

**TOWN OF MOORESVILLE**  
**TRANSPORTATION IMPACT ANALYSIS**  
**PROCEDURES MANUAL**



**TOWN OF MOORESVILLE, NORTH CAROLINA**

**Effective November 7, 2022**

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# TOWN OF MOORESVILLE, NORTH CAROLINA | TIA PROCEDURES MANUAL

## INTRODUCTION

The Town of Mooresville is committed to establishing an interconnected, multimodal transportation system that increases mobility, safety, connectivity, health, and quality-of-life for its citizens and business owners. A Transportation Impact Analysis (TIA) is one important tool for evaluating the incremental impacts that new development may have on the surrounding transportation system, and it helps local decision-makers evaluate whether a development is appropriate for a site or identify mitigation measures that are necessary to maintain the integrity of the transportation system.

A TIA varies in detail and complexity depending on various factors such as project size, type, location, scope, recent development in the area, and other project-specific considerations. Town staff will determine the need for a TIA as part of the zoning and/or development review process outlined in the Town of Mooresville Unified Development Ordinance (UDO). At the discretion of the North Carolina Department of Transportation (NCDOT) and the Town, a technical memorandum may be allowed for some developments in lieu of a full TIA report.

Payment for completing the transportation impact analysis is solely the responsibility of the applicant. Studies prepared outside of the process described herein will not be accepted by the Town or NCDOT.

## PURPOSE OF THE TIA PROCEDURES MANUAL

The intent of this Procedures Manual is to provide a consistent basis by which the Town, in coordination with NCDOT, evaluate transportation impacts within the Mooresville community. Minimum development thresholds that require a TIA are defined in the UDO. This TIA Procedures Manual includes procedures for completing the TIA process and requirements for data collection, analysis methodology, and report format. A TIA submitted in conformance with this Procedures Manual shall satisfy the Town's requirements for identifying off-site mitigation; however, the NCDOT reserves the right to request additional information and/or subsequent analyses to satisfy their review requirements independent of the Town of Mooresville.

## HOW TO USE THE TIA PROCEDURES MANUAL

This procedures manual moves from the general to the specific for completing a TIA in the Town of Mooresville. The document is organized into two main sections: 1) general information for the applicant within the subdivision plan review process and 2) expected content and methodologies to be used in the TIA. All users are expected to be generally familiar with the information presented herein; however, a qualified transportation consultant is required to consult in detail those sections of the document most applicable to his/her role in preparing the TIA.

## SECTION 1: GENERAL INFORMATION FOR THE APPLICANT

The following information provides a general framework for TIAs in the Town of Mooresville.

### Responsibility for Studies

In accordance with the minimum thresholds for TIAs identified in the UDO, Town staff shall determine whether a TIA is required as a part of the development review and approval process. When required, the TIA shall be prepared for the applicant by a duly qualified and registered professional engineer in the State of North Carolina.

### Mandatory Scoping Meeting

A mandatory scoping meeting is required, prior to beginning the TIA, to discuss the requirements and strategies for a TIA specific to the site and the proposed development program. Town staff, NCDOT staff, the applicant's transportation consultant, and the applicant or his/her representative shall attend the mandatory scoping meeting. The Town Transportation Engineer shall schedule the meeting and the applicant may invite additional members of his/her development team as needed.

Prior to the meeting, the applicant shall provide a copy of any previous transportation studies prepared for the site and the type of plan required in the UDO showing the site location and land use(s), proposed internal circulation, and access point(s) in relation to adjacent properties and public roads. Approximate timelines for project phasing shall also be communicated and shall align with plan phasing. The information provided will be the basis for discussion during the scoping meeting.

During the scoping meeting, discussion will include confirmation of land use, project phasing, internal circulation, and site access; general distribution of project traffic to the site; proposed internal capture or pass-by capture rates; proposed multi-modal split (if appropriate); determination of the study intersections and the base condition assumptions for the future year, including committed development and transportation projects; and available traffic data and studies.

A memorandum of understanding (MOU) shall be prepared by the Town Transportation Engineer documenting the understood scope of the project. The MOU shall be signed by the applicant, Town staff, and the NCDOT Division 12, District 2 Supervisor, or his designee, before the transportation consultant can begin work on the TIA. Failure by the applicant to provide accurate information or failure by the transportation consultant to follow the MOU shall result in disapproval of the TIA or a request for additional information.

### Mitigation Measures Agreement

Upon completion of the TIA by the transportation consultant, Town staff will prepare the Mitigation Measures Agreement to summarize the development plan, phasing, and site access and the improvements required to adequately mitigate the site-specific impacts to the public transportation system. Any ongoing or additional considerations for the development as it moves forward shall be described in this document. The agreement shall be signed by the applicant, Town staff, and the NCDOT Division 12, District 2 Supervisor, or his designee, which completes of the Town's TIA process.

Any deviation from the development features as described in the final TIA, including but not limited to land uses, phasing and/or site access, shall be submitted to the Town Staff in writing who will then determine if a TIA revision will be required.

All mitigation measures included in the executed Mitigation Measures Agreement shall be implemented prior to receipt of any certification of occupancy or final plat approval, whichever is

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appropriate, unless otherwise provided for in the project's phasing plan that is included in the approved TIA and any performance guarantee that may be approved in accordance with the UDO.

## SECTION 2: CONTENTS AND METHODOLOGIES FOR A TRANSPORTATION IMPACT ANALYSIS

The following outline shall be used for all TIA reports submitted to the Town of Mooresville. All of the required data and information shall be clearly identified in the appropriate sections of the report. Text contained in the required chapters shall be comprehensive and complete.

A detailed summary of the expected content and methodologies to be used in the TIA are discussed below. The MOU shall be included in the appendix of the TIA report.

### Signature Page

The *Signature Page* summarizes the name of the project, project location, name of the applicant, contact information for the applicant, and date of the study. The name, contact information, registration number, signature, and seal of a duly qualified and registered professional engineer in the State of North Carolina are also required to appear on this page.

### Table of Contents

The *Table of Contents* shall provide a list of all section headings, figures, tables, and appendices included in the TIA report. Page numbers shall denote the location of all information, excluding appendices, in the TIA report.

### Executive Summary

The *Executive Summary* of the report represents a clear, concise description of the study findings. It should include a general description of the project scope, study horizon years, study locations, and mitigation measure recommendations. A figure summarizing recommended mitigation measures should be included. Technical publications, calculations, documentation, data reporting, and detailed design should not be included in this section. This section should be no longer than two pages.

### I. Introduction

The *Introduction* to the report identifies the applicant's request. A scalable, 11" x 17" site plan or Concept Plan, pursuant to UDO requirements, illustrating the project as proposed at full build-out shall be included with the TIA report (*Figure #1 – Site Plan Map*). Information presented in the TIA report shall be identical in every respect to the site plan or Concept Plan submitted for development approval, including phasing.

#### Site Description

The *Site Description* should describe project location within the Town and region, the planning jurisdiction, existing zoning and use (and proposed use if applicable), and key physical characteristics of the site, including general terrain and environmentally sensitive or protected areas.

#### Project Description

The *Project Description* is a detailed description of the development, including the size of the parcel, development size, existing and proposed uses for the site, anticipated completion dates (including phasing). This information should include the square footage of each use or the number and size of dwelling units proposed.

#### Site Access

A complete description of the ingress/egress of the site should be explained and depicted. It should include number of driveways, their locations, distances between driveways and intersections, types of driveways (two-way, one-way, etc.), traffic controls, etc. Internal streets, parking lots, sidewalks and bicycle lanes, and designated loading/unloading areas should also be described. Similar information for adjacent properties should be provided to evaluate opportunities for internal connections.

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The design, number, and location of access points to collector and arterial roadways immediately adjacent to the site shall be fully analyzed. The number of access points should be kept to a minimum and designed to be consistent with the type of roadway facility.

Driveways serving the site should be designed in accordance with the NCDOT's *Policy on Street and Driveway Access to North Carolina Highways* (see Recommended Treatment for Turn Lanes, pgs. 78-79) and/or the Town's standards, as applicable.

### II. Study Area

The limits of the *Study Area* shall be based on the location, size, and extent of the proposed project, and an understanding of existing and future land uses and traffic conditions surrounding the site. The limits of the study area for the TIA shall be reviewed and approved by the Town and NCDOT staff at the mandatory scoping meeting. At a minimum, the study area should include all streets and intersections where site traffic estimated for build-out of the project will constitute 10% or more of any intersection approach during the peak hour. Due to related impacts or current operational problems, the Town and/or NCDOT staff may require other intersections to be included in the study area.

A narrative describing the study area should identify the location of the proposed project in relation to the existing transportation system and list the specific study intersections and/or segments. Any unique transportation plans or policies applicable to the area should be mentioned. A site location map (*Figure #2 - Vicinity Map*) shall be provided and should identify natural features, major and minor roadways within the study area, study intersections, and a boundary of the site under consideration.

### III. Study Scenarios

This section identifies the base conditions to be used to build the transportation model.

#### Existing Conditions

A description of the *Existing Conditions* for the transportation system within the study area shall include a narrative and map that presents AM and PM peak hour turning movement volumes for all study intersections (signalized and unsignalized) (*Figure #3 – Existing Traffic Volumes*).

Traffic volumes shall be 15-minute interval weekday turning movement counts (Tuesday through Thursday) and no more than twelve months old. Typically, the required count timeframes are from 7:00-9:00 a.m. and 4:00-6:00 p.m., however site-specific conditions may necessitate different traffic counting hours or requirements. For example, 13-hour turning movement counts shall be required to complete the analysis if a traffic signal warrant analysis is required as part of the TIA. Town staff will determine if additional peak hours or weekend analyses shall be included in the TIA at the mandatory scoping meeting.

Traffic volumes shall also represent weeks that have no observed federal, state, or local holidays and periods of the year when local schools are in session with standard operating hours. Traffic volumes shall not be used when collected during a week with local race activities. In heavily commercial or retail corridors, traffic volumes shall not be used between November 20 and January 1. The source of existing traffic volume information shall be explicitly stated (e.g., Town counts, new counts collected by the applicant, NCDOT counts, etc.). Summary sheets for existing turning movement counts shall be included in the appendix of the TIA report.

A separate narrative and map shall be prepared to describe the characteristics of surrounding major roadways, including functional classification, number of lanes, posted speed limit, existing average daily traffic volumes, typical cross section, intersection control (signalized or unsignalized), and lineal

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distance between major roadways (*Figure #4 – Existing Geometrics*). Field notes for the existing conditions investigation may be included in the appendix of the TIA report.

### Future No-Build Conditions

*Future Year No-Build Conditions* for a single-phase development is future year build-out + 1 year. If the development plan indicates that a multiple phase TIA is necessary, the scenarios should be completed in order, with any improvements specified by development included in the subsequent build scenarios. Specific analysis periods to include in the study shall depend greatly upon the development program, proposed project phasing plan, and significant improvements programmed for the transportation system.

The committed development and transportation projects to be included in the base Future Year Conditions for the transportation system within the study area shall be determined during the scoping meeting. Transportation improvements assumed in the base future year conditions analysis may include those with an expected completion date prior to the date when needed by a phase and funded through either the Town of Mooresville Capital Improvements Plan, State of North Carolina Transportation Improvement Program, or indicated as a required condition of approval from another nearby development application. Only projects approved by Town staff at the scoping meeting shall be included in the analysis as future existing infrastructure. Those improvements committed by other projects shall be clearly identified in the report as approved off-site development road improvements. Adjacent development traffic information used in the development of the base Future Year condition shall be included in the appendix of the TIA report. Unfunded, planned infrastructure projects may be mentioned but the description shall specifically identify that these projects are not included in the base condition.

Future year traffic volumes shall be forecasted using historical growth rate information, regional models, and/or TIA reports for development approved by the Town but not yet built. A narrative and map shall be prepared that presents turning movement volumes for each peak hour for all intersections (signalized and unsignalized) identified for study (*Figure #5 – Future Year Traffic Volumes*). Future year base volumes, other development volumes, and site traffic volumes shall be clearly separated, and combined, in the map.

### Future Project Build Condition

*Project Traffic* shall be generated for the proposed development program using the traditional three step process of trip generation, distribution, and assignment. These steps are described in detail below.

#### *Trip Generation*

Base trip generation for the proposed land use(s) shall be calculated using the latest data published in the Institute of Transportation Engineers' (ITE) *Trip Generation Manual*. Data limitations, data age, choice of peak hour or adjacent street traffic, choice of independent variable, and choice of average rate versus equation shall be discussed at the mandatory scoping meeting.

Local trip generation rates may be acceptable if appropriate validation is provided by the applicant to support them. Any deviation from ITE trip generation rates shall be discussed in the mandatory scoping meeting and documented in the MOU if approved by Town staff and NCDOT. ITE Trip Generation rates for age-targeted and/or age-restricted housing developments (or communities) will assume single-family (detached), single-family (attached), or multi-family (attached) land use codes when estimating site vehicular trips, not senior adult housing land use codes.



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The NCDOT Municipal School Transportation Assistance (MSTA) calculator shall be used to calculate projected trip generations for school sites. Documentation of the approval by MSTA of calculations shall be included in the submitted TIA.

*Internal Capture* - Base generation may be reduced by rate of internal capture when two or more land uses are proposed using methodology recommended in the most current *Trip Generation Handbook* published by the Institute of Transportation Engineers. Reductions greater than 10% require consultation and acceptance by Town staff and NCDOT. The internal capture reduction should be applied before pass-by trips are calculated.

*Pass-by Trips* - Pass-by trips are those made as intermediate trips between an origin and primary destination (i.e., home to work, home to shopping, etc.). However, pass-by trips are not diverted from another roadway. Base trip generation may be reduced by rate of pass-by capture using methodology recommended in the most current *Trip Generation Handbook* published by the Institute of Transportation Engineers. Pass-by trips associated with the development program shall not exceed 10% of the existing volume reported for the adjacent public street.

A trip generation table (*Table #1 – Trip Generation*) shall summarize all trip generation calculations for the project.

### *Trip Distribution*

External trip distribution shall be determined on a project-by-project basis using one of several sources of information available to transportation professionals. Potential sources for determining project trip distribution may include the regional travel demand model, market analysis, existing traffic patterns, or professional judgment. Regardless of methodology, the procedures followed and logic for estimating trip distribution percentages shall be well-documented in the TIA. Trip distribution percentages proposed for the surrounding transportation network should be discussed during the mandatory scoping meeting and shall be approved by Town Staff and NCDOT before proceeding with the TIA.

A map showing the percentage of site traffic on each street included in the study area shall be included in the TIA (*Figure #6 – Trip Distribution*).

### *Trip Assignment*

Project traffic shall be distributed to the surrounding transportation system based on the site's trip generation estimates and trip distribution percentages. Future year traffic forecasts (i.e., future year background traffic plus project traffic) shall be presented in both tabular and graphic formats for AM and PM peak hour conditions at all intersections included in the study area (*Figure #7 – Future Year Traffic Volumes with Project*). If the project will be built in phases, traffic assignments shall be reported for each phase. Pass-by traffic shall be included at the driveways and access points for evaluating driveway volumes.

## **IV. Capacity Analysis**

The primary measurement for impacts to the transportation system is level of service (LOS), as defined by the most current edition of the *Highway Capacity Manual*. Levels of service for signalized intersections shall be determined using existing signal timing plans provided by either the Town of Mooresville or the NCDOT. Existing signal timing plans shall be included in the appendix of the TIA report. If a traffic signal is part of a coordinated system, it shall be analyzed as such under all conditions. Other standard practices and default input values for evaluating signalized intersections shall be consistent with guidelines published by the NCDOT Traffic Engineering and Safety Systems Branch, Congestion Management Unit ("*Capacity Analysis Guidelines*"). Town staff may also require

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safety, traffic simulation, gap, and/or other analyses appropriate for evaluating a development application. Additional analyses required for the TIA shall be identified during the mandatory scoping meeting.

All TIA reports shall use Synchro Software for signalized and unsignalized intersections, Sidra Software for roundabouts, and SimTraffic consistent with policies released by the NCDOT. A narrative, table, and map shall be prepared that summarizes the methodology and measured conditions at the intersections reported in level of service (LOS A – F), approach delay for unsignalized intersections or intersection signal delay for signalized intersections for all intersections (*Table #2 – Summary of Level of Service Measurements, Figure #8 – Existing LOS, Figure #9 – Future LOS (No Build), Figure #10 – Future LOS (Build-out)*). Capacity analysis worksheets and turn lane warrants shall be included in the appendix of the TIA report.

Capacity analyses shall be conducted to determine levels of service in each peak hour for all intersections (signalized and unsignalized) identified for study using methodologies contained in the most current edition of the *Highway Capacity Manual*. Capacity calculations shall be included for existing, future year no build + 1-year, future year build phase(s), and future year build-out + 1-year conditions for all project phases. Impacts from the proposed project shall be measured by comparing the Future year build + 1 year and the Future year no-build + 1-year conditions. Unless otherwise approved by Town staff and NCDOT, the proposed project shall not degrade the overall intersection level of service for signalized intersections, or level of service for the critical movement of unsignalized intersections. Further, signalized or unsignalized intersections operating at LOS E or F within the study area shall not experience increased delay (measured in seconds) as a result of the proposed project. The following text shall be embedded into the report:

*Mitigation is required when the Build condition exceeds the No-Build conditions by any of the following minimum thresholds:*

- 1. The average delay at an intersection or individual approach increases by 25% or greater, or*
- 2. The overall intersection Level of Service for signalized intersections, or Level of Service for the critical movement of unsignalized intersections degrades by at least one level, or*
- 3. The overall intersection Level of Service for signalized intersection, or Level of Service for the critical movement of unsignalized intersections is “F”*

Recommendations to mitigate development impacts back to the no-build condition shall be described in this section and documented with Build with Capacity Improvements capacity analysis.

### **V. Queuing Analysis**

95<sup>th</sup> percentile and simulation analysis of future year queues shall be consistent with NCDOT’s Traffic Engineering and Safety Systems Branch, Congestion Management Unit current practices and published *Capacity Analysis Guidelines*. Turn lanes for unsignalized driveways serving the site shall be identified using volume thresholds published in the NCDOT’s *Policy on Street and Driveway Access to North Carolina Highways* (see Warrant for Left- and Right-Turn Lanes Nomograph, pg. 80). Recommendations for left and right turn lanes serving the site shall be designed to meet future year capacity needs identified in the TIA report. The following text shall be embedded into the report:

*Mitigation is required when the Build condition exceeds the No-Build conditions by any of the following minimum thresholds:*

- 1. Increase of 50’ or more in queue length*
- 2. Left-turn and/ or right-turn lane warrants (NCDOT’s Policy on Street and Driveway Access to North Carolina Highway) are identified*

### 3. *Future Build with Capacity Improvements queue exceeds existing storage length*

For projects that include drive-through facilities or entrance gates, a queuing analysis may be required by Town staff to ensure that vehicle stacking will not adversely impact the public transportation system. The queuing analysis shall be performed using accepted transportation engineering procedures. This analysis shall be required for all fast-food drive-through uses.

If a TIA is required for a new school site, the consultant shall model the internal circulation and ingress/egress of the site using a “dummy signal” in the Synchro software as prescribed by NCDOT Municipal School Transportation Assistance (MSTA) department.

## **VI. Collision Analysis**

A summary of crash data (type, number, and severity) for the most recent 3-year period at each study location is required. Traffic Engineering Accident Analysis System reports will be provided by the transportation consultant and shall be included in the appendix of the TIA report.

At a minimum, the proposed development features shall not contribute to factors potentially involved in collision rates. If contributing factors are identified, recommendations to eliminate these features shall be included.

## **VII. Traffic Signal Warrants**

Town staff and NCDOT may consider potential signal locations at the mandatory scoping meeting. However, traffic flow progression is of paramount importance when considering a new traffic signal location. A new traffic signal should not cause an undesirable delay to the surrounding transportation system.

Installation of a traffic signal at a new location shall be based on the application of warrants criteria contained in the most current edition of the Manual on Uniform Traffic Control Devices (MUTCD) and engineering judgment. Traffic signal warrants shall be included in the appendix of the TIA report. Additionally, spacing of traffic signals within the Town of Mooresville shall adhere to guidelines published in the FHWA and NCDOT requirements. Pedestrian movements shall be considered in the evaluation and adequate pedestrian clearance provided in the signal cycle split assumptions.

If a signal warrant analysis is recommended in the TIA, the Town and/or NCDOT may decide to defer a signal warrant analysis until after the development has opened in order to use actual turning movement counts at an intersection. The TIA recommendations shall clearly state that this analysis will occur at a specified date following the opening of the development. The applicant shall issue a bond or letter of credit in the name of the Town or NCDOT as appropriate for the estimated cost of the signal warrant analysis and resulting signal prior to final approval of the Site Plan or NCDOT Driveway Permit. The cost shall be established based on an engineer’s estimate provided by the engineer of record for the applicant, however final approval of the dollar amount rests with the Town or NCDOT.

## **VIII. Compliance with Adopted Transportation Plans**

All TIA reports shall include a statement of compliance with plans, programs, and policies adopted by the Town of Mooresville for maintaining a safe and efficient multimodal transportation system. Town staff shall provide the applicant with information to consider for improving bicycle and pedestrian circulation and/or access to the site at the mandatory scoping meeting.

## **IX. Recommendations**

This section of the report shall provide a clear, concise description of the study’s findings regarding impacts of the proposed project on the existing and proposed transportation system and describe the

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location, nature, and extent of all mitigation measures recommended to the applicant to improve and/or maintain the future year no build level of service (LOS) conditions through phasing and build-out of the project. The applicant is only required to mitigate transportation deficiencies for his/her development and not unacceptable background conditions, or other deficiencies caused by off-site development within the defined study area.

For multi-phase developments, the capacity analyses scenarios shall address the phasing of improvements required to provide an acceptable level of service with each phase. A narrative and table shall be prepared that summarizes the methodology and measured conditions at the intersections reported in level of service (LOS A – F) and seconds of stop delay (*Table #3 – Level of Service with Mitigation*). A narrative and map shall also be prepared that describes and illustrates recommended mitigations, by phase if necessary, for maintaining the integrity of the transportation system (*Figure #11 – Recommended Roadway Laneage*). Phases shall have logical ties to the phases shown on the projects' corresponding site plan or concept plan, in accordance with the UDO requirements.

Timing and scope of any deferred analysis shall be clearly described.

The recommendation shall end with a statement by the duly qualified and registered professional engineer in the State of North Carolina responsible for the TIA that indicates whether or not the proposed project will meet minimum standards described herein through build-out of the project.

Town staff and NCDOT will review the recommendations in the final version of the TIA and will have the ultimate determination in the scope of the required mitigation measures. The TIA shall be approved if the recommendations from the report will adequately mitigate the site-specific impacts to the public transportation system.

Final mitigation measures shall be the responsibility of the applicant unless otherwise determined by Town staff and NCDOT.

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### Appendices

The *Appendix* of the TIA shall contain in following information (if applicable), in the order provided below:

- Approved Memorandum of Understanding (MOU) from the mandatory scoping meeting
- Traffic Counts Worksheets
- Field Investigation Notes
- Adjacent Development Traffic Information
- Traffic Signal Plans
- Capacity Analysis Worksheets
- Synchro/SimTraffic Output Files
- Turn Lane Warrants
- Traffic Engineering Accident Analysis System (TEAAS) Report
- Traffic Signal Warrants
- Email and Written Correspondence

# TOWN OF MOORESVILLE, NORTH CAROLINA | TIA MEMORANDUM OF UNDERSTANDING

Rev 11/7/2022

## Project Information

Project Name: \_\_\_\_\_

Project Location: \_\_\_\_\_

Project Owner: \_\_\_\_\_

Case Number: \_\_\_\_\_

## Applicant Information

Applicant Name: \_\_\_\_\_

Applicant Telephone: \_\_\_\_\_

Applicant Address: \_\_\_\_\_

Applicant Email: \_\_\_\_\_

Application Request: \_\_\_\_\_  
(e.g. rezoning, preliminary or final plat, special use permit, site plan, etc.)

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The Town of Mooresville and the applicant hereby agree that the information documented herein accurately and completely describes the information to be used in the development of the transportation impact analysis (TIA) report to be prepared by \_\_\_\_\_, the qualified transportation consultant. All sections are required unless otherwise noted. The analysis methodologies and report format shall comply with the requirements in the *Town of Mooresville Transportation Impact Analysis Procedures Manual*.

## Signature Page

Include the name of the project, location, Town case number, applicant information, and date of the study as well as the name, registration number, signature, and seal of a duly qualified and registered professional engineer in the State of North Carolina responsible for the TIA.

## Table of Contents

Include a list of all section headings, figures, tables, and appendices included in the TIA report. Pages numbers will denote the location of all information, excluding appendices, in the TIA report.

## Executive Summary

Include a clear, concise description of the study findings. It should include a general description of the project scope, study horizon years, existing conditions, probable impacts of the project, and mitigation measure recommendations.

## I. Introduction

Identify the applicant's request and attach a scalable, 11" x 17" site plan illustrating the project as proposed at full build-out to this Memorandum of Understanding.

Parcel Size: \_\_\_\_\_ acres      Development Size: \_\_\_\_\_ acres

Existing land use(s): \_\_\_\_\_

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Proposed development program (include the square footage of each use or the number and size of dwelling units proposed):

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Anticipated Build-Out: \_\_\_\_\_

Project Phasing (as it relates to TIA development and timing of off-site mitigation) : \_\_\_\_\_

## Site Description

Include details of the project location within the Town and region, the planning jurisdiction, existing zoning and use (and proposed use if applicable), and, including general terrain, and environmentally sensitive or protected areas.

Planning Jurisdiction: \_\_\_\_\_

Existing Zoning: \_\_\_\_\_

Proposed Zoning: \_\_\_\_\_

Key Physical Characteristics of the Site: \_\_\_\_\_

Environmentally Sensitive or Protected Areas: \_\_\_\_\_

## Site Access

Inventory and describe the ingress/egress of the site including number driveways, their locations, distances between driveways and intersections, types of driveways (two-way, one-way, etc.), and traffic controls serving the driveways. Internal streets, parking lots, sidewalks and bicycle lanes, gates, and designated loading/unloading areas should also be described.

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Special data collection and/or analysis requirements:

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## **II. Study Area**

Identify study intersections and segments to be included in the capacity, queuing, and collision analysis:

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### **III. Study Scenarios**

#### Existing Conditions

Include peak hour turning movement volumes for all study intersections (signalized or unsignalized). Traffic volumes shall be collected in weeks that have no observed federal, state, or local holidays and periods of the year when local schools are in session. Traffic volumes may not be used when collected during a week with local race activities.

Required 15-minute interval weekday turning movement counts for the following Peak Hour(s) (e.g. AM 7-9 and PM 4-6) and Locations (e.g. all study intersection):

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Special data collection requirements (e.g., weekend counts, vehicle classification counts, etc.):

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Existing Count Data available?

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#### Future No-Build Conditions

Include a description of the future year(s) transportation system within the study area. Future year traffic volumes shall be forecasted using historical growth rate information and transportation impact analysis reports for development approved by the Town but not yet built. Transportation improvements assumed in the future conditions analysis shall include those with an expected completion date concurrent with that of the development and funded through either the Town of Mooresville Capital Improvements Plan, State of North Carolina Transportation Improvement Program, or indicated as a condition of approval from another nearby application.

Committed transportation improvements within the study area (type, location, and year for start of construction):

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List of approved developments to include as committed project traffic in the TIA:

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Method and source of information for growing existing background traffic volumes:

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## Future Project Build Traffic

Generate project traffic for each phase of the proposed development program using the traditional three step process of trip generation, distribution, and assignment.

## Trip Generation

Include the ITE trip generation rates used for the TIA, including choice of peak hour or adjacent street traffic, choice of independent variable, and choice of average rate versus equation. If local trip generation rates are used, provide documentation to the satisfaction of the Engineering Services staff for supporting such rates.

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Is NCDOT Municipal School Transportation Assistance (MSTA) calculation required?

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If any trip reductions are to be incorporated into the trip generation calculations (e.g., internal capture, pass-by capture, mode split, etc.), describe the methodology and supporting documentation for making such trip reductions:

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Engineering Services staff and NCDOT must approve the trip generation prior to capacity analysis. If changes are made to the site plan during TIA development that affect trip generation, revised trip generations and site plans must be reviewed by Engineering Services Staff and NCDOT prior to revising the capacity analysis.

## Trip Distribution

Include trip distribution for each phase of the proposed for the surrounding transportation network.

Describe the methodology that will be used in the TIA to determine trip distribution percentages:

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Engineering Services staff and NCDOT must approve the trip distribution prior to capacity analysis. If changes are made to the site plan during TIA development that affect trip distribution, revised trip distributions and site plans must be reviewed by Engineering Services Staff and NCDOT prior to revising the capacity analysis.

## Trip Assignment

Distribute project traffic, for each phase, to the surrounding transportation system based on the site's trip generation estimates and trip distribution percentages. Traffic forecasts for all peak hour conditions at all intersections in the study area shall be included. If the project will be built in phases, traffic assignments shall be reported for each phase. Pass-by traffic shall be included at the driveways and access points for evaluating driveway volumes.

**IV. Capacity Analysis**

Conduct capacity analyses for all study area intersections for existing, future year (no build+1 year), future year (project phase(s)), and future year (build-out+1 year) conditions. Provide a summary table in this section that compares the level of service for all study scenarios.

The TIA report shall use Synchro Software v. \_\_\_\_\_ for measuring level of service at signalized and unsignalized intersections and SimTraffic simulation.

Additional analyses required for the TIA (e.g., safety, SIDRA, etc.):

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**V. Queuing Analysis**

Include future year queuing analysis to determine turn lane impacts using NCDOT’s Traffic Engineering and Safety Systems Branch, Congestion Management Unit current practices and published *Capacity Analysis Guidelines*. Provide a summary table in this section that compares the maximum queues for all study scenarios.

Does the project include drive-through facilities and/or entrance gates or for a new school site which requires additional queuing analysis to ensure peak period stacking is accommodated onsite?

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Additional data needs: \_\_\_\_\_

**VI. Collision Analysis**

Provide a summary of crash data (type, number, and severity) for the most recent 3-year period at each study location is required. For locations with prevalent crash types and/or frequency, include a discussion describing factors that may be contributing to the incidents.

Special data collection and/or analysis requirements:

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**VII. Traffic Signal Warrants**

Required       Not Required

Engineering Services staff and NCDOT may consider potential signal locations. However, traffic flow progression is of paramount importance when considering a new traffic signal location. A new traffic signal should not cause an undesirable delay to the surrounding transportation system. Installation of a traffic signal at a new location shall be based on the application of warrants criteria contained in the most current edition of the Manual on Uniform Traffic Control Devices (MUTCD) and engineering judgment.

Special data collection and/or analysis requirements:

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**VIII. Compliance with Adopted Transportation Plans**

Include a statement of compliance with plans, programs, and policies adopted by the Town of Mooresville for maintaining a safe and efficient multimodal transportation system.

Relevant transportation adopted plans or applicable to the study area:

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**IX. Recommendations**

Provide a clear, concise description of the study’s findings regarding impacts of the proposed project on the existing and proposed transportation system and describe the location, nature, and extent of all mitigation measures recommended to the applicant to improve and/or maintain future year no-build level of service (LOS) conditions through phasing and build-out of the project. Provide a summary table in this section that compares the level of service for all study scenarios.

The applicant is only required to mitigate transportation deficiencies for their development and not unacceptable background conditions or other deficiencies caused by off-site development within the defined study area.

Engineering Services staff and NCDOT will have the ultimate determination in the scope of the required mitigation measures.

Special data collection and/or analysis requirements:

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**X. Appendices**

Include applicable appendices:

- Approved Memorandum of Understanding (MOU) from the mandatory scoping meeting
- Traffic Counts Worksheets
- Field Investigation Notes
- Adjacent Development Traffic Information
- Traffic Signal Plans
- Capacity Analysis Worksheets
- Synchro/SimTraffic Output Files
- Turn Lane Warrants
- Traffic Engineering Accident Analysis System (TEAAS) Report
- Traffic Signal Warrants
- Email and Written Correspondence

Additional information to be included: \_\_\_\_\_

**Submittal Requirements**

The transportation consultant will submit the transportation impact analysis (TIA) report for concurrent review by the Engineering Services staff and the NCDOT. NCDOT reserves the right to send any TIA for review at any time during the TIA process to the Congestion Management section of NCDOT. This may extend the review time.

<b>Submittal</b>	<b>Engineering Services</b>	<b>NCDOT</b>
<b>Traffic Counts and Trip Generation &amp; Distribution</b>	<input checked="" type="checkbox"/> electronic	<input checked="" type="checkbox"/> electronic
<b>Sealed TIA Report</b>	<input checked="" type="checkbox"/> electronic	<input checked="" type="checkbox"/> electronic

The TIA shall be approved if the recommendations from the report will adequately mitigate the site-specific impacts to the public transportation system. The TIA process is not complete until concurrence from the Town and NCDOT has been received and the Mitigation Measures Agreement (MMA) has been signed by all parties.

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**Additional Comments**

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**TOWN OF MOORESVILLE, NORTH CAROLINA | TIA MEMORANDUM OF UNDERSTANDING**

Rev 11/7/2022

**Agreement by All Parties**

The undersigned agree to the contents and methodology described in this Memorandum of Understanding (MOU) for completing the required transportation impact analysis (TIA) supportive of the development application identified herein. Any changes to the above methodology contemplated by the applicant or transportation consultant must be submitted to the Engineering Services Staff and NCDOT Staff in writing and a revised MOU executed before such changes will be accepted for the TIA report. Town Staff and NCDOT Staff reserve the right to reject any TIA that deviates from the details described and agreed upon in this MOU.

Agreed to this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**APPLICANT**

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)

**ENGINEERING SERVICES STAFF**

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)

Reviewed and approved by the North Carolina Department of Transportation, Division 12, District 2 on this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**DISTRICT REPRESENTATIVE**

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)

# TOWN OF MOORESVILLE, NORTH CAROLINA | TIA MITIGATION MEASURES AGREEMENT

Rev 11/7/2022

## Project Information

Project Name: \_\_\_\_\_

Project Location: \_\_\_\_\_

Project Owner: \_\_\_\_\_

Case Number: \_\_\_\_\_

## Applicant Information

Applicant Name: \_\_\_\_\_

Applicant Telephone: \_\_\_\_\_

Applicant Address: \_\_\_\_\_

Applicant Email: \_\_\_\_\_

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The Town of Mooresville, with concurrence from the North Carolina Department of Transportation, and the applicant hereby agree that the information documented herein accurately and completely describes the development project and mitigation measures required to adequately mitigate the site-specific impacts to the public transportation system. The applicant is responsible for the complete implementation of the mitigation measures as a condition of development.

## Development Information

Parcel Size: \_\_\_\_\_ acres

Development Size: \_\_\_\_\_ acres

Proposed development program (include the square footage of each use or the number and size of dwelling units proposed):

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Project Phasing and Anticipated Build-Out:

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## Site Access

Inventory and description of ingress/egress of the site including number driveways, their locations, distances between driveways and intersections, types of driveways (two-way, one-way, etc.), and traffic controls serving the driveways. Internal streets, parking lots, sidewalks and bicycle lanes, and designated loading/unloading areas should also be described. Attach a plan if necessary.

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# TOWN OF MOORESVILLE, NORTH CAROLINA | TIA MITIGATION MEASURES AGREEMENT

Rev 11/7/2022

## Mitigation Measures

Describe the location, nature, extent, and phasing of all transportation improvements required of the applicant by Engineering Services staff and NCDOT to improve and/or maintain future year no-build level of service (LOS) conditions through phasing and build-out of the project. Attach additional pages if needed.

**Phasing:** \_\_\_\_\_

Location: \_\_\_\_\_

Required Mitigation(s): \_\_\_\_\_

\_\_\_\_\_

## Additional Conditions

Describe additional items to be coordinated through the development process.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**TOWN OF MOORESVILLE, NORTH CAROLINA | TIA MITIGATION MEASURES AGREEMENT**

Rev 11/7/2022

**Agreement by All Parties**

The undersigned agree that the final mitigation measures described herein adequately mitigate the site-specific impacts to the public transportation system for the development identified herein and the applicant is responsible for complete implementation of all mitigation measures as a condition of development approval. Any deviation from the development features as described in the final TIA, including but not limited to land uses and site access, must be submitted to the Engineering Services Staff in writing who will then determine if a revised TIA will be required.

Agreed to this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**APPLICANT**

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)

**ENGINEERING SERVICES STAFF**

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)

Concurrence by the North Carolina Department of Transportation, Division 12, District 2 on this day of \_\_\_\_\_, 20\_\_.

**DISTRICT REPRESENTATIVE**

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Print Name)