisdiction could consider including a written agreement as part of a mitigation effort, with a financial penalty identified for non-compliance

Parameter	Rationale for Consideration	Possible Challenges	Discussed at/following Framework Workshop		Study Recommendations	
			Comments	Changes for Consideration by BMC Agencies?	Final Suggested Best Practices	Additional Information/Discussion
7) Other Measures of Effectiveness (MOEs)	• Opportunity to move away from generally evaluating roadway LOS	• Additional detailed analyses will increase the level of review required • Potentially difficult to standardize and provide guidelines for other unestablished MOEs	• VMT analysis	• Delay and queues more meaningful?	• Delay and queuing are discussed in *Table 1, Parameter 9) Network Evaluation/Analysis Methodology*	• VMT analysis and travel time reliability are probably too detailed for most TISs, at this time
8) COVID-19 Considerations	• Lessons learned from how other agencies handled the pandemic • Future impact on transportation planning, design, etc. of the post-pandemic "normal" • Should street closures for pedestrian/bicycle social distancing remain in-place while reducing space for vehicles? • Traffic volume reduction? • Impacts on peak-spreading?	• Unknowns – i.e. will traffic patterns and volumes return to previous levels? • Data collection	• Very difficult to change public perception and take away anything temporary *(previously mentioned by Baltimore City)* • COVID-19 addendum calling out what will be accepted in terms of data collection (counts up to three years old with growth rate added) • Potentially allow counts during the summer, etc. if no other valid counts are available and add adjustment factor	• Add COVID-19 addendum to existing guidelines to address short-term needs (in effect until State of Emergency is lifted and schools reopen on a normal schedule) before reverting to previous guidelines • With situation evolving monthly/weekly/daily, do we know enough to provide something meaningful, other than to just note that it is an issue?	• Add COVID-19 addendum to existing guidelines to address short-term needs (in effect until State of Emergency is lifted and schools reopen on a normal schedule) before reverting to previous guidelines • Addendum to guidelines should address: ○ Maximum age for acceptable traffic counts ○ Procedure for adapting older traffic counts to approximate "non-COVID-19" existing conditions • No other changes to existing TIS procedures are suggested	• If post-development audits are to be performed, they should be deferred until State of Emergency is lifted and schools reopen on a normal schedule – see *Table 1, Parameter 18) Post-Development Audit* for additional information

B. Additional Background

To the extent practical, additional information/discussion of each of the parameters has been included in **Table 2**. However, this was not feasible for Parameter *1) Safety Analyses* and Parameter *8) COVID-19 Considerations*. Additional background information leading to the Final Suggested Best Practices for these parameters is provided below.

Safety Analyses

Safety is an important consideration for transportation planning and design; however, safety analyses are often ignored in TISs. ITE recommended practice states that "the initial review of existing data within a study area should include recent (within three years) collision experience. This review should identify locations where transportation safety should be given extra consideration. High-collision locations (based on number, rate and severity) on roadways serving the study site should be analyzed." This also ties into the aggressive agenda of Maryland's Strategic Highway Safety Plan (i.e., Toward Zero Deaths) to eliminating highway fatalities and serious injuries by the year 2030. It is therefore recommended that elements of safety analyses be considered, particularly for developments which have significant impacts on existing vehicular and pedestrian traffic. The extent of the evaluation may be negotiated as part of the scoping process.

It should be noted that in terms of safety, some jurisdictions may be independent of the County agencies responsible for making safety improvements and may not choose to include specific guidelines in the TIS process. Additionally, a TIS can be viewed as a public review process whose outcome should not always place the burden on the applicant, particularly in terms of safety.

As an illustration, there might be a finding that a bus stop/shelter should be relocated, which the area transit agency can easily undertake; or that a traffic signal needs re-timing or a stop sign may need to be relocated/ repaired that could easily be undertaken by MDOT SHA or the jurisdiction.

COVID-19 Considerations

The implications of COVID-19 on existing traffic have been evolving and will continue into the future. A few predictions regarding the long-term impacts of COVID-19 on the transportation system have been made and continue to be made. A sample of these predictions, none of which are endorsed by the Study Team, and which are included here solely for illustrative purposes, include the following:

- Daily and peak hour trip generation rates for land uses such as offices may be substantially reduced, as work-from-home continues.
- Daily and peak hour trip generation rates for retail and restaurant land uses may be substantially reduced, due to the convenience of at-home delivery services.
- Transit usage may be substantially reduced from pre-COVID levels for a lengthy period.
- Parking demand may increase at many land uses, as individuals avoid ridesharing in favor of driving alone.

As may be seen by the sample of predictions above, there is not yet a consensus regarding the long-term impacts of COVID-19. For this reason, with the exception of **Table 1's** Parameter *5) Existing Traffic Conditions and Related Data Requirements*, the Study Team recommends that jurisdictions not modify their existing guidelines to address COVID-19. If modifications are to be made to that parameter, the Suggested Best Practices found in **Table 2** Parameter *8) COVID-19 Considerations* should be followed.

As an example, within the BMC region, Harford County recently worked with its Law Department to create an addendum to the Traffic Impact Analysis Guidelines due to the impacts of COVID-19 and placed the document on the County website, effective immediately. The addendum allows the use of traffic counts that are up to three years old with applied growth rates and will revert to the original guidelines once Maryland's State of Emergency is lifted and Harford County Schools reopen on a normal in-person schedule.

V. Summary of Final Suggested Best Practices

The formats of **Table 1** and **Table 2,** while highly useful, do not lend themselves to straightforward reproduction of the Suggested Best Practices. For that reason, the Final Suggested Best Practices are repeated here in text format.

As stated earlier in this report, the acronym TIS typically stands for Traffic Impact Studies. However, it is readily apparent that the guidelines discussed in this report for BMC jurisdictions, as well as others in use around the county, are transitioning towards more of a multi-modal approach instead of focusing predominantly on vehicles. As such, it is recommended that agencies begin using the term *Transportation Impact Studies* rather than Traffic Impact Studies, although the acronym would remain the same.

Study Scoping Process

- Note: Many of the parameters identified in this study require discussion during scoping
- Require formal scoping linked to the development application intake process
- Require formal meeting to discuss all key/study parameters
- Participation by the State and neighboring jurisdictions is strongly recommended, for developments which impact State roadways and broader local transportation system

Study Requirement Threshold

- If not already in use, identify quantitative parameters, where practical
- Allow flexibility to consider unusual conditions, such as proximity to high pedestrian/ bicycle generators, proximity to existing dense development, etc.

Study Area Definition

- Identify definitive parameters where practical and adjust as necessary since the agency reviewer has institutional knowledge of transportation/access/community issues and concerns
- Allow flexibility to consider unusual conditions and site-specific issues
- Identify a generalized radius from the main site entrance (or site center) as a starting point; modify on a case-by-case basis
- Allow for reasonable review and response from the applicant – this should strongly be linked to the study scoping process

Study Horizon/Design Year

- Use build-out year as design year
- Use the results of the analyses for that year as the criteria for approval
- Use interim build-out years for large and phased developments
- Link approval of phased development to mitigation measures required for that proposed phasing

Existing Traffic Conditions and Related Data Requirements

- Set a maximum age for acceptable traffic counts from date of scoping – one year is suggested, with older counts being acceptable on an exception basis
- If a signal warrant analysis may be needed, require 13-hour TMCs
- For new intersection counts, require pedestrian and bicycle volumes
- Require documentation of other relevant transportation system features

Background Traffic Projections/Considerations

- Provide a list of background developments to be approved
- Identify an annual growth rate to be applied to the build-out year; growth rates can be used in the absence of or with background development site traffic
- If background developments are to be included, consider potential reduction of the annual growth rate

Site Trip Generation

- Use jurisdiction-approved local rates, if available
- Otherwise, use ITE Trip Generation Manual
- On a case-by-case basis, allow adjustments to trip generation rates, based on land use density, proximity to transit, etc.

Site Trip Distribution and Traffic Assignment

- Identify on a case-by-case basis, depending upon type, size and location of development
- For developments with significant truck traffic, identify separate distribution/assignment for trucks
- Consider referring to navigation apps for confirmation of trip distribution assumptions

Network Evaluation/Analysis Methodology

Overall

- Keep LOS as the standard pass-fail metric, but report delay (and queueing, where necessary) – delay is generally better-understood by the public than LOS
- VMT analysis and travel time reliability are probably too detailed for most TISs, at this time

For small/medium TISs (those without regional implications)

- For vehicular analyses of intersections, require:
  - HCM analysis – this can be accomplished by either HCS or Synchro/SimTraffic
  - Synchro/SimTraffic for closely spaced intersections, for network analysis, and for study areas where queuing is of concern
  - Where queuing is a concern, report 95th% queues and excessive block times
  - Reporting of both LOS and delay in all instances
- Require VISSIM for freeways and for TISs that require transit-specific analysis
- Require Sidra analysis for roundabouts
- For pedestrian/bicycle analyses, use Level of Comfort

For TISs with regional implications

- For vehicular analyses:
  - Use Synchro/SimTraffic, unless VISSIM is required (based on freeway/transit criteria above)
  - Use delay and queuing as performance metrics

Safety Evaluation

- Since the inclusion of safety as a parameter is not standard, this is discussed below as part of *Safety Analyses*

Site Access and Mitigation

- Determine physical and operational improvements needed to achieve the jurisdiction's LOS/delay/queuing criteria for intersections and roadways
- Require either construction of those improvements or contribution to funding those improvements
- Identify other desirable transportation system features (TSFs)
- Require either construction of those desirable TSFs or contribution to funding those improvements
- On a case-by-case basis, allow improvements to TSFs in lieu of other identified improvements

Jurisdictional Coordination

- Participation by neighboring jurisdictions is strongly recommended, for developments with multi-jurisdictional impacts

MDOT SHA Involvement

- Participation by MDOT SHA is strongly recommended for developments with impacts on State facilities

Incorporation of Planned Developments

- Incorporation of planned developments is discussed above in *Background Traffic Projections/Considerations*

"Preliminary" TIS Submittal Before Capacity Analyses Conducted

- Not recommended at this time
- Require submission of sufficient information during the scoping process to fulfill the intent of this parameter

Guidelines for Software Analysis

- A specific version of each permitted software package (e.g, HCS, Synchro/SimTraffic, VISSIM, and Sidra) should be identified
- Calibration requirements for each software package should be identified
- Limits on modifications of some software parameters (such as length of yellow interval at signalized intersections) should be identified

Appeals Process

- No specific appeals process is recommended at this time

Post-Development Audit

- The intention of this requirement would be to allow the jurisdiction to develop a database of the effectiveness of various mitigation measures, not to penalize the developer
- Require post-build-out year data collection by developer

- Require documentation by developer of effectiveness of implemented mitigation measures
- Do not require additional mitigation by the developer, even if goals have not been achieved

Safety Analyses

- Given the challenges associated with obtaining crash data, it is probably not reasonable to require quantitative crash analyses in all TISs
- Require assessment of sight distance at all intersections and along roadway segments; require identification of needed sight distance improvements
- Identify specific locations of concern during scoping, based on crash history or other factors; require qualitative identification of potential improvements
- Require assessment of how all roadways/intersections in the study area conform to the jurisdiction's design standards
- On a case-by-case basis, allow improvements to TSFs in lieu of other identified improvements – see *Site Access and Mitigation*

Multi-modal Analyses

- See recommendations in *Existing Traffic Conditions and Related Data Requirements* and *Site Access and Mitigation*
- The need for multi-modal analyses should be discussed as part of the scoping process

Transportation Demand Management (TDM)

- On a case-by-case basis, allow consideration of TDM in lieu of other identified improvements
- Require post-development audit – see *Post-Development Audit* for additional information

Types of Trips Besides Vehicle-Trips

- This topic is discussed above in *Multi-modal Analyses*

Additional Types of Mitigation Strategies

- This topic is discussed in *Site Access and Mitigation* and *Transportation Demand Management*

Penalties for Non-Achievement of Mitigation Requirements

- Penalties are not recommended at this time
- Require post-development audit – see *Post-Development Audit* for additional information

Other Measures of Effectiveness (MOEs)

- Delay and queuing are discussed in *Network Evaluation/Analysis Methodology*

COVID-19 Considerations

- Add COVID-19 addendum to existing guidelines to address short-term needs (in effect until State of Emergency is lifted and schools reopen on a normal schedule) before reverting to previous guidelines
- Addendum to guidelines should address:
  - Maximum age for acceptable traffic counts
  - Procedure for adapting older traffic counts to approximate "non-COVID-19" existing conditions
- No other changes to existing TIS procedures are suggested