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Guidelines for the Preparation of Transportation Impact Studies

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INTRODUCTION

The Department of Public Service is responsible for ensuring the public health, safety, and welfare associated with new development and redevelopment as they may affect the City of Hilliard's transportation system. A Transportation Impact Study (TIS) is one of the ways to determine and evaluate the effects of a proposed development on that transportation system. A TIS also suggests infrastructure improvements and other mitigating measures necessary to accommodate travel generated by the development.

The City of Hilliard Comprehensive Plan establishes overlying principles pertaining to transportation and development that change the way in which transportation impacts are evaluated. Traditional TISs of the past focused primarily on resolving congestion by widening roadways to increase vehicular capacity. This auto-centric approach tends to result in over widening of roadways to meet peak hour vehicle demand at the expense of community character, livability, and the needs of non-motorized users. The adoption of the Hilliard Comprehensive Plan and the corresponding Thoroughfare Plan and Access Management Plan in 2011 has prompted the need to update TIS requirements to meet new community goals. Today's TIS focuses more on accommodations to support and encourage a safe and efficient active transportation system, focusing more on the needs of pedestrians, cyclists, and transit users.

While transportation objectives and policies are the primary focus of a TIS, the broader Comprehensive Plan goals integral to the creation of a strong city should be kept in mind. These include developing a livable and sustainable suburban area, promoting a fiscally-responsible approach to development, having regard for environmental health, and generally enhancing social wellbeing by providing a balanced transportation system that is supportive of vehicles, pedestrians, bicyclists, and transit users.

OVERVIEW

The *Guidelines for the Preparation of Transportation Impact Studies (Guidelines)* is a reference document describing the City of Hilliard requirements and methodologies for assessing and mitigating the transportation impacts associated with applications for property development in the City. The *Guidelines* supersede the *Applicant's Guide for Traffic Access and Impact Studies for Proposed Development (January 2001)*. It reflects current City transportation goals and incorporates the latest methodologies, practices, and tools to analyze transportation impacts at City intersections and within its corridors. The *Guidelines* will be reviewed and updated periodically to reflect changes in City policy and development review and approval practice.

1. Purpose of a TIS

A TIS is intended to provide the information necessary to guide City staff in reviewing the transportation aspects of a development proposal by:

- Accessing the extent of transportation impacts;

- Evaluating how the development meets the provisions of the City of Hilliard Thoroughfare Plan and the Access Management Plan;
- Identifying physical infrastructure improvements that should be considered either on opening day or upon full build out of the development to ensure network safety and acceptable operating conditions for motorized and non-motorized users on streets, sidewalks, pathways, pedestrian crossings, and access points;
- Determining if the physical infrastructure improvements are consistent with Hilliard Comprehensive Plan objectives, particularly in the four Focus Areas;
- Determining if the physical infrastructure improvements are reasonable based on planned Capital Improvement Projects in the area;
- Identifying appropriate travel demand management (TDM) strategies to reduce private motor vehicle use and encourage pedestrian and bicycling; and
- Maintaining consistency with other City transportation objectives and policies.

2. When a TIS is Required

In most cases, a TIS is required when a proposed development meets one or more of the following criteria:

- **Significantly-Sized Project.** The development generates more than 100 vehicle trips per hour of an average day based on ITE trip generation rates or site-specific traffic data previously obtained at a similar location (subject to the approval of City staff).
- **Nearby Congestion.** Vehicle traffic generated by the development is expected to trigger a critical capacity or safety condition at one or more of the surrounding signalized intersections as defined by:
 - Volume to capacity ratio of 1.0 or greater
 - Vehicle level of service (LOS) greater than “E” for any approach
 - Vehicle queuing at through or turn lanes, which impacts the ability to enter or exit the development or existing driveways located opposite the development
- **Change in Access.** The development proposal incorporates a change in access to a street listed in the Hilliard Thoroughfare Plan.
- **Change in Site Circulation.** The development proposal incorporates a change in the site layout that results in traffic pattern changes on the site that would impact operations on the public street. Examples include changes to drive-thru window locations or major drive aisle locations.
- **Change in current land use which encourages street crossing.** The development proposal changes the land use to a use that is complimentary to a use located across a street listed on the Hilliard Thoroughfare Plan, prompting the need to evaluate pedestrian crossing accommodations. Examples include residential/school, residential/neighborhood retail, and office/restaurant.
- **Growth Corridor Location.** The development proposal is located in an area that is expected to experience significant growth. Coordination with other development proposals within the larger area is critical to plan driveway locations, cross access points, and corridor-wide streets and bike/ped improvements.

Many factors impact the size and scope of a TIS. In some cases a smaller traffic operations analysis or an update to an existing study may be all that is necessary. If a developer proposes a change in existing land use or zoning that results in fewer vehicle trips generated on the site and the development proposal does not adversely impact the accommodations for non-motorized users, the TIS requirement may be waived by the City. Documentation must be provided in letter format by the developer's engineer that supports the claim that the proposed use or zoning is a less intense land use. The applicant should consult with staff to determine the level of analysis that is required.

If a TIS, or a less detailed analysis based on the nature of the development proposal, is required, it should be submitted at the following times to allow for appropriate review and comment by staff:

- Included with a Planning & Zoning Commission or Board of Zoning Appeals application. Examples include:
 - Rezoning
 - Zoning modification
 - Conditional use
 - Final development plan
 - Level "B" site plan review

- Included with submittals that require staff-level approval. Examples include:
 - Level "A" site plan review
 - Zoning certificate
 - Building permit

Failure to submit a TIS or an appropriate traffic operations analysis in a timely manner could result in delay of approval or issuance of permits. Early staff consultation is recommended for all development or redevelopment proposals that meet one of the above criteria.

3. Staff Consultation

Developers who are required to complete a TIS are strongly encouraged to consult with the appropriate staff from the City of Hilliard early in the application process. Benefits of pre-consultation include:

- **Identifying transportation issues** that may affect the land use, density, site plan, building placement, access location, or other area-specific issues before a high level of effort is expended by the Developer;
- **Confirming the TIS scope** to ensure a complete submission concurrent with the development application;
- **Assessing the need for additional meetings** with City Planning staff and/or other agencies for information gathering and/or coordination.

4. Key TIS Elements

A TIS generally contains the elements listed below. Each of these components is addressed in detail Section 3.

- Define the development proposal (land use & site layout)
- Compare development proposal to the Hilliard Thoroughfare Plan and Access Management Plan
- Define the study area and study intersections
- Determine analysis years, background traffic conditions, and appropriate growth rates
- Determine site-generated traffic, trip distribution, and project phasing (if applicable)
- Identify Travel Demand Management (TDM) strategies and establish any trip reductions
- Analyze vehicle level of service, intersection capacity, vehicle queuing, turn lane storage requirements, sight distance at intersections, signal warrant or roundabout feasibility, and pedestrian & bicycle mobility and safety
- Propose improvements to mitigate impacts to streets, sidewalks, multi-use paths, or on-street bicycle facilities
- Propose improvements to pedestrian and bicycle accommodations, including crossings of all Thoroughfare Plan streets in a safe and convenient way, and identify ways to connect the development to Hilliard's regional trail infrastructure
- Evaluate how mitigation strategies adhere to the principles of the Hilliard Comprehensive Plan

TIS Report Requirements

A TIS report consists of six parts as listed below. As stated in Section 2.2, the level of detail required for the report varies based on the type, location, and size of the development proposal.

1. Description of the development
2. Description of the surrounding area and context
3. Technical analysis
4. Evaluation of development's adherence to Comprehensive Plan goals
5. Conclusions and Recommendations
6. Technical Appendices

The TIS, or a more abbreviated traffic analysis, should be submitted concurrently with the Planning & Zoning Commission application for the rezoning, zoning modification, conditional use, or final development plan application. In cases when approval is not required through the Planning & Zoning Commission, traffic information should be submitted with all plans or applications submitted for staff approval.

One full copy with appendices, one copy without appendices, and electronic (PDF) versions of each shall be submitted for review by the City.

1. The Development

This section of the report includes a detailed description of what is being proposed for the site, including but not limited to:

- **Land Use, Size & Density.** A summary of the overall development size and the land use, size and density of each individual land use type within the development should be identified.
- **Projected build-out date and phasing plans.** If the proposed development is to be constructed in phases, each phase must be described along with the construction phasing schedule and construction management plans.
- **Building size(s), driveway locations and onsite circulation for all motorists, including cyclists and pedestrians.** A site plan, combined with maps, drawings, tables and/or text as appropriate, must accompany the TIS.
- **Floor space of each proposed commercial use.** Use of gross, net, or commercial floor space must be applied consistently throughout the document.
- **Pedestrian accommodations.** Internal pedestrian access points, connection locations, walking routes, including those for pedestrians with disabilities, must be identified. Show how all internal pedestrian facilities connect to the surrounding system. On transit corridors, nearby transit station/stop locations and associated walking distances to these locations should be identified.
- **Access point location and design.** Development driveways, as well as those access points adjacent and/or directly opposing the site, must be shown. Each driveway's proximity to adjacent driveways and the interaction between turns must be identified.
- **Connectivity of the site and street network.** Access points, both public and private, should connect to adjacent properties to encourage alternate ways of access. For residential development, the internal drive or street network should be laid out in a manner that discourages long, continuous routes that encourage higher vehicle volumes and speeds. If future Thoroughfare Plan streets are shown to go through the proposed site, these should be identified.
- **Site parking and circulation.** The location and arrangement of parking areas should be shown. Vehicle queuing as a result of onsite vehicle circulation patterns must be evaluated to ensure that queuing vehicles do not interfere with on-street traffic operations. Other considerations include comparing the proposed parking supply with applicable zoning standards, the location of vehicle parking areas, accessible parking stalls, bicycle parking and pedestrian crossing areas.
- **Loading areas.** The number, location, design and operation of loading and service areas and their compliance with zoning or other applicable technical standards, must be identified.
- **Location of drive-thru windows.** The location of all drive-thru windows and length of queueing areas should be identified.

2. The Surrounding Area and Context

This section of the report documents the character and use of the surrounding development and street network, including all pedestrian and bicycle accommodations. A description of the

surrounding area should be presented using a combination of maps and text. The report should document both existing conditions and future conditions based on known planning documents, including the Hilliard Comprehensive Plan, Hilliard Thoroughfare Plan, Hilliard Bikeway Plan, and plans by other government agencies. This includes:

- **Identification of adjacent land use types.** Land use types surrounding the development should be identified. If the surrounding area is undeveloped land or an area that is located within one of the four Focus Areas in the Hilliard Comprehensive Plan, future land use information should be included.
- **Identification of adjacent street network.** All Thoroughfare Plan streets and local streets that are adjacent to the site should be identified. Existing pedestrian, bicycle, and transit accommodations should be included. Speed limits, roadway widths and condition, shoulder width and condition, drainage conditions, and any unique roadway characteristics (horizontal or vertical curves, geometric deficiencies that do not meet current design standards, drainage concerns) should be documented.
- **Crash History.** Any nearby intersections with a documented crash history should be identified.
- **Location of intersections and traffic control devices.** All upstream and downstream signalized or unsignalized intersections and pedestrian/bicycle crossings should be identified and located. Turn lane storage at existing intersections or driveways should be provided.
- **Location of public space.** Parks, open space, regional trails, schools, and other community facilities within a walkable (½ mile) and bikeable (2 mile) distance of the site must be identified. The ability to connect the proposed development to public space through walks or paths should be documented.
- **Interaction between development and surrounding area.** Complementary land use types within a walkable (½ mile) and bikeable (2 mile) distance of the site should be identified. Complementary land uses include residential-retail, office-retail, and residential-office. The ability to connect these complementary uses through walks or paths should be documented.

3. Technical Analysis

For a major TIS, a Memorandum of Understanding (MOU) should be developed to document the study parameters prior to commencement of the study. If a development is located within close proximity to other jurisdictions or within a growth corridor, other government agencies should be contacted to determine their desired involvement in the development of the MOU and review of the TIS.

A. Study Area

Any complete transportation study analyzing offsite access needs and impact will include at least all site access points and major intersections (signalized and unsignalized) adjacent to the site. All major and minor arterial roads, expressways, interchanges, and transit services and stations that are expected to be affected by vehicle and pedestrian traffic generated by the proposed development should also be included in the study area.

The size of the study area can be reduced or enlarged in those situations where City staff or other government agencies determine it is appropriate.

B. Horizon Year(s) and Peak Period(s) for Analysis

Transportation impact studies are to address conditions in: (1) the opening year and, (2) the anticipated completion year of the proposed development assuming full build out and occupancy or ten years beyond the current year, whichever is later. It may be appropriate to assess conditions in the actual completion year of the proposed development, if significantly less than the ten-year horizon, in order to define staged roadway improvement needs. If the proposed development is to be implemented in phases, it may also be appropriate to analyze each major phase (i.e., initial phase, one intermediate phase, and full project build out).

The design hour(s) to be used in a TIS will be discussed and designated by the reviewers at the initial meeting. At a minimum, all studies must include assessments of conditions during both the AM and PM peak commuter hours (unless otherwise directed by the City Engineer).

Land use classifications that experience their highest trip generation levels during periods other than street peak hours may require analyses for such periods to determine proper site access and turn lane storage requirements. Examples of land use classifications that typically have substantially higher site trip generation peaks at times other than weekday street peak hours are: shopping centers, discount stores, recreational uses (e.g., theaters, zoos, theme parks, stadiums, and arenas), restaurants, schools, churches, and garden centers. Special consideration must also be given to a development located in a zone that experiences (or will experience) significant seasonal variations in traffic volumes due to unique land uses.

C. Background Traffic Volumes

Background traffic consists of existing traffic and growth calculated for each horizon year. In some cases, traffic generated by other non-site developments anticipated in the area may also contribute to background traffic. The TIS needs to clearly identify the different sources of background traffic in all exhibits.

The most recent available traffic counts should be used in developing background traffic. These counts are available from the City's website at www.hilliardohio.gov. In situations where traffic counts are more than two years old, or where the available traffic count data is not representative of typical conditions or appears to be inconsistent, additional traffic counts will have to be conducted. All traffic counts included in the TIS report must be referenced in a separate technical appendix.

In situations where traffic volumes through an intersection do not appear to reflect actual demand, additional field observations may be necessary to properly calibrate level-of-service calculations to actual operating conditions.

Where traffic counts along a transportation corridor have been conducted at different times of the year or in different years, the proponent will need to adjust and balance traffic volumes entering and exiting the intersections within the study area.

In areas experiencing high levels of pedestrian and cycling activity, and where the proposed development is expected to substantially add to those levels, data collection and analysis must include these travel modes.

Historic traffic counts may be used to calculate growth rates. In areas where traffic patterns are expected to change dramatically because of changes to the street network or significant development changes, the applicant should consult the Mid-Ohio Regional Planning Commission (MORPC) to determine appropriate growth rates for a corridor.

D. Background Transportation Conditions Adjusted for Time Horizons

Defining the transportation context at the location and the timing of the development build out is key to an effective analysis. These transportation conditions must include all planned and/or potential future transportation movements and anticipated changes in background vehicle, bicycle, and pedestrian traffic along key routes and intersections.

- **Future Transportation Improvements**

The analysis must include all planned or potential future transportation improvements, including those shown in the City of Hilliard's Thoroughfare Plan. Other planned improvements, such as pedestrian facilities or bicycle lanes, may need to be included as part of the future background transportation conditions. In each case, the status and anticipated date of implementation and source of the information should be identified. City staff should be consulted to help determine the current state of future projects.

- **Future Background Traffic Conditions**

When considering background traffic including cycling, transit ridership and pedestrian volumes, adjustments must be made to account for new development within the study area that is approved and/or under construction.

Volume and ridership changes resulting from developments beyond the study area and the ongoing growth of travel across the region and through the study area must be considered. In general, observed growth trends or future projections based on area transportation studies or modeling must be considered, if available.

E. Development Site Traffic

Traffic demand generated by the proposed development for the relevant trip types must be estimated by trip generation, modal splits, trip distribution and trip assignment.

o Trip Generation

Trip generation is the process of estimating the amount of traffic to be generated by a subject development. This is usually done through the use of rates or equations expressed in terms of units of development.

Data sources and methods for estimating trip generation include:

1. Institute of Transportation Engineers (ITE) Trip Generation report (latest edition) containing data from observations around the country for over 30 years.
2. Prior local studies that have been made for various reasons, but that are applicable for the purpose of estimating trip generation for site development. These studies should be approved by the reviewers prior to being used.
3. Prior studies made outside the area for a similar land use. These studies should only be used if they are approved in advance by the reviewers.
4. Special studies conducted especially for the study at hand. Developments surveyed should be representative of the development for which the trip generation estimate is to be made. These should be local if similar developments exist and can be isolated for proper surveys. They may be made out of the area if no adequate local examples can be surveyed. Proper procedures should be used. Study sites should be approved in advance by the reviewers.
5. A combination of the above, adding local data to the ITE data, or combining local or special study data. Additions to ITE data should be plotted on the scatter diagram provided in the latest edition of Trip Generation, if available, to check for consistency. The combination of data from different sources should be approved in advance by the reviewers.

In cases of land uses characterized by high volumes of pedestrian or cycling activity, it may be necessary to analyze peak pedestrian/cycling trip generation.

Where the development proposal is to be implemented in phases, or where significant future changes to the transportation system or to overall travel patterns might affect site travel patterns, additional trip generation scenarios for the site may need to be developed and evaluated.

o Trip Reduction Measures

Depending on the situation and the proposed mitigation measures, it may be appropriate to adjust the calculated trip generation.

Pass-by trip reduction procedures are well documented in ITE's Trip Generation and may be applied to certain land use types that tend to draw traffic that is already traveling on the adjacent street network.

Internal trip reductions are used when a site contains a mix of uses that tend to have synergy. The actual percent reduction used for internal capture will vary based on types of uses and site layout. Therefore, any internal trip reduction factor should be agreed upon with the City in advance and documented in the MOU.

Travel Demand Management (TDM) is the application of strategies and techniques to reduce a development's trip generation during peak hours. Typically this is achieved through site design that encourages a pedestrian, bicycle or transit trips or through unique zoning or work-place measures. Some TDM techniques to reduce vehicle trips during peak hours are listed below. These measures should be evaluated and recommended as part of the traffic study where appropriate.

- Quality transit service to place of trip origins. Reliance on transit to mitigate a significant effect is only appropriate where transit service is currently available;
- Accommodations for bicycles such as bike lanes, bike boulevard treatments, bike parking;
- Ride-sharing and vanpool programs;
- Carpool incentives, such as preferred parking;
- Modified work schedules;
- Mixed uses connected by a quality pedestrian environment;
- Reduction in parking availability or substantial increase in parking prices;
- Direct pedestrian connections to other nearby pedestrian facilities; and
- Trip-reduction ordinances.

These TDM techniques can be effective, alone or in combination, under a variety of conditions. For example, an increase in parking prices is most effective in reducing peak hour vehicle trips when accompanied by quality carpool, transit, or other alternative modes that provide good service to commuters and travelers.

o **Distribution and Assignment of Traffic to the Network**

Once trips are generated for the proposed development, they must be distributed to the existing and future street network and assigned to various intersections. Evaluation of transportation planning models, the directional split of existing traffic, or origin & destination estimating may be used to determine approximate percentage split of traffic to the street network. These splits may vary based on land use type. Directional distribution split percentages of each land use type should be agreed upon with the City in advance and documented in the MOU.

F. Determining Transportation Impacts

The projected transportation impacts of the proposed development should be compared to the summary baseline conditions for all horizon years and peak hour conditions. The following analyses may be required to determine the impact of the proposed development:

- Capacity
- Site Access Location and Design
- Signal Warrants
- Roundabout Feasibility
- Turn Lane Warrants
- Pedestrian/Bicycle Crossing
- Parking and Site Circulation

Details on the various analysis types are provided below.

Capacity analyses should be performed at all proposed site driveways and all intersections adjacent to the subject site. Other critical or currently congested segments of the network within the study area may also be identified for analysis at the discretion of the reviewers. Elements such as freeway weaving sections, ramps, parking facility access points, and site access vehicular storage reservoirs are examples.

For each horizon year, the capacity analyses should be conducted for conditions with and without the proposed development to determine the incremental impacts of the project and the improvements necessary to support each phase of the development.

The latest edition of the Highway Capacity Manual (HCM), published by the Transportation Research Board, is to be used for performing all capacity analyses. However, the results of any capacity analysis do not replace the need for professional engineering judgment. Careful review of the numbers and a field check of the location are very important.

The applicant should discuss with the City appropriate default values to be used in the capacity analyses. The computer output associated with all relevant capacity analyses must be included in the Appendix of the TIS report.

In the past many communities required a new development to obtain and mitigate for a LOS C. The City of Hilliard recognizes that designing for this unrealistically high level of service is cost prohibitive and results in overly wide streets with little benefit to pedestrians, bicyclists, and transit users. **Therefore, minimum acceptable design level of service in the City of Hilliard is "E" provided that the development includes provisions for non-motorized users to reasonably access the site in accordance with the Hilliard Comprehensive Plan goals.** Analyses should show an intersection LOS of "E" overall (with no individual movement operating at less than a "E" LOS or a v/c ratio greater than 1.0) to be acceptable.

The minimum acceptable design level of service in the City of Hilliard is “D” (overall intersection and individual movement) for developments that do not include provisions for non-motorized users to reasonably access the site.

If the analyses show that conditions with only non-site traffic will result in a level of service below these criteria, the preparer should document this finding and ascertain the level of improvement needed to maintain at least the base level of service once site traffic is added. Additional information about level of service can be found in the HCM.

All signalized and unsignalized intersections significantly impacted by site-generated traffic volumes, for all relevant time periods and development phasing, must be evaluated. A table should be prepared for each TIS intersection, study period, and study horizon year listing the level of service and delay (or v/c ratio) by (1) individual movement, (2) approach leg, and (3) overall movement. This evaluation should include forecast operating conditions for both build and no-build conditions.

Intersection analysis must also compare the adequacy of existing auxiliary storage lane lengths to observed or calculated peak period during vehicle queuing. Queuing that routinely exceeds the storage lane length suggests that the intersection operation is worse than calculated in the analysis and warrants further investigation.

Surveys of saturation flow rates at intersections are required for shared through/turn lanes, or where queue spillback from turn lanes routinely blocks the adjoining through lane.

Site Access Location and Design should be thoroughly evaluated as part of the TIS. For larger developments with multiple access points, determining the appropriate number and location of access points may need to be an iterative process, adjusting the site plan or land use based on expected trip generation and pedestrian/bicycle needs. The following elements should be examined when evaluating existing and proposed access points:

- Adequacy with respect to design operation and level of service, including sight distances that conform with the ODOT Location & Design Manual
- Potential conflicts between modes, particularly conflicts with pedestrians and cyclists, localized hazards for pedestrians, and any requirements to restrict certain turning movements to address sight restrictions or pedestrian/cyclist safety
- Site access opportunities for cyclists and pedestrians, including those with disabilities, with emphasis on convenient and safe access to transit services
- Prohibiting or restricting direct access to arterial roads where access to collector or local roads is available
- Adverse impacts on road and transit operations with appropriate remedial measures
- Possible interference with other adjacent or opposing driveways
- The need to mitigate potential on-street queuing and weaving problems
- The need for and sizing of auxiliary turning lanes
- Collision history and safety analysis

Signal warrant analyses may be required in some cases based on development intensity and traffic volumes. These warrant analyses are conducted for planning purposes in the development stage. It should be noted that signal warrant analyses may be conducted using projected traffic volumes to identify the potential need for the installation of traffic signals. However, traffic signals will not be installed unless: (1) the subject intersection is unquestionably projected to meet warrants on opening day of the development, or (2) actual counts at the intersection meet warrant thresholds.

Roundabout feasibility and analyses may be required in lieu of or as supplement to a signal warrant analysis. The City of Hilliard prefers roundabouts over traffic signals for all new intersection that meet, or come close to meeting signal warrant analyses, in locations where the desire is to slow traffic along a corridor or in locations where enhanced pedestrian crossing is desired. A roundabout analysis may include a capacity analysis, conceptual layout, and/or other planning level analyses.

Turn Lane Warrants should be evaluated for each site driveway using procedures established in the ODOT Location and Design Manual. Meeting the minimum ODOT criteria is used as a general guide by the City of Hilliard for the installation of auxiliary lanes. In some cases turn lanes, particularly right turn lanes, may be waived by the City to ensure that the street environment balances needs of non-motorized users.

Pedestrian/Bicycle Crossings should be evaluated for all developments or redevelopments that include residential, retail, office, school, or other uses that tend to generate pedestrian activity or are likely to change the routing of pedestrian activity in an area. In locations where a change in land use is expected to result in pedestrian crossings of a Thoroughfare Plan street at an unsignalized location, a gap analysis of traffic may be necessary. The evaluation may need to include the feasibility of unique pedestrian treatments such as raised medians, flashing beacons, roundabouts, or traffic calming measures to ensure a higher level of safety for non-motorized users that will want to cross the street as a result of the proposed (re)development. Routing of pedestrian traffic to an adjacent traffic signal in lieu of addressing the safety of a more direct intermediate crossing location is acceptable only in locations where the normal walking route is rerouted less than 500 feet total. City staff should be consulted to establish the need for this analysis and determine the scope and approach.

Parking and Site Circulation can impact the operation and safety of adjacent public streets. The following factors should be considered for commercial development:

- All development parking must be consistent with the modal split assumptions used in travel demand analysis and account for modal split objectives, all within the context of local policies, standards and zoning
- The provision of bicycle parking, parking for high-occupancy vehicles, car share vehicles and vehicles operated by or for persons with disabilities, must be examined where necessary
- Vehicle queuing as a result of onsite vehicle circulation patterns must be evaluated to ensure that queuing vehicles do not interfere with on-street traffic operations

- Delivery vehicle/courier loading facilities must be evaluated in regards to access and convenience (pickup and deliveries happen onsite and not on the street)
- A loading vehicle maneuvering assessment should be undertaken to assess adequacy of access into and out from the loading area and its associated driveway
- Any impacts to on-street parking that would be necessary for delivery vehicles to access the site should also be identified

Reference must be made to any measures taken to make the proposed development accessible to persons with disabilities, including transit facilities.

In some unique cases, it may be necessary to evaluate parking for residential developments located within close proximity to active parks, schools, or commercial uses where vehicles may utilize residential areas for overflow parking. Residential developments may need to modify site design or street widths to accommodate a greater than usual on-street parking demand located near offsite uses that tend to experience a high parking demand during special events.

4. Transportation System Improvements Required to Mitigate Impacts

Transportation system improvements and other measures required to ensure acceptable transportation systems operation and safety, must be identified in the TIS report. Mitigating measures must not hinder or preclude the realization of City initiatives envisioned to be implemented within the study horizon.

In order to adequately determine appropriate mitigation, the following data should be clearly identified in the main body of the report under existing, future background and total future traffic conditions:

- The delay per vehicle, level of service and v/c ratios for all critical movements or lane groups at signalized and unsignalized intersections within the study area.
- The intersection delay and intersection v/c ratios for all signalized and unsignalized intersections within the study area.
- Vehicle queuing that exceeds the available auxiliary lane storage
- Road safety issues, including collision statistics, and existing and projected sight distance assessments.
- Operational issues, including merging/weaving constraints, driveway blockage, and restricted sight distance.

A. Mitigation Considerations

Development related transportation improvements that mitigate the impacts of the site on transportation infrastructure should be made such that:

- Generated traffic does not cause any intersections or individual traffic movements to meet or exceed the criteria in Section 3.3.6

- Intersections or individual traffic movements where the level of service meet or exceed the criteria in Section 3.3.6 before the addition of site-generated traffic, are not worsened by this addition
- Adequate storage is provided in exclusive turning lanes to accommodate projected traffic, including site-generated traffic
- Traffic operations are not significantly impacted nor have unmanageable adverse impact on transit operations, and safety is maintained or improved
- The capacity of transit services or facilities is sufficient to accommodate site-generated transit demand
- Pedestrian and cycling needs are safely accommodated and, where applicable, the required capacity of pedestrian infrastructure is demonstrated and other needs accounted for following further assessment.

Mitigating measures identified should give due consideration to improve conditions for and avoid adverse impacts upon more sensitive road users (i.e., pedestrians, cyclists, or those with disabilities)

B. Proposed Infrastructure and Operational Improvements to Mitigate Impacts

Proposed transportation improvements must support the objectives of the City’s initiatives and planned improvements and reflect the remaining elements of the City’s transportation system while contributing to the effective and efficient movement of people and goods.

The development Proponent is financially responsible for transportation improvements identified to support their proposal, or to mitigate adverse impacts of the proposal. Normally, such improvements will be included as conditions of development approval. When the need for improvement is attributable to several developments, the Proponent may wish to negotiate a cost-sharing arrangement. In cases where required transportation improvements are already scheduled by public agencies, phasing of the development in conjunction with the proposed timing of these improvements, or with the demonstrated success of TDM initiatives should be indicated. Alternatively, to advance the implementation schedule for their development, the Proponent may wish to consider the option of assuming financial responsibility for these improvements.

The Proponent must identify feasible realistic transportation infrastructure, service improvements, or additional TDM measures that can mitigate vehicle traffic and cycling, transit and pedestrian impacts, and improve safety or convenience of travel to and from the proposed development.

The Proponent must assess the potential need to phase the development in conjunction with the transportation infrastructure or service improvements, supplementary TDM measures, or in association with proposed, committed, or under-construction transportation infrastructure. Development can proceed in advance of physical infrastructure improvements provided it is demonstrated that transportation demand and supply can be kept reasonably balanced over this period.

When signal timing changes are proposed to existing traffic control signals, consultation with City staff should take place to determine if equipment changes will be required. City staff should also be consulted if a new traffic control signal is to be installed.

5. Evaluation of Development's Adherence to Comprehensive Plan Goals

The City of Hilliard Comprehensive Plan identifies six goals:

1. Become a better connected community
2. Grow into a truly sustainable city
3. Promote active and healthy lifestyles
4. Define and reinforce the character of Hilliard
5. Optimize development potential in ways that benefit current and future citizens
6. Collaborate with surrounding communities and local stakeholders

As part of the TIS, the report should state how the proposed development adheres to the above six Comprehensive Plan goals.

If any mitigation measures identified in Section 3.4 result in a poorer adherence to the Comprehensive Plan goals, the conflicting items should be clearly identified, and the report should provide discussion on ways to reconcile conflicts.

6. Conclusions and Recommendations

Recommendations should be developed to address the conclusions resulting from the analyses of a proposed development's access needs and impacts on the transportation system. Recommendations should address feasible transportation system improvements needed to satisfactorily accommodate site and non-site traffic. The recommendations should reflect improvements currently planned or programmed by any public or private entity. Recommendations may include improvement scheduling that could beneficially be changed. Transportation facility improvements can be classified as either major structural improvements, such as the widening of roadways, or operational improvements, such as installing a traffic signal or changing lane usage.

It is important to view recommendations for improvements within appropriate time perspectives. Recommendations should be sensitive to the following issues:

- Timing of short-range and long-range network improvements that are already committed and scheduled.
- Anticipated time schedule of adjacent developments.
- Size and timing of individual phases of the proposed development.
- Logical sequencing of various improvements or segments.
- Right-of-way needs and availability of additional right-of-way within the appropriate time frames.
- Local priorities for transportation improvements and funding.

- Cost-effectiveness of implementing improvements at a given stage of development.
- Necessary lead time for additional design and construction.

Since improvements can often be implemented in more than one order, the recommendations should address an implementation sequence that would provide maximum compatibility with the overall roadway system configuration needed for network effectiveness.

7. Technical Appendices

All supporting documentation and analyses shall be provided in technical appendices. This includes development site plans, traffic counts, build and no-build traffic volumes for all horizon years and design hours, and all analyses listed in Section 3.3.6.

Scaled drawings that show the site access and roadway plan(s) with sufficient detail to provide the following information should also be provided in the appendix:

- Location and spacing of all site access points and driveways (including relationships to other nearby roadways, intersections, and driveways),
- External roadway improvements/modifications,
- Lane configurations and control,
- Queuing and vehicle storage distances,
- Spacing of traffic signals to permit proper traffic progression on the adjacent roadway system,
- Sight distances and sight triangles clearly defining “clear zone” areas,
- Adequate pedestrian, bicycle, and transit provisions,
- Sufficient emergency and service/delivery access, and
- Proper onsite circulation and parking layout so as not to affect traffic flow and operations on the external street system.

More detailed location and design studies may be requested to deal with such items as geometrics, right-of-way requirements, topography, and physical constraints.